FINAL - Environmental Assessment Rangeland Grasshopper and Mormon Cricket Suppression Program

ARIZONA
EA Number: AZ-22-01

Prepared by:

Animal and Plant Health Inspection Service
3640 East Wier Ave.
Phoenix, Arizona 85040

Site-Specific

Gila and Graham County portion within the San Carlos Apache Reservation.

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Acronyms and Abbreviations

ac	acre
a.i.	active ingredient
AChE	acetylcholinesterase
APHIS	Animal and Plant Health Inspection Service
BCF	bioconcentration factor
BLM	Bureau of Land Management
CEQ	Council of Environmental Quality
CFR	Code of Federal Regulations
EA	environmental assessment
e.g.	example given (Latin, exempli gratia, “for the sake of example”)
EIS	environmental impact statement
E.O.	Executive Order
FONSI	finding of no significant impact
FR	Federal Register
FS	Forest Service
g	gram
ha	hectare
HHERA	human health and ecological risk assessments
i.e.	in explanation (Latin, id est “in other words.”)
IPM	integrated pest management
lb	pound
MBTA	Migratory Bird Treaty Act
MOU	memorandum of understanding
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act

NIH	National Institute of Health
ppm	parts per million
PPE	personal protective equipment
PPQ	Plant Protection and Quarantine
RAATs	reduced agent area treatments
S&T	Science and Technology
ULV	ultra-low volume
U.S.C.	United States Code
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Services

[Final] Site-Specific Environmental Assessment

Rangeland Grasshopper and Mormon Cricket Suppression Program

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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 Graham and Gila County, San Carlos Apache Reservation. The Animal and Plant Health Inspection Service (APHIS) and 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 reduces 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 2022 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 could take place from 04/01/22 to 09/30/22 on rangeland in Graham and Gila County, San Carlos Apache Reservation (Appendix D).

This EA is prepared in accordance with the requirements under the National Environmental Policy Act of 1969 (NEPA) (42 United States Code § 4321 *et. seq.*) and the NEPA procedural requirements promulgated by the Council on Environmental Quality, United States Department of Agriculture (USDA), and APHIS. A decision will be made by APHIS based on the analysis presented in this EA, the results of public involvement, and consultation with other agencies and individuals. A selection of one of the program alternatives will be made by APHIS for the 2022 Control Program for infested rangeland in Graham and Gila County, San Carlos Apache Reservation.

B. Background Discussion

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

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

The site-specific data used to make treatment decisions in real time is gathered during spring 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 (AUM's) present in grazing allotment, forage damage estimates, number of potential AUM's consumed by grasshopper population, potential AUM's managed for allotment and value of the AUM, estimated cost of replacement feed for livestock, rotational time frame for grazing allotments, number of livestock in grazing allotment. These are all factors that are considered when determining the economic infestation level.

[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.

APHIS surveys grasshopper populations on rangeland in the Western United States, provides technical assistance on grasshopper management to landowners and managers, and may cooperatively suppress grasshoppers when direct intervention is requested by a Federal land management agency or a State agriculture department (on behalf of a State or local government, or a private group or individual). APHIS' enabling legislation provides, in relevant part, that 'on request of the administering agency or the agriculture department of an affected State, the Secretary, to protect rangeland, shall immediately treat Federal, State, or private lands that are infested with grasshoppers or Mormon crickets'… (7 U.S.C. § 7717(c)(1)). The need for rapid and effective response when an outbreak occurs limits the options available to APHIS. The application of an insecticide within all or part of the outbreak area is the response available to APHIS to rapidly suppress or reduce grasshopper populations and effectively protect rangeland.

In June 2002, APHIS completed an environmental impact statement (EIS) document concerning suppression of grasshopper populations in 17 Western States (Rangeland 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 United States Code (U.S.C.) § 7701) to take actions to control and minimize the economic, ecological, and human health impacts that harmful plant pests can cause. APHIS uses this authority to protect U.S. agriculture, forests, and other natural resources from harmful pest species.

Section 417 of the PPA (7 U.S.C. § 7717) authorizes APHIS' efforts to minimize the economic impacts of grasshoppers. Section 417(a) states that subject to the availability of funds, the Secretary "shall carry out a program to control grasshoppers and Mormon crickets on all Federal lands to protect rangeland." Section 417(c) (1) states that "Subject to the availability of funds pursuant to this section, on request of the administering agency or the agriculture department of an affected State, the Secretary, to protect rangeland, shall immediately treat Federal, State, or private lands that are infested with grasshoppers or Mormon crickets at levels of economic infestation, unless the Secretary determines that delaying treatment will not cause greater economic damage to adjacent owners of rangeland." Section 417(c)(2) states, "In carrying out this section, the Secretary shall work in conjunction with other Federal, State, and private prevention, control, or suppression efforts to protect rangeland."

APHIS has the authority to implement Section 417 of the PPA through the Rangeland Grasshopper and Mormon Cricket Suppression Program. The priorities of the APHIS program are:

- to conduct surveys for grasshopper and Mormon cricket populations on rangelands in the western United States,

- to provide technical assistance on grasshopper management to landowners/managers, and

- subject to the availability of funds, to suppress grasshoppers and Mormon crickets on rangeland when direct intervention is requested by the landowner/manager.

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 September 16, 2016, APHIS and the Bureau of Indian Affairs (BIA) signed a Memorandum of Understanding (MOU) detailing cooperative efforts between the two groups on suppression of grasshoppers on BIA managed lands. This MOU clarifies that APHIS will prepare and issue to the public, site-specific environmental documents that evaluate potential impacts associated with the proposed measures to suppress economically damaging grasshopper populations. The MOU also states that these documents will be prepared under the APHIS NEPA implementing procedures with cooperation and input from the BIA.

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

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

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

On 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 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. RAATs are one of the methods that has been developed to reduce the amount of pesticide used in suppression activities and is a component of IPM. APHIS continues to evaluate new suppression tools and methods for grasshopper and Mormon cricket populations, including biological control, and as stated in the EIS, will implement those methods once proven effective and approved for use in the United States.

C. About This Process

The NEPA process for grasshopper management is complicated by the fact that there is very little time between requests for treatment and the need for APHIS to act swiftly with respect to those requests. Surveys help to determine general areas, among the millions of acres where harmful grasshopper infestations may occur in the spring of the following year. Survey data provides the best estimate of future grasshopper populations, while short-term climate or environmental factors change where the specific treatments will be needed. Therefore, examining specific treatment areas for environmental risk analysis under NEPA is typically not possible. At the same time, the program strives to alert the public in a timely manner to its more concrete treatment plans and avoid or minimize harm to the environment in implementing those plans.

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

Public involvement under the CEQ Regulations for Implementing the Procedural Provisions of NEPA distinguishes federal actions with effects of national concern from those with effects primarily of local concern (40 CFR 1506.6). The grasshopper and Mormon cricket suppression program EIS were 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 environmental quality that could be affected by treatments in the area where grasshopper outbreaks are anticipated. The Draft EA will be made available to the public for a 30-day comment period. **The comment period will begin March 2nd and end April 1st, 2022.** Comments can be sent to USDA, APHIS, 3640 East Wier Ave. Phoenix, Arizona 85040, or contacting the local USDA, APHIS Arizona State Office (602)431-3200. When the program receives a treatment request and determines that treatment is necessary, the specific site within the state will be evaluated to determine if environmental factors were thoroughly evaluated in the Draft EA. If all environmental issues were accounted for in the Draft EA, the program will prepare a Final EA and FONSI. Once the FONSI has been finalized copies of those documents will be sent to any parties that submitted comments on the Draft EA, and to other appropriate stakeholders. To allow the program to respond to comments in a timely manner, the Final EA and FONSI will be posted to the APHIS website. The program will also publish a notice of availability in the same manner used to advertise the availability of the Draft EA.

II. Alternatives

To engage in comprehensive NEPA risk analysis APHIS must frame potential agency decisions into distinct alternative actions. These program alternatives are then evaluated to determine the significance of environmental effects. The 2002 EIS presented three alternatives: (A) No Action; (B) Insecticide Applications at Conventional Rates and Complete Area Coverage; and (C) Reduced Agent Area Treatments (RAATs), and their potential impacts were described and analyzed in detail. The 2019 EIS was tiered to and updated the 2002 EIS. Therefore the 2019 EIS considered the environmental background or 'No Action' alternative of maintaining the program that was described in the 2002 EIS and Record of Decision. The 2019 EIS also considered an alternative where APHIS would not fund or participate in grasshopper suppression programs. The preferred alternative of the 2019 EIS allowed APHIS to update the program with new information and technologies that not were analyzed in the 2002 EIS. Copies of the complete 2002 and 2019 EIS documents are available for review at USDA, APHIS, 3640 East Wier Ave. Phoenix, Arizona 85040**.** These documents are also available at the Rangeland Grasshopper and Mormon Cricket Program website, 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 Final EA analyzes the significance of environmental effects that could result from the alternatives described below. These alternatives differ from those described in the 2019 EIS because grasshopper treatments are not likely to occur in most of the rangeland in Arizona and therefore the environmental baseline should describe a no treatment scenario in those rangeland areas.

A. No Suppression Program Alternative

Under Alternative A, the No Action alternative, APHIS would not conduct a program to suppress grasshopper infestations within Arizona. 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 work by inhibiting acetylcholinesterase (enzymes involved in nerve impulses) and diflubenzuron inhibits the formation of chitin by insects. APHIS would make a single application per year to a treatment area and could apply insecticide at an APHIS rate conventionally used for grasshopper suppression treatments, or more typically as reduced agent area treatments (RAATs). APHIS selects which insecticides and rates are appropriate for suppression of a grasshopper outbreak based on several biological, logistical, environmental, and economical criteria. The identification of grasshopper species and their life stage largely determines the choice of insecticides used among those available to the program. RAATs are the most common application method for all program insecticides, and only rarely do rangeland pest conditions warrant full coverage and higher rates.

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

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

- 8.0 fluid ounces (0.25 lb a.i.) of carbaryl ULV spray per acre.
- 5-10.0 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

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 depending on type of ground equipment used. 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.

Figure 1. Reduced Agent Area Treatment (RAAT's)

Applicators 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.

Treatments are conducted using the Reduced Agent Area Treatment (RAAT's) method. This method of skipping swaths (fig.1) decreases the amount of chemical and acreage treated still 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% RAAT's the acreage actually 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 and diflubenzuron would cover all treatable sites within the designated treatment block per label directions. The application rates under this alternative are typically at the following application rates:

- 16.0 fluid ounces (0.50 lb a.i.) of carbaryl spray per acre.
- 5-10.0 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

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.

C. *Experimental Treatments Alternative*

APHIS-PPQ continues to refine its methods of grasshopper and Mormon cricket management in order to improve the abilities of the Rangeland Grasshopper and Mormon Cricket Suppression Program (herein referred to as the Program) to make it more economically feasible, and environmentally acceptable. These refinements can include reduced rates of currently used pesticides, improved formulations, development of more target-specific baits, development of biological pesticide suppression alternatives, and improvements to aerial (e.g., incorporating the use of Unmanned Aircraft Systems (UAS)) and ground application equipment. A division of APHIS-PPQ, Science and Technology's (S&T) Phoenix Lab is in Arizona and its Rangeland Grasshopper and Mormon Cricket Management Team (Rangeland Unit) conducts methods development and evaluations on behalf of the Program. The Rangeland Unit's primary mission is to comply with Section 7717 of the Plant Protection Act and protect the health of rangelands (wildlife habitats and where domestic livestock graze) against economically damaging cyclical outbreaks of grasshoppers and Mormon crickets. The Rangeland Unit tests and develops more effective, economical, and less environmentally harmful management methods for the Program and its federal, state, tribal, and private stakeholders.

To achieve this mission, experimental plots ranging in area from less than one foot to 640 acres are used and often replicated. The primary purpose of these experiments is to test and develop improved methods of management for grasshoppers and Mormon crickets. This often includes testing and refining pesticide and biopesticide formulations that may be incorporated into the Program. These investigations often occur in the summer (May-August) and the locations typically vary annually. The plots often include "no treatment" (or control) areas that are monitored to compare with treated areas. Some of these plots may be monitored for additional years to gather information on the effects of utilized pesticides on non-target arthropods. Note that an Experimental Use Permit is not needed when testing non-labeled experimental pesticides if the use is limited to laboratory or greenhouse tests, or limited replicated field Trials involving 10 acres or less per pest for terrestrial tests.

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

Methods Development Studies

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

Rangeland Unit often uses one square foot micro plots covered by various types of cages depending on the study type and species used. These types of study plots are preferred for Mormon cricket treatments and those involving non-labeled experimental pesticides or biopesticides. Our most common application method for micro plots is simulating aerial applications via the Field Aerial Application Spray Simulation Tower Technique (FAASSTT). This system consists of a large tube enclosed on all sides except for the bottom, so micro plot treatments can be accurately applied to only the intended treatment target. Treatments are applied with the FAASSTT in micro doses via a syringe and airbrush apparatus mounted in the top. The rangeland unit is also investigating the potential use of Unmanned Aerial Systems (UAS) for a number of purposes related to grasshopper and Mormon cricket detection and treatment. UAS will be operated by FAA-licensed pilots with an aerial pesticide applicator's permit.

