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DRAFT - Environmental Assessment Rangeland Grasshopper and Mormon Cricket Suppression Program

ARIZONA
EA Number: AZ-24-02

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Site-Specific

Coconino and Mohave County portion within the BLM-Arizona Strip District.

December 19, 2023

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Table of Contents

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Acronyms and Abbreviations

ac	acre
a.i.	active ingredient
AChE	acetylcholinesterase
APHIS	Animal and Plant Health Inspection Service
ATV	all-terrain vehicle
BIA	Bureau of Indian Affairs
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	U.S. Forest Service
g	gram
GIPM	Grasshopper Integrated Pest Management
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
PPA	Plant Protection Act of 2000
PPE	personal protective equipment
PPQ	Plant Protection and Quarantine
RAATs	reduced agent area treatments
S&T	Science and Technology
UAS	unmanned aircraft system
ULV	ultra-low volume
U.S.C.	United States Code
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Services

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[Draft] Site-Specific Environmental Assessment

Rangeland Grasshopper and Mormon Cricket Suppression Program

ARIZONA
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I. Need for Proposed Action

A. Purpose and Need Statement

An infestation of grasshoppers or Mormon crickets may occur on rangeland in Coconino and Mohave Counties, BLM-Arizona Strip District. The Animal and Plant Health Inspection Service (APHIS) may, upon request by land managers or State departments of agriculture, conduct treatments to suppress grasshopper infestations as part of the Rangeland Grasshopper and Mormon Cricket Suppression Program (program). The term "grasshopper" used in this environmental assessment (EA) refers to both grasshoppers and Mormon crickets, unless differentiation is necessary.

Populations of grasshoppers that trigger the need for a suppression program are normally considered on a case-by-case basis. Participation is based on potential damage such as grasshoppers which defoliate grasses by direct feeding on leaf and stem tissue and by cutting off leaves or stems and heads while feeding. High populations of grasshoppers on rangeland can damage plant crowns so severely that many grass plants will not recover. Some grasshopper species not only reduce grass forage by consuming it but also by cutting it down. The cut grass may become litter on the ground where it may also be used for food by grasshoppers or becomes wasted biomass. Potential areas where large populations may occur can be found in the 2024 Grasshopper Hazard Map in appendix B. The benefits of treatments include the suppressing of over abundant grasshopper populations to lower adverse impacts to range plants and adjacent crops. Treatment would also decrease the economic impact to local agricultural operations and permit normal range plant utilization by wildlife and livestock.

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

This EA analyzes potential effects of the proposed action and its alternatives. This EA applies to a proposed suppression program that would take place from 04/01/24 to 09/30/24 on rangeland in Coconino and Mohave County, BLM-Arizona Strip District (Appendix D).

This EA is prepared in accordance with the requirements under the National Environmental Policy Act of 1969 (NEPA) (42 U.S.C. § 4321 *et. seq.*) and the NEPA procedural requirements promulgated by the Council on Environmental Quality, United States Department of Agriculture (USDA), and APHIS. A decision will be made by APHIS based on the analysis presented in this EA, the results of public involvement, and consultation with other agencies and individuals. A selection of one of the program alternatives will be made by APHIS for the 2024 Control Program for infested rangeland in Coconino and Mohave Counties, BLM-Arizona Strip District.

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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 wildlife 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 nymphal 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 (AUMs) permitted in grazing allotments, forage damage estimates, number of potential AUMs consumed by grasshopper population, estimated cost of replacement feed for livestock, rotational system for grazing allotments. 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,

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

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or private lands that are infested with grasshoppers or Mormon crickets'… (7 U.S.C. § 7717(c)(1)). The need for rapid and effective response when an outbreak occurs limits the options available to APHIS. The application of an insecticide within all or part of the outbreak area is the response available to APHIS to rapidly suppress or reduce grasshopper populations and effectively protect rangeland.

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

APHIS has authority under the Plant Protection Act of 2000 (PPA) (7 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.

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Additional information regarding technical assistance and other aspects of the program can be obtained from the USDA Agricultural Research Service site at http://www.sidney.ars.usda.gov/grasshopper/index.htm.

On January 11, 2022, APHIS and the Bureau of Land Management (BLM) signed a Memorandum of Understanding (MOU) detailing cooperative efforts between the two groups on suppression of grasshoppers on BLM managed lands (Document #22-8100-0870-MU, January 11, 2022). This MOU clarifies that APHIS will prepare and issue to the public, site-specific environmental documents that evaluate potential impacts associated with 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 the BLM approves the Pesticide Use Proposal.

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

In addition to providing technical assistance, APHIS completed the Grasshopper Integrated Pest Management (GIPM) project. One of the goals of the GIPM is to develop new methods of suppressing grasshopper and Mormon cricket populations that will reduce non-target effects. 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 in consultation with land management agencies, 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 also provide additional opportunities for local public involvement, such as public meetings. In addition, when an interested party asks to be informed APHIS ensures their contact information is added to the list of interested stakeholders.

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

The current EIS provides a solid analytical foundation; however, it may not be enough to satisfy NEPA completely for actual treatment proposals. The program typically prepares a Draft EA tiered to the current EIS for each of the 17 Western States, or portion of a state, that may receive a request for treatment. The Draft EA analyzes aspects of environment 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 comment period will begin January 3rd and end February 2nd, 2024.** Comments can be sent to USDA, APHIS, 3640 East Wier Ave. Suite 1, Phoenix, Arizona 85040, or contacting the local USDA, APHIS Arizona State Office (602)431-3200. **Comments will be accepted until February 2nd at 4pm MST**. When the program receives a treatment request and determines that treatment is necessary, the specific site within the state will be evaluated to determine if environmental factors were thoroughly evaluated in the Draft EA. If all environmental issues were accounted for in the Draft EA, the program will prepare a Final EA and FONSI. Once the FONSI has been finalized copies of those documents will be sent to any parties that submitted comments on the Draft EA, and to other appropriate stakeholders. To allow the program to respond to comments in a timely manner, the Final EA and FONSI will be posted to the APHIS website. The program will also publish a notice of availability in the same manner used to advertise the availability of the Draft EA.

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II. Alternatives

To engage in comprehensive NEPA analysis APHIS must frame potential agency decisions into distinct alternative actions. These program alternatives are then evaluated to determine the significance of environmental effects. The 2002 EIS presented three alternatives which were described and analyzed in detail: (A) No Action; (B) Insecticide Applications at Conventional Rates and Complete Area Coverage; and (C) Reduced Agent Area Treatments (RAATs). 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 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, 3640 East Wier Ave. Suite 1, Phoenix, Arizona 85040. These documents are also available at the Rangeland Grasshopper and Mormon Cricket Program web site, http://www.aphis.usda.gov/plant-health/grasshopper.

All insecticides used by APHIS for grasshopper suppression are used in accordance with applicable product label instructions and restrictions. Representative product specimen labels can be accessed at the Crop Data Management Systems, Incorporated web site at www.cdms.net/manuf/manuf.asp. Labels for actual products used in suppression programs will vary, depending on supply issues. All insecticide treatments conducted by APHIS will be implemented in accordance with APHIS' treatment guidelines and operational procedures, included as Appendix A to this Draft EA.

This Draft EA analyzes the significance of environmental effects that could result from the alternatives described below. These alternatives differ from those described in the 2019 EIS because grasshopper treatments are not likely to occur in most of the rangeland in Arizona and therefore the environmental baseline should describe a no treatment scenario in those rangeland areas.

A. No Action Alternative

Under Alternative A, the No Action alternative, APHIS would not conduct a program to suppress grasshopper infestations within the Arizona Strip. 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 and diflubenzuron. These chemicals have varied modes of action. Carbaryl works by inhibiting acetylcholinesterase (enzymes involved in nerve impulses) and diflubenzuron inhibits the formation of chitin by insects. APHIS would make a single application per year to a treatment area and could apply insecticide at an APHIS rate conventionally used for grasshopper suppression treatments, or more typically as 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, because of treatment delays, then carbaryl are the remaining control options. Certain species are more susceptible to carbaryl bait, and sometimes that pesticide is the best control option.

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

- 8.0 fluid ounces (0.25 lb a.i.) of carbaryl ULV spray per acre.
- 10.0 pounds (0.20 lb a.i.) of 2 percent carbaryl bait per acre.
- 0.75 or 1.0 fluid ounce (0.012 lb a.i.) of diflubenzuron per acre; or
- 4.0 fluid ounces (0.013 lbs a.i./ac sprayed) of chlorantraniliprole.

The width of the area not directly treated (the untreated swath) under the RAATs approach is not standardized. The proportion of land treated in a RAATs approach is a complex function of the rate of grasshopper movement, which is a function of developmental stage, population density, and weather (Narisu et al., 1999, 2000), as well as the properties of the insecticide (insecticides with longer residuals allow wider spacing between treated swaths). Foster et al. (2000) left 20 to 50% of their study plots untreated, while Lockwood et al. (2000) left 20 to 67% of their treatment areas untreated. Currently the grasshopper program typically leaves 50% of a spray block untreated for ground applications where the swath width is between 20 and 45 feet. For aerial applications, the skipped swath width is typically no more than 100 feet for carbaryl and 200 feet for diflubenzuron. The selection of insecticide and the use of an associated swath widths is site dependent. Rather than suppress grasshopper populations to the greatest extent possible, the goal of this method is to suppress grasshopper populations to less than the economic infestation level. APHIS will employ measures, such as buffer zones, to protected species and their habitat. In Arizona, all stock tanks/ponds will be buffered with a 500-foot buffer. APHIS will also consult with local agency officials to determine appropriate protective measures.

