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Final Environmental Assessment Rangeland Grasshopper and Mormon Cricket Suppression Program

Beaver, Garfield, Iron, Kane, Washington & Wayne Counties, Utah
EA Number: UT-21-3

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Acronyms and Abbreviations

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

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Final Site-Specific Environmental Assessment

Rangeland Grasshopper and Mormon Cricket Suppression Program
Beaver, Garfield, Iron, Kane, Washington & Wayne Counties, Utah

I. Need for Proposed Action

A. Purpose and Need Statement

An infestation of grasshoppers or Mormon crickets may occur in Beaver, Garfield, Iron, Kane, Washington &/or Wayne Counties, Utah. The Animal and Plant Health Inspection Service (APHIS) and any cooperating agency, based on location of infestation may, upon request by land managers or state departments of agriculture, conduct treatments to suppress grasshopper infestations as part of the Rangeland Grasshopper and Mormon Cricket Suppression Program (program). The term "grasshopper" used in this environmental assessment (EA) refers to both grasshoppers and Mormon crickets, unless differentiation is necessary.

Populations of grasshoppers that trigger the need for a suppression program are normally considered on a case-by-case basis. Participation is based on potential damage such as wildlife and livestock forage destruction and benefits of treatments including crop protection or protection of sensitive species from grasshopper depredation. The goal of the proposed suppression program analyzed in this EA is to reduce grasshopper populations below economical infestation levels in order to protect rangeland ecosystems or cropland adjacent to rangeland.

This EA analyzes potential effects of the proposed action and its alternatives. This EA applies to a proposed suppression program that would take place from May 1st to September 30th in Beaver, Garfield, Iron, Kane, Washington &/or Wayne Counties, Utah.

This EA is prepared in accordance with the requirements under the National Environmental Policy Act of 1969 (NEPA) (42 United States Code § 4321 *et. seq.*) and the NEPA procedural requirements promulgated by the Council on Environmental Quality, United States Department of Agriculture (USDA), and APHIS. A decision will be made by APHIS based on the analysis presented in this EA, the results of public involvement, and consultation with other agencies and individuals. A selection of one of the program alternatives will be made by APHIS for the 2021 Control Program for Beaver, Garfield, Iron, Kane, Washington &/or Wayne Counties.

B. Background Discussion

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

1996) that result in competition with livestock and other herbivores for rangeland forage and can result in damage to rangeland plant species.

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

The site-specific data used to make treatment decisions in real time is gathered during spring nymph surveys. The general site-specific data include: grasshopper densities, species complex, dominant species, dominant life stage, grazing allotment terrain, soil types, range conditions, local weather patterns (wind, temp., precipitation), slope and aspect for hatching beds, animal unit months (AUM's) present in grazing allotment, forage damage estimates, number of potential AUM's consumed by grasshopper population, potential AUM's managed for allotment and value of the AUM, estimated cost of replacement feed for livestock, rotational time frame for grazing allotments, number of livestock in grazing allotment. Baseline thresholds for Mormon crickets are two per square yard and grasshoppers are eight per square yard, though neither of those thresholds guarantees justification for treatment alone. These are all factors that are considered when determining the economic infestation level.

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

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

outbreak area is the response available to APHIS to rapidly suppress or reduce grasshopper populations and effectively protect rangeland.

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

APHIS' authority for cooperation in this suppression program is based on Section 417 of the Protection Act otL.000 (7 U.S.C. § 7717).

The Utah Agricultural Code, Section 4-35, provides for certain actions authorized by this "Insect Infestation Emergency Control Act." It authorizes the Utah Commissioner of Agriculture to appoint members to a Decision and Action Committee who are directly affected and involved in the current insect infestation emergency. The committee establishes a system of priorities for any insect infestation emergency, and members of USDA, APHIS, PPQ in Utah have served on the committee and have been asked to help address the grasshopper/Mormon cricket problem which this document analyzes. The Commissioner of Agriculture, with the consent of the governor, has declared that this infestation jeopardizes property and recourses and has designated, with the help of APHIS surveys, the areas affected. He has initiated operations to control the problem in those designated areas and has request APHIS to enter into a cooperative agreement with the Utah Department of Agriculture and Food (UDAF) in order to cooperatively attack the infestations and mitigate consequences related thereto.

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

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

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

In November 2019, APHIS and the Forest Service (FS) signed an MOU detailing cooperative efforts between the two groups on the suppression of grasshoppers on FS system lands (Document # 19-8100-0573-MU, November 06, 2019). This MOU clarifies that APHIS would prepare and issue to the public site-specific environmental documentations that evaluate potential impacts associated with the proposed measures to suppress economically damaging grasshopper populations. The MOU also states that these documents would be prepared under the APHIS NEPA implementation procedures with cooperation and input from the FS.

The MOU further states that the responsible FS official would request in writing the inclusion of appropriate lands in the APHIS suppression project when treatment on FS land is necessary The FS 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 FS prepares and approves the Pesticide Use Proposal.

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

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

APHIS supports the use of Integrated Pest Management (IPM) principles in the management of grasshoppers and Mormon Crickets. APHIS provides technical assistance to Federal, Tribal, State and private land managers including the use of IPM. However, implementation of on-the-ground IPM activities is limited to land management agencies and Tribes, as well as private landowners. In addition, APHIS' authority under the Plant Protection Act is to treat Federal, State and private lands for grasshoppers and Mormon cricket populations. APHIS' technical assistance occurs under each of the three alternatives proposed in the EIS.

In addition to providing technical assistance, APHIS completed the Grasshopper Integrated Pest Management (GIPM) project. One of the goals of the GIPM is to develop new methods of suppressing grasshopper and Mormon cricket populations that will reduce non-target effects. RAATs are one of the methods that has been developed to reduce the amount of pesticide used in suppression activities and is a component of IPM. APHIS continues to evaluate new suppression tools and methods for grasshopper and Mormon cricket

populations, including biological control, and as stated in the EIS, will implement those methods once proven effective and approved for use in the United States.

C. About This Process

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

When treatments occur on Tribal lands the following caveat may explain the program's reticence to share site-specific treatment details in the Draft EA. 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 1506.6). The grasshopper and Mormon cricket suppression program EIS was published in the Federal Register (APHIS-2016-0045), and met all applicable notice and comment requirements for a federal action with effects of national concern. This process provided individuals and national groups the ability to participate in the development of alternatives and provide comment. Our subsequent state-based actions have the potential for effects of local concern, and we publish them according to the provisions that apply to federal actions with effects primarily of local concern. This includes the USDA APHIS NEPA Implementation Procedures, which allows for EAs and findings of no significant impact (FONSIs) where the effects of an action are primarily of regional or local concern, to normally provide notice of publication in a local or area newspaper of general circulation (7 CFR 372.7(b)(3)). These notices provide potentially locally affected individuals an additional opportunity to provide input into the decision-making process. Some states, including Utah, also provide additional opportunities for local public involvement, such as public meetings. In addition, when an interested party asks to be informed APHIS ensures their contact information is added to the list of interested stakeholders.

APHIS uses the scoping process to enlist land managers and the public to identify alternatives and issues to be considered during the development of a grasshopper or Mormon cricket suppression program. Scoping was helpful in the preparation of the draft EAs. The process can occur formally and informally through meetings, conversations, or written comments from individuals and groups.

The current EIS provides a solid analytical foundation; however, it may not be enough to satisfy NEPA completely for actual treatment proposals. The program typically prepares a

Draft EA tiered to the current EIS for each of the 17 Western States, or portion of a state, that may receive a request for treatment. The Draft EA analyzes aspects of environmental quality that could be affected by treatments in the area where grasshopper outbreaks are anticipated. The Draft EA will be made available to the public for a 30-day comment period.

When the program receives a treatment request and determines that treatment is necessary, the specific site within the state will be evaluated to determine if environmental factors were thoroughly evaluated in the Draft EA. If all environmental issues were accounted for in the Draft EA, the program will prepare a Final EA and FONSI. Once the FONSI has been finalized copies of those documents will be sent to any parties that submitted comments on the Draft EA, and to other appropriate stakeholders. To allow the program to respond to comments in a timely manner, the Final EA and FONSI will be posted to the APHIS website. The program will also publish a notice of availability in the same manner used to advertise the availability of the Draft EA.

II. Alternatives

To engage in comprehensive NEPA risk analysis APHIS must frame potential agency decisions into distinct alternative actions. These program alternatives are then evaluated to determine the significance of environmental effects. The 2002 EIS presented three alternatives: (A) No Action; (B) Insecticide Applications at Conventional Rates and Complete Area Coverage; and (C) Reduced Agent Area Treatments (RAATs), and their potential impacts were described and analyzed in detail. The 2019 EIS was tiered to and updated the 2002 EIS. Therefore the 2019 EIS considered the environmental background or 'No Action' alternative of maintaining the program that was described in the 2002 EIS and Record of Decision. The 2019 EIS also considered an alternative where APHIS would not fund or participate in grasshopper suppression programs. The preferred alternative of the 2019 EIS allowed APHIS to update the program with new information and technologies that not were analyzed in the 2002 EIS. Copies of the complete 2002 and 2019 EIS documents are available for review at 1860 W. Alexander St., Suite B, West Valley City, UT 84119. These documents are also available at the Rangeland Grasshopper and Mormon Cricket Program web site, http://www.aphis.usda.gov/plant-health/grasshopper.

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

This Fianl EA analyzes the significance of environmental effects that could result from the alternatives described below. These alternatives differ from those described in the 2019 EIS because grasshopper treatments are not likely to occur in most of Beaver, Garfield, Iron, Kane, Washington &/or Wayne Counties, Utah, and therefore the environmental baseline should describe a no treatment scenario.

A. No Suppression Program Alternative

Under Alternative A, the No Action alternative, APHIS would not conduct a program to suppress grasshopper infestations within Beaver, Garfield, Iron, Kane, Washington &/or Wayne Counties. Under this alternative, APHIS may opt to provide limited technical assistance, but any suppression program would be implemented by a Federal land management agency, a State agriculture department, a local government, or a private group or individual.

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

Under Alternative B, the Preferred Alternative, APHIS would manage a grasshopper treatment program using techniques and tools discussed hereafter to suppress outbreaks. The insecticides available for use by APHIS include the U.S. Environmental Protection Agency (USEPA) registered chemicals carbaryl, diflubenzuron, and malathion. These chemicals have varied modes of action. Carbaryl and malathion work by inhibiting acetylcholinesterase (enzymes involved in nerve impulses) and diflubenzuron inhibits the formation of chitin by insects. APHIS would make a single application per year to a treatment area and could apply insecticide at an APHIS rate conventionally used for grasshopper suppression treatments, or more typically as reduced agent area treatments (RAATs). APHIS selects which insecticides and rates are appropriate for suppression of a grasshopper outbreak based on several biological, logistical, environmental, and economical criteria. The identification of grasshopper species and their life stage largely determines the choice of insecticides used among those available to the program. RAATs are the most common application method for all program insecticides, and only rarely do rangeland pest conditions warrant full coverage and higher rates.

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

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

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

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

Applicators ensure that pesticides are sprayed only in the treatment blocks. For example: Contractors' use of Trimble GPS Navigation equipment (e.g., Sat-loc or Ag-Nav) is used to navigate and capture shapefiles of the treatment areas. All sensitive sites are buffered out of the treatment area using the navigation equipment or flagging, which is highly visible to the applicator. In addition, APHIS personnel monitor all project activities to help contractors maintain treatment integrity. All sensitive sites are reviewed in the daily briefing with APHIS personnel and the applicator working on the treatment site.

