Final Environmental Assessment Rangeland Grasshopper and Mormon Cricket Suppression Program

BIG HORN, CARBON, CARTER, CUSTER, DANIELS, DAWSON, FALLON, GARFIELD, GOLDEN VALLEY, McCONE, MUSSELSHELL, POWDER RIVER, PRAIRIE, RICHLAND, ROOSEVELT, ROSEBUD, SHERIDAN, STILLWATER, SWEET GRASS, TREASURE, WHEATLAND, WIBAUX, YELLOWSTONE counties, and that portion of VALLEY County falling within the Fort Peck Indian Reservation, MONTANA

EA Number MT-20-01

Prepared by:
Joey Esilva
Plant Health Safeguarding Specialist
Animal and Plant Health Inspection Service
1220 Cole Ave.
Helena, MT 59601

June 13, 2020

Table of Contents

Appendices

Draft Site-Specific Environmental Assessment
Rangeland Grasshopper and Mormon Cricket Suppression Program
BIG HORN, CARBON, CARTER, CUSTER, DANIELS, DAWSON, FALLON, GARFIELD, GOLDEN VALLEY, McCONE, MUSSELSHELL, POWDER RIVER, PRAIRIE, RICHLAND, ROOSEVELT, ROSEBUD, SHERIDAN, STILLWATER, SWEET GRASS, TREASURE, WHEATLAND, WIBAUX, YELLOWSTONE counties, and that portion of VALLEY County falling within the Fort Peck Indian Reservation, MONTANA

I. Need for Proposed Action

A. Purpose and Need Statement

An infestation of grasshoppers or Mormon crickets may occur in Big Horn, Carbon, Carter, Custer, Daniels, Dawson, Fallon, Garfield, Golden Valley, McCone, Musselshell, Powder River, Prairie, Richland, Roosevelt, Rosebud, Sheridan, Stillwater, Sweet Grass, Treasure, Wheatland, Wibaux, Yellowstone counties, and that portion of Valley County falling within the Fort Peck Indian Reservation, Montana. The Animal and Plant Health Inspection Service (APHIS) may, upon request by land managers or state departments of agriculture, conduct treatments to suppress grasshopper infestations as part of the Rangeland Grasshopper and Mormon Cricket Suppression Program (program). The term “grasshopper” used in this environmental assessment (EA) refers to both grasshoppers and Mormon crickets, unless differentiation is necessary.

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

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

This EA analyzes potential environmental consequences of the proposed action and its alternatives. This EA applies to a proposed suppression program that would take place from 05/11/20 to 09/30/20 in Big Horn, Carbon, Carter, Custer, Daniels, Dawson, Fallon, Garfield, Golden Valley, McCone, Musselshell, Powder River, Prairie, Richland, Roosevelt, Rosebud, Sheridan, Stillwater, Sweet Grass, Treasure, Wheatland, Wibaux, Yellowstone counties, and that portion of Valley county falling within the Fort Peck Indian Reservation, Montana.

This EA is prepared in accordance with the requirements under the National Environmental Policy Act of 1969 (NEPA) (42 United States Code § 4321 *et. seq.*) and the NEPA procedural requirements promulgated by the Council on Environmental Quality, United States Department of Agriculture (USDA), and APHIS.

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 population levels, particularly during high levels referred to as outbreaks (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 outbreak levels 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.

APHIS surveys grasshopper populations on rangeland in the Western United States, provides technical assistance on grasshopper management to land owners and managers, and may cooperatively suppress grasshoppers when direct intervention is requested by a federal land management agency or a state agriculture department (on behalf of a state or local government, or a private group or individual). APHIS' enabling legislation provides, in relevant part, that 'on request of the administering agency or the agriculture department of an affected State, the Secretary, to protect rangeland, shall immediately treat Federal, State, or private lands that are infested with grasshoppers or Mormon crickets'… (7 U.S.C. § 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 destruction 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. In November 2019, APHIS published an updated EIS to incorporate the available data and analyze the environmental risk of new program tools.

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

In April 2014, APHIS and the USDA Forest Service (FS) signed a Memorandum of Understanding (MOU) detailing cooperative efforts between the two groups on suppression of grasshoppers on national forest system lands (Document #14-8100-0573-MU, April 22, 2014). This MOU clarifies that APHIS will prepare and issue to the public, site-specific environmental documents that evaluate potential impacts associated with proposed measures to suppress economically damaging grasshopper populations. The MOU also states that these documents will be prepared under the APHIS NEPA implementing procedures with cooperation and input from the Forest Service.

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

In February 2015, APHIS and the Bureau of Land Management (BLM) signed a memorandum of understanding (MOU) detailing cooperative efforts between the two groups on suppression of grasshoppers on BLM system lands (Document #15-8100- 0870-MU, October 15, 2015). This MOU clarifies that APHIS will prepare and issue to the public site-specific environmental documents that evaluate potential impacts associated with proposed measures to suppress economically damaging grasshopper populations. The MOU also states that these documents will be prepared under the APHIS NEPA implementing procedures with cooperation and input from BLM.

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

In September 2016, APHIS and Bureau of Indian Affairs (BIA) signed a MOU detailing cooperative efforts between the two agencies on suppression of grasshoppers and Mormon crickets on BIA managed lands, APHIS PPQ MOU # 16-8100-0941-MU, September 16, 2016). This MOU clarifies that APHIS will prepare and issue to the public site-specific environmental documents that evaluate potential impacts associated with proposed measures to suppress damaging grasshopper and Mormon cricket populations. The MOU also states that these documents will be prepared under the APHIS NEPA implementing procedures with cooperation and input from the BIA.

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

C. About This Process

The EA 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 take action with respect to those requests. Surveys help to determine general areas, among the scores of millions of acres, where grasshopper infestations may occur in the spring of the following year. Survey data provides the best estimate of future grasshopper populations, yet environmental factors lead to uncertainty that makes analyzing specific treatment areas under NEPA impossible. When possible, the program strives to alert the public in a timely manner to more routine treatment plans and to avoid or minimize harm to the environment while implementing those plans.

The current EIS provides a solid analytical and regulatory 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 the environment that could be affected by treatments in the area where grasshopper outbreaks are anticipated. The Draft EA is made available to the public for a 30-day comment period. When the program receives a treatment request and determines that treatment is necessary, the specific site within the state will be evaluated to determine if environmental factors were thoroughly evaluated in the Draft EA. If all environmental factors were accounted for in the Draft EA, the program will prepare a Final EA and Finding of No Significant Impact (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. The Final EA and FONSI will be posted to the APHIS website. The program will also publish a notice of availability in the same manner used to advertise the availability of the Draft EA.

II. Alternatives

To engage in comprehensive NEPA risk analysis APHIS must frame potential agency decisions into distinct alternative actions. These program alternatives are then evaluated to determine the significance of environmental effects. The 2002 EIS presented three alternatives: (A) No Action; (B) Insecticide Applications at Conventional Rates and Complete Area Coverage; and (C) Reduced Agent Area Treatments (RAATs), and their potential impacts were described and analyzed in detail. The 2019 EIS was tiered to and updated the 2002 EIS. Therefore the 2019 EIS considered the environmental background or 'No Action' alternative of maintaining the program that was described in the 2002 EIS and Record of Decision. The 2019 EIS also considered an alternative where APHIS would not fund or participate in grasshopper suppression programs. The preferred alternative of the 2019 EIS allowed APHIS to update the program with new information and technologies that not were analyzed in the 2002 EIS. Copies of the complete 2002 and 2019 EIS documents are available for review at 1220 Cole Ave, Helena, MT 59602, or 1400 S 24th ST W, Suite 8A, Billings, MT 59102. A draft EA was prepared with a notice of availability for a 30 day comment period. Notice was placed in: Billings Gazette, Bozeman Daily Chronicle, Daily Inter Lake, Great Falls Tribune, Helena Independent Record, and the Missoulian newpapers. Comments were received from two parties and are referenced in appendix 5 of this document.These documents are also available at the Rangeland Grasshopper and Mormon Cricket Program web site, http://www.aphis.usda.gov/plant-health/grasshopper.

All insecticides used by APHIS for grasshopper suppression are used in accordance with applicable product label instructions and restrictions. Representative product specimen labels can be accessed at the Crop Data Management Systems, Inc. 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, included as Appendix 1 to this Final EA.

This Final EA analyzes the significance of environmental effects that could result from the alternatives described below. These alternatives differ from those described in the 2019 EIS because grasshopper treatments are not likely to occur in most of Big Horn, Carbon, Carter, Custer, Daniels, Dawson, Fallon, Garfield, Golden Valley, McCone, Musselshell, Powder River, Prairie, Richland, Roosevelt, Rosebud, Sheridan, Stillwater, Sweet Grass, Treasure, Wheatland, Wibaux, Yellowstone counties, and that portion of Valley county falling within the Fort Peck Indian Reservation, Montana, and therefore the environmental baseline should describe a no treatment scenario.

A. No Action Alternative

Under Alternative A, the No Action alternative, APHIS would not fund or participate in any program to suppress grasshopper infestations within Big Horn, Carbon, Carter, Custer, Daniels, Dawson, Fallon, Garfield, Golden Valley, McCone, Musselshell, Powder River, Prairie, Richland, Roosevelt, Rosebud, Sheridan, Stillwater, Sweet Grass, Treasure, Wheatland, Wibaux, Yellowstone counties, and that portion of Valley county falling within the Fort Peck Indian Reservation, Montana. Under this alternative, APHIS may opt to provide limited technical assistance, but any suppression program would be implemented by a federal land management agency, a state agriculture department, a local government, or a private group or individual.

B. Insecticide Applications at Conventional Rates or Reduced Agent Area Treatments with Adaptive Management Strategy (Preferred Alternative)

Under Alternative B, the Preferred Alternative, APHIS would manage a grasshopper treatment program using techniques and tools discussed hereafter to suppress outbreaks. The insecticides available for use by APHIS include the U.S. Environmental Protection Agency (USEPA) registered chemicals carbaryl, diflubenzuron, and malathion. These chemicals have varied modes of action: carbaryl and malathion work by inhibiting acetylcholinesterase (enzymes involved in nerve impulses); and diflubenzuron is a chitin inhibitor. 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.

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

- 8.0 fluid ounces (0.25 lb a.i.) of carbaryl ULV spray per acre;
- 10.0 pounds (0.20 lb a.i.) of 2 percent carbaryl bait per acre;

- 0.75 fluid ounce (0.012 lb a.i.) of diflubenzuron per acre; or
- 4.0 fluid ounces (0.31 lb a.i.) of malathion per acre.

The width of the area not directly treated (the untreated swath) under the RAATs approach is not standardized. The proportion of land treated in a RAATs approach is a complex function of the rate of grasshopper movement, which is a function of developmental stage, population density, and weather (Narisu et al., 1999, 2000), as well as the properties of the insecticide (insecticides with longer residuals allow wider spacing between treated swaths). Foster et al. (2000) left 20 to 50% of their study plots untreated, while Lockwood et al. (2000) left 20 to 67% of their treatment areas untreated. Currently the grasshopper program typically leaves 50% of a spray block untreated for ground applications where the swath width is between 20 and 45 feet. For aerial applications, the skipped swath width is typically no more than 20 feet for malathion, 100 feet for carbaryl and 200 feet for diflubenzuron. The selection of insecticide and the use of an associated swath widths is site dependent. Rather than suppress grasshopper populations to the greatest extent possible, the goal of this alternative is to suppress grasshopper populations to a desired level.

As specific treatment areas are identified, the specific agent and treatment methodologies will be identified in supplemental documents.

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

- 16.0 fluid ounces (0.50 pound active ingredient (lb a.i.)) of carbaryl spray per acre;
- 10.0 pounds (0.50 lb a.i.) of 5 percent carbaryl bait per acre;
- 1.0 fluid ounce (0.016 lb a.i.) of diflubenzuron per acre; or
- 8.0 fluid ounces (0.62 lb a.i.) of malathion per acre.

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

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 located in Arizona and its Rangeland Grasshopper and Mormon Cricket Management Team (Rangeland Unit) conducts methods development and evaluations on behalf of the Program. The Rangeland Unit's primary mission is to comply with Section 7717 of the Plant Protection Act and protect the health of rangelands (wildlife habitats and where domestic livestock graze) against economically damaging cyclical outbreaks of grasshoppers and Mormon crickets. The Rangeland Unit tests and develops more effective, economical, and less environmentally harmful management methods for the Program and its federal, state, tribal, and private stakeholders.

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

Studies and experimental plots are typically located on rangeland 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.

The 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.

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

APHIS conducts adult grasshopper surveys throughout the assessment area in the late summer and early fall of each year and identifies areas where grasshopper populations could indicate significant infestations in the following year. Appendix 3 illustrates the results of the 2019 adult grasshopper survey, and where problem areas may exist.

Appendix 2 indicates the boundaries of the area covered by this EA. Control programs may occur throughout the assessment area as per program guidelines (Appendix 1) and as agreed to by cooperators (private, state and federal land managers).

The 2019 programmatic Final Environmental Impact Statement (APHIS FEIS 2019) and the associated human health and ecological risk assessments contain detailed analyses of impacts of selected grasshopper control methods. In addition, APHIS FEIS 2019 contains a hazard, exposure, and risk analysis for grasshopper control chemicals on terrestrial wildlife, aquatic species, and humans. Those analyses serve as the basis for the determination of impacts in this EA, and are incorporated here by reference. The following components of the affected area are identified as being within the scope of this EA.

A. Description of Affected Environment

The proposed suppression program area included in the EA encompasses 35,854,005 acres within 24 counties in Southern, Central and Eastern Montana of which 16,938,597 acres are considered rangeland The counties are: Big Horn ((population from July 1, 2016 Census estimates unless specified -13,343), Carbon (10,460), Carter (1,203), Custer (11,924), Daniels (1,755), Dawson (9,327), Fallon (3,120), Garfield (2,011), Golden Valley (831), McCone (1,700), Musselshell (4,589), Powder River (1,746), Prairie (1,182), Richland (11,482), Roosevelt (11,305), Rosebud (9,287), Sheridan (3,648), Stillwater (9,406), Sweet Grass (3,623), Treasure (692), Valley (7,539), Wheatland (2,117), Wibaux (1,093), and Yellowstone (158,437). Ownership or stewardship of the land in this area is as follows: Private – 25,827,992 acres, BLM – 3,252,611 acres, Indian Trust – 2,847,400 acres, State – 2,041,700 acres, USFS – 1,409,183 acres, and Other Federal – 319,442 acres. Appendix 2 indicates the boundaries of the area covered by this EA. Specific treatment areas will be identified as an addendum to this document as they become identified.

The vast majority of this area is in the short-grass prairie region but also includes smaller areas in the mountain region. The elevation ranges from 2,000 feet along the lower river valleys to over 12,000 feet in the Beartooth Mountains. The area is composed of glaciated and sedimentary plains with rolling hills, foothills with moderate to steep slopes, and complex mountains that can be very rugged with deep canyons and sparse vegetation or timber covered with open meadows. Annual precipitation varies from less than 10 inches a year in some semi-arid plains regions along the Missouri River and the Montana-Wyoming border to over 40 inches in the mountain areas in the south. The largest portion of the region falls within the 10-18 inches of precipitation per year range.

Major water resources include, but are not limited to: Missouri River, Yellowstone River, Bighorn River, Musselshell River, Stillwater River, Boulder River, Powder River, Tongue River, Little Bighorn River, Clarks Fork of the Yellowstone River, Little Missouri River, Little Powder River, Poplar River, Redwater River, Rosebud Creek, Cabin Creek, O'Fallon Creek, Beaver Creek, Pumpkin Creek, Mizpah Creek, Big Muddy Creek, Dry Creek, Little Dry Creek, Sunday Creek, Cottonwood Creek, Wolf Creek, Porcupine Creek, Little Porcupine Creek, Rock Creek, Sweet Grass Creek, Lodge Grass Creek, Fort Peck Lake, Bighorn Lake, Medicine Lake, Mystic Lake, Tongue River Reservoir, Lodge Grass Storage Reservoir, Cooney Reservoir, and Deadman's Basin Reservoir. Numerous small streams, ponds, reservoirs, lakes, seasonal streams, and stock ponds are located throughout the area.

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

The 24 county seats represented in this EA have a very large variance in population totals (eight county seats have less than 1,000 residents, seven have 1,000-1,999 residents, three have 2,000-2,999 residents, two have 3,000-3,999 residents, two have 4,000-4,999 residents, one has over 8,000 residents, and one nearly 104,000 residents.) The county seat of Golden Valley County is Ryegate with a population of 236 and the county seat of Yellowstone County is Billings with a population of 110,323 (approximately 10% of the total state population). Miles City, the county seat of Custer County, has the second largest population with 8,647. Jordan, with a population of 381, is the second smallest and the county seat of Garfield County.

There are three Indian Reservations within the boundaries of this EA. They are the Crow Indian Reservation within parts of Big Horn and Yellowstone Counties, the Fort Peck Indian

Reservation within parts of Roosevelt, Daniels, Sheridan, and Valley Counties, and the Northern Cheyenne Indian Reservation in parts of Big Horn and Rosebud Counties.

Custer National Forest covers portions of southern Rosebud and eastern Powder River Counties, north central and eastern Carter County, southeastern and southwestern areas in Carbon County, and southern Stillwater and Sweet Grass Counties. A small portion of Lewis and Clark National Forest is in the northwest areas of Golden Valley and Wheatland Counties.

In addition to the National Forests, other major recreational areas include Fort Peck Lake, Bighorn Lake, Missouri River, Yellowstone River, Bighorn River, Tongue River Reservoir, Deadman's Basin Reservoir, Cooney Reservoir, Charles M. Russell National Wildlife Refuge, Medicine Lake National Wildlife Refuge, Makoshika State Park, Medicine Rocks State Park, Little Bighorn Battlefield, BLM lands including Pompey's Pillar National Monument, and many smaller wildlife refuges, historic sites and numerous streams, rivers, lakes, and other bodies of water used for recreational activities.

B. Site-Specific Considerations

1. Human Health

The population of the area covered by this EA is concentrated primarily in cities and towns. Hospitals are located in Baker (population – 1,990), Billings (110,323), Circle (619), Columbus (2,028), Culbertson (804), Ekalaka (353), Forsyth (1,869), Glendive (5,332), Hardin (3,829), Harlowton (984), Jordan (399), Miles City (8,647), Plentywood (1,904), Poplar (854), Red Lodge (2,237), Roundup (1,840), Scobey (1,032), Sidney (6,566), Terry (609), and Wolf Point (2,806). In addition licensed ambulance service is available in Absarokee (1,234, 2010 Census), Big Timber (1,645), Bridger (732), Broadus (481), Colstrip (2,311), Fairview (922), Hysham (312), Joliet (640), Judith Gap (123), Lame Deer (2,018, 2010 Census), Laurel (6,865), Lodge Grass (446), Lustre (200), Nye (272, 2010 Census), Park City (870, 2010 Census), Richey (187), Savage (714), Wibaux (649), and Worden (506). Schools are located in most of the cities and towns. Since treatments are conducted in rural rangeland, no impact to these facilities is expected. Agriculture is a primary economic factor for the area and single rural dwellings are widely scattered throughout the region. In the event a rural school house or inhabited dwelling is encountered, Program mitigation measures will be implemented to ensure no treatments occur within the required buffer zones and impacted residents are notified prior to treatment.

Potential exposures to the general public from traditional application rates are infrequent and of low magnitude. These low exposures to the public pose little risk of direct toxicity, carcinogenicity, neurotoxicity, genotoxicity, reproductive toxicity, or developmental toxicity. Program use of carbaryl, malathion, and diflubenzuron had occurred routinely in many past programs, and there is a lack of any adverse health effects reported from these projects. Therefore, routine safety precautions are anticipated to continue to provide adequate protection of worker health. Immunotoxic effects from carbaryl and malathion exposure are generally expected at concentrations much higher than those from grasshopper applications, but individuals with allergic or hypersensitive reactions to the insecticides or other chemicals in the formulated product could be affected. These individuals will be advised to avoid treatment areas at the time of application until the insecticide has time to dry on the treated vegetation.

2. Nontarget Species

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

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

3. Socioeconomic Issues

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

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

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

Ranchers displaced from grazing lands due to early loss of forage from insect damage will be forced to search for other rangeland, sell their livestock prematurely or purchase feed hay. It will affect other ranchers by increasing demand, and consequently, cost for hay and/or pasture in the area. This will have a beneficial effect on those providing the hay or range, and a negative impact on other ranchers who use these same resources throughout the area. In addition, grazing on impacted lands will compound the effects to vegetation of recent drought conditions over the last five years (e.g., continual heavy utilization by grasshoppers/crickets, wildlife and wildfire), resulting in longer-term impacts (e.g., decline or loss of some preferred forage species) on grazing forage production on these lands. The lack of treatment would result in the eventual magnification of grasshopper problems resulting in increased suppression efforts, increased suppression costs, and the expansion of suppression needs onto lands where such options are limited. For example, control needs on crop lands where chemical options are restricted because of pesticide label restrictions. Under the no action alternative, farmers would experience economic losses. The suppression of grasshoppers in the affected area would have beneficial economic impacts to local landowner, farmers and beekeepers. Crops near infested lands would be protected from grasshopper and Mormon cricket outbreaks., resulting in higher crop production; hence, increased monetary returns.

4. Cultural Resources and Events

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

5. Special Considerations for Certain Populations

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

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

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

Three Indian Reservations exist within the boundaries of this EA. They are the Crow Indian Reservation (11,357 members), the Fort Peck Indian Reservation (11,876 members), and the Northern Cheyenne Indian Reservation (10,840 members). Member numbers are approximations and may or may not include tribal members living off and/or near each of the reservations.

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

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

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

IV. Environmental Consequences

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

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

A. Environmental Consequences of the Alternatives

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

1. No Action Alternative

Under this alternative, APHIS would not fund or participate in any 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 general 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 seed production, and loss of important plant species, or seed production may lead to reduced diversity of 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 significantly high 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. Local communities could see adverse economic impacts to the entire area.

Grasshoppers that infest rangeland could move to surrounding croplands. Farmers could incur economic losses from attempts to chemically control grasshopper populations or due to the loss of their crops. The general public could see an increase in the cost of meat, crops, and their byproducts.

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

Under Alternative 2, APHIS would participate in grasshopper programs with the option of using one of the insecticides carbaryl, diflubenzuron, or malathion, depending upon the various factors related to the grasshopper outbreak and the site-specific characteristics. The use of an insecticide would typically occur at half the conventional application rates following the RAATs strategy. APHIS would apply a single treatment to affected rangeland areas in an attempt 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).

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). 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 lepidopterans (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).

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.

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

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

c) Malathion

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

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

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

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

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

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

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

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

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

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

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

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

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

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

d) Reduced Area Agent Treatments (RAATs)

The use of RAATS is the most common application method for all program insecticides and would continue to be so accept in rare pest conditions that warrant full coverage and higher rates. The goal of the RAATs strategy is to suppress grasshopper populations to a desired level, rather than to reduce those populations to the greatest possible extent. This strategy has both economic and environmental benefits. APHIS would apply a single application of insecticide per year, typically using a RAATs strategy that decreases the rate of insecticide applied by either using lower insecticide concentrations, or by alternating one or more treatment swaths. Usually RAATs applications use both options. 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 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). 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.

3. Experimental Treatments Alternative

Experimental *Metarhizium robertsii* Applications

Metarhizium is a common entomopathogenic fungus genus containing several species, all of which are host-restricted to the Arthropoda, with some having greater host specificity to an insect family, or even a group of related genera. Once considered a single species based on morphology but split into a number of species based on DNA sequence data, the genus is found worldwide and is commonly used as a management alternative to chemicals (USDA, 2000; Lomer et al., 2001; Zimmerman, 2007; Roberts, 2018; Zhang et al. 2019). Two *Metarhizium*, *M. brunneum* strain F52 and *M. anisopliae* ESF1, are registered with the USEPA as insecticides and are commercially used against a range of pest insects.

No harm is expected to humans from exposure to *Metarhizium* by ingestion, inhalation, or touching products containing this active ingredient. No toxicity or adverse effects were seen when the active ingredient was tested in laboratory animals. *M. anisopliae* has undergone extensive toxicology testing for its registration in Africa and the registration of Green Guard in Australia. There has been no demonstrated adverse effect on humans from these products. There is a potential for an allergic reaction to dry conidia if a person is extensively exposed to the product and has a preexisting allergy to fungal spores. *Metarhizium* use in this program is not expected to cause adverse impacts to soil, water, or air. No adverse impacts from the use of *Metarhizium* biopesticides have been observed in almost 20 years of field trials in other countries.

From 2005 to 2017, a large project (led by Donald W. Roberts, Utah State University, in collaboration with USDA and others, and funded by APHIS-PPQ-S&T) was undertaken to collect 38,052 soil samples from across the 17 western states, from areas that were historically known to have large populations of grasshoppers and/or Mormon crickets. The purpose of these collections was to locate a domestic alternative to the nonindigenous *M. acridum*, used around the world for management of grasshopper (usually locust) populations, particularly in Australia and sub-Sahelian Africa, but also in Mexico and Brazil. The use of such a pathogen would be highly useful to the Program as a biopesticide. Approximately 2,400 new isolates of *Metarhizium* spp., *Beauveria* spp. and other entomopathogenic fungi were found. Many of these fungi isolates were selected for lab and field trials with grasshoppers and Mormon crickets, the most promising being strain DWR2009 belonging to the species *M. robertsii* (Bischoff et al., 2009). The DWR2009 isolate is still undergoing lab and field testing for efficacy against orthopterans. This species is closely related to *M. anisopliae*, which is commonly found worldwide and discernible only on the basis of diagnostic DNA sequences (Roberts, 2018).

There is the potential for prolonged persistence in the environment of a domestic isolate from one area brought to another. Despite this possibility, potential environmental impact is minimal given the widespread and common nature of *Metarhizium* in the western United States and because the DWR2009 isolate have been chosen for their optimized effects on orthopterans (Roberts, 2018). Although entomopathogenic fungi can reduce grasshopper populations, a substantial portion of the treated population are able to resist the infection through thermoregulation. Molecular systematics analyses (by the Roberts Lab; Bischoff et al., 2009; Kepler et al., 2014; Mayerhofer et al., 2019) revealed DWR2009 is very closely related to many other strains within *M. robertsii*, all of which are basically biologically equivalent to each other. In fact, *Metarhizium robertsii* can only be really differentiated from other species by a multiplexed PCR assay based on two gene sequences. Furthermore, it is likely that persistence effects would mirror those found to be the case for *M. anisopliae* and *M. acridum*. Both of these species need optimal temperature ranges to thrive, as well as relatively humid conditions (Zimmerman, 2007; EA, 2010). In particular, *M. acridum* does not persist in semi-arid and arid environments, which is what rangeland habitats are, where U.S. grasshopper outbreaks occur (EA, 2010). If the DWR2009 strain derived biopesticide is spread outside of the experimental plots exceptional rates of fungal infection are not anticipated. Since *M. anisopliae* is a generalist entomopathogen, lethal effects on non-target arthropods have been reported, but are more commonly observed in laboratory experiments than in the field. Plus, such effects are dependent on how the pathogen is applied; i.e., its intended target and application method play roles in non-target effects (Zimmerman, 2007). During experiments, the Rangeland Unit will spray ultra-low volumes (on 10 acres or less) of DWR2009 on grasshopper and Mormon cricket species from aircraft, or through the FAASSTT system. The Rangeland Unit may also coat small amounts of grasshopper bait with the DWR2009.

For the following four reasons, overall environmental impact by experimental studies utilizing *Metarhizium robertsii* applications should not be significant: **1)** various strains of the pathogen are already common in rangeland habitats; **2)** "behavioral fever" enables species to often "burn out" the infection by basking, allowing infected grasshoppers and Mormon crickets to escape death by mycosis; **3)** fungal pathogens are fairly susceptible to heat and ultraviolet light, greatly reducing the environmental persistence of spores to a few days on treated foliage or ground; and **4)** at least three days of 98-100% relative humidity is required for fungal outgrowth and sporulation (reproduction) from infected cadavers (Lomer et al., 2001; Zimmerman, 2007; EA, 2010; Roberts, 2018).

Experimental LinOilEx Applications

LinOilEx (Formulation 103) is a non-traditional pesticide alternative still in the early stages of development. Its mode of action appears to be topical, often inducing a "freezing" effect in treated specimens whereby they appear to have been mid-movement when they die. Previous studies by its creator using locusts and katydids showed promise in its efficacy (Abdelatti and Hartbauer, 2019). Initial Mormon cricket microplot field studies and grasshopper lab studies are intriguing and warrant further field investigations via microplot cage experiments. The formulation is proprietary, but includes linseed oil, lecithin, wintergreen oil, and caraway oil mixed into a bicarbonate emulsion.

Target effects on locust and katydids in initial studies were high while non-target results were mixed, with one tested beetle species, as well as wheat seedlings, experiencing almost no impact. Another tested beetle species did experience relatively high mortality, but well-below target levels (Abdelatti and Hartbauer, 2019). The mode of action appears to be topical, meaning that direct contact with the formulation is needed to induce mortality. The Rangeland Unit's initial studies demonstrated that indirect contact, by spraying vegetation, did not induce mortality. Together, these data suggest that overall environmental impact by experimental studies utilizing LinOilEx applications is expected to be relatively minimal.

B. Other Environmental Considerations

1. Cumulative Impacts

Cumulative impact, as defined in the Council on Environmental Quality (CEQ) NEPA implementing regulations (40 CFR § 1508.7) "is the impact on the environment which results from the incremental impact of the action when added to the past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time."

Potential cumulative impacts associated with the No Action alternative where APHIS would not take part in any grasshopper suppression program include the continued increase in grasshopper populations and potential expansion of populations into neighboring range and cropland. In addition, State and private land managers could apply insecticides to manage grasshopper populations however, land managers may opt not to use RAATs, which would increase insecticides applied to the environment. Increased insecticide use from the lack of coordination and RAAT applications where suitable could increase the exposure risk to non-target species and the environment. In addition, land managers may not employ the extra program measures designed to reduce exposure to the public and the environment.

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. Herbicide treatments for invasive plant species may occur. However, the vast majority of the land where program treatments occur is uncultivated rangeland and additional treatments by land owners or managers are very uncommon making possible cumulative or synergistic chemical effects extremely unlikely.

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

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

The proposed experimental treatments are short-term and would take place in a very limited area. The purpose of the field tests conducted by the Rangeland Unit will help determine whether APHIS would eventually include *Metarhizium robertsii* (isolate DWR2009) based biopesticides as an option for the Program. The data generated by these studies would likely be used as part of the EPA registration process for this biopesticide. Inclusion of effective and environmentally friendly insecticides would provide the Program additional control options for grasshoppers and Mormon crickets in sensitive habitats. If successful, the use of *M.*

robertsii could decrease the amount of chemical insecticides used in rangeland against grasshoppers and Mormon crickets.