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Figure 1. Reduced Agent Area Treatment (RAATs)

Applicator's use of Trimble GPS Navigation equipment is used to navigate and capture shapefiles of the treatment areas. All sensitive sites are buffered out of the treatment area using flagging which is highly visible to the aerial applicator. All sensitive sites are reviewed in the daily briefing with APHIS personnel including the applicator working on the treatment site. Treatments are conducted to suppress large grasshopper populations to protect rangeland vegetation. This method of skipping swaths (fig.1) decreases the amount of chemical and acreage treated while maintaining an effective kill rate. Swath widths usually range from 40-45 feet depending on ground equipment used. In Arizona, only ground equipment is used, no aerial treatments are conducted. Grasshoppers in untreated areas will tend to move to treated areas, thus becoming exposed to the insecticide. For example, if the area in figure 1 was 100 acres, with 50% RAATs the acreage treated would be 50 acres. Protection would include the entire 100 acres, only exposing half the area with half the chemical amount compared to a conventional blanket treatment covering the entire 100 acres and the label rate of application.

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, or diflubenzuron would cover all treatable sites within the designated treatment block per label directions. The application rates under this alternative are as follows:

- 16.0 fluid ounces (0.50 lb a.i.) of carbaryl spray per acre.
- 10.0 pounds (0.50 lb a.i.) of 5 percent carbaryl bait per acre.
- 1.0 fluid ounce (0.016 lb a.i.) of diflubenzuron per acre; or
- 8.0 fluid ounces (0.027 lb a.i.) chlorantraniliprole per acre.

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

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III. Affected Environment

A. Description of Affected Environment

The Site-Specific Coconino County and Mohave County portion within BLM-Arizona Strip District proposed suppression program area in the EA encompasses 1.8 million acres. This is the total estimated acres within the proposed action area (Appendix D map). A letter of request from BLM-Arizona Strip District is presently pending signature. This request is for APHIS to suppress economic populations within the action area. Acres treated will be from somewhere within this location. Actual treatment boundaries will be made at time of nymphal surveys if populations warrant a treatment. Actual acres treated are far less than the total acres in the proposed action area. For example, 2020 season only 2,229 actual acres were treated and in the 2021 and 2022 seasons, 0 acres were treated from within this proposed action area. This was due to the large densities of grasshoppers within the action area in 2020. The populations in 2021 and 2022 did not warrant treatments in this action area.

The vegetative communities within this area are semiarid grasslands; Plains & Great Basin Grasslands; Great Basin Conifer woodland; Interior Chaparral. Soil types include basalt and basalt flows, weakly consolidated sandstone and siltstone, unconsolidated alluvial sand, silt, and some gravel. All rangeland covered in this EA is managed by the BLM.

Elevations range from approximately 3,500 to over 7,000 feet. Potential treatment sites are within watersheds which drain into tributaries of the Colorado and Virgin River. There are stock tanks in the potential treatment area. All potential treatment areas fall within the Great Basin shrub-grassland, Great Basin Desert-scrub and Rocky Mountain montane conifer forest biomes (Brown, 1994). Rangeland representative species of these biomes include but not limited to:

Plants: Emory oak (*Quercus emoryi*), alligator bark juniper (*Juniperus deppeana*), pinyon pine (*Pinus edulis*), gray oak (*Quercus grisea*), canyon live oak (*Quercus chrysolepis*), Arizona oak (*Quercus arizonica*), western chokecherry (*Prunus virginiana*), shrub live-oak (*Quercus turbinella*), ceanothus (*Ceanothus greggii*), crucifixion thorn (*Canotia holocantha*), penstemon (*Penstemon spp.*), desert verbena (*Verbena wrightii*), Wright buckwheat (*Eriogonum wrightii*), narrowleaf yerbasanta (*Eriodictyon angustifolium*), sideoats grama (*Bouteloua curtipendula*), cane bluestem (*Bothriochloa barbinodis*), plains lovegrass (*Eragrostis intermedia*), Black grama (*Bouteloua eriopoda*), Blue grama, (*Bouteloua gracilis)* Hairy grama, (*Bouteloua hirsuta)* Rothrock's grama, *(Bouteloua rothrockii),* Fendler three-awn (*Aristida spp.*), agave (*Agave parryi*), beargrass (*Nolina microcarpa*), sotol (*Dasylirion wheeleri*), banana yucca (*Yucca baccata*), squirreltail, *(Elymus elymoides),* Arizona cottontop, *(Digitaria californica),* Green sprangletop (*Leptochloa dubia*), *Junegrass, (Koeleria spp.),* Western wheatgrass (*Pascopyrum smithii),* Tobosagrass, (*Pleuraphis mutica),* Vine Mesquite, *(Panicum obtusum*), curly-mesquite (*Hilaria belangeri),* Cholla (*Opuntia spp.*), Prickly Pear (*Opuntia spp.).*

Mammals: cliff chipmunk (*Eutamias dorsalis*), white-throated woodrat (*Neotoma albigula*), mule deer (*Odocoileus hemionus*), brush mouse (*Peromyscus boylei*), rock mouse (*P. difficilis*), white-footed mouse (*Peromyscus maniculatus sonoriensis*), cottontail rabbit

(*Syhilagus nuttalii granger*), pronghorn (*Antilocapra americana*), elk (*Cervus elaphus)* javalina **(***Pecari tajacu),* jackrabbit(*Lepus spp.*), coyote (*Canis latran),* coyote (*Canis latrans lestes)*, antelope ground squirrel (*Citellus leucurus leucurus),*piate ground squirrel (*Citellus townsendi mollis),* kangaroo rat(*Dipodomys microps honnevillei*),(*Dipodomys ordii celeripes),*pallid big brown bat (*Eptesicus fuscus pallidus)*, black-tailed jackrabbit(*Lepus californicus deserticola*), Great Basin pocketmouse (*Perognathus parvus olivaceus*), harvest mouse(*Reithrodontomys megalotis megalotis*), badger, (*Taxidea taxus*), Bighorn sheep (*Ovis canadensis),* Mountain lion *(Puma concolor).*

Birds: rufous-crowned sparrow (*Aimophila ruficeps*), scrub jay (*Aphelocoma coerulescens*), canyon wren (*Catherpes mexicanus*), rufous-sided towhee (*Pipilo erythrophthalmus*), brown towhee (*P. fuscus*), bushtit (*Psaltriparus minimus*), black-chinned sparrow (*Spizella atrogularis*), crissal thrasher (*Toxostoma dorsale*), burrowing owl (*Athene cunicularia*), Cooper's hawk (*Accipiter cooperii*), northern sage sparrow (*Amphispiza helli nevadensis*), desert black-throated sparrow(*Amphispiza bilineata deserticola*), golden eagle (*Ayuila chrysaetos canadensis*), long-eared owl(*Asio otus wilsonianus*), red-tailed hawk (*Buteo jamaicensis*), Swainson's hawk (*Buteo swainsoni*), western turkey vulture(*Cathartes aura teter*), nighthawk (*Chordeiles minor*), marsh hawk (*Circus cyaneus hudsonicus*), American raven (*Corvus corax sinulatus*), pinyon jay (*Cyanocephalus cyanocephalus*), Brewer's blackbird (*Euphagus c.vnnocephalus cyanocephalus*), prairie falcon (*Falco mexicanus*), Great Basin shrike (*Lanius ludovicianus nevadensis*), western mockingbird (*Mimus polyglottos leucopterus*), green-tailed towhee (*Oberkolseria chlorura*), sage thrasher (*Oreoscoptes montanus*), slate-colored fox sparrow (*Passerella iliaca schistacea*), Nuttall's poor-will (*Phalaenoptilus nuttallii nuttallii*), American magpie (*Pica pica hudsonia*), western gnatcatcher (*Polioptila caerulea amoenissima*), western vesper sparrow (*Pooecetes gramineus confinis*), rock wren (*Salpinctes obsoletus obsoletus*), say phoebe (*Sayornis saya saya*), Broad-tailed hummingbird (*Selasphorus platycercus platycercus*), mountain bluebird (*Sialia currucoides*), Brewer's sparrow (*Spizella breweri breweri*), western chipping sparrow (*Spizella passerina arizonae*), kingbird (*Tvrannus verticalis*), western mourning dove (*Zenaidura macroura marginella*), white-crowned sparrow (*Zonotrichia Ieucophrys*).

