U.S. DEPARTMENT of ENERGY

NNSA National Nuclear Security Administration

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AERIAL HERBICIDE APPLICATION FOR WILDLAND FIRE FUELS REDUCTION AT THE NEVADA NATIONAL SECURITY SITE

Environmental Assessment and Finding of No Significant Impact

DOE/EA-2303

OCTOBER 2025

Aerial Herbicide Application for Wildland Fire Fuels Reduction at the Nevada National Security Site

Environmental Assessment

October 2025

U.S. Department of Energy
National Nuclear Security Administration
Nevada Field Office
Las Vegas, NV

It is certified by *Betty L. Huck, National Nuclear Security Administration Nevada Field Office Manager,* with publication of this final document, that the National Nuclear Security Administration considered factors mandated by the National Environmental Policy Act, represented a good-faith effort to prioritize documentation of the most important considerations within the Congressionally mandated page limits and timeframe requirements, reflects National Nuclear Security Administration's expert judgement, and any information left out was not substantive enough to meaningfully inform decision-making, in National Nuclear Security Administration's opinion.

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LIST OF ACRONYMS

a.i. – Active Ingredients

BLM – Bureau of Land Management

DOE – U.S. Department of Energy

EA – Environmental Assessment

EPA – U.S. Environmental Protection Agency

ha – Hectare(s)

HHERA – Human Health and Ecological Risk Assessment

HQ – Hazard Quotient

MSTS – Mission Support and Test Services, LLC

NEPA – National Environmental Policy Act

NHPA – National Historic Preservation Act

NNSA/NFO – National Nuclear Security Administration Nevada Field Office

NNSS – Nevada National Security Site

oz/ac - Ounces per Acre

PEIS – Programmatic Environmental Impact Statement

SERA – Syracuse Environmental Research Associates

SHPO –State Historic Preservation Office(r)

SME – Subject Matter Expert

UAV – Unmanned Aerial Vehicle

USDA – U.S. Department of Agriculture

USFS – U.S. Forest Service

WSSA – Weed Science Society of America

1.0 INTRODUCTION

The U.S. Department of Energy (DOE), National Nuclear Security Administration Nevada Field Office (NNSA/NFO) manages the Nevada National Security Site (NNSS) located in Nye County, Nevada. The NNSS occupies approximately 1,360 square miles of desert and mountain terrain and is surrounded on three sides by other lands managed by the federal government. The site is approximately 65 miles northwest of Las Vegas, Nevada, and public access is restricted. Over the last 15 years, the NNSS has experienced an increase in the frequency and severity of wildland fires. Figure 1-1 and Table 1-1 identify the areas on NNSS previously impacted by wildland fires. Postfire recovery of the plant community in burned areas is typically dominated by nonnative, invasive plant species, which are ideal fuels for wildland fires and displace native plants to which native wildlife are adapted and dependent.

Of concern are nonnative, invasive annual brome grasses (cheatgrass [*Bromus tectorum*] and red brome [*Bromus rubens*]). Bromes are problematic for several reasons. Bromes thrive in areas of disturbance, especially previously burned areas. They can germinate and grow at colder soil temperatures, outcompeting native plants for resources. Bromes have a high germination rate, grow quickly, and are able to produce a lot of biomass in a short amount of time. Because they are an annual species, they dry out early in the season resulting in an abundant, highly flammable fine fuel that is easily ignited and carries fire readily. The fine fuels these bromes produce is not only problematic in the year they germinate but for two–three years after due to the residual biomass remaining.

There is a management need to reduce and control the fine fuel load that nonnative, invasive annual brome grasses create. The advantages of reducing the fine fuel load in previously burned areas are to protect and conserve biological and cultural resources, reduce exposure of firefighters to ground hazards and air emissions while fighting fires in high hazard and radiological areas, and allow for stabilization and rehabilitation of sites impacted by wildland fires.

NNSA/NFO has prepared this Environmental Assessment (EA) to evaluate the environmental impacts of aerial application of select herbicides that prevent germination of grass seeds and provide some control of grasses already growing at the NNSS to reduce wildland fire fuel loads. The scope of this effort would be limited to burned areas (areas that have burned in the past or that burn from wildland fire in the future) that are located north of the desert tortoise (*Gopherus agassizii*) demarcation boundary line. The desert tortoise is the only species protected under the Endangered Species Act (listed as threatened) on the NNSS; therefore, all efforts will be taken to protect the species and avoid its habitat. The EA describes the potential impacts of a No Action Alternative and the Proposed Action.

This EA has been prepared pursuant to the National Environmental Policy Act (NEPA) and the DOE *NEPA Implementing Procedures*, issued on June 30, 2025.

1.1 Purpose and Need

The purpose and need for the action is to reduce wildland fire risk, frequency, and severity at the NNSS through reduction of highly flammable invasive species fuel loads. The action supports the objectives of the *NNSS Wildland Fire Management Plan* (NNSA/NFO 2024d).

2.0 DESCRIPTION OF ALTERNATIVES

2.1 No Action Alternative

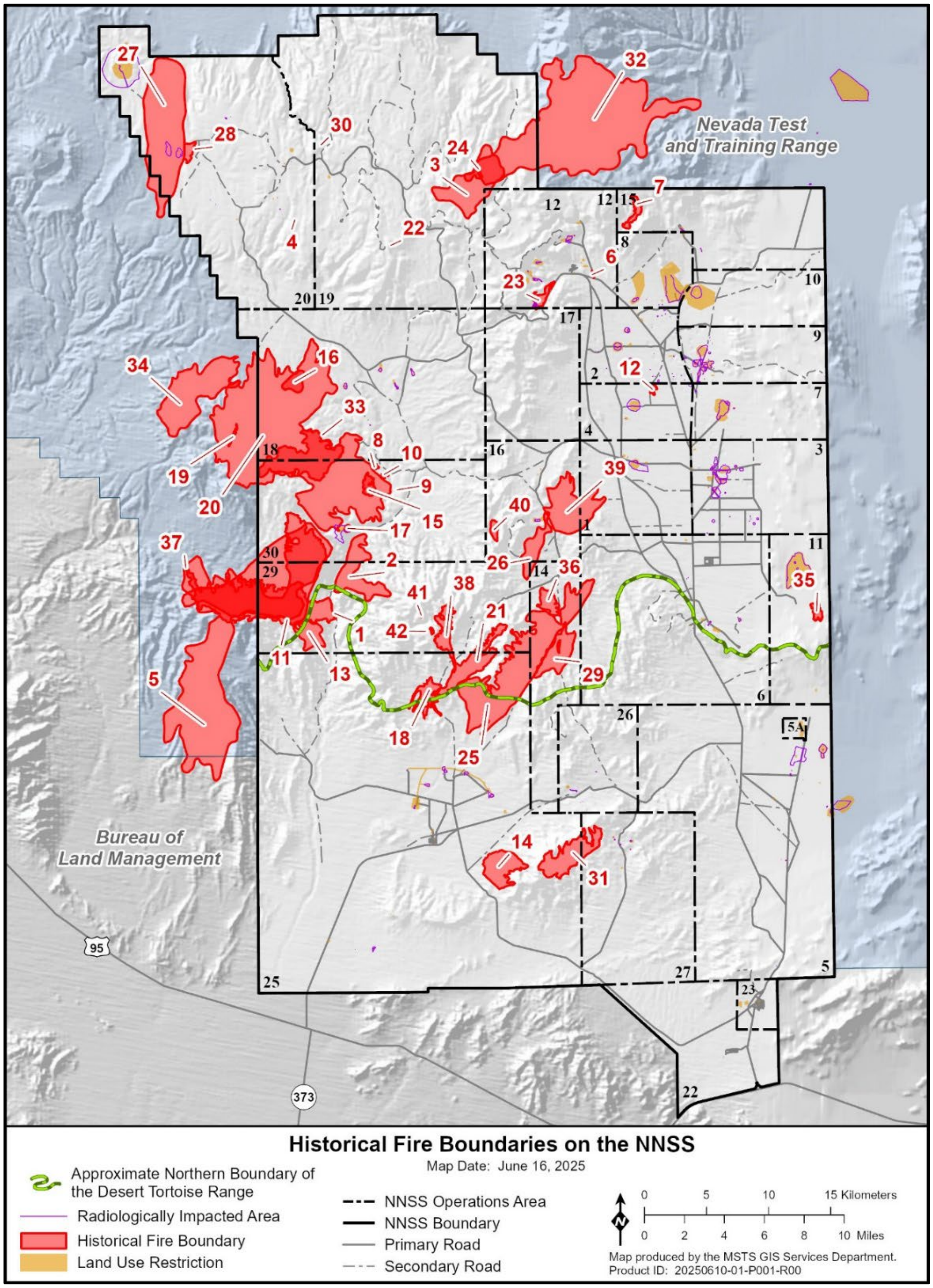
Under the No Action Alternative, the aerial application of herbicides within wildland fire-burned areas would not occur on the NNSS. Herbicides would not be applied by other methods (e.g., vehicle-mounted spraying or hand application).

2.2 Proposed Action

Under the Proposed Action, NNSA/NFO would apply a mixture to include indaziflam, imazapic, or a combination of both herbicides to historic and future wildland fire-burned areas north of the desert tortoise range boundary at the NNSS using rotary- and fixed-wing aircraft and Unmanned Aerial Vehicles (UAV). The herbicide mixture would be applied in upland habitats, targeting upland nonnative and invasive species, primarily cheatgrass (*Bromus tectorum*) and red brome (*Bromus rubens*). Multiple firebreaks (defined here as strips of land with reduced fine fuel loads that act as barriers to slow or stop the progression of wildland fire) would be established within burned areas by applying herbicides to inhibit the growth of invasive species and slow or stop the spread of future wildland fires. Figure 1-2 depicts the Proposed Action Area; it is expected that a total of 1,500-2,000 acres within this area would be treated each year. Because the southern third of the NNSS is desert tortoise habitat and the tortoise is protected as threatened under the Endangered Species Act, herbicide application would not occur within the southern third of the NNSS (i.e., where ecological conditions support the tortoise), including a protective buffer of 900 feet. Other resource-specific protective buffer areas would be established annually based on a pretreatment review of the proposed treatment areas. The annual pretreatment review would be conducted by NNSS Subject Matter Experts (SME) and would be based on the type of resources in the treatment area (e.g., water, cultural resources, sensitive plant populations). This review would be completed to identify the type of herbicide mixture, applicable avoidance areas and appropriate protective buffer distances within the treatment area, and to verify that current conditions are consistent with those evaluated in this EA. Each fire-impacted area has been assigned an identification number (see Table 1-1), which would be used to track herbicide application.

The targeted fuels of the Proposed Action are nonnative and invasive species, primarily cheatgrass and red brome. Invasive brome grasses have a large negative impact on a wide range of environmental values. They are often more flammable and grow in a denser arrangement than native desert plants, which increases wildland fire intensity and often decreases the intervals between wildland fires (CSU 2024). They are not good forage plants for wildlife and do not provide good cover or nesting habitat compared to native plants (Working Lands for Wildlife 2025). They also convert shrub landscapes into annual grasslands by outcompeting native plants that attempt to grow and resprout after a fire.

