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Final Environmental Assessment Rangeland Grasshopper and Mormon Cricket Suppression Program

Missouri Slope Assessment Area

Adam, Billings, Bowman, Burke, Burleigh, Divide, Dunn, Emmons, Grant, Golden Valley, Hettinger, McKenzie, McLean, Mercer, Morton, Mountrail, Oliver, Sioux, Slope, Stark, Ward, and Williams County North Dakota

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Acronyms and Abbreviations

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

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Final Site-Specific Environmental Assessment

Rangeland Grasshopper and Mormon Cricket Suppression Program Missouri Slope Assessment Area

I. Need for Proposed Action

A. Purpose and Need Statement

An infestation of grasshoppers or Mormon crickets may occur in the Missouri Slope Assessment Area of North Dakota. 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 forage loss to cattle and wildlife, reduction of cover available to wildlife, and increased soil erosion and benefits of treatments including protection of vegetation. 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 late April to early September of the respective year in North Dakota and will be in effect for the calendar years 2022-2025.

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 2021 Control Program for North Dakota.

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.

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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, and number of livestock in grazing allotment. 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 landowners 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. § 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

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[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.

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

In November 2019, APHIS and the United States Forest Service (USFS) signed a Memorandum of Understanding (MOU) detailing cooperative efforts between the two groups on suppression of grasshoppers and Mormon crickets on National Forest system lands (Document #19-8100-0573-MU, November 6, 2019). This MOU clarifies that APHIS will prepare and issue to the public site-specific environmental documents that evaluate potential impacts associated with proposed measures to suppress economically damaging grasshopper and Mormon cricket populations. The MOU also states that these documents will be prepared under the APHIS NEPA implementing procedures with cooperation and input from the USFS.

The MOU further states that the responsible USFS official will request in writing the inclusion of appropriate lands in the APHIS suppression project when treatment on national forest land is necessary. According to the provisions of the MOU, APHIS can begin treatments after APHIS issues an appropriate decision document.

In October 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 and Mormon crickets on BLM 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 and Mormon cricket populations. The MOU also states that these documents will be prepared under the APHIS NEPA implementing procedures with cooperation and input from the BLM.

The MOU further states that the responsible BLM official will request in writing the inclusion of appropriate lands in the APHIS suppression project when treatment on BLM land is necessary. The BLM must also prepare a Pesticide Use Proposal (Form FS-2100-2) for APHIS to treat infestations. According to the provisions of the MOU, APHIS can begin treatments after APHIS issues an appropriate decision document and BLM prepares and approves the Pesticide Use Proposal.

In September 2016, APHIS and the Bureau of Indian Affairs (BIA) signed a Memorandum of Understanding (MOU) detailing cooperative efforts between the two groups on suppression of grasshoppers and Mormon crickets on BIA lands (Document #10-8100-0941-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 economically damaging grasshopper and Mormon cricket populations. The MOU also states that these documents will be prepared under the APHIS NEPA implementing procedures with cooperation and input from the BIA.

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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 BIA land is necessary. The request should include the dates and locations of all tribal ceremonies and cultural events, as well as "not to be treated" areas that will be in or near the proposed treatment block(s). According to the provisions of the MOU, APHIS can begin treatments after APHIS issues an appropriate decision document.

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

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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 North Dakota, 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

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2019 EIS documents are available for review at 3509 Miriam Avenue, Suite A, Bismarck ND 58501. 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 1 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 North Dakota 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 North Dakota. 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.

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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.

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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 < 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 then be observed for a duration of time to determine efficacy.

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III. Affected Environment

A. Description of Affected Environment

The proposed suppression program area included in this EA encompasses the Missouri Coteau and Southwestern Slope biotic/geomorphic regions encompassing 22 western and central North Dakota counties with a total acreage of 21,133,091 acres, or 33,020 square miles. The counties include Adams, Billings, Bowman, Burke, Burleigh, Divide, Dunn, Emmons, Grant, Golden Valley, Hettinger, McKenzie, McLean, Mercer, Morton, Mountrail, Oliver, Sioux, Slope, Stark, Ward, and Williams. This region exhibits general similarities in geological history, topography, soils, climate, vegetation, natural resources, wildlife, farming and ranching practices, and economy. Appendix B delimits the boundaries and ecoregions of the assessment area. Grasshopper populations commonly occur in economic proportions. Dominant species include: *Melanoplus sanguinipes, Trachyrhachys kiowa, Ageneotettix deorum, Amphitornus coloradus, Aulocara elliotti, Melanoplus bivittatus*, *Eritettix simplex*, *Melanoplus femurrubrum*, and *Camnula pellucida*. The statewide rangeland grasshopper population adult survey is illustrated in Appendix B.

The topography of the assessment area varies from the Little Missouri badlands landscape dominating the western fourth of the area to the rolling uplands of the Missouri Coteau region in central North Dakota. The western area has been deeply eroded by the Little Missouri River and its tributaries. Persistent clay buttes are common in the area with steep slopes that grade to long foot and toe slopes where most grazing occurs. Moving east, the terrain calms to rolling hills with numerous V-shaped valleys, coulees, and narrow ridge tops. Moving further east to the Missouri Coteau, past glaciation is evident by the short, irregular slopes and numerous kettle lakes. The Missouri Coteau marks the westernmost extent of continental glaciation.

The climate of the Missouri Slope is typically semi-arid, and continental characterized by long, cold winters and short, warm summers. The temperature varies widely throughout the year. The area's frost-free season is typically 115-
130 days. The length of daylight ranges from approximately nine hours in December to 12 hours in June. In the spring, the prevailing wind direction is from the east at an average 8-15 miles per hour. Precipitation is quite irregular and averages 16 inches per year with 3/4 of the total occurring during the growing season and one fourth falling in the form of snow. Drought and dry spells are quite common and contribute to grasshopper infestations. Soil texture in the western area is dominated by exposed scoria on butte tops and silt and clay loams as you move to lower areas of the landscape. Moving eastward, the well-drained soils of the rolling areas developed from sandstones, shale, and clays characterized by light color and low organic content. Soil erosion, caused by water and wind action, is often severe in these areas.

The native grass vegetation consists of mixed grass prairie with typical cool and warm season plant species composition. Predominant grass species include blue gramma, needle and thread, western wheat grass, prairie June grass, smooth brome grass, and little blue stem. Crested wheat grass is a common introduced tame grass found throughout the area. Wooded draws are found throughout the western badland's areas while the natural forests in the eastern portions are confined to bottom lands and coulees along streams and rivers, and to the stronger north- facing slopes. Cattle ranching is the dominant agricultural practice throughout the badland's areas due to the rough terrain. The small amount of tillable land is used mostly to produce forage for winter feeding of range cattle. Dryland farming dominates the eastern portion, producing mostly cash crops. Most farms also operate small scale ranching operations.

The Missouri River connects Lake Sakakawea and Lake Oahe which, along with the Little Missouri River and Heart River systems, comprise the largest water bodies in the assessment area. Throughout the assessment area there are many rivers, creeks, lakes, ponds, stock dams, and wetlands, each habitat vital to the livelihood and reproduction of a diverse range of aquatic plants and wildlife. The Missouri Coteau region contains the largest concentration of wetlands in North Dakota. This area is a key feature in the central flyway of North America.

The US Forest Service administers a large amount of public land in the western portion of the assessment area. These lands are extensively used for recreation as well as cattle and oil production. These lands are intermingled with private land, State land, Bureau of Land Management, Corps of Engineers, and National Park Service land creating a mosaic pattern of ownership in this area. Theodore Roosevelt National Park, and other important park service properties and interpretive centers are in the assessment area as well as eight State parks and numerous county managed parks. Additionally, many Federal and State historic sites are located within the assessment area.

B. Site-Specific Considerations

1. Human Health

Human population is sparse throughout most of the assessment area with most people living in small towns and on farms and ranches. The area contains five cities of populations over 13,000. These include Minot, Williston, Dickinson, Mandan, and Bismarck. Groundwater and surface water are the major rural and livestock water source, with wells being a major source of domestic water supplies. No impact is anticipated. Strict adherence to label requirements and USDA treatment guidelines (Appendix 1) will be followed in regard to treatments bordering open surface waters.

Malathion and carbaryl are cholinesterase inhibitors. Cholinesterases (including acetylcholinesterase) are enzymes that function at the nerve synapse. The nerve synapse is the point where information in the form of electrical impulses is relayed or transmitted by chemical messengers (called transmitters) from one nerve cell to another. Cholinesterase then inactivates or destroys the transmitter chemical (like acetylcholine) after it completes its job, otherwise the transmitter would continue indefinitely, and precise control of the enervated tissue (muscle or organ) would be lost. Refer to the guidelines (Appendix 1) for further information on mitigating exposure to cholinesterase inhibitors.

No human health effects are likely from exposure to Dimilin 2L (diflubenzuron) if it is used according to label instructions. A human exposure assessment was done in detail for diflubenzuron and can be found in APHIS's "Chemical Risk Assessment for Diflubenzuron Use in Grasshopper Cooperative Control Program".

2. Nontarget Species

A. Endangered, Threatened, and Proposed Species

The U.S. Fish and Wildlife Service (FWS) has outlined reasonable and prudent measures for APHIS to follow so there will be no adverse effects to these federally listed endangered or threatened species. These are outlined in the June 1, 1987, the August 3, 1990, and the August 29, 1991, Biological Opinions written by the Service and have been adopted in APHIS programs. The State Game and Fish Department may also have protection measures developed for certain federally listed species that will also be adopted in program planning. Before beginning a project, APHIS consults with the North Dakota Game and Fish Department, the United States Fish and Wildlife Service, the US Forest Service or other appropriate land managing agency that has requested a control program for exact locations of any State or Federally listed endangered, threatened, or proposed species or sensitive habitats or areas. APHIS conducts informal conferences with the above-mentioned organizations at the field level as a component of site-specific operations. The purpose of these consultations is to gain insight as to the distributional patterns and exact locations of sensitive species or habitats. Sensitive species include Federal endangered and threatened species, State endangered, threatened and watch species, Federal candidate species, and species and habitats of local concern. These discussions involve the approximate acreage of the project, treatment options, timing of pesticide application (starting and ending dates), and local issues and concerns. United States Fish and Wildlife Service (FWS) and National Marine Fisheries Service (NMFS) Section 7 consultation is ongoing.
The USFWS concurrence letter and species assessment will be included as an Appendix in the final version of this EA, treatments described in this EA will not proceed until we receive their concurrence. APHIS will use this information to implement protection measures as outlined in the biological opinions for federally listed threatened and endangered species. Protection measures for species and habitats of State and local concern will also be developed during these field level conferences. These procedures are designed to ensure no impact to these species. With protection measures in place, there would be no effect to these species.

Table 1. Federally Listed Species Occurring in the Missouri Slope Assessment Area

Federally Listed Species	Scientific Name	Status	Formal ESA Section 7
Black-footed ferret	*Mustela nigripes*	Endangered	ongoing
Gray wolf	*Canis lupus*	Endangered	ongoing
Whooping crane	*Grus americana*	Endangered	ongoing
Pallid sturgeon	*Scaphirhynchus albus*	Endangered	ongoing
Northern long-eared bat	*Myotis septentrionalis*	Endangered	ongoing

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Piping Plover	*Charadrius melodus*	Threatened	ongoing
Red Knot	*Calidris canutus rufa*	Threatened	ongoing
Dakota Skipper	*Hesperia dacotae*	Threatened	ongoing
Greater sage grouse	*Centrocercus*	Candidate	ongoing
Sprague's Pipit	*Anthus spragueii*	Candidate	ongoing
Bald eagle	*Haliaeetus*	Delisted	Protection Act applies

B. Bees

North Dakota often ranks first in the nation in honey production, so the preservation of the honeybee population is critical. Honey production begins to increase in late June as the colonies increase and strengthen and peaks during July when as much as two-thirds of the annual production will be realized.

In North Dakota, all apiarists are required to register the locations of their bee yards with the N.D. Department of Agriculture. In cooperation with the North Dakota State Entomologist, all registered beekeepers in the treatment area are notified twice by letter prior to treatment. A complete ground survey of the area as well as pretreatment reconnaissance flights are also conducted before all programs. Any beekeepers still operating in the area are contacted a third time by phone, fax transmission, or personal contact informing them of the treatment area boundaries and projected treatment dates. For honeybees it is suggested the
apiarists move the beehives at least two miles from any sprayed land to ensure no bee fatalities from drift. For alkali or leaf cutter bees it is suggested the apiarists move them four miles from any sprayed land. With these protection measures, APHIS concludes no adverse effects on honeybees will occur due to chemical alternatives.

C. Weed biological control insectaries

Availability of biological control alternatives to weed and insect management has greatly increased throughout North Dakota and the Western States in recent years. Biological control insectaries have become a consideration in conducting grasshopper treatment projects that use a chemical alternative.

Currently in North Dakota, APHIS, county weed control agencies, and Federal, State, and private land managers are establishing leafy spurge *Euphorbia esula* biocontrol insectaries as well as insectaries for species of insects which help control spotted knapweed *Centaurea maculosa*, purple loosestrife Lythrum salicaria, Canada thistle *Cirsium arvense*, Dalmatian toadflax *Linaria genistifolia ssp dalmatic*, and field bindweed Convolvulus arvensis. These groups will continue to establish insectaries throughout the assessment

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area. The exact number of insectaries is unknown. It will be assumed by APHIS that insectaries could occur in any treatment block.

