Draft

Programmatic Environmental Assessment for Integrated, Adaptive Management of the Common Raven on Department of Defense Lands in the California Desert

November 2021

Prepared by:
United States Marine Corps,
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Acronyms and Abbreviations

%	percent
AFB	Air Force Base
APHIS	Animal and Plant Health Inspection Service
BASH	Bird/Wildlife Aircraft Strike Hazard
BLM	Bureau of Land Management
BO	Biological Opinion
BSOs	Buildings, Structures, or Objects
CATEX	categorical exclusion
CDFW	California Department of Fish and Wildlife
CEQ	Council on Environmental Quality
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CMAGR	Chocolate Mountain Aerial Gunnery Range
DoD	Department of Defense
DoDI	DoD Instruction
DoN	Department of the Navy
DRECP	Desert Renewable Energy Conservation Plan
EA	Environmental Assessment
EIS	Environmental Impact Statement
EO	Executive Order
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FONSI	Finding of No Significant Impact
INRMP	Integrated Natural Resources Management Plan
km	kilometer(s)
km^2	square kilometer(s)
MAGTFTC	Marine Air Ground Task Force Training Command
MBTA	Migratory Bird Treaty Act
MCAGCC	Marine Corps Air Ground Combat Center
MCLB	Marine Corps Logistics Base
MCO	Marine Corps Order
NAVFAC	Naval Facilities Engineering Systems Command
NAWSCL	Naval Air Weapons Station China Lake
NEPA	National Environmental Policy Act
NFWF	National Fish and Wildlife Foundation
NHPA	National Historic Preservation Act
NOA	Notice of Availability
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRHP	National Register of Historic Places
NTC	National Training Center
PEA	Programmatic Environmental Assessment
PPE	personal protective equipment
PSFWO	Palm Springs Fish and Wildlife Office
SCE	Southern California Edison
SELF	Strategic Expeditionary Landing Field
SHPO	State Historic Preservation Officer
RASP	Recovery and Sustainment Partnership
RFFA	Reasonably Foreseeable Future Action
ROD	Record of Decision
UAV	unmanned aerial vehicle
U.S.	United States
USACE	U.S. Army Corps of Engineers
USC	U.S. Code
USDA	U.S. Department of Agriculture
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USMC	U.S. Marine Corps
WMRNP	West Mojave Route Network Project

PROPOSED FINDING OF NO SIGNIFICANT IMPACT (FONSI)

Programmatic Environmental Assessment (PEA) for Integrated, Adaptive Management of the Common Raven on Department of Defense Lands in the California Desert

INTRODUCTION

The Marine Air Ground Task Force Training Command (MAGTFTC), National Environmental Policy Act (NEPA) lead agency, and cooperating agencies prepared the Draft Programmatic Environmental Assessment (PEA) for *Integrated, Adaptive Management of the Common Raven on Department of Defense Lands in the California Desert*.

The Draft PEA was prepared in accordance with NEPA (42 United States Code §§ 4321-4370h), Council on Environmental Quality NEPA implementing regulations (40 Code of Federal Regulations [CFR] §§ 1500-1508) (version effective July 18, 2005), and agency-specific supplemental NEPA regulations, namely: 32 CFR Part 775 (Navy); 32 CFR Part 989 (Air Force); 32 CFR Part 651 (Army); 7 CFR Part 372 (Animal and Plant Health Inspection Service); and 43 CFR Part 46 (U.S. Fish and Wildlife Service). The Draft PEA is incorporated by reference into this Proposed Finding of No Significant Impact (FONSI).

There is a need to resolve the ecological, economic, and health and safety impacts of the elevated and increasing common raven (*Corvus corax*) populations in the California desert (Draft PEA, Sections 1.3.2 and 1.3.3). To resolve these issues, integrated raven management is proposed to occur primarily at these six installations: Marine Corps Air Ground Combat Center (Combat Center or MCAGCC); Marine Corps Logistics Base Barstow; Edwards Air Force Base; Fort Irwin National Training Center; Naval Air Weapons Station China Lake; and Chocolate Mountain Aerial Gunnery Range (administered by Marine Corps Air Station Yuma) (Draft PEA, Section 1.2). These installations are located in the California counties of Kern, Inyo, Imperial, Los Angeles, Riverside, and San Bernardino.

This Proposed FONSI is MAGTFTC-specific. Each cooperating agency is individually responsible for issuing separate agency decisions, obtaining any necessary permits, and completing any required consultations (Draft PEA, Sections 1.8, 1.10, and 5.4).

PROPOSED ACTION & ALTERNATIVES

The Draft PEA analyzed the No-Action Alternative (current raven management actions; primarily *ad hoc* and non-lethal) and the Proposed Action (integrated, adaptive management of the raven; non-lethal and lethal raven management actions). No other action alternatives were evaluated because all potential raven management actions are included in the Proposed Action. Continuing with the No-Action Alternative will not achieve the Purpose and Need (Draft PEA, Sections 2.1, 2.2, and 2.3).

SUMMARY OF ENVIRONMENTAL CONSEQUENCES

In accordance with Council on Environmental Quality regulations, the Draft PEA focused its analysis on the potential resources that could be most affected by the No-Action Alternative and Proposed Action, and considered the topics included within definition of "significantly" (40 CFR §1508.27).

The Draft PEA did not identify any significant adverse, beneficial, or cumulative impacts on the human environment or any resource from implementing the No-Action Alternative or Proposed Action (Draft PEA, Chapters 3 and 4). Implementation of non-lethal methods in conjunction with lethal methods of controlling the overpopulation of ravens will have beneficial and/or less than significant impacts to the following resources: *Biological Resources*, *Health and Safety*, and *Cultural Resources* (Draft PEA, Sections 3.1, 3.2, and 3.3). Notable impacts are beneficial and associated with the Proposed Action due to the implementation of additional lethal raven management actions, which are summarized below. Potential impacts to other resources were considered but determined to be negligible or non-existent, and not warranting detailed analysis (Draft PEA, Section 3.4).

The Draft PEA analyses did not reveal any data gaps or uncertainties that could warrant further data collection or analysis. Resource protection measures, discretionary monitoring, and discretionary mitigation would minimize and/or mitigate environmental impacts associated with implementation of the Proposed Action to less than significant levels (Draft PEA, Section 2.4).

- ***Biological Resources.*** The proposed reduction in densities of ravens on Department of Defense (DoD) lands in the California desert will have overall beneficial impacts to wildlife populations, primarily those that experience predation pressure from increased raven populations. Once implemented and maintained, non-lethal raven management actions, in conjunction with lethal management actions, will successfully serve the Purpose and Need of this PEA and will provide short-term and long-term beneficial effects to the desert tortoise and other wildlife species. Lethal management under the Proposed Action will initially remove up to 11,830 to 13,293 ravens from the population on DoD lands in the California desert, followed by 1,477 to 1,715 ravens removed annually. This lethal removal of ravens will have more immediate beneficial impacts on desert tortoise hatchlings and juveniles because removal of ravens, especially those directly impacting desert tortoises, will reduce predation pressure on the species. This represents a direct and indirect beneficial impact on desert tortoise populations in the California desert (Draft PEA, Sections 3.1.3.2 and 4.3.1).
- ***Health and Safety.*** The reduction of raven populations at DoD installations in the California desert will have overall beneficial impacts to health and safety. Reduced nesting and roosting and associated build-up of fecal material, scattering of trash, and Bird/Wildlife Aircraft Strike Hazard risk will benefit health and safety. The proper use of lethal management actions by trained personnel following proper precautions will result in less than significant impacts to health and safety (Draft PEA, Section 3.2.3.2 and 4.3.2).
- ***Cultural Resources.*** Impacts to historic properties will be avoided or minimized to the extent possible. Raven management actions will be in compliance with the Native American Graves Protection and Repatriation Act and any impacts to tribal burial sites would be avoided. In the event that any lethal or non-lethal raven management action could affect historic properties, each installation, on a case-by-case basis, will (1) conduct individual Section 106 consultation with the California State Historic Preservation Officer (SHPO) and federally recognized Tribal Governments to decide on details of how management actions must be implemented to avoid or minimize impacts to historic properties; (2) comply with any existing program alternative the installation may have negotiated with the California SHPO for the undertaking; or (3) comply with any existing installation-specific Programmatic Agreement (Draft PEA, Section 3.3.3.2 and 4.3.3).

CONCLUSION

Based on my review the Draft PEA, I conclude that there will not be any significant impacts with the implementation of the No-Action Alternative or the Proposed Action to any resources, individually or collectively, across the six DoD installations, nor cumulatively when taking into account other local and regional projects. Thus, an environmental impact statement will not be prepared. Overall, the proposed raven population reduction goal will affect a small percent (~4%) of the total state population with success dependent on the collective efforts across the six DoD installations. The reduction of overpopulated ravens will have immediate and long-term beneficial effects to its prey species, including the desert tortoise. If the Proposed Action is successfully implemented, balance to the ecosystem will be significantly restored without changing the natural predator-prey dynamics. Additionally, if ecosystem balance is restored, there will be an immediate decrease of the negative economic and health and safety impacts at DoD installations caused by the overpopulation of ravens.

DECISION

To achieve the Draft PEA's Purpose and Need, I authorize implementation of the Proposed Action at the Combat Center, which represents a shift toward implementing more lethal means of raven management,

and more systematic and explicit integration of non-lethal and lethal means. The precise mix of raven management actions will be determined by the Combat Center's Environmental Affairs Office, in coordination with appropriate agencies, to include the U.S. Fish and Wildlife Service.

Pursuant to NEPA and Endangered Species Act Section 7(a)(1) and subject to the availability of funds:

- I authorize the adoption of resource protection measures incorporated in the Proposed Action.
- I tentatively authorize adoption of the U.S. Fish and Wildlife recommended discretionary monitoring. Funding these efforts is contingent on further coordination with the U.S. Fish and Wildlife Service to ensure efforts are focused on what is necessary to meet legal requirements and sustain the military mission at the Combat Center. The Combat Center's Environmental Affairs Division will ensure off-site efforts comply with these limitations.
- I tentatively authorize adoption of the Recovery and Sustainment Partnership Initiative discretionary mitigation. This is subject to landowner or land manager authorization. In light of this long-term commitment, MAGTFTC would re-evaluate its existing desert tortoise management at the Combat Center to determine if any changes are needed to support current and future training. MAGTFTC's commitment would be contingent on increased regulatory flexibilities that facilitate military training at the Combat Center, if needed. The Combat Center's Environmental Affairs Office will ensure compliance with these limitations. The MAGTFTC/MCAGCC Environmental Affairs Office will ensure compliance with these limitations.

IMPLEMENTATION

The Proposed Action may be implemented any time after the FONSI is signed, subject to any required permits (e.g., Migratory Bird Treaty Act) and consultations (e.g., National Historic Preservation Act, Section 106) and any additional NEPA analysis as explained in the Draft PEA (Sections 1.8 and 5.6).

A. E. RENFORTH Date
Major General, U.S. Marine Corps
Commanding General
Marine Air Ground Task Force Training Command
Marine Corps Air Ground Combat Center

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PROGRAMMATIC ENVIRONMENTAL ASSESSMENT FOR INTEGRATED, ADAPTIVE MANAGEMENT OF THE COMMON RAVEN ON DEPARTMENT OF DEFENSE LANDS IN THE CALIFORNIA DESERT

Lead Agency: United States Marine Corps, Marine Air Ground Task Force Training Command (MAGTFTC), Marine Corps Air Ground Combat Center at Twentynine Palms (Combat Center)

Cooperating Agencies: Marine Corps Logistics Base Barstow; Edwards Air Force Base; Fort Irwin National Training Center; Naval Air Weapons Station China Lake; Marine Corps Air Station Yuma; U.S. Fish and Wildlife Service, Palm Springs Fish and Wildlife Office; and U.S. Department of Agriculture, Animal and Plant Health Inspection Service

Title of Proposed Action: Integrated, Adaptive Management of the Common Raven on Department of Defense Lands in the California Desert

Affected Region: Western Mojave Desert and Colorado Desert, California

Designation: Programmatic Environmental Assessment

Abstract

This Programmatic Environmental Assessment (PEA) has been prepared to evaluate the potential environmental impacts associated with integrated, adaptive management of the Common Raven (*Corvus corax*) at lands owned or used by the Department of Defense in the California desert. Six installations are included in this PEA: the Combat Center; Marine Corps Logistics Base Barstow; Edwards Air Force Base; Fort Irwin National Training Center; Naval Air Weapons Station China Lake; and Chocolate Mountain Aerial Gunnery Range. This PEA has been prepared by the United States (U.S.) Marine Corps in accordance with the National Environmental Policy Act (NEPA) of 1969 (42 U.S. Code §§ 4321-4370h); Council on Environmental Quality regulations (40 Code of Federal Regulations [CFR] Parts 1500-1508) (1978, as amended in 1986 and 2005); Department of the Navy procedures for implementing NEPA (32 CFR Part 775); Marine Corps Order 5090.2, dated June 11, 2018, *Environmental Compliance and Protection Program*; the Air Force's Environmental Impact Analysis Process (32 CFR Part 989); the Army's regulation implementing NEPA (32 CFR Part 651); and other relevant laws, regulations, and policies discussed herein. MAGTFTC initiated the NEPA process before the revision to the CEQ NEPA regulations in 2020. This PEA is being prepared under the former regulations (effective July 18, 2005), as permitted by 40 CFR § 1506.13 (effective September 14, 2020).

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EXECUTIVE SUMMARY

This Programmatic Environmental Assessment (PEA) has been prepared to evaluate the potential environmental impacts associated with integrated, adaptive management of the Common Raven (*Corvus corax*; hereinafter raven) at lands owned or used by the Department of Defense (DoD) in the California desert. The following six DoD installations are located in the California desert and included in this PEA:

- Marine Air Ground Task Force Training Command (MAGTFTC), Marine Corps Air Ground Combat Center at Twentynine Palms (Combat Center)
- Marine Corps Logistics Base (MCLB) Barstow
- Edwards Air Force Base (AFB)
- Fort Irwin National Training Center (NTC)
- Naval Air Weapons Station China Lake (NAWSCL)
- Chocolate Mountain Aerial Gunnery Range (CMAGR) (administered by Marine Corps Air Station [MCAS] Yuma)

This PEA has been prepared by the United States (U.S.) Marine Corps in accordance with the National Environmental Policy Act (NEPA) of 1969 (42 U.S. Code §§ 4321-4370h); Council on Environmental Quality (CEQ) regulations (40 Code of Federal Regulations [CFR] Parts 1500-1508) (1978, as amended in 1986 and 2005); Department of the Navy procedures for implementing NEPA (32 CFR Part 775); Marine Corps Order 5090.2, dated June 11, 2018, *Environmental Compliance and Protection Program*; the Air Force's Environmental Impact Analysis Process (32 CFR Part 989); the Army's regulation implementing NEPA (32 CFR Part 651); and other relevant laws, regulations, and policies discussed herein. MAGTFTC initiated the NEPA process before the revision to the CEQ NEPA regulations in 2020. This PEA is being prepared under the former regulations (effective July 18, 2005), as permitted by 40 CFR § 1506.13 (effective September 14, 2020).

MAGTFTC is the lead agency for the NEPA analysis and made a formal request for cooperating agencies on July 20, 2021. The cooperating agencies are MCLB Barstow; Edwards AFB; Fort Irwin NTC; NAWSCL; MCAS Yuma; U.S. Fish and Wildlife Service (USFWS), Palm Springs Fish and Wildlife Office (PSFWO); and U.S. Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS). Other agencies that participated are listed in Chapter 7.

The overpopulation of the raven in both the built and undeveloped areas of the California desert has created several negative impacts on the various installations within the region. For instance, increased raven numbers result in higher incidences of predation on hatchling or juvenile desert tortoises (*Gopherus agassizii*). The desert tortoise is the only federally listed species that occurs within the boundaries of all six DoD installations in the California desert, and the DoD is legally obligated by federal law to ensure the species is protected. Ravens are also causing property damage (including but not limited to utility supply equipment, radar equipment, mission testing equipment, and parked vehicles and aircraft) and a human health hazard in the built environment, particularly in and around areas where vehicles and aircraft are parked and where DoD personnel must work directly underneath high-use roosting sites.

The purpose of the Proposed Action is to better manage raven populations at lands owned or used by the DoD in the California desert. Primarily non-lethal raven management actions are currently applied piecemeal at DoD locations in the California desert. In contrast, the Proposed Action would allow for integrated and adaptive raven management using a combination of non-lethal and lethal measures to reduce raven populations and activities at lands owned or used by the DoD in the California desert. The Proposed Action is needed to mitigate the ecological, economic, and health and safety impacts of elevated and increasing raven populations in the California desert, all of which hinder military readiness on DoD

installations in the region. The intent of this PEA is to analyze additional raven management tools to assist in reducing current raven overpopulation numbers to more sustainable levels, which is required to reduce the imminent risk to the recovery of the desert tortoise from its Threatened Status. Reduced raven populations would also reduce impacts on health and safety, economic costs, and the DoD mission.

Two alternatives were analyzed in this PEA: the No-Action Alternative and the Proposed Action:

- Under the No-Action Alternative, current raven management actions, primarily *ad hoc* and non-lethal, would continue to be conducted piecemeal at the identified DoD installations in the California desert. These current management actions would continue if the Proposed Action is not selected. Non-lethal management techniques alone do not meet the Purpose and Need, and DoD installations would continue to experience negative, and increasingly detrimental, impacts to ecological, economic, and health and safety resources from elevated and increasing raven populations. All of these impacts would continue to hinder military readiness.
- Under the Proposed Action, the DoD would integrate the identified raven management actions on lands owned or used by the DoD in the California desert. Raven management would include non-lethal (subsidy management and unoccupied nest removal) and lethal (age-class specific removals informed by current density estimates and a Desert Tortoise-Common Raven Conflict threshold) raven management actions to reduce raven populations and activities. Management under the Proposed Action would be integrative and adaptive. Adjustments in management strategy would be made based on changing numbers and effectiveness of efforts in achieving the Purpose and Need.

The scope of this PEA's environmental analysis focuses on *Biological Resources*, *Health and Safety*, and *Cultural Resources*. The proposed raven management actions would help to alleviate impacts to fragile desert tortoise populations by bringing raven densities closer to historic levels. A summary of potential effects is provided in Table ES-1. No significant impacts were identified for either alternative, individually or cumulatively to any resource.

Under either alternative, each DoD installation is responsible for ensuring compliance with NEPA and other relevant laws, policies, and procedures, including the regulatory requirement for depredation permits from the USFWS, Migratory Bird Program and, if necessary, National Historic Preservation Act Section 106 consultations by each DoD installation that could potentially impact historic properties during management of ravens.

Table ES-1 Summary of Environmental Consequences

Alternative	*Biological Resources*	*Health and Safety*	*Cultural Resources*
No-Action Alternative Methods: continued use of primarily non-lethal raven management actions.	Common Raven Impacts: reduced subsidies; reduced access to non-natural infrastructure; flushing of individuals; avoidance of treatment areas; increased stress levels; and disruption of nesting attempts. No concerted lethal removal would occur. Desert Tortoise Impacts: sparse and temporary noise impacts from noise-producing deterrents that would not affect normal life behaviors or rise to the level of take. Continued threat to survival/management from raven predation pressure. Other Avian/Wildlife Impacts: reduced subsidies; reduced non-natural infrastructure; flushing of individuals; and avoidance of treatment areas, but primarily for generalist species that congregate/occur in the same areas as ravens and/or share the same subsidized resources (often overpopulated and/or non-native species). Level of Significance: less than significant adverse impacts because this alternative would be a continuation of existing piecemeal raven management activities that would have little to no impact on biological resources, although raven populations would remain largely unchecked and may continue to affect populations of other species.	Raven Management Actions: non-lethal (e.g., use of lasers for hazing) management actions would be implemented by trained personnel, following all applicable requirements and guidelines and per resource protection measures (Section 2.4.1 of the PEA). Reduced/Managed Raven Populations: overall, raven populations would not be reduced by a measurable amount on the six DoD installations. There would continue to be health and safety impacts related to raven congregation in areas used by DoD personnel, but cleanup of raven excreta and use of personal protective equipment (PPE) would continue to occur. Level of Significance: overall less than significant impact to health and safety with the proper use of non-lethal management actions by trained personnel and the continued implementation of cleanup measures for raven excreta.	Raven Management Actions: in the event that any non-lethal management action could affect historic properties, each installation, on a case-by-case basis, would: (1) conduct individual Section 106 consultation with the California State Historic Preservation Officer (SHPO) and federally recognized Tribal Governments to decide on details of how management actions must be implemented to avoid or to minimize impacts to historic properties; (2) comply with any existing program alternative the installation may have negotiated with the California SHPO for the undertaking; or (3) comply with any existing installation-specific Programmatic Agreement. Level of Significance: overall less than significant impact with avoidance/ minimization of impacts to historic properties.
Proposed Action Methods: integrated, adaptive management using non-lethal and lethal raven management actions.	Impacts to biological resources from non-lethal management actions under the No-Action Alternative would also occur under the Proposed Action. Common Raven Impacts: lethal removal of 11,830 to 13,293 ravens initially, followed by up to 1,477-1,715 ravens removed annually.	Raven Management Actions: non-lethal (e.g., use of lasers for hazing, conditioned taste aversion) and lethal (e.g., shooting, poisoning) management actions would be implemented by trained personnel, following all applicable requirements and guidelines and per resource protection measures (Section 2.4.1 of the PEA).	Raven Management Actions: in the event that any non-lethal or lethal management action could affect historic properties, each installation, on a case-by-case basis, would: (1) conduct individual Section 106 consultation with the California SHPO and federally recognized Tribal Governments to decide on details of how management actions must be

Table ES-1 Summary of Environmental Consequences

Alternative	*Biological Resources*	*Health and Safety*	*Cultural Resources*
	Desert Tortoise Impacts: sparse and temporary noise impacts from shooting of ravens that would not affect normal life behaviors or rise to the level of take. Shooting would often be done with suppressed firearms, with little to no noise. Immediate beneficial impacts on hatchlings and juveniles from reduced raven predation pressure. Other Avian/Wildlife Impacts: low potential for other species to be shot and experience noise impacts from shooting of ravens. Shooting would only be done by authorized personnel and would often be done with suppressed firearms. Low risk of induced illness from inadvertent consumption of conditioned taste aversion chemicals and for non-target species to ingest the pesticide DRC-1339. Impacts to non-target species avoided and minimized per resource protection measures (Section 2.4.1 of the PEA) Beneficial impacts to species that are preyed on by or compete with ravens. Level of Significance: less than significant adverse impacts to the raven population, because the species is overpopulated in the California desert and, at most, 4 percent (%) of the California population would be removed. Less than significant, and overall, beneficial impacts to desert tortoise and other wildlife species that ravens threaten.	Reduced/Managed Raven Populations: reduced raven populations and deterring the presence of ravens in areas used by DoD personnel would improve the health and safety of the working environment in these areas. There would also be a reduced Bird/Wildlife Aircraft Strike Hazard (BASH) risk. Level of Significance: overall less than significant beneficial impact to health and safety with the proper use of non-lethal and lethal management actions by trained personnel and a less than significant beneficial impact to health and safety with the reduction and management of raven populations.	implemented to avoid or to minimize impacts to historic properties; (2) comply with any existing program alternative the installation may have negotiated with the California SHPO for the undertaking; or (3) comply with any existing installation-specific Programmatic Agreement. Level of Significance: overall less than significant impact with avoidance/ minimization of impacts to historic properties.

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PROGRAMMATIC ENVIRONMENTAL ASSESSMENT FOR INTEGRATED, ADAPTIVE MANAGEMENT OF THE COMMON RAVEN ON DEPARTMENT OF DEFENSE LANDS IN THE CALIFORNIA DESERT

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CHAPTER 1
PURPOSE OF AND NEED FOR THE PROPOSED ACTION

1.1 INTRODUCTION

This Programmatic Environmental Assessment (PEA) has been prepared to evaluate the potential environmental impacts associated with integrated, adaptive management of the Common Raven (*Corvus corax*; hereinafter raven) at lands owned or used by the Department of Defense (DoD) in the western Mojave Desert and the Colorado Desert, collectively described as the California desert for the purpose of this PEA, and includes the following six DoD installations:

- Marine Air Ground Task Force Training Command (MAGTFTC), Marine Corps Air Ground Combat Center at Twentynine Palms (Combat Center or MCAGCC)
- Marine Corps Logistics Base (MCLB) Barstow
- Edwards Air Force Base (AFB)
- Fort Irwin National Training Center (NTC)
- Naval Air Weapons Station China Lake (NAWSCL)
- Chocolate Mountain Aerial Gunnery Range (CMAGR) (administered by Marine Corps Air Station [MCAS] Yuma)

This PEA has been prepared by the United States (U.S.) Marine Corps (USMC) in accordance with the National Environmental Policy Act (NEPA) of 1969 (42 U.S. Code [USC] §§ 4321-4370h); Council on Environmental Quality (CEQ) regulations (40 Code of Federal Regulations [CFR] Parts 1500-1508) (1978, as amended in 1986 and 2005); Department of the Navy (DoN) procedures for implementing NEPA (32 CFR Part 775); and Marine Corps Order (MCO), dated June 11, 2018, *Environmental Compliance and Protection Program*; the Air Force's Environmental Impact Analysis Process (32 CFR Part 989); the Army's regulation implementing NEPA (32 CFR Part 651); and other relevant laws, regulations, and policies discussed herein. MAGTFTC initiated the NEPA process before the revision to the CEQ NEPA regulations in 2020. This PEA is being prepared under the former regulations (effective July 18, 2005), as permitted by 40 CFR § 1506.13 (effective September 14, 2020).

Raven management would include a combination of non-lethal and lethal measures to reduce raven populations and activities, thereby reducing ecological, economic, and health and safety impacts. Two alternatives were analyzed in this PEA: the No-Action Alternative and the Proposed Action. Under the No-Action Alternative, current raven management actions, primarily *ad hoc* and non-lethal, would continue to be conducted piecemeal at the identified DoD locations in the California desert. Under the Proposed Action, the DoD installations would move toward a more effective, integrated raven management approach on lands owned or used by these DoD installations in the California desert.

MAGTFTC is the lead agency for the NEPA analysis and made a formal request for cooperating agencies on July 20, 2021. The cooperating agencies are MCLB Barstow; Edwards AFB; Fort Irwin NTC; NAWSCL; MCAS Yuma; U.S. Fish and Wildlife Service (USFWS), Palm Springs Fish and Wildlife Office (PSFWO); and U.S. Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS). Other agencies that participated are listed in Chapter 7.

Overall, MAGTFTC and the cooperating agencies intend for this Draft PEA to make the public aware of regional issues with the raven and their localized impacts; encourage DoD installations to work together to address regional issues with the raven by moving toward more of an integrated management approach;

comprehensively evaluate raven management at DoD installations and allowing for public comment; and encourage integrated raven management outside of DoD installations.

By comprehensively evaluating raven management and seeking public comment on this PEA, MAGTFTC and the cooperating agencies seek to facilitate NEPA compliance and increase the transparency of agency action. This is because many raven management actions would ordinarily be within the scope of NEPA categorical exclusions (CATEXs) with no opportunity for public involvement (e.g., studies) and some actions would not have impacts within the scope of NEPA (e.g., subsidy reduction).

1.2 PROJECT LOCATION

1.2.1 DoD Installations

The six DoD installations (Table 1-1) and associated Geographically Separated Units,[1] including all other lands used by the DoD (Section 1.2.2), are located in the California counties of Kern, Inyo, Los Angeles, San Bernardino, Riverside, and Imperial (Figure 1-1). All of these DoD installations, except CMAGR, are within the western Mojave Desert; CMAGR is located in the Colorado Desert sub-region of the Sonoran Desert.

Table 1-1 Department of Defense Installations in the California Desert

Installation	***County/ Counties***	***Size (acres)***	***Description***
Combat Center	San Bernardino	761,000	• Composed of multiple training areas and the Mainside (5,260 acres) and Camp Wilson (1,702 acres) support areas. • Majority is undeveloped and devoted to combined arms live-fire and maneuver training activities. • Mainside (southernmost portion of the installation) is the primary developed area on the installation, providing maintenance, storage, administrative, commercial, and housing facilities.
MCLB Barstow	San Bernardino	5,567	• Diverse collection of cantonment and range areas positioned at significant highway and railway crossroads.
Edwards AFB	Kern; Los Angeles; San Bernardino	308,180	• Consists of largely undeveloped or semi-improved land that is used predominantly for aircraft test ranges, and maintained and unmaintained landing sites (i.e., dry lake beds). • Developed portion occupies approximately 6 percent (%) of the base area, is concentrated on the west side of Rogers Dry Lake, and includes North Base, South Base, Main Base, and Family Housing areas. • There are also multiple Geographically Separated Units associated with the base.
Fort Irwin NTC	San Bernardino	753,537	• Serves as the U.S. Army's premier field combat training facility with over 60% of land area is used for desert battlefield training. • Cantonment occupies 3-square mile area that hosts the command-and-control elements and provides temporary and permanent living quarters for soldiers and their families with residential areas, support facilities, retail centers, restaurants, and health care facilities.

[1] In the U.S. military, a Geographically Separate Unit is a base that is physically separate from, yet not autonomous of its "parent" base.

Table 1-1 Department of Defense Installations in the California Desert

Installation	*County/ Counties*	*Size (acres)*	*Description*
NAWSCL	Inyo; Kern; San Bernardino	1.1 million	• Provides and maintains land, facilities, and other assets that support the Navy's research, development, acquisition, testing and evaluation of cutting-edge weapons systems for the warfighter. • DoN's largest single landholding, representing 85% of the Navy's land for weapons and armaments research, development, acquisition, testing, and evaluation use and 38% of the Navy's land holdings worldwide.
CMAGR (administered by MCAS Yuma)	Riverside; Imperial	458,267	• Primarily serves as an air-to-ground training venue for the USMC. • Sometimes hosts other live-fire and desert warfare training for the DoN and is closed to civilian use.

1.2.2 Non-DoD Lands

These lands may include adjacent properties, offsite conservation areas, and mitigation lands that are owned or managed by federal, tribal, state, local, and/or private entities that have agreements and/or partnerships with the DoD. For instance, the Combat Center uses recipient and control sites outside of the installation boundaries for translocating and managing desert tortoises (*Gopherus agassizii*) (DoN 2017) (Figure 1-2). These recipient and control sites include areas that are primarily Bureau of Land Management (BLM) lands but also include some state and private lands. Raven management actions performed on non-DoD lands require advance approval from the landowner or land manager.

In addition, the agencies involved in preparing this PEA recommend adjacent and regional landowners conduct raven management, including subsidy reduction, on their properties. Issues on adjacent properties contribute to the issues on DoD installations and may affect the success of the proposed DoD efforts. Thus, cooperation is required to resolve this regional issue of raven overpopulation.

To facilitate raven management by other non-federal entities on non-federal land, this PEA includes topics typically addressed under the California Environmental Quality Act (CEQA). Entities and persons subject to CEQA can use NEPA documents to satisfy CEQA requirements (CEQA Guidelines, Sections 15221 and 15365); this PEA is the equivalent of an Initial Study.

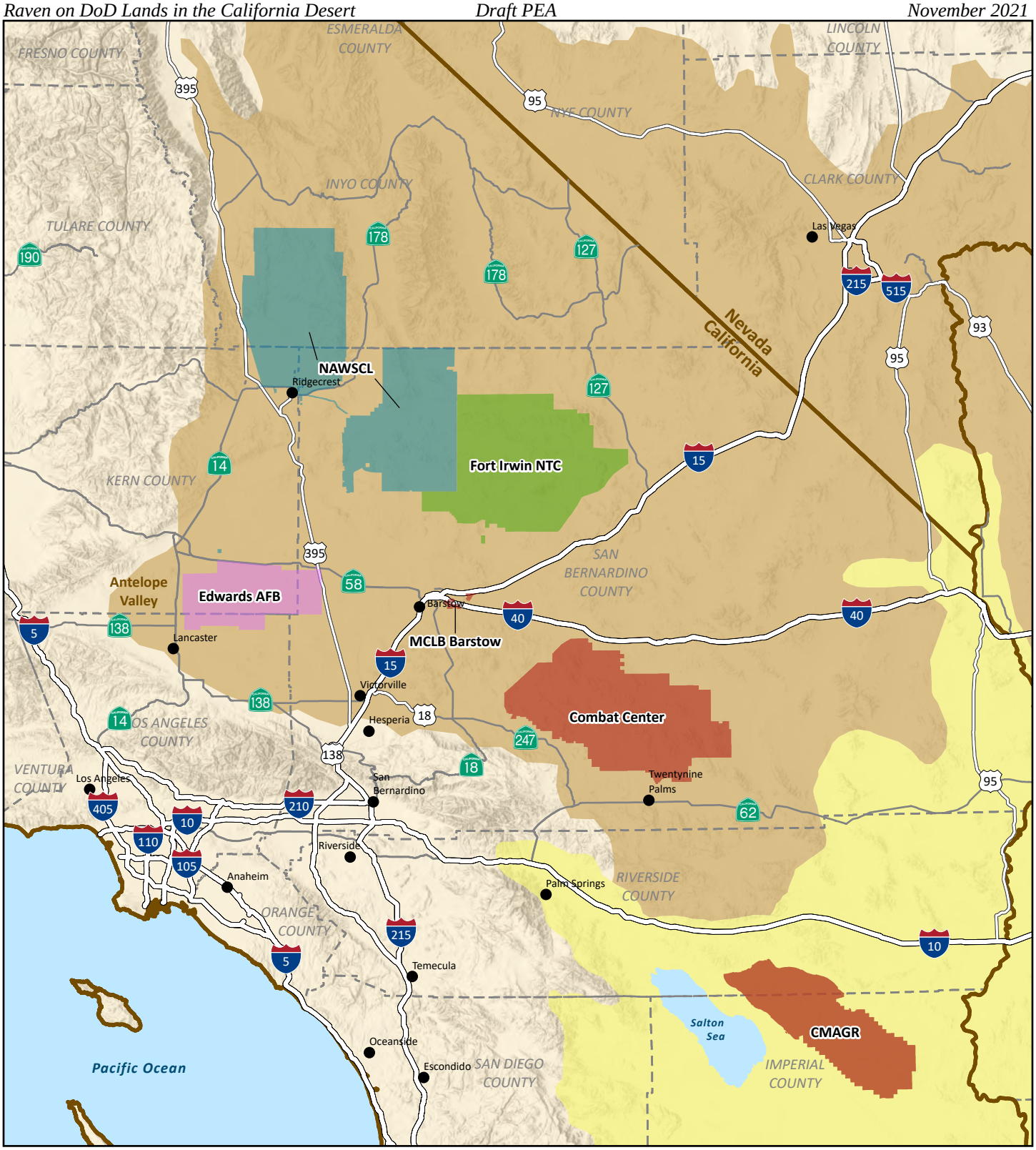


Figure 1-1. Department of Defense Installations in the California Desert

State Boundary
County Boundary
Mojave Desert
Sonoran Desert

Military Installations
U. S. Air Force
U. S. Army
U. S. Marine Corps
U. S. Navy

0 25 50 Miles

Sources: DoD 2017, Esri 2017, U.S. Geological Survey 2010

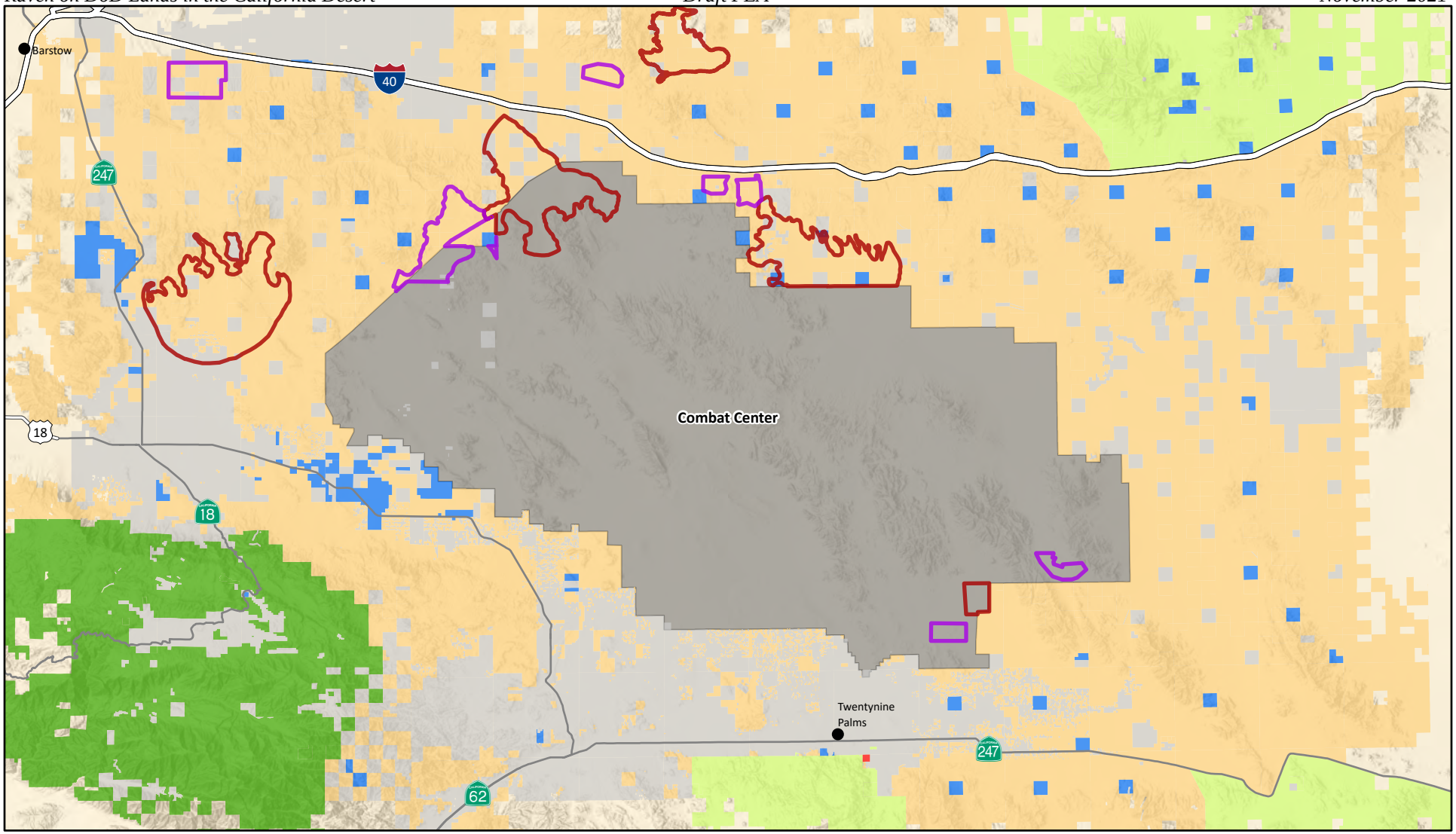


Figure 1-2. Desert Tortoise Translocation Recipient and Control Sites

1.3 BACKGROUND

1.3.1 Relevant Documents

The documents listed below are relevant to the development of this PEA's Purpose and Need, Proposed Action, level of NEPA analysis and scope of the environmental effects analysis. These documents are incorporated by reference into this PEA. Specific citations are included in this PEA as appropriate.

- 2005 Environmental Impact Report and Statement for the West Mojave Plan (BLM 2005)
- 2005 Report on Ecology of Common Ravens at the Marine Corps Air Ground Combat Center, Twentynine Palms, California (Chamblin and Boarman 2005)
- 2008 Environmental Assessment (EA) to Implement a Desert Tortoise Recovery Plan Task: Reduce Common Raven Predation on the Desert Tortoise (USFWS 2008)
- 2010 Mojave Population of the Desert Tortoise 5-Year Review (USFWS 2010)
- 2011 Revised Recovery Plan for the Mojave Population of the Desert Tortoise (*Gopherus agassizii*) (USFWS 2011a)
- 2012 Biological Opinion for Land Acquisition and Airspace Establishment to Support Large-scale Marine Air Ground Task Force Live-Fire and Maneuver Training, Twentynine Palms, California (USFWS 2012)
- 2014 Report Assessing Common Raven Abundance, Subsidies and Impacts to Agassiz's Desert Tortoises at the Marine Corps Air Ground Combat Center, Twentynine Palms, California (Boarman 2014)
- 2016 Migratory Bird Damage Project Report, USAG Fort Irwin (Fort Irwin 2016)
- 2017 Compilation of Frequently Implemented Best Management Practices to Protect Mojave Desert Tortoise during Implementation of Federal Actions (Desert Tortoise Council 2017)
- 2017 Biological Opinion for Land Acquisition and Airspace Establishment, Twentynine Palms, California (USFWS 2017a)
- Final Report, Baseline Investigation of Tortoise Predators for the Marine Corps Air Ground Combat Center, Twentynine Palms, California (Vernadero Group Inc. 2018a)
- Second Annual Baseline Investigation of Tortoise Predators for the Marine Corps Air Ground Combat Center Twentynine Palms, California (Vernadero Group Inc. 2018b)
- 2018 Occupational Safety and Health Inspection, Combat Center Twentynine Palms (Combat Center 2018a)
- 2018 Memorandum of Decision for 5090/13088.6 Categorical Exclusion - *Install Anti-perching Devices At First Tanks* (Combat Center 2018b)
- 2019 Memorandum 1st Tanks Battalion Raven Conflict (Combat Center 2019a)
- 2020 Memorandum of Decision for TP20200079 Categorical Exclusion - *Common Raven Movement and Resource Use at MCAGCC* (Combat Center 2020)
- 2021 Strategic Expeditionary Landing Field (SELF) Raven Damage (Combat Center 2021a)
- 2021 Management of Conflicts Associated with Common Ravens in the United States, A Technical Review of the Issues (Raven Core Team 2021a)
- 2021 Draft Raven Management Options Document (Raven Core Team 2021b)

In addition to these documents, the DoD actively collaborates via regional interagency partnerships, including the Desert Tortoise Management Oversight Group and Desert Managers Group. Both groups pursue raven population management and ecosystem conservation.

MAGTFTC, Fort Irwin NTC, BLM, and USFWS are also collaborating to develop partnerships to advance desert tortoise recovery pursuant to the USFWS's 2011 Revised Recovery Plan for the Mojave Population of the Desert Tortoise and the 2018 Memorandum of Understanding Between the Department of Defense and the Department of the Interior Establishing a Recovery and Sustainment Partnership (RASP) Initiative (DoD-Department of Interior 2018). RASP is currently focused on the western Mojave Desert in California (see Section 2.4.3 for more information on this effort).

1.3.2 Common Raven Populations on DoD Lands in the California Desert

Over the last 3 to 5 decades, raven numbers have increased in much of southern California and by a factor of 15 in parts of the California desert (Boarman and Berry 1995; Camp et al. 1995; Boarman 2014). In a recent study of bird populations in the Mojave Desert, the raven was the only species shown to have a significant population increase since the early twentieth century, while every other native species has shown a decrease (Iknayan and Beissinger 2018) (Figure 1-3). In general, as human communities increase, raven populations increase, taking advantage of resource subsidies that humans inadvertently provide (e.g., food, water, nesting opportunities, etc.) (Boarman 2014).

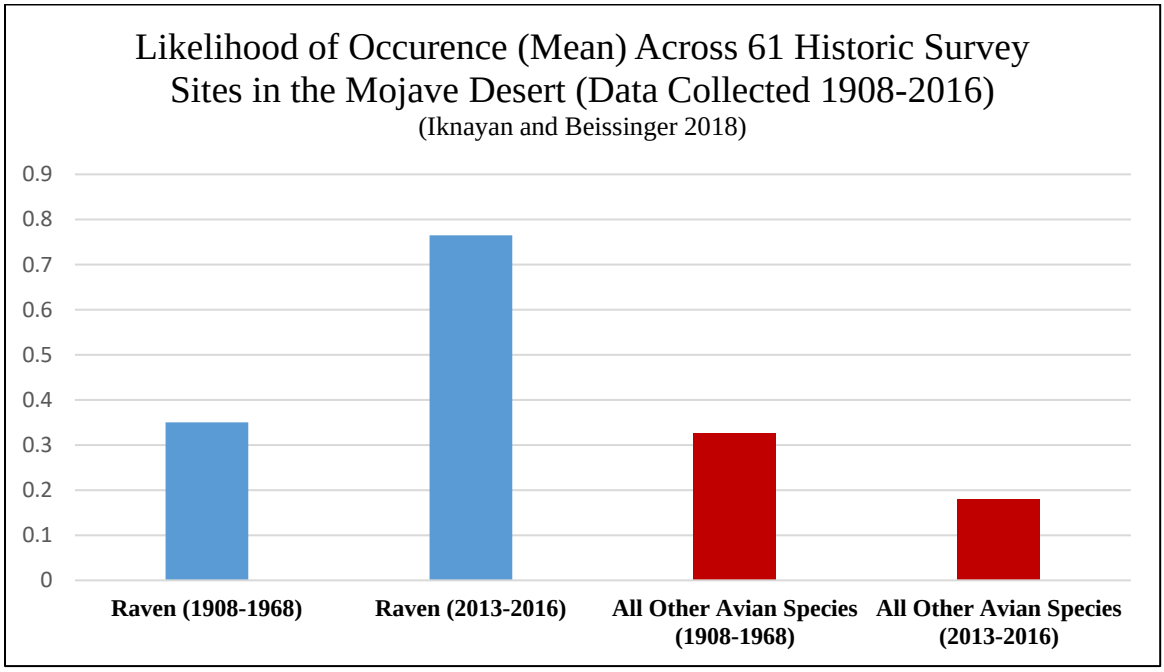


Figure 1-3 Historic and Modern Occurrence of Avian Species in the Mojave Desert

In 2008, the USFWS and cooperating agencies, including the five DoD installations in the western Mojave Desert that are identified in this PEA, prepared an *Environmental Assessment to Implement a Desert Tortoise Recovery Plan Task: Reduce Common Raven Predation on the Desert Tortoise* (USFWS 2008). At the time of the 2008 EA, the USFWS estimated the California desert raven population at 37,500. As of 2021, the USFWS estimates that there are over 100,000 ravens in the California desert (Holcomb 2021a). The current raven population in the U.S. is roughly 2.5 million (DoD Partners in Flight 2021). Refer to Sections 1.3.3.1 and 3.1.2 for more detailed raven density and population estimates. The DoD has worked

for multiple years to control raven numbers, primarily by non-lethal means. However, management of raven populations by non-lethal means is difficult because ravens are intelligent, have good eyesight, and have an acute sense of smell (Merrell 2012). Most methods used to successfully remove roosts of other bird species work only marginally on ravens, because ravens habituate rapidly to frightening techniques, such as air cannons, sirens, and scarecrows. Ravens quickly learn that these tactics do not pose a danger to them, and they maintain their roosts (Merrell 2012). A combination of lethal and non-lethal techniques and tools to control raven populations often provides higher success rates (Merrell 2012).

1.3.3 Impacts from Increased Raven Populations

The overpopulation of ravens in both the built and undeveloped areas of the California desert has had several detrimental impacts on the DoD installations within the region. For instance, increased raven numbers result in higher incidences of predation on juvenile desert tortoises (USFWS 1994, 2011a). The desert tortoise is the only federally listed species that occurs within the boundaries of all six DoD installations in the California desert, and the DoD is legally obligated by federal law to ensure the species is protected. Ravens are also causing property damage and pose a human health hazard in the built environment, particularly in and around areas where vehicles and aircraft are parked and where DoD personnel must work directly underneath high-use roosting sites. Details on these impacts are provided in Sections 1.3.3.1 to 1.3.3.4.

1.3.3.1 Ecological Impacts

In 1990, the USFWS listed the desert tortoise as federally threatened because of sharp population declines documented throughout its range (USFWS 1990). The desert tortoise is also listed as threatened under the California Endangered Species Act (ESA) (California Department of Fish and Wildlife [CDFW] 2021). The threats identified in the 1994 Recovery Plan for the species (USFWS 1994), and that formed the basis for listing the tortoise as a threatened species, continue to affect the species (USFWS 2011a). Management areas and habitat models have been established for desert tortoises in the California desert (Figure 1-4).

One of the primary threats to desert tortoises is extensive raven predation of juvenile tortoises, which are vulnerable to raven predation until they are at least 8 years old (Photo 1; USFWS 2011a). Predation by ravens has increased because of resource subsidies provided by humans (Kristan and Boarman 2007). Ravens obtain resources such as food from landfills and trash containers, water from human-made sources, and nesting substrates on billboards, utility towers, bridges, and buildings (Boarman et al. 2006). Predator populations that increase and benefit from resources associated with human habitation are known as subsidized predators (Crowe and Longshore 2007). Predation by subsidized predators can adversely impact native prey populations because human-provided subsidies allow such predator populations to remain high even when natural prey become rare (Courchamp et al. 2000).

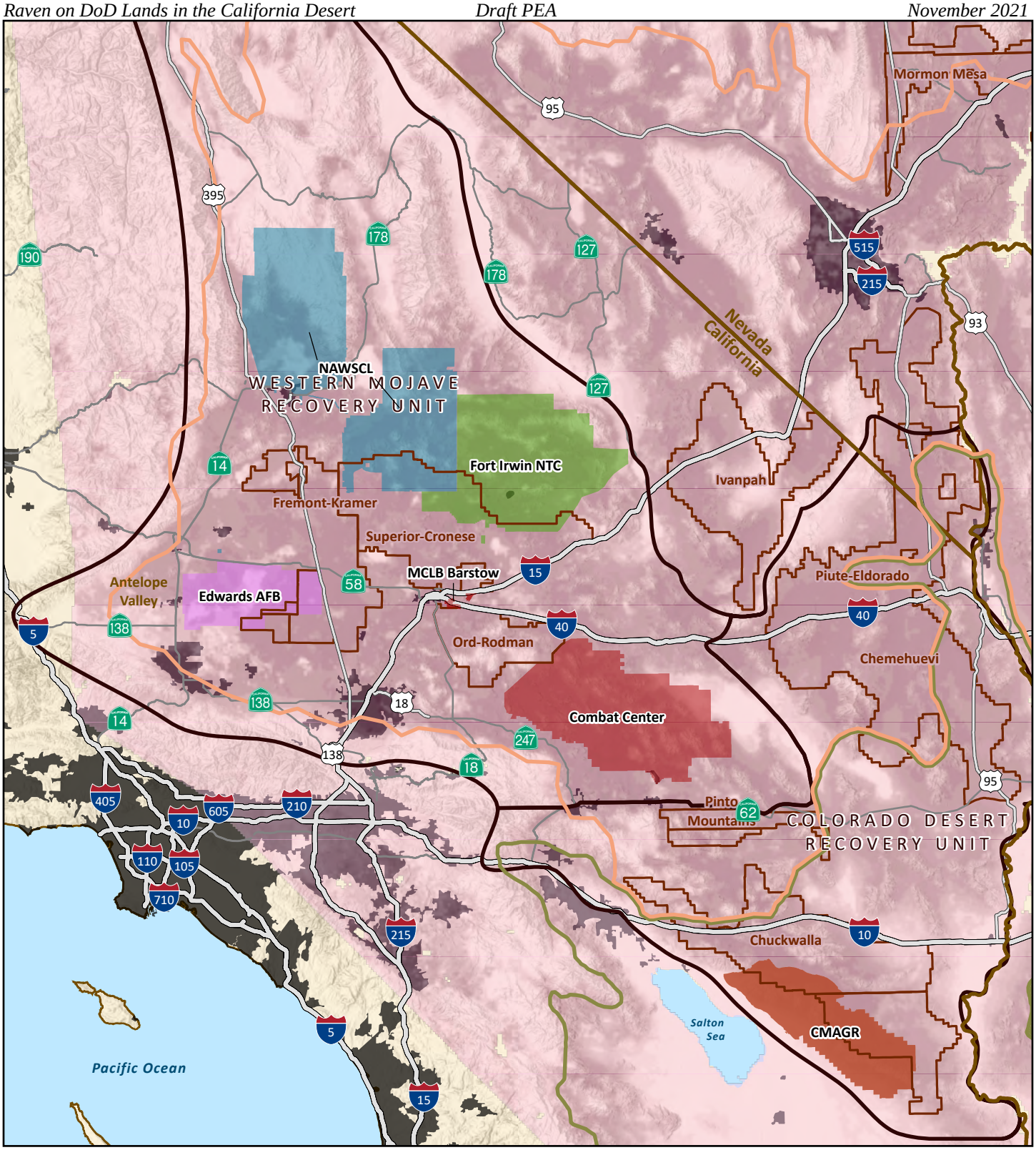


Figure 1-4. Desert Tortoise Habitat and Management Areas in the California Desert

Source: Corvus Ecological Consulting 2016a.

Photo 1 Desert Tortoise Carcass Found Below Active Raven Nest in 2016

Table 1-2 provides examples of the energy contents of desert tortoise eggs and juveniles compared to potential subsidized food items for ravens. To meet its daily energy requirements, an adult, non-breeding raven would need to eat one cheeseburger (Table 1-2). While focusing only on tortoises, that raven could sustain itself by eating 9 hatchlings or 1.35 small juvenile tortoises per day.

Table 1-2 Energy Contents of Desert Tortoise Eggs/Juveniles and Subsidized Food Items

Prey/Food Item	***Calories (kcal)***	***% Daily Energy Requirement of an Adult Common Raven (273 kcal/day)***
Tortoise egg or hatchling (33 grams)	34	12%
Tortoise juvenile (200 grams)	206*	75%
Hardboiled egg, chicken, large (50 grams)	77	28%
Cheese puffs (28 grams)	160	59%
Rabbit, roasted (85 grams)	165	60%
Glazed donut (49 grams)	190	70%
French fries, small (71 grams)	220	81%
Hamburger (100 grams)	250	92%
Cheeseburger (113 grams)	300	110%

Note: *Based on the energy density (Kcal/g) of an egg or hatchling.
Sources: Henen 1997; Nagy et al. 1999; MyFoodDiary 2021.

Ravens had the greatest impact on the mortality of juvenile (less than 2 years old) tortoises released from DoD Headstart programs in the western Mojave Desert (Nagy et al. 2015a). In a study of desert tortoises released from the Headstart program at Fort Irwin NTC, of the 23 small juveniles (less than 2 years old) that died, 2 were confirmed as having been depredated by ravens (shells showed characteristic raven damage or carcasses were located beneath raven nesting or roosting sites), and 16 others were strongly suspected to have been taken by ravens (e.g., tortoise transmitter found under known raven perching sites or near fresh raven footprints).

Of 15 tortoises released from the Edwards AFB Headstart Program between 2005 and 2006, the probable cause of death of 8 tortoises was predation, with 7 by ravens that lived in the area (Nagy et al. 2015b). The Edwards AFB Headstart Program also released an additional 120 juvenile tortoises between 2013 and 2018. Of the known mortalities for these 120 juveniles, 45 occurred where the remains were found, and a likely cause of death could be determined with a high degree of certainty. Of these 45 mortalities, 15 (33%) were attributed to ravens based on peck marks and other evidence indicative of raven predation (Berry 2021). In total, the Edwards AFB Headstart Program has conducted seven major releases for a total of 299 juveniles released into the wild. Of these 299 juveniles, only 57 are known to be alive (all others are dead or missing) (Edwards AFB 2021a). As the numbers above show, raven predation has been a major factor in the mortality rates of small head-started tortoises. Head-started tortoises may avoid depredation by ravens if the tortoises are large enough (e.g., carapace length greater than 10 centimeters) (Nagy et al. 2015b; Nagy et al., unpublished data) and have hard shells (greater than or equal to 98% of adult shell hardness; see Nagy et al. 2020) that resist attacks by ravens. Because desert tortoises require about 9 years to reach this state, younger tortoises are particularly vulnerable and require substantive conservation.

Unlike ravens, that occur throughout most of the western U.S. and California, the geographic range of the Mojave population of desert tortoise is limited to portions of the Mojave and Sonoran deserts and their population is in decline (Allison and McLuckie 2018). The declining desert tortoise population trends in the Western Mojave and Colorado Desert Recovery Units are detailed in Table 1-3. Figure 1-5 shows the California ranges of the desert tortoise and raven, the boundaries of the desert tortoise Western Mojave and Colorado Desert Recovery Units, and the location of the DoD installations.

Table 1-3 Estimated Change in Abundance of Adult Desert Tortoises in the Western Mojave and Colorado Desert Recovery Units between 2004 and 2014

Recovery Unit	***2004 Adult Population Estimate***	***2014 Adult Population Estimate***	***Change***
Western Mojave	131,540	64,871	**-66,668**
Colorado Desert	103,675	66,097	**-37,578**

Source: Allison and McLuckie 2018.

Figure 1-5. Common Raven and Desert Tortoise Ranges in California

The USFWS estimates that a range of 0.64-0.75 raven/square kilometer (km^2) is a sustainable and manageable ecological threshold for raven densities in the California desert that would significantly reduce predation pressure on desert tortoises (Shields et al. 2019; Hanley et al. 2020a, 2020b, 2021). Current raven densities at the five DoD installations in the western Mojave Desert are estimated to range from 1.23 to 2.44 ravens/km^2 and are at 0.70 ravens/km^2 at CMAGR (administered by MCAS Yuma) in the Colorado Desert (Table 1-4). These current raven densities exceed the minimum threshold on all five DoD installations in the western Mojave Desert.

Table 1-4 Raven Densities and Population Estimates at DoD Installations in the California Desert

Installation	***Population Estimates***				
	Current Density (Ravens/km²)	***Current Eggs/Hatchlings***	***Current Non-breeders***	***Current Breeders***	***TOTAL***
Combat Center	1.23	1,358	485	1,948	**3,791**
MCLB Barstow	1.32	12	4	17	**33**
Edwards AFB	2.44	1,082	386	1,553	**3,021**
Fort Irwin NTC	1.56	1,705	609	2,447	**4,761**
NAWSCL	2.00	3,304	1,180	4,741	**9,225**
CMAGR[1]	0.70	466	166	699	**1,331**
TOTAL	**1.60[2]**	**7,927**	**2,830**	**11,375**	**22,162**

Notes: [1]CMAGR is administered by MCAS Yuma.
[2]Average across all DoD installations in the California desert.
Source: Holcomb 2021b.

Ravens are protected by the Migratory Bird Treaty Act (MBTA) and desert tortoises are protected by the ESA. Federal agencies are required by ESA Section 7(a)(1) and MBTA Section 703(a) to use their authorities to conserve both species, but desert tortoises are protected to a greater degree than ravens. However, raven populations in the California desert are thriving, while desert tortoise densities remain very low and are still decreasing in certain areas (see Section 3.1.2). A large part of this dynamic is a result of anthropogenic factors: as human-subsidized predators, raven numbers are much higher near urban sites in the California desert, placing those tortoises at much higher risk of predation (Kristan and Boarman 2003).

The purpose of the 2008 EA was to facilitate desert tortoise recovery by reducing raven depredation of tortoises in the California desert (USFWS 2008). Reducing raven depredation may be enhanced by reducing their subsidies, such as reducing trash available at landfills, removing illegal dumps, adding fencing along highways to reduce roadkill, and removing or modifying nesting and roost sites. The program was also meant to provide immediate protection to hatchling and juvenile desert tortoises by identifying and removing ravens that had preyed or attempted to prey on desert tortoises (USFWS 2011a). As explained in Section 1.3.4, the USFWS has not yet successfully reduced the raven population as planned. Therefore, the 2008 EA, and lack of effectiveness of existing management efforts to meet the purpose and need, were precursors to this PEA.

Other wildlife taxa that are known or are likely to be directly impacted by increased raven populations in the California desert include small mammals, reptiles, and nesting birds such as Burrowing Owls (*Athene cunicularia*) (Liebezeit and George 2002; Crowe and Longshore 2007; DeGregorio et al. 2016). Ravens also harass and depredate the nests of birds of prey in the California desert, including Golden Eagle (*Aquila chrysaetos*) nests (Simes et al. 2017; Combat Center 2018c). Impacts from ravens on other wildlife in the California desert are further discussed in Section 3.1.