Typical treatment decisions result from consultations between APHIS personnel and land managers to determine the best economically and biologically-sound strategy to protect impacted range and wildlife resources. Treatment designs attempt to include as much of the grasshopper or Mormon cricket infestation as possible in order to minimize re-infestation potential. RAATs is always implemented in Utah in order to reduce treatment costs and environmental exposure.

For example, an aerial spray project took place in Millard and Beaver Counties, Utah to suppress an infestation of Mormon crickets which threatened private agricultural areas and BLM-managed and state range forage. The total project area included nearly 21,000 acres and took place in early June of 2012. APHIS and BLM range specialists determined to apply Dimilin (diflubenzuron) at 1 ounce per acre at 50% RAATs coverage to suppress the cricket infestation of 2 or more per square yard. Due to the implementation of the RAATs method, more than 10,000 acres within the block remained untreated.

Utah recognizes no minimum treatment area to suppress grasshoppers or Mormon crickets so long as the objective to protect range forage and sensitive species is achieved. Normally larger blocks are needed to encompass entire infestations, but small incipient populations which threaten sensitive resources may be treated.

The typical suppression treatment design will be 1.0 ounce of diflubenzuron per acre applied at 50% coverage.

Insecticide applications at conventional rates and complete area coverage, is an approach that APHIS has used in the past but is currently uncommon. Under this alternative, carbaryl,

diflubenzuron or malathion would cover all treatable sites within the designated treatment block per label directions. The application rates under this alternative are typically at the following application rates:

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

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

PPQ S&T at times will be conducting experimental grasshopper treatments not categorically excluded from NEPA analysis and within the suppression program area covered under this EA. However, there are currently none planned for 2021.

III. Affected Environment

A. Description of Affected Environment

The proposed suppression program area included in this EA encompasses 11,316,243 acres (17,682 sq. miles) within south central Utah. This represents 21% of the land in Utah. Approximately 79.6% of the land within the six-county area is classified as federal; 6.6% of the acreage is state; and the remaining 13% of the land is private.

Beaver and Iron Counties are characteristic of the basin and range province of the Intermountain West. Broad, relatively flat alluvial valley floors characterize the area with elevations of 5,000 to 6,000 feet, bordered by mountain ranges. Most of the area drains into the Great Basin. These two counties include some higher elevation mountain ranges, foothills and lowland areas of native and improved rangeland, irrigated pastures, cropland and some orchards.

Kane, Garfield and Wayne Counties are within the Colorado Plateau Province and ranges from the Canyonlands Section in the east to the High Plateaus Section in the west. The Canyonlands Section has been deeply carved by the Colorado River and its tributaries. Sheer-walled canyons, cliffs, low plateaus, mesas, buttes and badlands characterize the area including the Henry Mountains, Circle Cliff uplands and Kaiparowitz Plateau. The High Plateaus Section borders the Canyonlands and is distinguished by a series of escarpments and cliffs including the Chocolate Vermillion, White, gray, Pink and Black Cliffs. Elevations range from less than 2,500 feet along the Colorado River to the 11,615 foot Mt. Ellen. The landscape consists of high mountains, forested plateaus, desert plateaus, basins and canyons, alluvial slopes, flood plains, toe slopes, terraces and breaks, slick rock and sand dunes.

The six-county area is semi-arid with an average rainfall of 6 to 10 inches in the lowlands and 20 to 25 inches in the higher mountain elevations. Precipitation is equally divided between winter Pacific storms and summer thundershowers. The climate is characterized by low relative humidity, rapid evaporation, generally clear skies and daily and annual fluctuations in temperatures (i.e. cold winters, hot summers). The average number of frost free days at the lower elevations is 80-180 days.

The soils of Beaver and Iron Counties vary with elevations, precipitation and vegetation. The fertile, agricultural land of Beaver County is mainly sandy loam. The desert soils are alluvial, with little soil development or leaching of soluble salts. The mountainous areas contain gravelly, stony soils, also often containing high clay content. Some of these soils are in a critical erosion class. Throughout Kane, Garfield and Wayne Counties the soil types include fine sand, fine sandy loam, sandy loam, clay, sandy clay loam, gravelly loam and gravelly fine sandy loam.

The native vegetation of Beaver and Iron Counties consists primarily of sagebrush, desert shrub communities, pinyon pine, natural grassland and mountain shrub and woodland communities at higher elevations. The wet north mountain slopes support aspen, conifers

and shrubs. The agriculturally important vegetation is natural and improved rangeland for sheep and cattle and irrigated crops of alfalfa, silage and small grains.

Vegetative types within Kane, Garfield and Wayne Counties range from subalpine and mixed conifers such as spruce, white fir and Douglas fir at the higher elevations to ponderosa pine, pinyon-juniper, serviceberry, cliffrose, aspen, mountain mahogany, Gambel oak, big sage, Mormon tea, four wing salt bush, globe mallow, blue gramma, black gramma, sand drop seed, galleta, rabbitbrush, cactus, Indian rice grass, black brush and other grasses and forbs. Sagebrush and pinyon-juniper generally occupy intermediate elevations. Most of the vegetative types in this three-county area are not conducive to large grasshopper/Mormon cricket population outbreaks. Agricultural lands threatened by outbreaks of grasshoppers and crickets are primarily devoted to alfalfa and some small grains as well. Small orchards and gardens are common around homes.

The cropland area just south of Kanab range in Kane County is adjacent to sagebrush. The cropland areas just north of the Vermillion Cliffs east of Kanab are bordered by pinyon juniper and sagebrush. The cropland around Tropic to Henrieville area is bordered by pinyon-juniper, sagebrush, some barren lands, desert shrub and grass. The croplands near Escalante are bordered primarily by pinyon-juniper with some sagebrush and grass in the bottoms. The area near Fremont south and east to Grover is bordered primarily by sagebrush with some pinyon-juniper.

Within Beaver, Iron, Kane, Garfield and Wayne Counties, surface water resources consist of Powell, Barney, Green, Philo and Roundy lakes; Minersville Reservoir; Colorado, Freemont, Paria, Escalante, Beaver and Sevier Rivers; East Fork of the Virgin River and numerous creeks, lakes, springs, seeps and small ponds. Most drainages are ephemeral, flowing only after periods of extended or intensive rainfall. The water resources provide adequate water for wildlife and domestic livestock use as well as wildlife habitat and excellent recreation. Mountain springs and wells supply Beaver, Minersville, Greenville and other communities in these counties. The ground water reserves are in good condition and are not currently being depleted. These and all other waters are protected with buffer zones for water outlined in the operational procedures.

Major croplands in Beaver, Iron, Washington Kane, Garfield and Wayne Counties occur as follows. There are 37 crop protection sites in Beaver County and 3 in Iron County, totaling 7,000 acres. In Beaver County, major croplands under consideration are as follows: agricultural lands in the area surrounding the town of Beaver from Manderfield and west to Greenville; west of Minersville Reservoir; lands associated with Minersville. The area north and west of Milford, the Wah Wah Valley north of Hwy 21 and the southern end of Pine Valley. In Iron County these lands are in the western portion of the Escalante Desert between Beryl and Modena on the north and Newcastle on the south.

Major croplands in Kane County are south of Kanab, both south and north of Hwy 89, also Johnson Wash and Skutumpah Creek and south of Cannonville. Garfield County has croplands west and southwest of Escalante, near Cannonville, Henrieville and Tropic, and northwest of Hilldale to southeast of Panguitch. Major croplands in Wayne County occur near Fremont, Lyman, Loa, Bicknell, Teasdale, Torrey and

Grover. The Washington County area that is covered by this EA will include 536,986 acres of land managed by the Bureau of Land Management, 101,040 acres of state land, 255,060 acres of private,

27,890 acres of tribal lands, 143,605 acres of Park Service land and 425,285 acres of lands managed by the U.S. Forest Service. Approximately 92,019 acres of designated desert tortoise habitat will be excluded, and no APHIS treatments will be considered therein.

(See Appendix B for relevant maps.)

IV. Site-Specific Considerations

1. Human Health

The major population centers within Beaver, Garfield, Iron, Kane, Washington and Wayne Counties are sparse. The total population of the six counties is approximately 246,580 (less than five percent of the entire population of Utah).

Beaver County has a population of nearly 6,600, and the county seat is the town of Beaver with a population of roughly 3,100 which have access to Beaver Valley Hospital. Notable recreation areas include the American Discovery Trail which traverses the county through Beaver and Minersville; Elk Mountain which is home to Eagle Point ski area; Fishlake National Forest and Rock Corral Recreation Area which is an area of geologic interest managed by the BLM.

Garfield County has a population of a little more than 5,000. The county seat is Panguitch with a population of about 1,695 and where Garfield Memorial Hospital is located. Other communities include Antimony, Bryce Canyon City, Boulder, Cannonville, Escalante, Hatch, Henrieville and Tropic. Recreational areas in the vicinity include Bryce Canyon National Park, Canyonlands National Park, Capitol Reef National Park, Dixie National Forest, Escalante Petrified Forest, Fishlake National Forest, Glen Canyon National Recreation Area, Grand Staircase-Escalante National Monument and Mammoth Cave.

Iron County has a population of about 52,780, and its county seat is Parowan with a population of around 3,100. Cedar City has the largest population (a little over 33,000), and other communities include Beryl Junction, Brian Head, Cedar Highlands, Enoch, Hamiltons Fort, Hamlin Valley, Kanarraville, Lund, Newcastle, Modena, Old Irontown, Newcastle, Paragonah and Summit. Valley View Medical Center in Cedar City is the only hospital in the county. Recreational areas include Brian Head Ski Resort, Dixie National Forest, Fishlake National Forest, Three Peaks Recreation Area and Woods Ranch Recreation Area.

Kane County has a population of around 7,700, and its county seat and largest town is Kanab with a population of nearly 4,800. Other communities in the county include Alton, Big Water, Glendale and Orderville. Kane County Hospital is located in Kanab. Recreational areas include Bryce Canyon National Park, Coral Pink Sand Dunes State Park, Dixie National Forest, Glen Canyon National Recreation Area, Lake Powell and Navajo Lake.

Washington County has a population of about 171,800, and its county seat and largest city is Saint George with a population of about 86,000. Other communities in the county include Central, Enterprise, Gunlock, Hurricane, Ivins, La Verkin, Pine Valley, Rockville, Santa Clara, Springdale, the Shivwits Band of Paiutes Indian Reservation and Veyo. Dixie Regional Medical Center is the major hospital in Washington County. Recreational areas include Beaver Dam Wash National Conservation Area, Dixie National Forest, Quail Creek State Park, Red Cliffs National Conservation Area, Sand Hollow State Park, Snow Canyon State Park and Zion National Park.

Wayne County has a population of around 2,700, and its county seat and largest town is Loa with a population of about 600.

The 2002 EIS and 2019 EIS contains detailed hazard, exposure, and risk analyses for the chemicals available to APHIS. Impacts to workers and the general public were analyzed for all possible routes of exposure (dermal, oral, inhalation) under a range of conditions designed to overestimate risk. The operational procedures and spraying conditions examined in those analyses conform to those expected for operations. The following discussion summarizes the hazards, potential exposure, and risk to workers and the general public for operations in Utah. Operational procedures identified in Appendix A would be required in all cases and further mitigation measures are identified in this section, as appropriate.