Research conducted by APHIS Methods Development concluded that *Aphthona spp*. are susceptible to the chemical treatment alternatives including carbaryl bait. Treatments could greatly lower the current season's harvest potential depending on treatment timing. One study has been conducted to determine the effects of program insecticides on the flea beetles, *Aphthona nigriscutis* and *A. lacertosa*. They are used to control leafy spurge, an invasive weed that is spreading on rangeland and other ecosystems in the Western States. Because leafy spurge infestations can occur on rangeland where damaging grasshopper populations may require treatment*, Aphthona* beetles could be exposed to insecticides.

Foster et al. (2001) determined the effect of grasshopper suppression programs on flea beetles addressing issues such as how much flea beetle mortality grasshopper program insecticides cause and how long it takes for flea beetles to return to pretreatment levels. In laboratory tests diflubenzuron produced no substantial flea beetle mortality; malathion spray produced moderate (25 to 41 percent) mortality; and carbaryl spray produced 86 to 96 percent mortality. Field evaluations showed that diflubenzuron resulted in 18 percent mortality at 1-week post-treatment and a full recovery to pre-treatment levels 2 weeks after treatment. Carbaryl bait resulted in 17 percent mortality, carbaryl spray resulted in 60 to 82 percent mortality, and malathion resulted in 21 to 44 percent mortality. In these field evaluations at 1 year after treatment, adult *Aphthona* populations in 23 of 24 plots had surpassed pre-treatment levels.

Site specific conditions or views of cooperators may warrant protection measures such as no treatment buffer zones or augmentation releases of biocontrol agents. Modifications to application patterns would be made only after informal field level consultations with cooperators. RAATs application techniques would also reduce impacts because untreated areas would act as refugia for nontarget species. In addition to pilot briefing, fluorescent orange flagging, a kytoon, and/or radio communications may be used to alert the pilots of the insectary locations.

As per operational procedures (Appendix 1), APHIS will hold public meetings well in advance of any grasshopper treatment program to alert the public and in the process, could learn the whereabouts of any insectaries in the area. Land managers will also be informed about using the available alternatives and the various protection measures at these meetings. APHIS concludes that a grasshopper treatment program should have no adverse effects on the biological control insectaries.

3. Socioeconomic Issues

The control of grasshoppers would have beneficial economic impacts to the farmers and ranchers in the area. The forage not utilized by grasshoppers will be available for livestock and wildlife utilization and harvesting. This will mean reduced competition between domestic stock and wildlife, decreased needs for supplemental feed, and increased monetary returns.

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Mann et al. (1983) used a series of computer models to perform an economic analysis of alternative grasshopper control strategies. Their principal goal was to evaluate Nosema on bran bait as a control alternative, but their analysis encompassed all the currently available control measures, including conventional pesticide sprays and carbaryl bran bait. They also examined the use of various ranch management practices including feeding hay, selling cattle early, reducing the stocking rate, and relocating the herd to other pasture which could offset the effects of a grasshopper infestation on cattle weight gains. These ranch management practices are non-APHIS-funded practices conducted by individual ranchers. Each of the models was quite complex and produced a large amount of output. The models and their respective numerical outputs will not be presented here, but the models will be briefly described and the results and conclusions summarized.

A grasshopper population dynamics model was used to determine the amount and types of range forage lost per day. Stocking rate models were used to estimate the impact of increased stocking rate, in terms of loss of forage to grasshoppers, on cattle weight gains, calf crop, and calf birth weight, and in turn on rancher revenues. A cattle simulation model examined in greater detail the competition between livestock and grasshoppers for range forage. Finally, a linear programming (LP) model of a ranch operation examined optimal ranch resource allocation in response to a grasshopper infestation on a single rangeland pasture. The ranch model represented a smaller that average ranch in Sheridan, Wyoming, and is used here as a case study of a ranch that participates in APHIS' cooperative grasshopper management program.

The modeling results showed that ranchers were able to alleviate income losses under grasshopper infestation through changes in management practices. The stocking rate and cattle simulation models indicated that feeding hay in the fall, increased over-winter feeding, and early marketing of cattle could provide some economic relief from grasshopper infestations. The linear programming models indicated which changes in feeding and stocking patterns would lead to an optimum resource allocation for the entire ranch. Relocating cattle to other available pasture appeared to be most economical in some situations.

However, ranch operations often do not have the option for short-run variations in feeding and selling practices in response to grasshopper infestations. Their flexibility may be limited by contractual arrangements, lead time needed, and uncertainty in estimating grasshopper populations and subsequent impacts. In these instances, ranchers may choose to participate in APHIS' cooperative grasshopper control program.

4. Cultural Resources and Events

A. Historic sites

APHIS will adopt mitigative measures developed through informal consultation with the North Dakota Historical Society pertaining to any registered historical sites that occur in a treatment area. When historic sites occur in the treatment area, maps of the proposed area will be sent for consultation to the North Dakota Historical Society well

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in advance of any project. No adverse effect would be expected to historical sites due to APHIS programs.

B. State parks

Informal consultation with the North Dakota Parks and Tourism Department will dictate the policy APHIS follows pertaining to any proposed treatment area adjoining a State park. APHIS will adopt mitigative measures developed in consultation with the North Dakota Parks and Tourism Department to protect parks from adverse effects. APHIS policy does not allow flyovers of State or National parks.

C. Indian Reservations

Three Indian Reservations exist within the boundaries of the assessment area. They are the Standing Rock Indian Reservation, the Fort Berthold Indian Reservation and the Trenton Indian Service Unit. Prior to any grasshopper treatment program near the reservations, APHIS will alert the Bureau of Indian Affairs and the tribal government as to the precise location of a prospective spray block and adopt any mitigative measures developed through informal consultations.

If treatments are requested by any Indian Agency, the land operations departments of the agency and tribal government will be included in site-specific informal consultations. The land operations departments and tribal governments must concur with each other as to locations of sensitive areas and mitigative measures required prior to control operations.

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.

Minority populations of Native Americans live within the assessment area. Letters of request for treatments must be on file from the tribal government and Bureau of Indian Affairs before grasshopper control activities can begin on reservation land or areas

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managed for traditional Native American activities. Additionally, any protection measures for sensitive people or areas must be agreed upon before operations can begin.

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).

The human health risk assessment for the 2019 EIS analyzed the effects of exposure to children from the three insecticides. Based on review of the insecticides and their use in the grasshopper program, the risk assessment concluded that the likelihood of children being exposed to insecticides is very slight and that no disproportionate adverse effects to children are anticipated over the negligible effects to the general population. Treatments are primarily conducted on open rangelands where children would not be expected to be present during treatment or enter should there be any restricted entry period after treatment. No treatment will occur over congested areas or schools and if appropriate, a buffer zone will be enacted and enforced.

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.

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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

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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

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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).

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

USEPA regulates the amount of pesticide residues that can remain in or on food or feed commodities as the result of a pesticide application. The agency does this by setting a tolerance, which is the maximum residue level of a pesticide, usually measured in parts per million (ppm), that can legally be present in food or feed. USEPA-registered carbaryl products used by the grasshopper program are labeled with rates and treatment intervals that are meant to protect livestock and keep chemical residues in cattle at acceptable levels (thereby protecting human health). While livestock and horses may graze on rangeland the same day that the land is sprayed, 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.

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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

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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

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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.

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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

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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 were 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.

e) Experimental <u>Metarhizium robertsii</u> (isolate DWR2009) 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 isolate 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 treatments utilizing *Metarhizium robertsii* (isolate DWR2009) 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).

f) Experimental LinOilEx Applications

LinOilEx (Formulation 103) is a non-traditional insecticide 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

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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 uses 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.

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

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

The proposed experimental treatments are short-term and would take place in a very limited area. The purpose of the field tests conducted by Rangeland Unit will help determine whether APHIS might eventually include the following as options for the Program: 1) the use of the biopesticide *Metarhizium robertsii* (isolate DWR2009) and 2) 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 these treatment options. Inclusion of effective and more environmentally friendly treatment options would provide the Program additional management options for grasshoppers and Mormon crickets, particularly in sensitive habitats. If successful, the use of these novel treatment options could decrease the amount of chemical insecticides used on rangelands against grasshoppers and Mormon crickets.

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

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

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

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

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

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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.

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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) or the National Marine Fisheries Service (NMFS) (where applicable) to determine if listed species are present in the suppression area, and whether mitigations or protection measures must be implemented to protect listed species or critical habitat.

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

- RAATs are used in all areas adjacent to salmonid habitat
- ULV sprays are used, which are between 50% and 66% of the USEPA recommended rate
- Insecticides are not aerially applied in a 3,500-foot buffer zones for carbaryl or malathion, or applied within a 1,500-foot buffer zones for diflubenzuron along stream corridors

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- Insecticides will not be applied when wind speeds exceed 10 miles per hour. APHIS will attempt to avoid insecticide application if the wind is blowing towards salmonid habitat
- Insecticide applications are avoided when precipitation is likely or during temperature inversions

APHIS determined that with the implementation of these measures, the grasshopper suppression program may affect, but is not likely to adversely affect listed salmonids or designated critical habitat in the program area. NMFS concurred with this determination in a letter dated April 12, 2010.

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

APHIS considers the role of pollinators in any consultations conducted with the FWS to protect federally listed plants. Mitigation measures, such as no treatment buffers are applied with consideration of the protection of pollinators that are important to a listed plant species.

7. Bald and Golden Eagle Protection Act

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

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

8. Additional Species of Concern

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

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

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

APHIS 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.

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).

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The safety data sheet for each insecticide identifies these combustion products for each insecticide as well as recommendations for PPE. The PPE is similar to what typically is used in fighting wildfires. Material applied in the field will be at a much lower concentration than what would occur in a fire involving a concentrated formulation. Therefore, the PPE worn by rangeland firefighters would also be protective of any additional exposure resulting from the burning of residual insecticides.

10. Cultural and Historical Resources

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

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Appendix A : APHIS Rangeland Grasshopper and Mormon Cricket Suppression Program

FY-20XX Treatment Guidelines
Version DD/MM/YYYY

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 / landowner 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

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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.

<u>Operational Procedures</u>

GENERAL PROCEDURES FOR ALL AERIAL AND GROUND APPLICATIONS

1) Follow all applicable Federal, Tribal, State and local laws and regulations in conducting grasshopper and Mormon cricket suppression treatments.
2) Notify residents within treatment areas, or their designated representatives, prior to proposed operations. Advise them of the control method to be used, proposed method of application, and precautions to be taken.
3) One of the following insecticides that are labeled for rangeland use can be used for a suppression treatment of grasshoppers and Mormon crickets:
   a) Carbaryl
      i) solid bait
      ii) ultra-low volume (ULV) spray
   b) Diflubenzuron ULV spray
   c) Malathion ULV spray

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

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Furthermore, provide the following buffers for water bodies:

- 500-foot buffer with aerial liquid insecticide.
- 200-foot buffer with ground liquid insecticide.
- 200-foot buffer with aerial bait.
- 50-foot buffer with ground bait.

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

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

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

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

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

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

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

SPECIFIC PROCEDURES FOR AERIAL APPLICATIONS

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

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

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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.

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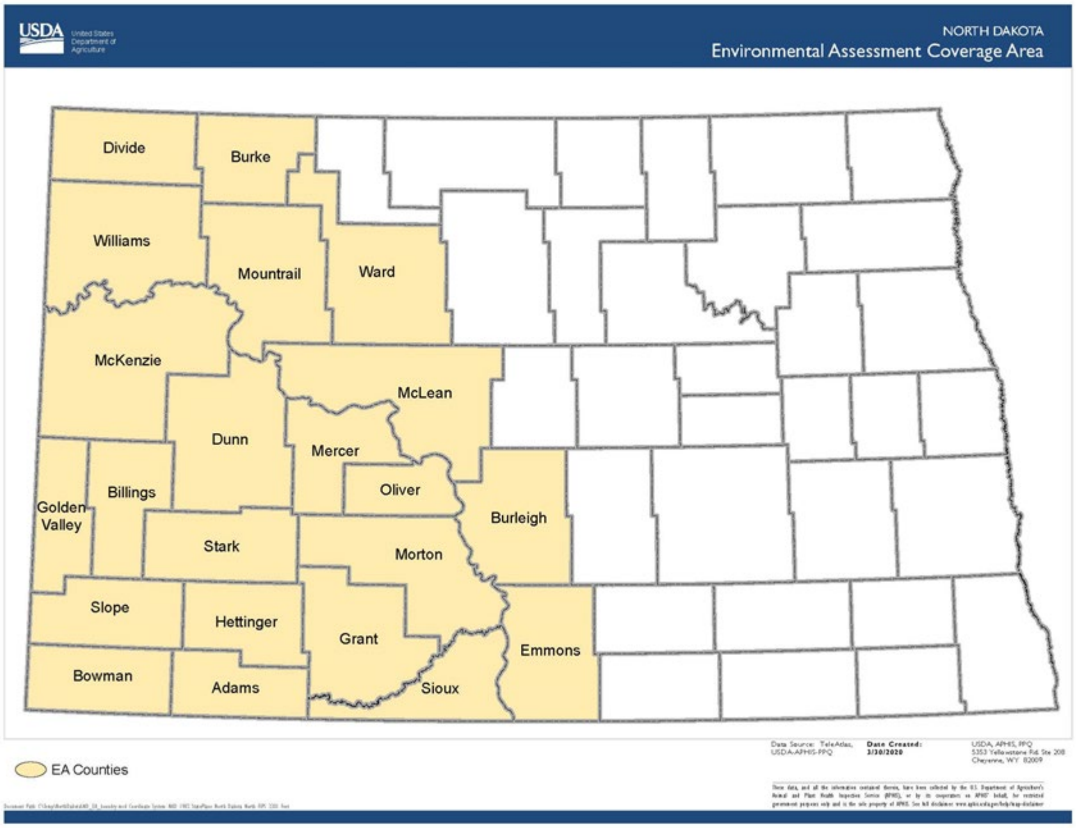
Appendix B: Map of the Affected Environment



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Appendix C: Biological Assessment

2022 Biological Assessment for Federally Listed Threatened or Endangered Species in North Dakota

The goals of the cooperative grasshopper management programs are consistent with recovery plans formulated for sensitive species. Federally listed endangered species (3 species) under this heading include the whooping crane *Grus americana*, black- footed ferret *Mustela nigripes*, the gray wolf *Canis lupus,* the Northern long-eared Bat, *Myotis septentrionalis*, in addition, there are three Federally threatened species listed which are*,* the piping plover *Charadrius melodus,* the Dakota Skipper, *Hesperia dacotae,* and the rufa red knot, *Calidris canutus rufa.* The pallid sturgeon *Scaphirhynchus albus* is an endangered aquatic species that is discussed under aquatic species in this EA. The bald eagle, *Haliaeetus leucocephalus* was listed as a Federal endangered species in March 1967. Since its original listing, bald eagle populations have recovered significantly, and the species status has been changed to Delisted. Although delisted, The Bald and Golden Eagle Protection Act (BGEPA, 16 U.S.C. 668-668c) remains in effect.