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

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

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

Three Indian Reservations exist within the boundaries of this EA. They are the Crow Indian Reservation (11,357 members), the Fort Peck Indian Reservation (11,876 members), and the Northern Cheyenne Indian Reservation (10,050 members). Member numbers are approximations and may or may not include tribal members living off and/or near each of the reservations.

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

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

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

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

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

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

Impacts on children will be minimized by the implementation of the treatment guidelines:

Aerial Broadcast Applications (Liquid Chemical Methods)

- Notify all residents within treatment areas, or their designated representatives, prior to proposed operations. Advise them of the control method to be used, the proposed method of application, and precautions to be taken (e.g., advise parents to keep children and pets indoors during ULV treatment). Refer to label recommendations related to restricted entry period.
- No treatments will occur over congested urban areas. For all flights over congested areas, the contractor must submit a plan to the appropriate Federal Aviation Administration District Office and this office must approve of the plan; a letter of authorization signed by city or town authorities must accompany each plan. Whenever possible, the program plans aerial ferrying and turnaround routes to avoid flights over congested areas, bodies of water, and other sensitive areas that are not to be treated.

Aerial Application of Baits (Dry Chemical Methods)

- Do not apply within 500 feet of any school or recreational facility.

Ultra-Low-Volume Aerial Application (Liquid Chemical Methods)

- Do not spray while school buses are operating in the treatment area.
- Do not apply within 500 feet of any school or recreational facility.

4. Tribal Consultation

Executive Order 13175 "Consultation and Coordination with Indian Tribal Governments," calls for agency communication and collaboration with tribal officials when proposed Federal actions have potential tribal implications. The Archaeological Resources Protection Act of

1979 (16 U.S.C. §§ 470aa-mm), secures the protection of archaeological resources and sites on public and tribal lands.

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

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

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

Executive Order 13186 directs Federal agencies taking actions with a measurable negative effect on migratory bird populations to develop and implement a Memorandum of Understanding with the USFWS that promotes the conservation of migratory bird populations. On August 2, 2012, a Memorandum of Understanding between APHIS and the USFWS was signed to facilitate the implementation of this Executive Order.

In accordance with Executive Order 13186, MBTA, APHIS will support the conservation intent of the migratory bird conventions by integrating bird conservation principles, measures, and practices into agency activities and by avoiding or minimizing, to the extent practicable, adverse impacts on migratory bird resources when conducting agency actions. Impacts 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 (listed) species, or result in the destruction or adverse modification of critical habitat. Numerous federally-listed species and areas of designated critical habitat occur within the 17-State program area, although not all occur within or near potential grasshopper suppression areas or within the area under consideration by through this EA.

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

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

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

APHIS has determined that the suppression program will have no effect on Canada lynx *(Lynx canadensis)* or white sturgeon *(Acipenser transmontanus)* critical habitat, and may affect, but is unlikely to adversely affect critical habitat for the piping plover *(Charadrius melodus)* or bull trout *(Salvelinus confluentus).* Further analysis can be found in Appendix 4

The United States Fish and Wildlife Services provided APHIS a letter of concurrence on June 3, 2020 (Appendix 4)

7. Bald and Golden Eagle Protection Act

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

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

8. Additional Species of Concern

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

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

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

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

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

General Guidelines for Treatment

1. Notify BLM local and state offices in a timely manner of proposed treatments.
2. Coordinate with local BLM offices to identify areas containing sensitive

status species (see the BLM Montana list).

3. Coordinate with local BLM offices to identify exclusion areas, other mitigation measures, and sensitive site monitoring needed for the protection of important fish, wildlife, and plant habitat.

Mitigation Measures for Sage-grouse

1. RAATs are to be used in all sage-grouse habitat and for crop protection in priority sage-grouse areas.
2. Exclude priority areas from treatment in May.
3. No disruptive activity[2] within sage-grouse priority areas or within 3 miles of a sage-grouse lek outside of these areas from March 15 – June 30.
4. Treat priority areas through aerial application only and limit ground treatments within 3 miles of a sage-grouse lek outside a priority area to after June 30.
5. Avoid treatment in wet meadows areas as identified by field offices as important for sage-grouse brood rearing.
6. Use Malathion and Carbaryl inside priority areas only with approval from local field manager.
7. Provide local and state BLM offices with effectiveness monitoring results including grasshopper density before and after treatment.

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

9. Fires and Human Health Hazards

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

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

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

10. Cultural and Historical Resources

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

V. Literature Cited

Abdelatti1, Z.A.S., and Hartbauer, M. 2019. Plant oil mixtures as a novel botanical pesticide to control gregarious locusts. Journal of Pest Science. https://doi.org/10.1007/s10340-019-01169-7

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

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

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

Bischoff, J.F., S.A. Rehner, R.A. Humber. 2009. A multilocus phylogeny of the *Metarhizium anisopliae* lineage. Mycologia. 101(4):512-30.

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

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

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

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

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

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

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

Catangui, M.A., Fuller, B.W., and Walz, A.W., 1996. Impact of Dimilin® on nontarget arthropods and its efficacy against rangeland grasshoppers. *In* U.S. Department of Agriculture, Animal and Plant Health Inspection Service, 1996. Grasshopper

Integrated Pest Management User Handbook, Tech. Bul. No. 1809. Sec. VII.3. Washington, DC.
Cooper, R. J., K. M. Dodge, P. J. Marinat, S. B. Donahoe, and R. C. Whitmore. 1990. Effect of diflubenzuron application on eastern deciduous forest birds. J. Wildl. Mgmt. 54:486-493.
Cordova, D., E. Benner, M. D. Sacher, J. J. Rauh, J. S. Sopa, G. Lahm, T. Selby, T. Stevenson, L. Flexner, S. Gutteridge, D. F. Rhoades, L. Wu, R. M. Smith, and Y. Tao. 2006. Anthranilic diamides: a new class of insecticides with a novel mode of action, ryanodine receptor activation. Pesticide Biochemistry and Physiology 84:196-214.
Deakle, J. P. and J. R. Bradley, Jr. 1982. Effects of early season applications of diflubenzuron and azinphosmethyl on populations levels of certain arthropods in cotton fields. J. Georgia Entomol. Soc. 17:189-200.
Deneke, D. and J. Keyser. 2011. Integrated Pest Management Strategies for Grasshopper Management in South Dakota. South Dakota State University Extension.
Dinkins, M. F., A. L. Zimmermann, J. A. Dechant, B. D. Parkins, D. H. Johnson, L. D. Igl, C. M. Goldade, and B. R. Euliss. 2002. Effects of Management Practices on Grassland Birds: Horned Lark Northern Prairie Wildlife Research Center. Page 34. Northern Prairie Wildlife Research Center, Jamestown, ND.
Dobroski, C. J., E. J. O'Neill, J. M. Donohue, and W. H. Curley. 1985. Carbaryl: a profile of its behaviors in the environment. Roy F. Weston, Inc. and V.J. Ciccone and Assoc., Inc., West Chester, PA; Woodbridge, VA.
Eisler, R. 1992. Diflubenzuron Hazards to Fish, Wildlife, and Invertebrate: A Synoptic Review. U.S. Department of Interior, Fish and Wildlife Service, Washington, D.C.
Eisler, R., 2000. Handbook of chemical risk assessment: health hazards to humans, plants, and animals. Lewis Publishers, New York.
El-Refai, A. and T. L. Hopkins. 1972. Malathion adsorption, translocation, and conversion to malaoxon in bean plants. J. Assoc. Official Analytical Chemists 55:526-531.
Environmental Assessment, December 2010: Field Study Using *Metarhizium acridum*, a Mycoinsecticide for Control of Grasshoppers
Fischer, S. A. and L. W. Hall, Jr. 1992. Environmental concentrations and aquatic toxicity data on diflubenzuron (Dimilin). Critical Rev. in Toxicol. 22:45-79.
Follett, R. F. and D. A. Reed. 2010. Soil carbon sequestration in grazing lands: societal benefits and policy implications. Rangeland Ecology & Management 63:4-15.
Foster, R. N., K. C. Reuter, K. Fridley, D. Kurtenback, R. Flakus, R. Bohls, B. Radsick, J. B. Helbig, A. Wagner, and L. Jeck. 2000. Field and Economic Evaluation of Operational Scale Reduced Agent and Reduced Area Treatments (RAATs) for Management of Grasshoppers in South Dakota Rangeland. U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Plant Protection and Quarantine, Phoenix, AZ.
George, T. L., L. C. McEwen, and B. E. Peterson. 1995. Effects of grasshopper control programs on rangeland breeding bird populations. J. Range Manage. 48:336–342.

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

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

Havstad, K. M., D. P. Peters, R. Skaggs, J. Brown, B. Bestelmeyer, E. Fredrickson, J. Herrick, and J. Wright. 2007. Ecological services to and from rangelands of the United States. Ecological Economics 64:261-268.

Howe, F. P. 1993. Effects of Grasshopper Insecticide Application on Diet, Food Delivery Rates, Growth, and Survival of Shrubsteppe Passarine. Page 108 PhD dissertation. Colorado State University, Fort Collins, CO.

Howe, F. P., R. L. Knight, L. C. McEwen, and T. L. George. 1996. Direct and indirect effects of insecticide applications on growth and survival of nestling passerines. Ecol. Appl. 6:1314-1324.

Kar, A., K. Mandal, and B. Singh. 2012. Environmental fate of cholorantraniliprole residues on cauliflower using QuEChERS technique. Environ. Monit. Assess 85:1255-1263.

Keever, D. W., J. R. Bradley, Jr, and M. C. Ganyard. 1977. Effects of diflubenzuron (Dimilin) on selected beneficial arthropods in cotton fields. J. Econ. Entomol. 6:832-836.

Kepler, R.M., R.A., Humber, J.F. Bischoff, S.A. Rehner. 2014. Clarification of generic and species boundaries for *Metarhizium* and related fungi through multigene phylogenetics. Mycologia.106(4):811-29.

LaFleur, K. S. 1979. Sorption of pesticides by model soils and agronomic soils: rates and equilibria. Soil Sci. 127:94-101.

Larsen, J. and R. N. Foster. 1996. Using Hopper to Adapt Treatments and Costs to Needs and Resources. U.S. Department of Agriculture, Animal and Plant Health Inspection Service Grasshopper Integrated Pest Management User Handbook, Washington, D.C.

Larson, J. L., C. T. Redmond, and D. A. Potter. 2012. Comparative impact of an antrhanilic diamide and other insecticidal chemistries on beneficial invertebrates and ecosystem services in turfgrass. Pest Management Science 68:740-748.

Latchininsky, A., G. Sword, M. Sergeev, M. Cigiliano, and M. Lecoq. 2011. Locusts and grasshoppers: behavior, ecology, and biogeography. Psyche 2011:1-4.

Lockwood, J. A. and S. P. Schell. 1997. Decreasing economic and environmental costs through reduced area and agent insecticide treatments (RAATs) for the control of rangeland grasshoppers: empirical results and their implications for pest management. J. Orthoptera Res. 6:19-32.

Lockwood, J., S. Schell, R. Foster, C. Reuter, and T. Rahadi. 2000. Reduced agent-area treatments (RAAT) for management of rangeland grasshoppers: efficacy and economics under operational conditions. International Journal of Pest Management 46:29-42.

Lockwood, J. A. and A. Latchininsky. 2000. The Risks of Grasshoppers and Pest Management to Grassland Agroecosystems: An International Perspective on Human Well-Being and Environmental Health. Pages 193-215 in A. Latchininsky and M. Sergeev, editors. Grasshoppers and Grassland Health. Kluwer Academic Publishers.

Lockwood, J., R. Anderson-Sprecher, and S. Schell. 2002. When less is more: optimization of reduced agent-area treatments (RAATs) for management of rangeland grasshoppers. Crop Protection 21:551-562.

Lomer, C.J., R.P. Bateman, D.L. Johnson, J. Langewald, and M. Thomas. 2001. Biological control of locusts and grasshoppers. Annual Review of Entomology. 46:667-702.

Matsumara, F. 1985. Toxicology of insecticides. Plenum Press, New York.

Mayerhofer, J., A. Lutz, F. Dennert, S.A. Rehner, R.M. Kepler, F. Widmer, J. Enkerli. 2019. A species-specific multiplexed PCR amplicon assay for distinguishing between *Metarhizium anisopliae*, *M. brunneum*, *M. pingshaense*, and *M. robertsii*. Journal of Invertebrate Pathology. 161(1): 23-28.

McEwen, L.C., Althouse, C.M., and Peterson, B.E., 1996. Direct and indirect effects of grasshopper integrated pest management (GHIPM) chemicals and biologicals on nontarget animal life. *In* U.S. Department of Agriculture, Animal and Plant Health Inspection Service, 1996. Grasshopper Integrated Pest Management User Handbook, Tech. Bul. No. 1809. Sec. III.2. Washington, DC.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Roberts, D.W. 2018. FINAL REPORT 2008-2017. Cooperative Agreement #14-8130-0348-CA, USDA-APHIS-PPQ. Pp.1-137.

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

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

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

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

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

Smith, D. I., J. A. Lockwood, A. V. Latchininsky, and D. E. Legg. 2006. Changes in non-target populations following applications of liquid bait formulations of

insecticides for control of rangeland grasshoppers. Internat. J. Pest Mgt. 52:125-139.
Stanley, J. G. and J. G. Trial. 1980. Disappearance constants of carbaryl from streams contaminated by forest spraying. Bul. Environ. Contam. Toxicol. 25:771-776.
Swain, J. L. 1986. Effect of Chemical Grasshopper Controls on Non-Target Arthropods of Rangeland in Chaves County, New Mexico. New Mexico State University.
Tepedino, V. J. 1979. The importance of bees and other insect planetaries in maintaining floral species composition. Great Basin Naturalist Memoirs 3:139-150.
Thomson, D. L. K. and W. M. J. Strachan. 1981. Biodegradation of carbaryl in simulated aquatic environment. Bul. Environ. Contam. Toxicol. 27:412-417.
USDA APHIS– see U.S. Department of Agriculture, Animal and Plant Health Inspection Service
U.S. Department of Agriculture, Animal and Plant Health Inspection Service, 1999. APHIS Directive 5600.3, Evaluating APHIS programs and activities for ensuring protection of children from environmental health risks and safety risks. September 3, 1999. U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Riverdale, MD. [online] available: http://www.aphis.usda.gov/library/directives.
U.S. Department of Agriculture, Animal and Plant Health Inspection Service. 2000. Grasshopper Integrated Pest Management User Handbook: Section I. Biological Control.
U.S. Department of Agriculture, Animal and Plant Health Inspection Service. 2015. Biological Assessment for the APHIS Rangeland Grasshopper and Mormon Cricket Suppression Program. Page 162. U.S. Department of Agriculture, Animal and Plant Health Inspection Service.
U.S. Department of Agriculture, Animal and Plant Health Inspection Service. 2016. APHIS Rangeland Grasshopper/Mormon Cricket Suppression Program Aerial Application, Statement of Work. Page 39 pp. U.S. Department of Agriculture, Animal and Plant Health Inspection Service.
U.S. Department of Agriculture, Animal and Plant Health Inspection Service. 2018a. Human Health and Ecological Risk Assessment for Carbaryl Rangeland Grasshopper and Mormon Cricket Suppression Applications. United States Department of Agriculture, Animal and Plant Health Inspection Service.
U.S. Department of Agriculture, Animal and Plant Health Inspection Service. 2018c. Human Health and Ecological Risk Assessment for Diflubenzuron Rangeland Grasshopper and Mormon Cricket Suppression Applications. United States Department of Agriculture, Animal and Plant Health Inspection Service.
U.S. Department of Agriculture, Animal and Plant Health Inspection Service. 2018d. Human Health and Ecological Risk Assessment for Malathion Rangeland Grasshopper and Mormon Cricket Suppression Applications. United States Department of Agriculture, Animal and Plant Health Inspection Service.
USDA FS. 2004. Control/eradication agents for the gypsy moth—human health and ecological risk assessment for diflubenzuron (final report). United States Department of Agriculture, Forest Service
USDA FS. 2008. Malathion- Human Health and Ecological Risk Assessment. U.S. Department of Agriculture, Forest Service.

USEPA – See U.S. Environmental Protection Agency
U.S. Environmental Protection Agency. 1997. Reregistration Eligibility Decision (RED): Diflubenzuron. U.S. Environmental Protection Agency.
U.S. Environmental Protection Agency. 2000a. Malathion Reregistration Eligibility Document Environmental Fate and Effects. Page 146. U.S. Environmental Protection Agency, Office of Prevention, Pesticides and Toxic Substances.
U.S. Environmental Protection Agency. 2000b. Reregistration Eligibility Decision (RED) for Malathion. U.S. Environmental Protection Agency.
USEPA. 2003. Environmental Fate and Ecological Risk Assessment for Re-Registration of Carbaryl. U.S. Environmental Protection Agency.
U.S. Environmental Protection Agency. 2006. Malathion Reregistration Eligibility Document. Page 147. U.S. Environmental Protection Agency, Office of Pesticide Programs.
U.S. Environmental Protection Agency. 2007. Reregistration Eligibility Decision (RED) for Carbaryl. Page 47. U.S. Environmental Protection Agency, Prevention, Pesticides and Toxic Substances.
U.S. Environmental Protection Agency. 2012a. Fyfanon ULV AG. U.S. Environmental Protection Agency.
U.S. Environmental Protection Agency. 2012c. Sevin XLR Plus Label. Pages 1-40 Pesticide Product and Label System. U.S. Environmental Protection Agency.
U.S. Environmental Protection Agency. 2015a. Annual Cancer Report 2015, Chemicals Evaluated for Carcinogenic Potential Page 34. U.S. Environmental Protection Agency, Office of Pesticide Programs.
U.S. Environmental Protection Agency. 2015b. Memorandum - Diflubenzuron: human health risk assessment for an amended Section 3 registration for carrot, peach subgroup 12-12B, plum subgroup 12-12C, pepper/eggplant subgroup 8010B, cottonseed subgroup 20C, alfalfa (regional restrictions) and R175 Crop Group Conversion for tree nut group 14-12. Page 71 U.S. Environmental Protection Agency, Office of Pesticide Programs.
U.S. Environmental Protection Agency. 2016a. Appendix 3-1: Environmental transport and fate data analysis for malathion. In: Biological Evaluation Chapters for Malathion ESA Assessment.
U.S. Environmental Protection Agency. 2016b. Chapter 2: Malathion Effects Characterization for ESA Assessment. In: Biological Evaluation Chapters for Malathion ESA Assessment.
U.S. Environmental Protection Agency. 2016c. Malathion: Human Health Draft Risk Assessment for Registration Review. Page 258. U.S. Environmental Protection Agency.
U.S. Environmental Protection Agency. 2017a. Memorandum - Carbaryl: Draft Human Health Risk Assessment in Support of Registration Review. Page 113 U.S. Environmental Protection Agency.
U.S. Environmental Protection Agency. 2017b. Prevathon Label. U.S. Environmental Protection Agency.
U.S. Environmental Protection Agency. 2018. Preliminary Risk Assessment to Support the Registration Review of Diflubenzuron.

USFWS. 2007. National Bald Eagle Management Guidelines. Page 23 pp. U.S. Fish and Wildlife Service.
Wakeland, C. and W. E. Shull. 1936. The Mormon cricket with suggestions for its control, Extension Bulletin No. 100. University of Idaho, College of Agriculture, Idaho Agricultural Extension.
Zhang, L., M. Lecoq, A. Latchininsky, and D. Hunter. 2019. Locust and grasshopper management. Annual Review of Entomology. 64:15-34.
Zimmermann, G. 2007. Review on safety of the entomopathogenic fungus *Metarhizium anisopliae*, Biocontrol Science and Technology, 17(9):879920.doi:10.1080/09583150701593963
Zinkl, J. G., C. J. Henny, and L. R. DeWeese. 1977. Brain cholinesterase activities of birds from forests sprayed with trichlorfon (Dylox) and carbaryl (Sevin 4-oil). Bul. Environ. Contam. Toxicol. 17:379-386.

VI.Listing of Agencies and Persons Consulted

PPQ- Science and Technology
PPQ- Field Operations
PPQ- Policy and Management

Alvin Not Afraid, Chairman Crow Nation
159 U.S. Highway 212
Crow Agency, MT 59022
AJ.NotAfraid@crow-nsn.gov

Floyd Azure, Chairman
Fort Peck Tribe
501 Medicine Bear Rd
P.O. Box 1027
Poplar, MT 59255
fazure@fortpecktribes.net

Rynalea Pena, President
Northern Cheyenne Tribal Council
600 S Cheyenne Ave
P.O. Box 128
Lame Deer, MT 59043
Rynalea.Pena@CheyenneNation.com

Charlene Alden, Environmental Director
Northern Cheyenne Environmental Protection
P.O. Box 128
Lame Deer, MT 59043
charlene.alden@cheyennenation.com

Gene Small, Director
Northern Cheyenne Land Authority
P.O. Box 128
Lame Deer, MT 59043
gene.small@cheyennenation.com

Ernestine Spang, DES Coordinator
Northern Cheyenne Tribe
P.O. Box 128
Lame Deer, MT 59043
emslamedeer@rangeweb.net

Henry Thompson, Director, Cooperative Extension Service
Chief Dull Knife College 1 College Drive
P.O. Box 98
Lame Deer, MT 59043
henry@cdkc.edu

Latonna Old Elk, Project Director
Little Big Horn College 1 Forestry Lane
P.O. Box 370
Crow Agency, MT 59022
latonna@lbhc.edu

Connie Howe, Environmental Director
Crow Environmental Protection
P.O. Box 159
Crow Agency, MT 59022
connie.howe@crow-nsn.gov

Thomas Ten Bear, Cabinet Head
Crow Tribe Natural Resources
P.O. Box 159
Crow Agency, MT 59022
Thomas.Ten.Bear@Crow-nsn.gov

Deb Madison, Environmental Programs Manager
Fort Peck Office of Environmental Protection
P.O. Box 1027
Poplar, MT 59255
2horses@nemontel.net

Rob Magnan, Director
Fort Peck Fish & Game
P.O. Box 1027
Poplar, MT 59255
robertm@nemontel.net

Myrna Walking Eagle, Director
Fort Peck Natural Resources
P.O. Box 1027
Poplar, MT 59255
mwalkingeagle@fortpecktribes.net

Wilhelmina "Willie" Keenan, Division Manager
Confederated Salish & Kootenai Tribes
Environmental Protection Division of Environmental Protection
P.O. Box 278

Pablo, MT 59855
willie.keenan@cskt.org

Jasmine Brown, U. S. EPA R 8 Tribal Circuit Rider Pesticide Program Manager
Confederated Salish and Kootenai Tribes
Federal Credential Inspector
Division of Environmental Protection,
USEPA Federal Insecticide Fungicide, Rodenticide Act (FIFRA)
301 Main Street
Polson, MT 59860
Jasmine.Brown@cskt.org

Ryan D. Evans, Pesticides Specialist I,
Confederated Salish & Kootenai Tribes
FIFRA Inspector
Natural Resource Dept.
301 Main Street
Polson, MT 59860
Ryan.Evans@cskt.org

Clifford Serawop, Superintendent
Bureau of Indian Affairs, Crow Agency
P.O. Box 69
Crow Agency, MT 59022
Clifford.Serawop@bia.gov

Howard Bemer, Superintendent
Bureau of Indian Affairs, Fort Peck Agency
U.S. Department of the Interior
P.O. Box 637 Poplar, MT 59255
Howard.bemer@bia.gov

Norma Gourneau, Superintendent
Bureau of Indian Affairs, Northern Cheyenne Agency
U.S. Department of the Interior
P.O. Box 40
Lame Deer, MT 59043
Norma.gourneau@bia.gov

Robert Demery, Soil Conservationist
Bureau of Indian Affairs, Rocky Mountain Region
U.S. Department of the Interior
2021 4th Avenue North
Billings, MT 59101
Robert.Demery@bia.gov

Desmond Rollefson, Regional Biologist
Bureau of Indian Affairs Rocky Mountain Region
U.S. Department of the Interior
2021 4th Avenue North
Billings, MT 59101
Frank.Rollefson@bia.gov

Robin Stewart, Environmental Protection Specialist
Bureau of Indian Affairs
U.S. Department of the Interior
Weaver Dr. Bldg. #2
Crow Agency, MT 59022
robin.stewart@bia.gov

Dan Lucas, Extension Western Region Department Head
MSU Extension
P.O. Box 666
Philipsburg, MT 59858
daniel.lucas@montana.edu

Jeff Chilson, Extension Agent
Roosevelt County Extension Office
P.O. Box 416
Culbertson, MT 59218
Jeffrey.chilson@montana.edu

Sheila Friedrich, Extension Agent
Colleen Buck
Sheridan County Extension Office
100 West Laurel Avenue (Courthouse)
Plentywood, MT 59254
sfriedrich@montana.edu
colleen.buck@montana.edu

Inga Hawbaker, Extension Agent
Daniels County Extension Office
106 Railroad Avenue East
P.O. Box 187
Scobey, MT 59263
inga.hawbaker@montana.edu

Ken Nelson, Extension Agent
McCone County Extension Office
Vejtasa Bldg.
905 B Avenue
Circle, MT 59215

kennelson@montana.edu

Tim Fine, Extension Agent
Richland County Extension Office
1499 N. Central Ave.
Sidney, MT 59270
tfine@montana.edu

Bruce Smith, Extension Agent
Dawson County Extension Office
207 West Bell
Glendive, MT 59330
acxbs@montana.edu

Danielle Harper, Extension Agent
Wibaux County Extension Office
203 South Wibaux St. (Courthouse)
Wibaux, MT 59353
danielle.harper1@montana.edu
Elin Kittelmann, Extension Agent
Fallon/Carter Extension Office
P.0. Box 850
Baker, MT 59313
elin.kittelmann@montana.edu

Tara Andrews, Extension Agent
Mike Schuldt, Extension Agent
Custer County Extension Office
1010 Main St. (Courthouse)
Miles City, MT 59301
tandrews@montana.edu
acxms@montana.edu

Julie Riley, Extension Agent
Mary Rumph, Extension Agent
Powder River County Extension Office
101 Courthouse Square
Broadus, MT 59317
jriley@montana.edu
mrumph@montana.edu

Melissa Ashley, Extension Agent
Rosebud and Treasure County Extension Office
P.O. Box 65
Forsyth, MT 59327
Melissa.Ashley@montana.edu

Callie Colley, Extension Agent
Yellowstone County Extension Office
301 N. 27th St. Suite 330
Billings, MT 59107
Callie.Cooley@montana.edu

Molly Hammond, Extension Agent
Big Horn County Extension Office
317 N. Custer Ave.
Hardin, MT 59034
molly.hammond@montana.edu

Sharla Sackman, Extension Agent
Prairie County Extension Office
217 W. Park St.
Terry, MT 59349
sackman@montana.edu

Nikki Bailey, Extension Agent
Carbon County Extension Office
202 State St.
Joliet, MT 59041
nikki.bailey@montana.edu
Wendy Becker, Extension Agent
Fort Peck Reservation Extension Office
Fort Peck Community College
P.O. Box 1552
Poplar, MT 59255
wbecker@montana.edu

Eric Miller, Extension Agent
Garfield County Extension Office
P.O. Box 81 (Courthouse)
Jordan, MT 59337
emiller@montana.edu

Mat Walter, Extension Agent
Musselshell/Golden Valley County Extension Office
204 Ace Ave. East
Roundup, MT 59072
m.petersonwalter@montana.edu

Lee Schmelzer, Extension Agent
Stillwater County Extension Office
431 Quarry Rd

P.O. Box 807
Columbus, MT 59019
lees@montana.edu

Marc King, Extension Agent
Sweet Grass County Extension Office
515 Hooper Street
Big Timber, MT 59011
mking@montana.edu

Mandie Reed, Extension Agent
Wheatland County Extension Office
201 A Avenue NW
P.O. Box 733
Harlowton, MT 59036
reed@montana.edu

Leonard Berry, Pesticide Compliance Supervisor
Montana Department of Agriculture
P.O. Box 200201
Helena, MT 59620
lberry@mt.gov

Lyle Scott, Plant Science Specialist
Montana Department of Agriculture
315 South 24th Street West Suite 3
Billings, MT 59102
Lyle.Scott@mt.gov

Rick Northrup, Habitat Bureau Chief
Montana Fish, Wildlife and Parks
1420 East Sixth Avenue
Helena, MT 59620
rnorthrup@mt.gov

Ashley Taylor, Wildlife Biologist
Montana Fish, Wildlife and Parks
P.O. Box 7940
Harlowton, MT 59036
ataylor@mt.gov

Jocee Hedrick, Land Use Specialist
Department of Natural Resources and Conservation
1371 Rimtop Drive
Billings, MT 59105
jhedrick@mt.gov

Wendy Velman, Botany Program Lead
Bureau of Land Management
Montana/Dakotas State Office
5001 Southgate Dr.
Billings, MT 59101
wvelman@blm.gov

Ruth Miller, NEPA Lead
Bureau of Land Management
U.S. Department of the Interior
5001 Southgate Drive
Billings, MT 59101
ramiller@blm.gov

Dave Lefevre, Field Manager
Bureau of Land Management
U.S. Department of the Interior
5001 Southgate Drive
Billings, MT 59101
Dlefevre@blm.gov

Michael Philbin, Supervisory Natural Resources Specialist
Bureau of Land Management
U.S. Department of the Interior
5001 Southgate Drive
Billings, MT 59101
mphilbin@blm.gov

John Carlson, Conservation Biologist
Bureau of Land Management
5001 Southgate Drive
Billings, MT 59101
jccarlso@blm.gov

Jennifer Macy, Archaeologist/Planning and Environmental Specialist
Bureau of Land Management
U.S. Department of the Interior
5001 Southgate Drive
Billings, MT 59101
jmacy@blm.gov

Larry Padden, Natural Resource Specialist
Bureau of Land Management
5001 Southgate Drive
Billings, MT 59101
lpadden@blm.gov

Shane Trautner, Rangeland Management Specialist
Bureau of Land Management
U.S. Department of the Interior
5001 Southgate Drive
Billings, MT 59101
strautner@blm.gov

Diane Friez, Field Manager
Bureau of Land Management
U.S. Department of the Interior
111 Garryowen Rd
Miles City, MT 59301
DFriez@blm.gov

Wendy M. Warren, Assistant Manager
Bureau of Land Management
U.S. Department of the Interior
111 Garryowen Rd
Miles City, MT 59301
wwarren@blm.gov

Andy Daniels, Wildlife Biologist
Bureau of Land Management
U.S. Department of the Interior
111 Garryowen Rd
Miles City, MT 59301
adaniels@blm.gov

Jodi Bush, Field Supervisor
Ben Conard, Deputy Field Supervisor
U.S. Fish and Wildlife Service
U.S. Department of the Interior
585 Shepard Way Suite 1
Helena, MT 59601
Jodi_Bush@fws.gov
ben_conard@fws.gov

Kim Reid, Rangeland Management Specialist
U.S. Forest Service
U.S. Department of Agriculture
5001 Southgate Dr. Suite 2
Billings, MT 59101
kreid@fs.fed.us

Ryan Melin, Supervisory Rangeland Management Specialist
Ron Hecker, District Ranger
U.S. Forest Service
U.S. Department of Agriculture
2378 Hwy 212
P.O.Box 168
Ashland, MT 59003
rlmelin@fs.fed.us
rhecker@fs.fed.us

Julia Bryant, Executive Assistant of Indian Affairs
Montana Governor's Office of Indian Affairs
P.O.Box 200801
Helena, MT 59620
Julia.Bryant@mt.gov

VII. Public Comment

Comments to this EA were due to Joey Esilva by **May 25, 2020**.