Note: Throughout this EA, the term “herbicide mixture” is used to describe the mixture of herbicide active ingredients (a.i.), adjuvants/surfactants, spray dye, and water that would be applied in the Proposed Action as discussed in Sections 2.2.2 through 2.2.6.



Note: Numbers correspond to historical fires listed in Table 1-1.

Figure 1-1. Historical Fire Boundaries at the NNSS

Table 1-1. Historical Fires at the NNSS

Identification Number	Incident Name	Affected Acres	Incident Date
1	12-300 Fire	3.3	05-29-2012
2	40 Mike	2,203.8	09-09-2011
3	7.28.18 Area 19 Fire	3,401.0	08-03-2018
4	921 Fire	4.6	08-17-2012
5	Air Force Fire	20,431.2	06-06-2005
6	Area 12 Core Library	8.4	07-12-2006
7	Area 12 Fire	307.0	08-30-2012
8	Area 30	29.2	07-09-2009
9	Area 30	0.5	07-09-2009
10	Area 30	27.9	07-09-2009
11	Area 30 Fire (Timber Peak)	10,532.8	09-05-2017
12	BEEF	60.6	06-09-2011
13	Black Glass Canyon Wildfire	860.0	07-22-2021
14	Bren Tower	1,579.1	06-17-2005
15	Briley	308.9	07-04-2011
16	Buckboard Mesa	481.1	08-27-2011
17	Bushy Fire	60.4	07-20-2021
18	Calico Hills	734.0	No Date Available
19	Cat Canyon	41.7	09-11-2020
20	Cherrywood Fire	26,406.2	05-23-2021
21	Doents1	1,824.4	08-25-1995
22	Echo Peak Fire	0.3	06-05-2024
23	Egg Point	303.3	08-17-2002
24	Gritty Gulch	177.5	07-12-2011
25	Mid Valley	8,563.1	07-04-2006
26	Mid Valley Fire	1,129.8	04-17-2018
27	Ribbon Fire	7,889.9	08-24-2024
28	Ribbon Fire	238.5	08-27-2024
29	Shoshone Mountain	1,481.2	No Date Available
30	Silent Canyon Fire	1.0	09-17-2024
31	Skull Mountain	2,064.3	07-21-2005
32	Southern Bench Fire	20,325.7	09-30-2021
33	Timber	3,325.8	07-08-2011

Identification Number	Incident Name	Affected Acres	Incident Date
34	Timber Mountain	4,825.7	No Date Available
35	Tweezer	208.4	07-29-2011
36	Unknown	568.1	No Date Available
37	Unknown	6,878.4	No Date Available
38	Weston	921.4	07-11-2011
39	Wild Land Fire Area 1/16	3,129.0	07-31-2020
40	Wildland Fires 06292021	194.6	07-01-2021
41	Wildland Fires 06292021	5.3	07-05-2021
42	Wildland Fires 06292021	24.3	07-05-2021

2.2.1 Goals of the Proposed Action

The goal of the Proposed Action is to reduce wildland fire risk, frequency, and severity on the NNSS through control of preemergent and postemergent cheatgrass and red brome in previously burned areas. Historically, the NNSS has been impacted by wildland fires that have been exacerbated by invasive cheatgrass and red brome. By establishing firebreaks within the previously burned areas, wildfire spread is expected to slow down in areas with these invasive populations. The reduction of wildland fires would serve to protect and conserve biological and cultural resources, protect critical infrastructure, reduce the chance of wildfires burning through surface contaminated areas which can serve to remobilize contaminants, reduce exposure of firefighters to ground hazards and air emissions while fighting fires in high hazard areas (e.g., unexploded ordnance) and radiological areas, and allow for the stabilization and rehabilitation of sites impacted by wildland fires.

2.2.2 Herbicide, Adjuvant, and Spray Dye Types

The individual herbicides would be mixed with adjuvant and spray dye to comprise the herbicide mixture. Herbicide, adjuvant, and spray dye manufacturer's product labels, Safety Data Sheets, and manufacturer's recommendations for all chemicals used in the Proposed Action would be followed to ensure proper application and protect project personnel and the environment.

Imazapic

Imazapic (Table 2-1) is a pre- and postemergent herbicide that impacts germinating seeds and established plants. It is used to control annual and perennial grasses and broadleaf species and is typically effective for one year. It is a selective herbicide that only kills certain plant species, not all plant species (BLM 2007a, Chapter 2). The active ingredient is ammonium salt of imazapic and it kills plants by inhibiting the activity of the enzyme acetohydroxy acid synthase. It is recommended for use on rangeland for the control of undesirable (nonnative, invasive, and noxious) plant species in order to (1) aid in the establishment of desirable rangeland plant species; (2) aid in establishment of desirable rangeland vegetation after a fire; (3) aid in the reduction of vegetation that would fuel a wildfire; (4) aid in the release of existing desirable rangeland vegetation from the competitive pressure of undesirable plant species; and (5) aid in habitat improvement for wildlife (Alligare 2020).

Indaziflam

Indaziflam (Table 2-1) is strictly a preemergent herbicide, which means it only impacts germinating seeds. It can be effective for up to three–five years and is registered for both ground and aerial applications to manage invasive annual grasses such as cheatgrass and broadleaf species. It is a cellulose biosynthesis inhibitor, which weakens the cell wall. Because of its long residual activity and selectivity, this herbicide may also be used to maintain and promote intact native plant communities threatened by invasive annual grasses and some broadleaf noxious weeds as a spray and release treatment (BLM 2023, 2.2.6; BLM 2024, 2.1.6).

Adjuvants

Adjuvants/surfactants are commonly used to improve the effectiveness of herbicides. A soil adjuvant helps the herbicide spread more evenly, penetrate deeper into the soil (Kampa 2025), and can help reduce spray drift during aerial application (Pacanoski 2015). Spray drift is the movement of herbicide particles or droplets through the air at the time of application or soon after, to any area outside the targeted treatment area. Surfactants, a type of adjuvant, primarily reduce the surface tension between the spray droplet and the leaf surface (FBN 2024). Typical adjuvants/surfactants used under the Proposed Action would be a specialized blend of surfactants and aliphatic hydrocarbons designed to enhance the deposition and absorption of aerial spray applications (Table 2-1). Specifically, the adjuvants Efficax or Grounded would be used in the herbicide mixture for the Proposed Action.

Hash Mark Blue Liquid Spray Dye

A spray dye (e.g., Hash Mark Blue Liquid) (Table 2-1), or spray pattern indicator dye, is a temporary colorant which visually marks where the spray has been applied. Spray dye would be used to determine overall spray pattern and to define what areas have been treated. The dye is only visible for a few days after application and is crucial to ensuring that the aerial disbursement was successful (Hall et al. 2025).

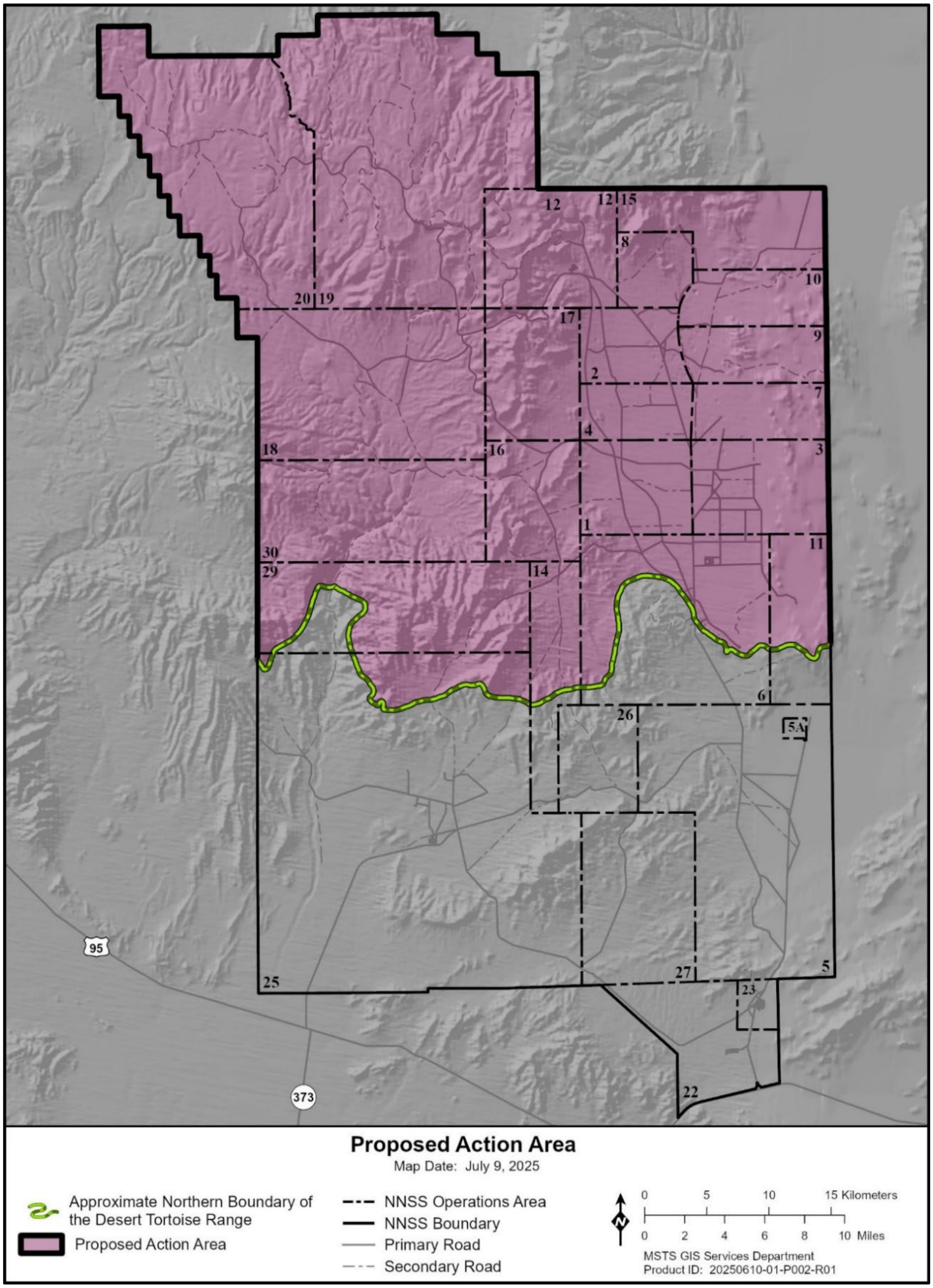


Figure 1-2. Proposed Action Area at the NNSS

Table 2-1. Herbicide, Adjuvants, and Spray Dye

Active Ingredient	Product Trade Name	Manufacturer/ Distributer	Concentration of Formula	EPA Registration Number	Herbicide Resistance – Weed Science Society of America (WSSA) Code	Mode and Mechanism of Action	Pre- or Post-Emergence Application	Reference
Indaziflam	Alion, Esplanade, Merengo, Specticle, and Rejuvra	Bayer Environmental Science	1.67 pounds a.i./gallon	432-11609	Group 29 [1]	Cellulose biosynthesis inhibitor	Preemergence control	BLM 2023; Table 2.1
Imazapic	Panoramic, Plateau, and Cadre	Alligare LLC	2.0 pounds a.i./gallon	66222-141-81927	Group 2 [2]	Acetolactate Synthase enzyme inhibitor	Pre- and Postemergence control	Alligare 2020
Propriety blend of aliphatic hydrocarbons, hexahydric alcohol ethoxylates and C18-C20 fatty acids and alkanolamides	Grounded	Helena Agri-Enterprises	99%	N/A	N/A	Enhances herbicide deposition and absorption and reduces wind drift	Preemergence	Helena Holding Company 2018
Esterified seed oil	Efficax	Wilbur-Ellis Company	94.79% by weight	N/A	N/A	Enhances and improves herbicide deposition and soil residual activity and reduces wind drift	Preemergence	Wilbur-Ellis 2019
Proprietary colorant mixture	Hash Mark Blue Liquid	Exacto Inc.	N/A	N/A	N/A	Temporary colorant to mark treated areas and assess spray pattern	N/A	Exacto Inc 2020

1. Group 1: The chemical code 1 WSSA refers to a group of herbicides that inhibit the enzyme Acetyl-CoA Carboxylase, which is crucial for fatty acid synthesis in plants. This group is further divided into two main chemical families: aryloxyphenoxypropionates and cyclohexanediones.
2. Group 29: The chemical WSSA code 29 refers to herbicides that inhibit **cellulose synthesis**. This means that these herbicides target the process of plant cell wall formation, which is crucial for plant growth and development. By inhibiting cellulose synthesis, these herbicides disrupt the integrity of cell walls, ultimately leading to plant death.

