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# *Draft* Environmental Assessment Rangeland Grasshopper and Mormon Cricket Suppression Program

Adam, Billings, Bowman, Dunn, Emmons, Grant, Golden Valley, Hettinger, McKenzie, Mercer, Morton, Sioux, Slope, Stark, County North Dakota

PPQ and CEQ Identification Number: ND -25-01 EAXX-005-32-24P-1748352201


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May 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 |
| ND | North Dakota |

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# *Draft* Site-Specific Environmental Assessment

## Rangeland Grasshopper and Mormon Cricket Suppression Program

Adam, Billings, Bowman, Dunn, Emmons, Grant, Golden Valley, Hettinger, McKenzie, Mercer, Morton, Sioux, Slope, Stark Counties North Dakota

# I. Need for Proposed Action

## *A. Purpose and Need Statement*

An infestation of grasshoppers or Mormon crickets may occur in the above listed counties of North Dakota (ND). 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. Besides 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.

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.

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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 1st only in areas requested for grasshopper control in these eligible counties, Adam, Billings, Bowman, Dunn, Emmons, Grant, Golden Valley, Hettinger, McKenzie, Mercer, Morton, Sioux, Slope, Stark. The historical treatment areas included areas in McKenzie, Billings, Dunn and Slope counties which is largely managed USFS grasslands. These land managers may request that some of the areas be excluded from control programs. If requested, APHIS could provide suppression assistance to any of the counties listed in the 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 on the basis of anticipated economic, environmental, and sociological consequences. The

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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):

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

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.

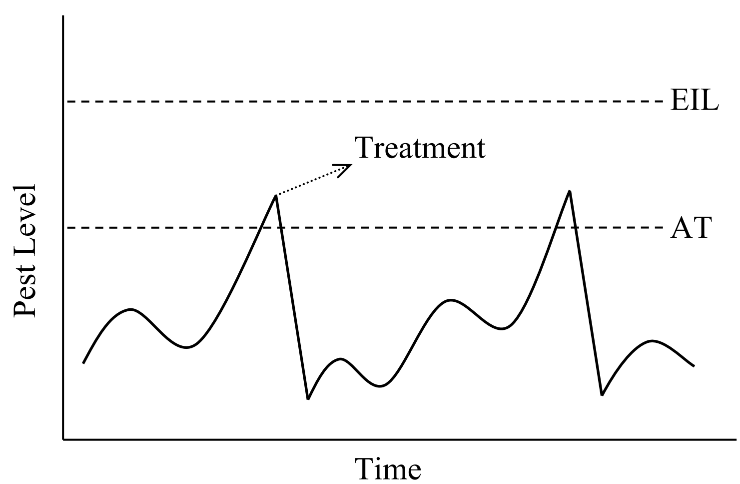


Figure 2. Diagram of the typical relationship between the economic injury level (EIL) and action threshold (AT) for applying pest treatments (Rashford et al., 2012).

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.

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 of 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 in North Dakota traditionally use integrated pest management practice to maximize the production of healthy vegetation however each land managing agencies have different missions and priorities then that of the USDA APHIS PPQ.

Bureau of Land Management (BLM) lands are managed under the principles of multiple use and sustained yield to protect natural resources and provide opportunities for recreational use, livestock grazing, timber harvest, energy development, and other uses. Because high populations of Grasshoppers and Mormon Crickets have the potential to negatively impact resources on public lands, the BLM supports cooperative and coordinated efforts for an integrated pest management approach for addressing Grasshoppers and Mormon Crickets populations.

United States Fish and Wildlife Services (FWS)as a Federal agency within the U.S. Department of the Interior, the mission of the FWS is to work with others to conserve, protect, and enhance fish, wildlife, plants, and their habitats for the continuing benefit of the American people.

The United States Forest Services (FS) is responsible for the protection and management of FS lands. Forage, timber, wildlife, recreation, wilderness, minerals and water resources are produced from these lands under the multiple-use concept. Grasshoppers and Mormon Crickets outbreaks may threaten FS resources. Any proposed response, including suppression action, must be evaluated to determine the expected impact on FS resources and those of adjacent landowners. The FS supports cooperative and coordinated efforts for an integrated pest management approach to deal with damaging Grasshoppers and Mormon cricket outbreaks.

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)).

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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.

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.

Each year beginning in mid-May we begin to collect data to assess and support grasshopper survey and control for the survey and treatment season. Based on the previous year's survey, species complex and weather data we can anticipate in what areas we may see increased grasshopper populations. Each year when survey when both nymphal and adult surveys are being conducted, we collect information on grasshopper densities, species complex, dominant specie and life stage, range condition, grazing practices, local weather patterns, national drought monitors, cattle and hay prices as well as other factors. All site-specific data helps us to anticipate if grasshopper problems are a possibility and what the interest in control might be. APHIS works cooperatively with land mangers and private individuals as we share grasshopper survey information and provide technical support. Based on interest we may host public meetings to educate producers and land managers on grasshopper control. Should control go forward all eligible land must meet the requirements identified in this document and biological assessment. Additional restrictions to the acres treated may be identified by the land manager. No treatment is conducted without a thorough review of the data that is collect during the current year as well as previous years. Baseline thresholds of eight or more grasshoppers pers square yard alone do not justify control and multiple factors as identified are considered including available program funding and determining economic injury level. In all cases we are working to determine if control, no action or supplemental forage is the most effective option to manage their populations.

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. AHPIS PPQ typically starts considering control programs in early to mid-June when grasshoppers are in their early instars. Our preferred pesticide diflubenzuron limits the formation of chitin in arthropod exoskeletons in addition to its narrow scope and reduced cost. When timed with early instars it can produce 90% to 97% grasshopper mortality in populations. If the window for the use of diflubenzuron closes, because of treatment delays then another more broad-spectrum type of pesticide such as carbaryl would be needed. APHIS PPQ will typically end the treatments around the beginning of July depending on life stage.

In the Affected Environment Section below; Section 111 Environmental Consequences, A: Description of Affected Environment, 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 the identified EA coverage area 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, and diflubenzuron 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).

In August 2024, APHIS and the FS signed a Memorandum of Understanding (MOU) detailing cooperative efforts between the two groups on suppression of grasshoppers and Mormon crickets on National Forest system lands (Document # 24-8100-0573-MU, August 16,2024). 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 FS.

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

In October January 2022, APHIS and the BLM signed a MOU detailing cooperative efforts between the two groups on suppression of grasshoppers and Mormon crickets on BLM lands (Document # 22-8100-0870-MU, January 11, 2022). This MOU clarifies that APHIS will prepare and issue to the public site-specific environmental documents that evaluate potential impacts associated with proposed measures to suppress economically damaging grasshopper and Mormon cricket populations. The MOU also states that these documents will be prepared under the APHIS NEPA implementing procedures with cooperation and input from the BLM.

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

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

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

For control to occur, APHIS PPQ needs a letter of request from all landowners involved in the treatment area. That would include all Federal, state, local, private and Tribal cooperators. If control treatments were to be warranted on any Tribal land, APHIS PPQ would need a letter need letters of request from both the BIA and Tribal Council prior to treatment.

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) regulations 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.

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- 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 North Dakota.

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 announcing as a legal notice in the Bismarck Tribune, The Dickinson Press, Minot Daily News, Mckenzie County Farmer. In addition to newspapers, the draft EA is published on the APHIS Stakeholders Registry which is accessible by the public and regulations.gov. Printed copies are also available at the PPQ North Dakota Field Office located at 3509 Miriam Avenue, Bismarck, ND 58501. 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:

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1. Alternative 1: No action alternative, which would maintain the status quo of allowing applications of three pesticides (carbaryl and diflubenzuron). 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 two pesticides (carbaryl and diflubenzuron). 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 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 regions encompassing 14 western North Dakota counties. The counties include Adam, Billings, Bowman, Dunn, Emmons, Grant, Golden Valley, Hettinger, McKenzie, Mercer, Morton, Sioux, Slope, Stark. to analyze more site-specific impacts. The EA tiers to the 2019 programmatic EIS and incorporates by reference the carbaryl, and diflubenzuron, HHERAs also published in 2019. Copies of the 2019 programmatic EIS and ROD are available for review at 3509 Miriam Avenue, Bismarck, ND 58501.These documents are also available at the Rangeland Grasshopper and Mormon Cricket Program web site, http://www.aphis.usda.gov/plant-health/grasshopper.

## *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 EA coverage area. 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 and, diflubenzuron. These chemicals have varied modes of action. Carbaryl works by inhibiting acetylcholinesterase (enzymes involved in nerve impulses). 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 considered if requested by land managers. Even so, this is an unlikely scenario due to the extra expense 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, as a result of treatment delays, then carbaryl is the remaining control option. 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 clear winged 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 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;
- 0.75 or 1.0 fluid ounce (0.012 lbs a.i./ac sprayed) of diflubenzuron; or

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), and diflubenzuron. 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

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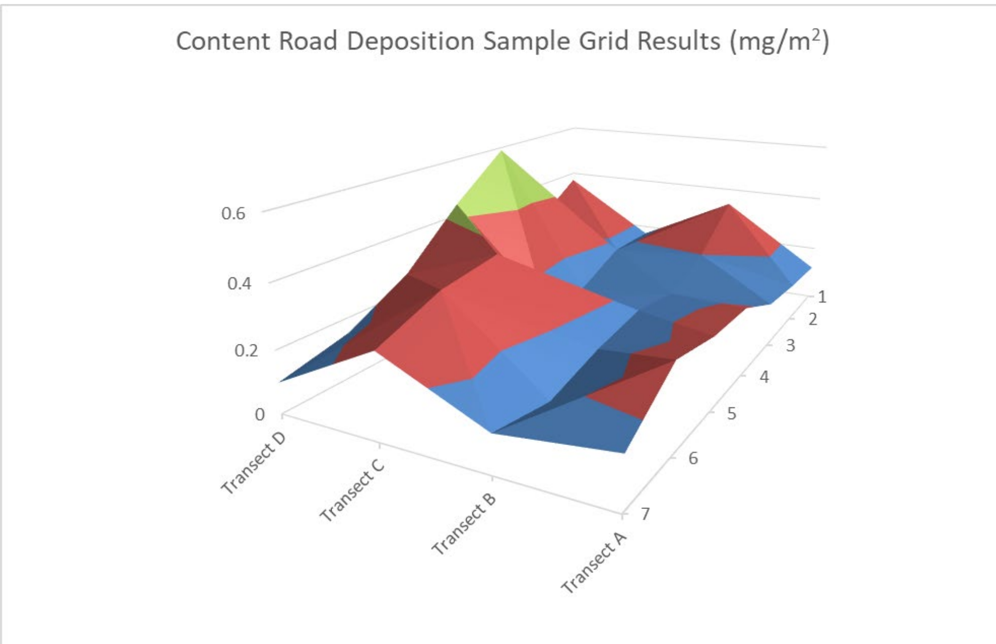
flight swaths that were sprayed to the unsprayed swaths. Shortly after the portion of the treatment block containing the dye card grid was sprayed, the program managers ceased operations for the morning because wind gusts were measured over ten miles per hour. Figure X is a graph showing the pesticide 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 1 – Diflubenzuron concentration on dye cards placed 150 feet apart in a grid**




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 this method is known as RAATs. 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 late May and 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 and have reached the economic threshold. 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 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;
- 1.0 fluid ounce (0.016 lbs a.i./ac sprayed) of diflubenzuron; or

The generalized potential environmental effects of the application of carbaryl or 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. Pesticides are regulated to utilize their benefits while protecting public health and welfare and preventing harm to the environment. Federal and state pesticide laws and regulations control the labeling. The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) is the federal law or statute that regulates the production, transportation, sale, use, and disposal of pesticides. FIFRA is administered by the U.S. Environmental Protection Agency (EPA). FIFRA provides the overall framework for the federal pesticide regulatory program.