Joey Esilva
Plant Health Safeguarding Specialist
Joey.esilva@usda.gov
1220 Cole Ave., Helena, MT, 59601
Office: (406) 449-5210
Cell: (406) 661-0113

Appendix 1: APHIS Rangeland Grasshopper and Mormon Cricket Suppression Program FY-2020 Treatment Guidelines

Version 04/10/2020

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

General Guidelines for Grasshopper / Mormon Cricket Treatments

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

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

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

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

5) On APHIS run suppression programs, the Federal government will bear the cost of treatment up to 100 percent on Federal and Tribal Trust land, 50 percent of the cost on State land, and 33 percent of cost on private land. There is an additional 16.15% charge,

however, on any funds received by APHIS for federal involvement with suppression treatments.

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.

6) 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.

7) 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.

8) 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
   i) solid bait
   ii) ultra-low volume (ULV) spray
b) Diflubenzuron ULV spray
c) Malathion ULV spray

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

   Furthermore, provide the following buffers for water bodies:
   - 500-foot buffer with aerial liquid insecticide.
   - 200 foot buffer with ground liquid insecticide.
   - 200-foot buffer with aerial bait.
   - 50-foot buffer with ground bait.

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

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

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

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

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

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

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

SPECIFIC PROCEDURES FOR AERIAL APPLICATIONS

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

   a) Wind velocity exceeds 10 miles per hour (unless state law requires lower wind speed);
   b) Rain is falling or is imminent;
   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.

2020 Operational Procedures

ALL METHODS

1. Follow all applicable Federal, State, Tribal and local environmental laws and regulations in conducting GH&MC suppression treatment operations.

2. Hold public meetings well in advance of proposed programs. Arrange for public announcements to encourage public input into the decision making process.

3. Notify Federal and State land managers and private cooperators of GH&MC infestations on their lands. This program will describe estimated boundaries, severity of infestations, and optimal time frames for treatment and control options. The notifications will request the land manager to advise USDA-APHIS-PPQ of any sensitive areas (e.g., parks, recreation areas, etc.) that may exist in the proposed treatment areas.

4. Obtain request, in writing, from land managers and owners for suppression treatments to be undertaken on their land. When these requests originate as telephone calls, ensure that a follow-up letter is received before the expenditure of USDA-APHIS-PPQ funds.

5. Avoid residences and other premises whose occupants object to their property being treated, except when treatments are mandatory under State law. In cases when State law requires treatment but land owners or occupants object to the treatments, USDA-APHIS-PPQ will cooperate to the extent authorized by Federal and State laws.

6. Endangered Species (also see operational procedures listed under each control method in the EIS).

    a. Formal consultation will be accomplished with the U.S. Fish and Wildlife Service (USFWS) at the national level or designated points of contact. The Portland Regional Office has been designated as the official contact for formal consultation. Communications with the USFWS at the local level will be conducted to consider activities outside the National Biological Opinion.

    b. State-listed endangered and threatened species, Federal candidate species, and other sensitive areas will be addressed in the site-specific Environmental Assessment (EA).

7. Instruct all program personnel in the use of equipment, materials and procedures; supervise to ensure procedures are followed properly.

AERIAL BROADCAST APPLICATIONS (LIQUID CHEMICAL METHODS)

1. Strictly follow all EPA and State approved label instructions for chemical insecticides.

2. Aircraft, dispersal equipment and pilots that do not meet all contract requirements of the 2003 Prospectus will not be allowed to operate on the program.

3. All USDA-APHIS-PPQ employees who plan, supervise, recommend or perform pesticide treatments must be certified under the USDA-APHIS-PPQ Certification Plan. They are also required to know and meet any additional qualifications or requirements of the State wherein they perform duties involving pesticide use.

4. Notify all residents in treatment areas, or their designated representatives, prior to proposed operations. Advise them of the control method to be used, the proposed method of application, and precautions to be taken (e.g., advise parents to keep children and pets indoors during ULV treatment). Refer to label requirements related to restricted entry period.

5. 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.).

6. Provide two-way communication equipment for all field personnel. Communication will be available for continuous contact among all units (including pilots) involved in any program.

7. In advance of any treatment, stock safety kits, thermometers, flagging material, wind gauges, spray-deposit samplers and daily aircraft records, and make them available to relevant personnel.

8. No treatments will occur over congested urban areas. For all flights over congested areas, the contractor must submit a plan to the appropriate FAA District Office and this office must approve of the plan; a letter of authorization signed by city or town authorities must accompany each plan. Whenever possible, plan aerial ferrying and turnaround routes to avoid flights over congested areas, bodies of water, and other sensitive areas that are not to be treated.

9. Pesticide Container Disposal. All insecticide containers must be stored and disposed of properly. Rinse solution for drums may be used as diluent in preparing spray tank mixes, or it may be collected and stored for subsequent disposal in accordance with label instructions. One of the following methods for disposal (listed in order of preference) must be used:

   a. Require chemical companies, distributors, or suppliers to accept the triple-rinsed containers.

   b. Crush and/or puncture the empty triple-rinsed containers, report on Form AD-112 to Property Services, Field Servicing Office, Minneapolis, MN, and dispose of as scrap metal.

   c. Other methods as approved locally in concurrence with Safety, Health and Environmental Security (SHES; Bill Benson, 301-734-5577).

10. Conduct mixing, loading, and unloading in an approved area where an accidental spill will not contaminate a stream or other body of water.

11. In the event of an accidental spill, follow the procedures set forth in PPQ Guidelines for Managing Pesticide Spills (USDA APHIS, *Treatment Manual*, 1996, pages 11.17-11.26).

12. Pre-spray reconnaissance flights may be conducted to ensure that pilots are familiar with program area boundaries, buffer zones, and any other areas that are not to be treated.

13. Notify local law enforcement agencies and fire officials of pesticide storage areas and treatment blocks.

<u>Aerial Application of Baits (Dry Chemical Methods)</u>

1. Do not use blowers for loading baits into the hopper, as blowers can cause packing of baits.

2. The bait-hopper must be dust-tight. It must empty completely with uninterrupted flow, and it must be vented to avoid erratic flow of materials.

3. There must be a dust-tight gate in the hopper throat to avoid leakage during ferry flights when flying over sensitive areas and during turnarounds. Linkage between the gate and its cockpit control handle must be secure. Gate stops are required to ensure that the hopper gate is opened to exactly the same position each time. Screw-type stops are preferred, whereas stops that are adjustable through a series of holes or notches are not acceptable. The gate stop must be at the gate and not in the cockpit on Category A and B aircraft.

4. Aerial Bait
   a. Protective clothing will be worn by all pilots, loaders and field personnel, as required by the label and APHIS Safety and Health Manual, Chapter 11.

   b. Empty bags must be disposed of according to EPA regulations.

   c. Follow label requirements when treatment areas contain reservoirs, lakes, ponds, pools left by seasonal streams, springs, wetlands, and perennial streams and rivers. The label indicates no direct application to water or wetlands.

   d. Do not apply within 500 feet of any school or recreational facility.

   e. Do not apply where the water table is high, where leaching or runoff is likely, or when precipitation is imminent.

   f. Follow label recommendations when treatment areas contain oats, barley, and rye (fall treatments). For all other crops, observe the minimum days required between final application and harvest.

   g. Follow label requirements when treatment areas contain commercial bee hives.

<u>Ultra-Low-Volume (ULV) Aerial Application (Liquid Chemical Methods)</u>

1. To minimize drift and volatilization, do not use ULV sprays when any of the following conditions exist in the spray area: wind velocity exceeds 10 miles per hour (unless lower wind speed required under State law); rain is falling or is imminent; weather is foggy; F; air turbulence that could seriously□normally when temperatures exceed 80 affect the normal spray pattern; and temperature inversions that could lead to off-site movement of spray.

2. Weather conditions on treatment areas will be monitored by trained personnel before and during application. Operations will be suspended anytime it appears that weather conditions could jeopardize the safe placement of the spray on target areas.

3. Do not apply when foliage is wet.

4. Do not apply chemical ULV directly to any crop for which it is not labeled, unless an exemption has been granted under Section 18 of the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA).

5. All APHIS project personnel will have baseline cholinesterase tests before the first application of insecticide and on a routine basis as described in the *APHIS Safety and Health Manual*. It is recommended that contract, State, and private project personnel also participate in a cholinesterase monitoring program.

6. Require unprotected workers to stay out of treated areas, per the label re-entry requirements, or until the insecticide has dried, whichever period is longer.

7. Use nozzle types and sizes, spray system pressure, and nozzle orientation as specified in the 2003 Prospectus or as approved by Aircraft and Equipment Operations (AEO) and the Contracting Officer.

8. It is mandatory that the insecticide tank on the aircraft be adequately vented to provide for unrestricted flow, in the event that the load must be jettisoned.

9. Do not spray while school buses are operating in the treatment area.

10. Protective long-sleeved work clothing will be worn by all pilots, loaders, and field personnel, as specified in the label and the *APHIS Safety and Health Manual*.

11. Follow label requirements that indicate not applying directly onto reservoirs, lakes, ponds, pools left by seasonal streams, springs, wetlands, and perennial streams and rivers.

12. Do not apply where the water table is high or where leaching or surface runoff is likely.

13. Do not apply within 500 feet of any school or recreational facility.

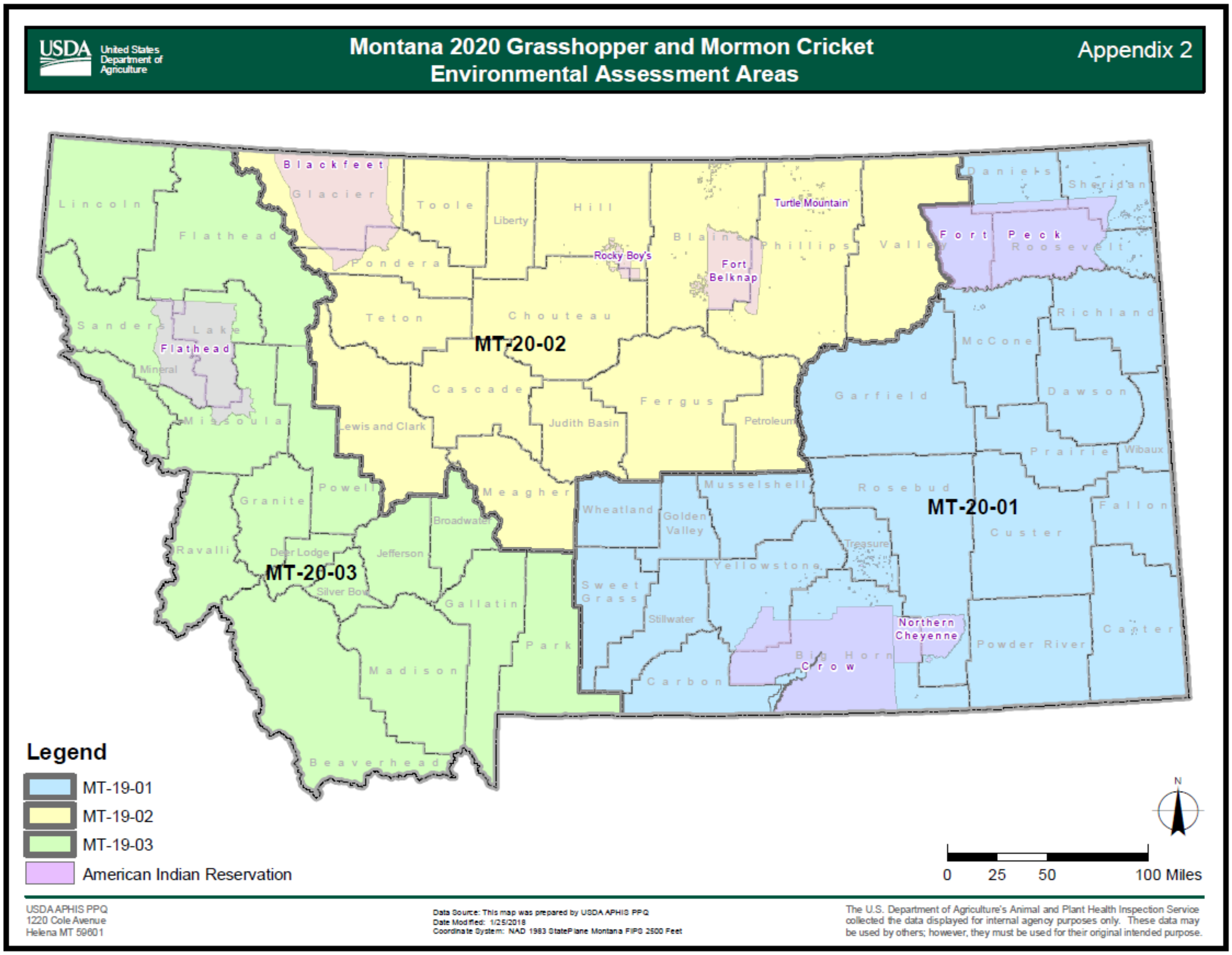
14. Protection of Bees:
    a. When off-season or early-season planning indicates an area may require treatment, send early notification letters and maps to all registered apiarists in the State or near the area.

    b. Pre-spray reconnaissance flights may be conducted to ensure that all honey bees and all other bees used as commercial crop pollinators have been moved or protected. Should bees remain, ensure that the beekeeper received notice of the impending treatment and that programs are conducted in accordance with State law.

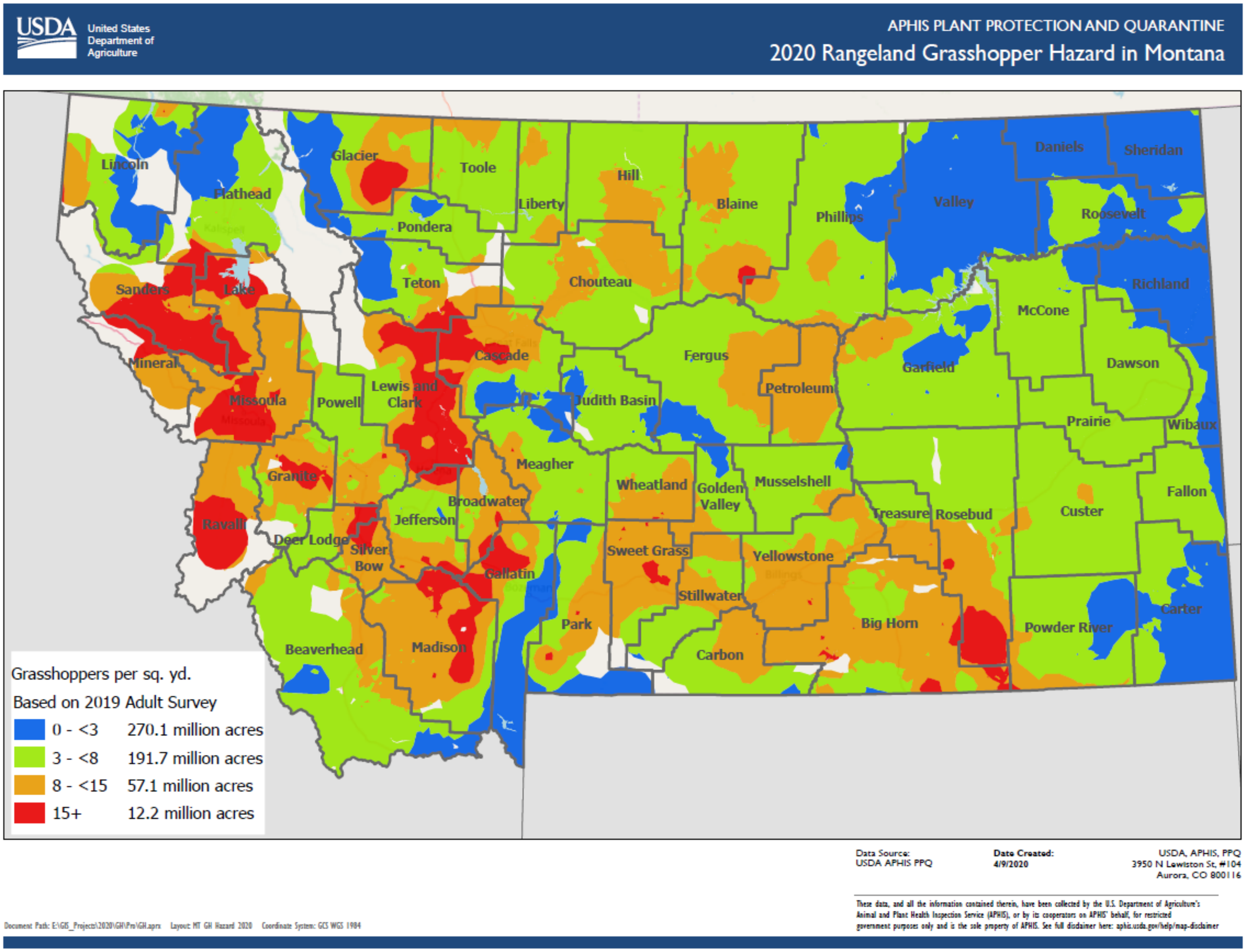
c. If treatments are planned within 4 miles of areas where alkali or leaf cutter bees are being used for increasing the yield of alfalfa seed, monitor wind conditions and other drift factors closely. Do not apply ULV sprays when drift could reach these areas. In all such cases, use spray samplers (dye cards) near those areas

d. Do not apply ULV diflubenzuron, carbaryl, or malathion to any blooming crops or allow it to drift onto blooming crops if commercial bees are visiting the area.

Appendix 2: Map of Affected Environment



Appendix 3: 2020 Montana Rangeland Grasshopper Hazard Map



2020 Biological Assessment

For

Montana

Rangeland Grasshopper and Mormon Cricket Suppression Program

Revision 3: 05/29/2020

Prepared by USDA,
APHIS, PPQ
1220 Cole Ave.
Helena, MT 59601

BIOLOGICAL ASSESSMENT (BA) FOR STATEWIDE CONSULTATION AND CONFERENCE FOR 2020 GH/MC PROGRAMS IN MONTANA.

A. 1.0 INTRODUCTION

The Animal and Plant Health Inspection Service (APHIS), in conjunction with Federal agencies, State departments of agriculture, Native American tribes, and private individuals is planning to conduct grasshopper/Mormon cricket control programs in Montana in 2020. This document is intended as statewide consultation and conference with the U.S. Fish and Wildlife Service (FWS) regarding the APHIS Rangeland Grasshopper and Mormon Cricket Suppression Program.

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

APHIS is requesting initiation of informal consultation for the implementation of the 2020 Mormon cricket and grasshopper suppression program on rangeland in Montana. Our determinations of effect for listed species, proposed species, critical habitat, and proposed critical habitat are based on the October 3, 1995 FWS letter, the analysis provided in the 2019 Environmental Impact Statement (EIS) for APHIS suppression activities in 17 states, the 2004 Montana BA, and local discussions with FWS.

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

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

With this letter, APHIS is requesting concurrence with our determination for listed species, and listed critical habitat that may occur in Montana within the area of the proposed 2020 grasshopper suppression program.

B. 2.0 PURPOSE

This BA is for grasshopper/Mormon cricket control activities in the entire state of Montana. APHIS is requesting Endangered Species Act (ESA), section 7, informal consultation for those species that have been listed or proposed for listing in Montana since the October 3, 1995 FWS letter to Carl Bausch and for all listed species in those counties for the use of the growth regulator, Diflubenzuron. This assessment will repeat or update the language presented in the 2018 BA. The agreements for Montana reached between APHIS and FWS will be in effect until a BO for the entire Rangeland Grasshopper Cooperative Management Program is issued and the nationwide, formal consultation process is completed.

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

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

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

C. 3.0 DESCRIPTION OF ACTION

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

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

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

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

Conventional rates for these agents are:

- 16 fluid ounces (0.50 pound active ingredient (lb a.i.)) of carbaryl spray per acre,
- 10 pounds (0.50 lb a.i.) of 5 percent carbaryl bait per acre, 1.0 fluid ounce (0.016 lb a.i.) of diflubenzuron per acre, or 8 fluid ounces (0.62lb a.i.) of malathion per acre.

Rates utilizing RAATs are:

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

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

Diflubenzuron is a growth regulator that functions as a chitin inhibitor affecting the formation and/or deposition of chitin in the insect's exoskeleton. Application rates range from .75 to 1.0

fluid ounce (fl. oz.) per acre in rangeland and 1.0 fl. oz. per acre in border protection situations where nearby agricultural lands are being threatened by grasshoppers originating in adjacent federally managed rangeland.

4.0 ASSESSMENTS:

D. 4.1 MAMMALS

1. ***4.1.1*** Bear, grizzly, *Ursus arctos horribilis*

4.1.1.1 Status:

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

4.1.1.2 Habitat and Distribution:

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

4.1.1.3 Assessment:

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

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

4.1.1.4 Protective measures:

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

4.1.1.5 Determination:

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

2. ***4.1.2*** Lynx, Canada, *Lynx Canadensis*

4.1.2.1 Status:

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

4.1.2.2 Habitat and Distribution:

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

4.1.2.3 Assessment:

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

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

4.1.2.4 Protective measures:

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

4.1.2.5 Determination:

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

3. *4.1.4* Ferret, black-footed, *Mustela nigripes*

4.1.4.1 Status:

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

4.1.3.2 Habitat and Distribution:

Black-footed ferrets are directly correlated with active prairie dog towns. Proctor (1998) developed a GIS model to provide a method for creating habitat maps outlining suitable black-tailed prairie dog habitat on lands in the northern Great Plains short grass prairie at a scale that will identify regional potential for prairie dog ecosystem recovery, "including the needs of associated species." Preferred and potential suitable habitat categories were developed… The categories that identified suitable habitat for black-tailed prairie dogs were the preferred (favored vegetation and favored slope), potential (favored slope, less favored vegetation) and potential (favored vegetation and less favored slope). Favored vegetation can be described as very low cover grassland, salt- desert shrub, dry salt-flats, and mixed barren sites. Favored slope has a 0-4% slope and less favored slope ranges 4-25% slope (Proctor 1998). Montana counties containing preferred habitat include the following: Treasure (43 acres), Golden Valley (1,007 acres), Rosebud (147,671 acres), Powder River (166,425 acres), Wheatland (1,448 acres), Musselshell (93,015 acres), Sweet Grass (2,965 acres), Carbon (65,269 acres), Blaine (276,860 acres), Stillwater (4,571 acres), Yellowstone (52,855 acres), Big Horn (8,399 acres), Park (4,204 acres), Gallatin (17,151 acres), Carter (444,645 acres), and Custer (233,128acres).

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

The failure to locate additional extant black-footed ferret populations, coupled with the ubiquity of sylvatic plague throughout the historic range of the species, has prompted the U.S. Fish and

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

4.1.3.3 Assessment:

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

4.1.3.4 Protective measures:

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

4.1.3.5 Determination:

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

4. *4.1.4* Northern Long-Eared Bat – *Myotis septentrionalis*

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

4.1.4.2 Habitat and Distribution:

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

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

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

4.1.4.3 Assessment:

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

4.1.4.4 Protective measures:

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

4.1.4.5 Determination:

APHIS has determined that the 2020 USDA APHIS PPQ Montana Grasshopper/Mormon Cricket Suppression Program may affect, but are not likely to adversely affect the Northern Long-Eared Bat.

E. 4.2. BIRDS

1. ***4.2.1*** Plover, piping, *Charadrius melodus*

4.2.1.1 Status:

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

4.2.1.2 Habitat and Distribution:

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

4.2.1.3 Assessment:

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

4.2.1.4 Protective measures:

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

4.2.1.5 Determination:

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

2. ***4.2.2*** Crane, whooping, *Grus americana*

4.2.2.1 Status:

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

4.2.2.2 Habitat and Distribution:

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

4.2.2.3 Assessment:

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

4.2.2.4 Protective measures:

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

4.2.2.5 Determination:

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

a) 4.2.4 Tern, least, Sterna antillarum

4.2.4.1 Status:

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

4.2.4.2 Habitat and Distribution:

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

4.2.4.3 Assessment:

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

4.2.4.4 Protective measures:

No aerial ULV application will be applied 2.5 miles up and down river to prevent abandonment of nesting least turn colonies due to aircraft flyovers and a possible decrease on the fishery forage base due to accidental aquatic application. A 0.25 mile no-aerial ULV application buffer on each side of the river and around other bodies of water containing least tern colonies will also be observed. This, in addition, would include a 500 foot no treatment zone around nesting colonies.

These protective measures are in compliance with the June 1, 1987, FWS Biological Opinion for malathion and carbaryl. APHIS has adopted these measures for the use of Diflubenzuron.

4.2.4.5 Determination:

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

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

4.2.5.1 Status:

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

4.2.5.2 Habitat and Distribution:

The Yellow-billed cuckoo inhabits the canopies of deciduous trees such as cottonwoods and willows that line large rivers. The yellow-billed cuckoo is primarily an invertivore that mainly eats caterpillars, other insects, some fruits, sometimes small lizards and frogs and bird eggs (Terres 1980). It gleans food from branches or foliage, or sallies from a perch to catch prey on the wing (Ehrlich et al. 1992).

Montana counties in which Yellow-Billed Cuckoo are known or believed to occur in: Flathead, Lake, Missoula, and Ravalli Counties. See the Yellow-Billed Cuckoo Species Occurrence Map Montana, attachment 9.

4.2.5.3 Assessment:

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

4.2.5.4 Protective measures:

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

4.2.5.5 Determination:

APHIS has determined that the 2020 USDA APHIS PPQ Montana Grasshopper/Mormon Cricket Suppression Program may affect, but are not likely to adversely affect the yellow-billed cuckoo.

b) 4.2.6 Red Knot – Calidris canutus rufa

4.2.6.1 Status:

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

4.2.6.2 Habitat and Distribution:

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

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

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

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

4.2.6.3 Assessment:

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

4.2.6.4 Protective measures:

In accordance with Executive Order 13186, Migratory Bird Act, APHIS will support the conservation intent of the migratory bird conventions by integrating bird conservation principles, measures, and practices into agency activities and by avoiding or minimizing, to the extent practicable, adverse impacts on migratory bird resources when conducting agency actions.

APHIS maintains a 500 foot buffer around all water bodies, which would exclude most riparian areas where the Red Knot is likely to occur. Impacts will be minimized as a result of buffers to water, habitat, nesting areas, subsequently riparian areas, and the use of RAATs. For any given treatment, only a portion of the environment will be treated, therefore minimizing any potential impact to migratory bird populations.

4.2.6.5 Determination:

APHIS has determined that the 2020 USDA APHIS PPQ Montana Grasshopper/Mormon Cricket Suppression activities may affect, but are not likely to adversely affect red knot.

F. 4.3 FISH

1. ***4.3.1*** Sturgeon, pallid, *Scaphirhynchus albus*

4.3.1.1 Status:

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

4.3.1.2 Habitat and Distribution:

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

4.3.1.3 Assessment:

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

4.3.1.4 Protective measures:

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

4.3.1.5 Determination:

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

2. ***4.3.2*** Sturgeon, White, *Acipenser transmontanus*

4.3.2.1 Status:

The white sturgeon was designated Endangered on September 6, 1994

4.3.2.2 Habitat and Distribution:

Occurrences of Kootenai River White Sturgeon (KRWS) in Western Montana are isolated to the Kootenai River, downstream of Kootenai Falls (approximately 31 river miles downstream from Libby Dam). Montana has less than 30 miles of white sturgeon habitat in the Kootenai River. Occurrences of adult and sub adult KRWS in the Kootenai River within Montana have been documented, however, no confirmed records of spawning have occurred in the past 20 years. Individuals reach sexual maturity between the ages 9-16 years (4-6 ft. in length), and females do not spawn annually but rather at intervals of 3-11 years, depending on food availability. KRWS spawn during the spring runoff period when water temperatures reach 8-19 C. Outside of the spawning period, 4 large adults typically occur in the larger deeper pools of the main river channel, while juveniles and sub adults seasonally occupy sloughs off the main channel. (See Attachment 12).

4.3.2.3 Assessment:

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

4.3.2.4 Protective measures:

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

4.3.2.5 Determination:

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

3. *4.3.3* Trout, Bull, *Salvelinus confluentus*

4.3.3.1 Status:

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

4.3.3.2 Habitat and Distribution:

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

4.3.3.3 Assessment:

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

4.3.3.4 Protective measures:

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

4.3.3.5 Determination:

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

G. 4.4 PLANTS

1. ***4.4.1*** Ladies'-tresses, Ute, *Spiranthes diluvialis*

4.4.1.1 Status:

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

4.4.1.2 Habitat and Distribution:

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

4.4.1.3 Assessment:

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

4.4.1.4 Protective measures:

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

4.4.1.5 Determination:

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

a) 4.4.2 Howellia, Water, Howellia aquatilis

4.4.2.1 Status:

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

4.4.2.2 Habitat and Distribution:

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

4.4.2.3 Assessment:

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

4.4.2.4 Protective measures:

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

4.4.2.5 Determination:

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

2. *4.4.3* Catchfly, Spalding's, *Silene spaldingii*

4.4.3.1 Status:

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

4.4.3.2 Habitat and Distribution:

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

4.4.3.3 Assessment:

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

4.4.3.4 Protective measures:

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

4.4.3.5 Determination:

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

H. 4.5 Invertebrates

1. ***4.5.1*** Meltwater Lednian Stonefly, *Lednia tumana*

4.5.1.1 Status:

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

4.5.1.2 Habitat and Distribution:

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

4.5.1.3 Assessment:

Treatments are unlikely to occur near meltwater lednian stonefly habitat.

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

4.5.1.4 Protective measures:

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

4.5.1.5 Determination:

APHIS has determined that the 2020 USDA APHIS PPQ Montana Grasshopper/Mormon Cricket Suppression Program activities may affect, but are not likely to adversely affect the meltwater lednian stonefly.