2.2.3 Selection of Treatment Areas

The selection of herbicides and treatment areas would be based on, but not limited to, the factors adopted from the 2007 and 2023 Bureau of Land Management (BLM) Programmatic Environmental Impact Statements (PEIS) (BLM 2007a; BLM 2019, Chapter 2; BLM 2023; BLM 2024) and expert knowledge of NNSS biologists:

- Growth characteristics of the target invasive species
- Seed longevity and germination
- Proximity of the treatment area to sensitive areas, such as habitat for sensitive plants or animals, cultural resources, and/or water sources

2.2.4 Timing of Treatments

All weather restrictions and mitigation measures described on the manufacturer's product label would be strictly adhered to during treatment planning and application. Treatments would be timed to coincide with relevant plant growth stages (i.e., timing of seed germination), typically between September and December.

2.2.5 Size of Treatment Areas

Specific treatment areas on the NNSS would be selected annually; the size and shape of treatment areas would vary. It is anticipated that a total of 1,500–2,000 acres would be treated each year at wildland fire-burned areas within the Proposed Action Area (Figure 1-2). The herbicides would be applied to create multiple firebreaks strategically placed within the burned areas to prevent the growth of invasive fuels and slow down or stop the spread of future wildland fires.

2.2.6 Application Method and Rate

The primary method of application under the Proposed Action would be aerial using rotary-and fixed-wing aircraft and UAVs. Both indaziflam and imazapic may be used in the same mixture to target germinated cheatgrass and red brome plants as well as to suppress germination of seeds. There are no ground-disturbing actions associated with the Proposed Action.

Application rates would be limited to those specified on the manufacturer's product label, which are reviewed and approved by the U.S. Environmental Protection Agency (EPA). Under the Proposed Action, aerial application of indaziflam would be at a rate of 5 Ounces per Acre (oz/ac) and imazapic would be applied at a rate of 4 oz/ac (Harry Quicke, personal communication). The herbicide mixture would also include seven to ten gallons of water per acre, a soil adjuvant at 8 oz/ac, and spray dye to temporarily mark the area at 8 oz/ac (Harry Quicke, personal communication).

2.2.7 Annual Pre-Treatment Review

An annual pretreatment review of resources potentially affected by the Proposed Action would be completed by NNSS SMEs for all proposed treatment areas and include the following:

- A desktop/literature review to identify new and updated studies, reports, and data relevant to the effects of the proposed herbicides used in the herbicide mixture.
- Preparation of a map of the proposed treatment areas and resources within these areas.
- Identification of protective buffer and avoidance areas.
- Review of annual pretreatment and posttreatment documentation to determine the effectiveness of the herbicide mixture.

This information would be used to (1) modify the proposed treatment areas to avoid or reduce potential impacts to resources and (2) verify that current site conditions are consistent with those evaluated in this EA.

2.2.8 NNSS-Specific Research

NNSS-specific research has been ongoing since 2021 to evaluate the impacts of imazapic and indaziflam on nonnative, invasive annual grass fuels reduction and has shown that application of the herbicides has been effective (Hall and Perry 2023, 2024; Hall et al. 2025 [in press]; Hall D.B. unpublished data). Under the Proposed Action, research would include annual pretreatment and posttreatment documentation of the effectiveness of which imazapic and/or indaziflam in the herbicide mixture to inform future treatments.

2.3 Alternatives Considered but Eliminated from Detailed Analysis

Alternatives that were considered but not carried forward for analysis include mechanical herbicide application using sprayers mounted on ground-based vehicles; manual (by hand) herbicide application; and use of domestic livestock to reduce established annual grasses. Mechanical and manual (by hand) application methods are not viable options for reducing wildland fire fuel loads because wildland fires at the NNSS (1) can impact large areas (thousands of acres); (2) often occur in rugged, remote locations with limited access and (3) can occur at locations with additional ground-based hazards like unexploded ordnance. Additionally, mechanical and manual application methods create ground disturbance which can increase seed transfer to unaffected areas by walking or driving vehicles through the invasive species and soil disturbance increases invasive species germination. In locations outside of the NNSS, domestic livestock (e.g., goats, cows) have been used to graze the annual grasses while they are still green to reduce the fuel loads. This alternative was not considered for the NNSS due to radiological, safety, security, and logistical concerns.

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL IMPACTS

This section describes the resources on the NNSS that could be affected by the Proposed Action and the potential impacts the Proposed Action would have on those resources. An interdisciplinary team of NNSS resource specialists and SMEs were consulted to identify resources within the Proposed Action Area (Figure 1-2) that may be impacted by the Proposed Action. These potential impacts were then evaluated considering context and intensity to determine their significance. Cumulative impacts are also discussed, which are those impacts that result from the incremental impact of the Proposed Action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or individual performs them. Cumulative impacts could result from individually minor but collectively significant actions taking place over a period of time.

Table 3-1 lists the resources considered in the evaluation of the Proposed Action and No Action Alternative. Only resources present within the Proposed Action Area (Figure 1-2) and which have the potential to be impacted by the Proposed Action were carried forward for additional analysis in this EA. These are included in blue on Table 3-1. Resources that are not present within the Proposed Action Area and resources that are present but would not be impacted by the Proposed Action were not carried forward for analysis. A rationale and references for supporting information are provided in Table 3-1.

Table 3-1. Resources Considered in the Evaluation of the Proposed Action and No Action Alternative

Resource	May be Impacted (carry forward for analysis)	Present and Not Impacted or Not Present	Rationale for Not Impacted	Reference and/or SME Concurrence
Air Quality		X	The chemicals being proposed are not regulated pollutants under the Clean Air Act or under Nevada Division of Environmental Protection Bureau of Air Pollution Control Criteria or Hazardous Air Pollutant lists. Furthermore, according to the 2007 BLM PEIS (Chapter 4, page 10), the application of imazapic does not affect air quality through volatilization. Regarding the application of indaziflam, the 2023 BLM PEIS (Chapter 3) does not identify environmental effects to air quality.	BLM 2007, Chapter 4, p. 10; EPA 2010a, 2010c, 2010d; BLM 2023, Chapter 3 SME Erika Lomeli-Uribe
Cultural Resources	X			NNSA/NFO 2013, 4.1.10; NNSA/NFO 2024a, 3.1.10 SME Laura O'Neill
Fish and Wildlife Excluding Federally Listed Species	X			SMEs Derek Hall and Jeanette Hannon
Floodplains		X	No jurisdictional floodplains occur on the NNSS.	Clean Water Act SME Nik Taranik
Groundwater		X	The Proposed Action would not impact groundwater due to the extensive depth to groundwater (average 900 feet) across the NNSS.	NNSA/NFO 2024a, 3.1.6 SME Nik Taranik
Human Health		X	Use of personal protective equipment and licensed/trained personnel in the preparation of the herbicide mixture would minimize exposure to workers. Based on the risk assessment studies conducted by the EPA, the dilution protocol combined with the low level of toxicity does not present a risk for uptake from the herbicide mixture when dispersed via aerial application. Precautions established by the manufacturer and notifications during preparation of chemicals and during spraying would eliminate the possibility of workers inside of proposed treatment areas. The preparation of the herbicide mixture would not occur on the NNSS and would be conducted by personnel trained to handle herbicides. A comprehensive Human Health and Ecological Risk Assessment (HHERA) for indaziflam was prepared for the U.S. Department of Agriculture (USDA) Forest Service (USFS) and BLM (Kestrel Tellevate 2020). As part of the human health risk assessment, risks were characterized for workers and the general public. The	EPA 2010a, 2010c, 2010d; SERA 2004; Tu 2004; Tu et al. 2021; Bayer 2020 SME Seuri Tauru

Resource	May be Impacted (carry forward for analysis)	Present and Not Impacted or Not Present	Rationale for Not Impacted	Reference and/or SME Concurrence
			exposure scenarios represent dermal, inhalation, and incidental oral exposures of short- and intermediate-term durations. None of the Hazard Quotients (HQ) for workers exceeded the level of concern based on central estimates of exposures. However, the upper bound estimates of the HQ slightly exceed the level of concern for aerial applications (HQ = 1.09). Based on the dose-severity relationship, this HQ is a relatively modest exceedance in the level of concern and does not raise substantial concern. Similar to workers, none of the central estimates of HQs exceeded the level of concern for members of the general public. The likelihood that individuals from the general public would be exposed to indaziflam would be negligible given the restricted public access and remoteness of treated areas (EPA 2010a, 2010c, 2010d). A comprehensive HHERA for imazapic was prepared for USFS and they concluded that “Adverse effects in human or other animal species do not appear to be plausible. There is no route of exposure or scenario suggesting that workers or members of the general public will be at any substantial risk from exposure to imazapic” (SERA [Syracuse Environmental Research Associates] 2004). A potential pathway for human exposure is through ingestion of animals that have consumed vegetation treated with herbicides. Although hunting on the NNSS is prohibited and has been for several decades, the potential exists for exposed animals to move off the NNSS into an area where hunting is allowed. The potential risk to a person consuming that animal is negligible because imazapic and indaziflam do not bioaccumulate in animals and are rapidly expelled via urine and feces.	
Invasive, Nonnative Annual Grasses	X			BLM 2007a, Chapter 4, p. 63; NNSA/NFO 2013, 4.1.7.1; BLM 2019, Chapter 3, Table 3-1; BLM 2024, Appendix B; NNSA/NFO 2024a, 3.1.7 SMEs Derek Hall and Jeanette Hannon
Jurisdictional Wetlands and Riparian Areas		X	There are no jurisdictional wetlands or riparian areas located within the Proposed Action Area.	Clean Water Act; NNSA/NFO 2024a, 3.1.6 SMEs Nik Taranik and Derek Hall