Amphibians and reptiles: chuckawalla, (Sauromalus *ater*), desert horned lizard (*Phrynosoma platyrhinos),* glossy snake (*Arizona elegans*), Arizona alligator lizard (*Gerrhonotus kingi*), night snake (*Hypsiglena torquata*), Sonoran mountain kingsnake (*Lampropeltis pyromelana*), southwestern blind snake (*Leptotyphlops humilis*), Sonora whipsnake (*Masticophis bilineatus*), desert striped whipsnake (*M. taeniatus*), western fence lizard (*Scleroporus occidentalis*), eastern fence lizard (*S. undulates*), western blackhead snake (*Tantilla planiceps*), Sonoran lyre snake (*Trimorphodon biscutatus lambda*), Texas lyre snake (*T. b. vilkinsoni*), side-blotched lizard (*Uta stansburiana*), Arizona night lizard (*Zantusia arizonae*), Western Diamond-backed Rattlesnake *(Crotalus atrox)*, Black-tailed Rattlesnake *(Crotalus molossus)*, Arizona Black Rattlesnake *(Crotalus cerberus)*

Grassland, shrub land, and woodlands are present across the general proposed action area. Grasshopper treatments would occur only in grass and shrub lands, not in forested or woodland areas. The rangelands are utilized for cattle grazing and provide habitat for a variety of wildlife species.

Up to 100 species of grasshoppers may occur within the proposed action area. Of these, no more than 10-15 species have been known to reach outbreak status and threaten crops and/or valuable rangeland resources in Arizona. The widespread grasshopper outbreaks of the mid-1980s were comprised primarily of the *Melanopli* group. It is anticipated that potential treatment suppression requests would be most likely for *Aulocara elliotti, Camnula pellucida, Melanoplus sanguinipes, M. femurrubrum, M. packardi* and possibly *Anabrus simplex* in Northern Arizona.

B. Summary of Target Grasshopper Species

There are over 600 species of grasshoppers in the United States. Of these there are 238 species of grasshoppers and other orthoptera which been recorded from localities in Arizona (Ball et al. 1942). There are 35 species in Arizona known to reach outbreak status and threaten crops and/or valuable range resources. The most frequent complex of economic grasshopper species in Arizona have included the following damaging species:

Melanoplus sanguinipes	migratory grasshopper
Camnula pellucida	clear-winged grasshopper
Aulocara elliotti	big-headed grasshopper
Oedaleonotus enigma	valley grasshopper
Melanoplus bivittatus	two-striped grasshopper
Melanoplus femurrubrum	red-legged grasshopper
Ageneotettix deorum	white-whiskered grasshopper
Melanoplus packardii	Packard's grasshopper
Melanoplus foedus	striped sand grasshopper
Cordillacris occipitalis	spotted-wing grasshopper
Amphitornus coloradus	striped grasshopper
Melanoplus infantilis	small spur-throat grasshopper
Philibostroma quadrimaculatum	Four-spotted grasshopper
Phoetaliotes nebrascensis	Large-headed grasshopper
Hadrotettix trifasciatus	three-banded grasshopper

C. Site-Specific Considerations

1. Human Health

The 2019 EIS contains detailed hazard, exposure, and risk analyses for the chemicals available to APHIS. APHIS has incorporated by reference the analysis from the EIS and the associated risk assessments of pesticides which are mentioned this EA. These documents are titled, The Final Human Health and Ecological Risk Assessments (USDA, APHIS

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2018a, 2018b, 2018c, 2018d) for program pesticides which are available at the following website, http://www.aphis.usda.gov/plant-health/grasshopper.

Impacts to workers and the general public were analyzed for all possible routes of exposure (dermal, oral, inhalation) under a range of conditions designed to overestimate risk. The operational procedures and spraying conditions examined in those analyses conform to those expected for operations. The following discussion summarizes the hazards, potential exposure, and risk to workers and the public for operations within these potential proposed treatment areas detailed in this EA. The operational procedures identified in Appendix 1 would be required in all cases and further mitigation measures are identified in this section, as appropriate.

The suppression program would be conducted on federally managed rangelands. No treatments will occur over congested or residential areas, recreation areas, and schools. The nearest residential or populated area to potential treatment areas are at least 30 miles away. Refer to the Operational Procedures, Specific Procedures for Aerial and Ground Applications in Appendix A for further information.

Groundwater wells are a major source of domestic water supplies. Groundwater and surface water are the major rural and livestock water sources. No impact is anticipated. Strict adherence to label requirements and the USDA treatment guidelines (appendix A) will be followed in regard to treatments bordering open surface waters.

2. Nontarget Species

Threatened & Endangered Species and Sensitive Species of Concern

APHIS has entered in Section 7 consultations with Fish & Wildlife Service regarding the T&E species which are covered in the 2024 Rangeland Grasshopper Suppression Program Biological Assessment. Effects determinations for T&E species covered in the proposed action areas are outlined in table 1. All protective measures to be implemented by APHIS, PPQ, Arizona Field Operations outlined in the 2024 BA document will be adhered to (table 2). APHIS also consulted with local agency officials to determine appropriate protective measures for sensitive species of concern not covered by the ESA and FWS does not issue concurrence determinations for.

The area assessed by this EA includes a variety of organisms i.e., terrestrial vertebrates and invertebrates, migratory birds, biocontrol agents, pollinators, aquatic organisms, plants (both native and introduced), etc. APHIS will employ measures, such as buffer zones, to protect these species and their habitat. In Arizona, all stock tanks/ponds will be buffered with a 500-foot buffer. APHIS will also consult with local agency officials to determine appropriate protective measures.

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

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

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

The wildlife risk assessment in APHIS FEIS 2002 estimated wildlife doses of Malathion and carbaryl to representative rangeland species and compared them with toxicity reference levels. No dose of Malathion will approach or exceed the reference species LD50. Some individual animals may be at risk of fatality or behavioral alterations that make them more susceptible to predation resulting from ChE level changes in Malathion spraying for grasshopper control. However, most individual animals would not be seriously affected.

Carbaryl also poses a low risk to wildlife, with few fatalities likely to occur and a low risk of behavioral anomalies caused by cholinesterase depression. There is some chance of adverse effects on bird reproduction through the use of any of these chemicals or diesel oil through direct toxicity to developing embryos in birds' eggs.

Some species of herbivorous mammals and birds may consume wheat bran bait after it has been applied to grasshopper-infested areas. Carbaryl is moderately toxic to mammals and slightly toxic to birds. We have found no valid data which suggests that (absent a spill) any species other than certain mice would be subjected to a dosage in excess of 1/5 of the LD50 for carbaryl (Pg. B-37 GH EIS.) Therefore, it is not apparent that any fatalities would be likely to occur as a result of carbaryl intoxication. Additionally, we note that carbaryl 5% bait is labeled at 3 lbs. /1000ft^2 in poultry houses when poultry are present. (http://www.cdms.net/Label-Database.)

Chitin or chitin-like substances are not as important to terrestrial mammals, birds, and other vertebrates as chitin is to insects; therefore, the chitin inhibiting properties of diflubenzuron applications under the conditions of Alternative 2 such as reductions in the food base for insectivorous wildlife species, especially birds. As stated above, diflubenzuron is practically nontoxic to birds, including those birds that ingest moribund grasshoppers resulting from diflubenzuron applications, as described in Alternative 2.

While immature grasshoppers and other immature insects can be reduced up to 98 percent in area covered with diflubenzuron, some grasshoppers and other insects remain in the treatment area. Although the density of grasshoppers and other insects may be low, it is most likely sufficient to sustain birds and other insectivores until insect populations recover. Those rangeland birds that feed primarily on grasshoppers may switch to other diet items. However, in some areas the reduced number of invertebrates necessary for bird survival and development may result in birds having less available food. In these cases, birds will either have less than optimal diets or travel to untreated areas for suitable prey items, causing a greater foraging effort and a possible increased susceptibility to predation. It also should be

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noted that suppressing grasshopper populations conserves rangeland vegetation that often is important habitat to rangeland wildlife. Habitat loss is frequently the most important factor leading to the decline of a species and reducing grasshopper densities can be an aid in reducing habitat loss.

APHIS is the lead agency in Arizona regarding biological control for invasive weeds. All biocontrol programs are coordinated between APHIS and Federal, Tribal, State agencies and Weed Management Districts and City Municipalities. APHIS has GIS data for all Biological Control programs throughout Arizona. There has been no overlap between biocontrol programs and grasshopper treatments. If this does become the case in the future, the grasshopper program would eliminate questionable acreage from the treatment area.

Bald and Golden Eagle Protection Act (BGEPA)

The Eagle Act (16 U.S.C. 668-668c), enacted in 1940, and amended several times since then, prohibits anyone, without a permit issued by the Secretary of the Interior, from "taking" bald eagles, including their parts, nests, or eggs. The Act provides criminal and civil penalties for persons who "take, possess, sell, purchase, barter, offer to sell, purchase or barter, transport, export or import, at any time or any manner, any bald eagle ... [or any golden eagle], alive or dead, or any part, nest, or egg thereof." The Act defines "take" as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb." "Disturb'' means: "Disturb means to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, 1) injury to an eagle, 2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior." In addition to immediate impacts, this definition also covers impacts that result from human- induced alterations initiated around a previously used nest site during a time when eagles are not present, if, upon the eagle's return, such alterations agitate or bother an eagle to a degree that injures an eagle or substantially interferes with normal breeding, feeding, or sheltering habits and causes, or is likely to cause, a loss of productivity or nest abandonment.

As listed in the National Bald Eagle Management Guidelines (USFWS, May 2007) and adapting recommendations from (Driscoll et al. 2006) the following mitigation measures would be followed.