2. *4.5.2* Western Glacier Stonefly, *Zapada glacier*

4.5.2.1 Status:

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

4.5.2.2 Habitat and Distribution:

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

4.5.2.3 Assessment:

Treatments are unlikely to occur near western glacier stonefly habitat.

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

4.5.2.4 Protective measures:

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

4.5.2.5 Determination:

APHIS has determined that the 2020 USDA APHIS PPQ Montana Grasshopper/Mormon Cricket Suppression Program activities may affect, but are not likely to adversely affect the Western Glacier Stonefly.

5.0 CRITICAL HABITAT

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

5.1 Canada Lynx, *Lynx Canadensis*

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

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

5.2 Piping Plover, *Charadrius melodus*

Critical habitat for the Northern Great Plains Breeding Population of the Piping Plover was designated September 11, 2002. Montana critical habitats include: alkali lakes in Sheridan

County; the Missouri river and Fort Peck reservoir shoreline in Garfield, McCone, Phillips, Richland, Roosevelt, and Valley counties; Bowdoin National Wildlife Refuge in Phillips County. Habitat includes prairie alkaline wetlands and surrounding shoreline, including 200 feet (ft), 61 meters (m) of uplands above the high water mark; river channels and associated sandbars, and islands; reservoirs and their sparsely vegetated shorelines, peninsulas, and islands; and inland lakes and their sparsely vegetated shorelines and peninsulas.

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

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

5.3 Sturgeon, White, Acipenser transmontanus

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

5.4 Bull Trout, Salvelinus confluentus

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

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

6.0 SUMMARY

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

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

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

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

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

APHIS-PPQ continues to refine its methods of grasshopper and Mormon cricket management in order to improve the Rangeland Grasshopper and Mormon Cricket Suppression Program's abilities, make it more economically feasible, and environmentally acceptable. These refinements can include reduced rates of currently used pesticides, improved formulations, development of more targetspecific 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&T), the Center for Plant Health

Science and Technology's (CPHST) Phoenix Lab is located in Phoenix, AZ and its Rangeland Grasshopper and Mormon Cricket Management Team (AKA 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 by testing and developing better, cheaper, and greener methods of managing grasshoppers and Mormon crickets on federal, state, tribal, and private rangelands (wildlife habitats and where domestic livestock graze) in the 17 contiguous western states of the U.S.A.

To achieve this mission, experimental plots (often replicated and ranging in size from 14" or less to 10 acres to 40 acres to 160 acres to 640 acres) incorporating wild populations of grasshoppers (130 rangeland species are potential candidates, but, usually, only 8-12 are the specific targets) or Mormon crickets (*Anabrus simplex*) are used. The primary purpose of these plots is to test and refine equipment and methods, and develop formulations (of both insecticides and biopesticides in both liquid and bait form) that will possibly be used in future rangeland grasshopper and Mormon cricket program years. These investigations often occur in the summer (May-August) and the location(s) typically varies annually throughout the 17 states. Also included are "no treatment" (or control) areas that are monitored to determine the effect of no treatments. Some of these plots may be monitored for additional years to gather information on the effects of utilized insecticides on non-target arthropods.

Examples of studies to test and refine equipment and methods using experimental plots may include using planes and ATVs to apply labeled materials using RAATs (Reduced Agent Area Treatments) methodology and blanket applications to determine expected mortalities associated with barrier or crop protection, and hot spot treatments. The use of a ULV (Ultra Low Volume) sprayer system (currently an Ulvamast by Micron Group) for applying biopesticides (such as native fungal pathogens) may also be an option. Another common application method for micro plots (that are often 14" across or less and are covered in varying cage types, preferred for treatments involving newly acquired insecticides/biopesticides) is simulating aerial applications via the FAASSTT (Field Aerial Application Spray Simulation Tower Technique). Furthermore, research is ongoing into the potential use of UAS for a number of purposes related to grasshopper and Mormon cricket surveillance and treatment. Field trials incorporating UAS would be operated by FAA-licensed pilots.

Examples of studies to develop formulations using experimental plots may include RAATs/blanket applications of insecticides (in both liquid and bait forms) at standard or experimental doses, often for the sake of comparison effects. Biopesticide testing (often in the form of native fungal pathogens) are also of great interest and actively being developed. Also, stressor tests (mixtures of native pathogens combined with low doses of insecticides) may be conducted to determine if combinations enhance mortality. Further examples could include attractant/repellant studies.

Insecticides likely to be involved in studies currently include: diflubenzuron (Dimilin and generics) and chlorantraniliprole (Prevathon). The standard diflubenzuron dose is 1.0 fl. oz. in a total volume of 31 fl. oz. while the standard chlorantraniliprole doses are 2 fl. oz. (RAATs) or 4 fl. oz. (blanket), both in a total volume of 32 fl. oz. Biopesticides (all U.S. natives and fungal pathogens) likely to be involved in studies currently include: *Metarhizium anisopliae* isolate DWR2009 and *Beauveria bassiana*.

Studies and experimental plots are typically located on 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 possible experimental micro plots, no adverse effects to the environment, including endangered species and sensitive/critical habitats, are expected to occur.

Works Cited:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

FWS 2014. Endangered and Threatened Wildlife and Plants; Revised Designation of Critical Habitat for the Contiguous United States Distinct Population Segment of the Canada Lynx and Revised Distinct Population Segment Boundary. Federal Register / Vol. 79, No. 177 / Friday, September 12, 2014. 54782-54846.

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

United States Department of the Interior

FISH AND
WILDLIFE SERVICE

Montana Ecological Services Field Office
585 Shephard Way, Suite 1
Helena, Montana 59601-6287

M.00 – APHIS (I)
06E11000-2020-I-0447
06E11000-2020-CPA-0015

June 03, 2020

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

Dear Mr. Adams:

Thank you for your May 29, 2020, letter requesting U.S. Fish and Wildlife Service (Service) concurrence on your determination of effects for listed species and designated critical habitats in your 2020 Biological Assessment (BA; APHIS 2020a) for the Rangeland Grasshopper and Mormon Cricket Suppression Program (Program) in Montana. This response is provided under the authority of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531-1543), the Migratory Bird Treaty Act (MBTA)(16 U.S.C. 703-712), and the Bald and Golden Eagle Protection Act (16 U.S.C. 668 et seq.).

The Animal and Plant Health Inspection Service (APHIS), in conjunction with Federal agencies, State departments of agriculture, Native American Tribes, and private individuals is planning to conduct grasshopper/Mormon cricket control programs in Montana in 2020. APHIS proposes chemical treatments of rangelands, which may include application of carbaryl, malathion, and/or diflubenzuron. Carbaryl would be applied by aerial spraying or distributing bran bait; malathion, and diflubenzuron would be applied by aerial spraying. Treatment rates are detailed in the BA (page 5) and would generally be less than standard application rates. Most treatments would be applied using reduced area agent treatment (RAATs) techniques, which generally reduce, by up to 50 percent, the amount of active ingredient applied relative to standard application rates.

APHIS has consulted with the Service on the Program (both National and State-specific consultations have been or are being conducted) since 1987. Information on the history of consultations on the Program is available in our prior letters, including Service (1995) and Service (2019), and in your BA (APHIS 2020a) and draft Environmental Assessments (APHIS 2020b, 2020c, 2020d) for the Project in Montana. This letter addresses the Program only within Montana for the current calendar year.

Listed Species

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

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

Upon review of the 2020 BA, the Service concurs with your *may affect, but is not likely to adversely affect* determinations for northern long-eared bat, piping plover, least tern, red knot, yellow-billed cuckoo, pallid sturgeon, white sturgeon, bull trout, meltwater lednian stonefly, western glacier stonefly, Ute Ladies'-tresses, water howellia, Spalding's catchfly, and designated critical habitats for piping plover and bull trout. The Service bases its concurrence on the information and analysis in the BA, including protective measures as stated in the BA, and information in our files. This concurrence is contingent upon the implementation of those committed protective measures. In most cases, there is little overlap between the rangelands that would be treated and habitat for these species. In addition, the BA proposes a suite of speciesspecific buffers and site-specific pre-treatment analyses (as detailed below) that further reduce the potential for listed species to be affected. No treatment would occur within critical habitat and a 0.25-mile buffer would be maintained for any aerial spraying near critical habitat for both piping plover and bull trout.

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

No aerial spray treatments would be implemented within 0.25 mile of piping plover or least tern nesting habitat. No Carbaryl bran bait treatments would be implemented within 500 feet of piping plover or least tern nesting habitat. In addition, no aerial spray treatments would be implemented within 2.5 miles up or downstream of least tern nesting habitat, to minimize the potential for accidental application of chemicals to river environments with resultant impacts to the least tern prey base (small fish).

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

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

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

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

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

Greater Sage-Grouse

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

Grasshopper suppression program activities may be subject to Montana Executive Order 122015. We recommend that you consult the Montana Sage-Grouse Habitat Conservation Program website (https://sagegrouse.mt.gov/) and interactive map to assist in determining where designated greater sage-grouse habitat occurs relative to proposed suppression activities. We further recommend that proposed suppression activities be coordinated with the Montana DNRC, Conservation and Resource Development Division, regarding any applicable required compliance with Montana Executive Order 12-2015 and the Montana sage-grouse conservation strategy.

Migratory Birds

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

Bald and Golden Eagles

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

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

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

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

[1] On December 22, 2017, the Department of the Interior’s (DOI) Office of the Solicitor Memorandum M-37050 titled The Migratory Bird Treaty Act Does Not Prohibit Incidental Take https://www.doi.gov/sites/doi.gov/files/uploads/m-37050.pdf) concludes that the MBTA’s prohibitions on pursuing, hunting, taking, capturing, killing, or attempting to do the same apply only to affirmative actions that have as their purpose the taking or killing of migratory birds, their nests, or their eggs. The MBTA list of protected species includes bald and golden eagles, and the law has been an effective tool to pursue incidental take cases involving eagles. However, the primary law protecting eagles is the Bald and Golden Eagle Protection Act (BGEPA) (16 U.S. Code § 668), since the bald eagle was delisted under the Endangered Species Act in 2007. Memorandum-37050 does not affect the ability of the Service to refer entities for prosecution that have violated the take prohibitions for eagles established by the BGEPA.

https://www.fws.gov/northeast/ecologicalservices/pdf/NationalBaldEagleManagementGu idelines.pdf

The Service also has promulgated new permit regulations under BGEPA:

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

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

The Service appreciates your efforts to minimize negative impacts to listed and proposed species in Montana. Should you have any questions, please contact Jacob Martin within our office at (406) 449-5225, extension 215.

Sincerely,

Jacob M Martin

for Jodi L. Bush
Office
Supervisor

References

Animal and Plant Health Inspection Service. 2020a. 2020 Biological assessment for Montana, rangeland grasshopper and Mormon cricket suppression program, revision 3: 5/29/2020, 29 pp. plus maps.

Animal and Plant Health Inspection Service. 2020b. Draft environmental assessment rangeland grasshopper and Mormon cricket suppression program, Big Horn, Carbon, Carter, Custer, Daniels, Dawson, Fallon, Garfield, Golden Valley, McCone, Musselshell, Powder River, Prairie, Richland, Roosevelt, Rosebud, Sheridan, Stillwater, Sweet Grass, Treasure, Wheatland, Wibaux, Yellowstone counties, and that portion of Valley County falling within the Fort Peck Indian Reservation, Montana. 55 pp. plus appendices.

Animal and Plant Health Inspection Service. 2020c. Draft environmental assessment rangeland grasshopper and Mormon cricket suppression program, Blaine, Cascade, Choteau, Fergus, Glacier, Hill, Judith Basin, Lewis & Clark, Liberty, Meagher, Petroleum, Phillips, Pondera, Teton, Toole, and Valley Counties (except Fort Peck Reservation), Montana. 68 pp.

Animal and Plant Health Inspection Service. 2020d. Draft environmental assessment rangeland grasshopper and Mormon cricket suppression program, Beaverhead, Broadwater, Deer Lodge, Flathead, Gallatin, Granite, Jefferson, Lake, Lincoln, Madison, Mineral, Missoula, Park, Powell, Ravalli, Sanders, Silver Bow Counties, and the Flathead Indian Reservation, Montana. 62 pp.

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

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

Appendix 5: APHIS response to public comments on Montana's draft EA's (EA Number: MT-20-1, MT-20-2, and MT-20-3).

USDA APHIS received two public comments to the publication of the Draft Environmental Assessments (EAs) from the Xerces Society and from the Center for Biological Diversity Center. Comments similar in nature were grouped under one response. Comments that were editorial in nature or requested additional citations are not addressed in the appendix but were incorporated into the final EAs, where appropriate. The Grasshopper Program has decided not to use chlorantraniliprole in Montana during 2020. All references to this chemical was removed from the final EAs. Any exposure scenarios that could result from use of this insecticide which the commenters are concerned about are not relevant to the remaining risk analysis.

Comment 1
USDA APHIS received one comment about the EA providing little in the way of solid information about where, how, and when the treatments may actually occur within the counties covered under the EAs, during the year 2020, which makes it impossible to determine if effects would actually be significant or not.

APHIS described the purpose and need for grasshopper suppression treatments, potential treatment options, the affected environment within the state, and an analysis of the potential environmental consequences in the Draft EA that were made available for public comment. These documents become programmatic because APHIS cannot precisely predict where an outbreak will occur each year; we only know that outbreaks will occur, and treatments in a timely manner will be absolutely necessary. The emergency response aspect is why site-specific treatment details cannot be known, analyzed, and published in advance. APHIS relies on its emergency provisions within its NEPA Implementing Regulations (7 CFR 372.10) to address these situations.

Please be aware that as per conversations with BIA may preclude disclosure of Tribal information to the public or outside of APHIS without the consent of BIA or the Tribes. Individuals may request information on the specific treatment areas on Tribal Lands from the individual Tribal Nations or the Bureau of Indian Affairs.

Comment 2
USDA APHIS received one comment concerning the lack of transparency about the location of actual treatment areas, particularly on public lands, being a disservice to the public that prevents the public from reviewing sufficient information to be able to gauge justification for and the risks involved in the suppression effort.

APHIS did not withhold the location of actual treatment areas while preparing the Draft EA, but rather those facts were not known at that time because economically damaging grasshopper populations had not become apparent. See previous comment concerning the prevention of the commenter's ability to gauge the justification and risks of treatments within the proposed action areas.

Comment 3

APHIS received one comment urging APHIS to provide the public with maps of specific treatment areas and proposed treatment strategies (including proposed date of application and chemical and rate to be used), immediately after approving any treatment and at least 14 days prior to implementation of any treatment. This comment suggested that this specific information be posted at the APHIS website as soon as it is available, sent to interested parties, and made available for public comment.

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. APHIS typically does not have 14 days between planning a treatment and the actual application because of the rapid population growth and potential damage of grasshopper infestations.

Comment 4
APHIS received one comment that mentioned "APHIS' procedure to approve or disapprove treatments based on a cost-benefit analysis performed using the "Hopper" model" and that is site-specific data are not available or current, APHIS must use protective values as defaults in Hopper."

The "Hopper" program is an older model, and Montana never found it useful in predicting economic loss from orthopteran infestation depredation.

In Montana, site specific data is used to determine the need for and type of treatments. It is gathered at the time of actual surveys and cannot be included in the Draft EAs. The data include: grasshopper and/or Mormon cricket densities, species complex, dominant species, dominant life stage, terrain, soil types, range conditions, local weather patterns (wind, temp., precipitation), slope and aspect for hatching beds, grazing status and number of livestock grazing the site/allotment and forage damage estimates. These are all factors taken into consideration during the survey season.

Comment 5
APHIS received one comment concerning how analysis of projected economic injury levels and ultimately, treatment decisions, might be determined in the absence of site-specific data (specifically rangeland productivity and composition, precipitation and soil moisture, accessibility and cost of alternative forage, effectiveness of treatment, cost of treatment, timing of treatment, and grasshopper population density, life stage, and species composition).

See comment 4 above. In Montana, general site specific data, which is used to determine treatments in real time and gathered at time of actual surveys are used to make treatment decisions. This decision making process is a cooperative effort between the requesting land owners and land managers and APHIS.

Comment 6
APHIS received one comment related to disclosing its analysis for each of the seven variables mentioned in comment 5.

The site specific data that is used to determine treatments in real-time is gathered at the time of actual surveys. This data is not available at the time that the environmental assessments are prepared. See comment 4 for an example of general site specific data used to determine treatments.

Please be aware that as per conversations with BIA may preclude disclosure of Tribal information to the public or outside of APHIS without the consent of BIA or the Tribes. Individuals may request information on the specific treatment areas on Tribal Lands from the individual Tribal Nations or the Bureau of Indian Affairs.

Comment 7
APHIS received one comment about providing the public with a more precise definition of when the threshold for spraying has been met**.**

Economic thresholds are variable based on the value of protected resources and management objectives. Baseline thresholds for Mormon crickets are 2 per sq. yd. and grasshoppers are 8 per sq. yd., though neither of those thresholds guarantees justification for treatment alone. All of the site-specific data mentioned in comment 4 above are also considered for Montana.

Comment 8
APHIS received one comment urging APHIS to delay the publication of EA and FONSI until after treatment requests are received and all treatment areas have been delineated and are identified to the public.

In Montana, it is necessary to complete the EA and FONSI prior to the start of field season. Delaying the publication of the EA and FONSI would make responding to requests from land owners and land managers unreasonable. Cooperating agency's which tier their NEPA documents to APHIS's need a reasonable amount of time before or at the start of the field season and specific treatment decisions are made during the nymphal survey which, due to grasshopper biology, need to be timely in order to use APHIS' preferred chemical and most ecologically sound treatment strategies.

Comment 9
APHIS received one comment regarding the EA's list three insecticide options (diflubenzuron, carbaryl, and malathion), and states that the choice of which to use will be site-specific, without being clear about how that choice of insecticide is made.

Letters of Request in previous years from land managers may be specific to use a particular insecticide and not treat during specific times of the day or on weekends and may include special sites to be buffered out of the treatment. These requests are adhered to in Montana. The letters of request come from the individual land managers. The decision to use diflubenzuron is determined by the life stage of the dominant species within the outbreak population. In the case of early instars, diflubenzuron, the preferred insecticide, can produce 90 to 97% mortality. If the window for the use of diflubenzuron closes, as a result of treatment delays, then the only other option would be the use of Carbaryl 2% or 5% bait. There are certain species which are *susceptible to carbaryl bait. If the species complex present in the outbreak is not susceptible to bait and the diflubenzuron window is closed, then no treatments will occur. This is discussed with the requesting land managers.*

Comment 10

APHIS received one comment concerning BeeREX calculating the expected environmental concentration (EEC) of diflubenzuron in pollen and nectar from foliar overspray as 1.76 mg/kg, which is equivalent to 1760 ppb.

Nectar and pollen values in BeeREX are based on residues that would be expected to occur from direct pesticide applications to long grass which is a food source EPA estimates in its T-REX model. These assumptions may overestimate expected residues of diflubenzuron in pollen and nectar. Available data for diflubenzuron pollen residues in crops show a low frequency of occurrence and low concentrations. The concentration in pollen will depend on application rates and when applications are made relative to flower bloom. Program applications of diflubenzuron are at the lower end of labeled use rates for Dimilin due to the sensitivity of Orthoptera. In addition, the Program uses rates less than the current labeled rates for grasshoppers and other labeled crops and makes only one application.

Comment 11

APHIS received one comment regarding chitin synthesis and its importance in the early life stages of insects, as they molt and form a new exoskeleton in various growth stages. The specific concern was that aquatic guideline tests, (or terrestrial invertebrate acute tests), which typically run for 48 hours, may not capture a molting stage, and thus underrepresent acute toxicity. Single doses may cause mortality, if received at a vulnerable time, and consequently, conclusions from RQs based on acute toxicity studies for invertebrates may not fully represent actual risk.

APHIS agrees that chitin synthesis is a critical function for terrestrial and aquatic invertebrates. APHIS in its risk assessments prepared for each Program insecticide summarized available acute and chronic toxicity data. This would include studies of short duration such as 48 to 96 hours as well as much longer term studies that would evaluate continuous exposures during critical life stages and development.

Comment 12

APHIS received the following comment, "For honey bees (the surrogate species for risk assessment in the absence of other data), USEPA (2018) reported a chronic 21-day ED50 and NOAEL of 0.012 and <0.0064 µg a.i./larva, respectively. Utilizing these values in BeeREX (EPA's model that calculates risk quotients for bees) and assuming an application rate of 0.016 lb. a.i./ac, BeeREX calculates an acute dietary risk quotient of 18.13 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."

BeeREX is a tier one screening level model used by EPA to assess potential risk to pollinators. Estimates of risk quotients are used to determine if there is a presumption of risk that requires additional evaluation. APHIS also relies on available field data to further characterize the risks *of Program insecticides to terrestrial and aquatic invertebrates, where available. A limitation of BeeREX is it does not account for pesticide degradation that would normally occur in Program treatments.*

Nectar and pollen values in BeeREX are based on residues that would be expected to occur from direct pesticide applications to long grass which is a food source EPA estimates in its T-REX model. These assumptions may overestimate expected residues of diflubenzuron in pollen and nectar. Available data for diflubenzuron pollen residues in crops with higher use rates show a low frequency of occurrence and low concentrations. The concentration in pollen will depend on application rates and when applications are made relative to flower blooming. Diflubenzuron Program applications are at the lower end of labeled use rates for Dimilin due to the sensitivity of Orthoptera. In addition, the Program uses rates less than the current labeled rates and makes one application.

Comment 13

APHIS received one comment, "EIS discloses 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. Rangeland persistence is unfortunately not available, but diflubenzuron applied to plants remains adsorbed to leaf surfaces for several weeks."

Diflubenzuron persistence varies depending on site conditions. Diflubenzuron degradation is microbially mediated with soil aerobic half-lives much less than dissipation half-lives. While dissipation half-lives may extend up to 78 days, they have also been shown to be much less under other use patterns.

Comment 14

APHIS received the following comment, "APHIS discounted the pollinator risk by claiming that studies finding significant effects to pollinators utilized doses far above levels that would be used in grasshopper control. Unfortunately, this does not appear to be true for all studies cited. Mommaerts et al. (2006) conducted dose-response assays and found that exposure to diflubenzuron resulted in reproductive effects in *Bombus terrestris*, with only the doses at 0.001 of maximum field recommended concentrations (MFRC) in pollen and 0.0001 in sugar water resulting in effects statistically similar to controls. The MFRC for diflubenzuron is listed in the study as 288 mg/L (equivalent to 288,000 ppb). At 1/10,000 of this level, diflubenzuron effects would be similar to controls only at levels at or below 28.8 ppb while at 1/1000 of this level, diflubenzuron "no effect" concentrations would be equivalent to 288 ppb. This analysis thus shows the opposite of what APHIS claims – that the effective dose for reproductive effects is actually far below the EEC expected for diflubenzuron at RAATS rates used in grasshopper suppression. This raises concern that the application of diflubenzuron at the specified RAATS rates may cause severe impacts to bee reproduction within treated areas."

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.

Comment 15

APHIS received six comments about chlorantraniliprole.

Chlorantraniliprole is not proposed for use in Montana in 2020. Appendix 1: APHIS Rangeland Grasshopper and Mormon Cricket Suppression Program FY-2020 Treatment Guidelines are updated for the national grasshopper program for all 17 western states. The final EA has been updated to reflect the changes in the program.

Comment 16
APHIS received one comment concerning malathion being found to cause jeopardy in 1,284 endangered species according to recent nationwide Biological Opinions

APHIS recognizes that EPA and the Services are continuing to develop updated national level consultations. APHIS currently consults with the Services at the State level for the Grasshopper program to ensure program activities <u>do not adversely affect</u> protected species or their critical habitat.

See response to comment 9 for use of Malathion in Montana.

Comment 17
APHIS received one comment regarding the EPA determined that carbaryl is likely to adversely affect 1,542 species.

The Endangered Species Act section 7 pesticide consultation process between the U.S. Fish and Wildlife Service and the National Marine Fisheries Service (the Services, collectively) and the EPA specifically concerns FIFRA pesticide registration and reregistration in the United States, including all registered uses of a pesticide. The state-level Biological Assessments for APHIS invasive species programs are separate from any consultations conducted in association with pesticide registration and reregistration process. The Agricultural Improvement Act of 2018 (Farm Bill) created a partnership between USDA, EPA, the Services, and the Council on Environmental Quality to improve the consultation process for pesticide registration and reregistration. USDA is committed to working to ensure consultations are conducted in a timely, transparent manner and based on the best available science. The Revised Method for National Level Listed Species Biological Evaluations of Conventional Pesticides provides a directionally improved path to ensuring that pesticides can continue to be used safely for agricultural production with minimal impacts to threatened and endangered species.

APHIS provided information about use of carbaryl to EPA for the FIFRA consultation for carbaryl. The Grasshopper Program use of carbaryl has in the past comprised substantially less than 1% of the percent crop treated (PCT) for rangeland use of carbaryl. This is the case for the reasonably foreseeable future. For rangeland, in the EPA BE, the Grasshopper Program's very low usage was rounded up to <1% PCT, which gives an overestimate of rangeland acres treated and thus endangered species risk. APHIS use of carbaryl is even smaller compared to all uses of carbaryl nationwide. Further, the Grasshopper Program consults directly with the Services to ensure program activities do not adversely affect protected species or their critical habitat.

Comment 18

APHIS received the following comment: The jeopardy and LAA calls for malathion and carbaryl should be included in the EAs and should preclude the use of these chemicals.

APHIS consults directly with the U.S. Fish and Wildlife Service on treatments and methods. The U.S. Environmental Protection Agency's consultation on pesticide registration across all nationwide uses of program pesticides does not provide sufficiently detailed analysis or conclusions relevant to the Grasshopper Program consultations to comply with the Endangered Species Act.

Comment 19
APHIS received one comment that it should take into account the risk to native bees and butterflies from these treatments, especially those designated species of greatest conservation need. 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 treatments.

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 non-target 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. In addition APHIS used RAATs to treat approximately 99% of the acres historically treated by the Program. APHIS also uses RAATs that are typically below the labeled RAAT rates further reducing the amount of insecticide used by the program. APHIS also emphasizes the use of carbaryl bait, where applicable, as a means to suppress pest populations while protecting native bees and pollinators. These methods of applications have been shown to be protective of non-target invertebrates. These studies are referenced and summarized in the EIS.

Comment 20
APHIS received the following comment, This EA and the EIS claim that the use of untreated swaths will mitigate impacts to natural enemies, bees, and other wildlife. However, the width of the skipped swaths is not designated in advance in the EA, and there is no minimum width specified.

APHIS assumes that the reduced amount of pesticide that would occur using untreated swaths over a given treatment block will result in reduced risk to non-target organisms by reducing exposure. The swath width can vary based on site specific conditions, however, the end result is reduced pesticide exposure over a treatment area. The EIS cites studies that demonstrate that the use of RAATs result in higher non-target invertebrate populations compared to treatment blocks that did not use RAATs.

Comment 21

APHIS received two comments/recommendations about minimum swath widths, "Without knowing minimum (rather than maximum) swath widths that will be applied under this EA, it is hard to compare results from this study (Lockwood et al. 2000) to the results on non-targets expected under RAATS in this EA. 2). APHIS should commit to science-based methodologies to assess actual risk from the proposed treatments and institute minimum untreated swath widths wide enough to meaningfully minimize exposure to bees and other beneficials."

Typically, APHIS employs 50% skip swaths when using RAATs. Swath widths and skips are determined by the type of plane doing the aerial application, the smallest being 75 feet, but the minimum skip swath is typically 100 feet because larger planes are often contracted.

The commenter references the work of Lockwood et al. 2000, this study looked at RAAT's increasing swath widths in some instances by double skipping the untreated area. They also used ATV's in their study which only have a minimum effect swath width of 30 feet. Using modifications presently being done in Arizona with the UTV's ability to adjust the hopper height, using the same ATV spreader, the minimum effective swath width can be increased to 40 feet, thus also increasing the untreated swath to 40 feet. APHIS uses science based methodologies to assess treatment related benefits or risks. APHIS has for decades funded the Science and Technology Research Lab in Phoenix, Arizona, which is specific to Rangeland Grasshopper and Mormon Cricket Program research and development. It is the only one of its kind in the U.S. The S&T Lab in cooperation with ASU researchers have evaluated non-target invertebrate impacts in the past and have made recommendations to the Program side of APHIS.

Comment 22

APHIS received the following comment, "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 EIS cites studies that demonstrate that the use of RAATs result in higher non-target invertebrate populations compared to treatment blocks that did not use RAATs.

Comment 23

APHIS received three comments about the drift analysis described in the EA, 1)"The drift analysis described in the EA 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. EPA's (2018) Ecological Risk Assessment for diflubenzuron uses AgDrift to estimate the drift fraction from aerial LV applications, although it is unclear whether AgDrift is validated for the purposes of predicting deposition of insecticides applied using ULV technology. EPA assumed a volume mean diameter (VMD) of 90 µm [note that this is approximately 2/3 of the VMD used in the APHIS analysis]. Under EPA's analysis, the drift fraction comprises 19% at 150 ft.", 2) "APHIS should disclose its quantitative analysis and the percent drift it expects--by distance-- into untreated swaths for each application method it proposes", and 3) "APHIS must also specify in its operational procedures the use of nozzles that will result in droplet spectra that accord with its analysis".

The VMD used by APHIS for diflubenzuron is the preferred median diameter used by the Program. APHIS recognizes that the range of droplet sizes can vary under a ULV application.

Comment 24
APHIS received a comment that it is "unrealistic that APHIS can comply with mitigation measures designed to protect bees on pesticide labels "(e.g., bumble bees fly earlier and later in the day, diflubenzuron is toxic to developing forms, if plants are flowering, bees are active, etc.).

APHIS utilizes diflubenzuron at far lower levels than allowed by the label, thereby minimizing risks to non-targets, such as bees. There have been several studies on diflubenzuron effects on bees, such as Schroeder et al., 1980 and insect growth regulator effects reviewed in Tasei, 2001, which support the idea that the diflubenzuron levels APHIS uses for grasshoppers and Mormon crickets are a minimal risk to bees. APHIS also complies with any label requirements designed to minimize impacts to pollinators.

Comment 25
APHIS received the following comment, "Except for untreated swath widths, the EA is silent on how it will avoid impact to pollinators. It has already been shown that within sprayed areas, risk quotients at expected application rates would be well above 1.0. Leaving skipped widths is also not a full solution at expected widths since, due to drift, untreated swaths are highly likely to be exposed to levels above risk quotients".

As previously stated, APHIS utilizes diflubenzuron at far lower levels than allowed by the label, thereby minimizing risks to non-targets. Additionally, APHIS commonly incorporates untreated swaths into its treatment programs, which have consistently demonstrated reduced impacts on non-target arthropods (Lockwood et al., 1999, 2001; Norelius and Lockwood, 1999).