Resource	May be Impacted (carry forward for analysis)	Present and Not Impacted or Not Present	Rationale for Not Impacted	Reference and/or SME Concurrence
Land Use		X	The NNSS contains lands that have federally managed Land Use Restrictions for various contaminants and there are radiological postings throughout the site. There is the potential to encounter unexploded ordnance anywhere on the NNSS. Because of the generally low toxicity of the herbicides, the Proposed Action would not affect current land use and any reasonably foreseeable future use of the treated areas.	NNSA/NFO 2013, 4.1.1; NNSA/NFO 2021a; NNSA/NFO 2024a, 3.1.1; NNSA/NFO 2024c SME Jill Dale
Migratory Birds		X	No adverse impacts are anticipated due to the low- to nontoxic nature of imazapic and indaziflam at the concentrations that would be used in the Proposed Action. As an extra precaution, the Proposed Action would occur outside of the bird breeding season (February–August) to avoid disturbing nesting birds from overflights.	BLM 2005, 3.1.2.2; BLM 2007a, Chapter 4, p. 105; BLM 2007c, Chapter 6, p. 42; NNSA/NFO 2013, 4.1.7.2; BLM 2019, Chapter 3, Table 3-1; NNSA/NFO 2024a, 3.1.7; SERA 2004; Kestrel Tellevate 2020 SMEs Derek Hall and Jeanette Hannon
Nonjurisdictional Water Resources	X			BLM 2007a, Chapter 4, p. 29; EPA 2010b; NNSA/NFO 2013, 4.1.6; BLM 2019, Chapter 3, Table 3-1; BLM 2024, 4.3.1; NNSA/NFO 2024a, 3.1.6 SMEs Derek Hall and Nik Taranik
Socioeconomics		X	The NNSS is 65 miles from Las Vegas, Nevada, and 30 miles from Pahrump, Nevada. There is little to no socioeconomic impact to these nearby communities because the action is short-term (less than one week per year) and involves a small number of personnel. There would be no opportunities for employment of local residents.	NNSA/NFO 2013, 4.1.13; NNSA/NFO 2024a, 3.1.4 SME Jill Dale
Soils		X	When used according to label instructions, there is minimal indication of adverse effects to soil from imazapic. Herbicides would be applied at specified product label rates. Limited effects on soil microbial activity from indaziflam have been observed, although future research is needed to fully understand its impacts. The typical half-life for imazapic and indaziflam in soil is 120 and 150 days, respectively. In clear, shallow water, measured half-life for indaziflam is less than five days due to aqueous photolysis. Following application, indaziflam is not likely to volatilize, nor be transported via atmospheric processes (e.g., wind erosion) nor be transmitted through the vadose zone (i.e., volatilize) if buried in the subsurface. Therefore, its dissipation in the environment takes	PDCNR 2020; BLM 2007a, Chapter 4, p. 15; NNSA/NFO 2013, 4.1.5; BLM 2019, Chapter 3, Table 3-1; BLM 2024, 4.3.1; NNSA/NFO 2024a, 3.1.5; Gonzalez-Delgado et al. 2022; WSDOT 2021; Lewis et al. 2025; EPA 2010a; EPA 2010b SMEs Jeanette Hannon and Derek Hall

Resource	May be Impacted (carry forward for analysis)	Present and Not Impacted or Not Present	Rationale for Not Impacted	Reference and/or SME Concurrence
			place primarily through degradation into metabolites and leaching through the soil column from surface water infiltration. Given the arid climate of the NNSS (low precipitation, high evaporation), indaziflam is not anticipated to leach very far into the soil profile.	
Threatened Endangered or Candidate Animal Species		X	The southern one third of the NNSS is habitat for the threatened Mojave desert tortoise. Herbicide application would not occur in known desert tortoise habitat (i.e., outside the ecological conditions of the desert tortoise) or within 900 feet of the approximate northern tortoise boundary. The 900-foot protective buffer area would be established to account for the possibility of spray drift. Herbicide application would occur during the time of year when the desert tortoise is less active (November–February).	BLM 2007a, Chapter 4, p. 118; BLM 2007c, Table 6-3); NNSA/NFO 2013, 4.1.7.3; BLM 2019, Chapter 3, Table 3-1; BLM 2024, Appendix B; NNSA/NFO 2013, 4.1.7.3; NNSA/NFO 2024a, 3.1.7; SERA 2004; Kestrel Tellevate 2020; Tu 2004; Tu et al. 2021 SMEs Jeanette Hannon and Derek Hall
Threatened Endangered, Candidate or Sensitive Plant Species	X			BLM 2007a, Chapter 4, p. 71; BLM 2007c, Chapter 6, p. 98; NNSA/NFO 2013, 4.1.7.1; BLM 2019, Chapter 3, Table 3-1; BLM 2024, 4.3.1; NNSA/NFO 2024a, 3.17 SMEs Jeanette Hannon and Derek Hall
Vegetation, Fuels and Fire Management	X			BLM 2007a, Chapter 4, p. 28; BLM 2019, Chapter 3, Table 3-1; BLM 2023, Chapter 3, p. 57; BLM 2024, 4.3.1. NNSA/NFO 2021a; DOE 2023; NNSA/NFO 2024c; NNSA/NFO 2024d SMEs Derek Hall and Dakota Vaughn-O'Brien
Visual Resources		X	There would be no permanent impacts to visual resources from spraying via aerial application. Based on field observations during the establishment of test plots to determine effectiveness, the spray dye in the herbicide mixture identified as a temporary colorant is not visible after three days. Visual resources have already been impacted by fire, so application of herbicide to these areas would not have an impact and would improve visual resources in the future when native plants repopulate the areas. Treated areas are not accessible by the public or tribes and cannot be seen from off the NNSS, so there would be no impact to the public or tribes.	BLM 2007, p 4-154; NNSA/NFO 2013, 4.1.9; NNSA/NFO 2024a, 3.1.9; Hall et al. 2025 SMEs Derek Hall and Jeanette Hannon

Resource	May be Impacted (carry forward for analysis)	Present and Not Impacted or Not Present	Rationale for Not Impacted	Reference and/or SME Concurrence
Wastes (hazardous or solid)		X	Herbicides and other chemicals identified in the herbicide mix are not regulated under the Resource Conservation Recovery Act. Any generated waste is permitted to be disposed at onsite permitted solid waste landfills following all local, state, and federal regulations.	SME Amanda Rasmussen
Wild Horse and Burros		X	No adverse impacts are anticipated due to the low- to nontoxic nature of imazapic and indaziflam at the concentrations that would be used in the Proposed Action. The herbicide mixture and specifically the individual herbicides do not bioaccumulate in wildlife because they rapidly excrete in urine and feces. Wild horse and burro habitat would not be disturbed by the Proposed Action. Herbicide treatments would benefit the overall health of the ecosystem and available forage plants by reducing the presence of nonnative and invasive species. Cheatgrass is a low-nutrient forage plant and is not sustainable as primary forage for wildlife. Due to the herbicide treatments only impacting small areas within burned habitat, evidence of low toxicity, and benefits to native forage plants, the Proposed Action would not impact wild horses and burros.	EPA 2010b, B.2.; SERA 2004; Kestrel Tellevate 2020; Grotting 2021; BLM 2007a, Chapter 4, p. 136; BLM 2007c, Chapter 6, p. 159; NNSA/NFO 2013, 6.2.4.2; BLM 2019, Chapter 3, Table 3-1 SMEs Jeanette Hannon and Derek Hall

3.1 Mitigation Measures

Mitigation measures that would reduce or avoid impacts to resources carried forward for additional analysis are presented in each respective section below. Mitigation measures would be communicated to personnel performing the application through the planning process (e.g., planning documents, maps, global positioning system coordinates).

Mitigation measures for the Proposed Action that are applicable to all potentially affected resources include:

- Project personnel would comply with applicable local, state, and federal laws and regulations for the protection of resources and the environment, to include but not limited to air, cultural resources, hazardous materials, soil, vegetation, water, and wildlife.
- Spray drift control agents and low volatile herbicide formulations used in the herbicide mixture would be used to avoid or minimize spray drift.
- Climate, soil type, slope, and vegetation type would be considered when selecting herbicide mixture treatment locations.
- Before herbicide mixture application, the effects of wind, humidity, temperature inversions, and heavy rainfall on the individual herbicide effectiveness and risks would be considered.
- Herbicide mixture application would not occur during bird breeding season (generally February through August) to avoid disturbing nesting birds from overflights.
- Herbicide application would occur at the time of year when the Mojave desert tortoise is less active and spends much of its time in underground burrows (generally November through February).

3.2 Cultural Resources

3.2.1 Affected Environment

Under the Proposed Action, the herbicide mixture would be applied to historic and future wildland fire-burned areas within the Proposed Action Area (Figure 2-1). Because future burn areas cannot be predicted, the Proposed Action Area for cultural resources is the entire NNSS north of the desert tortoise range boundary. It totals 843 square miles.

Archival review indicates that seven percent of the Proposed Action Area has been inventoried and there are nearly 1,600 cultural resources (both evaluated and unevaluated) within the prior inventory areas, ranging from prehistoric sites to Cold War-era built resources. Given that the majority of the Proposed Action Area has not been inventoried, there are likely many more unknown cultural resources present, the locations of which have yet to be identified.

Examples of known and likely cultural resource types within the Proposed Action Area include petroglyphs, pictographs, lithic and/or ceramic scatters, basketry, prehistoric camps, ranching and mining sites, and nuclear testing-related buildings and structures, among others (NNSA/NFO 2013, 4.1.8.4).

3.2.2 Environmental Effects of the No Action Alternative

Under the No Action Alternative, recurrent wildland fires would continue to burn in annual grasslands and spread into adjacent unburned habitat converting intact shrublands and woodlands into annual grasslands. Conversion to invasive annual grasslands destroys habitat and greatly increases the frequency of wildland fires in those areas (Hall and Perry 2024). Increased fire frequency and spread would increase the probability of fire damage to cultural resources.

3.2.3 Environmental Effects of the Proposed Action

There are three potential ways in which the Proposed Action could affect cultural resources: 1) prevention of fire damage; 2) change to the physical features of the setting by dispersing colorant; and 3) physical damage from the interaction of the proposed chemicals with cultural resource material types. The first potential effect would be positive as it would result in the protection of cultural resources from fire-related damage.

The second potential effect would be temporary: the colorant that would be dispersed with the herbicides would change the physical features of the setting; however, based on observation of herbicide test plots at the NNSS, the colorant dissipates from soil and vegetation quickly in three to five days (Hall et al 2025).

To consider the third potential effect, physical damage to cultural resource material types, research into the herbicides and their effects was conducted. The research was inconclusive; the effects, if any, of the specific herbicides on materials associated with cultural resources (such as rock types, petroglyphs, pictographs, ceramics, basketry, masonry, and others) are unknown and have not been studied or documented to date.

3.2.4 Cumulative Impacts of the Proposed Action

Previous operations at the NNSS included nuclear explosive testing, and experiments using conventional explosives and chemicals. The potential effects to cultural resources from these previous activities are unknown.

Current operations at the NNSS include similar activities as in the past, with the exception of nuclear explosive testing which ceased several decades ago. Nuclear explosive testing is not currently conducted at the NNSS. For known cultural resources, the Proposed Action is expected to contribute minimally to cumulative impacts because protective buffer areas would be established around known resources and they would be avoided during application. The cumulative impacts to unknown cultural resources from the Proposed Action are unknown.

