# Draft Environmental Assessment Rangeland Grasshopper and Mormon Cricket Suppression Program

BEAVERHEAD, BROADWATER, DEER LODGE, FLATHEAD, GALLATIN, GRANITE, JEFFERSON, LAKE, LINCOLN, MADISON, MINERAL, MISSOULA, PARK, POWELL, RAVALLI, SANDERS, SILVER BOW counties, and THE FLATHEAD RESERVATION, MONTANA

CEQ Identification Number: MT-25-03-EAXX-005-32-24P-1740751854

**Figure 1**: Example of progressive grasshopper damage to rangeland vegetation on the Flathead Reservation, Montana. The left picture shows some vegetation still left, but with grasshoppers actively feeding on it (black specks on the vegetation). The right picture shows the same vegetation eaten down to the bare ground only a few days later as a result of no intervention.

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March 17, 2025

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## Acronyms and Abbreviations

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

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**Draft Site-Specific Environmental Assessment**

**Rangeland Grasshopper and Mormon Cricket Suppression Program**

BEAVERHEAD, BROADWATER, DEER LODGE, FLATHEAD, GALLATIN, GRANITE, JEFFERSON, LAKE, LINCOLN, MADISON, MINERAL, MISSOULA, PARK, POWELL, RAVALLI, SANDERS, SILVER BOW counties, and THE FLATHEAD RESERVATION, MONTANA

# I. Need for Proposed Action

## *A. Purpose and Need Statement*

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

Under the guidance of Section 417 of the Plant Protection Act of 2000, USDA plays a coordinating role between Federal agencies, State agricultural departments, and private ranchers to control both grasshoppers and Mormon crickets.

Populations of grasshoppers that trigger the need for a suppression program are normally considered on a case-by-case basis and are difficult to predict. Through late summer and autumn adult grasshopper surveys, APHIS can sometimes forecast areas where damaging grasshopper populations may occur during the following year (the next summer). Land managers and property owners request APHIS assistance to control grasshopper outbreaks because of a history of damage, the potential damage to rangeland resources forecast in the current year, and as determined by spring nymphal assessment and delimitation surveys conducted prior to the summer treatment season. Some benefits of preventing high populations of grasshoppers include the following: Rural economies depend on rangelands that managed for productive forage to provide for livestock grazing. A reduction in forage has significant impact on cattle health and gain which adversely impacts producers and their livelihoods. Economic values of rangelands also include energy production sites, both fossil and renewable, and recreation sites.  In addition to these direct market values, rangelands also provide important ecosystem services, such as purification of air and water, water conservation, generation and preservation of soils and renewal of their fertility, detoxification and decomposition of wastes and pollutants, pollination of crops and natural vegetation, dispersal of seeds, cycling and movement of nutrients, control of potential agricultural pests, maintenance of biodiversity, and aesthetic beauty.

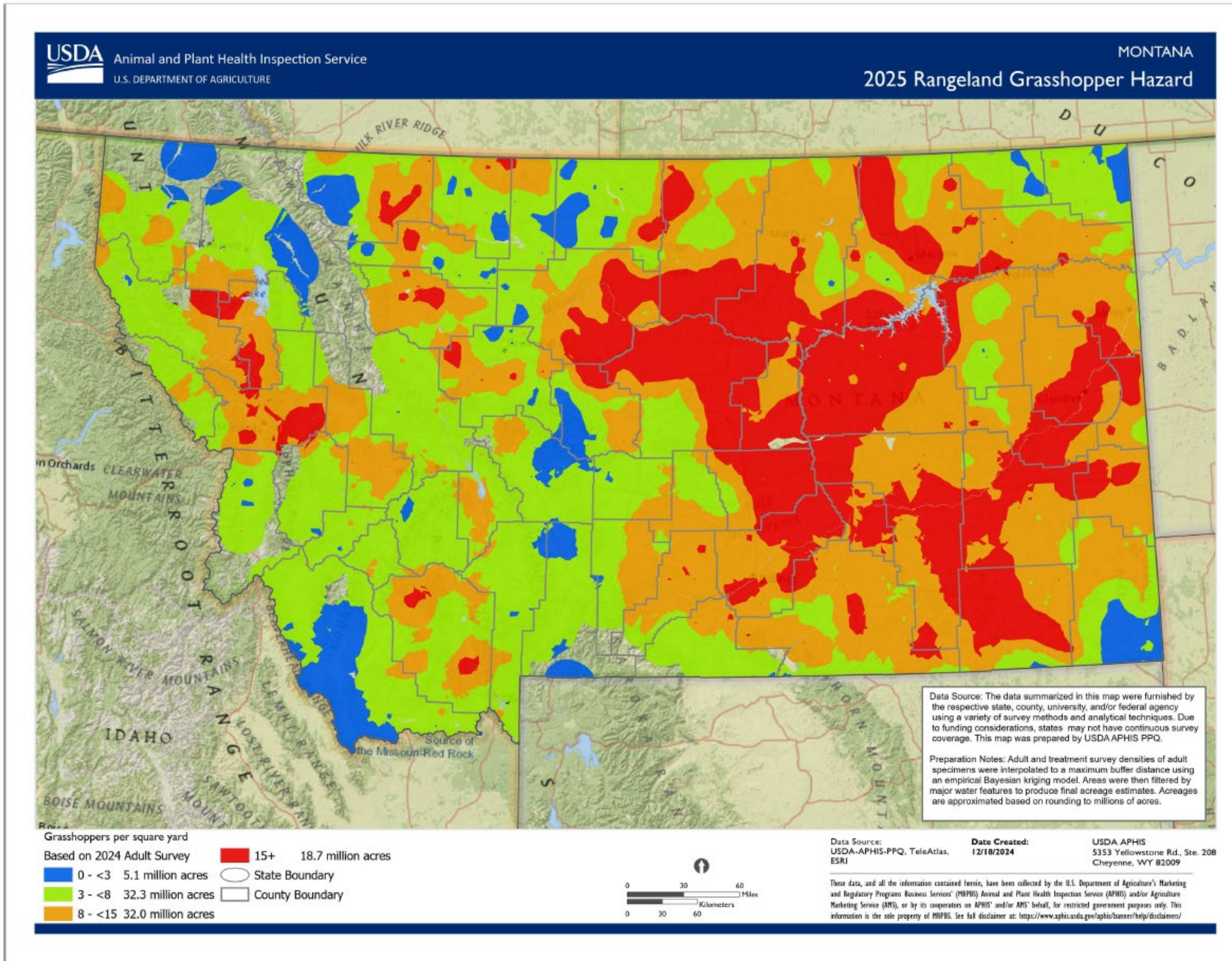


**Figure 2**: 2025 Rangeland Grasshopper Hazard Map. Grasshopper population density data is based on surveys conducted by APHIS staff in the summer of 2024.

The goal of the proposed suppression program analyzed in this EA is to reduce grasshopper populations below economic injury levels in order to protect the natural resources of rangeland ecosystems, the value of livestock and wildlife forage, and 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 approximately June 1st to September 30th only in areas and locations that are requested for grasshopper suppression. Typically, APHIS is requested to suppress rangeland grasshoppers and Mormon crickets in areas where most the land is federally managed by Bureau of Land Management (BLM), U.S. Forest Service (USFS), and land held in trust to Native American sovereign nations. This includes the Flathead Reservation in parts of Sanders, Lake, Flathead, and Missoula counties. Regarding areas covered under this EA, APHIS has historically conducted suppression activities within areas of the Flathead Reservation. However, APHIS only conducts grasshopper suppression programs in areas requested by land managers. These land managers may request that some of these areas be excluded from the suppression programs. Similarly, if requested, APHIS could provide suppression assistance in any of the counties listed in this EA.

This EA is prepared in accordance with the requirements under the National Environmental Policy Act (NEPA) (42 U.S.C. 4321 *et seq*.); Council on Environmental Quality's (CEQ) regulations implementing NEPA (40 CFR 1500 *et seq*.); USDA (7 CFR Part 1b) and APHIS NEPA Implementing Procedures (7 CFR Part 372). APHIS make and issue a decision based on the analysis presented in this EA, the results of public involvement, and consultation with other agencies and individuals.

APHIS is aware of the November 12, 2024 decision in Marin Audubon Society v. Federal Aviation Administration, No. 23-1067 (D.C. Cir. Nov. 12, 2024). To the extent that a court may conclude that the CEQ regulations implementing NEPA are not judicially enforceable or binding on this agency action, APHIS has nonetheless elected to follow those regulations at 40 C.F.R. Parts 1500– 1508, in addition to the APHIS's procedures and regulations implementing NEPA at 7 CFR Part 372, to meet the agency's obligations under NEPA, 42 U.S.C. §§ 4321 et seq.

## *B. Background Discussion*

### 1. Grasshopper Ecology

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, referred to as outbreaks (Belovsky et al., 1996), that result in competition with livestock and other herbivores for rangeland forage and can result in damage to rangeland plant species (Wakeland and Shull, 1936; Swain, 1944; Wakeland and Parker, 1952; Hewitt, 1977; Hewitt and Onsager, 1983; Belovsky et al., 1996; Belovsky, 2000; Pfadt, 2002; Branson et al., 2006; Bradshaw et al., 2018). Out of approximately 650 western grasshopper species, only 10 to 15 are recurrent economic pests. However, even during "normal" population years, they remove over 20% of above-ground rangeland forage annually at an estimated cost of $1.2 billion per year (Hewitt & Onsager, 1983; dollar amount adjusted). During severe outbreaks, grasshoppers consume substantial forage, which may disrupt the ecological functioning of rangelands (Rashford et al., 2012).

APHIS supports the use of Integrated Pest Management (IPM) principles in the management of grasshoppers and Mormon Crickets. Integrated pest management is the selection, integration, and implementation of pest control tactics in a systems approach based on anticipated economic, environmental, and sociological consequences. The economic injury level (EIL) concept is the most widely accepted decision-making framework for pest management (Pedigo et al. 1986). The basic principle is to determine the pest level (e.g., population per unit area) that results in monetary damages greater than the cost of treatment – benefit cost ratio greater than one in standard economic terminology. The mathematical formulations can vary depending on the application and data available, but the basic formulation for EIL is given by (see Higley and Pedigo 1996):

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$$\text{EIL} = \frac{C}{VDK},$$

where, $C$ is treatment cost (e.g., \$/acre), $V$ is market value per unit of production (e.g., \$/lb.), $D$ is production loss per pest (e.g., lb./pest) and $K$ is the proportional reduction in loss from applying control. The EIL identifies the pest population (e.g., pest/acre) that justifies spending $C$ dollars on control.

The EIL can be used as an actionable criterion; however, given pest population dynamics and delays in treatment effect, applying treatment once EIL pest levels are observed may result in substantial economic losses. APHIS and our cooperators assess whether grasshopper populations are exceeding an action threshold (historically termed the “economic infestation level”), which identifies the pest level when treatment should be initiated to avoid an increasing pest population from reaching the EIL. The action threshold therefore identifies a temporal criterion to initiate management given observations of pest levels (Figure 1). Action thresholds can be developed in a variety of ways including subjective determinations based on local experience, to objective functions of the EIL.

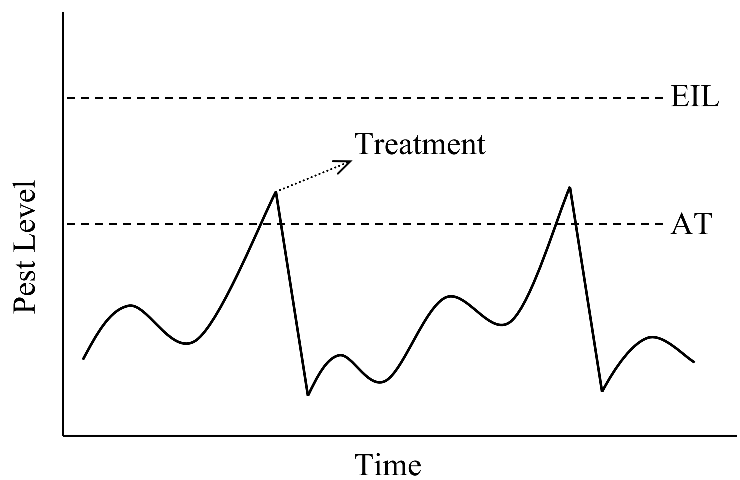


**Figure 3**. Diagram of the typical relationship between the economic injury level (EIL) and action threshold (AT) for applying pest treatments (Rashford et al., 2012).

The “economic injury 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 injury 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. Grasshopper caused losses to rangeland habitat and cultural and personal values (e.g., aesthetics and cultural resources), although a part of decision making, are not part of the economic values in determining the necessity of treatment.

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While market prices are good proxies for the direct market value of commodities damaged by pests (e.g., crops or forage), market prices do not capture all the potential economic values affected by pests. Market prices, for example, can be highly variable over time and space, depending on local supply and demand conditions (Rashford et al., 2012).

### 2. Grasshopper Population Control

Grasshopper populations sometimes build to economic injury levels despite even the best land management and other efforts to prevent outbreaks. Land managers traditionally use tools and basic integrated pest management practices to maximize the production of healthy vegetation. While APHIS provides technical assistance, it is up to the land manager to manage their land for high productivity and healthy range ecosystems. When forage and land management have failed to prevent grasshopper outbreaks insecticides may be needed to reduce the destruction of rangeland vegetation. 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)).

Under the guidance of Section 417 of the Plant Protection Act of 2000, USDA plays a coordinating role between federal agencies, state agricultural departments, and private ranchers to control both grasshoppers and Mormon crickets. APHIS accomplishes this by conducting cooperative surveys during the early spring and late summer to measure both nymphal and adult populations of grasshoppers, respectively. The annual adult surveys can be used to forecast grasshopper population levels in the following year. Where outbreaks are common, the program selectively employs nymphal surveys to delimit potential treatment boundaries.

IPM procedures are thoroughly incorporated into the management of grasshoppers by APHIS. IPM strategies consider economic, environmental, and pesticide resistance consequences of pest control tactics. The primary objective of IPM is to control agricultural pest populations below the economic injury level. APHIS published a programmatic EIS in 1987 for rangeland grasshopper control that included IPM methods as the preferred alternative. At that time APHIS expected the IPM alternative would primarily include biological or chemical methods for grasshopper control. APHIS would continue to participate in research and testing to identify other feasible cultural and mechanical control methods. The current program uses IPM principles by selecting a particular control method on an individual site after taking into consideration of economic (the cost and the cost-effectiveness of various methods in both the short and long term), ecological (the impact on nontarget organisms and the environment), and sociological (the acceptability of various IPM methods to cooperators, or the potential effects on land use) factors.

APHIS uses survey data to inform stakeholders of the potential for economic damage associated with grasshoppers. The program also provides technical assistance on insecticides, application methodology and cost benefit analysis to equip land managers with information needed to make economically and environmentally sound grasshopper treatment decisions.

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APHIS responds to solicitations from land managers to assess, and if necessary, suppresses grasshopper infestations. While many stakeholders interact with the program, Federal Land Managers represent about 75% of suppression requests. Engaging in grasshopper suppression is complicated, and funding, rangeland conditions, environmental regulations, politics and public sentiment all impact the process. 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 often the only response available to APHIS to rapidly suppress or reduce grasshopper populations and effectively protect rangeland (USDA APHIS, 2011). APHIS uses several factors to determine if grasshopper suppression is warranted, including, but not limited to, the pest species present, maturity of the pest species population, timing of treatment, costs and benefits of conducting the action, and ecological considerations (USDA APHIS, 2008).

The site-specific data used to make treatment decisions in real time is gathered during spring nymph surveys. Surveys help to determine general areas, among the millions of acres where harmful grasshopper infestations may occur in the spring of the following year. Survey data provides the best estimate of future grasshopper populations, while short-term climate or environmental factors change where the outbreak populations occur. The general site-specific data include: grasshopper densities, species complex, dominant species, dominant life stage, grazing allotment terrain, soil types, range conditions, local weather patterns (wind, temp., precipitation), slope and aspect for hatching beds, animal unit months (AUM's) present in grazing allotment, forage damage estimates, number of potential AUM's consumed by grasshopper population, potential AUM's managed for allotment and value of the AUM, estimated cost of replacement feed for livestock, rotational time frame for grazing allotments, number of livestock in grazing allotment.

As a cooperative program, APHIS jointly works with land managers to decide whether suppression programs, no action, or purchasing supplemental forage is the best course of action. This process starts the year before, when APHIS grasshopper scouts survey rangeland statewide and determine adult grasshopper densities and species makeup in each county in Montana. The adult survey density information is used to make a statewide grasshopper hazard map that is shared with cooperators. APHIS provides technical assistance which can occur at public meetings where the agency describes grasshopper biology and the specifics of the Rangeland Grasshopper and Mormon Cricket Suppression Program. Following public meetings, some land managers may decide to sign up for the program. During the spring, after land managers inform APHIS what to include and exclude from potential treatment areas, APHIS grasshopper scouts will verify if grasshopper populations densities are high enough to warrant treatment in these potential treatment areas. If treatments are warranted and still requested, APHIS may conduct suppression treatments. The bottom line is that the decisions whether and where to conduct suppression treatments are based on information (and funding) contributed by several parties. APHIS collects survey, density, and species data, which is combined with data collected from cooperators to come to a mutual decision. These are all factors that are considered when determining the economic injury level.

Although APHIS does surveys and considers the factors described above to determine whether treatment is warranted, many grasshopper and Mormon cricket species can be found statewide within suitable habitat meaning that damage or threats of damage to rangelands can occur wherever those species occur. Program activities fall within the category of actions in which the exact location of individual requests for treatments can be difficult to predict with sufficient notice to accurately describe the locations within which APHIS can reasonably expect to be acting.

Nymphal grasshopper surveys occur generally in early-late June, with the first adults of species most likely to cause economic harm emerging in late June. Hatches of economically harmful species like *Melanoplus sanguinipes* can occur over a period of time resulting in several life stages within a single population. APHIS's preferred insecticide to suppress grasshopper outbreaks is diflubenzuron which must be used only on grasshopper in the nymphal life stages. Therefore, very little time can pass after nymphs of the most destructive grasshopper species are discovered (i.e., several days or a week) and when treatments with diflubenzuron must happen. Diflubenzuron is the preferred insecticide of the program due to its selectivity and cost effectiveness. For Mormon Crickets, the process begins with surveying for egg and hatching beds. If the hatching beds are widespread and there is risk of Mormon crickets migrating into land used for crop agriculture treatments may be warranted to protect agricultural commodities. This is generally achieved by treating Mormon cricket infested rangeland within a half-mile wide area adjacent to the cropland. In the Affected Environment Section below, APHIS does its utmost to predict locations where treatments may occur based on survey data, past and present requests for treatments, and historical data and trends. However, APHIS cannot predict all the specific locations at which affected resource owners would determine that a rangeland damage problem has become intolerable to the point that they request treatment, because these locations change from year to year. Therefore, APHIS must be ready for treatment requests on short notice anywhere in within the counties listed in this EA to protect rangeland where consistent with applicable federal and state laws, land management agency policies, and where funding and resources to conduct treatments are available.

### 3. APHIS Environmental Compliance and Cooperators

In June 2002, APHIS completed an EIS describing the agency's most effective methods of reducing 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 human health and ecological risk assessments (HHERA) for the use of carbaryl, chlorantraniliprole, diflubenzuron and malathion by the program. APHIS has decided not to use malathion to suppress grasshopper populations in Montana. APHIS also published an updated EIS to consolidate and incorporate the available data and analyze the environmental risk of new program tools. The risk analysis in the 2019 EIS is incorporated by reference (USDA APHIS, 2019).

Within reservation boundaries, each sovereign nation has its own infrastructure and government which requests and approves suppression activities. APHIS requires letters of request from both the Tribe and the Bureau of Indian Affairs (BIA).

Elsewhere, no State or local laws or plans exist in Montana for grasshopper management. Counties have the authority to establish pest management districts but have not done so for grasshopper management.  Custer County, in 2024 provided pesticide for private parties to apply on their own at a discounted rate (without APHIS involvement).

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The Governor or Montana issued a letter to the APHIS Administrator on January 30, 2024, indicating support for the APHIS Rangeland Grasshopper and Mormon Cricket Program.

The Director for the Montana Department of Agriculture issues a letter of support annually to APHIS requesting assistance for private landowners needing assistance for the APHIS Rangeland Grasshopper and Mormon Cricket Program for Montana.

The Director for the Montana Department of Natural Resources and Conservation issues a letter annually, supporting the APHIS Rangeland Grasshopper and Mormon Cricket Program instructing APHIS to work directly with the leasers to identify State Lands needing suppression activities and for those leasers to cost-share directly with APHIS.

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.

APHIS provides technical assistance to Federal, Tribal, State and private land managers including the use of IPM. However, implementation of on-the-ground IPM activities is limited to land management agencies and Tribes, as well as private landowners. APHIS completed the Grasshopper Integrated Pest Management (GIPM) project. One of the goals of the GIPM is to develop new methods of suppressing grasshopper and Mormon cricket populations that will reduce non-target effects. Reduced agent area treatments (RAATs) is one of the methods that has been developed to reduce the amount of pesticide used in suppression activities and is a component of IPM because grasshopper populations are reduced below the level causing economic harm. APHIS typically employs the RAATs method in which the application rate of insecticide is reduced from conventional levels, and treated swaths are alternated with swaths that are not directly treated. The RAATs strategy relies on the effects of an insecticide to suppress grasshoppers within treated swaths while conserving grasshopper predators and parasites in swaths not directly treated (USDA APHIS, 2002). APHIS continues to evaluate new suppression tools and methods for grasshopper and Mormon cricket populations, including biological control.

## *C. About This Process*

Activities under the Program are subject to the National Environmental Policy Act (NEPA) (42 U.S.C. 4321 *et seq*.). APHIS follows the Council on Environmental Quality's (CEQ) guidance when implementing NEPA (40 CFR 1500 *et seq*.) along with USDA (7 CFR Part 1b) and APHIS NEPA Implementing Procedures (7 CFR Part 372) as part of the decision-making process. NEPA sets forth the requirement that all federal actions be evaluated in terms of the following:

- Their potential to significantly affect the quality of the human environment for the purpose of avoiding or, where possible, mitigating and minimizing adverse impacts;
- Making informed decisions; and
- Including agencies and the public in their NEPA planning in support of informed decision-making.

As previously discussed in the background section above, the NEPA process for grasshopper management is complicated by the fact that there is a limited window of time when treatments are most effective, and it is difficult to forecast which specific sites within the area covered by this EA will both have requests for treatment and be warranted for treatment to suppress grasshopper outbreaks. As such, the geographic scope of the actions and analyses in this EA is for all counties listed in this EA to account for the wide geographic areas in which grasshoppers and Mormon crickets occur on rangelands. Then, when grasshopper populations grow to nuisance levels, program managers examine the proposed treatment area to ensure that this EA applies to the specific areas where control activities will be conducted and can act quickly. 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.

Section 1619 of the Farm Bill (7 USC 8791) also prohibits disclosure of certain information from agricultural producers who provide information to participate in programs of the department. Intergovernmental agreements between APHIS and cooperators with Tribal Nations may preclude disclosure of Tribal information to the public without the consent of the Tribal Administrator. Individuals may request information on the specific treatment areas on Tribal Lands from the individual Tribal Nations.

Public involvement under the CEQ Regulations for Implementing the Procedural Provisions of NEPA distinguishes Federal actions with effects of national concern from those with effects primarily of local concern (40 CFR 1501.9). The 2019 EIS is a programmatic analysis of the environmental impacts of the Program across 17 Western States, including Montana.

To assist with understanding applicable issues and reasonable alternatives to manage grasshopper outbreaks in rangelands and to ensure that the analysis is complete for informed decision making, APHIS has made this Draft EA available for a 30-day public review and comment period. Public outreach notification methods for this EA include publishment in major state newspapers, including the Billings Gazette, the Great Falls Tribune, the Helena Independent Record, the Missoulian, the Bozeman Chronicle, and the Daily Inter Lake. In addition to newspapers, the draft EAs are published on

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Regulations.gov, and sent via direct mailings and email distribution as well. Printed copies are also on file at both PPQ MT field offices in Helena and Billings.

After reviewing and considering all timely received comments, APHIS will issue a decision and will notify the public of the decision using the same methods as for the advertising the availability of the Draft EA.

# II. Alternatives

To engage in comprehensive NEPA risk analysis APHIS must frame potential agency decisions into distinct action alternatives. These program alternatives are then evaluated to determine the significance of environmental effects. The 2019 programmatic EIS looked at the environmental impacts of three different alternatives:

1. Alternative 1: No action alternative, which would maintain the status quo of allowing applications of three pesticides (carbaryl, diflubenzuron, and malathion). Pesticides may be applied as a spray or bait using ground or aerial equipment at full coverage rates or, more typically, by using RAATs.
2. Alternative 2: No suppression alternative where APHIS would not fund or participate in any program to suppress grasshopper infestations. Any suppression program would be implemented by another entity; and
3. Alternative 3: Preferred alternative updates the information allows use of four pesticides (carbaryl, diflubenzuron, malathion, and chlorantraniliprole). Upon request, APHIS would make a single application per year to a treatment area, and would apply it at conventional or, more likely, RAAT rates. The approach to use either conventional treatment or RAATs is an adaptive management feature that allows the Program to make site-specific applications with a range of rates to ensure adequate suppression. The preferred alternative further incorporates adaptive management by allowing treatments that may be approved in the future, and by including protocols for assessing the safety and efficacy of any future treatment when compared to currently approved treatments.

APHIS selected Alternative 3 in the Record of Decision (ROD). However, under each alternative APHIS would conduct survey activities, provide technical assistance, and may make insecticide treatments according to the agency's authority under the Plant Protection Act. An example of APHIS technical guidance is the agency's work on integrated pest management (IPM) for the grasshopper program. IPM is defined as a sustainable approach to managing pests by combining biological, cultural, physical and chemical tools in a way that minimizes economic, health and environmental risks (7 U.S. Code 136r-1). IPM for grasshoppers includes biological control, chemical control, rangeland and population dynamics, and decision support tools. Under all the alternatives considered in the EIS APHIS would continue to conduct grasshopper surveys and provide information on ways to manage grasshopper populations in the long-term, such as livestock grazing methods and cultural control by farmers.

APHIS has funded the investigation of various 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

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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 (www.sidney.ars.usda.gov/grasshopper/index.htm).

The 2019 programmatic EIS provides a solid analytical foundation, but no site-specific suppression pesticide treatments are implemented relying entirely on the risk analysis of the EIS and ROD. The EIS provides the basic background information needed for the "tiering" of future project-specific analyses on rangelands in accordance with the CEQ regulations for implementing NEPA. APHIS instead prepares state-or site-specific EAs to address local issues before implementing suppression pesticide treatments. Therefore, APHIS decided to prepare an EA for the counties listed above to analyze more site-specific impacts. The EA tiers to the 2019 programmatic EIS and incorporates by reference the carbaryl, chlorantraniliprole, diflubenzuron, and malathion HHERAs also published in 2019. Copies of the 2019 programmatic EIS and ROD are available for review at 1220 Cole Avenue, Helena, MT 59601 and 1400 S 24th St W, Ste 8, Billings, MT 59102. These documents are also available at the Rangeland Grasshopper and Mormon Cricket Program web site, http://www.aphis.usda.gov/plant-health/grasshopper.