*Category G Helicopters and fixed-wing aircraft. Except for authorized biologists trained in survey techniques, avoid operating aircraft within **2,000** feet of the nest during the breeding season, except where eagles have demonstrated tolerance for such activity. In addition, Category A (Agriculture) and Category D (Off Road Vehicle Use) both provide the same guidance for use of ATV's or trucks: No buffer is necessary around nest sites outside the breeding season. During the breeding season, do not operate off-road vehicles within **1,000** feet of the nest. In open areas, where there is increased visibility and exposure to noise, this distance should be extended to 1,000 feet.*

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Table 1. 2023 Biological Assessment Effects Determination for T&E Species.

Species	Status	Effects Determination
California condor, *Gymnogyps californianus*	Endangered	May affect- Not likely to adversely affect
California Least Tern, *Sterna antillarum browni*	Endangered	May affect- Not likely to adversely affect
Mexican spotted owl, *Strix occidentalis lucida*	Threatened	May affect- Not likely to adversely affect
Southwestern willow flycatcher, *Empidonax traillii extimus*	Endangered	May affect- Not likely to adversely affect
Yellow-billed cuckoo, *Coccyzus americanus*	Threatened	May affect- Not likely to adversely affect
Chiricahua leopard frog, *Rana chiricahuensis*	Threatened	May affect- Not likely to adversely affect
Northern leopard frog, *Rana pipiens*	Arizona Game and Fish Department, Species of Greatest Conservation Need.	May affect- Not likely to adversely affect
Gila chub, *Gila intermedia*	Endangered	May affect- Not likely to adversely affect
Gila topminnow, *Poeciliopsis occidentalis occidentalis*	Endangered	May affect- Not likely to adversely affect
Loach minnow, *Tiaroga cobitis*	Endangered	May affect- Not likely to adversely affect
Spikedace, *Meda fulgida*	Endangered	May affect- Not likely to adversely affect
Humpback chub, *Gila cypha*	Endangered	May affect- Not likely to adversely affect
Razorback sucker, *Xyrauchen texanus*	Endangered	May affect- Not likely to adversely affect
Woundfin, *Plagopterus argentissimus*	Endangered	May affect- Not likely to adversely affect
Arizona cliffrose, *Purshia subintegra*	Endangered	No Effect
Fickeisen plains cactus, *Pediocactus peeblesianus fickeiseniae*	Endangered	No Effect
Jones cycladenia, *Cycladenia jonesii*	Threatened	No Effect
Siler pincushion cactus, *Pediocactus sileri*	Threatened	No Effect
Welsh's milkweed, *Asclepias welshii*	Threatened	No Effect
Mohave Desert tortoise, *Gopherus agassizii*	Threatened	May affect- Not likely to adversely affect
Northern Mexican gartersnake, *Thamnophis eques megalops*	Threatened	May affect- Not likely to adversely affect
Monarch Butterfly, *Danaus plexippus*	Candidate	May affect- Not likely to adversely affect

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Table 2. Proposed application buffers to protect listed T&E species and habitat.

Species	Method of Application	Protective Measure Only RAAT's Methodology Used
California condor	Ground Aerial	.25-mile buffer 1.5-mile buffer
California Least Tern		No Treatments within 5 miles of known nesting habitat
Mexican spotted owl	Ground	RAAT's Only No Aerial treatments
Southwestern willow flycatcher		No Treatments within 5 miles of known nesting habitat
Yellow-billed cuckoo		No Treatments within 5 miles of known nesting habitat
Chiricahua leopard frog	Ground Aerial	500-foot buffer .25-mile buffer
Northern leopard frog	Ground Aerial	500-foot buffer .25-mile buffer
Gila chub		No Treatments within 1 mile of rivers and tributaries
Gila topminnow		No Treatments within 1 mile of rivers and tributaries
Loach minnow		No Treatments within 1 mile of rivers and tributaries
Spikedace		No Treatments within 1 mile of rivers and tributaries
Humpback chub		No Treatments within 1 mile of rivers and tributaries
Razorback sucker		No Treatments within 1 mile of rivers and tributaries
Woundfin		No Treatments within 1 mile of rivers and tributaries
Arizona cliffrose	Aerial Ground	3-mile buffer occupied habitat .25-mile buffer from Cottonwood Canyon Gila/Graham County
Fickeisen plains cactus		All occupied habitat excluded from treatment area
Jones cycladenia		All occupied habitat excluded from treatment area
Siler pincushion cactus		All occupied habitat excluded from treatment area
Welsh's milkweed		All occupied habitat excluded from treatment area
Mohave Desert tortoise		All designated habitat excluded from treatment area
Northern Mexican gartersnake	Ground	500-foot buffer
Monarch Butterfly		Any known milkweed stands on rangeland will be buffered by 50 feet. Riparian areas excluded from treatment area

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3. Socioeconomic Issues

These grasslands provide forage for cattle and wildlife. Farming, recreational use, hunting, and mining provide the employment on these rangeland areas.

The possible treatment areas are subject to reoccurring drought. A combination of drought and grasshopper damage causes economic stress to landowners and permittees. The control of grasshoppers in this area would have beneficial economic impacts to local landowners. The forage not utilized by grasshoppers will be available for livestock consumption and harvesting. This will allow greater livestock grazing, decreased needs for supplemental feed, and increased monetary returns.

The possible treatment areas are subject to reoccurring drought. A combination of drought and grasshopper damage causes economic stress to public land users and permittees. The control of grasshoppers in this area would have beneficial economic impacts to local landowners. The forage not utilized by grasshoppers will be available for livestock and wildlife consumption.

4. Cultural Resources and Events

To ensure that historical or cultural sites, monuments, buildings or artifacts of special concern are not adversely affected by program treatments, APHIS will confer with Tribal Officials, and other appropriate land management agencies on a local level to protect these areas of special concern.

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.

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

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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).

IV. Environmental Consequences

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

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

A. Environmental Consequences of the Alternatives

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

1. No Action Alternative

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

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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 rangeland forage is removed, valued at a dollar adjusted amount of $900 million. This value represents 32 to 63% of the total value of rangeland across the western states (Rashford et al., 2012). Other market and non-market values such as carbon sequestration, general ecosystem services, and recreational use may also be impacted by pest outbreaks in rangeland.

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

When the density of grasshoppers reaches economic infestation levels, grasshoppers begin to compete with livestock for food by reducing available forage (Wakeland and Shull, 1936; Belovsky, 2000; Pfadt, 2002; Branson et al., 2006; Bradshaw et al., 2018). Ranchers could offset some of the costs by leasing rangeland in another area and relocating their livestock, finding other means to feed their animals by purchasing hay or grain, or selling their livestock. Local communities could see adverse economic impacts to the entire area. Grasshoppers that infest rangeland could move to surrounding farmland. Farmers would then incur economic losses due to grasshopper populations.

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

a) Carbaryl

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

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

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

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

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

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

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

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

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

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

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

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

b) Chlorantraniliprole

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

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

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

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

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

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

Effects to fish and other aquatic biota from consumption of contaminated aquatic prey are not expected to be a significant pathway of exposure for chlorantraniliprole, based on the low residues and the low bioconcentration factor (BCF; ratio of the concentration of a chemical in an organism to the concentration of the chemical in the surrounding environment) values in aquatic systems. Direct impacts to aquatic plants are also not anticipated because of the estimated environmental residues and available data for five aquatic plants (USDA APHIS, 2018b).

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

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

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

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

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; Schaefer et al., 1980). Mobility and leachability of diflubenzuron in soils is low, and residues are usually not detectable after seven days (Eisler, 2000). Aerobic aquatic half-life data in water and sediment was reported as 26.0 days (USEPA, 1997). Diflubenzuron applied to foliage remains adsorbed to leaf surfaces for several weeks with little or no absorption or translocation from plant surfaces (Eisler, 1992, 2000). Field dissipation studies in California citrus and Oregon apple orchards reported half-life values of 68.2 to 78 days (USEPA, 2018). Diflubenzuron persistence varies depending on site conditions and rangeland persistence is unfortunately not available. Diflubenzuron degradation is microbially mediated with soil aerobic half-lives much less than dissipation half-lives. Diflubenzuron treatments are expected to have minimal effects on terrestrial plants. Both laboratory and field studies demonstrate no effects using diflubenzuron over a range of application rates, and the direct risk to terrestrial plants is expected to be minimal (USDA APHIS, 2018c).

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

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

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

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

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

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

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

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

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

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

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

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

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

d) Reduced Area Agent Treatments (RAATs)

The use of RAATS is the most common application method for all program insecticides and would continue to be so, 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, 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. The program may treat an area with different insecticides but does not overlap the treatments. The program does not mix or combine insecticides. Based on historical outbreaks in the United States, the probability of an outbreak occurring in the same area where treatment occurred in the previous year is unlikely; however, given time, populations eventually will reach economically damaging thresholds and require treatment

The insecticide application reduces the insect population down to levels that cause an acceptable level of economic damage. The duration of treatment activity, which is relatively short since it is a one-time application, and the lack of repeated treatments in the same area in the same year reduce the possibility of significant cumulative impacts.

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

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

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

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.”

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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 public land visitors, 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.

The areas consist of widely scattered, single, rural dwellings in ranching communities adjacent to public lands with low population density. The program notifies residents near treatment areas, or their designated representatives, prior to proposed operations to reduce the potential for incidental exposure to residents including children. Treatments are conducted on open rangelands where children would not be expected to be present during 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 recreational areas.

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.