No treatment will occur over congested areas, recreation areas, or schools and if appropriate, a buffer zone will be enacted and enforced.

Groundwater wells are a major source of domestic water supplies. Groundwater and surface water are the major rural and livestock water source. No impact is anticipated. Strict adherence to label requirements and USDA treatment guidelines (Appendix A) will be followed regarding treatments bordering open surface waters.

Malathion and carbaryl are cholinesterase inhibitors. Cholinesterases (including AChE) are enzymes that function at the nerve synapse. The nerve synapse is the point where information in the form of electrical impulses is relayed or transmitted by chemical messengers (called transmitters) from one nerve cell to another. Cholinesterase then inactivates or destroys the transmitter chemical (like acetylcholine) after it completes its job, otherwise the transmitter would continue indefinitely and precise control of the enervated tissue (muscle or organ) would be lost. Refer to the 2015 guidelines (Appendix A) for further information on mitigating exposure to cholinesterase inhibitors.

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

2. Nontarget Species

Upland game species which occur in the area include sage grouse, ruffed grouse, blue grouse, chukar partridge, quail and ring-necked pheasant.

Waterfowl, shorebirds and waders occur in wetland/marsh habitats. Game fish (trout and catfish) are known to inhabit the aquatic areas. Mule deer, elk, antelope, mountain lion, black bear, coyote, rabbits, Gambel's quail, mourning dove, band tailed pigeon, coot and snipe also occur within the combined five- county area.

Candidate species for federal listing, state-listed species and/or other sensitive species identified by state or federal agencies within the area include: the white-faced ibis, long-billed curlew, western snowy plover, least chub, mountain plover, Arizona Bell's vireo, Merriman's kangaroo rat, Williamson's sapsucker, Lewis' woodpecker, Grace's warbler, Mexican vole, western, burrowing owl, ferruginous hawk, Swainson's hawk, western bluebird and the purple martin.

3. Socioeconomic Issues

Recreation use is moderate over most of the affected area. There are several dispersed camping sites. Hunting seasons increase recreation use in the form of dispersed camping and general hunting activity. Hunting season occurs later in the year during a time when grasshopper and cricket populations have begun to dwindle such that fewer insects are present. Hunters probably will not be affected. ATV use is fairly prevalent throughout.

The presence of high densities of grasshoppers or Mormon crickets will result in fewer people engaging in recreational activities during the spring and summer within the affected areas. High insect densities in a campsite detract considerably from the quality of the recreational experience. Crickets tend to get into unsecured tents and food.

The quality of the recreational experience for ATV users and horseback riders also will be indirectly impaired by high densities of grasshoppers and/or crickets. Such numbers crossing roads and trails are killed by vehicle traffic, leaving wind rows of dead insects in the travel way as well as providing a vehicular safety hazard by leaving slick residues on local roads.

People who normally recreate in areas that are heavily infested will likely relocate to areas that are not infested. Displacement of users will be more of an inconvenience to the public than an actual effect on the recreational values of the area. Displacement will also increase pressure on other public lands as people move to new locations to camp and to engage in other recreational activities. Social capacity tolerances will be impacted. The potential for user

conflict will increase, in particular as motorized recreationists displace to other already heavily used areas. Such locations will experience more pressure and may experience site degradation. Areas currently not impacted or used by dispersed campers may become subjected to use and development as people look for areas for recreation which are not infested with insects.

Small towns near the affected areas receive limited business from recreationists who visit public lands. Many local gas stations/public stores rely fairly heavily on summer business to support their operations.

Livestock grazing is one of the main uses of most of the affected area, which provides summer range for ranching operations. Permittees may run cattle, sheep and/or horses for a season that runs generally from the first of June to the end of September, weather and vegetation conditions permitting.

A substantial threat to the animal productivity of these rangeland areas is the proliferation of grasshopper/Mormon cricket populations. These insects have been serious pests in the Western States since early settlement. Weather conditions favoring the hatching and survival of large numbers of insects can cause outbreak populations, resulting in damage to vegetation. The consequences may reduce grazing for livestock and result in loss of food and habitat for wildlife.

Livestock grazing on public lands contributes important cultural and social values to the area. Intertwined with the economic aspects of livestock operations are the lifestyles and culture that have co-evolved with Western ranching. Rural social values and lifestyles, in conjunction with the long heritage of ranching and farming continue to this day, dating back to the earliest pioneers in Utah, who shaped the communities and enterprises that make up much of the state. The rural Western lifestyle also contributes to tourism in the area, presenting to travelers a flavor of the West through tourist-oriented goods and services, photography of sheep bands or cattle in pastoral settings and scheduled events. .

Ranchers displaced from public lands due to early loss of forage from insect damage will be forced to search for other rangeland, to sell their livestock prematurely or to purchase feed hay. This will affect other ranchers (non- permittees) by increasing demand, and consequently, cost for hay and/or pasture in the area. This will have a beneficial effect on those providing the hay or range, and a negative impact on other ranchers who use these same resources throughout the area. In addition, grazing on private lands resulting from this impact will compound the effects to vegetation of recent drought conditions over the last six years (e.g., continual heavy utilization by grasshoppers/crickets, wildlife and wildfire), resulting in longer-term impacts (e.g., decline or loss of some preferred forage species) on grazing forage production on these lands.

The lack of treatment would result in the eventual magnification of grasshopper/Mormon cricket problems resulting in increased suppression efforts, increased suppression costs and the expansion of suppression needs onto lands where such options are limited. For example, control needs on crop lands where chemical options are restricted because of pesticide label restrictions.

Under the no action alternative, farmers would experience economic losses. The suppression of grasshoppers and/Mormon crickets in the affected area would have beneficial economic impacts to local landowner, farmers and beekeepers. Crops near infested lands would be protected from devastating migrating hordes, resulting in higher crop production; hence, increased monetary returns.

4. Cultural Resources and Events

Federal and state public lands that are part of the region's visual and cultural resources include the Canyonlands National Park, Glen Canyon National Recreation Area, Fishlake National Forest, Zion National Park, Cedar Breaks National Monument, Capitol Reef National Park, Bryce Canyon National Park and the Dixie National Forest. State parks within the area include: Minersville, Coral Pink Sand Dunes, Grand Staircase Escalante National Monument and the Anasazi Indian Village State Parks.

A variety of activities have occurred throughout the area of concern that affect cultural resources. These activities and any cumulative impacts associated with them will occur regardless of whether or not grasshoppers/Mormon crickets are treated.

Use of motorized equipment off existing roads could impact surface artifacts by damaging them or displacing them in their overall juxtaposition with other artifacts. Maintaining the integrity of a historical site is important to understanding the significance of the site and the artifacts found therein. Non-treatment of infested land will likely later result in more intensive and extensive treatment of that infested land. Most of the non-public lands that will be affected have already been heavily disturbed and any artifacts on them likely impacted. Consequently, it is unlikely that additional treatments will result in additional impacts on cultural properties.

With no treatment of grasshoppers or crickets on public lands, aerial application of insecticides off public lands will likely increase. Though this should not disturb or displace cultural artifacts, carrying agents in the spray could damage artifacts (USDA, APHIS EIS, 2002, p. 71). However, most if not all the areas likely to be treated have been heavily disturbed in the past, and any artifacts on them likely impacted. Consequently, it is unlikely that these aerial treatments will result in additional impacts on cultural properties.

Motorized vehicles (pick-up trucks and/or ATV's) may be used to treat portions of the affected areas. This will create a risk of impacting cultural properties. The risk is small given that the off-road use of vehicles will create only minor soil disturbance, and the areas involved are not likely to contain significant sites of which public officials are not already aware. Known sites will be avoided to mitigate impacts. Any sites located during treatment activities will be reported, then avoided during continuing operations. Past similar grasshopper/cricket treatments throughout the state have not resulted in any known impacts to cultural properties.

In addition to the treatments proposed under this alternative, a broad variety and number of activities throughout the project area could affect, or have affected, cultural resources. These activities and any cumulative impacts associated with them will occur, regardless of whether or not grasshoppers/crickets are treated. No direct, indirect or change in cumulative impacts on cultural resources in the area will occur due to implementation of the treatment alternative.

To ensure that historical or cultural sites, monuments, buildings or artifacts of special concern are not adversely affected by program treatments, APHIS will confer with

BLM, Forest Service or other appropriate land management agency on a local level to protect these areas of special concern. APHIS also will confer with the appropriate tribal authority and with the BIA office at a local level to ensure that the timing and location of planned program treatments do not coincide or conflict with cultural events or observances, such as sun dances, on tribal lands.

5. Special Considerations for Certain Populations

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

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

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

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

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

In past grasshopper programs, the U.S. Department of the Interior's (USDI) Bureau of Land Management or Bureau of Indian Affairs (BIA) have notified the appropriate APHIS State Plant Health Director when any new or potentially threatening grasshopper infestation is discovered on BLM lands or tribal lands held in trust and administered by

BIA. Thus, APHIS has cooperated with BIA when grasshopper programs occur on Indian tribal lands. For local Indian populations, APHIS program managers will work with BIA and local tribal councils to communicate information to tribal organizations and representatives when programs have the potential to impact the environment of their communities, lands or cultural resources.

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

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

Treatments used for 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 or Mormon cricket program is very slight and that no disproportionate adverse effects to children are anticipated over the negligible effects to the general population.

APHIS also institutes program measures (i.e., 500-foot buffers around homes, schools and occupied buildings and campgrounds) and notification of residents that mitigates the potential for exposure of program insecticides to children.

V. Environmental Consequences

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

APHIS has written human health and ecological risk assessments (HHERAs) to assess the insecticides and use patterns that are specific to the program. The risk assessments provide an in-depth technical analysis of the potential impacts of each insecticide to human health; and non-target fish and wildlife along with its environmental fate in soil, air, and water. The assessments rely on data required by the USEPA for pesticide product registrations, as well as peer-reviewed and other published literature. The HHERAs are heavily referenced in the

EIS and this Final EA. These Environmental Documents can be found at the following website: http://www.aphis.usda.gov/plant-health/grasshopper.

A. Environmental Consequences of the Alternatives

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

1. No Suppression Program Alternative

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

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

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

When the density of grasshoppers reaches economic infestation levels, grasshoppers begin to compete with livestock for food by reducing available forage (Wakeland and Shull,

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

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

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

a) Carbaryl

Carbaryl is a member of the N-methyl carbamate class of insecticides, which affect the nervous system via cholinesterase inhibition. Inhibiting the enzyme acetylcholinesterase (AChE) causes nervous system signals to persist longer than normal. While these effects are desired in controlling insects, they can have undesirable impacts to non-target organisms that are exposed. The APHIS HHERA assessed available laboratory studies regarding the toxicity of carbaryl on fish and wildlife. In summary, the document indicates the chemical is highly toxic to insects, including native bees, honeybees, and aquatic insects; slightly to highly toxic to fish; highly to very highly toxic to most aquatic crustaceans, moderately toxic to mammals, minimally toxic to birds; moderately to highly toxic to several terrestrial arthropod predators; and slightly to highly toxic to larval amphibians (USDA APHIS, 2018a). However, adherence to label requirements and additional program measures designed to prevent carbaryl from reaching sensitive habitats or mitigate exposure of non-target organisms will reduce environmental effects of treatments.

