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

Environmental Assessment Rangeland Grasshopper and Mormon Cricket Suppression Program

Rio Arriba County, NM
EA Number: NM-23-01

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Table of Contents

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

Site-Specific Environmental Assessment

Rangeland Grasshopper and Mormon Cricket Suppression Program
Rio Arriba County, NM

I. Need for Proposed Action

A. Purpose and Need Statement

An infestation of grasshoppers or Mormon crickets may occur in Rio Arriba County, NM. 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. Land managers and property owners request APHIS assistance to control grasshopper outbreaks because of the potential to damage grassland areas and benefits of treatments including the protection of rangeland resources. Some benefits of preventing high populations of grasshoppers include increased forage for cattle and native species. The goal of the proposed suppression program analyzed in this EA is to reduce grasshopper populations below economical infestation levels in order to protect the natural resources of rangeland ecosystems, the value of livestock and wildlife forage, 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 May 1, 2023 to October 31, 2023 in Rio Arriba County, NM.

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 2023 Control Program for New Mexico.

B. Background Discussion

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

In rangeland ecosystem areas of the United States, grasshopper populations can build up to economic infestation levels[1] despite even the best land management and other efforts to prevent outbreaks. At such a time, a rapid and effective response may be requested and needed to reduce the destruction of rangeland vegetation. In some cases, a response is needed to prevent grasshopper migration to cropland adjacent to rangeland. In most circumstances, APHIS is not able to accurately predict specific treatment areas and treatment strategies months or even weeks before grasshopper populations reach economic infestation levels. The need for rapid and effective response when an outbreak occurs limits the options available to APHIS to inform the public other than those stakeholders who could be directly affected by the actual application. The emergency response aspect is why site-specific treatment details cannot be known, analyzed, and published in advance.

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

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

[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.

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

APHIS has authority under the Plant Protection Act of 2000 (PPA) (7 United States Code (U.S.C.) § 7701) to take actions to control and minimize the economic, ecological, and human health impacts that harmful plant pests can cause. APHIS uses this authority to protect U.S. agriculture, forests, and other natural resources from harmful pest species. Section 417 of the PPA (7 U.S.C. § 7717) authorizes APHIS' efforts to minimize the economic impacts of grasshoppers. Section 417(a)states that subject to the availability of funds, the Secretary "shall carry out a program to control grasshoppers and Mormon crickets on all Federal lands to protect rangeland." Section 417(c) (1) states that "Subject to the availability of funds pursuant to this section, 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 at levels of economic infestation, unless the Secretary determines that delaying treatment will not cause greater economic damage to adjacent owners of rangeland." Section 417(c)(2) states, "In carrying out this section, the Secretary shall work in conjunction with other Federal, State, and private prevention, control, or suppression efforts to protect rangeland." APHIS has the authority to implement Section 417 of the PPA through the Rangeland Grasshopper and Mormon Cricket Suppression Program. The priorities of the APHIS program are: • to conduct surveys for grasshopper and Mormon cricket populations on rangelands in the western United States, • to provide technical assistance on grasshopper management to landowners/managers, and • subject to the availability of funds, to suppress grasshoppers and Mormon crickets on rangeland when direct intervention is requested by the landowner/manager.` 4 Additional information regarding technical assistance and other aspects of the program can be obtained from the USDA Agricultural Research Service site at https://www.ars.usda.gov/plains-area/sidney-mt/northern-plains-agricultural-research-laboratory/pest-management-research/pmru-docs/grasshoppers-their-biology-identification-and-management/grasshopper-site-highlights/. On September 16, 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 on BIA managed lands. This MOU clarifies that APHIS will prepare and issue to the public, site-specific environmental documents that evaluate potential impacts associated with the proposed measures to suppress economically damaging grasshopper populations. The MOU also states that these documents will be prepared under the APHIS NEPA implementing procedures with cooperation and input from the BIA. The MOU further states that the responsible BIA official will request in writing the inclusion of appropriate lands in the APHIS suppression project when treatment on BIA land is necessary. The BIA must also approve a Pesticide Use Proposal for APHIS to treat infestations. According to the provisions of the MOU, APHIS can begin treatments after APHIS issues an appropriate decision document and BIA approves the Pesticide Use

Proposal. On November 6, 2019, APHIS and the Forest Service (FS) signed a Memorandum of Understanding (MOU) detailing cooperative efforts between the two groups on suppression of grasshoppers on FS managed 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 the proposed measures to suppress economically damaging grasshopper populations. The MOU also states that these documents will be prepared under the APHIS NEPA implementing procedures with cooperation and input from the FS. The MOU further states that the responsible FS official will request in writing the inclusion of appropriate lands in the APHIS suppression project when treatment on FS land is necessary. The FS must also approve a Pesticide Use Proposal for APHIS to treat infestations. According to the provisions of the MOU, APHIS can begin treatments after APHIS issues an appropriate decision document and FS approves the Pesticide Use Proposal. On October 15, 2015, APHIS and the Bureau of Land Management (BLM) signed a Memorandum of Understanding (MOU) detailing cooperative efforts between the two groups on suppression of grasshoppers on BLM managed lands (Document #15-8100-0870- MU, October 15, 2015). This MOU clarifies that APHIS will prepare and issue to the public, site-specific environmental documents that evaluate potential impacts associated with the proposed measures to suppress economically damaging grasshopper populations. The MOU also states that these documents will be prepared under the APHIS NEPA implementing procedures with cooperation and input from the BLM. The MOU further states that the responsible BLM official will request in writing the inclusion of appropriate lands in the APHIS suppression project when treatment on BLM land is necessary. The BLM must also approve a Pesticide Use Proposal for APHIS to treat infestations. According to the provisions of the MOU, APHIS can begin treatments after APHIS issues an appropriate decision document and BLM approves the Pesticide Use Proposal.

The New Mexico Department of Agriculture has in place an act that covers grasshopper and other rangeland pests. The "Grasshopper and Other Range Pest Control Act" provides for the establishment of control districts for grasshopper and other range pests, collection and disposition of assessments. The text of this act can be found here: Chapter 76 - Agriculture - NMOneSource.com

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. Reduced agent area treatments (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.

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

Scoping as defined by NEPA is an early and open process for determining the scope of issues to be addressed by the environmental risk analysis and for identifying the significant issues related to a proposed action (40 CFR 1501.7). 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 suppression program. The process can occur formally and informally through meetings, conversations, or written comments from individuals and groups.

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. The program will prepare a Final EA and FONSI when the program determines that grasshopper suppression treatments are possible within a portion of the state, and that all environmental issues were accounted for in the Draft EA. 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 requests for treatments 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 action alternatives. These program alternatives are then evaluated to determine the significance of environmental effects. The 2002 EIS presented three alternatives: (A) No Action; (B) Insecticide Applications at Conventional Rates and Complete Area Coverage; and (C) Reduced Agent Area Treatments (RAATs), and their potential impacts were described and analyzed in detail. The 2019 EIS was tiered to and updated the 2002 EIS. Therefore the 2019 EIS considered the environmental background or 'No Action' alternative of maintaining the program that was described in the 2002 EIS and Record of Decision. The 2019 EIS also considered an alternative where APHIS would not fund or participate in grasshopper suppression programs. The preferred alternative of the 2019 EIS allowed APHIS to update the program with new information and technologies that not were analyzed in the 2002 EIS. Copies of the complete 2002 and 2019 EIS documents are available for review at USDA-APHIS-PPQ, 270 South 17th Street, Las Cruces, NM 88005 address. 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 [Draft] EA.

This [Draft] EA analyzes the significance of environmental effects that could result from the alternatives described below. These alternatives differ from those described in the 2019 EIS because grasshopper treatments are not likely to occur in most of Rio Arriba County, NM 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 Rio Arriba County, NM. 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, chlorantraniliprole, diflubenzuron, and malathion. These chemicals have varied modes of action. Carbaryl and malathion work by inhibiting acetylcholinesterase (enzymes involved in nerve impulses). Chlorantraniliprole activates insect ryanodine receptors which causes an uncontrolled release of calcium, impairing insect muscle regulation and leading to paralysis. Diflubenzuron inhibits the formation of chitin by insects which causes weak exoskeletons. 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, chlorantraniliprole 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 treated and untreated swaths. Both options are most often incorporated simultaneously into RAATs. Either carbaryl, chlorantraniliprole, diflubenzuron, or malathion would be considered under this alternative, typically at the following application rates (i.e. sprayed or spread directly from the aircraft or vehicle):

- 8.0 fluid ounces (0.25 lbs a.i./ac sprayed) of carbaryl spray;
- 10.0 pounds (0.20 lbs a.i./ac treated) of 2 percent carbaryl bait;

- 4.0 fluid ounces (0.013 lbs a.i./ac sprayed) of chlorantraniliprole;
- 0.75 or 1.0 fluid ounce (0.012 lbs a.i./ac sprayed) of diflubenzuron; or
- 4.0 fluid ounces (0.31 lbs a.i./ac sprayed) of malathion.

The width of the area not directly treated (the untreated swath) under the RAATs method is not standardized. The proportion of land treated during RAATs 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 recommended skipped swath width is typically no more than 100 feet for carbaryl (liquid), chlorantraniliprole, and diflubenzuron, and 25 feet for malathion. However, many federal government-organized treatments of rangelands tend to prefer to use a 50% skipped swath width, meaning if a fixed-wing aircraft's swath width is, for example, 150 ft., then the skipped habitat area will also be 150 ft. 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.

Any programs that are either contracted or Agency performed will use GPS navigation equipment (i.e. SatLoc ®, or other equipment) to navigate and capture shapefiles of the treatment areas. All sensitive sites will be buffered out of the treatment area zone using visual aids such as flags which are highly visible to the applicator in addition to the applicators' GIS shape file which outlines treatment areas. All sensitive sites will be reviewed in the daily briefing with APHIS personnel including the applicator working on the treatment site.

Insecticide applications at conventional rates and complete area coverage, is an approach that APHIS has used in the past but is currently uncommon. Under this alternative, carbaryl, chlorantraniliprole, diflubenzuron, or malathion would cover all treatable sites within the designated treatment block per label directions. The application rates under this alternative are typically at the following:

- 16.0 fluid ounces (0.50 lbs a.i./ac sprayed) of carbaryl spray;
- 4.0 pounds (0.08 lbs a.i./ac treated) of 2 percent carbaryl bait;
- 8.0 fluid ounces (0.027 lbs a.i./ac sprayed) of chlorantraniliprole;
- 1.0 fluid ounce (0.016 lbs a.i./ac sprayed) of diflubenzuron; or
- 8.0 fluid ounces (0.62 lbs a.i./ac sprayed) of malathion.

The potential generalized environmental effects of the application of carbaryl, chlorantraniliprole, 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 EA.

III. Affected Environment

A. Description of Affected Environment

The proposed suppression program included in this 2023 EA encompasses the central portions of Rio Arriba County, NM. The estimated area of treatment is 26,000 acres. For New Mexico, APHIS in this document considers mainly four ecologic regions to exist, these are: the short-grass prairie of the southern extent of Great Plains (Southern High Plains and the Southwestern Tablelands in the eastern counties), the Arizona/New Mexico Plateaus and Mesas (in the northwestern counties), the southern Rocky Mountains with the Arizona and New Mexico Mountains (north-central and west central counties), the Chihuahuan Desert (in the southern counties). These four basic designated eco-regions are at the northeastern reach of the greater southwest desert area that extends from western Texas to south-central California.

The main watershed basins that dissect New Mexico are Upper Rio Grande and Upper Colorado (San Juan) being fed from the state of Colorado, the Arkansas- White-Red (Southern Canadian), Pecos, Lower Colorado (Zuni and Gila), Lower Rio Grande, Central Closed (Estancia and Tularosa and Salt Basins), Southwest Closed (Mimbres), and Texas-Gulf (Southern High Plains).

New Mexico soils are of three basic soil orders: Aridisoils (being most common in arid zones), Entisoils (incipient soil process), and Mollisoils (usually associated with the mountains).

Basically, there are four weather zones found in New Mexico; Northern Chihuahuan Desert, Southern High Plains, Southern Rockies and Arizona-New Mexico Plateau. These zones are affected by colder temperatures increasing with elevation year-round. Higher elevations of the upper mountain zones are associated with coniferous and alpine plants; receive more rain, snow and ice than lower mountain elevations. Average annual minimum temperature may reach -25 to -20 degrees Fahrenheit (°F). The intermediate elevations and mountain transition zone below 9,600 feet as l to 7,000 feet above sea level is dominated by mixed coniferous; fir and spruce and deciduous trees such as aspen, and some shrubs, such as bearberry, mountain mahogany, and barberry, which receive slightly less moisture during the year with average minimum temperature lows of -15 to -10 °F.

Elevation below 7,000 to 4,500 feet are general considered the marginal limit of the Upper Sonoran Zone with most vegetation consisting of pine, juniper, oak, buckbrush, sagebrush and sagewort, rabbitbrush, wolfberry, hackberry, Apache plume and winterfat.

Elevation below 4,500 to 2,500 or the Lower Sonoran Zone has predominant vegetation consisting of mesquite, cottonwood, Jerusalem thorn, acacia, creosote bush, tarbush, greasewood, turpentine bush, sand shinnery, whitebrush, yucca, agave, desert willow, beargrass, desert candle, and various cacti, and along riparian zones willows, Russian olive, seep willow and salt cedar.

The elevations below 5,400 feet are mostly open rangeland areas with the milder southwest part of the state having winter temperature lows between 15° F and 10° F, and rainfall averages of 12 inches annually. As one goes eastward, rainfall averages increase to 16 inches or more, and winter temperatures fall to 5° F to 0° F lows. Further decreasing average lows naturally occur as one moves northward in the state.

Public land management covers about 50% of the New Mexico's 33 counties that contain the state's 77.67 million acres (121,356 mi^2). Of these 38.83 million acres of public land, the land surface management responsibility is mainly divided between the Bureau of Land Management (16.5%) and the U.S Forest Service (12.0%), the State Land Office (11.9%) and Indian Trust Lands (9.6%).

APHIS mainly does grasshopper suppression programs on level to rolling hill topography, avoiding water resources, over grassland vegetation during daytime in warm weather with wind speeds less than 10 mph. Treatment activities are monitored by direct APHIS-Plant Protection and Quarantine (PPQ) supervision and are found in Appendix 1.

For site specific information, maps, or other visual representations of the suppression program area, please reference the materials included in the Appendix.

