

# Final Environmental Assessment Rangeland Grasshopper and Mormon Cricket Suppression Program

## Missouri Slope Assessment Area

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

EA Number: ND-20-01

### **Prepared by:**

Animal and Plant Health Inspection Service  
Plant Protection and Quarantine  
3509 Miriam Ave. Suite A  
Bismarck, ND 58501

March 2, 2020

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## Acronyms and Abbreviations

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

**Final Site-Specific Environmental Assessment**  
**Rangeland Grasshopper and Mormon Cricket Suppression Program**  
**Missouri Slope Assessment Area**

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

**I. Need for Proposed Action**

***A. Purpose and Need Statement***

An infestation of grasshoppers and/or Mormon crickets (hereafter referred to collectively as grasshoppers) may occur in the Missouri Slope Assessment Area. This assessment area includes the following counties: Adams, Billings, Bowman, Burke, Burleigh, Divide, Dunn, Emmons, Grant, Golden Valley, Hettinger, McKenzie, McLean, Mercer, Morton, Mountrail, Oliver, Sioux, Slope, Stark, Ward, and Williams. The Animal and Plant Health Inspection Service (APHIS) and may, upon request by land managers or State departments of agriculture, conduct treatments to suppress grasshopper infestations as part of the Rangeland Grasshopper and Mormon Cricket Suppression Program (program). The term “grasshopper” used in this environmental assessment (EA) refers to both grasshoppers and Mormon crickets, unless differentiation is necessary.

Populations of grasshoppers that trigger the need for a suppression program are normally considered on a case-by-case basis. Participation is based on potential damage such as forage loss to cattle and wildlife, reduction of cover available to wildlife, and increased soil erosion and benefits of treatments including protection of vegetation. The goal of the proposed suppression program analyzed in this EA is to reduce grasshopper populations to economically acceptable levels in order to protect rangeland ecosystems or cropland adjacent to rangeland.

This EA analyzes potential effects of the proposed action and its alternatives. This EA applies to a proposed suppression program that would take place from April to September in the Missouri Slope Assessment Area.

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

APHIS. A decision will be made by APHIS based on the analysis presented in this EA, the results of public involvement, and consultation with other agencies and individuals. A selection of one of the program alternatives will be made by APHIS for the 2020 Control Program for the Missouri Slope Assessment Area.

## ***B. Background Discussion***

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

In rangeland ecosystem areas of the United States, grasshopper populations can build up to economic infestation levels<sup>1</sup> 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.

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

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

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

APHIS PPQ program managers will have current North Dakota Pesticide Applicator certification and APHIS PPQ Pesticide Applicators certification. SARA Title III Community Right to Know laws will be followed.

In April 2014, APHIS and the United States Forest Service (USFS) signed a Memorandum of Understanding (MOU) detailing cooperative efforts between the two groups on suppression of grasshoppers and Mormon crickets on National Forest system lands (Document #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 and Mormon cricket populations. The MOU also states that these documents will be prepared under the APHIS NEPA implementing procedures with cooperation and input from the USFS.

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

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

The MOU further states that the responsible BLM official will request in writing the inclusion of appropriate lands in the APHIS suppression project when treatment on BLM land is necessary. The BLM must also prepare a Pesticide Use Proposal (Form FS-2100-2) for APHIS to treat infestations. According to the provisions of the

MOU, APHIS can begin treatments after APHIS issues an appropriate decision document and BLM prepares and approves the Pesticide Use Proposal.

In September 2016, APHIS and the Bureau of Indian Affairs (BIA) signed a Memorandum of Understanding (MOU) detailing cooperative efforts between the two groups on suppression of grasshoppers and Mormon crickets on BIA lands (Document #10-8100- 0941-MU, September 16, 2016). This MOU clarifies that APHIS will prepare and issue to the public site-specific environmental documents that evaluate potential impacts associated with proposed measures to suppress economically damaging grasshopper and Mormon cricket populations. The MOU also states that these documents will be prepared under the APHIS NEPA implementing procedures with cooperation and input from the BIA.

The MOU further states that the responsible BIA official will request in writing the inclusion of appropriate lands in the APHIS suppression project when treatment on BIA land is necessary. The request should include the dates and locations of all tribal ceremonies and cultural events, as well as “not to be treated” areas that will be in or near the proposed treatment block(s). According to the provisions of the MOU, APHIS can begin treatments after APHIS issues an appropriate decision document.

### ***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 that potentially could be affected, 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 certain forecasts where the specific treatment areas will be. Therefore examining specific treatment areas for environmental risk analysis under NEPA is typically not possible. At the same time, the program strives to alert the public in a timely manner to its more concrete treatment plans and avoid or minimize harm to the environment in implementing those plans.

The current EIS provides a solid analytical foundation; however, it may not be enough to satisfy NEPA completely for actual treatment proposals. The program typically prepares a Draft EA tiered to the current EIS for each of the 17 Western States, or portion of a state, that may receive a request for treatment. The Draft EA analyzes aspects of environmental quality that could be affected by treatments in the area where grasshopper outbreaks are anticipated. The Draft EA will be made available to the public for a 30-day comment period. When the program receives a treatment request and determines that treatment is necessary, the specific site within the state will be evaluated to determine if environmental factors were thoroughly evaluated in the Draft EA. If all environmental issues were accounted for in the Draft EA, the program will prepare a Final EA and 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. To allow the program to respond to comments in a timely manner, the Final EA and FONSI will be posted to the APHIS website. The program will also publish a notice of availability in the same manner used to advertise the availability of the Draft EA.

## **II. Alternatives**

To engage in comprehensive NEPA risk analysis APHIS must frame potential agency decisions into distinct alternative actions. These program alternatives are then evaluated to determine the significance of environmental effects. The 2002 EIS presented three alternatives: (A) No Action; (B) Insecticide Applications at Conventional Rates and Complete Area Coverage; and (C) Reduced Agent Area Treatments (RAATs), and their potential impacts were described and analyzed in detail. The 2019 EIS was tiered to, and updated the 2002 EIS. Therefore the 2019 EIS considered the environmental background or ‘No Action’ alternative of maintaining the program that was described in the 2002 EIS and Record of Decision. The 2019 EIS also considered an alternative where APHIS would not fund or participate in grasshopper suppression programs. The preferred alternative of the 2019 EIS allowed APHIS to update the program with new information and technologies that not were analyzed in the 2002 EIS. Copies of the complete 2002 and 2019 EIS documents are available for review at 3509 Miriam Avenue, Suite A, Bismarck ND 58501. These documents are also available at the Rangeland Grasshopper and Mormon Cricket Program web site, <http://www.aphis.usda.gov/plant-health/grasshopper>.

All insecticides used by APHIS for grasshopper suppression are used in accordance with applicable product label instructions and restrictions. Representative product specimen labels can be accessed at the Crop Data Management Systems, Incorporated web site at [www.cdms.net/manuf/manuf.asp](http://www.cdms.net/manuf/manuf.asp). Labels for actual products used in suppression programs will vary, depending on supply issues. All insecticide treatments conducted by APHIS will be implemented in accordance with APHIS’ treatment guidelines and operational procedures, included as Appendix 1 to this draft EA.