The U.S. Fish and Wildlife Service (FWS) has outlined reasonable and prudent measures for APHIS to follow so there will be no adverse effects to these federally listed endangered or threatened species. These are outlined in the June 1, 1987, the August 3, 1990, and the August 29, 1991, Biological Opinions written by the Service and have been adopted in APHIS programs. The State Game and Fish Department may also have protection measures developed for certain federally listed species that will also be adopted in program planning.

Before beginning a control program, APHIS will consult with FWS and other relevant land managing agencies five days prior to treatment. This will identify the exact location of the requested control program and any State or Federally listed endangered, threatened, or proposed species or sensitive habitats or areas.

APHIS conducts informal conferences, with organizations impacted by the potential control program, at the field level as a component of site-specific operations. The purpose of these consultations is to gain insight as to the distributional patterns and exact locations of sensitive species or habitats. These discussions involve the approximate acreage of the project, treatment options, timing of pesticide application (starting and ending dates), and local issues and concerns. APHIS will use this information to implement protection measures as outlined in the biological opinions for federally listed threatened and endangered species. These procedures are designed to ensure no impact to these species. With protection measures in place, there would be no effect to these species.

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Table 1. Federally Listed Species Occurring in the Missouri Slope Assessment Area

Federally Listed Species in Assessment Area	Scientific Name	Status
Black-footed ferret	*Mustela nigripes*	Endangered
Gray wolf	*Canis lupus*	Endangered
Bald eagle	*Haliaeetus leucocephalus*	Recovered
Whooping crane	*Grus americana*	Endangered
Piping plover	*Charadrius melodus*	Threatened
Pallid sturgeon	*Scaphirhynchus albus*	Endangered
Red Knot	*Calidris canutus rufa*	Threatened
Dakota Skipper	*Hesperia dacotae*	Threatened
Northern long-eared	*Myotis septentrionalis*	Endangered

A. Mammals

1. Black-footed ferret *Mustela nigripes*

The black-footed ferret was declared endangered as early as 1967. It was analyzed in the January 1987 APHIS Biological Assessment for possible effects resulting from the Rangeland Grasshopper Cooperative Management Program.

Black-footed ferrets are closely associated with the prairie dog towns and spend much of their time underground in prairie dog constructed burrows. Food consists of prairie dogs, with other small mammals making up the remainder of the diet (Chapman and Feldhamer 1982).

The major concern with the decline of this species is the reduction and local eradication of prairie dogs; therefore, this assessment evaluates any adverse effects a grasshopper control program might exert on the black-footed ferret or its habitat.

Toxic effects of the authorized insecticides used in grasshopper control programs on the black-footed ferret or on prairie dog populations are not expected.

Prairie dogs are known to feed upon the target organisms of the program and the prairie dog prey base for the ferret could conceivably be lessened (Burt and Crossenheider 1976). However, because the prairie dog's primary sources of food are forbs and grasses, an effective grasshopper control program in the area might have the effect of actually assisting the maintenance of the prairie dog colony by conserving available food.

Protection Measures:

Black-footed ferrets are not known to occur in North Dakota. The APHIS/FWS ESA formal consultations concluded that the species continued existence would not be jeopardized by the proposed program if program personnel consulted with local FWS as to the existence and exact location of any black-footed ferrets prior to any control programs. APHIS will adopt these measures and will consult at least five days prior to any treatments in North Dakota to develop adequate protection measures for documented and verified occurrences of the ferret. These measures should ensure that treatments may affect, will Not Likely to Adversely Affect the any ferrets or their habitats.

2. Gray Wolf *Canis lupus*

The gray wolf (also known as the timber wolf) was listed as endangered on March 11, 1967. The listing was clarified March 9, 1987, to include all subspecies under one species, *Canis lupus*.

The gray wolf or timber wolf is a member of the Canidae family and resembles a large dog, but differs in having relatively longer legs, larger feet, and narrower chest. Wolves also have tails that are straight rather than curved upward posteriorly like those of dogs. Total length is about 51 to 71 inches, and weight is above 44 to 176 pounds.

Gray wolves do not seem particular about habitat. They originally occurred in arctic tundra, taiga, plains or steppes, savannahs, and hardwood, softwood, and mixed forests. Wolves now usually inhabit remote terrain. They are difficult to locate and move over great distances. Two specifics which appear to be in common in the various habitats include abundance of prey, and minimal contact with human interest, especially livestock.

The primary objective of the 1980 recovery plan for the wolf is reestablishing at least two populations within its former range and reestablishing populations in suitable areas within the former range where it does not presently exist.

The decline of wolf populations is primarily due to the spread of domestic livestock. In the past, wolves were exterminated where sheep and cattle were raised.

Protection Measures:

Gray wolves are not known to occur in the project area, and it is unlikely that gray wolves will have any contact with the grasshopper control program. Should any wander into a treatment area, there will be no effect to the continued existence of this species as a consequence of the insecticide application, nor will the habitat of the gray wolves be affected.

The June 1, 1987, FWS Biological Opinion concurs with this assessment that the action may affect, is Not Likely to Adversely Affect the gray wolf.

3. Northern long-eared bat *Myotis Septentrionalis*

The northern long-eared myotis is a small bat, typically 5-10 g and 84 mm in total length. The fur is dull brown on the dorsum and yellowish on the venter. Compared to other Myotis species, these bats have long ears with a relatively long tragus in each ear.

This species has been recommended by the United States Fish and Wildlife Service for listing under section 4(d) of the Endangered Species Act. A final decision was published in the Federal Register, listing the species as Threatened effective 30 days from the date of the publication (starting May 4, 2015).

Females give birth to 1 pup each summer and often form large maternity colonies (30-60 individuals) consisting mainly of females and their young. In the fall, northern long-eared bats migrate to caves to hibernate. Migration distances are not known for this species.

Northerns are often found roosting singly in caves, rather than in the large clusters typical of other *Myotis* species, like *Myotis sodalis.*

Northern long-eared bats are well-suited to foraging in the forest interior. Echolocation calls have a classic frequency-modulated structure that allows these bats to navigate through cluttered environments. Further, their small size allows for more agility in dense vegetation. Long ears allow these bats to find even stationary insects. Northerns' diets are focused on moths, which they often capture by gleaning, or plucking, the insects from a surface. Gleaning is a unique foraging habit for insectivorous bats since many capture their prey in flight.

Protection Measures:

There are presently no confirmed northern long-eared bat populations in North Dakota. Suitable habitat may be found in the Turtle Mountains, which is outside of the area covered under this EA, and the riparian corridors of the Little Missouri and Missouri rivers, where program activities already require a .25-mile buffer along the waterways.

Based on information presented it appears that the probability is extremely low that the northern long eared bats would be encountered in areas potentially affected by the rangeland grasshopper program. But even in areas in which the grasshopper program and the bat's reported distribution overlap, the species reported reliance on intact interior forests and harborages such as cave or mines describes a habitat that is not present in the rangeland portions of the grasshopper survey area in which suppression might actually be conducted.

APHIS PPQ has submitted a Biological Assessment to FWS which includes this species and is awaiting a final determination. No buffers for treatments have been proposed for this species due to the low mammalian toxicity of the treatment alternatives and that treatment operations will not occur when the bat is present.

As with other sensitive species or species of local concern, APHIS will conduct informal field level conferences with the FWS and the US Forest Service to develop site-specific protection measures for the Northern long eared bat. Any protection measures as developed during those consultations will be adopted. With informal consultation conducted prior to treatment, and protection measures in place, the determination is the program may affect, is Not Likely to Adversely Affect the Northern long eared bat.

B. Birds

1. Bald Eagle *Haliaeetus leucocephalus*

The bald eagle was listed as a Federal endangered species in March 1967. Since its original listing, a recovery program was initiated that has been very successful. Bald eagle populations have recovered significantly, and the species status has been changed to Delisted.

Protection Measures:

Although delisted, the following act remains in effect: The Bald and Golden Eagle Protection Act (BGEPA, 16 U.S.C. 668-668c), enacted in 1940, and amended several times since then, prohibits anyone, without a permit issued by the Secretary of the Interior, from "taking" bald eagles, including their parts, nests, or eggs. The Act provides criminal and civil 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." The Act defines "take" as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb." "Disturb'' means: "Disturb 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." In addition to immediate impacts, this definition also covers impacts that result from human-induced alterations initiated around a previously used nest site during a time when eagles are not present, if, upon the eagles return, such alterations agitate or bother an eagle to a degree that injures an eagle or substantially interferes with normal breeding, feeding, or sheltering habits and causes, or is likely to cause, a loss of productivity or nest abandonment.

As listed in the National Bald Eagle Management Guidelines (USFWS, May 2007) the following mitigation measures will be followed when practical. Category G. Helicopters and fixed-wing aircraft. Except for authorized biologists trained in survey techniques, avoid operating aircraft within 1,000 feet of the nest during the breeding season, except where eagles have demonstrated tolerance for such activity. In addition, Category A (Agriculture) and Category D (Off Road Vehicle Use) both provide the same guidance for use of ATV's or trucks: No buffer is necessary around nest sites outside the breeding season. During the breeding season, do not operate off-road vehicles within 330 feet of the nest. In open areas, where there is increased visibility and exposure to noise, this distance should be extended to 660 feet.

No toxic effects are anticipated on the bald eagle as a direct consequence of the insecticide treatment. Toxic effects on the principal food source, fish, are not expected since insecticide treatments will not be conducted over rivers or lakes.

Specific nesting sites and foraging areas would be identified through contacts with local FWS field offices at least five days prior to treatments.

APHIS believes the use of low-toxicity compounds, use of RAATs application strategies, and the limited duration of the treatment would adequately protect the eagle and its habitat, and thus, grasshopper control operations may affect, is Not Likely to Adversely Affect the bald eagle or its habitat.

2. Whooping crane *Grus americana*

The whooping crane was listed as a Federal endangered species in June 1970. It is one of the rarest and largest birds in the world.

Like many other wading birds, the whooping crane subsists on a diet of blue crabs, clams, frogs, or fish, depending on seasonal availability. Whooping crane decline has been associated primarily with the following human-related factors: human disturbance, habitat modification, hunting, and specimen collection. It is likely that loss of breeding and wintering areas to agriculture land use has been a major factor in whooping crane decline.

Although it was expected that agricultural chemicals from adjacent croplands would contaminate coastal habitats, all tissue samples and egg contents analyzed show pesticide residues well below that of other migratory bird averages. No changes in egg thicknesses have been observed. To date, there is no evidence suggesting pesticide contamination has adversely affected the welfare of the whooping crane.

The few remaining wild whooping crane breeding populations annually migrate between breeding grounds in Wood Buffalo National Park, Canada and Matagorda Island, Texas. Migrations occur in April and again in September, therefore based on the timing of a proposed grasshopper treatment project, it is assumed all whooping cranes will have continued their migration pattern and should be out of any proposed treatment area. As an added precaution, APHIS will ensure that no whooping cranes have wandered into treatment areas through informal consultation with Federal and State wildlife agencies.

Protection Measures:

- Carbaryl ULV: An aerial application buffer of ½ mile (2,640 feet) and a 500-foot buffer for ground applications will be implemented at the edge of known locations or their critical habitat.
- Carbaryl bait: A treatment buffer of 750 feet and a 500-foot ground buffer will be implemented at the edge of known locations or their critical habitat.
- Dimilin 2L: A 1,000-foot aerial and 500-foot ground buffer will be implemented at the edge of known locations or their critical habitat.
- Malathion: A ½ mile (2,640 feet) aerial and 500-foot ground buffer will be implemented at the edge of known locations or their critical habitat.

No disturbance to the whooping crane and its habitat is projected due to: (1) the absence of the crane from treatment areas during the insecticide applications, (2) the elimination of critical habitats and wildlife refuges from the treatment area,

(3) the avoidance of lakes and rivers, and resultant lack of effect on food sources of the whooping crane, (4) the crane's observed ability to tolerate infrequent encroachment by aircraft, (5) lack of evidence to suggest that agro-chemicals or past programs have ever been factors in the species decline, (6) use of low- toxicity compounds, and (7) use of RAATs application strategies. Thus, the grasshopper control programs is Not Likely to Adversely Affect the whooping crane or have adverse modifications to its critical habitat.