B. Site-Specific Considerations

1. Human Health

The rangeland areas where treatments may occur are sparsely populated by isolated ranch units having mainly cattle operations and "ranchettes" (homesteads generally five acres or less). Rangeland grazing is the predominant livestock feeding method. A buffer of 1.25 miles from the treatment area to the perimeter of any town and other communities will be used. Ranch buildings and structures (such as stock tanks) will have a buffer of 200 feet. Federal highways and State roads will have a buffer of 25 feet. Potential exposures to the general public from conventional application rates are infrequent and of low magnitude. The RAATs approach reduces this potential even further by using reduced rates and less actual directly treated area. The proposed program should benefit human and environmental health by reducing the risk of insect annoyance, blowing dust, higher light reflection, and higher temperature on the semi-arid land surface. Sensitive areas to the public will have designated buffers. Local law enforcement, fire departments EMS, hospitals and tribal agencies will be notified prior to any treatment as an advisory to access any safety risk, the treatment date and location and contact personnel.

2. Nontarget Species

Non-target species such as pollinators and other beneficial insects, which may be impacted, by the suppression program are those present during application in the sprayed swathes by direct chemical contact, or by feeding upon the contacted surface of vegetation, litter or on affected grasshoppers. Some migratory and nesting birds in contact with the application may temporarily be affected, mainly by feeding on treated grasshoppers or other insects, but not adversely. These suppression applications avoid water bodies and aquatic life, and due to the timing of these applications and their short residual life, the risk of their movement into seasonal or permanent water is minimal. Pre-treatment monitoring will identify any potential nearby water source to ensure that adequate buffers are used to protect these areas. Phytotoxicity has not been found to be a concern to rangeland plants when these chemicals are applied at the recommended rates.

Currently the F&WS has 52 Endangered and Threatened Species and 2 Candidate Species listed for New Mexico. There are currently 14 threatened and endangered species and two candidate species listed for Rio Arriba County. The list of these species is found for individual species details at these three following links: **https://ipac.ecosphere.fws.gov/project/6XMULLDRQ5ALRBJVIQPFMR6NLU/resources**, **http://www.fws.gov/endangered/,** **http://www.fws.gov/southwest/es//NewMexico/,** The New Mexico Department of Game and Fish has a list of 120 endangered and threatened species found at: **http://www.bison-m.org/.**

3. Socioeconomic Issues

New Mexico has many historic and recreation sites, and unique natural features throughout the state. Most of these occur on federal, state, or tribal lands. The majority of these visitor sites and natural features are not found on rangeland, except with low frequency. Lava flow fields, geological landmarks and outcroppings, ancient archaeological sites, man-made reservoirs, lakes and dams, and historical ranch or church sites, and old military forts are sometimes visited within this rangeland environ.

Some county fairgrounds outside of town are located adjacent to rangelands; however, these events occur in late summer or early autumn. Golf courses, racing tracks, rodeo arenas, FFA and 4-H livestock shows are located at the margins of towns and would be protected by the designated program buffers.

4. Cultural Resources and Events

Native American fiesta days and Colonial Hispanic ceremonies are not performed on rangeland, but in towns and pueblos. Old, abandoned community graveyards or "camposantos" and Indian burial grounds would be excluded as are heritage and historic, petroglyphs and pictographs sites that are protected and preserved in the National Park Service areas or in New Mexico State parks and monuments. These ancestral cultural areas are under the protection of the federal 1906 Antiquities Act and the 1965 National Heritage Act, and the NM State provisions with the Habitat Protection Act (NMSA 17-6-1 et seq.) and the Rangeland Protection Act (NMSA 76-7B) and are excluded from any APHIS grasshopper program.

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.

New Mexico is a minority/majority state. As such, low-income and minority populations are scattered throughout the state as well as Rio Arriba County. In this area of concern, the central portion of Rio Arriba County, there is one Reservation adjacent to, but not included in the proposed treatment area. This is the Jicallia Apache Nation. We will communicate with the Tribe to address any concerns. Low-income, mainly Anglo and Latino, populations are scattered throughout the areas of concern.

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 percentage of the human population within the areas of concern are unknown. Any areas of human habitation, outside of isolated homesteads (these are buffered), are excluded from any program. New Mexico will identify any day care operations, schools or large concentrations of children and exclude these areas from any program operations. These may include buffers or completely excluding from the program any populated areas.

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 the grasshopper 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, non-target wildlife, and its environmental fate in soil, air, and water. The assessments rely on data required by USEPA for pesticide product registrations, as well as peer-reviewed and other published literature. The HHERAs are heavily referenced in the EIS and this is likewise tiered to that analysis. These Environmental Documents can be found at the following website: http://www.aphis.usda.gov/plant-health/grasshopper.

A. Environmental Consequences of the Alternatives

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

1. No Suppression Program Alternative

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

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

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

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

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.

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's degradation in aerobic soil varies from rapid to slow with half-lives ranging from 4 to 253 days (USEPA, 2017a). Half-lives decrease with increasing pH from acidic to alkaline conditions. Under anaerobic soil conditions, carbaryl has a half-life of 72 days. Little transport of carbaryl through runoff or leaching to groundwater is expected due to the low water solubility, moderate sorption, and rapid degradation in soils. There are no reports of carbaryl detection in groundwater, and less than 1% of granule carbaryl applied to a sloping plot was detected in runoff (Caro et al., 1974).

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

A number of studies have reported no effects on bird populations in areas treated with carbaryl (Buckner et al., 1973; Richmond et al., 1979; McEwen et al., 1996). Some applications of formulated carbaryl were found to cause depressed AChE levels (Zinkl et al., 1977); 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, 2012a). 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 pollinators to carbaryl treatments for grasshopper suppression. In areas of direct application where impacts may occur, alternating swaths and reduced rates (i.e., RAATs) would reduce risk. Potential negative effects of grasshopper program insecticides on bee populations may also be mitigated by the more common use of carbaryl baits than the ULV spray formulation. Studies with carbaryl bran bait have found no sublethal effects on adults or larvae bees (Peach et al., 1994, 1995).

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

USEPA regulates the amount of pesticide residues that can remain in or on food or feed commodities as the result of a pesticide application. The agency does this by setting a tolerance, which is the maximum residue level of a pesticide, usually measured in parts per million (ppm), that can legally be present in food or feed. USEPA-registered carbaryl products used by the grasshopper program are labeled with rates and treatment intervals that are meant to protect livestock and keep chemical residues in cattle at acceptable levels (thereby protecting human health). While livestock and horses may graze on rangeland the same day that the land is sprayed, in order to keep tolerances to acceptable levels, carbaryl spray applications on rangeland are limited to half a pound active ingredient per acre per year (USEPA, 2012a). 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 liquid 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, 2012a) during loading and applications. APHIS quantified the potential health risks associated with accidental worker exposure to carbaryl during mixing, loading, and applications. The quantitative risk evaluation results indicate no concerns for adverse health risk for program workers (http://www.aphis.usda.gov/plant-health/grasshopper).

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

b) Chlorantraniliprole

Chlorantraniliprole (Rynaxypyr™) is a recently introduced insecticide that belongs to the anthranilic diamide insecticide class. The mode of action is the activation of insect ryanodine receptors which causes an uncontrolled release of calcium from smooth and striated muscles that impairs muscle regulation and causes paralysis in insects (USEPA, 2008). Although these receptors occur in mammals, the insecticide is very selective to insect ryanodine receptors with more than 350-fold differential selectivity compared to mammalian receptors (Cordova et.al. 2006, USEPA, 2008). Primary activity of chlorantraniliprole is through ingestion with some contact toxicity against lepidopteran pests but also against Orthoptera, Coleoptera, Diptera, and Hemiptera pests (Hannig et al., 2009).

Chlorantraniliprole is considered practically nontoxic via oral, dermal, and inhalation exposures (DuPont, 2011; USEPA, 2008). Median lethality values (LD50) from oral and dermal exposure to the active ingredient, chlorantraniliprole, and the proposed formulation exceeded the highest concentration tested (5,000 milligrams/kilogram (mg/kg)). Inhalation toxicity is also very low for the technical material and the formulation with median lethality values exceeding the highest test concentration (2.1 mg/L). Available acute toxicity data suggests that the acute toxicity between the active ingredient and the formulation are comparable. Prevathon® is not considered an irritant to the eyes or skin and is not a skin sensitizer. In addition, chlorantraniliprole is not considered to be carcinogenic or mutagenic, and is not known to cause reproductive or developmental toxicity. The no observable effect level (NOEL) in reproductive and developmental toxicity studies was 1,000 mg/kg/day, or the highest concentration tested (USEPA, 2008). Studies designed to assess neurotoxicity and effects on the immune system show no effects at a range of doses from the low mg/kg range to greater than 1,000 mg/kg.

Exposure and risk to all population groups is expected to be negligible. The potential for exposure is greatest for workers from handling and applying Prevathon®, however the very low toxicity and label required personal protective equipment result in minimal exposure and risk to this subgroup of the population. Exposure and risk to the general public will also be negligible based on Program use of Prevathon®. Conservative estimates of potential groundwater contamination using standard USEPA models suggest residues would be orders of magnitude below any levels of concern for the general public, including children. Drift may occur during applications however Program restrictions regarding treatment proximity to schools, and other measures to reduce drift, will minimize the potential for exposure and risk to the general public (USDA APHIS, 2013).

Toxicity to most non-target organisms is low based on available toxicity data. Acute fish toxicity is low with median lethality values (LC50) for freshwater and marine test species above the highest test concentration. Amphibian toxicity data does not appear to be available however based on the reported toxicity values for fish, the toxicity to amphibians is expected to be low. Aquatic invertebrates are more sensitive to the effects of chlorantraniliprole with median lethality and effect concentrations ranging from 0.0098 milligrams per liter (mg/L) for the freshwater cladoceran, *Daphnia magna*, to 1.15 mg/L for marine mysid shrimp (Barbee et al., 2010; EPA, 2012b). Chronic no observable effect concentrations (NOEC) range from 0.0045 mg/L for *D. magna* to 0.695 mg/L for a marine mysid (USEPA, 2012b). Available aquatic plant toxicity data suggests low toxicity of chlorantraniliprole to diatoms, algae, and aquatic macrophytes with median effect concentrations exceeding the highest test concentration (USEPA, 2008). Primary and secondary metabolites that could occur in aquatic environments are less toxic than the parent material when comparing toxicity values for the freshwater cladoceran, *D. magna* (USEPA, 2012b).

The exposure and risk to aquatic organisms from the proposed applications of Prevathon® will be negligible based on the low toxicity of chlorantraniliprole, and program restrictions regarding applications near surface water. The Program currently uses a 200-foot ground and 500-foot aerial application buffer from surface water. Using standardized drift modeling at the highest application rate proposed in this study results in shallow water residues of chlorantraniliprole that are approximately ten-fold below the most sensitive sublethal endpoint for aquatic invertebrates (USDA APHIS, 2018b). Residue values were also approximately ten-fold below the most sensitive acute toxicity value for aquatic vertebrates and four orders of magnitude below the acute toxicity values for fish. No indirect effects would be expected for aquatic vertebrates that depend on aquatic plants and invertebrates for habitat and prey from the proposed use of Prevathon®.

Acute toxicity for terrestrial wildlife such as mammals and birds is very low with median lethality values exceeding the highest concentration tested for mammals and birds, such as bobwhite quail and the mallard (USEPA, 2012b). Laboratory toxicity data for technical and formulated chlorantraniliprole shows that the product is practically non-toxic to honeybees in oral or contact exposures. In semi-field studies using two formulations reported NOECs ranging from 52.5 to 156.16 g a.i. chlorantraniliprole/ha (Dinter et al., 2009; USEPA, 2008). Three semi-field honeybee tunnel tests demonstrated no behavioral or flight intensity effects nor were any hive related impacts noted at a dose of 52.5 g/ha (Dinter et al., 2009). The lowest reported NOEC is approximately four times the proposed RAATs application rate for chlorantraniliprole and two times the proposed full rate. Similar NOECs have been observed for other invertebrates such as the hover fly, *Episyrphus balteatus*, ladybird beetle larvae, *Coccinella septempunctata*, green lacewing, *Chrysoperla carnea*, the plant bug, *Typhlodromus pyri*, and predatory mite, *Orius laevigatus* (USEPA, 2008; USEPA, 2012b). The low toxicity to non-target terrestrial invertebrates has also been observed in greenhouse and field applications. Gradish et al. (2011) reported low acute toxicity of formulated chlorantraniliprole to the parasitoid, *Eretmocerus eremicus*, the pirate bug, *Orius insidiosus* and the predatory mite, *Amblyseius swirskii*, in 48-hour exposures. Brugger et al. (2010) evaluated lethal and sublethal impacts of formulated chlorantraniliprole to seven parasitic hymenopterans and found no negative impacts on adult survival, percentage parasitism, or emergence when compared to controls at rates well above the full and RAATs program rates. The lack of toxicity in other insect groups at rates that are toxic to grasshoppers is related to the activity of chlorantraniliprole which is primarily through ingestion. Insects such as grasshoppers and larval Coleoptera and Lepidoptera would receive a larger dose consuming treated plant material compared to many of the non-target pests that have been evaluated in the literature.

Exposure and risk to terrestrial vertebrates that may consume treated plant material or insects in the proposed spray blocks will be negligible. USEPA exposure models to this group of non-target organisms from treated plant material and insects at maximum Prevathon® rates show that residues are at least two orders of magnitude below the most sensitive toxicity endpoint for wild mammals or birds (USDA APHIS, 2015). Indirect risk to this group of organisms is also not anticipated based on the selectivity of chlorantraniliprole to certain insect taxa and the relatively small areas of treatment. Additionally, the selective nature of chlorantraniliprole to certain insect taxa and the low application rates suggest that impacts to all terrestrial invertebrates would not be anticipated. Any decrease in chlorantraniliprole-sensitive terrestrial invertebrate numbers would be expected to be local in nature due to the size of the treatment plots and recovery would occur more rapidly than in larger treatment areas due to immigration and the selective nature of chlorantraniliprole to certain life stages of invertebrates.