This draft EA analyzes the significance of environmental effects that could result from the alternatives described below. These alternatives differ from those described in the 2019 EIS because grasshopper treatments are not likely to occur in most of the Missouri Slope Assessment Area 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 conduct a program to suppress grasshopper infestations within the Missouri Slope Assessment Area. 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, chlorantraniliprole, or malathion would be considered under this alternative, typically at the following application rates:

- 8.0-16.0 fluid ounces (0.25-0.50 lb a.i.) of carbaryl ULV spray per acre;
- 2.0-10.0 pounds (0.04-0.20 lb a.i.) of 2 percent carbaryl bait per acre;
- 2.0-10.0 pounds (0.10-0.50 lb a.i.) of 5 percent carbaryl bait per acre;
- 0.75 or 1.0 fluid ounce (0.012-0.016 lb a.i.) of diflubenzuron per acre; or
- 4.0-8.0 fluid ounces (0.31-0.62 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.

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

- 16.0 fluid ounces (0.50 lb a.i.) of carbaryl spray per acre;
- 10.0 pounds (0.20 lb a.i.) of 2 percent carbaryl bait 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.

### **III. Affected Environment**

#### ***A. Description of Affected Environment***

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

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

Missouri Coteau, past glaciation is evident by the short, irregular slopes and numerous kettle lakes. The Missouri Coteau marks the westernmost extent of continental glaciation.

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

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

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

The US Forest Service administers a large amount of public land in the western portion of the assessment area. These lands are extensively used for recreation as well as cattle and oil production. These lands are intermingled with private land, State land, Bureau of Land Management, Corps of Engineers, and National Park Service land creating a mosaic pattern of ownership in this area. Theodore Roosevelt National Park, and other important park service properties and

interpretive centers are in the assessment area as well as eight State parks and numerous county managed parks. Additionally many Federal and State historic sites are located within the assessment area.

## ***B. Site-Specific Considerations***

### **1. Human Health**

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

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

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

### **2. Nontarget Species**

#### **A. Endangered, Threatened, and Proposed Species**

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

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

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

Federally Listed Species	Scientific Name	Status	Formal ESA Section 7
Black-footed ferret	<i>Mustela nigripes</i>	Endangered	ongoing
Gray wolf	<i>Canis lupus</i>	Endangered	ongoing
Whooping crane	<i>Grus americana</i>	Endangered	ongoing
Interior least tern	<i>Sterna antillarum</i>	Endangered	ongoing
Pallid sturgeon	<i>Scaphirhynchus albus</i>	Endangered	ongoing
Northern long-eared bat	<i>Myotis septentrionalis</i>	Endangered	ongoing
Piping Plover	<i>Charadrius melodus</i>	Threatened	ongoing
Red Knot	<i>Calidris canutus rufa</i>	Threatened	ongoing
Dakota Skipper	<i>Hesperia dacotae</i>	Threatened	ongoing
Greater sage grouse	<i>Centrocercus</i>	Candidate	ongoing
Sprague's Pipit	<i>Anthus spragueii</i>	Candidate	ongoing
Bald eagle	<i>Haliaeetus</i>	Delisted	Protection Act applies

## B. Bees

North Dakota often ranks first in the nation in honey production so the preservation of the honey bee population is critical. Honey production begins to

increase in late June as the colonies increase and strengthen and peaks during July when as much as two-thirds of the annual production will be realized.

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

### **C. Weed biological control insectaries**

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

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

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

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

Site specific conditions or views of cooperators may warrant protection measures such as no treatment buffer zones or augmentation releases of biocontrol agents. Modifications to application patterns would be made only after informal field level consultations with cooperators. RAATs application techniques would also reduce impacts because untreated areas would act as refugia for nontarget species.

In addition to pilot briefing, fluorescent orange flagging, a kytoon, and/or radio communications may be used to alert the pilots of the insectary locations.

As per operational procedures (Appendix 1), APHIS will hold public meetings well in advance of any grasshopper treatment program to alert the public and in the process, could learn the whereabouts of any insectaries in the area. Land managers will also be informed about using the available alternatives and the

various protection measures at these meetings. APHIS concludes that a grasshopper treatment program should have no adverse effects on the biological control insectaries.



### **3. Socioeconomic Issues**

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

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

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

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

However, ranch operations often do not have the option for short-run variations in feeding and selling practices in response to grasshopper infestations. Their flexibility may be limited by contractual arrangements, lead time needed, and

uncertainty in estimating grasshopper populations and subsequent impacts. In these instances, ranchers may choose to participate in APHIS' cooperative grasshopper control program.

#### **4. Cultural Resources and Events**

##### **A. Historic sites**

APHIS will adopt mitigative measures developed through informal consultation with the North Dakota Historical Society pertaining to any registered historical sites that occur in a treatment area. When historic sites occur in the treatment area, maps of the proposed area will be sent for consultation to the North Dakota Historical Society well in advance of any project. No adverse effect would be expected to historical sites due to APHIS programs.

##### **B. State parks**

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

##### **C. Indian Reservations**

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

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

## **5. Special Considerations for Certain Populations**

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

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

Minority populations of Native Americans live within the assessment area. Letters of request for treatments must be on file from the tribal government and Bureau of Indian Affairs before grasshopper control activities can begin on reservation land or areas managed for traditional Native American activities. Additionally, any protection measures for sensitive people or areas must be agreed upon before operations can begin.

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

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

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

## IV. Environmental Consequences

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

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

### ***A. Environmental Consequences of the Alternatives***

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

#### **1. No Action Alternative**

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

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, chlorantraniliprole, diflubenzuron, or malathion, depending upon the various factors related to the grasshopper outbreak and the site-specific characteristics. The use of an insecticide would typically occur at half the conventional application rates following the RAATs strategy. APHIS would apply a single treatment to affected rangeland areas 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; Bondarenko 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 lepidopteran (order of insects that includes butterflies and moths) larvae compared to controls; however, the total amount of food consumed did not differ between treated and untreated plots. Body measurements, weight, and fat content in mice collected from treated and non-treated areas did not differ.

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

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

Diflubenzuron applications have the potential to affect chitin production in various other beneficial terrestrial invertebrates. Multiple field studies in a variety of application settings, including grasshopper control, have been conducted regarding the impacts of diflubenzuron to terrestrial invertebrates. Based on the available data, sensitivity of terrestrial invertebrates to diflubenzuron is highly variable depending on which group of insects and which life stages are being exposed. Immature grasshoppers, beetle larvae, lepidopteran larvae, and

chewing herbivorous insects appear to be more susceptible to diflubenzuron than other invertebrates. Within this group, however, grasshoppers appear to be more sensitive to the proposed use rates for the program. Honeybees, parasitic wasps, predatory insects, and sucking insects show greater tolerance to diflubenzuron exposure (Murphy et al., 1994; Eisler, 2000; USDA FS, 2004).