Pesticides and Biopesticides Used in Studies
Pesticides likely to be involved in studies currently include:

1) Liquids: diflubenzuron (Dimilin 2L and generics: currently Unforgiven and Cavalier 2L) and chlorantraniliprole (Prevathon). Program standard application rates are diflubenzuron - 1.0 fl. oz./acre in a total volume of 31 fl. oz./acre; chlorantraniliprole - 2.0 fl. oz./acre (RAATs) or 4.0 fl. oz./acre (conventional coverage), both in a total volume of 32 fl. oz./acre. Experimental rates often vary, but the doses are lower than standard Program rates unless otherwise noted.

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

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

Biopesticides likely to be involved in studies currently include:

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

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

At this time, we are unsure where in the 17 states we will be doing most of the following proposed experimental field studies. The final location decision is dependent upon grasshopper and/or Mormon cricket population densities, and availability of suitable sites, but we plan to most likely work in Arizona, Idaho, New Mexico, Oregon, Montana, or Washington.

Study 1: Evaluate efficacy of a UAS-mounted bait spreader applying 2% carbaryl bait at 5 lbs/acre. This study plans to use replicated 40-acre plots (320 acres total) on Colville Confederated Tribes land in Washington sometime in May/June, but is contingent upon a population of sufficient size. Mortality will be then be observed for a duration of time to determine efficacy.

Study 2: Evaluate persistence of the experimental biopesticide DWR2009 in bait form by coating wheat bran with the pathogen. A species of local abundance will be placed into replicated microplot cages and fed the baits by hand. Mortality and sporulation will be then be observed for a duration of time to determine persistence in both the field and lab.

Study 3: Evaluate efficacy of the experimental biopesticide DWR2009 in bait form by coating wheat bran with the pathogen. A species of local abundance will be placed into replicated microplot cages and fed the baits by hand. Mortality and sporulation will be then be observed for a duration of time to determine efficacy in both the field and lab.

Study 4: A stressor study to evaluate efficacy of the experimental biopesticide DWR2009 in liquid form when combined with Dimilin 2L. The FAASSTT will be utilized to apply varying dose levels of Dimilin 2L (below label rates) in order to compare efficacy, starting at the rate of 1.0 fl. oz. /acre. Replicated microplots will be treated and then a species of local abundance will be placed into each cage. Mortality will be then be observed for a duration of time to determine efficacy.

Study 5: Evaluate efficacy of the experimental biopesticide DWR2009 in liquid and bait form (by coating wheat bran with the pathogen) using ultra-ultra low volume RAATs (involves a timing device and ULV nozzles) and a 10-acre plot. ATV-mounted liquid and bait spreaders will be utilized to apply DWR2009. Specimens will be periodically collected to observe mortality and sporulation for a duration of time to determine efficacy.

Study 6: Evaluate efficacy of the experimental, non-traditional pesticide LinOilEx (Formulation 103). A micro-FAASSTT (airbrush system mounted on a 5-gal bucket) will be utilized to apply varying dose levels in order to compare efficacy, starting at the base rate of 6.64 ml/cage. A species of local abundance will be placed into replicated microplot cages and sprayed directly. Mortality will be then be observed for a duration of time to determine efficacy.

III. Affected Environment

A. Description of Affected Environment

The Site-Specific Graham and Gila County portion within the San Carlos Apache Reservation proposed suppression program area in the EA encompasses 332,120 acres. This is the total estimated acres within the proposed action area (Appendix D map). Acres treated will be from somewhere within this total. Actual acres treated will be far less than this amount. For example, 2021 season only 2,437 actual acres were treated from within this proposed action area. The vegetative communities (fig. 2) are semiarid grasslands; Plains & Great Basin Grasslands; Great Basin Conifer woodland; Interior Chaparral covered in this area. 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 San Carlos Apache Tribe and BIA.

Figure 2. Typical rangeland ecosystem surveyed for economic species of grasshoppers in Arizona.

Elevations range from approximately 3,500 to over 6,000 feet. Potential treatment sites are within watersheds which drain into tributaries of the Bonita Creek, Hackberry Creek, Hackberry Draw, Cottonwood Canyon Salt Creek, and San Carlos River. There are stock tanks in the potential treatment area. All potential treatment areas fall within the Arizona Interior Chaparral biome (Brown, 1994), grassland representative species of this biome include:

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 (*P. leucopus*), eastern cottontail (*Sylvilagus floridanus holzeri*), pronghorn antelope (*Antilocapra americana*), elk (*Cervus elaphus)* javalina **(***Pecari tajacu),* jackrabbit (*Lepus spp.*), coyote (*Canis latran),* White-tailed deer *(Odocoileus virginianus).*

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*).

Amphibians and reptiles: 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)*

B. *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 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 general 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 6 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 2022 Rangeland Grasshopper Suppression Program Biological Assessment. All protective measures to be implemented by APHIS, PPQ, Arizona Field Operations are outlined in the 2022 BA document (see Appendix E). APHIS also consulted with local agency officials to determine appropriate protective measures for species of concern.

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.

Federally Listed Threatened and Endangered Species Covered by this EA:

MAMMALS

Endangered Mexican gray wolf, *Canis lupus baileyi* - Endangered

BIRDS

Mexican spotted owl, S*trix occidentalis lucida* - Threatened
Southwestern willow flycatcher, *Empidonax traillii extimus* -Endangered
Western, yellow-billed cuckoo, *Coccyzus americanus* – Threatened

FISH

Desert pupfish, *Cyprinodon macularius* - Endangered
Gila chub, *Gila intermedia* - Endangered
Razorback sucker, *Xyrauchen texanus* – Endangered

AMPHIBIANS

Chiricahua leopard frog, *Rana chiricahuensis* - Threatened

PLANTS

Arizona cliffrose, *Purshia subintegra* – Endangered

REPTILES

Northern Mexican gartersnake, *Thamnophis eques megalops* - Threatened

Sensitive Species of Concern:
Sonoran Desert tortoise, *Gopherus morafkai* – Candidate
Headwater chub, *Gila nigra* - Candidate
Roundtail chub, *Gila robusta* – Candidate
Monarch Butterfly, *Danaus plexippus* – Candidate
Northern leopard frog (*Rana pipiens*), (Arizona Game and Fish Department Species of Greatest Conservation Need).

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 will 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.*

Representative wildlife and plant spp.

See Table 1 for list of representative wildlife, and plant spp.

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

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

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

The wildlife risk assessment in 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/manuf/)

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 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.

3. Socioeconomic Issues

Livestock grazing and hunting are the main uses of the potential treatment area. These grasslands provide forage for cattle and wildlife. Farming, forestry occupations, agriculture, fishing and hunting, and mining provide 10.6% of the employment on San Carlos Apache Reservation (U.S. Bureau of the Census, Census 2000).

As of August 2014, the San Carlos Apache tribe had an enrollment of 15,393 tribal members. Currently there is approximately 9,945-10,945 living on the Reservation according to the My Tribal Data. US Census. Retrieved 20 July 2020.

The San Carlos Reservation's annual median household income of approximately $27,542, according to the US Census. About 49.2 percent of the people live under the poverty line, and 36.7 percent of the active labor force is unemployed. Replacement feed for damage rangeland would be almost impossible to afford under these circumstances. It is critical that APHIS provide the Rangeland Grasshopper Suppression Program to assist the Tribal Ranches management of resources.

The principal economic activities are tourism, cattle ranching, and arts and crafts. The San Carlos is rich in hunting, fishing. The tribe sells guided big-game hunting permits for desert bighorn sheep, trophy elk, antelope, and mountain lion.

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.

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

5. Special Considerations for Certain Populations

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

Executive Order (E.O.) 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, was signed by President Clinton on February 11, 1994 (59 *Federal Register* (FR) 7269). This E.O. requires each Federal agency to make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations. Consistent with this E.O., APHIS will consider the potential for disproportionately high and adverse human health or environmental effects on minority populations and low-income populations for any of its actions related to grasshopper suppression programs.

The San Carlos Reservation's annual median household income of approximately $31,696 according to the US Census and BUREAU OF WOMEN'S AND CHILDREN'S HEALTH, Arizona Department of Health Services. About 49.2 percent of the people live under the poverty line, and 36.7 percent of the active labor force is unemployed.

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

The increased scientific knowledge about the environmental health risks and safety risks associated with hazardous substance exposures to children and recognition of these issues in Congress and Federal agencies brought about legislation and other requirements to protect the health and safety of children. On April 21, 1997, President Clinton signed E.O. 13045, Protection of Children from Environmental Health Risks and Safety Risks (62 FR 19885). This E.O. requires each Federal agency, consistent with its mission, to identify and assess environmental health risks and safety risks that may disproportionately affect children and to ensure that its policies, programs, activities, and standards address those risks. APHIS has developed agency guidance for its programs to follow to ensure the protection of children (USDA, APHIS, 1999).

According to the BUREAU OF WOMEN'S AND CHILDREN'S HEALTH, Arizona Department of Health Services, there are 3,235 children between the ages of 0-14. There is approximately 1,151 youth from the ages of 15-19 according to the Arizona Department of Health Services. The risk for children to be exposed to treatment pesticides is very low due to the remote nature of the Tribal Rangeland. The nearest communities are approximately 50 miles from the Tribal rangeland areas. There will be no aerial treatments conducted in Arizona only by ground-based equipment.

IV. Environmental Consequences

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

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

A. Environmental Consequences of the Alternatives

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

1. No Suppression Program Alternative

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

The potential environmental impacts from the No Action alternative, where other agencies and land managers do not control outbreaks, stem primarily from grasshoppers consuming vast amounts of vegetation in rangelands and surrounding areas. Grasshoppers are generalist feeders, eating grasses and forbs first and often moving to cultivated crops. High grasshopper density of one or several species and the resulting defoliation may reach an economic threshold where the damage caused by grasshoppers exceeds the cost of controlling the grasshoppers. Researchers determined that during typical grasshopper infestation years, approximately 20% of forage rangeland is removed, valued at a dollar adjusted amount of $900 million. This value represents 32 to 63% of the total value of rangeland across the western states (Rashford et al., 2012). Other market and non-market values such as carbon sequestration, general ecosystem services, and recreational use may also be impacted by pest outbreaks in rangeland.

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

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

2. Insecticide Applications at Conventional Rates or Reduced Agent Area Treatments with Adaptive Management Strategy

Under Alternative 2, APHIS would participate in grasshopper programs with the option of using one of the insecticides carbaryl 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 and horses may graze on rangeland the same day that the land is sprayed, in order to keep tolerances to acceptable levels, carbaryl spray applications on rangeland are limited to half a pound active ingredient per acre per year (USEPA, 2012c). The grasshopper program would treat at or below use rates that appear on the label, as well as follow all appropriate label mitigations, which would ensure residues are below the tolerance levels.

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

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

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

b) Diflubenzuron

Diflubenzuron is a restricted use pesticide (only certified applicators or persons under their direct supervision may make applications) registered with USEPA as an insect growth regulator. It specifically interferes with chitin synthesis, the formation of the insect's exoskeleton. Larvae of affected insects are unable to molt properly. While this effect is desirable in controlling certain insects, it can have undesirable impacts to non-target organisms that are exposed.

USEPA considers diflubenzuron relatively non-persistent and immobile under normal use conditions and stable to hydrolysis and photolysis. The chemical is considered unlikely to contaminate ground water or surface water (USEPA, 1997). The vapor pressure of diflubenzuron is relatively low, as is the Henry's Law Constant value, suggesting the chemical will not volatilize readily into the atmosphere from soil, plants or water. Therefore, exposure from volatilization is expected to be minimal. Due to its low solubility (0.2 mg/L) and preferential binding to organic matter, diflubenzuron seldom persists more than a few days in water (Schaefer and Dupras, 1977; Schaefer et al., 1980). Mobility and leachability of diflubenzuron in soils is low, and residues are usually not detectable after seven days (Eisler, 2000). Aerobic aquatic half-life data in water and sediment was reported as 26.0 days (USEPA, 1997). Diflubenzuron applied to foliage remains adsorbed to leaf surfaces for several weeks with little or no absorption or translocation from plant surfaces (Eisler, 1992, 2000). Field dissipation studies in California citrus and Oregon apple orchards reported half-live values of 68.2 to 78 days (USEPA, 2018). Diflubenzuron persistence varies depending on site conditions and rangeland persistence is unfortunately not available. Diflubenzuron degradation is microbially mediated with soil aerobic half-lives much less than dissipation half-lives. Diflubenzuron treatments are expected to have minimal effects on terrestrial plants. Both laboratory and field studies demonstrate no effects using diflubenzuron over a range of application rates, and the direct risk to terrestrial plants is expected to be minimal (USDA APHIS, 2018c).