The offsite movement and deposition of carbaryl after treatments is unlikely because it does not significantly vaporize from the soil, water, or treated surfaces (Dobroski et al., 1985). Temperature, pH, light, oxygen, and the presence of microorganisms and organic material are factors that contribute to how quickly carbaryl will degrade in water. Hydrolysis, the breaking of a chemical bond with water, is the primary degradation pathway for carbaryl at pH 7 and above. In natural water, carbaryl is expected to degrade faster than in laboratory settings due to the presence of microorganisms. The half-lives of carbaryl in natural waters varied between 0.3 to 4.7 days (Stanley and Trial, 1980; Bonderenko et al., 2004). Degradation in the latter study was temperature dependent with shorter half-lives at higher temperatures. Aerobic aquatic metabolism of carbaryl reported half-life ranged of 4.9 to 8.3 days compared to anaerobic (without oxygen) aquatic metabolism range of 15.3 to 72 days (Thomson and Strachan, 1981; USEPA, 2003). Carbaryl is not persistent in soil due to

multiple degradation pathways including hydrolysis, photolysis, and microbial metabolism. Little transport of carbaryl through runoff or leaching to groundwater is expected due to the low water solubility, moderate sorption, and rapid degradation in soils. There are no reports of carbaryl detection in groundwater, and less than 1% of granule carbaryl applied to a sloping plot was detected in runoff (Caro et al., 1974).

Acute and chronic risks to mammals are expected to be low to moderate based on the available toxicity data and conservative assumptions that were used to evaluate risk. There is the potential for impacts to small mammal populations that rely on terrestrial invertebrates for food. However, based on the toxicity data for terrestrial plants, minimal risks of indirect effects are expected to mammals that rely on plant material for food. Carbaryl has a reported half-life on vegetation of three to ten days, suggesting mammal exposure would be short-term. Direct risks to mammals from carbaryl bait applications is expected to be minimal based on oral, dermal, and inhalation studies (USDA APHIS, 2018a).

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

While sublethal effects have been noted in fish with depressed AChE, as well as some impacts to amphibians (i.e. days to metamorphosis) and aquatic invertebrates in the field due to carbaryl, the application rates and measured aquatic residues observed in these studies are well above values that would be expected from current program operations. Indirect risks to amphibian and fish species can occur through the loss of habitat or reduction in prey, yet data suggests that carbaryl risk to aquatic plants that may serve as habitat, or food, for fish and aquatic invertebrates is very low.

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

The majority of rangeland plants require insect-mediated pollination. Native, solitary bee species are important pollinators on western rangeland (Tepedino, 1979). Potential negative effects of insecticides on pollinators are of concern because a decrease in their numbers has been associated with a decline in fruit and seed production of plants. Laboratory studies have indicated that bees are sensitive to carbaryl applications, but the studies were at rates above those proposed in the program. The reduced rates of carbaryl used in the program and the implementation of application buffers should significantly reduce exposure of carbaryl applications to pollinators. In areas of direct application where impacts may occur, alternating swaths and reduced rates (i.e., RAATs) would reduce risk. Potential negative effects of grasshopper program insecticides on bee populations may also be mitigated by the more common use of carbaryl baits than the ULV spray formulation. Studies with

carbaryl bran bait have found no sublethal effects on adults or larvae bees (Peach et al., 1994, 1995).

Carbaryl can cause cholinesterase inhibition (i.e., overstimulate the nervous system) in humans resulting in nausea, headaches, dizziness, anxiety, and mental confusion, as well as convulsions, coma, and respiratory depression at high levels of exposure (NIH, 2009a; Beauvais, 2014). USEPA classifies carbaryl as "likely to be carcinogenic to humans" based on vascular tumors in mice (USEPA, 2007, 2015a, 2017a).

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

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

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

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

b) Diflubenzuron

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

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

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

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

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

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

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

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

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

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

Diflubenzuron is moderately toxic to spiders and mites (USDA APHIS, 2018c). Deakle and Bradley (1982) measured the effects of four diflubenzuron applications on predators of *Heliothis* spp. at a rate of 0.06 lb a.i./ac and found no effects on several predator groups.

This supported earlier studies by Keever et al. (1977) that demonstrated no effects on the arthropod predator community after multiple applications of diflubenzuron in cotton fields. Grasshopper integrated pest management (IPM) field studies have shown diflubenzuron to have a minimal impact on ants, spiders, predatory beetles, and scavenger beetles. There was no significant reduction in populations of these species from seven to 76 days after treatment. Although ant populations exhibited declines of up to 50 percent, these reductions were temporary, and population recovery was described as immediate (Catangui et al., 1996).

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

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

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

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

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

c) Malathion

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

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

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

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

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

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

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

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

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

plants suggest low indirect risks related to reductions in habitat or aquatic prey items from malathion treatments.

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

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

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

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

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

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d) Reduced Area Agent Treatments (RAATs)

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

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

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

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

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

No APHIS experimental treatments are planned for 2021.

B. Other Environmental Considerations

1. Cumulative Impacts

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

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

Potential cumulative impacts associated with the Preferred Alternative are not expected to be significant because the program applies an insecticide application once during a treatment. The program may treat an area with different insecticides but does not overlap the treatments. The program does not mix or combine insecticides. Based on historical outbreaks in the United States, the probability of an outbreak occurring in the same area where treatment occurred in the previous year is unlikely; however, given time, populations eventually will reach economically damaging thresholds and require treatment. The insecticide application reduces the insect population down to levels that cause an acceptable level of economic damage. The duration of treatment activity, which is relatively short since it is a one-time application, and the lack of repeated treatments in the same area in the same year reduce the possibility of significant cumulative impacts.

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

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

The 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.

APHIS does not anticipate that any federal or non-federal pest control actions to coincide with any grasshopper or Mormon cricket treatments which might occur within the project areas. Such would preclude any negative issues that would arise due to cumulative pesticide application impacts.

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

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

When planning a site-specific action related to grasshopper or Mormon cricket infestations, APHIS will consider the potential for disproportionately high and adverse human health or environmental impacts of its actions on minority and low-income communities in a program area. APHIS has evaluated the proposed grasshopper program and has determined that there are no disproportionately high and adverse human health or environmental effects on minority populations or low-income populations.

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

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

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

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

4. Tribal Consultation

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

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

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

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

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

6. Endangered Species Act

Section 7 of the Endangered Species Act (ESA) and its implementing regulations require Federal agencies to ensure their actions are not likely to jeopardize the continued existence of listed threatened or endangered species or result in the destruction or adverse modification of critical habitat. Numerous federally listed species and areas of designated critical habitat occur within the 17-State program area, although not all occur within or near potential grasshopper suppression areas or within the area under consideration by through this EA.

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

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

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

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

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

USFWS is completed, APHIS will conduct consultations with USFWS field offices at the local level.

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

APHIS completed informal consultation with the FWS regarding the Program at the State level years ago after having developed agreed-upon mitigation measures for all T&E and Proposed T&E species relative to GH/MC suppression projects in Utah. The USFWS has concurred with APHIS's assessment that the Utah GH/MC suppression program is not likely to adversely affect species of concern. That consultation/concurrence has continued throughout the years as the T&E list has evolved.

7. Bald and Golden Eagle Protection Act

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

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

8. Additional Species of Concern

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

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

Because grasshopper numbers are so high in an outbreak year, treatments would not likely reduce the number of grasshoppers below levels present in a normal year. Grasshopper densities in excess of 8 per square yard could initiate treatment project planning. Should grasshoppers be unavailable in small, localized areas, sage grouse chicks may consume

other insects, which sage grouse chicks likely do in years when grasshopper numbers are naturally low. By suppressing grasshoppers, rangeland vegetation is available for use by other species, including sage grouse, and rangeland areas are less susceptible to invasive plants that may be undesirable for sage grouse habitat.

APHIS will work with BLM, the state of Utah and any other appropriate agencies when grasshopper treatments are proposed in areas where sage grouse are present, or any other species that is known to be of special interest or concern to federal or state agencies or the public.

9. Fires and Human Health Hazards

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

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

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

10. Cultural and Historical Resources

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

APHIS, prior to any treatment project, will consult with the appropriate landowner, the State Historic Preservation Office, any affected National Trail's administrative office or other appropriate agencies, to ensure minimal impacts to cultural and historical resources.

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VII. Listing of Agencies and Persons Consulted

A. Bureau of Land Management

Nebeker, Glenn, Field Manager, Fillmore, UT Field Office

Riding, Trevor, Range Specialist, Fillmore, UT Field Office

Robbins, Josh, State Weed Coordinator, State Office

B. Utah Department of Agriculture and Food

Hougaard, Robert, Director of Plant Industry

Watson, Kristopher, State Entomologist, Plant Industry

C. USDA, APHIS, PPQ

Caraher, Kai, Biological Scientist – Staff Officer

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Sullivan, Melinda, GH/MC National Operations Manager

Warren, Jim, Environmental Protection Specialist/Environmental Toxicologist

Wild, Alana, Utah/Nevada State Plant Health Director

D. USDA, Forest Service

E. USDA, Fish and Wildlife Service

Novak, Kate, T&E Specialist, Utah

Romin, Laura, Acting Field Supervisor, Utah

F. Utah Division of Wildlife Resources

Mumford, Vance, Southern Region Biologist

G. Utah State University Extension Service

Nelson, Mark, Beaver

Dallin, Josh, Box Elder

Cooper, Troy, Duchesne

Taylor, Kalen, Millard

Gale, Jody, Sevier County Agriculture Agent

Greenhalgh, Linden, Tooele

Hadfield, Jacob, Cache

Kitchen, Boyd, Uintah

Wilde, Trent, Piute & Wayne

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H. Utah County Commissioners

Brown, Ralph, Sevier County

Draper, Dean, Millard

I. Utah State Legislators

J. Federal Legislators

Appendix A - APHIS Rangeland Grasshopper and Mormon Cricket Suppression Program
FY-2021 Treatment Guidelines
Version 02/05/2021

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, the Federal government will bear the cost of treatment up to 100 percent on Federal and Tribal Trust land, 50 percent of the cost on State land, and 33 percent of cost on private land. There is an additional 16.15% charge, however, on any funds received by APHIS for federal involvement with suppression treatments.