Diflubenzuron is moderately toxic to spiders and mites (USDA APHIS, 2018c). Deakle and Bradley (1982) measured the effects of four diflubenzuron applications on predators of *Heliothis* spp. at a rate of 0.06 lb. ai./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 except in rare pest conditions that warrant full coverage and higher rates. The goal of the RAATs strategy is to suppress grasshopper populations to a desired level, rather than to reduce those populations to the greatest possible extent. This strategy has both economic and environmental benefits. APHIS would apply a single application of insecticide per year, typically using a RAATs strategy that decreases the rate of insecticide applied by either using lower insecticide 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.

## ***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. 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.

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

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

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

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

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

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

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

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.

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

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

- RAATs are used in all areas adjacent to salmonid habitat
- ULV sprays are used, which are between 50 and 66% of the USEPA recommended rate
- Insecticides are not aerially applied in 3,500 foot buffer zones for carbaryl or malathion or in 1,500 foot buffer zones for diflubenzuron along stream corridors
- Insecticides will not be applied when wind speeds exceed 10 miles per hour. APHIS will attempt to avoid insecticide application if the wind is blowing towards salmonid habitat
- Insecticide applications are avoided when precipitation is likely or during temperature inversions

APHIS determined that with the implementation of these measures, the grasshopper suppression program may affect, but is not likely to adversely affect listed salmonids or designated critical habitat in the program area. NMFS concurred with this determination in a letter dated April 12, 2010. APHIS will consult with NMFS at the local level if there could be co-occurrence of program chlorantraniliprole applications and listed salmonids.

APHIS submitted a programmatic biological assessment and requested consultation with USFWS on March 9, 2015 for use of carbaryl, malathion, and diflubenzuron, 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.

## **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.

## **9. Fires and Human Health Hazards**

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

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

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

## **10. Cultural and Historical Resources**

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

## **V. Literature Cited**

- Beauvais, S. 2014. Human exposure assessment document for carbaryl. Page 136. California Environmental Protection Agency, Department of Pesticide Regulation.
- Belovsky, G. E., A. Joern, and J. Lockwood. 1996. VII.16 Grasshoppers—Plus and Minus: The Grasshopper Problem on a Regional Basis and a Look at Beneficial Effects of Grasshoppers. Pages 1-5 in G. L. Cunningham and M. W. Sampson, editors. Grasshopper Integrated Pest Management User Handbook, Technical Bulletin No. 1809. U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Washington, DC.
- Belovsky, G. E. 2000. Part 1. Grasshoppers as integral elements of grasslands. 1. Do grasshoppers diminish grassland productivity? A new perspective for control based on conservation. Pages 7-29 in J. A. Lockwood et al, editor. Grasshoppers and Grassland Health. Kluwer Academic Publishers, Netherlands.
- Bonderenko, S., J. Gan, D. L. Haver, and J. N. Kabashima. 2004. Persistence of selected organophosphate and carbamate insecticides in waters from coastal watershed. *Env. Toxicol. Chem.* 23:2649-2654.
- Bradshaw, J. D., K. H. Jenkins, and S. D. Whipple. 2018. Impact of grasshopper control on forage quality and availability in western Nebraska. *Rangelands* 40:71-76.
- Branson, D., A. Joern, and G. Sword. 2006. Sustainable management of insect herbivores in grassland ecosystems: new perspectives in grasshopper control. *BioScience* 56:743-755.
- 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. Agric. 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.
- 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 chlorantraniliprole residues on cauliflower using QuEChERS technique. *Environ. Monit. Assess* 85:1255-1263.
- Keever, D. W., J. R. Bradley, Jr, and M. C. Ganyard. 1977. Effects of diflubenzuron (Dimilin) on selected beneficial arthropods in cotton fields. *J. Econ. Entomol.* 6:832-836.
- LaFleur, K. S. 1979. Sorption of pesticides by model soils and agronomic soils: rates and equilibria. *Soil Sci.* 127:94-101.
- Larsen, J. and R. N. Foster. 1996. Using Hopper to Adapt Treatments and Costs to Needs and Resources. U.S. Department of Agriculture, Animal and Plant Health Inspection Service Grasshopper Integrated Pest Management User Handbook, Washington, D.C.
- Larson, J. L., C. T. Redmond, and D. A. Potter. 2012. Comparative impact of an anthranilic 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.

- Malhat, F., H. Adbdallah, and I. Hegazy. 2012. Dissipation of chlorantraniliprole in tomato fruits and soil. *Bul. Environ. Contam. Toxicol.* 88:349-351.
- Matsumura, F. 1985. *Toxicology of insecticides*. Plenum Press, New York.
- McEwen, L.C., Althouse, C.M., and Peterson, B.E., 1996. Direct and indirect effects of grasshopper integrated pest management (GHIPM) chemicals and biologicals on nontarget animal life. *In* U.S. Department of Agriculture, Animal and Plant Health Inspection Service, 1996. *Grasshopper Integrated Pest Management User Handbook*, Tech. Bul. No. 1809. Sec. III.2. Washington, DC.
- Miles, C. J. and S. Takashima. 1991. Fate of malathion and O.O.S. trimethyl phosphorothioate byproduct in Hawaiian soil and water. *Arch. Environ. Contam. Toxicol* 20:325-329.
- Murphy, C. F., P. C. Jepson, and B. A. Croft. 1994. Database analysis of the toxicity of antilocus 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. Sublethal effects of carbaryl bran bait on nesting performance, parental investment, and offspring size and sex ratio of the alfalfa leafcutting bee (Hymenoptera: Megachilidae). *Environ. Entomol.* 24:34-39.
- Pfadt, R. E. 2002. *Field Guide to Common Western Grasshoppers*, Third Edition. Wyoming Agricultural Experiment Station Bulletin 912. Laramie, Wyoming.
- Purdue University. 2018. National Pesticide Information Retrieval System. West Lafayette, IN.