To ensure that everyone adheres to the pesticide label, contractors participating in suppression programs must have a valid and current state of North Dakota pesticide license and pass the required exam. For APHIS personnel, an MOU is in place with the state of ND requiring that ND 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 taken a certification course and passing the exam. This is accepted in lieu of the State of ND pesticide licensing requirements. Program managers oversee the mixing and loading pesticide by contractors and monitor application rates to ensure proper calibration is maintained over the entire application process.

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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 grasshopper control programs have Trimble GPS Navigation equipment which is used to navigate and capture shapefiles of the treatment areas. All sensitive sites are buffered out of the treatment area using flagging which is highly visible to the applicator. All sensitive sites are reviewed in the daily briefing with APHIS personnel including the applicator working on the treatment site. In a control situation all sensitive sites are discussed and identified with the contractor during the daily briefings. Additional environmental monitoring is conducted to ensure correct pesticide placement. Sensitive sites are selected and dye cards that register pesticide application are placed and monitored. Water and soil samples can be taken. All label requirements are followed. On site field personnel and consistently monitoring and recording wind and temperature readings that are shared with the program manager that has communication with the contractor and can cancel or delay aerial treatments to prevent drift. Loading and reloading is monitored, and any spills are reported to the proper authorities. Both neat and mixed pesticide samples are taken and analyzed for proper mixing ratios.

# 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.

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## *A. Description of Affected Environment*

The proposed suppression program area included in the EA encompasses the proposed suppression program area included in this EA encompasses Southwestern Slope biotic/geomorphic regions encompassing 14 western and central North Dakota counties with a total acreage of 12,788,595 acres, or 19,983 square miles. The counties include Adam 632,077 ac, Billings 735,264 ac, Bowman 743,558 ac, Dunn 1,285,414 ac, Emmons 966,400 ac, Grant 1061850 ac, Golden Valley 640,5056 ac, Hettinger 724,6211 ac, McKenzie 1,766,6055 ac, Mercer 667,494 ac, Morton 1,232,813 ac, Sioux 700,218 ac, Slope 777,549 ac, Stark 854,227ac. This region exhibits general similarities in geological history, topography, soils, climate, vegetation, natural resources, wildlife, farming and ranching practices, and economy. Appendix B delimits the boundaries of the assessment area. Grasshopper populations commonly occur in economic proportions. Dominant species include *Melanoplus sanguinipes*, *Trachyrhachys kiowa*, *Ageneotettix deorum*, *Amphitornus coloradus*, *Aulocara elliotti*, *Melanoplus bivittatus*, *Eritettix simplex*, *Melanoplus femurrubrum*, and *Camnula pellucida*. As an example, the 2024 adult rangeland grasshopper population survey is illustrated in Appendix C.

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

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

The native grass vegetation consists of mixed grass prairie with typical cool and warm season plant species composition. Predominant grass species include blue gramma, needle and thread, western wheat grass, prairie June grass, smooth brome grass, and little blue stem. Crested wheat grass is a common introduced tame grass found throughout the area. Wooded draws are found throughout the western badland's areas while the natural forests ` 12 in the eastern portions are confined to bottom lands and coulees along streams and rivers, and to the stronger north- facing slopes. Cattle ranching is the dominant agricultural practice throughout the badland's areas due to the rough terrain. The small amount of tillable land is used mostly to produce forage for winter feeding of range cattle. Dryland

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farming dominates the eastern portion, producing mostly cash crops. Most farms also operate small scale ranching operations.

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

The US Forest Service administers a large amount of public land in the western portion of the assessment area. These lands are extensively used for recreation as well as cattle and oil production. These lands are intermingled with private land, State land, BLM, Corps of Engineers, and National Park Service land creating a mosaic pattern of ownership in this area. Theodore Roosevelt National Park, and other important park service properties and interpretive centers are in the assessment area as well as State parks and numerous county managed parks. Additionally, many Federal and State historic sites and Wilderness areas are located within the assessment area of approximately 12,788,595 acres.

The USFS Dakota Prairie Grasslands (DPG) make up 1.2 million acres in western North Dakota, much of which is intermingled across historical grasshopper treatment areas. In 2024 a review of rangeland acres eligible for potential grasshopper control was conducted by USFS DPG in an effort to assist producers and meet the broad land use goals for the DPG. That review based on a variety of environmental and land use factors identified the USFS DPG treatable acres in McKenzie, Billing and Slope Counties. Appendix D identifies those areas. Because of the scattered and "shot hole" nature of the eligible acres, potential grasshopper control in these areas has been dramatically reduced. There is little opportunity to conform to the generally required 10,000 of rangeland needed to meet program guidelines and conduct control. There is limited opportunity for protection programs.

The Dakota Skipper, *Hesperia dacotae* is an important endangered pollinator historically found in western North Dakota. This EA indicates that APHIS will maintain a one-mile buffer on all occupied Dakota skipper locations. Appendix E is the current identified Dakota skipper occupied habitat.

APHIS led program require large acres of contiguous rangeland acres. Our programs require that no more than 20% of the block be cropland. Many counties such as Adams, Bowman, Hettinger, Mercer and Slope have a significant amount of cropland distributed across the county. The high percentage of cropland dispersed throughout the county provides a challenge as it relates to identifying large areas of rangeland eligible for control should it be warranted.

## *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 identify areas to be 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 as well as critical habitat for T&E species.

## *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)).

Cumulative impact, as defined in the Council on Environmental Quality (CEQ) NEPA implementing regulations (40 CFR § 1508.1) "is the impact on the environment which results from the incremental impact of the action when added to the past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time."

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

Potential cumulative impacts associated with the Preferred Alternative are not expected to be significant because the program applies an insecticide application once during a treatment 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. No treatments have been conducted in North Dakota since 2012. The insecticide application

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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.

Due to the parameters and requirements of Federal programs many individual producers choose to work together to control economic grasshopper populations outside of Federal programs. These programs are outside the control of APHIS or cooperating agencies. These programs are typically all private land and do not include Federal land however it may include some State lands.

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.

Pesticide application on agronomic crops, rangeland, mosquito abatement may all occur within the EA coverage area. No state or county entity maintains statewide pesticide application records to include types of pesticide used, acres treated, or counties or areas treatment occurred. Individual applications maintain application records that may be verified by a state or Federal agency, but collection of those records does not take place.

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, most of the land where program treatments occur is uncultivated rangeland and additional treatments by landowners or managers are very uncommon making possible cumulative or synergistic chemical effects extremely unlikely.

APHIS has prepared this EA for the Missouri slope Assessment Area in North Dakota and following counties include, Adam, Billings, Bowman, Dunn, Emmons, Grant, Golden Valley, Hettinger, McKenzie, Mercer, Morton, Sioux, Slope, Stark. because treatments could be request by if grasshopper populations reach outbreak levels. Past experience and continuing land use, climate, grasshopper population conditions lead APHIS to believe treatments may 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. Conversely anticipated treatments actions may be requested but may not occur to due application costs, environmental considerations, landowner management practices, or lack of funding.

Historical treatment areas include Billings, Grant, Golden Valley, McKenzie, Morton, and Slope Counties. Aerial treatments in these areas occurred in the early 1980's and continued sporadically through the early and mid 1990's. They ranged in size from approximately 300,000 acres to small incipient treatments under 2,000 acres utilizing primarily carbaryl, and malathion. Small, incipient ground treatments occurred in 2006 – 2013 using diflubenzuron and carbaryl under a cooperative agreement held between PPQ and the grazing associations in some of these counties. Those agreements were not renewed in 2019. No control programs have taken place since 2013.

## *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 Section E. Environmental Consequences of the Alternatives 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. Average population density in rural areas of 0.2 and 7.1 persons per square mile (United States Census Bureau, 2018).

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 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.

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The 2019 EIS contains detailed hazard, exposure, and risk analyses for the chemicals available to APHIS. Impacts to workers and the 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 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.

### 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.

The U.S. Fish and Wildlife Service (FWS) has outlined reasonable and prudent measures for APHIS to follow so there will be no adverse effects to these federally listed endangered or threatened species. These are outlined in the June 1, 1987, the August 3, 1990, and the August 29, 1991, Biological Opinions written by the Service and have been adopted in APHIS programs. The State Game and Fish Department may also have protection measures developed for certain federally listed species that will also be adopted in program planning. Before beginning a project, APHIS consults with the North Dakota Game and Fish Department, the United States Fish and Wildlife Service, the US Forest Service or other appropriate land managing agency that has requested a control program for exact locations of any State or Federally listed endangered, threatened, or proposed species or sensitive habitats or areas. APHIS conducts informal conferences with the abovementioned organizations at the field level as a component of site-specific operations. The purpose of these consultations is to gain insight as to the distributional patterns and exact locations of sensitive species or habitats. Sensitive species include Federal endangered and threatened species, State endangered, threatened and watch species, Federal candidate species, and species and habitats of local concern. These discussions involve the approximate acreage of the project, treatment options, timing of pesticide application (starting and ending dates), and local issues and concerns.

APHIS will implement protection measures as outlined in the biological opinions for federally listed threatened and endangered species identified in North Dakota. With protection measures in place, there would be no effect to these species.

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 regulations 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 North Dakota 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 North Dakota, species wide population estimate data is available from the "U.S. Fish & Wildlife Services IPaC Information for Planning & Consultation" website (https://ipac.ecosphere.fws.gov/). This sites detail species occurrences throughout the state of North Dakota. Population and distribution data relies heavily on documented occurrences as well as and their critical habitat. (https://ipac.ecosphere.fws.gov/).

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 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 and diverse 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 sec-ondary 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 diverse 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).

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 bee 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.

Most North Dakota pollinators are insects, such as native bees, wasps, beetles, flies, moths, butterflies, and non-native honeybees. North Dakota has about 150 species of butterflies, more than 1,400 moths, and an unknown number of bee species (probably hundreds). There are also numerous non-insect pollinators, such as some birds and bats. (North Dakota Game & Fish, 2021, "Pollinators Fact Sheet") Over 85% of terrestrial plants rely on pollinators for reproduction. The entire life cycle of pollinators and the result of their work provides food for all forms of life. The economic value of these native pollinators is estimated at $3 billion per year in the U.S. Beyond agriculture, pollinators are keystone species in most terrestrial ecosystems. Fruits and seeds derived from insect pollination are a major part of the diet of approximately 25% of all birds, and of mammals ranging from red-backed voles to grizzly bears. (Xerces Society, 2006-2025).

There are 13 more common species that are accolated with North Dakota and one of those is the Suckley cuckoo bumble bee *Bombus suckleyi* (Lindsey Dahle 2025). A species that has just been proposed to list as endangered under the Endangered Species Act. The Suckley cuckoo bumble bee is a social parasite, and nesting occurs exclusively in the nests of other bees. Males of this species patrol circuits in search of mates. Its known breeding host is *Bombus occidentalis*, but it has also been recorded as present in colonies of other *Bombus* species. (Nature Serve Explorer, 2025)

North Dakota is the No. 1 honey-producing state in the nation. In 2023, North Dakota bees produced 38.3 million pounds of honey valued at over $67.8 million. (NDDA, 2025) Apiaries are widely distributed across 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 diverse ecosystems. Pollinators include managed exotic species such as 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 may potentially be found throughout this EA assessment area and is being considered for ESA protections. (As such it will be discussed in detail in IV. Environmental Consequences, B.6. Endangered Species Act and/or B.8. Additional Species of Concern.)

The program is unlikely to have any impact on this butterfly therefore, except as described in the No Suppression Program Alternative section of this EA (IV.A.1), in that the absence of an APHIS run program may result in neighboring private landowners using more and stronger pesticides, which could potentially impact this species negatively.

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Vertebrates occurring in rangelands of North Dakota 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).