Consultation with local Tribal representatives takes place prior to treatment programs to inform fully the Tribes of possible actions APHIS may take. 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.

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

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

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

6. Endangered Species Act

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

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

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

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

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

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

APHIS submitted a programmatic biological assessment for grasshopper suppression in the 17-state program area and requested consultation with USFWS on March 9, 2015. With the incorporation and use of application buffers and other operational procedures APHIS anticipates that any impacts associated with the use and rate of program insecticides will be insignificant and discountable to listed species and their habitats. Based on an assessment of the potential exposure, response, and subsequent risk characterization of program operations, APHIS concludes the proposed action is not likely to adversely affect listed species or critical habitat in the program area. APHIS has requested concurrence from the USFWS on these determinations. Until this programmatic Section 7 consultation with USFWS is completed, APHIS will conduct consultations with USFWS field offices at the local level. The BA addresses the protective measures and use of diflubenzuron and carbaryl bait as it relates to species previously addressed in biological assessments with concurrences from FWS dated March 6, 2023, and March 15, 2023; February 24, 2022, and April 1, 2022.

Concurrence to informal consultations from FWS State office is pending signature from State Director (Appendix E).

APHIS considers the role of pollinators in any consultations conducted with the FWS to protect federally listed plants. Mitigation measures, such as no treatment buffers are applied with consideration of the protection of pollinators that are important to a listed plant species. Correspondence from FWS is in appendix E of this EA. There are no species in Arizona regulated by NMFS. No consultation or concurrence from NMFS is needed.

In this biological assessment APHIS, PPQ Arizona Field Ops determined that the proposed action **will not affect**: the endangered Arizona cliffrose (*Purshia subintegra*); endangered Fickeisen plains cactus (*Pediocactus peeblesianus fickeiseniae*) with critical habitat; threatened Jones cycladenia, (*Cycladenia jonesii*); threatened Siler pincushion cactus (*Pediocactus sileri*); threatened Welsh's milkweed (*Asclepias welshii*) with critical habitat; threatened Mojave Desert tortoise (*Gopherus agassizii*) with critical habitat.

APHIS has determined that the proposed action **may affect but is not likely to adversely affect:** experimental population California Condor (*Gymnogyps californianus*); endangered California Least Tern, (*Sterna antillarum browni)*; endangered Southwestern willow flycatcher (*Empidonax traillii extimus*) with critical habitat; endangered Gila chub (*Gila* *intermedia*); endangered Razorback sucker (*Xyrauchen texanus*) with critical habitat; threatened Mexican spotted owl (*Strix occidentalis lucida*) with critical habitat; threatened Western yellow-billed cuckoo (*Coccyzus americanus*) with proposed critical habitat, threatened Northern Mexican gartersnake (*Thamnophis eques megalops*).

APHIS is not required to develop mitigation buffer zones for candidate or other species of concern. The Monarch Butterfly, *Danaus plexippus*, Northern leopard frog (*Rana pipiens*), (Arizona Game and Fish Department Species of Greatest Conservation Need) are species of concern and may or may not be located within our proposed treatment areas for 2024. However, species of concern receive no legal protection under the Act, but consideration of these species will be discussed with the local land managers prior to any treatments to assist in conservation efforts. Agreed upon mitigation measures between USFWS, BLM, Tribal Nations, BIA, ADA, Arizona Game & Fish, and APHIS will be adhered too for species of concern (see table 2).

7. Bald and Golden Eagle Protection Act

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

No toxic effects are anticipated on eagles as a direct consequence of insecticide treatments. Toxic effects on the principal food source, fish, are not expected because insecticide treatments will not be conducted over rivers or lakes. Protective buffers 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.

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

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formaldehyde produced from the incomplete combustion of burning biomass (Reisen and Brown, 2009; Burling et al., 2010; Broyles, 2013). Particulate matter, CO, benzene, acrolein, and formaldehyde have been identified as compounds of particular concern in wildland fire smoke (Reinhardt and Ottmar, 2004).

Many of the naturally occurring products associated with combustion from wildfires may also be present as a result of combustion of program insecticides that are applied to rangeland. These combustion byproducts will be at lower quantities due to the short half-lives of most of the program insecticides and their low use rates. Other minor combustion products specific to each insecticide may also be present as a result of combustion from a rangeland fire but these are typically less toxic based on available human health data (http://www.aphis.usda.gov/plant-health/grasshopper).

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

10. Cultural and Historical Resources

Federal actions must seek to avoid, minimize, and mitigate potential negative impacts to cultural and historic resources as part of compliance with the National Historic Preservation Act (NHPA), the Archaeological Resources Protection Act of 1979, and NEPA. Section 106 of the NHPA requires Federal agencies to provide the Advisory Council on Historic Preservation with an opportunity to comment on their findings. The Dominquez-Escalante historic trail is within the proposed action area. This area is excluded from potential treatments.

V. Literature Cited

Ball E.D., Tinkham E.R., Flock R. and Vorhies C.T. 1942. The grasshoppers and other Orthoptera of Arizona. Tech. Bull. 93, Univ. Ariz., Tucson.

Barbee, G.C., McClain, W.R., Lanka, S.K. and M.J. Stout. 2010. Acute toxicity of chlorantraniliprole to non-target crayfish (*Procambarus clarkii*) associated with rice–crayfish cropping systems. Pest Manag. Sci. 66: 996–1001.

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

Belovsky, G. E., A. Joern, and J. Lockwood. 1996. VII.16 Grasshoppers—Plus and Minus: The Grasshopper Problem on a Regional Basis and a Look at Beneficial Effects of Grasshoppers. Pages 1-5 in G. L. Cunningham and M. W. Sampson, editors.

Grasshopper Integrated Pest Management User Handbook, Technical Bulletin No. 1809. U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Washington, DC.

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

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

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

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

Brown, D. E. 1994. Biotic Communities: Southwestern United States and Northwestern Mexico. 66 pg. University of Utah Press.

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

Brugger, K.E., Cole, P.G., Newman, I.C., Parker, P., Scholz, B., Suvagia, P., Walker, G. and T.G. Hammond. 2010. Selectivity of chlorantraniliprole to parasitoid wasps. Pest Manag. Sci. 66: 1075–1081.

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

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

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

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

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

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

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

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

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

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

Dinter, A., Brugger, K.E., Frost, N.M. and M.D. Woodward. 2009. Chlorantraniliprole (Rynaxypyr): A novel DuPont™ insecticide with low toxicity and low risk for honey bees (*Apis mellifera*) and bumble bees (*Bombus terrestris*) providing excellent tools for uses in integrated pest management. Hazards of pesticides to bees – 10th International Symposium of the ICP-Bee Protection Group. Pp. 84-96.

Dupont. 2011. Material Safety Data Sheet - Prevathon®.

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

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

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

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

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

Follett, R. F. and D. A. Reed. 2010. Soil carbon sequestration in grazing lands: societal benefits and policy implications. Rangeland Ecology & Management 63:4-15.

Foster, R. N., K. C. Reuter, K. Fridley, D. Kurtenback, R. Flakus, R. Bohls, B. Radsick, J. B. Helbig, A. Wagner, and L. Jeck. 2000. Field and Economic Evaluation of Operational Scale Reduced Agent and Reduced Area Treatments (RAATs) for Management of Grasshoppers in South Dakota Rangeland. U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Plant Protection and Quarantine, Phoenix, AZ.

George, T. L., L. C. McEwen, and B. E. Peterson. 1995. Effects of grasshopper control programs on rangeland breeding bird populations. J. Range Manage. 48:336–342.

Gradish, A.E., Scott-Dupree, C.D., Shipp, L. and R. Harris. 2011. Effect of reduced risk pesticides on greenhouse vegetable arthropod biological control agents. Pest Manag. Sci. 67: 82–86.

Gramlich, F. J. 1979. Effects of Sevin on songbird cholinesterase. Environmental Monitoring of Cooperative Spruce Budworm Control Projects. Maine Department of Conservation, Bureau of Forestry, Augusta, ME.

Guerrant, G. O., L. E. Fetzer, Jr., and J. W. Miles. 1970. Pesticide residues in Hale County, Texas, before and after ultra-low-volume aerial applications of Malathion. Pesticide Monitoring J. 4:14-20.