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

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

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

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

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

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

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

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

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

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

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

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

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

c) Reduced Area Agent Treatments (RAATs)

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

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

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

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

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

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, most 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.

Herbicide treatments for invasive species have been conducted on the San Carlos Reservation by Tribal management agencies. These areas are not located in the 2021 Action area for the rangeland grasshopper suppression program. Therefore, there would be no synergistic effect from an overlap of pesticide and herbicide treatments.

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

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

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

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

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

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

According to the BUREAU OF WOMEN'S AND CHILDREN'S HEALTH, Arizona Department of Health Services, there are 3,235 children between the ages of 0-14. There is approximately 1,151 youth from the ages of 15-19 according to the Arizona Department of Health Services. The risk for children to be exposed to treatment pesticides is very low due to the remote nature of the Tribal Rangeland. The nearest communities are approximately 50 miles from the Tribal rangeland areas. There will be no aerial treatments conducted in Arizona only by ground-based equipment.

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

4. Tribal Consultation

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

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

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

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

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

6. Endangered Species Act

Section 7 of the Endangered Species Act (ESA) and its implementing regulations require Federal agencies to ensure their actions are not likely to jeopardize the continued existence of listed threatened or endangered species or result in the destruction or adverse modification of critical habitat. Numerous federally listed species and areas of designated critical habitat occur within the 17-State program area, although not all occur within or near potential grasshopper suppression areas or within the area under consideration by 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
- Insecticides will not be applied when wind speeds exceed 10 miles per hour. APHIS will attempt to avoid insecticide application if the wind is blowing towards salmonid habitat

- Insecticide applications are avoided when precipitation is likely or during temperature inversions

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

APHIS submitted a programmatic biological assessment for grasshopper suppression in the 17-state program area and requested consultation with USFWS on March 9, 2015. With the incorporation and use of application buffers and other operational procedures APHIS anticipates that any impacts associated with the use and fate of program insecticides will be insignificant and discountable to listed species and their habitats. Based on an assessment of the potential exposure, response, and subsequent risk characterization of program operations, APHIS concludes the proposed action is not likely to adversely affect listed species or critical habitat in the program area. APHIS has requested concurrence from the USFWS on these determinations. Until this programmatic Section 7 consultation with USFWS is completed, APHIS will continue to 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 FWS dated February 24, 2022, April 1, 2022, January 19, 2021; March 29, 2021.

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.

APHIS received concurrence to informal consultations from FWS Regional office, on April 22, 2022, rangeland within the San Carlos Apache Reservation. (Appendix E).

In this biological assessment APHIS, PPQ Arizona Field Ops determined that the proposed action **will not effect**: 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:** the endangered Mexican gray wolf (*Canis lupus baileyi*); endangered California Condor (*Gymnogyps californianus*); endangered California Least Tern, (*Sterna antillarum browni)*; endangered Southwestern willow flycatcher (*Empidonax traillii extimus*) with critical habitat; endangered Desert pupfish (*Cyprinodon macularius*); 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 Chiricahua leopard frog (*Rana chiricahuensis*) with 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*, Sonoran Desert tortoise, *Gopherus morafkai*, 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 2022. 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, BLM, and APHIS will be adhered too.

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. Buffer's protective of aquatic biota is applied to their habitats to ensure that there are no indirect effects from loss of prey.

8. Additional Species of Concern

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

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

Because grasshopper numbers are so high in an outbreak year, treatments would not likely reduce the number of grasshoppers below levels present in a normal year which would usually range from 3-7 gh/yd^2. Should grasshoppers be unavailable in small, localized areas, sage grouse chicks may consume other insects, which sage grouse chicks likely do in years when grasshopper numbers are naturally low. By suppressing grasshoppers, rangeland vegetation is available for use by other species, including sage grouse, and rangeland areas are less susceptible to invasive plants that may be undesirable for sage grouse habitat.

However, extreme grasshopper outbreaks can cause massive defoliation and the loss of forbs, reducing nesting cover for the following spring and reducing another important food source for sage- grouse. An effective rangeland treatment program will balance these short- and long- term impacts. The goal is to reduce grasshopper numbers to what would be encountered in a normal year, leaving an ample food base while protecting rangeland resources.

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

9. Fires and Human Health Hazards

Various compounds are released in smoke during wildland fires, including carbon monoxide (CO), carbon dioxide, nitrous oxides, sulfur dioxide, hydrogen chloride, aerosols, polynuclear aromatic hydrocarbons contained within fine particulate matter (a byproduct of the combustion of organic matter such as wood), aldehydes, and most notably formaldehyde produced from the incomplete combustion of burning biomass (Reisen and Brown, 2009; Burling et al., 2010; Broyles, 2013). Particulate matter, CO, benzene, acrolein, and formaldehyde have been identified as compounds of particular concern in wildland fire smoke (Reinhardt and Ottmar, 2004).

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

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. There are no known historic resources and National Trails within the proposed action area.

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VI. Listing of Agencies and Persons Consulted

John Nystedt, Fish and Wildlife Biologist, U.S. Fish and Wildlife Service. Flagstaff Suboffice

323 N. Leroux Street, Suite 201

Flagstaff, Arizona 86001

Brenda Smith, Fish and Wildlife Biologist, U.S. Fish and Wildlife Service Flagstaff Suboffice

323 N. Leroux Street, Suite 201

Flagstaff, Arizona 86001

Shaula Hedwall, Fish and Wildlife Biologist,

U.S. Fish and Wildlife Service Flagstaff Suboffice

323 N. Leroux Street, Suite 201

Flagstaff, Arizona 86001

Brian J. Wooldridge, Fish and Wildlife Biologist,

U. S. Fish and Wildlife Service Flagstaff Suboffice

323 N. Leroux St., Suite 201

Flagstaff, AZ 86001

Jessica Miller, Fish and Wildlife Biologist,

U. S. Fish and Wildlife Service Flagstaff Suboffice

2500 South Pine Knoll Drive

Flagstaff, AZ 86001

(928) 556-2050

Terry Rambler, Tribal Chairman, San Carlos Apache Tribe

P.O. Box 0
#3 San Carlos Avenue
San Carlos, Arizona 85550
Clark Richins, Land Operation Coordinator, San Carlos Agency, Bureau of Indian Affairs
#3 San Carlos Avenue

San Carlos, Arizona 85550

Teresa Goseyun, Rangeland Management Specialist, San Carlos Apache Tribe

#3 San Carlos Avenue

San Carlos, Arizona 85550

Daniel Juan, Biologist, San Carlos Apache Tribe PO Box 97

San Carlos, Arizona 85550

Paul Buck, Soil Scientist, San Carlos Apache Tribe PO Box 0

San Carlos, Arizona 85550

Michael J. Herder, Arizona Strip District Manager, BLM
345 East Riverside Drive
St. George, Utah 84790

Ben Otte, Rangeland Management Specialist,
Arizona Strip District Manager, BLM
345 East Riverside Drive
St. George, Utah 84790

Justin Reeves, Rangeland Management Specialist,
Arizona Strip District Manager, BLM
345 East Riverside Drive

St. George, Utah 84790

Travis Largent, Wildlife Biologist
Kaibab National Forest, Williams and Tusayan Ranger Districts
742 S Clover Rd.
Williams, AZ 86046

Kelly Hetzler, Forester, Inventory and GIS, San Carlos Apache Tribe

PO Box 0

San Carlos, Arizona 85550

Victoria Wesley, San Carlos Apache Tribe, Forestry

PO Box 0

San Carlos, Arizona 85550

Daniel Juan, Wildlife Technician,

San Carlos Apache Tribe

PO Box 0

San Carlos, Arizona 85550

Jeff McFadden, Wildlife Technician,

San Carlos Apache Tribe

PO Box 0

San Carlos, Arizona 85550

Sabrina Tuttle, Ph.D., Assistant Extension Agent, Gila County Cooperative Extension, U of A,

San Carlos Apache Reservation

PO Box 850

San Carlos, Arizona 85550

Jennifer Cordova, Wildlife Specialist II,

Arizona Game and Fish Dept.

PO Box 397

Seligman, AZ 86337

Lori Ann Burd, Environmental Health Director and Senior Attorney
Center for Biological Diversity
PO Box 11374
Portland, OR 97211
laburd@biologicaldiversity.org

Sharon Selvaggio, Pesticide Program Specialist
Xerces Society
628 NE Broadway, Suite 200
Portland, OR 97232
sharon.selvaggio@xerces.org

Appendix A: APHIS Rangeland Grasshopper and Mormon Cricket Suppression Program

FY-2022 Treatment Guidelines
Version 2/15/2022

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

General Guidelines for Grasshopper / Mormon Cricket Treatments

1. All treatments must be in accordance with:
    a. the Plant Protection Act of 2000;
    b. applicable environmental laws and policies such as: the National Environmental Policy Act, the Endangered Species Act, the Federal Insecticide, Fungicide, and Rodenticide Act, and the Clean Water Act (including National Pollutant Discharge Elimination System requirements – if applicable);
    c. applicable state laws;
    d. APHIS Directives pertaining to the proposed action;
    e. Memoranda of Understanding with other Federal agencies.

2. Subject to the availability of funds, upon request of the administering agency, the agriculture department of an affected State, or private landowners, APHIS, to protect rangeland, shall immediately treat Federal, Tribal, State, or private lands that are infested with grasshoppers or Mormon crickets at levels of economic infestation, unless APHIS determines that delaying treatment will not cause greater economic damage to adjacent owners of rangeland. In carrying out this section, APHIS shall work in conjunction with other Federal, State, Tribal, and private prevention, control, or suppression efforts to protect rangeland.

3. Prior to the treatment season, conduct meetings or provide guidance that allows for public participation in the decision-making process. In addition, notify Federal, State and Tribal land managers and private landowners of the potential for grasshopper and Mormon cricket outbreaks on their lands. Request that the land manager / landowner advise APHIS of any sensitive sites that may exist in the proposed treatment areas.

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

5. On APHIS run suppression programs 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

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.

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)

B. Providing an entry for each treatment in the PPQ Grasshopper/Mormon Cricket treatment database
C. For aerial treatments, providing copies of forms and treatment/plane data for input into the Federal Aviation Interactive Reporting System (FAIRS) by PPQ's designee

SPECIFIC PROCEDURES FOR AERIAL APPLICATIONS

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

2. Minimize the potential for drift and volatilization by not using ULV sprays when the following conditions exist in the spray area:

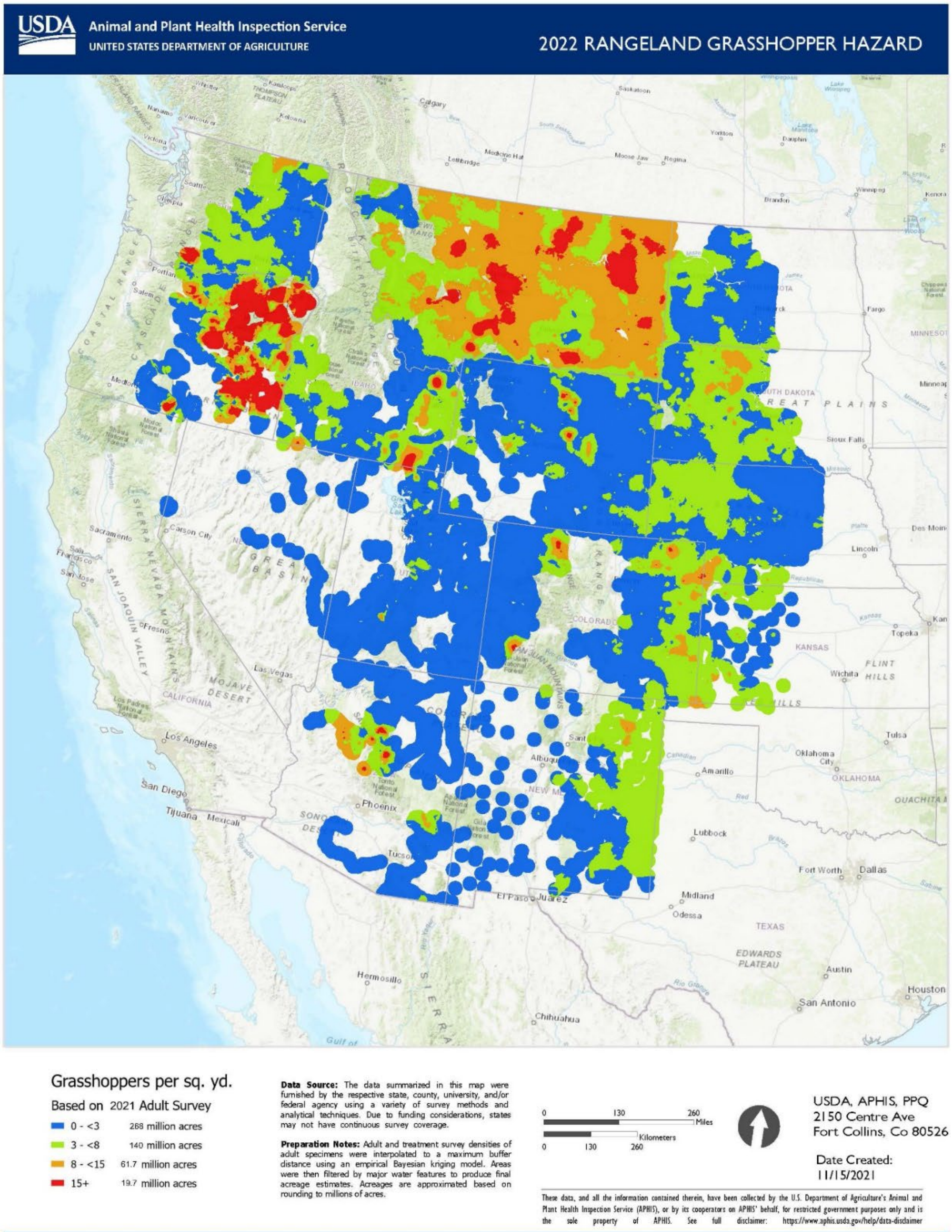
    a. Wind velocity exceeds 10 miles per hour (unless state law requires lower wind speed);
    b. Rain is falling or is imminent;
    c. Dew is present over large areas within the treatment block;
    d. There is air turbulence that could affect the spray deposition;
    e. Temperature inversions (ground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