## *A. Alternatives Considered for Comparative Analysis*

### 1. No Suppression Program Alternative

Under Alternative A, the No Action alternative, APHIS would not conduct a program to suppress grasshopper infestations within the counties listed in this EA. Under this alternative, APHIS would continue to conduct grasshopper surveys and provide information on ways to manage grasshopper populations in the long-term, such as different livestock grazing methods and cultural control by farmers. 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.

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

Under Alternative B, the Preferred Alternative, APHIS would manage a grasshopper treatment program using techniques and tools discussed hereafter to suppress outbreaks. The insecticides available for use by APHIS include the U.S. Environmental Protection Agency (USEPA) registered chemicals carbaryl, chlorantraniliprole, and diflubenzuron. These chemicals have varied modes of action. Carbaryl works by inhibiting acetylcholinesterase (enzymes involved in nerve impulses). Chlorantraniliprole activates insect ryanodine receptors which causes an uncontrolled release of calcium, impairing insect muscle regulation and leading to paralysis. Diflubenzuron inhibits the formation of chitin by insects which causes weak exoskeletons. APHIS would make a single application per year to a treatment area and could apply insecticide at an APHIS rate conventionally used for grasshopper suppression treatments, or more typically as reduced agent area treatments (RAATs). RAATs are the most common application method for all program insecticides, and only rarely do rangeland pest conditions warrant full coverage and higher rates. Full coverage is not the preferred method and would only be an option if specifically requested by land managers. Even so, this is an unlikely scenario due to the extra expenses it would incur compared to other options.

APHIS selects which insecticides and rates are appropriate for suppression of a grasshopper outbreak based on several biological, logistical, environmental, and economical criteria. The primary biological factor is the grasshopper species and the most common life stage of the dominant species of concern. When grasshopper populations are mostly comprised of the first three instars diflubenzuron is typically selected because it is effective, economical and least harmful to non-target species. Diflubenzuron limits the formation of chitin in arthropod exoskeletons and can produce 90 to 97% grasshopper mortality in nascent populations with a greater percentage of early instars. If the window for the use of diflubenzuron closes, because of treatment delays, then carbaryl, or chlorantraniliprole are the remaining control options. The circumstances where the use carbaryl bait would be best are reduced because of the higher cost per acre than liquid insecticide formulations. Only certain species consume carbaryl insecticide when it is formulated as a bait and their migratory or banding behavior allows targeted treatments over smaller areas. Some examples of species that meet these criteria are clearwinged grasshopper (*Camnula pellucida*) and Mormon crickets (*Anabrus simplex*).

The RAATs strategy is effective for grasshopper suppression because the insecticide controls grasshoppers within treated swaths while conserving grasshopper predators and parasites in swaths not directly treated. RAATs can decrease the rate of insecticide applied by either using lower insecticide concentrations or decreasing the deposition of insecticide applied by alternating treated and untreated swaths. Typically, program managers choose both options to lower the total amount of insecticide applied and treatment costs. Either carbaryl, chlorantraniliprole, or diflubenzuron would be considered under this alternative, typically at the following application rates ((Lockwood et al., 2000, Foster et al., 2000, USDA APHIS, 2019):

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

The width of the area not directly treated (the untreated swath) under the RAATs method is not standardized. The proportion of land treated during RAATs is a complex function of the rate of grasshopper movement, which is a function of developmental stage, population density, and weather (Narisu et al., 1999, 2000), as well as the properties of the insecticide (insecticides with longer residuals allow wider spacing between treated swaths). Foster et al. (2000) left 20 to 50% of their study plots untreated, while Lockwood et al. (2000) left 20 to 67% of their treatment areas untreated. Following the conventions and procedures established by these studies, the grasshopper program typically leaves 50% of a spray block untreated for ground applications where the swath width is between 20 and 45 feet. For aerial applications, the recommended skipped swath width is typically no more than 100 feet for carbaryl (liquid), chlorantraniliprole, and diflubenzuron, and 25 feet for malathion.

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However, many Federal government-organized treatments of rangelands tend to prefer to use a 50% skipped swath width, meaning if a fixed-wing aircraft's swath width is, for example, 150 ft., then the skipped habitat area will also be 150 ft. The selection of insecticide and the use of an associated swath widths is site dependent. Rather than suppress grasshopper populations to the greatest extent possible, the goal of this method is to suppress grasshopper populations to less than the economic injury level.

The variation in pesticide deposition resulting from following the RAATs procedures is not expected to result in chemical residues within the no spray swaths. Instead, swaths with maximum application rates alternate with swaths of low deposition rates. Program managers decided to increase the number of deposition dye card samples during 2021 to gather more data on actual application rates inside treatment blocks. Field personnel stationed 28 dye cards in a 150-foot spaced grid with four transects of seven cards. The long axis of the grid was oriented approximately parallel with the direction the aircraft were flying during the treatment. Unfortunately, strong winds caused pesticide drift from the flight swaths that were sprayed to the unsprayed swaths. Shortly after the portion of the treatment block containing the dye card grid was sprayed, the program managers ceased operations for the morning because wind gusts were measured over ten miles per hour. Figure 1 is a graph showing the pesticide concentrations on the dye cards as they were positioned in the grid. Despite the strong winds, the linear variation in deposition during an application using the RAAT method is evident. The program diflubenzuron application rate is 1.0 fluid ounce per acre which is equivalent to 1.75 mg/m2, approximately three times greater than the highest dye card concentration.

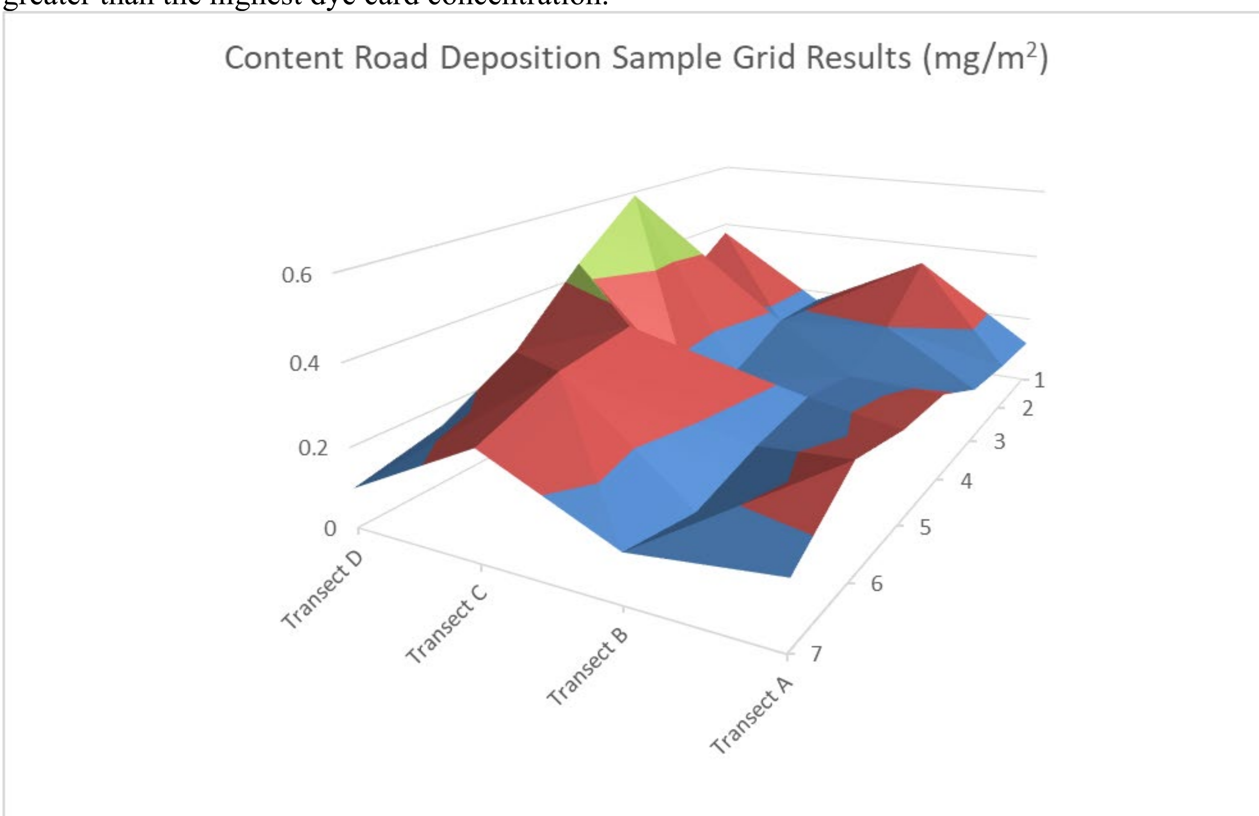


**Figure 4** – Diflubenzuron concentration on dye cards placed 150 feet apart in a grid

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The concept of reducing the treatment area of insecticides while also applying less insecticide per treated acre was developed in 1995, with the first field tests of RAATs in Wyoming (Lockwood and Schell, 1997). Applications can be made either aerially or with ground-based equipment (Deneke and Keyser, 2011). Studies using the RAATs strategy have shown good control (up to 85% of that achieved with a total area insecticide application) at a significantly lower cost and less insecticide, and with a markedly higher abundance of non-target organisms following application (Deneke and Keyser, 2011; Lockwood et al., 2000). 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).

In recent years APHIS alternates spray and no-spray (skipped) swaths resulting in treatment of 50% of an area where grasshopper populations are being suppressed. APHIS anticipates continuing using the RAATs method exclusively in the future. Starting early in the year, land manager meetings are held, and any interested parties sign cooperative agreements, letters of request, and site-specific questionnaires for potential treatment areas. As grasshoppers or Mormon Crickets begin to hatch in June, and after PPQ employees survey these areas to determine actual populations preliminary maps are prepared of the treatment areas. At densities of eight grasshopper per square yard, APHIS and the land managers cooperatively decide if treatments are warranted. However, typically treatments will not occur unless the grasshopper population densities are greater than ten per square yard. Generally, grasshopper densities of eight per square yard, or two per square yard for Mormon crickets may warrant intervention by the land manager.

Insecticide applications at conventional rates and complete area coverage, is an approach that APHIS has used in the past but is currently uncommon because RAATs treatments use less insecticide and take less time to treat the same area resulting in substantial cost savings. Under this alternative, carbaryl, chlorantraniliprole, or diflubenzuron would cover all treatable sites within the designated treatment block per maximum treatment rates following label directions:

- 16.0 fluid ounces (0.50 lbs a.i./ac sprayed) of carbaryl spray;
- 4.0 pounds (0.20 lbs a.i./ac treated) of 5 percent carbaryl bait;
- 8.0 fluid ounces (0.027 lbs a.i./ac sprayed) of chlorantraniliprole;
- 1.0 fluid ounce (0.016 lbs a.i./ac sprayed) of diflubenzuron

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

## B. Protective Measures and Program Procedures to Avoid or Reduce Adverse Impacts

The Program applies insecticides as liquid ultra-low volume (ULV) sprays or solid-based carbaryl baits through aerial or ground applications. Habitat diversity, topographical features, meteorological conditions, economic concerns, and environmental considerations all have important roles in choosing the best form of treatment (Foster and Onsager, 1996). Aerial applications are typical for treatments over large and less accessible areas. Ground applications are most likely to be made when treating localized grasshopper outbreaks or for treatments where the most precise placement of insecticide is desired.

Compared to sprays, baits are easier to direct toward the target area, are much more specific toward grasshoppers, act primarily through ingestion, and affect fewer non-target organisms than sprays (Peach et al., 1994; Foster, 1996; Latchininsky and VanDyke, 2006). The baits have a carrier, such as bran, that absorbs the carbaryl, making it less bioavailable, particularly in dermal exposures (USDA APHIS, 2015). Biodegradation of carbaryl occurs readily in soil, but there is moderate potential for bioconcentration in aquatic organisms. This is unlikely to occur due to the application buffers from aquatic sites and the lack of significant drift due to the large bait size used during application.

ULV applications use lower than the conventional label rates, specifically 0.5 gallon or less per acre of insecticide in liquid form. Liquid applications typically produce a quicker, greater, and more predictable grasshopper mortality rate than bait applications (Fuller et al., 1996). Generally, contract costs are substantially lower for applying ULV sprays compared to conventional liquid application rates and bait applications because ULV sprays use less product (Foster and Onsager, 1996). The program avoids off target drift to protect environmentally sensitive areas and maintain treatment efficacy. Various spray carriers and adjuvants minimize off-target movement of ULV sprays including synthetic or natural oils (e.g., canola oil).

The RAATs strategy reduces the treatment area, the application rate of insecticides, or both. RAATs methods suppress grasshopper populations below the economic injury level, rather than to the greatest extent possible, keeping with the IPM principles that have governed the program since the 1980s. Insecticides suppress grasshoppers within treated swaths, yet RAATs reduces cost and conserves non-target biological resources (including predators and parasites of grasshoppers, as well as beneficial grasshoppers) in untreated areas. With less area being treated, more beneficial grasshoppers and pollinators survive treatment. There is no standardized percentage of area that is left untreated. 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).

APHIS grasshopper treatments must follow all applicable Federal, State, tribal, and local laws and regulations regarding pesticide use, including all USEPA- and State-approved label instructions. APHIS has also implemented several measures that go beyond label instructions to protect workers and the environment. All aircraft must have a positive on/off system that will prevent leaks from the nozzles and a positive emergency shutoff valve between the tank and the pump. Whenever possible, applicators must avoid aerial ferrying and turnaround routes over water bodies and sensitive habitats (USDA APHIS, 2013). This will reduce the risk of accidental release of insecticides into aquatic habitats and other sensitive habitats.

Contractors participating in suppression programs must have a valid and current state of Montana pesticide license and pass the required exam. For APHIS personnel, an MOU is in place with the state of Montana requiring that Montana PPQ personnel must hold a valid pesticide certificate under the PPQ pesticide certification plan approved by the Administrator of the Environmental Protection Agency, which requires taking a certification course and passing the exam. This is accepted in lieu of the State of Montana's pesticide licensing requirements. Program managers oversee the mixing and loading of pesticide by contractors and monitor application rates to ensure proper calibration is maintained over the entire application process.

The program has procedures to limit potential movement of applied insecticides outside of the intended treatment area. Operationally, the accurate placement of the ULV spray insecticide is essential if grasshopper populations are to be suppressed efficaciously. Winds may displace the insecticide, and high air temperatures combined with low humidity may cause fine droplets to evaporate and drift without reaching the targeted vegetation. During applications, APHIS personnel constantly monitor wind conditions because when steady wind speeds exceed 10 miles per hour (mph), or wind direction changes towards sensitive habitat treatments are suspended until conditions improve. Field personnel measure ground and air temperatures to check for temperature inversions characterized by stable air with little mixing. Temperature inversions can cause ULV spray droplets to remain aloft increasing the potential for off-site transport of drift.

The program has also established treatment restriction buffers around water bodies to protect those features from insecticide drift and runoff. The labels for all program insecticides prohibit direct application to water (defined as reservoirs, lakes, ponds, pools left by seasonal streams, springs, wetlands, and perennial streams and rivers). APHIS maintains the following additional buffers for water bodies that are not designated critical habitat for listed aquatic species: 500-foot buffer for aerial sprays, 200-foot buffer for ground sprays, and a 50-foot buffer for bait applications (USDA APHIS, 2013).

Aerial applicators contracted for suppression programs use Trimble GPS Navigation equipment to navigate and capture shapefiles of the treatment areas. All sensitive sites are buffered out of the treatment area and are shown in the final treatment area maps that go into the pilot's navigation system. All sensitive sites are reviewed in the daily briefing with APHIS personnel including the applicator working on the treatment site. No-spray buffers are greater than what the label requires, for a distance of 500 feet from sensitive sites. APHIS also collects chemical residue samples to monitor for off target spray drift during treatments. These include setting up oil-sensitive dye cards adjacent to sensitive areas. Field personnel also take periodic wind and weather readings and communicate them to the program manager who can cancel or delay aerial treatments to prevent pesticide drift and run off. Pesticide spills at loading and refueling sites are to be immediately contained and remedied by the contractor and are reported to the proper state pesticide regulatory officials.

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# III. Environmental Consequences

Chapter III identifies the affected environment where the Program will be implemented, identifies the types of impacts or effects that will be evaluated, and the environmental issues that will be studied. Each environmental issue section addresses a separate environmental resource, and includes background information, an evaluation of the impacts on those resources, and a conclusion. The alternatives are compared with the environmental consequences of the proposed action at the end of each issue section. Determination of significance of the impacts predicted in this chapter does not occur in this EA but is made by the APHIS decisionmaker documented in the appropriate decision document.

## *A. Description of Affected Environment*

The proposed suppression program area included in the EA encompasses 26,647,331 acres within 17 counties in Western Montana. The counties are: Beaverhead (population - 9,371), Broadwater (6,774), Deer Lodge (9,421), Flathead (104,357), Gallatin (118,960), Granite (3,309), Jefferson (12,085), Lake (31,134), Lincoln (19,677), Madison (8,623), Mineral (4,535), Missoula (117,922), Park (17,191), Powell, (6,946), Ravalli (44,174), Sanders (12,400), and Silver Bow (35,133). All population estimates are from the 2020 Census. Ownership or stewardship of the land in this area is as follows: USFS – 12,945,714 acres, Private – 9,868,590 acres, BLM – 1,323,375 acres, state – 1,181,565 acres, Other federal – 708,795 acres, and Indian Trust – 619,292 acres. Appendix 2 indicates the boundaries of the area covered by this EA. However, actual location and total acres aren't known until suppression programs are slated to occur.

This entire area has mountainous regions throughout. The elevation ranges from 1,820 feet (the lowest point in Montana) in the northwest corner to 12,799 feet (Granite Peak – the highest point in Montana) in the southeast corner. The area is composed of plains foothills with moderate to steep slopes and complex mountains that can be very rugged with deep river canyons and sparse vegetation or timbered covered with open meadows. APHIS does not conduct suppression programs in mountains, canyons, or forests. Annual precipitation varies from less than 10 inches in some foothill areas in the south to over 80 inches in some northern mountain areas. The area covered by this EA has the most varied range of annual precipitation in the state.

Major water resources include, but are not limited to: Canyon Ferry Lake, Ennis Lake, Flathead Lake (the largest natural freshwater lake west of the Mississippi), Georgetown Lake, Hebgen Lake, Lake Koocanusa, Lake Mary Ronan, Lake McDonald, Lower Red Rock Lake, Quake Lake, Seeley Lake, Swan Lake, Upper Red Rock Lake, Whitefish Lake, Cabinet Gorge Reservoir, Clark Canyon Reservoir, Hungry Horse Reservoir, Kicking Horse Reservoir, Hyalite Reservoir, Lima Reservoir, Ninepipe Reservoir, Noxon Reservoir, Pablo Reservoir, Ruby River Reservoir, Willow Creek Reservoir, Beaverhead River, Big Hole River, Bitterroot River, Blackfoot River, Boulder River, Clark Fork River, Clearwater River, Flathead River, Gallatin River, Jefferson River, Jocko River, Kootenai River, Little Bitterroot River, Little Blackfoot River, Madison River, Missouri River, Red Rock River, Ruby River, Shields River, Spotted Bear River, Swan River, Thompson River, Tobacco

River, Yaak River, Yellowstone River, Blacktail Deer Creek, Danaher Creek, Flint Creek, Grasshopper Creek, Nevada Creek, Rock Creek, Sixteen Mile Creek, and Swift Creek. Numerous small streams, ponds, lakes, reservoirs, seasonal streams, and stock ponds are located throughout the area.

Agriculture, being a primary industry in the Montana economy, and livestock grazing (primarily cattle, sheep, and horses) occurs in every county in the state. Typical vegetation types can be found in Table 2 – representative plant species. Generally, the crops grown in the area covered by this EA are small grains such as wheat, barley, oats, irrigated and non-irrigated hay (alfalfa and grass), and potatoes.

There is one Reservation within the boundaries of this EA. The Flathead Indian Reservation occupies portions of Flathead, Lake, Missoula, and Sanders Counties. Within this specific EA, National Forest land occupies some portion of every county. They are Beaverhead-Deerlodge National Forest, Bitterroot National Forest, Flathead National Forest, Gallatin National Forest, Helena National Forest, Kaniksu National Forest, Kootenai National Forest, and Lolo National Forest. APHIS led suppression programs do not occur within the confines of any National Forests in Montana.

In addition to the National Forests, other major recreation areas include Glacier and Yellowstone National Parks (no action is expected to be taken inside the boundaries of the Parks), Lewis and Clark Caverns, The National Bison Range, Lee Metcalf Wildlife Refuge, Red Rocks Lakes National Wildlife Refuge, Swan River National Wildlife Refuge, Bob Marshal Wilderness, Great Bear Wilderness, Lee Metcalf Wilderness, Mission Mountains Wilderness, Rattlesnake Wilderness and National Recreation Area, Souse Gulch Recreation Area, Welcome Creek Wilderness, Big Hole National Battlefield, Bannack Historic District, Grant-Kohrs Ranch National Historic Site, Sacagawea Historical Area, Virginia City Historic District, Madison Buffalo Jump State Monument, Madison Canyon Earthquake Area, Three Forks Of The Missouri (Missouri Headwaters), BLM lands, many smaller wildlife refuges and historic sites, Canyon Ferry Lake, Ennis Lake, Flathead Lake, Georgetown Lake, Hebgen Lake, Lake Koocanusa, Lake Mary Ronan, Lake McDonald, Lower Red Rock Lake, Quake Lake, Seely Lake, Swan Lake, Upper Red Rock Lake, Whitefish Lake, Cabinet Gorge Reservoir, Clark Canyon Reservoir, Hungry Horse Reservoir, Kicking Horse Reservoir, Hyalite Reservoir, Lima Reservoir, Ninepipe Reservoir, Noxon Reservoir, Pablo Reservoir, Ruby River Reservoir, Willow Creek Reservoir, Beaverhead River, Big Hole River, Bitterroot River, Blackfoot River, Boulder River, Clark Fork River, Clearwater River, Flathead River, Gallatin River, Jefferson River, Jocko River, Kootenai River, Little Bitterroot River, Little Blackfoot River, Madison River, Missouri River, Red Rock River, Ruby River, Shields River, Spotted Bear River, Swan River, Thompson River, Tobacco River, Yaak River, Yellowstone River, and numerous other lakes, reservoirs, rivers, streams, and other bodies of water used for recreational activities.

Water based recreational sites are buffered from any nearby APHIS led suppression activities. All other recreational sites would not be subject to treatments unless specifically requested by the land management agency in charge of them. To date, APHIS has not conducted a suppression program within the boundaries of a Montana State Park.

## *B. Special Management Areas*

APHIS is aware there are areas that have greater scenic and environmental value within the rangeland areas considered by this EA. These areas might have remote recreational uses, special ecological characteristics or species that are of special concern to land management agencies, the public, or other groups and individuals. APHIS only treats areas that are requested, and land managers will request areas they want excluded. All areas of critical habitat and federally protected species are discussed, and mitigations measures are addressed in the 2025 Biological Assessment and consulted on with the USFWS. APHIS and land managers identify and exclude Wilderness Study Areas and areas of Critical Environmental Concern.

## *C. Effects Evaluated*

Chapter III examines the direct, indirect, and cumulative effects of each of the alternatives on the biological, physical, and sociocultural aspects of the human environment (issues). Direct effects are caused by the action and occur at the same time and place (40 CFR § 1508.1(i)(1)). Indirect effects are caused by the action but are later in time and farther removed in distance (40 CFR § 1508.1(i)(2)). Cumulative effects are the effects on the environment that result from the incremental effects of the action when added to other past, present, and reasonably foreseeable actions regardless of what agency or person undertakes such other actions (40 CFR § 1508.1(i)(3)). Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time (40 CFR § 1508.1(i)(3)).

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

Potential cumulative impacts associated with the Preferred Alternative are not expected to be significant because the program applies an insecticide application once during a treatment season. The program may treat an area with different insecticides but does not overlap the treatments. The program does not mix or combine insecticides. Based on historical outbreaks in the United States, the probability of an outbreak occurring in the same area where treatment occurred in the previous year is unlikely; however, given time, populations eventually will reach economically damaging thresholds and require treatment. In 2024, areas covered in this EA that were treated included land falling within the boundaries of the Flathead Reservation. Approximately 24,000 acres of private, state, and trust lands were treated on the Flathead Reservation in 2024. However, APHIS only treats a fraction of Montana in any given year and grasshopper hazard forecasts can vary from the time adult surveys are conducted one year, to the time populations are surveyed the following year. The predominant species of grasshopper in this area is *Camnula pellucida.* Since diflubenzuron is only effective on nymphs, it is possible that adult grasshoppers from untreated areas could reinfest areas that were treated, repopulating those areas. Hatching bed treatments have occurred in this area in subsequent years. 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.

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.

A majority of USDA run suppression programs include federal land, which are generally not treated by the lessee prior to APHIS rangeland grasshopper suppression programs.

Other non-APHIS pesticide application activities may or may not take place in the vicinity of grasshopper suppression treatment areas. They may be undertaken by private applicators, members of the public, or state and county governments for a variety of reasons and without APHIS involvement. For instance, typically, mosquito control programs are an example of an activity where pesticide application is conducted in areas outside of grasshopper suppression areas, such as towns. These treatments are conducted by licensed county-personnel, not APHIS personnel. Mosquito abatement programs and their operations vary throughout Montana. In general, the approach is either to use larvicide or adulticide for mosquito suppression and conduct the applications in the early morning or at night when pollinators are not active. In Custer County, Fyfanon ULV, an adulticide with malathion as the active ingredient, is applied using trucks with mist guns after the sun goes down within boundaries of the Custer County Mosquito District. In Park County, an adulticide called MasterLine Kontrol 4-4 is used, containing permethrin and piperonyl butoxide as the active ingredients. The county also stocks a limited supply of larvicide containing the active ingredient methoprene that is made available to residents after site evaluation and approval for larvicide application. Mosquito control districts are generally confined to towns and the immediate outskirts. Conditions that permit spraying include an ambient temperature above 50 degrees F, wind speeds below 10 mph, and a forecast free of rain. Mosquito abatement programs are just one example of activities where pesticide may be applied in Montana.

APHIS contacted the Montana Department of Agriculture (MDA), Pesticide Program Manager and requested the following information:

- Types of pesticides used for grasshopper control in Montana
- General acres of crop and rangeland.

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- Counties or areas where treatments occurred in 2024 (and other years if available)

APHIS received the following response on January 13, 2025, "Because the MDA does not require nor do we collect the use/application information you are asking for, we would not have the answers to your questions below." APHIS also reached out to County Extension Agents in Montana via email requesting information about the primary pesticides private parties use for controlling grasshoppers on their properties. Only one County Extension Agent responded to the request, he listed that the common active ingredients were carbaryl, lambda-cyhalothrin, diflubenzuron, zeta-cypermethrin, and cyfluthrin. The same question was posed to an aerial applicator in Montana who confirmed that these were the most common pesticides to use in private party grasshopper control.