Common reptiles found in the EA are as follows, False Map Turtle *Graptemys pseudogeographica* are restricted to the Missouri River and its tributaries. Smooth Softshell *Apalone mutica* is restricted to sandy stretches of the Missouri River and its tributaries. Spiny Softshell *Apalone spinifera* known only from the Missouri River and its tributaries. Unconfirmed reports from the Red River watershed need verification. Painted Turtle *Chrysemys picta* is found statewide. Snapping Turtle *Chelydra serpentina* is found statewide. Painted Turtle *Chrysemys picta* is found statewide. Plains Hog-nosed Snake *Heterodon nasicus* are most often encountered in sandy habitats along rivers, and in the bandlands. Sagebrush Lizard *Sceloporus graciosus* seem to prefer rocky areas near water and adjacent areas of sandy soil and sagebrush in the badlands. Short-horned Lizard *Phrynosoma hernandesi* found in and around the badlands of western North Dakota. They are found in sagebrush habitats, rocky or sparsely vegetated areas. Smooth Green Snake, *Opheodrys vernalis may* be found statewide in appropriate habitat. Many observations occur near wetlands surrounded by grassy uplands. Common Gartersnake *Thamnophis sirtalis* is most often found near water in stream and river floodplains. Plains Gartersnake *Thamnophis radix* is most frequently encountered gartersnake in North Dakota. May be found statewide. Racer *Coluber constrictor* is most observations come from south and west of the Missouri River. Bullsnake *Pituophis catenifer* is most often observed south and west of the Missiouri River. Prairie Rattlesnake *Crotalus viridis* found in grasslands and sagebrush areas, as wells as high rocky ledges of buttes. They are primarily found in southwestern North Dakota but have been observed in counties bordering the Missouri River on the east. (Dyke, Steve R., Sandra K. Johnson, and Patrick T. Isakson. 2015. "North Dakota State Wildlife Action Plan").

Common amphibians found in our EA region are as follows, Plains Spadefoot *Spea bombifrons* inhabit dry grasslands, with sandy or loose soil primarily south and west of the Missouri River, although some scattered populations have been found in central and northern North Dakota. Eastern Tiger Salamander *Ambystoma tigrinum* most often breed in fishless wetlands, but adults spend much of the season in upland habitats. Adults overwinter in the uplands and burrow below the frostline. Western Tiger Salamander *Ambystoma mavortium* most often breed in fishless wetlands, but adults spend much of the season in upland habitats. Adults overwinter in the uplands and burrow below the frostline. Northern Leopard Frog *Lithobates pipiens* is one of North Dakota's most common frogs along ponds and lakes. Great Plains Toad *Anaxyrus cognatus* occur statewide and may be found far from water. Boreal Chorus Frog *Pseudacris maculata* North Dakota's most common frog and may even be found in urban environments. Woodhouse's Toad *Anaxyrus woodhousii* is most abundant in western North Dakota where it may be found in grasslands, wetlands, floodplains, and back yards. ((Dyke, Steve R., Sandra K. Johnson, and Patrick T. Isakson. 2015. "North Dakota State Wildlife Action Plan")

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North Dakota’s EA is home to numerous different species of fish such as, seven7 different species of Catfish, Codfish, Drum, Gar, Killifish, two different kinds of Lamprey, 35 different species of Minnows, two different species of Mooneye, paddlefish, nine different species of Perch, Northern Pike, Muskellunge, Tiger Muskellunge, Shad, Herring, Gizzard Shad, Rainbow Smelt, Brook Stickleback, Lake Sturgeon, Pallid Sturgeon, Shovelnose Sturgeon, 11 different species of Sucker fish, nine different species of Sunfish, White Bass, Brown Trout, Rainbow Trout, Lake Trout, Cutthroat Trout, Chinook Salmon, Lake Whitefish and Cisco which the program has established treatment restriction buffers around water bodies to protect those features from insecticide drift and runoff which protects the aquatic life. 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). (Dyke, Steve R., Sandra K. Johnson, and Patrick T. Isakson. 2015. “North Dakota State Wildlife Action Plan”). 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, 2024).

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 Golden Valley, Slope and Bowman counties and only in the far southwestern side of these counties. Primarily associated with sagebrush, particularly big sagebrush. Silver sagebrush and rabbitbrush is utilized to a lesser extent. Riparian and upland meadows irrigated, and non-irrigated croplands and pasturelands are also used, especially for brood rearing habitat. Leks may be natural openings within a sagebrush community or created by disturbance such as dry stream bed channels, ridges, grassy meadows, burned areas, gravel pits, plowed fields, and roads. Nest under larger bushes generally within 1.5-3 km of the lek. Brood-rearing habitat should contain succulent herbaceous vegetation such as false dandelion, hawksbeard, milkvetch, and insects such as grasshoppers. Rely nearly exclusively on big sagebrush for food during winter. 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.

A diverse 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, *Venenata*), annual forbs (e.g. diffuse knapweed, Scotch thistle), 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 1 to 4 mm 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 North Dakota 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 is potential habitat for Black-footed ferret *Mustela nigripes,* Gray wolf *Canis lupus,* Northern long-eared bat *Myotis septentrionalis,* Whooping crane *Grus americana,* Piping plover *Charadrius melodus,* Red Knot *Calidris canutus 'rufa',* Bald Eagle *Haliaeetus leucocephalus,* Golden Eagle *Aquila chrysaetos,* Pallid sturgeon *Scaphhirhynchus albus,* Dakota Skipper *Hesperia dacotae,* although not all occur within or near potential grasshopper suppression areas. Some of these species also have critical habitat identified. within the EA coverage area.

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' 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."

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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 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 staff notified FWS on March 12, 2025, through the Section 7 process that we would be utilizing the protection measures identified in the 2025 Rangeland Grasshopper and Mormon Cricket Suppression Program Biological Assessment, Appendix 9 summary for North Dakota should control be warranted. We further identified the endangered and threatened species considered in the assessment area for North Dakota. Appendix F provides the correspondence between North Dakota PPQ and North Dakota FWS personnel.

Those species are: Black-footed ferret, *Mustela nigripes*
Gray wolf, *Canis lupus*
Northern long-eared, *Myotis septentrionalis*
Whooping crane, *Grus americana*
Piping plover, *Charadrius melodus*
Red Knot, *Calidris canutus rufa*
Pallid sturgeon, *Scaphhirhynchus albus*
Dakota Skipper, *Hesperia dacotae*
Bald Eagle, *Haliaeetus leucocephalus*

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.

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 a variety of bird species including the sage and sharp-tail grouse. Grasshopper suppression programs reduce grasshoppers and at least some other insects in the treatment area that can be a food item for a variety of bird species including the sage and sharp-tail grouse. 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.

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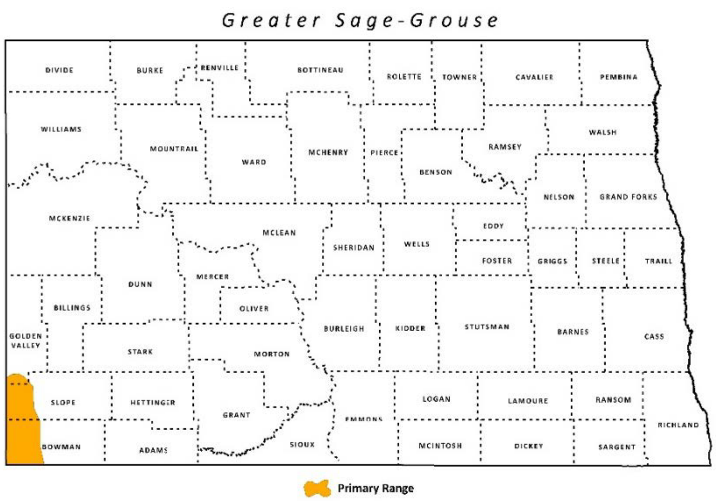
Greater Sage-Grouse *Centrocercus urophasianus* is primarily associated with sagebrush, particularly big sagebrush. Silver sagebrush and rabbitbrush are utilized to a lesser extent. Riparian and upland meadows and irrigated, and non-irrigated croplands and pasturelands are also used, especially for brood-rearing habitat. Leks may be natural openings within a sagebrush community or created by disturbance such as dry stream bed channels, ridges, grassy meadows, burned areas, gravel pits, plowed fields, and roads. Nest under larger bushes generally within 1.5-3 km of the lek. Brood-rearing habitat should contain succulent herbaceous vegetation such as false dandelion, hawksbeard, milkvetch, and insects such as grasshoppers. The Greater Sage-Grouse relays nearly exclusively on big sagebrush for food during winter. The key areas for Greater Sage-Grouse in North Dakota and the most active and inactive leks have been identified and only occur in far southwestern corner of North Dakota's Golden Valley, Slope and Bowman counties. (Dyke, Steve R., Sandra K. Johnson, and Patrick T. Isakson. 2015, "North Dakota State Wildlife Action Plan").




(Dyke, Steve R., Sandra K. Johnson, and Patrick T. Isakson. 2015. "North Dakota State Wildlife Action Plan)

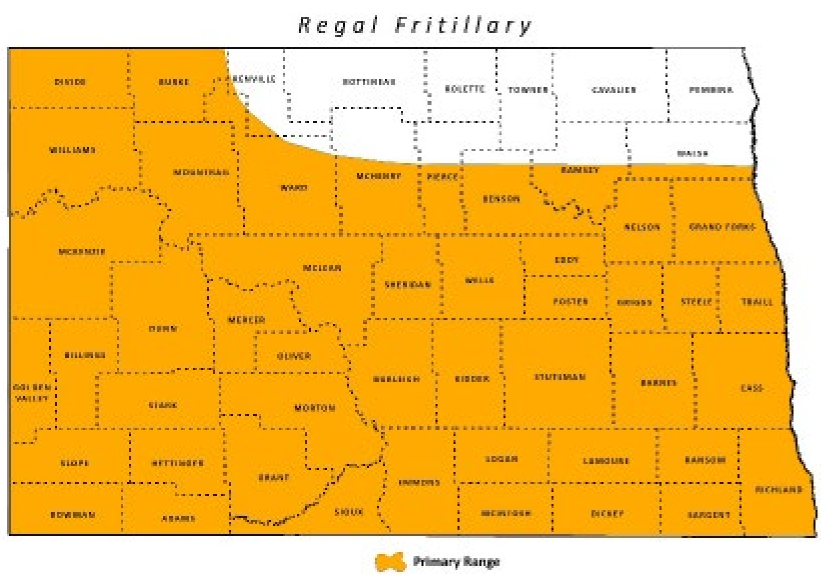
Because grasshopper numbers are so high in an outbreak year, treatments would not likely reduce the number of grasshoppers below levels present in a normal year. Densities in a normal year vary widely and can be as low as zero or 8-10/sq yard. Should grasshoppers be unavailable in small, localized areas, sage grouse chicks may consume other insects, which include Formicidae, Coleoptera, Lepidoptera larvae. (Richardson, W., String,. T.K., Nuss, A.B., Morra, B., Snyder, K.A. 2023) as they 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 rangeland bird habitat.

APHIS works closely with all federal, state and private land managers when grasshopper treatments are proposed and consider species that are known to be of special interest or concern to Federal or State agencies or the public.

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

There are three candidate species identified in the North Dakota EA coverage area. They are the Regal Fritillary, *Speyeria idalia,* Monarch Butterfly, *Danaus Plexippus and the* Suckley Cuckoo Bumble Bee, *Bombus suckleyi. S*ince these species are proposed, there is no statutory protection for them under the Endangered Species Act (ESA).