There is currently no plan in place to respray areas previously treated with herbicides. Operations would continue at the NNSS but reasonably foreseeable impacts to cultural resources are unknown.

3.2.5 Mitigation Measures

The scope of the Proposed Action includes annual pretreatment reviews to delineate avoidance areas and to identify new and updated studies, reports, and data relevant to the effects of herbicide application. Based on the results of the annual pretreatment reviews, the following mitigation would be implemented for known cultural resources:

- Treatment areas would be delineated in consultation with NNSS cultural resource SMEs prior to any aerial herbicide application and would include avoiding known cultural resources, both evaluated and unevaluated.
- Avoidance area data would be provided to the project team as geospatial data to ensure accuracy.
- All avoidance areas identified by SMEs would be eliminated from treatment areas.
- SMEs would visit a representative sampling of known cultural resources in avoidance areas following herbicide application to ensure the areas were avoided.

Because the entirety of the Proposed Action Area has not been inventoried for cultural resources and doing so is beyond a reasonable level of effort, the locations of unknown resources cannot be identified and avoided. Whether or not the herbicides would affect these resources is unknown due to a lack of existing information and data. In the absence of this information, NNSA/NFO will take the following due diligence measures:

- As part of the annual pretreatment review, cultural resource SMEs would conduct an updated literature review of new information and data generated by industry or comparable herbicide programs at other agencies. NNSA/NFO would re-evaluate the effects of the proposed chemicals on cultural resource material types based on the results of the updated literature reviews.
- If SMEs identify new studies that demonstrate that the herbicides negatively impact cultural resource material types, NNSA/NFO would initiate consultation with the Nevada State Historic Preservation Officer (SHPO) per Section 106 of the National Historic Preservation Act (NHPA), its implementing regulations at Title 36 Code of Federal Regulations, Part 800, and the stipulations of the *2024 NNSS Programmatic Agreement for the Protection of Historic Properties*.

3.3 Fish and Wildlife Excluding Federally Listed Species

3.3.1 Affected Environment

The Proposed Action Area supports and is adjacent to lands that support wildlife characteristic of the Great Basin Desert and the transition area between this and the Mojave Desert. Wildlife in the general area may include small mammals, rodents, birds, insects, and reptiles. Biological diversity varies according to topography, plant community, proximity to water, soil type, and season (NNSA/NFO 2013, 4.1.7.2). For a comprehensive discussion of potential wildlife species that may be present, refer to *Ecology of the Nevada Test Site: An Annotated Bibliography* (Wills and Ostler 2001) and the latest *Ecological Monitoring and Compliance Program Annual Report*, which includes the current list of sensitive and protected/regulated animal species (Hall et al. 2025).

One noteworthy species (i.e., proposed for official listing as threatened under the Endangered Species Act), the western monarch butterfly (*Danaus plexippus*), is known to occur in the Proposed Action Area, although it is extremely rare. There have been four occurrences of monarchs on the NNSS, two of which were outside the Proposed Action Area. The observations occurred mostly during the fall migration period; July 30, 1990, September 22, 2004, September 30, 2004, and October 10, 2023. Monarchs breed and their caterpillars feed exclusively on milkweed plant leaves (*Asclepias* spp.) (Western Association of Fish and Wildlife Agencies 2019). Two milkweed plants (*A. erosa* and *A. fascicularis*) occur in the Proposed Action Area. Both species are perennials, bloom from June to September on the NNSS, and die back to the ground in the fall (Beatley 1976). They occur in very small (typically 1–40 plants), isolated patches along road shoulders so there is minimal monarch habitat on the NNSS.

3.3.2 Environmental Effects of the No Action Alternative

Under the No Action Alternative, recurrent wildland fires would continue to burn in annual grasslands and spread into adjacent unburned habitat converting intact shrublands and woodlands into annual grasslands. This would alter the species composition and diversity of native plant communities and reduce the quality and quantity of habitat and forage for numerous wildlife species, including the monarch. Unplanned and uncontrolled fire could consume large tracts of wildlife habitat, having a negative effect on wildlife populations.

3.3.3 Environmental Effects of the Proposed Action

Aerial application of herbicides could temporarily displace wildlife species from treatment areas due to associated human presence and noise. However, reducing the risk of wildland fires in undisturbed habitat would have beneficial, long-term impacts by maintaining intact habitat, thus protecting wildlife habitat (BLM 2023, 3.7; BLM 2024, 4.3).

Based on information from the imazapic and indaziflam safety data sheets and comprehensive ecological risk assessments, toxicological risks from acute (short-term) exposure to terrestrial fauna from the herbicides are negligible (BLM 2007c, Chapter 6; Kestrel Tellevate 2020). Based on acute studies, the EPA (2010a, 2010c, 2010d) classified indaziflam as “practically nontoxic” to mammals, birds, honeybees, and earthworms. However, some chronic (long-term) effects were observed in mammals and birds from eating vegetation treated with indaziflam. These studies assumed all of their diet consisted of vegetation treated at application rates above those recommended in the herbicides labels. Under the Proposed Action, this scenario is highly unlikely given that the herbicides would be applied at rates limited to those specified in the herbicides labels and only a portion of the food available to wildlife would be treated (i.e., wildlife would forage outside treated areas). No data are available on the toxicity of indaziflam to reptiles or amphibians (Kestrel Tellevate 2020). Direct effects for nonaccidental exposure on aquatic invertebrates and plants are all below the level of concern (EPA 2010b). No specific data exists for the impacts of indaziflam and imazapic on monarch butterflies. Imazapic is a pre- and postemergent herbicide which can target seed germination, established grasses, and some established broadleaf plants. Milkweed is a broadleaf plant and may be negatively impacted by direct application of imazapic. Indaziflam, on the other hand, is a preemergent that only targets seed germination and would not negatively impact established milkweed plants.

Indirect, adverse effects of herbicide application on wildlife include reduction in the availability of preferred food, habitat, and breeding areas due to reduced plant species diversity and habitat; and range disruption if treated areas are avoided due to habitat changes, both of which may result in a decrease in wildlife population densities because of limited reproduction; and increase in predation due to loss of cover (BLM 2019). These same impacts will already have occurred after a wildland fire to a greater degree than those caused by limited herbicide treatments.

The extent of direct and indirect impacts to wildlife would vary by the effectiveness of herbicide treatments in controlling target plants and promoting the growth of native vegetation, physical features of the terrain (e.g., soil type, slope), and weather conditions (e.g., wind speed) at the time of application (BLM 2019, Chapter 3).

Long-term benefits of the Proposed Action would include increased native perennial vegetation, decreased susceptibility to intense, large-scale fires, and increased native forage and cover (BLM 2019, Chapter 3; BLM 2023, 3.7; BLM 2024, 4.3).

3.3.4 Cumulative Impacts of the Proposed Action

Previous operations at the NNSS included nuclear explosive testing, and experiments using conventional explosives and chemicals. The potential impacts of these activities on wildlife at the site have been studied and monitoring is ongoing (NNSA/NFO 2013).

Current operations at the NNSS include similar activities as in the past, with the exception of nuclear explosive testing which ceased several decades ago. Nuclear explosive testing is not currently conducted at the NNSS. The Proposed Action is expected to contribute minimally to cumulative impacts to wildlife because of the low toxicity of the diluted herbicides that would be applied and because neither imazapic nor indaziflam are known to bioaccumulate in wildlife (Tu et al 2001; Bayer 2020). Long term benefits to wildlife would be improved habitat quality (BLM 2019, Chapter 3).

There is currently no plan in place to respray areas previously treated with herbicides. Operations would continue at the NNSS but reasonably foreseeable impacts are unknown.

3.3.5 Mitigation Measures

An annual pretreatment review of the proposed treatment areas would be conducted to identify any avoidance areas that need to be established. Potential effects to important pollinators (e.g., monarch butterflies, bees) and the plant species they depend on (e.g., milkweeds) would be considered when selecting treatment areas and timing of treatments.

3.4 Invasive, Nonnative Annual Grasses

3.4.1 Affected Environment

Red brome and cheatgrass (bromes) are the two primary nonnative, invasive annual grasses that contribute the most fuels that increase the risk of wildland fire size and frequency (Molvar et al. 2024). Bromes were introduced to North America in the 1800s (Molvar et al. 2024) and known by 1976 to be well entrenched throughout the middle and higher elevations of the NNSS (Beatley 1976). Bromes provide forage for some wildlife species for a couple of weeks while they are vegetative and flowering but are not good quality forage otherwise. Bromes can also provide some protection from soil erosion. However, the negative effects bromes have on ecosystems far outweigh any benefits they provide (NNSA/NFO 2013; 4.1.7.1).

Red brome is typically found at the lower and middle (2,500-5,500 feet) elevations while cheatgrass occurs most often at the middle and higher (5,000-6,000 feet) elevations (Ostler et al. 2000). Bromes are problematic for several reasons. They can germinate and grow at colder soil temperatures than many native species, so by the time the native species germinate and start growing, the bromes have used up most of the available soil moisture, which results in native seedlings struggling to survive (Hall et al. 1999). Bromes have a high germination rate even with little precipitation, grow quickly, and are able to produce a lot of biomass in a short amount of time. Because they are an annual species, they dry out early in the season when the soil moisture declines, resulting in an abundant, highly flammable fine fuel that is easily ignited and carries fire readily. Bromes can grow almost anywhere but thrive in areas of disturbance, especially previously burned areas. The fine fuels these bromes produce is not only problematic in the year they germinate but for two–three years after due to the residual biomass remaining. Even if there are a couple of years when bromes do not germinate and grow well, the residual biomass perpetuates a state of nearly constant fine fuels that increase the risk of wildland fire.

3.4.2 Environmental Effects of the No Action Alternative

The No Action Alternative would increase the risk, frequency, and severity of future wildland fires by maintaining the persistence of invasive annual grasslands and converting thousands of additional acres of unburned native shrublands and woodlands to nonnative, invasive annual grasslands.

3.4.3 Environmental Effects of the Proposed Action

The Proposed Action would reduce invasive species in burned areas by decreasing risk, frequency, and severity of future wildland fires on the NNSS. An overall reduction in wildland fire fuels would make the native perennial vegetation more resilient and better able to compete with invasive species, allowing for better quality wildlife habitat and restoration of ecosystem function (Molvar et al. 2024). Several studies have shown the benefits of using indaziflam and imazapic to control cheatgrass and enhance native vegetation. Davison et al. (2007) evaluated the use of imazapic in reducing cheatgrass to maintain firebreaks that were constructed by a tractor the year prior in sagebrush habitat in northern Nevada. They found a single treatment of imazapic significantly reduced the production of cheatgrass for two years without negatively affecting native plant species. Courkamp et al. (2022) evaluated the effectiveness of indaziflam for reducing cheatgrass density and cover over a five-year period in sagebrush-grassland sites in Wyoming. They found indaziflam reduced cheatgrass cover and density up to 45 months after treatments, and perennial grass responded positively to some treatments. They "suggest[ed] that long-term control with a single indaziflam treatment may be possible in some cases." Davies et al. (2025) mixed the two herbicides, imazapic and indaziflam, finding mixing provided better control of annual grasses and promoted perennial vegetation growth compared to using each herbicide individually. They also found that mixing the two herbicides improved first-year control of annual grasses. These studies imply that long-term control of annual grasses can be effective with herbicide treatments and perennial vegetation positively responds to the removal of annual grasses.