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

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

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

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

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

Operational Procedures

GENERAL PROCEDURES FOR ALL AERIAL AND GROUND APPLICATIONS

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

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

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

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a. solid bait
b. ultra-low volume (ULV) spray

B. Diflubenzuron ULV spray
C. Malathion ULV spray

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

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

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

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

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

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

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

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

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

SPECIFIC PROCEDURES FOR AERIAL APPLICATIONS

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

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

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

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

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

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

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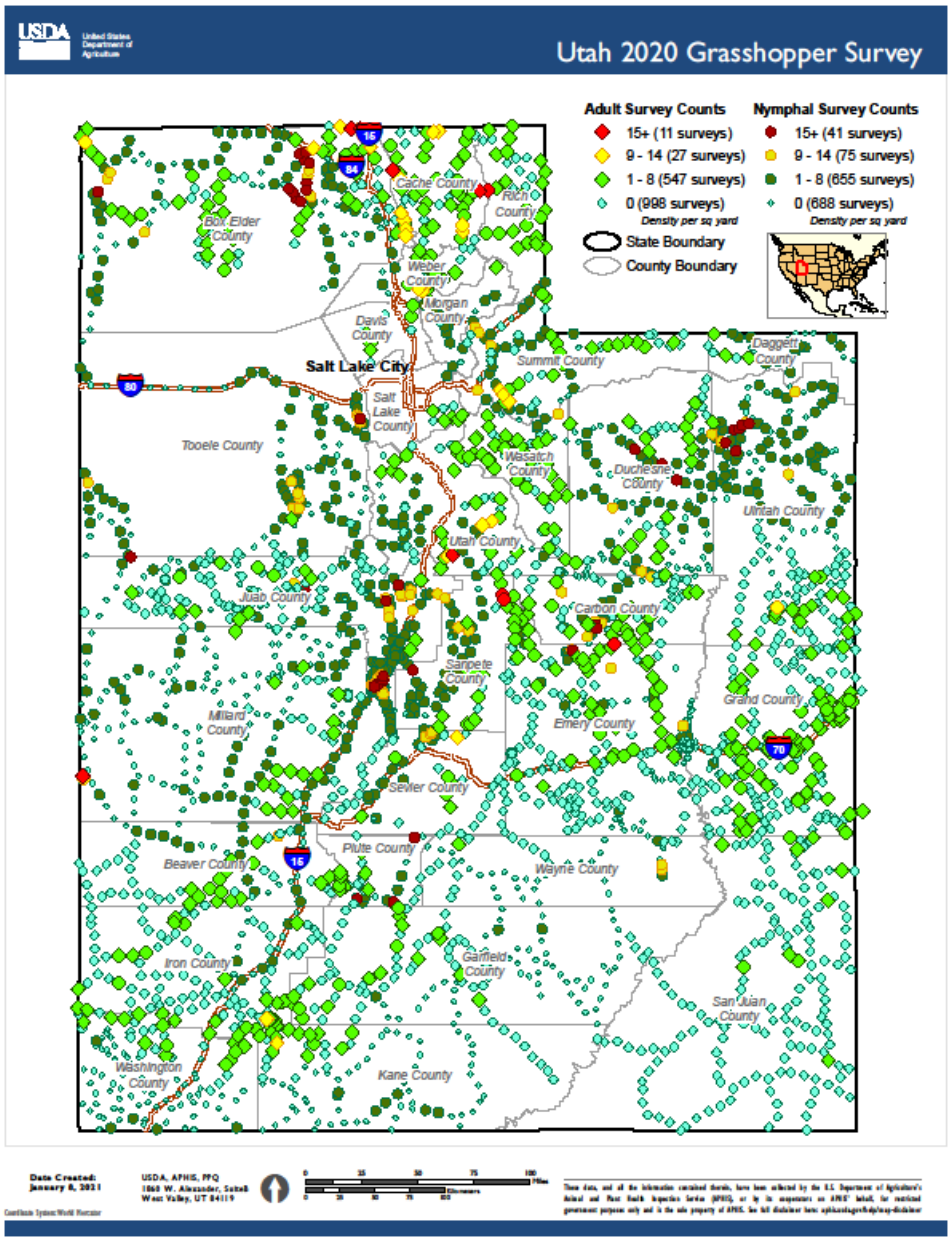
Appendix B: Map of the Affected Environment



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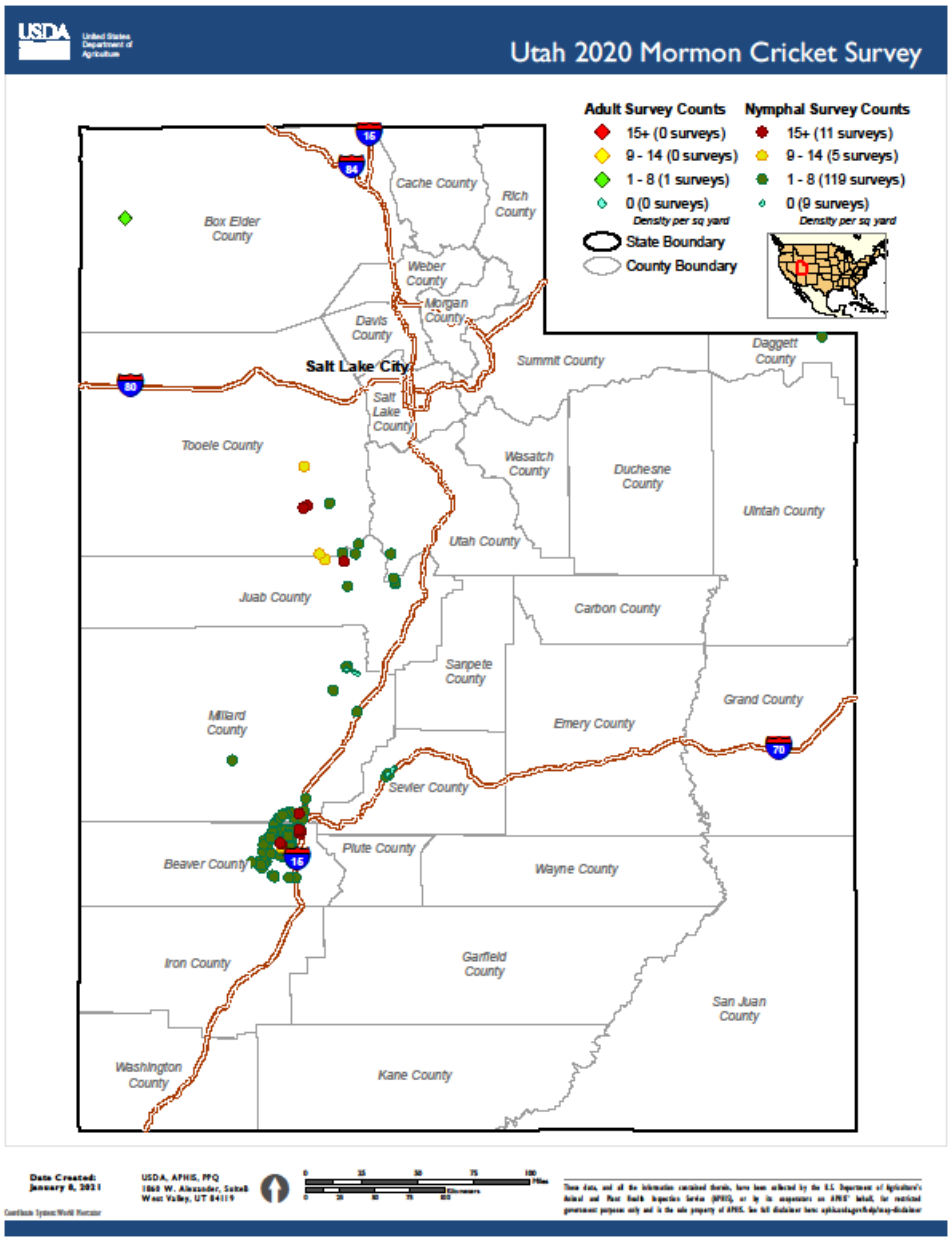
USDA
United States Department of Agriculture
Utah 2020 Mormon Cricket Survey
Adult Survey Counts
15+ (0 surveys)
9 - 14 (0 surveys)
1 - 8 (1 surveys)
0 (0 surveys)
Density per sq yard
Nymphal Survey Counts
15+ (11 surveys)
9 - 14 (5 surveys)
1 - 8 (119 surveys)
0 (9 surveys)
Density per sq yard
State Boundary
County Boundary
Box Elder County
Cache County
Rich County
Weber County
Morgan County
Davis County
Salt Lake City
Salt Lake County
Summit County
Daggett County
Tooele County
Wasatch County
Duchesne County
Uintah County
Utah County
Juab County
Carbon County
Sanpete County
Millard County
Emery County
Grand County
Sevier County
Beaver County
Piute County
Wayne County
Iron County
Garfield County
San Juan County
Washington County
Kane County
Date Created:
January 6, 2021
USDA, APHIS, PPQ
1868 W. Alexander, Suite8
West Valley, UT 84119

Appendix C: FWS Correspondence

THREATENED & ENDANGERED SPECIES DETERMINATIONS FOR UTAH APHIS 2021 GRASSHOPPER/MORMON CRICKET SUPPRESSION PROJECTS

1. Canada lynx (*Lynx canadensis*) (Threatened): The preferred habitat of the Canada lynx is montane coniferous forest. The proposed APHIS suppression program will have no effect on or cause no jeopardy to any population of Canada lynx since projects will avoid known or historic species habitat areas.

2. Black-footed ferret (*Mustela nigripes*) (Threatened): Possibly found in Carbon, Daggett, Duchesne, Emery, Grand, Rich, San Juan, Summit and Uintah Counties. Black-footed ferrets live in underground prairie dog burrows and eat prairie dogs as their primary food source. The black-footed ferret is, therefore, closely associated with prairie dog towns. For this reason, the major threat to the species is the decimation of prairie dog colonies through plague, poisoning and habitat loss. The only known population occurs in Coyote Basin, Uintah County. Direct toxic effects from carbary bait are low since plant-based baits are not sought-after food items for ferrets. Indirect effects by consumption of contaminated insects or prairie dogs might occur. Though prairie dogs may ingest carbaryl bait, and therefore, transfer that consumed carbaryl to a predator like the ferret, the potential for adverse effects remains low due to the unlikelihood of encountering significant quantities. Ten pounds of 2 percent active ingredient per acre maximum application rates preclude ingestion of sufficient toxin by insects or prairie dogs, themselves, to cause undesirable effects to ferrets. Direct toxic effects from Dimilin are low since diflubenzuron is slightly to very slightly toxic to mammals (Maas *et al.*, (1981). There would be few if any indirect effects from the use of Dimilin. The proposed APHIS suppression program is not likely to adversely affect this species. PROTECTIVE MEASURES: No aerial application of Dimilin within 1 mile and no ground applications within 0.25 mile of the edge of identified habitat.

3. Utah prairie dog (*Cynomys parvidens*) (Threatened): Found in Beaver, Garfield, Iron, Kane, Millard, Piute, Sanpete, Sevier and Wayne Counties. Direct toxic effects from carbaryl bait are moderate since prairie dogs may ingest it. However, 10 pounds per acre maximum application rates preclude ingestion of sufficient toxin to create behavioral anomalies, let alone mortality, due to the unlikelihood of encountering significant quantities. Since prairie dogs may consume insects, indirect effects from carbaryl bait are possible, but large quantities of contaminated insects would have to be consumed for such to occur. Rapid decomposition rates of dead insects, quickly making them unpalatable as food items, coupled with low application rates, minimize the risk of adverse effects on prairie dogs from carbaryl bait treatments. Direct toxic effects from Dimilin are low since diflubenzuron is slightly to very slightly toxic to mammals (Maas *et al.,* (1981). There would be no indirect effects from the use of Dimilin. The proposed APHIS suppression program would not likely adversely affect this species. PROTECTIVE MEASURES: Avoid using any pesticide within 1 mile of occupied habitat.

4. California condor (*Gymnogyps californianus*) (Endangered): California condors were released as part of Recovery Program efforts in northern Arizona beginning in the late 1990's. Sightings of the birds that were released have since been made almost statewide. Condors prefer mountainous country at low and moderate elevations, especially rocky and brushy areas near cliffs. California condors eat carrion, usually feeding on large items such as dead sheep, cattle and deer. Due to their foraging habits and preferences, the proposed APHIS grasshopper/Mormon cricket suppression program is unlikely to affect California condors. In addition, condors to date are occasional and temporary visitors to the state and are unlikely to contact suppression activities.