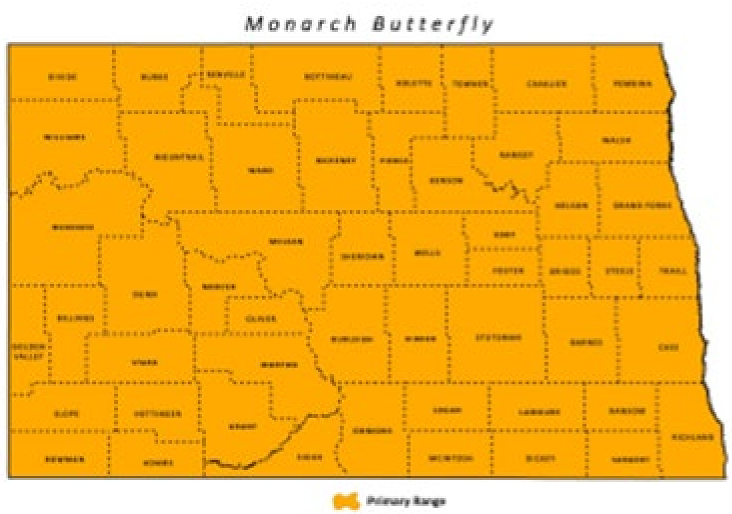
Regal Fritillary *Speyeria idalia* is recognized by their forewings that are orange with black bars running between the veins, the hind wings are darker orange to black with a pattern of white spots present. Regal Fritillary is typically found in tall-grass prairie remnants and other native prairie habitats. Regal Fritillary larva relies exclusively on native violets as a food source. Areas with high density of violets will contain both caterpillars and adults. Key areas for Regal Fritillary are mainly found in the southwest quarter of the state which provides the best habitat remaining but may be encountered state-wide in patches of quality habitat. The loss of native habitat especially those that contain violets, is the primary cause for this species' decline. (Dyke, Steve R., Sandra K. Johnson, and Patrick T. Isakson. 2015)




(Dyke, Steve R., Sandra K. Johnson, and Patrick T. Isakson. 2015)

Monarch Butterfly *Danaus Plexippus* is most recognizable by their orange wings with black and white markings. The outer edge of the wing is black with patterns of white spots. Monarchs are typically found in areas with a high number of nectar sources. While domestic plants are used native flowers are preferred. Monarchs in the caterpillar stage rely exclusively on milkweed so areas with high density of milkweed will contain both caterpillars and adult Monarchs. Key areas for Monarch butterflies are found throughout North Dakota within areas that have a higher density of native prairie. The Monarch is currently under consideration for list under the Threatened and Endangered Species Act. (Dyke, Steve R., Sandra K. Johnson, and Patrick T. Isakson. 2015)

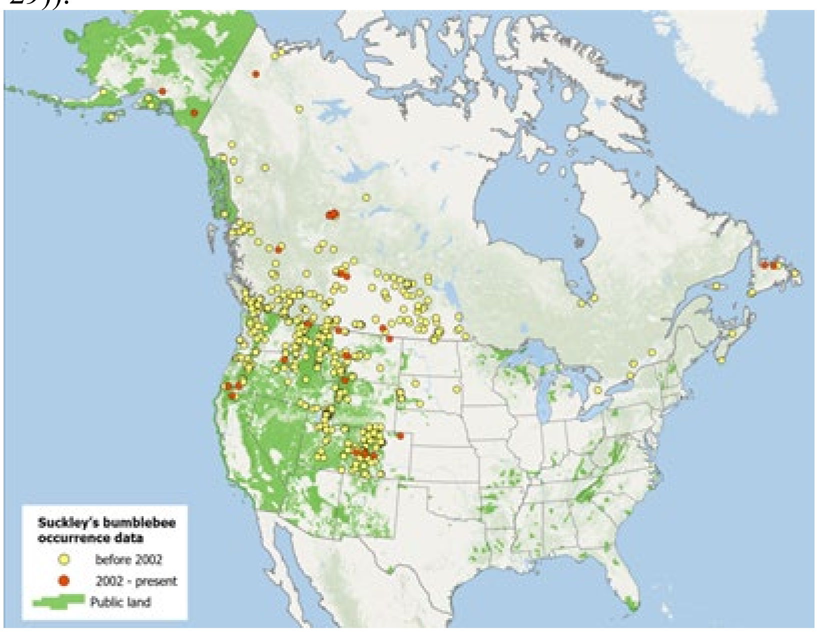
Monarch Butterfly's east of the Rocky Mountains migrates up to 3,000 miles from the northern United States and Canada south to the forests high in the mountains of Mexico. The monarch's migration is driven by seasonal changes, daylength and temperature changes. The annual migration of the eastern population of monarch butterflies encompasses up to three countries and five generations of butterflies. Near the end of February, monarchs overwintering in oyamel fir forests in Mexico, begin their migration north. In March these butterflies begin laying eggs on milkweed plants as they continue moving north. Most of this generation dies off by May. Offspring of the first generation continue the northward migration, laying eggs as they go, until some reach Canada and the northern limits of milkweed ranges. On their summer grounds, monarchs may produce a third and fourth generation. These generations of reproductive monarchs generally only live 2-5 weeks while the migratory generations can live 8-9 months. The fourth (and some of the third) generation begins migrating south in late summer. A fifth generation may also be produced in the southern U.S. Monarchs overwinter in the same 11-12 mountain areas in Mexico each year. They cluster together in colonies to stay warm. Thousands of monarchs may be found on a single oyamel tree. (North Dakota Game & Fish, 2025)




(Dyke, Steve R., Sandra K. Johnson, and Patrick T. Isakson. 2015)

Suckley Cuckoo Bumble Bee, *Bombus suckleyi* is a medium sized bumble bee with a short-tongued with the queens being around 18-23 mm long with no workers. The outer surface of hind-leg tibia is convex and densely hairy and lacks a pollen basket. The hair is short and even and has black on its face. The Suckley Cuckoo Bumble Bee has predominantly yellow on the sides of the thorax with black continuously along midline to anterior region of T4. The Males are 13-16 mm long and their hair color on the sides of the thorax is yellow. The T2is extensively yellow, T4 is mostly yellow and sometimes with narrow area of black hairs along midline. The T7 is black, and their antenna is medium length and their flagellum 3x longer than the scape (Suckley's Cuckoo Bumble Bee — Bombus suckleyi. Montana Field Guide).

Suckley cuckoo bumble bee *Bombus suckleyi* a species that has just been proposed to list as endangered under the Endangered Species Act. The Suckley cuckoo bumble bee is a social parasite, and nesting occurs exclusively in the nests of other bees. Males of this species patrol circuits in search of mates. Its known breeding host is *Bombus occidentalis*, but it has also been recorded as present in colonies of other *Bombus* species. (Nature Serve Explorer, 2025). The Suckley's cuckoo bumble bee had a broad historical distribution across North America, stretching from the Yukon down to Arizona and as far east as Newfoundland. The species has been collected in various habitat types from 2 to 3,200 meters (6 to 10,500 feet) in elevation and has been documented in the following states: Arizona, California, Colorado, Idaho, Minnesota, Montana, Nebraska, Nevada, New Mexico, North Dakota, Oregon, South Dakota, Utah, Washington, Wyoming.( U.S. Fish & Wildlife Service. (2024, November 29)).




Center for Biological Diversity

## 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.

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The Missouri Slope's consist of sandstone and shale layers that were largely unaffected by glaciers that covered the eastern half of North Dakota. The area has an irregular topography with the occasional butte rising above the landscape. Complex drainage systems cut breaks through the topography. Livestock grazing is the predominant use, with some small grain farming mixed in. With in the Missouri Slope you will find the badlands which are a series of buttes, rock outcrops, washouts, and hard wood draws along the banks of the Little Missouri River. This area is characterized by poor soil, steep slopes, high erosion, and shortgrass prairie. Soils are continually changing in response to their environment but changes in soil properties which occur naturally take place over a long period of time.

About 250 different soils are currently recognized in North Dakota. (D.D. Patterson, J.L. Richardson and M.D. Sweeney, Jul 1, 1983)

### b) Hydrology and Water Resources

The State of North Dakota is separated into two major drainage basins by a continental divide running from the northwest through the central and southeastern part of the state. The northeastern portion of the state falls generally within the Hudson Bay drainage, while the southwestern part is drained by the Missouri River into the Gulf of Mexico. These two drainages are known as the Missouri River Drainage and the Hudson Bay Drainage.

The Missouri River drainage basin in North Dakota includes the major sub-basins of the Missouri River and James Rivers and encompasses the entire EA coverage area. (Official Portal, NDDA 2021) This Basin covers all or portions of ten states and two Canadian provinces. The Missouri River stretches over 2,300 miles from central Montana to its confluence with the Mississippi River, making it the longest river in the United States.

Six dams and reservoir projects make up the Missouri River reservoir system. Each of the projects were constructed by the federal government and are operated and maintained by the Corps of Engineers for the purposes of flood control, water supply, recreation, irrigation, hydropower, water quality, fish and wildlife, and navigation. Harnessing the Missouri River has brought substantial economic, environmental, and social benefits to North Dakota and the other states. (Official Portal, NDDA, 2021)

Major water resources include, but are not limited to: Yellowstone River, Missouri River, Little Missouri River, Heart River, Cannon Ball River, (U.S. Fish & Wildlife Service IPac) Major aquafers in the EA include but are not limited to: Missouri River-Lake Sakakawea, Killdeer, Elm Creek, Missouri River, Missouri River- Oahe. (NDGISHDP-DEQ)

### c) Air Quality and Climate

North Dakota's climate is continental and is characterized by large variances in temperature, both on a seasonal and daily basis. Precipitation ranges from low to moderate, and air flow through the region creates windy conditions. North Dakota is affected by regular changes in atmospheric air masses. Air masses from the polar region bring cold, dry air to the state. Northern Pacific air masses produce warmer, drier conditions, and tropical masses bring warm, wet weather. The Rocky Mountains frequently block air masses from the southern Pacific Ocean from reaching the state. North Dakota's average annual temperature ranges from 37° F in the northern part of the state to 43° F in the south. January is the coldest month. Temperatures average from 2° F in the north to

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17° F in the southwest with an average of fifty days below 0˚. July is the warmest month with temperatures averaging 67° F in the north and 73° F in the south. Temperatures over 90˚ are common. North Dakota's highest temperature was 121° F and the lowest -60° F, were both recorded in 1936. Annual precipitation ranges from 13 to 20 inches a year. The average increases from west to east, with the southeast receiving the highest average precipitation. Winter precipitation is highest in January. June is the wettest month, receiving 3 to 4 inches of rain. Air quality is generally good but can be affected by seasonal dust storms, wildfires, winter inversions, and agricultural activities. (Dyke, Steve R., Sandra K. Johnson, and Patrick T. Isakson. 2015, "North Dakota State Wildlife Action Plan").

## 4. Socioeconomic Issues

Rangelands are essential to western livestock producers providing forage for a variety of domestic 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 western North Dakota's economy and landscape.

The counties in this EA that produce a variety of crops, some of which are organic. Crops produced in these counties include canola, barley, flax, wheat, buckwheat, rye, clover, sweet clover oats, alfalfa, hay, dry edible beans, field peas/pulse crops and sunflowers. North Dakota is No. 2 in the U.S. for both oil and confection sunflower production, producing a whopping 1.06 billion pounds of sunflower seeds in 2015. (Stroop, R. 2016) North Dakota is a leader in canola production. (United States Department of Agriculture. 2024)

North Dakota is number one in the U.S for honey production. Apiarists maintain hives across North Dakota. Alfalfa relies on pollination from bees which may nest or forage on or near proposed suppression areas. North Dakota bees are shipped annually to nut and fruit producing states.

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Livestock grazing is one of the primary uses of rangeland in the area, and is the dominate agricultural activity in many areas, including McKenzie and Billings Counties. Livestock enterprises include rangeland grazing by beef and dairy cattle, sheep, and horses; some feedlots for beef; Rangeland may be utilized for grazing during the summer or reserved for fall and winter grazing. (Stroop, R. 2016)

Much of the land in the potential suppression area is publicly owned. The area contains the US Forest Service National Dakota Prairie Grasslands, encompassing 1.2 million acres. The majority of land is under Federal grazing leases.