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

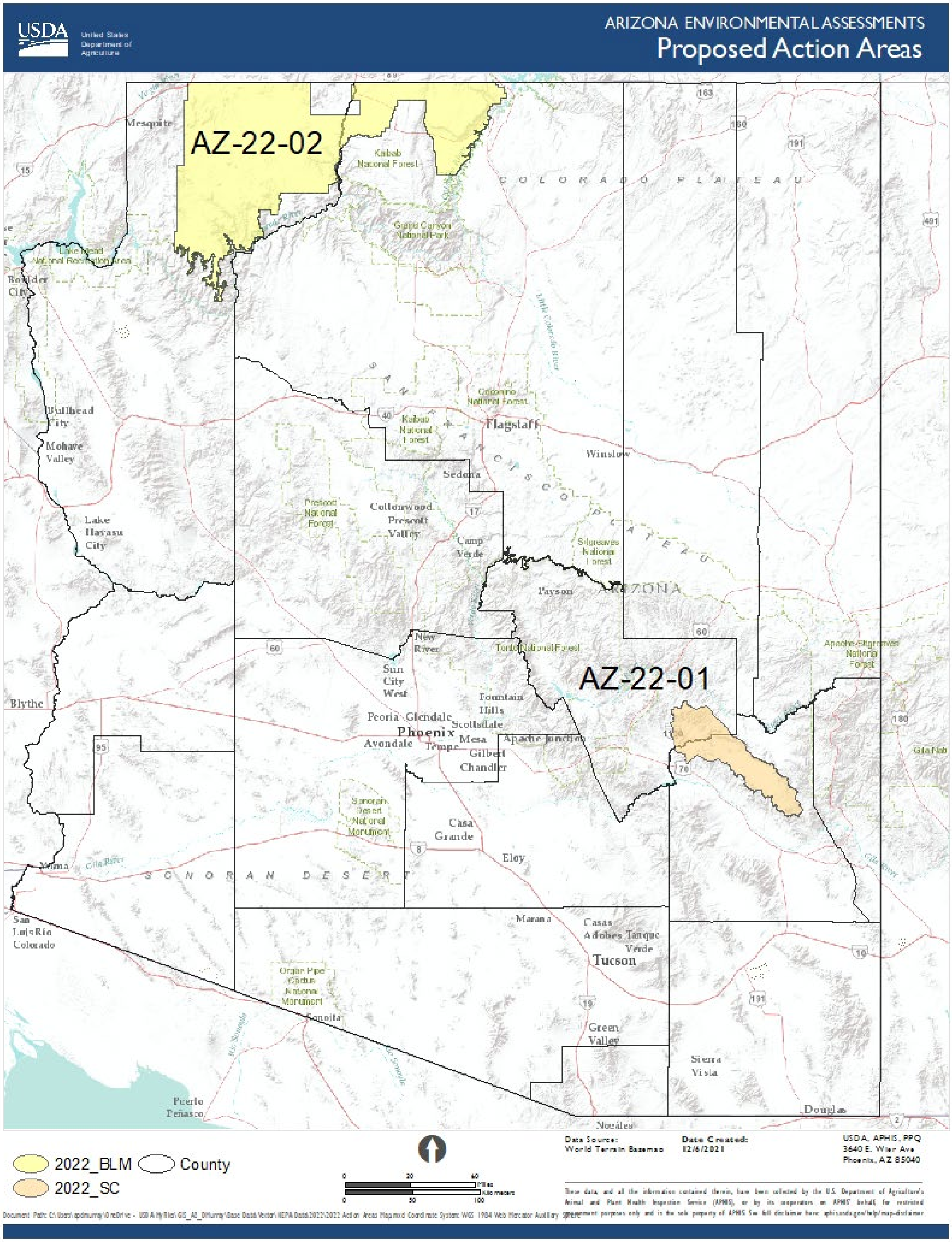
4. Application aircraft will fly at a median altitude of 1 to 1.5 times the wingspan of the aircraft whenever possible or as specified by the COR or the Treatment Manager.

5. Whenever possible, plan aerial ferrying and turnaround routes to avoid flights over congested areas, water bodies, and other sensitive areas that are not to be treated.

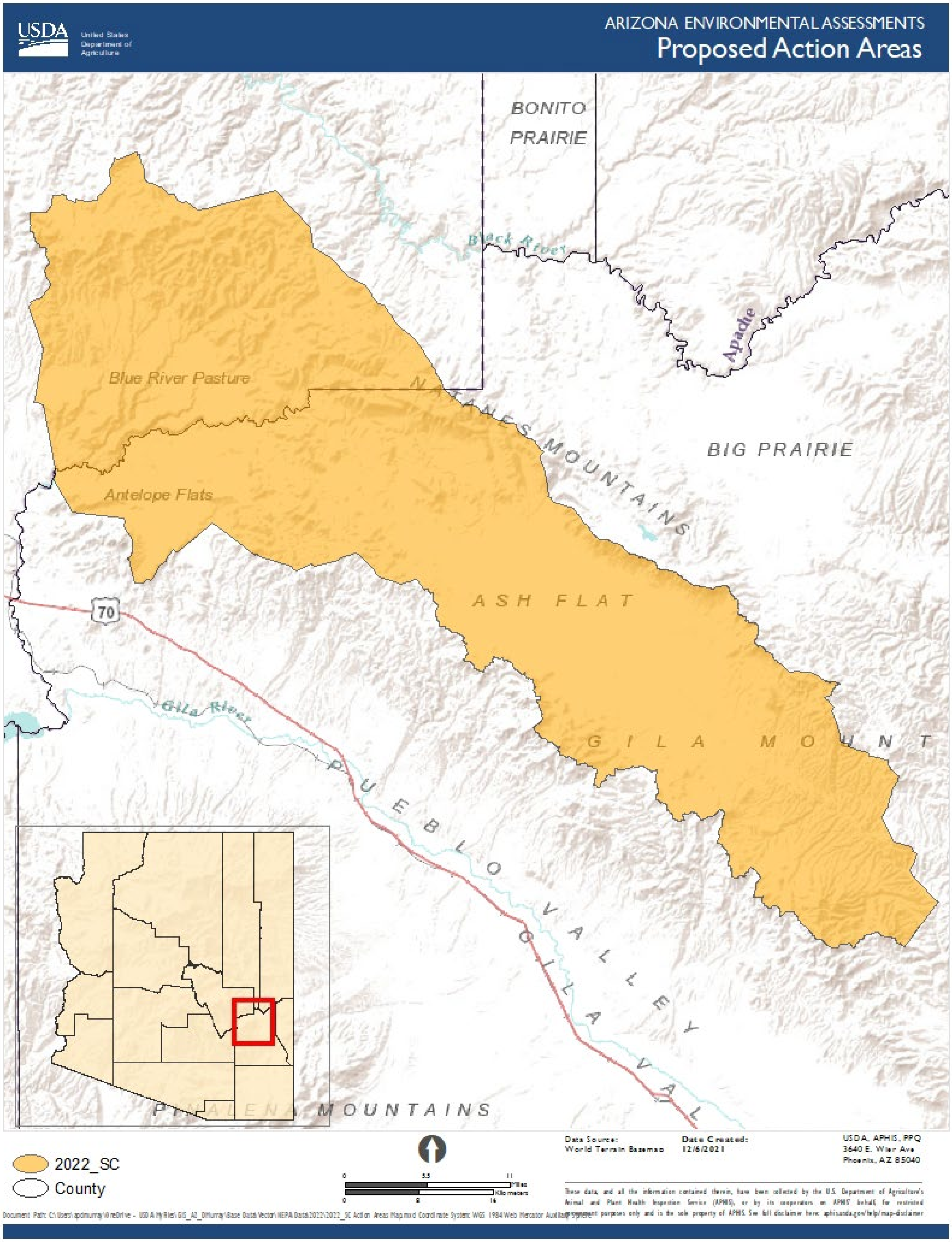
Appendix B: Grasshopper Hazard Map of the Affected Environment



Appendix C: Map of Proposed Action Areas



Appendix D: Map of the San Carlos Apache Tribal Proposed Action Area



Appendix E: FWS/NMFS Correspondence

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Post Office Box 1306
Albuquerque, New Mexico 87103

In Reply Refer To:
FWS/IR06/IR08/ES/ER/076671
2022-0023918-S7-001

Dewey Murray, Domestic Program Coordinator - Arizona
Animal and Plant Health Inspection Service
Plant Protection and Quarantine
3640 East Weir Avenue
Phoenix, Arizona 85040

Dear Mr. Murray:

Thank you for your January 19, 2022, correspondence, which we received via email the same day. This letter documents our review of your Animal and Plant Health Inspection Service (APHIS) 2022 Rangeland Grasshopper and Mormon Cricket Suppression Program, in compliance with section 7 of the Endangered Species Act of 1973 as amended (16 U.S.C. 1531 et seq.). Specifically, the project under analysis in this letter includes a portion of the San Carlos Reservation in Gila and Graham counties, Arizona.

Your letter concluded that the proposed project "may affect, but is not likely to adversely affect" the endangered desert pupfish (*Cyprinodon macularius*), Gila chub (*Gila intermedia*), Gila topminnow (*Poeciliopsis occidentalis occidentalis*), loach minnow (*Tiaroga cobitis*), Mexican gray wolf (*Canis lupus baileyi*), southwestern willow flycatcher (*Empidonax traillii extimus*), spikedace (*Meda fulgida*), the threatened Chiricahua leopard frog (*Lithobates chiricahuensis*), Mexican spotted owl (*Strix occidentalis lucida;* owl), and the western distinct population segment of the yellow-billed cuckoo (*Coccyzus americanus*; cuckoo). We concur with your determinations and provide our rationales below.

You also described conservation measures to minimize impacts to bald eagles (*Haliaeetus leucocephalus*), anticipating our technical assistance with respect to Bald and Golden Eagle Protection Act compliance. Appendix A includes our documentation of APHIS's minimization measures to reduce the likelihood of take.

DESCRIPTION OF THE PROPOSED ACTION

A complete description of the proposed action is included in your January 19, 2022, Biological Assessment (BA) and the email you sent on March 22, 2022, which clarified the species addressed in the consultation.

The APHIS, in coordination with the San Carlos Apache Tribe, is planning for potential grasshopper/Mormon cricket suppression programs to protect rangeland from economic infestations to reduce rangeland vegetation losses. The BA, section 3.0, describes treatment area, and section 7.2, "San Carlos Tribal Lands" delineates them. The areas APHIS plans to treat within the San Carlos Apache Reservation are rangeland within Antelope Flats and Ash Flats in Graham County, and Blue River Pasture and Rocky Gulch Valley in Gila County. The APHIS will exclude treatments within Antelope Flats, Cottonwood Canyon with a 0.5-mile buffer along canyon rim. All treatment areas are located within rangelands and APHIS is not treating grasslands associated with woodlands or forests.

The Plant Protection Act of 2000 (PPA) authorizes APHIS's programs to suppress grasshoppers and Mormon crickets on rangeland. The PPA mandates APHIS control economic infestations of grasshoppers and crickets to protect Federal rangeland, when requested. The APHIS only considers conducting suppression upon request from a tribal government or land management agency.