5. Gunnison Sage-Grouse (*Centrocercus minimus*) (Threatened): Found in Grand and San Juan Counties. Male Gunnison sage-grouse conduct an elaborate display when trying to attract females on breeding grounds, or leks in the spring. Nesting begins in mid-April and continues into July. Gunnison sage-grouse require a variety of habitats such as large expanses of sagebrush with a diversity of grasses and forbs and healthy wetland and riparian ecosystems. It requires sagebrush for cover and fall and winter food. Direct toxic effects from carbaryl bait are low (Peach *et al.,* 1994), but there may be minimal indirect effects since the young of this species depend upon arthropod groups for food. The use of carbaryl baits temporarily may lower the insect food base in the immediate area, though certainly not sufficiently to create adverse consequences to immature sage-grouse. Direct toxic effects from Dimilin are low since diflubenzuron is slightly to very slightly toxic to birds, but there may be minimal indirect effects such as a slight reduction in available prey items. The proposed APHIS suppression program will not likely adversely affect this species. PROTECTIVE MEASURES: No ground/aerial application will occur within 1 mile of known leks between March and July. Otherwise, no ground/aerial applications within 100/500 ft. of the edge of occupied habitat.

6. Mexican spotted owl (*Strix occidentalis lucida*) (Threatened): Possibly found in Carbon, Emery, Grand, Garfield, Iron, Kane, San Juan, Washington and Wayne Counties. In Utah spotted owls occupy and nest in rocky canyon habitats. Nests are located on cliffs and in caves. Mexican spotted owls feed mainly on small rodents, but also consume rabbits and other small vertebrates, including birds, reptiles and insects. Direct toxic effects from carbaryl bait are low since owls do not directly ingest it and since they do not depend on arthropod groups for food or seed dispersal. (George *et al*., 1992). Indirect toxic effects from carbaryl bait are low due to low application rates (10 pounds per acre or less) and small bait particle sizes, which preclude birds and small mammals from encountering sufficient quantities of toxin to cause adverse consequences to them or to owls which might consume them. APHIS only applies baits to areas of high grasshopper or Mormon cricket densities (8 or more per square yard), so any bait treatment is quickly and nearly totally consumed by the insects. Any remaining bait rapidly degrades from exposure to the elements (dew and higher soil pH's). Birds and rodents may prey upon debilitated insects, but rapid decomposition rates quickly make dead insects unpalatable. That, coupled with low application rates, makes it unlikely that spotted owls would be adversely affected by eating birds or small mammals that may prey upon insects

debilitated by carbaryl bait treatments. APHIS ground baiting protocol excludes treatment near the canyon habitats that spotted owls use for nesting. Direct and indirect toxic effects from Dimilin are also low since diflubenzuron is slightly to very slightly toxic to birds (Wilcox and Coffey, 1978). The proposed APHIS suppression program will not likely adversely affect this species. PROTECTIVE MEASURES: No aerial application will occur within 1 mile of suitable nesting habitat, and ground applications will be no closer than 0.25 mile to nesting habitat.

7. Southwestern willow flycatcher (*Empidonax traillii extimus*) (Endangered): Possibly found in Kane, San Juan and Washington Counties. The southwestern willow flycatcher utilizes dense riparian habitats. Forage items include insects, seeds and berries. Direct toxic effects from carbaryl bait are low (Peach *et al.,* 1994), but there may be minimal indirect effects since this species depends on arthropod groups for food. The use of carbaryl baits may temporarily lower the insect food base in the immediate area, though certainly not sufficiently to create adverse consequences to flycatchers. Direct toxic effects from Dimilin are low since diflubenzuron is slightly to very slightly toxic to birds, but there may be minimal indirect effects such as a slight reduction in available prey items. The proposed APHIS suppression program will not likely adversely affect this species. PROTECTIVE MEASURES: No aerial application will occur within 1 mile of suitable nesting habitat, and ground applications will be no closer than 0.25 mile to nesting habitat.

8. Yellow-billed Cuckoo (*Coccyzus americanus*) (Threatened): Found throughout Utah. The yellow-billed cuckoo uses wooded habitat with dense cover and water nearby. Its nests in the West are often placed in willows along streams and rivers, with nearby cottonwoods serving as foraging sites. They sometimes lay their eggs in other birds' nests. Cuckoos feed on insects (especially caterpillars), spiders, frogs, lizards, fruits and seeds. Direct toxic effects from carbaryl bait are low (Peach *et al.,* 1994), but there may be minimal indirect effects since this species depends upon arthropod groups for food. The use of carbaryl baits may temporarily lower the insect food base in the immediate area, though certainly not sufficiently to create adverse consequences to cuckoos. Direct toxic effects from Dimilin are low since diflubenzuron is slightly to very slightly toxic to birds, but there may be minimal indirect effects such as a slight reduction in available prey items. The proposed APHIS suppression program will not likely adversely affect this species. PROTECTIVE MEASURES: No aerial application will occur within 1000 ft. and no ground application will occur within 500 ft. of the edge of known locations of yellow-billed cuckoos or their critical habitat.

9. Bonytail (*Gila elegans*) (Endangered): Found in Carbon, Emery, Garfield, Grand, Kane, San Juan, Tooele, Uintah, Wayne and possibly Duchesne and formerly Daggett Counties. Bonytail are opportunistic feeders, eating insects, zooplankton, algae and higher plant matter. Although bonytail spawning in the wild is now rare, spawning occurs in the spring and summer over gravel substrate. Most bonytail are now produced in hatcheries and released into the wild as adults. Direct toxic effects from carbaryl bait are low since APHIS ground applicators remain at least 50 feet from water which precludes any bait from entering a water body, even during and after heavy rains. Carbaryl rapidly

decomposes in the presence of water and soils with higher pH's. Indirect effects from carbaryl bait are also low. Insects that ingest the bait are incapacitated by it within a matter of a minute or so; therefore, few could hop or fly into water bodies after bait consumption (APHIS personal experience). The use of bait near streams would not likely create an unnatural influx of contaminated grasshoppers or crickets into the water, so that fish might prey on them. Direct toxic effects from diflubenzuron are also low since it is only slightly toxic to fish (Willcox and Coffey, 1978; Julin and Sanders, 1978). Indirect effects from either carbaryl bait or Dimilin are minimal due to APHIS's standard practice of maintaining 50 foot buffers with ground applications of bait and 500 foot buffers with aerial sprays around water. The proposed APHIS suppression program will not likely adversely affect this species. PROTECTIVE MEASURES: No aerial applications within 1 mile of habitat or no ground treatments within 500 feet of habitat.

10. Colorado pikeminnow (*Ptychocheilus lucius*) (Endangered): Found in Carbon, Daggett, Emery, Garfield, Grand, San Juan, Uintah, Wayne and possibly Duchesne and formerly Kane Counties. Colorado pikeminnows are primarily piscivorous (they eat fish), but smaller individuals also eat insects and other invertebrates. The species spawns during the spring and summer over riffle areas with gravel or cobble substrate. Eggs are randomly broadcast onto the bottom, and usually hatch in less than one week. The proposed APHIS suppression program will not likely adversely affect this species. Direct and indirect toxic effects and PROTECTIVE MEASURES same as # 9.

11. Greenback cutthroat trout (*Oncorhynchus clarki stomias*) (Threatened): Found in San Juan County. The greenback cutthroat trout is a member of the Salmonidae family and is a subspecies of *O. clarki*. The subspecies feeds on aquatic insects as well as terrestrial invertebrates. It spawns in the spring in riffle areas when water temperatures reach 5-8 degrees C. It requires clear, swift-flowing mountain streams with cover such as low, overhanging banks and vegetation. The proposed APHIS suppression program will not likely adversely affect this species. Direct and indirect toxic effects and PROTECTIVE MEASURES same as # 9.

12. Humpback chub (*Gila cypha*) (Endangered): Found in Carbon, Daggett, Emery, Garfield, Grand, San Juan, Uintah, Wayne and possibly Duchesne and formerly Kane Counties. Humpback chub primarily eat insects and other invertebrates, but algae and fishes are occasionally consumed. The species spawns during the spring and summer in shallow, backwater areas with cobble substrate. Young humpback chub remain in these slow, shallow, turbid habitats until they are large enough to move into white-water areas. The proposed APHIS suppression program will not likely adversely affect this species. Direct and indirect toxic effects and PROTECTIVE MEASURES same as # 9.

13. Lahontan cutthroat trout (*Oncorhynchus clarkii henshawi*) (Threatened): The Lahontan cutthroat trout is a race of the cutthroat trout native to the Lahontan Basin of Oregon, California, and western Nevada. It has been introduced and become established in the Pilot Peak Range of western Box Elder County, Utah. Like other cutthroat races, the Lahontan cutthroat is an opportunistic feeder, with the diet of small individuals dominated by invertebrates, and the diet larger individuals composed primarily of fish.

The proposed APHIS suppression program will not likely adversely affect this species. Direct and indirect toxic effects and PROTECTIVE MEASURES same as # 9.

14. June sucker (*Chasmistes liorus*) (Endangered): Found in Box Elder, Salt Lake, Utah and Weber Counties. June suckers are members of the sucker family, but they are not bottom feeders. The jaw structure of the June sucker allows the species to feed on zooplankton in the middle of the water column. June sucker adults leave Utah Lake and swim up the Provo River to spawn in June of each year. Spawning occurs in shallow riffles over gravel or rock substrate. Fertilized eggs sink to the stream bottom, where they hatch in about four days. The proposed APHIS suppression program will not likely adversely affect this species. Direct and indirect toxic effects and PROTECTIVE MEASURES same as # 9.

15. Razorback sucker (*Xyrauchen texanus*) (Endangered): Found in Carbon, Daggett, Emery, Garfield, Grand, San Juan, Uintah, Wayne and possibly Duchesne and formerly Kane Counties. The razorback sucker eats mainly algae, zooplankton and other aquatic invertebrates. The species spawns from February to June, and each female may deposit over 100,000 eggs during spawning. The proposed APHIS suppression program will not likely adversely affect this species. Direct and indirect toxic effects and PROTECTIVE MEASURES same as # 9.

16. Virgin chub (*Gila seminuda*) (Endangered): Found in Washington County. Virgin chub are opportunistic feeders, consuming zooplankton, aquatic insect larvae, other invertebrates, debris and algae. Interestingly, the diet of many adults is composed primarily of algae, whereas the diets of younger fish contain more animal matter. The species spawns during late spring and early summer over gravel or rock substrate. The proposed APHIS suppression program will not likely adversely affect this species. Direct and indirect toxic effects and PROTECTIVE MEASURES same as # 9.

17. Woundfin (*Plagopterus argentissimus*) Endangered): Found in Washington County, the species is now restricted to the Virgin River system. Woundfin diets are quite varied, consisting of insects, insect larvae, other invertebrates, algae, and detritus. The species spawns during the spring in swift shallow water over gravel substrate. The proposed APHIS suppression program will not likely adversely affect this species. Direct and indirect toxic effects and PROTECTIVE MEASURES same as # 9.