1.3.3.2 Economic Impacts

Ravens can have negative economic impacts to agriculture and property (USDA 2002). Ravens will eat crops such as grains, nuts, and fruits, and have been implicated in the killing or maiming of small livestock (Berg 1999; USDA APHIS 2020). A survey of stakeholders, primarily across the western U.S., found that the following raven-related economic impacts were of most concern: injury and killing of calves, lambs, and other young livestock; contamination of livestock feed; damage to powerlines and associated equipment, causing power outages, and increasing potential for wildfire; nesting on structures; damage to buildings; damage to rubber expansion joints on dams; and wildlife/aircraft collisions at airports (Raven Core Team 2021a).

Raven damage reported to USDA's Wildlife Services program in 2018 was estimated at $5,328,456 throughout the United States; however, not all raven damage in the United States is reported to Wildlife Services (USDA APHIS 2020). Estimating economic and resource-related costs and damages from raven overpopulation in the California desert is extremely difficult due to the vastness of the area and the lack of reported raven-related perturbations.

On DoD installations in the California desert, it is commonly acknowledged that ravens detrimentally impact places they are attracted to, such as: landfills, trash dumpsters, vehicle shade structures, hangars, parking decks, and barracks (Fort Irwin 2016; Combat Center 2018c). In locations where ravens form large communal roosts in and around built structures on DoD lands, the accumulation of excrement causes economic impacts from damage to military equipment (including but not limited to utility supply equipment, radar equipment, mission testing equipment, and parked vehicles and aircraft) and the person-hours that are required to clean these areas (see Photos 2 to 6). The estimated costs for cleanup include salary for a fuel system technician (4 hours a day for 2 months), $200 for personal protective equipment (PPE), and flushing and rinsing of storm drains using approximately 3,000 gallons of water. The annual cost to repair coatings and markings on bulk fuel pipes, pumps, valves, etc. is approximately $5,000 (Combat Center 2021a).

Photo 2 Raven Excreta Causing Economic and Human Health Impacts

Photos 3 and 4 Raven Caused Corrosion of Facilities at SELF

Photos 5 and 6 Typical Daily Raven Mess and Cleanup at SELF

To study the effects of ravens on desert tortoise survival, the DoD has spent considerable amounts of time and money on research studies and programs. Between 2018 and 2019, MAGTFTC spent more than $300,000 studying ravens in both the developed and natural areas, more than $280,000 was spent on raven deterrents at a single site in 2018, and approximately $250,000 on NEPA compliance for raven management (Combat Center 2018c, 2019b). In 2020, $10,000 was spent on falconry and another $110,000 spent for ongoing raven monitoring (B. Henen, Combat Center, personal communication). In addition, other site-specific expenditures have occurred. For instance, ongoing raven issues at the Combat Center's SELF have resulted in a request for about $20,000 to install anti-perching devices such as bird spikes at one small facility (Combat Center 2021a). A series of bird spikes (unknown cost) have been applied recently

(September and October 2021) to awnings, with limited effectiveness, where ravens have returned, roosted, and excreted on equipment and the workspace (e.g., Photo 2). These examples do not include the indirect costs associated with the time and labor spent to address the raven impacts and coordinating with regulators for a depredation permit on a case-by-case basis.

1.3.3.3 Health and Safety Impacts

The most common complaint that the USDA receives from industrial and commercial facilities regarding ravens is about the excreta from ravens deposited on equipment, working surfaces, handrails, stairs, and other surfaces that workers contact (Merrell 2012) (see Photos 2 and 5). Bacterial and viral diseases are prevalent in congregating bird species, including ravens (McLean 2003; Pederson and Clark 2007). This includes certain diseases such as virulent Newcastle disease, West Nile virus, avian flus (H1N1 & H5N1), Campylobacter serovars (e.g., *Campylobacter jejuni*), and salmonellosis, which pose a direct threat to human health on DoD installations in the California desert (Combat Center 2021b).

Overpopulation of the raven in the California desert has resulted in human health hazards and potential disease vectors associated with significant build-up of raven excreta in shade structures and hangars and on buildings, dwellings, and other public locations where ravens roost and nest (Fort Irwin 2016). Ravens frequently build nests on electrical and communications systems, hangars, and other structures, causing health, safety, and operational issues due to their presence and during nest removal. This causes a human health hazard in the built environment, particularly in and around areas where vehicles and aircraft are parked and where DoD personnel must work directly underneath high-use roosting sites. The ability of ravens to identify and exploit food and garbage sources creates a public health and safety nuisance as the birds remove and scatter food and garbage items, thereby making conditions unsanitary, attracting and subsidizing local coyote populations, and creating further health and safety issues (Fort Irwin 2016). Other risks from ravens landing on or using power lines for nesting include power outages at critical infrastructure (B. Henen, Combat Center, personal communication) or the fire hazard associated with electrocuted ravens or nests catching fire if they touch power lines and then drop to the ground and start a wildfire (Lehman and Barrett 2001; K. Bjurman, Southern California Edison [SCE], personal communication via email, November 1, 2021).

Ravens are also a concern at DoD installations in the California desert because they can form large nocturnal roosts on power lines (over 2,000 birds in the winter) near military airfields, creating risk of significant bird/wildlife aircraft strike hazard (BASH) (Chamblin and Boarman 2005). The DoN has directed the removal of any known raven and/or crow roosting sites on or around airfields (Commander Navy Installations Command 2010). Although ravens are implicated in BASH incidents involving civilian aircraft (Federal Aviation Administration 2016), Pfeiffer et al. (2018) found that of over 125,000 wildlife strike report records for the DoN and U.S. Air Force between 1990 and 2017, none of them involved ravens.

The DoD implements a BASH prevention program to improve aviation safety. Development and implementation of an effective BASH program requires constant interaction between natural resources, aviation safety, and air operations communities as well as the pilots and aircrews. Habitat modifications, active hazing, and understanding the behavior and movements of birds in relation to the airfield environment and military training routes by pilots and aircrews are critical in reducing bird strikes (DoD Partners in Flight 2019). However, BASH plans/programs only reduce BASH risk and do not totally prevent incidents.

1.3.3.4 Overall Impact on Military Readiness

Ravens affect military readiness at DoD installations in California desert through the ecological, economic, and health and safety impacts described above. The primary purpose of DoD installations is to provide training and facilities to support the combat readiness of the U.S. military to protect national security (DoD 2019).

Management of natural resources on DoD lands, including federally listed species such as the desert tortoise, ensures military mission readiness by sustaining the quality of training, maintaining compliance with all applicable natural resource laws, and facilitating natural resources management in a manner that is consistent with DoD federal stewardship requirements (Combat Center 2018d). As described in Section 1.3.3.1, the raven has had significant ecological impacts on DoD lands in the California desert, which requires monetary funds, person-hours, and other valuable resources to be diverted away from other natural resource management needs.

The continued decline of the desert tortoise population adversely affects military readiness indirectly. Over time, it may become more difficult for DoD installations to obtain regulatory authorizations and locate funds to implement more restrictive terms and conditions if other desert tortoise stressors continue unmitigated. Under normal circumstances, ravens are natural predators of desert tortoises, but currently raven populations are subsidized and largely unchecked in the California desert. These aspects have rendered tortoise populations unable to sustain recruitment into adult breeding size and age classes (Holcomb 2021a).

Economic impacts from ravens on DoD lands in the California desert stem from ecological impacts, as described above, but also from time, effort, and resources spent trying to mitigate the impacts of ravens and their impacts on facilities, equipment, and BASH potential. Military readiness is affected when DoD facilities, equipment, and personnel are impacted by the time and resources that are spent to mitigate raven impacts in the California desert. The health and safety of military personnel is of utmost importance to military mission readiness. Where ravens form large communal roost or perching sites on DoD lands, the health and safety of military personnel is at risk, either from potential for disease or illness transmission or from BASH potential. Therefore, ravens in the California desert have and will likely continue to impact military readiness without an integrative, adaptive management plan to control the species.

1.3.4 Procedural History

The 2008 EA analyzed a variety of raven management methods, including reduction of the adult raven population in the California desert. Prior to this EA, management was limited to non-lethal methods at a few locations with no lethal control (USFWS 2008). The USFWS is still in the process of implementing Alternative F of the 2008 EA, which includes a three-phased approach to raven population reduction:

- *Phase 1*: Focuses on reducing human subsidies to raven such as food, water, and nesting sites, but also, enables the removal of ravens that preyed or attempted to prey on the desert tortoise, up to 0.5 percent (%) of the adult ravens
- *Phase 2*: Continues human subsidy control efforts, and enables the removal of all ravens from specific areas, up to 5.3% of the adult ravens
- *Phase 3*: Continues human subsidy control efforts, and enables the removal of ravens from specific areas and concentration areas, such as landfills, up to 18.7% of the ravens

The USFWS is currently implementing Phase 2 but is transitioning to Phase 3 of the 2008 EA since Phases 1 and 2 did not effectively reduce raven depredation of tortoise populations as planned (Holcomb 2021a). The shortcomings of both phases are best exemplified by spring 2020 estimates of raven density from various study areas in the Mojave Desert, where the annual survival probability of desert tortoises decreased as raven density increased (Holcomb 2021b). Healthy tortoise populations consist of a variety of tortoises at different life stages but because they are not expected near raven nests, Holcomb (2021b) hypothesized that an excess of juvenile tortoise mortality has overloaded natural limits, thus halting recruitment. Consequently, much of the western Mojave Desert may currently be incapable of supporting recovery.

In 2016, Fort Irwin NTC submitted applications to the USFWS for lethal control of ravens (Fort Irwin 2016), citing that non-lethal measures alone have not been effective in reducing ecological, economic, and health and safety impacts from increased raven populations. Fort Irwin NTC applied for and received a depredation permit for the lethal take of up to 150 individual ravens and 100 raven nests.

In its Biological Opinion (BO) for Land Acquisition and Airspace Establishment at the Combat Center, the USFWS confirmed that the USMC should seek a raven depredation permit to perform direct removals of ravens within the recipient sites for desert tortoise translocation (USFWS 2017a). In April 2018, MAGTFTC decided to pursue lethal management of ravens and submitted a depredation permit application to the USFWS, Migratory Bird Program for lethal take of up to 600 ravens at the Combat Center. Upon further discussion with the USFWS, MAGTFTC decided to initiate the NEPA process for raven management throughout the Combat Center. The scope of this effort was subsequently expanded to include other DoD installations in the California desert that have a need to add lethal management methods, while also bolstering non-lethal subsidy control and denial methods to form an integrated raven management plan for these DoD installations. Doing so ensures that DoD installations do not act as raven population reservoirs, which facilitate recolonization of previously treated areas. More importantly, this approach ensures equal subsidies control effort across the California desert, thus removing the impetus of the current raven issue.

In October 2018, MAGTFTC and cooperating agencies initiated the NEPA process for this PEA. During the development of the Draft PEA, MAGTFTC decided to obtain additional data to better support the NEPA analysis and determine raven management thresholds. From 2019 to 2021, MAGTFTC worked with the USFWS to obtain data supported by USFWS's raven population analyses to improve this Draft PEA and satisfy the following relevant data requirements set forth in the ESA and NEPA:

- ESA requires federal agencies to use *"[t]he best scientific and commercial data available."* See generally 50 CFR Part 402, Subpart B – Consultation Procedures. This standard does not mean best data scientifically possible. Where uncertainty exists, the benefit of the doubt goes to the species protected under the ESA. In this case, there is no uncertainty; the facts are clear. The desert tortoise population is in continued decline with a potential for up-listing to endangered status while the raven population continues to increase.
- NEPA requires federal agencies to ensure scientific accuracy and integrity of discussions and analyses based on supporting data. See 40 CFR 1502.8 and 1502.24. NEPA does not require scientific certainty before federal agencies can propose action to resolve issues. Uncertainty in a NEPA effects analysis, however, may require additional data collection or mitigation or monitoring to resolve the uncertainty or bridge the gap.

In spring of 2021, MAGTFTC and cooperating agencies resumed the preparation of the Draft PEA. As previously explained in Section 1.3.3, there is sufficient data available to support proposed integrated, adaptive raven management at the identified DoD installations.

1.4 PURPOSE OF AND NEED FOR THE PROPOSED ACTION

The purpose of the Proposed Action is to better manage raven populations at lands owned or used by the DoD in the California desert (see Figure 1-1). Primarily non-lethal raven management actions are currently applied piecemeal at DoD locations in the California desert. In contrast, the Proposed Action would allow for integrated and adaptive raven management using a combination of non-lethal and lethal measures to reduce raven populations and activities at lands owned or used by the DoD in the California desert. As discussed in Section 1.3.3, the Proposed Action is needed to mitigate the ecological, economic, and health and safety impacts of subsidy-elevated and increasing raven populations in the California desert, all of which hinder military readiness on DoD installations in the region (Fort Irwin 2016; Combat Center 2018c). The focus on DoD lands is also important because of its contribution to the current raven situation on the landscape. DoD installations often provide considerable subsidies for many communities (e.g., budgets, infrastructure, personnel, metabolic rates, or energy consumption).

Integrated raven management at the local level (DoD installations) can help reduce raven populations to more sustainable levels at the regional level and enhance current efforts, such as the USFWS's efforts to reduce raven predation on the desert tortoise (USFWS 2008).

1.5 SCOPE OF ENVIRONMENTAL ANALYSIS

This PEA provides an analysis of the No-Action Alternative and Proposed Action at a broad level. To the extent site-specific data is available and relevant to the analysis, it is included in Chapter 3. The identified DoD installations and other cooperating agencies can use this PEA to focus any future analyses needed to satisfy NEPA (e.g., supplemental/tiered EA or Categorical Exclusion). CEQ guidance addresses this topic in detail in *Effective Use of Programmatic NEPA Reviews* (CEQ 2014). For more information on future NEPA requirements, see Sections 1.10 and 5.5.

Based on a preliminary review of the potential effects of the No-Action Alternative and Proposed Action, MAGTFTC and cooperating agencies determined that the scope of the PEA analysis would be limited to two resources: *Biological Resources* and *Health and Safety*. After discussions with the San Manuel Band of Mission Indians, a third resource was added: *Cultural Resources*. This analysis is presented in Sections 3.1, 3.2, and 3.3, respectively. Other resources considered but not analyzed in detail are briefly discussed in Section 3.4.

The PEA analyses covers both non-lethal and lethal raven management actions, with the main difference between the No-Action Alternative and Proposed Action being a transition toward utilization of more lethal forms of raven management to achieve the Purpose and Need. From a NEPA perspective, lethal management actions may hold more potential for significant impacts on the human environment than the non-lethal management actions.

1.6 RELEVANT MANAGEMENT AND REGULATORY DIRECTION

In addressing environmental consequences, the lead and cooperating agencies are guided by statutes, regulations, Executive Orders (EOs), and agency-specific policies that establish standards and provide a framework for environmental and natural resource management and planning. The lead and cooperating agencies prepared this PEA in accordance with the relevant regulatory and management direction listed below.

1.6.1 Statutes

- NEPA of 1969 (Public Law 91-190, 42 USC §§ 4321-4370h);

- Sikes Act Improvement Act of 1997 (16 USC § 670 *et seq*.); and
- Resource-specific statues listed and discussed in Sections 3.1 to 3.4.

1.6.2 Regulations

- CEQ regulations implementing the procedural provisions of NEPA (40 CFR Parts 1500-1508) (version effective July 18, 2005);
- DoN regulations for implementing NEPA (32 CFR Part 775);
- U.S. Air Force's Environmental Impact Analysis Process (32 CFR Part 989);
- U.S. Army's regulation implementing NEPA (32 CFR Part 651);
- USDA APHIS NEPA regulations (7 CFR Part 372); and
- USFWS NEPA regulations (43 CFR Part 46).

1.6.3 Executive Orders

- Resource-specific EOs listed and discussed in Sections 3.1 to 3.4.

1.6.4 Policies

- DoD Instruction Number (DoDI) 4715.9, Environmental Planning and Analysis (May 3, 1996);
- DoDI 6055.01, DoD Safety and Occupational Health Program, Change 3 (April 21, 2021);
- DoDI 4710.02, DoD Interactions with Federally Recognized Tribes (September 14, 2006);
- DoD American Indian and Alaska Native Policy (January 2012);
- MCO 5090.2, Volume 12, Environmental Compliance and Protection Program (2018); and
- USFWS NEPA Reference Handbook (USFWS 2018).

1.6.5 Integrated Natural Resource Management Plans (INRMPs)

- Combat Center: Fiscal Year (FY) 2018-2022;
- MCLB Barstow: FY 2017-2021;
- Edwards AFB: FY 2019-2024;
- Fort Irwin NTC: FY 2020-2025;
- NAWSCL: FY 2020-2025; and
- CMAGR (administered by MCAS Yuma): FY 2017-2022.

1.7 TRIBAL COORDINATION

Federally recognized Tribal Governments that ascribe significance to the raven or desert tortoise may be specifically affected by the No-Action Alternative and/or Proposed Action. In advance of public involvement (see Section 1.9), MAGTFTC and cooperating agencies contacted 35 potentially interested and/or affected Tribal Governments (listed in Chapter 6) in the vicinity of the identified DoD installations to determine whether the No-Action Alternative and/or Proposed Action may affect any tribal lands, rights, sites, or practices. At the time of this Draft PEA, three Tribal Governments have expressed interest in the PEA: San Fernando Band of Mission Indians, Fernandeno Tataviam Band of Mission Indians, and San Manuel Band of Mission Indians. Discussion with the San Manuel Band of Mission Indians resulted in *Cultural Resources* being included for detailed analysis in this PEA (J. Mauck and L. Clauss, San Manuel Band of Mission Indians, personal communication, October 5, 2021). Results of any additional input and/or coordination with federally recognized Tribal Governments will be summarized in the Final PEA.

1.8 PERMITS AND AUTHORIZATIONS

Depending on the raven management actions selected by each DoD installation, the following permits and authorizations may be required under the No-Action Alternative and/or Proposed Action:

- ESA Section 7. Concurrent with this Draft PEA, MAGTFTC initiated informal consultation for potential beneficial effects to desert tortoises from the anticipated reduction in the raven population under the Proposed Action and for MAGTFTC-specific discretionary mitigation. Results of consultation will be explained in the Final PEA. This consultation covers MAGTFTC and the cooperating agencies.
- MBTA. Each DoD installation would be responsible for ensuring compliance with the MBTA for lethal raven management. A permit is required for depredation of ravens (intentional take) (50 CFR § 21.41[a]). The USFWS, Migratory Bird Program requires the information listed below to be provided as part of the application process (50 CFR § 21.41(b)(1)-(4)):
    1. A description of the area where depredations are occurring.
    2. The nature of the crops or other interests being injured.
    3. The extent of such injury.
    4. The particular species of migratory birds committing the injury.
- National Historic Preservation Act (NHPA) Section 106. Once the PEA is completed, each DoD installation would determine the best raven management actions to implement for their installation. For actions that are considered undertakings with the potential to adversely affect historic properties (36 CFR 800.3(a)(1)), as identified in Section 3.3.3, each DoD installation, on a case-by-case basis, would: (1) conduct individual Section 106 consultation with the California State Historic Preservation Officer (SHPO) and federally recognized Tribal Governments; (2) comply with any existing program alternative the installation may have negotiated with the California SHPO for the undertaking; or (3) comply with any existing installation-specific Programmatic Agreement. The California Office of Historic Preservation has concurred with this approach for this PEA (J. Tozer, California Office of Historic Preservation, personal communication, October 15, 2021).

Given the potential impacts and resource protection measures incorporated into the No-Action Alternative and Proposed Action, no other permitting or consultation is required for this PEA.

1.9 PUBLIC INVOLVEMENT

The CEQ regulations (40 CFR 1506.6) direct agencies to provide public notice of the availability of NEPA documents and solicit public input. There is a 30-day public comment period on the Draft PEA and MAGTFTC-specific Proposed (unsigned) Finding of No Significant Impact (FONSI) that runs from November 18, 2021, to December 18, 2021. The start date for the public comment period will be based on the publication date of the Notice of Availability (NOA) (Appendix A) in the following newspapers:

- San Bernardino Sun
- Imperial Valley Press
- Inyo Register
- Kern Valley Sun

Hardcopies of the NOA, Draft PEA, and MAGTFTC-specific Proposed (unsigned) FONSI will be made available at the following county libraries:

- Imperial County: Calipatria Branch

- Kern County: Ridgecrest Branch and Rosamond Branch
- Los Angeles County: Lancaster Library
- San Bernardino County: Barstow Branch, Trona Branch, Twentynine Palms Branch, Joshua Tree Branch, and Yucca Valley Branch
- Riverside County: Mecca Branch

Electronic copies of the NOA, Draft PEA, and MAGTFTC-specific Proposed (unsigned) FONSI will be:

- Posted on the Combat Center's website at: https://www.29palms.marines.mil/Staff-offices/Environmental-Affairs/ (under "Environmental Assessments");
- Submitted to the State Clearinghouse for state notification; and
- Emailed to potentially interested or affected entities, to include federal, tribal, state, and non-profit entities.

Comments may be submitted by the following methods:

- Email. Jesse.w.martinez1@navy.mil
- Mail. Written comments may be sent to:
  Attention Jesse Martinez
  C/O Cardno Government Services
  3888 State Street, Suite 201
  Santa Barbara, CA 93105
- Hand Delivery. Due to COVID-19, hand delivered comments will not be accepted.

The public involvement process will conclude at the end of the 30-day comment period.

1.10 DECISIONS TO BE MADE

Based upon the information contained in this PEA, the responsible official from each lead and cooperating agency would make one or more of the following NEPA-related decisions:

- Whether to implement the No-Action Alternative or Proposed Action (whole or in part);
- Whether to adopt additional discretionary monitoring and/or discretionary mitigation;
- Whether the analysis presented in this PEA supports a FONSI or requires further analysis in an Environmental Impact Statement (EIS); and/or
- Whether to adopt the PEA in support of the agency decision.

Each agency would prepare separate decisions in accordance NEPA regulations and agency-specific NEPA regulations and policies (see Section 1.6).

MAGTFTC's decision is planned for mid-February 2022. If MAGTFTC determines a FONSI is appropriate, the Final PEA and signed MAGTFTC-specific FONSI will be made available to the public at the same public libraries and online on the Combat Center's website listed in Section 1.9. A NOA will be published in the following newspapers: San Bernardino Sun, Imperial Valley Press, Inyo Register, and Kern Valley Sun.

Cooperating agencies would issue separate decisions following completion of their NEPA adoption process (40 CFR §1506.3) and focused on their specific decisions to be made. These future decisions would be made available at the relevant county library, listed above, and/or on agency websites. Additional discussion of future NEPA requirements is provided in Section 5.5.

CHAPTER 2
PROPOSED ACTION AND ALTERNATIVES

This chapter describes current and proposed raven management at DoD installations in the California desert. Section 2.1 describes the types of current and proposed raven management actions at DoD installations. Section 2.2 describes the No-Action Alternative. Section 2.3 describes the Proposed Action. Section 2.4 describes the resource protection measures incorporated into the No-Action Alternative and Proposed Action, USFWS-recommended discretionary monitoring, and MAGTFTC-specific discretionary mitigation. Section 2.5 provides a summary of alternatives considered but eliminated from further analysis.

In summary, the No-Action Alternative represents current *ad hoc* raven management conducted at each installation whereas the Proposed Action would represent a shift towards integrated, adaptive raven management. While the Proposed Action would still involve individual DoD installation efforts, the installations would be focused on achieving a collective raven population reduction goal to achieve the Purpose and Need. The No-Action Alternative would not achieve the Purpose and Need but represents the management scenario that would continue if no management changes are made.

2.1 DESCRIPTION OF THE RAVEN MANAGEMENT ACTIONS

Raven management actions that have been or are currently being conducted at DoD installations in the California desert and that would potentially be conducted under the Proposed Action are presented in Table 2-1. Table 2-1 also discusses advantages and disadvantages of each management action, and its effectiveness, feasibility, and need for an MBTA depredation permit. More detailed descriptions of the non-lethal and lethal management actions are provided in Sections 2.1.1 and 2.1.2, respectively.

Table 2-1 Advantages and Disadvantages of Potential Raven Management Actions

Raven Management Action*	***Advantages***	***Disadvantages***	***MBTA Permit Required?***
Non-Lethal Management Actions			
Reduction of Food and Water Subsidy: Reducing the availability of human food sources (e.g., roadkill removal, cover garbage cans, wildlife proof dumpsters, baling garbage, cover refuse at landfills, repairing leaking sources of water).	**Effectiveness:** - Ravens experience depressed vital rates or relocate to find food or water off installation. - Raven overpopulation would eventually decline some in areas of reduced human subsidy. **Feasibility and Cost Effectiveness:** - Staff on military installations already conduct environmental education and training on regulatory compliance (e.g., orders for waste management). - All appropriate staff could participate in removing roadkill or other food and water subsidies. - Prevention is a very humane, biologically sound, and inexpensive long-term solution for maintaining the desired population density.	**Effectiveness:** - Subsidies are common on DoD installations despite INRMPs and other existing orders, including waste management, that direct compliance. - Efforts within military installations may not be mirrored by adjacent cities and towns that are part of the subsidy issue. - Does not immediately decrease the raven overpopulation, nor remove damaging individuals. - Decreased food subsidy might temporarily increase raven predation on tortoises and other wildlife if the method is not coupled with methods to immediately decrease overpopulation of ravens (Table 1-3; food subsidies can be energy dense compared to that of tortoise eggs and juveniles).	No
Education and Outreach Regarding Ravens: Proactive efforts to educate public and military population about adverse effect of their actions on the environment, using the desert tortoise as a tangible example.	**Effectiveness:** - A more educated public may make subsidy reduction more effective for longer and across a broader area, causing raven population reductions or dispersal over time to find food. **Feasibility and Cost Effectiveness:** - Environmental staff already conduct environmental education (e.g., newcomer's briefings, exercise briefs, field cards for units and Earth Day) on military installations. - Prevention is a very humane, biologically sound, and inexpensive long-term solution for maintaining the desired population density. - Low cost for materials.	**Effectiveness:** - Portions of public may not change behavior substantially or consistently. - Often, preventative environment protections are atypical, unsustained, or reactionary responses to direct experiences of environmental damage. - Efforts on installations may be offset easily by incongruous efforts in adjacent cities and towns. - It neither immediately decreases the raven overpopulation, nor removes damaging ravens.	No

Table 2-1 Advantages and Disadvantages of Potential Raven Management Actions

*Raven Management Action**	*Advantages*	*Disadvantages*	*MBTA Permit Required?*
Removal of Perching, Roosting, and Nesting Sites: Removal of unnecessary man-made structures (e.g., fence posts and telephone poles) or modification of existing structures to discourage raven nesting or use in areas of concern (e.g., desert tortoise habitat).	**Effectiveness:** - Ravens would lack infrastructure in areas of concern. **Feasibility and Cost Effectiveness:** - Low-to-moderate cost for materials. - Existing environmental and/or Public Works Department staff could implement using available resources (e.g., vehicles). - Reduction of footprint of built environment typically in line with military requirements (e.g., building demolition goals, transfer to newer technology [mobile phone technology]).	**Effectiveness:** - Efforts on installations may be offset easily by incongruous efforts in adjacent cities and towns. - It neither immediately decreases the raven overpopulation, nor removes damaging individuals. **Feasibility and Cost Effectiveness:** - Public Works Departments on installations may have a different focus and funding priority than do Environmental Divisions (e.g., cleaning raven excreta). - Contractors may be required to implement if in-house staff do not have the experience, equipment, or time to implement.	No
Hazing and Other Active Deterrents: Auditory and visual stimuli to cause avoidance response (e.g., propane cannons, wailers, lasers, pyrotechnics, flashing lights, falconry, drones).	**Effectiveness:** - Ravens may leave the area temporarily. **Feasibility and Cost Effectiveness:** - Low-to-moderate cost for materials for some options. - Existing environmental or conservation law enforcement staff could implement using available resources (e.g., vehicles and devices).	**Effectiveness:** - Ravens return to area after hazing. - Ravens readily habituate to deterrents. - It neither immediately decreases the raven population, nor removes damaging individuals. - Increases difficulty and intensity of subsequent removal or deterrence of experienced or habituated ravens. **Feasibility and Cost Effectiveness:** - Moderately labor intense (i.e., costly). - Materials may be expensive for some options. - Some methods unsafe (e.g., cannons, lasers) or annoy nearby humans (e.g., wailers). - Contractors may be required to implement if in-house staff lack experience, equipment, or time to implement. - Drone use on military installations may be restricted. - Prohibitions and exceptions set forth under the Airborne Hunting Act (1971) may apply to use of drones to harass ravens (see 16 USC 742j-1 (a) and (b)).	No

Table 2-1 Advantages and Disadvantages of Potential Raven Management Actions

Raven Management Action*	***Advantages***	***Disadvantages***	***MBTA Permit Required?***
Exclusion: Devices installed on structures (e.g., spikes, wires, netting) to discourage raven nesting, perching, loafing, or congregation.	**Effectiveness:** - May discourage nesting and congregation in areas of concerns (e.g., high traffic stores on installations). **Feasibility and Cost Effectiveness:** - Low-to-moderate cost for materials. - Less labor intensive and less annoying than many other deterrents. - Existing Public Works Department staff could implement. - Original construction designs (e.g., power pole beams, or underground utilities) offer long-term solutions to subsequent raven use and defecation (health and maintenance costs).	**Effectiveness:** - Ravens can still nest and congregate around devices. - It neither immediately decreases the raven overpopulation, nor removes damaging individuals. **Feasibility and Cost Effectiveness:** - Some designs are expensive. - Contractors may be required to implement if in-house staff lack experience, equipment, or time to implement.	No
Effigies: Partial representation or likeness of an object (e.g., dead raven) as a raven deterrent.	**Effectiveness:** - Ravens may avoid the area. **Feasibility and Cost Effectiveness:** - Low costs for materials. - Existing environmental or conservation law enforcement staff could implement.	**Effectiveness:** - It neither immediately decreases the raven overpopulation, nor removes damaging individuals. - Many ravens may ignore effigies. - This method is more effective if used in conjunction with raven distress sounds or lethal controls. **Feasibility and Cost Effectiveness:** - Specialists may be required to implement if in-house staff lack experience, equipment, or time to implement.	Yes (only if lethal take of raven required for effigy)

Table 2-1 Advantages and Disadvantages of Potential Raven Management Actions

Raven Management Action*	***Advantages***	***Disadvantages***	***MBTA Permit Required?***
Trapping for Relocation and/or Scientific Study: Physically trapping ravens. Setting up the trap may require some limited ground disturbance for placement and securing the trap to the ground with stakes or reinforcement bars.	**Effectiveness:** - Some ravens might be removed from the landscape. **Feasibility and Cost Effectiveness:** - Low-to-moderate cost for materials.	**Effectiveness:** - Ravens released into other areas would remain on the landscape and potentially cause similar damage in another location. - Ravens may return to area where trapped. - Ravens may learn to avoid traps. - Likely to relocate the problem threatening wildlife (e.g., desert tortoises), human health and infrastructure damage elsewhere. - Can increase disease transmission. - Difficult to obtain relocation permits from CDFW and USFWS. - Stresses relocated birds without providing substantial benefit. - Difficult to find acceptable relocation sites. **Feasibility and Cost Effectiveness:** - Labor intensive – placement and checking of traps routinely and across landscape, and transporting birds more than 100 miles away. - Specialist contractors may be required to implement if in-house staff lack experience, equipment, or time to implement. - May require additional CDFW permits or Memorandums of Understanding for relocation off of DoD property.	Yes
Removal of Inactive Nests: Remove nests before eggs are laid.	**Effectiveness:** - Raven nesting attempt is disrupted, hindering raven population increase. - May discourage future nesting attempts at that location. - May reduce transformer and powerline outages. **Feasibility and Cost Effectiveness:** - Removing inactive nests already authorized and occurs in built environment on DoD installations. - Existing environmental and public works staff could implement using available resources. - Raven nests on infrastructure are often detected easily.	**Effectiveness:** - It neither immediately decreases the raven overpopulation, nor removes damaging individuals. - Ravens may re-nest successfully. **Feasibility and Cost Effectiveness:** - Requires knowledge of nest locations. - Nest removal outside the built environment not standard, potentially arduous. - Labor intensive – one nest at a time. - Specialist contractors may be required to implement if in-house staff lack experience, equipment, or time to implement.	No

Table 2-1 Advantages and Disadvantages of Potential Raven Management Actions

Raven Management Action*	***Advantages***	***Disadvantages***	***MBTA Permit Required?***
Conditioned Taste Aversion: Conditions avoidance behavior in ravens by luring them to models (e.g., juvenile tortoise models) that release mildly irritating grape odors, stimulating adverse reactions.	**Effectiveness:** - Ravens may learn to avoid certain foods or areas of concern (e.g., desert tortoise areas). **Feasibility and Cost Effectiveness:** - Low costs for materials. - Existing environmental staff could implement.	**Effectiveness:** - It neither immediately decreases the raven overpopulation, nor removes damaging individuals. - Retraining ravens to avoid food sources or areas may be a long-term effort. - Specific to individual ravens. USFWS found that a single raven would need to encounter bait multiple times before they start to avoid real tortoises. **Feasibility and Cost Effectiveness:** - Labor intensive – long-term sustained effort required. - Specialist contractors may be required to implement if in-house staff lack experience, equipment, or time to implement.	Yes
Lethal Management Actions			
Egg Oiling: Coating eggs with cooking grade oil that prevents embryos from developing.	**Effectiveness:** - Ravens continue attending eggs and may miss a year of successful reproduction. - Raven population would not increase (if an adequate percentage of nests were treated). **Feasibility and Cost Effectiveness:** - Low costs for materials. - Existing environmental staff might implement. - Many raven nest locations are known. - Future electronic surveillance may reduce costs.	**Effectiveness:** - It neither immediately decreases the raven overpopulation, nor removes damaging individuals. **Feasibility and Cost Effectiveness:** - Goal would be to oil greater than 90% of eggs. - Labor intensive – eggs treated in nest, which are often remote, on treacherous cliffs or on transmission lines, requiring use of drone or extendable pole. - Costly – $100 to $500 per egg oiled: personnel training, intensive annual nest surveys, egg oiling, and personnel time. Costs could be reduced if remote electronic surveillance methods developed. - Specialist contractors may be required to implement if in-house staff lack experience, equipment, or time to implement. - Requires knowledge of nest locations.	Yes
Shooting: Removal of ravens using firearms.	**Effectiveness:** - Ravens are removed immediately. - Can target damaging individuals. - Extremely target-specific. - More effective when ravens aggregate. - Occasional shooting increases efficacy of hazing operations. - Use of suppressed firearms by experienced professionals is very effective.	**Effectiveness:** - Ravens, often taken one at a time. - Ravens often disperse after first shot (less likely when using suppressed firearms). - Ravens learn appearance of shooter and vehicle. - Ravens may return after shooter departs. **Feasibility and Cost Effectiveness:** - Labor intensive – one bird shot at a time. - Requires trained professionals. - Typically not viable in urban areas of military installations.	Yes

Table 2-1 Advantages and Disadvantages of Potential Raven Management Actions

*Raven Management Action**	*Advantages*	*Disadvantages*	*MBTA Permit Required?*
Trapping for Euthanasia: Physically trapping ravens. Setting up the trap may require some limited ground disturbance for placement and securing the trap to the ground with stakes or reinforcement bars.	**Effectiveness.** - Ravens are removed from population immediately. **Feasibility and Cost Effectiveness:** - Low-to-moderate cost for materials. - Non-target captures can be released. - Inexperienced personnel, supervised by an expert, can check traps.	**Effectiveness:** - Ravens can quickly learn to avoid traps. - Ravens might not respond well to large communal traps. - Requires expertise to be effective. **Feasibility and Cost Effectiveness:** - Labor intensive – placement and checking of traps on a routine basis. - Specialist contractors may be required to implement if in-house staff lack experience, equipment, or time to implement. - Small potential for non-target take.	Yes
Egg/Nest Destruction: Remove and dispose of nests with eggs.	**Effectiveness:** - Raven population would not increase (if a sufficient percentage of nests are destroyed). - Nest removal may decrease future raven nesting there. **Feasibility and Cost Effectiveness:** - Existing environmental staff could implement using available resources (e.g., vehicles). - Many raven nest locations are known.	**Effectiveness:** - It neither immediately decreases the raven population, nor removes damaging individuals. - Ravens will re-nest if nest removed early in the nesting season. **Feasibility and Cost Effectiveness:** - Labor intensive – one nest at a time, finding nest. - Specialist contractors may be required to implement if in-house staff lack experience, equipment, or time to implement. - Requires knowledge of nest locations.	Yes
Poisoning: A lethal dose of pesticide powder (i.e., DRC-1339 [3-chloro-4-methylanine hydrochloride]) would be mixed into bait cubes, hardboiled eggs, dog food, or other baits, which would be secured to platforms or existing structures used by ravens.	**Effectiveness:** - Ravens are removed from population. - Specific damaging individuals can be targeted in some locations. **Feasibility and Cost Effectiveness:** - Low cost for materials. - Lower cost than many other methods, especially when attempting to remove higher numbers of ravens from an area. - USDA APHIS assistance may be cheaper than contractor solution.	**Feasibility and Cost Effectiveness:** - Moderately labor intensive – pre-baiting, creating treated bait for application, and area-specific application. - Area must be monitored and surveyed prior to deployment to ensure non-target species are avoided and minimized. - Only USDA APHIS personnel can deploy DRC-1339.	Yes

Note: *Green indicates that the management action is an integral tool for use in Common Raven control because of the immediate effectiveness or its long-term value. Yellow indicates that the management action may have value on a local, case-by-case basis, and in conjunction with other actions, but is not necessarily integral to the management of ravens on DoD installations as a standalone action.

Sources: Combat Center 2021; Holcomb 2021c; Raven Core Team 2021a; USDA APHIS 2021; USMC 2021.

2.1.1 Non-lethal Management Actions

2.1.1.1 Reduction of Food and Water Subsidy

The DoD implements trash and litter control programs on installations in the California desert and prescribes trash and litter best management practices for all projects aboard DoD lands (Desert Tortoise Council 2017). Additionally, illegal dumping of trash that occurs on DoD installations is controlled to the extent practicable to reduce the attractiveness of these areas to ravens (USFWS 2008). To deter ravens from foraging at trash and landfill sites on DoD installations, management actions include daily cover of trash layers at the end of each day. Another management action includes baling up garbage to reduce the availability of human-related food sources for ravens. Baling is the process where solid waste is compacted and baled, typically held together with steel strapping or wrapped in plastic before being placed in a landfill.

Water is a limited resource for wildlife in the desert. Ravens may be subsidized by numerous anthropogenic sources of water, which can influence the size and quality of habitats for desert bird species (Harrington 2002; Boarman 2003). Ravens commonly drink from unrestricted artificial water sources such as stock tanks (Harrington 2002), golf course and sewage ponds (Boarman 2003), wildlife water catchments, domestic and commercial over-irrigation (O'Brien et al. 2006), groundwater recharge ponds, and transport canals. The raven has even been documented turning on and drinking from water faucets in campgrounds in the Mojave Desert (Hanks et al. 2009). DoD installations would manage actions to reduce or eliminate the availability of non-natural water sources that supplement raven populations on lands owned or used by the DoD in the California desert (puddles, leaky water lines/structures, etc.).

DoD installations in the California desert currently implement water conservation strategies and programs to reduce the use of potable water to the extent possible, largely due to ongoing drought concerns. For instance, the Combat Center has a Water Conservation Task Force that manages efforts to ensure the conservation and preservation of water resources by evaluating current and projected water use; assessing infrastructure, operations, and management practices; implementing relevant conservation technologies and methods; and educating all members aboard the Combat Center (Combat Center 2018e). Continued water conservation management by DoD installations in the California desert should reduce the availability of subsidized water sources to wildlife, including ravens.

2.1.1.2 Education and Outreach Regarding Ravens

The DoD provides educational outreach and briefings for military personnel and contractors that work on installations in the California desert. As part of this outreach, personnel are informed of the importance of not feeding ravens and cleaning up all trash and litter from sites to prevent attracting ravens (Desert Tortoise Council 2017; Combat Center 2018d). Fort Irwin Natural Resources personnel present approximately 40 – 60 hours of verbal and visual raven educational media annually to resident and transient military personnel and their families, civilian employees, and contractors. Additionally, numerous newspaper and radio spots specific to raven subsidy awareness are distributed each year in the Mojave Desert region (Fort Irwin 2016). Edwards AFB also provides specific education on reducing subsidies including dumpster signs and partnering with The Living Desert Zoo and Gardens to provide educational pamphlets and promotional items during outreach events. The DoD would continue to provide educational outreach to reduce potential sources of raven subsidies.

2.1.1.3 Removal of Perching, Roosting, and Nesting Sites

DoD installations in the California desert have removed or modified human-made structures that provide roosting, perching, and nesting sites for ravens. Aboveground transmission lines and utility poles in certain

areas heavily impacted by ravens have been removed and replaced with underground utilities (Combat Center 2010). Efforts are also being made to design new structures to discourage potential raven nesting and perching (Desert Tortoise Council 2017) by avoiding all flat surfaces (i.e., no surfaces parallel with the ground and to alternatively place all surfaces at a 45-degree angle).

2.1.1.4 Hazing and Other Active Deterrents

Hazing can be used to frighten and modify bird behavior and discourage birds from feeding, roosting, or gathering (USDA APHIS 2020). Various methods for this method are identified below.

Noise

Several deterrents and hazing devices have been used at DoD installations in the California desert, including streamers, air cannons, and wailers. However, the air cannons and wailers were frequently found unplugged or completely missing while monitoring the effectiveness of these deterrents (Combat Center 2018c). Merrell (2012) reported that ravens habituate rapidly to air cannons and wailers, paying little attention to the noise after multiple exposures. It is likely that loud, sharp noises are such a common occurrence at many industrial facilities and military installations that ravens have already habituated to them (Merrell 2012). However, Merrell (2012) found that after ravens are shot, and some killed, with a shotgun or other loud firearm, air cannons and wailers become much more effective. Therefore, the use of noise-producing anti-perching devices becomes more effective when used in conjunction with lethal control methods.

Lasers

When properly used, commercial bird-deterrent lasers are safe for birds and people, and they have utility as a management tool. Lasers have been used successfully to haze birds from civil and military airfields, with a primary drawback of not being effective during bright daylight hours (Briot 1995; Blackwell et al. 2002). Because laser treatment is completely silent and can be directed selectively at individuals or groups of birds, lasers can be useful for dispersing birds in sites where disturbance of other wildlife or humans is a concern (Glahn et al. 2000). In addition, a logistic advantage of laser devices for dispersing birds is that they have a long effective range (over 3,300 feet), allowing for the user to disperse birds from long distances (Glahn et al. 2000).

Merrell (2012) reports that lasers, when used alone, have only short-term success in flushing ravens from perch and roost sites, as the birds quickly realize there is no inherent danger and become accustomed to the laser light or only fly away a short distance. Lasers can be of greater value when used in conjunction with other solutions, such as shooting, which reinforces the association of danger (Merrell 2012). Also, use of laser light to flush birds is most effective when natural light levels are low (Glahn et al. 2000), such as at dusk and dawn, when ravens are using roost sites. Laser usefulness may, therefore, be confined to nighttime roosts and feeding sites at dawn (Bishop et al. 2003).

Lasers have been used experimentally in the Mojave Desert as a means to deter ravens from sensitive tortoise areas (Opar 2016). Use of lasers to deter ravens would be done in accordance with all applicable installation regulations to avoid impacts to aircraft, military training, and personal safety. This would include coordination with an installation's Range Control to ensure safety for humans in the area. Lasers would not be utilized in areas where humans could be affected. Lasers would not be used on ravens in flight, due to the small chance that the beam could affect aircraft or pilots. Likewise, lasers would only be utilized per the standards of the most current scientific research and per the most widely accepted professional standards (e.g., within accepted ranges of wavelengths, power).

Falconry

Trained raptors, generally falcons and hawks, have been used for dispersing birds at airports to prevent bird/aircraft strikes (Erickson et al. 1990), and can successfully deter flocking birds, including corvids (members of the family Corvidae, including ravens) from other sites, such as landfills (Baxter and Allan 2006).

Compared to other commonly used bird-hazing or frightening methods, the use of falconry as an employed technique may not be as practical or effective as many other methods (Erickson et al. 1990). Due to the relative scarcity of trained raptors and handlers, the use of falconry as a dispersal tool is limited to special situations such as airfields, where the incidence of bird strikes is potentially high, or where pest birds are posing an imminent threat to ecological resources or health and safety (Erickson et al. 1990; Allan 2000).

The use of falconry would be a management option on lands owned or used by the DoD in the California desert to disperse roosting/flocking ravens. A pilot program to use falconry to haze ravens was conducted for several days in November/December 2020 at the Combat Center. The pilot program was successful and kept the patrol area raven free while falcons were present. There is potential to drive ravens completely out of an area, given the opportunity to determine the correct frequency (e.g., use falconry for 2 weeks, 5 days a week followed by a maintenance program of 3 days a week until ravens leave and do not immediately return).

Drones

Drones, or unmanned aerial vehicles (UAVs), can be used to haze and/or harass flocks of certain bird species to deter them from sites such as airports, work sites, and sensitive environmental or contaminated areas (McDermott 2018; Paranjape et al. 2018). UAVs used to deter birds can not only mimic the visual and physical presence of a flying predator but can also employ auditory deterrents such as predator cries and distress calls (Bird-X 2018). Automated UAV technology incorporating geographic positioning system-guided, programmed flight paths is being studied as an effective bird-hazing option (Goel et al. 2017).

Use of UAVs for raven control can be expensive and would require waivers and/or clearance from the individual installations, specific to current airspace use and regulations at each installation. In addition, each installation would be responsible for ensuring that UAV operators are properly trained and possess any applicable permits or licenses.

2.1.1.5 Exclusion

Anti-perching devices that physically block ravens and other birds from perching, such as bird spikes and wire rope have been used to varying degrees at DoD installations. These devices, when placed on structures where birds prefer to gather, prevent birds from accessing perching and roosting sites. However, such barriers have been applied on only a small scale because of the tremendous cost and huge scale of deployment necessary for this approach and the wide distribution, adaptability, and mobility of ravens (Combat Center 2018c).

Infrastructure design for new construction on DoD lands (e.g., buildings, fences, power poles) should incorporate proactive measures to deter raven roosting, perching, and nesting. Incorporating such design features in new construction can be cost-effective and prevent considerable post-construction management.

2.1.1.6 Effigies

Effigies are carcasses, taxidermic preparations, or artificial models placed in unnatural positions to resemble dead wildlife and are used to scare wildlife and deter their use of specific areas. Effigies can be effective raven deterrents if used properly. The best effigy for dispersing ravens is a fresh raven carcass (Peebles and Spencer 2020). Ravens are curious birds, and artificial effigies are typically pecked at and rendered useless. Use of effigies has been shown to reduce average raven abundance and incidence at treatment sites, but the effects are typically temporally and geographically limited (effigies become less effective over time and ravens continue to occur in the vicinity of them) (Peterson and Colwell 2014). Effigies are typically most effective when used with other measures that reinforce the association of danger (Merrell 2012).

2.1.1.7 Trapping for Relocation and/or Scientific Study

Ravens can be captured using several techniques, including rocket nets, drop-in traps, padded leghold traps, Havahart® traps, handheld net guns, noose-poles, and trap door box traps, among others (Engel and Young 1989). Trapping ravens can be difficult and is not always effective (Engel and Young 1989; Camp et al. 2013) because ravens tend to be wary of changes in their environment and are able to habituate rapidly to such changes (Engel and Young 1989; Merrell 2012). However, trapping can be an effective and useful tool when applied systematically and/or in combination with other management methods (Stiehl 1978; Young and Engel 1988; Restani et al. 1996).

Raven trapping would not be used as a broad-scale management technique as it is impractical as a tool for population management (USDA APHIS 2020). A recent trapping and relocation study has shown that the probability that relocated ravens will return to a site largely depends on release distance and on the time after release (Marchand et al. 2018). The study found that ravens released within 150 kilometers (km) of trapping locations have a high probability of returning to the site; more than 85% of 268 ravens relocated within 150 km returned to the capture site. Releasing ravens at distances greater than 150 km from trapping sites significantly reduces the return probability (Marchand et al. 2018), but does not eliminate the potential for return.

Trapping ravens for scientific study would be done for purposes of analyzing raven resource use, movement, and life history patterns on DoD installations to better manage raven populations and their resources. For instance, in 2020, the Combat Center began a study to live-trap, mark, and monitor ravens so MAGTFTC Environmental Affairs could quantify and describe raven use of Combat Center resources, including ground and air space, infrastructure, and sources of food, water and other subsidies (e.g., nesting and roost sites) (Combat Center 2020).

2.1.1.8 Removal of Inactive Nests

Removal of inactive raven nests, prior to eggs being laid, disrupts nesting attempts. In addition, removal of nests may discourage future nesting attempts at that location. A USFWS depredation permit is not required for destruction of inactive bird nests (ones without eggs or chicks present) (USFWS 2014a). In addition, the removal of inactive nests is already authorized and is often implemented by environmental and public works staff on DoD installations. Inactive nest removal by DoD staff is more commonplace in the built environment (on infrastructure) than in natural nesting locations, as natural nesting locations can be more difficult to locate or access. However, removal of inactive nests can be a quick and local method of raven control, particularly in the built environment.

2.1.1.9 Conditioned Taste Aversion

Aversive conditioning is a non-lethal method of using negative conditioning to modify undesirable behaviors of wildlife. Aversive conditioning can reduce unwanted predation among various types of wildlife (Shivik and Martin 2000; Maguire et al. 2010). Studies have shown that egg predation by ravens can be alleviated through conditioned taste aversion using eggs treated with illness-inducing or harsh-tasting compounds (Avery et al. 1995). Hypothetically, after "teaching" predators to avoid the food item using aversive conditioning, even food items that have not been treated with the aversion agent would be avoided.

Although conditioned taste aversion was considered in the 2008 USFWS EA to reduce raven predation on the desert tortoise (USFWS 2008), it was subsequently dismissed for the following reasons: difficulty locating a suitable mimic for hatchling and juvenile desert tortoises; potential for non-target individuals and other species to be adversely affected; inability to implement the method on a region-wide or desert-wide area; and lack of data to demonstrate its effectiveness and longevity.

If conditioned taste aversion were to be used as a non-lethal method to control raven predation on desert tortoises, suitable mimics for hatchling/juvenile desert tortoises would have to be developed. Successful desert tortoise decoys have recently been produced using 3-dimensional printing technology for the purpose of raven aversion (Saunders 2017). The mimic would be treated with an environmentally safe aversion agent, such as carbachol (carbamylcholine chloride), that would induce illness (vomiting) or other unwanted reaction in ravens with the hopes of conditioning individuals to avoid preying on desert tortoises. Carbachol is widely available, water soluble, colorless, odorless, and tasteless at doses capable of producing conditioned taste aversion (Nicolaus et al. 1989). Brinkman et al. (2018) found that use of carbachol as a taste-aversive agent was effective at reducing raven predation on artificial bird nests. A carbachol safety data sheet is provided in Appendix B.

Another repellent mechanism being explored is the "techno-tort"™ (Hardshell Labs) which is an artificial replica of a juvenile desert tortoise. When pecked by ravens, the replica emits methyl anthranilate, an aromatic chemical derived from grape juice that deters ravens (USDA APHIS 2020). A methyl anthranilate safety data sheet is provided in Appendix B.

2.1.2 Lethal Management Actions

The DoD would implement lethal management of ravens to either remove offending ravens or achieve overall population management goals in the California desert. According to the MBTA, ravens may only be lethally removed or live trapped with a depredation permit issued by the USFWS. The level of lethal management of ravens would vary year-to-year and would be installation-specific, depending on the need for control efforts. However, to prevent potential risks to public health, other animals, and/or the environment, all carcasses of deceased ravens would be handled and disposed of in accordance with the guidelines and methods established by the USDA as outlined in Vantassel and King (2018).

2.1.2.1 Egg Oiling

Egg oiling (addling) is a common method for wildlife managers to manage bird populations (Humane Society of the United States 2009), whereby eggs are made non-viable (commonly done by coating the egg in vegetable or silicon oil) and remain in the nest. By keeping the non-viable eggs in the nest, the parent birds will often continue to care for the eggs instead of producing a new clutch of eggs (Humane Society of the United States 2009). Egg oiling has been found to be more effective in preventing successful nesting than direct removal of eggs or nests because nesting birds continue incubation often beyond the typical

hatch date, thereby reducing the probability of producing a second clutch (Blokpoel and Tessier 1991). Oiling of raven eggs has been shown to be a viable, localized method to reduce raven reproduction, which can reduce predation and increase the reproductive performance of their prey (Brussee and Coates 2018).

2.1.2.2 Shooting

Shooting ravens would supplement other management actions. Baxter and Allan (2008) report that supplementing non-lethal control methods, such as air cannons, with shooting can enhance the efficacy of non-lethal methods by reducing the potential for habituation. Shooting (or euthanizing) ravens is an important management action to reduce raven populations, especially in areas where large roosts form or where ravens are significantly impacting other species, such as desert tortoises (Boarman 1992, 2002, 2014; Boarman et al. 2005; Merrell 2012).

Shooting ravens on lands owned or used by the DoD in the California desert would be closely monitored and tracked for reporting requirements to the USFWS. Shooting ravens would be conducted in a focused, rather than dispersed, method because shooting is not practical or desirable as a method for reducing large numbers of ravens (USDA APHIS 2020). By focusing these efforts within a smaller geographic range, costs can be lowered, allowing more funding for non-lethal control methods.

2.1.2.3 Trapping for Euthanasia

As discussed in Section 2.1.1.7, there are several techniques that can be used to trap ravens. Trapping ravens can be difficult and is not always effective; however, trapping can be an effective and useful tool when applied systematically (Stiehl 1978; Young and Engel 1988; Restani et al. 1996).

Raven trapping for euthanasia would not be used as a broad-scale management technique as it is impractical as a tool for population management (USDA APHIS 2020). Instead, targeted trapping would be part of an integrated pest management program and used in a focused manner. Ravens would be trapped and humanely euthanized by authorized individuals where shooting is unsuccessful or unsafe. In addition, ravens that are inadvertently caught in other predator traps (e.g., coyote traps) would be humanely euthanized instead of being released.

2.1.2.4 Egg/Nest Destruction

Destruction of active raven nests would be accomplished through physical removal, and unhatched eggs would be removed and destroyed. NestEgg addling is a common method for wildlife managers to manage bird populations (Humane Society of the United States 2009), whereby eggs are made non-viable (commonly done by coating the egg in vegetable or silicon oil) and remain in the nest. By keeping the non-viable eggs in the nest, the parent birds will often continue to care for the eggs instead of producing a new clutch of eggs (Humane Society of the United States 2009). Egg addling has been found to be more effective in preventing successful nesting than direct removal of eggs or nests because nesting birds continue incubation often beyond the typical hatch date, thereby reducing the probability of producing a second clutch (Blokpoel and Tessier 1991). Addling of raven eggs has been shown to be a viable, localized method to reduce raven reproduction, which can reduce predation and increase the reproductive performance of their prey (Brussee and Coates 2018). Nest removal can be a viable management tool when conducted at the appropriate time (e.g., close to the end of the breeding season), as ravens are less likely to attempt to re-nest in that season. The USFWS depredation permits issued to individual DoD installations in the California desert would specify the number of active nests/eggs that can be destroyed, and the DoD would abide by all specifications and protocols of the permits.

2.1.2.5 Poisoning

Targeted poisoning of ravens on lands owned or used by the DoD in the California desert would be part of an integrated pest management program and used in a focused manner. Specifically, 3-chloro-4-methylanine hydrochloride (also known as DRC-1339), a pesticide registered by the USDA for use on birds under U.S. Environmental Protection Agency (EPA) labels 56228-29 and 56228-63 (EPA 2019, 2020), would be used to poison and remove ravens. DRC-1339 can be selectively used by injecting the pesticide solution into hardboiled chicken eggs or other potential food items that ravens would consume. Use of DRC-1339 would occur on DoD installations in the California desert only under the guidelines of the most up to date pesticide product label (EPA 2019, 2020; Appendix C), and per the limits of the depredation permits issued to individual DoD installations by the USFWS.

2.2 DESCRIPTION OF THE NO-ACTION ALTERNATIVE

Under the No-Action Alternative, current raven management actions, primarily *ad hoc* and non-lethal, would continue to be conducted piecemeal at the identified DoD installations in the California desert (see Figure 1-1).

Table 2-2 lists the current or previous raven management actions known to have been conducted at the identified DoD installations. Some of these efforts were conducted many years ago (e.g., experimental poisoning in 1989) or represent one-time efforts (e.g., falconry at the Combat Center). Some efforts have not been very effective. For example, reducing food subsidies on the Combat Center is challenging due to lack of human awareness, concern, or consequence (see Photo 7). This situation is worse during exercises when there is a rapid increase in visiting units and associated trash on the Combat Center (see Photo 8). The demand during these times typically exceeds service capacity. Although DoD environmental education aims to resolve these issues, such education only extends to those persons living and working on the installations (e.g., pre-construction briefs). Also, enforcement of environmental requirements within installations is limited by available staff and other higher enforcement priorities.

Table 2-2 Current or Previous Raven Management Actions at DoD Installations in the California Desert

Management Action	*Combat Center*	*MCLB Barstow*	*Edwards AFB*	*Fort Irwin NTC*	*NAWSCL*	*CMAGR*[1]
Non-Lethal Management Actions						
Reduction of Food and Water Subsidy	X	X	X	X	X	X
Education and Outreach Regarding Ravens	X	X	X	X		X
Removal of Perching, Roosting, and Nesting Sites	X	X	X	X	X	X
Hazing and other Active Deterrents	X			X	X	
Exclusion	X	X	X	X	X	X
Effigies						
Trapping for Relocation and/or Scientific Study	X[2]					
Removal of Inactive Nests	X	X	X	X	X	X
Conditioned Taste Aversion						
Lethal Management Actions						
Egg Oiling						
Shooting	X[3]					

Table 2-2 Current or Previous Raven Management Actions at DoD Installations in the California Desert

Management Action	*Combat Center*	*MCLB Barstow*	*Edwards AFB*	*Fort Irwin NTC*	*NAWSCL*	*CMAGR[1]*
Trapping for Euthanasia						
Egg/Nest Destruction				X		
Poisoning	X[4]					

Notes: [1]CMAGR is administered by MCAS Yuma.
[2]Ongoing trap-mark-release and radiotracking project; ravens released only at capture site (Combat Center 2020).
[3]Under MBTA Depredation Permit #DPRD086145C, 136 ravens were taken at 1st Tanks Ramp (Combat Center 2019).
[4]Experimental poisoning was conducted for a brief time in 1989 (Rado 1990).

Photos 7 and 8 Truck with Exposed Meals, Ready-to-Eat (Ravens Fled) and Overfilled Dumpster with Raven

In addition, efforts made within DoD installations to manage ravens and correct deficiencies may be negated by lack of efforts in adjacent cities and lands, which also contribute to raven subsidies on installations.

2.3 DESCRIPTION OF THE PROPOSED ACTION

Under the Proposed Action, each DoD installation would determine the appropriate mix of raven management actions to be implemented at each installation. Integrated, adaptive management of the raven would be set forth in a separate plan, as part of a specific program, and/or incorporated as an update to each installation's INRMP.

Although each DoD installation would retain the individual discretion to determine the appropriate mix of raven management actions, the collective goal of the Proposed Action is to reduce the raven population to more sustainable levels (i.e., between 0.64 to 0.75 raven/km^2, as described below). To this end, information and recommendations by agency staff with experience in raven management are integrated in Table 2-1 to inform agency decision makers on the potential effectiveness of the various raven management actions.

Sustained implementation of a mix of effective non-lethal and lethal raven management actions at each installation would best achieve the Purpose and Need, collectively. Available literature supports this

recommendation (see e.g., Boarman 1992, 1993, 2002, 2003; Boarman et al. 2005; Corvus Ecological Consulting 2016b).

Lethal management methods for the control of raven populations on lands owned or used by the DoD in the California desert could include all actions described in Section 2.1.2, pending receipt of the appropriate depredation permit. Under the Proposed Action, individual DoD installations would be responsible for applying for and maintaining valid USFWS depredation permits to lethally control ravens. The USFWS depredation permits for each installation would authorize specific limits and adaptive management schemes for the numbers of ravens that could be controlled by each method. The depredation permits would specify the number of active nests/eggs/hatchlings and adult ravens that can be removed, and the DoD would abide by all specifications and protocols of the permits. Raven management actions could be carried out as singular actions or they could be done in coordination with multiple management actions to better achieve installation-specific goals.