As with other sensitive species or species of local concern, APHIS will conduct informal field level conferences with the FWS and the US Forest Service to develop site-specific protection measures for the whooping crane. Any protection measures as developed during those consultations will be adopted. With informal consultation conducted prior to treatment, and protection measures in place, the APHIS determination is the grasshopper program may affect, is Not Likely to Adversely Affect the Whooping Crane.

3. Piping plover *Charadrius melodus*

The piping plover was listed as a threatened species in December 1989. The decline of piping plover has been associated with habitat loss or modification and to a lesser degree with hunting pressure. Level, sparsely vegetated ground near water, relative freedom from terrestrial predators and human disturbance, and an adequate prey base are considered essential (USDA 1986).

Protection Measures:

- Carbaryl ULV: An aerial application buffer of 1/4 mile (1,320 feet) and a 500-foot buffer for ground applications will be implemented around suitable habitat.
- Carbaryl bait: A treatment buffer of 500-foot aerial and ground buffer will be implemented around suitable habitat.
- Dimilin 2L: A treatment buffer of 500-foot aerial and ground buffer will be implemented around suitable habitat.
- Malathion: An aerial application buffer of 1/4 mile (1,320 feet) and a 500-foot buffer for ground applications will be implemented around suitable habitat.

A buffer of 0.5 mile is recommended during nesting season (April 15-August 15) for all on-the-ground applications (UTVs, foot, etc) in occupied habitat, to avoid crushing eggs and nestlings and harassment. To determine the specific nesting areas, APHIS personnel will contact the local FWS and US Forest Service office and at least five days prior to program activities. APHIS believes these measures, along with the use of low-toxicity compounds, use of RAATs application strategies, and a limited duration of the project, should adequately protect the piping plover and its breeding habitat from program effects.

As with other sensitive species or species of local concern, APHIS will conduct informal field level conferences with the FWS and the US Forest Service to develop site-specific protection measures for the piping plover. Any protection measures as developed during those consultations will be adopted. With informal consultation conducted prior to treatment, and protection measures in place, the APHIS determination is the grasshopper program may affect, is Not Likely to Adversely Affect the piping plover.

4. Rufa Red Knot *Calidris canutus rufa*

The U.S. Fish and Wildlife Service placed the rufa red knot on the Threatened list for the Endangered Species Act on January 12, 2015. The reasons for the rufa red knot listing were varied; habitat degradation, loss of key food supplies, and threats posed by climate change and sea level rise were all listed as factors that were considered when the rufa red knot was listed.

The red knot (*Calidris canutus*) (just knot in Europe) is a medium-sized shorebird which breeds in tundra and the Arctic Cordillera in the far north of Canada, Europe, and Russia. On the breeding grounds, knots eat mostly spiders, arthropods, and larvae obtained by surface pecking, and on the wintering and migratory grounds they eat a variety of hard-shelled prey such as bivalves, gastropods and small crabs that are ingested whole and crushed by a muscular stomach.[18]

Late in the fall of 2014, the rufa red knot was listed as a federally threatened species under the United States Endangered Species Act.. This followed a decade of intensive petitioning by environmental groups and a lawsuit against the Department of the Interior for alleged negligence in the protection of endangered species through failure to evaluate and list them.

Protection Measures:

APHIS PPQ has submitted a Biological Assessment to FWS which includes this species and is awaiting a final determination. APHIS is proposing a Not Likely to Adversely Affect determination. No protection measures were proposed as program activities would likely not overlap this species habitat. As with other sensitive species or species of local concern, APHIS will conduct informal field level conferences with the FWS and the US Forest Service to develop site-specific protection measures for Rufa red knot.

Any protection measures as developed during those consultations will be adopted. With informal consultation conducted prior to treatment, and protection measures in place, the APHIS determination is the grasshopper program may affect, is Not Likely to Adversely Affect Rufa red knot.

C. Aquatic Species

Pallid Sturgeon *Scaphirhynchus albus*

The only listed aquatic species in the assessment area is the pallid sturgeon. The pallid sturgeon was declared endangered September 6th, 1990. The pallid sturgeon occurs in the Missouri, Mississippi, and Yellowstone Rivers. The Missouri and Yellowstone Rivers run through or are bordered by eleven North Dakota counties: Burleigh, Dunn, Emmons, McKenzie, McLean, Mercer, Morton, Mountrail, Oliver, Sioux, and Williams.

Threats to the continued existence of the pallid sturgeon include habitat modification by activities which tend to change river flow such as canalization and impoundments.

Protection Measures:

- Carbaryl ULV: An aerial application buffer of ½ mile (2,640 feet) and a 300-foot buffer for ground applications will be implemented around occupied habitat.
- Carbaryl bait: A treatment buffer of 750 feet and a 100-foot ground buffer will be implemented around occupied habitat.
- Dimilin treatments: A ¼ mile (1,320 feet) aerial and 200-foot ground buffer will be implemented around occupied habitat.
- Malathion: A ½ mile (2,640 feet) aerial and 500-foot ground buffer will be implemented around occupied habitat.

As with other sensitive species or species of local concern, APHIS will conduct informal field level conferences with the FWS and the US Forest Service to develop site-specific protection measures for the pallid sturgeon. Any protection measures as developed during those consultations will be adopted. With informal consultation conducted prior to treatment, and protection measures in place, the determination is the program may affect, is Not Likely to Adversely Affect the pallid sturgeon.

D. Insects

1. Dakota skipper *Hesperia dacotae*

The U.S. Fish and Wildlife Service placed the Dakota Skipper butterfly on the Threatened list for the Endangered Species Act on November 24, 2014. This was based on declining populations from development of native prairie for grazing, herbicide use and building.

The Dakota Skipper is a small to medium-sized North American butterfly. It has a wingspan of approximately one inch and the antennae form a hook. The male's wings are a tawny-orange to brown on the forewings with a prominent mark and dusty yellow on the lower part of the wing. The female wing is a darker brown-orange and white spots on the forewing margin.

The adult Dakota Skippers are active for about three weeks in June and July which is their total adult life. Their eggs, which are laid on the underside of leaves, are hatched in July and the caterpillar larvae feed on native grass until they go dormant in late summer. The caterpillar larvae then winter in shelters very close to the ground. In spring they come out of dormancy in their adult form. They are found in healthy natural tall grass and prairie grass from Minnesota to Saskatchewan. They are now considered extinct in Illinois and Iowa. The largest most stable population is now found in North Dakota.

The Dakota skipper is listed as threatened based on habitat loss and degradation of native prairies and prairie fens, resulting from conversion to agriculture or other development; ecological succession and encroachment of invasive species and woody vegetation primarily due to lack of management; past and present fire, haying, or grazing management that degrades or eliminates native prairie grasses and flowering forbs; flooding; and groundwater depletion, alteration, and contamination. Other natural or manmade factors, including loss of genetic diversity, small size and isolation of sites, indiscriminate use of herbicides such that it reduces or eliminates nectar sources, climate conditions such as drought, and other unknown stressors. Finally existing regulatory mechanisms are inadequate to mitigate this species.

Nine of the twenty-two counties covered by this EA are positive for presence of Dakota skipper: Burke, Burleigh, Dunn, Emmons, McKenzie, McLean, Mountrail, Oliver, and Ward. Nineteen additional counties in ND are positive for Dakota skipper presence but are outside the coverage area of this EA, APHIS does not conduct grasshopper activities in those counties.

Formal Section 7 Consultation has not yet been completed at the National level. APHIS PPQ has submitted a Biological Assessment to FWS which includes this species and is awaiting a final determination. The following are the protection measures proposed in that assessment for the Dakota skipper:

Protection Measures:

- Carbaryl ULV: An aerial application buffer of 1.0 mile and a 750 ft. buffer for ground applications will be implemented around suitable habitat.
- Carbaryl bait: A treatment buffer of 500 ft. aerial and 250 ft. ground will be implemented around suitable habitat.
- Dimilin 2L: A treatment buffer of 1.0-mile aerial and a 750 ft. ground will be implemented around suitable habitat.
- Malathion: A treatment buffer of 1.0-mile aerial and a 750 ft. ground will be implemented around suitable habitat.

As with other sensitive species or species of local concern, APHIS will conduct informal field level conferences with the USFWS to develop site-specific protection measures for the Dakota skipper. With the informal consultation conducted prior to treatment, and protection measures in place, the determination is the program may affect, is Not Likely to Adversely Affect the Dakota Skipper.

E. Plants

Information available from the FWS and the North Dakota Game and Fish Department indicate there are no Federally listed endangered, threatened, or proposed plant species occurring in the assessment area.

Plant species of local management will be addressed in informal consultations with the US Forest Service, State Game and Fish Department and the Fish and Wildlife Service. Policies or recommendations developed at these meetings will be adopted by APHIS for the protection of sensitive plant species. Under the no action alternative, grasshoppers could damage or destroy sensitive plant species.

Malathion, carbaryl, and Dimilin® are highly toxic to bees that may be pollinators of endangered or threatened plants. Operational procedures have been developed to protect domestic bees (Appendix 1), but wild pollinators may be impacted. Wild pollinators are likely to move back into the area quickly after treatment (FEIS 2002), as only a small percentage of their range would be treated. RAATs application techniques would also provide untreated strips in the control block that would allow pollinators and other non-target insects to recolonize treated areas.

Appendix D: USFWS Concurrence Letter

United States Department of the Interior

FISH AND WILDLIFE SERVICE
North Dakota Ecological Services Field Office
3425 Miriam Avenue
Bismarck, North Dakota 58501
(701) 250-4481, ndfieldoffice@fws.gov

IN REPLY REFER TO:
2022 Rangeland Grasshopper
Environmental Assessment

April 6, 2022

Donald G. Anderson
Plant Health Safeguarding Specialist
USDA, APHIS, PPQ
3509 Miriam Ave, Suite A.
Bismarck, ND 58501

Dear Mr. Anderson:

Thank you for the opportunity to comment on the 2022 Rangeland Grasshopper Environmental Assessment for the Missouri Slope Assessment Area. The U.S. Fish and Wildlife Service (FWS) has the following comments.

The FWS offers these comments under the authority of and in accordance with the Endangered Species Act (ESA) (16 U.S.C. 1531 *et seq*.). You requested FWS concurrence with your "may affect, not likely to adversely affect" determination for the species listed in the columns below. In accordance with Section 7 of the Endangered Species Act of 1973, as amended(ESA) (16 U.S.C. 1531 *et seq*.), we concur with your determination for the below listed species.

Black-footed ferret	*Mustela nigripes*
Gray wolf	*Canis lupus*
Whooping crane	*Grus americana*
Pallid sturgeon	*Scaphirhynchus albus*
Northern long-eared bat	*Myotis septentrionalis*
Piping plover	*Charadrius melodus*
Rufa red knot	*Calidris canutus rufa*
Dakota skipper	*Hesperia dacotae*

The Service appreciates the opportunity to work with you as part of our joint responsibilities under ESA to conserve threatened and endangered species and their habitats. If you have any further questions, please contact Lauren Toivonen at (701) 355-8573 or Lauren_Toivonen@fws.gov, or contact me at (701) 355-8512 or Drew_Becker@fws.gov.

Sincerely,

DREW BECKER Digitally signed by DREW BECKER
Date: 2022.04.08 11:29:48 -05'00'

Drew Becker
North Dakota Ecological Services Office Supervisor

Appendix E: BLM Stipulations

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 North Dakota 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 are 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.

ModifyAPHIS EA ND-22-1
DD: 05/20/2022

Chapter	Page	Line	Commenter	Comment/Suggested Revision	Accept/Modify /Reject
1	1	13	Paul Barnhart	States that economic impacts are the reason for grasshopper suppression on the rangeland ecosystems. There should be information here about how the use of grasshopper suppression also has ecological benefits.	Modify
1	1	25	Paul Barnhart/Cory Neuharth	States "2021", should be 2022.	Done
1	1	31-33	Paul Barnhart	Is the citation (Belovskey et al. 1996) for research to document that grasshoppers and mormon crickets can occur at high population levels or that those high population levels result in "competition with livestock and other herbivores for rangeland forage and can result in damage to rangland plant species"? If it is intended for the latter, the citiation should go at the end of the sentence. If the citation is only referring to the fact that grasshoppers go through boom-and-bust cycles then this sentence will need more/another citation at the end to document the damage to rangeland plants and herbivores.	Reject
1	2	5-8	Paul Barnhart	I would imagine that there are research papers out there that connect grasshopper population booms to environmental factors such as drought, rainfall, last year's population levels, etc. We need to frame this approach using the best available science or at least state that no science exists.	Reject
1	2	20-21	Paul Barnhart	Similar to my first comment, I think it is important to not just frame the need in terms of economics but also ecology.	Reject