3.4.4 Cumulative Impacts of the Proposed Action

Previous operations at the NNSS included nuclear explosive testing, and experiments using conventional explosives and chemicals. The potential impacts to invasive species from these activities have not been studied and are unknown.

Current operations at the NNSS include similar activities as in the past, with the exception of nuclear explosive testing which ceased several decades ago. Nuclear explosive testing is not currently conducted at the NNSS. No negative cumulative impacts are anticipated from the Proposed Action. The long-term benefits of the Proposed Action include reducing the abundance of invasive, nonnative annual grasses and the risk of large-scale conversion of native shrublands and woodlands to annual grasslands.

There is currently no plan in place to respray areas previously treated with herbicides. Operations would continue at the NNSS but reasonably foreseeable impacts are unknown.

3.4.5 Mitigation Measures

None.

3.5 Nonjurisdictional Water Resources

3.5.1 Affected Environment

Although they are not considered or regulated as jurisdictional wetlands, there are many natural and constructed water sources in the Proposed Action Area that are important resources. While there are both perennial and ephemeral water sources at the NNSS, most are ephemeral (intermittent) with water present only a few weeks to a few months during the year (NNSA/NFO 2013, 4.1.6).

3.5.2 Environmental Effects of the No Action Alternative

The No Action Alternative would result in continued degradation of upland habitat around these water resources as recurrent wildland fires burn through annual grasslands into unburned, intact habitat, which may negatively affect water quality (e.g., erosion causing sedimentation) and wildlife use of these important resources.

3.5.3 Environmental Effects of the Proposed Action

The Proposed Action would maintain the integrity of upland habitats around water resources and provide quality wildlife habitat. Aerial herbicide application has the potential to deposit herbicide in water resources, which may affect primarily aquatic plant and animal species (BLM 2007c); however, the toxicity is low due to dilution and not expected to have adverse effects in the case of spray drift. Potential impacts are primarily applicable to perennial water sources at NNSS because ephemeral sources are dry except during storm events and typically do not have aquatic plant or animal species present.

3.5.4 Cumulative Impacts of the Proposed Action

Previous operations at the NNSS included nuclear explosive testing, and experiments using conventional explosives and chemicals. The potential impacts of these activities to nonjurisdictional water resources at the site are discussed in existing environmental documents (NNSA/NFO 2013).

Current operations at the NNSS include similar activities as in the past, with the exception of nuclear explosive testing which ceased several decades ago. Nuclear explosive testing is not currently conducted at the NNSS. The Proposed Action is expected to contribute minimally to cumulative impacts because protective buffer areas around water resources would be established and the resources would be avoided during herbicide application. If trace amounts of herbicides were to reach water bodies, the toxicity is anticipated to be negligible because of dilution effects and the low risk of adverse consequences from spray drift (Tu et al. 2001).

There is currently no plan in place to respray areas previously treated with herbicides. Operations would continue at the NNSS but reasonably foreseeable impacts are unknown.

3.5.5 Mitigation Measures

During the annual pretreatment review, water resources would be identified and appropriate protective buffers would be established to avoid directly spraying water resources. Every effort would be made to avoid spraying herbicides within 900 feet of a known perennial water source due to potential spray drift (Kestrel Tellevate 2020).

3.6 Threatened, Endangered, Protected, and Sensitive Plant Populations

3.6.1 Affected Environment

No threatened, endangered, or protected plant species occur on the NNSS. However, there are 15 plant species in the Proposed Action Area considered sensitive (NNSA/NFO 2013, 4.1.7.1; Hall et al. 2025). Of these, ten are perennial and five are annual. Indaziflam does not impact existing perennial vegetation, whereas imazapic may impact both perennial and annual species.

3.6.2 Environmental Effects of the No Action Alternative

The No Action Alternative would result in the potential continued loss of habitat for sensitive plant species due to the increased risk in frequency and spread of wildland fires caused by the increased fuel load created by nonnative, invasive annual grasses. The No Action Alternative could result in reduced sensitive plant vigor and reproduction due to competition for limited moisture and nutrients with the invasive grasses.

3.6.3 Environmental Effects of the Proposed Action

The Proposed Action poses a risk to sensitive plant species as a result of exposure from the direct spray of plants and from spray drift. Possible negative effects include one or more of the following: mortality, reduced vigor, abnormal growth, and reduced reproductive output. One or more of these effects could result in the extirpation of a sensitive population or a reduction in the size of the population.

Kestrel Tellevate (2020) found that both monocots and dicots appear more sensitive to exposures in seedling emergence testing than those from vegetative vigor testing for both formulations. This is consistent with indaziflam's mode of action as a preemergent herbicide. Risks to oilseed rape (i.e., canola an annual mustard plant) remained above the level of concern downwind from the application site for distances of at least 900 feet for fine droplets and about 500 feet for coarse droplets downwind following aerial application. The BLM Biological Assessment for using imazapic recommends a 300-foot buffer around terrestrial threatened, endangered, and protected plant species (BLM 2007c).

Beneficial effects of the Proposed Action include reduced competition of sensitive plant species with nonnative, invasive annual grasses, which increases the water and nutrient resources available to sensitive plant species and decreases the risk of wildland fires burning into existing sensitive plant populations by reducing the fuel load of nonnative, invasive annual grasses.

3.6.4 Cumulative Impacts of the Proposed Action

Previous operations at the NNSS included nuclear explosive testing, and experiments using conventional explosives and chemicals. The potential impacts of these activities on vegetation at the site have been studied and monitoring is ongoing (NNSA/NFO 2013).

Current operations at the NNSS include similar activities as in the past, with the exception of nuclear explosive testing which ceased several decades ago. Nuclear explosive testing is not currently conducted at the NNSS. The Proposed Action is expected to contribute minimally to cumulative impacts because protective buffer areas around threatened, endangered, protected, and sensitive plant populations would be established and the resources would be avoided during herbicide application.

There is currently no plan in place to respray areas previously treated with herbicides. Operations would continue at the NNSS but reasonably foreseeable impacts are unknown.

3.6.5 Mitigation Measures

During the annual pretreatment review process, all proposed herbicide treatments would be coordinated with NNSS biologists to avoid or mitigate impacts to areas with sensitive plant species. Mitigation measures may include changing the timing of application and/or the type of herbicide to best accommodate sensitive plant areas. Spray drift would be mitigated by applying herbicides only in low wind conditions, flying low to the ground (e.g., typically <100 feet above ground level, and using adjuvants to maximize droplet size. Treatment areas would be designed to avoid sensitive plant populations, especially the annual species, to the maximum extent feasible. Every effort would be made to avoid application of herbicide within 300 feet of a known perennial sensitive plant population (BLM 2007c, Chapter 4) and 900 feet of a known annual sensitive plant population (Kestrel Tellevate 2020).

The mitigation measures would reduce the likelihood of adverse effects, and posttreatment monitoring would provide valuable feedback about how to modify future treatments to reduce impacts to sensitive plant communities (Hall and Perry 2024).

3.7 Vegetation, Fuels, and Fire Management

3.7.1 Affected Environment

Blackbrush vegetation types appear to be the most vulnerable plant communities to fire on the NNSS, followed by pinyon pine/Utah juniper/sagebrush species (*Pinus monophylla*/*Juniperus osteosperma/Artemisia* spp.) vegetation types, all of which are native species (Hall and Perry 2024; Wills and Ostler 2001).

Blackbrush (*Coleogyne ramosissima*) shrubland covers approximately 72,976 Hectares (ha) (21.6 percent) of the NNSS (about half of this occurs in the Proposed Action Area) and typically occurs at elevations between 1,900 to 5,000 feet at the transition between creosote bush scrub and sagebrush scrub (Ostler et al. 2000). Blackbrush is a slow-growing and long-lived (up to 400 years), densely branched shrub. Blackbrush does not resprout after fire and it is very difficult to reestablish following fire or other disturbances. Blackbrush vegetation communities are extremely slow to recover from fire and may not return to predisturbance conditions for several decades. Following fire, this vegetation community can be expected to be dominated by nonnative annual grasses and forbs for an extended time and basically converted to an annual grassland having lost key ecosystem components (Callison et al. 1985). Invasion by nonnative annual grasses (cheatgrass and red brome) increases the potential for blackbrush communities to burn. Elevations where blackbrush typically grows are also where most of the lightning strikes on NNSS occur. The main threat to this vegetation type is wildland fire (Hall and Perry 2024; Wills and Ostler 2001).

Sagebrush shrubland covers approximately 61,333 ha (18.1%) of the NNSS (all of which occurs in the Proposed Action Area) and typically occurs at elevations between 5,000 and 6,000 feet (Ostler et al. 2000). It is comprised mostly of black sagebrush (*Artemisia nova*) and basin big sagebrush (*Artemisia tridentata*). Black sagebrush typically grows in areas with shallower soils on slopes and ridgetops whereas big sagebrush grows in deeper soils such as valley or drainage bottoms. Sagebrush does not resprout after fire and can be moderately difficult to establish from seed. The sagebrush vegetation community is slow to recover from fire and may not return to predisturbance conditions for many years. However, given the higher elevations where these species grow and the concomitant increased annual rainfall, vegetation recovery is more probable than in blackbrush habitat. Following fire, this vegetation community can be expected to be dominated by nonnative annual grasses and forbs for an extended time. Resprouting shrubs do well but are sparsely distributed and don't control cheatgrass. Perennial grasses may also reestablish and compete with cheatgrass (Hall and Perry 2024; Wills and Ostler 2001). Invasion by cheatgrass has increased the potential for sagebrush communities to burn. The main threat to this vegetation type is wildland fire (Hall and Perry 2024; Wills and Ostler 2001).

Pinyon pine/sagebrush woodland covers approximately 44,852 ha (13.3 percent) of the NNSS (all of which occurs in the Proposed Action Area) and occurs at elevations between 6,000 and 7,600 feet (Ostler et al. 2000). Dominant species found in this woodland type include single-leaf pinyon pine (*Pinus monophylla*), Utah juniper (*Juniperus osteosperma*), black sagebrush, and big sagebrush, none of which resprout after fire. Pinyon pine trees in many areas, especially at the lower elevations of this vegetation community, are showing signs of stress and are dying, which creates a heavy fuel load with the potential to spread wildland fire. The main threat to this vegetation type is wildland fire (Hall and Perry 2024; Wills and Ostler 2001).

The pinyon pine/sagebrush woodland vegetation community is slow to recover from fire and may not return to predisturbance conditions for many years. However, given the higher elevations where these species grow and the increased annual rainfall, vegetation recovery is more probable than in blackbrush or sagebrush habitat. At the highest elevations (usually above 7,000 feet), fire recovery is possible given the increased annual rainfall concomitant with the higher elevation. While cheatgrass may dominate some areas, enough perennial vegetation reestablishes to prevent a complete conversion to an annual grassland. Between 6,000- and 7,000-feet following fire, this vegetation community can be expected to be dominated by nonnative annual grasses and forbs for an extended time. Resprouting shrubs do well but are sparsely distributed and do not control cheatgrass. Perennial grasses may also reestablish and compete with cheatgrass (Hall and Perry 2024; Wills and Ostler 2001).