The PSFWO, as a cooperating agency and utilizing various versions of *StallPOPd Web Interactive: Software to Compute Population Control Treatments of a Subsidized Predator* (Shields et al. 2019; Hanley et al. 2020a, 2020b, 2021), developed a range of density thresholds for ravens in the California desert to reduce predation pressure on desert tortoises, while maintaining sustainable raven populations. Under the Proposed Action, raven removal actions would occur on DoD installations in the California desert to reduce raven populations on those lands to densities between 0.64-0.75 raven/km^2. Per USFWS analysis, the reduction of raven densities to such levels would allow for greater desert tortoise survivorship, while allowing for raven populations to be maintained at relatively constant population densities with ongoing annual maintenance removal.

Table 1-4 provides current raven density estimates and population by age-class estimates at DoD installations in the California desert (Holcomb 2021b). Tables 2-3 and 2-4 provide the target raven populations and initial levels of raven removal to reduce raven population densities on DoD lands ("reset" levels) to 0.64 raven/km^2 and 0.75 raven/km^2, respectively. Under the 0.64 raven/km^2 scenario, approximately 13,293 ravens would initially need to be removed from DoD lands in the California desert (Table 2-3). Under the 0.75 raven/km^2 scenario, approximately 11,830 ravens would initially need to be removed from DoD lands in the California desert (Table 2-4) (Shields et al. 2019; Hanley et al. 2020a, 2020b, 2021).

Tables 2-5 and 2-6 provide the average amount of raven removal that would need to occur annually, following initial "reset" of the populations (Tables 2-3 and 2-4) to maintain raven populations on DoD lands in the California desert at the 0.64 raven/km^2 and 0.75 raven/km^2 density thresholds, respectively. Under the 0.64 raven/km^2 scenario, approximately 1,477 ravens would need to be removed on an annual basis to maintain the population at roughly 0.64 raven/km^2 (Table 2-5). Under the 0.75 raven/km^2 scenario, approximately 1,715 ravens would need to be removed on an annual basis to maintain the population at roughly 0.75 raven/km^2 (Table 2-6) (Shields et al. 2019; Hanley et al. 2020a, 2020b, 2021).

In total, under the Proposed Action, up to 11,830-13,293 ravens would initially be removed from the population on DoD lands in the California desert (population "reset"). Following initial raven removal, up to 1,477-1,715 ravens would be removed annually from DoD lands in the California desert to maintain ravens at sustainable population levels while reducing the ecological, economic, and health and safety impacts of the species.

Table 2-3 Target Raven Populations and Population Reset Estimates under the 0.64 Raven/km^2 Scenario

Installation	*Population Targets*				*Removal Estimates*			
	Eggs/ Hatchlings[1]	*Non-breeders*	*Breeders*	*Total Population*	*Eggs/Hatchlings Removed*	*Non-breeders Removed*	*Breeders Removed*	*Total Ravens Removed*
Combat Center	706	252	1,014	1,972	652	233	934	**1,819**
MCLB Barstow	5	2	8	15	7	2	9	**18**
Edwards AFB	283	101	407	791	799	285	1,146	**2,230**
Fort Irwin	699	249	1,003	1,951	1,006	360	1,444	**2,810**
NAWSCL	1,057	377	1,517	2,951	2,247	803	3,224	**6,274**
CMAGR[2]	426	152	611	1,189	40	14	88	**142**
TOTAL	**3,176**	**1,133**	**4,560**	**8,869**	**4,751**	**1,697**	**6,845**	**13,293**

Notes: [1]Target Eggs/Hatchlings are given a value of 0.5 each to account for loss of individuals prior to reaching non-breeder/breeder status.
[2]CMAGR is administered by MCAS Yuma.
Sources: Shields et al. 2019; Hanley et al. 2020a, 2020b, 2021.

Table 2-4 Target Raven Populations and Population Reset Estimates under the 0.75 Raven/km^2 Scenario

Installation	*Population Targets*				*Removal Estimates*			
	Eggs/ Hatchlings[1]	*Non-breeders*	*Breeders*	*Total Population*	*Eggs/Hatchlings Removed*	*Non-breeders Removed*	*Breeders Removed*	*Total Ravens Removed*
Combat Center	828	295	1,188	2,311	530	190	760	**1,480**
MCLB Barstow	6	2	9	17	6	2	8	**16**
Edwards AFB	332	118	477	927	750	268	1,076	**2,094**
Fort Irwin	819	292	1,176	2,287	886	317	1,271	**2,474**
NAWSCL	1,239	442	1,778	3,459	2,065	738	2,963	**5,766**
CMAGR[2]	466	166	669	1,301	0	0	0	**0**
TOTAL	**3,690**	**1,315**	**5,297**	**10,302**	**4,237**	**1,515**	**6,078**	**11,830**

Notes: [1]Target Eggs/Hatchlings are given a value of 0.5 each to account for loss of individuals prior to reaching non-breeder/breeder status.
[2]CMAGR is administered by MCAS Yuma.
Sources: Shields et al. 2019; Hanley et al. 2020a, 2020b, 2021.

Table 2-5 Average Annual Raven Maintenance Removal under the 0.64 Raven/km^2 Scenario

Installation	***Removal Estimates[1]***			
	Eggs/Hatchlings Removed	***Non-breeders Removed***	***Breeders Removed***	***Total Ravens Removed***
Combat Center	176.5	50.4	101.4	**328.3**
MCLB Barstow	70.8	20.2	40.7	**131.7**
Edwards AFB	264.3	75.4	151.7	**491.4**
Fort Irwin	1.3	0.4	0.8	**2.5**
NAWSCL	174.8	49.8	100.3	**324.9**
CMAGR[2]	106.5	30.4	61.1	**198.0**
TOTAL	**794.2**	**226.6**	**456.0**	**1,476.8**

Notes: [1]Decimals are used to the tenths place as Removal Estimates are annual averages.
[2]CMAGR is administered by MCAS Yuma.
Sources: Shields et al. 2019; Hanley et al. 2020a, 2020b, 2021.

Table 2-6 Average Annual Raven Maintenance Removal under the 0.75 Raven/km^2 Scenario

Installation	***Removal Estimates[1]***			
	Eggs/Hatchlings Removed	***Non-breeders Removed***	***Breeders Removed***	***Total Ravens Removed***
Combat Center	207.0	59.0	118.8	**384.8**
MCLB Barstow	83.0	23.6	47.7	**154.3**
Edwards AFB	309.8	88.4	177.8	**576.0**
Fort Irwin	1.5	0.4	0.9	**2.8**
NAWSCL	204.8	58.4	117.6	**380.8**
CMAGR[2]	116.5	33.2	66.9	**216.6**
TOTAL	**922.6**	**263.0**	**529.7**	**1,715.3**

Notes: [1]Decimals are used to the tenths place as Removal Estimates are annual averages.
[2]CMAGR is administered by MCAS Yuma.
Sources: Shields et al. 2019; Hanley et al. 2020a, 2020b, 2021.

2.4 RESOURCE PROTECTION MEASURES, MONITORING, AND MITIGATION

Under NEPA, mitigation includes measures to avoid, minimize, rectify, reduce, eliminate, or compensate for potential impacts of the actions (40 CFR §1508.20). These types of measures may be offered even where there is no potential for significant impact and is typically distinguished by not using the term mitigation. In this PEA, proposed resource protection measures (Section 2.4.1) are incorporated into the actions to promote safe, integrated raven management, not as a result of potential significant impacts. Proposed discretionary monitoring (Section 2.4.2) is proposed by USFWS. Proposed discretionary mitigation (Section 2.4.3) is MAGTFTC-specific and offered to address the desert tortoise aspect of the Purpose and Need, which would not be resolved by focusing on ravens alone.

2.4.1 Resource Protection Measures

The measures listed below would apply to both the No-Action Alternative and/or Proposed Action unless otherwise specified. Some measures may be location-specific.

1) Non-lethal methods of harassment would be used in conjunction with lethal control to minimize the lethal take of migratory birds.
2) All euthanasia would be done in accordance with humane methods identified as acceptable or conditionally acceptable by the American Veterinary Medical Association's (AVMA [2020]) *Guidelines for the Euthanasia of Animals*.
3) Shooting of ravens would be conducted by trained professionals and in a manner that ensures safety to personnel and public safety.
4) Shotguns used to take migratory birds can be no larger than 10-gauge and must be fired from the shoulder (50 CFR 21.41).
5) If shooting is used, shot must be non-toxic, as listed in 50 CFR 20.21(j).
6) DoD installations would adhere to any requirement and limitation in any future-issued MBTA depredation permit (e.g., no decoys, duck calls, or other devices to lure or entice migratory birds into gun range can be used) (50 CFR 21.41).
7) No take, capture, harassment, or disturbance (including noise disturbance) of Bald Eagles, Golden Eagles, or species listed as threatened or endangered under the ESA can occur.
8) If a bird with a federal band issued by the U.S. Geological Survey Bird Banding Laboratory is encountered, the band number must be reported to 1-800-327-BAND (2263) or http://www.reportband.gov.
9) To minimize risk to personnel and non-target species, handling and application of pesticides (i.e., DRC-1339) and other chemicals (e.g., carbachol and methyl anthranilate) would be conducted in accordance with the most current pesticide product label (EPA 2019, 2020) and Safety Data Sheet instructions and limitations. For more information, see Appendices B and C.
10) Pesticides would not be used where there is a potential for non-target species to consume baits without special precautions (USDA 2019b).
11) Toxic bait traps, when employed, would be pre-baited and monitored for evidence of use by non-target species according to the most current pesticide product label (EPA 2019, 2020; USDA 2019b; Appendix C).
12) The use of DRC-1339 would not occur on or in the vicinity of burial sites protected under the Native American Graves Protection and Repatriation Act (43 CFR 10).

13) Use of lasers to deter ravens would be done in accordance with all applicable installation regulations to avoid impacts to aircraft, military training, and safety of personnel.

14) DoD installations would avoid conducting actions in waters of the U.S. unless covered by a Nationwide Permit (U.S. Army Corps of Engineers [USACE] 2021).

2.4.2 Discretionary Monitoring

If adopted, monitoring of raven populations on DoD lands in the California desert would be done in accordance with the PSFWO Variable Radius Point Count Monitoring Protocol (Holcomb 2021d). Point count data would be collected at all six DoD installations during the first year of implementation, as well as every 3 years thereafter to monitor raven populations. Monitoring results may indicate that existing or additional actions may be necessary to adjust annual depredation rates for maintaining raven populations at sustainable population levels. Consequently, active monitoring would allow for adaptive management and multiple courses of action to be used simultaneously to achieve successful results (see Chapter 5 for more details).

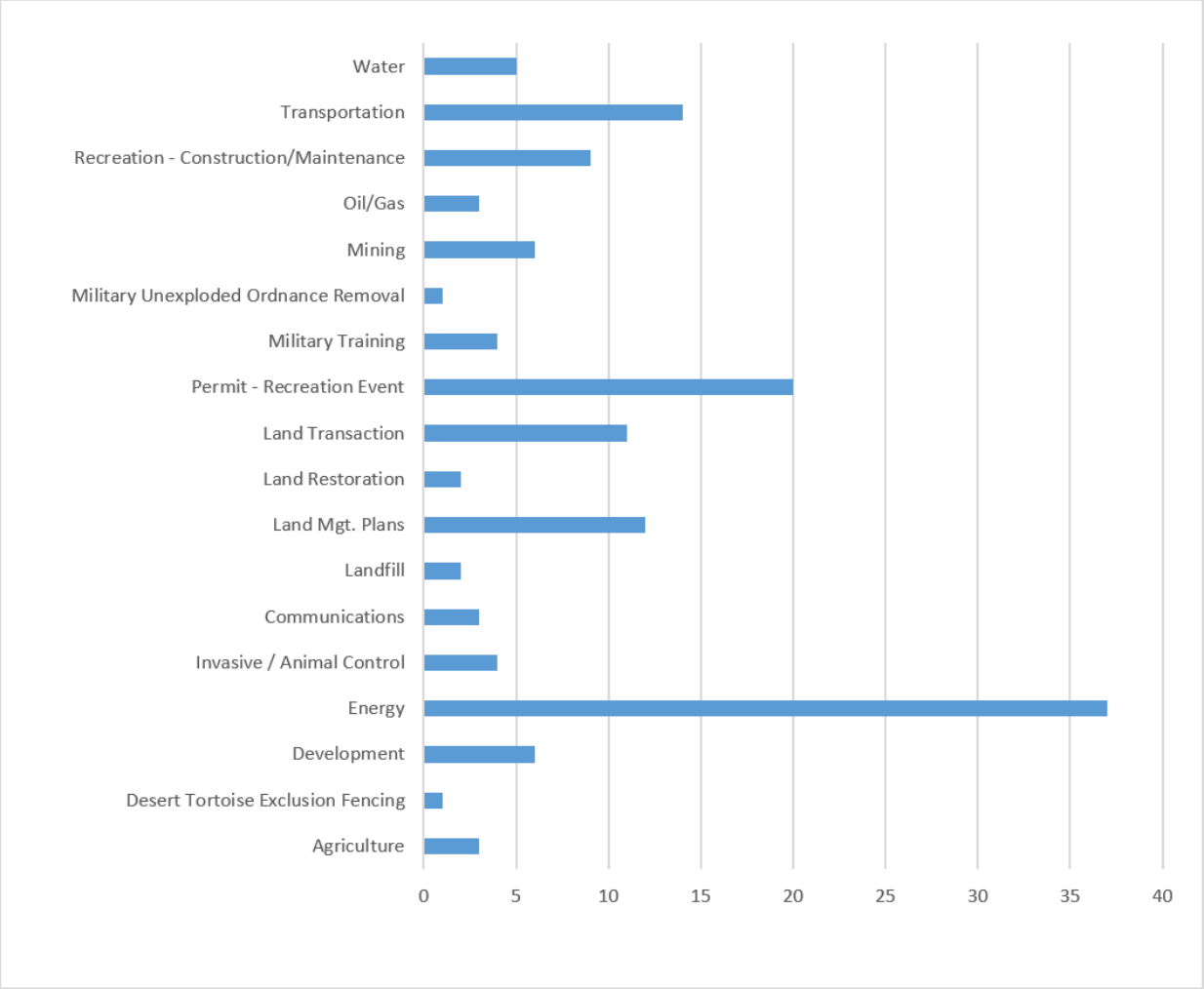
2.4.3 Discretionary Mitigation – Recovery and Sustainment Partnership Initiative

MAGTFTC proposes to contribute funds to advance desert tortoise recovery on federal and/or non-federal lands outside the Combat Center, in the western Mojave Desert, under the auspices of the RASP Initiative that was advanced in 2018 at the Departments of Defense and Interior levels (see Section 1.3.1).

This discretionary mitigation is proposed to resolve, in part, the non-raven stressors affecting the desert tortoise because addressing the raven stressor alone would not resolve desert tortoise decline if other stressors are left unmitigated. Some projects in the region (Figure 2-1) that may affect the desert tortoise, may also increase raven predation. Recovery would benefit the military mission if the costs of desert tortoise management in the western Mojave Desert decreases, and as the species recovers and is eventually de-listed.

The authorities for this discretionary mitigation are ESA Section 7(a)(1) and NEPA. Federal agencies can offer mitigation to achieve a more preferable environmental outcome under NEPA. Under ESA Section 7(a)(1), agencies are directed to use their authorities for the conservation of listed species but are afforded discretion in how to meet this mandate.

In light of this proposed long-term commitment, MAGTFTC would re-evaluate its existing desert tortoise management at the Combat Center to determine if any changes are needed to continue to support current and future training (e.g., USMC Force Design 2030). MAGTFTC's proposed commitment would be contingent on increased regulatory flexibilities that facilitate military training at the Combat Center, if needed. Any changes to management or training would comply with NEPA and ESA.



Source: USFWS 2019.

Figure 2-1 Number of and Project Categories for USFWS Biological Opinions Issued for Desert Tortoise from 2013 – 2020

2.4.3.1 RASP Background

As early as the 2000s, MAGTFTC has worked to advance desert tortoise recovery with the construction and continued operation of the Marine Corps' Tortoise Research and Captive Rearing Site (Combat Center 2005). Over the past 2 years, MAGTFTC and other partners (i.e., Fort Irwin NTC, BLM, and USFWS) have discussed how to collaborative to advance species recovery pursuant to the USFWS's 2011 Revised Recovery Plan, while fulfilling independent obligations and commitments. It was determined that the best approach would be for partners to pool funds, implement recovery actions in the areas that would most benefit the species, and initially, implement actions within the scope of existing agency obligations and commitments. The local effort for desert tortoises is referred to as RASP.

RASP is needed now for the following reasons:

- As of 2014, a 63% decline in tortoise abundance occurred in all recovery units, with a 49% decline in the Western Mojave Recovery Unit (Allison and McLuckie 2018).

- Desert tortoise populations densities lower than 3.9 adult tortoises/km^2 are considered depleted and not viable over the long-term (USFWS 2011a). As of 2014, population density in the Western Mojave Recovery Unit was 2.8 adult tortoises/km^2 (USFWS 2020).
- Per USFWS's 2011 Revised Recovery Plan, it is estimated that recovery would cost $159 million and could be achieved by 2025 if recovery actions were implemented promptly (USFWS 2011a). If expenditures remain at FY 2017 levels ($16 million), there is already a $31 million shortage (USFWS 2017b). Thus, collaboration is necessary and federal agencies in the Western Mojave Recovery Unit are willing and able to collaborate and advance species recovery.
- The desert tortoise is currently listed as a threatened species, but USFWS is currently reviewing a petition to up-list the species to endangered status. As a species moves toward extinction, it would become more difficult and expensive to achieve recovery and military readiness could be impaired to a greater degree due to ESA's mandate to federal agencies. As explained by the U.S. Supreme Court: "*[t]he plain intent of Congress in enacting [ESA] was to halt and reverse the trend toward species extinction, whatever the cost…. Agencies [a]re directed … to use... all methods and procedures which are necessary to preserve endangered species…. [T]he legislative history … reveals [a] conscious decision by Congress to give endangered species priority over the primary missions of federal agencies.*" (Tennessee Valley Authority v. Hill et al., 437 U.S. 153, 184-185 [1978] [internal citations, quotations and emphasis omitted]).

2.4.3.2 RASP Summary

The scope of RASP includes the following types of recovery actions:

- Highway Exclusion Fencing
- Unauthorized Route Closure and Habitat Restoration
- Population Augmentation & Head Starting
- Recovery Coordination and Enforcement
- Permanent Habitat Protection
- Effectiveness Monitoring
- Objective Monitoring
- Range-wide Monitoring

RASP projects would be focused on the following short-term objectives (next 1 to 5 years):

- Construct desert tortoise exclusion fencing along priority highways in the western Mojave Desert
- Close all unauthorized routes of travel in the identified recovery focus areas
- Protect and restore up to 250,000 acres of habitat in recovery focus areas

RASP projects would be implemented within the Western Mojave Recovery Unit focus areas (Figure 2-2), in areas consistent with desert tortoise conservation and protection.

Current RASP partners include:

- MAGTFTC
- Fort Irwin NTC
- BLM, Barstow Field Office – U.S. Department of Interior Region 8 & 10
- USFWS, PSFWO
- National Fish and Wildlife Foundation (NFWF)

The proposed framework and schedule for implementing RASP is summarized in Table 2-7.

Table 2-7 Schedule for Implementing RASP

RASP Framework	***Proposed Schedule***
NFWF's RASP Implementation Plan Completed	Fall 2021
NFWF Issues Request for Proposals (RFPs)	Spring 2022
Applicants provide response to RFPs	
Partners review and approve projects	Summer 2022
Applicants notified of selection and begin implementation	
NFWF manages the partners contributions and disburses project funds	Ongoing

Note: If your organization or agency is interested in participating in this effort, please contact the USFWS's Mojave Desert Division, Palm Springs Office at (760) 322-2070, or contact the MAGTFTC/MCAGCC Office of Government and External Affairs (contact information available at: https://www.29palms.marines.mil/Staff-Offices/Government-and-External-Affairs/).

2.4.3.3 Regulatory Compliance

Implementing RASP does not require additional NEPA analysis at this time for the following reasons:

- The RASP Implementation Plan is a framework that partners, and applicants would work within and mirrors the contents of the USFWS's 2011 Revised Recovery Plan; previously subject to public comment;
- Projects with details capable of NEPA analysis would be later developed by applicants and are not known at this time; and
- Initial projects would be within the scope of existing agency obligations and authorizations, namely:
    - BO for the Combat Center and BLM (USFWS 2017a).
    - West Mojave Route Network Project for route/habitat restoration (BLM 2019).
    - Fort Irwin NTC's NEPA and ESA requirements that would result from its current proposed Military Training and Public Land Withdrawal and Extension (Department of the Army 2020).
    - Final EIS Land Acquisition and Airspace Establishment to Support Large-Scale Marine Air Ground Task Force Live-Fire and Maneuver Training at the Marine Corps Air Ground Combat Center, Twentynine Palms, CA (DoN-USMC 2012) and associated Record of Decision (DoN 2013).
    - Supplemental EIS for Land Acquisition and Airspace Establishment to Support Large-Scale Marine Air Ground Task Force Live-Fire and Maneuver Training, Marine Corps Air Ground Combat Center, Twentynine Palms, California (DoN 2017).

Projects with no existing regulatory coverage would be subject to project-specific NEPA, NHPA, and ESA compliance prior to implementation. Applicants would be responsible for working with the federal land manager to ensure compliance prior to using MAGTFTC funds to implement recovery actions.

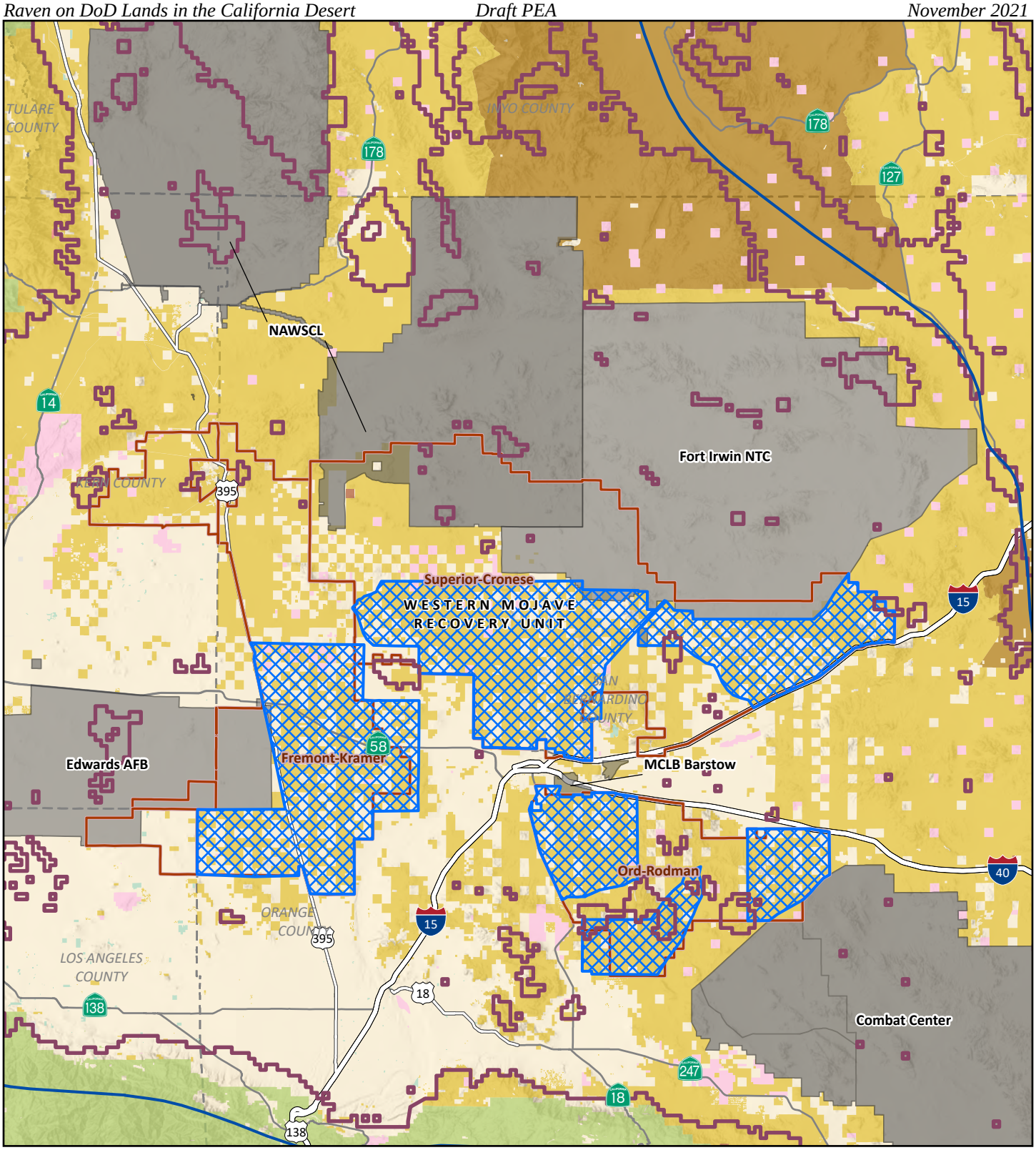


Figure 2-2. RASP Focus Areas in the Western Mojave Recovery Unit

2.5 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

During the planning process, the DoD identified and then eliminated the following potential action alternatives because they did not meet the purpose of and need for the Proposed Action or were not otherwise feasible.

2.5.1 Coordinated Management of Common Ravens Using Only Non-Lethal Means

An alternative to conduct coordinated management of ravens by only non-lethal means was considered and is generally occurring at some DoD installations under the No-Action Alternative. For the reasons explained in the sections above, a focus on non-lethal management is not an effective approach to achieve the Purpose and Need. The DoD has worked for multiple years to control raven numbers with non-lethal means. Several perching deterrents were installed and evaluated over the past 8 years, including streamers, air cannons, and wailers; all demonstrated limited long-term success (Combat Center 2018c). Ravens became desensitized to the streamers, and anecdotal reports indicate the noises emitted by the air cannons and wailers disturbed the resident service members. The air cannons and wailers were frequently found unplugged or completely missing while monitoring the effectiveness of these deterrents (Combat Center 2018c).

More recently, MAGTFTC has invested significantly in evaluating more costly bird barrier options. These, when emplaced, physically block birds from accessing preferred perching and roosting sites. These barriers have been applied on a small scale, at specific areas where intense raven use negatively affects the health of the Marines and condition of tactical equipment. However, the number of ravens, extent of the built environment, and cost of this approach severely limit the scale in which the materials may be deployed. For example, bird spikes and wire barriers that were installed in 2018 on the undersides of vehicle shade structures at the 1st Tanks Battalion yard at the Combat Center to reduce opportunities for ravens to roost in sheltered locations were mostly effective for the limited surface they covered, but the ravens quickly adapted by moving their roosting and perching sites to nearby structures that did not have the barriers (Combat Center 2019a) (Photo 9).

Photo 9 Raven Excreta after Installing Anti-Perching Devices at the 1st Tanks Battalion yard at the Combat Center

Although non-lethal methods such as education programs can be used to increase human awareness of raven issues and reduce the potential for individuals to subsidize ravens (e.g., litter, water, etc.), non-lethal methods have not been effective in controlling raven populations in the California desert. As it is not feasible to remove all resources that attract ravens, management of ravens by non-lethal means only is not a feasible alternative.

2.5.2 2008 EA Alternatives

As to the desert tortoise aspect of the Purpose and Need, the following alternatives are dismissed for the same reasons as explained in the 2008 EA:

- establish a hunting season and/or bounty for permitted hunters
- establish an adopt-a-raven program
- provide another food source for ravens
- implement visual or auditory aversion for ravens
- introduce a predator for ravens
- implement a birth control or chemical sterilization program
- allow diseases (e.g., West Nile virus and Newcastle's disease) to reduce the raven population
- control/reduce human population control
- modify all utility poles and towers to preclude raven perching or nesting

Some aspects of these dismissed alternatives may be an aspect of the No-Action Alternative because raven management at the identified DoD installations predates 2008. To the extent some of these alternatives are viable as to reducing the economic and health aspects of the Purpose and Need, they are incorporated into the Proposed Action.

CHAPTER 3
AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

Potential effects of the No-Action Alternative and Proposed Action are discussed in Sections 3.1 (*Biological Resources*), 3.2 (*Health and Safety*), and 3.3 (*Cultural Resources*). To the extent potential indirect effects were identified, they would be expressly discussed, otherwise, all effects are considered direct effects. The effects of past actions are considered part of the affected environment (CEQ 2005). A summary of potential effects is provided in Table 3-1. Additional resources were considered but not carried forward for detailed analysis as explained in Section 3.4; this includes CEQA-related topics. The cumulative effects analysis is provided in Chapter 4.

3.1 BIOLOGICAL RESOURCES

Biological resources include plant and animal species, and the habitats within which they occur. This analysis focuses on species that have potential to be present in the project area or affected by actions conducted in the project area. The region of influence for biological resources includes the western Mojave Desert and the Colorado Desert, collectively described as the California desert in this PEA. No major ground-disturbing activities would occur under the Proposed Action. Therefore, plant communities would not be affected and are not discussed further in this PEA. Activities that would involve major ground disturbance, including vegetation removal, such as the replacement of aboveground transmission lines and utility poles with underground utilities, would require separate NEPA and/or other required environmental analysis by the individual DoD installations.

3.1.1 Regulatory Framework

Biological resources occurring within the proposed project area that would potentially be impacted by proposed activities are protected by, and managed in accordance with, various statutory and executive requirements including, but not limited to, the following:

- ESA (16 USC §§ 1531-1599)
- MBTA (16 USC §§ 703-712)
- Bald and Golden Eagle Protection Act (16 USC §688 *et seq*.)
- Sikes Act Improvement Act of 1997 (16 USC § 670 *et seq*.)
- EO 13112, *Invasive Species*
- EO 13186, *Responsibilities of Federal Agencies to Protect Migratory Birds*

3.1.2 Affected Environment

The raven is a native bird species in California. However, ravens are not desert specialists and historically existed at low population densities in the California desert (Boarman and Berry 1995; Camp et al. 1995). As discussed in Section 1.3.2, over the last 3 to 5 decades, raven numbers have increased in much of southern California and by a factor of 15 in parts of the California desert (Boarman and Berry 1995; Camp et al. 1995; Boarman 2014). As of 2021, the USFWS estimates that there are approximately 330,000 ravens in California (confidence interval of 230,000 to 440,000), with over 100,000 ravens in the California desert and approximately 22,162 total ravens on the six DoD installations in the California desert (Holcomb 2021b). Figure 3-1 shows the estimated current densities of ravens on DoD lands in the California desert (Holcomb 2021b).

Table 3-1 Summary of Environmental Consequences

Alternative	*Biological Resources*	*Health and Safety*	*Cultural Resources*
No-Action Alternative Methods: continued use of primarily non-lethal raven management actions.	Common Raven Impacts: reduced subsidies; reduced access to non-natural infrastructure; flushing of individuals; avoidance of treatment areas; increased stress levels; and disruption of nesting attempts. No concerted lethal removal would occur. Desert Tortoise Impacts: sparse and temporary noise impacts from noise-producing deterrents that would not affect normal life behaviors or rise to the level of take. Continued threat to survival/management from raven predation pressure. Other Avian/Wildlife Impacts: reduced subsidies; reduced non-natural infrastructure; flushing of individuals; and avoidance of treatment areas, but primarily for generalist species that congregate/occur in the same areas as ravens and/or share the same subsidized resources (often overpopulated and/or non-native species). Level of Significance: less than significant adverse impacts because this alternative would be a continuation of existing piecemeal raven management activities that would have little to no impact on biological resources, although raven populations would remain largely unchecked and may continue to affect populations of other species.	Raven Management Actions: non-lethal (e.g., use of lasers for hazing) management actions would be implemented by trained personnel, following all applicable requirements and guidelines and per resource protection measures (Section 2.4.1). Reduced/Managed Raven Populations: overall, raven populations would not be reduced by a measurable amount on the six DoD installations. There would continue to be health and safety impacts related to raven congregation in areas used by DoD personnel, but cleanup of raven excreta and use of PPE would continue to occur. Level of Significance: overall less than significant impact to health and safety with the proper use of non-lethal management actions by trained personnel and the continued implementation of cleanup measures for raven excreta.	Raven Management Actions: in the event that any non-lethal management action could affect historic properties, each installation, on a case-by-case basis, would: (1) conduct individual Section 106 consultation with the California SHPO and federally recognized Tribal Governments to decide on details of how management actions must be implemented to avoid or to minimize impacts to historic properties; (2) comply with any existing program alternative the installation may have negotiated with the California SHPO for the undertaking; or (3) comply with any existing installation-specific Programmatic Agreement. Level of Significance: overall less than significant impact with avoidance/ minimization of impacts to historic properties.
Proposed Action Methods: integrated, adaptive management using non-lethal and lethal raven management actions.	Impacts to biological resources from non-lethal management actions under the No-Action Alternative would also occur under the Proposed Action. Common Raven Impacts: lethal removal of 11,830 to 13,293 ravens initially, followed by up to 1,477-1,715 ravens removed annually.	Raven Management Actions: non-lethal (e.g., use of lasers for hazing, conditioned taste aversion) and lethal (e.g., shooting, poisoning) management actions would be implemented by trained personnel, following all applicable requirements and	Raven Management Actions: in the event that any non-lethal or lethal management action could affect historic properties, each installation, on a case-by-case basis, would: (1) conduct individual Section 106 consultation with the California SHPO and federally recognized Tribal Governments to decide on details of how management actions must be

Table 3-1 Summary of Environmental Consequences

Alternative	*Biological Resources*	*Health and Safety*	*Cultural Resources*
	Desert Tortoise Impacts: sparse and temporary noise impacts from shooting of ravens that would not affect normal life behaviors or rise to the level of take. Shooting would often be done with suppressed firearms, with little to no noise. Immediate beneficial impacts on hatchlings and juveniles from reduced raven predation pressure. Other Avian/Wildlife Impacts: low potential for other species to be shot and experience noise impacts from shooting of ravens. Shooting would only be done by authorized personnel and would often be done with suppressed firearms. Low risk of induced illness from inadvertent consumption of conditioned taste aversion chemicals and for non-target species to ingest the pesticide DRC-1339. Impacts to non-target species avoided and minimized per resource protection measures (Section 2.4.1) Beneficial impacts to species that are preyed on by or compete with ravens. Level of Significance: less than significant adverse impacts to the raven population, because the species is overpopulated in the California desert and, at most, 4% of the California population would be removed. Less than significant, and overall, beneficial impacts to desert tortoise and other wildlife species that ravens threaten.	guidelines and per resource protection measures (Section 2.4.1). Reduced/Managed Raven Populations: reduced raven populations and deterring the presence of ravens in areas used by DoD personnel would improve the health and safety of the working environment in these areas. There would also be a reduced BASH risk. Level of Significance: overall less than significant beneficial impact to health and safety with the proper use of non-lethal and lethal management actions by trained personnel and a less than significant beneficial impact to health and safety with the reduction and management of raven populations.	implemented to avoid or to minimize impacts to historic properties; (2) comply with any existing program alternative the installation may have negotiated with the California SHPO for the undertaking; or (3) comply with any existing installation-specific Programmatic Agreement. Level of Significance: overall less than significant impact with avoidance/ minimization of impacts to historic properties.

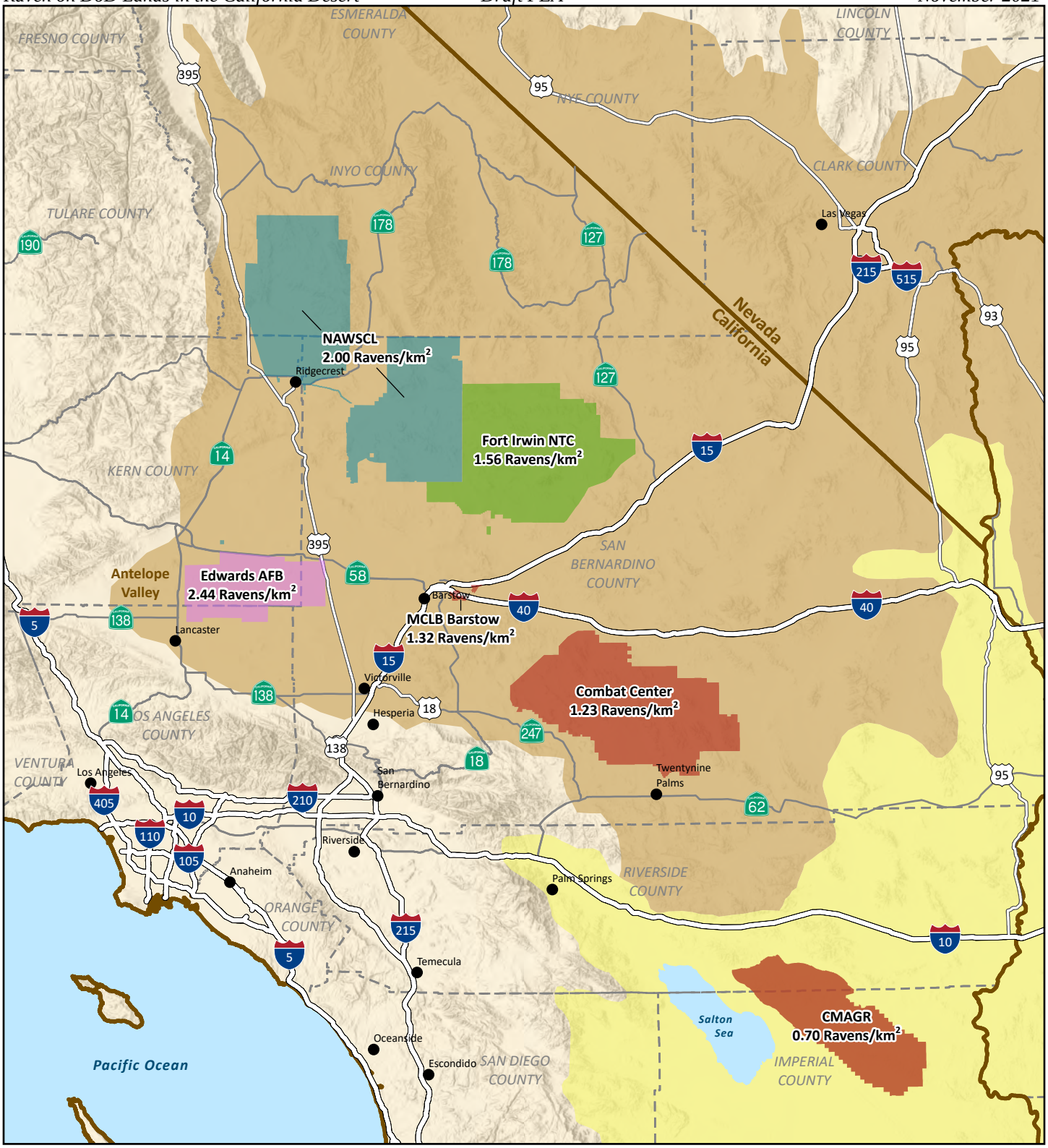


Figure 3-1. Current Raven Densities at Department of Defense Installations in the California Desert

State Boundary
County Boundary
Mojave Desert
Sonoran Desert

Military Installations
U. S. Air Force
U. S. Army
U. S. Marine Corps
U. S. Navy

0 25 50 Miles

Sources: DoD 2017, Esri 2017, Holcomb 2021b, U.S. Geological Survey 2010

For the Native American cultures of the Great Basin, Mojave, and Colorado deserts, the common raven also has significant spiritual and ritualistic meanings as part of the natural environment. Dr. Priscilla Porter (2010) and Dr. Lowell J. Bean (2017) note that while the Cahuilla culture ate various fauna, they did not eat the raven because of its ritualistic purposes. The Cahuilla culture Bird Songs are performed as ritual songs and dance that retrace the origin story of the Cahuilla people, plants, animals, and landscapes, including the raven. The Serrano culture also sing Bird Songs. Taught to Serrano elders by the neighboring Cahuilla tribes, Bird Songs "derive their name from the migration of birds that parallel the movement of the people through their territory, telling the story of the creation, animals seen along the way, and the sacred places" (San Manuel Band of Mission Indians 2021).

Typical of most desert systems, large mammals (e.g., bobcat [*Lynx rufus*] and desert bighorn sheep [*Ovis canadensis nelsoni*]) are uncommon and occur widely throughout the California desert. The coyote (*Canis latrans*) is the most common and opportunistic large mammal in the California desert. Small mammals (e.g., round-tailed ground squirrel [*Spermophilus tereticaudus*] and kangaroo rat [*Dipodomys* spp.]) and reptiles (e.g., side-blotched lizard [*Uta stansburiana*] and desert horned lizard [*Phrynosoma platyrhinos*]) are highly suited to harsh desert conditions and are much more common but tend to be secretive, nocturnal, or active for only short periods of the year.

Birds are among the most conspicuous species within the California desert. Washes and springs provide habitat for the greatest concentration of bird species throughout the region, as these areas tend to hold water that supports more complex floral assemblages than most desert plant communities. As many as 425 species of birds may occur in the California desert (England and Laudenslayer 1995). Common resident bird species include: Gambel's Quail (*Callipepla gambelii*), Mourning Dove (*Zenaida macroura*), Greater Roadrunner (*Geococcyx californianus*), Horned Lark (*Eremophila alpestris*), and Common Raven, among others. Common birds of prey include Red-tailed Hawk (*Buteo jamaicensis*), American Kestrel (*Falco sparverius*), Barn Owl (*Tyto alba*), and Great Horned Owl (*Bubo virginianus*) (Circle Mountain Biological Consultants 2010).

Special consideration is given to bird species protected under the MBTA and EO 13186, *Responsibilities of Federal Agencies to Protect Migratory Birds*. Under the MBTA, it is unlawful to pursue, hunt, take, capture, collect, kill, possess, sell, purchase, barter, import, export, or transport any migratory bird, or any part, nest, or egg of any such bird (USFWS 2013a). The relocation, transport, or depredation of migratory birds for management purposes may be accomplished through special purpose permits issued by the USFWS. The MBTA does not afford protection for non-native species such as the House Sparrow (*Passer domesticus*), European Starling (*Sternus vulgaris*), and the Rock Dove (*Columba livia*). Although the law was originally developed for migrating birds that crossed international borders, it now protects most non-migratory species. All native bird species that occur in the California desert are protected under the MBTA.

Special status animal species potentially occurring in the project area are listed in Table 3-2. Many of these species are migratory or seasonal residents that tend to occur at or near anthropogenically created water sources. Although there are several federally listed fish species that occur in aquatic habitats in the California desert, there are no definitive data to support raven predation on fish in the California desert. Therefore, fish species are not further addressed in this PEA.

The desert tortoise was listed as threatened by the State of California in 1989, and the Mojave Desert population (all tortoises north and west of the Colorado River in Arizona, Utah, Nevada, and California) was federally listed as threatened by the USFWS in 1990. The decline in desert tortoise numbers is thought to be due to several causes, including loss of habitat, upper respiratory tract disease, predation by ravens,

off-highway vehicle use, livestock grazing, the spread of invasive plant species, and direct disturbance and collection by humans (USFWS 2011a; Combat Center 2018d).

Desert tortoises in southern California occur predominantly in creosote scrub habitat at elevations below 4,300 feet above mean sea level (Combat Center 2018d). The species spends much of the year underground to avoid extreme temperatures during summer and winter. It constructs and maintains burrows for this purpose and there may be several located throughout an individual tortoise's home range. While the desert tortoise is active above ground during the spring, summer, and autumn when daytime temperatures are below 90 degrees Fahrenheit, they tend to be most active during spring and early summer (Combat Center 2018d).

In 2014, estimated adult desert tortoise density in the Western Mojave Recovery Unit ranged from 2.5 to 4.7 tortoises/km^2, with an overall average density of 2.8 tortoises/km^2, the result of an overall downward trend in the population of adult tortoises (USFWS 2015). In the recent past, from 2004 to 2014, desert tortoise populations among all recovery units decreased by 27%-67%, except for the Northeastern Mojave Recovery Unit, which increased by 270%; in the Western Mojave Recovery Unit, the adult tortoise population decreased by 51% between 2004 and 2014 (USFWS 2015). The low tortoise density in the West Mojave Recovery Unit in general is of particular concern, as the USFWS has determined that the minimum adult tortoise density necessary to sustain a viable population, assuming there is no gender bias (i.e., 50% of the population is male, 50% of the population is female), is 3.85 tortoises/km^2 (USFWS 1994, 2016a).

Similarly, from annual surveys taken from 2001 to 2007, density estimates of adult tortoises in the Colorado Desert showed dramatic losses detrimental to population sustainability. At the time, the Colorado Desert Recovery Unit previously consisted of separate Eastern and Northern Recovery Units, and the data were presented accordingly: in the Eastern Recovery Unit, desert tortoise populations fell from an estimated 10.1 tortoises per square km to 5.0 tortoises/km^2. The Northern Recovery Unit likewise suffered losses, dropping from 7.2 adult tortoises/km^2 to 4.6 adult tortoises per square km (USFWS 2011a).

Federal and state agencies, as well as conservation organizations, are currently putting much focus on the control and management of raven populations in the California desert, as predation by this species is considered one of the greatest threats to the long-term survival and recovery of the desert tortoise. For instance, the USFWS's Desert Tortoise Recovery Office, Desert Managers Group, and the Desert Tortoise Management Oversight Group are working toward and support the development of a region-wide management approach to predation by ravens on the desert tortoise (USFWS 2016b).

The Western Snowy Plover (*Charadrius nivosus nivosus*), Willow Flycatcher (*Empidonax traillii*), Western Yellow-billed Cuckoo (*Coccyzus americanus occidentalis*), and Bell's Vireo (*Vireo bellii*) are uncommon migrants in the California desert (Cutler et al. 1999; Combat Center 2018d). All subspecies of Willow Flycatcher are state-listed as endangered, but only the Southwestern subspecies (*Empidonax traillii extimus*) is federally listed as endangered. The Pacific coast population of Snowy Plover is federally listed as threatened, while both the coastal and interior populations are California species of special concern. There are two subspecies of Bell's Vireo known to occur in California, but only the Least Bell's Vireo (*Vireo bellii pusillus*) is federally and state-listed as endangered. These subspecies/populations tend to be very difficult to distinguish outside of their breeding habitats/regions.

The federally threatened Inyo California Towhee (*Pipilo crissalis eremophilus*) inhabits a very small geographic range and is limited to southwest Inyo County, California. Approximately 68% of its range is within NAWSCL, and it breeds in relatively small and often isolated riparian thickets (Center for Biological Diversity 2019). The raven has been implicated as a possible predator of eggs and/or nestlings of the

species. Although predation by ravens may occur or has the potential to occur, it is not known to have negative population-level effects to the Inyo California Towhee (USFWS 2013b).

Other special status species that have the potential to be impacted by the No-Action Alternative and/or Proposed Action, or for which there are available data concerning species' interactions with, or impacts from, ravens are described below. Certain species, such as bats and many of the non-resident bird species in Table 3-2, are not expected to be impacted by the No-Action Alternative and/or Proposed Action and are, therefore, not discussed further in this PEA.

The Burrowing Owl is a California species of special concern that lives in dry, open short grass areas devoid of trees. They are an opportunistic species which may also occur on golf courses, cemeteries, airports, vacant lots, university campuses, pastures, and prairie dog towns, yet Burrowing Owl populations are declining in many areas. Collisions with cars are a major source of mortality, but human activities have increased the species' range in some areas (Cornell Laboratory of Ornithology 2019a). Ravens are known to predate Burrowing Owl eggs, and harassment by ravens of Burrowing Owl nests can lead to nest abandonment (Henderson 2013). In addition, ravens have been observed preying on adult Burrowing Owls (Clark Jr. 2017).

The Golden Eagle is protected under the Bald and Golden Eagle Protection Act (16 USC 668-668d), is a USFWS Bird of Conservation Concern, and a fully protected species in California. Golden Eagles require relatively inaccessible cliff sites for nesting in steep, rugged terrain. Ravens harass and depredate the nests of Golden Eagles in the California desert (Simes et al 2017; Combat Center 2018c).

The Prairie Falcon (*Falco mexicanus*) is a California watch-listed species that breeds from Canada south through the western half of the U.S. into Mexico and winters throughout its breeding range. Preferred habitat for the species includes sagebrush, desert, prairie, some agricultural fields, and alpine meadows up to about 11,000 feet in elevation (Cornell Laboratory of Ornithology 2019b). The species occurs throughout the California desert. Prairie Falcons usually nest in a scrape on a sheltered ledge of a cliff overlooking a large, open area, often within a quarter mile of a water source (CDFW 2010). Prairie Falcons often share their nesting cliffs with ravens and will use abandoned raven nests for breeding (Steenhof 2013).

The Mojave fringe-toed lizard (*Uma scoparia*), a California species of special concern, is restricted to areas containing fine wind-blown sand, including dunes, the margins of dry lakebeds, flats with sandy hummocks formed around the bases of vegetation, desert washes, and hillsides. Their habitat ranges from 300-3,000 feet in elevation (Nafis 2019). Ravens prey on small reptile species and Jennings and Hayes (1994) suggest that increased raven populations may have a negative impact on Mojave fringe-toed lizard populations, although further study is needed.

The Mohave ground squirrel (*Xerospermophilus mohavensis*) is a medium-sized squirrel that is endemic to the western part of the Mojave Desert, including Edwards AFB, NAWSCL, and Fort Irwin NTC (USFWS 2011b). Ravens are known to kill other species of ground squirrels as a food source (Knight and Call 1980) and the raven is therefore a likely predator of the Mohave ground squirrel (USFWS 2011b). Harris and Leitner (2005) found empty radio collars from Mohave ground squirrels under raven perch sites and concluded this was evidence of predation by ravens on Mohave ground squirrels.

Table 3-2 Special Status Wildlife Species Occurrence in the Project Area

Common Name	***Scientific Name***	***Federal Status (State Status)***	***Installation Occurrence***					
			Combat Center	***MCLB Barstow***	***Edwards AFB***	***Fort Irwin NTC***	***NAWS China Lake***	***CMAGR***
Residents								
Mojave fringe-toed lizard	*Uma scoparia*	none (SSC)	Yes	No	Potential	Yes	No	Yes
Desert tortoise	*Gopherus agassizii*	T (T)	Yes	Yes	Yes	Yes	Yes	Yes
Western pond turtle	*Emys marmorata*	none (SSC)	No	No	Yes	No	No	No
Couch's spadefoot	*Scaphiopus couchii*	none (SSC)	No	No	No	No	No	Yes
Redhead	*Aythya americana*	none (SSC)	Potential	Potential	Potential	Potential	Potential	Potential
Brewer's Sparrow	*Spizella breweri*	BCC (none)	Yes	Yes	Yes	Yes	Potential	Potential
Loggerhead Shrike	*Lanius ludovicianus*	BCC (SSC)	Yes	Yes	Yes	Yes	Yes	Yes
Crissal Thrasher	*Toxostoma crissale*	None (SSC)	Potential	Potential	Potential	Yes	No	Yes
Le Conte's Thrasher	*Toxostoma lecontei*	BCC (SSC)	Yes	Potential	Yes	Yes	Yes	Yes
Inyo California Towhee	*Pipilo crissalis eremophilus*	T (E)	No	No	No	No	Yes	No
Costa's Hummingbird	*Calypte costae*	BCC (none)	Yes	Potential	Yes	Yes	Potential	Yes
Northern Harrier	*Circus hudsonius*	None (SSC)	Yes	Yes	Yes	Yes	Potential	Yes
Golden Eagle	*Aquila chrysaetos*	BGEPA, BCC (FP, WL)	Yes	Yes	Yes	Yes	Yes	Yes
Prairie Falcon	*Falco mexicanus*	BCC (WL)	Potential	Yes	Yes	Yes	Yes	Yes
American Peregrine Falcon	*Falco peregrinus anatum*	BCC (FP)	Yes	No	Yes	Yes	Yes	Yes
Cooper's Hawk	*Accipiter cooperii*	None (WL)	Yes	Yes	Yes	Yes	Yes	Yes
Burrowing Owl	*Athene cunicularia*	BCC (SSC)	Yes	Yes	Yes	Yes	Yes	Yes

Table 3-2 Special Status Wildlife Species Occurrence in the Project Area

Common Name	***Scientific Name***	***Federal Status (State Status)***	***Installation Occurrence***					
			Combat Center	***MCLB Barstow***	***Edwards AFB***	***Fort Irwin NTC***	***NAWS China Lake***	***CMAGR***
Long-eared Owl	*Asio otus*	None (SSC)	Yes	Potential	Yes	Yes	Yes	Potential
American White Pelican	*Pelecanus erythrorhynchos*	None (SSC)	Yes	Potential	Yes	Yes	Potential	Potential
Desert kit fox	*Vulpes macrotis*	None (FP)	Yes	Potential	Yes	Yes	Yes	Yes
American badger	*Taxidea taxus*	None (SSC)	Yes	Yes	Yes	Yes	Yes	Yes
California leaf-nosed bat	*Macrotus californicus*	None (SSC)	Yes	No	No	Yes	Potential	Yes
Western mastiff bat	*Eumops perotis californicus*	None (SSC)	Yes	No	Potential	Yes	Yes	Yes
Western yellow bat	*Lasiurus xanthinus*	None (SSC)	Yes	No	No	No	Potential	Yes
Pallid bat	*Antrozous pallidus*	None (SSC)	Yes	Yes	Yes	Yes	Yes	Yes
Townsend's big-eared bat	*Corynorhinus townsendii*	None (SSC)	Yes	No	Potential	Yes	Yes	Yes
Pocketed free-tailed bat	*Nyctinomops femorosaccus*	None (SSC)	Yes	No	Potential	No	Potential	Yes
Mohave ground squirrel	*Xerospermophilus mohavensis*	None (T)	No	Potential	Yes	Yes	Yes	No
Pallid San Diego pocket mouse	*Chaetodipus fallax pallidus*	None (SSC)	Yes	No	No	No	Yes	No
Southern grasshopper mouse	*Onychomys torridus*	None (SSC)	Yes	Yes	Yes	Yes	Yes	No
Desert bighorn sheep	*Ovis canadensis nelsoni*	None (FP)	Yes	No	No	Yes	Yes	Yes
Non-residents								
Willow Flycatcher[1]	*Empidonax traillii*	BCC, (E)	Yes	Yes	Yes	Yes	Yes	Potential
Olive-sided Flycatcher	*Contopus cooperi*	BCC (SSC)	Yes	Yes	Yes	Yes	Potential	Potential

Table 3-2 Special Status Wildlife Species Occurrence in the Project Area

Common Name	***Scientific Name***	***Federal Status (State Status)***	***Installation Occurrence***					
			Combat Center	***MCLB Barstow***	***Edwards AFB***	***Fort Irwin NTC***	***NAWS China Lake***	***CMAGR***
Vermilion Flycatcher	*Pyrocephalus rubinus*	None (SSC)	Potential	Yes	Yes	Yes	Potential	Potential
Gray Vireo	*Vireo vicinior*	BCC (SSC)	Potential	Potential	Yes	Yes	Potential	Potential
Least Bell's Vireo	*Vireo bellii pusillus*	E (E)	Yes	Potential	Yes	Yes	Yes	Potential
Western Snowy Plover[2]	*Charadrius nivosus*	T, BCC (SSC)	Yes	Potential	Yes	Potential	Yes	Potential
Western Yellow-billed Cuckoo	*Coccyzus americanus occidentali*	BCC (E)	Potential	Potential	Yes	Potential	Potential	Potential
Yellow-headed Blackbird	*Xanthocephalus xanthochephalus*	None (SSC)	Yes	Potential	Yes	Yes	Yes	Yes
Bendire's Thrasher	*Toxostoma bendirei*	BCC (SSC)	Potential	Potential	Potential	Yes	Potential	Potential
Gilded Flicker	*Colaptes chrysoides*	BCC (E)	Yes	No	No	No	No	No
Bank Swallow	*Riparia riparia*	None (T)	Yes	Potential	Yes	Yes	Potential	Potential
Short-eared Owl	*Asio flammeus*	None (SSC)	Yes	Yes	Yes	Yes	Potential	Potential
Yellow Warbler	*Dendroica petechia*	BCC (SSC)	Yes	Yes	Yes	Yes	Yes	Potential
Lucy's Warbler	*Oreothlypis luciae*	BCC (SSC)	Yes	Yes	Yes	Potential	Potential	Yes
Yellow-breasted Chat	*Icteria virens*	None (SSC)	Potential	Yes	Yes	Yes	Potential	Potential
Black Tern	*Chlidonias niger*	None (SSC)	Yes	Potential	Yes	Yes	Potential	Potential
Vaux's Swift	*Chaetura vauxi*	None (SSC)	Yes	Potential	Potential	Yes	Potential	Yes
Long-billed Curlew	*Numenius americanus*	BCC (WL)	Yes	Potential	Yes	Potential	Potential	Potential
Bald Eagle	*Haliaeetus leucocephalus*	BGEPA, BCC (E)	Potential	Potential	Yes	Potential	Yes	Potential

Table 3-2 Special Status Wildlife Species Occurrence in the Project Area

Common Name	***Scientific Name***	***Federal Status (State Status)***	***Installation Occurrence***					
			Combat Center	***MCLB Barstow***	***Edwards AFB***	***Fort Irwin NTC***	***NAWS China Lake***	***CMAGR***
Ferruginous hawk	*Buteo regalis*	BCC (WL)	Yes	Potential	Yes	Yes	Potential	Potential
Swainson's hawk	*Buteo swainsoni*	BCC (T)	Potential	Yes	Yes	Yes	Potential	Yes
Osprey	*Pandion haliaetus*	None (WL)	Yes	Potential	Yes	Yes	Potential	Potential

Notes: [1]Only the subspecies *extimus* is federally listed as endangered. All subspecies are state-listed as endangered.
[2]Pacific Coast Population. This population is federally listed as threatened. Both coastal and interior populations are SSC.

Legend: BCC = Bird of Conservation Concern; BGEPA = Bald and Golden Eagle Protection Act; E = Endangered; FP = Fully protected in accordance with the California Fish and Game Code; SSC = Species of Special Concern; T = Threatened; WL = Watch List.

Sources: Circle Mountain Biological Consultants 2010; Egan et al. 2012; LaRue 2013; Stepek et al. 2013; MCLB Barstow 2017; Combat Center 2018d; CDFW 2021.

3.1.3 Environmental Consequences

This analysis for biological resources emphasizes the consequences of raven management actions on the environment, especially as they affect ravens. It also mentions other species adversely affected by raven predation, such as the desert tortoise and other species potentially affected by raven management actions. It also mentions other species adversely affected by raven predation, such as the desert tortoise, and other species potentially affected by raven management actions. Table 3-3 provides an overview of the direct impacts of the various raven management actions on biological resources that could occur under the No-Action Alternative and/or the Proposed Action. The overall effects of the No-Action Alternative and Proposed Action on biological resources, including those that would occur due to reduced raven populations, are further discussed in Sections 3.1.3.1 and 3.1.3.2, respectively.

3.1.3.1 No-Action Alternative

The No-Action Alternative analysis for biological resources focuses on non-lethal management actions (Section 2.1.1 and Table 2-2) because those are primarily what have been and would continue to be implemented at DoD installations in the California desert under this alternative. Although individual installations have obtained depredation permits for relatively low numbers of ravens in the past (see Section 2.2) and could continue to do so under the No-Action Alternative, there would be no concerted lethal raven management actions under the No-Action Alternative and, therefore, impacts from lethal management actions are not addressed in this section.

Common Raven

As described in Table 3-3, impacts to ravens from non-lethal management actions could include reduced non-natural food and water subsidies; reduced non-natural infrastructure for perching, roosting, and/or nesting; flushing of individuals from active hazing; avoidance of treatment areas; increased stress levels from trapping; and disruption of nesting attempts from removal of inactive nests.

Impacts related to reduction of human-provided subsidies and infrastructure would be consistent with removal of non-natural environmental resources that have largely induced the overpopulation of ravens in the California desert.