The potential for impacts to soil, air and water quality are expected to be negligible based on the proposed use pattern and available environmental fate data for chlorantraniliprole. Air quality is not expected to be significantly impacted since chlorantraniliprole has chemical properties that demonstrate it is not likely to volatilize into the atmosphere (USEPA, 2008). There will be some insecticide present in the atmosphere within and adjacent to the spray block immediately after application as drift but this will be localized and of short duration. Chlorantraniliprole has low solubility in water (<1 mg/L) and is susceptible to sunlight with a half-life of 0.31 days. Microbial degradation in water and pH-related effects to chlorantraniliprole are minor with half-lives greater than 125 days (USEPA, 2008). Slow degradation in soil is also anticipated with half-lives ranging from 228 to 924 days in various soil types (USEPA, 2008). Chlorantraniliprole has a varying affinity for binding to soil, but is generally low, suggesting that it may be susceptible to run-off during storm events. However, the proposed use rates and program restrictions regarding buffers suggest that surface and ground water quality will not be impacted from the proposed Program use of chlorantraniliprole.

c) 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). 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 greatly reduced risk because the lack of effects seen in multiple field studies on other taxa of invertebrates at use rates much higher than those proposed for the program. Shifting diets in insectivorous birds in response to prey densities is not uncommon in undisturbed areas (Rosenberg et al., 1982; Cooper et al., 1990; Sample et al., 1993).

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

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

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

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

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

APHIS reduces the risk to native bees and pollinators through monitoring grasshopper and Mormon cricket populations and making pesticide applications in a manner that reduces the risk to this group of nontarget invertebrates. Monitoring grasshopper and Mormon cricket populations allows APHIS to determine if populations require treatment and to make treatments in a timely manner reducing pesticide use and emphasizing the use of Program insecticides that are not broad spectrum. The treatment history of Program since the introduction of diflubenzuron demonstrates it is the preferred insecticide. Over 90% of the acreage treated by the Program has been with diflubenzuron.

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.

d) 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 (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).

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

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

USEPA considers malathion highly toxic to bees if exposed to direct treatment on blooming crops or weeds. The Fyfanon® ULV AG label indicates not to apply product or allow it to drift to blooming crops or weeds while bees are actively visiting the treatment area (USEPA, 2012c). 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 et al., 1996; Norelius and Lockwood, 1999; Pascual, 1994).

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

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

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

Risks to terrestrial invertebrate populations are anticipated based on the available toxicity data for invertebrates and the broad-spectrum activity of malathion (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.

e) 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, except in rare pest conditions that warrant full coverage and higher rates. The goal of the RAATs strategy is to suppress grasshopper populations to a desired level, rather than to reduce those populations to the greatest possible extent. This strategy has both economic and environmental benefits. APHIS would apply a single application of insecticide per year, typically using a RAATs strategy that decreases the rate of insecticide applied by either using lower insecticide spray concentrations, or by alternating one or more treatment swaths. Usually RAATs applications use both lower concentrations and skip treatment swaths. The RAATs strategy suppresses grasshoppers within treated swaths, while conserving grasshopper predators and parasites in swaths that are not treated.

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

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

RAATs reduces treatment costs and conserves non-target biological resources in untreated areas. The potential economic advantages of RAATs 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, chlorantraniliprole, 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.

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

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

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

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).

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

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

4. Tribal Consultation

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

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

5. Executive Order 13186, Responsibilities of Federal Agencies to Protect Migratory Birds

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

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

6. Endangered Species Act

Section 7 of the Endangered Species Act (ESA) and its implementing regulations require Federal agencies to ensure their actions are not likely to jeopardize the continued existence of listed threatened or endangered species or result in the destruction or adverse modification of critical habitat. Numerous federally listed species and areas of designated critical habitat occur within the 17-State program area, although not all occur within or near potential grasshopper suppression areas or within the area under consideration by 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
- 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 anticipated and continues to believe 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 concluded in the programmatic biological assessment 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 primarily conduct consultations with USFWS field offices at the local level.

APHIS considers the role of pollinators in any consultations conducted with the USFWS 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.

APHIS-PPQ New Mexico has submitted a draft BA to Fish and Wildlife Services for review on February 17th 2023. Consultation is pending at this time.

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. However, rangeland grasshopper suppression treatments occur during the late spring or early summer, after the nesting season when eagle young typically will have already fledged. The Program also recognizes disruptive activities in or near eagle foraging areas can interfere with bald eagle feeding, reducing chances of survival. Program operational procedures that prevent applications near water bodies will reduce the possibility of disturbing eagle foraging activities. 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 respond 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).

The safety data sheet for each insecticide identifies these combustion products 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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VI. Listing of Agencies and Persons Consulted

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Appendix A - APHIS Rangeland Grasshopper and Mormon Cricket Suppression Program
FY-2023 Treatment Guidelines
Version 01/09/2023

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 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
   a. solid bait
   b. ultra-low volume (ULV) spray

B. Diflubenzuron ULV spray

C. Malathion ULV spray

D. Chlorantraniliprole

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). Furthermore, provide the following buffers for water bodies:

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

• 200-foot buffer with aerial bait.
• 50-foot buffer with ground bait.

5. Instruct program personnel in the safe use of equipment, materials and procedures; supervise to ensure safety procedures are properly followed.
6. Conduct mixing, loading, and unloading in an approved area where an accidental spill would not contaminate a water body.
7. Each aerial suppression program will have a Contracting Officer's Representative (COR) OR a Treatment Manager on site. Each State will have at least one COR available to assist the Contracting Officer (CO) in GH/MC aerial suppression programs.
NOTE: A Treatment Manager is an individual that the COR has delegated authority to oversee the actual suppression treatment; someone who is on the treatment site and overseeing / coordinating the treatment and communicating with the COR. No specific training is required, but knowledge of the Aerial Application Manual and treatment experience is critical; attendance to the Aerial Applicators Workshop is very beneficial.
8. Each suppression program will conduct environmental monitoring as outlined in the current year's Environmental Monitoring Plan.
APHIS will assess and monitor rangeland treatments for the efficacy of the treatment, to verify that a suppression treatment program has properly been implemented, and to assure that any environmentally sensitive sites are protected.
9. APHIS reporting requirements associated with grasshopper / Mormon cricket suppression treatments can be found in the APHIS Grasshopper Program Guidebook:
http://www.aphis.usda.gov/import_export/plants/manuals/domestic/downloads/grasshopper.pdf
APHIS reporting requirements associated with grasshopper / Mormon cricket suppression treatments include:

A. Completion of a post-treatment report (Part C of the Project Planning and Reporting Worksheet (PPQ Form 62)
B. Providing an entry for each treatment in the PPQ Grasshopper/Mormon Cricket treatment database
C. For aerial treatments, providing copies of forms and treatment/plane data for input into the Federal Aviation Interactive Reporting System (FAIRS) by PPQ's designee

SPECIFIC PROCEDURES FOR AERIAL APPLICATIONS

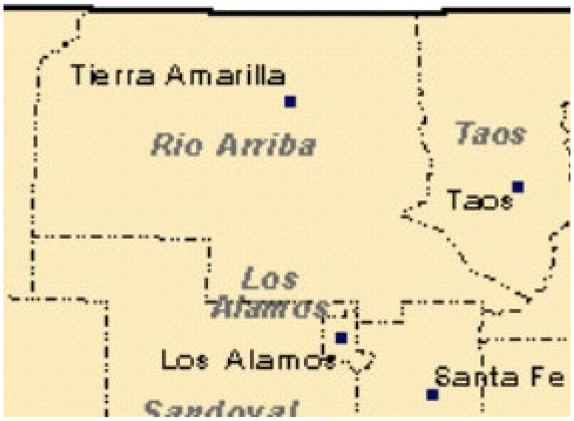
1. APHIS Aerial treatment contracts will adhere to the current year's Statement of Work (SOW).
2. Minimize the potential for drift and volatilization by not using ULV sprays when the following conditions exist in the spray area:

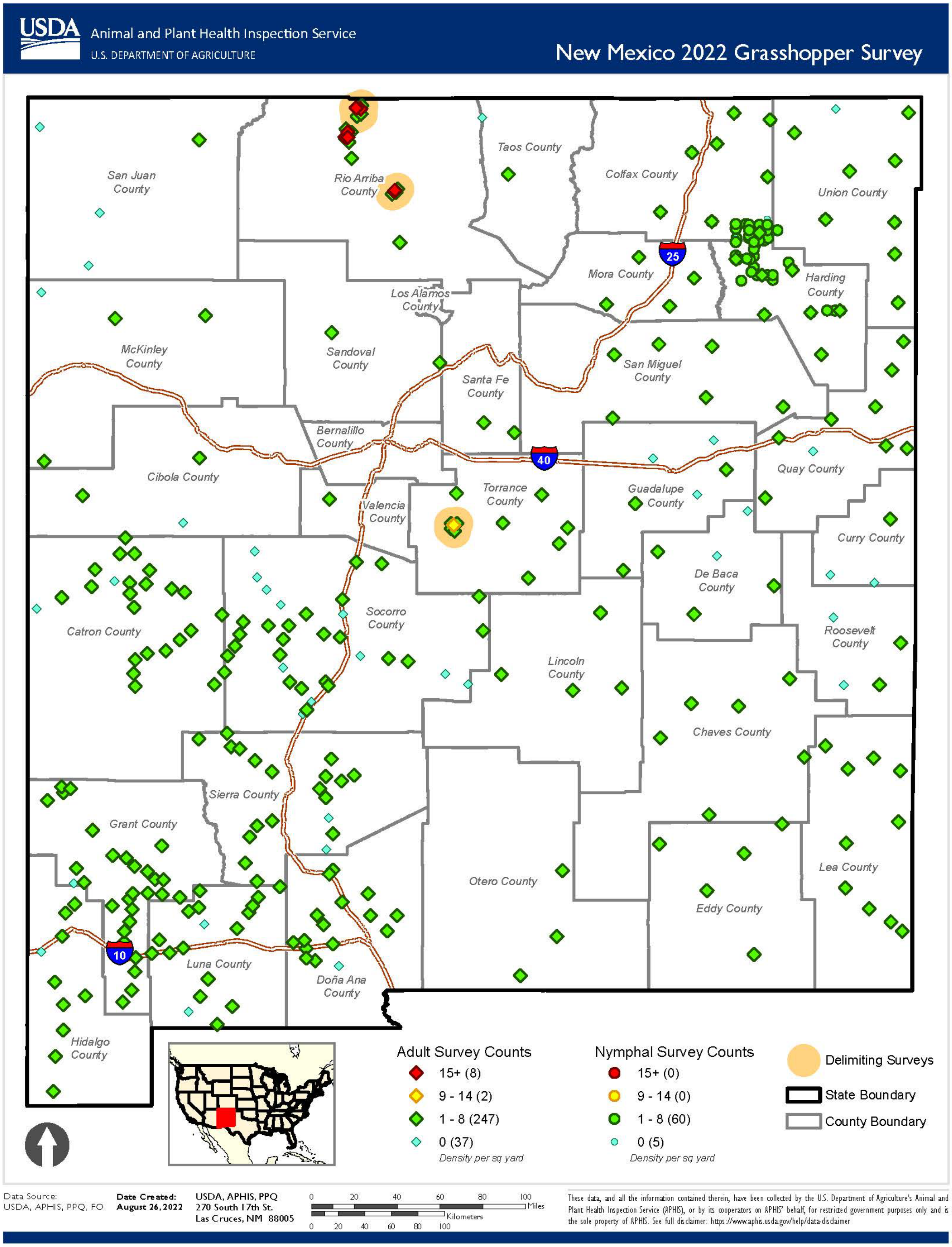
a. Wind velocity exceeds 10 miles per hour (unless state law requires lower wind speed);
b. Rain is falling or is imminent;
c. Dew is present over large areas within the treatment block;
d. There is air turbulence that could affect the spray deposition;
e. Temperature inversions (ground temperature higher than air temperature) develop and deposition onto the ground is affected.

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

4. Application aircraft will fly at a median altitude of 1 to 1.5 times the wingspan of the aircraft whenever possible or as specified by the COR or the Treatment Manager.
5. Whenever possible, plan aerial ferrying and turnaround routes to avoid flights over congested areas, water bodies, and other sensitive areas that are not to be treated.

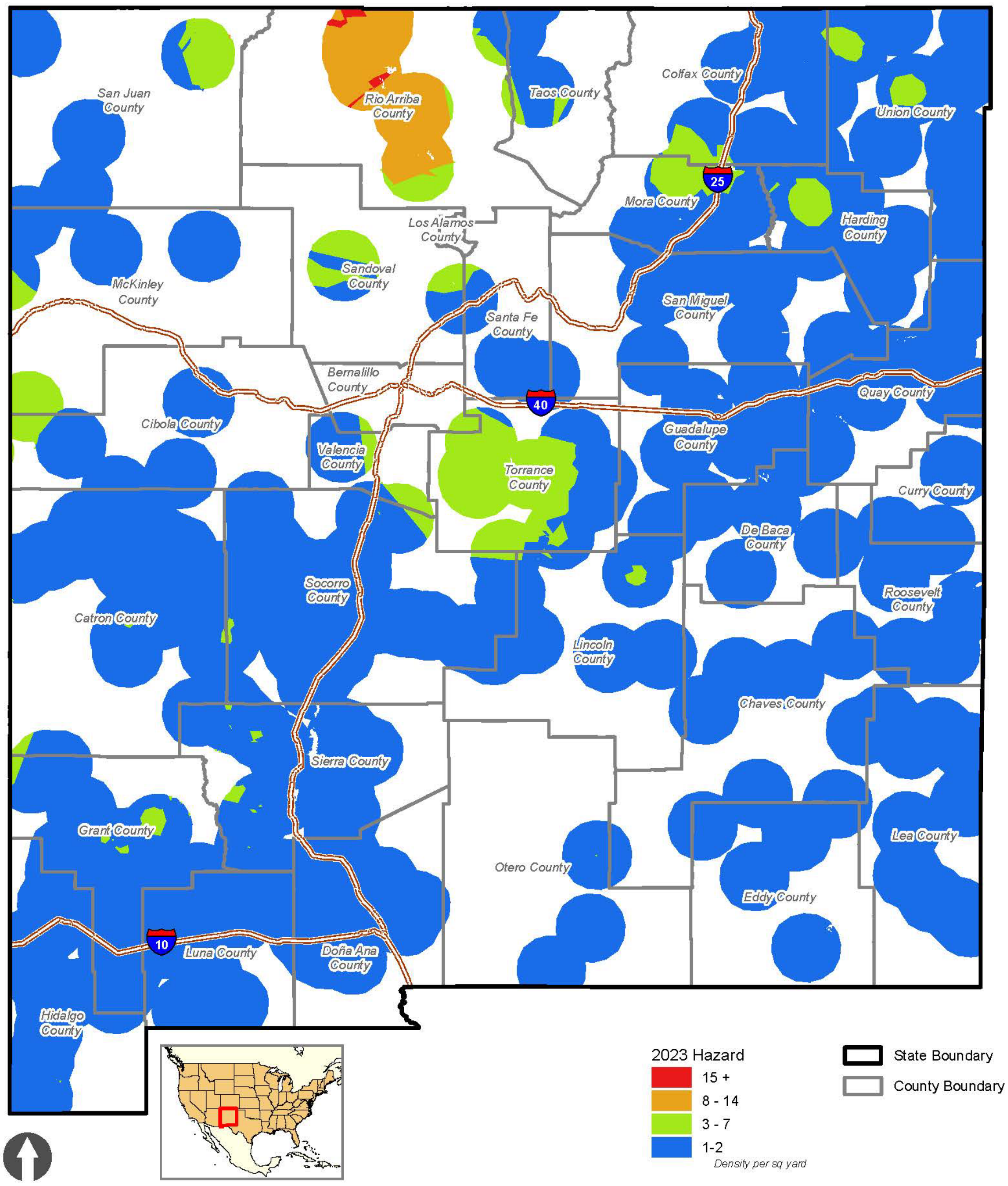
Appendix B - Map of the Affected Environment