18. Desert tortoise (*Gopherus agassizii*) (Threatened): Found in Washington County. Within its range, the desert tortoise can be found near water in deserts, semi-arid grasslands, canyon bottoms and rocky hillsides. Desert tortoises often construct burrows in compacted sandy or gravelly soil. Females nest under a large shrub or at the mouth of a burrow and lay one to three clutches of two to fourteen eggs from May to July; eggs hatch in late summer or fall. Burrows, which may contain many tortoises at once, are used for hibernation during cold winter months. The typical diet of the desert tortoise consists of perennial grasses, cacti, shrubs and other plant material. Historically APHIS has never received a request to treat in areas inhabited by desert tortoises, but if asked to

do so, there would exist the threat of direct take by running over small tortoises with ground equipment. Direct toxic effects from the use of carbaryl bait are unknown, but the tortoises would not likely consume the bait at low application rates (10 pounds per acre) and given the small size and consistency of bait particles. Indirect effects are low since they do not depend on insects for food. No information was located about diflubenzuron's toxicity to reptiles, but it is likely that it is low, based on the selective nature of its toxic mode of action (i.e., it interferes with the synthesis of chitin in those organisms that produce exoskeletons). The relative toxicity of diflubenzuron to reptiles is expected to be similar to that of mammals and birds (APHIS EIS, 2002). Indirect effects are also expected to be low since desert tortoises do not depend on insects for food. It is unlikely that grasshoppers or Mormon cricket populations would ever reach outbreak levels and require APHIS treatments in desert tortoise habitat. The proposed APHIS suppression program will not likely adversely affect this species. PROTECTIVE MEASURES: No aerial or ground applications will occur in the Beaver Dam Slope, the Tortoise Preserve or other occupied habitats of Washington County. If APHIS does receive a request to treat using ground equipment, then APHIS would re-consult with the USFWS.

19. Kanab ambersnail (*Oxyloma kanabense*) (Endangered): Found in Kane County. Pilsbry (1948), in the type description of this taxon, noted that it was found "on a wet ledge among rocks and cypripediums." Clarke (1991) reported the habitat of the Three Lakes population as a marsh dominated by *Typha* in its wettest portion. Grasses, *Carex*, violets, plantains and alders were also present. The densest snail aggregations were found under fallen *Typha* stalks, at the edges of thick *Typha* stands. The snails were also frequently observed just within the mouths of vole burrows. The presence of standing water appeared to be important to their local distribution. Clarke (1991) found that the habitat of the small population that existed along Kanab Creek also included *Mimulus guttatus*, *Dodocatheon pauciflorum*, *Aquilegia micrantha*, a tall grass species and *Juncus*. Direct toxic effects of carbaryl bait are high, but mitigation measures would insure that this species would not come in contact with the toxin. Indirect effects are low since the susceptible insects are not likely food items. Direct toxic effects from Dimilin are none to slight - the median lethal concentration of diflubenzuron in water to the snail is greater than 125 mg/L (Willcox and Coffey, 1978) - especially given the low application rates and the self-imposed water/spring buffers of APHIS programs. Indirect effects are also expected to be low since susceptible insects are not likely food items. The proposed APHIS suppression program will not likely adversely affect this species. PROTECTIVE MEASURES: No aerial applications within 1 mile of occupied habitat, and no ground treatments within 500 feet of occupied habitat.

20. Autumn buttercup (*Ranunculus aestivalis*) (Endangered): Found in Garfield County. Autumn buttercup produces abundant yellow flowers that can be seen from late-July to early October. It is found in low, herbaceous, wet meadow communities on islands of drier peaty hummocks, and sometimes in open areas, at elevations ranging from 1940 to 1965 meters. There are no direct toxic effects from carbaryl bait to this species. Indirect effects to plant pollinators from the use of carbaryl bait are low since insects must consume the bait in order to succumb to it. Target insects are unlikely pollinators of this

species. There are no direct toxic effects from Dimilin, and the indirect effects to pollinators from the use of diflubenzuron are low since it is not toxic to adult insects. APHIS's low application rate of one ounce per acre, coupled with the practice of treating not more than every other swath, preclude significant adverse impacts to larval insects as well. Only insect nymphs that undergo incomplete metamorphosis (i.e., grasshoppers/crickets) manifest significant adverse effects at the low doses of APHIS projects. The proposed APHIS program will not likely adversely affect this species. PROTECTIVE MEASURES: No aerial applications within 3 miles of occupied habitat, and no ground treatments within 300 feet of occupied habitat.

21. Barneby reed-mustard (*Schoenocrambe barnebyi*) (Endangered): Found in Emery and Wayne Counties. Specimens have a branched woody base that gives rise to purple veined, white, or lilac flowers from late April to early June. Barneby reed-mustard grows in xeric, fine textured soils on steep eroding slopes of the Moenkopi and Chinle formations. It grows in sparsely-vegetated sites in mixed desert shrub and pinyon-juniper communities, at elevations ranging from 1460 to 1985 meters. The proposed APHIS program will not likely adversely affect this species. Direct and indirect toxic effects and PROTECTIVE MEASURES same as # 20.

22. Barneby ridge-cress (*Lepidium barnebyanum*) (Endangered): Found in Duchesne County. This species grows in cushion-shaped tufts, has a thickened, branched woody base and produces abundant white to cream colored flowers that bloom in May and June. It grows along semi-barren ridges in pinyon-juniper woodlands, at elevations ranging from 1860 to 1965 meters. The proposed APHIS program will not likely adversely affect this species. Direct and indirect toxic effects and PROTECTIVE MEASURES same as # 20.

23. Clay phacelia (*Phacelia argillacea*) (Endangered): Found in Utah County. It is a narrow endemic to Spanish Fork Canyon, Utah County, Utah. A member of the waterleaf family, it has a scorpion tale-like inflorescence that continues, as it unrolls, to produce blue to violet flowers from June to August. This species is a winter annual and is found in fine textured soil and fragmented shale derived from the Green River Formation. It grows on barren, precipitous hillsides in sparse pinyon-juniper and mountain brush communities, at elevations ranging from 1840 to 1881 meters. The proposed APHIS program will not likely adversely affect this species. Direct and indirect toxic effects and PROTECTIVE MEASURES same as # 20.

24. Clay reed-mustard (*Schoenocrambe argillacea*) (Threatened): Found in Uintah County. It is a plant that occurs in the Uinta Basin, Uintah County, Utah. A member of the mustard family, this species is a hairless perennial with a stout, woody base. It produces lilac to white, purple-veined flowers that bloom from mid-April through mid-May. Shrubby reed-mustard grows on the Evacuation Creek Member of the Green River Formation, where it is on substrates consisting of at-the-surface bedrock, scree, and fine-textured soils. It occurs on precipitous slopes in mixed desert shrub communities, at elevations ranging from 1439 to 1765 meters. The proposed APHIS program will not

likely adversely affect this species. Direct and indirect effects and PROTECTIVE MEASURES same as # 20.

25. Deseret milkvetch (*Astragalus desereticus*) (Threatened): Found in Utah County. This plant occurs at a single site in Utah County, Utah. A member of the bean family, this species is a perennial herb with gray-silvery leaves four to five cm long and white to pinkish petals with evident lilac-colored keel-tips. It blooms from late April to early June. Deseret milkvetch grows exclusively on sandy-gravelly soils weathered from conglomerate outcrops of the Moroni Formation. It likes steep south and west (rarely north) facing slopes and does well on larger, west-facing road-cuts. It is grows in an open pinyon-juniper-sagebrush community, at elevations ranging from 1645 to 1740 meters. The proposed APHIS program will not likely adversely affect this species. Direct and indirect effects and PROTECTIVE MEASURES same as # 20.

26. Dwarf bear-poppy (*Arctomecon humilis*) (Endangered): Found in Washington County. This plant is a narrow endemic to (occurs only in) Washington County, Utah. A member of the poppy family, this species is a perennial herb that produces abundant white flowers. The flowers bloom from mid-April through May, and are quite showy next to the red soils in which the plant grows. Dwarf bearclaw-poppy is found on gypsiferous clay soils derived from the Moenkopi Formation. It occurs on rolling low hills and ridge tops, often on barren, open sites in warm desert shrub communities, at elevations ranging from 700 to 1402 meters. The proposed APHIS program will not likely adversely affect this species. Direct and indirect effects and PROTECTIVE MEASURES same as # 20.

27. Gierisch mallow (*Sphaeralcea gierischii*) (Endangered): Found in Washington County. A member of the mallow family, this species is a flowering perennial which is only found on gypsum outcrops associated with the Harrisburg Member of the Kaibab Formation in northern Mojave County, AZ and Washington County, UT. It has a woody base and dies back to the ground during the winter and re-sprouts from the base during late winter and spring depending on daytime temperatures and rainfall. How its flowers are pollinated, seed-dispersal mechanisms and the conditions under which seeds germinate are not yet known. Young plants have been observed on reclaimed portions within gypsum mining areas. The proposed APHIS program will not likely adversely affect this species. Direct and indirect effects and PROTECTIVE MEASURES same as # 20.

28. Graham beardtongue (*Penstemon grahamii*): Found in Carbon, Duchesne and Uintah Counties. It is endemic to (occurs only in) the Uinta Basin in Carbon County, Duchesne County and Uintah County, Utah, and in immediately adjacent Rio Blanco County, Colorado. A member of the figwort family, this species is a perennial herb that is 5 to 20 cm tall, with thick leathery leaves, and large, tubular, light to deep lavender flowers that bloom from late May to early June. Graham beardtongue grows on semi-barren knolls, ridges and steep slopes in a mix of fragmented shale and silty clay soils closely associated with the Mahogany zone (oil shale bearing) of the Green River Formation. It grows in sparsely vegetated communities of pinyon-juniper, desert shrub and Salina wildrye, at elevations ranging from 1430 to 2060 meters. The proposed APHIS program will not likely adversely affect this species. Direct and indirect effects and PROTECTIVE MEASURES same as # 20.

29. Heliotrope milkvetch (*Astragalus montii*) (Threatened): Found in Sanpete and Sevier Counties. This is a plant that occurs on the southern Wasatch Plateau in Sanpete County and Sevier County, Utah. A member of the bean family, this species is a dwarf tufted perennial herb with pink purple petals that have white wing-tips. It blooms from June to August. Heliotrope milkvetch grows in barren areas on shallow and very rocky soils derived from Flagstaff Limestone, at elevations ranging from about 3230 to 3322 meters. It grows in subalpine communities of cushion plants and other low-growing species that are scattered within more extensive conifer, tall-forb, and grass communities. The proposed APHIS program will not likely adversely affect this species. Direct and indirect effects and PROTECTIVE MEASURES same as # 20.

30. Holmgren milkvetch (*Astragalus holmgreniorum*) (Endangered): Found in Washington County. It occurs in Washington County, Utah, and in immediately adjacent Mohave County, Arizona. A member of the bean family, this species is a dwarf, tufted, stemless perennial herb. It has pinkish-purple flowers with unique white-tipped wings; it blooms in April and May. Holmgren milkvetch grows in topographic sites where water runoff occurs and where the soil surface is covered by a stony or gravelly erosional pavement. The soils are derived from the Moenkopi Formation. Holmgren milkvetch grows in warm desert shrub communities, at elevations ranging from 805 to 914 meters. The proposed APHIS program will not likely adversely affect this species. Direct and indirect effects and PROTECTIVE MEASURES same as # 20.