Chapter	Page	Line	Commenter	Comment/Suggested Revision	Accept/Modify /Reject
1C	5	13-17	Paul Barnhart	Will this scoping process occur before the implementation of insecticides on the landscape? Perhaps make that more clear.	Done
2B	6	30	Paul Barnhart	Perhaps make reference to a future section in the EA that describes the understanding and use of techniques to minimize impacts to non-target insects.	Reject
2C	8	17	Paul Barnhart	Define what is meant by “greener”.	Done
2C	10	1	Paul Barnhart	Typo. “At” should be “As”.	Done
3A	11	12	Paul Barnhart	Please define “...economic proportions.”	Reject
3A	11	27-28	Paul Barnhart	Formatting, strange space between “...115-130 days.” in pdf version.	Done
3B2A	13	21-23	Paul Barnhart	*Since consultation is now complete, this should be reworded.*	Accept: will be in final EA
3B2B	14	Bee Secti on	Paul Barnhart	This section should not just be concerned with the economic bees on the landscape but also the fact that certain bee species are being considered for listing with the USFWS and others as Sensitive Status Species with agencies such as USFS, BLM, NDGF.	Reject
3B3	15	6	Paul Barnhart	I would suggest using more contemporary sources. Computer models from 1983 are not rigorous enough to make contemporary management decisions.	Reject
4A1	19	20	Paul Barnhart	Vegetation damage is a natural process and so is the boom and bust cycles of grasshoppers. Disturbance is natural and important in the grassland ecosystem. I would suggest rewording to accurately reflect the true need for grasshopper suppression.	Reject
4A2	21	2-5	Paul Barnhart	The studies mentioned are fairly old and outdated. Are there not more current studies that look at insecticide use on bird populations?	Reject
4B1	32	12-22	Paul Barnhart	Have there been studies on the cumulative impacts? Bioaccumulation cannot just simply be ignored here and this is probably the most important, wildlife related, paragraph in the EA. How do we know that APHIS control is not impacting populations in a cumulative nature? There needs to be proof of concept here, not speculation.	Reject

Chapter	Page	Line	Commenter	Comment/Suggested Revision	Accept/Modify /Reject
4B6	36	3-6	Paul Barnhart	There needs to be more information and peer review of this short paragraph. Pollinators are impacted by insecticide usage and should have more representation here.	Reject
4B7	36	18	Paul Barnhart	Silent Spring would argue that no direct impacts are expected. Avoiding waterbodies is not enough to avoid toxic effects to birds. I would consider rewriting and including literature to back up this claim.	Reject
6	45	1-5	Paul Barnhart	Bureau of Land Management is not listed as a consulted agency.....	Accept, will be in final EA
Appendix D- A3	10	22	Paul Barnhart	"There is presently no confirmed northern long-eared bat populations in North Dakota." This statement is just blatantly false; I personally have 12 years of publications that are in the literature that document the occurrence of the species in the state. This whole section needs to be rewritten with current information; I would also believe that if this information was used by the USFWS for concurrence, they should be updated with this new information.	Info supplied by USFWS during consultation
1	1	??	Cory Neuharth	*North Dakota and will be in effect for the calendar years 2022-2025*.----**Questions about being a 4 year EA,rather than an annual review/update. Why?**	APHIS policy
1	3	???	Cory Neuharth	*In October January 2022*,---- Grammar fix only. Just need to remove the word "October" from the beginning of the sentence. `	Done
2	7	???	Cory Neuharth	All sensitive sites are buffered out of the treatment area using flagging which is highly visible to the applicator----Do we need designated buffer zone distances depending on the resource being protected? We have different buffer zone sizes for herbicide ground applications.	Reject
3	14	???	Cory Neuharth	culturally sensitive sites and other sensitive groups will be avoided or buffers will be established to prevent exposure after consultation with the appropriate agencies.--Again, does a designated buffer zone need to be determined?	Reject

Chapter	Page	Line	Commenter	Comment/Suggested Revision	Accept/Modify /Reject
6	49	???	Cory Neuharth	There is NO listing of the BLM being an agency or persons consulted on the document??	Accept: will be in final EA
VI	49		Wendy Velman	BLM was not Consulted as an agency to participate in developing this EA, as stated in the 2022 MOU between APHIS and BLM – Article 6 – APHIS Responsibility section d. on page 4 states "These documents will be prepared under the APHIS NEPA implementing regulations with coordination and input from BLM." BLM wants to be participatory in developing grasshopper EAS to reduce time and effort needed at the time an application is received that includes BLM lands. I am attaching some recommended additions – an Appendix similar to what was developed with APHIS in MT 2020-2022. If there is a treatment request that would include BLM lands, the BLM local field office (South Dakota Field Office) needs time to review the specific location requested and evaluate the site for specific resource concerns not addressed in the EA specifically. I am also attaching the 2020 BLM MT/DKs Special Status Species list, which includes species not included into the analysis that need to be taken into consideration if BLM lands are included into a treatment area. Unless analysis is done for these species, treatments could not be applied on BLM lands where these species occur.	Done

Appendix F: Comments received during the open comment period

USDA, APHIS, PPQ North Dakota received a joint response to the 2022 Draft EA (ND-22-01) from the Xerces Society/ American Bird Conservancy/Center for Biological Diversity

<u>Comments received and APHIS response</u>

1. **The EA Fails to Disclose Areas Likely for Treatment and Does Not Adequately Describe the Affected Environment or Analyze Impacts to the Affected Environment**

APHIS states in the EA:

> *"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 EA, 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 EA and certainly by the Final EA. 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 EA or as an Addendum to the Final EA.

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 EA does 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 EA, 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 EA, even if actual treatments end up less than these.

Recommendation: We urge APHIS to delay the publication of a FONSI until all treatment areas have been delineated and are identified to the public, using maps and providing acreage. Site-specific information related to the resources and values of these locations should then be included. This would provide the public with a much better understanding of the justification for the treatment, the actual number of acres to be treated and their location, the method to be used, and the scale of potential effects to local resources. This specific information should be posted at the APHIS website as soon as it is available, sent to interested parties, and made available for public comment.

As soon as available, we request to receive a copy of maps and acreages of all final treatment areas for 2022, whether or not a supplemental determination is published. Should a supplemental determination be published, please send a copy to us.

If APHIS chooses to finalize its EA and publish a FONSI earlier, it should at least provide its best estimate of where treatments will occur based on requests, nymphal survey information and historical treatment data, and describe the affected environment and anticipated environmental consequences in those areas with greater detail.

In future years, we urge APHIS to delay release of the EA until after treatment requests are received and all treatment areas have been delineated and are identified to the public.

Response: *Thank you for your engagement on this program, APHIS values criticism of the program to insure it meets the highest environmental standards. APHIS has explained the reasons why specific locations cannot be included in the EA in both the 2020 and 2021 responses to your comments from those years. Please see comments 1, 2, 8, 21, and 52-65 inclusive, from 2020, and 1, 3, 4, and 21 from 2021.*

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 commenter 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.

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 EA:

> *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 could include Important Bird Areas, Greater Sage Grouse Priority Habitat Management Areas, National Wildlife Refuges which support breeding migratory birds and many other wildlife species or Wilderness and Wilderness Study Areas.

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.

Recommendation: See above.
Response: *Trying to predict exactly where and when grasshopper outbreaks might occur is clearly a fool's errand and is exactly why the EA statement quoted above is valid. It is impossible to know with precision where treatments will be needed in advance. None the less, APHIS has adequately described the ecological, scientific and recreational resources of the area where grasshopper treatment could occur in 2022. Our Biological Assessment, and consultation with USFWS, cover the areas of concern stated above and outline what protective measures we will take to minimize impact of any treatment programs that may occur.*

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 EA: 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.

Recommendation: APHIS should cease claiming that it preferentially uses selective chemicals. This is untrue and misleading. An accurate assessment regarding the impacts of these non-selective chemicals must also be included.

Response: *This comment is similar to concerns submitted by the commenter for the 2020 and 2021 EA’s.*

See APHIS response to comment 4 from the 2021 EA, and 9, 21, 26, and 27 from the 2020 EA.

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 EA 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 EA contains 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.

Recommendation: APHIS should include a reasonable alternative to chemical suppression, such as buying alternate forage for affected landowners, including through cooperative agreements with other agencies, if necessary, since the PPA doesn't address this specifically. Given the many other values of, and ecosystem services provided by, public lands, it only makes sense to consider such an alternative. Another reasonable alternative is not treating public lands. In addition, APHIS should separate the conventional from the RAATs method into two different alternatives and analyze them accordingly.

Response: *This comment is similar to concerns submitted by the commenter for the 2020 and 2021 EA's.*

See APHIS response to comment 2 on 2021 EA and 9, 21, 25, 26 on the 2020 EA.

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 EA, APHIS described risk as "reduced." Reduced compared to what, exactly? The inexactness and lack of specificity of such statements make the EA 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.

Recommendation: APHIS must be more clear, specific, and careful about how it describes risk. The use of relative terms such as "reduced" should be avoided unless APHIS is very clear about the factors and results being compared.

Response: *This comment is similar to concerns submitted by the commenter for the 2020 and 2021 EA's. See APHIS response to comment 3 on 2021 EA and 5, 6, and 7 on the 2020 EA.*

6. **APHIS ignores the significance of North Dakota 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 600-900 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 EA.

Many of the pollinators that call North Dakota home are already considered at-risk. Pollinators, including bumble bee species that occur in North Dakota and are within the range of possible 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. 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 North Dakota are within the range of at least four bumble bee species that have experienced declines in abundance and range contractions: *Bombus suckleyii* ; *B. pensylvanicus*; *B. terricola,* and *B. fervidus*. 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. This species has been petitioned for listing under the Endangered Species Act, and has received a positive 90-day finding by the USFWS, a fact not disclosed in the APHIS EA.

The current abundance of *B. fervidus* relative to historic values is estimated at 38%. The current abundance of *B. pensylvanicus* relative to historic values is estimated at a mere 11.4%. *B. terricola* has declined by 30% in both range and persistence across its entire range, with particularly high (>80%) declines in relative abundance over the time period examined. Yet none of these species is even mentioned in the EA.

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 EA doesnot 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 North Dakota 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 EA. 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 EA 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).

Recommendation: In the face of declining pollinator and insect populations and the existence of federal directives for agencies to support and conserve pollinators and their habitat, APHIS must not conduct business as usual. APHIS should identify the at-risk pollinator species potentially present in the geographic area of the EA and map their ranges prior to approving any treatment requests. Prior to treatment, APHIS should ensure that it has identified specific, actionable measures it will take to protect the habitat of at-risk pollinator species from contamination that may occur as a result of exposure to treatment.

Some ways to enact protections for at-risk pollinators above and beyond those included in the EA include:

- Survey for butterfly host plants and avoid any applications to host plants.
- Time pesticide applications to avoid exposure to at risk species.
- Do not apply pesticides (especially insecticides) when pollinators (adult and immature) are present or expected to be present.
- Avoid aerial applications.
- Avoid using malathion and liquid carbaryl.
- Include larger buffers around all water sources, including intermittent and ephemeral streams, wetlands, and permanent streams and rivers, as well as threatened and endangered species habitat, honey bee hives, and any human-inhabited area. Buffers should be sufficient to reduce potential drift deposition to insignificant levels. For example, Tepedino (2000) recommends a three-mile buffer around rare plant populations, as many of these are pollinated by solitary bees that are susceptible to grasshopper control chemicals.

See McKnight et al. (2018) and Pelton et al. (2018) for more.

Response: *This comment is similar to concerns submitted by the commenter for the 2020 and 2021 EA's. See APHIS response to comment 5, 6, 9, and 12, on 2021 EA and 10, 12, 14,19, 20, and 25 on the 2020 EA.*

Currently, widespread treatments are not anticipated in North Dakota during 2022. If treatments were necessary, the size of the treatment blocks would be miniscule (substantially less than 1%) compared to the amount of rangeland in the state. The commenter has stated that pollinator populations are suffering significant declines, which APHIS does not dispute. However, the agency does not agree the proposed grasshopper treatments will significantly contribute to those declines.

APHIS believes the use of RAATs mitigates the risk of significant impacts to non-target insects and pollinator populations in North Dakota. 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 20-28 of the 2022 EA. Additional descriptions of APHIS' analysis methods and discussion of the toxicology can be found in the 2019 EIS.

7. **APHIS has not demonstrated that treatments in North Dakota 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 EA 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? Currently, on federal BLM and Forest Service lands, the US taxpayer receives $1.35 per AUM. In most Western states, based on the number of acres required to support a cow-calf pair, the US taxpayer currently receives pennies on the dollar per acre for the forage value on BLM or USFS federal rangelands.

Given that the direct costs of grasshopper treatments to the taxpayer appear to range from $2.70 up to

$45.44/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 is not quantified in the EA, 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 EA 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.

[1] The first figure applies to the cost for areas directly sprayed, the latter figure calculates a larger "protected acre" figure assuming that treatment effects radiate out into untreated swaths. This report was obtained through a FOIA request.

APHIS did include in the North Dakota EA pertinent information summarizing economic simulation models that were conducted by Mann et al. (1983), showing that "ranchers were able to alleviate income losses under grasshopper infestation through changes in management practices. The stocking rate and cattle simulation models indicated that feeding hay in the fall, increased over-winter feeding, and early marketing of cattle could provide some economic relief from grasshopper infestations. Relocating cattle to other available pasture appeared to be most economical in some situations." We thank you for including the results of these models.

Recommendation: Available data suggest that APHIS does not have adequate support to demonstrate that it treats only after lands reach an "economic infestation" according to its own definition, at least on federal lands. In addition, there appears to be insufficient support to demonstrate that APHIS will meet an economic threshold before treating. APHIS must disclose its procedures for determining when a spray block has been identified as meeting the level of economic infestation according to its definition, and APHIS must demonstrate in its EA, that each treatment area is justified and meets the economic threshold. On federal lands, costs of protecting the forage must be compared to the revenues received for the program. If site-specific data such as rangeland productivity are not available or current, APHIS should use known values from recently available comparable data. In addition, if insecticide applications are proposed to suppress grasshoppers, APHIS should also explore other options as an Alternative in the EA, such as buying substitute forage. We are aware that public lands are sometimes treated as a way to protect adjoining private lands. This is troubling; public lands should not be subjected to large-scale treatments to protect private interests.