Refuges in this EA include White Lake National Wildlife Refuge at 1044.31 acres, Stewart Lake National Wildlife refuge at 637.84 acres, Lake ILO National Wildlife Refuge at 4265.45 acre and Emmons County Waterfowl production area at 3602.82 acres. (U.S Fish & Wildlife Services, 2025, IPaC)

Scattered public rangeland associated with the BLM can also be found across the EA coverage area. Approximately 58,500 acres are in ND mostly in Dunn and Bowman counties.

This area also contains many parks, wilderness areas, public forests, and wilderness study areas administered by federal, state or local governments. There may also be areas of rangeland habitat considered as sensitive areas for the survival of non-listed species of concern.

Theodore Roosevelt National Park became a national park on November 10, 1978, encompassing 70,448 acres, located in three separate locations, the North Unit Theodore Roosevelt National Park in McKenzie County and Elkhorn Ranch Unit in the Northwest corner of Billings County, the South Unit Theodore Roosevelt National Park in Billings County. Elk, bison, coyotes, badgers, prairie dogs, wild horses and longhorn steers make up the main mammal attraction for visitors. Within the National Park there has been 400 different species of plants identified. The parks Grasslands is composed mostly of saltgrass, western wheatgrass, needle-and-thread and little bluestem. The forest within the park is mainly rocky mountain juniper and, on the river, bottoms you can find hardwoods such as cottonwood, ash, elm and boxelder. (National Park Service. 2025)

The general public uses rangelands in the proposed suppression area for a variety of recreational purposes including hiking; camping; general wildlife viewing and bird watching, insect collecting and watching; hunting; falconry; shooting; plant collecting; rock and fossil collecting; artifact collecting; sightseeing; and dumping. Members of the general public traverse rangelands in or near the proposed suppression area by various means including on foot, horseback, all-terrain vehicles, bicycles, motorcycles, four-wheel drive vehicles, snowmobiles, and aircraft.

## 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

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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.

At the end of each survey season, year-end survey summaries are provided to Tribal, Federal and private partners. Tribal partners are made aware of building populations and when grasshopper populations are identified that might warrant control. Program personnel notify Tribal land managers of the potential for grasshopper and outbreaks on their lands. Consultation with local Tribal representatives would take 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. We rely on guidance from the Tribal officials to identify culturally sensitive sites and ceremonies such as Sun Dances. 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.

## 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.

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. The potential harmful effects from the program activities on environmental components and nontarget species populations occur in a small portion of the area considered by this EA and for a limited duration. Site-specific environmental consequences of the alternatives are discussed below.

### 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. No other federal agencies would lead the effort. The Plant Pest Act of 2004 directs APHIS to be the lead agency in survey and potential control The national MOUs with BLM, BIA, FS supports that effort. Local producers have recently begun joining together and incorporating large acres of land with multiple ownership and conducting their own control programs often mirroring APHIS guidelines. APHIS estimates zero to one treatment would occur totaling possibly 10,000 acres per year. However private applicators have treated over a million rangeland acres in 2023 and 2024. The most economical choice of pesticides available to private applicators would be diflubenzuron. The conventions of IPM 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. No matter who conducts the treatments, disproportionately high and adverse human health or environmental impacts on Tribes, and historical and culturally sensitive sites in a program area are unlikely.

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 a 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 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.

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#### *(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. Low-income populations would suffer greater relative economic hardship from this increase in food prices, especially where grocery shopping choices are limited by longer travel between small rural villages. 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, carbaryl and 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.

### c) 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.

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.

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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.

The octanol-water partition coefficient ($\log K_{ow}$) is the relative concentration of a chemical in n-octanol versus water at pH 7, 20°C. Higher values of $\log K_{ow}$ indicate greater lipophilicity (and a lower affinity for water). Since carbaryl has a $\log K_{ow}$ 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).

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).

### d) 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, 2019b).

### *(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).

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 honeybee 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 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 one day after the

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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 14 samples without insecticide residues were collected in between spray swaths (i.e. within skip swaths).

Many of the flower samples were collected from the same, adjacent or nearby locations during the 24-hour and 14-day sampling events. Laboratory analysis showed five of the flower samples collected within spray swaths and 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.

Nine of the 11 contaminated 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. Five flower samples with diflubenzuron residues that were collected immediately after the 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. Specifically, two samples collected adjacent to the 11 contaminated samples had greater diflubenzuron concentrations and the amount of insecticide in three nearby samples did not diminish significantly 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. The laboratory analysis results are provided in Table X.

Table X. Diflubenzuron Residues on Flowers in a Grasshopper Treatment Area

| Sample Number | Flower Species | Swath Type | Time since Treatment | Results (ppm) | Duplicate or Adjacent Sample Locations and Results |
|---|---|---|---|---|---|
| PC-FLW-01 | Flodmann's Thistle | Skip | 22 hours | ND | PC-FLW-35 **(ND)** |
| PC-FLW-02 | Flodmann's Thistle | Skip | 22 hours | ND | PC-FLW-36 **(ND)** |
| PC-FLW-03 | Flodmann's Thistle | Spray | 22 hours | ND | PC-FLW-37 **(0.121 ppm)** |
| PC-FLW-04 | Flodmann's Thistle | Skip | Pretreatment | ND | PC-FLW-05 **(ND)** |
| PC-FLW-05 | Flodmann's Thistle | Skip | Pretreatment | ND | PC-FLW-04 **(ND)** |
| PC-FLW-06 | Flodmann's Thistle | Skip | Pretreatment | ND | No duplicate or adjacent sample |
| PC-FLW-07 | Soapweed Yucca | Spray[1] | Pretreatment | ND | Adjacent to PC-FLW-08 **(ND)** |
| PC-FLW-08 | Soapweed Yucca | Spray[1] | Pretreatment | ND | Adjacent to PC-FLW-07 **(ND)** |
| PC-FLW-09 | Soapweed Yucca | Spray[1] | Pretreatment | ND | No duplicate or adjacent sample |
| PC-FLW-10 | Yellow Sweetclover | Skip[2] | 20 hours | 0.391 | PC-FLW-38 **(ND)** |
| PC-FLW-11 | Yellow Sweetclover | Skip | 20 hours | 1.7 | PC-FLW-17 **(0.132 ppm)**, PC-FLW-39 **(ND)**, PC-FLW-42 **(0.137 ppm)** |
| PC-FLW-12 | Yellow Sweetclover | Spray | 20 hours | 0.538 | PC-FLW-18 **(0.184 ppm)**, PC-FLW-40 **(ND)**, PC-FLW-43 **(0.279 ppm)** |
| PC-FLW-13 | Wood's Rose | Skip[2] | 24 hours | ND | PC-FLW-15 **(0.189 ppm)**, PC-FLW-44 **(0.141 ppm)**, PC-FLW-46 **(0.1.89 ppm)** |
| PC-FLW-14 | Wood's Rose | Skip[2] | 24 hours | 0.304 | PC-FLW-45 **(0.162 ppm)**, Adjacent to PC-FLW-13 **(ND)**, PC-FLW-15 **(0.189 ppm)**, PC-FLW-44 **(0.141 ppm)**, PC-FLW-46 **(0.1.89 ppm)** |

| | | | | | |
|---|---|---|---|---|---|
| PC-FLW-15 | Wood's Rose | Skip[2] | 24 hours | 1.89 | PC-FLW-13 **(ND)**, PC-FLW-44 **(0.141 ppm)**, PC-FLW-46 **(0.1.89 ppm)** |
| PC-FLW-16 | White Milkwort | Skip | 20 hours | ND | PC-FLW-41 **(ND)** |
| PC-FLW-17 | White Milkwort | Skip | 20 hours | 0.132 | PC-FLW-11 **(1.70 ppm)**, PC-FLW-39 **(ND)**, PC-FLW-42 **(0.137 ppm)** |
| PC-FLW-18 | White Milkwort | Spray | 20 hours | 0.184 | PC-FLW-12 **(0.538 ppm)**, PC-FLW-40 **(ND)**, PC-FLW-43 **(0.279 ppm)** |
| PC-FLW-19 | Soapweed Yucca | Skip | 25 hours | 0.131 | PC-FLW-49 **(ND)**, Adjacent to PC-FLW-20 **(ND)**, PC-FLW-47 **(0.815 ppm)**, PC-FLW-50 **(ND)** |
| PC-FLW-20 | Soapweed Yucca | Skip | 25 hours | ND | PC-FLW-47 **(0.815 ppm)**, PC-FLW-50 **(ND)**, Adjacent to PC-FLW-19 **(0.131 ppm)**, PC-FLW-22 **(ND)**, PC-FLW-49 **(ND)** |
| PC-FLW-21 | Soapweed Yucca | Spray | 25 hours | 0.44 | PC-FLW-48 **(0.397 ppm)**, PC-FLW-51 **(ND)** |
| PC-FLW-22 | Flodmann's Thistle | Skip | 25 hours | ND | Adjacent to PC-FLW-23 **(ND)**, PC-FLW-27 **(ND)**, PC-FLW-47 **(0.815 ppm)**, PC-FLW-50 **(ND)** |
| PC-FLW-23 | Flodmann's Thistle | Skip[2] | 25 hours | ND | Adjacent to PC-FLW-22 **(ND)**, PC-FLW-27 **(ND)**, PC-FLW-47 **(0.815 ppm)**, PC-FLW-50 **(ND)** |
| PC-FLW-24 | Flodmann's Thistle | Spray | 25 hours | 0.146 | No duplicate or adjacent sample |
| PC-FLW-25 | Yellow Sweetclover | Spray | 25 hours | 0.187 | PC-FLW-52 **(ND)** |
| PC-FLW-26 | Yellow Sweetclover | Spray[1] | 25 hours | ND | PC-FLW-53 **(ND)**, PC-FLW-54 **(ND)**, PC-FLW-55 **(ND)**, PC-FLW-56 **(ND)**, PC-FLW-57 **(ND)**, PC-FLW-58 **(ND)** |
| PC-FLW-27 | White Milkwort | Spray[1] | 25 hours | ND | Adjacent to PC-FLW-28 **(ND)** |
| PC-FLW-28 | White Milkwort | Spray[1] | 25 hours | ND | Adjacent to PC-FLW-27 **(ND)** |
| PC-FLW-29 | Plains Pricklypear | Skip | Pretreatment | ND | No duplicate or adjacent sample |
| PC-FLW-30 | Plains Pricklypear | Spray[1] | Pretreatment | ND | No duplicate or adjacent sample |
| PC-FLW-31 | Plains Pricklypear | Spray[1] | Pretreatment | ND | No duplicate or adjacent sample |
| PC-FLW-32 | Plains Pricklypear | Skip | 24 hours | ND | No duplicate or adjacent sample |
| PC-FLW-33 | Plains Pricklypear | Skip | 24 hours | ND | PC-FLW-34 **(ND)** |
| PC-FLW-34 | Plains Pricklypear | Skip | 24 hours | ND | PC-FLW-33 **(ND)** |
| PC-FLW-35 | Flodmann's Thistle | Skip | 14 days | ND | PC-FLW-01 **(ND)** |
| PC-FLW-36 | Flodmann's Thistle | Skip | 14 days | ND | PC-FLW-02 **(ND)** |
| PC-FLW-37 | Flodmann's Thistle | Spray | 14 days | 0.121 | PC-FLW-03 **(ND)** |
| PC-FLW-38 | Yellow Sweetclover | Skip[2] | 14 days | ND | PC-FLW-10 **(0.391 ppm)** |
| PC-FLW-39 | Yellow Sweetclover | Skip | 14 days | ND | PC-FLW-11 **(1.70 ppm)**, PC-FLW-17 **(0.132 ppm)**, PC-FLW-42 **(0.137 ppm)** |
| PC-FLW-40 | Yellow Sweetclover | Spray | 14 days | ND | PC-FLW-12 **(0.538 ppm)**, PC-FLW-18 **(0.184 ppm)**, PC-FLW-43 **(0.279 ppm)** |
| PC-FLW-41 | White Milkwort | Skip | 14 days | ND | PC-FLW-16 **(ND)** |
| PC-FLW-42 | White Milkwort | Skip | 14 days | 0.137 | PC-FLW-11 **(1.70 ppm)**, PC-FLW-17 **(0.132 ppm)**, PC-FLW-39 **(ND)** |
| PC-FLW-43 | White Milkwort | Spray | 14 days | 0.279 | PC-FLW-12 **(0.538 ppm)**, PC-FLW-18 **(0.184 ppm)**, PC-FLW-40 **(ND)** |
| PC-FLW-44 | Wood's Rose | Skip[2] | 14 days | 0.141 | PC-FLW-13 **(ND)**, PC-FLW-15 **(0.189 ppm)**, PC-FLW-46 **(0.1.89 ppm)**, Adjacent to PC-FLW-14 **(0.304 ppm)**, PC-FLW-45 **(0.162 ppm)** |
| PC-FLW-45 | Wood's Rose | Skip[2] | 14 days | 0.162 | PC-FLW-14 **(0.304 ppm)**, Adjacent to **PC-FLW-13 (ND)**, PC-FLW-15 **(0.189 ppm)**, PC-FLW-44 **(0.141 ppm)**, PC-FLW-46 **(0.1.89 ppm)** |
| PC-FLW-46 | Wood's Rose | Skip[2] | 14 days | 0.189 | PC-FLW-13 **(ND)**, PC-FLW-15 **(0.189 ppm)**, PC-FLW-44 **(0.141 ppm)**, Adjacent to PC-FLW-14 **(0.304 ppm)**, PC-FLW-45 **(0.162 ppm)** |
| PC-FLW-47 | Soapweed Yucca | Skip | 14 days | 0.815 | PC-FLW-20 **(ND)**, PC-FLW-50 **(ND)** |
| PC-FLW-48 | Soapweed Yucca | Spray | 14 days | 0.397 | PC-FLW-21 **(0.44 ppm)**, PC-FLW-51 **(ND)** |
| PC-FLW-49 | Soapweed Yucca | Skip | 14 days | ND | PC-FLW-19 **(0.131 ppm)** |
| PC-FLW-50 | Flodmann's Thistle | Skip | 14 days | ND | PC-FLW-20 **(ND)**, PC-FLW-47 **(0.815 ppm)** |
| PC-FLW-51 | Flodmann's Thistle | Spray | 14 days | ND | PC-FLW-21 **(0.44 ppm)**, PC-FLW-48 **(0.397 ppm)** |
| PC-FLW-52 | Flodmann's Thistle | Spray | 14 days | ND | PC-FLW-25 **(0.187 ppm)** |
| PC-FLW-53 | Yellow Sweetclover | Spray[1] | 14 days | ND | PC-FLW-26 **(ND)**, PC-FLW-54 **(ND)**, PC-FLW-55 **(ND)**, PC-FLW-56 **(ND)**, PC-FLW-57 **(ND)**, PC-FLW-58 **(ND)** |
| PC-FLW-54 | Yellow Sweetclover | Spray[1] | 14 days | ND | PC-FLW-26 **(ND)**, PC-FLW-53 **(ND)**, PC-FLW-55 **(ND)**, PC-FLW-56 **(ND)**, PC-FLW-57 **(ND)**, PC-FLW-58 **(ND)** |
| PC-FLW-55 | Yellow Sweetclover | Spray[1] | 14 days | ND | PC-FLW-26 **(ND)**, PC-FLW-53 **(ND)**, PC-FLW-54 **(ND)**, PC-FLW-56 **(ND)**, PC-FLW-57 **(ND)**, PC-FLW-58 **(ND)** |