Impacts from hazing activities, specifically noise, may temporarily increase stress levels and cause flushing of ravens in the vicinity. Noises that are nearby, loud, sudden, and combined with a visual stimulus produce the most intense reactions in animals (Bowles et al. 1999). Impacts to bird species, including ravens, from noise stressors can include a startle reflex that induces flight, increased expenditure of energy, decreased time and energy spent on life functions such as feeding and mating and interruption of breeding or nursing behavior (Efroymson et al. 2000, Larkin 1996). However, anecdotally, ravens rapidly habituate to noise-causing hazing techniques (Merrell 2012).

Under the No-Action Alternative, raven management actions (primarily non-lethal) would continue to be conducted piecemeal at DoD installations in the California desert without any prescribed raven population goals. Raven populations would continue to remain well above historic population levels and are likely to continue to increase. The current population of ravens on DoD lands in the California desert, estimated to be 22,162 individuals (Holcomb 2021b), would not be sustainably reduced and would likely continue to increase if food and water subsidies remain available for the species.

Table 3-3 Direct Impacts of Raven Management Actions on Biological Resources

Raven Management Action	*Raven*	*Desert Tortoise*	*Other Avian Species*	*Other Wildlife Species*
Non-Lethal Management Actions				
Reduction of Food and Water Subsidy	Individual ravens could experience reduced resource availability, particularly those that occur in areas of high subsidized food/water.	No impact.	No impact to most species, as most do not rely on subsidized food/water sources. Species that may be impacted are those that utilize subsidized food/water sources and occur in high numbers, such as European Starlings. No adverse impact to any other avian population.	Generalist wildlife species that use the same subsidized food/water sources as ravens, such as coyote, would experience reduced subsidies. However, generalist species that utilize subsidized resources tend to be abundant in the California desert. No adverse impact to any other wildlife population.
Education and Outreach Regarding Ravens	May further reduce currently and potentially available food and water subsidies.	No impact.	No impact.	No impact.
Removal of Perching, Roosting, and Nesting Sites	Reduced non-natural infrastructure for ravens. May cause individuals to frequent treated sites less.	No impact.	Identical impacts as those to ravens, but only for avian species that utilize human-made infrastructure for perching/roosting/nesting (e.g., European Starling and Rock Dove).	No impact.
Hazing and Other Active Deterrents	Would cause individuals to flush. May cause individuals to avoid areas where hazing regularly occurs.	Tortoises in the vicinity may experience minor, temporary noise disturbance, but would not rise to the level of take under the ESA.	May cause individuals to flush if they are in the vicinity. May cause individuals to avoid areas where hazing has occurred. Impacts would be reduced by focusing activities on ravens.	May cause individuals to flush if they are in the vicinity. May cause individuals to avoid areas where hazing has occurred. Impacts would be reduced by focusing activities on ravens.
Exclusion	Individuals would be excluded from perching/roosting/nesting on human-made structures.	No impact.	Identical impacts as those to ravens, but only for avian species that utilize human-made structures for perching/roosting/nesting (e.g., European Starling and Rock Dove).	No impact.

Table 3-3 Direct Impacts of Raven Management Actions on Biological Resources

Raven Management Action	*Raven*	*Desert Tortoise*	*Other Avian Species*	*Other Wildlife Species*
Effigies	May cause individuals to avoid areas where effigies are placed.	No impact.	No impact.	No impact.
Trapping for Relocation and/or Scientific Study	Trapped individuals would likely experience increased stress levels. Individuals would be actively displaced.	No impact.	Non-target species could be inadvertently trapped and experience increased stress levels, but would be released onsite.	No impact.
Removal of Inactive Nests	Individual raven nesting attempts would be disrupted.	No impact.	No impact. Only raven nests would be removed.	No impact.
Conditioned Taste Aversion	Individuals would experience vomiting and/or mildly irritating odors/tastes associated with treated baits.	No impact.	Little to no impact. Would only be used on models of raven prey (e.g., juvenile tortoise models) and in controlled settings where ravens pose a threat. If other avian species were to attempt to ingest prey models, they would be exposed to mildly irritating odors/tastes and/or vomiting.	Little to no impact. Would only be used on models of raven prey (e.g., juvenile tortoise models) and in controlled settings where ravens pose a threat. If other wildlife species were to attempt to ingest prey models, they would be exposed to mildly irritating odors/tastes and/or vomiting.
Lethal Management Actions				
Egg Oiling	Direct loss of individuals.	No impact.	No impact	No impact
Shooting	Direct loss of individuals. May cause individuals that are not shot to flush if they are in the vicinity. May cause individuals to avoid areas where shooting has occurred.	Tortoises in the vicinity may experience minor, temporary noise disturbance, but would not rise to the level of take under the ESA.	Low risk of non-raven species being inadvertently shot. May cause individuals to flush if they are in the vicinity. May cause individuals to avoid areas where shooting has occurred. Impacts would be reduced by focusing activities on ravens and the areas they congregate.	Low risk of non-raven species being inadvertently shot. May cause individuals to flush if they are in the vicinity. May cause individuals to avoid areas where shooting has occurred. Impacts would be reduced by focusing activities on ravens and the areas they congregate.
Trapping for Euthanasia	Direct loss of individuals.	No impact.	Non-target species could be inadvertently trapped and experience increased stress levels, but would be released onsite.	No impact.

Table 3-3 Direct Impacts of Raven Management Actions on Biological Resources

Raven Management Action	***Raven***	***Desert Tortoise***	***Other Avian Species***	***Other Wildlife Species***
Egg/Nest Destruction	Direct loss of individuals.	No impact.	No impact.	No impact.
Poisoning	Direct loss of individuals via kidney and heart damage. DRC-1339 is slowly metabolized by ravens and fatal within days (Peoples 1965, DeCino et al. 1966, Cunningham et al. 1979, Timm 1994, USDA 2019a).	No impact.	Potential toxicity impacts to non-target birds if ingested or exposed through secondary toxicity. However, many similar non-target species (i.e., diurnal raptors like eagles) are not very sensitive to DRC-1339 (USDA 2019a, b). Impacts would be reduced and/or avoided by bait choice, bait location, pre-baiting, implementing measures in Section 2.4.1, and by using the pesticide in accordance with the pesticide product label (EPA 2019, 2020).	Potential toxicity impacts to non-target wildlife if ingested or exposed through secondary toxicity. However, toxicity to mammals occurs at levels 10-100 times higher than for birds, meaning it requires 10-100 times the amount of the pesticide to be lethal to mammals (USDA 2019a, b). Impacts would be reduced and/or avoided by bait choice, bait location, pre-baiting, implementing measures in Section 2.4.1, and by using the pesticide in accordance with the pesticide product label (EPA 2019, 2020).

Desert Tortoise

As described in Table 3-3, non-lethal raven management actions would have little to no direct impacts on desert tortoises. Under the No-Action Alternative, noise-producing raven hazing tools such as air cannons, streamers, or wailers could be used to deter ravens from certain areas. Although the noise produced from raven hazing activities has the potential to disturb desert tortoises in the vicinity of such activities, there is little potential for noise to affect tortoises for the vast majority of the year for the following reasons: (1) only 5% of a desert tortoise's life is spent aboveground (Nagy and Medica 1986); (2) noise-producing activities would occur on an as-needed basis, occur in specific locations, and would not be continuous; and (3) disturbance would cease immediately when the raven management action is complete. These effects would not cause mortality, and tortoises temporarily affected would be able to resume normal behaviors. As such, noise associated with raven management actions under the No-Action Alternative would not be likely to cause harm or behavioral effects that would rise to the level of take. No other management actions under the No-Action Alternative would directly impact desert tortoises.

As discussed in Section 1.3.3.1, one of the most significant threats to desert tortoises is predation, with ravens often preying on hatchling/juvenile tortoises (USFWS 2011a). Ravens have been implicated as a significant threat to desert tortoise survival and management on DoD lands in the California desert (Boarman et al. 2005; Nagy et al. 2015a, b). As discussed above, the current population of ravens on DoD lands in the California desert would not be sustainably reduced and would likely continue to increase. Therefore, ravens would continue to be a threat to desert tortoise survival and management on DoD lands in the California desert due to continued and perhaps increasing raven predation pressure on hatchling/juvenile tortoises.

Other Avian Species

As described in Table 3-3, certain other avian species would be susceptible to direct impacts from raven management actions under the No-Action Alternative. Raven management actions that would reduce non-natural food and water subsidies; reduce non-natural infrastructure for perching, roosting, and/or nesting; and induce flushing of individuals from hazing could impact non-raven avian species. However, the species that would likely be impacted are those that congregate in the same areas as ravens and/or share the same subsidized resources. Those species (e.g., European Starlings, House Sparrows, and multiple dove species, among others) are common and/or overpopulated and are often non-native species. In addition, if any non-raven species were to be caught in a raven trap, they may experience temporary increased stress levels, but the individual(s) would be released onsite.

Noise impacts to other avian species would be as described for ravens, above, except such activities would be directed at ravens and would only inadvertently and temporarily impact any other species that may be in the vicinity.

The Western Snowy Plover, Southwestern Willow Flycatcher, Western Yellow-billed Cuckoo, Least Bell's Vireo, and Inyo California Towhee, all federally listed species, are either uncommon migrants in the California desert (Cutler et al. 1999; Combat Center 2018d) or utilize habitats (e.g., riparian thickets) that would not be impacted under the Proposed Action and, therefore, there is little to no likelihood of them being directly impacted by non-lethal management actions under the No-Action Alternative.

Other special status species, such as the Burrowing Owl, eagles, and Prairie Falcon would potentially be exposed to noise impacts, as described above, under the No-Action Alternative. However, noise-producing deterrents such as air cannons or wailers would not occur in the vicinity of Golden Eagle nesting sites (refer to Section 2.4.1). In addition, species such as Burrowing Owl and Prairie Falcon occur sparsely and typically in habitats that would not be impacted by the No-Action Alternative.

Ravens are known to prey on eggs, juveniles, and adults of other bird species, including special status species and those protected under the MBTA. Where ravens occur in large numbers, they have been shown to have negative impacts on reproduction for other wild birds (Hayward et al. 2015; McIver et al. 2016; Carle et al. 2017). Under current raven management strategies, raven populations would not be reduced and birds susceptible to raven depredation and harassment would continue to experience a steady increase in predation pressure and harassment caused by ravens. Ravens would likely continue to compete with, harass, and/or prey on special status birds.

Other Wildlife Species

As described in Table 3-3, other wildlife species would be susceptible to direct impacts from raven management actions under the No-Action Alternative. Management actions that would reduce non-natural food and water subsidies and induce flushing of individuals from hazing could impact other wildlife species. However, the species that would likely be impacted are those that occur in the same areas as ravens and/or share the same subsidized resources. Generalist species, such as coyotes, that utilize subsidized resources are abundant in the California desert and resource availability would be reduced to a more natural condition.

Potential impacts from noise-producing deterrents to other wildlife species would be as described for other avian species, above. Any such impacts would be unlikely, temporary, sparse, and would not be lethal.

Ravens are predators of small mammals, reptiles, amphibians, and invertebrate species (Cornell Laboratory of Ornithology 2019c). In the California desert, ravens have been implicated as potential predators of the Mojave fringe-toed lizard and Mohave ground squirrel, although no data exist pertaining to the impacts that ravens have on populations of these special status species. These prey species are understudied, so existing accounts are generally anecdotal, and, as with other wildlife species, the No-Action Alternative would have no measurable direct impacts on their populations.

Summary

As described in the sections above, the No-Action Alternative would be a continuation of existing piecemeal, primarily non-lethal, raven management actions that would have little to no direct impacts on biological resources. Implementation of resource protection measures in Section 2.4.1 would further reduce any potential impacts to non-raven wildlife species. Raven populations at DoD installations in the California desert would remain largely unchecked and may continue to adversely affect populations of other wildlife species. However, continuation of current management actions under the No-Action Alternative would not change the current trajectories of impacts that ravens have on such species. Therefore, the No-Action Alternative would be implemented in compliance with the laws and regulations listed in Sections 1.6 and 3.1.1 and would have less than significant impacts on biological resources.

3.1.3.2 Proposed Action

The Proposed Action analysis for biological resources focuses on non-lethal (Section 2.1.1) and lethal (Section 2.1.2) raven management actions associated with integrated, adaptive management of the raven at each DoD installation. All lethal measures would be conducted according to measures listed in Section 2.4.1 to reduce impacts to non-target wildlife.

Impacts to wildlife from non-lethal management actions would be as described under the No-Action Alternative (Section 3.1.3.1) and are not described again in this section. However, by combining several solutions into a more synergistic approach, non-lethal raven management under the Proposed Action would be more effective for raven management than non-lethal management alone as part of the No-Action Alternative.

Common Raven

Under the Proposed Action, non-lethal management actions would continue to be used, and may be enhanced, to deter ravens from certain areas and reduce local population sizes within certain areas. Impacts to ravens from non-lethal management actions would be as described in Section 3.1.3.1. In addition, conditioned taste aversion could be used and would involve the use of foul-tasting (methyl anthranilate) or illness-inducing (i.e., carbachol) chemicals on treated baits (i.e., mimics for hatchling/juvenile desert tortoises). Individual ravens would either be repulsed by the chemical and/or become temporarily ill (e.g., vomiting), but individuals would not experience any other detrimental effects.

Lethal management actions would be used to enhance the efficacy of the non-lethal management actions that are also part of the Proposed Action and reduce the overall populations of ravens on DoD lands in the California desert. Lethal removal of ravens would be conducted in a focused, rather than dispersed method.

Under the Proposed Action, up to 11,830-13,293 ravens would initially be shot, trapped, poisoned, or otherwise removed (e.g., egg oiling or egg/nest removal) from the population on DoD lands in the California desert. This amount of take is based on current USFWS raven estimates (Holcomb 2021b) and would amount to roughly 60% of ravens on DoD lands in the California desert, 13% of ravens in the entire California desert, and 4% of the statewide population of ravens in California. Following initial raven removal, up to 1,477-1,715 ravens would be removed annually from DoD lands in the California desert to maintain raven populations at sustainable levels. Per USFWS analysis, as outlined in Section 2.3, this initial reduction of raven densities would allow for raven populations to be maintained at relatively constant densities. Ongoing removal would account for incidental raven recruitment.

Implementation of raven management actions under the Proposed Action are likely to have varying degrees of success temporally and geographically. Therefore, management actions would be implemented in a way that facilitates scientifically sound monitoring. If adopted, discretionary monitoring (Sections 2.4.2 and 5.2) and adaptive management (Section 5.4) would allow for multiple courses of action to be used simultaneously to achieve successful results and ensure that raven populations are maintained at sustainable population levels. Although individual ravens would be lethally removed, the integrated, adaptive management of ravens on DoD lands in the California desert is designed to maintain a sustainable raven population. Therefore, detrimental effects would be less than significant.

Desert Tortoise

As described in Table 3-3, lethal raven management actions would have little to no impact on desert tortoises. Noise associated with shooting of ravens would have similar impacts to tortoises as those described in Section 3.1.3.1 for the use of noise-producing deterrents. Overall, tortoises may experience minor, temporary impacts from noise, but would be able to resume normal behaviors following such activities. In addition, shooting of ravens would often be done with suppressed firearms and there would be little to no noise associated with the action. Other lethal management actions (Table 3-3) that would directly impact ravens would have no impact on tortoises.

A primary driver for the Proposed Action is to protect desert tortoise populations from predation by ravens. The Proposed Action would be consistent with the 2008 EA to facilitate desert tortoise recovery by reducing raven depredation of tortoises in the California desert (USFWS 2008). The 2008 EA provided a framework for non-lethal raven control mechanisms and localized lethal mechanisms to provide immediate protection to hatchling and juvenile desert tortoises. This was outlined by identifying and removing offending ravens that had preyed on, or attempted to prey on, desert tortoises (USFWS 2008). Both the 2008 EA and this PEA are consistent with the USFWS's 2011 Revised Recovery Plan for the Mojave Population of the Desert Tortoise (USFWS 2011a), which identifies reducing overall predation on the desert tortoise as a recovery task.

Lethal removal of ravens would have immediate beneficial impacts on desert tortoise hatchlings and juveniles by reducing predation pressure on these age classes. As outlined in Section 2.4.1, adherence to resource protection measures would reduce and/or mitigate any unintended effects (e.g., noise from shooting as discussed above) to non-target species, including desert tortoises implementation of the Proposed Action, therefore, would have little to no direct impacts on the desert tortoise but would have indirect beneficial impacts on desert tortoise populations in the California desert.

Other Avian Species

As with the No-Action Alternative, non-lethal raven management actions under the Proposed Action would have less than significant effects on non-target bird species as outlined in Section 3.1.3.1. In addition, conditioned taste aversion techniques would be directed at ravens (i.e., would only be used on models of raven prey, such as juvenile tortoise models) and only be used in controlled settings where ravens pose a threat. If other avian species were to attempt to ingest prey models, they would be exposed to mildly irritating odors/tastes and/or vomiting. However, it is not likely that other avian species would attempt to prey on models in a controlled setting, any impacts would be temporary, and they would not be lethal.

As described in Table 3-3, other avian species would be susceptible to direct impacts from lethal raven management actions under the Proposed Action. Egg oiling and nest destruction would only be directed at ravens and would have no impact on other species. As described in Section 3.1.3.1, if any non-raven species were to be caught in a raven trap, they may experience temporary increased stress levels, but the individual(s) would be released onsite.

Shooting would only be done by personnel authorized by installation commands following humane euthanasia practices. During the shooting of ravens, there would be low potential for other species to inadvertently be shot. However, this would be minimized because shooting would not occur where there is a high potential to impact other species. Noise impacts to other avian species from shooting would be similar to those described in Section 3.1.3.1 for noise-producing deterrents and would only inadvertently and temporarily impact any other species that may be in the vicinity. In addition, shooting of ravens would often be done with suppressed firearms and there would be little to no noise associated with the action. Moreover, firearms are regularly discharged on military installations, and hunting and shooting are allowed on much of the land in the California desert. Per the resource protection measures in Section 2.4.1, all shot used would be non-toxic as listed in 50 CFR 20.21(j).

Use of pesticide for raven control could have potential ecological toxicity impacts to non-target birds, specifically if individuals ingest the pesticide or are exposed through secondary toxicity (i.e., poisoning by ingesting another animal that already has pesticide in its system). However, a Human Health and Ecological Risk Assessment on the use of DRC-1339 (USDA 2019a; Appendix C) determined that the risk is low to non-target animals and the environment when used according to the most current product label (EPA 2019,

2020; Appendix C). DRC-1339 is toxic to some non-raven bird species, but this hazard can be avoided by bait choice, bait location, and pre-baiting. Moreover, many similar non-target species (i.e., diurnal raptors – hawks, eagles, and falcons) are not very sensitive to DRC-1339 because the pesticide is rapidly metabolized (90% in 2 hours) and excreted in these species (USDA 2019a, b).

As described in Section 3.1.3.1, the Western Snowy Plover, Southwestern Willow Flycatcher, Western Yellow-billed Cuckoo, Least Bell's Vireo, and Inyo California Towhee, all federally listed species, are either uncommon migrants in the California desert or utilize habitats that would not be impacted under the Proposed Action and, therefore, there is little to no likelihood of them being impacted by lethal management actions under the Proposed Action.

Other special status species, such as the Burrowing Owl, eagles, and Prairie Falcon would potentially be exposed to noise impacts from shooting. However, as discussed in Section 2.4.1, no take, including harassment or disturbance, of Bald Eagles or Golden Eagles would occur. Therefore, any shooting would not occur in the vicinity of Bald Eagle or Golden Eagle nesting sites. In addition, species such as Burrowing Owl and Prairie Falcon occur sparsely, shooting would only occur sporadically, and shooting would often be conducted with suppressed firearms to reduce noise impacts to negligible levels.

Indirect impacts of raven population control on non-raven bird species, including those protected under the ESA and/or MBTA, would be similar to those discussed under the No-Action Alternative, except that the goal of the Proposed Action is to reduce current raven populations to more sustainable levels consistent with historic population levels. This would result in beneficial impacts to species that are preyed upon or harassed by ravens or that compete with ravens for resources. Therefore, implementation of the Proposed Action could have minor, adverse direct impacts on non-raven bird species, but would have indirect beneficial impacts on some species.

Other Wildlife Species

Impacts to other wildlife species under the Proposed Action would be similar to those described above for other avian species. Any differences are described below.

As described in Table 3-3, other wildlife species could be susceptible to direct impacts from the use of pesticide on ravens, specifically if individuals ingest the pesticide or are exposed through secondary toxicity. However, toxicity to mammals occurs at levels 10-100 times higher than for birds, meaning it requires 10-100 times the amount of the pesticide to be lethal to mammals (USDA 2019a, b). Other wildlife, such as reptiles, are not likely to ingest the pesticide-baited food sources that would be used because the baited food would be chosen for raven consumption and the pesticide would be used in controlled settings. In addition, impacts would be reduced and/or avoided by bait location, pre-baiting, implementing measures in Section 2.4.1, and by using the chemical in accordance with the pesticide product label (EPA 2019, 2020; Appendix C).

As previously discussed, ravens have been implicated as potential predators of the Mojave fringe-toed lizard and Mohave ground squirrel, both special status species, although no data exist pertaining to the impacts that ravens have on populations of these species. These prey species are understudied, so existing accounts are generally anecdotal, but it may be inferred that reduction of raven densities could reduce predation pressure on these species.

Management of raven populations under the Proposed Action may indirectly benefit wildlife species that experience predation pressure or harassment from ravens in the California desert. Therefore, implementation of the Proposed Action could have minor, adverse direct impacts on wildlife species, but would have indirect beneficial impacts on some species.

Summary

As described in the sections above, the Proposed Action would reduce current raven populations on DoD lands in the California desert to more sustainable levels. Although individual ravens would be directly impacted under the Proposed Action, and other wildlife species may inadvertently be directly impacted, with the implementation of resource protection measures in Section 2.4.1, impacts to other wildlife species would be minimized and/or avoided. The proposed reduction in densities of ravens on DoD lands in the California desert would have overall beneficial impacts to wildlife populations, especially those that experience predation pressure from increased raven populations. Therefore, the Proposed Action would be implemented in compliance with the laws and regulations listed in Sections 1.6 and 3.1.1 and would have less than significant impacts on biological resources.

3.2 HEALTH AND SAFETY

Health and safety can be defined as the science of identifying and analyzing potential risk factors, and developing appropriate regulations and procedures intended to prevent accident or injury in the workplace or public environment. Health and safety issues addressed in this PEA include risks of exposure to military operations and personnel, impacts associated with accumulation of raven excreta under heavily used roost/perch sites, shooting of ravens, and use of pesticides and other chemicals for raven depredation and management. Potential risks to military operations and personnel are related to flight issues from bird/wildlife aircraft collisions, which are covered under the BASH program.

3.2.1 Regulatory Framework

DoD installations practice Operational Risk Management as specified in DoDI 6055.01, *DoD Safety and Occupational Health Program*, Change 3 (April 2021). It is DoD policy to protect DoD personnel from accidental death, injury, or occupational illness, and apply risk management strategies to eliminate occupational injury or illness and loss of mission capability and resources both on and off duty. DoD contractor personnel and contractor operations are directly responsible for complying with federal and state occupational safety and health standards. The use of pesticides including applications, storage, and the archiving of records are regulated by the Federal Insecticide, Fungicide and Rodenticide Act, state and local laws, DoD, Army, Air Force, DoN, and/or USMC regulations.

3.2.2 Affected Environment

3.2.2.1 Common Raven

Overpopulation of ravens in specific regions can result in human health hazards associated with build-up of raven excreta on buildings, dwellings, other public locations, vehicles, aircraft, and equipment where ravens roost, perch, and nest (Fort Irwin 2016; Combat Center 2018b). This can create a potential disease vector. Ravens frequently build nest substrates on electrical and communications structures and other non-natural structures, causing health, safety, and operational issues due to their presence, as well as during removal. The most common complaint that the USDA receives from industrial and commercial facilities regarding the raven is about the raven excreta deposited on equipment, working surfaces, handrails, stairs, and other surfaces that workers contact (Merrell 2012). Additional human health issues, as well as impacts

to natural resources, result from the removal and scattering of refuse material from garbage receptacles, dumpsters, and landfills by ravens.

As discussed in Section 1.3.3.3, the build-up of raven excreta on equipment, working surfaces, handrails, stairs, and other surfaces that workers contact is a health concern. At the Combat Center, the most significant human concerns associated with raven overpopulation result from ravens congregating in the hundreds around dusk in the shade structures of various yards at the Mainside cantonment area and powerlines near Camp Wilson (Boarman and Chamblin 2005). Excrement accumulation is cleaned daily at certain locations and times of year, but the volume is so significant that it poses a human health hazard and many failed work environment inspections (Photo 2). The Naval Hospital has prescribed PPE for daily cleanup and work performed around these contaminated areas (Combat Center 2018c). Despite management practices to discourage ravens from using these areas (i.e., signs, educational materials, notifications provided via email directing personnel in the reduction of subsidies, and a desert awareness educational briefing for all incoming personnel and contractors) and the installation of bird spikes and wire barriers, ravens continue to congregate in areas of concern and cause potential health and safety issues (Combat Center 2019a).

Ravens are known hosts of Newcastle disease, a viral infection that is deadly to many species of birds and which is spread through the bodily discharges of infected birds (Munir et al. 2015; Lastica-Ternura et al. 2016). Although Newcastle disease virus is not deadly to humans, it can cause flu-like symptoms, conjunctivitis, and/or laryngitis (National Cancer Institute 2019). This has been a cause of health concern for the 1st Tank Battalion at the Combat Center, because raven excrement accumulates in areas where ravens perch and roost. An accumulation of bird excreta can also spread *Histoplasma capsulatum*, which can cause histoplasmosis. Histoplasmosis is an infection caused by breathing in spores of a fungus often found in bird and bat droppings (Mayo Clinic 2019). Histoplasmosis is most commonly transmitted when these spores become airborne during cleanup or demolition projects and can also be transmitted by soil dust contaminated by bird or bat droppings. Another fungus found in bird excreta is *Cryptococcus neoformans*, which can cause mild infections that occur without symptoms. Pigeon droppings appear to be the most common source of this fungal infection in humans (New Jersey Department of Health and Senior Services 2000). There is a slight risk in dealing with raven excreta, but there is no current evidence that raven excreta is the source of any such infections in the California desert. However, precautions should be taken when cleaning areas contaminated with raven excreta. These include washing the excreta down with water and using PPE, including wearing gloves, goggles, and N95 masks.

Corvids, including ravens, are also carriers of the West Nile virus, a potentially fatal disease to humans. Mosquitoes serve as a vector, spreading West Nile virus from infected birds to people. Human outbreaks are often attributed to corvid outbreaks in the same location (Raven Core Team 2021a).

3.2.2.2 Bird/Wildlife Aircraft Strike Hazard

As discussed in Section 1.3.3.3, large groups of ravens can roost near military airfields, increasing the potential for BASH (Chamblin and Boarman 2005). Between 1996 and 2015, there were 43 reported BASH incidents involving ravens and civil aircraft in the U.S. (Federal Aviation Administration 2016). BASH is a serious threat to military aircraft and personnel. Most bird and wildlife strikes do not result in any aircraft damage, but some bird and wildlife strikes have led to serious accidents involving aircraft of every size. Bird and other wildlife strikes to aircraft result in an estimated cost of over $500 million in damage to the U.S. civil aviation industry each year (Federal Aviation Administration 2019). Although ravens are implicated in BASH incidents involving civilian aircraft (Federal Aviation Administration 2016), Pfeiffer et al. (2018) found that of over 125,000 wildlife strike report records for the DoN and U.S. Air Force

between 1990 and 2017, none of them involved ravens. However, the DoN has direction to remove any known raven and/or crow roosting sites on or around airfields because of their inherent risk to aircraft safety (Commander Navy Installations Command 2010).

From 2004 to 2011, approximately 124 bird airstrikes were recorded at Edwards AFB. Most of the birds involved in aircraft strikes along the main runways were identified as Horned Larks, one of the most common desert birds (Edwards AFB 2015). However, ravens, pigeons, House Finches, owls, and other birds are found in hangars and along the flightline (Edwards AFB 2015).

3.2.2.3 Pest Management

DoD installations have prepared Integrated/Installation Pest Management Plans (Combat Center 2017; Fort Irwin NTC 2017; Edwards AFB 2021b) that outline all the pest management and pesticide-related activities conducted on-installation. These plans provide compliance systems and streamlining operations involving the use of pesticides including applications, storage, and the archiving of records all of which are tightly regulated by the Federal Insecticide, Fungicide and Rodenticide Act, state and local laws, DoD, Army, Air Force, DoN, and/or USMC regulations. The pest management objectives of these plans include:

- Supporting the military mission by protecting the health and welfare of military and dependent personnel
- Protecting all buildings, real property, vehicles, and equipment
- Reducing the reliance on pesticides to solve pest problems
- Protecting native wildlife species and their habitats, including special status species

Lethal management of pests includes the use of traps, pesticides, and shooting. To ensure health and safety, pesticides are only used when nonchemical treatments fail. Authorized pesticides may only be applied on the installations by appropriately certified (DoD or State) pesticide applicators. All pesticide treatments must be made in strict accordance with label directions. Pesticides used must be registered by the EPA, approved for use as a pesticide in the State of California, and approved by the DoD, Army, Air Force, DoN, and/or USMC for control of target pests.

3.2.3 Environmental Consequences

This analysis emphasizes the consequences of raven management actions on health and safety, especially those associated with shooting and use of pesticides. It also discusses the health and safety impacts associated with reduced raven populations under the Proposed Action. Table 3-4 provides an overview of the direct impacts of the various raven management actions on health and safety that could occur under the No-Action Alternative and/or the Proposed Action. The overall effects of the No-Action Alternative and Proposed Action on health and safety, including those that would occur due to reduced raven populations, are further discussed in Sections 3.2.3.1 and 3.2.3.2, respectively.

Table 3-4 Direct Impacts of Raven Management Actions on Health and Safety

Raven Management Action	*Potential Effects to Health and Safety*
Non-Lethal Management Actions	
Reduction of Food and Water Subsidy	Could have beneficial impact if there is a reduction in scattering of refuse material from garbage receptacles, dumpsters, and landfills by ravens.
Education and Outreach Regarding Ravens	Could have beneficial impact if there is a reduction in scattering of refuse material from garbage receptacles, dumpsters, and landfills by ravens.
Removal of Perching, Roosting, and Nesting Sites	Could have beneficial impact if ravens are kept away from areas where raven excrement build-up could affect DoD personnel.
Hazing and Other Active Deterrents	Could have beneficial impact if ravens are kept away from areas where raven excrement build-up could affect DoD personnel. Use of lasers would result in less than significant impacts by following safety protocols described in Sections 2.1.1.4 and 2.4.1.
Exclusion	Could have beneficial impact if ravens are kept away from areas where raven excrement build-up could affect DoD personnel.
Effigies	Could have beneficial impact if ravens are kept away from areas where raven excrement build-up could affect DoD personnel.
Trapping for Relocation and/or Scientific Study	Could have beneficial impact if ravens are kept away from areas where raven excrement build-up could affect DoD personnel.
Removal of Inactive Nests	Could have beneficial impact if ravens are kept away from areas where raven excrement build-up could affect DoD personnel.
Conditioned Taste Aversion	Use of chemicals for taste aversion would result in less than significant impacts by following safety protocols described in Section 2.4.1.
Lethal Management Actions	
Egg Oiling	No direct impact.
Shooting	Shooting would result in less than significant impacts by following safety protocols described in Section 2.4.1.
Trapping for Euthanasia	Could have beneficial impact if ravens are kept away from areas where raven excrement build-up could affect DoD personnel.
Egg/Nest Destruction	Could have beneficial impact if ravens are kept away from areas where raven excrement build-up could affect DoD personnel.
Poisoning	Use of pesticides would result in less than significant impacts by following safety protocols described in Section 2.4.1.

3.2.3.1 No-Action Alternative

The No-Action Alternative analysis for health and safety is focused on non-lethal raven management actions (Section 2.1.1 and Table 2-2) because those are primarily what have been and would continue to be implemented at DoD installations in the California desert under this alternative.

Raven Management Actions

Under the No-Action Alternative, the continued use of non-lethal raven management actions would not have direct impacts on health and safety, as these management actions are not inherently dangerous to humans. As indicated in Table 3-4, only use of lasers as a method of hazing could affect health and safety. The use of lasers would follow safety protocols described in Sections 2.1.1.4 and 2.4.1, including coordination with an installation's Range Control to ensure human safety in the area(s) of use. Additional safety measures may include the use of laser safety glasses to prevent eye damage to personnel using lasers. Overall, implementation of any other non-lethal raven management action would be in compliance with DoDI 6055.01, *DoD Safety and Occupational Health Program*, Change 3 (April 2021).

Reduced/Managed Raven Populations

Overall, raven populations would not be reduced by a measurable amount on DoD installations under the No-Action Alternative. Some non-lethal measures (e.g., hazing, deterrents, and exclusion) could have minor indirect beneficial impacts by reducing the presence of ravens in areas used by DoD personnel, but these measures have had limited, short-term success in the past. In general, health and safety impacts described in Section 1.3.3.3 would likely continue to persist and increased raven populations would continue to result in, and likely increase, negative impacts on health and safety at DoD installations in the California desert. However, cleanup of raven excreta and use of PPE would continue to occur, as described in Sections 1.3.3.2 and 1.3.3.3. Therefore, these cleanup measures would reduce the health and safety impacts to less than significant.

Summary

As discussed above, the proper use of non-lethal raven management actions by trained personnel and implementation of resource protection measures (Section 2.4.1) would result in less than significant impacts to health and safety. Although raven populations would not be reduced by a measurable amount at the six DoD installations, cleanup of raven excreta and use of PPE would continue to occur and would reduce the health and safety impacts to less than significant levels. Therefore, the No-Action Alternative would be implemented in compliance with the laws and regulations listed in Section 1.6 and discussed in Section 3.2.1 and would have less than significant impacts on health and safety.

3.2.3.2 Proposed Action

The Proposed Action analysis for health and safety focuses on non-lethal (Section 2.1.1) and lethal (Section 2.1.2) raven management actions raven management actions associated with integrated, adaptive management of the raven at each DoD installation. Impacts to health and safety from non-lethal measures would be similar to those described under the No-Action Alternative.

Raven Management Actions

Because of their nature, lethal management actions could have direct impacts to health and safety. As indicated in Table 3-4, only use of lasers, shooting, use of pesticide, and use of chemicals for conditioned taste aversion could affect health and safety. Impacts associated with use of lasers would be the same as described under the No-Action Alternative.

Shooting of ravens would follow safety protocols described in Section 2.4.1 and be in compliance with all applicable federal, state, and local requirements. Specifically, (1) shooting of ravens would be conducted by trained professionals and in a manner that ensures safety to personnel and public safety, and (2) shot must be non-toxic as listed in 50 CFR 20.21(j).

Use of pesticide for targeted poisoning of ravens, using DRC-1339, on lands owned or used by the DoD in the California desert would be part of an integrated pest management program and used in a focused manner. Use of DRC-1339 would follow safety protocols described in Section 2.4.1. USDA has conducted a Human Health and Ecological Risk Assessment on the use of DRC-1339 (USDA 2019a; Appendix C), and determined that the risk is low to humans, animals, and the environment when used according to the label (EPA 2019, 2020; Appendix C). DRC-1339 readily degrades in soil (USDA 2001, Battelle 2018) and water (USDA 2001, EPA 2011), and therefore the pesticide does not persist in the environment. DRC-1339 products are restricted use pesticides and are available only for use by USDA Wildlife Services employees or others under their direct supervision (USDA APHIS 2020). Only personnel trained in the use of DRC-1339 products would implement the use of this pesticide to control ravens.

Carbachol could be used as a non-lethal raven management action to induce conditioned taste aversion to control raven predation on desert tortoises (see Section 2.1.1.9). This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200) (ThermoFisher Scientific 2018). Carbachol is fatal if swallowed by humans and may be irritating to the mucous membranes and upper respiratory tract; may be harmful by inhalation or skin absorption, and may cause eye, skin, or respiratory system irritation (Cayman Chemical 2018). Carbochol would only be used for the intended purpose (conditioned taste aversion) by trained personnel and while following guidelines outlined in the product Safety Data Sheet (Cayman Chemical 2018; ThermoFisher Scientific 2018; Appendix B).

Methyl anthranilate could also be used as a non-lethal raven management action to induce conditioned taste aversion to control raven predation on desert tortoises (see Section 2.1.1.9). However, methyl anthranilate is a food grade chemical derived from grape juice and commonly used as a flavoring agent. Methyl anthranilate is considered an eye and skin irritant and should be rinsed with plenty of water if in eyes and wash off with soap and plenty of water if on skin (ThermoFisher Scientific 2020; Appendix B). When used according to the product label, there would be less than significant impacts to health and safety associated with use of methyl anthranilate. A methyl anthranilate Safety Data Sheet is provided in Appendix B.

Reduced/Managed Raven Populations

Lethal management actions to reduce raven populations would result in reduced nesting and roosting in buildings, dwellings, other public locations, and equipment where ravens roost and nest. Removal or modification of nesting structures, installation of perching deterrents in specific areas of concern, and the use of hazing to deter ravens would result in reducing the build-up of raven excreta in these areas. Reduced raven populations would also reduce the potential for scattering of refuse material from garbage receptacles, dumpsters, and landfills by ravens. Management actions to reduce overall raven populations would also result in reducing the BASH risk associated with ravens. In addition, under the Proposed Action, the DoD could employ specific measures near airfields (e.g., falconry or harassment by drones) to deter large groups of ravens that are posing a BASH risk. These improvements would have a beneficial impact on health and safety.

Summary

As discussed above, the proper use of non-lethal and lethal management actions by trained personnel and implementation of resource protection measures (Section 2.4.1) would result in less than significant impacts to health and safety. The reduction of raven populations at DoD installations in the California desert under the Proposed Action would have a beneficial impact to health and safety by reducing health risks in areas used by DoD personnel. Therefore, the Proposed Action would be implemented in compliance with the laws and regulations listed in Section 1.6 and discussed in Section 3.2.1 and would have less than significant beneficial impacts on health and safety.

3.3 CULTURAL RESOURCES

Cultural resources are prehistoric or historic remains or indicators of past human activities, including artifacts, sites, structures, landscapes, and objects of importance to a culture or community for scientific, traditional, religious, or other purposes. This definition contrasts with the definition of a "historic property," which can be any of the above listed cultural resources or combination thereof that meets one or more of the National Register of Historic Places (NRHP) eligibility criteria. If a cultural resource does not meet the NRHP's eligibility criteria, it is not considered a historic property under the NHPA, as amended [54 USC §300101 et seq.].

Additional explanations of the general categories of historic properties are provided below:

- *Archaeological resources* occur in places where people altered the ground surface or left artifacts or other physical remains (e.g., projectile points, glass bottles, pottery). Archaeological resources can be classified as either isolates or sites. Isolates generally cover a small area and contain only one or two artifacts. Sites however are larger in size, contain more artifacts, and sometimes contain features or structures. Archaeological resources can be either prehistoric or historic.
- *Architectural resources* are standing buildings, dams, canals, bridges, windmills, oil wells, and other similar structures. They are generally historic in affiliation.
- *Traditional cultural properties* (TCPs) are those associated with the cultural practices or beliefs of a living community that link the community to its past and help maintain its cultural identity. Most traditional cultural resources in California are associated with American Indians. TCPs can include archaeological resources, locations of prehistoric or historic events, sacred areas, sources of raw materials used in the manufacture of tools and/or sacred objects, certain plants, or traditional hunting and gathering areas.

Historic properties are defined in the federal regulations outlining Section 106 of the NHPA, as amended (54 USC 306108 *et seq.*). The term historic property has a very specific meaning within cultural resources management (36 CFR 800). Historic properties can be categorized into classes of resources that have the potential to be adversely affected by various implementation methods for the Proposed Action if avoidance is not the first course of action. Typical historic property categories include, but are not limited to:

- Buildings, Structures, or Objects (BSOs)
- Prehistoric and Historic Archaeological Sites
- TCPs
- Sacred Sites
- Cultural Landscapes
- Archaeological and Historic Districts
- National Monuments
- National Historic Landmarks

To determine if a historic property is eligible for listing in the NRHP, an agency must consult with the SHPO, Tribal Historic Preservation Officer, federally recognized Tribal Governments, and other interested parties. If the agency and SHPO do not agree on the resource's determination of eligibility, then the agency can seek a formal Determination of Eligibility from the Keeper of the National Register (36 CFR 63).

To be eligible for the NRHP, a property must possess integrity of location, design, setting, workmanship, feeling, and association, and meet the following criteria for evaluation in at least one area of significance as defined by the *Secretary of the Interior's Standards for Evaluation* (36 CFR § 60):

> (a) associated with events that have made a significant contribution to the broad patterns of American history; or
>
> (b) associated with the lives of persons significant in our past; or
>
> (c) embody the distinctive characteristic of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic value, or that represent a significant or distinguishable entity whose components may lack individual distinction; or
>
> (d) have yielded, or may likely yield, information important in prehistory or history.

The NRHP criteria recognize seven aspects of integrity: location, design, setting, materials, workmanship, feeling, and association. A resource must retain several, if not all of these aspects, to be considered eligible for listing in the NRHP. For archaeological resources, eligibility is generally determined under Criterion D for the ability to provide important information in prehistory and/or history. The assessment of integrity for archaeological properties depends on the data requirements of an applicable research design. This includes the identification of appropriate physical remains in an intact depositional (horizontal or vertical) context. Once a federal agency has determined a cultural resource to be significant through the consultation process with the SHPO, federally recognized Tribal Governments, and other interested parties, and the SHPO concurs, the agency has a responsibility to manage the resource as a historic property.

3.3.1 Regulatory Framework

Although there are multiple laws, regulations, and EOs that govern the identification and management of cultural resources on DoD managed lands, the main regulatory drivers are Section 110 and 106 of the NHPA of 1966 [54 USC 300101 *et seq.*] and associated regulations [36 CFR § 800]. Section 110 of NHPA requires all federal agencies to identify historic properties on their landholdings while Section 106 of NHPA requires all federal agencies to consider the effects of their undertakings on historic properties and seek to avoid, minimize, or mitigate adverse effects to these properties (36 CFR § 800.1(a)). Section 106 also requires agencies to consult with federally recognized Tribal Governments and other stakeholders with a vested interest in the undertaking.

Cultural resources occurring within the proposed project area have the potential to be affected by lethal and non-lethal raven management actions. These resources are protected by, and managed in accordance with, various statutory and executive requirements including, but not limited to, the following:

- NHPA of 1966, as amended (54 USC §300101 *et seq*.)
- National Monument Act/Antiquities Act of 1906 (36 CFR 65)
- Reservoir Salvage Act of 1960
- Archaeological Resources Protection Act of 1979
- American Indian Religious Freedom Act of 1978
- Presidential Memorandum for Heads of Executive Departments and Agencies: *Government to Government Relations with Native American Tribal Governments*
- Curation of Federally Owned Archaeological Collections (36 CFR 79)
- NRHP (36 CFR 60) and Determinations of Eligibility for Inclusion in the National Register (36 CFR 63)
- Protection of Archaeological Resources: Uniform Regulations (43 CFR 7)
- Protection of Historic Properties (36 CFR 800) - Section 106 Process
- Secretary of Interior Standards for the Treatment of Historic Properties (36 CFR 68)
- Wavier of Federal Agency Responsibility under Section 110 of the NHPA (36 CFR 78)
- Regulations Implementing the NEPA (40 CFR 1500-1508)
- Preservation of American Antiquities (43 CFR 3)
- Supplemental Regulations [per Archaeological Resources Protection Act] (43 CFR 7)
- Native American Graves Protection and Repatriation Act Implementation (43 CFR 10)
- Historic Sites, Buildings, Objects and Antiquities Act of 1935
- Religious Freedom Restoration Act of 1993
- Archaeological and Historic Preservation Act of 1974
- EO 11593, *Protection and Enhancement of the Cultural Environment*

- EO 13006, *Locating Federal Facilities on Historic Properties in Our Nation's Central Cities*
- EO 13007, *Indian Sacred Sites*
- EO 13175, *Consultation and Coordination with Indian Tribal Governments*
- EO 13287, *Preserve America*
- EO 13327, *Federal Real Property Asset Management*
- EO 13514, *Federal Leadership in Environmental Energy, and Economic Performance*

The DoD and its agencies have developed numerous instructions, regulations, and orders to emphasis the legal requirements for cultural resources management. The Proposed Action currently involves DoD agencies from the Army, Air Force, Navy, and USMC. Each agency is required to adhere to all DoD polices and its agency-specific policies which include, but are not limited to the following:

- Army Regulation 200-4, Environmental Quality, Cultural Resources
- Air Force Manual 32-7003, Environmental Conservation (April 2020)
- DoDI 4715.16, Cultural Resource Management (September 2008)
- DoDI 4710.02, DoD Interactions with Federally Recognized Tribes (September 2018)
- DoD American Indian and Alaska Native Policy
- Marine Corps Guidance for Completion of Integrated Cultural Resources Management Plans (February 2009)
- MCO 5090.2 Ch. 3, Volume 8, Environmental Compliance and Protection Manual
- MCO 57501.1H, Manual for the Marine Corps Historical Program (February 2009)
- Secretary of the Navy Instruction 4000.35B, DoN Cultural Resources Program (April 2019)
- Secretary of the Navy Instruction 11010.14B, DoN Policy for Consultation with Federally Recognized Indian Tribes (January 2019)
- Office of the Chief of Naval Operations Instruction 5090.1, DoN Environmental Readiness Program Manual (June 2021)

3.3.2 Affected Environment

The affected environment for cultural resources is based on the establishment of the area of potential effect (APE) of an undertaking, through consultation with the California SHPO. An APE is defined in 36 CFR § 800.16(d) as "the geographic area or areas within which an undertaking may directly or indirectly cause changes in the character or use of historic properties, if any such properties exist." The APE, and therefore the affected environment, for the Proposed Action includes lands owned or used by the six DoD installations in the California desert under NEPA and is more discrete during the NHPA Section 106 consultation process. The APE for individual management methods shall be determined through the Section 106 consultation process.

Each of the six DoD installations has one or more historic properties within the boundaries of the installation lands. Details are provided below. In addition to the historic properties listed in the NRHP, each installation manages lands that have not been surveyed for potential historic properties and therefore has the potential to increase the number of historic properties if cultural resources are located and found to meet the NRHP eligibility criteria.

Combat Center

Currently, the Combat Center's cultural resources data base contains one NRHP-listed property, known as the Foxtrot petroglyph site, and 2,832 recorded archaeological sites. The cultural resources database is currently being updated and checked for accuracy, so percentages of historic, prehistoric, and

multicomponent sites are not available. However, most archaeological sites located at the Combat Center are prehistoric camp sites or lithic reduction occurrences.

Consulting Tribal Governments have identified four sacred sites as TCPs, but further consultation is needed to develop more understanding of the cultural ties to the lands.

As of 2018, the Combat Center's real property database (INFads) contains over 1,200 BSOs. In 2002, the Combat Center consulted with the SHPO on the eligibility of Cold War-era buildings constructed between 1946 to 1989 and none were found eligible for listing in the NRHP. In 2018, the Combat Center evaluated an additional 123 Cold War-era BSOs that where not 50 years or older when evaluated in 2002. The SHPO concurred that all 123 BSOs were not eligible for listing in the NRHP. The Combat Center currently has no architectural BSOs that are eligible for listing in the NRHP (SHPO 2018).

MCLB Barstow

In total, 227 archaeological resources have been identified at MCLB Barstow, consisting of 81 sites and 146 isolated resources. Of the 81 sites, 52 are prehistoric, 26 are historic, and 3 are multicomponent (contains both prehistoric and historic components). One archaeological site has been determined eligible for inclusion in the NRHP; three have been recommended eligible for inclusion in the NRHP; one site has also been designated a California Point of Historical Interest; and another has been designated a California Historical Landmark (DoN and MCLB Barstow 2020).

Previous studies have evaluated 714 buildings and structures located at MCLB Barstow. In 1996, 115 buildings were evaluated as part of a larger study; most of the buildings were World War II properties. In 1999, 627 buildings and structures were inventoried and evaluated, including 28 that had previously been inventoried in 1996; the resources addressed in this later study were primarily Cold War-era properties. Following the 1999 study, many buildings and structures at MCLB Barstow were demolished. The most recent study in 2011, identified 326 remaining structures at MCLB Barstow. Of these, 80 were modern structures built after 1989; the remaining 246 properties were recorded and evaluated. No buildings or structures evaluated in any of the three studies were found to be eligible for inclusion in the NRHP, either as a district or individually. In 2013, SHPO concurred with the NRHP eligibility determinations for 627 buildings and structures at MCLB Barstow, which concluded that all buildings, including those that turned 50 years of age since previous evaluation efforts, are not eligible for NRHP inclusion either individually or as contributors to a historic district (DoN and MCLB Barstow 2020).

There are currently no identified TCPs at MCLB Barstow. However, a site known as Rattlesnake Rock, may fit the definition of a TCP (DoN and MCLB Barstow 2020).

Edwards AFB

To date, Edwards AFB has identified 5,184 archaeological sites. Edwards AFB has 3,234 facilities and structures recorded as real property; as of 2016, one BSO was listed as a National Historic Landmark. Five sites have been identified by a Tribal Government as sacred sites. There are no TCPs within Edwards AFB.

Fort Irwin NTC

Fort Irwin NTC is approximately 750,000 acres in size. Cultural resource surveys have been conducted on approximately half the total acres and does not include the 103,000 acres of desert tortoise mitigation lands currently managed by Fort Irwin. The concentration of recent cultural resources surveys is targeted at the Western Training Area in preparation for opening the area to full training; however smaller-scale surveys are occurring throughout the installation on a project-by-project basis.

Known cultural resources include: 2 sites listed on the NRHP; 1 National Landmark; and approximately 1,800 archaeological sites. The National Landmark is the Pioneer Deep Space Antenna, which is technically on National Aeronautics and Space Administration's real property list. Of the 1,800 documented archaeological sites, 49 of these have been concurred upon as eligible for listing in the NRHP and an estimated 354 have been concurred upon as ineligible for listing in the NRHP by SHPO. Also, although no segments have been conclusively identified on the ground at Fort Irwin NTC, the Congressionally designated route of the Old Spanish Trail crosses Fort Irwin NTC.

NAWSCL

To date, NAWSCL has conducted cultural surveys on approximately 208,438 acres, or 19% of the installation. Based on the archaeological resources database for NAWSCL, of the 3,591 archaeological sites that have been recorded; 462 have been evaluated for eligibility for listing in the NRHP. Of these evaluated resources, 369 are prehistoric, 70 are historic, and 23 contain both prehistoric and historic components (Fort Irwin NTC 2015). These include 2 TCPs, the Coso Rock Art District National Historic Landmark, 5 NRHP individually-eligible buildings, 3 NRHP-eligible facilities, 2 listed archaeological sites, 4 historic districts (not yet listed), 1 archaeological district (not yet listed), 2,762 post-1943 military related BSOs, and over 2,000 eligible or unevaluated properties.

CMAGR

To date, MCAS Yuma has conducted cultural surveys at CMAGR on approximately 77,804 acres, or 17% of the CMAGR. MCAS Yuma's cultural resources database currently contains 361 recorded archaeological sites at CMAGR: 101 historical period, 239 prehistoric, 5 multicomponent, and 16 with an unknown period of cultural association. Of these, 8 are eligible, 97 are not eligible, and 256 are unevaluated for listing in the NRHP. CMAGR's built environment includes 17 military buildings, all dating from 1991. These buildings have not yet met the 50-year threshold to be considered an historic property under the NHPA. To date, no TCP's have been identified by any of the Tribal Governments that are affiliated with the lands at CMAGR.

3.3.3 Environmental Consequences

Based on the National Park Service digital archive record search for NRHP-listed properties within the APE and the six DoD installations' Integrated Cultural Resources Management Plans, the potential effects of the proposed raven management actions, and the data provided by the installations, the analysis for cultural resources focuses on the types of cultural resources that could be eligible for listing on the NRHP.

The regulations implementing Section 106 of the NHPA require that federal agencies consider the effects (impacts) of their undertakings (proposed actions) on historic properties (cultural resources). Impacts on cultural resources are considered significant if a historic property, as defined in 36 CFR 60.4, would be physically damaged or altered, would be isolated from the context considered significant, or would be affected by project elements that would be out of character with the significant property or its setting.

Analysis of potential impacts on historic properties considers both direct and indirect impacts. Direct impacts may occur by: (1) physically altering, damaging, or destroying all or part of a resource; (2) altering characteristics of the surrounding environment that contribute to resource significance; (3) introducing visual, audible, or atmospheric elements that are out of character with the property or alter its setting; or (4) neglecting the resource to the extent that it deteriorates or is destroyed. Direct impacts can be assessed by identifying the type and location of the action and by determining the exact locations of historic properties that could be affected. Indirect impacts primarily result from the effects that are farther removed from the

immediate project area including visual, audible (noise), or atmospheric changes due to the project implementation.

Table 3-5 provides an overview of the direct impacts of the various raven management actions on historic properties that could occur under the No-Action Alternative and/or the Proposed Action. Specifically, this analysis focuses on the potential physical, visual, and auditory adverse effects of the raven management actions on historic properties.

Table 3-5 Potential Direct Impacts and Section 106 Requirements of Raven Management Actions

Raven Management Action	***Potential Effects to Historic Properties***
Non-Lethal Management Actions	
Reduction of Food and Water Subsidy	No Section 106 required
Education and Outreach Regarding Ravens	No Section 106 required
Removal of Perching, Roosting, and Nesting Sites	Modification of buildings/structures could have the potential to affect historic properties (e.g., visual effects). Replacing aboveground utilities with underground utilities could involve ground disturbance. **Section 106 required**
Hazing and Other Active Deterrents	Hazing could have the potential to affect historic properties (e.g., auditory and visual effects). **Section 106 required**
Exclusion	Modification of buildings/structures could have the potential to affect historic properties (e.g., visual effects). **Section 106 required**
Effigies	Modification of buildings/structures could have the potential to affect historic properties (e.g., visual effects). **Section 106 required**
Trapping for Relocation and/or Scientific Study	Laying traps could involve ground disturbance. **Section 106 required**
Removal of Inactive Nests	No Section 106 required
Conditioned Taste Aversion	No Section 106 required
Lethal Management Actions	
Egg Oiling	No Section 106 required
Shooting	No Section 106 required
Trapping for Euthanasia	Laying traps could involve ground disturbance. **Section 106 required**
Egg/Nest Destruction	No Section 106 required
Poisoning	No Section 106 required

3.3.3.1 No-Action Alternative

The No-Action Alternative analysis for cultural resources focuses on current non-lethal management actions (Section 2.1.1 and Table 2-2) because those are primarily what have been and would continue to be implemented at DoD installations in the California desert under this alternative.

As indicated in Table 3-5, several non-lethal raven management actions have the potential to effect historic properties and would require Section 106 consultation prior to implementation. These could include ground disturbance associated with replacing aboveground utilities with underground utilities (i.e., removal of perching, roosting, and nesting sites) or modifications to existing buildings (i.e., removal of perching, roosting, and nesting sites; hazing; exclusion). These are summarized below.

- **BSOs.** BSOs have the potential to be adversely affected by many of the non-lethal raven management actions currently utilized by the DoD installations (e.g., bird spikes or the removal or modification of existing structures to discourage raven nesting, roosting or congregation) if they cannot be avoided.

- **Prehistoric and Historic Archaeological Sites.** Prehistoric and historic archaeological sites have the potential to be adversely affected by many of the non-lethal raven management actions currently utilized by the DoD installations if a proper cultural resource inventory is not conducted prior to an action, and avoidance measures are not implemented where historic properties are identified.
- **All Other Historic Property Types.** TCPs, sacred sites, cultural landscapes, national monuments, and national historic landmarks have the potential to be adversely affected by many of the non-lethal raven management actions currently utilized by the DoD installations if a proper cultural resource inventory is not conducted prior to an action, and avoidance measures are not implemented in areas where historic properties are identified.

Some non-lethal measures (e.g., hazing, deterrents, exclusion) could have minor indirect beneficial impacts by reducing the presence of ravens on historic properties. However, raven roosting and congregation in large numbers or for long periods would continue and could increase, resulting in the potential for adverse effects on historic properties visually from raven excrement and nest construction and audibly from raven noise (e.g., gurgling croaks).

Direct impacts to historic properties would be avoided or minimized to the extent possible. In the event that any non-lethal raven management action could affect historic properties, each installation, on a case-by-case basis, would: (1) conduct individual Section 106 consultation with the California SHPO and federally recognized Tribal Governments to decide on details of how management actions must be implemented to avoid or to minimize impacts to historic properties; (2) comply with any existing program alternative the installation may have negotiated with the California SHPO for the undertaking; or (3) comply with any existing installation-specific Programmatic Agreement. Therefore, the No-Action Alternative would be implemented in compliance with the laws and regulations listed in Sections 1.6 and 3.3.1 and would have an overall less than significant impact with avoidance/minimization of impacts to historic properties.

3.3.3.2 Proposed Action

The Proposed Action analysis for cultural resources focuses on non-lethal (Section 2.1.1) and lethal (Section 2.1.2) raven management actions associated with integrated, adaptive management of the raven at each DoD installation. Impacts to cultural resources from non-lethal measures would be similar to those described under the No-Action Alternative.

As indicated in Table 3-5, several non-lethal and lethal raven management actions have the potential to affect historic properties and would require Section 106 consultation prior to implementation. These could include ground disturbance associated with setting/placing traps (i.e., trapping for relocation/scientific study or euthanasia) or replacing aboveground utilities with underground utilities (i.e., removal of perching, roosting, and nesting sites) or modifications to existing buildings (i.e., removal of perching, roosting, and nesting sites; hazing; exclusion; effigies). These are summarized below.

- **BSOs.** BSOs have the potential to be adversely affected by one lethal (i.e., trapping for euthanasia) and many of the non-lethal raven management actions proposed for use by the DoD installations (e.g., bird spikes or the removal or modification of existing structures to discourage raven nesting, roosting or congregation) if BSOs cannot be avoided. There would be no measurable difference when compared to the No-Action Alternative.
- **Prehistoric and Historic Archaeological Sites.** Prehistoric and historic archaeological sites have the potential to be adversely affected by one lethal (i.e., trapping for euthanasia) and many of the non-lethal raven management actions proposed for use by the DoD installations if a proper cultural resource inventory is not conducted prior to an action, and avoidance measures are not implemented

where historic properties are identified. There would be no measurable difference when compared to the No-Action Alternative.

- **All Other Historic Property Types.** TCPs, sacred sites, cultural landscapes, national monuments, and national historic landmarks have the potential to be adversely affected by one lethal (i.e., trapping for euthanasia) and many of the non-lethal raven management actions proposed for use by the DoD installations if a proper cultural resource inventory is not conducted prior to an action, and avoidance measures are not implemented in areas where historic properties are identified. There would be no measurable difference when compared to the No-Action Alternative.

Impacts to historic properties would be avoided or minimized to the extent possible. For example, all known burial sites protected under the Native American Graves Protection and Repatriation Act (43 CFR 10) would be avoided (e.g., the use of DRC-1339 would not occur on or in the vicinity of burial sites). Therefore, raven management actions would be in compliance with the Native American Graves Protection and Repatriation Act and any impacts to tribal burial sites would be avoided.

The implementation of non-lethal and lethal measures to manage raven populations would reduce roosting and congregation of ravens on historic properties. This could have a beneficial impact to historic properties visually by reducing raven excrement and nest construction and audibly by reducing raven noise (e.g., gurgling croaks).

In the event that any non-lethal or lethal raven management action could affect historic properties, each installation, on a case-by-case basis, would: (1) conduct individual Section 106 consultation with the California SHPO and federally recognized Tribal Governments to decide on details of how management actions must be implemented to avoid or to minimize impacts to historic properties; (2) comply with any existing program alternative the installation may have negotiated with the California SHPO for the undertaking; or (3) comply with any existing installation-specific Programmatic Agreement. Therefore, the Proposed Action would be implemented in compliance with the laws and regulations listed in Sections 1.6 and 3.3.1 and would have and overall less than significant impact with avoidance/minimization of impacts to historic properties.

3.4 OTHER RESOURCES CONSIDERED

As explained below, these resources were considered and not carried forward for detailed analysis because potential effects were anticipated to be non-existent, negligible, and/or not capable of meaningful analysis. These topics includes those typically addressed under CEQA.