Comment 26
APHIS received one comment regarding that APHIS must not ignore requirements listed on pesticide labels, nor make assumptions about its compliance with these when RAATS measures that will actually be taken are vague and unspecified.

APHIS complies with all applicable Federal and State pesticide label language when making pesticide treatments.

Comment 27
APHIS received the following comment: "While flexibility with these may have been appropriate at the EIS stage, it is not appropriate at the EA stage. APHIS must fully disclose its RAATS plan for each treatment in the EA, including specifying application method, chemical to be used, rate, and width of untreated swaths."

RAATs are a dynamic treatment method based on size of the treatment area, species complex and density of target species. Specific details regarding RAATs cannot be determined until site-specific data is collected during the 2020 survey season and an appropriate chemical is identified. Once a treatment is determined necessary, application method, untreated swath widths, chemical choice and application rate are included in the bid for contracting.

Comment 28
APHIS received one comment about to be consistent with the Pollinator-Friendly BMPs for Federal Lands (see Comment 7), APHIS must go beyond the general statements on the pesticide labels and specify more exactly how its spray plan will further reduce exposure and risk to bees.

See response to comments 24 and 25

Comment 29
APHIS received one comment, " 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 NMFS to consult at the local level. The EAs state that APHIS has concluded No Effect or Not Likely to Adversely Affect for all of the federally listed species within the project area, but contains no information about the rationale for these calls, nor information about any mitigations or buffers to protected species."

In Montana, consultation with USFWS is completed as mandated by Section (7)(a)(1) of the Endangered Species Act (ESA). Local consultation with USFWS has since been completed, and the concurrence letter can be found in Appendix 4.

Comment 30

APHIS received two comments concerning operationally, how will listed species' protected locations be identified for ground and aerial applicators? How will such locations, buffer widths listed in the protective measures, and any specific instructions (i.e. use of carbaryl bait only) for some species be mapped and communicated to applicators? For each species to be protected within the project area, APHIS must provide to applicators a set of clear set of directions, maps, and GPS coordinates that clearly show intent to implement protective measures for the listed and proposed species found within this project area.

In Montana, after request letters are received and potential treatment areas are delineated, cooperative decision making begins which involves many cooperators. If additional consultation from USFWS is needed it is conducted prior to finalizing maps and shapefiles.

See comment 32 and 34.

Comment 31
APHIS received one comment about pesticide specific conservation measures for each listed species, where appropriate, should be explicitly addressed and adopted.

Agreed upon mitigation measures address specific chemicals when conservation measures are warranted. These measures are agreed upon during the consultation process with the USFWS and are applied in the field during application.

Comment 32

APHIS received one comment that APHIS should adopt the following operational guideline across all site-specific EAs: "provide to applicators a set of clear set of directions, maps, and GPS coordinates that clearly show intent to implement protective measures for the listed and proposed species found within this project area."

In Montana, treatment boundaries, water bodies, sensitive sites, listed and proposed species habitat, etc., are initially identified by data from land managers and land owners. These are further confirmed during nymphal surveys and any additional sensitive sites are identified to the GIS specialist. Finalized maps are shared with applicators in the form of shapefiles. These shapefiles clearly show treatment boundaries, water buffers as per program guidelines, and other sensitive site exclusions to be treated from areas to be excluded from treatment. Communications with applicators are extensive before, during and after treatments. Applicators participate in daily briefings with APHIS personnel to review all sensitive sites. During treatments, APHIS personnel conduct environmental monitoring in excluded areas. Furthermore, applicators provide APHIS track-files to APHIS as required in the statement of work.

Comment 33

APHIS received one comment that, " The essential role that pollinators play in the conservation of listed plant species is not addressed in the EAs and makes 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 including the 2014 Presidential Memorandum, the National Strategy to Promote the Health or Honey Bees and Other Pollinators, the Pollinator Friendly BMPs for Federal Land, and the Pollinator Research Action Item."

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

APHIS also implements several BMP practices in their treatment strategies that are designed to protect non-target 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.

Comment 34

APHIS received one comment, "The EA does 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 Montana designates any invertebrates as species of greatest conservation need."

Species of greatest conservation need in Montana are are discussed during cooperative decision making processes.

Comment 35
APHIS received one comment regarding, the EAs protections for at risk species, including the monarch butterfly which is currently being assessed for listing under the Endangered Species Act, are practically non-existent.

Under USFWS Section 7 Act there is no requirement to consult on proposed or candidate species. (See USFWS letter of concurrence in Appendix 2.) However, in Montana when there is concern by land management agencies, federal, state, etc. it is discussed in this cooperative process between APHIS and landowners and land management agencies and mitigation measures are decided upon prior to treatment.

Comment 36
APHIS received one comment, "In the face of declining pollinator 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. Prior to treatment, APHIS should survey for presence of host plants and ensure that it has identified specific, actionable measures it will take to protect monarch habitat and the habitat of at-risk butterfly species from contamination that may occur as a result of exposure to treatment, such as designating a 125-ft buffer around identified habitat. 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 monarchs (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, honey bee 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."

APHIS includes many of the proposed measures to minimize risks to non-target organisms and human health. These are summarized in the recent EIS. For example, no treatment buffers are applied to all water bodies and to areas where the public may potentially be exposed to Program applications. APHIS also minimizes aerial insecticide use, where possible, however site conditions may dictate the need for aerial treatments. APHIS minimizes use of liquid carbaryl and malathion which is reflected in the historical use for both insecticides. Diflubenzuron has been the preferred insecticide for making Program suppression treatments. In addition APHIS has incorporated the use of RAATS in the Program as a means to reduce insecticide use providing reduced risk while meeting the goal of suppression. APHIS continues to research and develop new techniques for management of grasshopper and Mormon cricket populations.

Comment 38

APHIS received the following comment, "While the mitigations that are identified for aquatic habitats in the EAs are heartening, 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 conducts environmental monitoring related to Program treatments. Monitoring is typically done adjacent to sensitive habitats, including aquatic habitats, to determine pesticide residues. These data can be used to determine risk to non-target organisms based on available toxicity data.

Comment 39
APHIS received the following comment, "To protect freshwater mussels, APHIS should use the same buffers agreed to in the national consultation with NMFS to protect listed salmon to protect freshwater mussels."

APHIS agrees that freshwater mussels should be protected, as well as other aquatic organisms, and uses ground and aerial application no treatment buffers adjacent to all aquatic habitats. In addition, APHIS uses reduced rates of Program insecticides compared to current labeled rates. These mitigation measures are beyond label requirements for protection of aquatic habitats. The intent of these buffers is to reduce off-site drift and runoff of Program insecticides to aquatic habitats.

Comment 40
APHIS received the following comment, "The EAs do not discuss water bodies of anthropogenic origin, such as stock tanks or stock ponds, nor any buffers that will be observed to prevent pesticide overspray or drift into these habitats."

In Montana, all stock tanks and stock ponds are buffered for applications.

Comment 41
APHIS received the following comment, "APHIS should recognize the potential for stock pond/tanks to contribute significantly to the diversity of aquatic invertebrates in rangelands."

See previous response. All bodies of water are buffered according to the APHIS Guidelines in Appendix 1 of the EA.

Comment 42
APHIS received the following comment, "APHIS should identify and map all stock tanks/ponds and specify a buffer around stock ponds/tanks from chemical treatment at least equivalent to that specified for wetlands, in order to protect aquatic diversity."

All bodies of water are buffered according to APHIS Guidelines in Appendix 1 of the EA. In Montana, locations of stock tanks are provided to APHIS by land owners and land managers to be used in the field during delimiting surveys and treatment planning. Tribal stock tank locations are provided to APHIS but are not to the public. Tribal maps can be provided from the BIA.

Comment 43
APHIS received one comment, "APHIS' reactive strategy includes 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."

APHIS is not a land management agency, but encourages IPM through past and current research and will continue to do so.

APHIS supports the use of IPM 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 land owners. 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, which is discussed in more detail on page 21 of this EIS. 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.

Comment 44
APHIS received one comment: "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. 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."

APHIS supports the use of IPM 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, including cultural techniques. However, implementation of on-the-ground IPM activities is limited to land management agencies and Tribes, as well as private land owners. In addition, APHIS' authority under the Plant Protection Act is to treat Federal, State and private lands for grasshoppers and Mormon cricket populations.

Comment 45
APHIS received one comment that, "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 supports the use of IPM 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, including cultural techniques. However, implementation of on-the-ground IPM activities is limited to land management agencies and Tribes, as well as private land owners. In addition, APHIS' authority under the Plant Protection Act is to treat Federal, State and private lands for grasshoppers and Mormon cricket populations.

APHIS has maintained cooperative relationships with state and federal land managers as well as private landowners and Indian tribes for decades. Those relationships have allowed APHIS to provide consistent and continual recommendations on land management practices designed to mitigate the damage from orthopteran infestations.

Comment 46
APHIS received on comment that, "APHIS and/or collaborating agencies should investigate and implement opportunities to incentivize healthy range management practices."

As part of its ongoing IPM strategy to manage grasshoppers and Mormon cricket outbreaks, APHIS collaborates with scientists and land managers focused on rangeland health.

Comment 47
APHIS received one comment that, "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. Memoranda of Understanding (MOUs) should be examined and updated to ensure that land management agencies are accountable in utilizing cultural techniques to diminish the carrying capacity of pest species.

APHIS supports the use of IPM 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 land owners. In addition, APHIS' authority under the Plant Protection Act is to treat Federal, State and private lands for grasshoppers and Mormon cricket populations.

Comment 48
APHIS received a comment, "Longer-term strategic thinking should include:
●Prevent conditions that allow pest populations to survive and reproduce.
● Employ diverse management techniques (e.g., biological, physical, and cultural).
● Select pesticides to minimize risks to non-target organisms.
● Implement frequent and intense monitoring to identify populations that can be controlled with small ground-based pesticide application equipment.

● 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 currently monitors for grasshopper and Mormon cricket populations. These measures are employed to allow APHIS to respond with treatment, where warranted, treating the smallest area possible and if practical using ground-based equipment. APHIS, due to its monitoring efforts, has been able to rely on diflubenzuron as the primary insecticide used in the Program. Diflubenzuron is a more selective insecticide compared to carbaryl and malathion posing less risk to non-target organisms. APHIS also uses environmental monitoring to assess application success and to determine if Program insecticides are reaching sensitive habitats, including aquatic habitats. APHIS supports the use of IPM 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 land owners. In addition, APHIS' authority under the Plant Protection Act is to treat Federal, State and private lands for grasshoppers and Mormon cricket populations. APHIS continues to research and develop new methods for assessing and controlling grasshopper and Mormon cricket populations that can be incorporated into IPM practices.

Comment 49
APHIS received one comment that, "The EAs do not make mention of any specific protections to be accorded to special status lands such as Wilderness areas, Wilderness study areas, Research Natural Areas, National Wildlife Refuges, and designated or proposed Areas of Critical Environmental Concern. 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 does not make treatments on lands of special status without a request from that agency and an evaluation of the whether treatments are necessary. Additional protection measures for these types of lands are established by the agency requesting treatment and are followed by APHIS.

Comment 50
APHIS received the following comment "We appreciate that public notice of this site-specific EA and its comment period was posted at the APHIS website. It does not appear to have been the practice to post the Draft EAs in the last several years, but limiting public notice is contrary to the spirit of the NEPA process. 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 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."

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). Our EIS process for the grasshopper and Mormon *cricket suppression program was published in the Federal Register (APHIS-2016-0045), and met all applicable notice and comment requirements for a federal action with effects of national concern. This process provided individuals and national groups the ability to participate in the development of alternatives and provide comment. Our subsequent state-based actions have the potential for effects of local concern, and we publish them according to the provisions that apply to federal actions with effects primarily of local concern. This includes the USDA APHIS NEPA Implementation Procedures, which allows for EAs and FONSIs where the effects of an action are primarily of regional or local concern to normally provide publication in a local or area newspaper of general circulation (7 CFR 372.7(b)(3)). Notification for the 3 EAs were published in the Daily Interlake, Billings Gazette, Missoulian, Independent Record, and the Bozeman Daily Chronicle on April 26, 29,and May 3, 2020. These publications provide potentially locally-affected individuals an additional opportunity to provide input into the decision-making process.*

Comment 51
APHIS received the following comments: "The Draft Environmental Assessments Frustrate Public Participation." and "APHIS frustrated public participation by failing to inform interested parties of the existence of the EAs." and "Limiting public notice is contrary to the spirit of the NEPA process. 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."

"Scoping" is the process APHIS uses through which the agency and the public 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 Environmental Assessments (EAs). The process can occur formally and informally through meetings, conversations, or written comments from individuals and groups.

APHIS notified Federal, State and Tribal land managers and private landowners of the potential for grasshopper and Mormon cricket outbreaks on their lands, and to inform them that the comment period was open.

Notice of public comment was published in local newspapers (see comment 50) and distributed to various tribal, federal, state, county, and private stakeholders for distribution to other interested parties. The comment period opened April 24, 2020 and expired May 25, 2020, although comments continued to be accepted as late as June 5, 2020.

Comment 52
APHIS received the following comment, "APHIS did not provide information for the submission of public comments including where and when to submit comments by."

APHIS works to inform all interested parties about draft EA's for comment. When an interested party asks to be informed, APHIS ensures contact information is added to the list of interested stakeholders. Each local office works to inform interested parties of the availability of an EA for comment. Any omission of an interested party is not intentional.

Further, Section VII of the 3 EAs titled "Public Comment," provides the name, physical address, email address, office phone number, and cell phone number of the correct employee to send comments to. The comment period closure date is stated in Section VII as well.

Comment 53
APHIS received the following comments, "APHIS limited public notice to local papers." and "This local notice is insufficient as it excludes countless other interested parties. In sum, APHIS has failed to meet NEPAs requirements for public involvement in these EAs."

APHIS emailed 165 tribal, federal, state, county, extension office, and private landowner stakeholders to notify that the EA comment period was open. These 165 recipients were encouraged to send the public notice to anyone interested. APHIS also published the public notice in 5 newspapers in Montana's 5 biggest cities, on 3 separate days.

Comment 54
APHIS received the following comments, "APHIS provided a short public comment period during this COVID-19 pandemic." "The 30 day comment deadline for the Draft EAs is wholly inappropriate during the current COVID-19 pandemic, where both staff and members of the concerned public have limited capacity, given the challenges associated with a global pandemic including but not limited to increased childcare demands, illness, etc."

The comment period was in accordance with CEQ regulations, 40 C.F.R. § 1501.4(e)(2), In determining whether to prepare an environmental impact statement the Federal agency shall: (e) Prepare a finding of no significant impact, if the agency determines on the basis of the environmental assessment not to prepare a statement. (2) In certain limited circumstances, which the agency may cover in its procedures under § 1507.3, the agency shall make the finding of no significant impact available for public review (including State and areawide clearinghouses) for 30 days before the agency makes its final determination whether to prepare an environmental impact statement and before the action may begin. CEQ guidance also notes: When preparing an EA, the agency has discretion as to the level of public involvement. The CEQ regulations state that the agency shall involve environmental agencies, applicants, and the public, to the extent practicable, in preparing EAs. Sometimes agencies will choose to mirror the scoping and public comment periods that are found in the EIS process. In other situations, agencies make the EA and a draft FONSI available to interested members of the public. APHIS would have considered extending the comment period if there had been a reason to believe that additional substantive issues remained, or that the pandemic itself created new issues. APHIS also accepted comments as late as June 5, 2020.

Comment 55
APHIS received the following comment, "the proposal in question is controversial and deals with issues of significant public interest."

The USDA became involved in grasshopper control on Federal rangeland in the 1930s. During that decade, grasshopper infestations covered millions of acres in 17 Western States. Unsuccessful efforts to control grasshopper outbreaks on a local basis proved that grasshoppers *needed to be dealt with on a broader basis. In 1934, Congress charged USDA with controlling grasshopper infestations on Federal rangeland. Thereafter, USDA was the lead agency in cooperative efforts among Federal agencies, State agriculture agencies and private ranchers to control grasshopper outbreaks.*

APHIS is not aware of any controversy in the program. Every year APHIS works with local stakeholders to gather information and discuss the grasshopper program. The grasshopper program requires a written request to treat on any land and discussions with the land owner or manager determine the course of the final action. APHIS acts in partnership with stakeholders through agreements and Memorandum of Understanding on all activities in the program.

APHIS operates under an act of congress and is mandated to provide support to communities affected by grasshopper and Mormon cricket outbreaks as funding is available. The grasshopper program in Montana has not raised concerns about pesticide use but rather concerns about NOT suppressing damaging infestations of grasshoppers that significantly reduce range forage for wildlife and livestock. APHIS' failure to act in a timely manner threatens the livelihood of farmers and ranchers who depend upon the land for subsistence as well as threatens wildlife forage and habitat essential to the maintenance of adequate range resources for native species.

Comment 56
APHIS received the following comment, "The Draft EAs also limit public participation by failing to provide contact information for the submission of written or electronic comments."

See response to comment 52.

Comment 57
APHIS received the following comment, "Nowhere on the webpage for the Draft Environmental Assessment Rangeland Grasshopper and Mormon Cricket Suppression Program is there any information on where to submit comments."

See previous responses to comments. The local offices send out public notice to a list of stakeholders that they have collected over the years and they also announced the open comment period in the local media. Those notices have the link for the EA's for comment and the point of contact. In an attempt to be more transparent, APHIS has placed Program EA's on to the website for people to access. When an interested party asks to be informed, APHIS ensures there contact information is added to the list of interested stakeholders. Each local office works to inform interested parties of the availability of an EA for comment. Any omission of an interested party is not intentional.

Comment 58
APHIS received the following comment, "Staff for USDA-APHIS that have been involved with the environmental review for this program were unable to readily provide information for the submission of public comment."

Please see previous comment responses. Further, APHIS is not aware of the direct personnel communication cited by the commenter. APHIS personnel are engaged in a wide variety of activities to protect American agriculture and not every staff member is completely informed about the details of the Grasshopper Program NEPA compliance procedures.

Comment 59
APHIS received the following comment, "there is no information on when the comment period opened or closed on the EAs provided on the webpage."

See previous comment responses. Contact information is located in Section VII of each EA. The local offices send out public notice to a list of stakeholders that they have collected over the years and they also announce the open comment period in the local media. Those notices have the link for the EA's for comment and the point of contact. In an attempt to be more transparent, we have put all of our EA's on to the website for people to access. When an interested party asks to be informed, APHIS ensures there contact information is added to the list of interested stakeholders. Each local office works to inform interested parties of the availability of an EA for comment. Any omission of an interested party is not intentional.

Comment 60
APHIS received the following comment, "APHIS has failed to comport with NEPA's threshold requirements."

APHIS did not fail to perform NEPA's threshold requirements for public outreach and engagement, but rather exceeded them. See previous comments concerning how APHIS informed interested parties of the availability of EAs for public comment, where to send comments, and the closing date for the comment period.

Comment 61
APHIS received the following comment, "The Draft EAs further limit public participation by failing to post notices in the Federal Register or on regulations.gov, unlike earlier versions of the environmental review."

APHIS further involves the public in the scoping process by the publication of notices of availability for EAs and a Findings of No Significant Impact (FONSIs). When an individual State level EA is written, a notice is published in the legal section of the local newspaper, advertising the availability of the EA during an open comment period. The notices published in local newspapers was conducted in accordance with APHIS' NEPA Implementation Procedures, 372.7 (b)(3), Notification of the availability of environmental assessments and findings of no significant impact for proposed activities will be published in the FEDERAL REGISTER, unless it is determined that the effects of the action are primarily of regional or local concern. Where the effects of the action are primarily of regional or local concern, notice will normally be provided through publication in a local or area newspaper of general circulation and/or the procedures implementing Executive Order 12372, "Intergovernmental Review of Federal Programs."

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). Our EIS process for the GMC program was *published in the Federal Register (APHIS-2016-0045), and met all applicable notice and comment requirements for a federal action with effects of national concern. This process provided individuals and national groups the ability to participate in the development of alternatives and provide comment. Our subsequent state-based actions have the potential for effects of local concern, and we publish them according to the provisions that apply to federal actions with effects primarily of local concern. This includes the USDA APHIS NEPA Implementation Procedures, which allows for EAs and FONSIs where the effects of an action are primarily of regional or local concern to normally provide publication in a local or area newspaper of general circulation (7 CFR 372.7(b)(3)). These publications 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.*

Comment 62
APHIS received the following comment, "[The Center for Biological Diversity] have been informed that there was notice in local newspapers. This local notice is insufficient as it excludes countless other interested parties."

See previous response.

Comment 63
APHIS received the following comment, "APHIS has failed to meet NEPAs requirements for public involvement in these EAs."

APHIS also notes CEQ guidance for public involvement in the NEPA process of agencies, "A Citizen's 12 Guide to the NEPA" states: "When preparing an EA, the agency has discretion as to the level of public involvement. The CEQ regulations state that the agency shall involve environmental agencies, applicants, and the public, to the extent practicable, in preparing EAs. Sometimes agencies will choose to mirror the scoping and public comment periods that are found in the EIS process. In other situations, agencies make the EA and a draft FONSI available to interested members of the public".

Contact information for the Montana state office is in Section VII of the Draft EA's. The notice of public comment clearly stated the website and address for EA documents and where to send comments and the closing date of May 25, 2020.

Comment 64
APHIS received the following comment, "the range of alternatives offered by APHIS is woefully inadequate."

APHIS structured and analyzed the risk of the substantial program alternatives available to the agency.

Comment 65
APHIS received the following comment, "[The alternatives] are, "No Action," "Insecticide Applications at Conventional Rates or Reduced Agent Area Treatments with Adaptive Management Strategy" (preferred alternative). While the RAATs are an improvement over

conventional approval rates, this alternative should actually be two, one, Insecticide Applications at Conventional Rates and two, Reduced Agent Area Treatments with Adaptive Management Strategy. Lumping the two together means that supporting this alternative could mean pesticide application at conventional rates without RAATs. APHIS must break these into different alternatives."

The EA states "Under Alternative A, the No Action alternative, APHIS would not conduct a program to suppress grasshopper infestations. 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."

Under Alternative B, the Preferred Alternative, APHIS would manage a grasshopper treatment program using potentially any of pesticides and application methods described in the EA Alternative B to suppress outbreaks. The grouping of conventional methods and pesticide rates with the more commonly used RAATs procedures reflects the variety of approaches that the agency may need depending on treatment specific circumstances.

Comment 66
APHIS received the following comment, "APHIS does not include an alternative that utilizes Integrated Pest Management."

APHIS technical guidance is part of each alternative proposed, and is not unique to any one alternative. An example of APHIS technical guidance is the agency's work on integrated pest management (IPM) for the grasshopper program. IPM for grasshoppers includes biological control, chemical control, rangeland and population dynamics, and decision support tools.

APHIS has funded the investigation of various integrated pest management (IPM) strategies for the grasshopper program. Congress established the Grasshopper Integrated Pest Management (GIPM) to study the feasibility of using IPM for managing grasshoppers.

The major objectives of the APHIS GIPM program were to: 1) manage grasshopper populations in study areas, 2) compare the effectiveness of an IPM program for rangeland grasshoppers with the effectiveness of a standard chemical control program on a regional scale, 3) determine the effectiveness of early sampling in detecting developing grasshopper infestations, 4) quantify short- and long-term responses of grasshopper populations to treatments, and 5) develop and evaluate new grasshopper suppression techniques that have minimal effects on non-target species (Quinn, 2000).

The results for the GIPM program have been provided to managers of public and private rangeland including ways to manage grasshopper populations in the long-term, such as livestock grazing methods and cultural control by farmers.

APHIS issued the GIPM User Handbook describing biological control, chemical control, environmental monitoring and evaluating, modeling and population dynamics, rangeland management, decision support tools, and future directions.

Federal and State land management agencies, State agriculture departments, and private groups or individuals may carry out a variety of preventative IPM strategies that may reduce the potential for grasshopper outbreaks. Some of these activities include grazing management practices, cultural and mechanical methods, and prescribe-burning of rangeland areas. These techniques have been tried with varying success in rangeland management, and some have been associated with the prevention, control and or suppression of harmful grasshopper populations on rangeland.

Regardless of the various IPM strategies taken, the primary focus of the risk analysis contained in the EAs is on the potential impacts from chemical treatments needed during an outbreak of economic importance. While APHIS provides technical expertise regarding grasshopper management actions, the responsibility for implementing most land management practices lies with other Federal (i.e., BIA, BLM and USDA's FS), State and private land managers.

Comment 67

APHIS received the following comment, "Given that much of APHIS's work on grasshopper and Mormon cricket suppression is on federal public lands or adjacent to federal public lands in Montana, it only makes sense that it would conform to their IPM mandates in these EAs."

See previous response. APHIS supports the use of IPM to prevent grasshopper outbreaks on or near Federal lands. These actions are and should continue to be considered by agencies as part of proper land management. APHIS treatments are a component of the IPM strategies that may be employed by Federal land management agencies. APHIS also adheres to any restrictions proposed by Federal land management agencies that may be part of their IPM strategies.

Comment 68

APHIS received the following comment, "APHIS must adopt an alternative that harmonizes its mandates in regard to grasshoppers and Mormon crickets with the IPM mandates of the federal lands that it operates on."

See previous response. A Memorandum of Understanding between land management agencies, i.e., the Department of Interior's Bureau of Indian Affairs and Bureau of Land Management, and USDA's Forest Service, indicates that while APHIS provides technical expertise, namely advice, regarding grasshopper management actions, the responsibility for implementing most land management practices, including IPM measures, lies with other Federal (i.e., BIA, BLM, and USDA's FS), State, and private land managers (page 32 of the 2019 EIS).

Comment 69

APHIS received the following comment, "APHIS must enlist IPM experts to craft an alternative that is land-use and pest-specific, using the minimum level of pest suppression necessary, relying on prevention, avoidance, monitoring, and suppression techniques in order to decrease pest pressure with the least harmful controls possible."

See previous response to comment 67.

Comment 70
APHIS received the following comment, “APHIS does not provide a single citation or any other evidence to support its assertions that the pesticides proposed to be used ‘pose no risk of direct toxicity, carcinogenicity, neurotoxicity, genotoxicity, reproductive toxicity, or developmental toxicity.’”

The quote referenced in the comment was indeed misworded. It has been amended in each of the EAs.. The risk analysis in the EA is tiered to the two Environmental Impact Statements (2002 and 2019) and the four Human Health and Ecological Risk Assessments as described in sections I.C. About this Process, II.A. Alternatives (where an internet link to the more in-depth risk analysis documents is provided on page 7), in the second paragraph of section IV. Environmental Consequences (a link is also provided there), and many other locations in the EA.

Comment 71
APHIS received the following comment, “APHIS must conduct an adequate analysis of human health effects.”

APHIS prepared and published separate Final Human Health and Ecological Risk Assessments for all the pesticides used by the Grasshopper Programs (November 2019).

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

Comment 72
APHIS received the following comment, “there is no description of how APHIS plans to identify or contact these individuals in order to advise them to avoid treatment areas.”

In areas considered for treatment, State-registered beekeepers and organic producers shall be notified in advance of proposed treatments. APHIS will notify residents within treatment areas, or their designated representatives, prior to proposed operations, and advise them of the control method to be used, proposed method of application and precautions to be taken.

Comment 73
APHIS received the following comment, “APHIS’s failure conduct any analysis of their impacts to human health is a far cry from the level of analysis demanded by NEPA and basic due care for public health.”

See responses to comment 71. APHIS prepared and published separate Final Human Health and Ecological Risk Assessments for all the pesticides used by the Grasshopper Programs (November 2019). These documents were incorporated by reference into the draft EA.

Comment 74
APHIS received the following comment, “APHIS states that “[n]o treatment will occur over congested areas, recreation areas, or schools and if appropriate, a buffer zone will be enacted and

enforced. While APHIS may believe this to be the case, it can not claim to know all the areas where people congregate or recreate in Montana, and it provides no information on what kinds of buffer zones it would enact and enforce even if it did".

The grasshopper program is a rangeland program and normally conducted in a mixture of federal lands, state lands and private lands where people are not likely to congregate or recreate. Open communications between applicators and APHIS personnel about treatment occur throughout the treatment to avoid any unforeseen bystanders. Landowners and land managers whose lands fall within the treatment area are aware of the treatment activities.

Comment 75
APHIS received the following comment, "APHIS's failure conduct any analysis of their impacts to human health is a far cry from the level of analysis demanded by NEPA and basic due care for public health."

See responses to comment 71. APHIS prepared and published separate Final Human Health and Ecological Risk Assessments for all the pesticides used by the Grasshopper Programs (November 2019). These documents were incorporated by reference into the draft EA.

Comment 76
APHIS received the following comment, "APHIS fails to look at the effects of the proposed action on migratory birds."

Executive Order 13186 directs Federal agencies taking actions with a measurable negative effect on migratory bird populations to develop and implement a Memorandum of Understanding with the USFWS that promotes the conservation of migratory bird populations. On August 2, 2012, a Memorandum of Understanding between APHIS and the USFWS was signed to facilitate the implementation of this Executive Order.

Specifically to the grasshopper and Mormon cricket program, APHIS evaluated potential impacts to birds in the final EIS and associated human health and ecological risk assessments. These documents are incorporated by reference into the final EA.

Comment 77
APHIS received the following comment, "APHIS needs to take a hard look at the impacts of the proposed action, including direct and indirect effects."

The EA incorporated the analysis from the EIS and associated human health and ecological risk assessments into the analysis. The EIS, and in particular, the risk assessments evaluated potential indirect effects to non-target organisms, relying on available toxicity data and estimates of risk.

Comment 78
APHIS received the following comment, "A direct effect of not spraying insecticides is abundant food for migratory birds. Conversely, a direct effect of spraying is reduced abundance of food for insectivorous migratory birds. Another potential direct effect of insecticide spraying is poisoning. An example of an indirect effect is the cumulative effect of continuous low level

pesticide exposure from numerous sites over many years. APHIS must take a hard look at all these impacts".

The routine use of Reduced Area Agent Treatment (RAAT) procedures results in the temporary reduction of insects that birds prey upon within the treated swaths. This indirect effect is mitigated by the unchanged abundance of prey in nearby untreated swaths. The EIS analyzes the toxicological effects of Grasshopper applied insecticides on birds (carbaryl p. 42-43, diflubenzuron p.50-52, malathion p.61-63, and chlorantraniliprole p.75). The EIS also describes the potential effects on birds caused by loss of prey (diflubenzuron p. 52, malathion p. 63, generally p. 88-89).

Comment 79
APHIS received the following comment, "APHIS's handling of impacts to non-target species and species of concern wholly fails to meet NEPA's requirement that the agency take a hard look at the impacts of its proposed action."