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

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

The 2002 EIS Appendix B, Environmental Risk Assessment for Rangeland Grasshopper Suppression Program – Insecticides, analyzed effects of various insecticide formulations and treatment rates and found minimal negative impacts for either carbaryl or diflubenzuron using the RAATs treatment strategies. "Diflubenzuron is only reported to be synergistic with the defoliant 'DEF'(NLM 1988)" (page 134). DEF is a defoliant registered for use in cotton crops with the active ingredient tribuphos (S,S,S-Tributyl phosphorotrithioate). Cotton crops are not grown in Montana, and no record of any of these compounds being used in Montana were found. For Carbaryl (all formulations): "The only studies of chemical interactions with carbaryl indicate that toxicity of organophosphates combined with carbaryl is additive not synergistic (Keplinger and Deichmann, 1967; Carpenter et al., 1961) (page 130). Regarding cumulative effects of these program pesticides, pesticide use data as well as land use are analyzed below.

A 2019 study by Wieben, C.M. from the U.S. Geological Survey (USGS) published estimates of annual agricultural pesticide use by major crop type (or crop group) for states of the conterminous United States from 1992 to 2017. The most recent ten-year dataset (2008-2017) establishes general trends of pesticide use by crop in Montana specific to the three program chemicals (carbaryl, diflubenzuron, and chlorantraniliprole) considered for use in the program, though the exact formulations, rates, and county level spatial data are not specified.

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In total for the decade in Montana, an estimated 60,266,788 kg of pesticides were applied, an average of 602,667 kg per year. 86% of the estimate was applied to Pasture and Hay (37.07%), Wheat (32.4%), and Fruit and Vegetables (16.63%). All other crop groups (Corn, Soybeans, Alfalfa, Orchards and Grapes, and Other) received the estimated remainder of 14%.

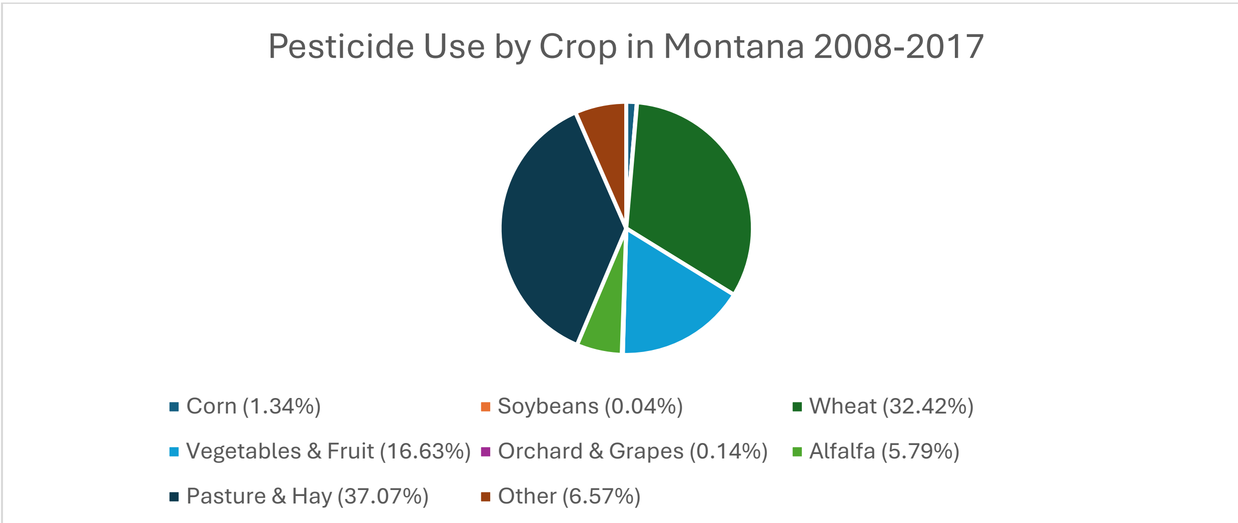


**Figure 5**: Estimated percentage of pesticide use by crop in Montana from 2008-2017

The APHIS rangeland Grasshopper and Mormon Cricket Suppression Program is not primarily intended for the treatment of cropland which includes any fields planted with the intent to market as a harvested commodity, including hay. Though rarely done, up to 20% of a project may include crops with no cost-share provided. Private rangeland or pasture may be included in APHIS treatments, especially in areas where public, federal, state, and private land is interspersed in a checkerboard like pattern. Though these land use patterns are not common throughout much of Montana, the Flathead Reservation in northwest Montana is an example of an area where these checkerboard-like land use patterns are present that have historically had suppression programs take place. However, these pesticide-use statistics from Wieben, 2019 likely do not include areas where APHIS treatment programs have occurred, or are likely to occur, due to the fact that APHIS led suppression programs are typically limited to publicly managed (or tribally managed) rangeland. Nevertheless, pasture is essentially high productivity rangeland and the closest ‘stand in’ for rangeland management captured in this data.

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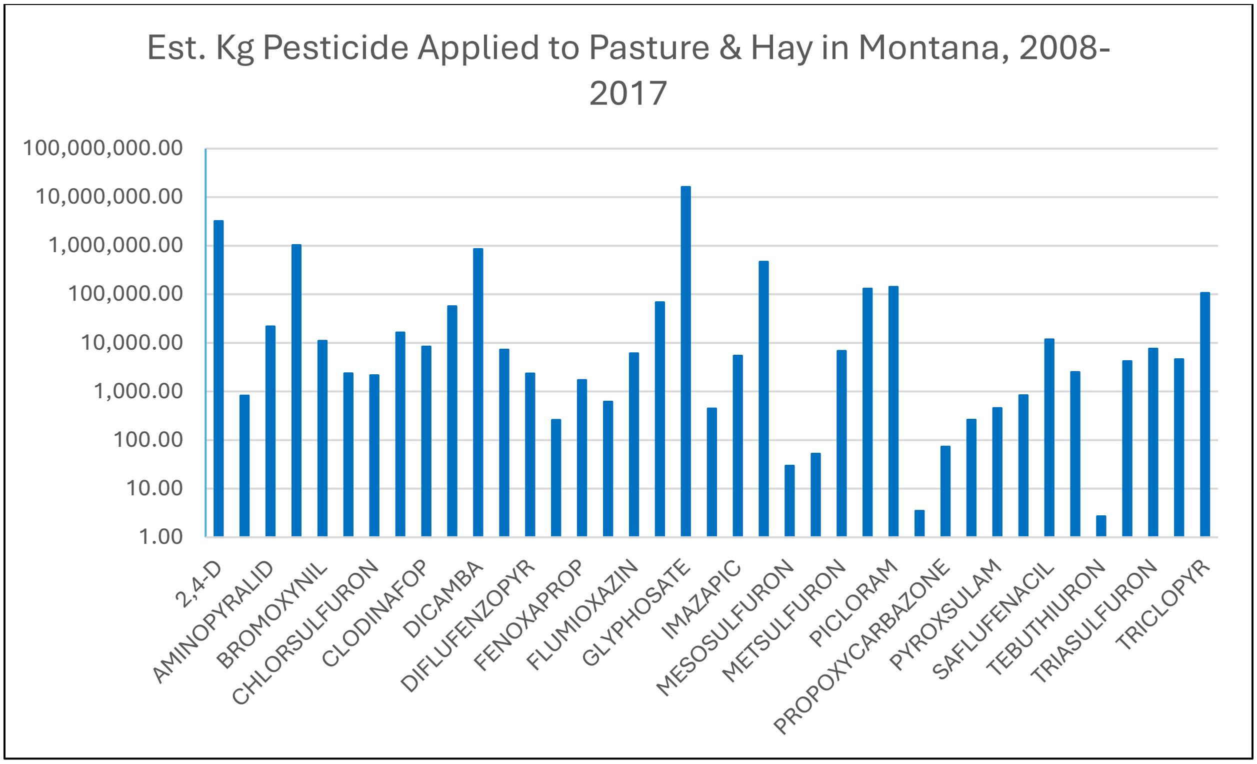


**Figure 6**: Estimated pesticide applied to Pasture and Hay (in kilograms) in Montana from 2008-2017

Hay and Pasture made up the highest percentage of pesticide use by crop type in Montana, taking 37% of the statewide share over the 2008-2017 period. The above graph shows the major pesticides applied to Pasture and Hay from 2008-2017 in Montana. Of note, all pesticides in the figure are herbicides, not insecticides. In sum, Hay & Pasture crops have a large share of the geographical size compared other agricultural operations in Montana (Wheat is comparatively high as well) and require less agricultural pesticides and no routine insecticides.

Weeds pose the biggest concern when it comes to rangeland and pasture management in Montana. A 2007 study estimated over 8 million acres of rangeland in Montana are infested with various species of noxious weeds. Montana Fish, Wildlife, and Parks conducts noxious weed management on over 360,000 acres alone. Many noxious weed species thrive in arid conditions common to rangeland ecosystems, increasing the frequency and intensity of wildfire and out-competing native and other ecologically beneficial species. Control methods include herbicide applications, mechanical control, prescribed grazing, and the utilization of biological control agents to target specific weed species. With a few exceptions, treatment of noxious weeds for the most part are accomplished via herbicide applications. Therefore, one can surmise that that herbicide applications occur on both private and public rangeland. Despite this, no cumulative or synergistic effects are anticipated to occur between the herbicides described above and the insecticides used during APHIS led grasshopper suppression programs.

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Beyond requests for APHIS to conduct grasshopper outbreaks, insecticide application on federally managed rangeland is neither well documented nor anticipated. Insecticidal treatments on private low-value rangeland which is reflected by the lack of insecticide documentation contained in the analysis by Wieben, C.M., (2019).

Analyzing the three program approved chemicals, starting with diflubenzuron, the chemical's use in Montana has been extremely uncommon in crop treatments. The chemical was only documented in 2010 and 2011 in Wheat and Alfalfa for a total of 980 kg over a 10-year period, or an average of 98 kg per year. It is important to note that diflubenzuron is a restricted use pesticide, which may account for its low total use during this period compared to some others.

**Table 1**: Estimated diflubenzuron application (in kilograms) in Montana across crop types (2008-2017)

| Compound | Year | Units | Wheat | Alfalfa | Total |
|---|---|---|---|---|---|
| DIFLUBENZURON | 2010 | kg | | 114.7 | 114.7 |
| DIFLUBENZURON | 2011 | kg | 706.5 | 159.2 | 865.7 |
| | | | | | |
| **10-year Sum** | | | **706.5** | **273.9** | **980.4** |
| Average per Year | | | 70.65 | 27.39 | 98.04 |

Chlorantraniliprole is another APHIS approved pesticide considered under this EA; however, it has never been used by the program in Montana to date. The chemical also appears to be rarely used for crop treatments elsewhere in Montana, with only one year on record for the treatment of Alfalfa in 2013.

**Table 2**: Estimated chlorantraniliprole application (in kilograms) in Montana across crop types (2008-2017)

| Compound | Year | Units | Alfalfa | Total |
|---|---|---|---|---|
| CHLORANTRANILIPROLE | 2013 | kg | 123.7 | 123.7 |
| **10-year Sum** | | | **123.7** | **123.7** |
| Average per Year | | | 12.37 | 12.37 |

Unlike diflubenzuron and chlorantraniliprole, carbaryl has shown a pattern of much more consistent use in Montana between 2008-2017. The chemical has also been used across many more crop categories, to include Wheat, Vegetables and Fruit, Orchard and Grapes, Alfalfa, and Other Crops. Carbaryl is a faster acting and broader spectrum insecticide and is not classified as a restricted use pesticide. Both factors make it an undoubtedly popular choice for use by the public compared to other chemicals.

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**Table 3**: Estimated carbaryl application (in kilograms) in Montana across crop types (2008-2017)

| Compound | Year | Units | Wheat | Vegetables & Fruit | Orchards & Grapes | Alfalfa | Other Crops | Total |
|---|---|---|---|---|---|---|---|---|
| CARBARYL | 2008 | kg | 89.40 | 859.90 | 93.10 | 9,965.40 | | **11,007.80** |
| CARBARYL | 2009 | kg | 36,422.50 | 1,171.20 | 33.00 | 35,294.30 | 37.90 | **72,958.90** |
| CARBARYL | 2010 | kg | 3,256.80 | | 378.00 | 3,281.00 | 66.40 | **6,982.20** |
| CARBARYL | 2011 | kg | 5,277.10 | | 99.80 | 3,174.10 | | **8,551.00** |
| CARBARYL | 2012 | kg | | 25.30 | 260.90 | | 116.40 | **402.60** |
| CARBARYL | 2013 | kg | | | 34.80 | | 102.20 | **137.00** |
| CARBARYL | 2014 | kg | 219.20 | 11.60 | 231.40 | | | **462.20** |
| CARBARYL | 2015 | kg | | | 48.30 | | | **48.30** |
| | | | | | | | | |
| **10-year Sum** | | | **45,265.00** | **2,068.00** | **1,179.30** | **51,714.80** | **322.90** | **100,550.00** |
| Average per Year | | | 4,526.50 | 206.80 | 117.93 | 5,171.48 | 32.29 | 10,055.00 |

Organophosphate pesticides and their cumulative effects are also a potential concern in Montana. There were ten documented organophosphate pesticides contained in the 10-year data provided by Wieben, C.M (2019). These chemicals included acephate, chlorpyrifos, diazinon, dimethoate, ethoprophos, malathion, naled, phorate, phosmet, and terbufos. However, none of these organophosphate based pesticides were applied to Pasture and Hay.

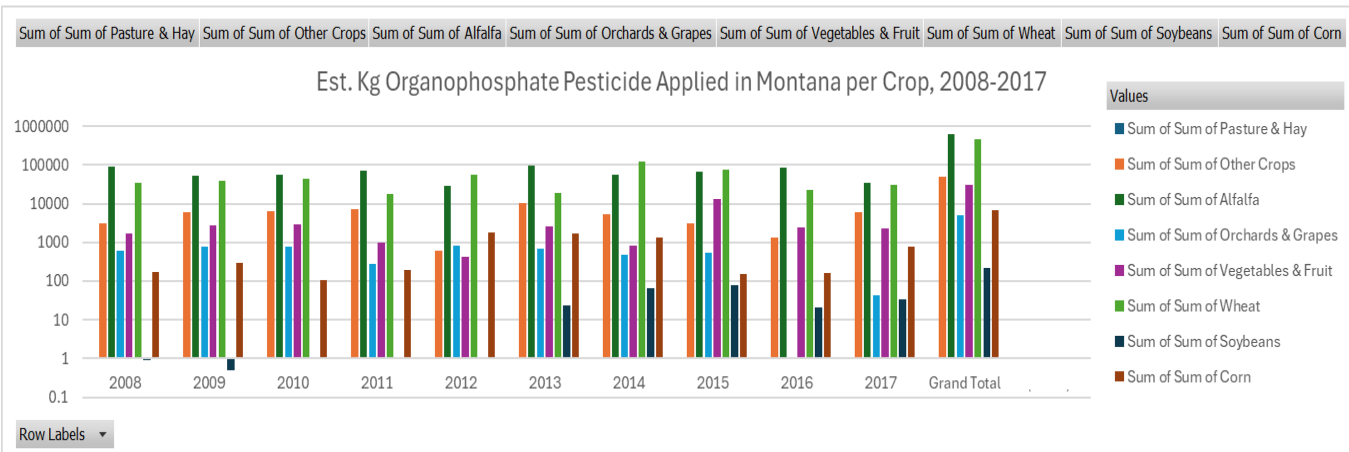


**Figure 7**: Estimated sum of organophosphate pesticide applied (in kilograms) in Montana per crop, 2008-2017

Alfalfa and wheat showed the highest organophosphate use by crop type in the data, though Corn, Vegetables and Fruit, and Other Crops saw consistent use as well. Orchards and Grapes and Soybeans saw meager use over the 10-year period. Considering the infrequency of APHIS led treatments and the lack of geographical overlap of any of the above treatments, the additive effects of APHIS program chemicals is likely insignificant, despite organophosphate use in the greater environment continuing to be a popular choice for agricultural use among the public.

The dataset from Wieben C.M., (2019) is currently the best analysis available for crop pesticide application in the state of Montana. Based on this data, there is no evidence that cumulative impacts would occur because of APHIS led grasshopper suppression programs given the low use of program insecticides overall, and the likely lack of geographic or crop usage overlap.

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APHIS continues to provide interested landowners and other members of the public information concerning program pesticides, timing and preferred application (i.e. RAATs) through technical assistance and public meetings. APHIS will continue to evaluate chemical application data as it becomes available.

APHIS has prepared this EA for the counties and areas listed above because treatments could be requested if grasshopper populations reach outbreak levels. Past experience and continuing land use, climate, and grasshopper population conditions lead APHIS to believe treatments will be needed in the near future. Unfortunately, the agency can't accurately predict exact treatment locations and usually discovers building grasshopper populations only a few weeks in advance. Requested treatments may not end up occurring for various reasons including land managers not following through with cooperative program obligations, land managers withdrawing their request for suppression assistance, or a lack of funding.

Treatments conducted by APHIS generally occur for a variety of reasons including land use, land ownership, grasshopper densities, landowner/managers' familiarity with the program, and other considerations. Populations of *Camnula pellucida* and *Melanoplus* species are common in this area. Much of Western Montana does not have large expanses of rangeland. A portion of the flathead reservation has expanses of rangeland that is held in trust for the Confederated Salish and Kootenai Tribes (CSKT), State-owned, or privately owned. The CSKT, the Montana Department of Natural Resources and Conservation (DNRC) and a multitude of private landowners, request APHIS assistance annually. This can include areas near Niarada, Hot Springs, the Little Bitterroot, and Camas Prairie. Occasionally, treatments will also occur on Irvine Flats. APHIS has never conducted treatment outside of the Flathead Reservation boundaries in the counties covered by this EA. Landownership can be found with the following link to the Montana Cadastral website: https://svc.mt.gov/msl/cadastral/?page=Map .

**Land ownership Legend for the following maps:**

☐ Private

☐ State

☐ Tribal/Trust

☐ USFS

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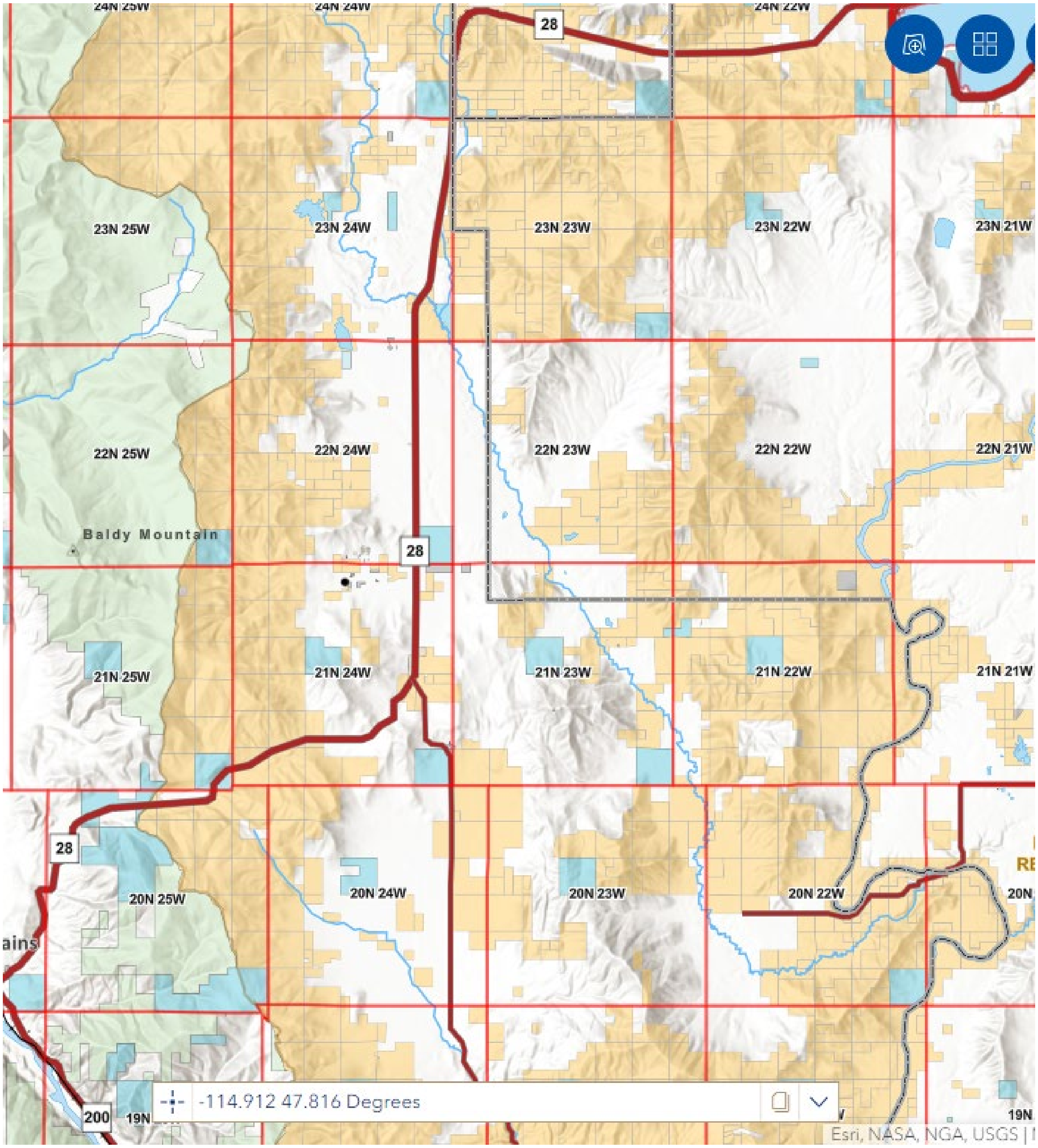


APHIS does not believe the program has had large rangeland treatments in the same location in Montana repeated in subsequent years.

The following map shows grasshopper outbreak trends in MT from 2002 – 2021.

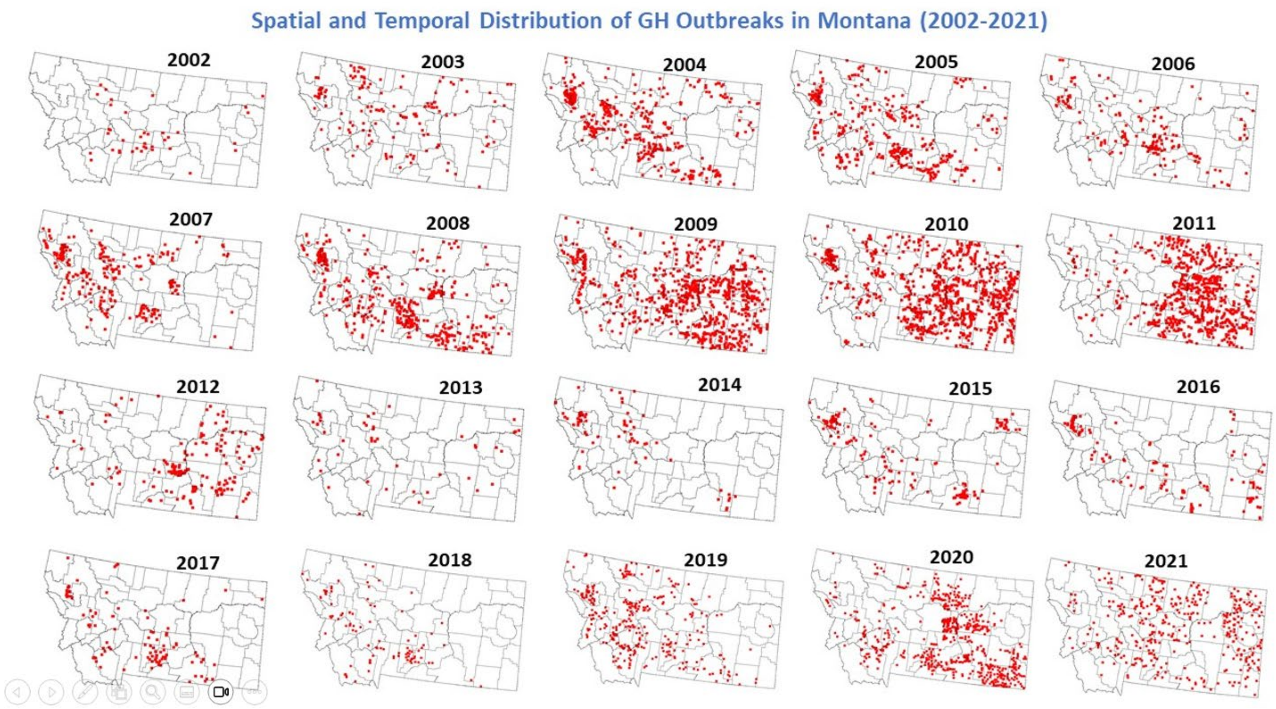


**Figure 8:** Grasshopper outbreak trends in Montana from 2002 – 2021

## *D. Site Specific Considerations and Environmental Issues*

Environmental issues are the resources that may be affected by the proposal, or concerns about the risks to humans from implementing the Program. The following issues are analyzed in Chapter IV Environmental Consequences in the order outlined.

### 1. Human Health

The rangeland areas where treatments may occur are sparsely populated by isolated ranch units having mainly cattle operations and “ranchettes” (homesteads generally five acres or less). Rangeland grazing is the predominant livestock feeding method.

A buffer of 1.25 miles from the treatment area to the perimeter of any town and other communities will be used. Ranch buildings and structures (such as stock tanks) will have a buffer of 200 feet. Federal highways and State roads will have a buffer of 25 feet. Local law enforcement, fire departments emergency medical services, hospitals and tribal agencies will be notified prior to any treatment as an advisory to access any safety risk, the treatment date and location and contact personnel.

The suppression program would be conducted on federally managed rangelands that are not inhabited by humans. Human habitation may occur on the edges of the rangeland. Most habitation is comprised of farm or ranch houses, but some rangeland areas may have suburban developments nearby. Average population density in rural areas of counties covered under this EA are between 0.2 and 7.1 persons per square mile (United States Census Bureau, 2018).

Recreationists may use the rangelands for hiking, camping, bird watching, hunting, falconry or other uses. Ranchers and sheepherders may work on the rangelands daily. Individuals with allergic or hypersensitive reactions to insecticides may live near or may utilize rangelands in the proposed suppression program area. Some rural schools may be in areas near the rangeland which might be included in treatment blocks. Children may visit areas near treatment blocks or may even enter treatment blocks before or after treatments.

The 2019 EIS contains detailed hazard, exposure, and risk analyses for the chemicals available to APHIS. Impacts to workers and the general public were analyzed for all possible routes of exposure (dermal, oral, inhalation) under a range of conditions designed to overestimate risk. The operational procedures and spraying conditions examined in those analyses conform to those expected for operations.

Direct exposure to program chemicals because of suppression treatments is unlikely due to the infrequency of treatments and the general lack of humans in treatment areas. In addition, program buffers and procedures further reduce the chances of human exposure. Finally, pesticide label specifications, standard spill prevention and rapid response measures mitigate the risk of accidental human exposure resulting from program activities.

Potential exposures to the general public from conventional application rates are infrequent and of low magnitude. The RAATs approach reduces this potential even further by using reduced rates and less actual directly treated area. The proposed program should benefit human and environmental health by reducing the risk of insect annoyance, blowing dust, higher light reflection and higher temperature on the semi-arid land surface.

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

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

The safety data sheet for each insecticide identifies these combustion products as well as recommendations for personal protective equipment (PPE) which is equal 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.