- Quinn, M. A., R. L. Kepner, D. D. Walgenbach, R. N. Foster, R. A. Bohls, P. D. Pooler, K. C. Reuter, and J. L. Swain. 1991. Effect of habitat and perturbation on populations and community structure of darkling beetles (Coleoptera: tenebrionidae) on mixed grass rangeland. *Environ. Entomol.* 19:1746-1755.
- Rashford, B. S., A. V. Latchininsky, and J. P. Ritten. 2012. *An Economic Analysis of the Comprehensive Uses of Western Rangelands*. U.S. Department of Agriculture, Animal and Plant Health Inspection Service.
- Reinhardt, T. and R. Ottmar. 2004. Baseline measurements of smoke exposure among wildland firefighters. *Journal of Occupational and Environmental Hygiene* 1:593-606.
- Reisen, F. and S. Brown. 2009. Australian firefighters' exposure to air toxics during bushfire burns of autumn 2005 and 2006. *Environment International* 35:342-353.
- Richmond, M. L., C. J. Henny, R. L. Floyd, R. W. Mannan, D. W. Finch, and L. R. DeWeese. 1979. Effects of Sevin 4-oil, Dimilin, and Orthene on Forest Birds in Northeastern Oregon. USDA, Pacific SW Forest and Range Experiment Station.
- Rosenberg, K. V., R. D. Ohmart, and B. W. Anderson. 1982. Community organization of riparian breeding birds: response to an annual resource peak. *The Auk* 99:260-274.
- Sample, B. E., R. J. Cooper, and R. C. Whitmore. 1993. Dietary shifts among songbirds from a diflubenzuron-treated forest. *The Condor* 95:616-624.
- Schaefer, C. H., A. E. Colwell, and E. F. Dupras, Jr. 1980. The occurrence of p-chloroaniline and p-c hlorophenylurea from the degradation of pesticide in water and fish. *Proceedings of the 48th Ann. Meeting Mosquito Vector Cont. Assoc.*:84-89.
- Schaefer, C. H. and E. F. Dupras, Jr. 1977. Residues of diflubenzuron [1-(4-chlorophenyl)-3(2,6-difluorobenzoyl) urea] in pasture soil, vegetation, and water following aerial applications. *J. Agric. Food Chem.* 25:1026-1030.
- Smith, D. and J. Lockwood. 2003. Horizontal and trophic transfer of diflubenzuron and fipronil among grasshoppers and between grasshoppers and darkling beetles (Tenebrionidae). *Archives of Environmental Contamination and Toxicology* 44:377-382.
- Smith, D. I., J. A. Lockwood, A. V. Latchininsky, and D. E. Legg. 2006. Changes in non-target populations following applications of liquid bait formulations of insecticides for control of rangeland grasshoppers. *Internat. J. Pest Mgt.* 52:125-139.
- Stanley, J. G. and J. G. Trial. 1980. Disappearance constants of carbaryl from streams contaminated by forest spraying. *Bul. Environ. Contam. Toxicol.* 25:771-776.
- Swain, J. L. 1986. *Effect of Chemical Grasshopper Controls on Non-Target Arthropods of Rangeland in Chaves County, New Mexico*. New Mexico State University.
- Tepedino, V. J. 1979. The importance of bees and other insect planetaries in maintaining floral species composition. *Great Basin Naturalist Memoirs* 3:139-150.
- Thomson, D. L. K. and W. M. J. Strachan. 1981. Biodegradation of carbaryl in simulated aquatic environment. *Bul. Environ. Contam. Toxicol.* 27:412-417.
- USDA APHIS– see U.S. Department of Agriculture, Animal and Plant Health Inspection Service
- U.S. Department of Agriculture, Animal and Plant Health Inspection Service, 1999. APHIS Directive 5600.3, Evaluating APHIS programs and activities for ensuring protection of children from environmental health risks and safety risks. September 3, 1999. U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Riverdale, MD. [online] available: <http://www.aphis.usda.gov/library/directives>.



- U.S. Department of Agriculture, Animal and Plant Health Inspection Service. 2015. Biological Assessment for the APHIS Rangeland Grasshopper and Mormon Cricket Suppression Program. Page 162. U.S. Department of Agriculture, Animal and Plant Health Inspection Service.
- U.S. Department of Agriculture, Animal and Plant Health Inspection Service. 2018a. Human Health and Ecological Risk Assessment for Carbaryl Rangeland Grasshopper and Mormon Cricket Suppression Applications. United States Department of Agriculture, Animal and Plant Health Inspection Service.
- U.S. Department of Agriculture, Animal and Plant Health Inspection Service. 2018c. Human Health and Ecological Risk Assessment for Diflubenzuron Rangeland Grasshopper and Mormon Cricket Suppression Applications. United States Department of Agriculture, Animal and Plant Health Inspection Service.
- U.S. Department of Agriculture, Animal and Plant Health Inspection Service. 2018d. Human Health and Ecological Risk Assessment for Malathion Rangeland Grasshopper and Mormon Cricket Suppression Applications. United States Department of Agriculture, Animal and Plant Health Inspection Service.
- U.S. Department of Agriculture, Animal and Plant Health Inspection Service. 2019. Rangeland Grasshopper and Mormon Cricket Suppression Program Final Environmental Impact Statement. United States Department of Agriculture, Animal and Plant Health Inspection Service.
- USDA FS. 2004. Control/eradication agents for the gypsy moth—human health and ecological risk assessment for diflubenzuron (final report). United States Department of Agriculture, Forest Service
- USDA FS. 2008. Malathion- Human Health and Ecological Risk Assessment. U.S. Department of Agriculture, Forest Service.
- USEPA – See U.S. Environmental Protection Agency
- U.S. Environmental Protection Agency. 1997. Reregistration Eligibility Decision (RED): Diflubenzuron. U.S. Environmental Protection Agency.
- U.S. Environmental Protection Agency. 2000a. Malathion Reregistration Eligibility Document Environmental Fate and Effects. Page 146. U.S. Environmental Protection Agency, Office of Prevention, Pesticides and Toxic Substances.
- U.S. Environmental Protection Agency. 2000b. Reregistration Eligibility Decision (RED) for Malathion. U.S. Environmental Protection Agency.
- USEPA. 2003. Environmental Fate and Ecological Risk Assessment for Re-Registration of Carbaryl. U.S. Environmental Protection Agency.
- U.S. Environmental Protection Agency. 2006. Malathion Reregistration Eligibility Document. Page 147. U.S. Environmental Protection Agency, Office of Pesticide Programs.
- U.S. Environmental Protection Agency. 2007. Reregistration Eligibility Decision (RED) for Carbaryl. Page 47. U.S. Environmental Protection Agency, Prevention, Pesticides and Toxic Substances.
- U.S. Environmental Protection Agency. 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. 2018. Preliminary Risk Assessment to Support the Registration Review of Diflubenzuron.
- USFWS. 2007. National Bald Eagle Management Guidelines. Page 23 pp. U.S. Fish and Wildlife Service.
- Wakeland, C. and W. E. Shull. 1936. The Mormon cricket with suggestions for its control, Extension Bulletin No. 100. University of Idaho, College of Agriculture, Idaho Agricultural Extension.
- Zinkl, J. G., C. J. Henny, and L. R. DeWeese. 1977. Brain cholinesterase activities of birds from forests sprayed with trichlorfon (Dylox) and carbaryl (Sevin 4-oil). *Bul. Environ. Contam. Toxicol.* 17:379-3

# **Appendix A - APHIS Rangeland Grasshopper and Mormon Cricket Suppression Program**

## **FY-2020 Treatment Guidelines**

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

### **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.
- 6) Land managers are responsible for the overall management of rangeland under their control to prevent or reduce the severity of grasshopper and Mormon cricket outbreaks. Land managers are encouraged to have implemented integrated pest management systems prior to requesting a treatment. In the absence of available funding or in the place of APHIS funding, the Federal land management agency, Tribal authority or other party/ies may opt to reimburse APHIS for suppression treatments. Interagency agreements or reimbursement agreements must be completed prior to the start of treatments which will be charged thereto.

- 7) There are situations where APHIS may be requested to treat rangeland that also includes small areas where crops are being grown (typically less than 10 percent of the treatment area). In those situations, the crop owner pays the entire treatment costs on the croplands.