APHIS prepared and published separate Final Human Health and Ecological Risk Assessments for all the pesticides used by the grasshopper and Mormon cricket suppression program (November 2019). The EIS and risk assessments evaluated available effects data and risk to non-target species. These documents are incorporated by reference into the final EA. The risk assessments provided the basis for summary statements in the EA that is tiered to the EIS.

The U.S. FWS defines "Species of concern" is an informal term that refers to those species which may require some conservation actions but which are not threatened with extinction. The conservation actions needed will vary depending on the health of the populations and types and degree of threats. At one extreme, there may only need to be periodic monitoring of populations and threats to the species and its habitat. At the other extreme, a species eventually may require listing as a Federal threatened or endangered species and become the subject of a Federal recovery program. Species of concern receive are not provided legal protection under the Endangered Species Act, and the use of the term does not necessarily mean that the species will eventually be proposed for listing as a threatened or endangered species. Based on U.S. FWS funding and staffing levels discussions with APHIS about species of concern may occur during broader ESA consultations and result in specific protections measures observed by the Grasshopper Program.

Comment 80
APHIS received the following comment, "the EA cannot be finalized until APHIS actually takes a hard look at the impacts on non-target and species of concern."

See previous response. Under FWS Section 7 Act there is no requirement to consult on sensitive species. However, in Montana when there is concern by land management agencies, federal, state, etc., APHIS has implemented protective measures for those species of concern. This is a cooperative effort by APHIS between FWS, Tribal Nations, Montana Fish, Wildlife, and Parks, and/or the requesting land management agency.

Comment 81

APHIS received the following comment, "APHIS doesn't even consider many sensitive or culturally important species. For example, monarch butterflies fly through Montana."

APHIS prepared and published separate Final Human Health and Ecological Risk Assessments for all the pesticides used by the Grasshopper Programs (November 2019). The risk assessments and EIS considered available field and laboratory data regarding impacts to Lepidoptera, including moths and butterflies.

Comment 82
APHIS received the following comment, "APHIS also doesn't consider the impacts of spraying on the thousands of native bee species that reside in Montana, including many that are exceedingly rare, existing no where else on earth."

APHIS works with Tribal, Federal and State land managers and their local biologists, natural resource specialists, and range conservationists to implement measures that reduce risks of Program treatments to native bees. These measures may include reduced insecticide applications associated with RAATS, avoidance measures and use of carbaryl bait, where applicable. APHIS also prepared and published separate Final Human Health and Ecological Risk Assessments for all the pesticides used by the Grasshopper Programs (November 2019). The risk assessments summarized available effects data for non-target species including pollinators.

Comment 83
APHIS received the following comment, "The EAs have not adequately analyzed the cumulative impacts of the program with other governmental or private entity actions."

APHIS discussed the potential of overlapping chemical treatments in the areas where outbreaks of grasshoppers have occurred or could occur in the future in the cumulative impacts section of the draft EIS, from page 79 to 83. It is unlikely there would be significant overlap between APHIS programs and the grasshopper program and coordinated treatments would mitigate impacts if there is ever overlap; current label and mitigations minimize significant exposure of soil, water and air to Program insecticides; grasshopper chemical treatments are not expected to persist or bioaccumulate in the environment; and, there is a lack of significant routes of exposure (page 82 to 83 of draft EIS).

APHIS consults with all its land managers within treatment blocks prior to project commencement and insures that any planned herbicide treatments are in harmony with the objectives of the project.

Comment 84
APHIS received the following comment, "The EA does not take into account the background level of exposure to humans and animals from pesticides and other pollutant sources that exist in the environment from other actions or the synergistic effects of the enhanced toxicity that many mixtures exhibit."

The commenter assumes that the rangeland in Montana which is covered by the Draft EAs has been exposed to pesticides and pollutants and that there is a synergistic effect which enhances toxicity to the environment. The land managers that manage the areas covered in the EAs, *document all pesticide applications. If these remote areas were at risk, the land manager would not request APHIS's services. The activities, or lack thereof, are discussed in the cumulative impacts section of the final EA.*

Comment 85
APHIS received the following comment, "[the EA] does not account for the range of cumulative exposures that would be anticipated. There was no mention of widespread mosquito spraying that takes place in many areas."

The Montana Draft EAs do not account for the commenter's remarks due to the fact that there is no widespread mosquito abatement in the State of Montana. APHIS follows program guidelines and treatment strategies listed in the EIS and only treat an area once per year. Treatments rarely occur in the same locations year to year.

Comment 86
APHIS received the following comment, "as cattle are grazing these pesticides will be washed off their bodies or excreted through waste and contaminate surrounding land and water bodies."

The labels for Dimilin 2L and Carbaryl 2% bait specify that there is no grazing restrictions. Any pesticide residues that may be present on forage in treated areas after treatment is typically metabolized and excreted as metabolites that have lower toxicity than the parent compound. In addition, the low application rates employed by APHIS relative to the current maximum labelled rates for each Program insecticide would result in very low residues in livestock waste.

Comment 87
APHIS received the following comment, "A substantial acreage of rangeland is adjacent to lands used for plant agriculture, and the EAs state that they also aim to protect these agricultural lands. These areas generally have a high potential for crossover contamination through drift or runoff of pesticides. Large quantities of pesticides, including insecticides and fungicides that may be synergistic with the insecticides included in the EAs, may be used on these lands. In addition, herbicide use on crops already significantly impacts insects by destroying habitat and food sources in agricultural lands".

The grasshopper program is a rangeland program and only rangeland is treated. Treatments on rangeland that is adjacent to agriculture lands also provide some protection from grasshoppers moving into crops. APHIS strictly adheres to pesticide labels which clearly state where their use is allowed or prohibited.

Comment 88
APHIS received the following comment, "None of these issues were disclosed or analyzed in the Draft EIS and add to the already large cumulative exposures from pesticides used in 1) the boll weevil eradication program, 2) fruit fly cooperative eradication program, 3) the gypsy moth cooperative eradication program, and 4) invasive plant control".

The commenter refers to the Draft EIS. The EIS has been finalized and the ROD has been signed. The final EIS does address the cumulative exposures from other APHIS programs on a *programmatic level. The documents in question are the Draft EAs. The first three programs mentioned by the commenter are not relevant to the Rangeland Grasshopper and Mormon Cricket Suppression Program in Montana. APHIS follows program guidelines and treatment strategies listed in the EIS and only treat an area once per year. Treatments rarely occur in the same locations. All grasshopper treatments are coordinated with the land managers and other non-grasshopper programs are discussed if the land managers are concerned about an overlap with other programs.*

Comment 89
APHIS received the following comment, "These cumulative exposures cannot only adversely affect human and environmental health but can also negatively impact biological control programs that try to manage insect and weed pests with natural predators".

APHIS follows program guidelines and treatment strategies listed in the EIS and only treat an area once per year. Treatments rarely occur in the same locations. All grasshopper treatments are coordinated with the land managers and other non-grasshopper programs are discussed if the land managers are concerned about an overlap with other programs. APHIS's preferred treatment chemicals and strategies are the most ecologically sound for non-targets such as biological control.

In Montana, APHIS is heavily involved with biocontrol collections, releases, and monitoring, and would take consideration before performing any grasshopper treatments in areas where biocontrol agents have previously been released. Before any grasshopper treatment takes place, APHIS conducts extensive consultation with land managers so that established biological control agents are not adversely impacted.

Comment 90
APHIS received the following comment, "How these pesticides act in conjunction with one another to additively or synergistically increase toxicity is not discussed and no mitigation measures were proposed. Therefore, APHIS must fully analyze the impacts from cumulative exposures and identify ways in which risk can be mitigated or prohibited".

The Grasshopper Program does not apply treatments more than once per year to any rangeland area. Cumulative exposures from pesticides applied by external parties are not anticipated in most cases due to coordination between APHIS, land managers and other cooperators, on rangeland that may be receive grasshopper or Mormon cricket treatments. The EA details many procedures APHIS employs to mitigate risk.

Comment 91
APHIS received the following comment, "The project is vague and ill-defined, it improperly precludes the disclosure of environmental effects because the information on the project and its impacts is incomplete".

The proposed Grasshopper treatment program described in the EA could occur within a specific area, using a limited number of insecticides and application methods. The environmental *consequences of suppressing or not suppressing grasshopper infestations are analyzed in the EA and other programmatic risk analysis documents.*

Comment 92
APHIS received the following comment, "APHIS's explanation of a "level of economic infestation," which is the trigger for insecticide spraying, does not give the public any sense whatsoever of when that threshold is met. The definition is too vague and ill-defined to meet NEPA's purposes and mandates. The agency could spray with minimal infestation levels if it saw fit whenever it decided to do so. There must be a more concrete definition that identifies specific thresholds that must be met for the agency to determine an economic level of infestation has been met".

APHIS utilizes and provides links to extensive resources for determining when a grasshopper outbreak is exceeding IPM thresholds including, "a level of economic infestation". The Purpose and Needs section of the EA and supporting documents adequately define the multiple factors that must be evaluated before APHIS decides a treatment is necessary.

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.

Comment 93
APHIS received the following comment, "The EA's description of the preferred alternative that includes "reduced agent area treatments" ("RAATs") is similarly vague and ill defined".

RAATs has long been in use, is public knowledge, and one of APHIS's preferred IPM strategies, supported by decades of research. Skipping swaths are the most common RAATs choice, leaving 50% of the treated area untreated to maximize refugia for non-target arthropods while simultaneously inducing target Orthoptera mortality at desired levels. RAATs are also described in detail in the final EIS that is incorporated by reference in the EA.

Comment 94
APHIS received the following comment, "It is unclear whether RAATs will even be used and how they will be used in the site specific area".

APHIS' preferred method of treatment is to use RAATs as a means to reduce program costs and potential environmental effects. However the program could decide to apply insecticides at conventional rates and total area coverage if a damaging grasshopper infestation warrants that *level of suppression. These instances are rare due to monitoring and other technical assistance provided by APHIS. An explanation of the uncertainties involved with predicting grasshopper populations before they emerge is provided in section I.C. About this Process.*

Comment 95

APHIS received the following comment, "APHIS could use the pesticide at 95% of the labelled rate and still call the application a RAAT."

RAAT's is defined as Reduced Agent and/or Area Treatments. The current pesticide labels for use in the Program do not allow applications at 95% of the labeled rate to be called RAATs. This information was also summarized in the final EIS. EPA has approved the RAAT verbiage for each pesticide label. The labels clearly state which rates are allowed to meet a RAAT rate. In the case of Dimilin 2L label, which clearly states the application rates for RAAT's is 0.75 - 1 ounce per acre. "Use on rangeland only, in a RAAT's application on early instars. A RAAT's application is an IPM strategy that takes advantage of grasshopper movement and conservation biological control to allow Dimilin 2L to be applied on rangeland on a reduced treated area and at reduced rates, while sustaining acceptable control."

The applicator can only use the RAAT's rate of .75 or 1 ounce per acre. The label rate, if not using RAAT's is 2 ounces/acre. The RAAT's rate would be 50% of the label rate not 95% of labeled rate.

In the case of using Carbaryl 5% bait the label rate is 20-40 lbs. per acre. APHIS uses the RAAT's rate of 10lbs/acre. In the case of Carbaryl 2% bait, the label clearly states for ground applications 25 pounds/acre. It clearly states for U.S. Federal Government and State affiliated Grasshopper/Mormon Cricket Suppression Programs using aerial applications the rate of application is 10 pounds/acre. So clearly the RAAT's applications are 50% or less than the labeled rates.

In the case of a full coverage treatment, the total acreage is treated. In the case of reduced area portion of RAAT's the treatment area would be 50% less than a full coverage treatment. The reduced area is achieved through alternating the treated and untreated swath widths. The RAAT's application rates are described in detail in the Draft EA's and depending on the pesticide used in a treatment, the label will also specify or clarify what the RAAT's rate. The reduced area is achieved by skipping a treated swath. For example, if the swath width of the treatment equipment is 40 feet, then the treated swath would be 40 feet. Then the adjacent swath would be skipped or untreated. The next treated swath would then be applied. So across the treatment block would be treated and untreated swaths. Thus the reduced area of actual treated ground, instead of a conventional broadcast treatment.

The RAAT procedures used by the program are flexible to allow for a reduction of pesticide use. Typically the RAAT procedures will result in half the amount of pesticide being applied to a treatment block than conventional rates and total coverage. Program managers may reduce the rate at which the pesticide is sprayed from the aircraft or increase the distance between swaths that are sprayed based on factors specific to grasshopper populations being suppressed. It should be noted that APHIS average RAAT rates are lower than the labeled RAAT rates further reducing pesticide loading into the environment.

Comment 96
APHIS received the following comment, "The agency must give the public a more precise definition of when the threshold for spraying has been met (i.e. number of grasshoppers or crickets/acre and a full description of the economic interests at stake)."

The commenter is asking for survey data to be submitted to the public. This data is accumulated during the nymphal survey season and is not available when compiling the EA's. APHIS utilizes and provides links to extensive resources for determining when a grasshopper outbreak is exceeding IPM thresholds including, "a level of economic infestation". The Purpose and Needs section of the EA and supporting documents adequately define the multiple factors that must be evaluated before APHIS decides a treatment is necessary. Establishing a treatment threshold based on the number of grasshoppers ignores a variety of factors that must be considered by program managers before treatments. Some examples include how voracious the individual species are that compose a grasshopper infestation and the hardiness of rangeland vegetation within a proposed treatment block. These factors are also discussed in the recently published final EIS and are incorporated by reference in the final EA.

See previous responses for economic thresholds.

Comment 97
APHIS received the following comment, "APHIS must also convey what metrics will be used to determine the area that will be sprayed in any given outbreak".

The size and exact configuration of a treatment block cannot be forecast prior to the emergence of the grasshoppers, requests from land managers and other cooperators, and other environmental considerations such as buffers from water and sensitive species. The program procedures and mitigation measures are adequately described in the EA and supporting documents.

APHIS is unable to predict exactly what areas will be treated before conducting surveys and completing the EA. For ground applications, the terrain is key to be able to treat safely. If the terrain is too rough to safely drive a UTV, then the area is not treated even though other factors warrant a treatment. There are many variables taken into account before an area is treated. Another factor that must be considered is the movement of populations. If for any number of reasons, a treatment can be delayed there is a risk that, depending on species, the boundaries will have to be readjusted to account for the movement of populations.

For example, it is documented that Melanoplus sanguinipes, the Migratory Grasshopper can swarm and fly up to 5-10 miles normally. The longest migrations recorded in 1938 were made by swarms that traveled from northeastern South Dakota to the southwestern corner of Saskatchewan, a distance of 575 miles (Pfadt, 1994). This is why it is critical to have a rapid response to outbreaks. Population dynamics of grasshoppers and Mormon crickets are fluid and responses have to be adaptable to the most current assessments to ensure successful suppression treatments while minimizing environmental impacts.

Comment 98
APHIS received the following comments, "The agency must accurately and comprehensively disclose and analyze the range of rare, sensitive, threatened, and endangered species, ecological areas, communities, Native American gathering grounds and sensitive receptors that could potentially be significantly affected by the proposed project" and "Without this baseline data the EA cannot disclose the environmental effects of the project".

APHIS works in cooperation with Federal and State land managing agencies to protect sensitive resources managed on their lands. In Montana, Native American sacred places or special sites are only made available to APHIS when necessary. These places are not published or disclosed to the public as per conversations with BIA. They are addressed in general terms when published in the EA. Specific details are addressed during meetings with BIA. Sensitive or special BLM sites are not published or disclosed to the public as per conversations with BLM. These sites are also in general terms when published in the EA. Specific details are addressed during meetings with BLM. T&E species are analyzed during the USFWS Section 7 consultations. APHIS adheres to protective measures which have been agreed upon with USFWS and addressed in the letters of concurrence. See USFWS concurrence letter in Appendix 2.

APHIS adequately summarized available data for current baseline conditions in the draft EA. This includes cultural resources as well as the potential for any overlap of federally listed species with the proposed areas of treatment.

Comment 99
APHIS received the following comment, "APHIS's description of the environmental effects of the pesticides at issue failed to properly capture many of their environmental effects".

APHIS prepared and published separate Final Human Health and Ecological Risk Assessments for all the pesticides used by the Grasshopper Programs (November 2019: https://www.aphis.usda.gov/plant_health/ea/downloads/2019/carbaryl-hhera-final.pdf). These documents and the associated final EIS are incorporated by reference.

Comment 100
APHIS received the following comment, "Long-term exposure to carbaryl is associated with decreased egg production and fertility in birds".

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). Carbaryl has a reported half-life on vegetation of three to ten days, therefore, long-term exposure to birds is not anticipated.

The study cited by the commenter noted. Carbaryl is practically nontoxic to birds on both an acute oral exposure (LD50 >2,000 mg/kg) and subacute dietary exposure basis (LC50 >5,000 mg/kg of diet). In addition, no chronic effects were observed at a dietary exposure of 300 mg/kg of diet.

Comment 101

APHIS received the following comment, “Carbaryl is considered moderately toxic to mammals with decreased pup survival being the most sensitive effect”.

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). Carbaryl has a reported half-life on vegetation of three to ten days, therefore the chronic exposure to mammals that resulted in decreased pup survival is not anticipated.

Comment 102
APHIS received the following comment, “EPA has designated carbaryl as “highly toxic” to bees on a short-term exposure basis and ranged from moderately to highly toxic to other insects, mites and spiders”.

Although the Grasshopper Program has used the liquid formulation of carbaryl in the past, nearly all carbaryl applications this year and for the foreseeable future are likely to be a bait. The potential exposures of bees and other pollinators to carbaryl bait are minimal. The risks of carbaryl to bees and other non-target organisms are summarized in the human health and ecological risk assessment that was prepared to support the final EIS. This analysis is incorporated by reference into the final EA.

Comment 103
APHIS received the following comment, “Carbaryl is considered “highly toxic” to certain species of fish when exposed to short-term bursts and can reduce the number of eggs spawned when fish are exposed to lower levels over a longer period of time”.

The EA provided links to APHIS’ Grasshopper Program webpage where the 2019 EIS and Final Human Health and Ecological Risk Assessment for Carbaryl Rangeland Grasshopper and Mormon Cricket Suppression Applications are published. Comparison of the distribution of acute, sublethal and chronic effects data for fish to the residues estimated using ground and aerial ultra-low volume spray and bait applications show that the range of residues do not overlap with acute toxicity values, suggesting there is no acute risk to fish species. APHIS determined there is some overlap with chronic and sublethal effect values and estimated residues. However, carbaryl half-lives in water are typically short and with the proposed one time application chronic exposure and risk to fish is not anticipated. Effects from consumption of contaminated prey are also not expected to be a significant pathway of exposure, based on the low residues and low bioconcentration factor values reported for carbaryl.

APHIS program guidelines describe buffers to bodies of water, streams and rivers are addressed in Appendix 1 of the Draft EAs and the USFWS Section 7 consultations and USFWS letters of concurrence (Appendix 4). All reduce the exposure to fish species.

Comment 104
APHIS received the following comments, “Carbaryl has been designated “very highly toxic” to aquatic invertebrates on an acute exposure basis by the EPA and mesocosm studies that analyze how the pesticide affects aquatic community structure have found significant negative effects at low levels”.

The EA provided links to APHIS' Grasshopper Program webpage where the 2019 EIS and Final Human Health and Ecological Risk Assessment for Carbaryl Rangeland Grasshopper and Mormon Cricket Suppression Applications are published. The risk assessment summarizes the available laboratory and field effects data for aquatic invertebrates and carbaryl. The risk assessment also summarized the potential exposure and risk to aquatic invertebrates. The EIS and carbaryl risk assessment are incorporated by reference into the EAs.

Comment 105
APHIS received the following comment, "The EPA identified potential interactions between carbaryl and the androgen pathway in fish, indicating that carbaryl is an endocrine disruptor in male aquatic vertebrates".

Carbaryl half-lives in water are typically short and with the proposed one time application chronic exposure and endocrine disruption risk to fish is not anticipated. Effects from consumption of contaminated prey are also not expected to be a significant pathway of exposure, based on the low residues and low bioconcentration factor values reported for carbaryl. Chronic risk is also a conservative estimate because chronic toxicity data is based on long-term exposures that what would not be expected to occur from a single application, based on the environmental fate of carbaryl in aquatic environments. The final EIS and human health and ecological risk assessment for carbaryl provides additional information regarding the effects of carbaryl to fish. APHIS program guidelines describe buffers to bodies of water, streams and rivers are addressed in Appendix 1 of the Draft EAs and the USFWS Section 7 consultations and USFWS letters of concurrence (Appendix 4). All reduce the exposure to fish species.

Comment 106
APHIS received the following comment, "On March 12, 2020, the EPA released a draft biological opinion finding that carbaryl is likely to adversely affect 1542 out of 1745, or 86% percent of all listed species in the U.S. and 713 out of 776 designated critical species' habitats across the U.S.".

The Endangered Species Act section 7 pesticide consultation process between the U.S. Fish and Wildlife Service and the National Marine Fisheries Service (the Services, collectively) and the EPA specifically concerns FIFRA pesticide registration and reregistration in the United States, including all registered uses of a pesticide. The state-level Biological Assessments for APHIS invasive species programs are separate from any consultations conducted in association with pesticide registration and reregistration process.

The Agricultural Improvement Act of 2018 (Farm Bill) created a partnership between USDA, EPA, the Services, and the Council on Environmental Quality to improve the consultation process for pesticide registration and reregistration. USDA is committed to working to ensure consultations are conducted in a timely, transparent manner and based on the best available science. The Revised Method for National Level Listed Species Biological Evaluations of Conventional Pesticides provides a directionally improved path to ensuring that pesticides can *continue to be used safely for agricultural production with minimal impacts to threatened and endangered species.*

APHIS provided information about use of carbaryl to EPA for the FIFRA consultation for carbaryl. The Grasshopper Program use of carbaryl has in the past comprised substantially less than 1% of the percent crop treated (PCT) for rangeland use of carbaryl. This is the case for the reasonably foreseeable future. For rangeland, in the EPA BE, the Grasshopper Program's very low usage was rounded up to <1% PCT, which gives an overestimate of rangeland acres treated and thus endangered species risk. APHIS use of carbaryl is even smaller compared to all uses of carbaryl nationwide. Further, the Grasshopper Program consults directly with the Services to ensure program activities do not adversely affect protected species or their critical habitat.

Comment 107
APHIS received the following comment, "EPA found many Montana species were likely to be adversely affected. This is a chemical far too toxic for APHIS to consider using across wide swaths of land in Montana."

Carbaryl is presently approved by the EPA and registered in Montana. It should be noted that the current labeled uses for carbaryl grasshopper treatments are at much higher rates and can be applied with more frequency than what APHIS is proposing for use in Montana. In addition carbaryl use by the Program is minor compared to the preferred alternative diflubenzuron. APHIS has evaluated the risk of carbaryl use in the Program and in general the conclusions are consistent with other risk assessments demonstrating low risk when adhering to label requirements. Additional mitigation measures used by APHIS further reduces the risk to human health and the environment.

APHIS submitted a programmatic biological assessment to the USFWS in 2015. APHIS is currently working with the USFWS to update and complete the biological assessment and receive concurrence. The intent of the programmatic biological assessment is to provide consistent mitigation measures for listed species that may co-occur with Program treatments. Consultation with the USFWS is still being completed at the local level prior to any treatments. No APHIS treatments are made in States without prior concurrence from the USFWS regarding federally-listed species. This information is also summarized in the final EIS.

APHIS consulted with the USFWS on federally-listed species that may occur within the county or areas where grasshopper and Mormon cricket treatments may be required. APHIS works closely with the USFWS to determine the application of protection measures and where those measures should be applied prior to any treatments. APHIS also evaluated the potential direct and indirect impacts to non-target species which is summarized in the final human health and ecological risk assessments for each insecticide.

Comment 108
APHIS received the following comment, "The European Union banned carbaryl in 2007 due to, among other things, "…a high long-term risk for insectivorous birds and a high acute risk to herbivorous mammals, a high acute and long-term risk to aquatic organisms and a high risk for beneficial arthropods".

APHIS summarizes the risk of carbaryl to non-target organisms in final human health and ecological risk assessment that was part of the recently published final EIS. Available effects data and the exposures that would be expected from proposed use in the grasshopper and Mormon cricket program are reduced based on mitigation measures (ex. RAATS, aquatic buffers) application methods and formulation types which further reduce risk.

Comment 109
APHIS received the following comments, "Carbaryl is classified as "likely to be carcinogenic to humans" based on treatment-related hemangiosarcoma development in mice".

The levels of carbaryl that caused the above-mentioned effects to mice are above exposure concentrations that would be expected to occur for the public as well as workers and applicators in the APHIS grasshopper and Mormon cricket suppression program. The risk to human health from carbaryl use, including the proposed APHIS use, have been evaluated by APHIS and are discussed in the final human health and ecological risk assessment for carbaryl. It should be noted that other agencies have evaluated the risk to carbaryl at much higher application rates than those used in the grasshopper and Mormon cricket program.

Comment 110
APHIS received the following comments, "EPA has determined that humans can be exposed to more than 4 times the amount of carbaryl known to cause neurotoxicity from some legal uses of the pesticide. EPA also found that the current labelled uses of carbaryl may result in neurotoxic harms to mixers, loaders and applicators" and "use of this dangerous old pesticide must be discontinued and should not be considered for use in grasshopper and Mormon cricket eradication in Montana".

The EA provided links to APHIS' Grasshopper Program webpage where the 2019 EIS and Final Human Health and Ecological Risk Assessment for Carbaryl Rangeland Grasshopper and Mormon Cricket Suppression Applications are published. APHIS evaluated the potential human health risks from the proposed use of carbaryl ULV sprays and carbaryl bait applications and determined that the risks to human health are low. The lack of risk to human health is based on the low probability of human exposure and the favorable environmental fate and effects data.

APHIS treatments are conducted in rural rangeland areas where agriculture is a primary economic factor. Rural rangeland areas consist of widely scattered, single dwellings in ranching communities with low population density. Risk to the general public from carbaryl ground or aerial applications is also expected to be minimal due to the low-population areas proposed for treatment, adherence to label requirements, and additional Program measures designed to reduce exposure to the public. APHIS is not obligated to analyze the risk posed by all legal uses of carbaryl, but rather the Grasshopper Program formulations and application rates.

The proposed use of carbaryl as a ULV spray, or a bait, and adherence to label requirements substantially reduces the potential for exposure to humans. APHIS does not expect adverse health risks to workers because of the low potential for exposure to carbaryl when applied according to label directions and use of personal protective equipment. APHIS quantified the potential risks associated with accidental exposure of carbaryl for workers during mixing, loading, and application. The quantitative risk evaluation results indicate no concerns for *adverse health risk for Program workers from carbaryl applications in accordance with program standard operating procedures for safety.*

As stated in the EA, the application of an insecticide within all or part of the outbreak area is the response available to APHIS to rapidly suppress or reduce, but not eradicate, grasshopper populations and effectively protect rangeland. At no time does APHIS ever strive to eradicate grasshoppers.

Comment 111
APHIS received the following comment, "EPA has found that all use scenarios of chlorantraniliprole can result in direct or indirect effects to all listed species".

The EPA risk assessment is a screening level ecological risk assessment that evaluated risk under a variety of application rates with most being well above use rates proposed in the APHIS Grasshopper Program. APHIS prepared a final human health and ecological risk assessment that assesses the risk of APHIS Program treatments. The state-level Biological Assessments for APHIS invasive species programs are separate from any consultations conducted in association with pesticide registration and reregistration process.

As previously stated, the Grasshopper Program will not be using chlorantraniliprole in Montana during 2020. Therefore any chlorantraniliprole exposure scenarios which the commenter is concerned about are not relevant at this time.

Comment 112
APHIS received the following comment, "EPA has found that all use scenarios of chlorantraniliprole can result in direct or indirect effects to all listed species. Chlorantraniliprole is considered "very highly toxic" to freshwater invertebrates and EPA found that many uses of it can result in acute and chronic harms to aquatic invertebrates. This was the case for both aerial and ground spray applications. Sublethal doses can impair locomotion in bees more than seven days post exposure. A 2013 European Food Safety Authority analysis of chlorantraniliprople found that the use of the pesticide poses a high risk to soil macro-organisms, aquatic invertebrates and sediment dwelling organisms." and "APHIS must consider chlorantraniliprole substantial environmental impacts, including population level effects".

The EA provided links to APHIS' Grasshopper Program webpage where the 2019 EIS and Final Human Health and Ecological Risk Assessment for Chlorantraniliprole Rangeland Grasshopper and Mormon Cricket Suppression Applications is published. The document summarizes available effects data and characterizes risk to human health and non-target organisms based on the use pattern proposed by the Program. Results from the risk assessment suggest low risk of chlorantraniliprole to non-target aquatic organisms and most terrestrial invertebrates.

As previously stated, the Grasshopper Program will not be using chlorantraniliprole in Montana during 2020. Therefore any chlorantraniliprole exposure scenarios which the commenter is concerned about are not relevant at this time.

Comment 113

APHIS received the following comments, “Diflubenzuron is considered “highly” to “very highly toxic” to aquatic invertebrates. In a 2018 analysis, EPA found that the registered, labeled uses of diflubenzuron may result in freshwater invertebrate exposure at up to 550 times the level known to cause harm. Diflubenzuron exposure to honeybees and other pollinators at the larval stage was estimated to be more than 500 times the level known to cause harm. Although arthropods are not a part of EPA’s ecological risk assessment, the European Food Safety Authority found that “Juvenile non-target arthropods were very sensitive to diflubenzuron. Very large in-field no-spray buffer zones would be needed to protect non-target arthropods. There is no reason for APHIS to exclude consideration of impacts to arthropods in its analysis of this pesticide.” and “APHIS also acknowledges the pollinator impacts but attempts to diminish them without providing evidence on how or why they are not significant”.

The EA provided links to APHIS’ Grasshopper Program webpage where the 2019 EIS and Final Human Health and Ecological Risk Assessment for Diflubenzuron Rangeland Grasshopper and Mormon Cricket Suppression Applications are published. The EPA risk assessment evaluated risk to aquatic organisms and pollinators based on application rates, methods of application and use patterns that would result in greater exposure and risk to aquatic and terrestrial invertebrates. APHIS evaluated risks to these groups of non-target organisms based on methods of application consistent with Program applications and other mitigation measures for diflubenzuron. The exposure potential is reduced compared to label uses due to many factors. This includes but is not limited to reduced application rates, one application per season, use of RAATs and buffers from aquatic habitats. APHIS relied on laboratory and field collected data regarding diflubenzuron effects to aquatic and terrestrial invertebrates to show that risk is low for most non-target invertebrates.