| | | | | | |
|---|---|---|---|---|---|
| PC-FLW-56 | Soapweed Yucca | Spray[1] | 14 days | ND | PC-FLW-26 **(ND)**, PC-FLW-53 **(ND)**, PC-FLW-54 **(ND)**, PC-FLW-55 **(ND)**, PC-FLW-57 **(ND)**, PC-FLW-58 **(ND)** |
| PC-FLW-57 | Soapweed Yucca | Spray[1] | 14 days | ND | PC-FLW-26 **(ND)**, PC-FLW-53 **(ND)**, PC-FLW-54 **(ND)**, PC-FLW-55 **(ND)**, PC-FLW-56 **(ND)**, PC-FLW-58 **(ND)** |
| PC-FLW-58 | Soapweed Yucca | Spray[1] | 14 days | ND | PC-FLW-26 **(ND)**, PC-FLW-53 **(ND)**, PC-FLW-54 **(ND)**, PC-FLW-55 **(ND)**, PC-FLW-56 **(ND)**, PC-FLW-57 **(ND)** |

Samples collected June 14, 20 and 27, 2024. Samples analyzed by method MET-101 at AMS-NSL in Gastonia, North Carolina.
ND = diflubenzuron not detected.
1 – Sample collected at or near windward edge of spray swath
2 – Sample collected at or near leeward edge of spray swath

The average concentration of diflubenzuron residues detected on plant tissue samples collected one day after the aerial treatment was 0.36 ppm. To calculate the mean, 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. The maximum concentration detected was 1.89 ppm, and the standard deviation was 0.51 ppm. The average concentration of diflubenzuron on samples collected 14 days after the aerial treatment was 0.159 ppm, and the maximum concentration was 0.815 ppm. The reduction in the average and maximum values of the detected concentrations should be attributed to degradation of the chemical after application. The apparent increases in the concentration of diflubenzuron during the 14-day sampling period were likely caused by sampling of different plants and variation in chemical deposition. Diflubenzuron is not known to act as a systemic insecticide.

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 $LD_{50}$ value for the honeybee, *Apis mellifera*, is reported at greater than 114.8 µg a.i./bee while the oral $LD_{50}$ 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 and Thompson et al documented sublethal effects on reproduction-related endpoints for the bumble bee, *Bombus terrestris* and *A. mellifera*, respectively, testing a formulation of diflubenzuron.

The Mommaerts et al 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 researchers estimated mean $LC_{50}$ concentrations based on the chronic exposure routes 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 maximum concentration of diflubenzuron detected on flowers collected one and 14 days after the treatment was greater than an order of magnitude below the $LC_{50}$ determined by the researchers. The average concentration was close to the $LC_{50}$ for ingested sugar-water, but this exposure scenario is extremely unlikely because the pesticide is applied as a foliar spray and the degradation of the chemical over time.

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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 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). The average concentration of diflubenzuron on plant tissues after 14 days was 0.159 ppm. Conversion to parts per billion (159 ppb) is straightforward but comparison of this tissue concentration to the sugar syrup concentration that caused reproductive effects (28.61 µg/liter approximately equivalent to 28.61 ppb) ignores the great uncertainty about how that conversion from tissue to nectar would occur in the field. Nonetheless, additional study of the deposition residues and resulting pollen and nectar concentrations resulting from aerial applications of diflubenzuron is warranted.

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.

### *(1) 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.

### *(2) 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).

#### e) Reduced Area Agent Treatments (RAATs)

The use of RAATS is the most common application method for all program insecticides and would continue to be so, except in rare pest conditions that warrant full coverage and higher rates. The RAATs method is an effective IPM strategy because the goal is to suppress grasshopper populations to a desired level, rather than to reduce those populations to the greatest possible extent. All APHIS grasshopper treatments are conducted in adherence with U.S. EPA approved label directions. Labeled application rates for grasshopper control tend to be lower than rates used against other pests. The RAATs rates used for grasshopper control by APHIS are lower than rates typically used by private landowners. APHIS would apply a single application of insecticide per year, typically using a RAATs strategy that decreases the rate of insecticide applied by either using lower insecticide spray concentrations, or by alternating one or more treatment swaths. Usually, RAATs applications use both lower concentrations and skip treatment swaths. The RAATs strategy suppresses grasshoppers within treated swaths, while conserving grasshopper predators and parasites in swaths that are not treated.

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

### *(1) Human Health*

The potential effects on human health during the application of pesticides using the RAATs method depends on the choice of insecticide. The possible exposure scenarios are described in detail in the above pesticide specific effects analysis. The minimal risk to program workers would not decrease because the mixing and formulation of the pesticide procedures would remain the same and are expected to prevent exposure. Any potential exposure of bystanders within treatment blocks would be reduced because of the lower application rates and skip swaths where insecticides are not applied.

### *(2) Nontarget Species*

The potential effects on nontarget species during the application of pesticides using the RAATs method depends on the choice of insecticide. The possible environmental impacts are described in detail in the above pesticide specific effects analysis. Any exposure of nontarget species within treatment blocks would be reduced because of the lower application rates and skip swaths where insecticides are not applied. Therefore, the risk of significant impacts to populations of nontarget species would be less than if the program used conventional application rates and complete coverage of the treatment area.

### *(3) Physical Environment Components*

The potential environmental effects of the application of pesticides using the RAATs method depends on the choice of insecticide. The expected fate of program applied chemicals, and possible environmental impacts are described in detail in the above pesticide specific effects analysis. The concentration of pesticide residues within treatment blocks would be reduced because of the lower application rates and skip swaths where insecticides are not applied. Therefore, the risk of significant impacts to air, soil and water resources would be less than if the program used conventional application rates and complete coverage of the treatment area.

### *(4) Socioeconomic Issues*

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

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

APHIS expects there is a negligible possibility of harm to cultural resources or disruption of events during grasshopper suppression operations because of our close cooperation with Tribes and other stakeholders. This would be the case regardless of whether the program used the RAATs method or conventional rates at complete coverage.

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

APHIS uses the RAATs method to suppress grasshopper populations in rural rangeland areas that are largely uninhabited. Disproportionately high and adverse human health or environmental impacts on Tribes in a program area are unlikely. The potential effects on human health during the application of pesticides using the RAATs method depends on the choice of insecticide. The possible exposure scenarios are described in detail in the above pesticide specific effects analysis. Any potential exposure of children near or within treatment blocks would be reduced because of the lower application rates and skip swaths where insecticides are not applied.

# 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 and diflubenzuron 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.

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

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

## FY-2023 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 Tribal Trust land, 50 percent of the cost on State land, and 33 percent of cost on private land. There is

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an additional 16.15% charge, however, on any funds received by APHIS for federal involvement with suppression treatments.

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

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

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

8 In some cases, rangeland treatments may be conducted by other federal agencies (e.g., Forest Service, Bureau of Land Management, or Bureau of Indian Affairs) or by non-federal entities (e.g., Grazing Association or County Pest District). APHIS may choose to assist these groups in a variety of ways, such as:

a. loaning equipment (an agreement may be required):
b. contributing in-kind services such as surveys to determine insect species, instars, and infestation levels;
c. monitoring for effectiveness of the treatment;
d. providing technical guidance.

9 In areas considered for treatment, State-registered beekeepers and organic producers shall be notified in advance of proposed treatments. If necessary, non-treated buffer zones can be established.