USDA
Animal and Plant Health Inspection Service
U.S. DEPARTMENT OF AGRICULTURE
New Mexico 2022 Grasshopper Survey
San Juan County
Rio Arriba County
Taos County
Colfax County
Union County
Mora County
Harding County
Los Alamos County
McKinley County
Sandoval County
Santa Fe County
San Miguel County
Bernalillo County
Cibola County
Torrance County
Guadalupe County
Quay County
Valencia County
Curry County
De Baca County
Socorro County
Catron County
Roosevelt County
Lincoln County
Chaves County
Sierra County
Grant County
Otero County
Lea County
Eddy County
Luna County
Doña Ana County
Hidalgo County
25
40
10
Adult Survey Counts
15+ (8)
9 - 14 (2)
1 - 8 (247)
0 (37)
Density per sq yard
Nymphal Survey Counts
15+ (0)
9 - 14 (0)
1 - 8 (60)
0 (5)
Density per sq yard
Delimiting Surveys
State Boundary
County Boundary
Data Source:
USDA, APHIS, PPQ, FO
Date Created:
August 26, 2022
USDA, APHIS, PPQ
270 South 17th St.
Las Cruces, NM 88005
0 20 40 60 80 100 Miles
0 20 40 60 80 100 Kilometers
These data, and all the information contained therein, have been collected by the U.S. Department of Agriculture's Animal and Plant Health Inspection Service (APHIS), or by its cooperators on APHIS' behalf, for restricted government purposes only and is the sole property of APHIS. See full disclaimer: https://www.aphis.usda.gov/help/data-disclaimer

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

New Mexico 2023 Grasshopper Hazard



Date Created: December 1, 2022
Data Source: USDA, APHIS, PPQ, FO

USDA, APHIS, PPQ
270 South 17th St.
Las Cruces, NM 88005

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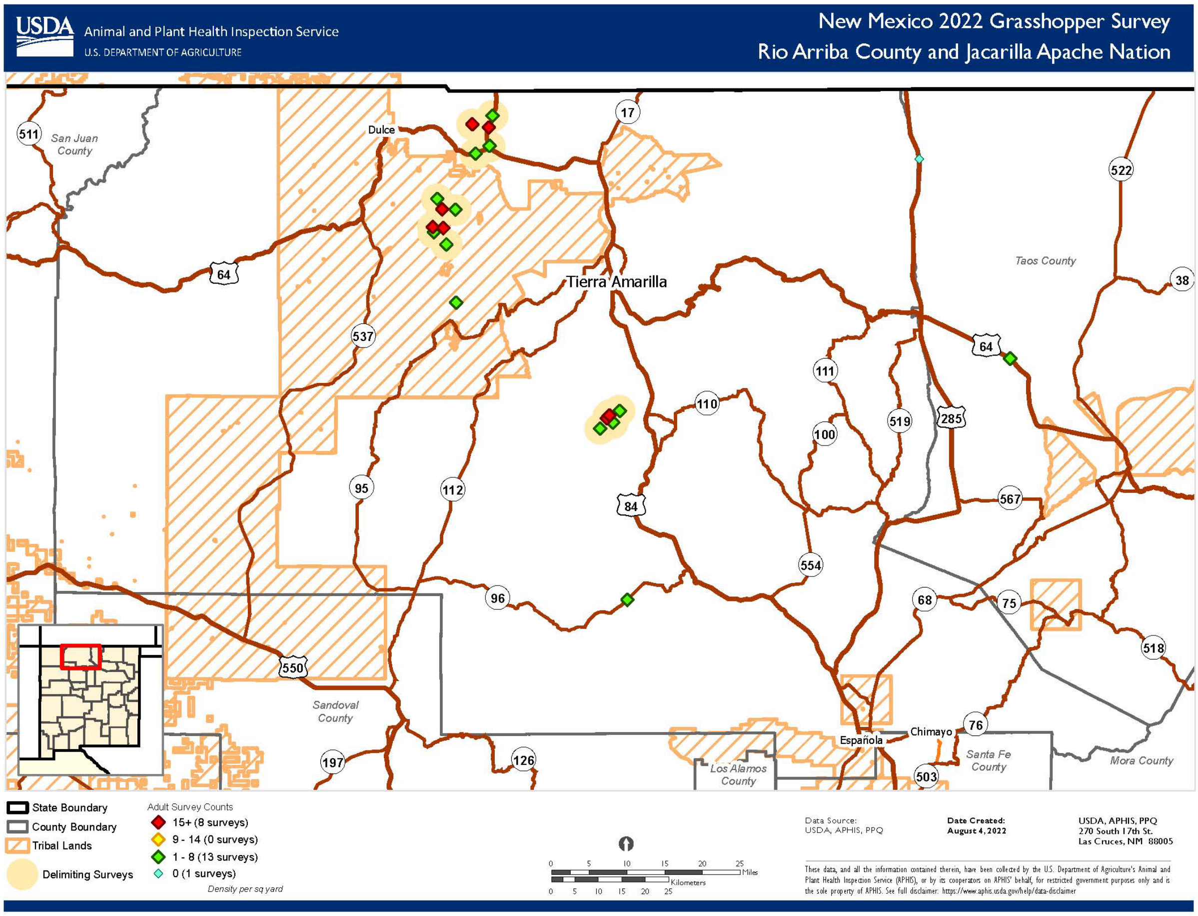
USDA
Animal and Plant Health Inspection Service
U.S. DEPARTMENT OF AGRICULTURE
New Mexico 2022 Grasshopper Survey
Rio Arriba County and Jacarilla Apache Nation
San Juan County
Dulce
Tierra Amarilla
Taos County
Sandoval County
Los Alamos County
Española
Chimayo
Santa Fe County
Mora County
511
17
522
64
38
537
111
64
519
285
110
100
95
112
84
567
554
96
68
75
518
550
76
197
126
503
State Boundary
County Boundary
Tribal Lands
Delimiting Surveys
Adult Survey Counts
15+ (8 surveys)
9 - 14 (0 surveys)
1 - 8 (13 surveys)
0 (1 surveys)
Density per sq yard
Miles
Kilometers
Data Source:
USDA, APHIS, PPQ
Date Created:
August 4, 2022
USDA, APHIS, PPQ
270 South 17th St.
Las Cruces, NM 88005
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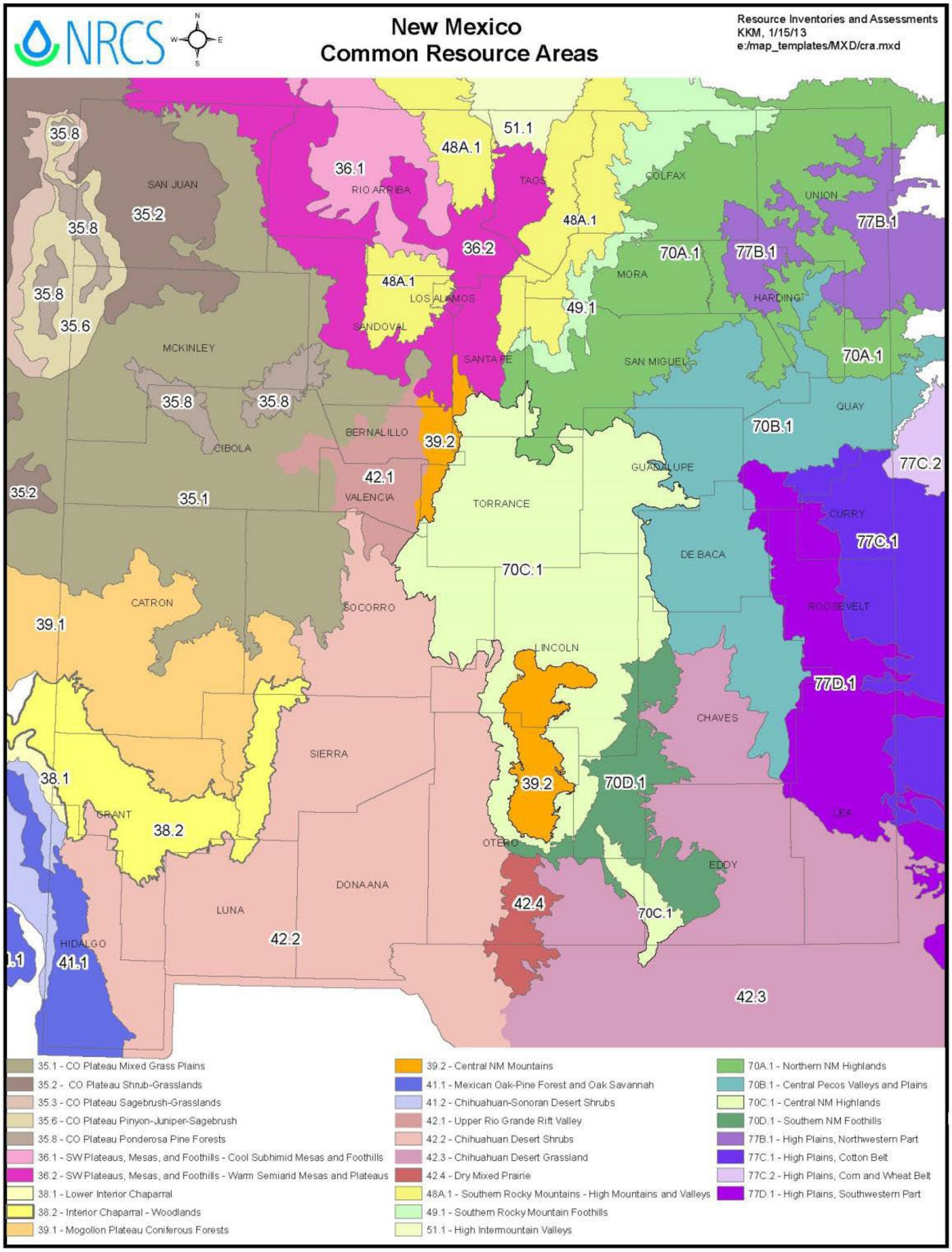
NRCS
New Mexico
Common Resource Areas
Resource Inventories and Assessments
KKM, 1/15/13
e:/map_templates/MXD/cra.mxd
SAN JUAN
RIO ARRIBA
TAOS
COLFAX
UNION
MORA
HARDING
LOS ALAMOS
SANDOVAL
SANTA FE
SAN MIGUEL
MCKINLEY
QUAY
BERNALILLO
CIBOLA
GUADALUPE
VALENCIA
TORRANCE
CURRY
DE BACA
CATRON
SOCORRO
ROOSEVELT
LINCOLN
CHAVES
SIERRA
GRANT
LEA
OTERO
EDDY
DONA ANA
LUNA
HIDALGO
35.1 - CO Plateau Mixed Grass Plains
35.2 - CO Plateau Shrub-Grasslands
35.3 - CO Plateau Sagebrush-Grasslands
35.6 - CO Plateau Pinyon-Juniper-Sagebrush
35.8 - CO Plateau Ponderosa Pine Forests
36.1 - SW Plateaus, Mesas, and Foothills - Cool Subhimid Mesas and Foothills
36.2 - SW Plateaus, Mesas, and Foothills - Warm Semiarid Mesas and Plateaus
38.1 - Lower Interior Chaparral
38.2 - Interior Chaparral - Woodlands
39.1 - Mogollon Plateau Coniferous Forests
39.2 - Central NM Mountains
41.1 - Mexican Oak-Pine Forest and Oak Savannah
41.2 - Chihuahuan-Sonoran Desert Shrubs
42.1 - Upper Rio Grande Rift Valley
42.2 - Chihuahuan Desert Shrubs
42.3 - Chihuahuan Desert Grassland
42.4 - Dry Mixed Prairie
48A.1 - Southern Rocky Mountains - High Mountains and Valleys
49.1 - Southern Rocky Mountain Foothills
51.1 - High Intermountain Valleys
70A.1 - Northern NM Highlands
70B.1 - Central Pecos Valleys and Plains
70C.1 - Central NM Highlands
70D.1 - Southern NM Foothills
77B.1 - High Plains, Northwestern Part
77C.1 - High Plains, Cotton Belt
77C.2 - High Plains, Corn and Wheat Belt
77D.1 - High Plains, Southwestern Part

Appendix C: FWS/NMFS Correspondence

1) 2005 Lincoln County B.A; FWS Consultation # 2-22-05-I-0460
2) 2006 New Mexico B.A; FWS Consultation # 22420-2006-I-0069
3) 2007 New Mexico B.A, FWS Consultation #22420-2006-I-0069a
4) 2008 New Mexico B.A, FWS Consultation #22420-2008-I-0062
5) 2009 New Mexico B.A, FWS Consultation #22420-2009-TA-0027
6) 2010 – 2015 New Mexico B.A, FWS Consultation #22420-2010-I-0047
7) 2015 – 2020 New Mexico B.A. FWS Consultation - #02ENNM00-2015-I-0244
8) 2023 New Mexico B.A FWS Consultation, pending

Appendix D: State and Tribal Species of Concern Review

1) Navajo Nation, Division of Natural Resources: Endangered Species List (Resource Committee Resolution No. RCS-41-08), September 10, 2008. https://www.nndfw.org/nnhp/nnhp_nesl.pdf
2) New Mexico Energy, Minerals & Natural Resources Department, Forestry and Resource Conservation Division, Title 19, Chapter 21 Part 2.9 Endangered Plants Species List. August 31, 1995.
3) New Mexico Department of Game and Fish: Conservation Services Division; Threatened and Endangered Fishes of New Mexico by David L. Propst, 1999.
4) New Mexico Department of Game and Fish: Conservation Services Division: New Mexico Species of Concern – Status and Distribution. April 2003 http://www.wildlife.state.nm.us/conservation/
5) New Mexico Rare Plant Technical Council: New Mexico Rare Plants; home page, http://nmrareplants.unm.edu (last update: 09-04-2009)

Appendix E: APHIS response to public comments on the Rio Arriba County, New Mexico draft EA (EA Number: NM-23-01)

USDA APHIS received three letters with public comments concerning the 2023 Draft Environmental Assessments (EAs) for the Rangeland Grasshopper and Mormon Cricket Suppression Program. Public comments were received from Ray Thompson, Western Watersheds Project, the American Bird Conservancy, the Center for Biological Diversity, and the Xerces Society.