The proposed action is Alternative 3, as the BA describes, involving a single application per year of one insecticide early in the target species' life cycle, applied using the Reduced Agent Area Treatment (RAAT) method, or modified RAAT. Target grasshoppers include *Aulocara elliotti* and *Melanoplus sanguinipes* (Dewey Murray, personal communication). The application time frame is April to September. The insecticides are diflubenzuron (Dimilin®2L), carbaryl and Malathion, only one of which will be used per application. The chemical control methods available to APHIS include the use of Ultra-Low-Volume (ULV) sprays of all three insecticides, and carbaryl in bait formulation, using ground or aerial equipment. The ULV application rates are 0.75 to 8.0 fluid ounces per acre. The application rate of carbaryl in bait formulation (five percent active ingredient) is 10 pounds per acre.

The APHIS will employ buffer zones, within which there will be no pesticide application, and other conservation measures from the nine biological opinions the U. S. Fish and Wildlife Service (FWS) issued the APHIS control program in 18 western states, and subsequently consolidated in an October 3, 1995, FWS - Mountain Prairie Region letter to the Deputy Director, APHIS. The APHIS will also employ buffer zones and other conservation measures from the 2007 "Recommended Protection Measures for Pesticide Applications in Region 2 of the U.S. Fish and Wildlife Service" (RPR) for species and the pesticide (diflubenzuron) not covered in the aforementioned consultations, or whichever buffer is greater. The APHIS will buffer all bodies of water to prevent contamination. Persistence of insecticides in the environment is limited (maximum half-life in soil is 28 days, and six days in water).

The action may also include experimental treatments. The APHIS continues to refine its grasshopper control methods to make the program more economically feasible and environmentally sound. Refinements may include reduced rates of currently used insecticides, improved formulations, more target-specific baits, and biological pesticide suppression alternatives or improvements to aerial and ground application equipment. The APHIS uses experimental plots for this work. The APHIS also monitors a no treatment area to determine the effect of no treatment. The APHIS monitors all plots for two additional years to gather insecticides effects information on non-target arthropods. The APHIS applies all buffers and other conservation measures to any experimental plot.

DETERMINATION OF EFFECTS

We concur with your determination the proposal "may affect, but is not likely to adversely affect", the Chiricahua leopard frog, desert pupfish, Gila club, Gila topminnow, loach minnow, Mexican gray wolf, Mexican spotted owl, southwestern willow flycatcher, spikedace, and western yellow-billed cuckoo for the reasons described below.

Chiricahua leopard frog

- Potential habitat for this species exists primarily in stock tanks. The APHIS will apply buffers and other RPR conservation measures to all stock tanks and any other body of water to minimize the likelihood of directly affecting aquatic habitats; therefore, effects to Chiricahua leopard frog habitat from the proposed action are discountable.

- Other conservation measures include avoiding applying insecticides before, during or after precipitation, which will avoid the time when Chiricahua leopard frogs may be foraging away from water; therefore, there will be no effects on foraging frogs.

- The likelihood of indirectly exposing Chiricahua leopard frogs to insecticides is extremely low; the magnitude of any exposure would not be detectable due to water dilution and insecticide degradation. Therefore, any effects to this species would be insignificant.

Desert pupfish, Gila topminnow, loach minnow and spikedace

- These species closest suitable habitat is the lower part of Bonita Creek, about eight miles downstream from the Ash Flat treatment area boundary, which overlaps an ephemeral part of Bonita Creek. Per the RPR, these species maximum buffer zone, including upstream considerations, is 1.75 miles, which is sufficient to avoid directly affecting these species and their habitats; therefore, effects to these species and their habitats from the proposed action are discountable.

- The likelihood of indirectly exposing desert pupfish, Gila topminnow, loach minnow, and spikedace to insecticides is extremely low, and the magnitude of any exposure would not be detectable due to water dilution and insecticide degradation. Therefore, any effects to these species would be insignificant.

Gila chub

- This species closest suitable habitat is in Bonita Creek, 2.5 miles from the Ash Flat treatment area boundary, which overlaps an ephemeral part of Bonita Creek. Per the RPR, the Gila chub maximum buffer zone, including upstream considerations, is 1.75 miles, which is sufficient to avoid directly affecting this species and its habitat; therefore, effects to Gila chub and its habitat from the proposed action are discountable.

- The likelihood of indirectly exposing Gila chub to insecticides is extremely low because the magnitude of any exposure would not be detectable due to water dilution and insecticide degradation. Therefore, any effects to this species would be insignificant.

Mexican gray wolf

- This species occurs on the San Carlos Apache Reservation, but for only brief periods of time and in very limited numbers; the reservation has no established wolf pack. Although wolves may occur infrequently near treatment areas, insecticide bioaccumulation is minimal for this species; therefore, any effects would be insignificant.

- The likelihood of exposing Mexican gray wolves directly or indirectly to the insecticides is extremely low; therefore, any project effects to this species are discountable.

Mexican spotted owl

- Potential habitat for this species may occur in higher elevations and canyons on the San Carlos Apache Reservation. However, treatments will be restricted to rangeland at lower elevations. Owls may migrate or disperse through the treatment area before or after the breeding season, but are not likely to be present in the proposed treatment area from March 1st to August 31st; therefore, the proposed action will not result in disturbance to breeding owls.

- The likelihood of exposing owls directly or indirectly to insecticides is extremely low; therefore, any effects to the species are discountable.

Southwestern willow flycatcher

- This species occurs along the San Carlos River below Talkalai Lake, which is about one mile from the proposed treatment area on Antelope Flats. Flycatchers may fly upstream along the San Carlos River, which APHIS buffered by a 0.25-mile no-treatment zone. Flycatchers may fly through part of a treatment area. However, treatment areas do not contain flycatcher nesting habitat; therefore, there will be no effect to nesting flycatchers from the proposed action.

- The likelihood of indirectly exposing this species to insecticides is extremely low, and the magnitude of any exposure would not be detectable due to dispersal over large distances, water dilution and insecticide degradation. Therefore, any effects to this species would be discountable and insignificant.

Western yellow-billed cuckoo

- This species may occur along the San Carlos River, which APHIS buffered by a 0.25-mile no-treatment zone and may fly through part of a treatment area. However, treatment areas do not contain cuckoo nesting habitat. Therefore, there will be no effect to breeding cuckoos from the proposed action.

- The likelihood of indirectly exposing cuckoos to insecticides is extremely low, and the magnitude of any exposure would not be detectable due to dispersal over large distances, water dilution and insecticide degradation. Therefore, any effects to this species would be discountable and insignificant.

In keeping with our trust responsibility to American Indian Tribes, by copy of this letter we are notifying the San Carlos Apache Tribe of our concurrence with your determinations, and we encourage you to invite the Bureau of Indian Affairs to review your proposed action.

Thank you for your continued coordination. No further section 7 consultation is required for this project at this time. Should project plans change, or if new information on the distribution or abundance of listed species or critical habitat becomes available, we may need to reconsider your determination. In all future correspondence on this project, please refer to the consultation number 2022-0023918-S7-001.

Please contact Michelle Durflinger, Fish and Wildlife Biologist, Environmental Review Branch, Ecological Services, at 505-248-6664, or Michelle_Durflinger@fws.gov, if you have questions or need further assistance.

Sincerely,

Marty Tuegel
Division of Environmental Review

Enclosure

(Electronic Copy)

cc: Director, Recreation and Wildlife Department, San Carlos Apache Tribe, San Carlos, AZ
Director, San Carlos Tribal Historic Preservation and Archaeology, San Carlos, AZ
Attorney General, San Carlos Apache Tribe, San Carlos, AZ
Branch Chief, Environmental Quality Services, Western Regional Office, Bureau of Indian Affairs, Phoenix, AZ
Environmental Coordinator, San Carlos Agency, Western Regional Office, Bureau of Indian Affairs, San Carlos, AZ
Field Manager, Safford Field Office, Gila District, Bureau of Land Management, Safford, AZ
Native American Liaison, Southwest Region, Fish and Wildlife Service, Albuquerque, NM
Assistant Field Supervisor, Arizona Ecological Services Office, Fish and Wildlife Service, Flagstaff and Phoenix, AZ (Attn: Shaula Hedwall, Jessica Miller, John Nystedt, Greg Beatty, Ryan Gordon)
Assistant Field Supervisor, Arizona Ecological Services, Fish and Wildlife Service, Tucson, AZ (Attn: Cat Crawford, Doug Duncan, Erin Fernandez, Marit Alanen)

Appendix F: APHIS response to public comments on the Arizona draft EAs (EA Number: AZ-22-01 and EA Number: AZ-22-02)

Xerces Society Comments

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

APHIS states in the EAs:
The need for rapid and effective response when an outbreak occurs limits the options available to APHIS to inform the public other than those stakeholders who could be directly affected by the actual application.
In this age of information, when the entire world can be informed of a decision via the push of a button, such an explanation for failing to inform the public--in advance--of treatment locations, acres, and methods falls rather flat. As APHIS explains in the EAs, APHIS only conducts treatments after receiving requests, which also help guide nymphal survey efforts. Moreover, it is our understanding that a state's treatment requests must be submitted for funding approval to headquarters in Washington D.C., and that this budget requesting work occurs during the winter. Therefore, this information must exist in APHIS files, and there is no valid reason for not disclosing more specific treatment maps, together with an estimate of acres to be treated and likely method and chemical -- in the Draft EA and certainly by the Final EA.

Some states (i.e. Oregon) publish survey data and reports week by week which also assists the general public in understanding which areas are being assessed, what grasshopper/Mormon cricket pressure may be, and where treatments are being considered. This practice should also be adopted in Arizona so that the public can stay abreast, in real time, of the locations and severity of any grasshopper outbreaks, and gain a rough idea of the likelihood of treatments occurring in any particular area.

As published, the Draft EAs provide almost no solid information about where, how, and when the treatments may actually occur in 2022. As a result, it is impossible to determine if applications might occur to sensitive areas or species locations within the specified counties. Similarly, although we are happy to see that APHIS reported the number of treated acres from the prior year, we do not have a
basis of comparison to know if grasshopper numbers are rising or falling relative to historic patterns. Much more meaningful would be a description of the average size of treatments in this state and a map of such treatments over a credible period, such as 2-3 decades, accompanied by detailed nymphal information (see above) and treatment request maps.

APHIS' lack of transparency about the location of actual treatment areas, particularly on public lands, is a disservice to the public and prevents citizens from reviewing sufficient information to be able to gauge the justification for and the risks involved in the suppression effort. Furthermore, as a result of the lack of specificity in the EA, it is impossible to determine whether effects would actually be significant or not.
There is also insufficient analysis of cumulative impacts. Some states have grasshopper programs that also operate at the state and local level. There is no mention of this or of their scale, if these in fact exist in Arizona. Obviously, final treatment decisions should hinge on a firm understanding of species-specific nymphal densities as well as other conditions related to the economic threshold, as described by APHIS, and it could be that APHIS would decide not to treat an area that was included in a budget request. Nonetheless, in order to adequately inform the public, describe the affected environment, and ascertain impacts, APHIS should provide the treatment request areas with the EA, even if actual treatments end up less than these.

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

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

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

APHIS RESPONSE
The commenter does not have an accurate understanding of program funding timelines and procedures. APHIS explained the reason why treatment maps cannot be provided in the draft Environmental Assessments in the 2020 and 2021 EA's. Please see APHIS response to comment # 2 in the 2021 EA and APHIS responses to comments 1, 2, 3, 4, 5, 6, 8, 55, 91,92, 96, 99 and 158 in the 2020 EA's.

To clarify the commenter's understanding regarding Tribal survey data. Once again, Arizona will not release Tribal survey data or treatment data to the public. Treatment requests cover all Tribal Rangeland and BLM requests cover all BLM-Arizona Strip District land. If the Land managers, specify a limited area then that is what is covered even if large populations are discovered outside the limited area. Once again treatment requests are received usually by February, in the case of Tribal requests the most recent request covers a 5-year period from March 2019 to December 2024. This is according to the Tribal request. This was explained in previous responses to 2020 and 2021 EA comments.

According to the commenters recommendations we do provide an estimated potential action area for a treatment according to the maps contained in the EA's. See appendix C and D of the EA. Large populations which occur outside of these areas are not considered for a suppression program.
The commenter cites how Oregon publishes survey data week to week. The state of Oregon plays a major role in the grasshopper program with APHIS. This is not the case in Arizona. The Arizona Department of Agriculture does not provide funding for Rangeland grasshopper management, so the same amount of detailed survey data is not available. In addition, there is no possibility of Federal and State grasshopper treatments occurring on the same rangeland so significant impacts from cumulative effects are not likely. Further analysis is provided in the EA section IV.B. 1. Cumulative Impacts. As stated, before Tribal data will not be released to the public.

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

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

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

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

In Arizona, only two relatively small areas of the state have been identified for potential treatments in the two EAs year after year. This tells us that these areas are the locations that have most commonly been treated in the past.

While APHIS may reasonably assert the need to respond quickly, that does not excuse keeping the public in the dark.

Recommendation: See above.