Response: *This comment is similar to concerns submitted by the commenter for the 2020 and 2021 EA's. See APHIS response to comment 5, 6, 9, 11, and 12, on 2021 EA and 10, 12, 14,19, 20, 24, 25, and 28 on the 2020 EA.*

8. **The EA understates 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.*

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

1.0 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.

9. **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 all but acknowledges the risk to managed bees in the 2022 EA by including notification to all apiarists before a treatment, and offering buffers. However, APHIS then provides a contradictory and misleading statement that diflubenzuron is expected to have "minimal risk" to pollinators.

APHIS left out or misrepresented important studies examining pollinator impacts. For example, APHIS misrepresents important study of diflubenzuron on bumble bees (Mommaerts et al. 2006). The Mommaerts study found drastic reproductive failure at concentrations that would be expected from program rates.

Other studies that have examined diflubenzuron impacts to pollinators are also left out or not adequately treated in the EA. 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 bee 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.

APHIS also left out any mention of 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 non-ant Hymenoptera (this group includes bees) at two of the three treated sites compared to untreated areas (not higher as APHIS stated in the EA). 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.

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.

Recommendation: Faced with significant and concerning pollinator declines, APHIS must better take into account the risk to native bees and butterflies from these treatments. APHIS should be presenting a

more thorough and accurate analysis on the impacts of selected pesticides to pollinators and other beneficial insects. Research findings do portend worrying results for native pollinators and other beneficial insects exposed in the treated areas, even for diflubenzuron. APHIS should constrain its treatments to take into account pollinator conservation needs—especially where species of greatest conservation need are located—and improve its monitoring capability to try to understand what non- target effects actually occur as a result of the different treatments.

Response: *This comment is similar to concerns submitted by the commenter for the 2020 and 2021 EA's. See APHIS response to comment 5, 6, 9, 11, and 12, on 2021 EA and 10, 12, 14,19, 20, 24, 25, 28, 34, and 37 on the 2020 EA.*

The commenter asserts the EA does not provide information on the possible effects of diflubenzuron and carbaryl sprays on bees and pollinators. That information is provided on pages 21-22 and 24-26. The Draft EA is tiered to more extensive analysis in the 2019 EIS (page 45-46 and 55-57) and the HHERAs for Carbaryl (page 21 and 44) and Diflubenzuron (pages 13-14, 29-30) that addresses risk to pollinators including bees and their larval stages.

The commenter's risk quotient (RQ) analysis compares their calculated estimated environmental concentration (EEC, from the BeeREX Tier 1 risk screening tool) to the dietary LC50 and NOAEL. The residues are based on T-REX, an EPA terrestrial plant residue model, that is used to estimate exposure to food items consumed by birds and mammals. In the case of BeeREX they use residues that would be expected from direct application onto long grass. These values would not be anticipated to occur on pollen. Additionally, nectar pesticide residues may be as much as an order of magnitude below levels that would occur on pollen (EFSA, 2017). The BeeREX model assumes that pesticide residues are equal in pollen and nectar. It is unclear how the commenter used effect concentrations expressed in mg/L (cited in the literature) to mg/kg which is not a direct conversion. APHIS invites them to share their modelling assumptions and inputs. APHIS notes that as is appropriate for a Tier 1 risk screening tool, BeeREX is very conservative method for estimating residues on pollen and nectar.

APHIS conducted a thorough risk analysis based on published toxicological studies for carbaryl and diflubenzuron and that analysis is provided in the HHERAs. The commenter asserts that APHIS incorrectly evaluated the exposure data presented in the Mommaerts et al. study of chitin synthesis inhibitors, including diflubenzuron. The researchers exposed bees via a contact application of 288 mg/L aqueous concentration which was topically applied to the dorsal thorax of each worker with a micropipette. Bumblebees also ingested orally sugar/water treated with the same concentration of diflubenzuron solution over a period of 11 weeks. Pollen was sprayed with the same concentration of diflubenzuron until saturation and then supplied to the nests. The bumble bees were not restricted in how much of these contaminated solutions they could consume. APHIS's review of the study did not identify findings of effects caused by diflubenzuron at the concentrations represented above by the commenter, "Mommaerts et al. (2006) conducted dose-response assays and found that exposure to diflubenzuron resulted in reproductive effects in Bombus terrestris, with only the doses at 0.001 (one thousandth) of maximum field recommended concentrations (MFRC) in pollen and 0.0001 (one ten *thousandth) in sugar water resulting in effects statistically similar to controls." The researchers instead estimated mean LC50 concentrations based on the chronic exposure routes described above. These were 25 mg a.i/L dermal contact, 0.32 mg a.i/L ingested sugar-water, and 0.95 mg a.i/L pollen. The researchers noted, "In practice, bumblebees will rarely be exposed to such high concentrations, but these experiments have been undertaken to evaluate with certainty the safety and compatibility of compounds with bumblebees." They elaborated, "the present authors agree that, before making final conclusions, it is necessary that the laboratory-based results are validated with risk assessments for these insecticides in field related conditions." APHIS believes conversion and comparison of program applied foliar spray rates to the concentrations of the solutions applied in this study would rely on unrealistic exposure scenarios. An exposure scenario where pollinators are exposed continuously for 11-weeks is not expected to occur in the APHIS grasshopper and Mormon cricket suppression program. In field applications diflubenzuron levels would decline over the 11-week exposure period due to degradation, flowering plants that have diflubenzuron residues would no longer be available for foraging by pollinators as flowers naturally die and do not provide pollen and nectar, and other plants would bloom after application without residues of diflubenzuron.*

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 season further reducing the risk to pollinators when compared to the current number of applications that can be made in a year to rangeland.

10. 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.

This EA 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).*
- North Dakota 2022 EA: *"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.*

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 EA.
- 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 EA 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.

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/m^2. 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 EPA analysis is of very limited utility based on the release height, as pointed out above. And while it is helpful to have the APHIS AgDISP analysis, we believe it—and the EIS and EAs that appear to rely on it—likely underestimates drift, and the resulting risk to non-targets within skipped swaths, as a result of several factors:

- The APHIS AgDISP analysis only analyzed deposition at the lower end of the application rate corresponding to 0.75 oz/acre (0.012 lb/A) rather than the upper end of the application rate that corresponds to 1 oz/acre (0.016 lb/A) which is a rate often specified in contracts.
- The APHIS aerial AgDISP analysis was conducted with a VMD of 137.5, far larger than those predicted for other ULV analyses. APHIS never explains exactly why.
- The number of flight lines are not specified in the input, yet according to the AgDrift user guide, "*the application area (swath width multiplied by the number of flight lines) can potentially have a major impact*" on drift (Teske et al. 2003).
- APHIS Program operational guidelines (included as an appendix in the EA) do not specify any minimum or maximum droplet size therefore it is unknown what nozzles are actually being used and what droplet sizes are actually being emitted.

In conclusion, APHIS has not presented evidence that its RAATs method, even with skipped swaths 200 feet, will "provide additional benefits" or significantly increase the survival of pollinators or other beneficials within the treated blocks. Given the enormous size of many treated blocks (a minimum size for aerial treatment is typically 10,000 acres, while treatment blocks of 100,000-150,000 acres are not uncommon in some states) and the limited mobility and small home ranges of many terrestrial

[2] We use these figures later in estimating the effect of these estimated environmental concentrations on non- target pollinators.

invertebrates, it is essential that AHIS conduct a rigorous assessment of drift into untreated swaths and compare that to toxicity endpoints for representative species.

Recommendation: APHIS should commit to minimum untreated swath widths wide enough to meaningfully minimize exposure to bees and other beneficials. APHIS must use science-based methodologies to assess actual risk from the proposed treatments and institute untreated swaths that would ensure meaningful protections for bees and other beneficials. APHIS should disclose its quantitative analysis and the EECs it expects--by distance-- into untreated swaths for each application method it proposes. APHIS must also specify in its operational procedures the use of nozzles that will result in droplet spectra that accord with its analysis.

Response: *This comment is similar to concerns submitted by the commenter for the 2020 and 2021 EA's. See APHIS response to comment 5, on 2021 EA and 20, 21, 22, 23, 25, 26, and 27 on the 2020 EA.*

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 20-28 of the 2021 EA. 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 sizes in the studies are relevant to North Dakota 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% would be 150 feet and at 33% 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 to minimize impacts across such a large landscape. For the safety of the applicator, it is a practice in New Mexico not to treat when the wind is blowing greater than 10MPH. Following the April 2019 APHIS Rangeland Grasshopper and Mormon Cricket Suppression Program Aerial Application Statement of Work, application aircraft will fly at a median altitude of 1 to 1.5 times the wingspan of the aircraft whenever possible. "Whenever *possible" accounts for the varying topography of North Dakota's rangelands. Regular environmental measurements (wind speed, wind direction, air temp) are taken before and during a treatment. The swath width has been described in detail in the above discussion. The swath width that is skipped is the swath width of the treated swath.*

11. 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. This is yet another study that APHIS left out of its analysis.

[3] Honey bee toxicity values for technical-grade carbaryl are used here since the APHIS EA did not include information on the toxicity of the formulated product that it uses.

Carbaryl baits pose risks to other insects. Quinn et al. (1991) (yet another pertinent study not referenced in the EA) 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.

Recommendation: APHIS must recognize the ecological impacts of applications of carbaryl bait, which remains in widespread use in several states. To more effectively target non-mobile species such as Mormon crickets, APHIS should avoid block treatments and focus on barrier treatments. In addition, APHIS should limit its treatments to only areas near cropland, and work with landowners on proven methods to protect their crops as outlined in many extension documents.

Response: *This comment is similar to concerns submitted by the commenter for the 2020 and 2021 EA's. See APHIS response to comment 6, 8, and 11 on 2021 EA and 76, 77, 78, and 79, on the 2020 EA.*

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 suppress grasshopper and Mormon cricket populations. APHIS reduces the exposure and risk to pollinators by using rates well below those labeled for used by EPA. Current labeling for grasshopper treatments also allows multiple applications per season. APHIS uses one application per season, further reducing the risk to pollinators when compared to the current number of applications that can be made in a year to rangeland. Currently, APHIS does not foresee treatment of large areas or grasshoppers or Mormon crickets in New Mexico during 2022. If treatments were necessary, the size of the treatment blocks would be miniscule (substantially less than 1%) compared to the amount of rangeland in North Dakota. APHIS believes the commenter's concerns about the direct and indirect effects of carbaryl on vertebrate species are exaggerated, and do not represent realistic potential significant impacts to the human environment.

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

In November 2021, a KFYR TV news segment reported that North Dakota Greater Sage-Grouse populations were done to 22 males and just six leks. Across its historic range, 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. Yet the EA discloses none of these facts, and downplays the risk of grasshopper suppression impacts to this iconic species.

Sage grouse chicks are dependent upon several orders of insects until they mature enough to eat sagebrush. 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.

Protecting habitat within 4 miles of 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 no protections are extended to sage-grouse to protect areas likely to be inhabited by chicks from aerial application of insecticides. Chick producing areas are where it is especially important that food sources be protected, including the insects that sage grouse chicks most need (grasshoppers, beetles, Lepidoptera, ants, and other insect species).

APHIS suggests that treatments would have no effect to sage-grouse saying *"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."* But APHIS neglects to consider the effect on other insects from its treatments. APHIS does not disclose that studies do suggest effects to sage-grouse from grasshopper treatments. Johnson (1987) found that insect reduction as a result of rangeland grasshopper control reduced brood sizes in a wild sage-grouse population.

Other studies (none mentioned in the EA with regard to sage-grouse) show that several of the groups of insects relied on by chicks, especially grasshoppers, beetles, and Lepidoptera, are adversely affected by diflubenzuron sprays, even when RAATs are employed. 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.

Recommendation*:* APHIS should address the deficiencies in its EA, and implement stronger protections for sage-grouse. Since most chick rearing happens within a certain distance of leks, APHIS should implement firm no-treatment 4-mile buffers around leks (or wider to protect against drift) that prohibit the use of any insecticide. There is too much risk from the use of diflubenzuron to allow its use within chick-rearing areas. And the risks from carbaryl bait are outlined above.

Response: *This comment is similar to concerns submitted by the commenter for the 2020 and 2021 EA's. See APHIS response to comment 6, 8, and 11 on 2021 EA and 76, 77, 78, and 79, on the 2020 EA.*

Under ESA Section 7 there is no requirement to consult on sensitive species. However, in North Dakota when there is concern by land management agencies (federal, state, etc.) for certain species, APHIS implements protective measures for those species of concern when warranted.

APHIS understands the commenter's concern that using diflubenzuron to control rangeland grasshoppers could affect populations of non-target insects that sage-grouse prey upon. 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. Similar non-significant difference could occur within grasshopper treatment areas between sprayed swaths and skipped swaths during RAATs applications. APHIS expects the highly motile sage-grouse will find sufficient prey in the untreated swaths and their population and fecundity will not be significantly reduced.

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.

13. **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."*

[4] Note that applying during this developmental stage is a necessity with the use of chitin-inhibiting insect growth regulators such as diflubenzuron.

Recommendation: In its EA, APHIS must address the role of natural enemies, their ability to regulate grasshopper populations, and the risk to these natural enemies posed by chemical treatments. APHIS must not stretch the science beyond where it is credible. APHIS should work with its research arm and research partners to conduct meaningful research exploring natural enemies, competition, and other natural processes that hold the potential of regulating grasshopper populations without the use of chemicals.