Ray Thompson Comment and APHIS Response

#1
"Why not trying an Insect Growth Regulator application when the population is in about the 2nd or 3rd instar. The IGR would break the life cycle and reduce the numbers for next year's population. The IGR could be used along with the Chiton Syntheses Inhibitor."

APHIS Response:

APHIS agrees with the commenter. The chemical of choice, if a treatment is required, is diflubenzuron. This chemical is a chitin inhibitor as well as being classified as an insect growth regulator (Group 15 insecticide). We try to catch the nymphal population at an early instar stage in order to use this type of chemical, if necessary.

Center for Biological Diversity Comments and APHIS Responses

#1
"All comments from last year and the years before are equally applicable this year as the 2023 draft EA suffer from the same or similar deficiencies as the 2022, 2021 and 2020 ones, and are incorporated by reference. Also, comments on these EAs by the Xerces Society for Invertebrate Conservation joined by the Center and others from 2023, 2022, 2021 and 2020 are equally applicable and incorporated by reference. All these documents have been submitted to your office. ".

APHIS Response:
Thank you for your engagement on this program. APHIS values criticism of the program to ensure that it meets the highest possible environmental standards as demanded by the public at large and recommended by non-profit environmental advocacy groups such as the Center for Biological Diversity.

The responses for comments 1 through 157 are found in the 2020 EA. These responses are equally applicable for the 2023 EA.

#2
"In addition to the matters raised in those comments, we wanted to raise a few additional concerns. The first is noting that this winter and spring have been extraordinarily cool and wet, leading to widespread speculation and early indications that we are in for a boom year for many species, including many species of butterflies, native bees, and birds. Periodic boom years are

vital for the health of many species, especially given the droughts of recent years, and spraying insecticides during this vital time could result in significant population level impacts for species, including those listed under the Endangered Species Act (ESA), several that have been petitioned for under the ESA that exist in New Mexico and are currently under review by the U.S. Fish and Wildlife Service, and countless imperiled pollinator species. We implore APHIS to exercise extreme caution to ensure that species that have taken a hit in recent years can use this year to recover."

APHIS Response:

This comment is similar in nature to comments from the 2022 EA, see responses to comment 23 and 24, see also responses to comments 4,5,8, and 11 of the 2021 EA. See also APHIS responses to comments 10, 12, 14, 19, 20, 25, 28 and 37 in the 2020 EA's. The commenter has expressed these concerns repeatedly, and APHIS has addressed them previously. Section 7 consultation with local FWS is pending for concurrence to APHIS protective measures to T&E species listed in the proposed action area.

#3

"Also, just over a week after you released these EAs, the U.S. Environmental Protection Agency (EPA) published a draft biological opinion issued by the National Marine Fisheries Service (NMFS) on carbaryl,1 one of the chemicals authorized for use in these EAs. While Arizona is not home to any of the species protected by NMFS, the draft biological opinion's findings of the extreme harm carbaryl poses to ESA listed species is troubling, and much of the analysis done by NMFS should be utilized to better understand the potential impacts of carbaryl on plants and animals in New Mexico. Most disturbingly, NMFS found that carbaryl is likely to jeopardize the continued existence of 37 listed species, and adversely modify 36 designated critical habitats. These findings make plain that APHIS can not continue to claim that carbaryl can be lawfully used in this program without entering into formal consultation with the U.S. Fish and Wildlife Service, as the gravity of this single pesticide's harm and the likelihood that it will take or even jeopardize ESA listed species if used within their range is almost certain."

APHIS Response:

The commenter referenced the draft Biological Opinion published by EPA, issued by NMFS concerning the use of carbaryl is likely to jeopardize 37 listed species and critical habitat. This document lists the carbaryl species conclusions are for 37 species that either are salmon, sockeye, steelhead, sturgeon, grouper, coral, and killer whale. These species do not occur in Rio Arriba County, New Mexico and are a moot point. The commenter failed to describe the Reasonable and Prudent Alternatives (RPA) issued in the Biological Opinion to be used to decrease the risk of exposure to listed species. NMFS believes the RPMs described below are necessary and appropriate to minimize the impacts of incidental take on threatened and endangered species:

RPM 1. Revise and approve all carbaryl and methomyl product labels and develop relevant EPA Endangered Species Protection Plan Bulletins to conserve ESA-listed species.

RPM 2. Improve ecological incident reporting, develop ESA educational materials, and report label compliance.

*On November 22, 2022, the EPA issued an interim registration review for Carbaryl. The following requirement was added to the label which was recommended by NMFS in their Reasonable and Prudent Alternatives section of the BiOp. "**Direction for Use: Endangered Species Protection Requirements.** Before using this product, you must obtain a Bulletin at any time within six months of the day of application. To obtain Bulletins, consult http://www.epa.gov/espp".*

APHIS acquired EPA bulletins for all T&E species in February 2023, even though the older labels on carbaryl products do not require this direction. According to EPA bulletins," no pesticide use limitations exist within the action areas (listed in the EA's), for the month/year and product selected, beyond the instructions specified on the pesticide label. Follow the use instructions on your label." APHIS is in compliance with EPA and the RPA issued in the BiOP.

Xerces Society, et al. Comments and APHIS Responses

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 2023. As a result, it is impossible to

determine if applications might occur to sensitive areas or species locations within the specified counties. The EA does not address why and whether grasshopper numbers are rising or falling relative to historic patterns. A meaningful addition 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.
In addition, a site-specific EA should consider the particular environmental conditions of areas, including fluctuations that occur from year to year.

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: In our comment letters on previous year's EAs we have repeatedly requested to receive a copy of maps and acreages of all final treatment areas. However, APHIS has neither provided those (except, in some cases for some states under formal FOIA requests) nor provided a reasonable explanation about why these taxpayer funded applications are necessary to keep secret.
We represent organizations that work to represent organisms without a voice--that could be impacted by the proposed actions either directly or indirectly. As such, we consider ourselves "stakeholders" and hereby request to be included among those whom APHIS informs of its proposed treatment areas once those are determined. It is time to end the secrecy around the extent and location and timing of these treatments.

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.
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 disclosed to the public.

APHIS Response: *Thank you for your engagement on this program. APHIS values criticism of the program to ensure that it meets the highest possible environmental standards as demanded by the public at large and recommended by non-profit environmental advocacy groups such the Xerces Society.*

Treatment requests are received before the survey season begins, but they are very dynamic and can change week-to-week. Arbitrarily publishing requested treatment locations in the draft EA would not accurately reflect future treatment actions. Treatment locations on public land cannot be described accurately in the EA because the exact location is only known after nymphal surveys are conducted. Grasshopper nymphal stages generally develop every 5-12 days depending on environmental temperature. If draft EAs are published after nymphal surveys dictate treatment locations the grasshopper life stage would advance to the point that treatments with diflubenzuron could no longer take place.

The potential treatment area is described in the EA, unless the commentor would prefer knowing exact details of an area that would need treatment over the demand of the public to have economically and ecologically effective treatment (e.g. spraying broad spectrum pesticides in July in an area the public has had time to review in detail). This is not how modern Integrated Pest Management (IPM) science best management practices work, and would not be in anyone's best interest, certainly not the publics.

Please see the APHIS responses to comment 1 in the 2022 EA, comment 1 in the 2021 EA and comments 1, 2, 3, 4, 5, 6, 8, 54, 72 and 119 in the 2020 EA.

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 the ecological, scientific, or recreational resources across the geography covered by the EA, such as Important Bird Areas, National Wildlife Refuges Wilderness Study Areas, National, state or county Parks, Wilderness areas, Areas of Critical Environmental Concern, and tribal and sacred lands within the geography that could be affected.
While APHIS may reasonably assert the need to respond quickly, that does not excuse ignoring existing information or refusing to do environmental disclosures as required by NEPA.

Recommendation: See above.

APHIS Response: *Predicting exactly where and when grasshopper outbreaks may occur is akin to predicting when and where tornados may occur. You might know the general area where they may break out but pinpointing exactly where they touch down is different story. APHIS does our best to utilize previous years' data to predict where these outbreaks may occur. Our Biological Assessments cover areas of ecological concern. They outline what protective measures we will take to minimize impact of our treatment programs. Please see APHIS response to comment 2 in the 2022 EA.*

Rate for Carbaryl Bait is Erroneous.

The 2023 EA includes rates of application for each of the insecticides that might be used. For carbaryl bait, the 2023 EA states:
4.0 pounds (0.20 lbs a.i./ac treated) of 5 percent carbaryl bait
This needs correction. For 4 lbs of 2 percent carbaryl bait, that would represent 0.08 lb ai/acre.
APHIS Response: *APHIS agrees with the commenter that there was a mistake in the rate of application listed in the Draft EA's. It was a typographical error and has been corrected to read," 4.0 pounds (0.08lb.a.i.) of 2% carbaryl bait per acre."*

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

Please note that we made this comment last year. Despite this, APHIS did not correct the record in its 2023 EA. APHIS claims in its EA that it reduces the risk to native bees and pollinators through several measures including preference for insecticides that are not broad-spectrum. As an example from the 2023 EA:
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 Preferred Alternative B: 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

The highly regarded Pesticide Properties Database (PPDB) maintained by the University of Hertfordshire also calls chlorantraniliprole broad-spectrum. EPA in its 2020 problem formulation for chlorantraniliprole, EPA calls this active ingredient "non-selective"—in other words, broad-spectrum (EPA 2020).

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.

APHIS Response: *The commenter is incorrect when stating that diflubenzuron is labeled as a "broad spectrum" insecticide (see Dimlin 2L EPA Reg. No. 400-461 and Cavalier 2L EPA Reg. No. 89799-1). APHIS and its contractors apply this chemical at rates at label recommendations (Grassland) and, when applying using the RAATs method, leave approximately half of the treatment area unapplied. In New Mexico, as of 2021, carbaryl baits were not authorized for use. Carbaryl liquids are applied at or below label rates (Rangeland) and again, when applying using the RAATs method, leave approximately half of the treatment area unapplied. This chemical choice would only be used when the grasshopper populations are mature (adult) or a mixture of life stages. Malathion is included only as a choice of last resort.*

APHIS recognizes that diflubenzuron poses a threat to aquatic invertebrates and fish and thus utilizes extensive buffer zones around sensitive areas. Use of these buffers are also applied when using the other chemicals. In addition, APHIS works with beekeepers in the affected area to limit or suppress any adverse effects.

Assessment of the impacts of these chemicals are found on pages 14 – 26 of the draft EA NM-23-01.

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.

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

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

The Plant Protection Act of 2000 does not give authority to APHIS to purchase replacement feed for ranchers, but rather only provides funding when available to suppress outbreak populations of grasshoppers to save forage.

The commenter is correct that APHIS believes the use of RAATs mitigates the risk to non-target insects including pollinators. However, APHIS does not solely rely on the reduced deposition of pesticides in the untreated swaths to determine the potential harmful effects of grasshopper treatments will not cause significant impacts. The environmental consequences risk analysis of carbaryl and diflubenzuron treatments using conventional methods (total area coverage and higher application rates) is provided on pages 20-28 of the 2021 EA. Additional descriptions of APHIS' analysis methods and discussion of the toxicology can be found in the 2019 EIS.

Please see the APHIS response in comment 2 of the 2021 EA and comment 4 of the 2022 EA.

3. **Statements on the effects of grasshopper damage are improperly supported.**

In the EA, APHIS asserts that under some outbreaks, vegetation damage is so severe that all grasses and forbs are destroyed, impairing plant growth for several years, but provides no citations to support this assertion. Furthermore, APHIS claims that grasshopper feeding results in soil drying which results in erosion, disruption of nutrient cycling, water infiltration, seed germination and other ecological processes. This assertion that grasshopper outbreaks lead to erosion, soil damage, and disruptions of rangeland ecosystems is based on a single study examining the effects of an outbreak of an introduced grasshopper in Hawaii in a non-rangeland ecosystem (Latchininsky et al. 2011). There are no data demonstrating similar extreme effects of grasshopper outbreaks in western rangelands, which have evolved with periodic grasshopper outbreaks. It is not appropriate to use the example from Hawaii in this context as justification for chemical treatments.

Recommendation: APHIS must substantiate its statements using science that is appropriate for the sites that will be treated under this EA, and avoid any impression of bias.

APHIS Response: *APHIS agrees with the commenter that using Latchininsky's study from Hawaii may not be an appropriate example. But, as the pictures below show, the damage is palpable. These were taken in the proposed area in August 2022.*

Granted, this past winter of 2022 – 2030 was generally wetter, more moisture was received, and the range has recovered, the potential for a repeat of this damage if the outbreak continues is great.

Photos courtesy of Jacob Howell, USDA-APHIS-PPQ-NM-FO

Impacts of pesticide use 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.

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.

APHIS Response: *The commenter is too vague to be able to respond accurately to this comment. Often in the EA the term Reduced Agent Area Treatment (RAAT), typically described as the RAATs treatment method, is used. Compared to conventional blanket applications of pesticide, the RAATs strategy uses a reduced rate by alternating treatment swaths in a spray block, reducing application rates, or both.*

All the analyses in the EA's are done at conventional rates of full coverage. Any reduction in rate of application or acreage treated (i.e., RAATs) is, by definition, a "reduction" in active ingredient deposited on any given project area when compared to full coverage treatment. Please see the APHIS response in comment 3 of the 2021 EA and comment 5 of the 2022 EA.