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## 2. Nontarget Species

While the program conducts grasshopper control treatments any other species affected by the insecticides can be viewed as non-target effects or unintentional take. The program has established and follows procedures to prevent take of species federally listed under the Endangered Species Act as endangered or threatened. The programmatic protection measures that resulted from consultation with the Services also prevent take of state listed species (sensitive species or species of concern) in the same habitats or having similar ecological (i.e., the relationship between species and their environment) niches as federal listed species. These procedures (e.g., no-spray buffers, RAATs, insecticide choices) also limit effects on pollinators (e.g., butterflies, moths, bees) and other beneficial insects.

NEPA requires agencies to use "high-quality information, including reliable data and resources, models, and Indigenous Knowledge. Agencies may rely on existing information as well as information obtained to inform the analysis. Agencies may use any reliable data sources, such as remotely gathered information or statistical models. Agencies shall explain any relevant assumptions or limitations of the information, or the particular model or methodology selected for use." 40 C.F.R. § 1506.6(b*)*

Estimating nontarget species population sizes over large areas can be extremely difficult, labor intensive, and expensive. State and federal wildlife management agencies have limited resources to conduct flora and fauna population surveys and monitor trends. States may monitor the status of wildlife populations by assessing sex ratios and age distribution. Plant species surveys often identify historical or potential habitat locations. In accordance with CEQ guidance and to preserve the professional and scientific integrity of the analysis, this EA uses reliable existing data and resources provided by jurisdictional agencies and peer-reviewed literature to estimate nontarget species population sizes.

To estimate population size for these species, conservative estimates are derived from the best available density estimates reported in the literature, with preference given to publications and studies in Montana or states having similar habitat. Density estimates may be for adults or all age classes. Population estimates based on potential habitat includes further extrapolation and speculation. The lowest estimate is assumed to be the minimum population. Habitat suitability indices, localized density fluctuations, and immigration or emigration may not be factored into these calculations, nor is density based on quantity of habitat. All population estimates are considered to be conservative, as we have used the lowest population estimate among the ranges of those available in the literature.

In Montana, species wide population estimate data is available from the 'Montana Field Guide' Website (www.fieldguide.mt.gov), a State of Montana run website that also houses the Montana Natural Heritage Program. These sites detail species occurrences throughout the state of Montana. Population and distribution data relies heavily on documented occurrences.

The program suppresses grasshopper populations on a small portion of the area considered by this EA in any given year. In those control treatment areas substantial portions are excluded from direct insecticide applications because of buffers around sensitive sites and the alternating spray and skip swaths inherent in the RAATs method. Thus, the potential

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impacts from the program activities on nontarget species populations occur in a small portion of the area considered by this EA and for a limited duration.

According to USDA's Natural Resource Conservation Service (NRCS), rangelands comprise about 30% of the entire land cover of the United States, totaling about 770 million acres. These lands are described by the NRCS as lands on which the indigenous vegetation is predominately grasses, grass-like plants, forbs, and possibly shrubs or dispersed trees, containing plant communities of either native or introduced plants. Grasslands, open forest, shrublands and associated wetlands are most likely to host outbreaks of grasshoppers and be targeted for suppression programs. These lands host abundant terrestrial and aquatic organisms.

Based on the available scientific research, there is a decrease in quantity of pollinators across the country and in rangeland ecosystems. However, the extent of program insecticide's role in this decrease is not clear. Existing research serves to outline the impact of these pesticides on pollinators of the order Hymenoptera and Lepidoptera primarily but also delves into pollinators of other orders to a lesser extent.

The availability of native floral resources is a primary determinant of the composition and abundance of bees and other pollinators in rangeland ecosystems in the United States (Potts et al. 2003, Gilgert and Vaughan 2011, Tuell et al. 2014). Approximately 4,000 different bee species aid in pollination in the United States (Black et al. 2011, Gilgert and Vaughan 2011). Many secondary pollinators such as moths and butterflies, wasps, flies, and beetles also contribute to distributing pollen despite being less efficient than bees (Larson et al. 2018).

According to Goosey et al., rangeland ecosystems are primarily pollinated by bee species. At 27 pastures in central Montana specimens from 27, 24, and 16 different bee genera were captured during 2016, 2017, and 2018, respectively. *Lasioglossum (Dialictus)*, *Agapostemon*, and *Eucera* were the most common genera captured constituting more than half (58%) of bee specimens. *Halictus* was the fourth most common genera, adding another 7% to the total bee capture. In 2016, secondary pollinators were ~8% of total pollinator catch. Lepidopterans were 10-fold more abundant than Syrphidae as secondary pollinators across all years. Secondary pollinators were 19% and 13% of the total catch in 2017 and 2018, respectively.

Furthermore, the researchers found in 2016 and 2017 bee abundance increased where periodic grazing of pastures provided suitable nesting habitat for these rangeland pollinators. They suggested forage consumption and hoof action likely created the unvegetated space required for reproduction by these mostly solitary, ground-nesting bees. However, abundances of secondary pollinators (i.e., butterflies and hover flies) were unrelated to grazing during two of the three study years. According to Gilgert and Vaughan, the assorted plant landscapes that rangelands are composed meet the needs of a variety of pollinators, including Hymenopterans and Lepidopterans. Idling large swaths of rangelands could be detrimental to bee populations because most ground-nesting species exhibit breeding-site fidelity, with multiple generations returning to nest in the same pasture (Michener 2007).

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The Xerces society promotes a symbiotic relationship between pollinators and rangelands, with each benefitting from the others existence (Buxton et al.). Noting rangelands provide large contiguous areas of food and shelter habitat for pollinators. Likewise, the pollination of a wide array of wildflowers produces valuable forage for cattle and wildlife, supports soil health, and makes grasslands more resilient. Information about rangeland pollinators species is generally limited, with most of it coming from "uncoordinated, short-term, small-scale sampling focusing on bees and butterflies" (Hanberry et al). Though this information is limited, studies on bees of the Great Plains indicate that about two-thirds of the bee species in rangelands are generalists, which use many families of plants for nectar and nesting. With this information about generalist nature of bees in rangelands, and the increased biodiversity caused by grazing, pollinators of the rangelands are very likely widespread in both species and location, which can increase their resiliency to disturbances.

Therefore, pesticides applications will also potentially impact a much more abundant and rich collection of pollinators due to the unique qualities of rangeland habitats. Additionally, the presence of agrochemicals and other pesticides have been found in samples of bee tissue from the Great Plains, likely due to the conversion of land from pollinator friendly rangeland to crop fields (Hladik et al 2016, Otto et al 2016).

According to a sampling of native bees communities across broad Canadian ecoregions Kohler et al, found climate and geographic variables caused differences in species abundance, richness, and composition, indicating that assessments on impacts may not be generalizable across the entire rangeland ecosystem. The researchers found bee community composition was significantly different across regions (i.e., Canadian grassland, parkland and boreal areas) and between land use types (i.e., rangeland and canola cropland). Within rangeland communities it may be difficult to understand the best conservation measures for bees due to the variance in responses on a larger scale.

In Montana, the state that has received the most treatments with almost 2 million acres treated since 2007, several studies have been conducted to determine the native pollinators and assess their status within the state. A study out of Montana State University aimed to understand the relationship between grazing and native pollinator activity (Blanchette 2019). Blanchette collected nearly 14,000 pollinator specimens over the course of three collecting seasons from 2016 to 2018. 27 Hymenoptera *Genera* were collected, with *Lasiglossum (Dialictus), Agapostemon,* and *Eucera* being the most commonly occurring. This study collected insects from near Sindey and Roundup Montana, representing only a small percentage of rangeland within the state. However, using this information it is clear that a large variety of pollinating species exist within rangeland habitats in Montana, and this study demonstrated that Hymenoptera were the most prevalent. According to Dolan et al, 28 species of *Bombus* have also been confirmed in Montana. With bees being primary pollinators of the rangelands, and Montana studies highlighting the diversity of bee species in the state.

Biodiversity of invertebrate organisms is crucial for ecosystem health. Biocontrol insects and pollinators in particular help control noxious weeds and provide pollination services crucial to sustaining ecosystems. Pollinators include managed exotic species such as

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European honeybees and a huge diversity of native species including many kinds of solitary and eusocial bees, wasps and ants, flies, hoverflies and bee-mimicking flies, many families of beetles, true bugs, moths and butterflies among others. In addition to general pollination services, some species of insects are obligate pollinators of rare plants, meaning the plants cannot reproduce without them. Other services which both terrestrial and aquatic invertebrates provide are less obvious but equally important, including nutrient cycling, decomposition and stimulating plant regrowth. Many species of herbivorous insects including grasshoppers are in this general category. Predacious invertebrates (e.g. arachnids, mantids, and dragonflies) help regulate herbivores while also providing food to larger animals. Invertebrates in general are incredibly important to ecosystem health and provide the greatest animal biodiversity within these ecosystems.

The monarch butterfly (*Danaus plexippus*), Suckley's cuckoo bumble Bee (*Bombus suckleyi*), and the western regal fritillary (*Argynnis idalia*, sometimes known as *Sepeyeria idalia*) are three invertebrate pollinators that occur in rangeland across Montana that are of special concern. The USFWS proposed listing of the monarch butterfly and Suckley's cuckoo bumble bee under the Endangered Species Act in December of 2024. Similarly, the eastern and western subspecies of the regal fritillary were also proposed for listing as threatened in August 2024.

Despite these species not yet being officially listed, during a February 13, 2025 discussion with Montana USFWS staff, APHIS grasshopper program staff asked about population and distribution data for these species in the state. USFWS staff advised APHIS to rely on the Montana Natural Heritage Program's species database (a program of the Montana State Library's Natural Resource Information system that serves as a depository of animal and plant species data and analytical tools) and USFWS' Environmental Conservation Online System (ECOS) to obtain occurrence data and habitat suitability and range data, emphasizing that other distribution data on wild pollinators in Montana, and elsewhere, is scarce or largely unknown.

APHIS grasshopper program staff primarily researched the Montana Natural Heritage Program and the ECOS tool for distribution and habitat suitability data for the three species, those findings are discussed below.

There are two populations of monarch butterfly in North America, separated by the continental divide (i.e. west and east of the Rocky Mountains). In the fall, monarchs in the more temperate western and eastern regions of the United States migrate long distances and overwinter in coastal California and parts of Mexico, respectively. In the spring and summer, monarchs again migrate vast distances to their spring and summer breeding grounds which encompass much of the United States. The entire state of Montana is within the summer breeding areas for the species, with western and eastern populations separated by the Rocky Mountains (Montana Natural Heritage Program. Monarch — Danaus plexippus.**)**.

Milkweed species are a necessity in the species lifecycle, particularly for oviposition and larval feeding. In western North America, milkweed and other nectar resources are most often associated with riparian corridors but also grow in a variety of habitats including

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roadsides and other heavily disturbed areas, fields, prairies, grasslands, and areas with soils that are typically sandy, loamy, rocky, and dry.

To visualize milkweed and Monarch distribution throughout Montana, APHIS program staff referenced the Western Monarch Milkweed Mapper website. The site is the result of a collaborative project through the partnerships of the Xerces Society, Idaho Department of Fish and Game, Washington Department of Fish and Wildlife, National Fish and Wildlife Foundation, and the U.S. Fish and Wildlife Service that takes a citizen science approach to report and document monarch butterfly and milkweed occurrences throughout the western United States in order to better understand the butterfly and it's host plants. The goal is to help understand the distribution and phenology of monarchs and milkweed, delineate breeding grounds, and identify conservation needs (www.monarchmilkweedmapper.org/about).

APHIS will continue to use monarchmilkweedmapper.org to help identify areas of milkweed and minimize the potential for exposure of monarchs to program insecticides.

Montana is located at the far northern edge of the monarch butterfly's range. According to the Montana Natural Heritage Program Database, most observations of the monarch butterfly appear between July and September in Montana. The highest densities of observations have occurred in Ravalli, Missoula, Yellowstone, and Carbon Counties. Grasshopper suppression programs in Montana generally occur in mid-June and rarely run past the first week of July. The Montana Natural Heritage Program database has only recorded ten observations of monarch butterflies in the month of June throughout the entire state since 1970.

The figures below show the monarch butterfly's range, documented observations, and habitat suitability models.

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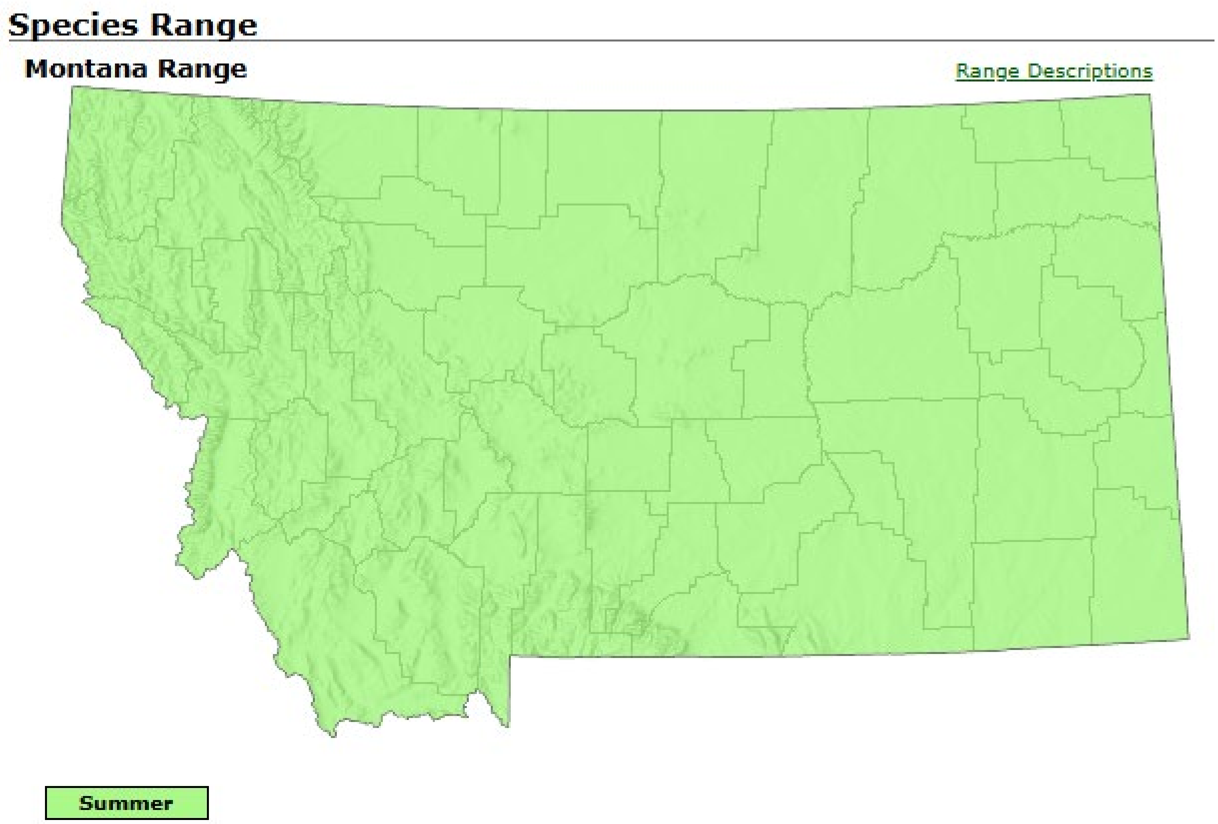


**Figure 9**: The entire state of Montana is considered part of the monarch butterfly's range. Map from the Montana Natural Heritage Program (https://FieldGuide.mt.gov/speciesDetail.aspx?elcode=IILEPP2010)

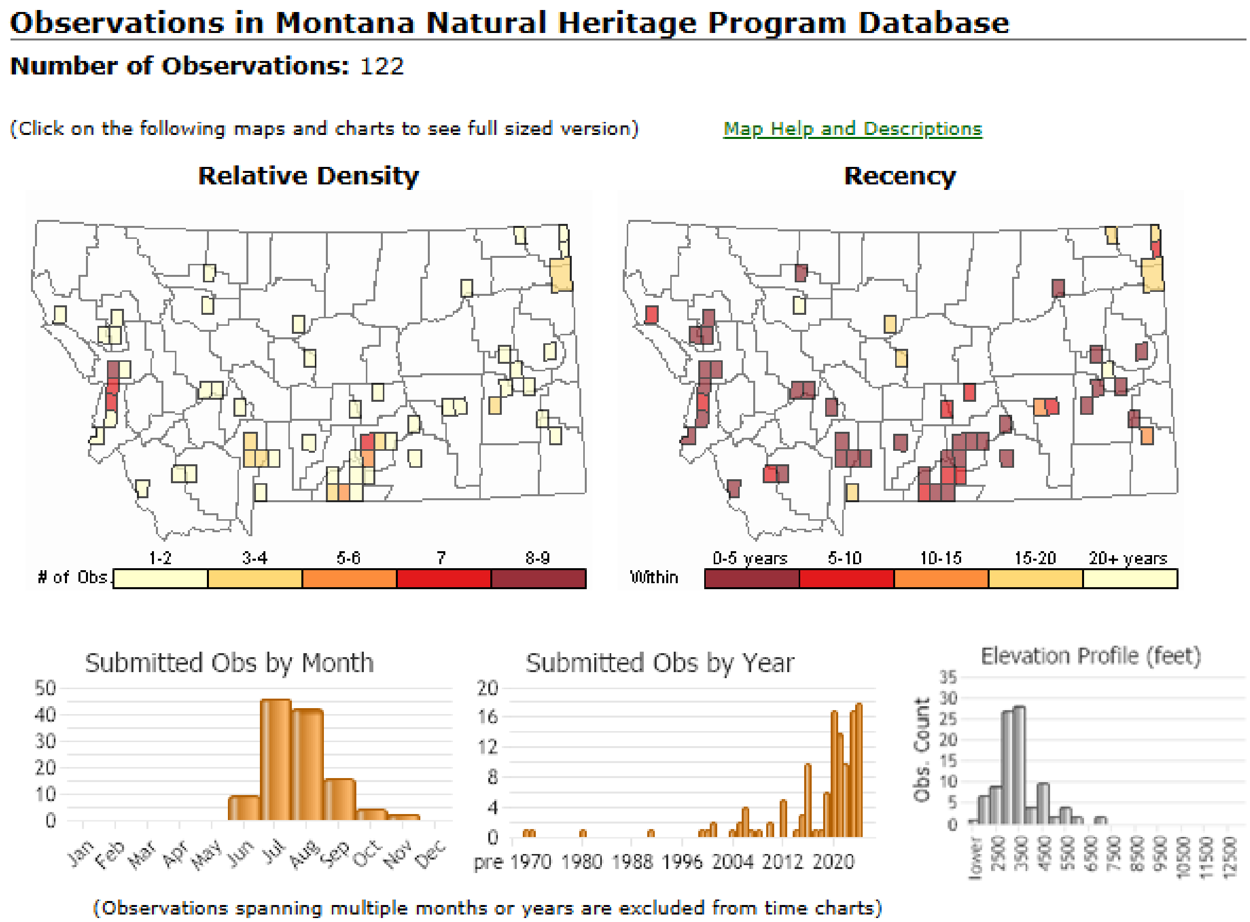


**Figure 10**: Documented observations of the monarch butterfly in Montana by month from 1970-2020 from the Montana Natural Heritage Program (https://FieldGuide.mt.gov/speciesDetail.aspx?elcode=IILEPP2010).

Model output classified into habitat suitability classes and aggregated into hexagons; observations used for modeling and potential survey locations (when available) are displayed for reference.

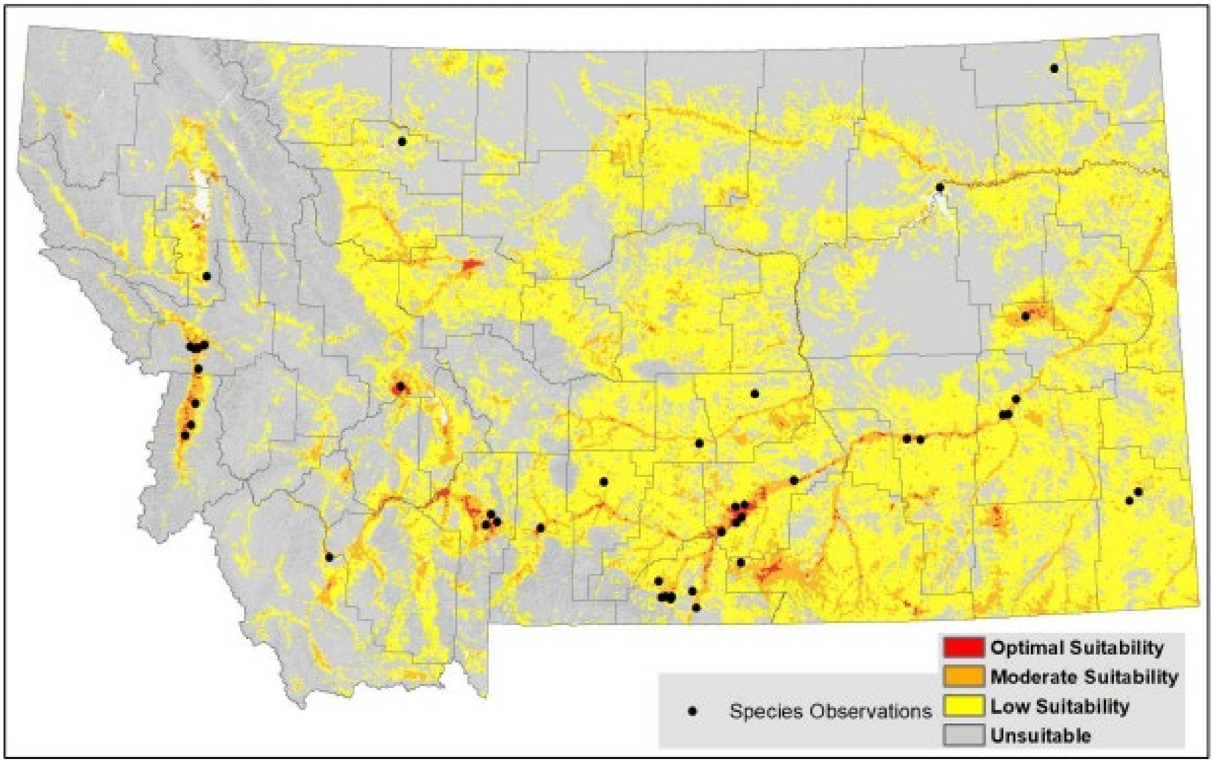


**Figure 11**: Estimated habitat suitability map for the monarch butterfly in Montana with species observation points. Map from the Montana Natural Heritage Program (https://FieldGuide.mt.gov/speciesDetail.aspx?elcode=IILEPP2010).

The Suckley's cuckoo bumble bee is a rare pollinator species that has been historically found in several habitats including prairies, grasslands, and meadows across the western United States, including Montana. However, populations of the species are thought to be currently much more fragmented, with the last confirmed sighting of the species occurring in Oregon in 2016. Observation data from the Montana Natural Heritage Program Database shows that the species has been observed in nineteen counties in Montana, mostly in the western regions of the state, though the data did not include the date of observations. Suckley's cuckoo bumble bee is a special parasitic species and is dependent on other bumble bee host species. Thus, population declines of the species could be linked to concomitant declines of other pollinating bumble bee species (Montana Natural Heritage Program. Suckley's Cuckoo Bumble Bee — Bombus suckleyi.**)**.

The figures below show Suckley's cuckoo bumble bee documented observations and estimated habitat suitability in Montana.

## Species Range

Resident Year Round

### Recorded Montana Distribution

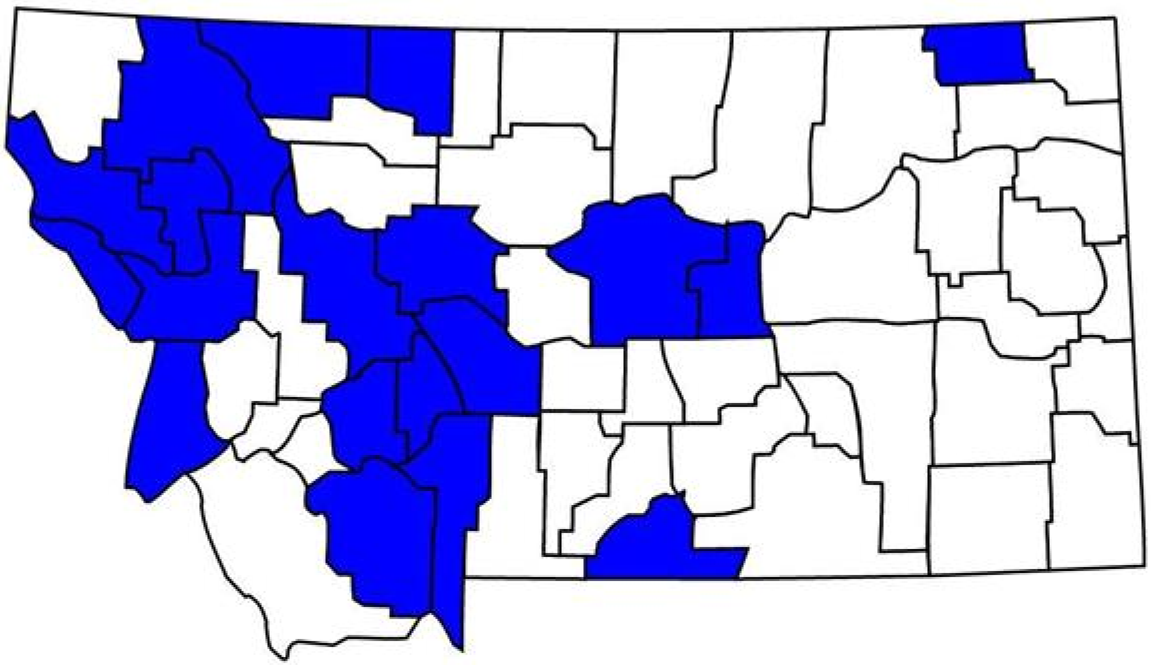

**Figure 12**: Counties in Montana where Suckley's cuckoo bumble bee has been historically observed. Map from the Montana Natural Heritage Program (https://FieldGuide.mt.gov/speciesDetail.aspx?elcode=IIHYM24350).

Current range maps are only shown within the jurisdictional boundaries of the United States of America. The species may also occur outside this region.