Hannig, G.T., Ziegler, M. and P.G. Marcon. 2009. Feeding cessation effects of chlorantraniliprole, new anthralinic diamide insecticide, in comparison with several

insecticides in distinct chemical classes and mode-of-action groups. Pest Manag. Sci. 65: 969–974.
Havstad, K. M., D. P. Peters, R. Skaggs, J. Brown, B. Bestelmeyer, E. Fredrickson, J. Herrick, and J. Wright. 2007. Ecological services to and from rangelands of the United States. Ecological Economics 64:261-268.
Howe, F. P. 1993. Effects of Grasshopper Insecticide Application on Diet, Food Delivery Rates, Growth, and Survival of Shrubsteppe Passarine. Page 108 PhD dissertation. Colorado State University, Fort Collins, CO.
Howe, F. P., R. L. Knight, L. C. McEwen, and T. L. George. 1996. Direct and indirect effects of insecticide applications on growth and survival of nestling passerines. Ecol. Appl. 6:1314-1324.
Kar, A., K. Mandal, and B. Singh. 2012. Environmental fate of cholorantraniliprole residues on cauliflower using QuEChERS technique. Environ. Monit. Assess 85:1255-1263.
Keever, D. W., J. R. Bradley, Jr, and M. C. Ganyard. 1977. Effects of diflubenzuron (Dimilin) on selected beneficial arthropods in cotton fields. J. Econ. Entomol. 6:832-836.
LaFleur, K. S. 1979. Sorption of pesticides by model soils and agronomic soils: rates and equilibria. Soil Sci. 127:94-101.
Larsen, J. and R. N. Foster. 1996. Using Hopper to Adapt Treatments and Costs to Needs and Resources. U.S. Department of Agriculture, Animal and Plant Health Inspection Service Grasshopper Integrated Pest Management User Handbook, Washington, D.C.
Larson, J. L., C. T. Redmond, and D. A. Potter. 2012. Comparative impact of an antrhanilic diamide and other insecticidal chemistries on beneficial invertebrates and ecosystem services in turfgrass. Pest Management Science 68:740-748.
Latchininsky, A., G. Sword, M. Sergeev, M. Cigiliano, and M. Lecoq. 2011. Locusts and grasshoppers: behavior, ecology, and biogeography. Psyche 2011:1-4.
Lockwood, J. A. and S. P. Schell. 1997. Decreasing economic and environmental costs through reduced area and agent insecticide treatments (RAATs) for the control of rangeland grasshoppers: empirical results and their implications for pest management. J. Orthoptera Res. 6:19-32.
Lockwood, J., S. Schell, R. Foster, C. Reuter, and T. Rahadi. 2000. Reduced agent-area treatments (RAAT) for management of rangeland grasshoppers: efficacy and economics under operational conditions. International Journal of Pest Management 46:29-42.
Lockwood, J. A. and A. Latchininsky. 2000. The Risks of Grasshoppers and Pest Management to Grassland Agroecosystems: An International Perspective on Human Well-Being and Environmental Health. Pages 193-215 in A. Latchininsky and M. Sergeev, editors. Grasshoppers and Grassland Health. Kluwer Academic Publishers.
Lockwood, J., R. Anderson-Sprecher, and S. Schell. 2002. When less is more: optimization of reduced agent-area treatments (RAATs) for management of rangeland grasshoppers. Crop Protection 21:551-562.
Matsumara, F. 1985. Toxicology of insecticides. Plenum Press, New York.
McEwen, L.C., Althouse, C.M., and Peterson, B.E., 1996. Direct and indirect effects of grasshopper integrated pest management (GHIPM) chemicals and biologicals on nontarget animal life. *In* U.S. Department of Agriculture, Animal and Plant Health

Inspection Service, 1996. Grasshopper Integrated Pest Management User Handbook, Tech. Bul. No. 1809. Sec. III.2. Washington, DC.

Miles, C. J. and S. Takashima. 1991. Fate of malathion and O.O.S. trimethyl phosphorothioate byproduct in Hawaiian soil and water. Arch. Environ. Contam. Toxicol 20:325-329.

Mommaerts, V., Sterk, G., and G. Smagghe. 2006. Hazards and uptake of chitin synthesis inhibitors in bumblebees *Bombus terrestris*. Pest Mgt. Science 62:752–758.

Murphy, C. F., P. C. Jepson, and B. A. Croft. 1994. Database analysis of the toxicity of antilocust pesticides to non-target, beneficial invertebrates. Crop Protection 13:413-420.

Muzzarelli, R. 1986. Chitin synthesis inhibitors: effects on insects and on nontarget organisms. CRC Critical Review of Environmental Control 16:141-146.

Narisu, J., A. Lockwood, and S. P. Schell. 1999. A novel mark-capture technique and its application to monitoring the direction and distance of local movements of rangeland grasshoppers (Orthoptera: Acridade) in context of pest management. J. Appl. Ecol. 36:604-617.

Narisu, J., A. Lockwood, and S. P. Schell. 2000. Rangeland grasshopper movement as a function of wind and topography: implications for pest movement. J. Appl. Ecol. 36:604-617.

Nation, J.L., Robinson, F.A., Yu, S.J., and A.B. Bolten. 1986. Influence upon honeybees of chronic exposure to very low levels of selected insecticides in their diet. J. Apic. Res. 25:170–177.

Neary, D. G. 1985. Fate of pesticides in Florida's forests: an overview of potential impacts of water quality. Pages 18-24 in Procs. Soil and Crop Sci. Soc. of FL.

Nigg, H. N., R. D. Cannizzaro, and J. H. Stamper. 1986. Diflubenzuron surface residues in Florida citrus. Bul. Environ. Contam. Toxicol. 36:833-838.

NIH. 2009a. Carbaryl, CASRN: 63-25-2. National Institutes of Health, U.S. National Library of Medicine, Toxnet, Hazardous Substances Database.

NIH. 2009b. National Institutes of Health, U.S. National Library of Medicine, Hazardous Substances Database.

Norelius, E. E. and J. A. Lockwood. 1999. The effects of reduced agent-area insecticide treatments for rangeland grasshopper (Orthoptera: Acrididae) control on bird densities. Archives of Environmental Contamination and Toxicology 37:519-528.

Pascual, J. A. 1994. No effects of a forest spraying of malathion on breeding blue tits (*Parus caeruleus*). Environ. Toxicol. Chem. 13:1127–1131.

Peach, M. P., D. G. Alston, and V. J. Tepedino. 1994. Bees and bran bait: is carbaryl bran bait lethal to alfalfa leafcutting bee (Hymenoptera: Megachilidae) adults or larvae? J. Econ. Entomol. 87:311-317.

Peach, M. P., D. G. Alston, and V. J. Tepedino. 1995. Subleathal effects of carbaryl bran bait on nesting performance, parental investment, and offspring size and sex ratio of the alfalfa leafcutting bee (Hymenoptera: Megachilidae). Environ. Entomol. 24:34-39.

Pfadt, R. E. 2002. Field Guide to Common Western Grasshoppers, Third Edition. Wyoming Agricultural Experiment Station Bulletin 912. Laramie, Wyoming.

Purdue University. 2018. National Pesticide Information Retrieval System. West Lafayette, IN.

Quinn, M. A., R. L. Kepner, D. D. Walgenbach, R. N. Foster, R. A. Bohls, P. D. Pooler, K. C. Reuter, and J. L. Swain. 1991. Effect of habitat and perturbation on populations and community structure of darkling beetles (Coleoptera: tenebrionidae) on mixed grass rangeland. Environ. Entomol. 19:1746-1755.

Rashford, B. S., A. V. Latchininsky, and J. P. Ritten. 2012. An Economic Analysis of the Comprehensive Uses of Western Rangelands. U.S. Department of Agriculture, Animal and Plant Health Inspection Service.

Reinhardt, T. and R. Ottmar. 2004. Baseline measurements of smoke exposure among wildland firefighters. Journal of Occupational and Environmental Hygiene 1:593-606.

Reisen, F. and S. Brown. 2009. Australian firefighters' exposure to air toxics during bushfire burns of autumn 2005 and 2006. Environment International 35:342-353.

Richmond, M. L., C. J. Henny, R. L. Floyd, R. W. Mannan, D. W. Finch, and L. R. DeWeese. 1979. Effects of Sevin 4-oil, Dimilin, and Orthene on Forest Birds in Northeastern Oregon. USDA, Pacific SW Forest and Range Experiment Station.

Rosenberg, K. V., R. D. Ohmart, and B. W. Anderson. 1982. Community organization of riparian breeding birds: response to an annual resource peak. The Auk 99:260-274.

Sample, B. E., R. J. Cooper, and R. C. Whitmore. 1993. Dietary shifts among songbirds from a diflubenzuron-treated forest. The Condor 95:616-624.

Schaefer, C. H., A. E. Colwell, and E. F. Dupras, Jr. 1980. The occurrence of p-chloroaniline and p-c hlorophenylurea from the degradation of pesticide in water and fish. Proceedings of the 48th Ann. Meeting Mosquito Vector Cont. Assoc.:84-89.

Schaefer, C. H. and E. F. Dupras, Jr. 1977. Residues of diflubenzuron [1-(4-chlorophenyl)-3(2,6-difluorobenzoyl) urea] in pasture soil, vegetation, and water following aerial applications. J. Agric. Food Chem. 25:1026-1030.

Smith, D. and J. Lockwood. 2003. Horizontal and trophic transfer of diflubenzuron and fipronil among grasshoppers and between grasshoppers and darkling beetles (Tenebrionidae). Archives of Environmental Contamination and Toxicology 44:377-382.

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

Stanley, J. G. and J. G. Trial. 1980. Disappearance constants of carbaryl from streams contaminated by forest spraying. Bul. Environ. Contam. Toxicol. 25:771-776.

Swain, J. L. 1986. Effect of Chemical Grasshopper Controls on Non-Target Arthropods of Rangeland in Chaves County, New Mexico. New Mexico State University.

Tepedino, V. J. 1979. The importance of bees and other insect planetaries in maintaining floral species composition. Great Basin Naturalist Memoirs 3:139-150.

Thompson, H.M, Wilkins, S. Battersby, A.H., Waite, R.J., and D. Wilkinson. 2005. The effects of four insect growth-regulating (IGR) insecticides on honeybee (*Apis mellifera* L.) colony development, queen rearing and drone sperm production. Ecotoxicology 14:757–769.