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

The geographic area covered by this EA may be home to 200-900 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 New Mexico home are already considered at-risk. See lists of at risk pollinators found in New Mexico in Attachments 1 and 2 from our comment letter submitted in 2020. We ask you to incorporate those attachments by reference.
Pollinators, including bumble bee species that occur in New Mexico within the range of possibly future treatments, are facing significant declines (National Research Council 2007; Cameron et al. 2011).

Bumble bees as a group, and several bumble bee species endemic to western states are perhaps the best known examples of pollinators in serious decline. Bumble bees are known to be important pollinators on many rangeland plants, including many listed plant species. 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 New Mexico are within the range of several bumble bee species that have experienced declines in abundance and range contractions: *Bombus fervidus* , *B. occidentalis, and B. pensylvanicus*. Their decline statistics and range contractions are captured in a valuable IUCN overview of North American bumble bee species (Hatfield et al. 2015). *B. occidentalis* relative abundance compared to historic values is only 28.5%, while the current abundance of *B. fervidus* relative to historic values is 38%. *B. pennsylvanicus*, another declining species also historically occurred in New Mexico. According to Hatfield et al. 2015, it has experienced a range loss of ~50% along with a 50% drop in persistence and 88.56% drop in relative abundance.

B. occidentalis and *B. pensylvanicus* have been petitioned for listing under the Endangered Species Act, and has each received a positive 90-day finding by the USFWS, a fact not disclosed in the APHIS EA.

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

As another example, the west coast lady butterfly (*Vanessa annabella*) is in steep decline. This species was historically common across much of the western U.S, and was locally abundant in some places, but has become increasingly rare across much of its range, despite continued monitoring and an increase in interest and participation in tracking butterflies among community scientist over the last 20 years. Analyses conducted by Forister et al. 2022 demonstrate that *Vanessa annabella* has declined across its range, even in areas of its range with the highest habitat suitability. This same study recently ranked this species as one of the butterflies most at risk of extinction in the next 50 years, eclipsing other imperiled widespread species, such as the monarch butterfly (*Danaus plexippu*s). Additional analyses show that *V. annabella* is observed less frequently in 50% of its range in the recent time period, including areas of historically high habitat suitability.

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 does not consider the threats that treatments could pose to these dwindling bumble bees or other native bees that are dwindling but not yet on the Endangered Species List. The EA further fails to disclose which, if any, invertebrates within the geographic area are listed as sensitive by federal land management agencies or as Species of Conservation Concern, or whether the state of Montana designates any invertebrates as species of greatest conservation need.

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

- Honey bee queens do not forage; native bee queens do
- Honey bee larvae do not eat raw pollen; native bee larvae do
- Honey bees nest above the ground in hives; native bees mostly nest in the ground
- Honey bees have well-defined caste systems and very large sizes; most native bees have little or no social organization and nests are very small.

• Foraging exposure is different, for example foraging bumble bee adults may experience higher exposure due to their ability to be active during weather conditions and at times that honey bees do not forage, and because bumble fee foragers visit more flowers per day.

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

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

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 EAs and map their ranges prior to approving any treatment requests. Please see tables of at-risk bee and butterfly species potentially located within the project area in our 2020 comment letter. 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.
APHIS Response: *The commenter has expressed similar concerns about the effects of rangeland grasshopper treatments on invertebrate pollinators in 2020, 2021 and 2022. If treatments are necessary, the size of the treatment blocks would be miniscule (substantially less than 1%) compared to the amount of rangeland in New Mexico. 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 New Mexico. 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 2021 EA. Additional descriptions of APHIS' analysis methods and discussion of the toxicology can be found in the 2019 EIS.

APHIS has not demonstrated that treatments in New Mexico in 2023 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 with the authority to exclude, eradicate, and control plant pests, including grasshoppers. Specifically, language in the PPA provides authority for APHIS to protect rangeland from "economic infestation" of grasshoppers. In its recent EIS updating the program (APHIS 2019), the Agency describes its determination of an economic infestation as follows:

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

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.

In the 2023 EA, APHIS states *"The goal of the proposed suppression program analyzed in this EA is to reduce grasshopper populations below economical infestation levels in order to protect the natural resources of rangeland ecosystems, the value of livestock and wildlife forage, or cropland adjacent to rangeland."* While the value of livestock forage is fairly easily obtained, APHIS did not—but should have—undertaken such an analysis in the EIS or the site-specific EA (or at least model it), 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.

In fact, the courts have held that "when an agency chooses to quantify the socioeconomic benefits of a proposed action, it would be arbitrary and capricious for the agency to undervalue the socioeconomic costs of that plan by failing to include a balanced quantification of those costs." *High Country Conservation Advocates v. U.S. Forest Serv.*, 52 F. Supp. 3d 1175, 1196–97 (D. Colo. 2014); *Motor Veh. Mfrs. Ass'n of U.S., Inc. v. State Farm Mut. Auto. Ins. Co.*, 463 U.S. 29, 43 (1983); *see also WildEarth Guardians v. Bernhardt*, CV 17-80-BLG-SPW, 2021 U.S. Dist. LEXIS 20792, *30 (D. Mont. Feb. 3, 2021).

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

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

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

In determining whether a treatment is economically justified, one must ask what is the revenue expected to be received for the product? CARMA, the model used by APHIS to determine if a treatment should occur, contains data for New Mexico that indicates

[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.

that the number of acres of rangeland to support one animal unit-month (AUM) ranges from 0-30 in the state. Currently, on federal BLM and Forest Service lands, the US taxpayer receives $1.35 per AUM. As a rough estimation, taking a median value of 15 acres per AUM, and calculating the value of the forage per acre as paid to the American taxpayer, the US taxpayer receives an estimated $0.09 per acre for the forage value on BLM or USFS federal rangelands in in New Mexico. Livestock permittees on federal lands are also provided with USDA-FSA Livestock Disaster Forage Program funds if there are natural events that impact their herds.[2]

These funds reduce the economic impact of infestations for permittees and this should have been considered in the EA. Additionally, federal agency actions providing additional economic support for this already heavily subsidized industry at taxpayer expense must be carefully considered, analyzed, and disclosed to the public.

Given that the direct costs of grasshopper treatments to the taxpayer appear to range from $3.99 up to $44.44/acre, it is clear that the economic threshold is nowhere near being met, at least on federal lands. Within the project area there are several vacant allotments, further reducing the economic benefit of treating these lands (the map on the next page shows vacant allotments in orange and red). The program makes no economic sense from the point of view of the taxpayer, and the economic loss is a significant impact that should be analyzed in an EIS, rather than an EA.

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

APHIS claims that treatments can reduce the likelihood of future outbreaks but this claim is not supported by evidence. Treatments are unreliable at thwarting outbreaks in subsequent years (Blickenstaff et al. 1974; Smith et al. 2006; Cigliano et al. 1995). At best, insecticide treatments may stem damage to forage and crops in the current year. The EAs did not include APHIS' protocol for delineation surveys which occur in spring and summer to identify treatment areas. We know that APHIS encourages landowners to "sign up" for treatments, in an effort, it appears, to attract contract bids for the aerial effort, and perhaps to lower the per acre cost overall. Without inclusion of information about how APHIS selects nymphal survey points, how it determines which nymphal survey points are at an "economic" threshold, and how APHIS delineates treatment blocks and accounts for areas between survey points, we have legitimate concern that unjustified treatment may be occurring, with repercussions for sensitive ecological systems.

Coming up with the monetary value – or even a qualitative measure -- of wildlife forage is a completely different animal. APHIS provides zero information on how it would measure that the value of wildlife forage is threatened.

2 See: https://azgrazingclearinghouse.org/government-assistance-for-arizona-ranchers/ as an example of the types of funds available to livestock permittees throughout the west.

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 analysis that it has determined the lands to be treated meet the level of economic infestation according to its definition, and APHIS must demonstrate in each EA, that treatment is justified by meeting an 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.

APHIS Response: *Please see APHIS' responses to comments 1 and 2 above. This comment is similar in nature to comments in the 2020 EA, please see the APHIS responses to comments 3, 4, 5, 7 from the 2020 EA.*

This comment questions the worth of grasshopper suppression on rangeland and it is difficult to parse out which of the demands it places on APHIS are possibly grounded in actual law. The commenter makes a primarily fiscal argument against social or political decisions APHIS is not empowered to make. NEPA requires environmental risk analysis, and it is not clear that APHIS has to demonstrate economic analysis in an Environmental Assessment. This political argument and could certainly proceed in other venues, however in the interest of explaining the purpose and need for grasshopper suppression APHIS will provide the following clarification.

Precipitation is a critical variable in determining range plant production; hence, forage production varies significantly from year to year and from place to place and cannot be predicted prior to the growing season. Only after grasshopper species and population levels are determined and forage value assigned, can any treatment decision be determined. Any and all APHIS treatments that would be considered must meet the economic infestation level at minimum. In most circumstances, APHIS is not able to accurately predict specific treatment areas and the best treatment strategies months or even weeks before grasshopper populations build up to economic infestation levels. PPQ-NM did provide a map of our 2022 survey results that assists us in determining possible areas where grasshoppers may exceed the economic infestation level.

The value of the forage is not based only on the grazing fees assessed by BLM or FS. There are a range of additional costs associated with replacement feed, the cost of hay, the cost to ship the hay, the cost and labor to move the hay to the rangeland, the cost of moving the cattle from the grazing allotments, the cost to provide or build a hay barn to store the hay, etc. Therefore, replacement feed costs in New Mexico would greatly outweigh any treatment costs accrued by the agency. The Plant Protection Act of 2000 does not give authority to APHIS to purchase replacement feed for ranchers, it only *provides funding when available to suppress outbreak populations of grasshoppers to save forage. The costs of treatments must not only be compared to the protected forage for livestock but for wildlife as well. The IPM User Handbook prepared by USDA discusses the cost benefit analysis for grasshopper suppression programs.*

5. **The EAs fail to state that nearly all species of fungi examined contain chitin. Absent from the EAs is any discussion of how diflubenzuron could affect fungi within the affected landscape and the cascading effects on ecosystems.**

Chitin is the second most abundant natural polymer after cellulose (Wen-Kai 2014). In addition to being part of arthropod exoskeletons, chitin is found in nematodes and fungi, in fact, nearly all fungi contain chitin as part of their cell walls (Abo-Alsoud and El-Kady 2019). Fungi are vital components of rangeland ecosystem, with a "profound influence" on ecosystem resilience and invasion resistance in rangelands, according to a recent paper by Hovland et al. (2019). Fungi contribute to plant community structure by facilitating nutrient cycling ad uptake, contributing to soil structural stability, and mediating plant competition (Hovland et al. 2019).
Diflubenzuron inhibits fungal growth and development (Ramos et al. 2013; Zhou et al. 2017). In the EAs, APHIS neglected any mention of the potential for diflubenzuron applications to affect fungi and by extension, plant communities.

Recommendation: APHIS must examine the risks of diflubenzuron to fungal organisms and the plant-soil interface so important for rangeland ecosystems.

APHIS Response: The commenter is correct in noting that chitin is found in fungi. However, the amount of pesticide used (half of what the label recommends) and the use of the RAATs technique should mitigate the adverse effects on the fungi. In addition, spraying time will be in the period prior to the normal rainfall season in New Mexico which should not affect fungal growth.

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

In its EA, APHIS states:

> *Based on the review of laboratory and field toxicity data for terrestrial invertebrates, applications of diflubenzuron are expected to have minimal risk to pollinators of terrestrial plants.*

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.

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

APHIS left out important studies examining pollinator impacts. For example, no mention is made of an 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 EAs. For example, Camp et al. (2020) found that *Bombus terrestris* microcolonies fed with diflubenzuron resulted inhibited of drone production. Litsey et al. (2021) examined the impact to honey 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 Lepidoptera (butterflies and moths) also showed lower abundances in sprayed zones. Other groups that also perform pollination or contain important natural enemies were affected as well. For example, the study reported that flies and predatory and parasitic wasps were significantly lower shortly after treatments (Grouse Creek treatment), significantly lower one year post-treatment (Vernon treatment), and fewer in the Ibabah treatment. See the following figure.

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.

APHIS Response: *Please see the APHIS responses to comments 10, 12, 14, 19, 20, 24, 25, 28, 33, 35, 80, 100, 111, 112 and 138 in the 2020 EA, comment 6 in the 2021 EA and comment 8 in the 2022 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.

7. **The EA understates the risks of the broad-spectrum insecticide chlorantraniliprole for a range of exposed terrestrial invertebrates.**

The data in the EA on chlorantraniliprole (used to justify a finding of no significant effect for chlorantraniliprole) is woefully incomplete. Effects on lepidopterans is missing entirely. While

APHIS acknowledges chlorantraniliprole is active on (toxic to) Coleoptera (beetles), an important order in rangeland ecosystems for dung recycling, food for other wildlife, and as predators, there is no examination of potential ecosystem effects from toxicity to beetles. Birds themselves may even be at direct risk from chronic exposure of chlorantraniliprole (EPA 2020). EPA also points out that some terrestrial dicots are sensitive to the chemical.

While industry and extension officials have touted chlorantraniliprole's low toxicity to bees, EPA (2020) points out that "the risk picture is incomplete due to a lack of toxicity data due to the potentially increased sensitivity of larval bees." Indeed, studies show that chlorantraniliprole suppresses bumble bee reproduction (Smagghe et al. 2013). Bumble bees are critical pollinators in rangeland ecosystems, including many listed plants. Chlorantraniliprole's soil persistence, discussed elsewhere in this letter, also poses a heightened risk of exposure to native bees, about 70% of which nest in the soil.

APHIS left out of its 2023 EA any mention of chlorantraniliprole's toxicity to butterflies and moths (Lepidoptera), even though chlorantraniliprole is described by Lahm et al. (2007) as having "exceptional" activity on Lepidoptera (butterflies and moths), while the product that contains chlorantraniliprole (Rynaxypyr) is described by FMC Corp. (2020) as "the industry standard for long residual control of Lepidopteran pests." Lepidopteran caterpillars are critical juvenile foods for many birds.