Depending on the raven management action selected and implemented, the No-Action Alternative and/or Proposed Action could involve modifications to existing buildings, structures, or aboveground transmission lines and utility poles to accommodate the removal or modifications of roosting, perching, or nesting sites for ravens or with the installation of perching deterrent. Activities that would involve major ground disturbance, including vegetation removal, such as the replacement of aboveground transmission lines and utility poles with underground utilities, would require separate environmental analysis. Individual DoD installations would be responsible for obtaining coverage for such activities under NEPA, CEQA, and any other applicable federal, state, or local requirements.

Aesthetics/Visual Resources. The No-Action Alternative and/or Proposed Action could involve modifications to existing buildings, structures, or aboveground transmission lines and utility poles as described above. These activities are generally expected to result in minimal impacts to the visual setting of the landscape. Any potential aesthetic or visual impacts to historic properties would be managed as described under *Cultural Resources*.

Air Quality and Greenhouse Gas Emissions. The No-Action Alternative and/or Proposed Action would not involve site improvements, construction of facilities, or other activities that typically affect air quality and result in greenhouse gas emissions. The use of existing vehicles to implement the proposed raven management actions under the No-Action Alternative or Proposed Action may result in short-term increases in dust and emissions, but no substantial increase in operations at any DoD installation would result under the No-Action Alternative or Proposed Action to warrant a detailed conformity analysis under the Clean Air Act. These emissions would have a negligible effect on air quality in the region. Any potential projects involving construction (e.g., replacement of aboveground transmission lines and utility poles with underground utilities) would require future NEPA analysis and are not analyzed in this PEA.

Agriculture/Forestry. There are no forests or farmland at the Combat Center, MCLB Barstow, Fort Irwin NTC, or CMAGR (administered by MCAS Yuma), but some agricultural land is within the boundaries of NAWSCL and Edwards AFB (California Department of Conservation 2014). The Inyo National Forest abuts Fort Irwin NTC to the north. There would be no adverse impact or loss of agricultural or forestland from implementing raven management on DoD installations or non-DoD lands. There may be some unquantifiable indirect benefit to agricultural lands from raven reduction, if ravens are adversely affecting crops under present conditions.

Energy and Utilities. The No-Action Alternative and/or Proposed Action would not involve site improvements, construction of facilities, or an increase in personnel that would place meaningful demand on the spectrum of utilities including electricity, potable water, sanitary sewer, phone, information technology, and gas transmission lines.

Geological Resources/Soils and Hazards. The No-Action Alternative and/or Proposed Action would not involve construction of facilities or any other ground-disturbing activities that would alter geological resources or degrade soil quality. Any raven management action resulting in soil disturbance affecting 1 or more acres may be required to comply with applicable National Pollutant Discharge Elimination System (NPDES) requirements to minimize soil erosion and sedimentation. This could include compliance under the California NPDES Construction Stormwater General Permit or applicable installation-specific NPDES requirements. Geologic hazard areas exist within the project area, including active faults as defined under the Alquist-Priolo Earthquake Fault Zoning Act (California Department of Conservation 2021). However, the No-Action Alternative and/or Proposed Action would not contribute to any increased incidence relating to these hazards.

Hazardous Materials & Hazardous Waste. The No-Action Alternative and/or Proposed Action would not involve substantial use of hazardous materials and waste. The use of specific pesticides and chemicals to manage raven populations is discussed and analyzed under health and safety (see Section 3.2). Petroleum, oils, and lubricants use would be minor and comprise the majority of hazardous materials associated with use of vehicles to implement raven management actions. Hazardous wastes (such as used engine oil) are expected to be minimal. Any hazardous materials and wastes associated with the project would be properly stored, labeled, handled, and disposed of according to all applicable federal, state, local, and DoD regulations and requirements. Contaminated sites requiring cleanup are present at the six DoD installations (California State Water Resources Control Board 2021). However, the No-Action Alternative and/or Proposed Action would not disturb or impact any of these sites.

Hydrology/Water Resources. The No-Action Alternative and/or Proposed Action could involve modifications to existing buildings, structures, or aboveground transmission lines and utility poles. Any raven management action resulting in soil disturbance affecting 1 or more acres may be required to comply with the California NPDES Construction Stormwater General Permit or applicable installation-specific

NPDES requirements to minimize impacts to water resources. A 2018 jurisdictional determination concluded there are no jurisdictional waters of the U.S. at the Combat Center (USACE 2018). No known waters of the State are located within the Combat Center. Any raven management action with the potential to impact waters of the U.S. would be conducted in accordance with Section 404 of the Clean Water Act (33 USC 1251 *et seq*.) and EO 11990, *Protection of Wetlands*, which directs federal agencies to minimize the loss of wetlands, including non-jurisdictional wetlands. If avoidance is not possible, activities with minor impacts to wetlands or other waters of the U.S. could be authorized under a Section 404 Nationwide Permit, provided the terms and conditions of the Nationwide Permit are satisfied. Actions permitted under Nationwide Permits typically require pre-construction notification to the USACE. Raven management actions involving pesticides would not be used in waters or waterways. Where pesticides are used near water, handling and application instructions would prevent the introduction of the pesticides into such waters. Implementation of resource protection measures (Section 2.4.1) would ensure impacts to water resources are avoided and minimized to the extent possible.

Land Use & Population and Housing. Under the No-Action Alternative and/or Proposed Action, no changes to existing land use would occur on lands owned by or used by the DoD in the California desert region. The non-DoD lands discussed in Section 1.2.2 includes those focused on desert tortoise protection. The raven management actions implemented under the No-Action Alternative and/or Proposed Action would be consistent with the County General Plans, including programs to reduce food and water subsidies for predator species such as the raven (see Section 4.2 for more information on County General Plans).

Mineral Resources. The No-Action Alternative and/or Proposed Action would not affect minerals or interfere with any mineral resource-related rights that may be located on the DoD installations and non-DoD lands. The non-DoD lands discussed in Section 1.2.2 includes those focused on desert tortoise protection and access would be subject to landowner approval and any valid existing rights. Existing mining activity and claims occur on public lands managed by the BLM in the California desert (BLM 2021).

Public Services & Wildfire Risk. Under the No-Action Alternative and/or Proposed Action, use of firearms to control ravens may have some risk of wildfire ignition due to the extreme heat and dry vegetation in the California desert. DoD installations would take precautions to avoid a scenario where public services are required. For instance, DoD installations would ensure in-house personnel and contractors are briefed on fire prevention and extinguishment measures and methods and utilize local fire-fighting resources (e.g., Combat Center Fire Department).

Recreation. Under the No-Action Alternative and/or Proposed Action, raven management would be implemented in a manner that does not interfere with existing recreational access and uses on DoD installations in the California desert. Much of the land in the California desert surrounding the DoD installations is open to public access (California Protected Areas Database 2021) and used for recreation (e.g., off-highway vehicle riding, auto touring, biking, camping, hiking, backpacking, horseback riding, hunting, wildlife viewing, and photography). Some limited recreational opportunities exist on certain DoD lands. The No-Action Alternative and Proposed Action would not impact these recreational resources.

Socioeconomics and Environmental Justice. Implementation of the No-Action Alternative and/or Proposed Action would be compliant with EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations*, and EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks*. Raven management would be implemented within DoD and non-DoD lands and focused on addressing specific impacts from increased raven populations. Based on a review of other potential impacts discussed in this PEA, there is no potential for offsite and/or adverse impacts that may affect sensitive populations (e.g., children, elderly) or disproportionally affect low-income

or minority populations. There could be minor beneficial health impacts and socioeconomic impacts to the local economy from increased expenditures on raven management under the Proposed Action.

Transportation and Circulation. Under the No-Action Alternative and/or Proposed Action, access to and from DoD installations and non-DoD lands would use existing routes, roads, and highways. There would be no measurable increase in personnel that would place an additional demand on the transportation and circulation network.

Noise. Discharge of firearms for shooting of ravens would be a potential source of noise under the No-Action Alternative and/or Proposed Action. However, firearms are regularly discharged on military installations and hunting, and shooting are allowed on much of the land in the California desert (e.g., BLM lands, Mojave National Preserve). Noise from firearm use is already a part of the environment in these areas. The use of air cannons and wailers as a hazing/deterrent measure under the No-Action Alternative and/or Proposed Action could also be a source of noise. Because these devices could disturb resident service members and personnel, individual DoD installations would need to ensure these devices are appropriate for use in a specific area.

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CHAPTER 4
CUMULATIVE IMPACT ANALYSIS

4.1 OVERVIEW OF CUMULATIVE EFFECTS ANALYSIS

The CEQ regulations implementing the procedural provisions of NEPA define cumulative impacts as:

> "*The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions.*" (40 CFR § 1508.7)

The CEQ also provides guidance on cumulative impacts analysis in *Considering Cumulative Effects Under the National Environmental Policy Act* (CEQ 1997), and *Guidance on the Consideration of Past Actions in Cumulative Effects Analysis* (CEQ 2005).

As explained in Section 1.5, the scope of the PEA analysis focused on the resources/issues holding the most potential for significant effects: biological resources and health and safety. This cumulative effects analysis is similarly focused on relevant past, present, and/or reasonably foreseeable future actions (RFFAs) that in combination with the No-Action Alternative or Proposed Action could result in a potential for significant effects. Based on available information, the relevant federal and non-federal projects are listed in Section 4.2. The region of influence for this cumulative effects analysis is the California desert for *Biological Resources* and the lands owned or used by the specific DoD installations for *Health And Safety* and *Cultural Resources*.

4.2 PAST, PRESENT, AND REASONABLY FORESEEABLE PROJECTS

This section describes the relevant past, present, and/or RFFAs in either the project area (i.e., the six DoD installations) or the greater regional area of influence. The projects are listed in Table 4-1, along with brief summaries of the proposed actions, the durations of the projects, and the relevancy of the projects to the No-Action Alternative or Proposed Action presented in this PEA. The locations of the projects are shown in Figure 4-1, either by name or by location reference (e.g., specific DoD installation or National Park/Preserve).

Table 4-1 Relevant Past, Present, and/or Reasonably Foreseeable Future Actions

Project	*Relevant Details*	*Status*
Federal Projects		
Project 1: Desert Tortoise Recovery Plan Task: Reduce Common Raven Predation on the Desert Tortoise (USFWS 2008)	Proposed Action. The USFWS prepared an EA to facilitate desert tortoise recovery by reducing raven depredation of tortoises in the California desert. Included the following cooperating agencies: USDA, APHIS; Edwards AFB; Fort Irwin NTC; Combat Center; MCLB Barstow; NAWSCL; BLM; and National Park Service (Mojave National Preserve and Joshua Tree National Park). Duration. Ongoing. Relevancy. Raven management.	Past/Present/RFFA
Project 2: Raven Control in the Mojave National Preserve (National Park Service 2016, NFWF 2021)	Proposed Action. The National Park Service prepared a CATEX for the implementation of 2008 USFWS Raven Control Plan (USFWS 2008) in the Mojave National Preserve (Project Number: 16-moja-025/PEPC 64601). Duration. Ongoing. Relevancy. Raven management.	Past/Present/RFFA
Project 3: Desert Tortoise Translocation Required for Land Acquisition/Airspace Establishment to Support Large-Scale Marine Air Ground Task Force Live-Fire and Maneuver Training (DoN 2017)	Proposed Action. The Combat Center prepared a Supplemental EIS for implementing a Desert Tortoise Translocation Program in support of large-scale Marine Air Ground Task Force Live-Fire and Maneuver Training. As described in Section 1.3.4 of this PEA, the USFWS confirmed that the Combat Center should seek a raven depredation permit to perform direct removals of ravens within the recipient sites for desert tortoise translocation (USFWS 2017a). Desert tortoise translocation recipient and control sites are shown in Figures 1-2 and 4-1. Duration. Ongoing. Relevancy. Raven management and impacts to desert tortoise and associated cultural and spiritual landscape.	Past/Present/RFFA
Project 4: Proposed Range Redesign of Special Warfare Training Areas 4 and 5, CMAGR, Imperial and Riverside Counties, California (USMC 2016)	Proposed Action. The USMC prepared an EA for the reconfiguring of existing range training areas, improving range infrastructure, and increasing the annual throughput of personnel and training events within Special Warfare Training Areas 4 and 5 in CMAGR. Implementation of avoidance, minimization, and mitigation measures and other requirements stated in the USFWS Programmatic BO for CMAGR (1-6-96-F-40) and the amended BO for the project would minimize potential for impacts to biological resources, including the desert tortoise. Duration. Ongoing. Relevancy. Raven management (measures for food and water subsidies and to discourage/remove raven perching, nesting, and roosting sites) and impacts to desert tortoise.	Past/Present/RFFA

Table 4-1 Relevant Past, Present, and/or Reasonably Foreseeable Future Actions

Project	*Relevant Details*	*Status*
Project 5: Integrated Natural Resources Management Plans (INRMPs): Combat Center: FY 2018-2022 MCLB Barstow: FY 2017-2021 Edwards AFB: FY 2019-2024 Fort Irwin NTC: FY 2020-2025 NAWSCL: FY 2020-2025 CMAGR (administered by MCAS Yuma): FY 2017-2022	Proposed Action. INRMPs are 5-year planning documents that guide DoD installations and bases in conserving and sustaining natural resources in order to maintain realistic, high-quality training environments over time. The INRMP describes how natural resources will be managed to ensure the sustained use of a natural landscape for military mission needs in compliance with applicable laws and regulations. The INRMPs present current information about the environmental conditions aboard the installations, review major military training activities, and present the goals, objectives, and elements of the Natural Resources Programs. INRMPs further ensure that natural resources conservation measures and military activities on mission lands are integrated and consistent with federal stewardship requirements outlined in the Sikes Act (as amended). Duration. Ongoing. Relevancy. The INRMPs for the DoD installations in the California desert include measures to manage raven populations, including raven management plans, predator assessments (raven, coyote), subsidy reduction, educational outreach, and predator depredation, among other natural resources management actions to enhance and maintain military readiness.	Past/Present/RFFA
Project 6: Desert Renewable Energy Conservation Plan (DRECP) (BLM 2015a, 2016)	Proposed Action. The DRECP is a collaborative, interagency landscape-scale planning effort covering 22.5 million acres in seven California counties: Imperial, Inyo, Kern, Los Angeles, Riverside, San Bernardino, and San Diego. The plan was conceived and developed through a collaborative effort by the BLM, USFWS, California Energy Commission, and CDFW that identifies areas in the California desert appropriate for the utility-scale development of wind, solar, and geothermal energy projects. The comprehensive plan also provides for the long-term conservation and management of covered species and preserves the natural resources, recreational areas, and scenic values. Duration. Ongoing. Relevancy. Raven management (measures for food and water subsidies and to discourage/remove raven perching, nesting, and roosting sites) and impacts to desert tortoise.	Past/Present/RFFA
Project 7: West Mojave Plan and West Mojave Route Network Project (WMRNP) and Plan Amendment (BLM 2006, 2015b, 2019)	Proposed Action. The WMRNP (and Plan Amendment) is a travel management planning effort covering 9.24 million acres in the western Mojave Desert that supplements the 2006 West Mojave Plan. The West Mojave plan defined a regional strategy for conserving plant and animal species and their habitats. The WMRNP considers seven planning decisions amending the motor vehicle access, recreation and livestock grazing elements within the California Desert Conservation Area Plan for the West Mojave Planning Area. Duration. Ongoing. Relevancy. Desert tortoise management.	Past/Present/RFFA

Table 4-1 Relevant Past, Present, and/or Reasonably Foreseeable Future Actions

Project	*Relevant Details*	*Status*
Project 8a: DoD Installation Depredation Permits (Combat Center)	Proposed Action. The Combat Center received a depredation permit in 2018 due to an overabundance of the common raven. The application requested a depredation permit, and amendment, for the Combat Center to take up to 500 ravens by gunshot, up to 100 ravens by trapping, up to 50 eggs by addling, and destroying up to 25 active nests a year (Combat Center 2018c). Implementation of the depredation permit resulted in the take of 136 ravens at the 1st Tanks Ramp (Combat Center 2019a). Duration. Annual; expired in 2018. Relevancy. Raven management (lethal removal of ravens). Proposed Action. The Combat Center received a depredation permit in 2020 to authorize the take of 20 ravens only on U.S. government lands within the Rodman-Sunshine-Peak North translocation area for desert tortoises (USFWS, Migratory Bird Program 2020) (see Project 3 for details on the Combat Center Desert Tortoise Translocation Program). No ravens were lethally removed under the permit. Duration. Effective: 07 May 2020 to 30 June 2020; expired. Relevancy. Raven management (lethal removal of ravens).	Past/Present/RFFA
Project 8b: DoD Installation Depredation Permits (Fort Irwin NTC)	Proposed Action. Fort Irwin NTC applied for and received a depredation permit in 2016 for lethal control of the raven (Fort Irwin 2016), citing that non-lethal measures alone have not been effective in reducing ecological, economic, and health and safety impacts from increased raven populations. Fort Irwin NTC applied for lethal take of up to 150 individual ravens and 100 raven nests. Lethal removal of ravens will be done through shooting. Destruction of both active and inactive nests will be accomplished through physical removal and unhatched eggs will be removed and destroyed or addled. Duration. Ongoing; permit renewed as required. Relevancy. Raven management (lethal removal of ravens).	Past/Present/RFFA
Project 8c: DoD Installation Depredation Permits (MCAS Yuma - CMAGR)	Proposed Action. MCAS Yuma applied for and received a depredation permit in 2008 for management of migratory birds, including the raven, to resolve or prevent threats to human safety and/or aircraft safety at airports or airfields. The permit includes CMAGR. Management includes lethal lake of up to 100 migratory birds; migratory bird nest take (including egg destruction/addling) of up to 40 nests; and trapping and relocating up to 100 migratory birds. Duration. Ongoing; permit renewed annually with current permit expiring on March 31, 2021.	Past/Present/RFFA

Table 4-1 Relevant Past, Present, and/or Reasonably Foreseeable Future Actions

Project	*Relevant Details*	*Status*
	Relevancy. Management of migratory birds, including ravens (lethal removal/trapping and relocation of ravens).	
Project 9: Categorical Exclusion to Install Anti-perching Devices at 1st Tanks, Combat Center (Combat Center 2018b)	Proposed Action. This project provided for the installation of permanent, physical barriers to roughly 15-17 vehicle shade structures to prevent large birds, including ravens, from accessing the shade structures at 1st Tanks. The CATEX concluded that there is no reason to anticipate any adverse effects on biological resources or public health or safety. Duration. Short-term. Relevancy. Raven management.	Past
Project 10: Common Raven Movement and Resource Use at MCAGCC (Combat Center 2020)	Proposed Action. The Combat Center prepared a CATEX to live-trap, mark, and monitor ravens so MAGTFTC Environmental Affairs could quantify and describe raven use of Combat Center resources, including ground and air space, infrastructure, and sources of food, water and other subsidies (e.g., nesting and roost sites). Ravens were live trapped and marked in the Combat Center's built environment (i.e., the cantonment) and less-built portions of the Range Training Areas. Duration. Ongoing for up to 10 years with approximately 40 ravens trapped per year). Relevancy. Raven monitoring.	Past/Present/RFFA
Project 11: RASP	Proposed Action. The Combat Center, Fort Irwin NTC, BLM, and USFWS are working together to develop partnerships to advance desert tortoise recovery pursuant to the USFWS's 2011 Revised Recovery Plan for the Mojave Population of the Desert Tortoise and the 2018 Memorandum of Understanding Between the DoD and the Department of the Interior. RASP establishment is currently focused on the western Mojave Desert in California and would include implementation of desert tortoise recovery actions in RASP focus areas (see Figure 2-2). These RASP focus areas are located outside of DoD installations and primarily in desert tortoise designated Critical Habit Units. See Section 2.4.3 for more information on this effort. Duration. Ongoing. Relevancy. Implementation of desert tortoise recovery actions.	Past/Present/RFFA
Project 12: Integrated/Installation Pest Management Plans	Proposed Action. Integrated/Installation Pest Management Plans have been prepared for DoD installations. These plans include management of predatory species (i.e., INRMP, raven and coyote) and the use of pesticides. Proper management of pesticides ensures a safe and cost-effective pest management program. Management of pesticides includes the proper selection of pesticides, pesticide approval, procurement, storage, mixing, use of pesticide application equipment, and cleanup. Pesticides used include insecticides, herbicides, and rodenticides. To ensure the safe use of pesticides, DoD personnel handle and apply pesticides in accordance with	Past/Present/RFFA

Table 4-1 Relevant Past, Present, and/or Reasonably Foreseeable Future Actions

Project	*Relevant Details*	*Status*
	the product's label directions and Armed Forces Pest Management Board Technical Guides concerning safety (DoDI 4150.07, Para. E4.5.3). Duration. Ongoing and usually updated every 5 years. Relevancy. Raven management (lethal removal of ravens) and health and safety impacts (pesticide use). Specifics for each of the six DoD installations are provided below. **Combat Center** (Combat Center 2017). The current version of the Plan does not include raven management, as Environmental Affairs was investigating effective means to discourage raven numbers and, as this plan was being written, was working towards obtaining a depredation permit for raven removal. **Edwards AFB** (Edwards AFB 2021b). The current version of the Plan does not identify the raven as a pest or include raven management. **Fort Irwin NTC** (Fort Irwin NTC 2017). The Plan outlines Fort Irwin NTC's raven management plan that implemented under their current raven depredation permit from the USFWS, Migratory Bird Program and allows the installation to take ravens, their nests, and eggs. While no take of live birds occurs, unoccupied nests are removed, and raven eggs are addled when found. These activities are performed by Fort Irwin natural resource personnel.	
Project 13: Edwards Air Force Base Invasive Species Management Plan (Edwards AFB 2018)	Proposed Action. This Plan provides a framework for managing invasive species on Edwards AFB. All herbicides and herbicide application shall comply with DoDI 4150.07 DoD Pest Management Program; AFI 32-1053 Integrated Pest Management Program; Armed Forces Pest Management Board list of approved herbicides; and the State of California Pesticide Regulations, and be registered for use in the State of California. Duration. Ongoing. Relevancy. Health and safety impacts (herbicide use).	Past/Present/RFFA
Non-Federal Projects		
Project 14: West of Devers Upgrade Project: Raven Monitoring, Management, and Control Plan (SCE 2019)	Proposed Action. SCE prepared an Environmental Impact Report and EIS for the project consisting of removing and replacing approximately 48 corridor miles of existing 220 kilovolt transmission lines with new double-circuit 220 kilovolt transmission lines, between the existing Devers Substation (near Palm Springs), El Casco Substation (Calimesa), Vista Substation (in Grand Terrace), and San Bernardino Substation. SCE implemented a Raven Monitoring, Management, and Control Plan to address mitigation measure WIL-2b to minimize raven predation on the desert tortoise during the construction, restoration, and operations and maintenance phases of the project. Duration. Construction completed in May 2021; ongoing for 3 to 5 years after construction and post-construction/restoration activities are completed.	Present/RFFA

Table 4-1 Relevant Past, Present, and/or Reasonably Foreseeable Future Actions

Project	*Relevant Details*	*Status*
	Relevancy. Raven management (measures to reduce food and water subsidies; and to discourage/remove raven perching, nesting, and roosting sites; and lethal removal of offending ravens) and impacts to desert tortoise.	
Project 15: Eldorado – Lugo – Mohave Series Capacitor Project: Raven Management Plan (SCE 2020a)	Proposed Action. This project is located within the overall range of the desert tortoise and passes through San Bernardino County and northwestern portion of the Combat Center. The goal of the Raven Management Plan is to utilize methods to deter raven depredation of juvenile desert tortoises, in order to reduce the potential for the overall numbers of desert tortoises to decrease as a result of the project. Duration. Ongoing during construction period from 2020 to 2022 and for 3 years following construction. Relevancy. Raven management (measures to reduce food and water subsidies and to discourage/remove raven perching, nesting, and roosting sites) and impacts to desert tortoise.	Present/RFFA
Project 16: Ivanpah-Control Project (SCE 202b)	Proposed Action. SCE prepared an EA for the project to enhance the safety of SCE's sub-transmission system. The north-south portion extends from Bishop (Inyo County) in the north south through Ridgecrest (Kern County) to Kramer Junction (San Bernardino County). From there the project goes east through Barstow and follows Interstate-15 to Ivanpah Substation. The east-west portion is located entirely within San Bernardino County. Duration. Ongoing with construction expected to begin by the end of 2021 and be complete in 2025. Relevancy. Raven management (measures to reduce food and water subsidies) and impacts to desert tortoise.	Present/RFFA
Project 17: County General Plans	Proposed Action. Every county in California is required by law to have a general plan for its future development. The General Plan provides a blueprint that guides the "physical development of the county or city, and any land outside its boundaries which bears relation to its planning" (California Government Code §65300). Duration. Ongoing. Relevancy. Protection of natural resources. **Kern County** (Kern County 2009). The General Plan includes policies and implementation measures to protect threatened and endangered species. The county works closely with state and federal agencies to assure that discretionary projects avoid or minimize impacts to fish, wildlife, and botanical resources and encourages the use of conservation plans and other methods promoting management and conservation of habitat lands. **Inyo County** (Inyo County 2013). The General Plan outlines the goals and policies for managing wildlife, including predatory animals and threatened and endangered or sensitive	Past/Present/RFFA

Table 4-1 Relevant Past, Present, and/or Reasonably Foreseeable Future Actions

Project	*Relevant Details*	*Status*
	species The goal is to coordinate with federal and state agencies to adopt local recovery plans, and develop management policies that are rooted in peer-reviewed science and local input. **Los Angeles County** (Los Angeles County 2015). The county has implemented a Habitat Conservation Plan Program with the goal to preserve important biological resources in the county planning jurisdiction to include native plant communities, biological linkages, and endangered species habitat. The General Plan also has a policy to address solid waste disposal includes ensuring adequate and regular waste and recycling collection services, which could help manage the increase in predator species, including ravens. The General Plan includes a policy under Sustainable Agricultural Practices to minimize pesticide use and encourages regulation of development adjacent to agricultural land to minimize concerns from pesticide use on neighboring farms. **San Bernardino County** (San Bernardino County 2014). The General Plan outlines goals and policies to develop, fund, and implement programs to maintain the county's natural resources. This includes a program to coordinate with state and federal agencies to identify and implement buffering techniques and create mitigation banks for sensitive species in the California desert region, which includes the desert tortoise. The goal of this program is to establish mitigation banks and conservation easements for protected species as a better long-term solution to habitat fragmentation and piecemeal mitigation. The General Plan also includes a program to work with local communities to improve trash collection and recycling programs and to reduce illegal dumping in unincorporated areas. The goal of this program is to sponsor mitigation efforts that minimize landfill growth, reduce trash haul routes that spread litter and increase predator species numbers, including ravens. **Riverside County** (County of Riverside 2015). The county has participated in or directed the development of two Multiple Species Habitat Conservation Plans to address the issues of wildlife health and sustainability. These Plans are stakeholder driven, comprehensive, and multi-jurisdictional, and focus on the conservation of both species and associated habitats, in order to address biological and ecological diversity conservation needs and provide mitigation for the impacts of development in county. **Imperial County** (Imperial County 2016). The General Plan includes goals to integrate programmatic strategies for the conservation of critical habitats to manage their integrity, function, productivity, and long-term viability of biological resources. The General Plan also provides a framework for the conservation and enhancement of natural and created open space which provides wildlife habitat values. The General Plan acknowledges that agricultural practices in the county result in pesticides impacting the environment and downstream water quality. The General Plan encourages that the implementation of integrated pest management policies and programs that focus on long-term prevention or suppression of pest problems with	

Table 4-1 Relevant Past, Present, and/or Reasonably Foreseeable Future Actions

Project	*Relevant Details*	*Status*
	minimum impact on human health, the environment, and non-target organisms to reduce the environmental problems associated with pesticides and other toxic chemicals.	
Project 18: California 2018 Pesticide Use Report (California Department of Pesticide Regulation 2018a, 2018b)	Proposed Action. The California Department of Pesticide Regulation provides an annual report on agricultural pesticide use. California has a broad legal definition of "agricultural use", so the reporting requirements include pesticide applications to parks, golf courses, cemeteries, rangeland, pastures, and along roadside and railroad rights-of-way. Within the project area, agricultural pesticide use is mostly concentrated in agricultural lands outside of the six DoD installations. Specifically, this includes the area south of Edwards AFB, west of NAWSCL along Highway 395, surrounding MCLB Barstow, and the Imperial Valley south/southwest of CMAGR (California Department of Pesticide Regulation 2018b). Pesticide use in California is regulated by the California Department of Pesticide Regulation, with the stated mission "to protect human health and the environment by regulating pesticide sales and use, and by fostering reduced-risk pest management." Duration. Ongoing. Relevancy. Health and safety impacts.	Past/Present/RFFA

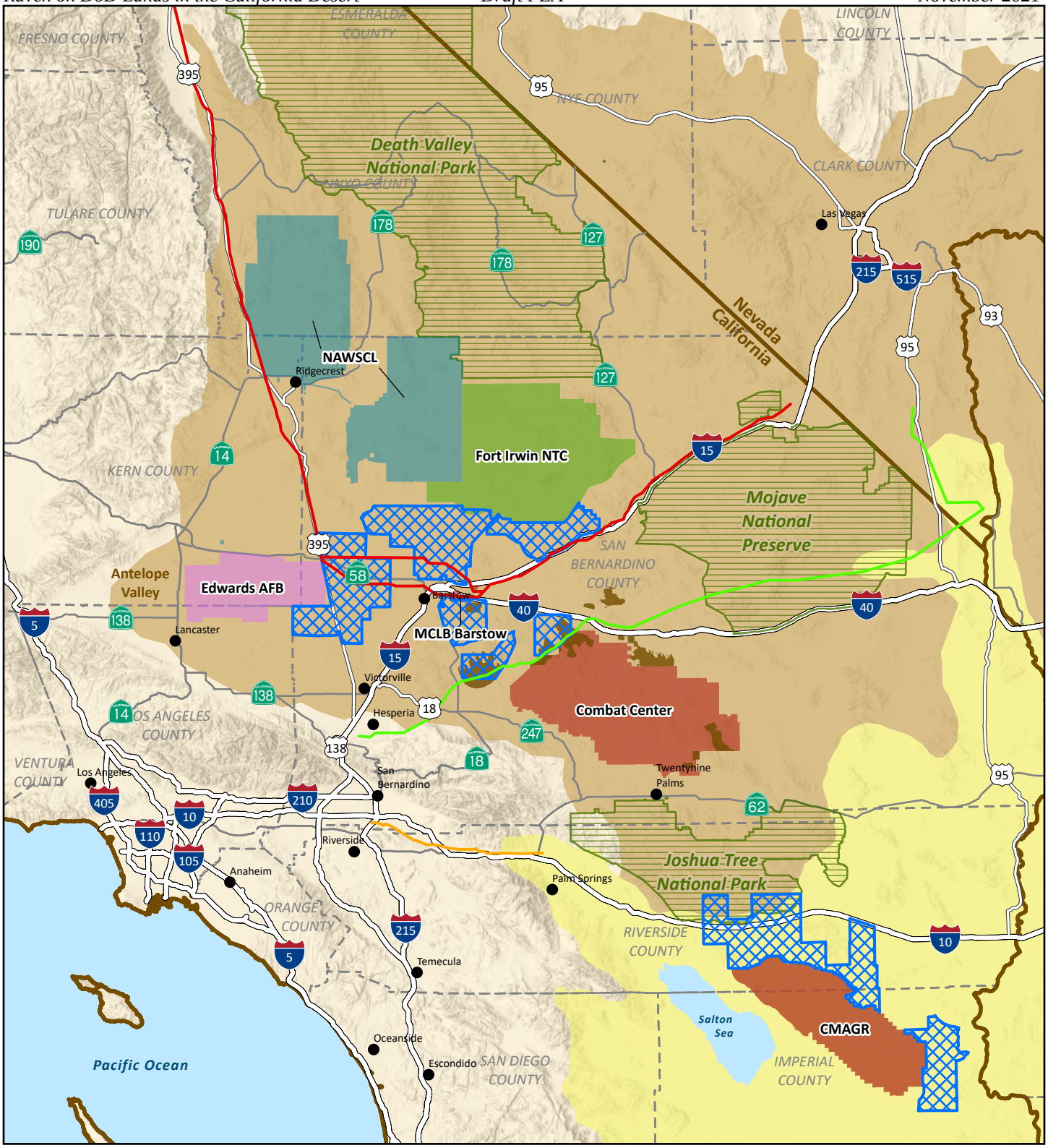

Figure 4-1. Cumulative Project Locations

State Boundary
County Boundary
Mojave Desert
Sonoran Desert
NPS Boundary

Military Installations
U. S. Air Force
U. S. Army
U. S. Marine Corps
U. S. Navy

Cumulative Projects
Eldorado – Lugo – Mohave Series Capacitor Project
Ivanpah-Control Project
West of Devers Upgrade Project
Desert Tortoise RASP Focus Areas
Translocation Recipient and Control Sites

0 25 50 Miles

Sources: DoD 2017; DoN 2017; Esri 2017; SCE 2019, 2020a, 2020b; USFWS 2021; U.S. Geological Survey 2010

4.3 CUMULATIVE IMPACTS

This section addresses potential cumulative impacts of the No-Action Alternative or Proposed Action in combination with the potential impacts of the projects described in Section 4.2. The content of this section is limited to available information and largely based on existing planning documents rather than confirmed actual effects from these projects. A summary of cumulative impacts is provided in Table 4-2.

4.3.1 Biological Resources

This cumulative impact analysis focuses on wildlife that may be impacted by the No-Action Alternative or Proposed Action, with an emphasis on the raven and the federally threatened desert tortoise.

Over the last 30 to 50 years, raven numbers have increased throughout southern California and by a factor of 15 in parts of the Mojave Desert (Boarman and Berry 1995; Camp et al. 1995; Boarman 2014). In a recent study of bird populations in the Mojave Desert, the raven was the only native species that had a significant population increase since the early twentieth century, while all other native species had decreased (Iknayan and Beissinger 2018). Generally, as human communities increase, raven populations increase, taking advantage of resource subsidies that humans inadvertently provide (food, water, nesting opportunities, etc.) (Boarman 2014).

The desert tortoise was federally listed as threatened in 1990 in response to habitat loss and degradation caused by human activities including urbanization, agricultural development, military training, recreational use, a modified fire regime caused by introduced plant species, changes in perennial vegetation communities, mining, livestock grazing, and a lack of regulatory mechanisms (USFWS 1990). The loss of individual desert tortoises to increased predation by ravens, canids (i.e., coyotes, kit foxes, and dogs), and Golden Eagles; collection by humans for pets or consumption; fire; collisions with vehicles on paved and unpaved roads; and mortality resulting from disease (upper respiratory tract disease) also contributed to the listing of the species (USFWS 2011a).

The majority of lands in the California desert are undeveloped and provide habitat for desert species. Areas that are developed in the California desert tend to attract generalist scavenger/predator species such as ravens because of the subsidized resources that are available (non-natural water sources, trash, roadkill, etc.). Actions to reduce or exclude raven populations in the California desert have had and/or will likely have localized success (see Table 4-1, Projects 1-6, 8-10, 12, 14-16), but with no manageable and sustainable success on overall population control. However, in conjunction with the Proposed Action, raven populations would be better managed at more sustainable levels throughout the California desert.

The installation-specific INRMPs (see Table 4-1, Project 5), provide integrated, comprehensive plans for managing the natural resources of DoD installations and for managing sustainable public use of those resources to the extent that such management and use is consistent with the military purposes of the installations. Natural resources and military use would continue to be managed so that there is no net loss in the capability of the DoD to support its military purposes and in a manner that is consistent with ecosystem management principles. Further, management prescribed by the INRMPs would continue to benefit threatened and endangered species, such as the desert tortoise, on DoD installations in the California desert, consistent with federal and state recovery actions for these species under the ESA.

The tortoise programs at these DoD installations, such as head starting at the Combat Center, and regional conservation plans, in particular the DRECP (see Table 4-1, Project 6), West Mojave Plan (see Table 4-1, Project 7), and RASP (see Table 4-1, Project 11), would continue to be implemented to minimize potential cumulative impacts to regional biological resources, including the desert tortoise.

Table 4-2 Summary of Cumulative Impacts

Alternative	*Biological Resources*	*Health and Safety*	*Cultural Resources*
No-Action Alternative: continued use of primarily non-lethal raven management actions.	• No measurable reduction of the raven population in the California desert. • Little to no direct impacts on other wildlife species. • Unchecked raven population may continue to adversely affect populations of other wildlife species.	• Non-lethal management actions would be implemented by trained personnel, following all applicable requirements and guidelines. • Continued health and safety impacts related to raven congregation in areas used by DoD personnel, but cleanup of raven excrement and use of PPE would continue to occur. • Management of raven populations would result in an overall less than significant impact to health and safety.	• Avoidance or minimization to historic properties; Section 106 consultation with the California SHPO and federally recognized Tribal Governments would occur for effects than cannot be avoided. • Management of raven populations would result in an overall less than significant impact to cultural resources.
Proposed Action: integrated, adaptive management using non-lethal and lethal raven management actions.	• Lethal removal of up to 11,830-13,293 ravens (roughly 4% of the statewide population of ravens in California). • Little to no direct impacts on other wildlife species. • Beneficial indirect impacts to populations of wildlife species currently affected by raven overpopulation.	• Non-lethal and lethal management actions would be implemented by trained personnel, following all applicable requirements and guidelines. • Reduced raven populations and deterring the presence of ravens in areas used by DoD personnel would improve the health and safety of the working environment in these areas. • Reduced BASH risk. • Management of raven populations would result in an overall less than significant beneficial impact to health and safety.	• Avoidance or minimization to historic properties; Section 106 consultation with the California SHPO and federally recognized Tribal Governments would occur for effects than cannot be avoided. • Management of raven populations would result in an overall less than significant impact to cultural resources.

Table 4-2 Summary of Cumulative Impacts

Alternative	*Biological Resources*	*Health and Safety*	*Cultural Resources*
Past, Present, and Reasonably Foreseeable Future Actions	• Localized raven management actions, including lethal take on a project-by-project basis, but with no concerted effort to manage and maintain raven populations at more sustainable levels. • Cumulative project impacts include increased management direction and planning for natural resources that coincides with increased land use and development.	• Cumulative projects involving raven management or measures for raven control would contribute to an overall beneficial impact to health and safety by reducing/managing raven populations in the region. • Implementation of raven management actions, including use of pesticides would be done in accordance with all applicable regulations.	• Cumulative projects would avoid or minimize impacts to historic properties; Section 106 consultation with the California SHPO and federally recognized Tribal Governments would occur for effects than cannot be avoided.
Potential Cumulative Effect	• The No-Action Alternative or Proposed Action, in combination with Projects 1-12 and 14-16 (see Table 4-1), would not contribute to a significant cumulative impact to biological resources.	• The No-Action Alternative or Proposed Action, in combination with Projects 1-6, 8-10, 12, and 14-18 (see Table 4-1), would not contribute to a significant cumulative impact to health and safety.	• The No-Action Alternative or Proposed Action, in combination with Projects 1-6, 8-10, 12, and 14-17 (see Table 4-1), would not contribute to a significant cumulative impact to cultural resources.

The No-Action Alternative or Proposed Action could potentially contribute to cumulative impacts on wildlife species, such as the desert tortoise, particularly through indirect population impacts from raven overpopulation management actions. Although, under the No-Action Alternative, raven populations would not be reduced by a measurable amount on DoD lands in the California desert, ravens are not implicated as the only reason for any species' decline in the California desert. Continuation of current management actions under the No-Action Alternative would not change the current trajectories of impacts on species, such as the raven and desert tortoise, and would, therefore, have less than significant impacts on biological resources. Therefore, the No-Action Alternative would not contribute to a significant cumulative impact to biological resources.

Under the Proposed Action, raven management actions would have little to no direct impacts on multiple wildlife species, including the desert tortoise. The proposed reduction in densities of ravens on DoD lands in the California desert would have overall beneficial indirect impacts to wildlife populations, especially those that experience predation pressure from increased raven populations. Therefore, the Proposed Action would not contribute to a significant cumulative impact to the desert tortoise or other beneficial wildlife species.

4.3.2 Health and Safety

None of the projects described in Section 4.2 would be expected to generate significant cumulative health and safety impacts with either the No-Action Alternative or Proposed Action, as described in this PEA. The DoD installations covered in this PEA have policies, plans, and procedures in place for protecting military personnel and the public, which would continue to be followed with implementation of the No-Action Alternative or Proposed Action. The resource management plans listed in cumulative projects (see Table 4-1, Projects 1, 5, 6, and 17) would not result in significant cumulative impacts with respect to health and safety. Cumulative projects specifically involving raven management or measures for raven control (see Table 4-1, Projects 1-6, 8-10, 12, and 14-17) would contribute to an overall beneficial impact to health and safety by reducing/managing raven populations in the region.

New depredation permits specific to the Proposed Action raven management actions would be obtained and replace expired/current depredation permits (see Table 4-1, Project 8). The use of pesticides and shooting under the Proposed Action would be integrated into each installation's appropriate plan (e.g., INRMP; see Table 4-1, Project 5) and would be used in accordance with resource protection measures listed in Section 2.4.1 to ensure the safe use of pesticides and predator control. The use of pesticides associated with agricultural lands outside/adjacent to the DoD installations (see Table 4-1, Project 18) would continue to occur under the regulation of the California Department of Pesticide Regulation. However, the use of pesticides under the Proposed Action (DRC-1339) would be in focused areas on DoD installations and would not have substantial overlap with the cumulative region of influence for health and safety (i.e., lands owned or used by the specific DoD installations as defined in Section 4.1).

Therefore, the No-Action Alternative or Proposed Action would not contribute to a significant cumulative impact to health and safety.

4.3.3 Cultural Resources

None of the projects described in Section 4.2 would be expected to generate significant cumulative cultural resources impacts with either the No-Action Alternative or Proposed Action.

Impacts to cultural resources and historic properties cannot typically be gauged from a cumulative impact perspective due to this resource being a generalized category and some resources or properties being unique. Despite this, the NHPA Section 106 process can be used to minimize impacts from a NEPA perspective.

Future projects with potential to impact historic properties would undergo Section 106 consultations with the California SHPO and other interested parties, and any adverse impacts would be mitigated, usually through avoidance or minimization, when possible. Adverse impacts under NHPA (36 CFR §800.5) are not the same as significant impacts under NEPA (40 CFR §§ 1508.27) (version effective 2005), but the NHPA process for resolving adverse effects (36 CFR §800.6) helps avoid significant impacts under NEPA.

Therefore, the No-Action Alternative or Proposed Action would not contribute to a significant cumulative impact to cultural resources.

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CHAPTER 5
MITIGATION, MONITORING, ADAPTIVE MANAGEMENT, & FUTURE NEPA REQUIREMENTS

The information in this chapter includes: a summary of proposed mitigation and monitoring; a summary of potential permits and consultations; a discussion of adaptive management; and a discussion of future NEPA requirements and limitation on future public participation.

5.1 MANDATORY MITIGATION

Resource protection measures are classified as mandatory because they have incorporated into the Proposed Action and No-Action Alternative, as described in Section 2.4.1. These measures are intended to reduce impacts associated with certain raven management actions, in advance; not in response to identified significant impacts.

- If any DoD installation could not implement some of these measures, the rationale would be explained in their separate, future decisions. Deviation, however, may require additional environmental analysis in support of the decision(s).

5.2 DISCRETIONARY MONITORING

If adopted, DoD installations would conduct USFWS's point count surveys per USFWS protocols, as described in Section 2.4.2, to ensure raven depredation remains within the scope of the PEA's effects analysis. This monitoring is classified as discretionary because the quantity of ravens lethally taken by the DoD installations would be documented and reported to the USFWS, Migratory Bird Program, as part of future depredation permits. The data generated by this reporting would be sufficient to ensure that raven take remains within the range estimated in this PEA and show that the raven population is collectively reduced as proposed in this PEA.

- DoD installations may decide to conduct such monitoring to help advance the state of current scientific knowledge and/or support compliance with the ESA for desert tortoise management.

5.3 DISCRETIONARY MITIGATION

If adopted and contingent on the availability of funds, MAGTFTC would contribute funds to RASP, as described in Section 2.4.3 to advance the recovery of the desert tortoise in compliance with ESA Section 7(a)(1) and to sustain the current and future military mission at the Combat Center

- Expenditure of MAGTFTC funds is contingent on the completion of regulatory processes by the applicant, landowner, and/or land manager.

5.4 PERMITS & CONSULTATIONS

Assuming adherence to the resource protection measures (Section 2.4.1) and completion of ESA Section 7 informal consultation on this PEA, potential future permits that could be required for some raven management actions (e.g., trap placement and removal of infrastructure), depending on the location where the action is implemented, include:

- NHPA, Section 106 consultation (see Sections 1.8 and 3.3); and
- CWA Nationwide Permit (see Section 3.4).

5.5 ADAPTIVE MANAGEMENT

During implementation of any raven management action under the No-Action Alternative or Proposed Action, it may be determined that adjustments are needed (e.g., methods and materials) to ensure effectiveness. Some adjustments may have effects on the natural and physical environment, and some may not.

- *For adjustments with potential effects,* each DoD installation would conduct an internal evaluation to determine whether the change requires a supplemental NEPA analysis in accordance with 40 CFR §1502.9 (d)(1)(i)-(ii). In the USMC, this internal evaluation is documented in a *Continuing Environmental Review Statement*. For example, Section 3.1.3.2 analyzed the effects of initially reducing raven populations by 11,830 (low end) to 13,293 (high end) (i.e., population "reset") and then by 1,477 (low end) to 1,715 (high end) per year across the DoD installations to maintain a sustainable raven population. Fluctuations between these two estimates would be considered within scope of the PEA, but a major increase in take above the high-end estimate might exceed the scope of the PEA and require supplementation.
    - If the internal evaluation concludes that supplemental NEPA analysis is not required, the DoD installation can move forward with the change subject to other regulatory approvals (e.g., MBTA and ESA).
    - If the internal evaluation concludes that supplemental NEPA is required, the DoD installation would initiate the appropriate NEPA process (e.g., CATEX, EA, or EIS).
- *For adjustments with no potential effects*, the change can be implemented without additional NEPA review. Other legal requirements and processes would still apply.

5.6 FUTURE NEPA REQUIREMENTS

This PEA seeks to facilitate and encourage raven management individually and collectively across several DoD installations but is not directing any specific action. Each DoD installation has the discretion to determine how they move forward with their natural resources management, including raven management. Based on this PEA, DoD installations take immediate action, implementing specific raven management actions, or conduct additional planning to develop a formal Integrated Raven Management Program or Plan for their installation.

- If immediate action is taken based on this PEA, installations would need to ensure completion of Section 106 for actions requiring consultation (see Table 3-5). The PEA is sufficient NEPA coverage because the analysis shows common regional impacts regardless of where the action is implemented.
- If additional planning occurs after this PEA, installations may not need to conduct additional NEPA analysis at the EA level if the future proposal slightly exceeds the scope of this PEA; not exceeding the NEPA supplementation threshold (40 CFR § 1502.9(c)).
- If additional planning occurs after this PEA, installations may need to conduct additional NEPA analysis at the EA level if the future proposal substantially exceeds the scope of this PEA; exceeding the NEPA supplementation threshold (40 CFR § 1502.9(c)). For example, an agency may need to prepare a separate EA for its INRMP. In this scenario, this PEA would not be sufficient NEPA coverage for the INRMP because its scope would be broader than just raven management.

Despite the foregoing, DoD installations can still conduct additional review at the CATEX level. For example, an agency may review specific raven management actions, not tied to a larger program or plan,

and it could be determined that the project is within scope of this PEA and/or a separate CATEX. Potential DoD CATEXs that could be used are listed below.

- Army CATEX #s: (b)(10), (b)(13), (c)(2), (d)(4), and (i)(2). (32 CFR Part 651, Appendix B to Part 651; available at: https://ecfr.io/Title-32/Part-651)
- Air Force CATEX #s: A2.3.7, A2.3.8, A2.3.11, A2.3.14, A2.3.24, and A2.3.25 (32 CFR Part 989, Appendix B; available at: https://ecfr.io/Title-32/Part-989)
- DoN-USMC CATEX #s: 4, 8, 9, 14, 17, 33, 40, 45, and 48 (32 CFR §775.6 (f)); available at: https://ecfr.io/Title-32/Section-775.6

As explained by the CEQ, "*agencies fulfill their NEPA responsibilities by: applying a categorical exclusion; preparing an environmental assessment; or preparing an environmental impact statement*" (CEQ 2014). Public comment is typically provided on EAs and EISs, but not CATEXs. Given that this PEA provides support that an EIS is not required to implement the analyzed raven management actions, future public comment would only occur if an installation is required to prepare an EA, supplemental EA, or does so at their discretion, as with this Draft PEA.

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CHAPTER 6
LIST OF AGENCIES CONTACTED

MAGTFTC consulted and coordinated with the agencies below during the development of the Draft PEA.

The following cooperating agencies were contacted:

- MCLB Barstow
- Edwards AFB
- Fort Irwin NTC
- NAWSCL
- MCAS Yuma
- USFWS, PSFWO
- USDA, APHIS

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- BLM, California District Office
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- Colorado River Indian Tribes
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CHAPTER 8
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Appendix A

Public Involvement

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Notice of Availability

Draft Programmatic Environmental Assessment and Proposed Finding of No Significant Impact for Management of the Common Raven on Department of Defense Lands in the California Desert

The U.S. Marine Corps' Marine Air Ground Task Force Training Command (MAGTFTC) and cooperating agencies have prepared a Draft Programmatic Environmental Assessment (PEA) to evaluate the potential environmental impacts associated with management of the Common Raven (*Corvus corax*) on lands owned or used by six Department of Defense (DoD) installations in the California desert. The six DoD installations include: Marine Corps Air Ground Combat Center at Twentynine Palms; Marine Corps Logistics Base Barstow; Edwards Air Force Base; Fort Irwin National Training Center; Naval Air Weapons Station China Lake; and Chocolate Mountain Aerial Gunnery Range (administered by Marine Corps Air Station Yuma). The purpose of the Proposed Action is to better manage raven populations at lands owned or used by the DoD in the California desert. The Proposed Action is needed to mitigate the ecological, economic, and health and safety impacts of subsidy-elevated and increasing raven populations in the California desert, all of which hinder military readiness on DoD installations in the region. MAGTFTC, as the National Environmental Policy Act lead agency, is requesting public input on the Draft PEA and the MAGTFTC-specific Proposed Finding of No Significant Impact (FONSI). The Proposed FONSI is being provided for public review to assist the agencies in deciding if there is any reason why a FONSI would not be appropriate. Electronic copies of the Draft PEA and Proposed FONSI are available for review at **https://www.29palms.marines.mil/Staff-offices/Environmental-Affairs/** (under "Environmental Assessments"). Hardcopies are available for review at the following libraries: Imperial County Library (Calipatria Branch), Kern County Libraries (Ridgecrest Branch Library, Rosamond Branch Library), Los Angeles County Library (Lancaster Library), San Bernardino County Libraries (Barstow Branch, Trona Branch, Twentynine Palms Branch, Joshua Tree Branch, Yucca Valley Branch), Riverside County Library (Mecca Branch). The 30-day public review period begins November 18, 2021, and electronic or written comments concerning the Proposed Action will be accepted through **December 18, 2021**. Comments may be submitted via email to jesse.w.martinez1@navy.mil or by mail C/O Cardno Government Services, Attention Jesse Martinez, 3888 State Street, Suite 201, Santa Barbara, CA 93105.

The public comments on the Draft Programmatic Environmental Assessment will be provided in Appendix A of the Final Programmatic Environmental Assessment.

Appendix B

Safety Data Sheets: Carbamylcholine chloride (Carbachol) and Methyl Anthranilate

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SAFETY DATA SHEET

Revision Date 23-Jan-2018 **Revision Number** 3

1. Identification

Product Name **Carbamylcholine chloride**

Cat No. : **AC108240000; AC108240050; AC108240250**

CAS-No 51-83-2
Synonyms (2-Hydroxyethyl)trimethylammonium chloride carbamate; Carbachol

Recommended Use Laboratory chemicals.
Uses advised against Food, drug, pesticide or biocidal product use.

Details of the supplier of the safety data sheet

Company

Fisher Scientific
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

Emergency Telephone Number
For information **US** call: 001-800-ACROS-01 / **Europe** call: +32 14 57 52 11
Emergency Number **US:**001-201-796-7100 / **Europe:** +32 14 57 52 99
CHEMTREC Tel. No.**US:**001-800-424-9300 / **Europe:**001-703-527-3887

2. Hazard(s) identification

Classification
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Acute oral toxicity	Category 2
Combustible dust	Yes

Label Elements

Signal Word
Danger

Hazard Statements
May form combustible dust concentrations in air
Fatal if swallowed

Precautionary Statements
Prevention
Wash face, hands and any exposed skin thoroughly after handling
Do not eat, drink or smoke when using this product
Ingestion
IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician
Rinse mouth
Storage
Store locked up
Store in a well-ventilated place. Keep container tightly closed
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
None identified

3. Composition/Information on Ingredients

Component	CAS-No	Weight %
Carbachol chloride	51-83-2	>95

4. First-aid measures

General Advice Show this safety data sheet to the doctor in attendance. Immediate medical attention is required.

Eye Contact Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. In the case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

Skin Contact Wash off immediately with plenty of water for at least 15 minutes. Immediate medical attention is required.

Inhalation Remove to fresh air. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Immediate medical attention is required. If not breathing, give artificial respiration.

Ingestion Do NOT induce vomiting. Call a physician or poison control center immediately.

Most important symptoms and effects No information available.

Notes to Physician Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media Water spray, carbon dioxide (CO2), dry chemical, alcohol-resistant foam.

Unsuitable Extinguishing Media No information available

Flash Point	No information available
Method -	No information available
Autoignition Temperature	No information available
Explosion Limits	
Upper	No data available
Lower	No data available
Sensitivity to Mechanical Impact	No information available
Sensitivity to Static Discharge	No information available

Specific Hazards Arising from the Chemical
Fine dust dispersed in air may ignite.

Hazardous Combustion Products
Nitrogen oxides (NOx). Carbon monoxide (CO). Carbon dioxide (CO_2). Chlorine. Ammonia. Hydrogen chloride gas.
Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear. Thermal decomposition can lead to release of irritating gases and vapors.

NFPA

Health	Flammability	Instability	Physical hazards
4	1	0	N/A

6. Accidental release measures

Personal Precautions	Ensure adequate ventilation. Use personal protective equipment as required. Keep people away from and upwind of spill/leak. Evacuate personnel to safe areas. Avoid dust formation.
Environmental Precautions	Should not be released into the environment. See Section 12 for additional Ecological Information.
Methods for Containment and Clean Up	Sweep up and shovel into suitable containers for disposal. Avoid dust formation.

7. Handling and storage

Handling	Do not get in eyes, on skin, or on clothing. Use only under a chemical fume hood. Wear personal protective equipment/face protection. Do not breathe (dust, vapor, mist, gas). Avoid dust formation. Do not ingest. If swallowed then seek immediate medical assistance.
Storage	Keep containers tightly closed in a dry, cool and well-ventilated place. Store under an inert atmosphere.

8. Exposure controls / personal protection

Exposure Guidelines	This product does not contain any hazardous materials with occupational exposure limitsestablished by the region specific regulatory bodies.
Engineering Measures	Ensure adequate ventilation, especially in confined areas. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal Protective Equipment

Eye/face Protection	Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Skin and body protection	Wear appropriate protective gloves and clothing to prevent skin exposure.

Respiratory Protection Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Hygiene Measures Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Powder Solid
Appearance	White
Odor	No information available
Odor Threshold	No information available
pH	No information available
Melting Point/Range	200 - 204 °C / 392 - 399.2 °F
Boiling Point/Range	No information available
Flash Point	No information available
Evaporation Rate	Not applicable
Flammability (solid,gas)	No information available
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	No information available
Vapor Density	Not applicable
Specific Gravity	No information available
Solubility	No information available
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	No information available
Decomposition Temperature	> 210°C
Viscosity	Not applicable
Molecular Formula	C6 H15 Cl N2 O2
Molecular Weight	182.65

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Hygroscopic.

Conditions to Avoid Incompatible products. Excess heat. Exposure to moist air or water.

Incompatible Materials Strong oxidizing agents, Strong acids

Hazardous Decomposition Products Nitrogen oxides (NOx), Carbon monoxide (CO), Carbon dioxide (CO_2), Chlorine, Ammonia, Hydrogen chloride gas

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Carbachol chloride	LD50 = 40 mg/kg (Rat)	Not listed	Not listed

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation No information available

Sensitization No information available

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Carbachol chloride	51-83-2	Not listed	Not listed	Not listed	Not listed	Not listed

Mutagenic Effects No information available

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure None known
STOT - repeated exposure None known

Aspiration hazard No information available

Symptoms / effects,both acute and delayed No information available

Endocrine Disruptor Information No information available

Other Adverse Effects The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity
Do not empty into drains.

Persistence and Degradability Soluble in water Persistence is unlikely based on information available.

Bioaccumulation/ Accumulation No information available.

Mobility Will likely be mobile in the environment due to its water solubility.

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

14. Transport information

DOT
- **UN-No** UN2811
- **Hazard Class** 6.1
- **Packing Group** II

TDG
- **UN-No** UN2811
- **Hazard Class** 6.1
- **Packing Group** II

IATA
- **UN-No** UN2811
- **Proper Shipping Name** TOXIC SOLID, ORGANIC, N.O.S.*
- **Hazard Class** 6.1
- **Packing Group** II

IMDG/IMO

UN-No	UN2811
Proper Shipping Name	Toxic solid, organic, n.o.s.
Hazard Class	6.1
Packing Group	II

15. Regulatory information

United States of America Inventory

Component	CAS-No	TSCA	TSCA Inventory notification - Active/Inactive	TSCA - EPA Regulatory Flags
Carbachol chloride	51-83-2	X	ACTIVE	-

Legend:
TSCA - Toxic Substances Control Act, (40 CFR Part 710)
X - Listed
'-' - Not Listed

TSCA 12(b) - Notices of Export Not applicable

International Inventories
Canada (DSL/NDSL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Australia (AICS), China (IECSC), Korea (ECL).

Component	CAS-No	DSL	NDSL	EINECS	PICCS	ENCS	AICS	IECSC	KECL
Carbachol chloride	51-83-2	-	X	200-127-3	-	-	X	-	-

U.S. Federal Regulations

SARA 313 Not applicable

SARA 311/312 Hazard Categories See section 2 for more information

CWA (Clean Water Act) Not applicable

Clean Air Act Not applicable

OSHA - Occupational Safety and Health Administration Not applicable

CERCLA This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

Component	Hazardous Substances RQs	CERCLA EHS RQs
Carbachol chloride	-	500 lb

California Proposition 65 This product does not contain any Proposition 65 chemicals.

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Carbachol chloride	X	X	X	-	-

U.S. Department of Transportation

Reportable Quantity (RQ):	N
DOT Marine Pollutant	N
DOT Severe Marine Pollutant	N

U.S. Department of Homeland Security This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade No information available

16. Other information

Prepared By
Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Revision Date 23-Jan-2018
Print Date 23-Jan-2018
Revision Summary This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS).