Response: *This comment is similar to concerns submitted by the commenter for the 2021 EA. See APHIS response to comment 7 on 2021 EA. APHIS disagrees with the commenter's opinion about the creditability of the science relied on by the agency. APHIS reminds 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 caused by those outbreaks.*

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

The EA does not discuss the state Species of Greatest Conservation Need (SGCN) list for birds in North Dakota. Nothing is said about conservation measures for these species, or for important and iconic species such as the Greater sage-grouse, a species that relies on grasshoppers as important food for chicks. The EA should explore the impacts to this and other declining bird species.

As a group, terrestrial birds rely heavily on grasshoppers and other insects for food. 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 Greater 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 claims that use of RAATS (again not strictly defined in Alternative B therefore very squishy in its possible implementation) would leave an adequate prey base for these declining bird species, even though the EA simultaneously states that RAATS only reduces grasshopper mortality slightly compared to conventional application.

Based on the drift information we have seen and presented elsewhere in this comment letter, and the likelihood of at least short-term effects to the prey base that is documented in a variety of studies, we question the conclusion that RAATs treatments with diflubenzuron within sage grouse areas would not be likely to have a significant impact.

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.

As described above, other studies show that several groups of insects relied on by many birds, such as grasshoppers, beetles, and Lepidoptera, are adversely affected by diflubenzuron sprays and carbaryl bait, even when RAATs are employed (Graham et al. 2008; Quinn et al. 1991 and 1992).

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.

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.

Recommendation*:* APHIS must address the potential for indirect impacts to rangeland birds, factoring in the noted declines documented for grassland birds, looking closely at how the scale of treatments may impact populations, and considering the cumulative impact of insecticide exposure to prey in combination with existing stressors already impacting these imperiled birds.

Response: *This comment is similar to concerns submitted by the commenter for the 2021 EA. See APHIS response to comment 8 and 20 on 2021 EA, and comments 74, 75, 77 on the 2020 EA.*

To promote range management and conservation to benefit wildlife, sensitive species and livestock, APHIS consults with range managers to determine if grasshopper or Mormon cricket *suppression is necessary to preserve range plant continuity. That way, overabundant orthopteran populations can be reduced without the danger of losing the range forage which is necessary to feed other species. Such is the very reason that Congress mandated that APHIS help range managers and landowners suppress "competing" grasshoppers in order to preserve range plant resources.*

The commenter also references Lowell McEwen's studies on rangeland birds' relationships with grasshoppers. The assertion is made that "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." McEwen's statement that "bird predation commonly reduces grasshopper densities on rangeland by 30-50%" dealt with non-outbreak grasshopper populations. APHIS grasshopper/Mormon cricket treatments occur only when infestation numbers reach many times the quantities of "non-outbreak" densities. Therefore, orthopteran suppression projects only reduce pest numbers back to normal levels, which leaves ample prey for all insectivorous bird species.

The commenter seems to assume that there are widespread treatments in North Dakota. APHIS has not undertaken any large-scale programmatic treatments any for many years in North Dakota. Instead, private landowners take on the burden and many use the RAATs method. Birds are highly motive predators and will search for prey in areas with the treatment blocks where pesticides are not sprayed. For example, the skip swaths where the RAATs method is employed or within protective buffers established around water resources or other sensitive sites.

15. 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 to diflubenzuron, as a group, than other taxa (Eisler 1992).

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 EA is 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.

Recommendation: APHIS must explain how its treatments are in compliance with the pesticide labels, and if necessary, incorporate additional mitigations to ensure that it is not in violation of federal pesticide laws.

Response: *This comment is similar to concerns submitted by the commenter for the 2021 and 2020 EA. See APHIS response to comment 5, 8, 9, and 12 on the 2021 EA, and comments 14, 19, 24, 26, 28, 31, and 33 on the 2020 EA.*

APHIS believes the use of RAATs reduces 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 EA. The environmental consequences risk analysis of carbaryl and diflubenzuron treatments is provided on pages 20-25 of the 2022 EA. Additional descriptions of APHIS’ analysis methods and discussion of the toxicology can be found in the 2019 EIS.

16. Reasoning for Endangered Species Act Determinations are Insufficient.

The EA includes APHIS' Biological Assessment and the FWS concurrence letter. One endangered invertebrate, the Dakota Skipper, is also present in the area.

However, the reasoning underlying the determination is insufficient. It is unclear why 1-mile buffers are considered sufficient to protect this endangered species when managed bees are protected with buffers of up to 4 miles.

No drift analysis is presented, nor is environmental monitoring information. Was USFWS apprised about the risks of drift from aerial applications and was its concurrence be adequately informed?

Listed species' protected locations must be mapped out for ground and aerial applicators, including all buffer widths listed in the protective measures it plans to implement to avoid impacts to listed species.

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 APHIS' past treatment areas, numbering in the hundreds of thousands of acres in many cases, such considerations are necessary.

Recommendation: APHIS should reexamine its reasoning in the cases of the three plants mentioned above and ensure that all determinations are supported by thorough analysis especially if a letter of concurrence is not yet available. In the Final EA, the letters of concurrence must be attached. APHIS should clarify its protective measures in the Final EA. If USFWS was not aware of modeled or empirical drift calculations, APHIS must provide its information to USFWS in a revised request for consultation. All determinations must be supported by thorough, complete analysis and accurate disclosure of the scientific studies underlying their reasoning. Under the ESA there must be disclosure of potential

impacts under the treatments, an analysis of whether the project would jeopardize the continued existence or modify or destroy the critical habitat for each adversely affected listed species, according to any active ingredients that may be selected. Determinations must include an analysis of direct and indirect effects to the listed species. Pesticide specific conservation measures for each listed species (actions to benefit or promote the recovery of listed species that are included by the Federal agency as an integral part of the proposed action), where appropriate, should be explicitly addressed and adopted.

APHIS should institute buffers around predicted suitable habitat for any listed species for which such modeling is available. APHIS should include buffers even for ground applications. APHIS should also consider upstream and watershed effects for aquatic species, and institute protections to guard against flushes of pesticide into their habitats.

For each species to be protected within the project area, APHIS must provide to applicators a set of clear directions outlining protective measures for the listed and proposed species found within this project area. In addition to these measures, APHIS should adopt the following operational guideline across all site-specific EAs: *"Use Global Positioning System (GPS) coordinates for pilot guidance on the parameters of the spray block. Ground flagging or markers should accompany GPS coordinates in delineating the project area as well as areas to omit from treatment (e.g., boundaries and buffers for bodies of water, habitats of protected species, etc.)."*

APHIS should also ensure that it has done due diligence in being aware of listed species or their habitat present on private land by asking specifically about this when gathering treatment requests.

Response: *This comment is similar to concerns submitted by the commenter for the 2021 and 2020 EA. See APHIS response to comment 5, 8, 9, and 12 on the 2021 EA, and comments 14, 19, 24, 26, 28, 31, and 33 on the 2020 EA.*

APHIS believes sharing the consultation documents has caused the commenter to conflate the different threshold in the risk analysis determinations between the Endangered Species Act (ESA) and the National Environmental Policy Act (NEPA), the latter of which is the relevant standard here. Through the consultation process for ESA, protection measures are evaluated so that federally protected species are not adversely affected. We believe that all relevant scenarios are evaluated and that additional protection measures are not warranted.

APHIS also finds it necessary to reassure the commenter that an applicator would be provided a clear set of directions outlining protective measures for the listed and proposed species found within this project area. Also, the program's Aerial Application Statement of Work requires the use of GPS, and an applicator will be briefed on required buffers.

17. **The monarch butterfly, is now a candidate species under the Endangered Species Act, but the EA contains no information about impacts to or consultation for this species. Monarchs need protection from liquid insecticides.**

No information is available in the EA 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.

Recommendation: We urge you to provide strong conservation measures for monarch butterfly. On monarch, buffering out known or potential milkweed areas would be an important conservation recommendation. Known and modeled habitat maps are available from at least three sources:

- Waterbury et al. 2019
- Dilts et al. 2019
- Western Monarch Milkweed Mapper

Any use of liquid insecticides warrants buffers from milkweed stands or areas where these may potentially occur. In order to limit harm to monarch, a species in steep decline, we recommend a 3-mile buffer from known or potential milkweed stands for aerial applications and a 1-mile buffer from known or potential milkweed stands for ground applications to provide a reasonable margin of conservation protection. Even these measures would not be able to protect migrating monarch who are nectaring outside of milkweed stands.

Response: *This comment is similar to concerns submitted by the commenter for the 2021and 2020 EA. See APHIS response to comment 10 and 15 on 2021 EA, and comments 34, 35, 36 on the 2020 EA.*

The Monarch butterfly was listed as a candidate species on December 15, 2020. The U.S. Fish and Wildlife Service's (USFWS) 12-month status review determined that it was "warranted but precluded". The Endangered Species Act (ESA) provides for a "warranted-but-precluded" finding when the Service does not have enough resources to complete the listing process, because the agency must first focus on higher-priority listing rules. "Warranted-but-precluded" findings require subsequent review each year until the USFWS undertakes a proposal or makes a not-warranted finding. APHIS is not required by ESA Section 7 consultations to consult on species that have been precluded from being listed as threatened and endangered (T&E) species.

The 2022 USFWS official species list for this Environmental Assessment covering the rangeland action areas for ESA Section 7 consultations with U.S. Fish and Wildlife Service, covered consultations on species from this official list. The USFWS does not give concurrence for candidate species.

The commenter cited an article by the USDA - National Resource Conservation Service (NRCS) (2016) for Monarch Butterfly Wildlife Habitat Evaluation Guides, but these guides deal with crop lands not rangelands. According to (USDA NCRS (2020), the NRCS agency's primary geographic focus for monarch habitat has been in Illinois, Indiana, Iowa, Kansas, Minnesota, Missouri, Ohio, Oklahoma, Texas, and Wisconsin, the primary eastern monarch migration corridor in a 10-state area of the central United States (USDA NRCS, 2020).

On August 26, 2014, a petition to protect the Monarch Butterfly under the ESA was submitted on behalf of the Center for Biological Diversity, Xerces Society, Center for Food Safety, and Dr. Lincoln Brower. In this petition under the factors and the justification listed ,"The ESA states that a species shall be determined to be endangered or threatened based on any one of five factors (16 U.S.C. § 1533 (a)(1)): 1) the present or threatened destruction, modification, or curtailment of its habitat or range; 2) overutilization for commercial, recreational, scientific, or educational purposes; 3) disease or predation; 4) the inadequacy of existing regulatory mechanisms; and 5) other natural or manmade factors affecting its continued existence." The monarch is threatened by all five of these factors and thus warrants protection under the Act. The petition failed to describe in any manner, under the factors listed in the petition if any decline of milkweed populations occurred in rangeland habitats. All descriptions under the factors described dealt with decline of populations in cropland settings due to the heavy use of chemicals to control pests to crops. APHIS believes the types and amounts of chemicals being used in cropland settings are more varied and greater than chemicals being used in open rangeland settings where relatively rare grasshopper suppression treatments occur. The commenter did not provide data or justification to explain any decline in the amount of milkweed or if any milkweed is even present on rangelands was given.

Monarchs require milkweed for both oviposition and larval feeding. The correct phenology, or timing, of both monarchs and nectar plants and milkweed is important for monarch survival (USFWS, 2020). The ecological requirements of a healthy monarch population are summarized by Redford et al. (2011). In order to be self-sustaining, a population must be demographically, genetically, and physically healthy without the following ecological requirements sufficient seasonally and geographically specific quantity and quality of milkweed, breeding season *nectar, migration nectar, and overwintering resources to support large healthy population sizes can occur.*

Milkweed poisons cattle and other livestock. The toxic agents are cardiac glycosides. To be poisoned, cattle can eat as little as 1.0 percent of their body weight in broad-leafed milkweed; amounts as low as 0.15 percent have poisoned sheep and goats (Clayton, 2021).

Due to this factor, rangeland with milkweed would be at risk to cattle foraging, and is unlikely to be treated. In North Dakota, the Monarch Butterfly has not been collected in sweep net samples during Nymphal or Adult surveys for grasshopper/Mormon crickets.

18. **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 EA.**

The EA does 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.

Species in North Dakota that are likely to be adversely affected by use of carbaryl, as determined in the BE, are nowhere mentioned in APHIS' EA.

Recommendation: The listed species determinations for carbaryl should be disclosed in the EA and should preclude the use of carbaryl spray in the grasshopper suppression effort until and unless a final Biological Opinion is issued and the suppression program implements all required measures under the Opinion.

Response: *This comment is similar to concerns submitted by the commenter for the 2021and 2020 EA. See APHIS response to comment 17 and 15 on 2021 EA, and comments 96,100, 101, 102, 104, 105, 106 and 108 on the 2020 EA.*

19. **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.

Recommendation: APHIS should increase the margin of safety for riparian and aquatic habitats. Any buffer should be measured from the edge of the riparian or wetland habitat (not the streambed itself). Buffers should be strengthened to ensure that there is no likelihood of drift into these important habitats.

Response: *This comment is similar to concerns submitted by the commenter for the 2021and 2020 EA. See APHIS response to comment 12 and 13 on 2021 EA, and comments 38 and 39, on the 2020 EA.*

APHIS will not spray when the following conditions exist:

- *Wind velocity exceeds 10 miles per hour (unless state law requires lower windspeed)*
- *Rain is falling or is imminent*
- *Dew is present over large areas within the treatment block*
- *There is air turbulence that could affect the spray deposition*

20. 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.