See specific studies of chlorantraniliprole's effects to Lepidoptera below.

APHIS Response:
This comment is similar to comment 4 in the 2022 EA, see also response to comment 5,6, and 11 of the 2021 EA. The commenter made similar comments addressed in the 2020 EA's. Please see the APHIS responses to comments 10, 12, 14, 19, 20, 25, 28 and 37 in the 2020 EA's.

Available laboratory toxicity data for technical and formulated chlorantraniliprole suggests that the product is practically non-toxic to honeybees in acute oral or contact exposures (EFSA, 2013; USEPA, 2008). In another laboratory study, the 48-hour median lethal concentration (LC50) was reported as greater than 100 micrograms (µg) a.i./bee, classifying chlorantraniliprole as practically non-toxic to honeybees (Zhu et al., 2015). Smagghe et al. (2013) reported that contact and pollen exposure to chlorantraniliprole had no effect on bumble bee survival, but exposure to dosed sugar water resulted in a 72-hour LC50 of 13.0 mg/L and a 7-week LC50 value of 7.0 mg/L. Gradish et al. (2010) reported no acute or sublethal impacts to the bumble bee, Bombus impatiens, at recommended application rates for pest control on vegetables in greenhouse applications.

Semi-field studies with two different formulations reported NOECs ranging from 52.5 to 156.16 g a.i. chlorantraniliprole/hectare (ha) (Dinter et al., 2009; USEPA, 2008). Three semi-field honeybee tunnel tests demonstrated no behavioral or flight intensity effects, nor were any hive-related impacts noted at a dose of 52.5 g/ha (Dinter et al., 2009). A similar lack of effects was noted in the bumble bees B. terrestris and B. impatiens, at an application rate of 40 g chlorantraniliprole/ha. In a field study, no effects on honeybee foraging, colony health and queen production were noted at chlorantraniliprole application rates of 230 g a.i./ha (Larson et *al., 2013). The lowest reported NOEC from these studies is approximately four times the proposed RAATs application rate for chlorantraniliprole and two times the proposed full rate. Similar NOECs reported for honeybees and bumble bees have also been observed for other invertebrates such as the hover fly Episyrphus balteatus, ladybird beetle larvae Coccinella septempunctata, green lacewing Chrysoperla carnea, the plant bug Typhlodromus pyri, and predatory mite Orius laevigatus (USEPA, 2008, 2012). The low toxicity to nontarget terrestrial invertebrates has also been observed in greenhouse and field applications. Gradish et al. (2011) reported low acute toxicity of formulated chlorantraniliprole to the parasitoid Eretmocerus eremicus, the pirate bug Orius insidiosus, and the predatory mite Amblyseius swirskii, in 48-hour exposures. Brugger et al. (2010) evaluated lethal and sublethal impacts of formulated chlorantraniliprole to seven parasitic hymenopterans and found no negative impacts on adult survival, percentage parasitism, or emergence when compared to controls at rates well above the full and RAATs program rates. Tome et al. (2015) observed low toxicity of a formulation of chlorantraniliprole to two native species of stingless bees, Partamona helleri and Scaptotrigona xanthotrica. The lack of toxicity in other insect groups at rates that are toxic to grasshoppers is related to the activity of chlorantraniliprole, which is primarily through ingestion. Insects such as grasshoppers and larval Coleoptera and Lepidoptera would receive a larger dose from consuming treated plant material compared to many of the nontarget pests that have been evaluated.*

Chlorantraniliprole has low toxicity to most soil borne invertebrates, with the springtail being the most sensitive test species. Lavtižar et al. (2016) evaluated the chronic effects of chlorantraniliprole to the springtail (Folsomia candida) in 28-day exposures with estimated half median effective concentration (EC50) values ranging from 0.16 to 0.76 mg/kg in various soil types. Similar studies using the isopod Porcellio scaber), the enchytraeid Enchytraeus crypticus, and oribatid mite Oppia nitens showed no sublethal effects at concentrations of 1,000 mg/kg. Other soil borne invertebrates, such as earthworms, have low sensitivity to chlorantraniliprole in acute and chronic exposures with NOEC and EC50 values, at, or greater than 1,000 mg/kg (EFSA, 2013).

8. APHIS fails to acknowledge the high risks of carbaryl to a wide variety of species (even when applied as baits).

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. However, we note that this year APHIS updated its information on carbaryl persistence, including information from EPA (2017) noting that some evaluations have found half-lives as long as 253 days. This suggests that carbaryl may be far more persistent than previously thought.

We conducted an analysis of risk to liquid carbaryl to bees in our 2021 comment letter. Even at deposition rates, 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

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.

deposition rates could be underestimates at that distance, based on empirical data), APHIS would exceed the acute toxicity Level of Concern designated by EPA 150-fold. 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.

In the EA, APHIS states that *"implementation of application buffers should significantly reduce exposure of pollinators to carbaryl treatments."* But how could this be true when there are no general applications of buffers for the vast majority of bees, which are wild and cannot be protected by human owners?

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/cm2 (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.

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

Coleoptera (beetles) are important for a variety of ecological roles - food for mammals and birds, as dung burial and recycling, and predation on other insects.

Other studies also found carbaryl baits affecting Coleoptera, with biomass diminished both in the short term and a year after application, compared to control areas (George et al., 1992).

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.

Recommendation: APHIS must recognize the ecological impacts of applications of carbaryl, including applications put on as 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.

APHIS Response: *The commentor submitted similar comments to the 2021 EAs. See responses to comments #5, 6, 8, and 12 in the 2021 EA and comment 10 in the 2022 EA. The commenter cites their previous risk analysis which APHIS did not find convincing. APHIS invites them to share their modelling assumptions and inputs in their EA comments so the agency can properly respond. APHIS notes that as is appropriate for a Tier 1 risk screening tool, BeeREX is a very conservative method for estimating residues on pollen and nectar.*
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 New Mexico. 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.

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

a. Final EIS p. 34: *"With less area being treated, more beneficial grasshoppers and pollinators will survive treatment."*
b. 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."*
c. 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).*

d. New Mexico 2023 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 not designated in advance in the EA, and 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 several 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 or chlorantraniliprole.

- • 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 an 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.

c) According to information APHIS provided to NMFS in a 2010 Biological Assessment (obtained through a FOIA request), actual aerial release heights are likely to be in the area of 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.[4]

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 in predicting drift under the grasshopper spray program, based on the release height EPA used in its model, as pointed out above. And while it is helpful to have found 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 for diflubenzuron - 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 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

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

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.

APHIS Response: *The commentor submitted similar comments to the 2022 EA. See response to comment 9 in the 2022 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 14 – 26 of the 2022 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 New Mexico 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 New Mexico'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. This again was described in the 2020 EA, please see comments 20, 21, 23, 25, 91, 93 of the 2020 EA and comment 5 in the 2021 EA.

9. **APHIS must strengthen its collection of and presentation of environmental monitoring data.**

The EA states: "*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.*"

Yet, if 2021's Environmental Monitoring Report is any indication, APHIS has a long way to go to achieve the goal of assuring that any environmentally sensitive sites are protected. The report on the 2021 spray program reveals that APHIS collected only 2 water samples, even though treatments that year were applied over a footprint of more than a million acres. It is unclear from the report whether cards were placed vertically, horizontally, or at an angle, of what material they were made, whether the distances shown were from the edge of the treatment block or not, whether samples were collected downwind and downstream or at a different orientation to the flow of air and water, etc.

Recommendations: APHIS must explain its methods more clearly, provide maps of monitoring points relative to spray blocks, describe the orientation of each card and the wind speeds range during each spray event where monitoring was conducted, and provide a statistically defensible number of monitoring samples. In addition, these reports should be made available to the public without having to resort to a FOIA. Environmental monitoring protocols could be strengthened by allowing public review of a draft report.

***APHIS Response:** All environmental monitoring is detailed in the March 2023 Environmental Monitoring Plan for the 2023 Rangeland Grasshopper and Mormon Cricket Suppression Program. A final report is prepared by the Environmental Compliance Unit.*

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. For example, elimination of "non-pest" grasshoppers generated this concern from ARS scientist David Branson and collaborating researchers:

> *The possibility that grasshopper control can worsen future outbreaks has explored by respected ontThe overwhelming majority of grasshoppers killed in control programs are not causing the problem and may be beneficial."* (Branson et al. 2006)

The possibility that grasshopper control can worsen future outbreaks 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. 198
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*[5] *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 insinuate 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

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

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."

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.

APHIS Response: *The commenter again refers to comments addressed in the 2020 EA, please see response to comments 20, 22, and 42 from the 2020 EA, comment 7 in the 2021 EA and comment 11 in the 2022 EA.*

The commenter states that "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." APHIS agrees with the assertion. In fact, that "competition with other grasshoppers" is caused by the destruction of their food sources by over-foraging due to overpopulation of the grasshoppers themselves. In this day and age of range management and conservation to benefit wildlife, sensitive species and livestock, APHIS consults with range managers to determine if grasshopper/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 asserts that "grasshoppers were regulated primarily by natural processes, including natural enemies such as birds." Comment #12 below (with which APHIS does not necessarily agree) contends that rangeland birds are declining. All the more reason to intervene with safe chemical suppression to help save valuable forage and cover for birds and other wildlife species, especially sensitive ones.
Another assertion states 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)."

The commenter seems to assume that there are widespread treatments in New Mexico. Although New Mexico has had limited experimental treatments performed by the agency in the past, APHIS has not undertaken any large-scale programmatic treatments any for many years. Instead, private landowners take on the burden and many use the RAATs method.

*The science does not support the substance of this comment, including a thorough reading of the ARS cited source**. For other citations it is not clear how applicable they are, such as how they would apply to the specific application methods being proposed.*
Another fundamental mischaracterization of the commenter, is the assumption that the proposals in this EA result in widespread treatments in New Mexico, rather than the targeted programs that occur in limited areas in any given year and err on the side on non-treatment. When grasshoppers are in outbreak conditions, they are generally only limited by disease and climatic conditions, not predators or parasitoids which become quickly satiated, as it well established in literature, including the ARS developed IPM handbook.
The quote taken from the ARS publication, which APHIS frequently provides to cooperators for IPM reference, is used by the commenter out of context and does not apply to the proposed work in the way that is implied, for the following reasons:

- *There is a strong distinction between low-productivity land which: Can be damaged by low densities of grasshoppers; but is generally controlled by trophic means (pests, predators and disease); and may want to be treated by land manager but is often not advisable for various reasons (including the specific long-term effects Xerces references) and is usually discouraged by APHIS.*
- *Mid-productivity, a hybrid of the two extremes. APHIS does not typically control grasshopper infestations on mid-productivity rangeland, unless they are part of a larger strategy.*
- *Finally, high productivity sites where in essence, grasshoppers are never controlled by trophic webs, except for them not having enough food to eat, or weather conditions making them very vulnerable. The generally available amount of food makes control by trophic means not scalable even under poor conditions. These are the situation that warrant control in New Mexico, where high productivity meets grasshopper population booms and natural enemies do not respond in scale, regardless of land management decisions or treatment history.*

We agree that protecting beneficial species is an important part of crop and rangeland management, and that treatment of low-productivity sites where grasshoppers can be limited by natural enemies may do more long-term harm than good. However, we also agree with the further points in the ARS publication which state that in other situations, especially where ample food is available for grasshoppers, that natural enemies play an insignificant role in providing any level of control under most climatic condition.
Therefore, as outlined in our operating procedures, APHIS recommends that land managers look at many ecological factors before formally requesting treatments, and we will happily provide them with information such as the quote given, that will recommend moderation under low to moderate productivity areas. The author's recommendation does not however, at any time, apply to areas with quantitatively high levels of grasshoppers.
**Here is a fuller discussion of the above ecological questions described in the publication cited (*https://www.ars.usda.gov/ARSUserFiles/30320505/grasshopper/Extras/PDFs/IPM%20Handbook/IV8.pdf*):*

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 (or other taxa) in New Mexico. Nothing is said about conservation measures for these species. Due to its wide diversity of habitats, New Mexico has recorded the second highest number of bird species of any non-coastal state in the U.S. The EA should explore the impacts to these focal 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 sage-grouse, Swainson's hawk, long-billed curlew, sage thrasher, and others.

Carbaryl may pose direct harm to grassland birds. Carbaryl has been found to cause dizziness, disorientation, loss of motor control, and other sublethal effects on chicks exposed to it (Khanam, 2019).

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 birds, 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 even RAATs treatments within the habitat of declining bird species 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).

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 many orders of insects were diminished due to the effects of grasshopper suppression. For example, 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.

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).

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.

Though direct effects on birds are listed as not likely, the indirect effects on vertebrates are not wholly accounted for. The loss of invertebrate prey is devastating grassland bird populations.

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. The use of broad spectrum insecticides and other pesticides has been repeatedly found to impact bird populations via declining insect populations, including a study which " demonstrated that the use of fertilizers and pesticides had reduced the abundance of insects, with consequences for the abundance of insectivorous bird species…" (Møller et al., 2021).

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.

APHIS Response: *This is a similar to comment 12 in the 2022 EA. To promote range management and conservation to benefit wildlife, sensitive species and livestock, APHIS consults with range managers to determine if grasshopper/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 8 – 10 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 New Mexico. Although New Mexico has had limited experimental treatments performed by the agency in the past, APHIS has not undertaken any large-scale programmatic treatments any for many years. 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. According to the USFWS, Greater Sage Grouse has disappeared from New Mexico. Refer to pages 34-36 of the 2021 EA and comment 8 in the 2021 EA.

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 most 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 avoid blooming plants in the treated areas or 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.

APHIS Response: *The commenter made similar comments addressed in the 2020 EA. Please see the APHIS responses to comments 10, 12, 19, 23, 24, 25, 26, 28, 33, 37, 38, 71, 81, 84, 93, 105, 108, 111, 119 and 122 in the 2020 EA, comment 9 in the 2021 EA and comment 13 in the 2023 EA.*

The commenter is correct that APHIS believes the use of RAATs mitigates the risk to non-target insects including pollinators and bees. APHIS does not believe the adherence to product use restrictions mitigates all harm to these species. Instead, APHIS has analyzed the benefits of relatively small grasshopper treatments against the potential for significant impacts to bee populations within the large area covered by the

EA. The environmental consequences risk analysis of carbaryl and diflubenzuron treatments is provided on pages 20-25 of the 2021 EA. Additional descriptions of APHIS' analysis methods and discussion of the toxicology can be found in the 2019 EIS.