Disclaimer
The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text

End of SDS

SAFETY DATA SHEET

Revision Date 13-Dec-2020 **Revision Number** 5

SECTION 1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

1.1. Product identifier

Product Description:	**Methyl anthranilate**
Cat No. :	**126320000; 126320025; 126320500; 126322500; 126325000**
Synonyms	Methyl 2-aminobenzoate
CAS-No	134-20-3
EC-No.	205-132-4
Molecular Formula	C8 H9 N O2

1.2. Relevant identified uses of the substance or mixture and uses advised against

Recommended Use	Laboratory chemicals.
Uses advised against	No Information available

1.3. Details of the supplier of the safety data sheet

Company

UK entity/business name
Fisher Scientific UK
Bishop Meadow Road, Loughborough,
Leicestershire LE11 5RG, United Kingdom

EU entity/business name
Acros Organics BVBA
Janssen Pharmaceuticalaan 3a
2440 Geel, Belgium

E-mail address begel.sdsdesk@thermofisher.com

1.4. Emergency telephone number

For information **US** call: 001-800-ACROS-01 / **Europe** call: +32 14 57 52 11
Emergency Number **US:**001-201-796-7100 / **Europe:** +32 14 57 52 99
CHEMTREC Tel. No.**US:**001-800-424-9300 / **Europe:**001-703-527-3887

SECTION 2: HAZARDS IDENTIFICATION

2.1. Classification of the substance or mixture

CLP Classification - Regulation (EC) No 1272/2008

Physical hazards

Based on available data, the classification criteria are not met

Health hazards

Skin Corrosion/Irritation	Category 2 (H315)
Serious Eye Damage/Eye Irritation	Category 2 (H319)

Environmental hazards
Based on available data, the classification criteria are not met

Full text of Hazard Statements: see section 16

2.2. Label elements

Signal Word **Warning**

Hazard Statements
H319 - Causes serious eye irritation
H315 - Causes skin irritation

Precautionary Statements
P302 + P352 - IF ON SKIN: Wash with plenty of soap and water
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing

2.3. Other hazards

Substance is not considered persistent, bioaccumulative and toxic (PBT) / very persistent and very bioaccumulative (vPvB)

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

3.1. Substances

Component	CAS-No	EC-No.	Weight %	CLP Classification - Regulation (EC) No 1272/2008
Methyl anthranilate	134-20-3	EEC No. 205-132-4	>95	Skin Irrit. 2 (H315) Eye Irrit. 2 (H319)

Full text of Hazard Statements: see section 16

SECTION 4: FIRST AID MEASURES

4.1. Description of first aid measures

Eye Contact	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Get medical attention.
Skin Contact	Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention.
Ingestion	Clean mouth with water. Get medical attention.
Inhalation	Remove from exposure, lie down. Remove to fresh air. If breathing is difficult, give oxygen. If not breathing, give artificial respiration. Get medical attention.
Self-Protection of the First Aider	Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves and prevent spread of contamination.

4.2. Most important symptoms and effects, both acute and delayed

No information available.

4.3. Indication of any immediate medical attention and special treatment needed

Notes to Physician Treat symptomatically.

SECTION 5: FIREFIGHTING MEASURES

5.1. Extinguishing media

Suitable Extinguishing Media
Water spray. Carbon dioxide (CO_2). Dry chemical. Chemical foam.

Extinguishing media which must not be used for safety reasons
No information available.

5.2. Special hazards arising from the substance or mixture

Thermal decomposition can lead to release of irritating gases and vapors.

Hazardous Combustion Products
Nitrogen oxides (NOx), Carbon monoxide (CO), Carbon dioxide (CO_2).

5.3. Advice for firefighters

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

SECTION 6: ACCIDENTAL RELEASE MEASURES

6.1. Personal precautions, protective equipment and emergency procedures

Ensure adequate ventilation.

6.2. Environmental precautions

See Section 12 for additional Ecological Information.

6.3. Methods and material for containment and cleaning up

Soak up with inert absorbent material (e.g. sand, silica gel, acid binder, universal binder, sawdust). Keep in suitable, closed

containers for disposal.

6.4. Reference to other sections

Refer to protective measures listed in Sections 8 and 13.

SECTION 7: HANDLING AND STORAGE

7.1. Precautions for safe handling

Avoid contact with skin and eyes. Do not breathe mist/vapors/spray.

Hygiene Measures
Handle in accordance with good industrial hygiene and safety practice. Keep away from food, drink and animal feeding stuffs. Do not eat, drink or smoke when using this product. Remove and wash contaminated clothing and gloves, including the inside, before re-use. Wash hands before breaks and after work.

7.2. Conditions for safe storage, including any incompatibilities

Keep in a dry, cool and well-ventilated place. Keep container tightly closed. Protect from light.

Technical Rules for Hazardous Substances (TRGS) 510 Storage Class (LGK) (Germany) Class 10

7.3. Specific end use(s)

Use in laboratories

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1. Control parameters

Exposure limits
This product, as supplied, does not contain any hazardous materials with occupational exposure limits established by the region specific regulatory bodies

Biological limit values
This product, as supplied, does not contain any hazardous materials with biological limits established by the region specific regulatory bodies

Monitoring methods
BS EN 14042:2003 Title Identifier: Workplace atmospheres. Guide for the application and use of procedures for the assessment of exposure to chemical and biological agents.

Derived No Effect Level (DNEL) No information available

Route of exposure	Acute effects (local)	Acute effects (systemic)	Chronic effects (local)	Chronic effects (systemic)
Oral				
Dermal				
Inhalation				

Predicted No Effect Concentration (PNEC) No information available.

8.2. Exposure controls

Engineering Measures
Ensure adequate ventilation, especially in confined areas. Ensure that eyewash stations and safety showers are close to the workstation location.
Wherever possible, engineering control measures such as the isolation or enclosure of the process, the introduction of process or equipment changes to minimise release or contact, and the use of properly designed ventilation systems, should be adopted to control hazardous materials at source

Personal protective equipment

Eye Protection Goggles (European standard - EN 166)

Hand Protection Protective gloves

Glove material	Breakthrough time	Glove thickness	EU standard	Glove comments
Natural rubber Nitrile rubber Neoprene PVC	See manufacturers recommendations	-	EN 374	(minimum requirement)

Skin and body protection Wear appropriate protective gloves and clothing to prevent skin exposure

Inspect gloves before use.
Please observe the instructions regarding permeability and breakthrough time which are provided by the supplier of the gloves. (Refer to manufacturer/supplier for information)
Ensure gloves are suitable for the task: Chemical compatability, Dexterity, Operational conditions, User susceptibility, e.g. sensitisation effects, also take into consideration the specific local conditions under which the product is used, such as the danger of cuts, abrasion.
Remove gloves with care avoiding skin contamination.

Respiratory Protection No protective equipment is needed under normal use conditions.

Large scale/emergency use Use a NIOSH/MSHA or European Standard EN 136 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced

Small scale/Laboratory use Maintain adequate ventilation

Environmental exposure controls No information available.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1. Information on basic physical and chemical properties

Physical State	Liquid	
Appearance	Dark yellow	
Odor	Characteristic	
Odor Threshold	No data available	
Melting Point/Range	24 °C / 75.2 °F	
Softening Point	No data available	
Boiling Point/Range	256 °C / 492.8 °F	@ 760 mmHg
Flammability (liquid)	No data available	
Flammability (solid,gas)	Not applicable	Liquid
Explosion Limits	**Lower** 1.4 Vol% **Upper** 7.8 Vol%	
Flash Point	104 °C / 219.2 °F	**Method -** No information available
Autoignition Temperature	530 °C / 986 °F	
Decomposition Temperature	No data available	

pH	No information available	
Viscosity	No data available	
Water Solubility	2.9 g/l	
Solubility in other solvents	No information available	
Partition Coefficient (n-octanol/water)		
Component	**log Pow**	
Methyl anthranilate	1.88	
Vapor Pressure	1 mmHg @ 20 °C	
Density / Specific Gravity	1.168	
Bulk Density	Not applicable	Liquid
Vapor Density	No data available	(Air = 1.0)
Particle characteristics	Not applicable (liquid)	

9.2. Other information

Molecular Formula	C8 H9 N O2
Molecular Weight	151.16

SECTION 10: STABILITY AND REACTIVITY

10.1. Reactivity

None known, based on information available

10.2. Chemical stability

Light sensitive.

10.3. Possibility of hazardous reactions

Hazardous Polymerization	No information available.
Hazardous Reactions	No information available.

10.4. Conditions to avoid

Exposure to light. Incompatible products.

10.5. Incompatible materials

Acids. Bases. Acid anhydrides. Acid chlorides. Chloroformates. Reducing Agent.

10.6. Hazardous decomposition products

Nitrogen oxides (NOx). Carbon monoxide (CO). Carbon dioxide (CO_2).

SECTION 11: TOXICOLOGICAL INFORMATION

11.1. Information on hazard classes as defined in Regulation (EC) No 1272/2008

Product Information

(a) acute toxicity;

Oral	Based on available data, the classification criteria are not met
Dermal	Based on available data, the classification criteria are not met
Inhalation	Based on available data, the classification criteria are not met

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Methyl anthranilate	LD50 = 2910 mg/kg (Rat)	>2000 mg/kg (Rat) >5 g/kg (Rabbit)	-

(b) skin corrosion/irritation; Category 2

(c) serious eye damage/irritation; Category 2

(d) respiratory or skin sensitization;
Respiratory No data available
Skin No data available

(e) germ cell mutagenicity; No data available

(f) carcinogenicity; No data available

There are no known carcinogenic chemicals in this product

(g) reproductive toxicity; No data available

(h) STOT-single exposure; No data available

(i) STOT-repeated exposure; No data available

Target Organs No information available.

(j) aspiration hazard; No data available

Other Adverse Effects The toxicological properties have not been fully investigated. See actual entry in RTECS for complete information

Symptoms / effects,both acute and delayed No information available.

11.2. Information on other hazards

Endocrine Disrupting Properties Assess endocrine disrupting properties for human health. This product does not contain any known or suspected endocrine disruptors.

SECTION 12: ECOLOGICAL INFORMATION

12.1. Toxicity
Ecotoxicity effects Contains no substances known to be hazardous to the environment or that are not degradable in waste water treatment plants.

Component	Freshwater Fish	Water Flea	Freshwater Algae
Methyl anthranilate	LC50: 9.12 mg/l/96 h (Lepomis macrochirus)	EC50: 18.2 mg/l/48 h	

12.2. Persistence and degradability Expected to be biodegradable
Persistence Soluble in water, Persistence is unlikely, based on information available.

12.3. Bioaccumulative potential Bioaccumulation is unlikely

Component	log Pow	Bioconcentration factor (BCF)
Methyl anthranilate	1.88	6

12.4. Mobility in soil The product is water soluble, and may spread in water systems Will likely be mobile in the environment due to its water solubility. Highly mobile in soils

12.5. Results of PBT and vPvB assessment Substance is not considered persistent, bioaccumulative and toxic (PBT) / very persistent and very bioaccumulative (vPvB).

12.6. Endocrine disrupting properties

Endocrine Disruptor Information This product does not contain any known or suspected endocrine disruptors

12.7. Other adverse effects

Persistent Organic Pollutant This product does not contain any known or suspected substance

Ozone Depletion Potential This product does not contain any known or suspected substance

SECTION 13: DISPOSAL CONSIDERATIONS

13.1. Waste treatment methods

Waste from Residues/Unused Products Waste is classified as hazardous. Dispose of in accordance with the European Directives on waste and hazardous waste. Dispose of in accordance with local regulations.

Contaminated Packaging Dispose of this container to hazardous or special waste collection point.

European Waste Catalogue (EWC) According to the European Waste Catalog, Waste Codes are not product specific, but application specific.

Other Information Waste codes should be assigned by the user based on the application for which the product was used. Do not empty into drains.

SECTION 14: TRANSPORT INFORMATION

IMDG/IMO Not regulated

14.1. UN number
14.2. UN proper shipping name
14.3. Transport hazard class(es)
14.4. Packing group

ADR Not regulated

14.1. UN number
14.2. UN proper shipping name
14.3. Transport hazard class(es)
14.4. Packing group

IATA Not regulated

14.1. UN number
14.2. UN proper shipping name
14.3. Transport hazard class(es)
14.4. Packing group

14.5. Environmental hazards No hazards identified

14.6. Special precautions for user No special precautions required

14.7. Maritime transport in bulk according to IMO instruments Not applicable, packaged goods

SECTION 15: REGULATORY INFORMATION

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

International Inventories
X = listed, Europe (EINECS/ELINCS/NLP), U.S.A. (TSCA), Canada (DSL/NDSL), Philippines (PICCS), China (IECSC), Japan (ENCS), Australia (AICS), Korea (ECL).

Component	EINECS	ELINCS	NLP	TSCA	DSL	NDSL	PICCS	ENCS	IECSC	AICS	KECL
Methyl anthranilate	205-132-4	-		X	X	-	X	X	X	X	KE-01204

Regulation (EC) No 649/2012 of the European Parliament and of the Council of 4 July 2012 concerning the export and import of dangerous chemicals
Not applicable

National Regulations

WGK Classification See table for values

Component	Germany - Water Classification (VwVwS)	Germany - TA-Luft Class
Methyl anthranilate	WGK1	

UK - Take note of Control of Substances Hazardous to Health Regulations (COSHH) 2002 and 2005 Amendment

15.2. Chemical safety assessment

A Chemical Safety Assessment/Report (CSA/CSR) has not been conducted

SECTION 16: OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3
H315 - Causes skin irritation
H319 - Causes serious eye irritation

Legend

CAS - Chemical Abstracts Service

EINECS/ELINCS - European Inventory of Existing Commercial Chemical Substances/EU List of Notified Chemical Substances
PICCS - Philippines Inventory of Chemicals and Chemical Substances
IECSC - Chinese Inventory of Existing Chemical Substances
KECL - Korean Existing and Evaluated Chemical Substances

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List
ENCS - Japanese Existing and New Chemical Substances
AICS - Australian Inventory of Chemical Substances
NZIoC - New Zealand Inventory of Chemicals

WEL - Workplace Exposure Limit
ACGIH - American Conference of Governmental Industrial Hygienists
DNEL - Derived No Effect Level
RPE - Respiratory Protective Equipment
LC50 - Lethal Concentration 50%
NOEC - No Observed Effect Concentration

TWA - Time Weighted Average
IARC - International Agency for Research on Cancer
Predicted No Effect Concentration (PNEC)
LD50 - Lethal Dose 50%
EC50 - Effective Concentration 50%
POW - Partition coefficient Octanol:Water

PBT - Persistent, Bioaccumulative, Toxic

vPvB - very Persistent, very Bioaccumulative

ADR - European Agreement Concerning the International Carriage of Dangerous Goods by Road

ICAO/IATA - International Civil Aviation Organization/International Air Transport Association

IMO/IMDG - International Maritime Organization/International Maritime Dangerous Goods Code

MARPOL - International Convention for the Prevention of Pollution from Ships

OECD - Organisation for Economic Co-operation and Development

ATE - Acute Toxicity Estimate

BCF - Bioconcentration factor

VOC (volatile organic compound)

Key literature references and sources for data

https://echa.europa.eu/information-on-chemicals

Suppliers safety data sheet, Chemadvisor - LOLI, Merck index, RTECS

Training Advice

Chemical hazard awareness training, incorporating labelling, Safety Data Sheets (SDS), Personal Protective Equipment (PPE) and hygiene.

Use of personal protective equipment, covering appropriate selection, compatibility, breakthrough thresholds, care, maintenance, fit and standards.

First aid for chemical exposure, including the use of eye wash and safety showers.

Revision Date	13-Dec-2020
Revision Summary	Update to CLP Format.

This safety data sheet complies with the requirements of Regulation (EC) No. 1907/2006 COMMISSION REGULATION (EU) 2020/878 amending Annex II to Regulation (EC) No 1907/2006

Disclaimer

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text

End of Safety Data Sheet

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Appendix C

Human Health and Ecological Risk Assessment for DRC-1339 & Pesticide Product Labels

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Human Health and Ecological Risk Assessment
for the Use of Wildlife Damage Management Methods
by USDA-APHIS-Wildlife Services

Chapter XVII

The Use of DRC-1339 in Wildlife Damage Management

June 2019

THE USE OF DRC-1339 IN WILDLIFE DAMAGE MANAGEMENT

EXECUTIVE SUMMARY

DRC-1339 is a toxicant registered to control various pest bird species under a variety of agricultural and nonagricultural uses. The USDA-APHIS-Wildlife Services (WS) Program uses DRC-1339 to control damage caused by specific species of blackbirds, grackles, cowbirds, starlings, pigeons, collared-doves, crows, ravens, magpies, and gulls. WS took an annual average of 2.8 million birds with DRC-1339 lethally from fiscal year (FY) 2011 to FY 2015 and 52% of these were European starlings, an invasive species. Of all WS take nationally for all species and with all methods, DRC-1339 represented 71% of the lethal take. WS annually averaged the use of 77.4 pounds of technical product for FY11-FY15 and took a total of 15 species in this time. APHIS is the registrant for DRC-1339 Technical and its end use products. DRC-1339 is a restricted use pesticide and only USDA APHIS certified applicators or by persons under their direct supervision trained in bird control use the product.

USDA APHIS evaluated the potential human health and ecological risks from the proposed use of DRC-1339 to control bird damage. DRC-1339 is corrosive to eyes and skin and the acute inhalation toxicity is unknown, but assumed to be Category I (most hazardous) by EPA. Although the hazard potential could be high, the anticipated minimal exposure to this pesticide will be low risk due to the limited use of the product. Exposure is greatest for workers who mix the product with a bait material; however, required personnel protective equipment results in a low potential for exposure and risk when factoring in available health effects. The potential exposure and risk to the general public is low due to the use pattern and label restrictions, as well as lack of dietary exposure through food or drinking water. WS is unaware of any exposure from 1987 to present to WS personnel or the general public.

Ecological risks to aquatic nontarget organisms is low based on the use pattern, available toxicity data and labeled mitigation measures designed to reduce exposure to aquatic habitats. Risks to terrestrial invertebrates and plants are also low based on available effects data and the method of application. Risk is greatest for sensitive terrestrial nontarget vertebrates, in particular birds, but these risks can be reduced with label requirements and other measures that are designed to reduce exposure.

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1 INTRODUCTION

DRC-1339 is an avicide (toxicant for birds) used by the U.S. Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), Wildlife Services (WS) Program to reduce bird conflicts at livestock facilities and airports, and to reduce damage to crops, livestock, property, and natural resources, including threatened and endangered species, per label allowances. The primary target species include European starlings[1], rock pigeons, Eurasian collared-doves, and specific species of blackbirds[2], corvids[3], and gulls. DRC-1339 is a very pale yellow, crystalline powder that is highly soluble in water and other polar solvents. It was named from a code it received at the Denver Research Center[4] (DRC), as the 1,339th chemical tested at the Center, which became its common name. It has also been known by the tradename Starlicide®, which was originally registered as a pelleted bait for starlings under a label from Purina Mills in 1967.

This human health risk assessment (HHRA) and ecological risk assessment (ERA) provides a qualitative and quantitative evaluation of potential risks and hazards to human health and the environment, including nontarget fish and wildlife, as a result of exposure to DRC-1339 from proposed WS uses, which are limited and targeted in scope (USDA 2012). The methods used to assess potential human health effects follow standard regulatory guidance and methodologies (National Research Council 1983), and generally conform to other Federal agencies such as the U.S. Environmental Protection Agency (USEPA 2017c). The methods used to assess potential ecological risk to nontarget fish and wildlife generally follow USEPA (2017c) methodologies.

The risk assessment is divided into four sections: problem formulation (identifying hazard), toxicity assessment (dose-response assessment), and exposure assessment (identifying potentially exposed populations and determining potential exposure pathways for these populations). Lastly, the information from the toxicity and exposure assessments is combined to characterize risk (determining whether there is adverse human health or ecological risk). A discussion of the uncertainties associated with the risk assessment and cumulative effects is also included in this risk assessment.

1.1 Use Pattern

For more than 50 years, DRC-1339 has proven to be an effective tool for starling, pigeon, blackbird, corvid, and gull damage management (West et al. 1967, West and Besser 1976, Besser et al. 1967, and DeCino et al. 1966). DRC-1339 is a slow acting avicide that kills target birds between 3 and 80 hours after ingestion of a lethal dose (Dawes 2006). The slow action of the avicide allows the chemical to be partially or mostly metabolized prior to the birds succumbing to the chemical (Schafer 1984, Goldade 2017). DRC-1339 appears to pose little risk of secondary poisoning to nontarget animals, including avian scavengers (Cunningham et al. 1979, Schafer 1984, Knittle et al. 1990). The technical grade[5] of the active ingredient is very highly acutely toxic to many pest birds, but generally less acutely toxic to raptors, waterfowl, finches, and other birds, and most mammals (DeCino et al. 1966, Palmore 1978, Schafer 1981). For example, an 89 g starling, a highly sensitive species, requires a dose of only 0.3 mg/bird to cause death (Royall et al. 1967) while many other bird species such as raptors, house sparrows, and finches are classified as non-sensitive, requiring a much higher dose (Eisemann et al. 2003). A 29 g house sparrow would require a dose of 9 mg, while a 22 g house

[1] Scientific names are given in the Risk Assessment Introduction Chapter I, unless first time used.
[2] Generic use of blackbirds for this risk assessment includes specific species of blackbirds, cowbirds, and grackles on labels.
[3] Corvids refers to the family Corvidae, which includes ravens, crows, magpies, and jays, but jays are not on any DRC-1339 label.
[4] Later was renamed the WS-National Wildlife Research Center when it moved from Denver to Fort Collins, CO.
[5] Technical grade chemicals are good quality used for commercial and industrial purposes. Not pure enough to meet the chemical standards of purified, lab grade, or above.

finch and a 118 g American kestrel would require more than 5 mg and 38 mg (DeCino et al. 1966, Schafer et al. 1983). It should be noted that larger birds and pigeons require more product (more toxicant) to be taken lethally. Secondary hazards of DRC-1339 are likely very low unless toxic bait is still largely intact in the carcass. DRC-1339 acts in a relatively humane manner producing a quiet death (Timm 1994, Dawes 2006). Prior to the application of DRC-1339, prebaiting is often required to monitor for nontarget species that may consume the bait. If nontarget species are observed, then the use of DRC-1339 would be postponed or not applied at that particular location. The application method such as the use of prebaiting to assess palatability of the bait and prevent overbaiting, and the low risk of secondary hazards reduce the potential exposure to sensitive threatened and endangered species as well as preclude hazards to most other non-target species.

Some people have stated that DRC-1339 is an inhumane toxicant and should not be used. WS recognizes that any use of lethal methods, toxicants in particular, is considered by many individuals to be inhumane even if time until death and symptoms exhibited appear to be minimal. DRC-1339 causes renal failure in treated birds (Timm 1994). Renal failure in birds causes weight loss, depression, lethargy, increased thirst (polydipsia) and urination (polyuria), dehydration, articular gout, and eventually death (Merck 2018a). Death in birds occurs typically within a few days following ingestion of a lethal dose (Timm 1994). Mammals can succumb rather quickly with those ingesting a lethal dose dying in 3 to 12 hours (Timm 1994). Higher doses do not increase the speed of mortality (Timm 1994). Research is not available on pain experienced by birds treated with DRC-1339, just observational reports (DeCino et al. 1966, Timm 1994, Dawes 2006); convulsions, spasms or distress calls have not been observed in birds receiving a lethal dose, rather the birds die a seemingly quiet death. Birds that get a lethal dose may show no outward clinical signs for many hours and go about normal activities. About four hours before death, the birds cease to eat or drink and become listless and inactive, and possibly comatose (Timm 1994, Dawes 2006). They perch with their feathers puffed up (piloerection) and appear to doze. The product has been assessed as relatively humane and suitable for further investigation into potential use in Australia (Dawes 2006, Bentz et al. 2007) and is registered in New Zealand.

The end use product, Compound DRC-1339 Concentrate (100% DRC-1339 Technical, which is 97% purity DRC-1339), is used to control various bird species under various agricultural and non-agricultural uses in the U.S. Labels have varied over the last 50 years when the first formulation was registered, changing species that can be targeted, allowing additional bait substrates, restricting amounts that can be used over a given area, and types of areas that can be treated. For FY11[6] to FY15, the data used for this risk assessment, the federal DRC-1339 labels included new labeling updates for various uses during this time (Table 1).

Table 1. DRC-1339 labels and significant dates when use restrictions on the label changed, to provide a comparison to take (Table 2) and label usage (Table 3) for the labels used from FY11 to FY15.

DRC-1339 LABEL CHANGES FOR FY11 TO FY15					
Product (Parent Label)	**EPA Registration No.**	**Significant Label Change Dates**			
Feedlots	56228-10	10/26/2009	02/01/2011	01/30/2014	03/05/2014
Gulls	56228-17	05/19/2010	12/11/2013		
Pigeons	56228-28	10/26/2009	12/11/2013		
Livestock, Nest & Fodder Depredations	56228-29	10/26/2009	12/11/2013		
Staging Areas	56228-30	10/26/2009	03/29/2011	12/11/2013	

In 2018, the Bird Control label (USDA 2017a) was developed, and replaced the Feedlots, Gulls, Pigeons, and Staging Areas labels as of January 2019; this Bird Control label also incorporated 14 state Special Local Needs (SLN) labels. The labeling lists the bait substrates, target species, and sites where DRC-1339 can be used. Mixing directions depend on the bait substrate (e.g., rice, cracked and whole corn, French fries, and livestock

[6] FY11 equals the federal Fiscal Year 2011, which is October 1, 2010-September 30, 2011 (the year is denoted by FY11, FY12, and so on).

pellets) that can be used to mix with DRC-1339 and how much untreated bait to cut with the treated bait. Prebaiting is required for all applications. DRC-1339 prepared baits deteriorate rapidly and need to be used relatively soon after preparation or disposed according to label directions.

WS took an annual estimated average of 2,810,095 target birds of 15 species using an annual average 35,122 grams (1,239 oz. or 77 lbs.) of DRC-1339 in 18 states from FY11 to FY15 (Table 2). During this time, WS applied DRC-1339 under 18 Section 3 and SLN (Section 24(c)) labels operationally (Table 3). The most common resources protected by WS were livestock and feed, aircraft, other wildlife, and crops. The species groups taken were starlings and blackbirds (99.1%), pigeons (0.5%), corvids (0.4%), and gulls (0.004%). The most common target species lethally taken were European starlings (52%), brown-headed cowbirds (27%), red-winged blackbirds (16%), and common grackles (4%) (Table 2). Weight-wise, the majority of DRC-1339 used targeted starlings (89%), common ravens (2.9%), feral pigeons (2.5%), American crows (1.8%), and brown-headed cowbirds (1.6%); it should be noted that some DRC-1339 targeting a specific species may have had minimal take for various reasons like birds did not show up to feed or bait was ruined by weather.

Table 2. The annual average number of target birds taken with DRC-1339 treated baits used by WS in wildlife damage management from FY11 through FY15. Take was estimated for WS projects that did not determine take.

ANNUAL AVERAGE DRC-1339 USE AND SPECIES TAKEN			
Species*	**Take**	**DRC-1339 (g)**	**States Where Used**
Target			
European Starling*	1,449,656	31,222.8	AZ CA CO CT IA ID IL IN KS MA MD ME MI MN MO MT NE NJ NM NV NY OH OK OR PA SD TX UT VA VT WA WI WV WY
Yellow-headed Blackbird	80	4.6	OK
Red-winged Blackbird	452,014	450.8	AZ CA CO LA NM NV OR TX WV WY
Brown-headed Cowbird	744,988	549.5	AZ CA LA NV OH OK TX
Brewer's Blackbird	6,062	41.1	AZ CA NM NV OR
Common Grackle	123,624	255.6	LA OK TX WV
Boat-tailed Grackle	60	0.2	LA
Great-tailed Grackle	7,897	34.9	AZ NM OK TX
Rock Pigeon*	13,112	896.0	AZ CA CO IA ID IL KS KY ME MI MN MO MT ND NE NM NV OK OR PA TN TX UT VT WA WV WY
Great Black-backed Gull	6	0.5	ME
California Gull	6	1.2	ID
American Herring Gull	90	7.9	ME
Black-billed Magpie	321	18.4	ID OR WY
American Crow	3,385	631.8	CA ID MA NE OK OR TX WA WY
Common Raven	8,794	1,006.5	AZ CA ID MT NM NV OR TX UT WA WY
TOTAL (15 sp.)	**2,810,095**	**35,121.8**	**38 States**
Nontarget			
Brown-headed Cowbird	12	0.1	WI
Rock Pigeon*	152	3.0	NM WV WY
American Crow	80	3.0	NM
Common Raven	0.4	0.1	NM
TOTAL (4 sp.)	**244**	**6**	**5 States**
GRAND TOTAL (15 sp.)	**2,810,339**	**35,128**	**38 States**

* Introduced species

WS personnel took an annual average of 244 nontarget birds of four species (Table 2); of these, 164 were being targeted at feedlots, but accidentally taken while targeting other species with a particular DRC-1339 formulation. The annual average of American crows (80) and common ravens (0.4) were not target species at the sites where they were accidentally taken. All of the nontarget species taken are species WS would take with DRC-1339 under different circumstances. WS did not take other nontarget species unintentionally, including threatened, endangered, or sensitive species, or species not listed on the label.

Historically, APHIS registered five DRC-1339 Section 3 labels, but only two Section 3 labels are currently registered as of 2019 (Table 3). Four labels (Feedlots, Gulls, Pigeons, and Staging Areas) were incorporated into the Bird Control label, while the Livestock, Nest and Fodder (LNFD) Depredations label remains a separate labeled use. Additionally, states have registered specific uses for DRC-1339 under SLN registrations. In addition to the cancelation of the four Section 3 labels, 25 SLN registrations were cancelled in 2018 after their uses were incorporated under the Bird Control label or were determined to no longer be needed. As of 2019, WS has only 6 active DRC-1339 SLN registrations (4 under the LNFD label and 2 under the Bird Control label), and two pending SLN registration applications under the Bird Control label (Table 3). Of the 36 labels active within FY11 to FY15, only half were used in those five years (Table 3). The majority of DRC-1339 product used by WS was used under the APHIS Feedlot label or SLNs that used it as the parent label (83.5%). The APHIS Staging Area label or SLN labels developed from it were used next most (11.3%). The others were used minimally.

Table 3. The annual average number of grams of DRC-1339 applied by APHIS-WS in WDM from FY11 thru FY15 by all labels with the number of projects and applications.

ANNUAL AVERAGE DRC-1339 USE BY Product FOR FY11 TO FY15				
Product (Parent Label)	**EPA Registration No.**	**Applied (g)**	**Projects**	**WTs**
Feedlots* (FLot) Cancelled	56228-10	28,065.0	302	350
Gulls* Cancelled	56228-17	9.6	0.4	0.4
Pigeons* Cancelled	56228-28	837.6	36	60
Livestock, Nest & Fodder Depredations (LNFD)	56228-29	471.6	118	394
Staging Areas* (SA) Cancelled	56228-30	3,252.4	53	143
SLN ID (FLot)** Cancelled	ID-050014	122.4	4	7
SLN ID (LNFD)^	ID-140005	0.8	0.2	0.2
SLN ID (SA)* Cancelled	ID-050013	-	-	-
SLN IL (FLot)Cancelled	IL-120002	155.9	7	7
SLN IN (FLot)* Cancelled	IN-080003	-	-	-
SLN IN (SA)* Cancelled	IN-040001	-	-	-
SLN KS (SA)* Cancelled	KS-120003	-	-	-
SLN KY (FLot)* Cancelled	KY-020003	-	-	-
SLN KY (SA)Cancelled	KY-020002	-	-	-
SLN MD (SA)* Cancelled	MD-080005	-	-	-
SLN MS (SA)* Cancelled	MS-050008	-	-	-
SLN ND (FLot)** Cancelled	ND-920001	-	-	-
SLN NE (SA & FLot)* Cancelled	NE-100003	-	-	-
SLN NM (SA)** Cancelled	NM-110004	-	-	-
SLN NV (LNFD)^	NV-150001	395.7	38	139
SLN NV (LNFD)^ Cancelled	NV-040004	40.1	3	14
SLN NV (SA)* Cancelled	NV-020005	-	-	-
SLN OK (SA)** (Replaced by OK-180002 in 2018)	OK-990001	567.6	50	117
SLN OR (SA)** (2019 Replacement Pending)	OR-010024	-	-	-
SLN TN (FLot)* Cancelled	TN-080003	-	-	-
SLN TN (SA)* Cancelled	TN-080004	-	-	-
SLN TX (FLot)** Cancelled	TX-890001	7.1	0.6	0.8
SLN TX (SA)** (2019 Replacement Pending)	TX-020003	9.2	1	1
SLN TX (FLot)Cancelled	TX-090010	975.2	1	1
SLN TX (LNFD)^	TX-060016	-	-	-
SLN UT (LNFD)^ Cancelled	UT-130005	7.7	0.2	0.2
SLN WV (SA)* Cancelled	WV-11001	-	-	-
SLN WV (SA)* Cancelled	WV-010002	-	-	-
SLN WV (SA)* Cancelled	WV-040001	46.7	6	7
SLN WY(LNFD)^	WY-110002	58.5	11	16
SLN WY (SA)** (Replaced by WY-180003 in 2018)	WY-070002	98.9	12	31
TOTAL	**5 FEDERAL 31 SLN**	**35,122.0**	**643**	**1,289**

Lightly shaded lines - registrations with no use from FY11-FY15. WTs – Work Tasks associated with using DRC-1339

* USEPA Registration No. 56228-63 - Bird Control label replaced these labels January 2019.

** Labels not fully incorporated in Bird Control label and re-registered by state under the Bird Control parent label or canceled January 2019.

^ Labels are under the LNFD parent label.

2 PROBLEM FORMULATION

DRC-1339 is used by APHIS WS for various projects on specific species of birds. The various use sites, depending on target species, include livestock and poultry feedlots, buildings and fenced non-crop areas, federal and state wildlife refuges and protected areas, gull colonies in coastal areas, and bird staging areas and roost sites. The following sections discuss the chemical description and product use; physical and chemical properties; environmental fate; and hazard identification for DRC-1339.

2.1 Chemical Description and Product Use

DRC-1339 ($C_7H_9Cl_2N$, CAS No. 7745-89-3) is 3-chloro-p-toluidine hydrochloride (synonyms: 3-chloro-4-methylbenzenamine hydrochloride, or 3-chloro-4-methylaniline hydrochloride). Technical DRC-1339 (DRC-1339 Technical, USEPA Reg. No. 56228-59) was first registered with USEPA in 1967 (USEPA 1995). PM [Purina Mills] Resources, Inc., which was acquired by Virbac Corporation, was previously the registrant for Starlicide Technical (USEPA registration No. 67517-7); however, the company transferred the registration to APHIS (USEPA registration No. 56228-59) in September 2013 (USEPA 2013b). When the registration was transferred, APHIS changed the name of the product to DRC-1339 Technical. All APHIS Compound DRC-1339 Concentrate products are prepared from and identical in composition to DRC-1339 Technical, which is comprised of 97% purity DRC-1339 (USDA 2019), the active ingredient (a.i.). APHIS currently has just two Compound DRC-1339 Concentrate Section 3 products registered with USEPA, but four Section 3 labels were replaced by the Bird Control label at the end of 2018 and are included below as these labels were used for the data included in this risk assessment.

- **Compound DRC-1339 Concentrate – Bird Control** (USEPA Reg. No. 566228-63), a combined label designed to replace the feedlots, gulls, pigeons, and staging areas labels. The label was approved by USEPA in December 2017 and supersedes the other four labels as of January 2019 (USDA 2017a); and

    - Compound DRC-1339 Concentrate – Feedlots (USEPA Reg. No. 56228-10) for bird control in feedlots (cancelled in 2018) (USDA 2017b);

    - Compound DRC-1339 Concentrate – Gulls (USEPA Reg. No. 56228-17) for control of gulls at landfills and to protect colonial nesting seabirds (cancelled in 2018) (USDA 2016a);

    - Compound DRC-1339 Concentrate – Pigeons (USEPA Reg. No. 56228-28) for control of pigeons causing health, nuisance, or economic problems in and around structures or in non-crop areas (cancelled in 2018) (USDA 2016c); and

    - Compound DRC-1339 Concentrate – Staging Areas (USEPA Reg. No. 56228-30) for bird control in non-crop staging areas associated with roosts (cancelled in 2018) (USDA 2016d);

- **Compound DRC-1339 Concentrate –LNFD** (USEPA Reg. No. 56228-29) for control of crows, ravens, and magpies that damage and feed on the contents of silage/fodder bags, prey on newborn livestock, eggs or the young of federally-designated Threatened or Endangered species, or of other species designated to be in need of special protection (USDA 2016b).

For the purpose of this risk assessment, the new Bird Control label will be used when assessing risk related to the feedlots, gulls, pigeons and staging areas use sites, because the separate Section 3 labels for each of those uses were cancelled at the end of December 2018. The four older Section 3 labels are discussed when describing prior projects conducted under these labels for the data used in this risk assessment. The Bird Control label also incorporated many of the State SLN registrations (Table 3).

In cases where an active SLN use was not incorporated into the Bird Control label and was still needed, a new SLN was submitted for that specific use under the Bird Control parent label. However, a summary of information for the old SLN labels regarding each use pattern as well as species controlled is given below and in Table 4, as well as referenced because these are the labels that WS used to apply DRC-1339 from FY11 to FY15.

- **Feedlots (Commercial Animal Operations):** Various bait materials can be used such as rolled barley, cracked corn, and rolled whole corn, but baits can only be used in feedlots to control target bird species identified on the label such as European starlings, rock pigeons, and specific species of blackbirds, crows, and ravens, as well as bronzed cowbirds (*Molothrus aeneus*) when in mixed flocks (Table 4). Feedlots are defined on the label as areas of commercial livestock operations where beef cattle, dairy cattle, swine, sheep, goats, poultry, or game birds are confined primarily for the purpose of production and eventual sale in agricultural markets. From FY11 to FY15, WS applied an annual average of 39,326 g of DRC-1339 under the Feedlots label and two SLN labels under the parent Feedlots label for 315 unique properties in 364 work tasks, primarily for European starlings (Table 3).

- **Gulls:** Bread cubes are mixed with DRC-1339 and can be used to control targeted species of gulls in coastal or inland gull colonies, within predation radii of important colonial nesting sites of terns, puffins, or other colonially nesting birds that will be protected; or close to areas where target gull species damage property or crops during the breeding season (Table 4). It may also be used at feeding sites located at airports, industrial sites, dumps or landfills, or other noncrop areas throughout the year. From FY11 to FY15, WS applied an annual average of 10 g of DRC-1339 under the Gulls label for gull damage on 0.4 unique properties in 0.4 work tasks (Table 3).

- **Pigeons:** Whole-kernel corn is mixed with DRC-1339, which then can be used to control feral pigeons in roosting or loafing areas on flat rooftops, or within fenced areas (Table 4). From FY11 to FY15, WS applied an annual average of 838 g of DRC-1339 under the Pigeons label for feral rock pigeon damage on 36 unique properties in 60 work tasks (Table 3).

- **Staging Areas:** Baits prepared with one of the grain components (cracked corn, rolled barley, brown rice, or poultry pellets) may only be used in noncrop, staging areas, "SA," associated with nighttime roosting sites of blackbirds, cowbirds, grackles, and starlings (Table 4) and crows under the various SLNs. From FY11 to FY15, WS applied an annual average of 3,975 g of DRC-1339 under the Staging Areas label and four SLN labels under the parent Staging Areas label for 122 unique properties in 286 work tasks, primarily for starlings, brown-headed cowbirds, red-winged blackbirds, common grackles, and crows (Table 3).

Table 4. Summary of use patterns for DRC-1339 (USDA 2017b, 2016a, b, c, d, USEPA 2017b).

Product Use	Target Species	Application Site	Application Method	Application Rate
Feedlots	Brewer's, Red-winged & Yellow-headed Blackbirds, Common, Boat-tailed & Great-tailed Grackles, Brown-headed Cowbird, European Starling, Common & Chihuahuan Ravens, American & Fish Crows, Black-billed Magpie, Rock Pigeon, and Eurasian Collared-Dove, and Bronzed Cowbird when in mixed flocks with one or more of the above species	Feedlots with beef or dairy cattle, swine, sheep or goats, and poultry or game bird farms	Manual baiting – bait stations/trays using a scoop or other appropriate utensil Mechanical baiting – hopper of truck-mounted or trailer-type feeder and apply with mechanical applicator	Maximum single: 0.1 lbs. a.i./treated acre (2% a.i. - 1:10 dilution of untreated bait: 50 lbs. of diluted bait/acre, or 1 lb. of diluted bait/1000 ft^2)
Gulls	Gull spp. - Herring, Great Black-backed, Ring-billed, Laughing (non-protected areas), Western & California Gulls	Target gull's nesting colonies and gull feeding areas at airports, industrial sites, dumps, landfills, and non-crop areas	Manual broadcast or place treated bread cubes wearing rubber gloves and using a scoop or other utensil	Maximum: 0.1 lb. a.i./per treated acre/treatment (bait densities of 5 treated cubes/100 ft^2 and 2200 treated cubes/ treated acre)
Pigeons	Feral pigeons	Roosting or loafing areas on flat rooftops, or within fenced areas from which the public, pets, domestic animals, and most non-avian wildlife can be excluded during bait application	Manual dispense or broadcast treated whole-kernel corn wearing rubber gloves and using a scoop or other utensil	Maximum: 0.05 lb. a.i./ treated acre (25 lbs./acres of a 1:1 dilution of properly treated whole-kernel corn with untreated whole-kernel corn)
Livestock, Nest & Fodder Depredations	Common & Chihuahuan Ravens, American & Fish Crows, and Black-billed Magpie	Rangeland and pasture areas where ravens, magpies, or crows prey upon newborn livestock; Refuges or other areas where ravens, magpies, or crows prey upon the eggs or young of federally designated Threatened or Endangered Species, or Federal or State protected wildlife; and within 25 feet of silage/fodder bags damaged or likely to be damaged by crows, ravens, or magpies	Manually place (wearing rubber-gloves) <75 meat cube baits at each baited site (5 to 10 baits in clusters over an area not to exceed 1000 ft^2)	Maximum: 0.083 lbs. of a.i./treated acre (18 treated-egg baits in at least 5 bait sets applied over an area of 400 ft^2 surrounding an animal carcass draw station). For meat baits, <0.01 a.i./treated acre, 5-10 baits per 1000 ft^2, no more than 75/baited site, and baits must be observed. Assuming a maximum used per acre, max of 0.003 lb. a.i./acre for meat baits.
Staging Areas	Red-winged Blackbird, Common, Boat-tailed & Great-tailed Grackles, Brown-headed Cowbird and European Starling, and Brewer's, Tricolored & Yellow-headed Blackbirds, American Crows, and Black-billed Magpie when in mixed flocks with one or more of the above species	SA: Stubble fields, harvested dormant hay fields, open grassy or bare-ground noncrop areas, roads, roadsides, rooftops, industrial and commercial structures, and secured parking areas	Feeding stations; Mechanical broadcasting with ground-based equipment; and Manual broadcasting – wearing rubber gloves and using a scoop or other utensil	Maximum: 0.1 lb. a.i./treated acre/ treatment or Maximum yearly: 0.5 lb. a.i./ acre (<58 lbs./treated acre of cracked corn or rolled barley baits, 110 lbs./treated acre of diluted poultry pellet bait, or 137 lbs./treated acre of diluted brown rice bait. Do not make more than 5 treatments per year to any one treated site)
Bird Control	Combined bird species	Commercial animal operations; staging areas; gull colonies; and gull feeding or loafing sites	Retrievable feeding stations, bait stations, or trays; manual or mechanical baiting; and hand or mechanical broadcast.	For broadcast applications: do not exceed a maximum single application rate of 0.1 lbs. a.i./acre (1.12 g a.i./100 m^2) or a maximum yearly application rate of 0.5 lb. a.i./acre (5.61 g a.i./100 m^2). For manual baiting: 1 lb./ 1000 ft^2 (0.49 kg/100 m^2) over dry or frozen areas

a.i. = Active Ingredient

- **Livestock, Nest & Fodder Depredations:** Hard boiled eggs or meat-cube baits are treated with DRC-1339, which can be used to control species such as common raven, Chihuahuan raven (*Corvus cryptoleucus*), American crow, black-billed magpie, and fish crow (Table 4). Baits (eggs or meat cubes) can be used in rangeland or pastureland where ravens or crows prey upon newborn livestock, or refuges or other areas where ravens or crows prey upon the eggs or young of federally designated threatened or endangered Species, or federal or state protected wildlife. From FY11 to FY15, WS applied an annual average of 974 g of DRC-1339 under the LNFD label and five SLN labels under the parent LNFD label for 170 unique properties in 552 work tasks, primarily for common ravens (Table 3).

USEPA has been reevaluating the data supporting DRC-1339 and the registered products under Registration Review since September 2011. The final work plan for registration review stated that USEPA (2012a) would require human health data for conducting a revised occupational risk assessment. The work plan also listed data needs for performing a comprehensive ecological risk assessment including an endangered species assessment for all uses. USEPA (2013a) issued a Data Call-In (DCI) formally listing the studies that would be required for continued registration of products containing DRC-1339. After reviewing submissions to address many of the initial data requirements in the DCI, USEPA reduced the number of required studies. In June 2014, USEPA (2014a) further agreed to waive some of the remaining studies by including additional mitigation language on product labels to reduce the likelihood of DRC-1339's movement to water and improve the success of leftover bait cleanup. Waived studies included photodegradation in soil, aerobic aquatic metabolism, anaerobic aquatic metabolism, terrestrial field dissipation, estuarine/marine fish acute toxicity, freshwater invertebrate lifecycle, terrestrial plant toxicity, and aquatic plant and algal toxicity studies (USEPA 2014a). With the approval of the amended DRC-1339 labels on October 20, 2015, USEPA (2015) officially waived the above-mentioned studies.

For the environmental study requirements that remained, APHIS agreed to conduct the studies using a phased approach as funds became available. These studies include honeybee acute oral toxicity, adsorption/ desorption or soil column leaching, aerobic soil metabolism, and environmental chemistry analytical methods and independent laboratory validation in soil and water. APHIS has completed the acute oral honeybee toxicity study, the aerobic soil metabolism study, and the analytical methods and independent laboratory validation study in water. The two remaining environmental fate studies have not been completed.

2.2 Physical and Chemical Properties

DRC-1339 is an off-white to yellow powder with a moth ball odor (USDA 2019). The 3-chloro-p-toluidine parent product, not DRC-1339, has a melting point ranging from 21 to 24°C and a boiling point ranging 220 to 230°C at 760 mm Hg. DRC-1339, on the other hand, has a melting point of 260°, at which point it sublimes (vaporizes). DRC-1339 has a reported vapor pressure of 1.06×10^{-4} torr at 25° C and calculated Henry's Law Constant of 1.47×10^{-8} atm/m^3/mol (USEPA 2011a). DRC-1339 has a bulk density of 0.44 g/ml. The water solubility for DRC-1339 ranges from 53 to 91 g/L (USEPA 1995, 2011a).

2.3 Environmental Fate

The environmental fate describes the processes by which DRC-1339 moves and degrades in the environment. The environmental fate processes include: 1) persistence, degradation, and mobility in soil; 2) movement to air; 3) migration potential to groundwater and surface water; 4) degradation in water; and 5) plant uptake.

In general, DRC-1339 is unstable and does not persist in soil. It degrades rapidly in soil when exposed to sunlight, heat, or ultraviolet radiation (USDA 2001). DRC-1339 has an average degradation half-life in soil of 0.17 days based on results from four different soil types (Battelle 2018). Dissipation half-life values ranged from 0.02 days in a Texas loam to 2.0 days in a clay soil. DRC-1339 has low mobility in high organic matter soils because it strongly binds to organic matter. DRC-1339 binds rapidly and irreversibly to soil organic matter suggesting that volatilization from soil into the atmosphere is not a significant pathway for exposure. DRC-1339 has moderate vapor pressure (1.06 X 10^{-4} torr at 25^{0}C) and a high Henry's Law constant value (estimated - 1.47 x 10^{-8} atm-m^{3}-mol^{-1}), suggesting a low potential for volatilization into the atmosphere from aqueous solutions (USEPA 2018a). DRC-1339 has low migration potential to groundwater and surface water due to its high affinity to soil organic matter.

DRC-1339 is highly soluble in water. DRC-1339 is resistant to hydrolysis but sensitive to light with a photodegradation half-life in water ranging from 6.5 to 41 hours depending on the season, as it is faster in summer than winter (USDA 2001, USEPA 2011a). DRC-1339 is not expected to bioconcentrate in aquatic environments. DRC-1339 slightly accumulates in bluegill with average bioconcentration factors of 33x (edible tissues), 150x (nonedible tissues), and 88x (whole fish) (Spanggord et al. 1996, USEPA 2018a).

Uptake by plants is unlikely since DRC-1339 is mixed with a bait that is used on bare soil, fallow ground, or in trays. Any DRC-1339 that would leach from the bait material would degrade quickly in soil or bind to soil organic matter reducing bioavailability to plants. In addition, most of the bait is removed by the target species reducing the amount of DRC-1339 available for any potential plant uptake.

2.4 Hazard Identification

DRC-1339 is hazardous to human health because of its acute inhalation toxicity and eye and skin corrosiveness. Pesticide label statements regarding the health effects based on toxicity studies include "*Fatal if inhaled. Corrosive. Causes irreversible eye damage and skin burns. May be fatal if swallowed. Harmful if absorbed through skin. Prolonged or frequently repeated skin contact may cause allergic reactions in some people.*" (USDA 2016b, 2017a, b).

USEPA evaluated human incident reports for DRC-1339 during product reregistration and did not identify any human incident cases from their Office of Pesticide Program Incident Data Systems (IDS) between 2006 and 2011 (USEPA 2011b). The aggregate IDS module includes less severe human incidents with minor, unknown, or no effect outcomes. WS has no "Adverse Incidence Reports" (6(a)2) from FY87 to FY18 for DRC-1339 for WS personnel or the public. An additional literature review did not identify any human exposure cases related to DRC-1339.

2.4.1 Mode of Action

The biochemical mechanism of action for DRC-1339 is not well understood. Previous studies suggest that ingested DRC-1339 is rapidly hydrolyzed to 3-chloro-p-toluidine, which is the toxic compound (Eisemann et al. 2003). In sensitive birds, DRC-1339 causes irreversible kidney and heart damage resulting in death normally within 1 to 3 days of ingestion. In mammals, DRC-1339 depresses the central nervous system at 10-100 times higher the dose that can cause effects in birds. Central nervous system depression can cause cardiac or respiratory arrest resulting in death 2 to 10 hours after ingestion. The effects to the central nervous system in non-sensitive mammals can be successfully treated symptomatically (USDA 2001, Eisemann et al. 2003). The kidney mitochondrial enzyme, deacetylase, may be responsible for the difference in susceptibility

to 3-chloro-p-toluidine (Eisemann et al. 2003). The enzyme is present in chickens, starlings, pheasants, and rock pigeon, which are sensitive to 3-chloro-p-toluidine. The enzyme is not present in red-tailed hawks and mammals resulting in lower sensitivity to 3-chloro-p-toluidine (Mull and Giri 1972).

2.4.2 Acute Toxicity

The acute oral median lethality values (LD_{50}), and ocular and dermal irritation scores in rats indicates that DRC-1339 is moderately (Category II) toxic via the oral route and highly toxic (corrosive, Category I) when in contact with skin and eyes (Table 5). USEPA (1995) concluded during registration review that DRC-1339 is highly toxic in acute inhalation exposures based on its oral toxicity and the moderate to severe irritation observed in ocular and dermal irritation studies, although an acute inhalation study was not performed. The eye and dermal irritation studies show that DRC-1339 is highly corrosive to skin and eyes when using rabbits as a test species (Category I). The dermal sensitization study shows that DRC-1339 is a mild to moderate skin sensitizer in guinea pigs. The DRC-1339 Safety Data Sheet (USDA 2019) states that contact exposure to the eye causes severe damage. Dermal contact can result in severe skin burns or an allergic reaction. Table 5 summarizes the acute toxicity values of DRC-1339 used by USEPA to assess acute toxicity risk to human health.

Table 5. Acute technical and formulation DRC-1339 toxicity data for mammals (USEPA 1995, USDA 2019).

Test Species	Test	DRC-1339 Conc.* 97% a.i.	USEPA Category
Laboratory Brown Rat	Oral LD_{50}	302-350 mg/kg	II
Domestic Rabbit	Dermal LD_{50}	> 2,000 mg/kg	III
Laboratory Brown Rat	Inhalation LC_{50}	Not Required	I
Domestic European Rabbit	Eye Irritation	Corrosive	I
Domestic European Rabbit	Dermal Irritation	Corrosive	I
Guinea Pig (*Cavia porcellus*)	Dermal Sensitization	Mild/Moderate	-

a.i. = active ingredient M = male, F = female, - = Does not apply

2.4.3 Subchronic and Chronic Toxicity

USEPA (2018b) waived the DRC-1339 subchronic toxicity study, as well as other chronic toxicity studies, based on a weight of evidence approach that considered use pattern, toxicology and exposure. However, two subchronic toxicity studies were performed in rats using 3-chloro-p-toluidine, the toxic non-protonated parent compound of DRC-1339. A 5-day study in male and female Wistar albino laboratory brown rats exposed to 3-chloro-p-toluidine administered through inhalation at doses of 0.027, 0.105, 0.382, or 1.284 mg/L for 6 hours/day showed no signs of toxicity up to 0.105 mg/L (No Observable Adverse Effects Level (NOAEL)). Clinical signs of toxicity at higher doses included neglected skin and ruffled fur, cyanosis, apathy, and decreased motility (Hazardous Substance Data Bank 2019). Rats in another study were orally dosed for two weeks with 3-chloro-p-toluidine at 300 mg/kg body weight (bw)/day (10% solution in peanut oil), for 5 days/week. The rats were ill and cyanotic after the third and fourth treatments (Hazardous Substance Data Bank 2019).

Long-term exposure to DRC-1339 concentrate may cause an allergic skin reaction (USDA 2019).

2.4.4 Developmental and Reproductive Effects

A literature review did not identify mammalian toxicity studies on reproductive or developmental effects. USEPA (2018b) waived a developmental toxicity study due to the low potential for repeat oral, dermal or inhalation exposure to workers or applicators.

2.4.5 Neurotoxicity Effects

A literature review shows depression of the central nervous system in mammals from exposure to DRC-1339 (Eisemann et al. 2003, Felsenstein et al. 1974, Borison et al. 1975). Although the direct effects on neurological function are unknown, 3-chloro-p-toluidine has been detected in brain tissue and the observed central nervous system effects include intense weakness, dyspnea, and complete paralysis following intraperitoneal administration (Eisemann et al. 2003). Other observed central nervous system effects include centrally induced skeletal muscle relaxation or paralysis, such as loss of the righting reflex in mice and rats (Felsenstein et al. 1974, Borison et al. 1975). USEPA (2013a) initially requested a neurotoxicity screening battery test in its data call-in notice during registration review. However, the USEPA Office of Pesticide Programs subsequently waived the neurotoxicity study in a Hazard and Science Policy Council meeting on August 30, 2012 (USEPA 2014b) and still considers it waived (USEPA 2018b).

2.4.6 Carcinogenicity and Mutagenicity

The USEPA (1995) human health assessment concluded that DRC-1339 is not a carcinogen based on two 78-week exposure studies of the free base (3-chloro-p-toluidine) in rats and mice performed by the National Cancer Institute (1978). The study results found body weight depression without inducing tumors at the highest dose administered (3,269 ppm).

USEPA (1995) also concluded that DRC-1339 is not a mutagen based on the negative results of three mutagenicity assays performed in *Salmonella* spp. strains and Chinese hamster (*Cricetulus griseus*) ovary cells (Stankowski et al. 1997). In the Ames assay with *Salmonella* strains TA1535, TA1537, TA1538, TA98, and TA100, DRC-1339 was negative for inducing reverse gene mutation at the histidine locus at levels up to 2,500 µg/plate with and without metabolic activation. In the Chinese hamster ovary mammalian cell forward gene mutation assay, DRC-1339 was also negative for inducing forward mutation at the hypoxanthine-guanine phosphoribosyltransferase locus with and without metabolic activation to cytotoxic/precipitating doses up to 600 µg/mL. In the chromosomal aberration assay in Chinese hamster ovary cells, DRC-1339 was positive in a dose-related manner for structural aberrations in S9-activated cultures at moderately cytotoxic doses of 250 or 350 µg/mL. However, DRC-1339 was negative without metabolic activation at cytotoxic doses up to 350 µg/mL.

2.4.7 Immunotoxicity Effects

A literature review did not identify any DRC-1339 mammalian immunotoxicity studies. USEPA (2013a) requested an immunotoxicity test (870.7800) in its DCI notice during registration review, but waived the study based on the weight of evidence approach considering all the available hazard and exposure information provided by USDA APHIS in a Hazard and Science Policy Council meeting on December 27, 2014 (USEPA 2014b). The low volume/minor use waiver justification included: 1) the limited time period a mixer, handler, or applicator would be exposed while using DRC-1339; (2) the current worker protection requirements on the

DRC-1339 labels; (3) the limited annual use of DRC-1339; and 4) data from 3-chloro-p-toluidine that can be used to bridge to 3-chloro-p-toluidine hydrochloride.

2.4.8 Endocrine Effects

A literature search did not identify any studies indicating the potential of DRC-1339 to affect the endocrine system. DRC-1339 is not among the group of 99 pesticide active ingredients on the initial and second lists to be screened under the USEPA (2014c) Endocrine Disruptor Screening Program. However, both lists were generated based on exposure potential and not whether the pesticide is a known or likely chemical to disrupt the endocrine system (USEPA 2014c). DRC-1339 is not among the EU (European Union) list of chemicals with the potential to impact the endocrine system (Danish Centre on Endocrine Disrupters 2018). The EU list includes three categories: Category 1 – endocrinal effect recorded at least on one type of animal; Category 2 – a record of biological activity *in vitro* leading to disruption; and Category 3 – not enough evidence or no evidence data to confirm or disconfirm endocrinal effect of tested chemicals (Hrouzková and Matisova 2012).

3 DOSE-RESPONSE ASSESSMENT

3.1 Human Health Dose-Response Assessment

A dose-response assessment evaluates the dose levels (toxicity criteria) for potential human health effects including acute and chronic toxicity. USEPA did not establish an oral reference dose for DRC-1339 because USEPA does not believe that the potential exists for significant exposure to occupational workers. USEPA did not establish a tolerance for DRC-1339 because there are no registered food or feed uses. The maximum contaminant level has not been established for drinking water.

3.2 Ecological Effects Analysis

This section of the risk assessment discusses available ecological effects data for terrestrial and aquatic biota. Available acute and chronic toxicity data are summarized for all major taxa and will be integrated with the exposure analysis section to characterize the risk of DRC-1339 to nontarget wildlife and domestic animals. Information in this section was gathered from on-line databases and searches for relevant peer reviewed and other published literature.

3.2.1 Aquatic Effects Analysis

DRC-1339 is moderately toxic to fish. The 96-hour median lethality concentration (LC_{50}) for bluegill is 11 ppm. The 96-hour LC_{50} for the rainbow trout is 9.7 ppm. The 96-hour LC_{50} for southern leopard frog (*Rana sphenocephala*) tadpoles is 44 mg/L (Marking and Chandler 1981).

DRC-1339 has moderate to high toxicity to aquatic invertebrates depending on the test species (Table 6). The 48-hour median effective concentration (EC_{50}) for the freshwater cladoceran is 0.07 ppm (USEPA 2011a) while marine species appear to be more tolerant with 96-hour LC_{50} values of 10.8 and 16.0 ppm for the penaeid shrimp and blue crab, respectively (Walker et al. 1979) (Table 6).

Table 6. Acute aquatic invertebrate toxicity for DRC-1339 technical.

Test species	Test	Results	Reference
Cladoceran (*Daphnia magna*)	EC_{50}	0.07 mg/L	USEPA 2011a
	LC_{50}	1.6 mg/L	Marking and Chandler 1981
Caddisfly (*Isonychia* sp.)	LC_{50}	6.5 mg/L	Marking and Chandler 1981
Mayfly (*Hydropscyche* sp.)	LC_{50}	12 mg/L	Marking and Chandler 1981
White River Crayfish (*Procambarus acutus acutus*)	LC_{50}	15 mg/L	Marking and Chandler 1981
River Horn Snail (*Oxytrema catenaria*)	LC_{50}	6.7 mg/L	Marking and Chandler 1981
Glass Shrimp (*Palaemetus kadiakensis*)	LC_{50}	6.1 mg/L	Marking and Chandler 1981
Panaeid Shrimp (*Panaeus* sp.)	LC_{50}	10.8 mg/L	Walker et al. 1979
Blue Crab (*Callinectes sapidus*)	LC_{50}	16.0 mg/L	Walker et al. 1979
Asiatic Clam (*Corbicula manilensis*)	LC_{50}	18.0 mg/L	Marking and Chandler 1981

3.2.2 Terrestrial Effects Analysis

Mammals

DRC-1339 appears to have moderate acute toxicity to rats with acute oral LD_{50}'s of 302-350 mg/kg (Table 5). Additional mammalian toxicity data indicate low to moderate acute toxicity for various mammals (Table 7), although DRC-1339 may be more toxic to cats (Felsenstein et al. 1974). In a swine gavage study with DRC-1339, none died and no adverse clinical or histopathological effects were reported when dosed with 50 mg/kg of DRC-1339. Swine were also fed poisoned birds with no reported mortalities or any external clinical effects (Caslick et al. 1972).