- **Listing status:** Proposed Endangered
  - **States/US Territories** in which this population is known to or is believed to occur: Arizona, California, Colorado, Idaho, Iowa, Kansas, Michigan, Minnesota, Missouri, Montana, Nebraska, Nevada, New Mexico, North Dakota, Oregon, South Dakota, Utah, Washington, Wisconsin, Wyoming
  - **US Counties** in which this population is known to or is believed to occur: View All
  - **USFWS Refuges** in which this population is known to occur:
  - **Countries** in which this population is known to occur: Canada, United States

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**Figure 13**: Range of Suckley's cuckoo bumble bee. Map from U.S. Fish and Wildlife Service Environmental Conservation Online System (https://ecos.fws.gov/ecp/species/10885)

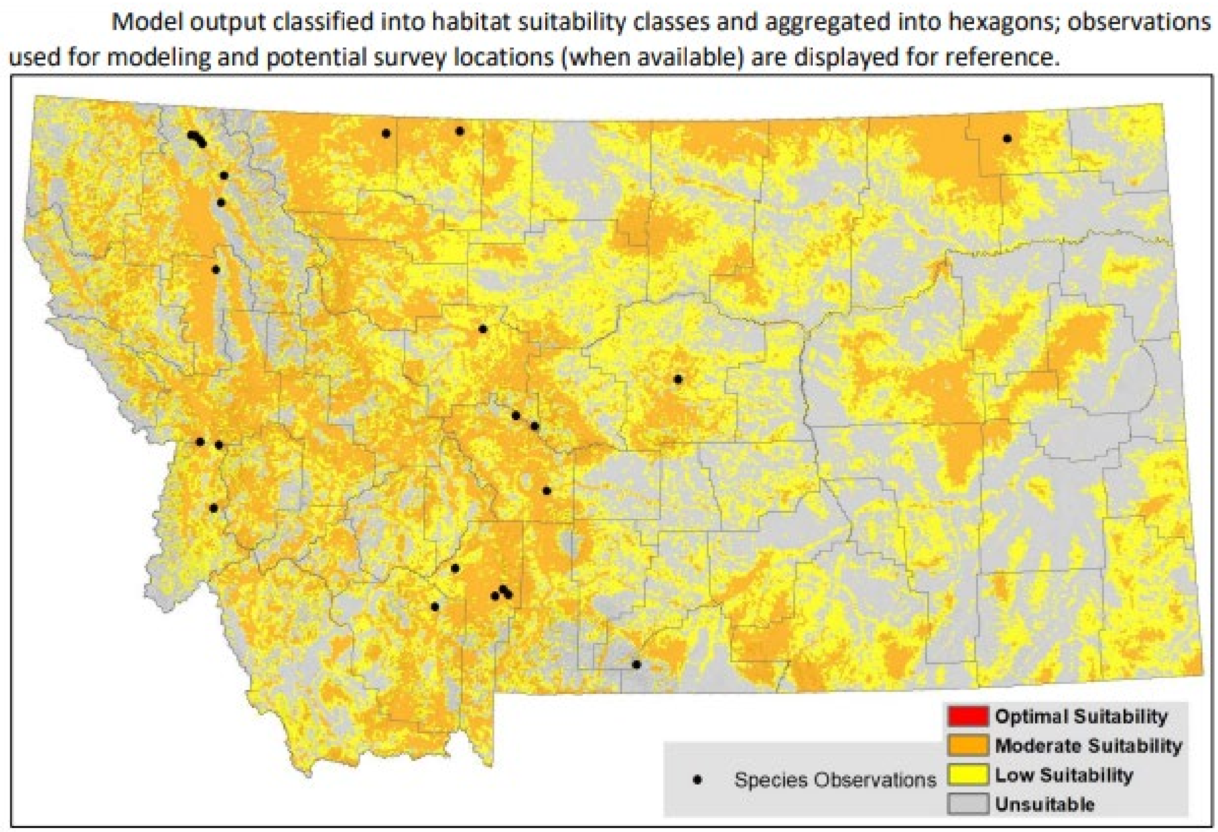


**Figure 14**: Estimated habitat suitability map for Suckley's cuckoo bumble bee in Montana with species observation points. Map from the Montana Natural Heritage Program (https://FieldGuide.mt.gov/speciesDetail.aspx?elcode=IIHYM24350).

Another rare pollinator species, the regal fritillary is a butterfly species divided into two subspecies consisting of eastern and western populations. The eastern regal fritillary is currently only found in a single location at a National Guard installation in Annville, Pennsylvania. However, the western subspecies, the western regal fritillary, is found in several central and western states. According to the Montana Natural Heritage Program Database, there have only been five documented observations of the species in Montana, all in the far eastern reaches of the state in Richland, McCone, and Custer counties. The U.S. Fish and Wildlife Service's species profile of the regal fritillary also lists that it is believed to occur in Big Horn, Carter, Fallon, Powder River, Roosevelt, Sheridan, and Wibaux counties. The species habitat preferences include wet meadows, prairie in proximity to marshes, and grasslands containing flowering plants and forbs. Dense grassland vegetation provides shelter for the species across all life stages (Montana Natural Heritage Program. Regal Fritillary – Argynnis idalia.). Regal fritillary's rely on violet species as a host plant for nectar resources and to supplement larval growth stages (U.S. Fish and Wildlife Service. Regal Fritillary).

The figures below show the distribution of observations of the western regal fritillary in Montana.

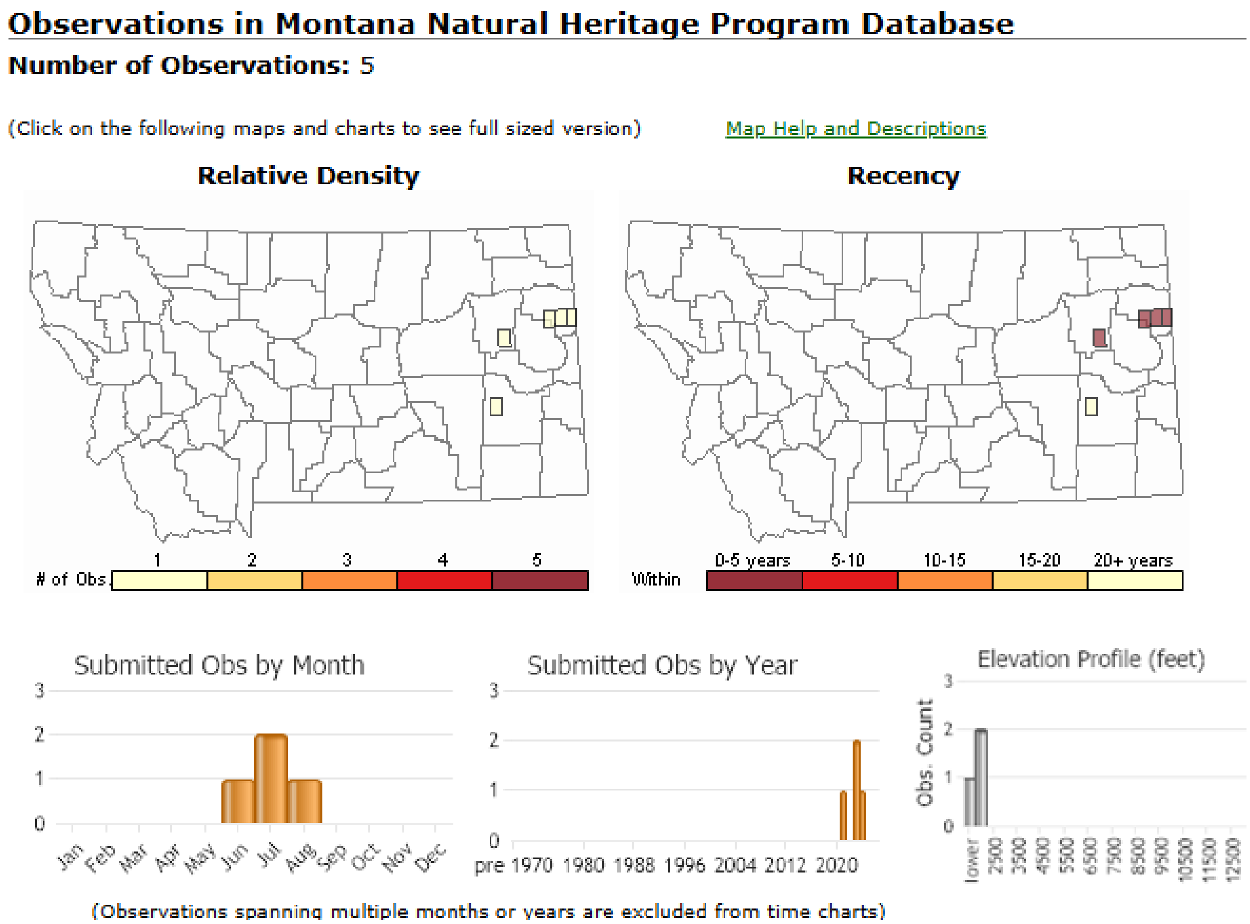


**Figure 15**: Observation data of the western regal fritillary in Montana from the Montana Natural Heritage Program (https://FieldGuide.mt.gov/speciesDetail.aspx?elcode=IILEPJ6040)

Current range maps are only shown within the jurisdictional boundaries of the United States of America. The species may also occur outside this region.


- **Wherever found**

  **Listing status:** **Not Listed**

  - **States/US Territories** in which this population is known to or is believed to occur: Arkansas, Colorado, Illinois, Indiana, Iowa, Kansas, Minnesota, Missouri, Montana, Nebraska, North Dakota, Oklahoma, Pennsylvania, South Dakota, Wisconsin, Wyoming
  - **US Counties** in which this population is known to or is believed to occur: View All
  - **USFWS Refuges** in which this population is known to occur:
  - **Countries** in which this population is known to occur: Canada, United States

**Figure 16**: Range of the western regal fritillary in Montana (areas shaded in dark green). Map from U.S. Fish and Wildlife Service Environmental Conservation Online System (https://ecos.fws.gov/ecp/species/8145)

According to the 2019 Rangeland Grasshopper and Mormon Cricket Program Final EIS, some programmatic pesticides may minimally impact larval stages of the lepidopteran species, particularly diflubenzuron, due to the pesticide being an insect growth regulator. APHIS will continue to consult with the USFWS regarding these sensitive pollinator species should they become listed for protections under the Endangered Species Act. More analysis of program applied pesticides and their possible effects on terrestrial invertebrate species is provided in the Environmental Consequences of the Alternatives section of this EA.

Vertebrates occurring in rangelands of the counties considered in this EA include introduced livestock and pets (e.g. cows, goats, sheep, horses, poultry, cats, dogs) and native species including carnivores (e.g. coyotes, foxes, wolves, cougars), large herbivorous mammals (e.g. deer, elk, pronghorn antelope, bighorn sheep), smaller ones (e.g. rabbits, gophers), omnivores (e.g. badgers, mice, bats). Birds comprise a large portion of the vertebrate species complex, and they also include exotic and native species. Some exotic game birds, like pheasant and partridge, have been deliberately introduced into the area, and other species such as starlings and pigeons have spread from other loci of introduction. Sage obligate bird species, typified by sage grouse, are present in rangeland. Herbivorous vertebrate species compete with some species of grasshoppers for forage, while omnivorous and predacious species utilize grasshoppers and other insects as an important food source.

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An assorted community of terrestrial plants occurs within the proposed suppression area. Many are considered as non-native, invasive weeds including annual grasses (e.g. cheat grass, Ventenata), annual forbs (e.g. diffuse knapweed, Scotch thistle, yellow starthistle), perennial forbs (e.g. Canada thistle, Russian thistle, leafy spurge, white top), and woody plants (e.g. Russian olive, tamarisk). A full complement of native plants (e.g. sagebrush, bitterbrush, numerous grasses and forbs) have coevolved with and provide habitat for native and domesticated animal species, while providing broad ecological services, such as stabilizing soil against erosion.

Biological soil crusts, also known as cryptogamic, microbiotic, cryptobiotic, and microphytic crusts, occur within the proposed suppression area. Biological soil crusts are formed by living organisms and their by-products, creating a crust of soil particles bound together by organic materials. Crusts are predominantly composed of cyanobacteria (formerly blue-green algae), green and brown algae, mosses, and lichens. Liverworts, fungi, and bacteria can also be important components. Crusts contribute to various functions in the environment. Because they are concentrated in the top four millimeters of soil, they primarily affect processes that occur at the land surface or soil-air interface. These include stabilizing soil against erosion, fixing atmospheric nitrogen, providing nutrients to plants, and improving soil-plant-water relations, infiltration, seedling germination, and plant growth.

Finally, sundry other organisms (e.g. fungi and fungus-like organisms, algae and lichens, non-vascular plants, earthworms and other annelids, both terrestrial and aquatic microorganisms) are often less visible in rangelands of western Montana but are nonetheless present and contribute to these ecosystems in various ways.

Section 7 of the Endangered Species Act (ESA) and its implementing regulations require Federal agencies to ensure their actions are not likely to jeopardize the continued existence of listed threatened or endangered species or result in the destruction or adverse modification of critical habitat. Within the area under consideration by this EA there are 18 federally listed species including the Black-footed Ferret, Whooping Crane, Pallid Sturgeon, White Sturgeon, Grizzly Bear, Piping Plover, Ute Ladies'-tresses, Bull Trout, Canada Lynx, Spalding's Catchfly, Yellow-Billed cuckoo, Red Knot, Northern Long-eared Bat, Meltwater Lednian Stonefly, Western Glacier Stonefly, and Whitebark Pine, although not all occur within or near potential grasshopper suppression areas.

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 submitted a programmatic biological assessment for grasshopper suppression in the 17-state program area and requested consultation with USFWS on March 9, 2015. In November 2023 APHIS revised the biological assessment to address USFWS comments and include species that had been listed since 2015. USFWS concurred with APHIS'

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determination the grasshopper program would have no effect or was not likely to adversely affect listed species and the critical habitat on March 21, 2024. USFWS stated:

> "As a result of the APHIS program conservation measures such as use of the buffer distances discussed above for all taxonomic groups and their designated critical habitats, as applicable, along with the reduced application rates as compared to label rates for each insecticide, and RAAT treatment procedures, any risk of exposure associated with the application of the three insecticides used under the APHIS grasshopper and Mormon cricket suppression program is expected to be minimal. Thus, any direct or indirect effects from the proposed action to listed species and their designated critical habitats are expected to be insignificant due to program conservation measures."

APHIS will also continue to consult with USFWS field offices at the local level to ensure listed species habitats are properly buffered during grasshopper suppression treatments.

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

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

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

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

APHIS staff contacted local USFWS staff twice during December 2024 and February 2025 regarding their preferences for consulting on the 2025 Rangeland Grasshopper and Mormon Cricket Suppression Program Biological Assessment for Montana and to ask some clarifying questions regarding NEPA and ESA. In short, local USFWS staff directed PPQ Montana to rely on the National Programmatic Consultation unless PPQ Montana thought aspects of the program would be outside what is covered in that consultation, which is not the case. PPQ Montana will opt to follow guidance from National Programmatic Consultation. Please see Appendix C for correspondence between Montana PPQ and Montana USFWS personnel.

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

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

The Bald and Golden Eagle Protection Act (16 U.S.C. 668–668c) prohibits anyone, without a permit issued by the Secretary of the Interior, from "taking" bald eagles, including their parts, nests, or eggs. During the breeding season, bald eagles are sensitive to a variety of human activities. Grasshopper management activities could cause disturbance of nesting eagles, depending on the duration, noise levels, extent of the area affected by the activity, prior experiences that eagles have with humans, and tolerance of the individual nesting pair. However, rangeland grasshopper suppression treatments occur during the late spring or early summer, after the nesting season when eagle young typically will have already fledged. The program also recognizes disruptive activities in or near eagle foraging areas can interfere with bald eagle feeding, reducing chances of survival. Program operational procedures that prevent applications near water bodies will reduce the possibility of disturbing eagle foraging activities. USFWS has provided recommendations for avoiding disturbance at foraging areas and communal roost sites that are applicable to grasshopper management programs (USFWS, 2007).

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

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.

There is special concern about the role of grasshoppers as a food source for some bird species in rangeland habitats (see Species of Concern List in Appendix D) in areas considered under this EA Grasshopper suppression programs reduce grasshoppers and at least some other insects in the treatment area that can be a food item for some of those species, including sage grouse chicks, however grasshopper suppression programs do not completely eradicate grasshopper populations in a treatment area. 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, ideally less than eight grasshoppers per square yard. Should grasshoppers be unavailable in small, localized areas, sage grouse chicks may consume other insects, which those species including 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, and rangeland areas are less susceptible to invasive plants that may be undesirable for sage grouse and other species habitat.

On January 23, 2025, grasshopper program staff met with employees of the Sage Grouse Habitat Conservation Program, part of the Montana Department of Natural Resources and Conservation. APHIS provided specific details of how the program works, the pesticides used and their modes of action, RAATs, and other protective measures put in place regarding sensitive sites and species of concern.

After explaining program specifics, Sage Grouse Program staff communicated that they were not concerned about a lack of grasshoppers as a food source because of suppression programs, or pesticide application impacting sage grouse in these habitats. However, they did express concern about the potential of aircraft disturbance to sage grouse leks. Sage Grouse Program staff also communicated that while the grasshopper program is exempt from mitigation requirements per Montana Executive Order 12-2015, APHIS is still required to consult locally on any potential treatment programs in sage grouse habitat. This will be accomplished by uploading treatment area shapefiles to the program's 'Sage Grouse Project Web Application'. Treatment areas will then be reviewed by Sage Grouse Program staff to identify areas that contain sage grouse leks. If any leks of substantial size reside in treatment areas, the program will request that APHIS implement a 100-foot buffer around the center of the ¼ mile diameter lek sites to minimize aircraft disturbance and to prevent flushing. Sage Grouse Program staff will also submit a letter to APHIS summarizing these requests in potential treatment areas.

APHIS works closely the CSKT Lands Department throughout the rangeland grasshopper and Mormon cricket suppression program process. CSKT is consulted on all treatment blocks, and CSKT provides exclusions and mitigation measures based on the tribe's specific policies.

APHIS works closely BLM throughout the rangeland grasshopper and Mormon cricket suppression program process. BLM is consulted on all treatment blocks, and BLM provides exclusions and mitigation measures based on BLM specific policies.

USDA APHIS PPQ Montana has compiled a list of species of concern (SOC) that may occur within rangeland ecosystems and habitats within the counties covered under this EA.

This list of species can be viewed in Appendix D. This list was compiled using the Montana Natural Heritage Program Map Viewer platform's environmental summary tool. The tool allowed APHIS to list species of concern on a county-by-county basis, that were then filtered to include only those species that occur within rangeland habitats that could be affected by suppression programs. While aquatic habitats may occur within rangeland ecosystems, these species were not included within the SOC appendix because aquatic habitats excluded from treatment areas by 500 foot or greater protective no-spray buffers. Because of these buffers, no harmful effects are expected to be caused by suppression programs, thus aquatic species such as fish are not included in Appendix D.

Any potential effects to species of concern listed in Appendix D are evaluated on a species class level, already discussed within this EA. APHIS is not required by the State of Montana to consult on species that are not federally protected but has included this consideration and discussion of effects on SOC to ensure the completeness of our environmental analysis. Discussion of potential effects determinations to federally listed species that occur within the counties and areas covered under this EA can be referenced by PPQ's 2025 Biological Assessment for Montana and in the Final 2024 National USFWS Grasshopper Mormon Cricket Suppression Program Consultation. Local USFWS staff directed APHIS to follow the National programmatic consultation. Correspondence can be referenced in Appendix C, and the 2025 Biological Assessment for Montana is available upon request.

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

## 3. Physical Environment Components

### a) Geology and Soils

Soil is the basic component of rangeland ecosystems and is associated with nearly all processes that occur within the ecosystem. It provides a medium to support plant growth. It is also the home for many insects and microorganisms. It is a product of parent material, climate, biological factors, topography, and time. The soil formation process is slow, especially in arid and semiarid climates. It is believed to take several hundred years to replace an inch of topsoil lost by erosion. Rangeland soils, as those found in the Great Plains and Palouse Prairie, have been extensively converted to agricultural crop production. Remaining rangeland soils may be rocky, steep, salt affected, or otherwise not very productive compared to prime agricultural lands. The chemical and physical characteristics of a soil determine: its ability to furnish plant nutrients, the rate and depth of water penetration, and the amount of water the soil can hold and its availability to plants.

Western and northwestern Montana is characterized by a varied and complex geology and soil structure, reflecting a variety of landscapes, from mountainous regions to valleys. The

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geologic makeup of the region was formed by major tectonic forces and heavy glaciation events forming the mountainous terrain and major sedimentary basins including the Flathead Valley, the Bitterroot Valley, and the Missoula Valley. The soils of this region are influenced by its topography, climate, and parent materials resulting in a wide range of soil types from fertile soils in the valleys to rocky soils in the more mountainous areas. The major soil types in the region range from Inceptisols, to Mollisols, Alfisols, Spodosols, and Entisols. The major soil complexes include the Missoula Complex, the Helena Complex, The Flathead Complex, The Bitterroot Complex, and the Sandpoint-Couer d'Alene Complex. Soils in the lower elevations tend to be more fertile than the mountainous regions, thus lending support to a wide range of agricultural activities.

### b) Hydrology and Water Resources

Major water resources include, but are not limited to: Canyon Ferry Lake, Ennis Lake, Flathead Lake (the largest natural freshwater lake west of the Mississippi), Georgetown Lake, Hebgen Lake, Lake Koocanusa, Lake Mary Ronan, Lake McDonald, Lower Red Rock Lake, Quake Lake, Seeley Lake, Swan Lake, Upper Red Rock Lake, Whitefish Lake, Cabinet Gorge Reservoir, Clark Canyon Reservoir, Hungry Horse Reservoir, Kicking Horse Reservoir, Hyalite Reservoir, Lima Reservoir, Ninepipe Reservoir, Noxon Reservoir, Pablo Reservoir, Ruby River Reservoir, Willow Creek Reservoir, Beaverhead River, Big Hole River, Bitterroot River, Blackfoot River, Boulder River, Clark Fork River, Clearwater River, Flathead River, Gallatin River, Jefferson River, Jocko River, Kootenai River, Little Bitterroot River, Little Blackfoot River, Madison River, Missouri River, Red Rock River, Ruby River, Shields River, Spotted Bear River, Swan River, Thompson River, Tobacco River, Yaak River, Yellowstone River, Blacktail Deer Creek, Danaher Creek, Flint Creek, Grasshopper Creek, Nevada Creek, Rock Creek, Sixteen Mile Creek, and Swift Creek. Numerous small streams, ponds, lakes, reservoirs, seasonal streams, and stock ponds are located throughout the area.

### c) Air Quality and Climate

The climate of western and the northwestern region of Montana is characterized by significant seasonal variations in temperature and precipitation, largely influenced by the mountainous terrain that creates microclimates in some areas. The winter months are cold, and snow is common. Summer temperatures are mild to warm in the low elevations, while higher elevations experience cooler summer temperatures. The Flathead and Missoula Valleys typically receive higher average precipitation compared to the rest of the state, typically receiving 15 to 30 inches annually. The Flathead and Missoula Valleys are home to microclimates due to the mountainous terrain surrounding them, which leads to the ability to grow some agricultural commodities in the region that could not be grown elsewhere in the state. Air quality in the region is generally good due to low population densities and lack of industrial activities. Inversions in the winter, wildfires in the summer, and some agricultural activities can worsen the air quality.

## 4. Socioeconomic Issues

Rangelands are essential to western livestock producers providing forage for a variety of domesticated animals. Economic values of rangelands also include energy production sites, both fossil and renewable, and recreation sites. Two important distinctions are between market and non-market values, and between use and non-use values. Market values are associated with goods and services sold directly in a marketplace (e.g., livestock); market prices are therefore a good estimate value. Non-market values arise from goods and services that are not directly sold in a marketplace (e.g., ecosystem services). Similarly, use values arise from goods that are physically used (now or in the future), such as forage for livestock (market value) or outdoor recreation (usually a non-market value). Non-use values arise from goods that are never physically used. Non-use values, for example, include the concept of "existence value" (i.e., the value people place on simply knowing something, such as an unspoiled wilderness area, exists). Non-use values are often unrelated to any market good but are real economic values, nonetheless. Non-market and non-use values are difficult to estimate; therefore, most economic injury level estimates only consider market values and, in most cases, only the single market value for the commodity (e.g., forage) being damaged. In the case of rangeland, there are a large suite of values, both market and non-market, and use and non-use, that can be affected by pests, such as grasshoppers (Rashford et al., 2012).

Agriculture is an important part of Montana's economy. A vast majority of the land covered by this EA, and specifically within the Flathead reservation, is used primarily for agricultural purposes, either rangeland or cropland. Most of the irrigated cropland lies along river corridors and rarely are included in any APHIS treatments. Dryland cropland (non-irrigated) is intermixed with rangeland is common throughout the area. Predominant annual dryland crops are small grains with occasional pulse crops in certain areas. Dryland hay can be common with its harvested product utilized the same way as rangeland, as feed for livestock, generally during winter months. Livestock grazing of rangeland by cattle, sheep, horses and wild animals is the dominant use throughout the area. Most of the communities in this area are dependent on agriculture for the economy.

Montana ranked 2$^{nd}$, nation-wide in 2016 for certified organic acreage with 266,048 acres statewide valued at $33,650,397. Approximately 11% of this total was for cattle, the rest primarily wheat and some lentils (https://agr.mt.gov/Statistics)APHIS will only provide suppression activities when requested. Organic producers would not request to participate. PPQ Montana's questionnaire of each cooperator requests information on potential adjacent organic farm locations. APHIS contacted the Montana Department of Agriculture and the Montana Organic Association. The MDA Organic Program Manager replied, "There is no mapping of organic acres. Every producer that MTDA certifies has the TRS information listed on their organic certificate, which can be found in the USDA Organic Integrity Data Base. By using the advanced search and entering MTDA as the certifier, Montana as the state and then the county, the database will bring up a list of producers in that county." APHIS will utilize this database and the questionnaire to ensure any organic properties adjacent to requested treatment areas are appropriately buffered.

Beekeepers maintain hives to produce honey and other bee products throughout Montana. Some crops and native plants rely on pollination from bees which may nest or forage on or

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near proposed suppression areas. Beekeepers have shared stories about having to move bee yards from rangeland areas heavily infested with grasshoppers due to the lack of flowering plants. APHIS communicates directly with local beekeepers to ensures bees are moved or applications buffered around bee yards.

Much of the land in the potential suppression area is publicly owned. The US forest Service, Bureau of Land Management and the State of Montana are significant landholders but generally don't participate in USDA programs outside of the Flathead Reservation. One exception was a small *Nosema locustae* treatment in the 90s on a small parcel of BLM land in Beaverhead County. Within the Flathead Reservations, where APHIS treatments have primarily occurred, there is a mixture of private and state land, as well as land held in trust to the US Government on behalf of the Confederated Salish and Kootenai Tribes. The land use in the Western half of the reservation, where grasshoppers are more common is a mixture of rangeland and cropland.

The general public does not have access to much of the tribal/trust lands, making use unlikely. Private lands involved in any treatments have requested the assistance avoid areas during treatments on their private properties.

## 5. Cultural Resources and Events

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.

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.

APHIS asks all cooperators, if there are any areas with historical, cultural, or other significance that they'd like excluded from pesticide application. APHIS works directly with Tribes and the Bureau of Indian Affairs to determine any area with historical, cultural or other significant to be excluded from requested treatment areas. The BLM reviews all shapefiles of BLM lands that leasers request to be treated and direct APHIS on any necessary exclusions.

## 6. Special Considerations for Certain Populations

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

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

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

## *E. Environmental Consequences of the Alternatives*

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

APHIS has written human health and ecological risk assessments (HHERAs) to assess the insecticides and use patterns that are specific to the program. The risk assessments provide an in-depth technical analysis of the potential impacts of each insecticide to human health, non-target wildlife, and its environmental fate in soil, air, and water. The assessments rely on data required by USEPA for pesticide product registrations, as well as peer-reviewed and other published literature. The HHERAs are heavily referenced in the 2019 EIS and this Draft is likewise tiered to that analysis (USDA APHIS, 2019a, 2019b, 2019c, 2019d). These Environmental Documents can be found at the following website: http://www.aphis.usda.gov/plant-health/grasshopper.