NOTE: The insecticide being considered must be labeled for the included crop as well as rangeland and current Worker Protection Standards must be followed by the applicator and private landowner.

- 8) In some cases, rangeland treatments may be conducted by other federal agencies (e.g., Forest Service, Bureau of Land Management, or Bureau of Indian Affairs) or by non-federal entities (e.g., Grazing Association or County Pest District). APHIS may choose to assist these groups in a variety of ways, such as:
- a) loaning equipment (an agreement may be required);
  - b) contributing in-kind services such as surveys to determine insect species, instars, and infestation levels;
  - c) monitoring for effectiveness of the treatment;
  - d) providing technical guidance.
- 9) In areas considered for treatment, State-registered beekeepers and organic producers shall be notified in advance of proposed treatments. If necessary, non-treated buffer zones can be established.

## **Operational Procedures**

### ***GENERAL PROCEDURES FOR ALL AERIAL AND GROUND APPLICATIONS***

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

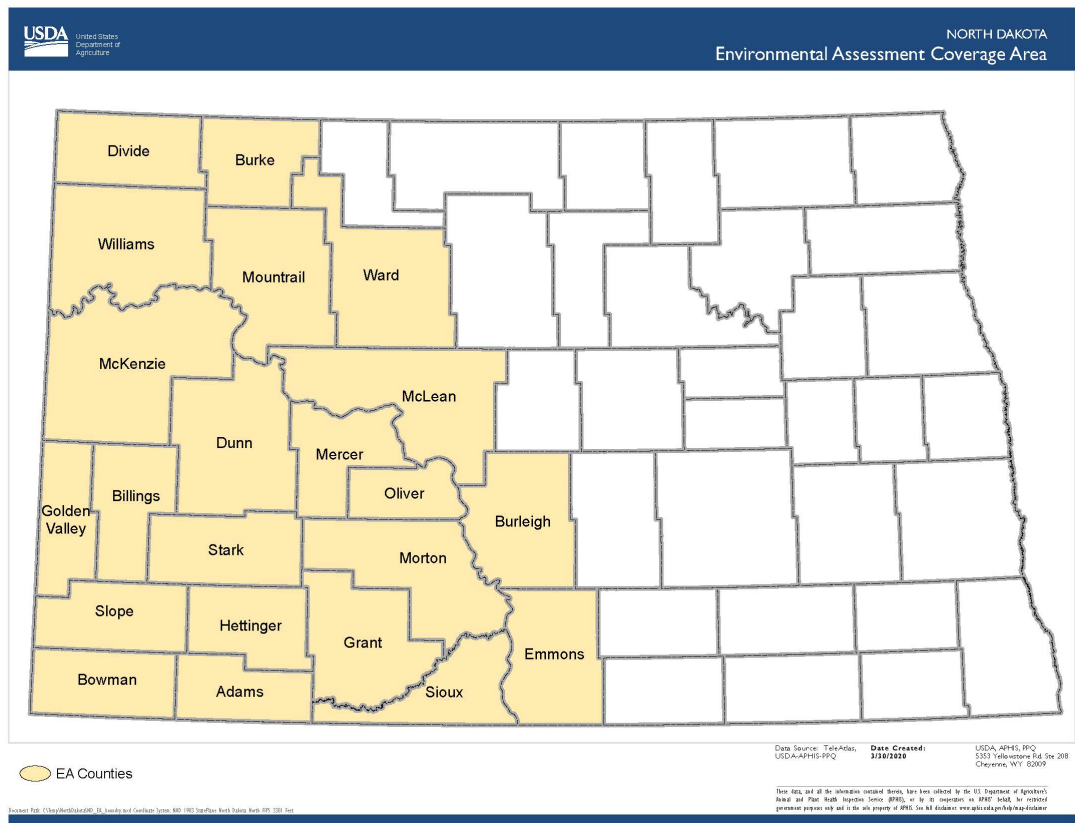
APHIS will assess and monitor rangeland treatments for the efficacy of the treatment, to verify that a suppression treatment program has properly been implemented, and to assure that any environmentally sensitive sites are protected.

- 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](http://www.aphis.usda.gov/import_export/plants/manuals/domestic/downloads/grasshopper.pdf)

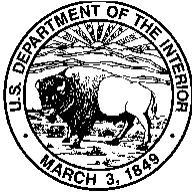
### ***SPECIFIC PROCEDURES FOR AERIAL APPLICATIONS***

- 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.

# Appendix B: Map of the Affected Environment



## Appendix C: FWS/NMFS Correspondence



### United States Department of the Interior

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



IN REPLY REFER TO:  
06E15000-2020-CPA-0136  
2020 Rangeland Grasshopper  
Environmental Assessment

May 26, 2020

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

Dear Mr. Anderson:

Thank you for the opportunity to comment on the Draft Environmental Assessment Rangeland Grasshopper and Mormon Cricket Suppression Program for the Missouri Slope Assessment Area. The

U.S. Fish and Wildlife Service (Service) has the following comments.

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

Black-footed ferret	<i>Mustela nigripes</i>
Gray wolf	<i>Canis lupus</i>
Whooping crane	<i>Grus americana</i>
Interior least tern	<i>Sterna antillarum</i>
Pallid sturgeon	<i>Scaphirhynchus albus</i>
Northern long-eared bat	<i>Myotis septentrionas</i>
Piping Plover	<i>Charadrius melodus</i>
Red Knot	<i>Calidris canutus rufa</i>

It is our understanding, based on the information provided, that suitable Dakota skipper (*Hesperia dacotae*) habitat is present within the proposed potential suppression area. Additionally, there are records of Dakota skipper being documented within the proposed potential suppression area. As such we encourage avoidance and minimization measures be implemented when practicable: we recommend that the word ‘occupied habitat’ is changed to ‘suitable habitat’ for Dakota skipper protection measures as described within the 2020 Biological Assessment for Federally Listed Threatened or Endangered Species in North Dakota (it is also listed below).

#### Protection Measures:

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

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

Sincerely,

**DREW BECKER**

Digitally signed by DREW BECKER  
Date: 2020.05.27 10:11:02 -05'00'

Drew Becker

ND Ecological Services Office Supervisor



## Appendix D: Comments received during the open comment period

USDA APHIS received two public responses to the publication of the North Dakota draft Environmental Assessment (EA) (EA Number: ND-20-01). Public comments were received from the Xerces Society and from the Center for Biological Diversity. 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 EA, where appropriate. The Grasshopper Program has decided not to use chlorantraniliprole in North Dakota during 2020, any exposure scenarios which the commenters are concerned about are not relevant, and references to this chemical has been removed from the final EA.