Recommendation: The diflubenzuron label indicates that the chemical is subject to runoff for months after application. APHIS must disclose impacts to at-risk mussels where they are present. In addition, APHIS should use larger buffers to protect freshwater mussels, such as those designated for listed salmonids in other states. In addition, APHIS should include monitoring for the presence and health of mussels in streams that traverse or are adjacent to treatment areas as part of its monitoring strategy.

Response: *This comment is similar to concerns submitted by the commenter for the 2021and 2020 EA. See APHIS response to comment 12 and 13 on 2021 EA, and comments 38 and 39, on the 2020 EA.*

APHIS believes sharing the consultation documents has caused the commenter to conflate the different threshold in the risk analysis determinations between the Endangered Species Act (ESA) and the National Environmental Policy Act (NEPA), the latter of which is the relevant standard here. Through the consultation process for ESA, protection measures are evaluated so that federally protected species are not adversely affected. We believe that all relevant scenarios are evaluated and that additional protection measures are not warranted.

21. **The EA is silent on buffers around stock tanks. These can be important reservoirs of biodiversity, even as they may be better known for being home to many non-native species.**

The EA does not identify any buffers that will be observed to prevent pesticide overspray or drift into these habitats. Studies of these habitats (Hale et al. 2014; Hasse and Best 2020) have shown that stock ponds/tanks are important surrogate habitats for native species, and can be equivalent to natural habitats in terms of total abundance and richness of aquatic invertebrates.

Recommendation: APHIS should recognize the potential for stock pond/tanks to contribute significantly to the diversity of aquatic invertebrates in rangelands. APHIS should identify and map all stock tanks/ponds and specify a buffer around stock ponds/tanks from chemical treatment at least equivalent to that specified for wetlands, in order to protect aquatic diversity.

Response: *This comment is similar to concerns submitted by the commenter for the 2021and 2020 EA. See APHIS response to comment 14 on the 2021 EA, and comments 41 and 42, on the 2020 EA.*

22. **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.

Recommendation: APHIS must disclose whether its program has obtained an NPDES permit, or whether this requirement has been waived (and if so, why). APHIS must comply with state water quality standards and disclose impacts to water quality in the EA. APHIS should also disclose its environmental monitoring reports at its website and conduct environmental monitoring in such a way as to test for runoff effects weeks or months after treatment, in addition to drift at the time of treatment.

Response: *This comment is similar to concerns submitted by the commenter for the 2021 EA. See APHIS response to comment 15 on the 2021 EA.*

23. Special status lands

North Dakota contains numerous areas of special status lands. However, the EA contains 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.

Recommendation: These special status areas have been designated for specific purposes and generally discourage human intervention with the natural ecosystem. Grasshopper suppression should not be undertaken in such areas. APHIS must review its procedures and ensure that it is not in danger of violating any federal laws or policies pertaining to such special designations. Buffers should also be considered to prevent drift into specially designated areas.

Response: *This comment is similar to concerns submitted by the commenter for the 2020 and 2021 EA's. See APHIS's responses to comments #49 in the 2020 EA and comment #16 in the 2021 EA.*

24. 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."*

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.

The general guidelines, crafted for the program as a whole, and included in each state's EA, 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.

Recommendation: APHIS should explain its notification process in the EA. 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 identification and notification process should include multiple sources beyond any state list, even if redundant, to ensure that any organic or transitioning producer is accounted for in the spatial footprint of the spray. APHIS should not just notify but also confirm notification for each organic and transitioning producer, to ensure that its communication has reached its recipient. Given the large drift potential and its previous protocol for native managed bees, APHIS should not leave buffers open-ended but should institute a minimum 4- mile buffer around each identified organic or transitioning parcel. Sites such as driftwatch.org and other spatial locators should be used to the full extent of their availability.

Response: *This comment is similar to concerns submitted by the commenter for the 2020 and 2021 EA's. See APHIS's responses to comments #49 in the 2020 EA and comment #17 in the 2021 EA.*

APHIS only treats rangeland where the land manager or property owner has requested suppression of grasshopper infestations. APHIS employs several mitigation measures intended to mitigate offsite transport of pesticides outside the treatment block to adjacent cropland. APHIS reduces the potential for drift and volatilization by not using ultra-low volume (ULV) sprays when the following conditions exist in the spray area:

- *Wind velocity exceeds 10 miles per hour (unless state law requires lower windspeed)*
- *Rain is falling or is imminent*
- *Dew is present over large areas within the treatment block*
- *There is air turbulence that could affect the spray deposition*

APHIS prepares maps of the treatment area that exclude sensitive sites, such as organic crops from the treatment area. The Program also notifies residents within treatment areas, or their designated representatives prior to proposed treatments. They are advised of the control method to be used, proposed method of application, and precautions to be taken. If necessary, non-treated buffer zones are established to protect these resources. A buffer zone is a distance or space around a sensitive area that will not be sprayed to minimize harm and disturbance of that area.

25. 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. 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.

Recommendation: APHIS should clarify whether and how it decides to treat private lands and what the likely impacts of that would be. APHIS should ensure that it is not overlooking the potential conservation issues that may exist on private lands, for example the presence of habitats for listed species or species of conservation interest should be specifically asked about on the treatment request form.

Response: *This comment is similar to concerns submitted by the commenter for the 2020 and 2021 EA's. See APHIS's responses to comments #49 in the 2020 EA and comment #18 in the 2021 EA.*

APHIS understands the commenter is concerned about grasshopper treatments on public and private lands. APHIS believes a more thorough examination of the EAs and EIS will reduce those concerns. The commenter is mistaken in their assertion that APHIS grasshopper treatments are not intended to occur on or benefit private lands. APHIS complies fully with the Endangered Species Act for all areas where treatments might occur. Those documents are included in the EA to alleviate public concerns.

26. Cumulative effects analysis

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

In the EA, 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. But without information provided about the location and scale of treatments in any previous years, and with the EA's lack of attention to important studies that show impacts from grasshopper suppression chemicals to a wide variety of invertebrates (as we have already detailed), we are very concerned about cumulative effects stemming from these treatments.

Based on our independent review, APHIS's statement that the probability of an outbreak occurring in the same area as a previous outbreak is not necessarily based on firm evidence. Shell and Lockwood (1997) examined decades-long patterns of outbreaks in Wyoming and 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 North Dakota.

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

Finally, the EA does 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 EA sweeps 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.

Recommendation: To have an adequate understanding of cumulative impacts, APHIS must disclose where spraying has occurred in the past, and what impacts have resulted, as part of the current condition assessment. APHIS must also analyze cumulative impacts considering declining species, as these species will be more vulnerable to negative effects resulting from the treatments. APHIS must consider cumulative exposure to any migratory species, especially those that merit more intensive consideration due to their legal protections, ecological importance or economic importance. APHIS must

also take into account grasshopper management that is led by other agencies or private partners, and the combined effects of these on resources of concern.

Response: *This comment is similar to concerns submitted by the commenter for the 2020 and 2021 EA's. See APHIS's responses to comments #81, #82, and #86 in the 2020 EA and comment #19 in the 2021 EA.*

APHIS is not required to disclose the locations where spraying has occurred in the past to conduct a thorough risk analysis in accordance with NEPA.

Cumulative impacts, as defined by the Council on Environmental Quality (CEQ), is "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time" (40 CFR § 1508.7). Potential overlap of APHIS grasshopper suppression treatments are unlikely to result in significant cumulative impacts because the program-applied pesticides are not persistent in the environment year to year. Grasshopper treatments conducted by state agencies or private landowners are unlikely to overlap where APHIS has conducted a treatment program. Potential environmental effects resulting from treatments conducted by other entities outside of APHIS treatment blocks will not contribute to potential cumulative significant impacts by APHIS as defined by CEQ. APHIS provided a more thorough analysis of potential cumulative impacts in the 2019 EIS for the grasshopper program.

27. 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 EA 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.

As described above birds may consume 50% of grasshoppers on site. Ensuring healthy bird populations is critical for long-term grasshopper management.

Another argument for re-thinking the chemical-centric suppression program is that the costs of the program constrain APHIS' ability to respond to treatment requests. In addition, climate change poses a threat that may alter the frequency and locations of outbreaks.

Recommendation: The operating guidelines state "*landowners requesting treatment are encouraged to have implemented IPM prior to undergoing treatment.*" This does not go far enough. APHIS must elevate the expectation of preventative approaches in its cooperative agreements with other land management agencies. APHIS can collaborate with agencies (such as the Natural Resource Conservation Service (NRCS), the Farm Service Agency (FSA), and State Extension program) to facilitate discussion and disseminate information to ranchers about preventative measures that can be taken and alternatives to pesticide use. APHIS and/or collaborating agencies should investigate and implement opportunities to incentivize healthy range management practices.

APHIS and its partners should be approaching the problem by keeping a focus on the potential to reduce grasshopper carrying capacity by making the rangeland environment less hospitable for the pests.

APHIS must not take a limited view of its role and responsibilities, and should utilize any available mechanism to require land management agencies to diminish the severity, frequency and duration of grasshopper outbreaks by utilizing cultural management actions. For example, Memoranda of Understanding (MOUs) should be examined and updated to ensure that land management agencies are accountable in utilizing cultural techniques to diminish the carrying capacity of pest species.

Longer-term strategic thinking should include:

- Prevent conditions that allow grasshopper and Mormon cricket populations to reach outbreak conditions by employing diverse management techniques (e.g., biological, physical, and cultural).
- Implement frequent and intense monitoring to identify populations that can be controlled with small ground-based pesticide application equipment.
- If pesticides are used, select active ingredients and application methods to minimize risks to nontarget organisms.

- Monitor sites before and after application of any insecticide to determine the efficacy of the pest management technique as well as if there is an impact on water quality or non-target species.

Response: *This comment is similar to concerns submitted by the commenter for the 2020 and 2021 EA's. See APHIS's responses to comments #43, #44, #45, and #46 in 2020 EA and comment #20 in 2021 EA.*
APHIS is not specifically tasked with these land management responsibilities, however the ARS IPM website—cited by the commentor above—is shared frequently, and the general understanding of the most practical IPM science available is included whenever possible in outreach efforts. As stated previously however, APHIS does not agree that there are always viable alternatives to selective pesticide use during grasshopper outbreaks, rather the alternative to non-action is often simply a continued and prolonged duration of damaging grasshopper populations, which are potentially limiting to the health and flora species abundance of the ecosystems in general.
The comments comparing rotational grazing to season long grazing are valid concerns. APHIS supports such management practices. However, the rotational grazing practices in New Mexico by the ranchers are not under the control of APHIS grasshopper program and APHIS only responds to the large outbreaks associated with the rangeland forage damage when requested by landowners in written form. The research the commenter referenced concerning biological control and other nonchemical methods are not valid APHIS management practices presently since more data is needed. Fire management of rangeland is not controlled by APHIS and would have to be implemented by the land management agencies.

APHIS is not expert in land-management practices – the respective land managers are. APHIS does make integrated pest management (IPM) recommendations, with respect to practices that help impede grasshopper and Mormon cricket outbreaks. But APHIS is mandated by law (Plant Protection Act), when these outbreaks reach infestation levels, to help land managers treat damaging populations of orthopterans when IPM/cultural practices are not sufficient.
These outbreaks are inevitable and have been an integral part of the Western rangeland ecosystems for millennia. Human populations and agriculture, in this day and age, have also become an integral component of those Western ecosystems. In order to co-exist, range resources must be managed to maintain continuity and integrity so that humans and wildlife might share those resources without undue impacts on sensitive species which struggle to compete.
APHIS, for the above reasons, encourages range managers to "prevent conditions that allow grasshopper and Mormon cricket populations to reach outbreak conditions by employing diverse management techniques (e.g., biological, physical, and cultural)." APHIS "Implement(s) frequent and intense monitoring," through its seasonal statewide surveys, "to identify populations that can be controlled with small ground-based pesticide application equipment."

28. 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.

Recommendation: We recommend that, in the future, notice of open public comment periods for all site-specific EAs for grasshopper suppression be posted in the Federal Register, and documents made available for review at regulations.gov and at the APHIS grasshopper website. In addition, we make the following recommendations:

- Actual proposed treatment areas should be mapped and shared with the public when each state APHIS office submits its treatment budget request. Special status lands and sensitive designations should be disclosed on these maps.
- Later refinements to locations should be mapped and shared with the public prior to treatments.
- Nymphal survey results should be provided as soon as available and prior to treatments, in map and table form (counts by species at each survey point, not total counts by survey point).
- Economic threshold analysis needs to be conducted and disclosed especially for treatments on public lands.
- Consultation documents, including APHIS' transmittal to the Services describing the listed species, APHIS determinations, and APHIS rationale for those determinations, should be shared with the public in the draft EA, along with the concurrence letter if it has been transmitted to APHIS.
- Results of environmental monitoring associated with treatments (i.e. drift cards, water samples) should be disclosed.

Response: *Again, this comment is similar to concerns submitted by the commenter for the 2020 and 2021 EAs. See APHIS' responses to comments #1, #2, and #52-#65 in the 2020 EAs, and#1 and #21 in the 2021 EAs.*

Thank you for the opportunity to comment on these actions. We recognize that it is challenging to balance various uses of these rangelands. With mounting science showing concerning declines in pollinators and other insects, APHIS should use its influence with land management agencies to ensure lands are maintained in a manner that prevent spikes of pest grasshoppers to avoid use of harmful pesticides on native grasshopper populations and habitats. Such forward thinking would not only could avoid harmful pesticide uses, it also would allow our valuable rangelands to better support pollinators and healthy ecosystems.

Please feel free to contact us should you have questions on our comments.

Sincerely,

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