Characterization of risk to aquatic species from Program-specific diflubenzuron applications was made by comparing the residue values in the exposure analysis from ground and aerial applications to the distribution of available acute and chronic fish toxicity data. Residue values were below the distribution of acute and chronic response data, suggesting that direct risk to aquatic species is not expected from diflubenzuron applications. More specifically, the distribution of aquatic invertebrate toxicity data is above the residues estimated from spray drift models for Grasshopper Program ground and aerial applications of diflubenzuron.
The Endangered Species Act section 7 pesticide consultation process between the U.S. Fish and Wildlife Service and the National Marine Fisheries Service (the Services, collectively) and the EPA specifically concerns FIFRA pesticide registration and reregistration in the United States, including all registered uses of a pesticide. The Grasshopper Program treatments employ methods and diflubenzuron application rates that result in substantially lower freshwater invertebrate exposures than the rate cited by the EPA and the commenter.

The EPA Preliminary Risk Assessment to Support Re-registration Review examines all legal uses of diflubenzuron, of which the Grasshopper Program constitutes a small fraction. APHIS is not obligated to examine all legal uses of the pesticide, but rather those contemplated by the program. The EA provided links to APHIS’ Grasshopper Program webpage where the 2019 EIS and Final Human Health and Ecological Risk Assessment for Diflubenzuron Rangeland Grasshopper and Mormon Cricket Suppression Applications are published. Characterization of risk to aquatic species from diflubenzuron applications was made by comparing the residue *values in the exposure analysis from ground and aerial applications to the distribution of available acute and chronic fish toxicity data. Residue values were below the distribution of acute and chronic response data, suggesting that direct risk to aquatic species is not expected from diflubenzuron applications. More specifically, the distribution of aquatic invertebrate toxicity data is above the residues estimated from spray drift models for Grasshopper Program ground and aerial applications of diflubenzuron.*

The EA provided links to APHIS' Grasshopper Program webpage where the 2019 EIS and Final Human Health and Ecological Risk Assessment for Diflubenzuron Rangeland Grasshopper and Mormon Cricket Suppression Applications are published. The APHIS analysis noted Diflubenzuron has low toxicity and risk to some non-target terrestrial invertebrates, including pollinators such as honey bees.

Comment 114

APHIS received the following comment, "APHIS also acknowledges the pollinator impacts but attempts to diminish them without providing evidence on how or why they are not significant. It does not mention that Montana is home to an amazing abundance of native bees and pollinators, and improperly uses honeybees as a surrogate for pollinators, when native pollinators are far more sensitive due to the lack of hive buffering effects. This is not a pesticide that should be applied to broad swaths of land. It is highly toxic to far too many species of importance in Montana."

Grasshopper 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 7 to 76 days after treatment. Although ant populations exhibited declines of up to 50%, these reductions were temporary, and population recovery was described as immediate (Catangui et al., 1996). No significant reductions in flying non-target arthropods, including honey bees, were reported. Within one year of diflubenzuron applications in a rangeland environment, no significant reductions of bee predators, parasites, or pollinators were observed for any level of diflubenzuron treatment (Catangui et al., 1996).

Comment 115

APHIS received the following comment, "Diflubenzuron is commonly fed to ranging cattle as a way to control flies. This pesticide is present in the excreted manure and urine of cattle where they range. Therefore, any decision on whether to use diflubenzuron in these areas must consider that listed or non-listed species can be exposed to other sources of the pesticide. It is that cumulative exposure that must be considered in this decision – and is compelled by the ESA and NEPA's mandate that an action agency take into account the environmental baseline".

APHIS recognizes that some diflubenzuron resides may be present in urine and feces from cattle that feed on forage immediately after diflubenzuron treatment; however this pathway of exposure is expected to be minor based on the proposed use pattern of diflubenzuron in the Program. Low application rates applied only once per season will reduce the amount of diflubenzuron present in manure and urine. In addition some metabolism of diflubenzuron occurs in animals, and there will be further environmental degradation once excreted.

Comment 116
APHIS received the following comment, "Malathion is considered "very highly toxic" to all aquatic and terrestrial invertebrates, as well as aquatic vertebrates such as fish. In addition indirect effects to taxa should be considered."

The EA provided links to APHIS' Grasshopper Program webpage where the 2019 EIS and Final Human Health and Ecological Risk Assessment for Malathion Rangeland Grasshopper and Mormon Cricket Suppression Applications are published. The risk assessment summarizes available laboratory and field collected aquatic and terrestrial effects data for malathion and then estimated risk based on conservative estimates of exposure. APHIS recognizes in the risk assessment that malathion can be toxic to sensitive non-target species however the effects have to be considered in relation to the potential for exposure to estimate risk, as well as historical use in the Program which is negligible.

Comment 117
APHIS received the following comment, "When exposed to malathion for longer periods of time, female birds displayed regressed ovaries, reduced number of hatched eggs and enlarged gizzards".

The EA provided links to APHIS' Grasshopper Program webpage where the 2019 EIS and Final Human Health and Ecological Risk Assessment for Malathion Rangeland Grasshopper and Mormon Cricket Suppression Applications are published.

Several reproductive and developmental studies have been conducted with birds. The lowest median lethal dose to chicken embryos (eggs) was 3.99 mg per egg for 4-day embryos (Greenberg and LaHam, 1969). The median lethal concentration for field applications of malathion to mallard duck eggs was found to be 4.7 lbs. a.i./acre (Hoffman and Eastin, 1981). This is approximately five times greater than the maximum rate for rangeland grasshopper (0.928 lbs. a.i./acre), 7.6 times greater than the maximum APHIS application rate (0.619 lbs. a.i./acre), and nearly 19 times greater than the average RAATs rate applied by APHIS.

No effect on reproductive capacity of chickens was found at dietary concentrations as high as 500 ppm in feed (Lillie, 1973). Based on the results from chronic reproduction studies using the bobwhite quail and mallard duck, the NOEC values were 110 and 1,200 ppm, respectively. The most sensitive endpoint in the quail study was regressed ovaries and reduced egg hatch at the next highest test concentration (350 ppm). The effect endpoint in the mallard study was growth and egg viability at the 2,400 ppm level Lowest Observed Effect Concentration (LOEC).

APHIS expects that direct avian chronic effects would be minimal for most species. The preferred use of RAATs during application reduces these risks by reducing residues on treated food items and reducing the probability that they will only feed on contaminated food items. In addition, malathion degrades quickly in the environment and residues on food items are not expected to persist.

Comment 118

APHIS received the following comments, “Malathion degrades into maloxon, which has been shown to be at least 22 times more toxic than the parent molecule”.

Similar to other organophosphate pesticides, malathion inhibits the enzyme AChE in the central and/or peripheral nervous system. Malathion is metabolized to malaoxon, which is the active AChE inhibiting metabolite. AChE inhibition is through phosphorylation of the serine residue at the active site of the enzyme, and leads to accumulation of acetylcholine and ultimately neurotoxicity. Malaoxon goes through detoxification with subsequent metabolism. Absorption and distribution of malathion and malaoxon are rapid with extensive metabolism and no accumulation in tissues.

Carboxylesterase detoxifies malathion and malaoxon to polar and water-soluble compounds for excretion. A rat metabolism study showed 80 to 90% of malathion excretion in the urine in the first 24 hours of exposure. Mammals are less sensitive to the effects of malathion than insects due to greater carboxylesterase activity resulting in less accumulation of malaoxon.

Available aquatic toxicity data show that malaoxon is approximately 1.5 to 6 times more toxic to fish and 1.8 to 93 times more toxic to amphibians. FMC, in their 2019 public response to the Grasshopper Program EIS, reported that malaoxon is 0.80 to 2.58 times more toxic to fish than malathion based on data that were determined to meet their criteria for acceptability (FMC, 2014). The conversion of malathion to malaoxon in aquatic environments can range from approximately 1.8 to 10% (CDPR, 1993; Bavcon et al., 2005; USEPA, 2012).

While APHIS assumed that malaoxon is most likely more toxic to aquatic invertebrates than the parent; however, due to its low percentage of occurrence in aquatic systems and its rapid breakdown, malaoxon is not anticipated to pose a greater aquatic risk when compared to malathion.

Comment 119

APHIS received the following comment, “A 2017 EPA biological evaluation also found that the use of malathion is likely to adversely affect 1778 out of 1835 listed species in the U.S. and 784 out of 794 critical species’ habitats across the U.S. These findings were based on methodology recommended by the National Academy of Sciences. EPA found many Montana species were likely to be adversely affected, such as the yellow billed cuckoo. The U.S. Fish and Wildlife Service later drafted a biological opinion finding that malathion is likely to jeopardize the continued existence of 1284 threatened and endangered species. This is an astounding number of jeopardy calls for a single pesticide, and makes it even more astounding that APHIS would continue to consider using it for grasshopper and cricket control.”

The Endangered Species Act section 7 pesticide consultation process between EPA and the Services specifically concerns FIFRA pesticide registration and reregistration in the United States, including all registered uses of the pesticide. The Grasshopper Program use of malathion comprised nearly none of the percent crop treated for rangeland in the past, and this remains APHIS’ expectation for the foreseeable future. Further, the Grasshopper Program consults directly with the Services to ensure program activities do not adversely affect protected species or their critical habitat.

Comment 120
APHIS received the following comment, "California's Proposition 65 list of chemicals known to cause cancer and has been designated as having suggestive evidence of carcinogenicity by the EPA for instances of liver, oral palate mucosa and nasal respiratory epithelium tumor formation in mice."

-The EA provided links to APHIS' Grasshopper Program webpage where the 2019 EIS and Final Human Health and Ecological Risk Assessment for Malathion Rangeland Grasshopper and Mormon Cricket Suppression Applications are published.

Comment 121
APHIS received a comment that, "EPA has determined that humans can be exposed to more than 6 times the amount of malathion known to cause neurotoxicity from some legal uses of the pesticide. EPA also found that the current labelled uses of malathion may result in neurotoxic harms to those exposed to pesticide drift from aerial applications at labelled rates". The commenter also pointed out that occupational applicators, mixers and loaders can be exposed to malathion through inhalation and dermal absorption at levels above what the EPA considers safe – even when using required personal protective equipment."

APHIS evaluated the risk to human health, including neurotoxicity data in its finale human health and ecological risk assessment. The risk assessment was prepared based on APHIS use patterns and Program mitigations that reduce risk to human health. APHIS is not obligated to ensure the EA and supporting documents analyze the risk posed by all legal uses of malathion, but rather the Grasshopper Program methods and application rates.

Malathion exposure to the general public is not expected from the program use based on label requirements and program standard operating procedures that prevent potential exposure. Only protected handlers may be in the area during application, and entry of the general public into the treated area is not allowed during the re-entry interval period. APHIS treatments are conducted on rural rangelands, where agriculture is a primary economic factor and widely scattered dwellings in low population density ranching communities are found. The program requires pilots avoiding flights over congested areas, water bodies, and other sensitive areas. Aerial applications are not allowed while school buses are operating in the treatment area; within 500 feet of schools or recreational facilities; when wind velocity exceeds 10 miles per hour (mph) (unless a lower wind speed is required under State law); when air turbulence could seriously affect the normal spray pattern; and/or temperature inversions could lead to off-site movement of spray. The Grasshopper Program also notifies residents within treatment areas, or their designated representatives, prior to application to reduce the potential for incidental exposure.

APHIS acknowledges workers in the program are the most likely human population segment to be exposed to malathion during grasshopper treatments. Occupational exposure to malathion may occur through inhalation and dermal contact during ground and aerial applications. Direct contact exposure from the application of a malathion ULV spray will be minimal with adherence to label requirements, the use of personal protective equipment (PPE), general safety hygiene *practices, and restricted entry intervals into treated areas after application. EPA estimates of risk to workers is based on use patterns and rates that result in greater exposure to malathion than would occur in the APHIS program. APHIS evaluated the risk from program specific uses of malathion and demonstrated low risk to applicators. It should also be noted that historical malathion use in the Program is negligible further reducing the potential for any types of human health risk.*

Comment 122
APHIS received the following comment, "APHIS touts EPA-approval as an indication that the pesticides that the agency proposes to use are safe. However, under our nation's pesticide laws, EPA-approval is an indication that use of the pesticide won the agency's cost-benefit analysis, and should not be misconstrued as a finding of safety."

The EA provided links to APHIS' Grasshopper Program webpage where the 2019 EIS and human health and ecological risk assessments for pesticides used by the Grasshopper Program are published. APHIS does not assert the FIFRA registration of the pesticides by the EPA demonstrates that the Grasshopper Program uses are safe. Instead the extensive risk analysis published by APHIS considered whether the suppression of grasshopper population will have significant environmental impacts, in accordance with NEPA.

Comment 123
APHIS received the following comment, "APHIS does not discuss or account for how pesticides impact overall soil health or the health of any organisms that reside in soil."

The EA provided links to APHIS' Grasshopper Program webpage where the 2019 EIS and HHERA for pesticides used by the Grasshopper Program are published. The HHERA contain extensive analysis of pesticide effects on terrestrial vertebrates, many of which reside in soil.

Comment 124
APHIS received the following comment, "Impacts on soil health can impact listed and non-listed plants by impacting nutrient cycling, soil oxygenation and soil water retention, as well as listed and non-listed animals that rely on plants or soil organisms for their survival."

The Grasshopper Program applies pesticides in accordance with current label restrictions and program operational procedures that are mitigations to minimize significant exposure of soil, water, and air to insecticides; grasshopper chemical treatments are not expected to persist or bioaccumulate in the environment. APHIS evaluated these effects in human health and ecological risk assessments that were prepared along with the final EIS for the grasshopper and Mormon cricket suppression program.

Comment 125
APHIS received the following comment, "Carbaryl was ranked as extremely toxic to earthworms in a lab test rating pesticide toxicity from relatively nontoxic, moderately toxic, very toxic, extremely toxic, and super toxic."

The study was a comparison of the toxicology of 45 pesticide to determine the LC50. These studies exposed earthworms to varying concentrations of carbaryl to determine toxicological endpoints. Based on the extremely high doses, the impact to the survival of earthworms was not only unsurprising, but the object of the studies. APHIS would like to note this laboratory dosing procedure is not comparable to any exposure levels resulting from the use of carbaryl ultra-low volume sprays by the Grasshopper Program.

Comment 126
APHIS received the following comment, "A single application of carbaryl in a field study caused a 38% reduction in survival of total Lumbricidae, and a 78% reduction in total earthworms for at least 5 weeks."

APHIS would like to note the "single application" involved applying carbaryl 6 times on a weekly interval to its assigned plots at the highest recommended dose (i.e. Sevin at 9.12 mg/m2), a rate that is greater than 16 times the Grasshopper ultra-low volume liquid rate (0.56 mg/m2). The Grasshopper program only makes one application per year, rather than six weekly treatments. Also, the field study found carbaryl significantly inhibited earthworm feeding activity for at least three weeks <u>without leading to any earthworm death</u>.

In addition, the 78% reduction in earthworm casts noted in the comment resulted from an application of a combination of clothianidin and bifenthrin pesticides.

Comment 127
APHIS received the following comment, "Carbaryl significantly impacted the survival or population abundance of E. fetida, E. andrei, Lumbricus terrestris, and Lumbricus rubellus, Aporrectodea caliginosa, and Allolobophora chlorotica."

These studies exposed earthworms to varying concentrations of carbaryl to determine toxicological endpoints (NOEC, LC50). Based on the extremely high doses, the impact to the survival of earthworms was not only unsurprising, but the object of the studies. For example in Lima et al. 2011, ten adult worms with individual fresh weight between 300 and 600 mg, were exposed to different carbaryl concentrations (20, 40, 60, 80, 100 mg/kg). APHIS would like to clarify the Grasshopper Program applies carbaryl ultra-low volume spray at a rate of half a pound active ingredient per acre.

Comparison of the results of paper contact test with those obtained in soils clearly demonstrates that the contact test has no predictive values for the toxicity of an insecticide in soils, though it is important for the initial screening of the environmental chemicals. The differences between lowest and highest LC50 values of insecticides for M. posthuma and E. fetida in paper contact method were only 6.9 and 2.5-fold respectively while in soil they were over 38 and 26-fold. These data demonstrated that worms could tolerate higher concentrations in soil than on moist filter paper. This difference in the behavior of the insecticide may probably due to the rate of diffusion/uptake of insecticide from the medium into the body of the earthworm. It is well reported in the literature that insecticides are adsorbed on soil medium through strong binding by organic matter contents in soils (Davis, 1971, Van Gestel and Van Dis, 1988). Hence, the *availability of insecticide for diffusion will be less from the soil than the impregnated filter paper. Contact filter paper test can be used as an initial screening technique to assess the relative toxicity of chemicals; however it fails to represent the situation in the soil ecosystem. Artificial soil test is more representative of the natural environment of earthworms and acute toxicity data on several insecticides can be used in the ecological risk assessment on soil ecosystems.*

Comment 128

APHIS received the following comment, "In another study, carbaryl induced an avoidance response in *E. fetida*. Soil structure changes were observed between the control and carbaryl treated sites, with higher treatments of carbaryl causing significantly more lumps in the soil due to earthworm inactivity."

The commenter cited a study where worms were rinsed in tap water and transferred to the flasks containing 2 ml solution per worm. The flasks were gently tilted every 5 min and the exposure was terminated after 30 min. The worms were removed, rinsed in cold tap water and transferred to Petri dishes (five worms in each) containing soil but no pesticide. The worms were inspected at intervals during 80 days or until all the worms were dead or had recovered. The structure of the soil in the Petri dishes was observed in order to get an idea about the ability to work the soil after pesticide treatment. APHIS would like to note this laboratory dosing procedure is not comparable to any exposure scenario resulting from the use of carbaryl ultra-low volume sprays by the Grasshopper Program.

Notably, E. foetida could tolerate high concentrations of carbaryl without dying, although low concentrations severely affected its ability to work the soil or to disappear from the soil surface. The researchers believe the solutions were equivalent to 64, 32, 16, 8 and 4 mg/kg of pesticide, and found that carbaryl did not kill E. foetida in concentrations up to 64 mg/kg, from the 800 mg/l solution.

The avoidance test is a behavioral test with several advantages (simple, quick and cheap) but one drawback: this is not a measure of toxicity but rather a measure of repellence (Capowiez and Bérard, 2006), and thus is termed 'measure of habitat modification'. As there is not always a direct relationship between avoidance and toxicity, an improvement of this test was recently proposed by Sanchez-Hernandez (2006).

APHIS would like to clarify the Grasshopper Program applies carbaryl ultra-low volume spray at a rate of half a pound active ingredient per acre. If a cubic foot of rangeland soil weighs 75 pounds, 1 acre (43,560 ft.2) of soil two inches deep would weigh 544,500 pounds, or 246,981 kilograms. The maximum rate used by the Grasshopper Program to apply carbaryl as an ultra-low volume spray is half a pound (226796 mg) active ingredient per acre. Therefore, the maximum concentration of 0.92 mg carbaryl spray per kg of soil could result from program applications. However, this analysis assumes none of the foliar spray settled on vegetation, and all of the carbaryl is instantaneously absorbed into the top two inches of soil. In addition, this maximum concentration was less than the lowest concentration which the researchers *determined has significant effects on the reduction of the P. excavatus hatching rate (1.51 mg carbaryl per kg of soil).*

Comment 129

APHIS received the following comment, "Carbaryl negatively affected the biomass of *E. andrei*, *Perionyx* excavates, total earthworms, and *Lumbricus terrestris* at a tenth of the recommended dose."

The carbaryl concentrations used for each test species was chosen based on the LC50/EC50 previously carried out and reported by Lima et al. (2011). This was also a toxicological endpoint study where the acute toxicity was determined by exposing the worms to a nominal concentration range of 20 to 100 mg/kg of technical grade carbaryl. The application rate was 850 grams per hectare of Sevin L85 which is equal to 1.12 pounds active ingredient carbaryl per acre, compared with Sevin XLR which is 44.1 % applied at half a pound active ingredient per acre by the Grasshopper Program.

This study was primarily designed to validate the production of casts by earthworms as a biomarker for behavioral effects. While the significant effects in earthworm weight observed at low concentrations of carbaryl are concerning, Grasshopper program applications of foliar sprays are unlikely to result in the subsurface soil becoming saturated at the concentrations created in the laboratory.

Comment 130

APHIS received the following comment, "A 60-99% reduction in earthworm biomass and density due to carbaryl treatment lasted 20 weeks. Burial of organic matter was also negatively affected. Casting activity of earthworms was reduced by 90%, and 71% and 81% after 3 and 5 weeks, respectively."

The researchers made two applications of carbaryl at a rate of 8 lbs. a.i./acre, 16 times greater than the maximum spray rate employed by the Grasshopper Program. The Grasshopper Program only makes one application per year. In addition, the foliar spray of ultra-low volume carbaryl over rangeland is unlikely to result in subsurface soil concentrations comparable to the direct turfgrass application made in this study.

Comment 131

APHIS received the following comment, "Carbaryl negatively affected growth in *E. fetida*, and the feeding rate of Diplocardia spp. Total cast production of *L. terrestris* was significantly impacted at one-tenth of the recommended field rate."

The lowest test concentration that effected E. fetida resulted from saturation of the test media with 25 mg/kg of carbaryl. Another field study found a single application of carbaryl significantly inhibited earthworm (Diplocardia spp.) feeding activity for at least three weeks <u>without leading to any earthworm death</u>. APHIS would like to note the "single application" involved applying carbaryl 6 times on a weekly interval to its assigned plots at the highest recommended dose (i.e. Sevin at 9.12 mg/m2), a rate that is greater than 16 times the

Grasshopper ultra-low volume liquid rate (0.5 lbs. a.i./acre). The Grasshopper program only makes one application per year, rather than six weekly treatments.

Comment 132
APHIS received the following comment, "Reproduction of *E. fetida*, and *Perionyx excavatus* was negatively affected, with the hatching rate of *P. excavatus* reduced by 87% at sublethal concentrations lower than the recommended field rate. A total loss of burrowing was observed at 4 and 8 mg/kg after 40 minutes and at 1 and 2 mg/kg after 80 minutes."

The lowest test concentration that effected E. fetida resulted from saturation of the test media with 25 mg/kg of carbaryl. In another study the reduction of the P. excavatus hatching rate was observed at a concentration of 1.51 mg carbaryl per kg of soil.

APHIS would like to clarify the Grasshopper Program applies carbaryl ultra-low volume spray at a rate of half a pound active ingredient per acre. If a cubic foot of rangeland soil weighs 75 pounds, 1 acre (43,560 ft.2) of soil two inches deep would weigh 544,500 pounds, or 246,981 kilograms. The maximum rate used by the Grasshopper Program to apply carbaryl as an ultra-low volume spray is half a pound (226796 mg) active ingredient per acre. Therefore, the maximum concentration of 0.92 mg carbaryl spray per kg of soil could result from program applications (0.92 mg/kg). However, this analysis assumes none of the foliar spray settled on vegetation, and the carbaryl instantly absorbed into the top two inches of soil, thus mirroring the laboratory conditions. In addition, this maximum concentration was less than the lowest concentration which the researchers determined has significant effects on the reduction of the P. excavatus hatching rate (1.51 mg/kg).

Comment 133
APHIS received the following comment, "Morphological abnormalities and histological changes in *E. andrei* and *M. posthuma* were observed at very low, sublethal doses ranging from 0.24-1.20 mg/kg and 0.5-1.20 mg/kg, respectively."

The cited study did not test E. andrei but rather E. fetida a closely related species. The sublethal doses were derived from anecdotal observations during filter paper tests where concentrations were measured in µg/cm2 not mg/kg. APHIS would also like to note the researcher's skepticism about toxicity tests where the worms are dosed on saturate filter paper. They wrote: Comparison of the results of paper contact test with those obtained in soils clearly demonstrates that the contact test has no predictive values for the toxicity of an insecticide in soils, though it is important for the initial screening of the environmental chemicals. The differences between lowest and highest LC50 values of insecticides for M. posthuma and E. fetida in paper contact method were only 6.9 and 2.5-fold respectively while in soil they were over 38 and 26-fold. These data demonstrated that worms could tolerate higher concentrations in soil than on moist filter paper. This difference in the behavior of the insecticide may probably due to the rate of diffusion/uptake of insecticide from the medium into the body of the earthworm. It is well reported in the literature that insecticides are adsorbed on soil medium through strong binding by organic matter contents in soils (Davis, 1971, Van Gestel and Van Dis, 1988). Hence, the availability of insecticide for diffusion will be less from the soil than the impregnated filter paper. Contact filter paper test can be used as an initial screening technique to assess the *relative toxicity of chemicals; however it fails to represent the situation in the soil ecosystem. Artificial soil test is more representative of natural environment of earthworms and acute toxicity data on several insecticides can be used in the ecological risk assessment on soil ecosystem.*

Comment 134

APHIS received the following comment, "Carbaryl impacted multiple biochemical biomarkers in E. andrei, including Acetylcholinesterase (AChE), methoxyresorufin-O-deethylase (MROD), and NADH and NADPH red cytochrome reductase."

This study exposed earthworms to carbaryl in artificial soil at concentrations of 12, 25 and 50 mg/kg. The research showed that carbaryl inhibited biotransformation enzyme activities but did not induce oxidative stress. Since carbaryl is a cholinesterases inhibitor, changes detected in acetylcholinesterase activities were not surprising. The acetylcholinesterase activity reduction was not complete and the residual activity was stable whatever the dose or the exposure duration because of the presence in E. andrei of a non-inhibited, non-specific cholinesterases.

APHIS would like to note the lowest tested soil concentration of carbaryl that caused these effects (12 mg/kg) is approximately 12 times greater than the hypothetical concentrations that could result from Grasshopper Program treatments where none of the foliar ultra-low volume spray settles on vegetation, and the chemical is instantly and uniformly mixed into the top two inches of soil.

Comment 135

APHIS received the following comment, "AChE activity was inhibited in *E. fetida* in two studies, one of which resulted in muscular paralysis that directly impacted earthworm burrowing capabilities."

In the first study, carbaryl stock solution was prepared in acetone and water to yield final concentrations of 1, 2, 4 and 8 parts per million. Five earthworms were individually exposed for 5, 10, 20, 40 and 80 minute intervals in a 50ml beaker containing 2.0ml of various concentrations of test solution. The researchers asserted the test concentrations used in the study were close to expected residues in the soil without any evidence or analysis as proof. They also used higher concentrations to exert significant inhibition of AChE activity and loss of burrowing in earthworms for establishing a dose effect "correlationship". These higher exposures occurred after the individual worms were rinsed in tap water, their borrowing rate was measured, they were rinsed again, and then placed back into the solution. Needless to say this systematic dosing in a pesticide solution does not match any exposure levels that could result from the application of ultra-low volume sprays.

While the significant reduction in the ability of worms to burrow in soil was clearly evident at the lowest test concentration (1 ppm) and the earliest period of exposure (5 min), all worms were alive and fully recovered to normal behavior (no tremors, efficient burrowing) 18 hrs. post-exposure to 1 ppm carbaryl.

The second study cited by the commenter measured AChE responses in earthworms exposed to carbaryl on filter paper and in a soil media. APHIS has previously noted the difficultly *extrapolating between filter paper toxicological tests to actual exposure scenarios relevant to the Grasshopper Program treatments. While the AChE inhibition reached significance after one day of exposure to 0.48 mg/kg carbaryl, the researchers did not conclude there was a reduction of burrowing capacity. Pure carbaryl was used as a liquid solution, while Zoril 5 was applied as a powder spread on the soil. Zoril 5 was thus more abundant on the superficial soil fraction, and was immediately in contact with the animals, whereas pure carbaryl penetrated into the soil and probably became bioavailable later. APHIS would also like to note the tested application rate of 17.8 pounds per acre carbaryl 5% powder formulation (Zoril 5), that was estimated to result in a concentration of 4.29 mg/kg was nearly twice the maximum Grasshopper Program carbaryl bait rate and had no effect on earthworm AChE activity or the lysosomal membrane stability of E. andrei.*

Comment 136

APHIS received the following comment, "In addition to earthworms, carbaryl negatively affected collembola population abundance and reproduction."

The first and second studies cited by the commenter did not investigate carbaryl or collembola (Panda and Sahu, 2004, and Stepić, et al., 2013). The third paper cited used carbaryl as a toxic standard for comparison of the effects of other pesticides (Larson et al., 2012). The researchers applied carbaryl at a rate of 8.17 lbs. a.i./acre. Researchers conducting the fourth study cited by the commenters (Potter et al., 1990) made two applications of carbaryl at the same rate of 8.17 lbs. a.i./acre, 16 times the maximum rate used by the Grasshopper Program in ultra-low volume sprays. The Grasshopper Program only makes one application per year. Therefore this study used 32 times the carbaryl rate as the program. In addition, the foliar spray of ultra-low volume carbaryl over rangeland is unlikely to result in subsurface soil concentrations comparable to the direct turfgrass application made in this study.

The next study cited by the commenters (Joy and Chakravorty, 1991) investigated carbaryl toxicity to collembola. Adult specimens of Cyphoderus sp. and Xenylla sp. and Lancetoppia sp. were exposed to soils saturated with solutions ranging from 0.5 to 10 ml/l. Although they noted the standard agricultural doses of carbaryl 50 WP was 6.25 ml/l, the researchers did not provide a sufficient description of their methods for APHIS to make a valuable comparison of the exposure rates of the collembola in the experiment to potential exposure levels resulting from Grasshopper Program treatments.

The commenters cited another study to suggest carbaryl effected collembola reproduction. Three nominal concentrations of carbaryl (1, 4 and 7 mg/kg) in soil chemical behavior and toxicity were investigated at different temperatures. After 15 days from soil spiking, it was observed that carbaryl concentration in soil decreased to 30% and 33% of the initial concentration at the temperature extremes of 8 °C and 28 °C, respectively, and 22.8% of the initial concentration under a 20 °C temperature regime. The collembola survival and reproduction were significantly affected at 4 and 7 mg/kg concentrations, approximately 4 and 7 times greater than hypothetical soil concentrations resulting from Grasshopper Program ultra-low volume sprays (see previous comments for estimations parameters).

Comment 137

APHIS received the following comments, "Carbaryl also negatively impacted Prostigmata mites, and *Tiphia vernalis*, a wasp that feeds on scarab beetle larvae in the soil."

In the first study cited carbaryl applied at a rate of 8.18 lbs. a.i./acre, greater than 16 times the Grasshopper Program's maximum rate, as a toxic standard for comparison of various pesticide control efficacy. The effects on oribatid and mesostigmatid mites was not surprising or comparable to exposure levels resulting from applications of carbaryl ultra-low volume sprays.

The commenters are mistaken, in that the research cited did not find effects on Tiphia vernalis (Helson et al., 1994).

Comment 138
APHIS received the following comment, "Carbaryl can be particularly toxic to ground-nesting bees, like *Andrena erythronii*, *Bombus terrestris*, and *Bombus terricola*."