Site-specific environmental consequences of the alternatives are discussed below.

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## 1. Alternative 1 - No Suppression Program Alternative

### a) Grasshopper Population Control

Under this alternative, APHIS would not conduct a program to suppress grasshoppers other than provide technical assistance and surveys to assist in the implementation of IPM strategies by land managers. When cultural or mechanical methods have failed to prevent harmful grasshopper populations Federal land management agencies, State agriculture departments, local governments, private groups or individuals, may not effectively combat outbreaks in a coordinated effort. Without the coordination that APHIS provides during grasshopper outbreaks, the land managers and owners 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).

Without APHIS' coordination and funding of grasshopper suppression programs in the area considered by this EA, the responsibility would rest with private parties, as no other federal agencies would likely be involved due to the fact that National MOU's with BLM, USFS, and BIA rely on APHIS to complete this work. Occasionally, county governments may provide reimbursement to landowners who conduct their own treatments. The most economical choice of pesticides available to private parties would be up to the land manager. APHIS discusses insecticides approved for use by the program and explains their benefits in conjunction with the RAATs approach but does not explicitly recommend specific insecticide brands to private parties. Inquiries to the Montana State University Extension and Montana Department of Agriculture Pesticide and Compliance staff indicate the following pesticides are commonly used by private parties: carbaryl, lambda-cyhalothrin, diflubenzuron, zeta-cypermethrin, and cyfluthrin. The conventions of IPM that APHIS has incorporated into our standard program procedures could be too burdensome for other agencies to observe. While the economic benefits of suppressing grasshoppers by using a RAATs method have been widely publicized, less frequent treatments by other agencies might encourage widespread complete coverage treatments to "eradicate" grasshopper populations. Adverse environmental effect particularly on nontarget species, could be much greater than under the APHIS led suppression program alternative due to lack of operational knowledge or coordination among the groups.

#### *(1) Human Health*

Human exposure and health risks could increase because of the inexperience of other agencies in planning, contracting and monitoring treatments. APHIS hygiene and safety protocols establish procedures for use of personal protection equipment and handling of hazardous chemicals. Other less experienced agencies might underestimate potential worker or bystander exposures, increasing health risks.

#### *(2) Nontarget Species*

Grasshopper treatment programs could occur with more random frequency as various agencies allocate funding when it is available. These programs would almost certainly not have the same procedures and safeguards incorporated into the APHIS program. The possibility of multiple agencies with overlapping jurisdictions could result in multiple treatments per year with the same or incompatible insecticides. This overlapping of treatments could cause synergistic chemical interactions and more severe effects to nontarget species. It is also unlikely the other agencies will be equally equipped as APHIS to incorporate guidance and species location information from USFWS. Therefore, adverse effects on protected species and their critical habitat could increase.

### *(3) Physical Environment Components*

The potential grasshopper control conducted by third parties could result in increases and a greater variety of pesticide residues in the environment. As noted previously, APHIS can only speculate which agencies and landowners will decide to control grasshoppers and what chemicals will be used. The program has also established treatment restriction buffers around water bodies to protect those features from insecticide drift and runoff. The labels for all program insecticides prohibit direct application to water (defined as reservoirs, lakes, ponds, pools left by seasonal streams, springs, wetlands, and perennial streams and rivers). APHIS maintains the following additional buffers for water bodies that are not designated critical habitat for listed aquatic species: 500-foot buffer for aerial sprays, 200-foot buffer for ground sprays, and a 50-foot buffer for bait applications (USDA APHIS, 2013). Almost certainly land management agencies and property owners would not observe the same buffers to prevent accidental spray drift to sensitive environments.

### *(4) Socioeconomic Issues*

In the absence of an APHIS administered grasshopper suppression program the cost of treatments would be paid entirely by land management agencies and landowners. Ranchers that lease land for grazing livestock might also have to pay third parties to protect rangeland forage from grasshopper outbreaks. These additional expenses would increase the cost of rangeland leases and production of livestock in general. Rural economies that depend on ranching and farming would experience increased economic hardship. The economic effects of infrequent and haphazard grasshopper treatments on rangeland forage could be similar to those described below for a scenario where no treatments occur.

### *(5) Cultural Resources and Events*

The potential grasshopper control conducted by third parties might or might not be coordinated with Tribes and other cultural or historical observance events. It is reasonable to assume Tribal interests would ensure grasshopper treatments would not interfere with events or occur in areas of cultural significance.

### *(6) Special Considerations for Certain Populations*

Grasshopper suppression programs are likely to occur in the same rural rangeland areas that are largely uninhabited.

Likewise, potential grasshopper control programs would be conducted in rural rangeland areas, where agriculture is a primary industry. These areas consist of widely scattered, single, rural dwellings in ranching communities with low population density. The other agencies and landowners might notify residents within treatment areas to reduce the potential for incidental exposure to residents including children. None the less, treatments would occur 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 APHIS grasshopper 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. Also, program insecticides are not applied while school buses are operating in the treatment area (USDA APHIS, 2016). There is a reasonable expectation that treatments conducted by third parties would also avoid spraying chemicals where children are present or congregate.

## b) No Grasshopper Population Control

Conversely, in the absence of an APHIS funded grasshopper suppression program the most likely environmental effects would result from other agencies and land managers not controlling outbreaks. As noted, grasshoppers consuming vast amounts of vegetation in rangelands and surrounding areas. Grasshoppers are generalist feeders, eating grasses and forbs first and often moving to cultivated crops. High grasshopper density of one or several species and the resulting defoliation may reach an economic threshold where the damage caused by grasshoppers exceeds the cost of controlling the grasshoppers. Researchers determined that during typical grasshopper infestation years, approximately 20% of forage on western rangeland is removed, valued at an estimated cost of $1.2 billion per year (Hewitt & Onsager, 1983; dollar amount adjusted). This value represents 32 to 63% of the total value of rangeland across the western states (Rashford et al., 2012). Other market and non-market values such as carbon sequestration, general ecosystem services, and recreational use may also be impacted by grasshopper outbreaks in rangeland.

### *(1) Human Health*

The risk of accidental exposure to insecticides would be reduced if no grasshopper control programs are implemented by APHIS or third parties. Grasshopper outbreaks could cause other health hazards including increased dust storms and road hazards.

### *(2) Nontarget Species*

Vegetation damage during serious grasshopper outbreaks may be so severe that all grasses and forbs are destroyed causing impaired plant growth for several years. Rare plants may be consumed during critical times of their development such as during seed production, and loss of important plant species, or seed production may lead to reduced biological diversity of the rangeland habitats, potentially creating opportunities for the expansion of invasive and exotic weeds (Lockwood and Latchininsky, 2000). Rangeland herbivorous wildlife would have to migrate or suffer food shortages caused by the loss of forage.

### *(3) Physical Environment Components*

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). A reduction vegetation will make steep rangeland topography more susceptible to erosion which would cause additional sediment loading in streams, rivers, and other water bodies. This would result in a decrease in water quality. Likewise, the denuded rangeland caused by poor grasshopper control would have less evapotranspiration, lower humidity, and higher daily temperature ranges. During

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windstorms the dry soil would be more likely to allow soil particles to become airborne and result in poor air quality and possibly health and other physical hazards to humans.

#### *(4) Socioeconomic Issues*

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

#### *(5) Cultural Resources and Events*

The lack of grasshopper treatments would reduce the possibility of accidental spraying by third parties of cultural resources and during activities observing cultural or historically significant events. Grasshopper outbreak populations could reduce recreational and cultural uses of rangeland. Uncontrolled grasshopper populations would make these effects more severe.

#### *(6) Special Considerations for Certain Populations*

The risk of accidental human exposure to insecticides would be reduced if no grasshopper control programs are implemented by APHIS or third parties.

As previously noted, the general public could see an increase in the cost of meat, crops, and other agricultural products. Likewise, the cost of food staples for families with children could increase.

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

### a) Carbaryl

Carbaryl is a member of the N-methyl carbamate class of insecticides, which affect the nervous system via cholinesterase inhibition. Inhibiting the enzyme acetylcholinesterase (AChE) causes nervous system signals to persist longer than normal. While these effects are desired in controlling insects, they can have undesirable impacts to non-target organisms that are exposed.

### *(1) Human Health*

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, 2017).

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

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

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

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

### *(2) Nontarget Species*

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, 2019a). However, adherence to label requirements and additional program measures designed to prevent carbaryl from reaching sensitive habitats or mitigate exposure of non-target organisms will reduce environmental effects of treatments.

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, 2019a).

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

Several field studies that assist in determining impacts of carbaryl on aquatic invertebrates and fish have been published (Relyea and Diecks, 2008; USDA FS, 2008a; NMFS, 2009) and are summarized in the 2019 EIS. The value of these studies is limited because they all had dosing levels or frequencies that are much higher than would occur 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.

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

Research from Gao et al. found that chronic exposure to Carbaryl led to several negative effects on adult bees including impacts on nesting performance, foraging ability and gut microbial community. The researchers posited the no observed adverse effect concentration (NOAEC) of the chronic toxicity test of carbaryl (5 mg/L) to *A. mellifera* larvae were much higher than the field-realistic levels as well as the residual levels detected in bee products. They designed this study to expand the risk assessment to the chronic effects of carbaryl on the transcriptional and metabolic level of *A. mellifera* larvae at the concentration where no adverse reactions were observed.

Stock solution of carbaryl was prepared by dissolving the powder in acetone and then diluted with normal components of bee diet (50% royal jelly, 2% yeast extract, 9% d-glucose, 9% d-fructose). The final concentration of 2 mg/L carbaryl was applied to the third instar larvae for four days and correspond to the no observed adverse effect concentration (NOAEC) determined in a previous study from the researchers (Yang et.al. 2019). However, they noted the carbaryl concentration on developing larvae was 48 times the maximum residual value in nectar or honey.

Carbaryl exposure at the NOAEC disrupted the transcriptional and metabolic regulatory networks of bees, even though no adverse physiological effects were observed in exposed larvae. Metabolome analysis showed that carbaryl treatment led to reduction of amino acids, accumulation of nucleic acid components, and disturbed flavonoids and fatty acids in exposed larvae which would suggest that chronic exposure to carbaryl might change internal metabolism in bee larvae (Gao et al., 2022).

Research from Novotny et al. found that pesticides that are traditionally considered contact-based and applied when flowers are unopened can reach pollen and nectar and produce measurable risk to bees. The persistence of some agrochemicals in leaves, pollen, and nectar up to a week following application merits consideration when managing pollinator-dependent crops. Novotny et al. analyzed residues of three insecticides (carbaryl, lambda-cyhalothrin, permethrin) and three fungicides (chlorothalonil, quinoxyfen, triflumizole) in pumpkin leaves, pollen, and nectar collected from five farms in the north-central United States, one day before a spray event, and one, three, and seven days after. Bees foraging on pumpkin flowers were collected one day before and one day after spraying and screened for the same pesticides. Chemical concentrations and application rates were decided by the farmer based on what a typical schedule would look like. The pumpkin seeds had a systemic treatment containing three fungicides and the neonicotinoid insecticide thiamethoxam.

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The octanol-water partition coefficient ($logK_{ow}$) is the relative concentration of a chemical in n-octanol versus water at pH 7, 20°C. Higher values of $logK_{ow}$ indicate greater lipophilicity (and a lower affinity for water). Since carbaryl has a $logK_{ow}$ value of 2.36 the chemical is less likely to adsorb and accumulate in lipid-rich plant tissues such as cuticular waxes or pollen. A chemical's ionizability is given as $pK_a$, the pH at which a chemical is 50% ionized, or in equilibrium between its undissociated and ionized state (calculated as the negative base-10 logarithm of the acid dissociation constant at 25°C). Chemicals with pKa < 7 are most likely to reach vascular tissue and mobilize systemically throughout the plant. A 'neutral' pKa indicates the chemical does not ionize under relevant plant conditions. Carbaryl does not offer systemic insecticidal protection because the chemical has a $pK_a$ of 10.4. However, carbaryl has a molecular weight of 201.2 g/mol well below 800 g/mol, the molecular weight typical of chemicals that are able to penetrate plant cuticles (University of Hertfordshire Agriculture and Environment Research Unit. Pesticide properties database (PPDB). 2024. [Cited 1 March 2024]. Available from: http://sitem.herts.ac.uk).

The researchers found foliar insecticide and fungicide spray residues were detected more frequently and in greater concentrations in pumpkin leaves than in pollen, nectar, or foraging bees and insecticide concentrations in leaves often exceeded levels of concern. However, the risk indices used to examine pollinator exposure against the levels of concern assume that a foraging bee would actually come into contact with all the chemical present on or in the leaf sample.

Carbaryl applied to foliage was present in some plant pollen and nectar samples, and in two or the 69 bee samples (male *X. pruinosa*) collected one day after a spraying event. The researchers noted the bees that tested positive (male squash bees) have life history traits that bring them into prolonged contact with sprayed crop plants. Typically, either the proportion of contaminated samples or the maximum concentration of insecticides in pumpkin tissues decreased over the week following foliar application. For example, one day after application of carbaryl spray 43% of nectar samples tested positive for the insecticide, but carbaryl was not present in nectar samples collected one week later. However, the pretreatment data suggested carbaryl residues can persist longer than a week in leaves and pollen.

Carbaryl has only moderate lipophilicity ($logK_{OW}$ = 2.4), giving it more potential to mobilize vascularly and be incorporated into developing floral tissue. Consistent with this reasoning, the researchers recorded a five-fold increase in carbaryl concentrations in pollen from the first to the third day after treatment. Carbaryl has a low molecular weight and is a very weak acid. Therefore, the chemical can cross membranes and bind with compounds in plant cells with similar pH before it reaches phloem. These properties contribute to its persistence in leaves, instead of translocation to pollen and nectar that bees eat. However, this persistence prolongs pollinator risk of exposure. The high concentrations of carbaryl in leaves during the week after foliar spray led to the highest bee risk quotient values. As previously noted, the assessments may overestimate bee toxicity from leaf contact because they assume a bee receives the entire dose of chemical present in the leaf sample (Novotny et al., 2024).

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Researchers analyzed persistence of pesticides in agroecosystems in the Emilia-Romagna region of northern Italy (Bogo et al. 2024). They investigated pesticide residue in beebread by analyzing 100 samples collected in 25 BeeNet national monitoring project stations in March and June of 2021 and 2022. They looked at the diversity and concentration of the chemicals, their correlation with land use, and the risk they posed to the bees. They calculated a toxicity-weighted concentration (TWC) of chemicals by computing the ratio between the measured concentration in beebread and the oral acute toxicity ($LD_{50}$) of that chemical for bees. For risk evaluation a risk threshold was assigned by dividing the TWC by an order of magnitude to account for chemical degradation, harmful synergistic interaction with other chemicals and chronic exposure causing sublethal effects. The risk threshold was exceeded in four beebread samples out of 100; one for carbaryl, fipronil, imidacloprid and thiamethoxam (Bogo et al. 2024).

Research from Nogrado et al. investigated the effect of carbaryl pesticides on gut microbiota of honeybees, which had come in contact with rapeseed plants (*Brassica napus*) sprayed with carbaryl wettable powder. Honeybee colonies were placed in tunnels covering an area of 70 meters squared and containing *Brassica napus*. Negative controls were sprayed with tap water (400 L/ha), while the experiments were sprayed with carbaryl (250 g a.i./ha in 400 L tap water/ha) during active flight of bees. Bees were collected from the negative control and the carbaryl-treated groups, after 2 h of exposure. The unexposed bees harbored *Alphaproteobacteria*, which were absent in the exposed bees. Microorganisms found in honeybee guts such as *Snodgrassella alvi* and *L. kullabergensis*, however, were observed only in the exposed bees, but not in the unexposed bees. The difference between the two groups was distinctly recognized when copy numbers of 16S rRNA genes were compared by quantitative PCR. The researchers noted they could not conclude decisively that the differences in the composition of the gut microbial communities from the two groups can be attributed directly to the pesticide exposure. However other researchers (Raymann et al.) have suggested that one difference between a healthy colony and a colony suffering from colony collapse disorder can be a decrease in *Alphaproteobacteria* in gut bacterial communities. Lastly, there were other bacteria that are not commonly found in the gut microbiota of honeybees could have been acquired from the environment and could be considered as opportunistic pathogens. These uncategorized bacteria were observed in more abundance in the exposed group as compared to the unexposed group. *Klebsiella* was only observed in the unexposed group, while *Cronobacter*, *Edwardsiella*, *Providencia*, *Serratia*, *Erwinia*, and *Pantoea* were observed in the exposed group. The researchers suggested the uncategorized bacteria could probably be indicative of disruption of balance of gut microbiome or disease as mentioned in previous studies in relation to dysbiosis in the presence of a potential cause like chemicals.

The researchers noted the analysis could measure endpoints of sublethal effects, but there is considerable uncertainty in how to relate to adverse effects. Furthermore, there is insufficient data to establish plausible adverse outcome pathways with consistent and reproducible linkages between molecular initiating events and key events across multiple levels of biological organization to an adverse effect at the whole organism or colony or population level (Nogrado.et.al.2019).

Laboratory studies have indicated that bees can be harmed by acute exposures to carbaryl, but the studies were at rates above those proposed in the program. The chronic exposures and effects modelled in the studies described above are unlikely to result from one-time applications conducted by the program. 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). The reduced rates of carbaryl used in the program and the implementation of application buffers should significantly reduce exposure of pollinators to carbaryl treatments for grasshopper suppression. In areas of direct application where impacts may occur, alternating swaths and reduced rates (i.e., RAATs) would reduce risk. The effects on pollinators resulting from control of rangeland grasshopper populations with carbaryl based insecticides are not expected to cause significant impacts to the human environment.

### *(3) Physical Environment Components*

Temperature, pH, light, oxygen, and the presence of microorganisms and organic material are factors that contribute to how quickly carbaryl will degrade in water. Hydrolysis, the breaking of a chemical bond with water, is the primary degradation pathway for carbaryl at pH 7 and above. In natural water, carbaryl is expected to degrade faster than in laboratory settings due to the presence of microorganisms. The half-lives of carbaryl in natural waters varied between 0.3 to 4.7 days (Stanley and Trial, 1980; Bonderenko et al., 2004). Degradation in the latter study was temperature dependent with shorter half-lives at higher temperatures. Aerobic aquatic metabolism of carbaryl reported half-life ranged of 4.9 to 8.3 days compared to anaerobic (without oxygen) aquatic metabolism range of 15.3 to 72 days (Thomson and Strachan, 1981; USEPA, 2003). Carbaryl's degradation in aerobic soil varies from rapid to slow with half-lives ranging from 4 to 253 days (USEPA, 2017). Half-lives decrease with increasing pH from acidic to alkaline conditions. Under anaerobic soil conditions, carbaryl has a half-life of 72 days. Little transport of carbaryl through runoff or leaching to groundwater is expected due to the low water solubility, moderate sorption, and rapid degradation in soils. There are no reports of carbaryl detection in groundwater, and less than 1% of granule carbaryl applied to a sloping plot was detected in runoff (Caro et al., 1974).

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

It is unlikely that carbaryl will significantly vaporize from the soil, water, or treated surfaces (Dobroski et al., 1985). Carbaryl may be found in the atmosphere within air-borne particulates or as spray drift and can react with hydroxyl radicals in the ambient atmosphere (Kao, 1994). Once in the air, carbaryl has a half-life of 1 to 4 months, however these minute amounts of carbaryl are not expected to reduce air quality. Carbaryl hydrolysis occurs quickly in natural waters with pH values of 7 or above, and the presence of microorganisms and organic material also contribute to the rapid degradation of the chemical. Adverse effects resulting from carbaryl contamination of water resources would harm aquatic organisms (described above) and would be temporary or de minimis.

### (4) Socioeconomic Issues

In addition to the environmental baseline conditions, APHIS also considers other factors such as pest population, pest life stage, pest and plant species affected, cost share with State and private landowners, and the cost benefit analysis of making a treatment. Because of the cost sharing private landowners and land managers typically would only use carbaryl to suppress rangeland grasshoppers and preserve forage for livestock. Insecticides applied using the RAATs strategy is expected to provide further economic advantages due to effective treatment at reduced costs. The economics of the RAATs strategy has been studied by both Foster et al. (2000), and Lockwood and Schell (1997). In summarizing both studies (which used various rates of insecticide below the conventional rates for suppression of rangeland grasshoppers and treated less area), the results concluded that treatment costs, under this alternative, when compared to the costs for conventional treatments for rangeland grasshopper infestations, were reduced 57 to 66% with carbaryl.

Another potential economic benefit of chemical treatment of grasshoppers is to crop growers near rangelands. Carbaryl bait treatments are sometimes used to reduce the potential for rangeland grasshoppers to move to surrounding croplands. This would result in socioeconomic benefits because losses, and therefore costs, of meat, crops, and their byproducts should be reduced. Additionally, the suppressed grasshopper populations in rangeland surrounding croplands could mean less of a need for costly chemical treatments by crop farmers at these sites.

There is the potential for organic farms adjacent to carbaryl spray applications in rangeland to control grasshopper outbreak populations. However, mitigations such as buffers are meant to protect adjacent environments from runoff and insecticide drift. These protective measures are expected to protect nearby organic farms, as well as other areas of concern, from the risk of inadvertent exposure to rangeland insecticide treatments. It is also likely the organic farms would also benefit economically from reductions in crop damage caused by grasshopper populations migrating from nearby rangeland.

The suppression of grasshopper populations with carbaryl should benefit public uses rangelands for recreational activities such as camping, fishing, hiking, and biking. The public may temporarily lose the use of rangeland during and directly after carbaryl insecticide applications. However, the preservation of vegetation is expected to benefit recreational activities in the long-term by preserving their aesthetic value. This in turn will also increase the economic value of the rangeland by preserving and improving recreational opportunities.

### (5) Cultural Resources and Events

There is the potential for impacts to cultural and historical resources if the proposed carbaryl treatments occur on or near historic trails or properties. If any proposed actions are at, or adjacent to, the site of a historic trail or property, APHIS will consult with the appropriate landowner or land management agency, the State Historic Preservation Office, any affected National Trail’s administrative office, or other appropriate agencies. Likewise, APHIS would coordinate the timing of treatments with Tribes or other cooperators to ensure carbaryl treatments would not occur during scheduled cultural events or ceremonies.

### *(6) Special Considerations for Certain Populations*

APHIS uses carbaryl insecticide treatments to suppress grasshopper populations in rural rangeland areas that are largely uninhabited. Disproportionately high and adverse human health or environmental impacts on Tribes, and historical and culturally sensitive sites in a program area are unlikely.

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. Also, program insecticides are not applied while school buses are operating in the treatment area (USDA APHIS, 2016).

APHIS' HHERA for carbaryl evaluated the potential exposure to each insecticide used in the program and risks associated with these insecticides to residents, including children. The HHERA suggest that no disproportionate risks to children, as part of the general public, are anticipated (USDA APHIS, 2019a).

## b) Chlorantraniliprole

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

### *(1) Human Health*

Chlorantraniliprole is considered practically nontoxic via oral, dermal, and inhalation exposures (DuPont, 2012; USEPA, 2008). Median lethality values (LD50) from oral and dermal exposure to the active ingredient, chlorantraniliprole, and the proposed formulation exceeded the highest concentration tested (5,000 milligrams/kilogram (mg/kg)). Inhalation toxicity is also very low for the technical material and the formulation (Vantacor®) with median lethality values exceeding the highest test concentration (5.16 mg/L, 4.0 hours exposure, dust/mist atmosphere). Available acute toxicity data suggests that the acute toxicity between the active ingredient and the formulation are comparable. Chlorantraniliprole is not considered to be carcinogenic or mutagenic and is not known to cause reproductive or developmental toxicity. The no observable effect level (NOEL) in reproductive and developmental toxicity studies was 1,000 mg/kg/day, or the highest concentration tested (USEPA, 2008). Studies designed to assess neurotoxicity and effects on the immune system show no effects at a range of doses from the low mg/kg range to greater than 1,000 mg/kg.

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

### *(2) Nontarget Species*

USDA APHIS (2019b) assessed the available literature regarding the toxicity of chlorantraniliprole to animals. In summary, the report indicates the chemical is of low toxicity to most terrestrial invertebrates, practically non-toxic to honeybees, low toxicity to fish, and is practically nontoxic to birds and mammals (USDA APHIS, 2019b). Aquatic invertebrates are more sensitive to chlorantraniliprole when compared to fish (USDA APHIS, 2019b). No reptile toxicity data appears to be available. In those cases where reptile toxicity data is not available, the avian data has been used as a surrogate to characterize sensitivity to reptiles. Chlorantraniliprole would be expected to be practically nontoxic to reptiles based on the available avian toxicity data (USDA APHIS, 2019b). The lack of toxicity in other insect groups at rates that are toxic to grasshoppers is related to the activity of chlorantraniliprole, which is primarily through ingestion. Insects such as grasshoppers and larval Coleoptera and Lepidoptera would receive a larger dose from consuming treated plant material, compared to many of the non-target pests that do not eat plants.

Toxicity to most non-target organisms is low based on available toxicity data. Acute toxicity for terrestrial wildlife such as mammals and birds is very low with median lethality values exceeding the highest concentration tested for mammals and birds, such as bobwhite quail and the mallard (USEPA, 2012b).

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

The exposure and risk to aquatic organisms from chlorantraniliprole will be negligible based on the low toxicity of the insecticide, and program restrictions regarding applications near surface water. The program currently uses a 200-foot ground and 500-foot aerial application buffer from surface water. Using standardized drift modeling at the highest application rate proposed in this study results in shallow water residues of chlorantraniliprole that are approximately ten-fold below the most sensitive sublethal endpoint for aquatic invertebrates (USDA APHIS, 2019b). Residue values were also approximately ten-fold below the most sensitive acute toxicity value for aquatic vertebrates and four orders of magnitude below the acute toxicity values for fish.

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

A researcher examined the effects of four- and 72-hour chlorantraniliprole oral exposures for both technical grade active ingredient and three formulations. After 24 hours, uncoordinated movement, lethargy, and trembling was observed in bees provided the highest treatments of technical-grade and formulated chlorantraniliprole for four hours. Although these intoxication symptoms subsided by 48 hours, bees exposed for 72 hours displayed the same symptomologies for the duration of the experiment (i.e., 30 days).

Bees receiving a more field-relevant short-term exposure of Chlorantraniliprole survived and moved similarly to untreated bees, reiterating the relative safety of chlorantraniliprole exposure to adult honeybees at recommended label concentrations. A 4-hour treatment of technical-grade and formulated Chlorantraniliprole did not significantly affect the 30-day survivorship, although significantly higher mortality was observed after 30 days for bees receiving a 72-hour treatment of technical-grade Chlorantraniliprole and two formulated products. The locomotion activity, or total walking distance, of bees receiving a 4-hour treatment of one Chlorantraniliprole formulation was significantly reduced, with these individuals recovering their normal locomotion activity at 48-hour post exposure. Conversely, there was observed lethargic behavior and significantly reduced walking distances for bees provided with a 72-hour treatment of technical-grade Chlorantraniliprole and each formulated product.

The survivorship was not significantly reduced for bees exposed to chlorantraniliprole for four hours compared to the control groups. The researcher observed a significant reduction in survivorship for bees provided the 72-hour treatment of technical grade and two formulated chlorantraniliprole products when compared to the untreated bees. However, a $LC_{50}$ was not estimated for technical-grade chlorantraniliprole or the tested formulations at the label concentration due to the low mortality observed (Williams, 2020).