Table 7. Acute oral median lethality and subacute dietary DRC-1339 toxicity studies for mammals and birds.

Test species	Test	Results	Reference
Mammals			
Brown Rat (Laboratory)	LD_{50}	302 mg/kg	USEPA 2018a
North American Deermouse	ALD	1,800 mg/kg	Schafer and Bowles 1985
Brown Rat (white lab)	LD_{50}	1,170-1,770 mg/kg	Ford 1967
Domestic Dog ^	LD_{50}	>100 mg/kg	Ford 1967
Domestic Sheep	LD_{50}	>200 mg/kg	Ford 1967
Birds			
Mallard	LD_{50}	105 mg/kg	USEPA 1995
	LC_{50}	322 mg/kg (98% a.i.)	
Chachalaca (*Ortalis* sp.)	LD_{50}	42.1 mg/kg	Eisemann et al. 2003
Northern Bobwhite	LD_{50}	2.9 mg/kg	USEPA 1995
	LC_{50}	14.1 mg/kg (98% a.i.)	
Ring-necked Pheasant	LD_{50}	10 mg/kg	Eisemann et al. 2003
Domestic Turkey	LD_{50}	10.26 mg/kg	Eisemann et al. 2003
Rock pigeon	LD_{50}	17.7 mg/kg	Eisemann et al. 2003
Mourning Dove	LD_{50}	3.2 mg/kg	Eisemann et al. 2003
Herring Gull	LD_{50}	4.6 mg/kg	Eisemann et al. 2003
Cooper's Hawk	LD_{50}	562 mg/kg	Eisemann et al. 2003
Barn Owl	LD_{50}	4.2 mg/kg	Eisemann et al. 2003
Scrub-Jay (*Aphelocoma* sp.)**	LD_{50}	1.8 mg/kg	Eisemann et al. 2003
American Crow	LD_{50}	1.33 mg/kg	Eisemann et al. 2003
Common Raven	LD_{50}	2.9 mg/kg	Eisemann et al. 2003
European Starling	LD_{50}	3.2 mg/kg	Eisemann et al. 2003
House Sparrow	LD_{50}	375 mg/kg	Eisemann et al. 2003
Red-winged Blackbird	LD_{50}	2.4 mg/kg	Eisemann et al. 2003

*ALD – Acute Lethal Dose estimated LD_{50} when unable to calculate ^ Emetic at doses of 10, 50 and 100 mg/kg a.i. = active ingredient

** Species split into 4 species (Island (*Aphelocoma insularis*), California, Florida (*A. coerulescens*), and Woodhouse's (*A. woodhousei*) Scrub-Jays) since Schafer et al. (1983), the data used in Eisemann et al. 2003 (likely California or Woodhouse's, or both, knowing where birds captured).

Birds

A large amount of toxicity data is available for acute exposures to a range of bird species (Table 7). Eisemann et al. (2003) summarized DRC-1339 avian toxicity data for more than 55 species available from published and unpublished sources. Available acute oral dosing studies show high toxicity to corvids, red-winged blackbirds, starlings, gallinaceous birds, doves, herring gulls, and barn owls with LD_{50}'s ranging from 1.33 to 42.1 mg/kg (Table 7). DRC-1339 ranges from slightly to moderately toxic for mallards, house sparrows, and cooper's hawks with LD_{50}'s ranging from 105 to 562 mg/kg (Table 7).

Available acute dermal toxicity testing using birds report an LD_{50} of 14 and 80 mg/kg for the breast and foot respectively, using the European starling (Schafer et al. 1969).

Subacute dietary testing using the northern bobwhite and mallard (Table 7) demonstrated that DRC-1339 is moderately to highly toxic to surrogate bird species representing upland game birds and waterfowl. Both studies were five-day exposures and are part of the USEPA standardized protocols for conducting avian subacute dietary toxicity studies.

Additional dietary toxicity studies have also been conducted with other species and different durations. Eisemann et al. (2003) summarized the available published and unpublished dietary toxicity data for various bird species with similar sensitivities to those reported in acute oral exposures. Schafer et al. (1977) reported 30 and 90-day LC_{50} values of 4.7 and 1.0 ppm, respectively, for European starlings. The same study also reported a 28-day LC_{50} of 18 ppm for the northern bobwhite and a 30-day LC_{50} of less than 100 ppm for rock pigeon. Cummings et al. (2003) exposed savannah sparrows, Canada geese, snow geese, western meadowlarks, mourning doves, and American tree sparrows for five days to dietary DRC-1339 concentrations of 769 ppm. No significant mortalities occurred in Canada geese, snow geese and savannah sparrows, but 80% mortality was observed in American tree sparrows and 90% mortality was observed for mourning doves and western meadowlarks. Cummings et al. (2002) reported no mortalities of wild-caught savannah sparrows, white crowned sparrows, field sparrows, song sparrows, and chipping sparrows offered 2% treated brown rice (714 ppm) over a five-day period.

Additional non-standardized studies evaluating chronic and reproductive effects are also available for various bird species. Schafer et al. (1977) conducted chronic reproduction studies using Japanese quail (*Coturnix japonica*) and domestic pigeons. Reproductive effects were seen at 10 ppm and above for quail including decreased egg and live-chick production, and increased incidence of egg breakage and at 25 ppm for pigeons including increased proportion of infertile eggs; no effects were observed in the first generation offspring for either of these species. Hubbard and Neiger (2003), in a 5-day reproduction study using ring-necked pheasants, dosed females and males three times each with a dose of 2 or 4 mg DRC-1339 and compared reproductive endpoints to a control group found a statistically significant effect on brood size and a non-statistical negative correlation on clutch and brood size with increasing dose.

Reptiles and Terrestrial Phase of Amphibians

DRC-1339 toxicity data for reptiles and the terrestrial phase of amphibians does not appear to be available. In cases where data is lacking, USEPA assumes that avian toxicity data is representative of reptiles. There are uncertainties in this assumption related to differences between the two taxa, but for this risk assessment DRC-1339 is considered moderately to highly toxic to reptiles when considering the range of sensitivities to

surrogate avian species. In the case of terrestrial phase amphibians, DRC-1339 is considered moderately toxic based on the aquatic phase LC_{50} value for the southern leopard frog.

Terrestrial Invertebrates

The acute oral toxicity study of DRC-1339 to the honey bee (*Apis mellifera*) demonstrates very low toxicity with a 48-hr LD_{50} greater than the nominal dose of 72 µg/bee, and a NOEC of 72 µg/bee, the highest concentration tested (USEPA 2018a).

Terrestrial Plants

DRC-1339 phytotoxicity is low based on available limited data with foliar applications to the pinto bean (*Phaseolus vulgaris*) and Douglas fir (*Pseudotsuga menziessi*) reporting no observed effects when treated with a 6% solution of DRC-1339 (Schafer and Bowles 2004).

3.2.3 Toxicity of Formulations and Metabolites to Nontarget Wildlife and Domestic Animals

Available toxicity data for nontarget mammals and birds to the technical DRC-1339 would be similar to the formulations since they are composed primarily of the technical active ingredient (97% a.i.) (Tables 5 and 7). The toxicity of DRC-1339 degradates and metabolites to nontarget species is unknown but is assumed to be similar to the parent for this risk assessment for two of the three metabolites. The three major degradates identified from environmental fate studies include carbon dioxide, 3-hydroxy-p-toluidine, and N-acetyl-3-chloro-p-toluidine. Carbon dioxide and N-acetyl-3-chloro-p-toluidine were measured in the aerobic soil metabolism study and 3-hyroxy-p-toluidine was the primary degradate identified in the aqueous photolysis study (USEPA 2011a).

Peoples (1965) found that starlings primarily excreted one metabolite, 4-amino-3-chlorobenzoic acid, categorized as an irritant and otherwise nontoxic, along with DRC-1339. The majority of excreta (89%) came within the first 2 hours following ingestion, which consisted of 82% 4-amino-3-chlorobenzoic acid and 18% DRC-1339; no DRC-1339 was excreted in four birds after 4 hours following ingestion. Thus, the majority of DRC-1339 is converted to nontoxic metabolites in excreta. The total weight of all excreta prior to death for 8 birds given 1 mg of DRC-1339 orally was the same percentage at 82% 4-amino-3-chlorobenzoic acid (0.64 mg) and 18% DRC-1339 (0.15 mg). Starling digestive systems change seasonally, primarily as the diet changes from invertebrates to plant material, which is typically the beginning of WDM targeting starlings (they really begin flocking as well as consume livestock food). Starling intestines and villi becoming longer and the gizzard gets larger when they change diets (Feare 1984); starlings consume more and thus the rate of food passage though the gut increases (Levey and Karasov 1989). Therefore, it would be expected that DRC-1339 passes with greater potential during this time.

Issues have been raised concerning the risk from birds killed with DRC-1339, exposure of carcasses to people and pets, and the impact of their carcasses on the environment. Birds often die in their nighttime roost. One issue is that birds could die near people's residences, which could be a bother to the property owner and pets. WS personnel try to determine the whereabouts of a roost associated with a project and try to pick up all birds that expire at these roosts. It is possible for birds, though, to leave a treated site and roost at a site not known to WS personnel. This could be at a residence or an area where the public may or may not have access. The primary concern has been the number that could die from a treatment on a property and their potential to be a risk to pets and people from the birds or their excrement. Mammals and birds metabolize or

excrete DRC-1339 within a matter of hours, and known metabolites are nontoxic to birds and mammals (Peoples 1965, Cunningham et al. 1979, Timm 1994). However, some DRC-1339 remains in the excreta from starlings. Species sensitive to DRC-1339 such as crows may be able to get a toxic dose of DRC-1339 from undigested gut contents, but this has only been anecdotally reported for crows (Knittle et al. 1990). Raptors (e.g., Cooper's hawk and American kestrel) fed a diet of birds killed with DRC-1339 for over 100 days were not found to suffer any ill effects and all gained weight (DeCino et al. 1966). WS personnel attempt to find all carcasses associated with a project, especially those associated with public areas. Some projects, especially treatment of ravens, occurs in areas where it is unlikely the public would be exposed and where WS personnel have the lowest potential for knowing where birds are roosting.

3.2.4 Indirect Effects of Carcasses from Control Actions on Wildlife and the Environment

Concerns have been voiced that the birds that die in a nighttime roost over water, such as in a cattail (*Typha* spp.) marsh, could increase the risk of communicable diseases or quicken eutrophication of the wetland. Birds may die and fall into the waters. The risks of these issues are analyzed, but are an indirect effect of the use of DRC-1339 on the environment and not directly related to the chemical analysis. The disease risk or quickened eutrophication would not likely occur from such a possibility, especially as compared to the excrement that would be deposited in those same waters should the birds continue to roost at that location.

4 EXPOSURE ASSESSMENT

4.1 Human Health Exposure Assessment

The exposure analysis evaluates the potential for exposure of humans to DRC-1339. The exposure assessment begins with the use pattern for DRC-1339. An exposure pathway for DRC-1339 includes (1) a release from a DRC-1339 source, (2) an exposure point where human contact can occur, and (3) an exposure route such as ingestion, inhalation, or dermal contact by which contact can occur. Exposures for the identified human populations are evaluated qualitatively for each identified exposure pathway.

4.1.1 Potentially Exposed Human Populations and Complete Exposure Pathways

DRC-1339 is a "*restricted use pesticide*," which currently is limited to use by USDA APHIS certified applicators trained in bird control, or by persons under their direct supervision (USDA 2016a, b, c, d, 2017a, b). DRC-1339 applications are typically conducted on small acreage (~1 acre), and typically occur once or twice before the project is completed (USDA 2011). Prebaiting is required for most uses to ensure that the bait is well accepted and nontarget species are not foraging on the baits. The treated baits are applied via manual or mechanical broadcast applications; manually by placing or dispensing baits into feeding stations or other application sites. The treated bait cannot be applied by air. All DRC-1339 labels are for non-food use only.

Based on the expected use patterns for DRC-1339, WS handlers and applicators (occupational workers) in the program who are mixing and applying the pesticide in the field are the most likely subgroup of the human population to be exposed to DRC-1339. A potential complete direct contact exposure pathway is identified for handlers and applicators with the potential for exposure evaluated in Section 4.1.2.

Exposure by the general public to DRC-1339 is unlikely when applicators follow label requirements concerning application sites, entry restrictions, prebaiting, and post-treatment cleanup requirements. Entry restrictions only allow protected applicators in the area during application. Persons other than authorized

handlers must stay away from the treated area at all times, and pets and livestock kept away from the treated area. Each DRC-1339 use has restrictions on storage, application, and temporary placement of treated bait to locations that are not accessible by children, pets, or domestic animals. Residential use is prohibited and unauthorized persons are restricted from entering application sites during application. Signage may be posted near treatment sites to warn people against handling bait, especially where it would be easily seen, or make owners of pets and possibly livestock from being exposed. During the prebaiting assessment, WS personnel determine which bait is most readily accepted by the target birds and assess the risk to children, livestock, and nontarget species for each potential use site. The prebaiting assessment also ensures that the proper amount of bait is used minimizing potential exposure to humans, domestic animals, and nontarget species. Labels also require observation of bait sites throughout the day when practical. The post-treatment cleanup requirement after application, especially broadcast applications, minimizes the potential for human exposure to uneaten baits. For several days after the baits are applied, applicators are required to search for and remove poisoned bird carcasses from the area to minimize exposure to the general public and nontarget wildlife. For example, the pigeon, gull, and staging area uses require burial of uneaten bait mechanically or manually covering baits to a minimum depth of 2 inches when the application is made to bare ground (USDA 2016c), to areas such as landfills or other non-crop lands (USDA 2016b), or to areas such as stubble fields, harvested dormant hay fields, open grass or bare-ground non-crop areas and roadsides (USDA 2016d, 2017a). The LNFD label (USDA 2016b) requires collecting unconsumed and leftover meat daily, and unconsumed and leftover egg baits, and carcasses within 7 days of treatment.

A complete exposure pathway is not identified for dietary exposure. DRC-1339 labels have no registered food or feed uses. All DRC-1339 uses have restrictions on using the treated baits as food, feed, or in any way used such that they could contaminate food commodities or animal feed. The labels have entry restrictions to keep livestock away from the bait at all times. The staging area use also includes a restriction against grazing animals or growing most crops for 365 days after areas are treated with DRC-1339 (USDA 2016d, 2017a). Other plant back restrictions are 15 days for rice, wheat, corn and barley and 30 days for sunflower and soybeans. The 365-day restriction is USEPA's default value in the absence of specific environmental fate/residue information. To address USEPA's (2011b) consideration of the registered use of DRC-1339 in livestock and poultry feedlots constituting a food use, the feedlot use prohibits placing treated bait in pens that are occupied by livestock (USDA 2017b). The label use restrictions are sufficient to preclude exposure to livestock and poultry.

A complete exposure pathway is not identified for drinking water because of the limited use pattern of DRC-1339, and label restrictions that prohibit placing treated baits near water bodies (within 50 feet of permanent manmade or natural bodies of water). Depending upon the use site, DRC-1339 can be applied by targeted broadcast application techniques, in open bait stations, or in individual meat or egg baits. Bait stations and meat and egg baits significantly reduce the risk of environmental contamination. Broadcast applications occur infrequently to limited areas and are designed so that bait remains on the ground for just a short duration. Bait removal by the target pest further reduces the chance of offsite transport via runoff. In addition, current labeling requires the applicator to retrieve unconsumed toxic bait. Any toxic bait that may be left on the ground after clean up would be minor and expected to degrade quickly in the environment based on the short reported half-lives in soil. The use patterns and environmental fate of DRC-1339 preclude contamination of surface and ground water that could be used for drinking water.

4.1.2 Exposure Evaluation

This section qualitatively evaluates worker exposure from direct contact while mixing DRC-1339 with baits and applying them in the field, as well as re-entering treated sites for post treatment cleanup activities. The Bird Control and LNFD labels are restricted use pesticides and are handled by certified applicators or persons under their direct supervision. As discussed in Section 2.4, DRC-1339 is an acute inhalation toxicant and corrosive to eye and skin. Exposure from inhalation and other direct contact to DRC-1339 for a handler (mixing the concentrate formulations) or an applicator (applying diluted baits) are minimized under normal conditions with proper worker hygiene and the use of personal protective equipment (PPE).

PPE requirements for handlers who mix packages containing 1 lb. or more of the product include:

- Coveralls over long-sleeved shirt and long pants;
- Chemical-resistant gloves;
- Footwear plus socks;
- Protective eyewear (goggles and face shield); and
- Respirator (this may be updated to an organic vapor respirator).

PPE requirements for handlers who mix packages containing less than 1 lb. include:

- Long-sleeved shirt and long pants;
- Chemical resistant gloves; and
- Protective eyewear (goggles or face shield).

PPE requirements for applicators who handle treated bait and for workers who collect carcasses or uneaten bait during post-treatment cleanup include:

- Long-sleeve shirt and long pants;
- Chemical-resistant gloves; and
- Protective eyewear (goggles or face shield).

Other safety requirements for users on the labels include:

- Properly cleaning and maintaining PPE following manufacturer's instructions or using detergent and hot water if no such instructions are provided,
- Washing hands before eating, drinking, chewing gum, using tobacco, or using the toilet;
- Removing clothing immediately if pesticide gets inside, then washing thoroughly and put on clean clothing; and
- Removing PPE immediately after handling the product.

Accidental exposure may occur during mixing and application of baits, but the chance of this type of exposure is low since DRC-1339 use is only allowed by USDA APHIS personnel that are certified applicators or persons under their supervision. The limited use of DRC-1339 reduces the potential for accidental exposure.

4.2 Ecological Exposure Assessment

Various application methods are allowed on the Bird Control label depending on the use site and the pest species. All applications are made by mixing DRC-1339 with a bait that can be applied to the target area. For the purpose of this ecological exposure assessment and the associated risk characterization section, the

broadcast application staging area use was used to estimate aquatic and terrestrial residues. Use rates for staging area applications are higher and allow for broadcast applications over larger areas, and therefore, increase potential for exposure to nontarget aquatic and terrestrial wildlife.

4.2.1 Aquatic Exposure Assessment

Aquatic exposure from proposed DRC-1339 applications is expected to be low based on the method of application, proposed use pattern and mitigation measures to protect aquatic resources. The current use restrictions for the Bird Control and LNF labels require a 50-foot "No-treatment" application buffer from manmade and natural water bodies that will reduce the potential for DRC-1339 to enter water bodies from runoff. Drift is not a potential pathway for exposure since applications are made as a bait and only broadcast in limited applications. No applications are allowed on either label using aerial application equipment, further reducing the potential for any off-site transport.

A very conservative estimate of aquatic residues was made using the maximum application rate from the Bird Control label (0.1 lb. a.i./acre) and assuming that all of the material would be deposited into a static water body. The maximum application rate for the LNFD label is 0.083 lb. a.i. per acre. The water body dimensions evaluated in this assessment were one acre in area and one to six feet deep. The maximum instantaneous DRC-1339 residues from this estimate ranged from 0.006 to 0.035 mg a.i./L. These are conservative estimates of exposure since it assumes all material from a treatment area would be deposited into a water body, assumes no DRC-1339 degradation and does not account for the mitigating effects of the "No treatment" application buffer. The aquatic residue values can be compared to the aquatic effects data for DRC-1339 to determine whether there is any potential for risk under the proposed exposure scenario. The results of this comparison are discussed in more detail in the aquatic risk characterization section of this risk assessment.

4.2.2 Terrestrial Exposure Assessment

Exposure estimates for nontarget birds and mammals were made using the USEPA (2012b) terrestrial exposure model, T-REX (Terrestrial Residue Exposure Model). The model allows the user to input pesticide use and environmental fate data as well as effects data for birds and mammals that can be used as a deterministic estimator of risk by deriving risk quotients. The model can be used for liquid pesticide applications as well as granular and treated seed applications. The LD_{50} per square foot method was used in this assessment to determine potential risk to nontarget birds and mammals since it's applicable for broadcast uses of treated seeds, or baits such as DRC-1339. The use of the LD_{50} per square foot does not have any ecological relevance since nontarget animals may forage over larger areas but it does provide a means to quantify risk with the assumption that risk increases as the number of LD_{50}s per square foot increases. This method is commonly used for granular pesticide applications. The staging area maximum labeled broadcast treatment (0.1 lb. a.i./acre) was used to develop exposure residues that could be compared to mammal and bird effects data for DRC-1339 and then used to extrapolate the risk for various sized birds and mammals. USEPA (2018a) estimated DRC-1339 residues for various bait types that may be applied using trays, bait stations, or feeding stations and can result in the concentration of treated bait to smaller areas than what would occur using broadcast applications. DRC-1339 exposure residues were estimated for various-sized birds and mammals similar to those used in estimating DRC-1339 exposures using broadcast treatments. Concentrations of DRC-1339 in the final bait mixture ranged from 680 ppm in whole raisins, culled French fries, and waste potatoes, to 2000 ppm in high nutrition animal feed. These estimates were used to estimate doses for various sized mammals and birds that could then be compared to weight-adjusted median lethality values.

4.2.3 Assessment of Indirect Effects of Carcasses from Control Actions on Wildlife and the Environment

A few potential issues could arise from the bird carcasses resulting from a control action using DRC-1339. In particular, it has been postulated that outbreaks of two avian diseases, botulism and cholera, could increase where birds fall into wetlands. There is also the potential for accelerated eutrophication of wetlands to result from the bird carcasses adding to nutrient deposits.

Disease

Avian Botulism. Avian botulism is a paralytic disease of birds that occurs when toxins produced by the bacterium *Clostridium botulinum* are ingested (Locke and Friend 1987, Rocke and Bollinger 2007). Seven distinct types of botulism toxins, designated by the letters A through G, have been identified. Type C and E toxins usually cause waterfowl die-offs from botulism (Locke and Friend 1987). Many species of birds and some mammals are affected by Type C and E botulism in the wild. Waterfowl, shorebirds, and gulls are commonly affected and songbirds are only infrequently affected (Locke and Friend 1987).

Botulism bacteria are common in the soil of both terrestrial and aquatic environments, but the bacteria will only produce toxin under certain environmental conditions that favor bacterial growth, such as times of the year with higher ambient temperatures (above 77˚F), low water levels, the presence of rotting vegetation and invertebrate and vertebrate carcasses, high fly[7] (e.g., Order Diptera family Muscidae (housefly and allies, house flies, populations, and areas with no oxygen (Rosen 1971, Locke and Friend 1987). Most botulism outbreaks occur during late summer from July through September. Aquatic invertebrates ingest *C. botulinum* when feeding on sediment, and many die during the summer because of high water temperatures and low water levels. The bacteria within the invertebrates produce the toxin as the invertebrates decay, and fish, waterfowl, and other birds become intoxicated when they consume the dead invertebrates (Reed and Rocke 1992). The affected fish and birds then die and maggots feeding on the carcasses pick up the toxin. These maggots are then eaten by other birds, which become sick, and the cycle continues. Large-scale bird die-offs occur as a result of this toxin amplification. This mode of transmission is common with type C botulism in the western United States, but the maggot-carcass cycle also occurs with type E botulism outbreaks in the Great Lakes. *C. botulinum* bacterium persists in wetlands in a spore form that can persist for many seasons since it is resistant to heat and drying (Locke and Friend 1987).

Management of the environmental conditions in wetlands, especially water levels, and early and continuous clean-up and incineration of botulism-killed waterfowl carcasses, is recommended to prevent or control avian botulism outbreaks (Locke and Friend 1987). In addition, the occurrence of carcass-maggot cycles of botulism is dependent on a number of factors in addition to the presence of carcasses with botulism spores. These factors include fly density, and environmental conditions that facilitate fly egg-laying, maggot development, and maggot dispersal from carcasses (Reed and Rocke 1992).

Control of birds with DRC-1339 is unlikely to cause or enhance a botulism outbreak. First, control operations would occur when botulism infected material is not present (late fall to early spring), but possibly could be exposed to some in drinking water. Thus, it is unlikely most birds would contribute to the maggot-bird transmission cycle since maggots should be unaffected. Secondly, most projects, especially projects that

[7] Insects in the Order Diptera including the families Muscidae – houseflies and allies such as the housefly (*Musca domestica*) and Tabanidae – predatory flies like deer fly (*Chrysops* spp.).

involve hundreds of birds, are conducted by WS from late fall through spring (December to March) when birds congregate. The carcasses would decompose by early summer, prior to when an outbreak would likely occur. Therefore, no evidence exists to suggest that the bird carcasses themselves could initiate rapid bacterial growth and amplification of bird-maggot transmission. Thus, it is unlikely that increased risk of avian botulism would result from bird carcasses killed by DRC-1339 that fell into a wetland.

Avian Cholera. Avian cholera, *Pasteurella multocida*, is a contagious, bacterial disease that most species of birds and mammals worldwide can contract, and particularly virulent strains are usually fatal (Friend 1999, Samuel et al. 2007, Merck 2018b). Avian cholera commonly occurs in waterfowl, with major die-offs occurring almost annually, whereas, it occurs less frequently with only occasional die-offs in coots and scavenging gulls and crows. There are only a small number of reports in shorebirds, cranes and songbirds as well as domestic fowl, and these are usually not associated with wild waterfowl outbreaks. Die-offs from avian cholera can occur any time of year, but predictable seasonal patterns exist, primarily in fall and winter, in areas where avian cholera has become well established in wild waterfowl, such as waterfowl movement corridors west of the Mississippi River. Transmission occurs from direct bird-to-bird contact, by ingestion of contaminated food or water, and possibly by aerosols. Transmission is enhanced by the gregarious nature of most waterfowl species and by dense concentrations of migratory water birds. The bacteria can persist in water for several weeks, in soil for up to 4 months, and in decaying bird carcasses for at least 3 months. Acute infections in birds can result in rapid death 6 to 12 hours after exposure, and birds have been known to fall from the sky due to the rapid onset. Therefore, early detection of outbreaks is crucial in stopping the disease. Rigorous and careful collection, removal, and incineration of waterfowl carcasses is recommended to control the outbreaks and to reduce exposure of scavenging birds.

Studies found that while *P. multocida* bacteria can be detected in water and soil samples from wetlands immediately after an outbreak (Moore et al. 1998), wetlands are probably not an important reservoir for maintaining the bacteria (Lehr et al. 1998). Starlings and blackbirds are susceptible to *P. multocida*, but little evidence has been found to suggest they are involved in many avian cholera outbreaks. The primary concern is blackbirds that roost in cattail marshes, especially during migration. The risk of exposing waterfowl to avian cholera from the presence of blackbird carcasses in the dense cattail marsh habitat where most are likely to occur is considered low.

Potential to Cause Accelerated Eutrophication of Wetland Areas

A concern has been raised that carcasses of birds killed by DRC-1339 might significantly increase nutrients in cattail marsh roosting areas, resulting in accelerated eutrophication. Eutrophication is an ecosystem's response to the addition of artificial or natural nutrients, mainly phosphates, to an aquatic system. The increased key nutrients, phosphorous (P), potassium (K), nitrogen (N), and carbon (C), increase plant production, which leads to increased decomposition of organic material that often reduces or depletes oxygen content in the water (Cole 1975). Less oxygen can reduce or eliminate certain species and the increased biomass can reduce the size of wetlands. The delayed mode of action of DRC-1339 is such that most birds would not become lethargic and die until they were in their nighttime roosts. If birds died in nighttime roosts, they would be an additional source of nutrients introduced into an aquatic system. To make a comparison, blackbirds and starlings deposit large quantities of fecal material into nighttime roost sites and would continue to roost and deposit fecal material into cattail marsh roosts for the entire winter roosting period. Therefore, this analysis looks at a comparison between the amount of nutrients that would be deposited by bird carcasses and the amount of nutrients from the bird droppings that would continue to be deposited into the winter wetland roost.

Most DRC-1339 blackbird projects are conducted from October to March. From FY11 to FY15, the most starlings taken in a single project was an estimated 152,000 in FY12 in Washington. The most red-winged blackbirds and brown-headed cowbirds taken in one project, respectively, was 67,000 in Texas and 65,000 in Louisiana, both in FY11. Of these species, red-winged blackbirds are the most likely species to be found roosting above wetlands, typically cattail marshes (Yasukawa and Searcy 1995), whereas starlings (Cabe 1993) and brown-headed cowbirds (Lowther 1993) prefer evergreen thickets and trees, but can sometimes be found in cattails. However, in order to assess the risk of wetland eutrophication from bird carcasses, we assumed all birds die and fall into a wetland.

The average weight of starlings, red-winged blackbirds, and brown-headed cowbirds (assuming equal male/female ratios) is 87 g (Blem 1981), 49 g (Hayes and Caslick 1984), and 42 g (Lowther 1993), respectively (Table 8). The lean dry weight (excluding the weight of water and fat) of starlings is about 38% of the whole weight (calculated from data in Blem 1981[8]). No data was found for red-winged blackbirds or brown-headed cowbirds. Using the 38% value for all three species, gives a lean dry weight of 33 g for starlings, 19 g for red-winged blackbirds, and 16 g for brown-headed cowbirds (Table 8). The amount of P, K, and N was estimated to be 1.3%, 0.7%, and 14%, respectively, of the lean dry mass. With these assumptions, Table 8 estimates the weights for birds and nutrients of concern added to a wetland.

On the other hand, nightly droppings into the wetland would continue if birds were not taken with DRC-1339. Fecal output, feces, urates and urine, is highly variable depending on the species and the extent of wetland water conservation needed by that species (e.g., arid vs. wet habitats). Daily fecal output varied significantly for starlings depending on the type of food eaten (animal *vs* plant matter (poultry pellets) or 3.5 g/day *vs* 14.7 g/day) (Taitt 1973); animal matter is typically selected if available, but starlings commonly feed on the pelletized grain at confined animal feeding operations. For this analysis, we will assume a starling's fecal output is an average from these two food sources, about 9 g/day, which would be appropriate for the winter months when most control actions occur. Starlings tend to rely more on plant matter intake than animal matter (fewer invertebrates are available in frozen ground and snow) during the winter months when most control actions occur. Additionally, we will consider the nightly fecal output to be half the daily output, about 4.5 g/starling, since that is the portion that would go into the wetland and use the same percentages for red-winged blackbirds and brown-headed cowbirds (Table 8). The dry matter of excreta was found to be an average of 0.73 g for females and male red-winged blackbirds (Hayes and Caslick 1985). This would be about 29% of their nightly output. Using this same percentage for dry fecal matter nightly output, starlings and cowbirds would excrete 1.31 g and 0.64 g. The amount of P, K, and N was estimated to be 1.3%, 0.7%, and 14% of the lean dry mass (Hayes and Caslick 1984, Chilgren 1977, 1985). Table 8 provides estimates of weights of carcasses and nutrients added to wetlands. Considering the estimated weights provided in Table 8, it would take less than a month of roosting for droppings to surpass the weights from bird carcasses in all categories except N, which would take about 39 days. Assuming that birds are on their nightly winter roosts for close to six months of the year (mid-October to mid-April) and that control actions, which occur mostly from mid-November to mid-March (Sept.-April), likely prevent about half the droppings or 3 months (90 nights) accumulation, the dry waste from carcasses would be less than the dry weight of droppings added to the wetland had the control action not occurred. This means that accelerated eutrophication would not be expected to occur from bird damage management activities.

[8] The lean dry weight divided by the overall weight minus weight of lipids (weight without water and fat)

Table 8. Amount of nutrients from bird carcasses and nightly fecal output potentially deposited into wetlands from birds controlled with DRC-1339.

Test Species	European Starling		Red-winged Blackbird		Brown-headed Cowbird	
Nutrient	Bird	Feces	Bird	Feces	Bird	Feces
	Statistics for Individual Birds or Nightly Fecal Output (grams)					
Ave. Wt. (male & female)/50% for feces/night	87	4.5[1]	49	2.5	42	2.2
Total Dry Weight (50% for feces/night)	33[2]	1.31	19	0.73[3]	16	0.64
Dry Weight Phosphorous (1.3%/1.5%)	0.429[4]	0.020	0.247	0.011[3]	0.208	0.010
Dry Weight Potassium (0.7%/1.4%))	0.231[4]	0.018	0.133	0.010[3]	0.133	0.009
Dry Weight Nitrogen (14%/9.2%)	4.62	0.121	2.66	0.067[3]	2.24	0.059
	Statistics for Maximum Single Project Take FY11-FY15 (kilograms)					
Highest WS Project Take (FY11-FY15)	152,000		67,000		65,000	
Project Weight of Birds/Wet Excreta	13,224	686	3,283	168	2,730	143
Project Dry Weight of Birds/Excreta	5,016	199	1,273	49	1,040	42
Total Dry Weight Phosphorous	65	3.0	16	0.75	13	0.65
Total Dry Weight Potassium	35	2.7	8.9	0.68	8.6	0.59
Total Dry Weight Nitrogen	702	18	178	4.5	146	3.8

[1] from Taitt 1973 [2] from Blem 1981 [3] from Hayes and Caslick 1984 [4] from Chilgren 1977, 1985/Murphy and King 1982

5 RISK CHARACTERIZATION

5.1 Human Health Risks

Risks associated with adverse human health are characterized qualitatively in this section. Under the existing WS uses, DRC-1339 baits to control bird populations should pose minimal risks to human health.

Adherence to label requirements regarding PPE minimizes risk to WS workers who mix and apply DRC-1339. Although DRC-1339 is a hazard to humans due to its acute toxicity via the inhalation, ingestion, ocular and dermal routes, the low potential for exposure to DRC-1339 when following label requirements during mixing and application suggests adverse health risks to workers are not expected. Any exposure and risk would be short term based on the methods for baiting and the low frequency of use for DRC-1339 by WS. Since 1987 when USDA APHIS started to record worker chemical exposures, no known cases of DRC-1339 exposure to WS personnel or the public have occurred. Exposure of the general public to DRC-1339 is not anticipated based on the limited use pattern (e.g. entry restriction, non-residential use, prebaiting assessment, and often observing baits throughout the day), and the post-treatment cleanup requirements (e.g. remove unconsumed or spilled baits and collect dying or dead birds for proper disposal). Therefore, adverse health risk to the general public is not expected which is supported by the lack of adverse incidents that have been reported to date.

5.2 Ecological Risks

5.2.1 Aquatic

The risk to aquatic organisms from the use of DRC-1339 is minimal. The method of application, label requirements for removal of unused bait and carcasses, and “No treatment” buffers adjacent to aquatic habitats results in a low potential for exposure and risk. A comparison of the available effects data for aquatic vertebrates and invertebrates to the estimated acute aquatic residues in static water bodies show wide margins of safety for aquatic organisms (Figure 1).

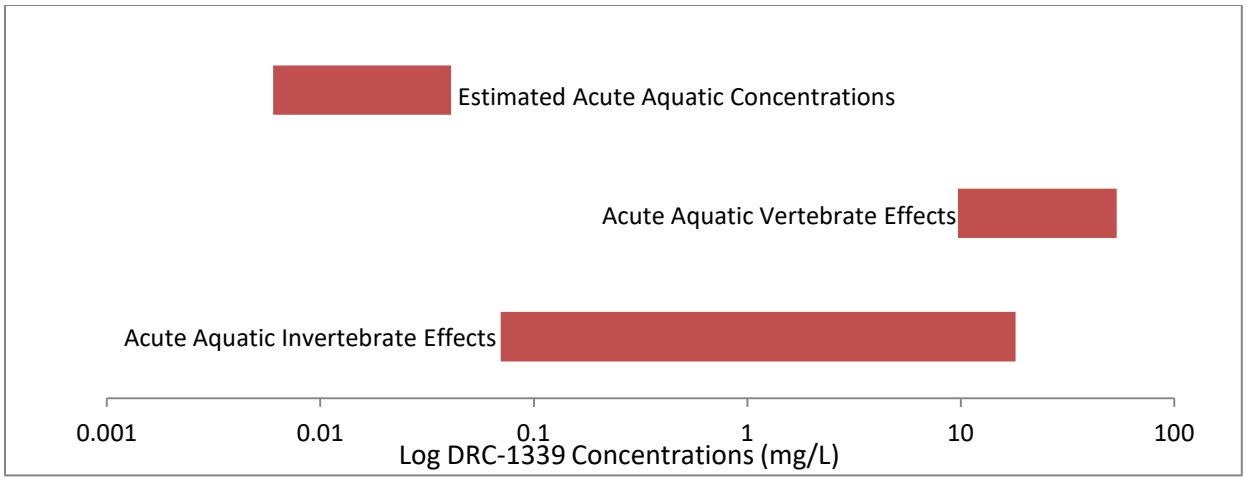

Figure 1. Aquatic risk characterization for DRC-1339.

Chronic effects data for aquatic invertebrates and vertebrates is not available, but the method of application for DRC-1339, collecting unused bait, and no treatment application buffers from aquatic water bodies, in addition to a short half-life in the environment would suggest that chronic risk would be negligible.

5.2.2 Terrestrial Wildlife and Domestic Animals

The risk of DRC-1339 use to domestic animals such as pets and livestock will likely be low. DRC-1339 has moderate toxicity to most mammals, but in the case of pets and livestock, the label provides use restrictions on storing, temporarily placing, and entry into treated areas to preclude harm to most domestic animals. Even under the highest precautions, free-roaming domestic pets and feral animals such as dogs and cats may access treated areas, but monitoring sites during prebaiting and baiting with DRC-1339 should reduce exposure.

The LD_{50} per square foot method was used to determine whether food consumption rates for various sized nontarget wild mammals would exceed median lethality values for DRC-1339 using broadcast applications. Risk quotient values for various sized mammals ranged from less than 0.01 for a 1000 g mammal to 0.10 for a 15 g mammal. Eisemann et al. (2001) reported risk quotient values of 0.01 and <0.01 for 30 and 300 g mammals, respectively, using the LD_{50} per square foot method. USEPA (2004, 2017c) has established levels of concern (LOC) above which there is a presumption of risk for nontarget organisms when a risk quotient is exceeded. The acute high risk LOC is 0.50, thus the acute risk of DRC-1339 exposure to wild mammals is presumed to be low for broadcast applications. DRC-1339 is more typically applied using various bait matrices in bait stations and trays. Risks may be higher for mammals under conditions where highly palatable baits are applied in small piles in bait trays concentrating the quantity of DRC-1339 that could be rapidly consumed by nontarget animals. USEPA (2018a) estimated risk quotient values exceeded the acute high risk LOC for small (15g) and medium-sized (35g) mammals exposed to DRC-1339 baits using seeds (corn, barley, distillers grain, milo, lentils and peast), dry pet food, culled French fries, waste potatoes, and high nutrition animal feed. Risk quotient values ranged from 0.10 for large mammals (1000 g) consuming DRC-1339-treated whole raisins to 0.63 for small mammals consuming the above mentioned baits. Risks from these types of applications are higher than those estimated using the LD_{50} per square foot method but provide a more representative estimate of risk since bait applications typically employ non-broadcast methods of application, concentrating DRC-1339-treated bait to smaller areas using bait stations or trays.

The risk to nontarget birds in broadcast applications is higher compared to mammals due to the higher toxicity of DRC-1339 to most bird species. Using the LD_{50} per square foot approach risk quotient values exceed the LOC of 0.50 for different sized birds using the USEPA T-REX model under broadcast applications. Risk quotient values for a 20, 100 and 1000 g bird were 24.92, 3.92 and 0.28, respectively. These values exceed the LOC for acute high risk suggesting acute risk to nontarget birds. Similar risk quotient values have been estimated for various bird species using the LD_{50} per square foot method (Eisemann et al. 2001). Risk quotient values ranged from 70.3 for the red-winged blackbird to 0.39 for the mallard suggesting acute risk to avian species. USEPA (2018a) estimated risk quotient values that exceeded the acute high risk LOC for all birds sizes (10, 100 and 1000 g), and for all bait types, suggesting acute high risk for all birds that consume treated bait regardless of the type of bait used. Risk quotient values ranged from 12 for large birds (1000 g) consuming DRC-1339-treated raisins to 240 for small birds (10 g) consuming DRC-1339-treated seeds, dry pet food and high nutrition animal feed. Similar to mammals, risks quotient values are higher for birds under use conditions where highly palatable baits are applied using bait trays or stations that result in high concentrations of DRC-1339 in small areas. Linder et al. (2004) estimated risk quotient values for various bird species using bird toxicity data and food ingestion rates to demonstrate acute risk was higher for smaller sized granivorous birds when compared to larger bodied nontarget birds such as the bobwhite and mallard. These estimates assume birds will consume only toxic bait and does not account for dilution of bait with nontoxic bait, which is true of most bait formulations. Nontarget birds that feed on treated bait used in bait stations, trays or broadcast applications are at risk of acute lethal and sublethal effects due to their sensitivity to DRC-1339 and methods of application that can concentrate DRC-1339 in small areas.

The acute risk to nontarget birds and mammals under field use can be reduced depending on the application method, removal of bait by the target species, and other measures, some of which are stated on the DRC-1339 labels. Broadcast label applications allow for individual rates up to 0.1 lb. a.i./acre and a seasonal maximum of 0.5 lb. a.i./acre, but typical application rates are lower. An assessment of use rates in Louisiana rice fields reported typical single application rates of 0.04 lb. a.i./acre with a seasonal maximum of 0.24 lb. a.i./acre. In addition, applications are not made to an entire field but are made to a small area within a field. The area where bait applications are made typically range from 0.5 to 1.0 acre in size with a swath width of no greater than 50 feet. Prebaiting reduces the risk to nontarget wildlife by increasing target species acceptance of the bait and ensures that nontarget species are not feeding on the bait. O'Hare (2013) reported that within the first 12 hours of application greater than 90% of the treated bait was removed in 75-95% of the baiting projects in rice fields in Texas and Louisiana. In addition, the average number of days spent prebaiting was 5.4 to 11 days compared to 1 to 3.5 days for toxic bait suggesting risk to nontarget birds and mammals is short term. The lower application rate, area of treatment, and bait removal efficiency by the target species lowers the risk to nontarget mammals and birds.

Additionally, several label requirements reduce the risk of DRC-1339 to nontarget terrestrial vertebrates and include:

- DO NOT apply toxic baits in locations where nontoxic prebait has not been accepted well by target species or where nontarget wildlife have been observed to feed on prebait.
- DO NOT store toxic baits in locations accessible to children, pets, domestic animals, or nontarget wildlife.
- DO NOT apply in areas where toxic baits may be consumed by Threatened or Endangered Species.
- DO NOT apply toxic baits made from this product by air.
- The applicator must remove all unconsumed, regurgitated, or spilled toxic bait, and as much of the broadcast toxic bait as possible at the conclusion of the treatment period.
- For broadcast applications made to areas such as stubble fields, harvested dormant hay fields, open grassy or bare-ground noncrop areas and roadsides, bury uneaten toxic bait via mechanical (e.g., discing under) methods

or to a minimum depth of 2 inches (5.08 cm) if manual (e.g., shoveling under) methods are used, as appropriate.

- Change prebaiting locations and nontoxic bait material if necessary to achieve good acceptance by target species or if nontarget species have been observed eating the prebait.

The Bird Control and LNFD labels also contain additional use specific information designed to reduce the exposure of DRC-1339 to nontarget wildlife. These label requirements and other measures collectively reduce the risk to nontarget wildlife, in particular, mammals and birds that may forage on treated seed, dog food, cull French fries, meat, and egg baits. Measures such as prebaiting small plots that are placed away from field edges where other bird species frequent can reduce nontarget effects in broadcast applications of DRC-1339 (Knittle et al 1980, Linz et al 2002). Prebaiting also allows observation of nontarget use where locations can be changed in the event of unacceptable nontarget use. Additionally, diluting bait with nontoxic rice or other nontoxic bait materials will reduce risk to nontarget birds that are less sensitive to the effects of DRC-1339 compared to the target species (Avery et al. 1998, Boyd and Hall 1987, Eisemann et al. 2001, Linz et al. 2002, Linz et al. 2004). Cummings et al. (2002) observed nontarget avian species in Louisiana DRC-1339 treated fields, but the number of species was low and was related to the location of the bait sites, feeding activity of blackbirds and bait availability that was designed to maximize blackbird use. Similar results have been observed in other applications (Knittle et al. 1980). The target bird species dominated the treatment areas reducing the potential for exposure to nontarget birds. In cases where applications are made in the spring, baiting can be made prior to the arrival of spring migrants reducing risk to nontarget bird species (Eisemann et al. 2001).

For treated rice applications, risk is greatest to those nontarget bird species that have been observed at feeding sites, are granivorous, and are sensitive to DRC-1339 broadcast treated rice baits. Ringed-necked pheasants, mourning doves, and northern bobwhite are examples of granivorous bird species that have been observed at baiting sites and are sensitive to DRC-1339 (Pipas et al. 2003). Various sparrow species have also been observed at baiting sites, but most appear to have moderate sensitivity to DRC-1339 based on acute oral toxicity data (LD_{50} = 100-400 mg/kg) (Eisemann et al. 2001) and would have to consume larger quantities of the diluted toxic bait than the more sensitive target species. Measures such as those discussed above will reduce the potential impacts to these nontarget species. Avery et al. (1998) suggested that risk will be reduced for ringed-necked pheasants in field applications of DRC-1339 to control blackbirds in sunflower fields when bait dilution is implemented. Acute risk is minimized, but chronic risk may occur in areas where pheasants receive sublethal doses and access other fields.

Other methods to reduce nontarget bird impacts include the use of traps that are specific to the target species that contain treated bait. Glahn et al. (1997) reported no nontarget impacts when using DRC-1339 to control boat-tailed grackles in citrus orchards. DRC-1339 treated watermelon was placed in cage traps that resulted in the control of grackles with no observed nontarget impacts.

The low risk to most nontarget species has been validated by field data where little to no nontarget carcasses have been observed or collected during and after baiting (Smith 1999, Cummings et al. 2002). There is some uncertainty with these results since time to death can be multiple days and locating poisoned carcasses or observing sick birds and mammals can be impacted by several factors (Vyas 1999). Acute risks to birds have been demonstrated in field applications with nine avian incidents reported to USEPA (USEPA 2018a). This is a relatively low number but supports the potential for effects to sensitive avian species. WS field personnel record nontarget species take and collect this information during and after baiting operations. From FY11-FY15, WS took an annual average of 244 nontarget birds including feral pigeons and brown-headed cowbirds,

which were being targeted with other methods where they were taken, and American crows and common ravens (Table 2). This was minimal in comparison to take (see Section 1.1).

Secondary poisoning risks are expected to be low based on the rapid metabolism of DRC-1339 in birds and low residues that have been observed post treatment. Approximately 90% or more of DRC-1339 is metabolized and excreted in animals within 2 hours after ingestion (USDA 2001, Cunningham et al. 1979). Goldade et al. (2004) reported that a rapid elimination phase occurred between 0 to 4 hours with an average half-life of 0.16 hours for juncos and 0.62 hours for blackbirds. A slower elimination phase followed with an average of 3.4 hours for juncos and 5.4 hours for blackbirds. At four hours post dosing approximately 91 and 85% of the parent compound had been excreted for the junco and blackbird, respectively. Residues in various organs for both birds were measured over a 24-hour period with residues highest in the kidneys. Residues as a percentage of the initial dose were low for all organs and tissues 24 hours post-dosing with values ranging from less than 0.01 to 2.20%. These values suggest that any secondary poisoning risks would be short term due to the lack of significant residues in any carcasses. Johnston et al. (1999) demonstrated the low potential for secondary poisoning in various avian and mammalian scavengers and predators based on measured residues in boat-tailed grackles. Residues were compared to available acute oral toxicity data and daily food consumption rates for various species with resulting risk quotients ranging from 0.034 for the barn owl to 0.00057 for the domestic dog. Kostecke et al. (2001) documented potential avian and mammalian scavengers of bird carcasses in South Dakota and determined that secondary poisoning risks for most scavengers and predators is low based on the species identified and their low sensitivity to the effects of DRC-1339. Cunningham et al. (1979) estimated that most scavengers and predators would have to consume two to three times their daily food consumption rates to exceed a lethal dose based on DRC-1339 residues measured in starlings. This type of risk would be low due to the method of application and label requirements to collect and remove bird carcasses during and after the baiting operation. There is the possibility of exposure from feeding on target bird species that receive a sublethal dose of DRC-1339. This type of risk could occur for species that are sensitive to DRC-1339 and feed solely on DRC-1339 exposed birds for greater than 30 days (Cunningham et al. 1979). The use pattern and metabolism of DRC-1339 makes this type of risk negligible.

5.2.3 Terrestrial Invertebrates and Plants

The risk of DRC-1339 use to terrestrial invertebrates and plants is negligible. Available data show low toxicity to both taxa and the methods of application for DRC-1339 suggest that potential exposure would also be low, resulting in a low probability of risk to either group. Some invertebrates may be attracted to the various baits that can be used with DRC-1339, but any impact to sensitive invertebrates would be localized to bait that is not readily consumed by the target species.

5.2.4 Indirect Effects of Carcasses from a Control Action on Nontarget Wildlife and the Environment

Our risk assessment indicated that even if all bird carcasses from the largest control actions between FY11 and FY15 were to fall into a single wetland, an increased risk of avian botulism and cholera would not be expected and the rate of eutrophication would not change.

6 UNCERTAINTIES AND CUMULATIVE IMPACTS

The uncertainties associated with this risk assessment arise primarily from lack of information about the effects of DRC-1339, its formulations, metabolites, and potential mixtures to nontarget organisms that can

occur in the environment. These uncertainties are not unique to this assessment but are consistent with uncertainties in human health and ecological risk assessments with any environmental stressor.

Another area of potential uncertainty in this risk assessment is the potential for cumulative impacts to human health and the environment from the proposed use of DRC-1339. The potential for cumulative impacts is expected to be low based on the low volume and minor use of DRC-1339 in the various APHIS uses. WS used an annual average of 77.4 pounds of DRC-1339 from FY11 to FY15 nationwide in 38 states, which is very minimal. Areas where cumulative impacts may occur include: 1) repeated worker and environmental exposures to DRC-1339 from program activities, and other sources; 2) exposure to other chemicals with a similar mode of action; and 3) exposure to other chemicals affecting the toxicity of DRC-1339.

Repeated exposures that could lead to significant risk from DRC-1339 are not expected due to label requirements that prevent significant exposure. An accidental exposure may occur from improper use of PPE but the potential for this to happen is unlikely because DRC-1339 products are used only by USDA APHIS certified applicators or those under their direct supervision.

Cumulative impacts may occur from DRC-1339 use in relation to other chemicals that have a similar mode of action, as well as others that have a different mode of action but could result in synergistic, additive or antagonistic effects. This is an area of uncertainty since its unknown what other stressors, including chemicals, humans and nontarget wildlife may be exposed to during a DRC-1339 application.

From a human health perspective, the WS low volume and minor use of DRC-1339 is expected to result in negligible cumulative impacts, as well as the potential for cumulative impacts from exposure to other chemicals. DRC-1339 is not registered for food use and is unlikely to impact surface or ground water so risks are negligible for the public. The lack of exposure and risk to the public suggests that cumulative impacts would also be incrementally negligible when factoring in other stressors.

Cumulative impacts to ecological resources are also expected to be incrementally negligible. Risks to aquatic resources and most terrestrial nontarget wildlife is low due to lack of toxicity and significant exposure. There is risk to some sensitive terrestrial vertebrates, including the target species; however, the potential cumulative impacts are expected to be minor for most species. The potential for cumulative impacts from the effects of DRC-1339 to terrestrial vertebrates will be greatest for those species that have low numbers, small home ranges, are sensitive to DRC-1339 and attracted to treated bait. Sensitive terrestrial vertebrates that may be impacted by the use of DRC-1339 and observed at baiting sites typically have wide geographic distributions and home ranges suggesting any potential cumulative impacts from the use of DRC-1339 relative to other stressors would be negligible.

7 SUMMARY

WS uses DRC-1339 to manage several bird species that damage a variety of agricultural and non-agricultural resources. For more than 50 years, DRC-1339 has proven to be an effective method of starling, pigeon, blackbird, corvid, and gull damage management. DRC-1339 is a slow acting avicide that is metabolized or excreted in birds and mammals within a matter of hours. DRC-1339 poses little risk of secondary poisoning to nontarget animals, including avian scavengers. DRC-1339 poses no risk to aquatic nontarget wildlife. Nontarget birds and mammals that are sensitive to DRC-1339 may be at risk to DRC-1339, but this risk can be reduced through label language designed to reduce exposure. Risks to pollinators and terrestrial plants is negligible based on the use pattern of DRC-1339 and available limited effects data. The WS use pattern,

application rates that are mostly on private lands, results in negligible risk for the public. Dietary risk from DRC-1339 exposure to the public is low since the avicide has no registered food uses and does not pose a threat to drinking water. The risk to WS applicators is also low because they receive training in the product's use, are certified by the State to use restricted use pesticides, and follow label instructions, including the use of appropriate PPE. The release of DRC-1339 into the environment is expected to have no or negligible cumulative impacts to nontarget species, the public, and the environment.

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9 PREPARERS: WRITERS, EDITORS, AND REVIEWERS

9.1 APHIS WS Methods Risk Assessment Committee

Writers for "Use of DRC-1339 in Wildlife Damage Management Risk Assessment":

Writer/Editor: Thomas C. Hall
Position: USDA-APHIS-WS, Operational Support Staff, Staff Wildlife Biologist, Fort Collins, CO
Education: BS Biology (Natural History) and BA Psychology – Fort Lewis College; MS Wildlife Ecology – Oklahoma State University
Experience: Special expertise in wildlife biology, identification, ecology, and damage management. Thirty-four years of service in APHIS Wildlife Services including operations and research in CO for research and OR, GU, CA, OK, and NV for operations conducting a wide variety of programs including bird damage research and management, livestock protection (predators and birds), invasive species management, wildlife hazard management at airports, property and natural resource protection including waterfowl, brown tree snake, feral swine, rodent, and beaver damage management. Applied and supervised the use of DRC-1339.

Primary Writer: Fan Wang-Cahill
Position: USDA-APHIS-Policy and Program Development (PPD), Environmental and Risk Analysis Services (ERAS), Environmental Health Specialist, Riverdale, MD
Education: B.S. Biology and M.S. Hydrobiology - Jinan University, Guangzhou, China; Ph.D. Botany (Ultrastructure/Cell Biology) – Miami University
Experience: Joined APHIS in 2012, preparing human health risk assessments and providing assistance on environmental compliance. Prior experience before joining APHIS includes 18 years environmental consulting experience specializing in human health risk assessments for environmental contaminants at Superfund, Resource Conservation and Recovery Act (RCRA), and state-regulated contaminated facilities.

Primary Writer: Jim Warren
Position: USDA-APHIS-Policy and Program Development (PPD), Environmental and Risk Analysis Services (ERAS), Environmental Toxicologist, Little Rock, AR
Education: B.S. Forest Ecology and M.S. Entomology – University of Missouri; Ph.D. Environmental Toxicology – Clemson University
Experience: Thirteen years of experience working for APHIS preparing ecological risk assessments and providing assistance on environmental compliance. Prior experience before joining APHIS includes other government and private sector work regarding ecological risk assessments related to various environmental regulations.

Editors/Contributors for "Use of DRC-1339 in Wildlife Damage Management Risk Assessment":

Editor: Michelle Gray
Position: USDA-APHIS-Policy and Program Development (PPD), Environmental and Risk Analysis Services (ERAS), Environmental Protection Specialist, Raleigh, NC
Education: BS Biology – University of Illinois; MS Zoology with an emphasis in wildlife toxicology – Southern Illinois University
Experience: Eight years of experience in preparing environmental analyses in compliance with the National Environmental Policy Act. Three years of service in APHIS conducting risk analysis.

Editor: Andrea Lemay
Position: USDA-APHIS-Policy and Program Development (PPD), Environmental and Risk Analysis Services (ERAS), Biological Scientist, Raleigh, NC
Education: BS Plant and Soil Science (Biotechnology) - University of Massachusetts; MS Plant Pathology -North Carolina State University
Experience: Thirteen years of service in APHIS conducting risk analysis. Four years of experience in preparing environmental analyses in compliance with the National Environmental Policy Act.

Editor/Contributor: Jeanette O'Hare
Position: USDA-APHIS-Wildlife Services (WS), National Wildlife Research Center (NWRC), Registration manger, Fort Collins, CO
Education: B.S. Biology – College of Saint Mary; M.A. Biology – University of Nebraska - Omaha
Experience: Thirteen years of experience working for WS NWRC providing regulatory compliance support for the development of wildlife damage management tools. Prior experience before joining APHIS includes assessing the environmental fate of pesticides and providing the agency guidance on water quality issues at the state government level, and laboratory experience in the fields of pharmacology and toxicology, and immunology.

Editor/Contributor: Emily Ruell
Position: USDA-APHIS-WS, NWRC, Registration Specialist, Fort Collins, CO
Education: B.S. Zoology and Biological Aspects of Conservation – University of Wisconsin - Madison; M.S. Ecology – Colorado State University (CSU); M.A. Political Science – CSU
Experience: Five years of experience with WS NWRC preparing and reviewing vertebrate pesticide registration data submissions and other registration materials, and providing pesticide regulatory guidance to WS, WS NWRC, and

collaborators. Prior experience before joining APHIS includes seven years of conducting field and laboratory wildlife research at CSU, and environmental policy research for the U.S. Geological Survey.

Editor: Ryan Wimberly
Position: USDA-APHIS-WS, Operational Support Staff, Staff Wildlife Biologist, Madison, TN
Education: BS Wildlife Management and Ecology – Northwest Missouri State University
Experience: Special expertise in wildlife biology, ecology, and damage management. Seventeen years of service with APHIS Wildlife Services, including operations and research, conducting a wide variety of programs, including bird damage research and management, livestock protection, invasive species management, wildlife hazard management at airports, property, and natural resource protection. Expert in preparing environmental documents for WS programs to comply with the National Environmental Policy Act and the Endangered Species Act.

Data Contributor: Joey Millison
Position: USDA-APHIS-WS Information and Technology (IT), Junior Applications Developer
Education: Information and Technology coursework from various sources
Experience: Eleven years of experience in APHIS, WS Management Information System (MIS) Group. Retrieves WS field data from the MIS for writers, reviewers, and editors.

9.2 Internal Reviewers

USDA APHIS Wildlife Services

Reviewer: Anthony G. Duffiney
Position: USDA-APHIS-WS, State Director, Okemos, MI
Education: BS Fisheries and Wildlife Biology, Michigan State University
Experience: Twenty-two years of service with APHIS Wildlife Services in Michigan, Florida and West Virginia. Specialized experience in all levels of WS Operations including pesticide use, NEPA, FOIA, ESA, predator control, feral swine damage management, wildlife hazards at airports, wildlife disease sampling, invasive reptiles, urban wildlife damage. Worked with NWRC and a private livestock feed company in developing new baiting strategy for use of DRC-1339 in cattle feedlots and dairy farms. Conducted bait trials with traditional baits to prove efficacy of new bait material, CU Bird Carrier. Trained WS personnel from 10 State programs in use of new bait. Experience with DRC-1339 to control damage caused by European starlings, common and boat-tailed grackles, rock pigeons, American crows, common ravens, and ring-billed gulls.

Reviewer: Jack W. Sengl
Position: USDA-APHIS-WS, Staff Biologist, Reno, NV
Education: BS Fisheries and Wildlife Biology, Utah State University
Experience: Special expertise in wildlife damage management and oversight. Twenty years of service in APHIS Wildlife Services in the Aleutian islands, AK, IL, NY, OH, VT, and NV with an array of experience including field experience (livestock, dairy, feedlot, property, natural resource, aquaculture, urban-deer management, human health and safety and managing wildlife hazards at airports and disease sampling/reporting) involving predators, birds and rodents and 11 years of program oversight (NEPA, ESA, FOIA, Policy, pesticide registration, monitoring and training, safety, firearms training, controlled material inventory tracking, and coordination of multi-agency meeting). Applied, supervised and provided annual training for the use of DRC-1339; created a 24c label for DRC-1339.