APHIS RESPONSE

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

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

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

APHIS reduces the risk to native bees and pollinators through monitoring grasshopper and Mormon cricket populations and making pesticide applications in a manner that reduces the risk to this group of nontarget invertebrates. Monitoring grasshopper and Mormon cricket populations allows APHIS to determine if populations require treatment and to make treatments in a timely manner reducing pesticide use and emphasizing the use of Program insecticides that are not broad spectrum.

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

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

Diflubenzuron is the most commonly used insecticide under APHIS' grasshopper suppression program. Diflubenzuron is an insect growth regulator and functions by disrupting synthesis of chitin, a molecule necessary to the formation of an insect's cuticle or outer shell. An insect larva or nymph exposed to

diflubenzuron is unable to successfully molt and thus dies. Chitin is not limited to insect cuticles, but is also, for example, a component of mollusk radula, fish scales and fungi cell walls.
The label for diflubenzuron itself calls the insecticide "broad-spectrum" (see Durant 2L label); therefore, APHIS' statement is not credible. Additionally, the EIS disclosed that under some circumstances, Dimilin may be quite persistent; field dissipation studies in California citrus and Oregon apple orchards reported half-live values of 68.2 to 78 days.
Recommendation: APHIS should cease claiming that it preferentially uses selective chemicals. This is untrue and misleading.

APHIS RESPONSE
Thank you for your engagement on this program. APHIS values criticism of the program to ensure that it meets the highest possible environmental standards as demanded by the public at large and recommended by non-profit environmental advocacy groups such as the Xerces Society. The Xerces Society submitted similar comments for the 2021 EAs. Please see response to comment # 5, 8, and 11 of the 2021 EA.

The EA stated on page 7-8 that the only pesticides used in Arizona was Carbaryl Bait or Diflubenzuron. This was explained also in the 2021 EA's. The commenter references the Durant 2L label, this product has never been used in Arizona and the commenter must be confused with another state use of this product. The Arizona EA only addresses the use of either Carbaryl Bait or Diflubenzuron. The exact label of the insecticide used cannot compare to other labels which are not used.

APHIS understands the commenter's concern about the effects of diflubenzuron on non-target organisms but disagrees treatments will have significant impacts caused by the disruption of chitin in aquatic invertebrates and fish. APHIS grasshopper treatments occur beyond program-imposed distance buffers designed to prevent substantial amounts of insecticide from entering those environments. Furthermore, APHIS prefers to use diflubenzuron which is a selective insecticide and the agency's characterization as such are neither baseless, untrue nor misleading.

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

The geographic area covered by this EA may be home to 500-1,000 species of native bees (McKnight et al. 2018, Figure 1). Perhaps this is not surprising since the majority of rangeland plants require insect-mediated pollination. Native, solitary bee species are important pollinators on western rangeland. Hence, pollinators are important not only for their own sake but for the overall diversity and productivity of native rangelands, including listed plant species. However, this essential role that pollinators play in the conservation of native plant communities is given very short shrift in the EAs.

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

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

Arizona potential spray areas are within the range of at least two bumble bee species that have experienced declines in abundance and range contractions: *Bombus morrisoni* and *B. occidentalis*. Their decline statistics and range contractions are captured in a valuable IUCN overview of North American bumble bee species (Hatfield et al. 2015).

Unfortunately, documented declines for pollinators are echoes of a larger ominous development facing insects as a whole. Recent reports suggest that insects are experiencing a multicontinental crisis that is apparent as reductions in abundance, diversity, and biomass (Forister et al. 2019).

The EAs do not acknowledge this very real crisis in overall insect biodiversity, and the specific problems facing native bee species that could be affected by this program. In addition, the EAs do not disclose which, if any, invertebrates within the geographic area are listed as sensitive by federal land management agencies or as Species of Conservation Concern, or whether the state of Arizona designates any invertebrates as species of greatest conservation need.

Researchers have outlined the many ways in which risk assessments may underestimate risk to native bees by relying exclusively on honeybee studies (see, for example Gradish et al. 2019). Native bees and honeybees have significant life history differences, including the following:
• Honeybee queens do not forage; native bee queens do
• Honeybee larvae do not eat raw pollen; native bee larvae do
• Honeybees nest above the ground in hives; native bees mostly nest in the ground
• Honeybees have well-defined caste systems and very large sizes; most native bees have little or no social organization and nests are very small, meaning that a toxic effect to any one member may have more pronounced effects to reproductive units.
• Foraging exposure is different, for example foraging bumble bee adults may experience higher exposure due to their ability to be active during weather conditions and at times that honeybees do not forage, and because bumble fee foragers visit more flowers per day.

APHIS stands to worsen the plight of pollinators and of insects as a group through implementation of its grasshopper suppression program as described in the EAs. In particular, the status of at-risk native bees and at-risk native butterflies may worsen as a result of insecticide treatments for grasshopper control.
In addition, the EAs make no mention of the fact that there are affirmative obligations incumbent on federal agencies with regard to protection of pollinators, regardless of whether they are federally listed. Federal documents related to pollinator health include were described in our previous comment letters (see those).

Recommendation: In the face of declining pollinator and insect populations and the existence of federal directives for agencies to support and conserve pollinators and their habitat, APHIS must not conduct business as usual. APHIS should identify the at-risk pollinator species potentially present in the geographic area of the EAs and map their ranges prior to approving any treatment requests. Please see tables of at-risk bee and butterfly species potentially located within the project area in our 2020 comment letter. Prior to treatment, APHIS should ensure that it has identified specific, actionable measures it will take to protect the habitat of at-risk pollinator species from contamination that may occur as a result of exposure to treatment.

Some ways to enact protections for at-risk species above and beyond those included in the EAs include:
● Survey for butterfly host plants and avoid any applications to host plants.
● Time pesticide applications to avoid exposure to at risk species.
● Do not apply pesticides (especially insecticides) when pollinators (adult and immature) are present or expected to be present.
● Avoid aerial applications.
● Avoid using malathion and liquid carbaryl.
● Include large buffers around all water sources, including intermittent and ephemeral streams, wetlands, and permanent streams and rivers, as well as threatened and endangered species habitat, honeybee hives, and any human-inhabited area. For example, Tepedino (2000) recommends a three-mile buffer around rare plant populations, as many of these are pollinated by solitary bees that are susceptible to grasshopper control chemicals.

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

APHIS RESPONSE
This is a similar comment from the 2021 EA's see response to comment # 5,8, and 11 of the 2021 EA.

5. APHIS has not demonstrated that treatments in Arizona in 2022 meet the "economic infestation level." No site-specific data or procedures are presented in the EAs to satisfy APHIS' own description of how it determines that the "economic infestation level" is exceeded.
The APHIS grasshopper suppression program draws its authority from the Plant Protection Act of 2000 (7 U.S.C § 7717). The statute authorizes APHIS to authority to exclude, eradicate, and control plant pests, including grasshoppers. Specifically, language in the PPA provides authority for APHIS to protect rangeland from "economic infestation" of grasshoppers. In its recent EIS updating the program (APHIS 2019), the Agency describes its determination of an economic infestation as follows:
The "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 a treatment.
Such a measure is in accordance with general IPM principles that treatments should only occur if it is judged that the cost of the treatment is less than the revenues expected to be received for the product.
APHIS should undertake such an analysis in the site-specific EAs—or at least model it—so as to determine whether the treatments might be justified because they have reached a "level of economic infestation." Yet none of the variables are discussed in the EAs at all, nor is site-specific data presented for any of these factors, nor are procedures shown that APHIS intends to abide by to determine when an economic threshold is exceeded. Instead, the reader is simply left to assume that all treatments will obviously meet the economic threshold.

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

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

In determining whether a treatment is economically justified, one must ask what is the revenue expected to be received for the product? Sprinkle and Baily (2004) present typical Arizona rangelands carrying capacity, ranging from 4-13 acres of rangeland needed to support one animal unit-month (AUM). Currently, on federal BLM and Forest Service lands, the US taxpayer receives $1.35 per AUM. As a rough estimation, taking the mean carrying capacity of Arizona rangeland from Sprinkle and Baily (8.5 acres per AUM), and calculating the value of the forage per acre as paid to the American taxpayer, the US taxpayer receives an estimated $0.16 per acre for the forage value on BLM or USFS federal rangelands in Arizona.

Given that the direct costs of grasshopper treatments to the taxpayer, even for "protected" acres, amounts to at least twenty-five times the amount of the revenue received by the taxpayer for the protection of that forage (assuming a cost of $3.99/protected acre), it is clear that the economic threshold is nowhere near being met. Were we to use the higher cost for treated acres, the ratio of cost to benefit is about 50. The program makes no economic sense from the point of view of the taxpayer.

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

APHIS RESPONSE
This is the same comment from the 2021 EA's, see response to comment # 2 of the 2021 EA. A similar comment from the 2020 EA's. Please see the APHIS responses to comments 1, 2, 3, 4, 5, 6, 8, 55, 91,92, 96, 99 and 158 in the 2020 EA's. This would be the funds needed by a rancher to replace the forage for a specific herd of cattle. Thus, from the rancher's perspective it is an emergency.

As stated in previous responses to 2020 and 2021 EA's, survey data will not be released to the public for Tribal Ranches.

*The commenter cited documents, Detailed Work Plan for 2017 and 2019 and the cost of the treatments. On these same documents which the commenter cites also contained the **economic pre-treatment densities** of 51 grasshopper/yd^2 and 41 grasshoppers/yd^2 respectively. At these densities the amount of forage damaged and or consumed would be approximately 550 pounds/acre in a 30-day period. This would amount to 176 tons in a 640-acre section. At the June 2019 replacement feed costs of $220/ton* *this would amount to $38,726 to replace forage lost in a section due to this population of grasshoppers for* *<u>one month</u>. The cost for 2022 would be approximately, $300/Ton. The replacement costs for a herd of 1,000 cattle would be $90,000 a month for a herd this size.*

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

In its EA, APHIS stated:
Based on the review of laboratory and field toxicity data for terrestrial invertebrates, applications of diflubenzuron are expected to have minimal risk to pollinators of terrestrial plants.

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

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

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

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

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

Many of the effects noted in Graham were observed 1-year post treatment, a lag effect which is not unexpected since diflubenzuron acts to impede arthropod development, rather than killing adults directly.
Nearly all of the other studies of diflubenzuron impacts on non-targets cited by APHIS that were conducted in Western rangelands were of very small scale (40 acres or less) or were barrier treatments (not a method used in

APHIS rangeland grasshopper suppression). Small acreage studies are of little use in gauging treatment impacts especially to more mobile invertebrates since small, tested acres can be easily recolonized from the edges.

Considering that bumble bees (and other native bees) have inherently low fecundity, recovery may be slow in and near suppression areas. As a result, we have concerns that population level impacts could occur to already declining native bees, resulting in potential impact to other species, such as flowering plants.
Managed bees may also be at risk; data shows that the alfalfa leafcutting bee (*Megachile rotundata*) and the alkali bee (*Nomia melanderi*) are both considered more susceptible than honeybees or *Bombus to* diflubenzuron.

Recommendation: Faced with significant and concerning pollinator declines, APHIS must better take into account the risk to native bees and butterflies from these treatments. APHIS should be conducting a more thorough and accurate analysis on the impacts of selected pesticides to pollinators and other beneficial insects. Research findings do portend worrying results for native pollinators and other beneficial insects exposed in the treated areas, even for diflubenzuron. APHIS should constrain its treatments to take into account pollinator conservation needs and improve its monitoring capability to try to understand what non-target effects actually occur as a result of the different treatment.

APHIS RESPONSE
This a similar comment from the 2021 EA's, see response to comment # 4 of the 2021 EA, and APHIS responses to comments 10, 12, 14, 19, 20, 25, 28 and 37 in the 2020 EA's.

APHIS relied on available laboratory and field collected data for each Program insecticide to summarize risks to terrestrial invertebrates. In evaluating studies, APHIS also evaluated likely routes of exposure for Program treatments. Estimates of exposure using the EPA tier one screening model likely overestimate potential residues in pollen and nectar.

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

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

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

7. APHIS relies too heavily on broad assertions that untreated swaths will mitigate risk. Untreated swaths are presented as mitigation for pollinators and refugia for beneficial insects, but drift is likely to expose beneficials in untreated swaths at unacceptable level.

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

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

● Final EIS P. 57: "*The use of RAATS provide additional benefits by creating reduced rates and/or untreated swaths within the spray block that will further reduce the potential risk to pollinators."*

● Final EIS p. 26. *"Studies using the RAATs strategy have shown good control (up to 85% of that achieved with a traditional blanket insecticide application) at a significantly lower cost and less insecticide, and with a markedly higher abundance of non-target organisms following application (Lockwood et al., 2000; Deneke and Keyser, 2011).*

● Arizona 2022 EAs: *"The use of RAATs provide additional benefits by using reduced rates and creating untreated swaths within the spray block that will further reduce the potential risk to pollinators."*

However, the width of the skipped swaths is uncertain, as there is no minimum width specified. Instead, APHIS states that for ground applications in Arizona, the skipped swath width is typically 40-45 feet.
For example, APHIS cites a study by Lockwood et al. (2000) to claim that RAATS treatments result in "a markedly higher abundance of non-target organisms following application." We note that: This study only investigated RAATs effects to non-targets for carbaryl, malathion, and fipronil, not on diflubenzuron.