### 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 grasshopper program strives to alert the public in a timely manner to its more concrete treatment plans and avoid or minimize harm to the environment in implementing those plans.*

*During January, 2020 APHIS prepared a Draft EA, tiered to the current EIS for the counties in North Dakota where grasshopper suppression treatments could occur. The Draft EA analyzed aspects of environmental quality that could be affected by treatments in the area where grasshopper outbreaks were anticipated. On May 10, 2020 the APHIS published a notice informing the public the Draft EA was available for a 30-day comment period (include dates here). 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. Since all environmental issues 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. To allow the program to respond to comments in a timely manner, the Final EA and FONSI will be posted to the APHIS website. The program will also publish a notice of availability in the same manner used to advertise the availability of the Draft EA.*

### 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 if site-specific data are not available or current, APHIS must use protective values as defaults in Hopper.”

*The “Hopper” model is an older model and is no longer used in North Dakota.*

*In North Dakota, 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. The general site specific data include: grasshopper densities, species complex, dominant species, dominant life stage, range conditions, local weather patterns (wind, temp., and precipitation), and known historical hatching beds. Land owners and land managers consider other factors such as animal unit months (AUM’s) present in grazing allotment, forage damage estimates, number of potential AUM’s consumed by grasshopper population, potential AUM’s managed for allotment and value of the AUM, estimated cost of replacement feed for livestock, rotational time frame for grazing allotments, and the number of livestock in grazing allotment when requesting APHIS’s assistance. These are all factors taken into consideration during this cooperative decision making process 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 North Dakota, 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.*

#### **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 North Dakota.*

#### **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.

*See the response to Comment 1. Delaying the publication of the Final EA and FONSI until after the publication of site specific maps would make responding to requests from land owners and land managers unreasonable. Cooperating agency's need a reasonable amount of time before or at the start of the field season to tier their NEPA documents to APHIS' The time between publication of the FONSI and treatments is further shortened because specific treatment decisions are made during the nymphal survey which, due to grasshopper biology, and 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 North Dakota. 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.*

*The final EA has been updated to reflect the changes in the program.*

#### **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 it's 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, regarding the EIS disclosing 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 North Dakota 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 do not adversely affect protected species or their critical habitat.*

*See response to comment 9 for use of Malathion in North Dakota.*

#### **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. 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 on-going consultation on pesticide registration across all nationwide uses of program pesticides does not provide sufficiently detailed analysis or conclusions relevant to the Grasshopper Program.*

#### **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 effective 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 uses 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”.

*APHIS uses 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 to non-target arthropods (Lockwood et al. (1999, 2001, 2002); 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 the 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, “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 Comment 25.*

#### **Comment 29**

APHIS received the following comment, “The EA describes the listed species potentially present, some information about these species life histories and habitats, and protective measures for some of these species, but is silent about the consultation response from USFWS. What is the status of such consultation? Does USFWS concur with the Not Likely to Adversely Affect or No Effect calls for each of the species present within the proposed project areas? If so, what additional mitigation measures (if any) does USFWS suggest?”

*In North Dakota, consultation with USFWS is completed as mandated by Endangered Species Act (ESA). The EA includes a section that discusses APHIS’s compliance with the ESA and the Final EA includes the USFWS concurrence letter in Appendix C.*

#### **Comment 30**

APHIS received the comment “Chlorantraniliprole is mentioned in the operating guidelines and in the sections describing proposed mitigations for listed species but is missing from the alternatives and effects sections. Chlorantraniliprole should not be used until fully analyzed.”

*Chlorantraniliprole is not proposed for use in 2020. The final EA has been updated to reflect the changes in the national grasshopper and Mormon cricket program.*

*See USFWS letters of concurrence stated in previous response.*

#### **Comment 31**

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? APHIS must provide to applicators a set of clear set of directions outlining protective measures for the listed and proposed species found within this project area and not burden applicators with a confusing set of directions split between multiple tables.

*In North Dakota, 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 33 and 35.*

#### **Comment 32**

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, incorporated into the treatment planning process and documents, and are applied in the field during application.*

### **Comment 33**

APHIS received one comment that APHIS should adopt the following operational guideline across all site-specific EAs: “Use Global Positioning System (GPS) coordinates for pilot guidance on the parameters of the spray block. Ground flagging or markers should accompany GPS coordinates in delineating the project area as well as areas to omit from treatment (e.g., boundaries and buffers for bodies of water, habitats of protected species, etc.).”

*In , treatment boundaries, water bodies, sensitive sites, 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 34**

APHIS received one comment that, “APHIS states that it has no legal obligation to manage for vulnerable species not on the Endangered Species List. 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 35**

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 North Dakota designates any invertebrates as species of greatest conservation need.”

*Species of greatest conservation need in North Dakota are discussed on page 20 of the EA and are also discussed during cooperative decision making processes.*

### **Comment 36**

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 North Dakota 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 37**

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 North Dakota, 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 North Dakota, 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.*

**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 comment “The EA cites a 1995 Biological Opinion with US Fish and Wildlife on listed species, but makes no mention of a newer Biological Opinion or letter of concurrence for the newer chemical diflufenzuron which is listed as one of the active ingredients allowed under the preferred alternative.”

*The 1995 Biological Opinion is the most current between APHIS and USFWS on a national level. Local and site specific consultations take place annually. The concurrence letter received this year from USFWS can be found in Appendix C.*

#### **Comment 51**

APHIS received the comment that the EA does not adequately address the essential role of pollinators in the conservations of listed plant species.

*APHIS analyzed the potential effects grasshopper suppression treatments could have on protected plant species in the Biological Assessments and other consultation documents submitted to USFWS, including potential reductions in pollinators. As a result of the ESA consultations APHIS often plans treatment blocks that include buffers around known locations of listed plant species.*

#### **Comment 52**

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 FONSI 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.*

#### **Comment 53**

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.”

*“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.*

*Prior to the treatment season, APHIS conducted meetings or provided guidance for public participation in the decision making process. In addition, APHIS notified Federal, State and BIA land managers and private landowners of the potential for grasshopper and Mormon cricket outbreaks on their lands.*

#### **Comment 54**

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.*

#### **Comment 55**

APHIS received the following comment, “ APHIS frustrated public participation by failing to inform interested parties of the existence of the EA, by not providing information for the submission of public comments including where and when to submit comments by, limiting public notice to local papers, and providing a short public comment period during this COVID-19 pandemic.”

*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 FONSI’s 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.*

*Notification of the EA’s availability was published on April 10 in the Bismarck Tribune, Minot Daily News, and the New Town News & Sanish Sentinel, and on April 15 in the Dickinson Press and McKenzie County Farmer. These publications provide potentially locally-affected individuals an additional opportunity to provide input into the decision-making process.*

#### **Comment 56**

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.”



*See previous comment response. 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.*

**Comment 57**

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.”

*The local offices send out public notices to a list of stakeholders that they have collected over the years and also announced the open comment period in the local media. Those notices have the link for the EA’s and the point of contact. The cover page of the EA has contact information included. In an attempt to be more transparent APHIS has also placed Program EA’s on to the APHIS website for the public to access. When an interested party asks to be informed, APHIS ensures their 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, “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 comment response. 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 APHIS has also placed Program EA’s on its website. When an interested party asks to be informed, APHIS ensures their 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. (See Previous Response).*

**Comment 59**

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.”