Wildland fire can be beneficial in certain ecosystems such as sagebrush and pinyon-juniper vegetation types. However, nonnative, invasive annual grasses such as red brome and cheatgrass have drastically altered historic fire regimes and caused ecological disruption of the areas they have invaded (Boyd et al. 2024). Brummer et al. (2016) explained, "A positive feedback between [cheatgrass] and fire exacerbates this negative impact, which further increases [cheatgrass] abundance." Wildland fire in all but the highest elevation habitats of the NNSS results in large-scale conversion from native shrublands and woodlands to annual grasslands that may never recover. This has significant deleterious results on the environment, including degraded ecosystem function (Germino et al. 2016), loss of wildlife and their habitat, increased soil erosion, loss of biodiversity, and increased wildland fire frequency and severity.

More than 800 plant species have been identified on the NNSS (Wills and Ostler 2001). The exact number of species that occur in the Proposed Action Area is unknown but is likely several hundred. Some of these have the potential to be impacted by the Proposed Action. However, because fuels reduction treatments are focused in wildland fire-burned areas, most species have already been drastically impacted by fire.

3.7.2 Environmental Effects of the No Action Alternative

Under the No Action Alternative, recurrent wildland fires would continue to burn in annual grasslands and may spread quickly into adjacent unburned habitat, converting intact shrublands and woodlands into annual grasslands. This conversion would negatively impact native plant species on the NNSS and on adjacent lands.

3.7.3 Environmental Effects of the Proposed Action

The Proposed Action would reduce the invasive, nonnative annual grasses that propagate wildland fires. Short-term adverse impacts may be observed in nontarget plant species such as native grasses and native annual forbs (i.e., herbaceous flowering plants other than grasses).

Indaziflam and imazapic may decrease native bunchgrass seedling emergence and aboveground biomass for up to two years (Terry et al. 2021). Indaziflam has the potential to reduce the density and richness of nontarget native annual seeds in the soil, but the impacts can be debated because the restoration value of native annuals in a burned area is limited when herbicide application is occurring in areas with native perennials (Courkamp and Meiman 2021). Impacted native annual forbs should recolonize treated areas via wind and animal seed dispersal. Adverse impacts to existing native perennial plants are expected to be minimal or negligible. Results from NNSS research trials and other studies have shown no adverse effects to native perennial plant species; rather, a positive response was observed with several native perennial plant species thriving in herbicide-treated plots (Davison et al. 2007, Courkamp et al. 2002, Hall et al. 2025). Herbicide treatment areas would be focused in wildland fire-burned areas dominated by invasive annual grasses rather than intact habitat. As a result, the impacts of herbicide application to nontarget plant species would be negligible, because most of these species would have been destroyed by the fire.

Exposure may occur from direct spray of plants, spray drift, surface runoff, and wind transport. Impacts from surface runoff and wind transport are expected to be negligible given the highly diluted concentration of herbicides dispersed over a large area, the use of adjuvants to adhere the herbicides to soil particles, and low rainfall in the Proposed Action Area. Additionally, because there is no surface disturbance from aerial application, soils would not be disturbed, which drastically reduces wind erosion. Spray drift of at least 900 feet for fine droplets and about 500 feet for coarse droplets were documented when indaziflam was applied aerially to annual mustard plants (Kestrel Tellevate 2020). Spray drift would be mitigated by spraying only in low wind conditions, flying low to the ground (e.g., typically <100 feet above ground level, and using adjuvants to maximize droplet size.

Reduced fine fuels from annual grasses and forbs, whether invasive or native, reduce the total fuel load which can carry wildland fire. In this case, the short-term reduction in fine fuels supports the objectives of fuels and fire management. Long-term impacts make treated areas more resilient to wildland fire by promoting growth of native perennial shrubs, grasses, and forbs that can better compete with establishing red brome and cheatgrass plants. Once an area has burned, the likelihood of another large fire is high with shorter intervals between fires (Whisenant 1990).

3.7.4 Cumulative Impacts of the Proposed Action

Previous operations at the NNSS included nuclear explosive testing, and experiments using conventional explosives and chemicals. The potential impacts of these activities on vegetation at the site have been studied and monitoring is ongoing (NNSA/NFO 2013).

Current operations at the NNSS include similar activities as in the past, with the exception of nuclear explosive testing which ceased several decades ago. Nuclear explosive testing is not currently conducted at the NNSS. No negative cumulative impacts are anticipated from the Proposed Action. The Proposed Action would have long-term beneficial impacts to wildland fire management resources. Reducing hazardous fuel accumulations would restore native plant communities and natural fire regimes. Specifically, indaziflam can be used to manage sites invaded by cheatgrass but treated areas can still retain desired native vegetation (BLM 2005;

SERA 2004). This would improve the overall health of NNSS lands, the quality and quantity of habitat and forage for wildlife, and soil productivity, and would reduce the potential for soil erosion (BLM 2024; Hall and Perry 2024).

There is currently no plan in place to respray areas previously treated with herbicides. Operations would continue at the NNSS but reasonably foreseeable impacts are unknown.

3.7.5 Mitigation Measures

Mitigation for vegetation, fuels, and fire management (NNSA/NFO 2024d) include the following:

- Use of standard fire prevention measures at all times. Conditions that support wildfires can occur any time of the year in southern Nevada.
- According to manufacturers' recommendations, do not apply imazapic in newly burned areas (approximately six months old).
- Minimize spray drift by applying herbicides only in low wind conditions, flying low to the ground (e.g., typically <100 feet above ground level), and using adjuvants to maximize droplet size.
- Design treatment areas to target burned areas dominated by invasive, nonnative annual grass species and avoid intact habitat.

4.0 NOTIFICATIONS

As a result of recent revisions to the DOE regulations, NNSA/NFO is no longer required as part of the NEPA process, to notify Native American tribes and the host state of their intention to prepare an EA. Instead, the tribes and state representatives are engaged through compliance with other environmental requirements, such as the NHPA. The NHPA requires federal agencies to take into account the effects of their activities on historic properties and consult with Native American Tribes and the SHPO concerning those effects.

4.1 Native American Tribes

There are 16 tribes and three major ethnic groups with known historical and cultural ties to the NNSS. All 16 tribes were notified of the Proposed Action via letter dated August 7, 2025, as part of NHPA Section 106 compliance. No responses to the letter have been received to date. Representatives from each of the major ethnic groups were also notified during a teleconference on June 17, 2025. During the teleconference, representatives asked if NNSA/NFO had considered using goats to control invasive plants. As previously noted in Section 2.3, livestock grazing is not a viable option due to radiological, safety, security, and logistical concerns.

4.2 Nevada SHPO

The Nevada SHPO was notified of the Proposed Action via letter dated August 28, 2025, as part of NHPA Section 106 compliance. No response has been received to date.

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APPENDIX A
Applicable Statutes and Regulations

- Clean Air Act of 1970
- Clean Water Act of
- Endangered Species Act of 1973
- Executive Order 11988, Floodplain Management
- Executive Order 11990, Protection of Wetlands
- Gold and Bald Eagle Protection Act of 1940
- Migratory Bird Treaty Act of 1918
- NHPA of 1966
- Wild Free-Roaming Horses and Burros Act of 1971

U.S. Department of Energy
National Nuclear Security Administration
Nevada Field Office
October 2025

FINDING OF NO SIGNIFICANT IMPACT

ENVIRONMENTAL ASSESSMENT FOR AERIAL HERBICIDE APPLICATION FOR WILDLAND FIRE FUELS REDUCTION AT THE NEVADA NATIONAL SECURITY SITE (DOE/EA-2303)

Summary: The U.S. Department of Energy National Nuclear Security Administration Nevada Field Office (NNSA/NFO) has prepared an Environmental Assessment (EA) to evaluate the potential environmental impacts of aerial herbicide application at the Nevada National Security Site (NNSS). The proposed action aims to reduce the risk, frequency, and severity of wildland fires by controlling invasive annual grasses—primarily cheatgrass (*Bromus tectorum*) and red brome (*Bromus rubens*)—which dominate postfire recovery areas and contribute to hazardous fine fuel loads. These grasses are highly flammable, outcompete native vegetation, and perpetuate fire cycles that threaten ecological and cultural resources.

Under the proposed action, NNSA/NFO would apply a mixture of herbicides (indaziflam and imazapic), adjuvants (Grounded and Efficax), and a temporary spray dye (Hash Mark Blue Liquid) using rotary- and fixed-wing aircraft and Unmanned Aerial Vehicles. Treatments would be limited to areas burned by wildland fires north of desert tortoise habitat. Resource-specific protective buffer areas would be established annually based on a pretreatment review of the proposed treatment areas. The annual pretreatment review would be conducted by NNSS Subject Matter Experts (SME) and would be based on the type of resources in the treatment area (e.g., water, cultural resources, sensitive plant populations). Approximately 1,500–2,000 acres would be treated annually, with timing scheduled between September and December to coincide with plant germination and avoid sensitive wildlife activity periods.

The EA evaluated the proposed action and the no-action alternative and included detailed assessments of potential impacts to cultural resources, wildlife, sensitive plant populations, water resources, and vegetation. While short-term adverse effects to nontarget species may occur, long-term benefits include reduced wildland fire risk, frequency, and severity; improved habitat quality; and restored native plant communities.

Mitigation measures that would be implemented to reduce or avoid effects on resources include establishment of protective buffer areas and adherence to manufacturer guidelines and recommendations for herbicide application. Notification of the herbicide application project was sent to the 16 Native American tribes culturally affiliated with the NNSS and the Nevada State Historic Preservation Office as part of compliance with the National Historic Preservation Act. No responses had been received at the time of drafting.

Purpose and Need: The purpose and need for the action is to reduce wildland fire risk, frequency, and severity at the NNSS through reduction of highly flammable invasive species fuel loads. The action supports the objectives of the NNSS Wildland Fire Management Plan.

Analysis: To determine whether the Proposed Action could cause significant environmental effects, an interdisciplinary team of NNSS resource specialists and SMEs were consulted to identify resources on the NNSS that could be affected by the Proposed Action and the potential effects the Proposed Action would have on those resources. The following summarizes the findings:

Resources Reviewed but Not Carried Forward for Analysis: Resources that are not present within the Proposed Action area and resources that are present but would not be impacted by the Proposed Action were not carried forward for analysis. Those resource areas include; air quality, floodplains, groundwater, human health, jurisdictional wetlands and riparian areas, land use, migratory birds, socioeconomics, soils, threatened and endangered candidate animal species, visual resources, waste, and wild horses and burros.

Cultural Resources: Under the Proposed Action, herbicides would be applied to areas affected by past and future wildland fires within the NNSS, covering 843 square miles north of the desert tortoise range. Since future burn locations cannot be predicted, the entire area was considered in the cultural resource review. Only seven percent of this area has been surveyed, revealing nearly 1,600 cultural resources—including prehistoric sites and Cold War-era structures. Because not much of the area has been inventoried, many more undiscovered cultural resources are likely present. Known and expected resource types include petroglyphs, pictographs, prehistoric camps, basketry, ranching and mining sites, and buildings related to nuclear testing.