Thomson, D. L. K. and W. M. J. Strachan. 1981. Biodegradation of carbaryl in simulated aquatic environment. Bul. Environ. Contam. Toxicol. 27:412-417.

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

U.S. Department of Agriculture, Animal and Plant Health Inspection Service, 1999. APHIS Directive 5600.3, Evaluating APHIS programs and activities for ensuring protection of children from environmental health risks and safety risks. September 3, 1999.

U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Riverdale, MD. [online] available: http://www.aphis.usda.gov/library/directives.
U.S. Department of Agriculture, Animal and Plant Health Inspection Service. 2015. Biological Assessment for the APHIS Rangeland Grasshopper and Mormon Cricket Suppression Program. Page 162. U.S. Department of Agriculture, Animal and Plant Health Inspection Service.
U.S. Department of Agriculture, Animal and Plant Health Inspection Service. 2018a. Human Health and Ecological Risk Assessment for Carbaryl Rangeland Grasshopper and Mormon Cricket Suppression Applications. United States Department of Agriculture, Animal and Plant Health Inspection Service.
U.S. Department of Agriculture, Animal and Plant Health Inspection Service. 2018b. Human health and Ecological Risk Assessment for Chlorantraniliprole used in Rangeland grasshopper and Mormon Cricket Suppression Program. United States Department of Agriculture, Animal Plant and health Inspection Service.
U.S. Department of Agriculture, Animal and Plant Health Inspection Service. 2018c. Human Health and Ecological Risk Assessment for Diflubenzuron Rangeland Grasshopper and Mormon Cricket Suppression Applications. United States Department of Agriculture, Animal and Plant Health Inspection Service.
U.S. Department of Agriculture, Animal and Plant Health Inspection Service. 2018d. Human Health and Ecological Risk Assessment for Malathion Rangeland Grasshopper and Mormon Cricket Suppression Applications. United States Department of Agriculture, Animal and Plant Health Inspection Service.
U.S. Department of Agriculture, Animal and Plant Health Inspection Service. 2019. Rangeland Grasshopper and Mormon Cricket Suppression Program Final Environmental Impact Statement. United States Department of Agriculture, Animal and Plant Health Inspection Service.
USDA FS. 2004. Control/eradication agents for the gypsy moth—human health and ecological risk assessment for diflubenzuron (final report). United States Department of Agriculture, Forest Service
USDA FS. 2008. Malathion- Human Health and Ecological Risk Assessment. U.S. Department of Agriculture, Forest Service.
USEPA – See U.S. Environmental Protection Agency
U.S. Environmental Protection Agency. 1997. Reregistration Eligibility Decision (RED): Diflubenzuron. U.S. Environmental Protection Agency.
U.S. Environmental Protection Agency. 2000a. Malathion Reregistration Eligibility Document Environmental Fate and Effects. Page 146. U.S. Environmental Protection Agency, Office of Prevention, Pesticides and Toxic Substances.
U.S. Environmental Protection Agency. 2000b. Reregistration Eligibility Decision (RED) for Malathion. U.S. Environmental Protection Agency.
USEPA. 2003. Environmental Fate and Ecological Risk Assessment for Re-Registration of Carbaryl. U.S. Environmental Protection Agency.
U.S. Environmental Protection Agency. 2006. Malathion Reregistration Eligibility Document. Page 147. U.S. Environmental Protection Agency, Office of Pesticide Programs.
U.S. Environmental Protection Agency. 2007. Reregistration Eligibility Decision (RED) for Carbaryl. Page 47. U.S. Environmental Protection Agency, Prevention, Pesticides and Toxic Substances.

U.S. Environmental Protection Agency, 2008. Pesticide fact sheet: Chlorantraniliprole. Office of Prevention, Pesticides and Toxic Substances. 77 pp.
U.S. Environmental Protection Agency. 2012a. Fyfanon ULV AG. U.S. Environmental Protection Agency.
U.S. Environmental Protection Agency. 2012c. Sevin XLR Plus Label. Pages 1-40 Pesticide Product and Label System. U.S. Environmental Protection Agency.
U.S. Environmental Protection Agency. 2015a. Annual Cancer Report 2015, Chemicals Evaluated for Carcinogenic Potential Page 34. U.S. Environmental Protection Agency, Office of Pesticide Programs.
U.S. Environmental Protection Agency. 2015b. Memorandum - Diflubenzuron: human health risk assessment for an amended Section 3 registration for carrot, peach subgroup 12-12B, plum subgroup 12-12C, pepper/eggplant subgroup 8010B, cottonseed subgroup 20C, alfalfa (regional restrictions) and R175 Crop Group Conversion for tree nut group 14-12. Page 71 U.S. Environmental Protection Agency, Office of Pesticide Programs.
U.S. Environmental Protection Agency. 2016a. Appendix 3-1: Environmental transport and fate data analysis for malathion. In: Biological Evaluation Chapters for Malathion ESA Assessment.
U.S. Environmental Protection Agency. 2016b. Chapter 2: Malathion Effects Characterization for ESA Assessment. In: Biological Evaluation Chapters for Malathion ESA Assessment.
U.S. Environmental Protection Agency. 2016c. Malathion: Human Health Draft Risk Assessment for Registration Review. Page 258. U.S. Environmental Protection Agency.
U.S. Environmental Protection Agency. 2017a. Memorandum - Carbaryl: Draft Human Health Risk Assessment in Support of Registration Review. Page 113 U.S. Environmental Protection Agency.
U.S. Environmental Protection Agency. 2017b. Prevathon Label. U.S. Environmental Protection Agency.
U.S. Environmental Protection Agency. 2018. Preliminary Risk Assessment to Support the Registration Review of Diflubenzuron.
USFWS. 2007. National Bald Eagle Management Guidelines. Page 23 pp. U.S. Fish and Wildlife Service.
Wakeland, C. and W. E. Shull. 1936. The Mormon cricket with suggestions for its control, Extension Bulletin No. 100. University of Idaho, College of Agriculture, Idaho Agricultural Extension.
Zinkl, J. G., C. J. Henny, and L. R. DeWeese. 1977. Brain cholinesterase activities of birds from forests sprayed with trichlorfon (Dylox) and carbaryl (Sevin 4-oil). Bul. Environ. Contam. Toxicol. 17:379-386.

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Appendix A- APHIS Rangeland Grasshopper and Mormon Cricket Suppression Program

FY-2024 Treatment Guidelines

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

<u>General Guidelines for Grasshopper / Mormon Cricket Treatments</u>

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 and subject to funding availablity, 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

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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.

Operational Procedures

GENERAL PROCEDURES FOR ALL AERIAL AND GROUND APPLICATIONS

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

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

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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 spray

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

   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) <u>OR</u> 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 include:
   A. Completion of a post-treatment report (Part C of the Project Planning and Reporting Worksheet (PPQ Form 62)

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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.

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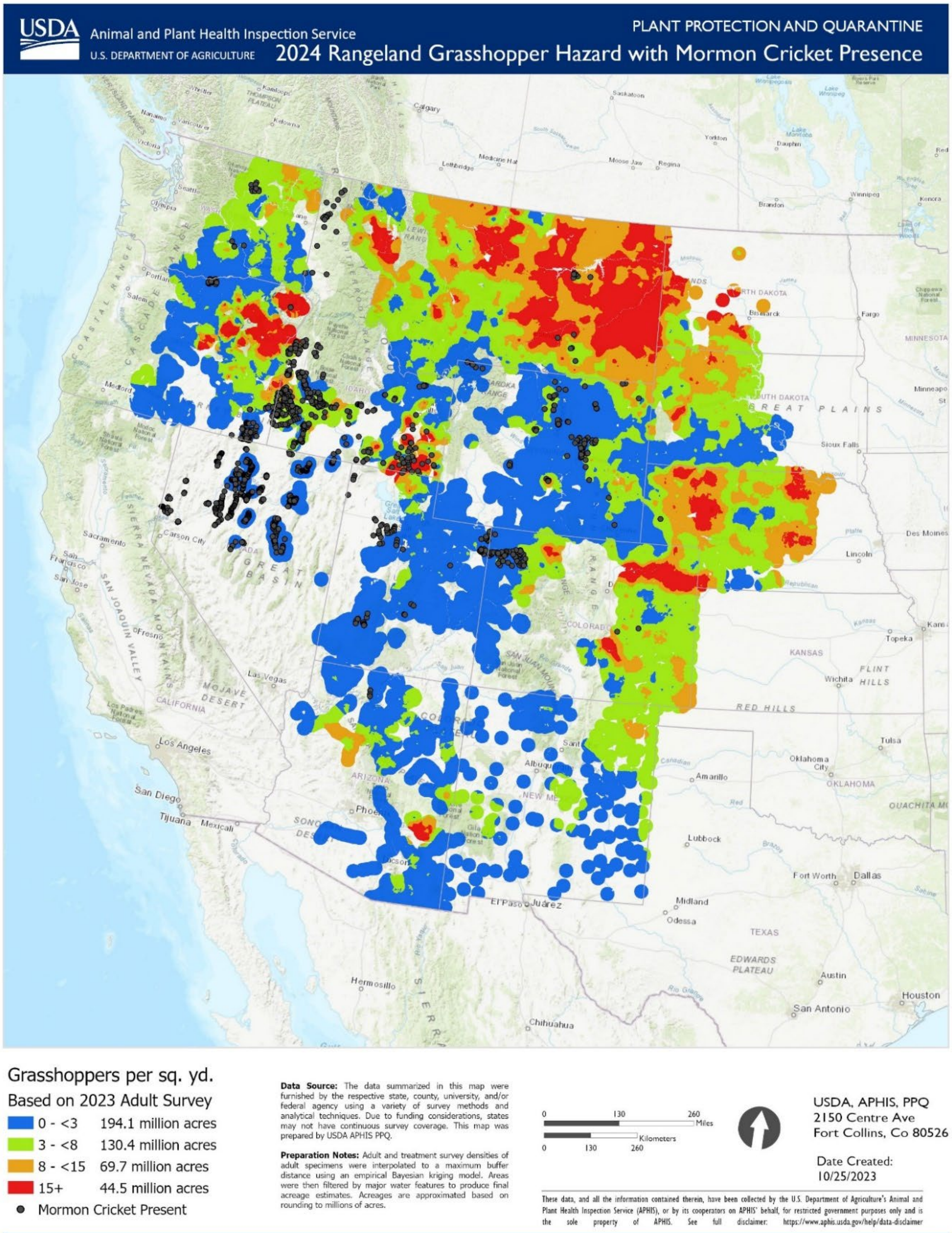
Appendix B: Grasshopper Hazard Map of the Affected Environment