10. Key Endangered Species Act information is missing

The EA states that a programmatic consultation with the US Fish and Wildlife Service on species listed under the Endangered Species Act was initiated in 2015, but is not yet complete. The backup is for APHIS to consult at the local level, which we assume is in progress. No other information was included about the consultation effort, not even an Official Species List from USFWS. No information is available that discloses the effects to threatened, endangered, proposed or candidate species and the Draft EA does not disclose the determinations it made under mandatory consultation. Neither the Biological Assessment nor the Concurrence letter is included in the Draft EA.

In the 2023 EA, APHIS references "buffers and other operational procedures" that will be applied to protect listed species, but does not provide any detail on how large these would be and whether they would vary by chemical, formulation or application method. As a result it is impossible for us to evaluate the adequacy of protection for listed species.

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

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

Recommendations: In the Draft EA, APHIS should present its reasoning for the listed species determinations and any protective measures for listed species. In the Final EA, the letter of concurrence must be attached. If USFWS was not aware of toxicity information, modeled or empirical drift, or other exposure considerations, 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 (not just occupied habitat) for any listed species for which such modeling is available. APHIS should include buffers even for ground applications for all species. 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.
APHIS Response: *ESA Section 7 consultations with US Fish and Wildlife for 2023 are ongoing for New Mexico. One meeting concluded successfully and the BA was edited and resubmitted. The commenter is asking that the letter of concurrence be attached. New Mexico will reference the letter of concurrence in the Final EA and it will be available upon request.*

The monarch butterfly is now a candidate species under the Endangered Species Act, but APHIS provides no mention of any protecting them or their their host plant, milkweed, from pesticide expos

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

Habitat suitability modeling for monarch butterfly in the counties covered by this EA (Dilts et al. 2018) shows there are large concentrations of potentially highly suitable monarch habitat in New Mexico, that could potentially be subject to grasshopper suppression.

For example, 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). More recent conservation guidelines from the U.S. Fish and Wildlife Service also recommend more robust buffers from milkweed for aerial applications.

Unfortunately, none of the pesticides that APHIS includes in its program are specific to grasshoppers or Mormon crickets. All of the pesticides in the APHIS program are active on other taxa of invertebrates, including butterflies and moths. Malathion is in group 1b, carbaryl in group 1a, diflubenzuron in group 15, and chlorantraniliprole in group 28 and each of these groups are active on Lepidoptera (IRAC 2020).

As mentioned above, chlorantraniliprole is described by Lahm et al. 2007 as having "exceptional" activity on Lepidoptera (butterflies and moths), while the product that contains chlorantraniliprole (Rynaxypyr) is described by Crop Life America as "the industry standard for long residual control of Lepidopteran pests."

Applications of chlorantraniliprole by USDA APHIS would be expected to deposit on plant surfaces between 1430-2200 ppb in the absence of drift (based on EPA's Bee-Rex model). At just 1000 ppb, 83% mortality of caterpillars occurred in a study of chlorantraniliprole by Liu et al. (2017). More concerningly, 50% mortality of monarch caterpillars occurred when consuming leaves with deposits of chlorantraniliprole at merely 1.6 to 8.3 ppb (Krishnan et al. 2021; Krishnan et al. 2020), obviously raising concern that direct exposure and drift, which is unavoidable from any liquid spray, could adversely affect monarchs.

The risk of liquid carbaryl applications would also 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.

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.

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

APHIS Response: *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 2021 USFWS official species list for this Environmental Assessments (EA) (NM-21-01) 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. As of this date, this species was not listed as a species of concern during the Tribal consultations. It has not been listed as a species of concern by Tribal Wildlife Department.*

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 New Mexico, the Monarch Butterfly has not been collected in sweep net samples during Nymphal or Adult surveys for grasshopper/Mormon crickets. According to the Western Monarch Milkweed Mapper, there are no milkweed or Monarch breeding sites nor any Monarch sightings in the proposed treatment area. See also comment and response to comments 34, 35 and 80 of the 2020 EA and comment 11 in the 2021 EA. This is similar to comment 15 in the 2022 EA.

11. **Recent national consultation efforts (including a Biological Opinion) for carbaryl effects to listed species show the potential for widespread harm and even jeopardy.**

The EA does not mention a recent nationwide consultation effort on carbaryl's effect to listed species. In March 2023, National Marine Fisheries Service (NMFS) released its Biological Opinion on carbaryl, finding grave harms from the chemical including determinations of jeopardy to 37 species. This is an extraordinary indictment of the chemical and finding of harm.
EPA released a final BE for carbaryl in March 2021 (EPA 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. Mitigation under APHIS' program should be designed to eliminate, not just avoid, harmful effects from this very toxic chemical.
Species in New Mexico 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.

APHIS Response: APHIS Response: *The commenter made similar comments in 2020, 2021and 2022, please see the APHIS responses to comment 17 in the 2020 EA ,comment 12 in the 2021 EA and comment 16 in the 2022 EA.*

12. **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.

APHIS Response: *This response will be similar to comment 20 in the 2022 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*

13. APHIS dismisses water quality concerns, includes misleading information about the potential for its chemicals to contaminate water, and includes no information about whether an NPDES permit has been obtained, and what provisions it includes.

Water is life in the arid West. The diflubenzuron Dimilin 2 label indicates that the chemical is subject to runoff for months after application, and could result in discharges to surface water. Despite this, APHIS suggests that diflubenzuron is unlikely to contaminate water, given its low solubility and affinity for organic material. But other pesticides with similar properties, such as pyrethroids, regularly make their way into aquatic systems (soil erosion is one key way) and these pesticides generally are found persisting in sediments, rather than the water column itself. Because so many aquatic invertebrates are benthic, and considering the fact that intermittent, ephemeral or seasonal streams enjoy no buffer protections, we have serious concerns about contamination of aquatic systems from the use of diflubenzuron, even with the buffers required for perennial streams.

Like diflubenzuron, chlorantraniliprole is persistent, but even more so, taking from 228 to 924 days for soil concentrations to be halved. In its 2018 ecological risk assessment, the EPA reported field dissipation half-lives up to 1130 days in studies on bare ground plots, meaning that if degradation is linear, it could take as long as fifteen years for the chemical to fully disappear from certain soils.

Unlike diflubenzuron, chlorantraniliprole is mobile, meaning it has higher potential to move through the soil, reaching ground water.

APHIS also includes no information about whether an NPDES permit has been obtained, and what provisions it include, if so. 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.
Both chemicals are toxic to mollusks and other aquatic invertebrates, several of which are listed as Species of Greatest Conservation Need in New Mexico.[6] Given their persistence, aquatic impacts from these chemicals could occur weeks or months beyond the treatment period. It is not clear if environmental monitoring is conducted in such a way as to pick up delayed transfer of APHIS chemicals to nearby waterways.

It is also unclear whether stock ponds are covered by the 500' buffer from surface water (see our comments on the biodiversity benefits of stock ponds in our 2022 comment letter.

Recommendation: APHIS should include buffers not just around surface water present at the time of treatment but also around ephemeral, intermittent, and seasonal water bodies, and around stock ponds. 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.

APHIS Response: *The commenter made the same comment in the 2021 EA and the 2022 EA. See comment 16 in the 2021 EA and comment 20 in the 2022 EA.*

APHIS complies with the Clean Water Act as administered by the New Mexico Department of Environmental Quality. An NPDES permit is required if pollutants are discharged from a point source into waters of the United States.

APHIS employs several mitigation measures intended to mitigate offsite transport of pesticides to sensitive habitats, including waterbodies. 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 also does not apply insecticides directly to water bodies such as reservoirs, lakes, ponds, pools left by seasonal streams, springs, wetlands, and perennial streams and rivers. APHIS also follows all other label restrictions designed to protect aquatic habitats. Furthermore, APHIS uses the following buffers for water bodies:

[6] See https://nmswap.org/swap-species/molluscs, and https://nmswap.org/swap-species/crustaceans.

- *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*

APHIS agrees with the commenter that NPDES permits do not absolve Federal agencies from complying with NEPA.

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: As discussed earlier, both diflubenzuron and chlorantraniliprole present a risk of runoff to aquatic systems 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.

APHIS Response: *The commenter made the similar comments on the 2020, 2021and the 2022 Draft EAs. Please see APHIS response to comment 36 and 37 in the 2020 EA, comment 14 in the 2021 EA and comment 18 in the 2022 EA.*

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

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

Stock tanks can be important reservoirs of biodiversity, even as they may be better known for being home to many non-native species.

It is unclear whether a buffer will be observed around stock tanks 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: We suggest that APHIS provide a no-treatment buffer around stock ponds/ stock tanks, taking into account drift, to protect the habitat that they provide for native species. 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 diver
APHIS Response: *All stock tanks are buffered 500 feet during aerial treatments with liquid insecticide and 200 feet for ground treatments with liquid insecticide. APHIS does not apply insecticide directly to water bodies and believes our buffers are adequate to prevent drift into stock tanks. In addition, APHIS will not apply insecticide when wind velocity exceeds 10 miles per hour (unless state law requires lower windspeed).*

Special status lands

New Mexico 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 frequently 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.
APHIS Response: *Because APHIS relies on treatment requests from land managers, including Federal and State land managers, it is taken for granted the areas suggested by the commenter are not likely to have grasshopper suppression programs. If there is somewhere in particular in the counties covered by this EA in New Mexico, where the commenter feels this is a likely concern, that would be constructive information to help with this EA. There is no information available to APHIS to expect that this is a reasonable concern.*

The commenter made the same comment in the 2020 and 2021 EAs. Please refer to APHIS responses to comments 48 of the 2020 EA, comment 17 in the 2021 EA and comment 21 in the 2022 EA.

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.
- While it is helpful that landowners requesting treatment are asked to identify organic producers in their vicinity, landowners may not, and should not be expected to, know the exact agricultural processes and philosophers of all landowners in the vicinity. We are concerned that some organic

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. Organic trade associations and sites such as driftwatch.org and other spatial locators should be used to the full extent of their availability.
APHIS Response: *The commenter made a similar comment on the 2021 and 2022 Draft EAs. Please refer to comment 18 in the 2021 EA and comment 22 in the 2022 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.

Extent of treatment to public and 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. In addition to our public lands concerns, we are also concerned about impacts to resources and species that overlap with private lands and the scope of APHIS's program, which is not supposed to be geared toward private lands. For example, determining occupied habitat occupied by listed or candidate species on private land may be difficult or tricky.
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.

APHIS Response: *Similar commenst were made on the 2021 and 2022 EAs. Please see comment 19 in the 2021 EA and comment 23 in the 2022 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.

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 associated with the Preferred Alternative "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 believe an adequate analysis of cumulative effects is missing from the 2023 EA. .

Based on our independent review of contract solicitation maps (not easy to find), 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. In fact, APHIS has treated large areas in close proximity, and even in overlapping areas in recent years, and it appears that large treatment areas concentrated in certain parts of the country have been the norm for quite some time (Cigliano et al. 1995), suggesting that APHIS is stating the opposite of the truth in the EAs. 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.

APHIS does not give serious consideration to the potential impact of its grasshopper insecticides co-occurring with other pesticides in the environment. Yet such environmental mixtures are the norm, not the exception, and should be considered and analyzed particularly with respect to focal non-target wildlife (Mullin et al. 2010; Cedergreen 2014). APHIS seems to believe that only other insecticide applications would be of concerns, stating "rangeland is unlikely to receive insecticide applications for any reason except for grasshopper/Mormon cricket treatment."

However this ignores insecticide treatments on croplands (croplands can be treated by APHIS) and ignores the potential for additive and/or synergistic effects with fungicides and herbicides (Cedergreen 2014).
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. 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 New Mexico.
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.

APHIS Response: *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.*

In addition, an APHIS sponsored treatment has not occurred in Rio Arriba County, New Mexico since at least the early 1980's. In fact, an APHIS sponsored treatment has not occurred anywhere in New Mexico, outside of research applications in Torrance County, since 1986 in the southwestern part of the state.

Please refer to APHIS responses to comments 76, 81, 82, 83, 84, 85, 86, 87, 88, 113 and 156 in the 2020 EA, comment 20 in the 2021 EA and comment 24 in the 2022 EA.

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 declining but not yet listed species, Resource Management Plan requirements, limitations on special status lands, etc. Due to the numerous sensitive species and the spatial specificity of such issues, the national MOUs simply cannot adequately address such concerns.

Unfortunately APHIS also makes no mention 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 (Onsager, 1996-2000) 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. While we don’t endorse any particular grazing strategy, this is an issue APHIS should have carefully considered. APHIS should also consider whether reducing the number of AUMs authorized, or eliminating grazing entirely, would be a reasonable alternative to repeated applications of toxic chemicals to large swaths of land.
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, requency 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.

APHIS Response: *The commenter made similar comments on the 2021 and 2022 EAs. Please see comment 21 in the 2021 EA and comment 25 in the 2022 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."

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 assume 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:

a. • 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.
b. • Later refinements to locations should be mapped and shared with the public prior to treatments.
c. • 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).
d. • 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.
e. • Results of environmental monitoring associated with treatments (i.e. drift cards, water samples) should be disclosed.

APHIS Response: *The commenter made the same comment in the 2020 EA, the 2021 EA and the 2022 EA. Please refer to APHIS responses to comments 1, 2, 3, 50, 51, 52, 53, 54, 55, 56, 57 and 58 of the 2020 EA, comment 22 in the 2021 EA and comment 26 in the 2022 EA. The following was submitted for on March 3rd, 2023, for publication on March 17th and 19th, 2023:*

The US Department of Agriculture, Animal and Plant Health Inspection Service, Plant Protection and Quarantine (USDA-APHIS-PPQ) may conduct rangeland grasshopper suppression programs in New Mexico in 2023. The local Environmental Assessment (EA) has been prepared for this activity in conformance with the National

Environmental Policy Act. Comments on this document will be received from March 20th trough April 19th, 2023. The Rangeland Grasshopper and Mormon Cricket Suppression Program Draft Environmental Assessment is available for review at USDA, APHIS, PPQ 270 South 17th Street, Las Cruces, NM 88005 or 125 Valencia Drive NE, Suite B, Albuquerque, New Mexico 87108.

E-mail notification was also sent to the commenter as well as The Center for Biological Diversity, New Mexico Department of Agriculture and Indian Nations Conservation Alliance on March 20th, 2023.