The Proposed Action may affect cultural resources in three ways: (1) by preventing fire damage, which is a beneficial outcome; (2) by temporarily altering the visual setting due to the use of spray colorant, which typically dissipates within three to five days; and (3) through possible physical interactions between herbicide chemicals and cultural materials. While the first effect offers protection, the second is short-lived and cosmetic. The third remains uncertain, as existing research does not provide conclusive evidence on how the herbicides may impact materials such as rock art, ceramics, or masonry. Further study is needed to understand these potential effects.

Fish and Wildlife Excluding Federally Listed Species: The Proposed Action area lies within and adjacent to lands that support wildlife typical of the Great Basin Desert and its transition to the Mojave Desert. Species in the area may include small mammals, birds, reptiles, insects, and rodents, with biological diversity influenced by factors such as topography, vegetation, water availability, and season.

Aerial application of herbicides under the Proposed Action may temporarily displace wildlife due to human presence and noise during treatment. However, the long-term benefits of reducing wildland fire risk include preserving undisturbed habitats, which supports the protection and stability of wildlife populations. Toxicological assessments indicate that acute exposure risks to terrestrial fauna from the herbicides imazapic and indaziflam are negligible. Indaziflam has been classified by the Environmental Protection Agency as “practically nontoxic” to mammals, birds, honeybees, and earthworms. While some chronic effects were observed in mammals and birds consuming vegetation treated with indaziflam, these studies assumed unrealistic dietary scenarios that exceed label-recommended application rates. Under the Proposed Action, herbicide use would be limited to labeled rates, and wildlife would continue to forage in untreated areas, making such exposure unlikely. No toxicity data is currently available for reptiles, amphibians, or monarch butterflies. Monarch butterflies are proposed for listing as threatened under the Endangered Species Act but have only rarely been observed on the NNSS. Imazapic may negatively affect milkweed, a critical plant for monarch butterflies, due to its action on broadleaf species, while indaziflam targets only seed germination and does not impact established milkweed.

Indirect adverse effects on wildlife may include reduced availability of preferred food sources, habitat, and breeding areas due to decreased plant diversity and habitat disruption. These changes could lead to lower population densities and increased vulnerability to predation from loss of cover. However, such impacts are expected to be less severe than those resulting from wildland fires. The extent of both direct and indirect impacts will vary depending on herbicide effectiveness, terrain characteristics such as soil type and slope, and weather conditions at the time of application. In the long term, the Proposed Action is expected to promote the growth of native perennial vegetation, reduce susceptibility to large-scale fires, and improve the availability of native forage and cover, thereby enhancing overall habitat quality for wildlife.

Invasive, Nonnative Annual Grasses: Red brome and cheatgrass are the two main nonnative, invasive grasses contributing to increased wildland fire risk on the NNSS. While they offer brief forage and erosion control, their ecological harm far outweighs any benefits. Bromes germinate earlier than native plants, depleting soil moisture and hindering native growth. Their rapid growth and high biomass production create highly flammable fine fuels that persist for two–three years, even in seasons with poor germination. These grasses thrive in disturbed and previously burned areas, perpetuating a cycle of elevated fire risk across the landscape.

The Proposed Action aims to lower the risk, frequency, and severity of future wildland fires on the NNSS by reducing invasive species in areas burned by wildland fires. By decreasing fire fuels, native perennial vegetation would become more resilient and better able to compete with invasive species, ultimately improving wildlife habitat and restoring ecosystem function. Research supports the effectiveness of the herbicides imazapic and indaziflam in providing long-term control of invasive annual grasses and supporting the recovery of native plant communities.

Nonjurisdictional Water Resources: Although they are not considered or regulated as jurisdictional wetlands, there are many natural and constructed water sources in the Proposed Action area that are important resources. While there are both perennial and ephemeral water sources at the NNSS, most are ephemeral (intermittent) with water present only a few weeks to a few months during the year.

The Proposed Action is designed to preserve the integrity of upland habitats surrounding water resources, thereby supporting high-quality wildlife habitat. While aerial herbicide application carries the potential for spray drift into nearby water sources, any resulting deposition is expected to have minimal impact due to low toxicity and natural dilution. These potential effects are primarily relevant to perennial water sources on the NNSS, as ephemeral sources are typically dry outside of storm events and do not support aquatic plant or animal life. Overall, adverse effects to aquatic ecosystems from herbicide drift are considered unlikely.

Threatened, Endangered, Protected, and Sensitive Plant Populations: No threatened, endangered, or protected plant species occur on the NNSS. However, there are 15 plant species in the Proposed Action area considered sensitive. Of these, ten are perennial and five are annual. Indaziflam does not impact existing perennial vegetation, whereas imazapic may impact both perennial and annual species.

The Proposed Action presents potential risks to sensitive plant species through direct herbicide spray and spray drift, which may lead to mortality, reduced vigor, abnormal growth, or diminished reproductive success. These effects could result in population declines or even local extirpation. Research indicates that both monocots and dicots are more vulnerable during seedling emergence than during vegetative growth, aligning with indaziflam's role as a preemergent herbicide. Notably, oilseed rape showed risk levels above concern at distances up to 900 feet for fine droplets and 500 feet for coarse droplets following aerial application. To mitigate these risks, the Bureau of Land Management recommends a 300-foot buffer around threatened, endangered, and protected plant species when using imazapic.

Despite these risks, the Proposed Action also offers ecological benefits. By reducing competition from invasive annual grasses, sensitive plant species may gain improved access to water and nutrients. Additionally, lowering the fuel load of invasive grasses decreases the likelihood of wildland fires encroaching on sensitive plant populations, thereby enhancing their long-term survival and habitat stability.

Vegetation, Fuels, and Fire Management: Wildland fire poses a major threat to native plant communities on the NNSS, particularly blackbrush shrubland, sagebrush shrubland, and pinyon pine/sagebrush woodland. Blackbrush, covering 21.6 percent of the NNSS, is especially vulnerable due to its inability to resprout after fire and its extremely slow recovery—often taking decades. Fires in blackbrush areas typically lead to long-term dominance by nonnative grasses like cheatgrass and red brome, which further increase fire risk.

Sagebrush shrubland, found at higher elevations, also struggles to recover postfire, though increased rainfall improves its chances. Like blackbrush, sagebrush does not resprout and is often overtaken by invasive grasses after fire. Pinyon pine/sagebrush woodland, occurring at the highest elevations, faces similar challenges. Dead and stressed pinyon pines contribute to heavy fuel loads, and while recovery is more likely at higher elevations, cheatgrass still threatens long-term ecosystem stability.

Overall, wildland fire—exacerbated by invasive grasses—has disrupted historic fire regimes and led to widespread conversion of native habitats into flammable annual grasslands. This transformation results in degraded ecosystem function, loss of biodiversity and wildlife habitat, increased soil erosion, and more frequent and severe fires. Although over 800 plant species are known on the NNSS, many have already been impacted by fire, and fuels reduction efforts will focus on these burned areas.

The Proposed Action is intended to reduce invasive, nonnative annual grasses that contribute to wildland fire propagation. While short-term adverse effects may occur in nontarget native plant species—particularly native grasses and annual forbs—these impacts are expected to be limited. Herbicides such as indaziflam and imazapic may temporarily suppress native bunchgrass seedling emergence and biomass, and reduce the density and diversity of native annual seeds in the soil. However, the ecological value of native annuals in burned areas is limited, especially where native perennials are present. Native annual forbs are expected to recolonize treated areas through natural seed dispersal, and existing native perennial plants are anticipated to experience minimal or negligible impacts. Research from the NNSS and other studies has shown that native perennials often respond positively to herbicide treatments, thriving in treated plots.

Herbicide applications would be concentrated in areas already affected by wildland fire and dominated by invasive annual grasses, not in intact habitats. Consequently, most nontarget species in these areas would have already been lost to fire, making additional herbicide-related impacts negligible. Potential exposure pathways include direct spray, spray drift, surface runoff, and wind transport. However, runoff and wind-related impacts are expected to be minimal due to low rainfall, the use of soil-binding adjuvants, and the absence of surface disturbance from aerial application. Spray drift distances of up to 900 feet for fine droplets and 500 feet for coarse droplets have been documented, but mitigation measures—such as spraying in low wind conditions, flying close to the ground, and using droplet-size adjuvants—would reduce this risk.

In the short term, reducing fine fuels from annual grasses and forbs—whether invasive or native—supports fire management goals by lowering the total fuel load. Over the long term, treated areas are expected to become more resilient to wildland fires through the recovery and dominance of native perennial shrubs, grasses, and forbs, which are better able to compete with invasive species like red brome and cheatgrass. This resilience is critical, as burned areas are more susceptible to recurring fires with shorter intervals between events.

Mitigation Measures: The Proposed Action includes annual pretreatment reviews to identify avoidance areas and incorporate the latest data relevant to herbicide application impacts. For known cultural resources, mitigation measures would include delineating treatment areas in consultation with SMEs, providing geospatial data to ensure accuracy, excluding identified avoidance areas from treatment, and conducting posttreatment site visits to confirm the resources were avoided. Because most of the Proposed Action area has not been inventoried and herbicide effects on cultural resource materials are unknown, any new evidence of adverse impacts would prompt consultation with the Nevada State Historic Preservation Officer under Section 106 of the National Historic Preservation Act.

Pretreatment reviews would also consider ecological resources. Sensitive pollinators and their host plants, such as monarch butterflies and milkweeds, would be considered when selecting treatment areas and timing. Water resources would be identified and protected with buffer areas that would require avoiding herbicide application 900 feet or greater from known perennial water sources to prevent spray drift. Sensitive plant populations would be similarly protected, with buffers of 300 feet for perennial species and 900 feet for annuals. Herbicides would only be applied in low wind conditions, at low altitudes, and with adjuvants to reduce drift and protect nontarget vegetation.

Additional mitigation for vegetation, fuels, and fire management would include avoiding use of imazapic in newly burned areas (less than six months old), targeting areas dominated by invasive grasses, and avoiding intact native habitats. Posttreatment monitoring of vegetation in the treated areas would inform future adjustments to minimize ecological impacts.

Reasonably Foreseeable Cumulative Impacts: Previous operations at the NNSS, including nuclear explosive testing and experiments using conventional explosives and chemicals, have had uncertain impacts on cultural resources and invasive species. The potential effects on wildlife, vegetation, and water resources from these operations have been studied and continue to be monitored. Current operations at the NNSS mirror past activities, excluding nuclear explosive testing which ceased several decades ago. Nuclear explosive testing is not currently conducted at the NNSS. The Proposed Action is expected to contribute minimally to cumulative impacts across known resources due to protective measures such as the establishment of buffer areas and targeted herbicide application. Herbicides proposed for use are low in toxicity, do not bioaccumulate, and offer long-term ecological benefits, including improved habitat quality and reduced wildland fire fuel loads.

The EA determined that cumulative impacts from the Proposed Action at the NNSS, when considered alongside past, present, and reasonably foreseeable future actions, are not significant.

Determination: Based on the analysis in the EA, NNSA has determined that the Proposed Action is not a major federal action significantly affecting the quality of the human environment, within the meaning of the National Environmental Policy Act of 1969 (42 United States Code 4321 et seq.). Therefore, the preparation of an Environmental Impact Statement is not required. NNSA is issuing this Finding of No Significant Impacts (FONSI) for the Proposed Action, concluding the National Environmental Policy Act process for this action. Mitigation is not necessary to render the impacts of the Proposed Action not significant.

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Betty L. Huck
Manager, NNSA/NFO