Researchers investigate the effects of chlorantraniliprole using a worst-case exposure model on bumblebee (*B. terrestris*) colonies under semi-field conditions in *Phacelia tanacetifolia*. The *P. tanacetifolia* crop was grown in soil treated with modelled worst-case 20-year plateau concentration of chlorantraniliprole in the top 20 cm of soil (equivalent to 0.088 mg a.s./kg). Additionally, two chlorantraniliprole spray applications at 60 g a.s./ha were made. Dinter et al. found no effects on queen and drone production or adult and larval mortality. There were not statistically significant decreases between the control and two chlorantraniliprole groups in flight activity, weight, mortality, and number of young queen and males.

Researchers determined that chlorantraniliprole caused chronic effects on queen larvae, and these effects are positively correlated with pesticide doses (He et al., 2024). The researchers found that queen larvae began to show reduced capping and emergence rates when exposed to 2 ng/larva of chlorantraniliprole. The differences were significant at 10 ng/larva; at 20 ng/larva queen capping and emergence rates were the lowest, and larva exhibited higher mortality at five days. There were significant reductions in larval hormone level. Queen larvae were exposed to these concentrations through dietary exposure (i.e., contaminated brood food of beebread or royal jelly) for six days.

The researchers noted that accurate concentrations of chlorantraniliprole in brood food (beebread or royal jelly) offered to larvae inside the hive during field exposure has not yet been determined. This can be attributed to chemical decomposition of pesticide molecules over time, and the individual bee organisms producing brood food are also capable of detoxification (Ardalani et al., 2021). Other researchers have proposed that detoxification of xenobiotic compounds among eusocial honeybees may be complemented by a “social detoxification system”, which includes colony food processing via microbial fermentation, dilution by pollen mixing, and worker discrimination (Berenbaum and Johnson, 2015).

According to Shankar and Mukhtar, chlorantraniliprole applications to control *H. armigera* on sunflower also reduced pollinator foraging visits, up to ten days after treatment. However, it also drastically reduced the floral visitation of pollinators. The study in Jammu, India showed Hymenoptera accounted for 89% of the total pollinators visiting sunflower crops followed by Lepidoptera and Diptera which covered 10% and 1% of the total foraging pollinators, respectively (Shankar and Mukhtar, 2023).

Haas et al. found a synergistic relationship between chlorantraniliprole and propioconazole (a triazole fungicide) in acute contact toxicity in honeybees. This study was centered around California almond production, an industry that regularly use both fungicides and insecticides. Pretreatment of honeybees with propiconazole in laboratory bioassays one hour prior to insecticide application significantly increased the acute contact toxicity of chlorantraniliprole, thus confirming a previously reported synergism. While topical application of 2 µg/bee and 0.2 µg/bee chlorantraniliprole alone resulted in mortality of <15% (in accordance with the reported $LD_{50}$ of >4 µg/bee[5]), honeybee pretreatment with 10 µg/bee propiconazole significantly increased the mortality at the same chlorantraniliprole exposure levels.

The low treatment rates and low acute toxicity of chlorantraniliprole to Hymenoptera should reduce any potential harmful effects of exposure of most pollinators during treatments for grasshopper suppression. Any potential chronic or synergistic effects are not expected to be significant because grasshopper infestations are treated once per year and overlap with other pesticide applications are unlikely. In areas of direct application where impacts may occur, alternating swaths and reduced rates (i.e., RAATs) would reduce risk to nontarget insects. The effects on pollinators resulting from control of rangeland grasshopper populations with chlorantraniliprole are not expected to cause significant impacts to the human environment.

Exposure and risk to terrestrial vertebrates that may consume treated plant material or insects in the proposed spray blocks will be negligible. USEPA acute and chronic direct risk exposure models to this group of non-target organisms from treated plant material and insects at maximum Vantacor® rates showed that residues were at least two orders of magnitude below the NOELs for various sized birds and mammals (USDA APHIS, 2015). A potential indirect effect of chlorantraniliprole applications is loss of habitat or food items. The selective nature of chlorantraniliprole to certain insect taxa and the low application rates suggests that impacts to all terrestrial invertebrates would not be anticipated. Indirect risk to terrestrial vertebrate wildlife is also not anticipated based on the selectivity of chlorantraniliprole to certain insect taxa, survival and recovery of chlorantraniliprole effected prey in untreated swaths (i.e., RAATs) and from outside treatment blocks. The potential for terrestrial indirect effects to amphibians and reptiles is also expected to be minimal. Chlorantraniliprole is not phytotoxic; therefore, risk to terrestrial wildlife habitat is minimal.

Aquatic habitat would consist of aquatic plants while aquatic food items would consist of algae, aquatic invertebrates, and small fish. To better understand the potential indirect effects of these applications, chlorantraniliprole levels were compared to the available chlorantraniliprole effects data for aquatic plants, invertebrates and fish (USDA APHIS, 2019b). Indirect risk to amphibians is expected to be minimal because expected residues do not exceed any effect endpoint for aquatic plants, invertebrates, or fish.

### *(3) Physical Environment Components*

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

### *(4) Socioeconomic Issues*

In addition to the environmental baseline conditions, APHIS also considers other factors such as pest population, pest life stage, pest and plant species affected, cost share with State and private landowners, and the cost benefit estimate of making a treatment. Because of the cost sharing private landowners and land managers typically would only use chlorantraniliprole to suppress rangeland grasshoppers and preserve forage for livestock. Insecticides applied using the RAATs strategy is expected to provide further economic advantages due to effective treatment at reduced costs.

Another potential economic benefit of chemical treatment of grasshoppers is to crop growers near rangelands. This would result in socioeconomic benefits because losses, and therefore costs, of meat, crops, and their byproducts should be reduced. Additionally, the suppressed grasshopper populations in rangeland surrounding croplands could mean less of a need for costly chemical treatments by crop farmers at these sites.

There is the potential for organic farms adjacent to chlorantraniliprole treatments in rangeland to control grasshopper outbreak populations. However, mitigations such as buffers are meant to protect adjacent environments from runoff and insecticide drift. These protective measures are expected to protect nearby organic farms, as well as other areas of concern, from the risk of inadvertent exposure to rangeland insecticide treatments. It is also likely the organic farms would also benefit economically from reductions in crop damage caused by grasshopper populations migrating from nearby rangeland.

The suppression of grasshopper populations with chlorantraniliprole should benefit public uses rangelands for recreational activities such as camping, fishing, hiking, and biking. The public may temporarily lose the use of rangeland during and directly after chlorantraniliprole insecticide applications. However, the preservation of vegetation is expected to benefit recreational activities in the long-term by preserving their aesthetic value. This in turn will also increase the economic value of the rangeland by preserving and improving recreational opportunities.

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#### *(1) Cultural Resources and Events*

There is the potential for impacts to cultural and historical resources if the proposed chlorantraniliprole treatments occur on or near historic trails or properties. If any proposed actions are at, or adjacent to, the site of a historic trail or property, APHIS will consult with the appropriate landowner or land management agency, the State Historic Preservation Office, any affected National Trail's administrative office, or other appropriate agencies. Likewise, APHIS would coordinate the timing of treatments with Tribes or other cooperators to ensure insecticide applications would not occur during scheduled cultural events or ceremonies.

#### *(2) Special Considerations for Certain Populations*

APHIS uses chlorantraniliprole insecticide treatments to suppress grasshopper populations in rural rangeland areas that are largely uninhabited. Disproportionately high and adverse human health or environmental impacts on Tribes, and historical and culturally sensitive sites in a program area are unlikely.

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. Also, program insecticides are not applied while school buses are operating in the treatment area (USDA APHIS, 2016).

APHIS' HHERA for chlorantraniliprole evaluated the potential exposure to each insecticide used in the program and risks associated with these insecticides to residents, including children. The HHERA suggest that no disproportionate risks to children, as part of the general public, are anticipated (USDA APHIS, 2019b).

### c) Diflubenzuron

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

#### *(1) Human Health*

Adverse human health effects from ground or aerial ULV applications of diflubenzuron to control grasshoppers are not expected based on the chemical's low acute toxicity and low potential for human exposure. Diflubenzuron has low acute dermal toxicity in rabbits and very low acute oral and inhalation toxicities in rats (USEPA, 2015b). 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).

The proposed use of diflubenzuron and adherence to label requirements substantially reduces the potential for exposure to humans and the environment. Program workers are the most likely to be exposed by program applications of diflubenzuron. APHIS does not expect adverse health risks to workers based on low potential for exposure to diflubenzuron when applied according to label directions and use of personal protective equipment (PPE) during applications (e.g., long sleeve shirt and pants, chemical-resistant gloves). APHIS quantified the potential risks associated with accidental exposure of diflubenzuron for workers during mixing, loading, and application based on proposed program uses. The quantitative risk evaluation results indicate no concerns for adverse health risk for program workers (USDA APHIS, 2019b).

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.

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. APHIS treatments are conducted in rural rangeland areas consisting of widely scattered, single, rural dwellings in ranching communities, where agriculture is a primary industry. Applications are not made to farm buildings or homes. Program measures beyond those on the label require application buffers from structures as well as aquatic areas reducing the potential for exposure to the public from direct exposure due to drift and from drinking water sources. The quantitative risk evaluation results indicate no concerns for adverse health risk for humans (USDA APHIS, 2019c).

#### *(2) Nontarget Species*

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 methemoglobinemia. Minimal direct risk to amphibians and reptiles is expected, although there is some uncertainty due to lack of information (USDA APHIS, 2019c; USEPA, 2018).

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

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

Indirect risk to fish species can be defined as a loss of habitat or prey base that provides food and shelter for fish populations; however, these impacts are not expected based on the available fish and invertebrate toxicity data (USDA APHIS, 2019c). 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, 2019c). Deakle and Bradley (1982) measured the effects of four diflubenzuron applications on predators of *Heliothis* spp. at a rate of 0.06 lb. a.i./ac and found no effects on several predator groups. This supported earlier studies by Keever et al. (1977) that demonstrated no effects on the arthropod predator community after multiple applications of diflubenzuron in cotton fields. Grasshopper integrated pest management (IPM) field studies have shown diflubenzuron to have a minimal impact on ants, spiders, predatory beetles, and scavenger beetles. There was no significant reduction in populations of these species from seven to 76 days after treatment. Although ant populations exhibited declines of up to 50 percent, these reductions were temporary, and population recovery was described as immediate (Catangui et al., 1996).

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

For example, in the Mommaerts et al. study researchers exposed bees via a contact application of 288 mg/L aqueous concentration which was topically applied to the dorsal thorax of each worker with a micropipette. Bumblebees also ingested orally sugar/water treated with the same concentration of diflubenzuron solution over a period of 11 weeks. Pollen was sprayed with the same concentration of diflubenzuron until saturation and then supplied to the nests. The bumble bees were not restricted in how much of these contaminated solutions they could consume. The researchers estimated mean LC50 concentrations based on the chronic exposure routes described above. These were 25 mg a.i/L dermal contact, 0.32 mg a.i/L ingested sugar-water, and 0.95 mg a.i/L pollen. The researchers noted, "In practice, bumblebees will rarely be exposed to such high concentrations," and elaborated, "it is necessary that the laboratory-based results are validated with risk assessments for these insecticides in field related conditions."

APHIS believes conversion and comparison of program applied foliar spray rates to the concentrations of the solutions applied in this study would rely on unrealistic exposure scenarios. An exposure scenario where pollinators are exposed continuously for 11-weeks is not expected to occur in the APHIS grasshopper and Mormon cricket suppression program. In field applications diflubenzuron levels would decline over the 11-week exposure period due to degradation, flowering plants that have diflubenzuron residues would no longer be available for foraging by pollinators as flowers naturally die and do not provide pollen and nectar, and other plants would bloom after application without residues of diflubenzuron.

Diflubenzuron has been associated with several potentially harmful effects on bees, even when mortality was not recorded. Research from Camp et al. used Eastern bumble bee (*Bombus impatiens*) as surrogates to measure the effect that diflubenzuron has on bee behavior. Diflubenzuron (0.1, 1, 10, 100, 1,000 µg/liter) was formulated as an emulsion of the sugar syrup with 0.5% (v/v) Honey-B-Healthy and 1% (v/v) acetone and was delivered in syrup feeders. Drone production was reduced in a concentration-dependent manner and the 42-d $IC_{50}$ (half-maximal inhibitory concentration) was calculated by Camp et al. to be 28.61 µg/liter diflubenzuron. They found that diflubenzuron delivered via dietary exposure of sucrose was associated with decreased pollen consumption and decreased drone production in bumble bee without there being a significant increase in adult mortalities (Camp et al., 2020).

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However, the tested solutions of diflubenzuron in the supplied syrup and pollen are greater than the range of the pesticide applied during grasshopper suppression treatments. Diflubenzuron is applied once per year to foliar vegetation and only a miniscule proportion would be to flowers with nectar and pollen. In this experiment the bumble bees were fed syrup and pollen with fresh doses of diflubenzuron three times per week. The same difficulty of applying this study's findings to real field exposures, as is also the case with Mommaerts et.al., 2006, is described above.

Research from Krueger et al. showed that while diflubenzuron exposure didn't impact bumble bee worker survival, the exposure did result in a significant decrease in drone emergence that is indicative of a greater sensitivity to diflubenzuron in the immature life stage. Microcolonies exposed to 10 mg diflubenzuron/kg pollen (i.e. the pollen was contaminated with 10 parts per million of diflubenzuron) produced fewer adult drones despite no effects on worker survival (Krueger et al., 2021).

A researcher found that exposure to diflubenzuron in a 10 ppm sucrose solution resulted had significant effect on the number of larvae successfully eclosing from eggs three days after collection. The researcher posited that bee embryos with poorly formed cuticle could initiate egg eclosion and perhaps complete it, though the survivorship of the resultant larvae would likely be compromised. The results she reported for diflubenzuron suggest that the larval cuticle was not developed, resulting in mortality before or during the hatching process, and that many of the larvae observed to have hatched may not have survived to the later instar stages. Although the doses examined in this work may be high relative to what has been found inside of honey bee colonies, the exposure did not have an observable effect on egg production. However, successful hatching rates were significantly decreased in response to diflubenzuron, a chitin synthesis inhibitor (Fine 2020).

Further investigations examined two-generational effects to diflubenzuron administered at 1 ppm through the workers' diet, thus exposing queens indirectly in a manner similar to what might occur in the field (Fine et al., 2023). The researchers tracked queen performance and worker responses to queens, then the performance of the exposed queens' offspring was assessed to identify patterns that may contribute to the long-term health and stability of a social insect colony.

None of the treatments had a significant effect on the total number of eggs laid. Treated worker diets had no effect on retinue response. No differences were detected between treatment groups in the consumption of pollen supplement. Treatment had no effect on worker survival (Kaplan Meier, chi-squared = 3.1, $p = 0.5$), and over the two-week monitoring period, mortality rates remained below 3.2% on average across all groups. No difference was detected between treatment groups in queen weight change. Major royal jelly protein-1, MRJP-3, vitellogenin, and vitellogenin precursor proteins were among those quantified, but their abundances were not different with respect to the control queens. The researchers investigated global patterns of differential protein abundance between exposure groups and found no proteins in the diflubenzuron group were significantly altered.

Receiving care from maternally exposed workers did not have an effect on the laying rates of new queens or their total eggs produced. Receiving care from maternally exposed workers did not affect the egg hatching rate of eggs laid by new queens or rate of adult eclosions relative to controls. Treatment also had no effect on worker pollen consumption, queen weight change, or weight at adult eclosion. However, treatment had a significant effect on the timing of adult eclosion. Maternal exposure to diflubenzuron and methoxyfenozide resulted in significantly longer average time to adult eclosion relative to maternal exposure to pyriproxyfen or the control group. Maternal pesticide treatment had no effect on worker survival and over the two-week monitoring period, mortality rates remained below 1.7% on average across all groups, and no queen death was observed.

Researchers examined synergistic toxicity of common insecticides and fungicides in California almond orchards. Synergistic toxicity is the toxicity of a chemical combination that is greater than that predicted from studies of isolated chemical constituents. Young worker larvae were fed diets contaminated with 2.28 µg diflubenzuron per larva and a fungicidal dose to achieve comparable concentration ratios simulating a tank-mix at the maximum label rate. Diflubenzuron cause significantly reduced adult emergence as measured by larval mortality, but no synergistic effect was observed when combined with fungicides (Wade et al., 2019).

During June 2024 the USDA Agricultural Research Service (ARS) collected 58 plant tissue samples from flowers within a grasshopper treatment area in Prairie County, Montana. The samples were sent to the USDA Agricultural Marketing Service – National Science Laboratory for analysis to determine the concentration of diflubenzuron residue both 24 hours and 14 days after the application. Nine pretreatment flower tissue samples were accidentally collected before the insecticide application because of miscommunication between the PPQ program manager, the ARS field technician, and the pilot. The program uses the RAATs method where spray and no-spray swaths are alternated. However, deposition of insecticide within the spray and no-spray swaths is variable because of changes in wind direction and speed, as well as the application height which is dictated by topography and other hazards. Of the 25 flower samples collected 24 hours after the treatment, 14 did not have detectable amounts of diflubenzuron, as was also the case with the nine pretreatment samples. The sample location coordinates, and applicator flight path software indicated only ten of these samples were collected in between spray swaths (i.e. within skip swaths). Laboratory analysis showed six samples collected within skip swaths, 24 hours after the aerial spray treatment had diflubenzuron residues. Of the 24 samples collected 14 days after the treatment, 16 did not have detectable amounts of diflubenzuron. Five of the eight samples that had diflubenzuron residues 14 days after treatment were collected in skip swaths.

Ten of the flower samples collected 24 hours after the treatment had measurable amounts of diflubenzuron that diminished in samples collected at the same location 14 days later. Laboratory analysis showed flower samples collected at five sample locations did not have detectable concentrations one day after the treatment, but did have diflubenzuron residues when samples were collected at the same or nearby locations 14 days later. Diflubenzuron residues on five flower samples collected immediately after treatment either did not attenuate significantly or had greater amounts of the chemical when more samples were collected at the same or adjacent locations 14 days later.

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To assess risk to bees from contact with the rangeland flowers and leaves while collecting pollen and nectar after foliar diflubenzuron treatments we calculated the hazard quotient (HQ). The HQ was calculated as the average concentration of diflubenzuron residues detected on plant tissue for both the samples collected 24 hours and 14 days after the treatment divided by acute contact $LD_{50}$ (Stoner and Eitzer 2013). Non-detection results were assigned a value of 0.099 parts per million (ppm), just below the limit of detection value of 0.100 ppm. Honeybee $LD_{50}$ was used as $LD_{50}$ was not consistently available for bumble and solitary bees.

HQ (24 hours) = 245 ppb (0.245 ppm) ÷ 114.8 µg diflubenzuron per bee = 2.134
HQ (14 days) = 159 ppb (0.159 ppm) ÷ 114.8 µg diflubenzuron per bee = 1.385

This analysis can be interpreted there is not a significant risk to bees using a common level of concern (LOC) of HQ > 50 (Thompson and Thorbahn 2009; Thompson 2021). Extrapolation to other pollinators by multiplying the HQ by an order of magnitude also did not indicate significant acute health risk from contact with the flowers with diflubenzuron residues.

In addition to HQ, we calculated contact Risk Quotient (RQcontact) using the BeeREX tool provided by the U.S. Environmental Protection Agency (EPA), which is intended for foliar sprays applied to crops in bloom. Risk quotient has the advantage over HQ of taking into account the amount of the contaminated substance consumed or encountered by a typical honeybee forager. The BeeREX RQcontact is calculated by comparing the chemical application rate, multiplied by a constant that represents the typical amount of chemical encountered by a honeybee forager if it flies through a cloud of spray, to the contact acute $LD_{50}$. The BeeREX RQcontact index value for 1.0 fl.oz. Dimilin/acre (0.0078125 gal. X 2.0 lb. = 0.015625 lbs./acre) = 0.000367.

To interpret risk to bees from contact with the diflubenzuron residues on flowers and plant tissues collected by USDA, the acute RQcontact value is compared to a pre-determined level of concern set to 0.4, which and is based on the historic average dose response relationship for acute toxicity studies with bees and a 10% mortality level in foragers and worker larvae. Based on calculations in the BeeREX risk model the index value of 0.000367 does not represent a significant risk to honeybees or a likely risk to other bee pollinators (USEPA 2014). Extrapolation to other pollinators by multiplying the RQ by an order of magnitude also did not indicate significant acute health risk from contact with the diflubenzuron flowers.

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

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

### *(3) Physical Environment Components*

USEPA considers diflubenzuron relatively non-persistent and immobile under normal use conditions and stable to hydrolysis and photolysis. The chemical is considered unlikely to contaminate ground water or surface water (USEPA, 1997). The vapor pressure of diflubenzuron is relatively low, as is the Henry's Law Constant value, suggesting the chemical will not volatilize readily into the atmosphere from soil, plants or water. Therefore, exposure from volatilization is expected to be minimal. Due to its low solubility (0.2 mg/L) and preferential binding to organic matter, diflubenzuron seldom persists more than a few days in water (Schaefer and Dupras, 1977). Mobility and leachability of diflubenzuron in soils is low, and residues are usually not detectable after seven days (Eisler, 2000). Aerobic aquatic half-life data in water and sediment was reported as 26.0 days (USEPA, 1997). Diflubenzuron applied to foliage remains adsorbed to leaf surfaces for several weeks with little or no absorption or translocation from plant surfaces (Eisler, 1992, 2000). Field dissipation studies in California citrus and Oregon apple orchards reported half-live values of 68.2 to 78 days (USEPA, 2018). Diflubenzuron persistence varies depending on site conditions and rangeland persistence is unfortunately not available. Diflubenzuron degradation is microbially mediated with soil aerobic half-lives much less than dissipation half-lives. Diflubenzuron treatments are expected to have minimal effects on terrestrial plants. Both laboratory and field studies demonstrate no effects using diflubenzuron over a range of application rates, and the direct risk to terrestrial plants is expected to be minimal (USDA APHIS, 2019c).

### *(4) Socioeconomic Issues*

In addition to the environmental baseline conditions, APHIS also considers other factors such as pest population, pest life stage, pest and plant species affected, cost share with State and private landowners, and the cost benefit estimate of making a treatment. Because of the cost sharing private landowners and land managers typically would only use diflubenzuron to suppress rangeland grasshoppers and preserve forage for livestock. Insecticides applied using the RAATs strategy is expected to provide further economic advantages due to effective treatment at reduced costs. The RAATs strategy reduces treatment costs to half of the costs for conventional treatments for rangeland grasshopper infestations (Foster et al., 2000, Lockwood and Schell, 1997).

Another potential economic benefit of chemical treatment of grasshoppers is to crop growers near rangelands. This would result in socioeconomic benefits because losses, and therefore costs, of meat, crops, and their byproducts should be reduced. Additionally, the suppressed grasshopper populations in rangeland surrounding croplands could mean less of a need for costly chemical treatments by crop farmers at these sites.

There is the potential for organic farms adjacent to diflubenzuron treatments in rangeland to control grasshopper outbreak populations. However, mitigations such as buffers are meant to protect adjacent environments from runoff and insecticide drift. These protective measures are expected to protect nearby organic farms, as well as other areas of concern, from the risk of inadvertent exposure to rangeland insecticide treatments. It is also likely the organic farms would also benefit economically from reductions in crop damage caused by grasshopper populations migrating from nearby rangeland.

The suppression of grasshopper populations with diflubenzuron should benefit public uses rangelands for recreational activities such as camping, fishing, hiking, and biking. The public may temporarily lose the use of rangeland during and directly after diflubenzuron insecticide applications. However, the preservation of vegetation is expected to benefit recreational activities in the long-term by preserving their aesthetic value. This in turn will also increase the economic value of the rangeland by preserving and improving recreational opportunities.

### *(5) Cultural Resources and Events*

There is the potential for impacts to cultural and historical resources if the proposed diflubenzuron treatments occur on or near historic trails or properties. If any proposed actions are at, or adjacent to, the site of a historic trail or property, APHIS will consult with the appropriate landowner or land management agency, the State Historic Preservation Office, any affected National Trail's administrative office, or other appropriate agencies. Likewise, APHIS would coordinate the timing of treatments with Tribes or other cooperators to ensure insecticide applications would not occur during scheduled cultural events or ceremonies.

### *(6) Special Considerations for Certain Populations*

APHIS uses diflubenzuron insecticide treatments to suppress grasshopper populations in rural rangeland areas that are largely uninhabited. Disproportionately high and adverse human health or environmental impacts on Tribes, and historical and culturally sensitive sites in a program area are unlikely.

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. Also, program insecticides are not applied while school buses are operating in the treatment area (USDA APHIS, 2016).

APHIS' HHERA for diflubenzuron evaluated the potential exposure to each insecticide used in the program and risks associated with these insecticides to residents, including children. The HHERA suggest that no disproportionate risks to children, as part of the general public, are anticipated (USDA APHIS, 2019c).

# IV. Conclusions

This EA examines alternatives available to APHIS when requested to suppress economically damaging outbreaks of grasshoppers. The preferred alternative includes insecticide treatments which are considered based on the site conditions. APHIS decides whether a suppression of the outbreak is warranted based on the IPM principles including an assessment of the economic injury level represented by the grasshopper populations. This EA discusses and examines the tools and strategies employed by APHIS and their potential effects on the human environment. This EA does not decide which alternative will be selected, however, all reasonable options available to the agency for dealing with grasshopper infestations have been adequately considered, including consideration of direct, indirect and cumulative environmental effects. Decisions about whether, how, and when to employ the tools and strategies discussed in the EA will be made as the need to suppress grasshopper populations at specific sites arises.

In June 2002, APHIS completed an EIS describing the agency's most effective methods of reducing the damage caused by grasshopper populations to rangeland in the western United States. During November 2019, APHIS published HHERA for the use of carbaryl, chlorantraniliprole, diflubenzuron and malathion by the program. APHIS also published an updated EIS to consolidate and incorporate the available data and analyze the environmental risk of new program tools. The risk analysis in the 2019 EIS is incorporated by reference (USDA APHIS, 2019).

This EA examined a No Action alternative, where APHIS would not conduct a program to suppress grasshoppers other than provide technical assistance and surveys to assist in the implementation of IPM strategies by land managers. Without an APHIS administered 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 coordination that APHIS provides during grasshopper outbreaks, the land managers and owners 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. Conversely, in the absence of an APHIS funded grasshopper suppression program the most likely environmental effects would result from other agencies and land managers not controlling outbreaks. As noted, grasshoppers consuming vast amounts of vegetation in rangelands and surrounding areas. Grasshoppers are generalist feeders, eating grasses and forbs first and often moving to cultivated crops.

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

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

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# Appendix A: APHIS Rangeland Grasshopper and Mormon Cricket Suppression Program FY-2025 Treatment Guidelines Version 01/09/2023

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

**General Guidelines for Grasshopper / Mormon Cricket Treatments**

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

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

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

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

5. On APHIS run suppression programs and subject to funding availability, the Federal government will bear the cost of treatment up to 100 percent on Federal and

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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.