In addition, the study had average wind speeds well below the maximum rate allowed under the operating guidelines indicated in the 2022 Treatment Guidelines (10 mph for aerial applications, no maximum wind speed specified for ground applications).

• The study authors make clear that reduced impact to non-target arthropods was "*presumably due to the wider swath spacing width* [30.5 and 60 m]"**.** Obviously, these swath widths are much greater than those reported as typical in Arizona ground treatments (40-50 feet).

• APHIS leaves out one of the key findings of the study: For carbaryl, the RAATs treatment showed *lower* abundance and biomass of non-targets after treatment compared to the blanket treatments on one of the two ranches at the end of the sampling period (28 days). Also, on both ranches, abundance and biomass reached their lowest points at the end of the study after treatment with carbaryl, so we don't know how long it took for recovery to occur.

• The experimental treatment areas in the study (243 ha or 600 acres) were quite small compared to aerial treatment sizes that occur in reality (minimum 10,000 acres). This could have allowed for recolonization from around the edges that would result in more rapid recovery, compared to a real-world treatment, some of which measure tens of thousands of acres.

In addition, although the EIS included a quantitative analysis of drift anticipated from ULV aerial applications to estimate deposition into aquatic areas, an analysis is not presented or available to back up the assumption that untreated areas (skipped swath widths) will act as refugia for natural enemies, bees, and other wildlife. The drift analysis described in the EIS assumed a droplet spectra size of fine to very fine (median diameter = 137.5 µm). However, labels do not require a minimum droplet size for ULV applications over rangeland, and other uses of ULV technology for pest control assume much smaller droplet sizes. For example, for ULV applications used in adult mosquito control operations, volume median diameter (VMD) measures between 8 and 30 µm and 90% of the droplet spectrum should be smaller than 50 µm (Schleier et al. 2012).
Schleier et al. (2012) performed field studies to measure environmental concentrations of ground-based ULV-applied insecticides and developed a validated model to predict their deposition. Sites contained little vegetative structure and a flat topography. The authors observed that an average of 10.4% of the insecticides sprayed settled out within 180 m (591 ft.) of the spray source. According to the authors, these results are similar to measurement in other studies of ground based ULV applications using both pyrethroid and organophosphate insecticides, which found 1 to 30% of the insecticide sprayed deposits on the ground within 100 m (328 ft) of the spray source.

One can only conclude, in review of these analysis, that a skipped swath width of 45 feet won't do much to protect insects in skipped swaths from drift. Hence, the value of these skipped swaths for pollinator or natural enemy conservation cannot be relied upon.

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

APHIS RESPONSE
This is a similar comment to the 2021 EA's, see response to comment # 5 of the 2021 EA, and see APHIS responses to comments 10, 12, 14, 19, 20, 21, 23, 24, 25, 28, 37 of the 2020 EA.

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

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

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

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

APHIS often stretches science to the point beyond where it is credible. For example, APHIS cites a study by Catangui et al. (1994) which investigated the effects of Dimilin on non-target arthropods at concentrations similar to those used in the rangeland grasshopper suppression program. In APHIS' characterization, the study showed that treatment with Dimilin should be of no concern since applications resulted in "minimal impact on ants, spiders, predatory and scavanger beetles." However, APHIS does not disclose that the plots studied by Catangui measured only 40 acres. This is a far cry from the ground treatments normally measuring thousands of acres or the aerial treatments measuring a minimum of ten thousand acres that are seen in the actual grasshopper suppression program. Small, treated plots of 40 acres can be quickly recolonized from the edges. Large, treated plots are quite a different story.

In contrast the field study of large scale applications by Graham et al (2008) found significant effects to important natural enemies, including Diptera, and non-ant Hymenoptera. These groups contain important predators and parasitoids of grasshoppers and other organisms. These are the very organisms that help regulate grasshopper populations.

In fact, researchers even warned about the problem in the Grasshopper IPM handbook. In Section IV.8 (Recognizing and Managing Potential Outbreak Conditions) Belovsky et al. caution,

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

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

APHIS RESPONSE
This is a similar comment to the 2021 EA's, see response to comment #6 above and of the 2021 EA, and see APHIS responses to comment #20 of the 2020 EA.

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

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

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

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

***Recommendation**:* APHIS must address the potential for indirect impacts to rangeland birds, especially those experiencing declining populations from these or other stressors.

APHIS RESPONSE
This is a similar comment from the 2021 EA's, see response to comment #7 of the 2021 EA.

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

APHIS claims that it will adhere to applicable mitigations designed to protect bees that are found on product labels. For example, the Final EIS categorically states that *"Product use restrictions and suggestions to protect bees appear on US EPA approved product labels and are followed by the grasshopper program. Mitigations such as not applying to rangeland when plants visited by bees are in bloom, notifying beekeepers within 1 mile of treatment areas at least 48 hours before product is applied, limiting application times to within 2 hours of sunrise or sunset when bees are least active, appear on product labels such as Sevin® XLR Plus (USEPA, 2012d). Similar use restrictions and recommendations do not appear on bait labels because risks to bees are reduced. APHIS would adhere to any applicable mitigations that appear on product labels."*

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

The Dimilin 2L label instructs the user to "minimize exposure of the product to bees" and to "minimize drift of this product on to beehives or to off-site pollinator attractive habitat." In the EIS, APHIS states that it will adhere to label recommendations for Dimilin (p. 57). However, if treated habitat is flowering and bees are active (as would be anticipated during any of the proposed treatment months of April-September), it is not clear how applications for grasshopper/Mormon cricket control can minimize exposure to bees.

Except for reduced rates and/or untreated swath widths, the EAs are silent on how it will avoid impact to pollinators. It has already been shown that within sprayed areas, risk quotients at expected application rates

would be well above 1.0. Leaving skipped widths is also not a full solution at expected widths since, due to drift, untreated swaths are highly likely to be exposed to levels above risk quotients (see above comment).
In cropland areas, applicators sometimes minimize exposure to bees by applying at night. From examination of some of the flight records from past grasshopper treatments, it is clear that this is not the norm for the program, at least for aerial treatments.

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

APHIS RESPONSE
This is a similar comment from the 2021 EA's, see response to comment #8 of the 2021 EA.
The commenter made similar comments addressed in the 2020 EA's. Please see the APHIS responses to comments 10, 12, 14, 19, 20, 25, 28 and 37 in the 2020 EA's.

11. Determinations for Listed species Should Rest on Sound Science and Complete Analysis.

According to the EAs, programmatic consultation with the US Fish and Wildlife Service on species listed under the Endangered Species Act was initiated in 2015 but is not yet complete. The backup is for APHIS to consult at the local level.

We appreciate the inclusion of the BA for the local level consultation within the Draft EAs this year. The concurrence letters were still not complete at the time of the Draft EA release.
In the BA, APHIS discloses its determinations for all species and the measures it plans to implement to avoid impacts to listed species. Most of the determinations are slim on rationale; in many cases, no discussion is made of dependencies these species may have on other species that may be affected by the insecticide sprays (these could include pollinators or prey items, depending on the species).
In some cases, planned buffers are not clear. For example, no buffers are designated around Desert Tortoise habitat. In other cases, no buffers are identified around listed plants when carbaryl bait is utilized, even though bait can lodge in flowers and partially dissolve, exposing bees.

Recommendation: In addition to direct effects, the determinations should examine indirect effects, including impacts from the pesticides to prey items or pollinators, or other dependencies. In the Final EA, the letters of concurrence should be attached. Under the ESA there must be an analysis of whether the project would jeopardize the continued existence or modify or destroy the critical habitat for each adversely affected listed species, according to any active ingredients that may be selected. Pesticide specific conservation measures for each listed species (actions to benefit or promote the recovery of listed species that are included by the Federal agency as an integral part of the proposed action), where appropriate, should be explicitly addressed and adopted.

For each species to be protected within the project area, APHIS must provide to applicators a set of clear set of directions outlining protective measures for the listed and proposed species found within this project area. In addition to these measures, APHIS should adopt the following operational guideline across all site-specific EAs:
"Use Global Positioning System (GPS) coordinates for pilot guidance on the parameters of the spray block.

Ground flagging or markers should accompany GPS coordinates in delineating the project area as well as areas to omit from treatment (e.g., boundaries and buffers for bodies of water, habitats of protected species, etc.

APHIS RESPONSE
This is a similar comment from the 2021 EA's, see response to comment #9 of the 2021 EA.
Please see the APHIS responses to comments 29,33,97,98,107,156 and 157, in the 2020 EA's.

APHIS believes sharing the consultation documents has caused the commenter to conflate the different threshold in the risk analysis determinations between the Endangered Species Act (ESA) and the National Environmental Policy Act (NEPA, the latter of which is the relevant standard here. While take of protected species or degradation of critical habitat is prohibited by ESA, the U.S. Fish and Wildlife Service consultation is not the forum for speculation about potential harmful scenarios or suggestions of extra protections measures imagined by the commenter. APHIS wishes to respectfully remind the Xerces Society to provide comments concerning potential overlooked significant impacts to the human environment resulting from the preferred alternative described in the draft EA.

12. The monarch butterfly, now designated a candidate species under the Endangered Species Act, needs stronger protection from liquid insecticide.

We appreciate the attention given to the monarch butterfly, recently designated a Candidate species under the Endangered Species Act, in Arizona's 2022 EAs. While Arizona's policy of not allowing aerial applications will go a long way toward protecting this species, we recommend stronger buffers if liquid insecticides are used.

Habitat suitability modeling for monarch butterfly in the counties covered by this EA shows there are notable concentrations of potentially highly suitable monarch habitat in Arizona, particularly in south and central Arizona but also in areas within the Arizona Strip geographic area in NW Arizona (Dilts et al. 2018).
Any of the program insecticides poses a concern to caterpillars of these species if exposed. Chlorantraniliprole appears to be in the queue for APHIS use in the suppression program in the near future as it is listed in the operating guidelines. Chlorantraniliprole is sometimes considered non-toxic to honey bees but is very important to be aware of its high toxicity to other pollinators. Krishnan et al. (2021) tested chlorantraniliprole along with five other insecticides on monarch caterpillars, finding that chlorantraniliprole was far and away the most toxic to monarch caterpillars when consumed, even more so than the neonics tested. This causes us considerable concern if indeed chlorantraniliprole is adopted for use under the APHIS program.

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

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

Any use of liquid insecticides warrants buffers from milkweed stands or areas where these may potentially occur. We recommend a 1-mile buffer from known or potential milkweed stands for ground applications to provide a reasonable margin of conservation protection.

APHIS RESPONSE
See response to comment 11 above. This is a similar comment from the 2021 EA's, see response to comment #1 of the 2021 EA. Please see the APHIS responses to comments #81 in the 2020 EA's.

Current Tribal management practices are to remove any milkweed plants from Tribal rangeland pastures, this safeguards livestock from the toxicity of milkweed plants. Due to the lack of milkweed on Tribal rangeland the monarch butterfly exposure to pesticide treatments in Arizona is greatly reduced.

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

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

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

APHIS RESPONSE
This is a similar comment from the 2021 EA's, see response to comment #10 of the 2021 EA. Please see the APHIS responses to comments #17 in the 2020 EA's.

In Arizona, APHIS has excluded the use of liquid carbaryl. See page 7-8 of 2022 EA.

The use of carbaryl bait was consulted with FWS, the FWS issued their concurrence on the proposed effect determinations and any mitigation. APHIS has completed Section 7 responsibilities under ESA. The BE is the first step in consultation between EPA and FWS on the national use of carbaryl but doesn't prescribe any mitigations which will be the next step.

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

The Dimilin label indicates that the product is toxic to mollusks. This is concerning because nationally, more than 90 mussel species are federally listed as endangered and threatened, and more than 70% are thought to be in decline. About 32 species are thought to have already gone extinct. In the western U.S., populations of western pearlshell, California floater, and western ridged mussel are all in decline, especially in Arizona, California, Montana, and Utah.

Recommendation: While the mitigations that are identified for aquatic habitats in the EAs are heartening, the diflubenzuron label indicates that the chemical is subject to runoff for months after application, and areas supporting listed mussels need greater protection. APHIS should use larger buffers to protect freshwater mussels, such as those designated for listed salmonids in other states. In addition, APHIS should include monitoring for the presence and health of mussels in streams that traverse or are adjacent to treatment areas as part of its monitoring strategy.

APHIS RESPONSE
This is a similar comment from the 2021 EA's, see response to comment #12 of the 2021 EA. Please see the APHIS responses to comments #40 and 41 in the 2020 EA's.