*See previous comment responses. The cover page of the EA has contact information included.*

**Comment 60**

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.*

**Comment 61**

APHIS received the following comment, “With the EA dated March 2, 2020, a reasonable person could have easily concluded that a 30 day comment period ended on April 2, 2020 rather than the May 15, 2020 comment deadline.”

*See previous comment responses. The comment period commences with the notice publication, in North Dakota the notice was published on April 10 and April 15, the staggered dates are due to the newspapers printing schedules.*

#### **Comment 62**

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, including public meetings, where to send comments, and the closing date for the comment period. See response to previous comments.*

#### **Comment 63**

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.*

#### **Comment 64**

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 65**

APHIS received the following comment, “APHIS has failed to meet NEPA’s 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”.*

#### **Comment 66**

APHIS received the following comment, “the range of alternatives offered by APHIS is inadequate.”

*APHIS structured and analyzed the risk of the substantial program alternatives available to the agency. Alternatives, including those excluded from further analysis, were discussed in the final EIS.*

#### **Comment 67**

APHIS received the following comment, “[The alternatives] are outlined as, “No Action,” and “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 (here called the No Suppression 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 the three approved 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 68**

APHIS received the following comment, “APHIS does not include an alternative that explicitly adopts and 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, 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.*

*The final EA will be updated to reflect APHIS support for IPM strategies in the grasshopper and Mormon cricket suppression program.*

#### **Comment 69**

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."

*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 70**

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 comment responses.*

#### **Comment 71**

APHIS received the following comments, “APHIS has not adequately analyzed the impacts to human health” and “ The relative density of human population does not absolve APHIS of its mandate to take a hard look at human health effects.”.

*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.*

*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, “ APHIS must consider the impacts to the humans to who pass through treated areas, whether they be ranchers or ranch hands, OHV riders, local residents or people who for whatever reason decided to take a walk or otherwise spend some time in the natural beauty of North Dakota’s open spaces. Especially during this COVID-19 crisis, people may well seek to spend time outdoors in North Dakota’s rangelands, and APHIS must consider the impacts of the proposed action on these individuals.”

*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 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 73. 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 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 75**

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 76**

APHIS received the following comments, “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” and “APHIS needs to explain how it will actually support the conservation intent, what it plans in terms of buffers, etc.” and “APHIS fails to comply with the Migratory Bird Treaty Act and NEPA. APHIS must take a hard look at the potential impacts to migratory birds.”

*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 77**

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 78**

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 to similar comments. Under USFWS Section 7 Act there is no requirement to consult on sensitive species. See USFWS letter of concurrence in Appendix 2.*

**Comment 79**

APHIS received the following comment, “APHIS must consider the impacts of the proposed action on sensitive or culturally important species.”

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

**Comment 80**

APHIS received the following comment, “While pollinators are mentioned, impacts to them are not actually analyzed. Grasshopper spraying season is precisely when bees are flying” and “Insecticide spraying done in the wrong place at the wrong time could have the tragic and unintended consequence of out an entire population of a species, or even driving extinct a rare species, perhaps even one that has never been named. Native bees remain understudied and underappreciated, despite the hugely important impacts they have on ecosystem function.”

*APHIS works with BIA, 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 81**

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).*

*We are unaware of any retreatment that would occur in an area where APHIS has conducted a treatment. Generally, the land that APHIS treats is a hybrid of BLM rangeland and requesting landowners leasing land for grazing. Private landowners do not actively manage that land and, therefore, are not*

*expected to be making any other types of chemical treatments. Although APHIS is unaware of any, BLM could potentially do herbicide treatments in areas we treat, but they would not treat for GHMC.*

#### **Comment 82**

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 North Dakota which is covered by the Draft EA has been exposed to pesticides and pollutants and have a synergistic effect which enhances toxicity to the environment. The land managers that manage the areas covered in the EAs, document all pesticide applications. The activities, or lack thereof, are discussed in the cumulative impacts section of the final EA.*

#### **Comment 83**

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 North Dakota Draft EA does not account for the commenter’s remarks due to the fact that there is no widespread mosquito abatement in the part of North Dakota covered by the EA. 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 84**

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 85**

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 86**

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 EA's. The first three programs mentioned by the commenter are not relevant to the Rangeland Grasshopper and Mormon Cricket Suppression Program in Wyoming. 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 87**

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.*

*APHIS works very closely with the North Dakota Department of Agriculture and the Weed and Pest Districts with respect to biological control. Before any grasshopper project takes place, APHIS conducts extensive consultation with land managers so that established biological control agents are not adversely impacted.*

#### **Comment 88**

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 89**

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 90**

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 91**

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 92**

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 93**

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 94**

*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)."*

*APHIS utilizes and provides links to extensive resources for determining when a grasshopper outbreak is exceeding economic 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.*

#### **Comment 95**

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 96**

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 North Dakota,, 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 97**

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). These documents and the associated final EIS are incorporated by reference.

#### **Comment 98**

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 99**

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 100**

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 101**

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 Draft EA WY-20-01 and the USFWS Section 7 consultations and USFWS letters of concurrence (Appendix 2). All reduce the exposure to fish species.*

#### **Comment 102**

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 103**

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 Draft EA WY-20-01 and the USFWS Section 7 consultations and USFWS letters of concurrence (Appendix 2). All reduce the exposure to fish species.*

#### **Comment 104**

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 105**

APHIS received the following comment, "EPA found many North Dakota 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 North Dakota."

*Carbaryl is presently approved by the EPA and registered in North Dakota. 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 North Dakota. 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 106**

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 107**

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 108**

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 North Dakota”.

*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 109**



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 North Dakota during 2020. Therefore any chlorantraniliprole exposure scenarios which the commenter is concerned about are not relevant at this time.*

#### **Comment 110**

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 chlorantraniliprole 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 North Dakota during 2020. Therefore any chlorantraniliprole exposure scenarios which the commenter is concerned about are not relevant at this time.*

#### **Comment 111**

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 112**

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 North Dakota 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 North Dakota.”

*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 113**

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 residues 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 114**

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 115**

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 116**

APHIS received the following comments, “Malathion degrades into malaoxon, 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 117**

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 Wyoming 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 118**

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 119**

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 120**

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 121**

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 122**

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 123**

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 124**

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/m<sup>2</sup>), a rate that is greater than 16 times the Grasshopper ultra-low volume liquid rate (0.56 mg/m<sup>2</sup>). 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 without leading to any earthworm death.*

*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 125**

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 126**

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.<sup>2</sup>) 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 127**

APHIS received the following comment, "Carbaryl negatively affected the biomass of *E. andrei*, *Perionyx excavatus*, 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 128**

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 129**

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 without leading to any earthworm death. 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/m<sup>2</sup>), 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 130**

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.<sup>2</sup>) 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 131**

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/cm<sup>2</sup> 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 132**

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 133**

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 difficulty 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 134**

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 135**

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 136**

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  $\mu\text{g a.i./g}$  body weight and of  $\mu\text{g a.i./bee}$ . 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 137**

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 1.0 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 138**

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 139**

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 North Dakota during 2020. Therefore any chlorantraniliprole exposure scenarios which the commenter is concerned about are not relevant at this time.*

#### **Comment 140**

APHIS received the following comment, “Chlorantraniliprole negatively affected *Folsomia candida* (collembola) reproduction.”