The commenters cited a toxicology study where carbaryl was applied topically to the thorax of the bees to investigate lethal doses and determine the concentration values in units of µg a.i./g body weight and of µg a.i./bee. This dosing method is not comparable to any exposure scenario resulting from the Grasshopper Program treatments using ultra-low volume sprays. APHIS would like to note that of the six insecticides tested, carbaryl had the second lowest relative toxicity, rather than as the commenter characterized being particularly toxic to ground-nesting bees. The researchers noted their study does not suggest an inherent, physiological relationship between size and pesticide susceptibility, and they further suggested that bumble bees may be at relatively little risk from carbaryl, contrary to the commenter's suggestion of particular toxicity to Bombus terricola. The researcher's elaborated carbaryl previously was not found to have significant effects on bumble bees, citing Hansen and Osgood (1984).

The acute effects of carbaryl on B. terrestris were investigated for ingestion and topical contact in another cited study. The researchers found the calculated hazard ratio for oral exposures of carbaryl (309) was below the mean (1399) and the median (381) of the 14 pesticides tested and reported. Carbaryl was not found to be toxic through topical exposure at the "highest dose advised on the label." The hazard ratio values permit only a comparative evaluation between the different active compounds tested.

Comment 139
APHIS received the following comment, "Carbaryl caused 100% mortality in *Nomia melanderi* when exposed to field-rate pesticide residues 3 hours post-application, 97% mortality with 8 hours post-application, and 78% mortality 2 days post application. Carbaryl was more toxic than DDT."

APHIS does not use DDT during Grasshopper Program treatments and does not agree that the relative toxicity to carbaryl is a concern. The study cited by the commenter did not test carbaryl toxicity on bees, but rather included data from earlier studies. The application rate of carbaryl emulated in the earlier studies was I.0 lbs. 80% wettable powder per acre, approximately twice the maximum ultra-low volume rate used by the Grasshopper Program. APHIS found the *literature did not provide sufficient details for a reasonable comparison of the carbaryl application methods and rates for additional effects analysis.*

Comment 140
APHIS received the following comment, "*Bombus impatiens* colony vitality (as measured by colony weight, worker weight) and the number of workers, honey pots, and brood chambers was reduced following carbaryl exposure."

The researchers noted the confinement of the bee colonies within cages represent a worst case scenario in that the workers were caged on the sprayed plots for two or four weeks. Whole-colony consequences of a smaller proportion of the workers foraging on insecticide-contaminated weeds in an open system likely would be less severe. In addition, the researchers explained extent to which an insecticide is hazardous to pollinators is determined by its inherent toxicity as well as the formulation and manner in which it is applied (Stark et al. 1995). For example, pollen contamination, which can decimate honey bee colonies, may be exacerbated by wettable powder or microencapsulated formulations that have high affinity for binding to pollen (Johansen et al. 1983).

APHIS would also like to note the direct application of carbaryl to turfgrass at rates ten times greater (5.44 lbs. a.i./acre) than the maximum rate used by the Grasshopper Program (0.5 lbs. a.i./acre) is not comparable to ultra-low volume foliar spray treatments.

Comment 141
APHIS received the following comment, "In a laboratory study, chlorantraniliprole negatively inhibited the enzymes acetylcholinesterase and glutathione-S-transferase in *Eisenia fetida*."

As previously stated, the Grasshopper Program will not be using chlorantraniliprole in Montana during 2020. Therefore any chlorantraniliprole exposure scenarios which the commenter is concerned about are not relevant at this time.

Comment 142
APHIS received the following comment, "Chlorantraniliprole negatively affected *Folsomia candida* (collembola) reproduction."

As previously stated, the Grasshopper Program will not be using chlorantraniliprole in Montana during 2020. Therefore, any chlorantraniliprole exposure scenarios which the commenter is concerned about are not relevant at this time.

Comment 143
APHIS received the following comment, "Microscopic examination in an avoidance test revealed that the collembola were paralyzed from the chlorantraniliprole treatment and couldn't migrate, clarifying an observed avoidance at 1 mg/kg, but no avoidance at any higher concentrations. The authors note that chlorantraniliprole may be more toxic to non-target arthropods closely related to insects than to other soil invertebrates."

As previously stated, the Grasshopper Program will not be using chlorantraniliprole in Montana during 2020. Therefore, any chlorantraniliprole exposure scenarios which the commenter is concerned about are not relevant at this time.

Comment 144
APHIS received the following comment, "In the field, ground-nesting bumble bees (*Bombus impatiens*) treated with chlorantraniliprole consumed less pollen than control bees."

As previously stated, the Grasshopper Program will not be using chlorantraniliprole in Montana during 2020. Therefore any chlorantraniliprole exposure scenarios which the commenter is concerned about are not relevant at this time.

Comment 145
APHIS received the following comment, "Staphylinidae (Coleoptera) population abundance was slightly but significantly suppressed."

As previously stated, the Grasshopper Program will not be using chlorantraniliprole in Montana during 2020. Therefore any chlorantraniliprole exposure scenarios which the commenter is concerned about are not relevant at this time.

Comment 146
APHIS received the following comment, "After one application of diflubenzuron, myriapoda populations were nearly eradicated (73% reduction), gamasina mites were reduced by 40%, and uropodina mites were reduced by 57%. Diflubenzuron treatment reduced the populations of oribatid mites, prostigmata mites, and soil arthropod larvae, mostly comprised of coleoptera and diptera, by nearly 15%."

The cited research does not suggest Grasshopper Program applications of diflubenzuron will result in significant impacts to soil microfauna. The researchers applied diflubenzuron to plots and investigated the effects on Collembola, Insecta, Myriapoda, and 4 groups of mites for 6 months. The observed taxa abundance fluctuated seasonally, but for a majority of taxa no significant differences were noticed between the control and exposed plots. The total number of microarthropods was insignificantly lower in exposed groups. While myriapods were the only taxon that was close to extinction after a single exposure to diflubenzuron the pesticide was applied directly to the soil at a rate four times greater than the maximum conventional application rate used by the program. The researchers noted their data proved that soil has some buffering capacity, and this fact should always be taken into consideration when estimating the risk for the environment.

Comment 147
APHIS received the following comment, "In a field study, collembola populations were negatively affected by diflubenzuron and did not recover for one and a half years. The earthworms, *Dendrobaena rubidus* and *Lumbricus rubellus* were reduced in plots treated with concentrations of diflubenzuron at half the recommended field rate. Gamasid and oribatid mite populations were additionally reduced, and oribatida were observed migrating into deeper soil layers to avoid the pesticide."

The commenters have cited a study where the researchers applied two treatments of diflubenzuron wettable powder directly to the forest floor at a rate 37% higher than the maximum rate used by the Grasshopper Program. Contrary to the characterization of the research findings presented by the commenter, the mean population size of earthworms did not differ significantly during the potential effect phase between control and the 137% the Grasshopper Program rate treatment plot. The populations of the enchytraeid species E. buchholzi, E. minutus, E. norvegicus and M. clavata did not respond to this 137% treatment of diflubenzuron applied twice per growing season. While the number of oribatids decreased after the application of the insecticides in all experimental plots including the control, these differences were only significant in the plot were diflubenzuron was applied directly to the forest floor at a rate nearly 14 times greater than the maximum Grasshopper Program rate. Where Brachychthoniid populations declined significantly in the diflubenzuron treated plots, the reductions were in part compensated by changes in numbers of the dominant genus Oppiella. The researchers explained the half-life of diflubenzuron in soil is reported to range from 1 to 27 days, which was borne out by their data. Therefore, residue accumulations in the organic layer is unlikely if diflubenzuron is only applied once per year.

The researchers acknowledged that there could be several potential reasons for differences in populations of soil invertebrates between the study plots. First, the plots could differ independent of any treatment. APHIS agrees this is a reasonable interpretation because of the small sample sizes during the pre-application, potential effect and early recovery data recording phases (I.e. four plots including the control, five sample dates, two replicates, n=10). The testing of natural variation during the 9 month pre-application phase may not have been sufficient. They decided to interpret deviations as a response to a treatment, if numbers in the potential effect phase were different to those in the other phases in the same plot and to the control in the same phase.

Comment 148

APHIS received the following comment, "Diflubenzuron treatment resulted in a total loss in brood production of male *Bombus terrestris*, and 100% inhibition of egg hatching success and larval growth. Transovarial transport and accumulation of the pesticide in deposited eggs explained the total loss of reproduction. Abnormal cuticle formation, which can lead to mechanical weakness and death, was observed in dead larvae that worker bees were observed removing from treated nests."

The commenters have cited a study where the B. terrestris was directly dosed with diflubenzuron to test acute toxicity. Adult worker bees were exposed via contact by topical application and orally via drinking sugar water and by eating pollen. For contact application, 50 µL of the aqueous concentration was topically applied to the dorsal thorax of each worker with a micropipette. The worker bumblebees were also provided diflubenzuron treated sugar-water for drinking for 11 weeks. Bumblebees can also be exposed orally to pollen sprayed until saturation with a diflubenzuron concentration. Both the sugar water and pollen were supplied for unlimited oral consumption.

While APHIS acknowledges the effects of acute diflubenzuron exposures on the egg hatching and larval stages of bumble bees is a concern, the direct dosing conducted by the researchers is not *comparable to any exposure levels that could result from the Grasshopper Program diflubenzuron ultra-low volume spray treatments.*

In addition, APHIS would like to note, no acute mortality was observed after topical application, nor after oral exposure to treated sugar-water or treated pollen. In all cases, the number of dead worker bees in the treated nests over a period of 11 weeks was not above that of the control groups using water (0–10%).

Comment 149

APHIS received the following comment, "Multiple studies have observed AChE inhibition in earthworms when malathion was applied. Malathion effected the sperm count and viability and testicular histology of male E. fetida at sublethal concentrations, potentially impairing population abundance."

APHIS agrees with the commenter that the main acute poisonous effect of malathion is the inhibition of the enzyme acetylcholinesterase, and acute poisoning such as was carried out by the researchers with direct exposures to high concentrations of the pesticide could occur in many types of organisms including earthworms. The direct dosing of earthworms to validate their use as toxicological test organisms does not mimic any exposure scenario resulting from the Grasshopper Program use of ultra-low volume sprays of malathion.

To further illustrate the disparity between exposures resulting from laboratory toxicity tests and grasshopper suppression treatments APHIS would like to note the lowest tested concentration was 80 mg/kg of soil. The Grasshopper Program applies malathion ultra-low volume spray at a rate of 0.62 pounds active ingredient per acre. If a cubic foot of rangeland soil weighs 75 pounds, 1 acre (43,560 ft.2) of soil two inches deep would weigh 544,500 pounds, or 246,981 kilograms. The maximum rate used by the Grasshopper Program to apply malathion as an ultra-low volume spray is 0.62 pounds (281227 mg) active ingredient per acre. Therefore, the maximum concentration of 1.14 mg malathion spray per kg of soil could result from program applications. However, this analysis assumes none of the foliar spray settled on vegetation, and the malathion instantly absorbed into the top two inches of soil. This hypothetical soil concentration resulting from ultra-low volume sprays should not be compared in a risk analysis with the 80 mg/kg tested for sub-lethal effects in the laboratory.

Comment 150

APHIS received the following comment, "In addition to AChE, the biochemical biomarkers glutathione-S-transferase, and catalase were also inhibited by malathion in studies with *Eisenia andrei*. Malathion has also been observed to negatively affect the reproduction of *E. andrei*."

The commenters have cited research that confirms malathion inhibits AChE in earthworms. While APHIS does not dispute this effect, the agency doubts such effects could result in significant impacts. Notably the researchers found the inhibition period suggests lengthening of retreatment intervals to 45 days is the appropriate conclusion from the study. APHIS only makes one suppression treatment per year to grasshopper infested rangeland.

Comment 151
APHIS received the following comment, “Malathion had a severe effect on AChE activity in *Drawida willsi*. Growth, casting activity, and respiration of *D. willsi* was negatively affected by malathion treatment and did not recover for 75, 60, and 30 days, respectively.”

The commenters have cited research that confirms malathion inhibits AChE in earthworms. While APHIS does not dispute this effect, the agency doubts these biomarker effects could result in significant impacts.

The study cited by the commenters described malathion's recommended agricultural dose as 2.7 to 4.0 kg a.i./ha and calculated the equivalent 1.5 to 2.22 mg a.i./kg soil, which APHIS would like to note are comparable to the concentration estimation provided above. However the toxicity results for a single dose of malathion were reported for a concentration of 2.2 mg a.i./kg which is equivalent to double the dose of 4.0 kg a.i./acre, nearly six times the application rate used by the Grasshopper Program.

Comment 152
APHIS received the following comment, “In addition to AChE, the biochemical biomarkers glutathione-S-transferase, and catalase were also inhibited by malathion in studies with *E. andrei*. Malathion has also been observed to negatively affect the reproduction of *E. andrei*.”

The commenters have cited two toxicology studies where earthworms were placed in test tubes lined with malathion saturated filter paper to determine acute effect concentrations, extrapolated from the biomarker, AChE reduction. The dosing methods and units of ug a.i./cm2 are not comparable to any exposure levels that could result from the application of malathion ultra-low sprays by the Grasshopper Program. The study cited by the commenter did not make any conclusions regarding malathion affecting reproduction of E. andrei.

Comment 153
APHIS received the following comment, “In a lab test rating the toxicity of 45 pesticides to *E. fetida*, malathion was ranked moderately toxic with an LC50 of 114.4 ug/cm.”

The study cited by the commenter was a comparison of the toxicology of 45 pesticide to determine the LC50. These studies exposed earthworms to varying concentrations of carbaryl to determine toxicological endpoints. Based on the extremely high doses, the impact to the survival of earthworms was not only unsurprising, but the object of the studies. APHIS would like to note this laboratory dosing procedure is not comparable to any exposure scenario resulting from the use of malathion ultra-low volume sprays by the Grasshopper Program.

Comment 154
APHIS received the following comment, “Malathion caused a 40% decrease in survival of the ground-nesting bee, *Nomia melanderi*.”

The study cited by the commenter did not test malathion toxicity on bees, but rather included data from earlier studies. The application rate of malathion emulated in the earlier studies was I.0 lb. of emulsifiable concentrate per acre, significantly greater than the maximum ultra-low *volume rate used by the Grasshopper Program. APHIS found the literature did not provide sufficient details for a reasonable comparison of the malathion application methods and rates for additional effects analysis.*

Comment 155

APHIS received the following comment, "The EAs an agency action subject to this consultation requirement, must be prepared "concurrently with and integrated with environmental impact analyses . . . required by . . . the Endangered Species Act of 1973."

The commenter has again confused the EA prepared by APHIS for the Grasshopper Program in Montana with other environmental risk analysis documents. See comment/response 156 below.

Comment 156

APHIS received the following comment, "In order to properly provide information to the public for commenting on the EIS and the EAs, the section 7 process should be completed prior to the completion of NEPA." and "APHIS must ensure that consultation addresses all species and critical habitat that could be directly and indirectly affected by the proposed project." The comment also states that APHIS has not complied with its responsibilities under Section 7 of the ESA.

APHIS submitted a programmatic biological assessment to the FWS in 2015. APHIS is currently working with the FWS to update and complete the biological assessment and receive concurrence. The intent of the programmatic biological assessment is to provide consistent mitigation measures for listed species that may co-occur with Program treatments. Consultation with the FWS is still being completed at the local level prior to any treatments. No APHIS treatments are made in States without prior concurrence from the FWS or NMFS regarding federally-listed species. This information is also summarized in the final EIS.

APHIS has on-going consultation with the FWS on federally-listed species that may occur within the counties or areas where grasshopper and Mormon cricket treatments may be required. APHIS has worked closely with the FWS to determine the application of protection measures and where those measures should be applied prior to any treatments. APHIS also evaluated the potential direct and indirect impacts to non-target species which is summarized in the final human health and ecological risk assessments for each insecticide.

In the response to comments appendix in the Grasshopper EAs, we noted that agencies are not required to publish concurrence letters as part of our NEPA documents. Coordination with other environmental reviews (50 CFR § 402.06) says, ". . . the results should be included in the documents required by those statutes." To reduce paperwork and an emphasis on background material (40 CFR § 1500.4), we make biological assessments part of the administrative record available through FOIA. APHIS complied with the applicable publication requirements for the programmatic EIS and all tiered EAs, consequently reopening public comment periods will not alleviate any perceived deficiency in public access and does not provide any additional remedy for NEPA compliance.

We would like to note that the 1998 ESA Handbook provides guidance for completing consultations. More recent guidance at https://www.fws.gov/endangered/what-we-do/faq.html#10 says, "Formal consultation should be initiated prior to or at the time of release *of the DEIS or EA. At the time the Final EIS is issued, section 7 consultation should be completed." We discussed our Section 7 consultation work to date in the final EIS which included timely initiation of formal consultation and provided for compliance to occur at the State level until a programmatic Biological Opinion is in place. This situation continues.*

Comment 157
APHIS received the following comment, "APHIS has failed to comply with the basic mandates of the ESA in these EA and actions and if it moves forward with this project, it will be doing so in violation of the ESA."

Please see the USFWS concurrence letter in Appendix 4.

Comment 158

APHIS received the following comment, "APHIS touts the completion of a 2015 consultation with NMFS in these EAs... there are zero species under the jurisdiction of NMFS in Montana"

That is correct, reference to NMFS will be removed in the Final EA.

Comment 159
APHIS received the following comment, "APHIS must complete consultation with FWS to analyze direct and indirect effects of the program on threatened, endangered and sensitive species and their habitats including, but not limited to, runoff, drift, synergistic effects, inert pesticide ingredients, and degraded pesticide ingredients. APHIS must ensure that consultation addresses all species and critical habitat that could be directly and indirectly affected by the proposed project."

See previous responses to comments. APHIS consults at the local level directly with USFWS. Appendix 4 in each EA lists all the T&E and proposed T&E species in Montana, including the mitigation measures that APHIS will employ during suppression projects to insure that said species will not be adversely impacted.

Comment 160
APHIS received the following comment, "APHIS would unlawfully be making an irreversible or irretrievable commitment of resources if it allows insecticide application on rangeland grasshoppers and/or Mormon crickets to occur prior to receipt of a final biological opinion from FWS. APHIS will run afoul of its Section 7 ESA requirements if it chooses to move forward, and it will also likely violate the ESA's prohibition against the take of endangered species as described by Section 9 of the statute if it moves forward with this project prior to properly completing its Section 7 duties. Even where there is a letter of concurrence, APHIS would still fail to comply with the ESA because informal consultation does not authorize the incidental take of federally-listed species nor does it authorize the adverse modification or destruction of critical habitat, and the letter of concurrence fails to articulate any rationale for the buffers."

APHIS has been able to complete informal consultation with the USFWS regarding the APHIS Grasshopper Program at the State level. Formal consultation has not been required since the USFWS has concurred with the APHIS determinations of not likely to adversely affect, including any associated critical habitat. Since APHIS has complied with Section 7 through informal consultation APHIS has not violated Section 9 of the ESA, nor has formal consultation been required resulting in a biological opinion.

The Program action will not result in "incidental take" since the agreed-upon mitigation measures, included in Appendix 4 of each EA, were developed to preclude such. Neither will APHIS projects modify or destroy critical habitat. The failure to suppress severe grasshopper infestations may pose a risk to listed species and "adverse modification or destruction of critical habitat" due to overfeeding, often causing defoliation of nurse plants and consumption of sensitive plants, themselves.

Comment 161

APHIS has received the following comments, "Grasshopper spraying can decrease prey populations for these species as well as produce chronic sub-lethal effects as a result of drift or ingesting pesticide through the insects they consume. For all these species, insecticide spraying threatens their food supply and imperils them with acute and subacute poisoning impacts." This comment is in reference to the Interior Least Tern (*Sterna antillarum*), Piping Plover (*Charadrius melodus*), Red Knot *(Calidris canutus rufa),* Western yellow-billed cuckoo (*Coccyzus americanus occidentalis*), and the Whooping Crane *(Grus Americana).*

Protective measures were developed during the lengthy local USFWS Section 7 consultations for each of the 19 T&E species and species of concern within proposed treatment areas. APHIS protective measures were determined using the USFWS Recommended Protection Measures for Pesticide Applications in Region 2 of the U.S. Fish and Wildlife Service" (USFWS 2007). The USFWS letters of concurrence agree with our determinations. See Appendix 4 for USFWS concurrence letter.

Comment 162

APHIS has received the following comments, "APHIS neglected to include this species (Pallid sturgeon) in the list of species it would engage in informal consultation on for this EA and must do so unless it can demonstrate that there are no pallid sturgeon present in the proposed action area.

In Montana, Pallid sturgeon is addressed in the 2020 Biological Assessment and concurrence letter. Please see Appendix 4

Comment 162

APHIS has received the following comments, "Both the Meltwater Lednian and Western Glacier stoneflies are highly imperiled sensitive species that APHIS must consult on to ensure that it does not unlawfully undertake actions that will adversely effect these species."

As stated in Appendix 4, it is not likely that APHIS grasshopper suppression activities will occur in areas of the stonefly's habitat, riparian areas due to a programmatic buffer placed on either side of streams or water bodies. This 500 foot buffer is standard procedure for all USDA APHIS PPQ grasshopper aerial suppression programs. For those areas that may be treated using ground equipment the 50 foot buffer will be increased to 500 feet around waters and riparian areas that are Western Glacier and Meltwater Lednian Stonefly suitable habitat, within the range of the species. See USFWS concurrence letter in Appendix 4

Comment 163

APHIS has received the following comments, "Both of these species (Northern long-eared bat and black footed ferret) can rely on the very rangelands this EA targets, or may pass through them. Impacts of spraying can include habitat disturbance, acute and subacute poisoning, and reduced prey, amongst other possible impacts that must be considered."

Please see Appendix 4.

Comment 164
APHIS has received the following comments, "Grizzly bears are imperiled by numerous factors, and the impact of stress from aerial pesticide applications must be considered for this iconic species. Also, grizzly bears can eat considerable plant material and quantities of fish, so impacts to plants and fish also must be considered when analyzing impacts to grizzlies."

Please see Appendix 4.

Comment 165
APHIS has received the following comments, "Use of insecticides can directly effect plants, can harm their soil and can also reduce available pollinators for these plants, threatening the viability of their life cycle. Any mitigation efforts to avoid adverse effects to this species will necessitate knowledge of all occupied habitat, which requires regular surveys, and also knowledge of groundwater, as well as knowledge of unoccupied but nonetheless essential habitat. This knowledge would also have to factor in current and anticipated threats, cumulative impacts, and likely climate change migration."

Please see Appendix 4.

Comment 165
APHIS has received the following comments, "The EAs state that the suppression efforts will extend from 5/11/20 till 9/23/20. This is concerning to us since the EA will not be finalized till after the comment period ends…which is 5/29/20."

No grasshopper treatment will take place in Montana until the EAs are finalized and the FONSI is signed.

EA Comment References

Bavcon, M., Trebse, P., and L. Zupancic-Kralj. 2005. Investigations of the determination and transformations of diazinon and malathion under environmental conditions using gas chromatography coupled with a flam ionization detector. Chemosphere. 50: 595–601.

Capowiez, Y., Y. A. Bérard, 2006. Assessment of the effects of imidacloprid on the behavior of two earthworm species (*Aporrectodea nocturna* and *Allolobophora icterica*) using 2D terraria. Ecotox. Environ. Saf., 64 (2006), pp. 198-206.

California Department of Pesticide Regulations (CDPR). 1993. Assessment of Malathion and Malaoxon concentration and persistence in water, plant, soil, and plant matrices under controlled exposure experiments by Rosemary H. Neal, Patrick M. Mccool, Theodore Younglove. University of California, https://www.cdpr.ca.gov/

Davis, B.N.K., 1971.Laboratory studies on the uptake of dieldrin and DDT by earthworms. Soil Biol. Biochem. 3, 221–223.

FMC. 2019. Appendix D. Ecological Study Evaluation and End Points for Tier 1 Risk Assessments. Cheminova's Ecotoxicological Study Evaluation Criteria, Study Evaluations and Proposed Screening-Level Effects Metrics for Registration Review of Malathion. March 4, 2014.

Greenberg, J. and Q.N. LaHam. Malathion-induced teratisms in the developing chick. Canadian Journal of Zoology, 47 (1969), pp. 539-542

Hansen, R. W. & E. A. Osgood. 1984. Effects of a split application of sevin-4-oil on pollinators and fruit set in in a spruce-fir forest. Can. Entomol. 116: 457-464.

Helson, B. V., Barber, K. N., & Kingsbury, P. D. 1994. Laboratory toxicology of six forestry insecticides to four species of bee (hymenoptera: Apoidea). Archives of Environmental Contamination and Toxicology, 27(1). https://doi.org/10.1007/BF00203895.

Hoffman, D.J. Eastin, W.C. 1981. Effects of malathion, diazinon, and parathion on mallard embryo development and cholinesterase activity. Environ Res. Dec, 26(2):472-85.

Johansen, C. A., D. F. Mayer, J. D. Eves, and C. W. Kious. 1983. Pesticides and bees. Environ. Entomol. 12: 1513-1518.

Joy, V. C., & Chakravorty, P. P. 1991. Impact of insecticides on non-target microarthropod fauna in agricultural soil. Ecotoxicology and Environmental Safety, 22(1), 8–16. https://doi.org/10.1016/0147-6513(91)90041-M.

Larson, J. L., Redmond, C. T., & Potter, D. A. 2012. Comparative impact of an anthranilic diamide and other insecticidal chemistries on beneficial invertebrates and ecosystem services in turfgrass. Pest Management Science, 68(5), 740–748. https://doi.org/10.1002/ps.2321.

Lima, M. P. R., Soares, A. M. V. M., & Loureiro, S. 2011. Combined effects of soil moisture and carbaryl to earthworms and plants: Simulation of flood and drought scenarios. Environmental Pollution, 159(7), 1844–1851. https://doi.org/10.1016/j.envpol.2011.03.029.

Lillie, R.J. 1973. Studies on the reproductive performance and progeny performance of caged White Leghorns fed malathion and carbaryl. Poult Sci. Jan, 52(1):266-72.

Lockwood, J.A., S.P. Schell, R.N. Foster, C. Reuter, and T. Rachadi.1999. Reduced agent-area treatments (RAATs) for management of rangeland grasshoppers: efficacy and economics under operational conditions. Int. J. Pest Manage. 46:29-42.

Lockwood, J.A., Narisu, S.P. Schell, and D.R. Lockwood. 2001. Canola oil as a kairomonal attractant of rangeland grasshoppers (Orthoptera: Acrididae): an economical liquid bait for insecticide formulation. Int. J. Pest Manage. 47:185–194.

Lockwood, J.A., R. Anderson-Sprecher, and S.P. Schell. 2002. When less is more: optimization of reduced agent-area treatments (RAATs) for management of rangeland grasshoppers. Crop Protection. 21:551-562.

Norelius, E.E. and J.A. Lockwood. 1999. The effects of standard and reduced agent-area insecticide treatments for rangeland grasshopper (Orthoptera: Acrididae) control on bird densities. Arch. Environ. Toxicol. 37:519–528.

Panda, S., & Sahu, S. K. 2004. Recovery of acetylcholine esterase activity of *Drawida willsi* (Oligochaeta) following application of three pesticides to soil. Chemosphere, 55(2), 283–290.

Pfadt, R. E. 1994. Field Guide to Common Western Grasshoppers. Wyoming Agricultural Experiment Station Bulletin 912. Wyoming Agricultural Experiment Station.

Potter, D. A., Buxton, M. C., Redmond, C. T., Patterson, C. G., & Powell, A. J. 1990. Toxicity of Pesticides to Earthworms (Oligochaeta: Lumbricidae) and Effect on Thatch Degradation in Kentucky Bluegrass Turf. Journal of Economic Entomology, 83(6), 2362–2369. https://doi.org/10.1093/jee/83.6.2362.

Quinn, M.A. 2000. North Dakota Integrated Pest Management Demonstration Project, Technical Bulletin No. 1891. Page 124 pp. U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Washington D.C.

Sanchez-Hernandez, J.C. 2006.Earthworms Biomarkers in Ecological Risk Assessment. In; Ware, G.W., et al., Eds., Reviews of Environmental Contamination and Toxicology, Springer, New York, 85-126.http://dx.doi.org/10.1007/978-0-387-32964-2_3

Saxena, P. N., Gupta, S. K., & Murthy, R. C. 2014. Comparative toxicity of carbaryl, carbofuran, cypermethrin and fenvalerate in *Metaphire posthuma* and *Eisenia fetida*—A possible mechanism.

Ecotoxicology and Environmental Safety, 100, 218–225. https://doi.org/10.1016/j.ecoenv.2013.11.006.

Schroeder. W.J., R. A. Sutton, and J. B. Beavers, 1980. *Diaprepes abbreviatus:* Fate of Diflubenzuron and Effect on Non-target Pests and Beneficial Species after Application to Citrus for Weevil Control, Journal of Economic Entomology. 73(5):637–638. https://doi.org/10.1093/jee/73.5.637

Stark, J. D., P. C. Jepson, and D. F. Mayer. 1995. Limitations to use of topical toxicity data for predictions of pesticide side effects in the field. J. Econ. Entomol. 88: 1081-1088.

Stepić, S., Hackenberger, B. K., Velki, M., Hackenberger, D. K., & Lončarić, Ž. 2013. Potentiation Effect of Metolachlor on Toxicity of Organochlorine and Organophosphate Insecticides in Earthworm *Eisenia andrei*. Bulletin of Environmental Contamination and Toxicology, 91(1), 55–61. https://doi.org/10.1007/s00128-013-1000-0.

Stepić, S., Hackenberger, B. K., Velki, M., Lončarić, Ž., & Hackenberger, D. K. 2013. Effects of individual and binary-combined commercial insecticides endosulfan, temephos, malathion and pirimiphos-methyl on biomarker responses in earthworm *Eisenia andrei.* Environmental Toxicology and Pharmacology, 36(2), 715–723. https://doi.org/10.1016/j.etap.2013.06.011.

Tasei, J. 2001. Effects of insect growth regulators on honey bees and non-*Apis* bees. A review. Apidologie. 32:527-545.

Van Gestel, C.A.M., VanDis, W.A., 1988. The influence of soil characteristics on the toxicity of four chemicals to earthworm *Eisenia andrei* (Oligochaeta). Biol. Fertil. Soils 6, 262–265.

U.S. Environmental Protection Agency. 2012. Ecotox database accessed at: http://cfpub.epa.gov/ecotox/

USFWS. 2007. Recommended Protection Measures for Pesticide Applications in Region 2 of the U.S. Fish and Wildlife Service. 205pp. https://www.fws.gov/southwest/es/arizona/documents/ecreports/rpmpa_2007.pdf