## Operational Procedures

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

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

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

3. One of the following insecticides that are labeled for rangeland use can be used for a suppression treatment of grasshoppers and Mormon crickets:

   A. Carbaryl
      a. solid bait
      b. ultra-low volume (ULV) spray
   B. Diflubenzuron ULV spray
   C. Malathion ULV spray
   D. Chlorantraniliprole spray

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

Furthermore, provide the following buffers for water bodies:

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

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

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

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

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9. APHIS reporting requirements associated with grasshopper / Mormon cricket suppression treatments include:
   A. Completion of a post-treatment report (Part C of the Project Planning and Reporting Worksheet (PPQ Form 62)
   B. Providing an entry for each treatment in the PPQ Grasshopper/Mormon Cricket treatment database
   C. For aerial treatments, providing copies of forms and treatment/plane data for input into the Federal Aviation Interactive Reporting System (FAIRS) by PPQ's designee

***SPECIFIC PROCEDURES FOR AERIAL APPLICATIONS***

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

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

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

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

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

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

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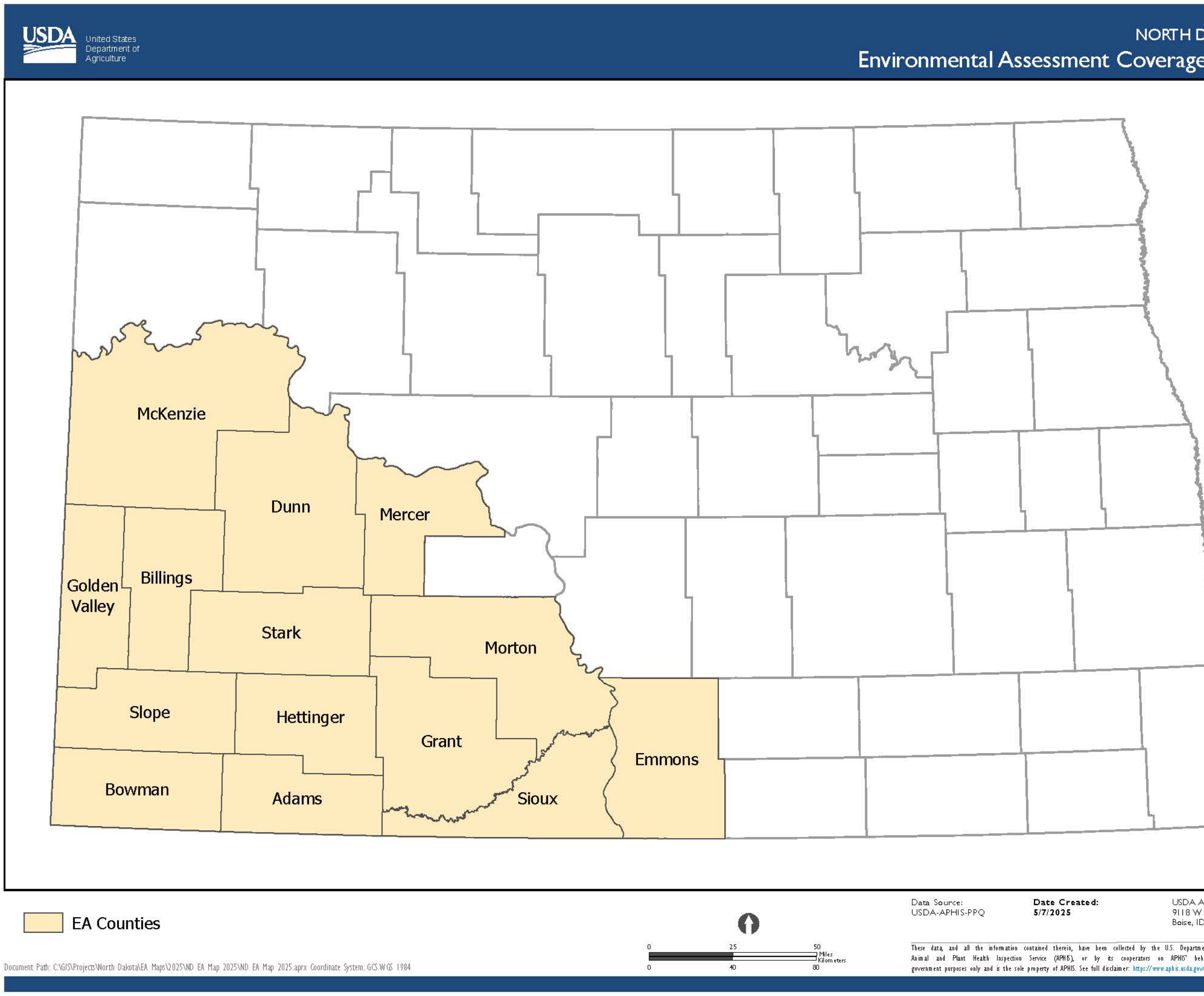
## B. *Appendix B: Map of the Affected Environment*




## C.

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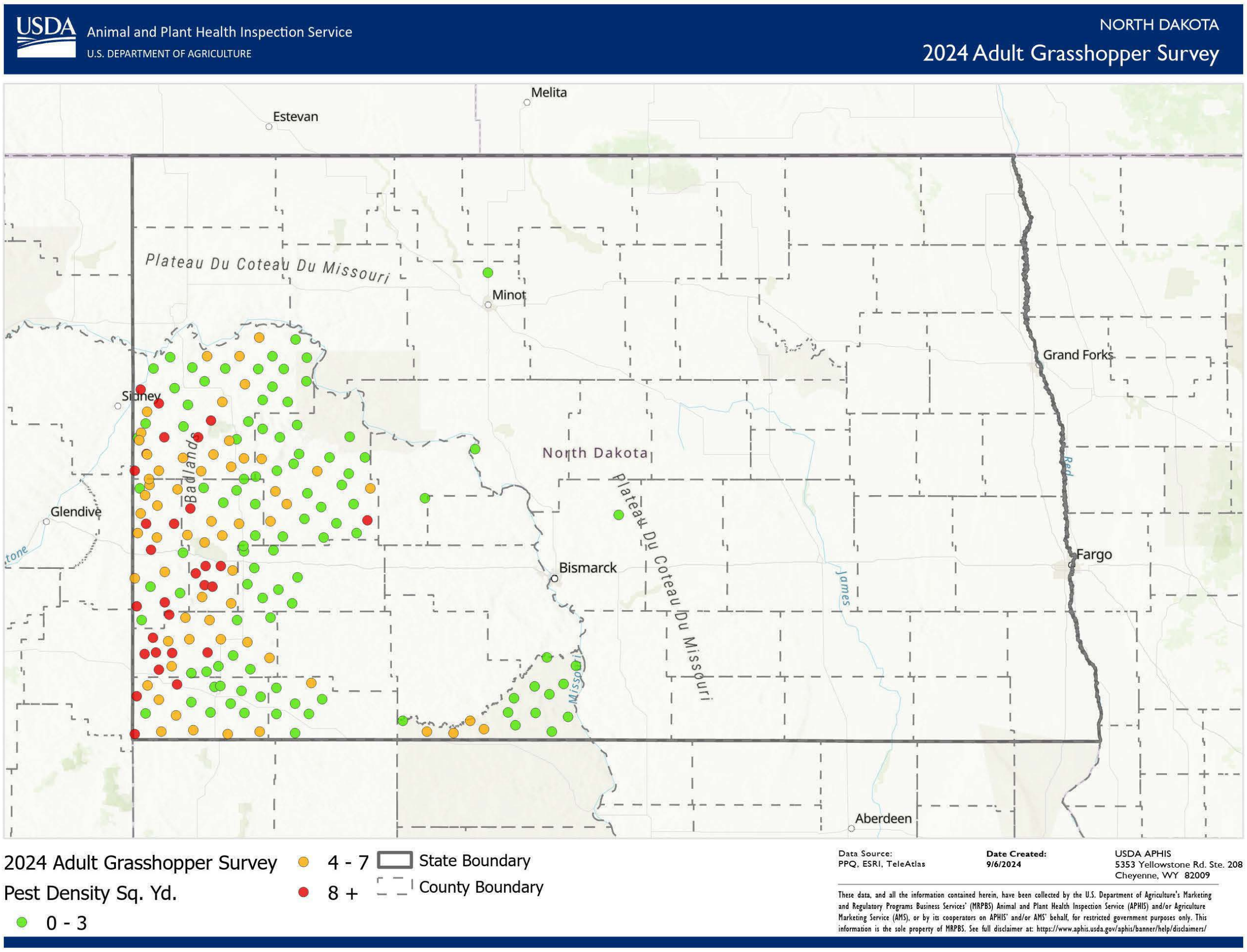
## *Appendix C: ND 2024 Adult Grasshopper Survey Map*



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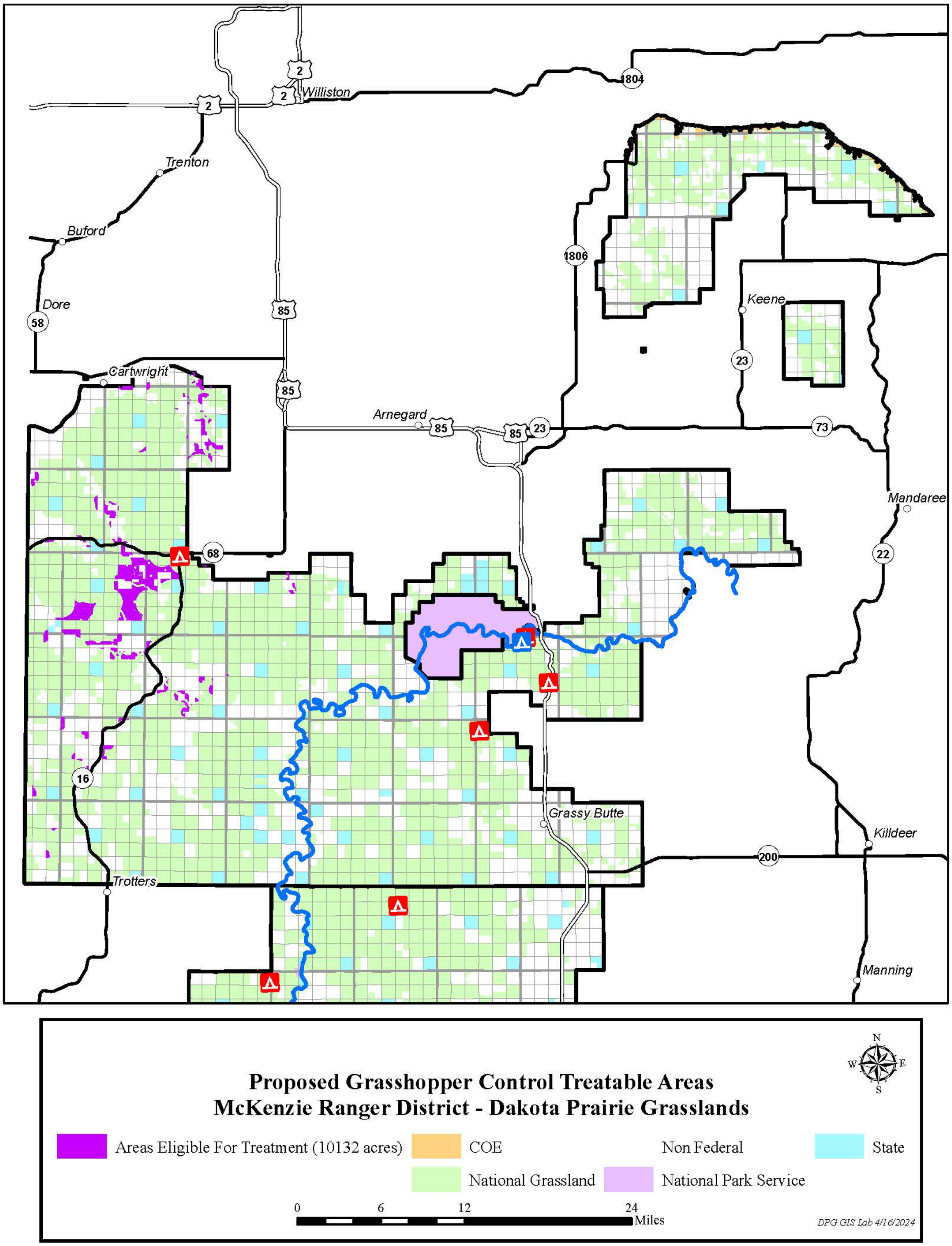
### *D. Appendix D: US FOREST SERVICE Eligible Treatment Areas 2024*