*As previously stated, the Grasshopper Program will not be using chlorantraniliprole in North Dakota during 2020. Therefore, any chlorantraniliprole exposure scenarios which the commenter is concerned about are not relevant at this time.*

#### **Comment 141**

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 North Dakota 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, “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 North Dakota 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, “Staphylinidae (Coleoptera) population abundance was slightly but significantly suppressed.”

*As previously stated, the Grasshopper Program will not be using chlorantraniliprole in North Dakota 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, “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 145**

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 where 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 *Oppeia*.*

*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 146**

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 147**

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.<sup>2</sup>) 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 (281,227 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 148**

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 149**

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 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 *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./cm<sup>2</sup> 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 151**

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 152**

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 1.0 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 153**

APHIS received the following comment, “The EA is 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 confused the EA prepared by APHIS for the Grasshopper Program in North Dakota with other environmental risk analysis documents. See comment/response 154 below.*

#### **Comment 154**

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.

*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. In the meantime consultations with the USFWS are still being completed at the local level prior to any treatments. No APHIS treatments are made in States without prior concurrence from the USFWS or NMFS regarding federally-listed species. This information is also summarized in the final EIS.*

*Local USFWS Section 7 consultations were entered into prior to the DRAFT EA. 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.*

*APHIS would like to note 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.*

*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 155**

APHIS received the following comment, “ All endangered species in North Dakota are under the jurisdiction of FWS, and 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.” and “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.”

*USFWS issued the letter of concurrence 26 May, 2020 regarding the local site specific biological assessment and it will be included in The Final EA as Appendix C.*

#### **Comment 156**

APHIS received the following comment, “ APHIS has failed to meet its consultation requirements with the U.S. Fish and Wildlife Service. There is no programmatic consultation that covers the FWS species for the proposed action. The initiation of consultation in 2015 does not provide any take coverage or signify that APHIS has complied with its Section 7 duties. There is nothing to substantiate APHIS’s claim that the proposed action is not likely to adversely affect listed species or critical habitat in the program area.”

*See previous response to comment 154. APHIS believes that the site specific information described in the draft EA is adequate to allow completion of Section 7 compliance with the USFWS. Information discussed in the draft EA is also shared with the USFWS during consultation so there is no discrepancy between actions described in the EA and other documents. The Biological Assessment and other documents shared with USFWS provide sufficient information on program operational procedures to allow thorough risk analysis for protected species and their habitats.*

#### **Comment 157**

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 fulfilling its Section 7 obligations. 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.”

*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.*

*The commenter errs in assuming that any of APHIS’s projects will result in “incidental take” since the agreed-upon mitigation measures, included in Appendix 3 of each EA, and were developed to preclude such. Neither will APHIS projects modify or destroy critical habitat. Quite the contrary, the failure to suppress severe grasshopper infestations pose the real inherent risk of “take” of T&E 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 158**

APHIS received the comment “below is a list of twelve North Dakota species that APHIS needs to consult on under Section 7 of the ESA, lest the agency risk violations of Section 9’s prohibition against unauthorized take of species”.

*The commenter is mistaken, there are nine species covered by the ESA within the area covered by the draft EA. The commenter incorrectly noted the Rusty patched bumble bee which does not occur in ND, and the Powershiek skipperling and Western Fringed prairie orchid which only occur in the southwestern corner of ND.*

#### **Comment 159**

APHIS has received the following comments, “Grasshopper spraying in or near riparian areas 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” in reference to “the Interior Least Tern (*Sterna antillarum athalassos*), the Piping Plover (*Charadrius melodus*), the Red Knot (*Calidris canutus rufa*), and the Whooping Crane (*Grus Americana*)”.

*Protective measures were developed during the lengthy local USFWS Section 7 consultations for each of the T&E species and species of concern within the proposed treatment area.*

#### **Comment 160**

APHIS received the comment “North Dakota’s endangered pallid sturgeon already facing significant threats from climate change, water usage, pesticide use more broadly, and habitat loss. Insecticide use threatens this species with direct effects, and also imperils their food supply. In the EPA’s recent biological evaluation for carbaryl, the agency found that its approval of the pesticide was likely to adversely affect the pallid sturgeon. APHIS neglected to include this species 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”.

*The commenter is mistaken, the Pallid Sturgeon is listed in table 1 “Federally Listed Species Occurring in the Missouri Slope Assessment Area” on pg. 14. It is also listed on the USFWS consultation letter found in Appendix C.*

#### **Comment 161**

APHIS received the comment “APHIS has inexplicable neglected to include two of North Dakota’s imperiled invertebrate species in this EA, the Poweshiek skipperling and the Rusty patched bumble bee. In addition, APHIS neglected to include the fact that EPA has concluded that all three are likely to be adversely affected by carbaryl in its recent draft biological evaluation for the species” and “these species are relatively recently listed pollinator species and are listed in part due to the threat of pesticides. Any insecticide spraying in their habitat is likely to adversely affect these and necessitates formal consultation. Any spraying that results in the take of these species will be unlawful until and unless APHIS completes such consultation”.

*The commenter is mistaken, while the Powershiek skipperling was once found in small native prairie remnants in the far southeastern part of the ND, it was geographically remote from the area covered by the draft EA, and USFWS did not include it in our consultation. Historical range of the Rusty patched bumble bee never extended into the area covered by the Draft EA, it too was only found in the far southeastern part of ND. Rusty patched bumble bees have not been observed or collected in these areas since before the year 2000. According*

to the USFWS, Section 7 consultation and Incidental Take Permits are not needed and no permits for surveys are needed.

#### **Comment 162**

APHIS received the comments, “Impacts to these three mammal species must be studied before this project may move forward, particularly the black-footed ferret and Northern long-eared bat (NLEB). These species can occupy the very rangelands this EA targets, or may pass through it. Impacts of spraying can include habitat disturbance, acute and subacute poisoning, and reduced prey, amongst other possible impacts that must be considered”

*See Appendix C for USFWS concurrence letter.*

#### **Comment 163**

APHIS received the comment “North Dakota is home to the Western prairie fringed orchid, a highly imperiled plant, as well as other rare plants that provide essential food and habitat for other rare and imperiled species. Use of insecticides can directly affect plants and it may also harm their soil and 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. APHIS also must consider the fact that EPA has concluded the Western prairie fringed orchid is likely to be adversely affected by carbaryl in its recent draft biological evaluation for this pesticide”.

*While western prairie fringed orchid does occur in North Dakota, it is found on and near the Sheyenne National Grasslands in the southeastern part of the State, quite geographically distant from the Missouri Slope Assessment Area. As such it wasn't included in the Draft EA, USFWS did not include it in consultation.*

#### **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 flame 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 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](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](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](https://www.fws.gov/southwest/es/arizona/documents/ecreports/rpmpa_2007.pdf)