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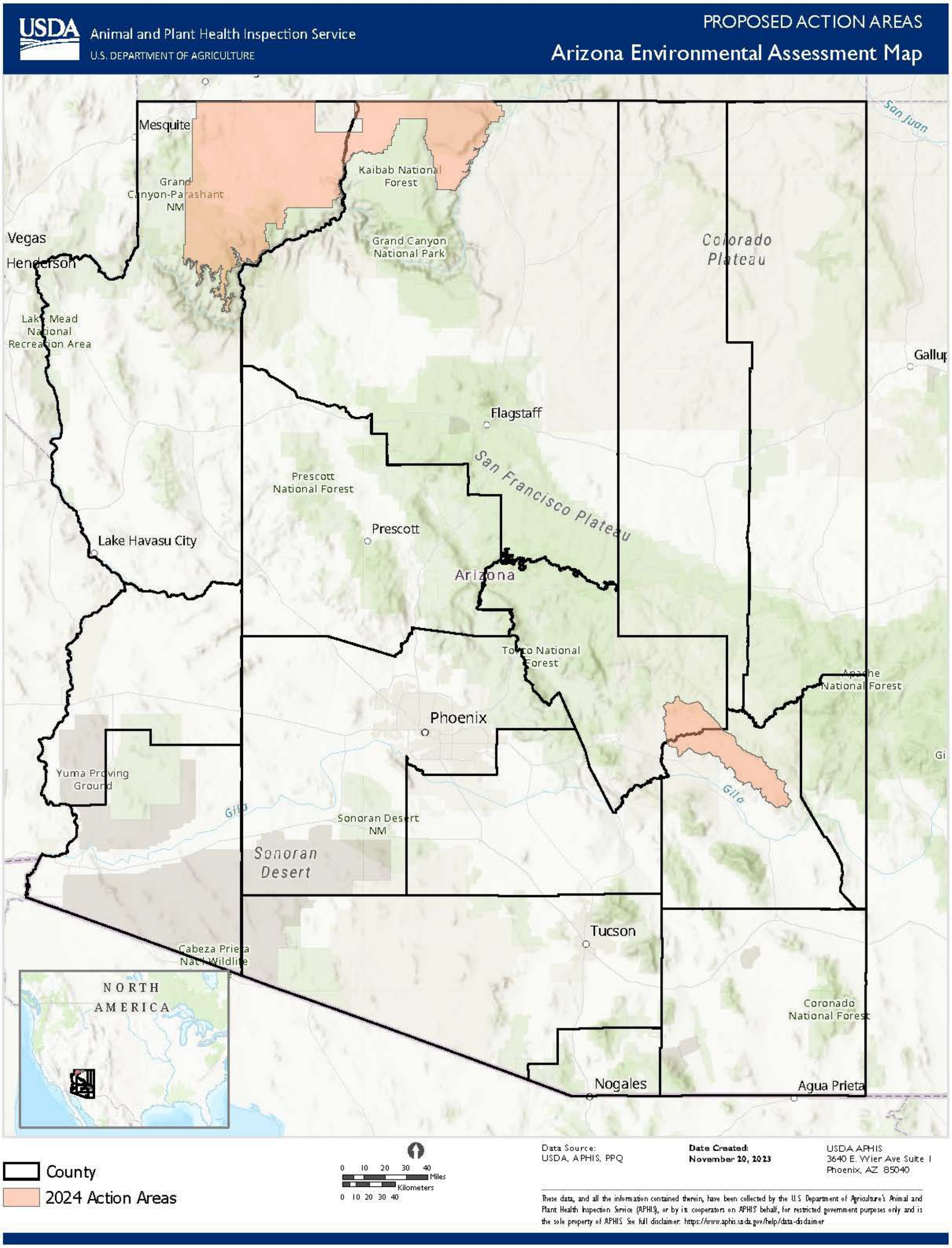
Appendix C: Map of Proposed Action Areas



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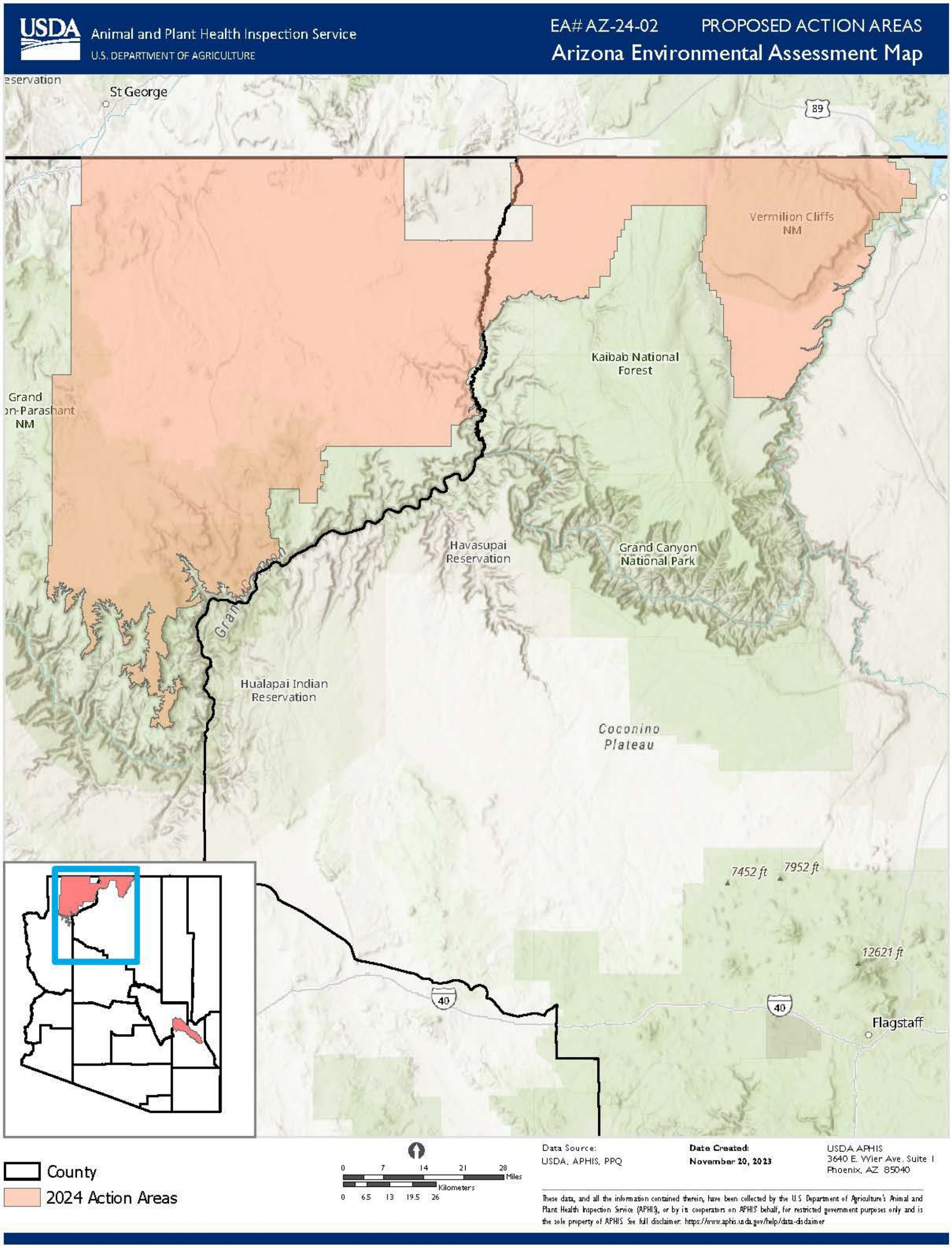
Appendix D: Map of the BLM-Arizona Strip District Proposed Action Area



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Appendix E: FWS Correspondence PENDING

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Appendix F: Public Comments and APHIS Response