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

Although one of the EAs mentions water bodies of anthropogenic origin and identifies that there are stock tanks or stock ponds present in the area, neither EA identified any buffers that will be observed to prevent pesticide overspray or drift into these habitats (except in analysis of listed species). Studies of these habitats (Hale et al. 2014; Hasse and Best 2020) have shown that stock ponds/tanks are important surrogate habitats for native species and can be equivalent to natural habitats in terms of total abundance and richness of aquatic invertebrates.

Recommendation: APHIS should recognize the potential for stock pond/tanks to contribute significantly to the diversity of aquatic invertebrates in rangelands. APHIS should identify stock tanks explicitly as covered by the buffers identified for aquatic areas in its Operational Guidelines.

APHIS RESPONSE
This is a similar comment from the 2021 EA's, see response to comment #13 of the 2021 EA. Please see the APHIS responses to comments #41,42 and 43 in the 2020 EA's.

16. Special status lands.

The EAs do not make mention the presence of or any specific protections to be accorded to special status lands such as Wilderness areas, Wilderness study areas, Research Natural Areas, National Wildlife Refuges, Important Bird Areas, and designated or proposed Areas of Critical Environmental Concern within potential treatment areas.

Recommendation: These special status areas have been designated for specific purposes and generally discourage human intervention with the natural ecosystem. Grasshopper suppression should not be undertaken in such areas.

APHIS RESPONSE
This is a similar comment from the 2021 EA's, see response to comment #14 of the 2021 EA. Please see the APHIS responses to comments #50 in the 2020 EA's.

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

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

According to the Rangeland Management section of the Grasshopper IPM handbook (Onsager, 1996-2000) high diversity in canopy structure and plant species composition tends to support high diversity in grasshopper species and this diversity and composition tend to provide stability and to suppress pest species that exploit disturbance.

Emphasizing cultural techniques through appropriate grazing management could help to minimize pesticide application and allow natural enemies to regulate grasshopper and Mormon cricket populations to the greatest extent possible. For example, Onsager (2000) found that (compared to season-long grazing) rotational grazing resulted in significantly less adult *Melanoplus sanguinipe*s grasshoppers and significantly less damage to forage. Under rotational grazing, the nymphs developed significantly slower and their stage-specific survival rates were significantly lower and less variable. Consequently, significantly fewer adults were produced significantly later in the season under rotational grazing.

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

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

As described above (See item 6 in this comment letter), birds may consume 50% of grasshoppers on site. Ensuring healthy bird populations is critical to long-term grasshopper management.
Another argument for re-thinking the chemical-centric suppression program is that the costs of the program constrain APHIS' ability to respond to treatment requests. In addition, climate change poses a threat that may alter the frequency and locations of outbreaks.

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

APHIS must not take a limited view of its role and responsibilities and should utilize any available mechanism to require land management agencies to diminish the severity, frequency and duration of grasshopper outbreaks by utilizing cultural management actions. For example, Memoranda of Understanding (MOUs) should be examined and updated to ensure that land management agencies are accountable in utilizing cultural techniques to diminish the carrying capacity of pest spec
Longer-term strategic thinking should include:
● Prevent conditions that allow grasshopper and Mormon cricket populations to reach outbreak conditions by employing diverse management techniques (e.g., biological, physical, and cultural).
● Implement frequent and intense monitoring to identify populations that can be controlled with small ground-based pesticide application equipment.
● If pesticides are used, select active ingredients and application methods to minimize risks to nontarget organisms.
● Monitor sites before and after application of any insecticide to determine the efficacy of the pest management technique as well as if there is an impact on water quality or non-target species.

APHIS RESPONSE
This is a similar comment from the 2021 EA's, see response to comment #15 of the 2021 EA.

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

We appreciate that public notice of this site-specific EA and its comment period was posted at the APHIS website. Grasshopper suppression efforts are of more than local concern and as federal actions, should be noticed properly, i.e. beyond local stakeholder audiences, local newspapers, etc.
We appreciate that this program may have attracted little public notice in the past. However, it is past time for APHIS to be more transparent about its actions, particularly on public lands. To do so will build trust. As such, there is little to lose and much to gain.
Recommendation: We recommend that, in the future, notice of open public comment periods for all site-specific EAs for grasshopper suppression be posted in the Federal Register, and documents made available for review at regulations.gov and at the APHIS grasshopper website. In addition, we make the following recommendations,

Actual proposed treatment areas should be mapped and shared with the public when each state APHIS office submits its treatment budget request. Sensitive designations should be disclosed on these maps.

• Later refinements to locations should be mapped and shared with the public prior to treatments.
• Nymph survey results should be provided to the public within one week of data collection in map and table form (counts by species at each survey point, not total counts by survey point).
• Economic threshold analysis needs to be conducted and disclosed especially for treatments on public lands. Factors identified by APHIS as important in the economic threshold determination should be assessed quantitatively with current data.
• Consultation documents should be shared with the public in the draft EA .

• Results of environmental monitoring associated with treatments (i.e. drift cards, water samples) should be disclosed.

APHIS RESPONSE
This is a similar comment from the 2021 EA's, see response to comment #16 of the 2021 EA.
The commenter made the same comment in the 2020 EA's. Please refer to APHIS responses to comments 1, 2, 3, 51 and 55 of the 2020 EA's.

Center for Biological Diversity

19. **All comments from last year and the year before are equally applicable this year as the 2022 draft EAs suffer from the same or similar deficiencies as the 2021 and 2020 ones, are incorporated by reference and are attached as appendices. Also, comments on these EAs by the Xerces Society for Invertebrate Conservation from both 2021 and 2020 are equally applicable, incorporated by reference and attached as appendices.**

    APHIS RESPONSE
    The commenter submitted similar comments for the 2021 EA's, see response to comment #1 of the 2021 EA. See response to comment #1 of the 2021 EA.
    The responses for comments 1 through 161 are found in the 2020 EA's. These responses are equally applicable for the 2021 EA's.

20. **The EA assumes recreation is not a significant use of potentially treated areas.**

    APHIS RESPONSE
    The commenter presumes that recreation is significantly used in the potentially treated areas in the Arizona EA's. APHIS agrees that recreation in Arizona is a major tourist attraction. But the rangeland in question is first, prohibited for recreation on Tribal lands. The ranches all have signs designating the fact. Second, the Tribe does issue permits for recreational use, this is limited to designated locations controlled by the Tribe. Even hunting is strictly controlled on Tribal ranches where only one tag is issued/hunt unit where Tribal Ranches are involved. Tribal ranches all include horses and cattle as the livestock as a source of revenue from the proceeds at auction.

    In the case of BLM -Arizona Strip District, people engaged in recreation in Arizona mainly go to the National Parks and other scenic areas. The rangeland on the Arizona Strip is a very remote area where there are no services, such as gas stations, sources of water, and cell service. Access routes are posted with warnings for the safety of any tourist. In Arizona, APHIS has excluded *any areas which would have any recreational interest such as National Parks, National Monuments, State Parks, and other areas which are normally visited by tourists.*

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

21. **The EA does not consider impacts to recreation and recreationists, specifically treatment impacts on adults, children, horses, and dogs.**

APHIS RESPONSE
See APHIS' response to comment #2 above. The cumulative impacts on people, adults and children were addressed on pages 33-35 of the Arizona EA's. The risk of Program pesticide use was also evaluated in the EIS that this EA tiers to and is incorporated by reference. The tribal ranches livestock is made of cattle and horses. The pesticides used by Arizona do not have a grazing restriction for cattle and horses.

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

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

APHIS RESPONSE
APHIS provides analysis of the potential effects of program applied insecticides on humans and animals in the Environmental Consequences section of the EAs, the Potential Environmental Impacts section of the Programmatic EIS (2019) and the human health and ecological risk assessments prepared for insecticides used by the grasshopper program. APHIS does not believe the program treatment will have significant impacts on the rangeland populations of

birds, bees or butterflies, or reduce recreational opportunities to see these animals. If parties wish to observe wildlife on the vast rangeland, they would be free to conduct those recreational activities anywhere else outside of the comparatively small grasshopper control areas. APHIS does not believe this minor inconvenience would cause significant impacts to the human environment.

23. The EA fails to fully account for impacts of this program on native bees.

Arizona Response:
This comment is similar to comments from the 2021 EA's, see response to comment # 4,5,8, and 11 of the 2021 EA. See also APHIS responses to comments 10, 12, 14, 19, 20, 25, 28 and 37 in the 2020 EA's. The commenter has expressed these concerns repeatedly, and APHIS has addressed them previously.

According to NatureServe Map Explorer, Documentation Distribution for information on Morrison's bumblebee displays this species as a vulnerable species, no other data is given. It is not listed with Arizona Environmental Review Tool from Arizona Game and Fish as a species of concern in Arizona. It is noted that data on the Navajo Nation is not available for display. The Nevada bumblebee does not have status ranking in Arizona according to Nature Serve Map Explorer.

APHIS disagrees with the commenter's opinion concerning the robustness of our risk analysis for native bees. APHIS provides analysis of the potential effects of program applied insecticides on pollinators including bumble bees in the Environmental Consequences section of the EAs, the Potential Environmental Impacts section of the Programmatic EIS (2019) and the human health and ecological risk assessments prepared for insecticides used by the grasshopper program.

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

24. The EA fails to fully account for impacts of this program on butterflies in the area.

Arizona Response
The Monarch butterfly which is listed as a FWS candidate species was addressed in the Biological Assessment which was attached in the EA's Appendix E. There are no other butterfly species listed as a species of concern by Arizona Game and Fish Environmental Review Tool. There are no butterfly species listed by the Tribal Department of Wildlife and Recreation associated with the EA AZ-22-01 as species of concern. The impacts of Program pesticides were also addressed in the programmatic EIS and associated risk assessments.

APHIS disagrees with the commenter's opinion concerning the robustness of our risk analysis for butterflies. APHIS provides analysis of the potential effects of program applied insecticides on non-target insects in the Environmental Consequences section of the EAs, the Potential Environmental Impacts section of the Programmatic EIS (2019) and the human health and ecological risk assessments prepared for insecticides used by the grasshopper program.

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

This is a similar comment from the 2021 EA's, see response to comment #1 of the 2021 EA. Please see the APHIS responses to comments #81 in the 2020 EA's.

25. **Further, we are deeply concerned about impacts to the Fickeisen plains cactus, a critically imperiled (S1) species that only exists in the project area, including *inside* and near areas that have already been treated. There are likely fewer than 1000 individuals remaining of this endangered species. According to NatureServe, "[t]he paucity of seed set has been speculated to be due to a scarcity in pollinator availability."1 Any activity that imperils pollination is an existential threat to this species. APHIS has failed to consider impacts to this species and must do so.**

Arizona Response:
Fish and Wildlife letter dated February 24, 2022, concurred with the protective measures to be used to safeguard this T&E species. This letter was in appendix E of the Draft EA#AZ-22-02. The Fickeisen plains cactus is not found in the Arizona Counties covered by the EA#AZ-22-01 so there is no impact on this species in these counties. The commenter cites Nature Serve link to this species; this is not accurately displaying the distribution for Fickeisen plain cactus in Arizona. This website cited it throughout the State of Arizona. According to FWS this is not the accurate distribution for this T&E species. Please refer to species Map 8.14 in the Biological Assessment noted in appendix E of EA.

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

Arizona Response:
This is similar to comment from the 2021 EA's, see response to comment #10 of the 2021 EA. Please see the APHIS responses to comments #17 in the 2020 EA's.

Malathion and liquid carbaryl are chemicals not used in Arizona. The EA was clear on what chemicals were used in Arizona, see EA page 11-12 for list of pesticides used in Arizona. As to the use of carbaryl bait, the protective measures for T&E species was concurred by FWS dated February 23, 2022, and April 1, 2022. This was in appendix F of the EA.

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

Arizona Response:
The use of what chemicals used in Arizona is detailed in the Biological Assessment submitted to FWS and concurred to APHIS by FWS. This document was also in appendix F of the EA's. The FWS Regional office, the State and Flagstaff Field Offices are all clearly aware of the pesticides

used in Arizona. These FWS offices all review the Biological Assessment and prepare the concurrence letters addressed to APHIS in Arizona. The pesticides used in Arizona are approved for use by US EPA and the Arizona Department of Agriculture. The pesticide labels are strictly adhered too as well other Program measures designed to reduce risk to nontarget organisms, including listed species.

28. The EAs lack specific information and fails to comply with NEPA, the Plant Protection Act, the ESA, and other applicable laws.

Arizona Response:
The EA explains the authority APHIS is given under the Plant Protection Act (7 U.S.C. § 7717(c)(1)) to protect Federal, State and private lands that are infested with grasshopper and or Mormon crickets (see page 6 of the EA). On page 9-10 of the EA, it cites the NEPA process APHIS uses in grasshopper management. Section 7 consultations were completed, and concurrence was received from FWS regarding T&E species (see appendix E of EA).