Reviewer: Randal S. Stahl
Position: USDA-APHIS-WS, Chemist, Fort Collins, CO
Education: BS Plant & Soil Science, University of Tennessee; MS Plant Physiology, Texas A&M University; PhD Soil Chemistry, University of Maryland
Experience: Special expertise in developing analytical methods to quantify DRC-1339 in baits and tissue matrices. Eighteen years of service in APHIS Wildlife Services supporting research activities conducted at the National Wildlife Research Center. Developed and support the DRC-1339 Unified Take estimate model used by Wildlife Services to

report take estimates for select species following baiting operations under the Bird Control and Livestock, Nest & Fodder Depredations labels.

Reviewer: Keith Wehner
Position: USDA-APHIS-WS, Assistant Regional Director, Fort Collins, CO
Education: BS in Biology, Michigan Technological University
Experience: Nineteen years of service in APHIS Wildlife Services with experience in a wide variety of programs (livestock, dairy, property, natural resources, and human health and safety protection) including predator, bird, beaver, feral swine, and disease management activities.

Reviewer: Michael Yeary
Position: USDA-APHIS-WS, State Director/Supervisory Wildlife Biologist, Lakewood, CO
Education: BS in Wildlife Ecology, Texas A&M University
Experience: Special expertise in wildlife damage management including supervising an aerial operation program. Thirty-seven years of service in APHIS Wildlife Services in TX, KS, and CO with experience in a wide variety of programs (livestock, aquaculture, dairy, property, natural resources, and human health and safety protection) including predator, bird, beaver, feral swine, and rodent damage management activities.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, DC 20460

OFFICE OF CHEMICAL SAFETY
AND POLLUTION PREVENTION

October 23, 2019

David A. Bergsten
Assistant Chief
Environmental and Risk Analysis Services
Policy and Program Development
Animal and Plant Health Inspection Service
U.S. Department of Agriculture
4700 River Road, Unit 149
Riverdale, MD 20737-1237

Subject: Label Amendment – Revision of respirator type requirement for applicators mixing >1 lb, clarification of Directions for Use, and other minor changes
Product Name: Compound DRC-1339 Concentrate- Bird Control
EPA Registration Number: 56228-63
Application Date: 05/17/2019
Decision Number: 551746

Dear Mr. Bergsten:

The amended label referred to above, submitted in connection with registration under the Federal Insecticide, Fungicide and Rodenticide Act, as amended, is acceptable. This approval does not affect any conditions that were previously imposed on this registration. You continue to be subject to existing conditions on your registration and any deadlines connected with them.

A stamped copy of your labeling is enclosed for your records. This labeling supersedes all previously accepted labeling. You must submit one copy of the final printed labeling before you release the product for shipment with the new labeling. In accordance with 40 CFR 152.130(c), you may distribute or sell this product under the previously approved labeling for 18 months from the date of this letter. After 18 months, you may only distribute or sell this product if it bears this new revised labeling or subsequently approved labeling. "To distribute or sell" is defined under FIFRA section 2(gg) and its implementing regulation at 40 CFR 152.3.

Should you wish to add/retain a reference to the company's website on your label, then please be aware that the website becomes labeling under the Federal Insecticide Fungicide and Rodenticide Act and is subject to review by the Agency. If the website is false or misleading, the product would be misbranded and unlawful to sell or distribute under FIFRA section 12(a)(1)(E). 40 CFR 156.10(a)(5) list examples of statements EPA may consider false or misleading. In addition, regardless of whether a website is referenced on your product's label, claims made on the website may not substantially differ from those claims approved through the registration process. Therefore, should the Agency find or if it is brought to our attention that a website contains false

or misleading statements or claims substantially differing from the EPA approved registration, the website will be referred to the EPA's Office of Enforcement and Compliance.

Your release for shipment of the product constitutes acceptance of these conditions. If these conditions are not complied with, the registration will be subject to cancellation in accordance with FIFRA section 6. If you have any questions, please contact Paul Di Salvo by phone at 703-347-0322, or via email at disalvo.paul@epa.gov.

Sincerely,

Paul D. Salvo for

Gene Benbow, Product Manager 07
Invertebrate and Vertebrate Branch 3
Registration Division (7505P)
Office of Pesticide Programs

Enclosure

RESTRICTED USE PESTICIDE

DUE TO HIGH ACUTE INHALATION TOXICITY AND EYE AND SKIN CORROSIVENESS TO HUMANS;
HIGH ACUTE TOXICITY TO NONTARGET BIRDS AND AQUATIC INVERTEBRATES;
AND THE NEED FOR HIGHLY SPECIALIZED APPLICATOR TRAINING.
For retail sale to and use only by USDA APHIS Certified Applicators trained in bird control or by persons under their direct supervision.

COMPOUND DRC-1339 CONCENTRATE – BIRD CONTROL

ACTIVE INGREDIENT:
DRC-1339; 3-chloro-p-toluidine hydrochloride:..... 97.0%
OTHER INGREDIENTS: 3.0%

TOTAL: 100.0%

ACCEPTED
10/23/2019
Under the Federal Insecticide, Fungicide and Rodenticide Act as amended, for the pesticide registered under EPA Reg. No. 56228-63

KEEP OUT OF REACH OF CHILDREN

DANGER-PELIGRO
POISON

FIRST AID

IF INHALED:
- Move person to fresh air.
- If person is not breathing, call 911 or an ambulance; then give artificial respiration, preferably mouth-to-mouth, if possible.
- Call a poison control center or doctor immediately for treatment advice.

IF IN EYES:
- Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye.
- Call a poison control center or doctor immediately for treatment advice.

IF SWALLOWED:
- Call a poison control center or doctor immediately for treatment advice.
- Have person sip a glass of water if able to swallow.
- Do not induce vomiting unless told to do so by a poison control center or doctor.
- Do not give anything by mouth to an unconscious person.

IF ON SKIN OR CLOTHING:
- Take off contaminated clothing.
- Rinse skin immediately with plenty of soap and water for 15-20 minutes.
- Call a poison control center or doctor immediately for treatment advice.

Have the product container or label with you when calling a poison control center or doctor or going for treatment. If you need immediate medical attention, call the Poison Control Center at 1-800-222-1222 or a doctor. For non-emergency information concerning this product, call the National Pesticide Information Center at 1-800-858-7378.

NOTE TO PHYSICIAN AND VETERINARIAN: Probable mucosal damage may contraindicate the use of gastric lavage. See **PRECAUTIONARY STATEMENTS** for additional information.

TREATMENT FOR PET POISONING: If pet eats bait, call a veterinarian at once.

United States Department of Agriculture
Animal and Plant Health Inspection Service
4700 River Road, Unit 149
Riverdale, MD 20737
EPA Est. 56228-ID-01

Net Contents: _____

Batch Code: _____

PRECAUTIONARY STATEMENTS

HAZARDS TO HUMANS AND DOMESTIC ANIMALS

DANGER

Fatal if inhaled. Corrosive. Causes irreversible eye damage and skin burns. May be fatal if swallowed. Harmful if absorbed through skin. Prolonged or frequently repeated skin contact may cause allergic reactions in some people. Do not get in eyes, on skin, or on clothing. Do not breathe dust.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Handlers who mix packages containing 1 lb (0.45 kg) or more of this product must wear:

- Coveralls over long-sleeved shirt and long pants
- Chemical-resistant gloves such as: barrier laminate, butyl rubber ≥ 14 mils, nitrile rubber ≥ 14 mils, neoprene rubber ≥ 14 mils, natural rubber ≥ 14 mils, polyethylene, polyvinyl chloride (PVC) ≥ 14 mils, or viton ≥ 14 mils
- Chemical-resistant footwear plus socks
- Protective eyewear (goggles or face shield)
- A minimum of a NIOSH-approved elastomeric half mask respirator with organic vapor (OV) cartridges and combination R or P filter OR a NIOSH-approved gas mask with OV canisters; OR a NIOSH-approved powered air purifying respirator with OV cartridges and combination HE filters

Handlers who mix packages containing less than 1 lb (0.45 kg) of this product must wear:

- Long-sleeved shirt and long pants
- Chemical-resistant gloves such as: barrier laminate, butyl rubber ≥ 14 mils, nitrile rubber ≥ 14 mils, neoprene rubber ≥ 14 mils, natural rubber ≥ 14 mils, polyethylene, polyvinyl chloride (PVC) ≥ 14 mils, or viton ≥ 14 mils
- Protective eyewear (goggles or face shield)

Applicators who apply or clean up bait must wear:

- Long-sleeved shirt and long pants
- Chemical-resistant gloves such as: barrier laminate, butyl rubber ≥ 14 mils, nitrile rubber ≥ 14 mils, neoprene rubber ≥ 14 mils, natural rubber ≥ 14 mils, polyethylene, polyvinyl chloride (PVC) ≥ 14 mils, or viton ≥ 14 mils
- Protective eyewear (goggles or face shield)

Any person who handles carcasses must wear:

- Waterproof gloves

USER SAFETY RECOMMENDATIONS

Users should:

- Follow the manufacturer's instructions for cleaning/maintaining PPE. If no such instructions are provided for washables, use detergent and hot water. Keep and wash PPE separately from other laundry.
- Wash hands before eating, drinking, chewing gum, using tobacco, or using the toilet.
- Remove clothing immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing.
- Remove PPE immediately after handling this product. As soon as possible, wash thoroughly and change into clean clothing.

ENVIRONMENTAL HAZARDS

- This product is very highly toxic to birds and aquatic invertebrates.
- **DO NOT** use in any manner that may endanger nontarget and protected bird species.
- Runoff may be hazardous to aquatic organisms in neighboring areas.
- **DO NOT** apply when runoff is likely to occur.
- **DO NOT** apply directly to water, or to areas where surface water is present, or to intertidal areas below the mean high water mark.
- **DO NOT** contaminate water by the cleaning of equipment or disposal of waste.

ENDANGERED SPECIES CONSIDERATIONS

- Before undertaking any control operations with the product, consult with local, State, and Federal Wildlife authorities to ensure the use of this product presents no hazard to any Threatened or Endangered Species.
- **DO NOT** apply in areas where the product may be consumed by Threatened or Endangered Species.

DIRECTIONS FOR USE

It is a violation of Federal law to use this product in a manner inconsistent with its labeling.

READ THIS LABEL: Read the entire label. This product must be used strictly in accordance with this label's precautionary statements and use directions, as well as with all applicable State and Federal laws and regulations.

Before using this product, contact the U.S. Fish and Wildlife Service and the applicable State wildlife agency and obtain all kill or collecting permits, if applicable. Use only for the sites, pests, and application methods described on this label.

PRODUCT INFORMATION: This product contains an avicide for control of target bird species (see list of allowed target species and allowed use sites in Table 1).

USE RESTRICTIONS

- **DO NOT** apply toxic baits within 50 feet (15.2 m) of permanent manmade or natural bodies of water.
- **DO NOT** apply toxic baits made from this product by air.
- **DO NOT** store toxic baits in locations accessible to children, pets, domestic animals, or nontarget wildlife.
- Prior to application, and during the time between the conclusion of application and the disposal of unconsumed toxic baits, **DO NOT** temporarily place toxic baits in locations accessible to children, pets, domestic animals, or nontarget wildlife. Follow the directions in **ENTRY RESTRICTIONS** to avoid exposure to children, pets, or domestic animals during application. Follow the directions in **PRETREATMENT OBSERVATIONS** to mitigate exposure to nontarget wildlife during application.
- **DO NOT** apply toxic baits in a way that will contact workers or other persons.
- **DO NOT** use toxic baits as food or feed.
- **DO NOT** apply toxic baits made from this product in any way that could contaminate human food or animal feed.
- Before toxic baits made from this product are applied, sites that are to be treated **must be observed** for evidence of nontarget activity and **must be prebaited** (see specific instructions for these activities under **PREBAITING**).
- **DO NOT** apply toxic baits in locations where nontoxic prebait has not been accepted well by target species or where nontarget wildlife have been observed to feed on prebait.
- **DO NOT** apply in areas where toxic baits may be consumed by Threatened or Endangered Species.
- **For broadcast applications: DO NOT exceed a maximum single application rate of 0.1 lbs of active ingredient (DRC-1339) per acre (0.11 kg DRC-1339 per hectare) or a maximum yearly application rate of 0.5 lb of DRC-1339 per acre (0.56 kg of DRC-1339 per hectare).**
  - See **BAIT PREPARATION** for bait-specific mixing directions, the percent (%) DRC-1339 in undiluted toxic bait, and bait dilution requirements.
  - The maximum broadcast application rates of diluted toxic bait can be calculated as follows:

    Maximum lbs/acre per application = (0.1 × D)/C

    Maximum lbs/acre per year = (0.5 × D)/C

    where:

    D = dilution factor (e.g., D = 5 for bait dilutions of 1:5, D = 1 for undiluted toxic bait)

    C = proportion of DRC-1339 in undiluted toxic bait (i.e., equal to (% DRC-1339 in undiluted toxic bait)/100)

DIRECTIONS FOR USE, continued

USE RESTRICTIONS, continued

TARGET SPECIES, USE SITES, AND ADDITIONAL USE RESTRICTIONS:

Toxic baits prepared with Compound DRC-1339 Concentrate – Bird Control may only be used to control the target bird species that are specifically listed (* Exceptions under Target Species) at the use sites listed for those target species in Table 1 below.

TABLE 1

Target Species	Use Sites	Additional Use Restrictions
Blackbirds: • Brewer's blackbird (*Euphagus cyanocephalus*) • Red-winged blackbird (*Agelaius phoeniceus*) • Yellow-headed blackbird (*Xanthocephalus xanthocephalus*) **Grackles:** • Common grackle (*Quiscalus quiscula*) • Boat-tailed grackle (*Quiscalus major*) • Great-tailed grackle (*Quiscalus mexicanus*) **Cowbirds:** • Brown-headed cowbird (*Molothrus ater*) **Starlings:** • European starling (*Sturnus vulgaris*) **Ravens:** • Common raven (*Corvus corax*) • Chihuahuan raven (*Corvus cryptoleucus*) **Crows:** • American crow (*Corvus brachyrhynchos*) • Fish crow (*Corvus ossifragus*) **Magpies:** • Black-billed magpie (*Pica hudsonia*) **Pigeons:** • Rock pigeon (*Columba livia*) **Collared doves:** • Eurasian collared dove (*Streptopelia decaocto*) * **EXCEPTIONS:** When in mixed flocks with one or more of the species listed above, the bronzed cowbird (*Molothrus aeneus*) and tri-colored blackbird (*Agelaius tricolor*) shall also be considered to be target species.	**Commercial Animal Operations:** • For the purposes of this label, commercial animal operations are defined as areas where cattle, swine, sheep, goats, poultry, game birds, or furbearers are confined primarily for the purpose of production for commercial markets. • Fenced pastures and other areas where one or a few animals are kept or tethered are not considered to be commercial animal operations.	• **DO NOT** place bait in pens that are occupied by livestock, poultry, game birds, or furbearers.
	Staging Areas: • For the purposes of this label, staging areas are defined as non-crop areas where target birds gather to feed, loaf, or roost. • Examples of staging areas are stubble fields, harvested dormant hay fields, open grassy or bare-ground noncrop areas, non-crop borders of crop areas, roads, roadsides, paved or concrete surfaces, secured parking areas, rooftops, power utilities, airports, dumps, landfills, and other industrial and commercial structures or sites.	• **DO NOT** graze animals on treated areas for 365 days following the last toxic bait application. • **DO NOT** apply toxic baits in any way that could contaminate food or feed crops, or that would allow bait to be consumed by livestock. • **DO NOT** apply toxic baits to orchards. • **Rotational Crop (Plantback) Restrictions:** After the last application of toxic bait, the plantback intervals are: rice, wheat, corn, and barley (15 days); sunflower and soybeans (30 days); and other crops (365 days).
Gulls: • Herring gull (*Larus argentatus*) • Great black-backed gull (*Larus marinus*) • Ring-billed gull (*Larus delawarensis*) • Laughing gull* (*Larus atricilla*) • Western gull (*Larus occidentalis*) • California gull (*Larus californicus*) *** DO NOT** use toxic baits made from this product to control laughing gulls in areas where this species is protected.	**Gull Colonies:** • During the breeding season, target gull species may be controlled in coastal or inland gull colonies that are: (1) likely predating on nesting colonies of terns, puffins, or other colonially nesting birds that are to be protected; or (2) close to areas where target gulls damage property or crops. **Gull Feeding or Loafing Sites:** • Throughout the year, target gull species may be controlled at gull feeding or loafing sites located at airports, industrial sites, dumps or landfills, or other non-crop areas IF the target gulls pose immediate threats to Threatened or Endangered Species or pose immediate human health or safety hazards that cannot readily be resolved by other means.	• **DO NOT** apply toxic baits by use of any mechanical equipment designed to broadcast baits or other pesticides.

ENTRY RESTRICTIONS

Keep pets and livestock, and persons other than authorized handlers away from the toxic bait at all times, and exclude all unauthorized persons, pets, and livestock from application sites during **PREBAITING**, **APPLICATION DIRECTIONS**, and **POSTTREATMENT CLEAN-UP**.

DIRECTIONS FOR USE, continued

PRETREATMENT OBSERVATIONS

Prior to application, the applicator or land manager must carefully observe and document the habits of target birds to (1) determine their relative numbers, (2) locate preferred feeding sites that can be baited in accordance with this label, (3) determine the optimum time of day for applying bait, and (4) evaluate the potential for hazards of the application to nontarget and protected species.

SELECTING BAIT MATERIALS

Use only the bait materials allowed for the target species in Table 2 below (allowed bait materials are marked with a "+").

If you are uncertain as to which bait material to select, expose the target population to small amounts of two or more of the nontoxic bait materials to determine a preferred bait material (see also **PREBAITING** below).

TABLE 2

	Target Species (See listed species in Table 1)									
Bait Material	Blackbirds	Grackles	Cowbirds	Starlings	Ravens	Crows	Magpies	Pigeons	Collared doves	Gulls
Barley (whole or steam-rolled)	+	+	+	+						
Wheat (whole or steam-rolled)	+	+	+	+						
Oats (whole or steam-rolled)	+	+	+	+						
Milo (whole or steam-rolled)	+	+	+	+						
Millet (whole)	+	+	+	+						
Distiller's grain	+	+	+	+						
Poultry scratch	+	+	+	+						
Corn (cracked or steam-rolled)	+	+	+	+				+	+	
Corn (whole)					+	+	+	+	+	
Unpopped popcorn								+	+	
Sunflower seeds (whole; unhulled or hulled)	+	+	+	+						
Dried peas (whole or cracked)								+	+	
Dried lentils								+	+	
Brown rice	+	+	+	+						
Raisins (whole)	+	+	+	+						
Dry dog food	+	+	+	+	+	+	+			
Dry cat food	+	+	+	+	+	+	+			
Poultry pellets	+	+	+	+	+	+	+	+	+	
Livestock pellets	+	+	+	+	+	+	+	+	+	
Fat nuggets	+	+	+	+	+	+	+	+	+	
High energy nuggets	+	+	+	+	+	+	+	+	+	
Culled French fries	+	+	+	+	+	+	+			
Waste potatoes	+	+	+	+	+	+	+			
Croutons					+	+	+			
Small bread cubes					+	+	+			
Large bread cubes					+	+	+			+

PREBAITING

Follow all prebaiting instructions listed for the use site in Table 3 below.

TABLE 3

Use Site	**Prebaiting Instructions**
Commercial animal operations **Staging areas**	• Prebait with nontoxic bait material of the same type to be used for toxic baiting. • Apply the prebait at the locations that are to be used for toxic baiting using the same application method that is to be used for toxic baiting (see **APPLICATION DIRECTIONS**). • Expose the prebait for 3-7 days or until the prebait is generally well accepted. • Change prebaiting locations and nontoxic bait material if necessary to achieve good acceptance by target species or if nontarget species have been observed eating the prebait. • **DO NOT** apply toxic bait at sites where the prebait has not been well accepted by target species or where nontarget species have been observed eating the prebait.
Gull colonies **Gull feeding or loafing sites**	• All potential use sites must be prebaited with nontoxic large bread cubes until the prebait is generally well accepted. • The number of nontoxic large bread cubes applied must not exceed five times the number of target gulls that are to be controlled at that location. • **DO NOT** apply toxic bait unless the target gulls consume at least 75% of the prebait in a 12-hour period and nontarget species are not observed feeding on the prebait. • Haze away Threatened or Endangered and nontarget species that might consume baits. Remove baits if such nontarget species continue to approach them.

BAIT PREPARATION

Baits made with Compound DRC-1339 Concentrate – Bird Control must be prepared as specified in Table 4.

NOTE: During bait preparation, wear all PPE as listed under **PERSONAL PROTECTIVE EQUIPMENT**.
NOTE: For most baits prepared from this product, it is important to dilute the toxic bait further with an additional amount of the same nontoxic bait material. Diluting reduces the possibility of a target bird consuming more than one lethal dose, reduces the risk to nontarget species, and may facilitate the birds' transition from consumption of the nontoxic bait material (i.e., prebait) to consumption of the toxic bait. Dilution requirements can be found under Bait Mixing Instructions in Table 4. Dilutions are notated as B:T, defined as parts toxic bait (B) per total parts (T = parts toxic bait + parts nontoxic bait material).

Place toxic bait into a container marked "**POISON**." Toxic bait that has been exposed to sunlight or heat in excess of 110 °F (43 °C) may discolor. Immediately use toxic bait that has been exposed to sunlight or heat in excess of 110 °F (43 °C) following preparation, or dispose of as directed under **STORAGE AND DISPOSAL**. Use toxic bait within the shelf life time period shown in Table 4, or dispose of as directed under **STORAGE AND DISPOSAL**.

TABLE 4

Bait Material	Bait Mixing Instructions	% DRC-1339 in Undiluted Toxic Bait	Shelf Life
Barley (whole or steam-rolled) **Wheat** (whole or steam-rolled) **Oats** (whole or steam-rolled) **Milo** (whole or steam-rolled) **Millet** (whole) **Distiller's grain** **Poultry scratch** **Corn** (cracked or steam-rolled)	1. Screen bait material to remove small particles and dust. 2. Dissolve 3.2 oz (92 g) of Compound DRC-1339 Concentrate in 13.5-20.3 fl oz (400-600 ml) of warm potable water at 110 °F (43 °C). 3. Binding agents such as lecithin oils, latexes, or polyvinyl acetates, or corn starch may be used on grain baits to enhance retention and reduce losses due to moisture. Add up to 1 fl oz (30 ml) of a binding agent, if needed. 4. For cracked corn only: instead of binding agent, add up to 3.4 fl oz (100 ml) of distiller's syrup, if needed. 5. Pour the solution or cornstarch mixture over 10 lbs (4.5 kg) of bait material, and mix or tumble slowly until mixture appears evenly distributed. 6. Air dry at ambient temperature if necessary. 7. **Dilution requirement:** Dilute toxic bait 1:10 or more with the same nontoxic bait material.	2.0%	Use toxic bait within 7 days
Corn (whole) **Unpopped popcorn** **Sunflower seeds** (whole; unhulled or hulled) **Dried peas** (whole or cracked) **Dried lentils**	1. Screen bait material to remove small particles and dust. 2. Dissolve 1.6 oz (46 g) of Compound DRC-1339 Concentrate in 13.5-20.3 fl oz (400-600 ml) of warm potable water at 110 °F (43 °C), **OR** thoroughly mix 1.6 oz (46 g) of this product with 1.3 oz (36 g) of corn starch. 3. Binding agents such as lecithin oils, latexes, or polyvinyl acetates, or corn starch may be used on grain baits to enhance retention and reduce losses due to moisture. Add up to 1 fl oz (30 ml) of a binding agent, if needed. 4. Pour the solution or cornstarch mixture over 10 lbs (4.5 kg) of bait material, and mix or tumble slowly until mixture appears evenly distributed. 5. Air dry at ambient temperature if necessary. 6. **Dilution requirements:** For commercial animal operations: dilute toxic bait 1:5 or more with the same nontoxic bait material. For staging areas: dilute toxic bait 1:10 or more with the same nontoxic bait material.	1.0%	Use toxic bait within 7 days
Brown rice	1. Screen bait material to remove small particles and dust. 2. Dissolve 3.2 oz (92 g) of Compound DRC-1339 Concentrate in 0.3 fl oz (10 ml) edible oil warmed to 110 °F (43 °C). 3. Add 1 fl oz (30 ml) of Alcolec-S. 4. Pour the solution over 10 lbs (4.5 kg) of brown rice and mix or tumble slowly until mixture appears evenly distributed. 5. Air dry at ambient temperature if necessary. 6. **Dilution requirement:** Dilute toxic bait 1:25 or more with the same nontoxic bait material.	2.0%	Use diluted toxic bait within 7 days
Raisins (whole)	1. Dissolve 0.3 oz (9.2 g) of Compound DRC-1339 Concentrate in 4.1 fl oz (120 ml) of warm potable water at 110 °F (43 °C). 2. Pour the solution over 10 lbs (4.5 kg) of raisins and mix or tumble slowly until mixture appears evenly distributed. 3. Air dry at ambient temperature if necessary. 4. **Dilution requirements:** For commercial animal operations: dilute toxic bait 1:2 or more with the same nontoxic bait material. For staging areas: dilute toxic bait 1:4 or more with the same nontoxic bait material.	0.2%	Use toxic bait within 24 hours

DIRECTIONS FOR USE, continued

BAIT PREPARATION, continued

TABLE 4, continued

Bait Material	Bait Mixing Instructions	% DRC-1339 in Undiluted Toxic Bait	Shelf Life
Dry dog food **Dry cat food**	1. Screen bait material to remove small particles and dust. 2. Dissolve 1.6 oz (46 g) of Compound DRC-1339 Concentrate in 9.5-11.3 fl oz (280-333 ml) of edible oil and 3 fl oz (85 ml) of Alcolec-S (lecithin) warmed to 110 °F (43 °C). 3. Pour the solution over 10 lbs (4.5 kg) of bait material and mix or tumble slowly until mixture appears evenly distributed. 4. Air dry at ambient temperature if necessary. 5. **Dilution requirements:** For commercial animal operations: dilute toxic bait 1:5 or more with the same nontoxic bait material. For staging areas: dilute toxic bait 1:10 or more with the same nontoxic bait material.	1.0%	Use toxic bait within 7 days
Poultry pellets **Livestock pellets** **Fat nuggets** **High energy nuggets**	**Standard Method:** 1. Thoroughly dissolve 1.6 oz (46 g) of Compound DRC-1339 Concentrate in 13.5-20.3 fl oz (400-600 ml) of warm potable water at 110 °F (43 °C), **OR** mix 1.6 oz (46 g) of this product with 13.5-20.3 fl oz (400-600 ml) edible oil and 3 fl oz (85 g) of Alcolec-S (lecithin) warmed to 110 °F (43 °C), **OR** thoroughly mix 1.6 oz (46 g) of this product with 1.3 oz (36 g) of corn starch. 2. Pour the solution or corn starch mixture over 10 lbs (4.5 kg) of bait material feed and mix or tumble slowly until mixture appears evenly distributed. 3. Air dry at ambient temperature if necessary. 4. **Dilution requirements:** For commercial animal operations: dilute toxic bait 1:5 or more with the same nontoxic bait material. For staging areas: dilute toxic bait 1:10 or more with the same nontoxic bait material.	1.0%	Use toxic bait within 7 days
	Microwave Method (fat nuggets and high energy nuggets only): 1. Heat 10 lbs (4.54 kg) of fat nuggets or high energy nuggets in a microwave for 2 minutes. 2. Sprinkle 1.6 oz (46 g) of Compound DRC-1339 Concentrate into warmed nuggets and tumble slowly until mixture appears evenly distributed. 3. Allow bait to cool to ambient temperature. 4. **Dilution requirements:** For commercial animal operations: dilute toxic bait 1:5 or more with the same nontoxic bait material. For staging areas: dilute toxic bait 1:10 or more with the same nontoxic bait material.		
Culled French fries **Waste potatoes**	**Wet Formulation:** 1. Dissolve 1.6 oz (46 g) of Compound DRC-1339 Concentrate in 13.5-20.3 fl oz (400-600 ml) of warm potable water at 110 °F (43 °C). 2. Pour the solution over 50 lbs (23 kg) of bait material and mix or tumble slowly until mixture appears evenly distributed. 3. Air dry at ambient temperature if necessary. 4. **Dilution requirement:** Dilution of toxic bait is not required. May dilute toxic bait up to 1:4 with the same nontoxic bait material.	0.2% (approx.)	Use toxic bait within 24 hours
	Dry Formulation: 1. Evenly blend 1 oz (30 g) of Compound DRC-1339 Concentrate with 1 oz (30 g) of corn starch in a small container. 2. Spread 20 lb (9.1 kg) of bait material evenly to about 1 inch (2.54 cm) depth on a plastic or vinyl sheet. 3. Using a small mesh sieve such as crank sifter or strainer with 225-576 holes/in^2 (35-89 holes/cm^2), gently transfer the Compound DRC-1339 Concentrate/corn starch mixture into the sieve while holding the device over the bait material. Shake the formulation equally over the bait material. Using a yard rake or other suitable manipulation device, roll the material on the plastic sheet to ensure blending and equal distribution. 4. **Dilution requirement:** Dilution of toxic bait is not required. May dilute toxic bait up to 1:4 with the same nontoxic bait material.		Use toxic bait within 24 hours

BAIT PREPARATION, continued

TABLE 4, continued

Bait Material	Bait Mixing Instructions	% DRC-1339 in Undiluted Toxic Bait	Shelf Life
Croutons **Small bread cubes** (bread slices cut into <1 inch cubes)	**Wet Formulation:** 1. Thoroughly mix 1 oz (30 g) of Compound DRC-1339 Concentrate with 2 gal (7.6 L) of unheated vegetable oil. 2. Using a strainer or colander, dip 10 lbs (4.5 kg) of croutons into the Compound DRC-1339 Concentrate/oil mixture. 3. Place dipped pieces on screen to drain and dry at ambient air temperature. 4. **Dilution requirement:** Dilution of toxic bait is not required. May dilute toxic bait up to 1:4 with the same nontoxic bait material.	0.7% (approx.)	Use toxic bait within 12 hours
	Dry Formulation: 1. Evenly blend 1 oz (30 g) of Compound DRC-1339 Concentrate with 1 oz (30 g) of corn starch in a small container. 2. Screen 20 lb (9.1 kg) of croutons using a 0.25-inch (6.35 mm) mesh screen to remove crumbs. 3. Spread bait material evenly to about 1 inch (2.54 cm) depth on a plastic or vinyl sheet. 4. Using a small mesh sieve such as crank sifter or strainer with 225-576 holes/in^2 (35-89 holes/cm^2), gently transfer the Compound DRC-1339 Concentrate/corn starch mixture into the sieve while holding the device over the bait material. Shake the formulation equally over the bait material. Using a yard rake or other suitable manipulation device, roll the material on the plastic sheet to ensure blending and equal distribution. 5. **Dilution requirement:** Dilution of toxic bait is not required. May dilute toxic bait up to 1:4 with the same nontoxic bait material.	0.2% (approx.)	
Large bread cubes (bread slices cut into 1-inch to 1.5-inch cubes)	1. Blend 0.2 oz (6 g) of Compound DRC-1339 Concentrate into 1 lb (0.45 kg) of melted stick margarine, or soft-spread margarine warmed to room temperature. 2. Spread 0.5 oz (14 g) of the blended mixture on a slice of standard sandwich bread of similar size and weight, and cover with another slice of bread of similar size and weight. The blended mixture should produce about 32 bread sandwiches. 3. Immediately cut each bread sandwich into 9 equally-sized cubes for about 288 cubes in total. 4. **Dilution requirement:** Dilution of toxic bait is not required.	Not determined	Use toxic bait within 12 hours

DIRECTIONS FOR USE, continued

APPLICATION DIRECTIONS

Use only the bait application methods listed for the use site in Table 5 below.

NOTE: During toxic bait application, wear all PPE as listed under **PERSONAL PROTECTIVE EQUIPMENT**. Use a scoop or other appropriate utensil when manually applying or loading toxic bait into application equipment. **NOTE:** In the State of California, scoops must be long-handled.

TABLE 5

Use Site	Bait Application Methods
Commercial animal operations	**Retrievable Feeding Stations, Bait Stations, or Trays:** • **On the perimeter of the lot OUTSIDE of the pen areas, in alleyways, or in unoccupied pens**, place bait in one or more retrievable feeding stations, bait stations, or trays before target birds arrive in the morning. When practical, use stations/trays that minimize consumption or access by nontarget species. • **Unoccupied pens** can be baited ONLY by using retrievable feeding stations, bait stations, or trays or other physical barriers that prevent bait from contacting the soil and facilitate cleanup of unconsumed toxic bait. • When practical, observe bait throughout the day.
	Manual Baiting: • **On the perimeter of the lot OUTSIDE of the pen areas and/or in alleyways**, using a scoop or other appropriate utensil, manually scatter bait thinly and uniformly over dry or frozen areas before target birds arrive in the morning. • When practical, observe bait throughout the day.
	Mechanical Baiting: • **On the perimeter of the lot OUTSIDE of the pen areas and/or in alleyways**, place bait into hopper of truck-mounted or trailer-type feeder and apply with mechanical applicator in a steady trail with a target band width of up to 1 ft (0.3 m) over dry or frozen areas before target birds arrive in the morning. • When practical, observe bait throughout the day.
Staging areas	**Retrievable Feeding Stations, Bait Stations, or Trays:** • Place bait in one or more retrievable feeding stations, bait stations, or trays at locations within staging areas that appear most likely to selectively attract target species. When practical, use stations/trays that minimize consumption or access by nontarget species. • When practical, observe bait throughout the day. • Replace toxic bait if ≥75% of the applied bait has been consumed, if more than 0.4 inches (1 cm) of precipitation has fallen, or after 7 days of exposure to birds to toxic bait. • Do not replenish toxic bait if target species are no longer present or are no longer feeding on bait.
	Hand Broadcast: • Use a scoop or other utensil to hand broadcast at a rate suitable for the level of target bird pressure, but not exceeding the maximum application rate limits specified under **USE RESTRICTIONS**. • Apply bait to (alternate) swaths 20-50 feet (6.1-15.2 m) wide that are spaced at least one swath width apart. • When practical, observe bait throughout the day. • Re-treat the same swath or bait previously untreated swaths if ≥75% of the applied bait has been consumed, if more than 0.4 inches (1 cm) of precipitation has fallen, or after 7 days of exposure to birds to toxic bait. • Do not replenish toxic bait if target species are no longer present or are no longer feeding on bait.
	Mechanical Broadcast: • Mechanical broadcasting may only be used for the following bait materials: barley, wheat, oats, milo, corn, brown rice, poultry pellets, or livestock pellets. • Broadcast bait using ground-based equipment calibrated so as not to exceed the maximum application rate limits specified under **USE RESTRICTIONS**. Do not apply bait by use of aircraft. • Apply bait to (alternate) swaths 20-50 feet (6.1-15.2 m) wide that are spaced at least one swath width (20-50 feet or 6.1-15.2 m) apart. • When practical, observe bait throughout the day. • Re-treat the same swaths or treat previously untreated swaths if ≥75% of the applied bait has been consumed, if more than 0.4 inches (1 cm) of precipitation has fallen, or after 7 days of exposure to birds to toxic bait. • Do not replenish toxic bait if target species are no longer present or are no longer feeding on bait.
Gull colonies **Gull feeding or loafing sites**	**Manual Baiting:** • Use a scoop or other utensil to manually scatter or place toxic large bread cubes in the same areas where nontoxic large bread cubes were accepted by gulls during the prebaiting period. • No broadcast applications may be made at nesting colonies or sites when nontarget birds are present. • Applications at gull colonies when nontarget nesting birds are present must be made by placing baits in or near gulls' nests. • The number of toxic large bread cubes used in each application may not exceed 5 times the total number of gulls remaining to be controlled at that location. • Haze away Threatened or Endangered and nontarget species that might consume baits. Remove baits if such nontarget species continue to approach them. • When practical, observe baits throughout the day. • Do not apply additional toxic bait unless gulls consume ≥75% of the applied bait within a 12-hour period.

DIRECTIONS FOR USE, continued

POSTTREATMENT CLEAN-UP

NOTE: During clean-up, wear all PPE as listed under **PERSONAL PROTECTIVE EQUIPMENT**. To further reduce the potential for exposure, use appropriate implements such as scoops or other tools to collect carcasses or uneaten toxic bait.

BAIT CLEAN-UP:

The applicator must remove all unconsumed, regurgitated, or spilled toxic bait, and as much of the broadcast toxic bait as possible at the conclusion of the treatment period.

For broadcast applications made to hard surfaces such as roads, airport tarmacs, rooftops, industrial and commercial structures, and secured parking areas, use shovels, scoops or other tools to collect uneaten toxic bait.

Dispose of collected, unused, and outdated toxic bait according to instructions under **STORAGE AND DISPOSAL** below.

For broadcast applications made to areas such as stubble fields, harvested dormant hay fields, open grassy or bare-ground noncrop areas and roadsides, bury uneaten toxic bait via mechanical (e.g., discing under) methods or to a minimum depth of 2 inches (5.08 cm) if manual (e.g., shoveling under) methods are used, as appropriate.

CARCASS CLEAN-UP:

Follow all carcass clean-up instructions listed for the use site in Table 6 below.

TABLE 6

Use Site	Carcass Clean-up Instructions
Commercial animal operations **Staging areas**	• Within 24 hours after toxic bait application, the applicator or land manager must search treated areas and immediate surrounding areas (including animal pens at commercial animal operations), and remove all dying birds and carcasses. • Dispose of all carcasses in accordance with applicable Federal, State, and local laws and regulations. • Repeat carcass searches at 1-2 day intervals as long as toxic bait is exposed and likely to remain toxic.
Gull colonies **Gull feeding or loafing sites**	• Within 72 hours after each toxic bait application, the applicator or land manager will search treated areas and other locations frequented by target gull populations, and remove all dying birds and carcasses found. • Dispose of all carcasses in accordance with applicable Federal, State, and local laws and regulations. • Carcass collections should not be made in areas where human entry would adversely affect nontarget species and their breeding efforts, unless the carcasses themselves also pose risks to nontarget species.

STORAGE AND DISPOSAL

Do not contaminate water, food, or feed by storage or disposal.

PESTICIDE STORAGE: Store only in original container, in a dry place inaccessible to children, pets, and domestic animals

PESTICIDE DISPOSAL: Pesticide wastes are acutely hazardous. Improper disposal of excess pesticide, spilled toxic bait, or rinsate is a violation of Federal law. If these wastes cannot be disposed of by use according to label instructions, contact your State Pesticide or Environmental Control Agency, or the Hazardous Waste representative at the nearest EPA Regional Office for guidance.

CONTAINER HANDLING: Nonrefillable container. Do not reuse or refill this container. Offer for recycling, if available. Completely empty bags by shaking and tapping sides and bottom to loosen clinging particles. Empty residue into application equipment. If bags are not to be recycled, dispose of bags in a sanitary landfill if allowed by State and local authorities or by incineration.

Container Label

RESTRICTED USE PESTICIDE
Compound DRC-1339 Concentrate - Bird Control
KEEP OUT OF REACH OF CHILDREN
Active Ingredient: DRC-1339 - 97.0%
Other Ingredients: 3.0%
See full label for FIRST AID & DIRECTIONS FOR USE
EPA Reg. No. 56228-63; EPA Est. 56228-ID-1
Net Contents: _____; Batch Code: _____

DANGER

Dimensions: 1 inch by 2.625 inches

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, DC 20460

OFFICE OF CHEMICAL SAFETY
AND POLLUTION PREVENTION

April 22, 2020

David A. Bergsten
Assistant Chief
Environmental and Risk Analysis Services
Policy and Program Development
Animal and Plant Health Inspection Service
U.S. Department of Agriculture
4700 River Road, Unit 149
Riverdale, MD 20737-1237

Subject: Notification per PRN 98-10 – Correction of mathematical errors on metric bait rates
Product Name: Compound DRC-1339 Concentrate- Livestock, Nest & Fodder Depredations
EPA Registration Number: 56228-29
Application Date: 02/27/2020
Decision Number: 561909

Dear Mr. Bergsten:

The Agency is in receipt of your Application for Pesticide Notification under Pesticide Registration Notice (PRN) 98-10 for the above referenced product. The Registration Division (RD) has conducted a review of this request for its applicability under PRN 98-10 and finds that the action requested falls within the scope of PRN 98-10.

The label submitted with the application has been stamped “Notification” and will be placed in our records.

Should you wish to add/retain a reference to the company’s website on your label, then please be aware that the website becomes labeling under the Federal Insecticide Fungicide and Rodenticide Act and is subject to review by the Agency. If the website is false or misleading, the product would be misbranded and unlawful to sell or distribute under FIFRA section 12(a)(1)(E). 40 CFR 156.10(a)(5) list examples of statements EPA may consider false or misleading. In addition, regardless of whether a website is referenced on your product’s label, claims made on the website may not substantially differ from those claims approved through the registration process. Therefore, should the Agency find or if it is brought to our attention that a website contains false or misleading statements or claims substantially differing from the EPA approved registration, the website will be referred to the EPA’s Office of Enforcement and Compliance.

If you have any questions, you may contact please contact Paul Di Salvo at 703-347-0322 or by email at disalvo.paul@epa.gov.

Sincerely,

Paul Di Salvo for

Gene Benbow, Product Manager 07
Invertebrate and Vertebrate Branch 3
Registration Division (7505P)
Office of Pesticide Programs

RESTRICTED USE PESTICIDE

DUE TO HIGH ACUTE INHALATION TOXICITY AND EYE AND SKIN CORROSIVENESS TO HUMANS;
HIGH ACUTE TOXICITY TO NONTARGET BIRDS AND AQUATIC INVERTEBRATES;
AND THE NEED FOR HIGHLY SPECIALIZED APPLICATOR TRAINING.
For retail sale to and use only by USDA APHIS Certified Applicators trained in bird control or by persons under their direct supervision.

COMPOUND DRC-1339 CONCENTRATE – LIVESTOCK, NEST & FODDER DEPREDATIONS

For control of crows, ravens, and magpies that prey on newborn livestock, that prey on eggs or the young of Federally-designated Threatened or Endangered Species or other species designated to be in need of special protection, or that damage and feed on the contents of silage/fodder bags.

ACTIVE INGREDIENT:
DRC-1339; 3-chloro-p-toluidine hydrochloride: 97.0%
OTHER INGREDIENTS: 3.0%

TOTAL: 100.0%

KEEP OUT OF REACH OF CHILDREN

DANGER-PELIGRO
POISON

NOTIFICATION
56228-29
The applicant has certified that no changes, other than those reported to the Agency have been made to the labeling. The Agency acknowledges this notification by letter dated:
04/22/2020

FIRST AID

IF INHALED:
- Move person to fresh air.
- If person is not breathing, call 911 or an ambulance; then give artificial respiration, preferably mouth-to-mouth, if possible.
- Call a poison control center or doctor immediately for treatment advice.

IF IN EYES:
- Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye.
- Call a poison control center or doctor immediately for treatment advice.

IF SWALLOWED:
- Call a poison control center or doctor immediately for treatment advice.
- Have person sip a glass of water if able to swallow.
- Do not induce vomiting unless told to do so by a poison control center or doctor.
- Do not give anything by mouth to an unconscious person.

IF ON SKIN OR CLOTHING:
- Take off contaminated clothing.
- Rinse skin immediately with plenty of soap and water for 15-20 minutes.
- Call a poison control center or doctor immediately for treatment advice.

Have the product container or label with you when calling a poison control center or doctor, or going for treatment. If you need immediate medical attention, call the Poison Control Center at 1-800-222-1222 or a doctor. For non-emergency information concerning this product, call the National Pesticide Information Center at 1-800-858-7378.

NOTE TO PHYSICIAN AND VETERINARIAN: Probable mucosal damage may contraindicate the use of gastric lavage. See **PRECAUTIONARY STATEMENTS** for additional information.

TREATMENT FOR PET POISONING: If pet eats bait, call a veterinarian at once.

United States Department of Agriculture
Animal and Plant Health Inspection Service
4700 River Road, Unit 149
Riverdale, MD 20737
EPA Est. 56228-ID-01

Net Contents: _____

Batch Code: _____

PRECAUTIONARY STATEMENTS

HAZARDS TO HUMANS AND DOMESTIC ANIMALS

DANGER

Fatal if inhaled. Corrosive. Causes irreversible eye damage and skin burns. May be fatal if swallowed. Harmful if absorbed through skin. Prolonged or frequently repeated skin contact may cause allergic reactions in some people. Do not get in eyes, on skin, or on clothing. Do not breathe dust.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Handlers who mix packages containing 1 lb (0.45 kg) or more of this product must wear:

- Coveralls over long-sleeved shirt and long pants
- Chemical-resistant gloves such as: barrier laminate, butyl rubber ≥ 14 mils, nitrile rubber ≥ 14 mils, neoprene rubber ≥ 14 mils, natural rubber ≥ 14 mils, polyethylene, polyvinyl chloride (PVC) ≥ 14 mils, or viton ≥ 14 mils
- Chemical-resistant footwear plus socks
- Protective eyewear (goggles or face shield)
- A minimum of a NIOSH-approved elastomeric half mask respirator with organic vapor (OV) cartridges and combination N, R, or P filter; OR a NIOSH-approved gas mask with OV canisters; OR a NIOSH-approved powered air purifying respirator with OV cartridges and combination HE filters

Handlers who mix packages containing less than 1 lb (0.45 kg) of this product must wear:

- Long-sleeved shirt and long pants
- Chemical-resistant gloves such as: barrier laminate, butyl rubber ≥ 14 mils, nitrile rubber ≥ 14 mils, neoprene rubber ≥ 14 mils, natural rubber ≥ 14 mils, polyethylene, polyvinyl chloride (PVC) ≥ 14 mils, or viton ≥ 14 mils
- Protective eyewear (goggles or face shield)

Applicators who apply or clean up bait must wear:

- Long-sleeved shirt and long pants
- Chemical-resistant gloves such as: barrier laminate, butyl rubber ≥ 14 mils, nitrile rubber ≥ 14 mils, neoprene rubber ≥ 14 mils, natural rubber ≥ 14 mils, polyethylene, polyvinyl chloride (PVC) ≥ 14 mils, or viton ≥ 14 mils
- Protective eyewear (goggles or face shield)

Any person who handles carcasses must wear:

- Waterproof gloves

USER SAFETY RECOMMENDATIONS

Users should:

- Follow the manufacturer's instructions for cleaning/maintaining PPE. If no such instructions are provided for washables, use detergent and hot water. Keep and wash PPE separately from other laundry.
- Wash hands before eating, drinking, chewing gum, using tobacco, or using the toilet.
- Remove clothing immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing.
- Remove PPE immediately after handling this product. As soon as possible, wash thoroughly and change into clean clothing.

ENVIRONMENTAL HAZARDS

- This product is very highly toxic to birds and aquatic invertebrates.
- **DO NOT** use in any manner that may endanger nontarget and protected bird species.
- Runoff may be hazardous to aquatic organisms in neighboring areas.
- **DO NOT** apply when runoff is likely to occur.
- **DO NOT** apply directly to water, or to areas where surface water is present, or to intertidal areas below the mean high water mark.
- **DO NOT** contaminate water by the cleaning of equipment or disposal of waste.

ENDANGERED SPECIES CONSIDERATIONS

- Before undertaking any control operations with the product, consult with local, State, and Federal Wildlife authorities to ensure the use of this product presents no hazard to any Threatened or Endangered Species.
- **DO NOT** apply toxic baits where there is a danger that Threatened or Endangered Species will consume baits unless special precautions are taken to limit such exposures.

DIRECTIONS FOR USE

It is a violation of Federal law to use this product in a manner inconsistent with its labeling.

READ THIS LABEL: Read the entire label. This product must be used strictly in accordance with this label's precautionary statements and use directions, as well as with all applicable State and Federal laws and regulations.

Before using this product, contact the U.S. Fish and Wildlife Service and the applicable State wildlife agency and obtain all kill or collecting permits, if applicable. Use only for the sites, pests, and application methods described on this label.

PRODUCT INFORMATION: This product contains an avicide for control of target bird species (see list of allowed target species and allowed use sites below).

USE RESTRICTIONS

- Baits made from Compound DRC-1339 - Livestock, Nest & Fodder Depredations may only be used to control the following species:
  - Common raven (*Corvus corax*);
  - Chihuahuan raven (*Corvus cryptoleucus*);
  - American crow (*Corvus brachyrhynchos*);
  - Fish crow (*Corvus ossifragus*); and
  - Black-billed magpie (*Pica hudsonia*).

- This product may be used to prepare egg or meat baits to control the target species listed above in the following use sites:
  - Rangeland and pastureland areas where ravens or crows prey upon newborn livestock;
  - Refuges or other areas where ravens or crows prey upon the eggs and/or young of Federally-designated Threatened or Endangered Species, or upon the eggs and young of other species which Federal or State wildlife agencies have determined to be in need of protection from nest predators due to documented declines in numbers and/or in nesting success; or
  - Within 25 feet (7.6 m) of silage/fodder bags that have been damaged or are likely to be damaged by crows, ravens, or black-billed magpies.

- Baits must be prepared and applied as specified on this label. **DO NOT** apply baits made from this product by air or by use of any mechanical equipment designed to broadcast baits or other pesticides. Users of this product must follow all limitations indicated on this label regarding the placement and monitoring of toxic baits.

- Before toxic baits made from this product are applied, sites that are to be treated **must be observed** for evidence of nontarget activity **and must be prebaited** (see specific instructions for these activities under **PREBAITING**).

- **DO NOT** apply toxic baits where there is a danger that Threatened or Endangered Species will consume toxic baits unless special precautions are taken to limit such exposures. Such precautions shall include observation of baited sites and use of hazing tactics to frighten away Threatened or Endangered Species that otherwise might feed upon toxic baits.

- **DO NOT** apply toxic baits within 50 feet (15.2 m) of permanent manmade or natural bodies of water, unless baited sites are under constant observation while baits are exposed.

- **DO NOT exceed a maximum single application rate of 5,200 meat baits/acre (~~2,104~~ 12,849 meat baits/hectare) or 1,000 egg baits/acre (~~405~~ 2,471 egg baits/hectare), or a maximum yearly application rate of 26,000 meat baits/acre (~~10,522~~ 64,246 meat baits/hectare) or 5,000 egg baits/acre (~~2,023~~ 12,355 egg baits/hectare).**

- **DO NOT** store toxic bait in locations accessible to children, pets, domestic animals, or nontarget wildlife.

- Prior to application, and during the time between the conclusion of application and the disposal of unconsumed bait, **DO NOT** temporarily place toxic bait in locations accessible to children, pets, domestic animals, or nontarget wildlife. Follow the directions in **ENTRY RESTRICTIONS** to avoid exposure to children, pets, or domestic animals during application. Follow the directions in **PRETREATMENT OBSERVATIONS** to mitigate exposure to nontarget wildlife during application.

- **DO NOT** apply toxic bait in a way that will contact workers or other persons.

- **DO NOT** use toxic baits as food or feed.

- **DO NOT** apply toxic baits made from this product in any way that could contaminate human food or animal feed.

DIRECTIONS FOR USE, continued

ENTRY RESTRICTIONS

Only protected applicators may be in the area during bait application. Keep pets and livestock, and persons other than authorized handlers away from the toxic bait at all times, and exclude all unauthorized persons, pets, and livestock from application sites during prebaiting, baiting, and posttreatment clean-up. For example, post signage near, in the vicinity of, or at main entrances or commonly used access points to prebaiting and baiting sites that warns persons not to pick up or handle any baits and to keep pets and livestock away from bait.

PRETREATMENT OBSERVATIONS

Prior to application, the applicator or land manager must carefully observe and document the habits of target birds to (1) determine their relative numbers, (2) locate preferred feeding sites that can be baited in accordance with this label, (3) determine the optimum time of day for applying bait, and (4) evaluate the potential for hazards of the application to nontarget and protected species.

PREBAITING

Prebaiting with nontoxic bait materials (or use of a draw station) is necessary to promote feeding by target species and to assess potential for exposure of nontarget species.

Apply the prebait at the locations that are to be used for toxic baiting using the same application method that is to be used for toxic baiting (see **APPLICATION DIRECTIONS**).

Observe baited areas (from blinds, if necessary) early in prebaiting period to determine whether nontarget species are approaching baits. Haze away Threatened or Endangered and nontarget species that might consume baits. Remove baits if such nontarget species continue to approach them.

BAIT PREPARATION

Toxic meat and egg baits must be prepared as specified in Table 1.

NOTE: During bait preparation, wear all PPE as listed under **PERSONAL PROTECTIVE EQUIPMENT**.
Place toxic bait into a container marked "**POISON**." Toxic bait that has been exposed to sunlight or heat in excess of 110 °F (43 °C) may discolor. Immediately use toxic bait that has been exposed to sunlight or heat in excess of 110 °F (43 °C) following preparation, or dispose of as directed under **STORAGE AND DISPOSAL**. Use toxic bait within the shelf life time period shown in Table 1, or dispose of as directed under **STORAGE AND DISPOSAL**.

TABLE 1

Bait Material	Bait Mixing Instructions	Amount of DRC-1339 in Toxic Bait	Shelf Life
Meat	1. Mix 0.027 oz (0.75 g) of Compound DRC-1339 Concentrate with 0.18 oz (5.0 g) of powdered sugar. 2. Pour or sprinkle concentrate-sugar mixture over 200 meat cubes that measure about 0.5 in (1.3 cm) on each side. 3. Mix or tumble bait slowly until all meat cubes appear to be evenly covered.	0.0001 oz (0.004 g) per meat cube	Store refrigerated; use toxic bait within 2 days
Hard-boiled Eggs (chicken, turkey, or duck)	1. Dissolve 0.07 oz (2 g) of Compound DRC-1339 Concentrate in 0.2 pint (100 ml) of warm potable water at 110 °F (43.3 °C) to make an approximately 2% solution; or dissolve 0.14 oz (4 g) of the product in 0.2 pint (100 ml) of warm potable water at 110 °F (43.3 °C) to make an approximately 4% solution; or in other proportions to produce a 2% or 4% solution. 2. Using an 18-gauge hypodermic needle or similarly-sized implement, make an entry hole in the end of each hard-boiled egg. 3. Using a syringe and a 20-gauge hypodermic needle, slowly inject 0.002 pints (1 ml) of the 2% solution (or 0.001 pints or 0.5 ml of the 4% solution) into the yolk of each egg. 4. Make only enough solution to treat the desired number of eggs. Mark toxic eggs with small skull and crossbones or the word "POISON."	0.0007 oz (0.02 g) per egg	Store refrigerated; use toxic bait within 7 days

APPLICATION DIRECTIONS

Use only the bait application methods listed for the use site in Table 2 below.

NOTE: During toxic bait application, wear all PPE as listed under **PERSONAL PROTECTIVE EQUIPMENT.** Use a scoop or other appropriate utensil when applying toxic bait. **NOTE:** In the State of California, scoops must be long-handled.

TABLE 2

Bait Type	Baiting Instructions
Meat baits	• Control of crows, magpies, and ravens with toxic meat baits prepared from this product is limited to the sites indicated above under **USE RESTRICTIONS**. • Place no more than 75 meat baits at each baited site. Place 5 to 10 baits in clusters over an area not to exceed 1,000 ft^2 (93 m^2) where control of ravens, magpies, and/or crows is to be affected. • **Draw stations** (fresh, unpoisoned animal carcasses) may be needed to attract ravens, magpies, and/or crows to the locations selected for bait exposure. If draw stations are used, place toxic meat baits on or within a few feet of the animal carcasses. • **WHILE TOXIC MEAT BAITS ARE EXPOSED, BAITED AREAS MUST BE OBSERVED CONTINUOUSLY FROM A DISTANCE OF NO MORE THAN 1,000 YARDS (914 m) TO DETECT APPROACHES BY THREATENED OR ENDANGERED SPECIES AND OTHER NONTARGET OR PROTECTED ANIMALS LIKELY TO EAT BAITS.** Because of wariness of target bird species, it may be necessary to observe baits from behind natural or specially-constructed blinds. Haze away Threatened or Endangered and nontarget species that might consume baits. Remove baits if such nontarget species continue to approach them. • Unconsumed toxic meat baits must be retrieved daily, at the conclusion of each observation period and no later than one hour after sunset.
Egg baits	• Control of crows, magpies, and ravens with toxic egg baits prepared from this product is limited to the sites indicated above under **USE RESTRICTIONS**. • Place all toxic egg baits to be used at one baited site within 25 ft (7.6 m) of the center of the site or within 25 ft (7.6 m) of any silage/fodder bags that are to be protected. Place 1-4 egg baits in each bait set, and do not use more than a total of 18 egg baits per baited site. • If a draw station (fresh, unpoisoned animal carcass) is used, all bait sets must be located at least 10 ft (3 m) from the carcass. • Wherever practical, bait sets should be made in “dummy” nests created by making small depressions in the ground. Dummy nests may be partially hidden by vegetation or other debris. • In other situations, egg baits may be placed on elevated wooden platforms 1 to 2 ft^2 (0.1 to 0.2 m^2) in area. Egg baits placed on platforms must be restrained by wire to prevent them from falling off platforms or being removed by birds. Apply 2-3 egg baits per platform. • **DO NOT USE MORE TOXIC EGG BAITS THAN ARE NEEDED FOR EFFECTIVE CONTROL, as ravens and crows tend to cache surplus food.** • Observe baited areas (from blinds) early in the baiting period to determine whether nontarget species are approaching egg baits. Haze away Threatened or Endangered and nontarget species that might consume baits. Remove baits if such nontarget species continue to approach them. • Rebait with additional toxic egg baits when more than 50% of the toxic egg baits offered have been removed by ravens, magpies, or crows. When replacing baits, take care not to frighten target birds actively removing or feeding upon eggs. • Retrieve unconsumed toxic egg baits within 7 days of exposure.

DIRECTIONS FOR USE, continued

POSTTREATMENT CLEAN-UP

NOTE: During clean-up, wear all PPE as listed under **PERSONAL PROTECTIVE EQUIPMENT**. To further reduce the potential for exposure, use appropriate implements such as scoops or other tools to collect carcasses or uneaten toxic bait.

BAIT CLEAN-UP:

The applicator must remove all unconsumed, regurgitated, or spilled toxic bait according to the directions for bait retrieval in Table 2.

Use shovels, scoops or other tools to collect uneaten toxic bait. If baits have broken down or are otherwise difficult to retrieve in their entirety, bury via manual methods (e.g., shoveling under) to a minimum depth of 2 inches (5.08 cm), as appropriate.

Dispose of collected, unused, and outdated toxic bait according to instructions under **STORAGE AND DISPOSAL**.

CARCASS CLEAN-UP:

Within 72 hours after each toxic bait application, the applicator or land manager will search treated areas and other locations frequented by target birds, and remove all dying birds and carcasses found.

Carcass collections should not be made in areas where human entry would adversely affect nontarget species and their breeding efforts, unless the carcasses themselves also pose risks to nontarget species.

Dispose of all carcasses in accordance with applicable Federal, State, and local laws and regulations.

STORAGE AND DISPOSAL

Do not contaminate water, food, or feed by storage or disposal.

PESTICIDE STORAGE: Store only in original container, in a dry place inaccessible to children, pets, and domestic animals

PESTICIDE DISPOSAL: Pesticide wastes are acutely hazardous. Improper disposal of excess pesticide, spilled toxic bait, or rinsate is a violation of Federal law. If these wastes cannot be disposed of by use according to label instructions, contact your State Pesticide or Environmental Control Agency, or the Hazardous Waste representative at the nearest EPA Regional Office for guidance.

CONTAINER HANDLING: Nonrefillable container. Do not reuse or refill this container. Offer for recycling, if available. Completely empty bags by shaking and tapping sides and bottom to loosen clinging particles. Empty residue into application equipment. If bags are not to be recycled, dispose of bags in a sanitary landfill if allowed by State and local authorities or by incineration.

Container Label

RESTRICTED USE PESTICIDE
Compound DRC-1339 Concentrate – Livestock, Nest & Fodder Depredations
KEEP OUT OF REACH OF CHILDREN
Active Ingredient: DRC-1339 - 97.0%
Other Ingredients: 3.0%
See full label for FIRST AID & DIRECTIONS FOR USE
EPA Reg. No. 56228-29; EPA Est. 56228-ID-1
Net Contents: _____; Batch Code: _____

DANGER

Dimensions: 1 inch by 2.625 inches

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