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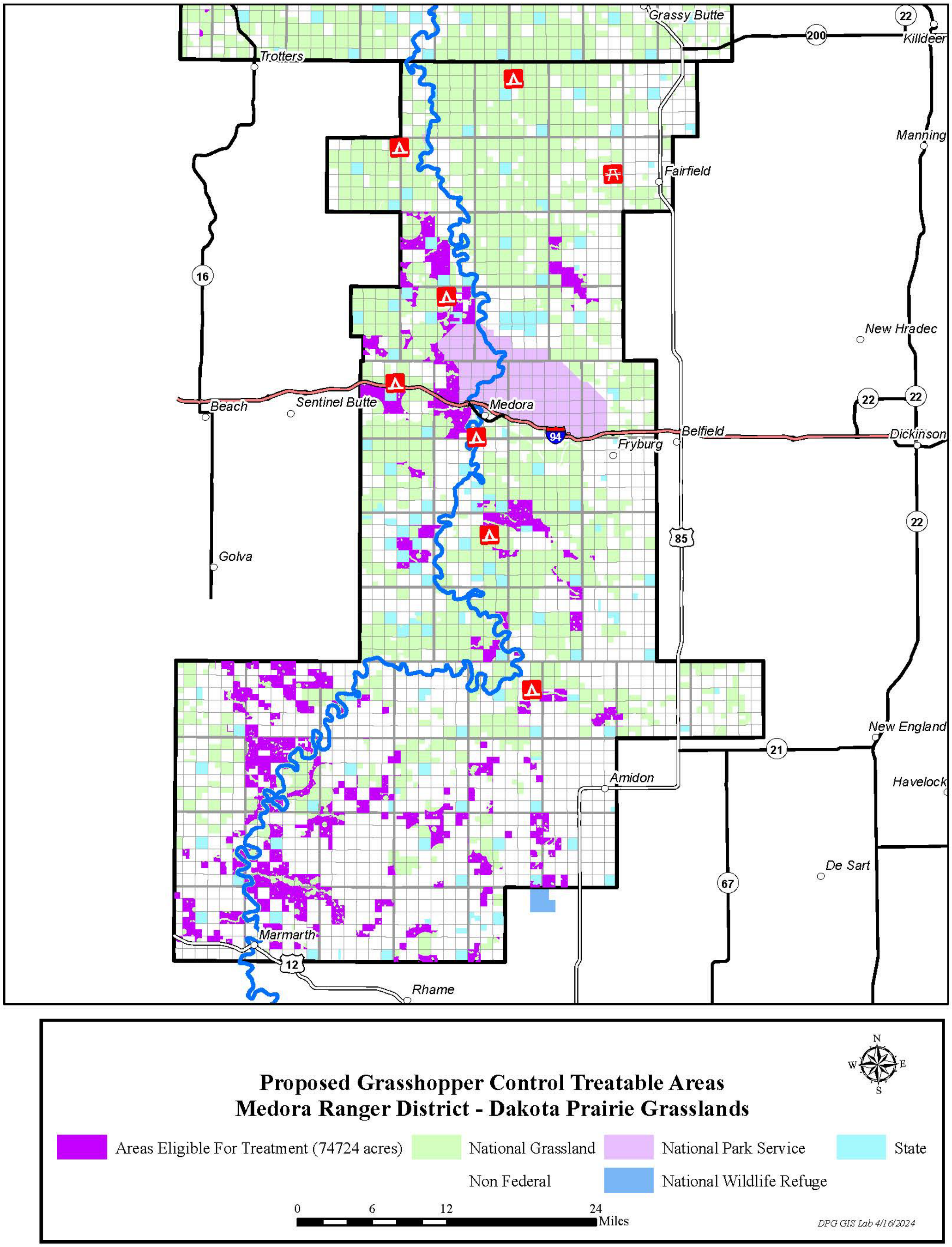


**Proposed Grasshopper Control Treatable Areas**
**Medora Ranger District - Dakota Prairie Grasslands**

***E.***

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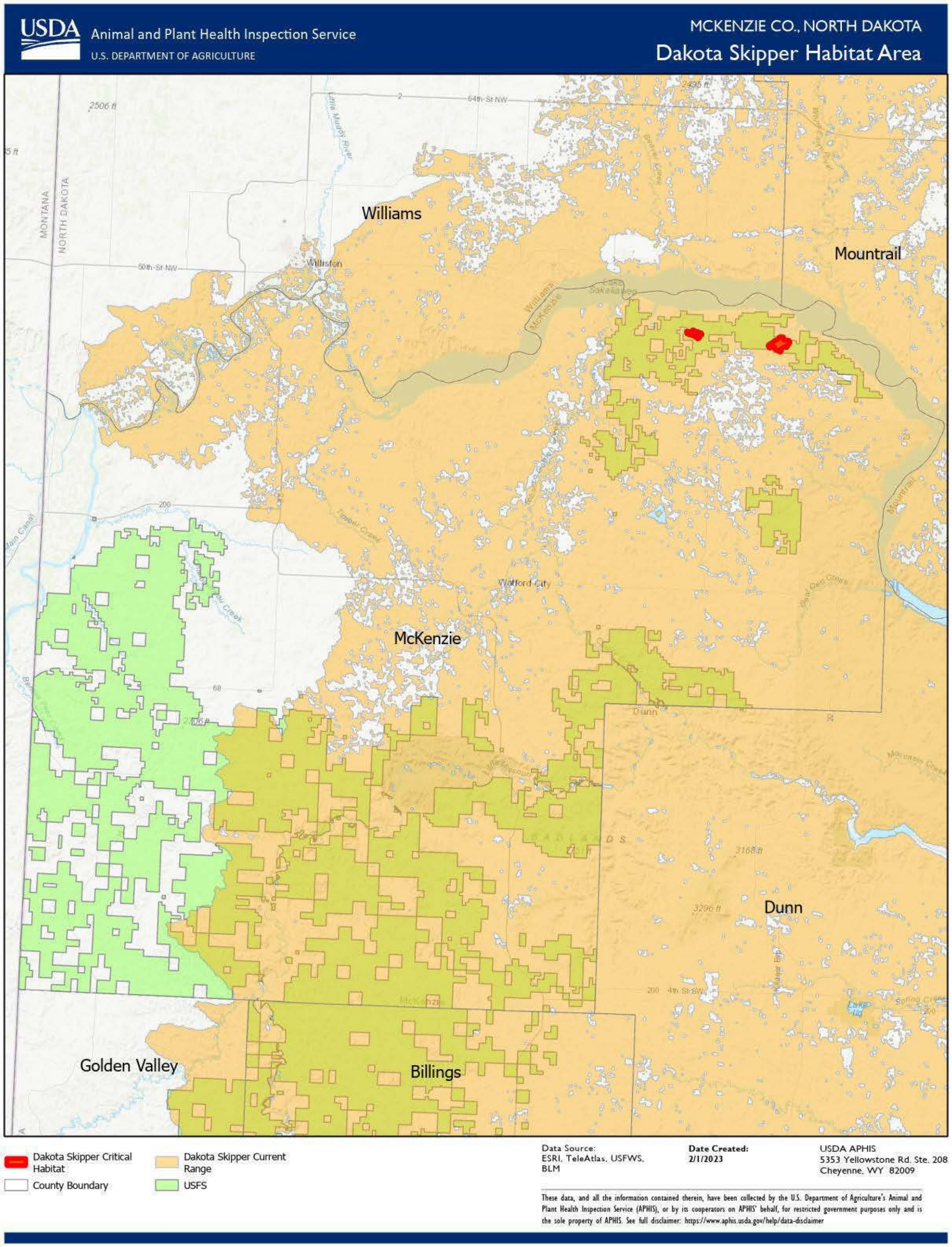
## *Appendix E: Dakota Skipper Occupied Habitat*



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# F. Appendix F: USFWS Correspondence

| | |
|---|---|
| **From:** | Vanwoert, Joshua - MRP-APHIS |
| **To:** | luke_toso@fws.gov |
| **Cc:** | chris_swanson@fws.gov; Mesman, Amy - MRP-APHIS |
| **Subject:** | 2025 North Dakota Section 7 Consultation Grasshopper Program |
| **Date:** | Wednesday, March 12, 2025 8:37:26 AM |
| **Attachments:** | image001.png<br>Appendix A-9 Effects Determinations for FWS Species and CH 2024.xlsx<br>Final FWS GH MC BA January 2024.pdf<br>FINAL_LOC_USDA_APHIS_MormonCricket_03202024 FOR SIGNATURE.pdf |

Good morning Luke,

USDA, Animal and Plant Health Inspection Service (APHIS), Plant Protection and Quarantine (PPQ) is preparing for potential control programs to protect rangeland from economic infestations of grasshoppers in North Dakota in 2025. Please consider this to be our informal Section 7 consultation regarding the APHIS Rangeland Grasshopper and Mormon Cricket Suppression Program.

In March of 2024 APHIS received national concurrence from FWS on the USDA, APHIS January 2024 Revised Programmatic Biological Assessment (BA), which is attached. The agreed upon protection measures are identified in the attached Appendix 9 - Effects Determination spreadsheet.

We will consider these protection measures as our guidance should treatment be warranted. We will contact you directly to identify locations of listed species and critical habitat in any proposed treatment area five days prior to treatment.

The nine North Dakota threatened and endangered species are identified below.

| Federally Listed Species in Assessment Area | Scientific Name | Status |
|---|---|---|
| Black-footed ferret | *Mustela nigripes* | Endangered |
| Gray wolf | *Canis lupus* | Endangered |
| Northern long-eared | *Myotis septentrionalis* | Endangered |
| Whooping crane | *Grus americana* | Endangered |
| Piping plover | *Charadrius melodus* | Threatened |
| Red Knot | *Calidris canutus rufa* | Threatened |
| Pallid sturgeon | *Scaphhirhynchus albus* | Endangered |
| Dakota Skipper | *Hesperia dacotae* | Threatened |
| Bald Eagle | *Haliaeetus leucocephalus* | Recovered |

APHIS' authority for carrying out control programs is found in the Plant Protection Act (PPA), Title IV, Agricultural Risk Protection Act of 2000, Section 417. The PPA mandates that APHIS control economic infestations of grasshoppers/Mormon crickets to protect rangeland, when requested, and provided funding is available.

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The USDA, APHIS, PPQ North Dakota Rangeland Grasshopper Environmental Assessment (EA) was a five-year EA set to expire in 2026. In May of 2022, a lawsuit was filed against the PPQ grasshopper program by several environmental groups. One of the resulting judgements was that all grasshopper states, including North Dakota, will be required to revise and update their EAs making significant changes.

We are actively working on the revisions however this process may not be complete prior to the 2025 field season resulting in our inability to treat grasshoppers should populations warrant control. Currently, we do not have any Federal control programs pending.

While we anticipate western North Dakota will continue to have areas of economic grasshopper populations, only a handful of small control programs have been conducted in the last 20 years. Funding constraints and other environmental considerations have drastically reduced grasshopper/Mormon cricket suppression activities. Our 2024 survey indicated a slight reduction in overall numbers. Due to our current hiring freeze we may have limited or no seasonal staff to conduct surveys in 2025.

We continue to have four chemical control options available to us for grasshopper treatment: diflubenzuron, Malathion, chlorantraniliprole and carbaryl. Chlorantraniliprole was not considered under the EA that expires in 2026 but will be considered in the revised EA that replaces it. As a growth regulator and chitin inhibitor, diflubenzuron is always our preferred choice based on the mode of action, chemical price and reduced impact to non-targets.

We continue to utilize the reduced area/agent treatment application method known as RAATS or 'skip swathing' when conducting a control program. This method leaves 50% of the intended control area untreated. Only in the case of a crop protection program would 100% coverage be considered. These programs involve a quarter to half mile buffer treatment on federal rangeland directly adjacent to private agricultural lands to prevent grasshopper migration.

Currently, approximately $500,000 is available to support treatment across the 17 western grasshopper states. Available cost share for PPQ implemented programs consists of paying 100% of the costs on federal land, 50% of the costs on state land and 33% of the cost on private lands.
If you have any questions or concerns, please let us know.

Joshua VanWoert

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