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3. One of the following insecticides that are labeled for rangeland use can be used for a suppression treatment of grasshoppers and Mormon crickets:
   - A. Carbaryl
     - a. solid bait
     - b. ultra-low volume (ULV) spray
   - B. Diflubenzuron ULV spray
   - C. Malathion ULV spray
   - D. Chlorantraniliprole spray

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

Furthermore, provide the following buffers for water bodies:

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

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

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

7. Each aerial suppression program will have a Contracting Officer's Representative (COR) 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 include:

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A. Completion of a post-treatment report (Part C of the Project Planning and Reporting Worksheet (PPQ Form 62)

B. Providing an entry for each treatment in the PPQ Grasshopper/Mormon Cricket treatment database

C. For aerial treatments, providing copies of forms and treatment/plane data for input into the Federal Aviation Interactive Reporting System (FAIRS) by PPQ's designee

***SPECIFIC PROCEDURES FOR AERIAL APPLICATIONS***

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

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

a. Wind velocity exceeds 10 miles per hour (unless state law requires lower wind speed);

b. Rain is falling or is imminent;

c. Dew is present over large areas within the treatment block;

d. There is air turbulence that could affect the spray deposition;

e. Temperature inversions (ground temperature higher than air temperature) develop and deposition onto the ground is affected.

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

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

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

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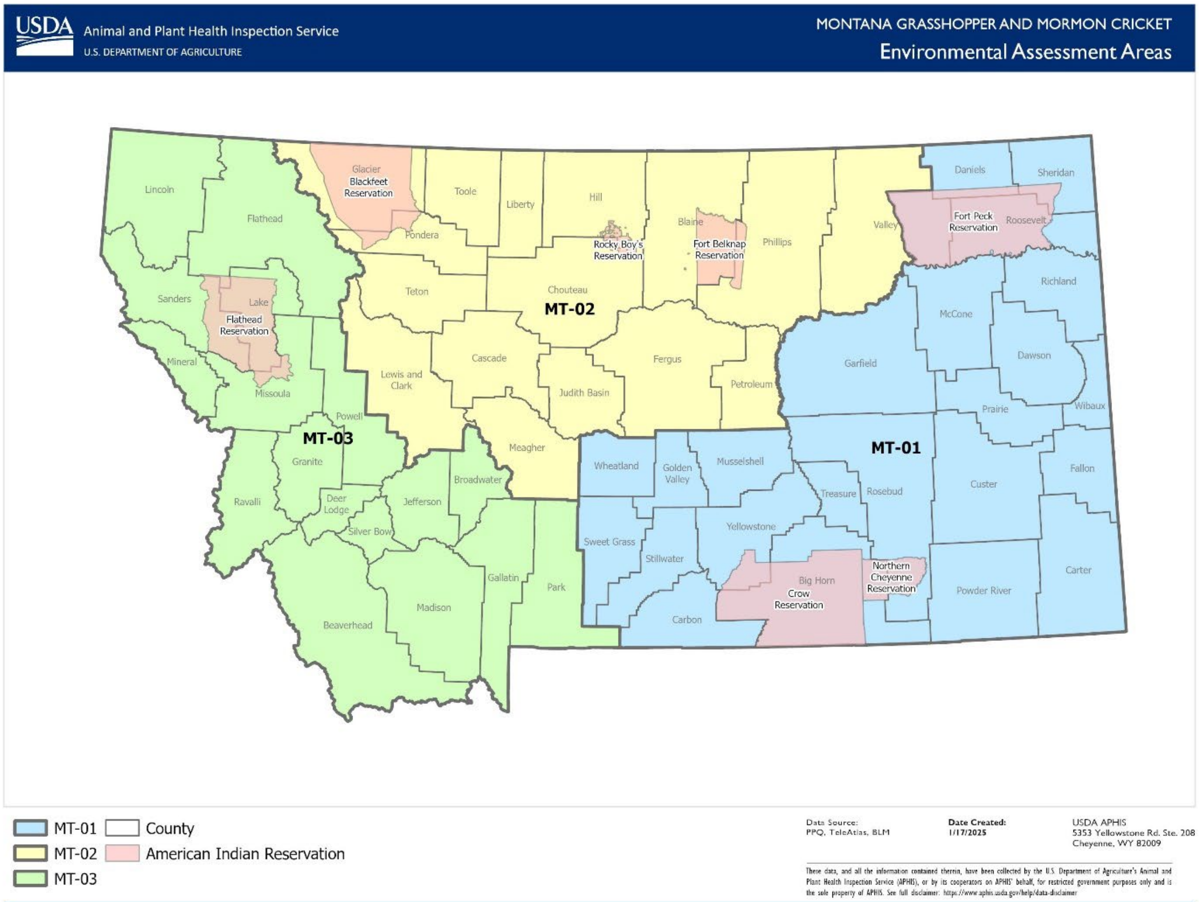
# Appendix B: Map of the Affected Environment – MT-03



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# Appendix C: FWS/NMFS Correspondence

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**Subject:** [EXTERNAL] A few questions regarding the USDA APHIS PPQ Montana 2025 Rangeland Grasshopper/Mormon Cricket Suppression Program Biological Assessment

**This email has been received from outside of DOI - Use caution before clicking on links, opening attachments, or responding.**

Hello Montana USFWS folks,

USDA APHIS PPQ in Montana is getting ready to update our 2025 Biological Assessment for our Rangeland Grasshopper/Mormon Cricket Suppression program and we have a few questions.

1. Are we (USDA APHIS PPQ Montana) to follow the National Consultation or would you still like us to consult locally with you on our Biological Assessment?

2. I have seen the news that the Monarch Butterfly is a candidate to be listed as threatened, however at this time we are not required to consult under section 7 of the ESA on that species. Despite this, do you have any guidance on that or updates to share that could be relevant to how this may impact our grasshopper suppression program in terms of drafting our BA?

3. We had a difficult time trying to communicate with USFWS staff in MT last year regarding our BA. Are there specific staff members you could recommend that we should be reaching out to about these matters?

Thanks for any info you can share with us, it is much appreciated.

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**Subject:** RE: [EXTERNAL] A few questions regarding the USDA APHIS PPQ Montana 2025 Rangeland Grasshopper/Mormon Cricket Suppression Program Biological Assessment

Hi Erik,

If your project fits into the nationwide programmatic consultation, then please use that. If there are aspects of your project that you think would be outside what is covered in the nationwide, let's discuss.

The monarch butterfly is currently proposed for listing. For a proposed species, you are only required to confer with us if you determine that your project is likely to jeopardize its continued existence. We have some standard recommended minimization measures for the species. We will track those down and share them with you in a separate message.

Similarly, please note that the western regal fritillary has been proposed for listing as threatened. This species' range in Montana is not well understood, but there are several locality records in east-central Montana; see MNHP for details. https://mtnhp.org/MapViewer/

Please send any inquiries on this project direct to me with cc to Jeff Berglund and Alan Harrington.

Thanks,

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**Cc:** Alan_Harrington@fws.gov
**Subject:** Re: [EXTERNAL] A few questions regarding the USDA APHIS PPQ Montana 2025 Rangeland Grasshopper/Mormon Cricket Suppression Program Biological Assessment

Hi Erik. Our latest (2023) monarch conservation measures are attached. Please see "For All Breeding and Migratory Zones" starting on page 5 of the attached. Thanks,

J

Jeff Berglund
Fish and Wildlife Biologist
U.S. Fish and Wildlife Service
Montana Ecological Services Office
585 Shephard Way, Suite 1
Helena, Montana 59601
***Note New Phone (Cell): 406-546-5831**

**From:** Norderud, Erik - MRP-APHIS <erik.d.norderud@usda.gov>
**Sent:** Thursday, December 19, 2024 1:55 PM
**To:** Berglund, Jeff <jeff_berglund@fws.gov>; Martin, Jacob <jacob_martin@fws.gov>
**Cc:** Harrington, Alan H <alan_harrington@fws.gov>; Adams, Gary - MRP-APHIS <gary.d.adams@usda.gov>; Witham, Lori - MRP-APHIS <lori.m.witham@usda.gov>; Macks, Kylee - MRP-APHIS <Kylee.Macks@usda.gov>; Lewis, Hannah - MRP-APHIS <Hannah.Lewis@usda.gov>
**Subject:** RE: [EXTERNAL] A few questions regarding the USDA APHIS PPQ Montana 2025 Rangeland Grasshopper/Mormon Cricket Suppression Program Biological Assessment

Thanks very much Jake and Jeff for the info. This should get us started on the right track. I was unaware of the status of the western regal fritillary, so thanks for pointing that out as well.

I'll be sure to reach out to Jake and Alan regarding any other questions we have.

We appreciate your help!

**Erik Norderud**
**Plant Health Safeguarding Specialist**
**USDA APHIS PPQ**
**1220 Cole Avenue**
**Helena, Montana 59601**
**406-594-9598 Cell**
**406-449-5210 Office**
erik.d.norderud@usda.gov

**:** Harrington, Alan H <alan_harrington@fws.gov>
**Sent:** Thursday, December 19, 2024 4:31 PM
**To:** Norderud, Erik - MRP-APHIS <erik.d.norderud@usda.gov>; Berglund, Jeff <jeff_berglund@fws.gov>;

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Martin, Jacob <jacob_martin@fws.gov>
**Cc:** Adams, Gary - MRP-APHIS <gary.d.adams@usda.gov>; Witham, Lori - MRP-APHIS <lori.m.witham@usda.gov>; Macks, Kylee - MRP-APHIS <Kylee.Macks@usda.gov>; Lewis, Hannah - MRP-APHIS <Hannah.Lewis@usda.gov>
**Subject:** RE: [EXTERNAL] A few questions regarding the USDA APHIS PPQ Montana 2025 Rangeland Grasshopper/Mormon Cricket Suppression Program Biological Assessment

Hi Erik,

Another species to keep on your radar Suckely's cuckoo bumble bee (*Bombus suckleyi*). We are currently in the 60-day public comment period after publishing a proposed rule to list the species as endangered. Attached is the associated SSA, and here is it's MTNHP profile. Most records are in central and western MT, and an observation in the NE corner of the state. Not sure how well understood the species range is in Montana.

- For *B. suckleyi*, pg. 26 discusses the preferred host species (only a few of which do not occur in Montana), pg. 41 discusses pesticide application, and pg. 51 outlines the Conservation Recommendations identified thus far.
- Western bumble bee *(Bombus occidentalis)* has been petitioned for listing (2015) and is one of the preferred hosts for B. suckleyi, but USFWS is still in the review process for this species.

Cheers,
Alan

**From:** Norderud, Erik - MRP-APHIS <erik.d.norderud@usda.gov>
**Sent:** Friday, January 31, 2025 11:17 AM
**To:** Harrington, Alan H <alan_harrington@fws.gov>; Berglund, Jeff <jeff_berglund@fws.gov>; Martin, Jacob <jacob_martin@fws.gov>
**Cc:** Witham, Lori - MRP-APHIS <lori.m.witham@usda.gov>; Macks, Kylee - MRP-APHIS <Kylee.Macks@usda.gov>
**Subject:** [EXTERNAL] RE: USDA APHIS PPQ Montana Draft Biological Assessment for the 2025 Rangeland Grasshopper and Mormon Cricket Suppression Program



Hello USFWS,

USDA APHIS PPQ Montana has finished the draft Biological Assessment for the 2025 Rangeland Grasshopper and Mormon Cricket Program. In previous correspondence you instructed us to rely

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on the National Programmatic BA unless we had any further questions. Since that last conversation, guidance on our end has directed us to send you our draft BA for local consultation anyway.

Every determination within the attached draft BA comes directly from the National Consult and Effects Determinations appendix (both attached as well). Please let us know if you have any further comments, or if you are in concurrence.

Thank you!


| | |
|---|---|
| | **Erik Norderud**<br>Plant Health Safeguarding Specialist<br>USDA APHIS PPQ<br>Helena, Montana<br>United States Department of Agriculture<br>Office 406-449-5210<br>Mobile 406-594-9598 |


**From:** Martin, Jacob <jacob_martin@fws.gov>
**Sent:** Monday, February 3, 2025 3:08 PM
**To:** Norderud, Erik - MRP-APHIS <erik.d.norderud@usda.gov>; Alan_Harrington@fws.gov; Berglund, Jeff <jeff_berglund@fws.gov>
**Cc:** Witham, Lori - MRP-APHIS <lori.m.witham@usda.gov>; Macks, Kylee - MRP-APHIS <Kylee.Macks@usda.gov>
**Subject:** RE: [EXTERNAL] RE: USDA APHIS PPQ Montana Draft Biological Assessment for the 2025 Rangeland Grasshopper and Mormon Cricket Suppression Program

Hi Erik,

Can we schedule a quick call on this (just you and me would be fine unless you want the larger group)? I'd like to better understand what in this consultation is not covered by the existing nationwide programmatic to help focus our review. Unless you think it is covered, but are getting direction to double cover it, which would also be something we should discuss.

I'm flexible on Wednesday or Friday if you have time then.

Thanks,

Jake


Jacob M. (Jake) Martin
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585 Shephard Way, Suite 1
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(406) 430-9007

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**From:** Norderud, Erik - MRP-APHIS
**Sent:** Tuesday, February 4, 2025 10:37 AM
**To:** Martin, Jacob <jacob_martin@fws.gov>; Alan_Harrington@fws.gov; Berglund, Jeff <jeff_berglund@fws.gov>
**Cc:** Witham, Lori - MRP-APHIS <lori.m.witham@usda.gov>; Macks, Kylee - MRP-APHIS <Kylee.Macks@usda.gov>
**Subject:** RE: [EXTERNAL] RE: USDA APHIS PPQ Montana Draft Biological Assessment for the 2025 Rangeland Grasshopper and Mormon Cricket Suppression Program

Hey Jake,

Yes, all effects determinations and mitigation measures came straight out of the National consultation for our Biological Assessment this year. I think this direction on our part was just to verify any other potential local-specific concerns to cover our bases. If y'all don't have any other concerns, we can probably just leave it at that.

However, this might be a good time to note that we are also currently in the process of updating our EAs for the program and have been instructed to broadly discuss non-T&E 'species of concern' in Montana. We had filtered down SOC lists from the Montana Natural Heritage Program database to include only those inhabiting rangeland for the purposes of our EA. These species are covered by discussion/analysis at a species class level in our EAs, and I'm guessing FWS doesn't have jurisdiction over non-T&E species or 'State Species of Concern' (let me know if I'm incorrect on any of that). However, we would welcome further input on proposed T&E species like the Monarch Butterfly and Western Fritillary.

Jeff had previously sent over some conservation guidance on the Monarch, which looked like it covered the western population of the species. The map on the last page details areas where will likely never have grasshopper suppression programs anyway. However, I'm curious about the eastern populations of the species, and if those conservation recommendations differ at all. From what I have read previously, Montana seems to be on the very northern edge of their breeding grounds, and looking at observation records, most of those observations have occurred after our grasshopper treatment windows (we traditionally treat starting in Mid-June and end around the 4th of July) as well. We primarily use diflubenzuron (and carbaryl, albeit rarely...only for smaller scale ground application) for our grasshopper suppression programs, which are neither neonicotinoids nor systemic pesticides. Chlorantraniliprole is another program approved pesticide, that I believe is systemic, but we have never used it and likely won't anytime soon.

This is all probably too much detail for an email, so I'll leave it at that for now. If FWS has any more input in addition to what you have already provided us regarding the Monarch Butterfly or other pollinators, or would like to discuss anything else above, we can schedule a call for tomorrow afternoon if that timeframe still works for you.

Thanks!

USDA
**Erik Norderud**
Plant Health Safeguarding Specialist

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|---|---|
| | PPQ Field Operations<br>1220 Cole Avenue<br>Helena, Montana 59601<br>United States Department of Agriculture<br>Office 406-449-5210<br>Mobile 406-594-9598 |

**Subject:** RE: [EXTERNAL] RE: USDA APHIS PPQ Montana Draft Biological Assessment for the 2025 Rangeland Grasshopper and Mormon Cricket Suppression Program

Jake,

Looks like this week got away from us. I'm going to be on annual leave on Monday and Tuesday next week, and busy most of the day on Wednesday. If you have any time to chat briefly on Thursday or Friday next week, let me know.

Thanks and have a good weekend.

| | |
|---|---|
| USDA | **Erik Norderud**<br>Plant Health Safeguarding Specialist<br>PPQ Field Operations<br>1220 Cole Avenue<br>Helena, Montana 59601<br>United States Department of Agriculture<br>Office 406-449-5210<br>Mobile 406-594-9598 |

**From:** Martin, Jacob <jacob_martin@fws.gov>
**Sent:** Friday, February 7, 2025 2:02 PM
**To:** Norderud, Erik - MRP-APHIS <erik.d.norderud@usda.gov>
**Subject:** RE: [EXTERNAL] RE: USDA APHIS PPQ Montana Draft Biological Assessment for the 2025 Rangeland Grasshopper and Mormon Cricket Suppression Program

Sorry Erik, busy week.  I could talk Thursday at 8:30-10 (preferred), 11-12, or 3:30-4:30.

Jacob M. (Jake) Martin
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`

**From:** Norderud, Erik - MRP-APHIS <erik.d.norderud@usda.gov>
**Sent:** Friday, February 7, 2025 2:13 PM
**To:** Martin, Jacob <jacob_martin@fws.gov>
**Subject:** RE: [EXTERNAL] RE: USDA APHIS PPQ Montana Draft Biological Assessment for the 2025 Rangeland Grasshopper and Mormon Cricket Suppression Program

No prob at all, totally get it. Lets chat at 9:00 on Thursday?

**Erik Norderud**
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Sounds good, thanks. I'll send you a Teams meeting and if we have trouble connecting there, give me a call

Jacob M. (Jake) Martin
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**From:** Norderud, Erik - MRP-APHIS
**To:** Witham, Lori - MRP-APHIS
**Cc:** Caraher, Kai - MRP-APHIS; Macks, Kylee - MRP-APHIS
**Subject:** 2/13/25 Call w/ Montana USFWS Summary
**Date:** Thursday, February 13, 2025 1:18:00 PM
**Attachments:** image001.png

Just a summary of my call with USFWS today regarding MT PPQ's EAs and BA, FYI:
-MT USFWS staff did not offer any additional protective measures for T&E species (or non-T&E species) outside of what is already contained in the National Programmatic BA for the GH program. We agreed that we will follow the species effect determinations and protective measures contained in that National Consultation for our EAs and BA.
-We chatted about some pollinators of concern that occur in MT (Monarch Butterfly, Western Regal Fritillary, Suckleys Cuckoo Bumblebee). I asked if they had any population distribution data regarding locations of these pollinators in the state. They thought our best bet would be using the Montana Natural Heritage Program database for occurrence data and habitat suitability and range. They emphasized that wild pollinator population distribution data is scarce or largely unknown in Montana and elsewhere. I will gather what I can from the MTNHP database and include that information in our EAs. I think some of the language on the Monarch Butterfly was going to be provided to us by one of Kai's colleagues, Andrea LeMay, at some point in the near

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future as well. They mentioned that when/if the Monarch Butterfly is listed as a T&E species (currently in Candidate status), we will need to reevaluate and focus on aspects of the timing of insecticide applications for the grasshopper program.
Let me know if any of you have questions.


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# Appendix D: List of Species of Concern within the Affected Environment

| MT Status | Species Group | Common Name | Scientific Name | Habitat | Distribution |
|---|---|---|---|---|---|
| SOC | Birds | Ferruginous Hawk | Buteo regalis | Sagebrush grassland | Migratory Summer Breeder |
| SOC | Birds | Green-tailed Towhee | Pipilo chlorurus | Shrub woodland | Migratory Summer Breeder |
| SOC | Birds | Golden Eagle | Aquila chrysaetos | Grasslands | Resident Year Round |
| SOC | Birds | Long-billed Curlew | Numenius americanus | Grasslands | Migratory Summer Breeder |
| SOC | Birds | Bobolink | Dolichonyx oryzivorus | Moist grasslands | Migratory Summer Breeder |
| SOC | Birds | Thick-billed Longspur | Rhynchophanes mccownii | Grasslands | Migratory Summer Breeder |
| SOC | Birds | Loggerhead Shrike | Lanius ludovicianus | Shrubland | Migratory Summer Breeder |
| SOC | Birds | Burrowing Owl | Athene cunicularia | Grasslands | Migratory Summer Breeder |
| SOC | Birds | Mountain Plover | Anarhynchus montanus | Grasslands | Migratory Summer Breeder |
| SOC | Birds | Sprague's Pipit | Anthus spragueii | Grasslands | Migratory Summer Breeder |
| SOC | Birds | Sage Thrasher | Oreoscoptes montanus | Sagebrush | Migratory Summer Breeder |
| SOC | Birds | Brewer's Sparrow | Spizella breweri | Sagebrush | Migratory Summer Breeder |
| SOC | Birds | Greater Sage-Grouse | Centrocercus urophasianus | Sagebrush | Resident Year Round |
| SOC | Invertebrates | Monarch | Danaus plexippus | Milkweed Milkweed | Migratory Summer Breeder |
| SOC | Invertebrates | Suckley's Cuckoo Bumble Bee | Bombus suckleyi | Montane/steppe grassland and shrubland | Resident Year Round |
| SOC | Mammals | Columbia Plateau Pocket Mouse | Perognathus parvus | Sagebrush / grassland | Resident Year Round |
| SOC | Mammals | Western Pygmy Shrew | Sorex eximius | Open conifer forest, grasslands, and shrublands, often near water | Resident Year Round |
| SOC | Mammals | Preble's Shrew | Sorex preblei | Sagebrush grassland | Resident Year Round |
| SOC | Mammals | Merriam's Shrew | Sorex merriami | Sagebrush grassland | Resident Year Round |
| SOC | Mammals | Little Brown Myotis | Myotis lucifugus | Generalist | Resident Year Round |
| SOC | Mammals | American Bison | Bos bison | Grasslands | Resident Year Round |
| SOC | Mammals | Black-tailed Prairie Dog | Cynomys ludovicianus | Grasslands | Resident Year Round |
| SOC | Mammals | Pygmy Rabbit | Sylvilagus idahoensis | Sagebrush | Resident Year Round |
| SOC | Reptiles | Greater Short-horned Lizard | Phrynosoma hernandesi | Sandy / gravelly soils | Resident Year Round |
| SOC | Reptiles | Western Skink | Plestiodon skiltonianus | Open conifer forest and adjacent grasslands | Resident Year Round |
| SOC | Vascular Plants | Hutchinsia | Hornungia procumbens | Sagebrush Steppe | Present |
| SOC | Vascular Plants | Lemhi Beardtongue | Penstemon lemhiensis | Sagebrush-grasslands | Present |
| SOC | Vascular Plants | Hooker's Balsamroot | Balsamorhiza hookeri | Sagebrush-grassland | Present |
| SOC | Vascular Plants | Sand Wildrye | Elymus flavescens | Sandy sites | Present |
| SOC | Vascular Plants | Small-flower Gymnosteris | Gymnosteris parvula | Grasslands/Sagebrush steppe | Present |
| SOC | Vascular Plants | Ballhead Ipomopsis | Ipomopsis congesta ssp. crebrifolia | Sagebrush Steppe | Present |
| SOC | Vascular Plants | Pale Evening-primrose | Oenothera pallida ssp. pallida | Sandy sites | Present |
| SOC | Vascular Plants | Low Beardtongue | Penstemon humilis | Sagebrush steppe (Montane) | Present |
| SOC | Vascular Plants | Showy Townsend-daisy | Townsendia florifer | Grasslands and Sagebrush | Present |
| SOC | Vascular Plants | Woolly-head Clover | Trifolium eriocephalum | Open areas (foothills and montane) | Present |
| SOC | Vascular Plants | Round-headed Cryptantha | Cryptantha humilis | Sagebrush Steppe (low-elevation) | Unknown |
| SOC | Vascular Plants | Platte Cinquefoil | Potentilla plattensis | Grasslands/Sagebrush (Mesic) | Present |
| SOC | Vascular Plants | Mat Buckwheat | Eriogonum caespitosum | Sagebrush steppe (Montane) | Present |
| SOC | Vascular Plants | Keeled Bladderpod | Physaria carinata | Grassland slopes (low-elevation) | Present |
| SOC | Vascular Plants | Linear-leaf Fleabane | Erigeron linearis | Sagebrush/Grasslands (Foothills to Montane) | Present |
| SOC | Vascular Plants | Railhead Milkvetch | Astragalus terminalis | Sagebrush steppe | Present |
| SOC | Vascular Plants | Chicken-sage | Sphaeromeria argentea | Sagebrush steppe (low-elevation) | Present |
| SOC | Vascular Plants | Bitterroot Milkvetch | Astragalus scaphoides | Sagebrush-grassland | Present |
| SOC | Vascular Plants | Small Onion | Allium parvum | Dry Forest-Grassland | Present |
| SOC | Vascular Plants | Fendler Cat's-eye | Cryptantha fendleri | Sandy sites | Present |
| SOC | Vascular Plants | Spiny Skeletonweed | Pleiacanthus spinosus | Grasslands (low-elevation) | Present |
| SOC | Vascular Plants | Yellow Beeplant | Cleome lutea | Sagebrush-grassland (Low-elevation) | Present |
| SOC | Vascular Plants | Wishbone Moonwort | Botrychium furculatum | Grasslands (Fescue) | Present |
| SOC | Vascular Plants | Frenchman's Bluff Moonwort | Botrychium gallicomontanum | Grasslands (Fescue) | Present |
| SOC | Vascular Plants | Small Dropseed | Sporobolus neglectus | Grasslands (low-elevation) | Present |
| SOC | Vascular Plants | Dwarf Purple Monkeyflower | Mimulus nanus | Open slopes (low-elevation) | Present |
| SOC | Vascular Plants | Small-winged Sedge | Carex stenoptila | Grasslands (Montane) | Present |
| SOC | Vascular Plants | Oregon Checker-mallow | Sidalcea oregana | Grasslands (low-elevation) | Present |
| SOC | Vascular Plants | Hollyleaf Clover | Trifolium gymnocarpon | Open areas (foothills and montane) | Present |
| SOC | Vascular Plants | Tilesius Wormwood | Artemisia tilesii | grassland, meadows | Present |
| SOC | Vascular Plants | Slender Hareleaf | Lagophylla ramosissima | Grasslands (Dry/Valley) | Present |
| SOC | Vascular Plants | Trailing Black Currant | Ribes laxiflorum | Shrublands (Rocky, montane) | Present |
| SOC | Vascular Plants | Slender Thelypody | Thelypodium sagittatum | Alkaline meadows (Valleys and Montane) | Present |
| SOC | Vascular Plants | Obscure Evening-primrose | Camissonia andina | Sandy sites | Present |
| SOC | Vascular Plants | Missoula Phlox | Phlox missoulensis | Slopes/ridges (Open, foothills to subalpine) | Present |
| SOC | Vascular Plants | Spiny Hopsage | Grayia spinosa | Shrublands (Dry) | Present |
| SOC | Vascular Plants | Small-flower Ipomopsis | Ipomopsis minutiflora | Sagebrush (Open) | Present |
| SOC | Vascular Plants | Simil Onion | Allium simillimum | Mesic Grasslands-Meadows | Present |
| SOC | Vascular Plants | Puzzling Rockcress | Sandbergia perplexa | Shrubland/woodland slopes (Open, Montane) | Present |
| SOC | Vascular Plants | Large Flowered Beardtongue | Penstemon grandiflorus | Sandy soils | Present |