31. Jones cycladenia (*Cycladenia humilis var. jonesii*) (Threatened): Found in Emery, Garfield, Grand and Kane Counties. This plant is restricted to the canyonlands of the Colorado Plateau in Emery County, Garfield County, Grand County, and Kane County, Utah, as well as in immediately adjacent Coconino County, Arizona. A member of the dogbane family, this species is a rhizomatous herb with round, somewhat succulent leaves, and small rose-pink hairy flowers that bloom from mid-April to early June. Jones' cycladenia grows in gypsiferous soils that are derived from the Summerville, Cutler, and Chinle formations; they are shallow, fine textured, and intermixed with rock fragments. The species can be found in Eriogonum-ephedra, mixed desert shrub, and scattered pinyon-juniper communities, at elevations ranging from 1219 to 2075 meters. The proposed APHIS program will not likely adversely affect this species. Direct and indirect effects and PROTECTIVE MEASURES same as # 20.

32. Kodachrome bladderpod (*Lesquerella tumulosa*) (Endangered): Found in Kane County. It is a plant that is a narrow endemic to (it occurs only in) Kane County, Utah. A member of the mustard family, this species is a perennial herb that forms densely matted and depressed mounds. It has a many-branched woody base with persistent leaf bases, has star-shaped hairs, and produces yellow flowers that bloom in May and early June. Kodachrome bladderpod is found on shallow soils that are fine textured, intermixed with shale fragments, and derived from the Winsor Member of the Carmel Formation. Kodachrome bladderpod grows on bare shale knolls and slopes in scattered pinyon-juniper communities, at elevations ranging from 1719 to 1845 meters. The proposed

APHIS program will not likely adversely affect this species. Direct and indirect effects and PROTECTIVE MEASURES same as # 20.

33. Last Chance townsendia (*Townsendia aprica*) (Threatened): Found in Emery, Sevier and Wayne Counties. This plant is a member of the sunflower family, and is a stemless perennial herb with flower heads submersed in its ground-level leaves. The flowers bloom in late April and May, and have yellow to golden petals. Last Chance townsendia is found in clay, clay-silt, or gravelly clay soils derived from the Mancos Formation; these soils are often densely covered with biological soil crusts. The species grows in salt desert shrub and pinyon-juniper communities, at elevations ranging from 1686 to 2560 meters. The proposed APHIS program will not likely adversely affect this species. Direct and indirect effects and PROTECTIVE MEASURES same as # 20.

34. Maguire primrose (*Primula maguirei*) Threatened): Found in Cache County. plant that is a narrow endemic to (it occurs only in) Logan Canyon, Cache County, Utah. A member of the primula family, this species is a perennial herb with broad, spatula-shaped leaves. Stems are approximately four to fifteen cm tall, with each bearing one to three showy rose to lavender-colored flowers that bloom in late April and May. Maguire primrose is found on either north-facing or well shaded south-facing moss covered sites on damp ledges, in crevices, and on over-hanging rocks along the walls near the bottom of the canyon. It grows at elevations ranging from 1550 to 2012 meters. The propose APHIS program will not likely adversely affect this species. Direct and indirect effects and PROTECTIVE MEASURES same as # 20.

35. Navajo sedge (*Carex specuicola*) (Threatened): Found in San Juan County, Utah, and in immediately adjacent Coconino County, Arizona. A member of the sedge family, this species is a loosely tufted perennial, 25 to 40 cm tall, with grass-like leaves that droop downward. Its flowers, seen in late June and July, are arranged in spikes, two to four spikes per stem. Navajo sedge is restricted to seep, spring, and hanging garden habitats in Navajo Sandstone, at elevations ranging from 1150 to 1823 meters. The proposed APHIS program will not likely adversely affect this species. Direct and indirect effects of treatment are the same as # 20. PROTECTIVE MEASURES: No aerial applications within 3 miles of occupied habitat and no ground applications within 300 feet of springs, seeps and hanging gardens.

36. Pariette cactus (*Sclerocactus brevispinus*) (Threatened): Found in Duchesne and Uintah Counties. A member of the cactus family, this taxon is a Uinta Basin endemic in northeast Utah, Duchesne County. It is known from "a series of small scattered populations…near Myton (Heil and Porter (1994)." It inhabits "stoney, gravelly, low hilly terrain, growing with desert grasses or low vegetation (Hochstätter 1993)"; the soils on which it grows are derived from the Uinta Formation (Specht, pers. comm. 2005). The proposed APHIS program will not likely adversely affect this species. Direct and indirect effects and PROTECTIVE MEASURES same as # 20.

37. San Rafael cactus (*Pediocactus despainii*) (Endangered): Found in Emery and Wayne Counties. A member of the cactus family, this species is a small, subglobose to ovoid cactus with usually solitary stems; the crown of the stem is at or very near ground level.

Its flowers are born near the tip of the stem, are yellow bronze to peach bronze, rarely pink in color, and bloom during April and May. San Rafael cactus is found in fine textured soils rich in calcium derived from the Carmel Formation and the Sinbad Member of the Moenkopi Formation. It occurs on benches, hill tops, and gentle slopes in pinyon-juniper and mixed desert shrub-grassland communities, at elevations ranging from 1450 to 2080 meters. The proposed APHIS program will not likely adversely affect this species. Direct and indirect effects and PROTECTIVE MEASURES same as # 20.

38. Shivwitz or Shem milkvetch (*Astragalus ampullarioides*) (Endangered): Found in Washington County. It occurs in only Washington County, Utah. A member of the bean family, Shivwits milkvetch is a perennial herb. Specimens are 20 to 45 cm tall, each with an underground, branching woody base and an erect flower stalk bearing yellow-white flowers that bloom from late April to early June. Shivwits milkvetch grows on the unstable clay soil of Chinle Shale in warm desert shrub and pinyon-juniper communities, at elevations ranging from 872 to 1116 meters. The proposed APHIS program will not likely adversely affect this species. Direct and indirect effects and PROTECTIVE MEASURES same as # 20.

39. Shrubby reed-mustard (*Schoenocrambe suffrutescens*) (Endangered): Found in Duchesne and Uintah Counties. A member of the mustard family, this species is a perennial clump-forming herb that produces yellow flowers that bloom from May through June. Shrubby reed-mustard grows along semi-barren, white-shale layers of the Green River Formation (Evacuation Creek Member), where it is found in xeric, shallow, fine textured soils intermixed with shale fragments. It grows in mixed desert shrub and pinyon-juniper communities, at elevations ranging from 1554 to 2042 meters. The proposed APHIS program will not likely adversely affect this species. Direct and indirect effects and PROTECTIVE MEASURES same as # 20.

40. Siler pincushion cactus (*Pediocactus sileri*) (Threatened): Found in Kane and Washington Counties. It is a plant that occurs in adjacent Coconino and Mohave counties, Arizona; the center of its distribution is in Mohave County. A member of the cactus family, this species is a small, globose cactus with solitary, occasionally clustered, stems typically 10 cm tall (as great as 45 cm), and spines that become white with age. Its flowers are yellow with purple veins, and bloom during March and April. Siler pincushion cactus is found on the white, occasionally red, gypsiferous and calcareous sandy or clay soils derived from the various members of the Moenkopi Formation. It is sometimes found, however, on the nearly identical Kaibab Formation. Siler pincushion cactus occurs on rolling hills, often with a badlands appearance, in warm desert shrub, sagebrush-grass, and, at its upper limits, pinyon-juniper communities, at elevations ranging from 805 to 1650 meters. The proposed APHIS program will not likely adversely affect this species. Direct and indirect effects and PROTECTIVE MEASURES same as # 20.

41. Uintah basin hookless cactus (*Sclerocactus wetlandicus*) (Threatened): Found in Carbon, Duchesne and Uintah Counties, Utah and in Delta, Garfield, Mesa, and Montrose counties, Colorado. A member of the cactus family, this species is a perennial herb with a

commonly solitary, egg-shaped, three to twelve cm long stem that produces pink flowers late from April to late May. Uinta Basin hookless cactus is found on river benches, valley slopes, and rolling hills of the Duchesne River, Green River, and Mancos formations. It is found in xeric, fine textured soils overlain with cobbles and pebbles, growing in salt desert shrub and pinyon-juniper communities, at elevations ranging from 1360 to 2000 meters. The proposed APHIS program will not likely adversely affect this species. Direct and indirect effects and PROTECTIVE MEASURES same as # 20.

42. Ute ladies'-tresses (*Spiranthes diluvialis*) (Threatened): Found in Daggett, Duchesne, Garfield, Juab, Salt Lake, Tooele, Uintah, Utah, Wasatch, Wayne and formerly Weber County. It also occurs in the states of Colorado, Idaho, Montana, Nebraska, Nevada, Washington, and Wyoming. A member of the orchid family, this species is a perennial herb with a flowering stem, 20-50 cm tall that arises from a basal rosette of grass-like leaves. The flowers are ivory-colored, arranged in a spike at the top of the stem, and bloom mainly from late July through August. Ute ladies'-tresses is found in moist to very wet meadows, along streams, in abandoned stream meanders, and near springs, seeps, and lake shores. It grows in sandy or loamy soils that are typically mixed with gravels. In Utah, it ranges in elevation from 1311 to 2134 meters. The proposed APHIS program will not likely adversely affect this species. Direct and indirect effects and PROTECTIVE MEASURES same as # 20.

43. Welsh's milkweed (*Asclepias welshii*) (Threatened): Found in Kane County, Utah as well as in immediately adjacent Coconino County, Arizona. A member of the milkweed family, this species is a stout, rhizomatous perennial herb with large oval leaves and spherical clusters of flowers that are cream-colored with pink-tinged centers. It blooms from June to August. Welsh's milkweed grows on dunes derived from Navajo Sandstone. It is found in sagebrush, juniper, and ponderosa pine communities, at elevations ranging from 1542 to 1993 meters. The proposed APHIS program will not likely adversely affect this species. Direct and indirect effects and PROTECTIVE MEASURES same as # 20.

44. Winkler cactus (*Pediocactus winkleri*) (Threatened): Found in Emery and Wayne Counties. A member of the cactus family, this species is a small, subglobose cactus with solitary or clumped stems; the crown of the stem is at or very near ground level. Its flowers are born near the tip of the stem, are peach to pink in color, and bloom late March to May. Winkler pincushion cactus is found in fine textured soils derived from the Dakota Formation and the Brushy Basin Member of the Morrison Formation. It occurs on benches, hill tops, and gentle slopes on barren, open sites in salt desert shrub communities, at elevations ranging from 1490 to 2010 meters. The proposed APHIS program will not likely adversely affect this species. Direct and indirect effects and PROTECTIVE MEASURES same as # 20.

45. Wright fishhook cactus (*Sclerocactus wrightiae*) (Endangered): Found in Emery, Sevier and Wayne Counties. A member of the cactus family, this species is a perennial herb with a solitary, hemispheric, ribbed, 6 to 12 cm tall stem that produces nearly-white to pink flowers from late April through May. Wright fishhook cactus is found in soils that range from clays to sandy silts to fine sands, typically in areas with well-developed

biological soil crusts. Wright fishhook cactus grows in salt desert shrub and widely scattered pinyon-juniper communities, at elevations ranging from 1305 to 1963 meters. The proposed APHIS program will not likely adversely affect this species. Direct and indirect effects and PROTECTIVE MEASURES same as # 20.