USDA

Nationwide Aerial Application of Fire Retardant on National Forest System Lands

Draft Supplemental Environmental Impact Statement

FOREST SERVICE
US
DEPARTMENT OF AGRICULTURE

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How to Provide Comments: Electronic comments can be provided at **https://cara.fs2c.usda.gov/Public/CommentInput?project=60450**

Comment Deadline: The opportunity to comment on this draft supplemental environmental impact statement ends 45 days following the date of publication of the Notice of Availability (NOA) in the Federal Register (see § 218.25(a)(2)). The Federal Register notice can be found at the Interagency Wildland Fire Chemicals Policy and Guidance website.

Abstract: This Draft Supplemental Environmental Impact Statement (SEIS) supplements portions of the Nationwide Aerial Application of Fire Retardant Final Environmental Impact Statement (USDA Forest Service 2011a) by updating analysis to consider modifications to the proposed action, new aerial retardant chemicals, information regarding aerial retardant use since 2011, and updated lists of threatened, endangered, proposed, and candidate species and Regional Forester Sensitive Species. The proposal is to continue aerial application of retardant as described in the 2011 Record of Decision (USDA Forest Service 2011d), with some modifications. The purpose and need, and the no action and one action alternative remain unchanged from the Final Environmental Impact Statement (FEIS), whereas Alternative 3 (proposed action) has been modified to clarify terminology, update requirements for coordination and for monitoring, and add procedures for adding products to the Qualified Products List.

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Summary

In 2020 the USDA Forest Service prepared a Supplemental Information Report (USDA Forest Service 2020a) to assess information that has changed since the Nationwide Aerial Application of Fire Retardant on National Forest System Lands, Final Environmental Impact Statement (FEIS) (USDA Forest Service 2011a) and Record of Decision (USDA Forest Service 2011d) were published in 2011. The report identified changes to lists of federally listed and Regional Forester sensitive species, new retardant formulations, and additional available data, and recommended modifications to the preferred alternative. It recommended preparation of a Supplemental Environmental Impact Statement (SEIS) for the Nationwide Aerial Application of Fire Retardant on National Forest System Lands. This draft SEIS has been completed and addresses those changes, summarized here.

The purpose of and need for the proposed action (SEIS Chapter 1) remain the same as in the 2011 FEIS. The modified proposed action (Modified Alternative 3; SEIS section 2.1.4), includes updated language and clarification of terminology, adds procedures for approving use of new aerial retardant products in compliance with requirements of the Endangered Species Act, and changes monitoring requirements. Chapter 3 of this SEIS provides updates and additions to the analysis of impacts of the modified proposed action on the resources that were analyzed in the 2011 FEIS (SEIS Chapter 3). Those updates are summarized below

- Data on aerial fire retardant use, intrusions (formerly termed 'misapplications') into avoidance areas, and fire size and frequency have all been updated to include the period from 2012 through 2019. This updated information has been considered in analyses of impacts to resources considered in the 2011 FEIS.
- An analysis of climate and carbon effects related to wildfires and to aerial fire retardant use has been added.
- Consideration has been given to potential impacts from the use of aerial retardants that contain ingredients not analyzed in the 2011 FEIS. Updated risk assessment information and toxicity limits for aerially delivered retardants is documented and included in resource analysis updates as needed.
- Analysis of impacts to species currently listed as threatened, endangered, or proposed under the federal Endangered Species Act has been completed and documented in Biological Assessments provided to the USDI Fish and Wildlife Service and to NOAA Fisheries. A summary of determinations of effect for all listed aquatic, plant, and wildlife species is provided in the SEIS and as follows:
    - A total of 148 aquatic species were analyzed, with determinations of no effect for 59 species; may affect but not likely to adversely affect for 57 species; and may affect, likely to adversely affect for 32 species.
    - A total of 171 plant species were analyzed, with determinations of no effect for 66 species; may affect but not likely to adversely affect for 53 species; and may affect, likely to adversely affect for 52 species. Critical habitats for 33 plant species were also analyzed, 4 of which would experience no effect, and 29 of which may be affected but are not likely to be adversely affected.

- A total of 121 wildlife species were analyzed, with determinations of no effect for 34 species; may affect but not likely to adversely affect for 58 species; and may affect, likely to adversely affect for 29 species. Critical habitats for 45 wildlife species were also analyzed, 10 of which would experience no effect, 29 of which may be affected but are not likely to be adversely affected, and 6 of which would be likely to experience adverse effects.

The Glossary and Literature Cited sections include only information that has changed or been added since the FEIS and ROD were published. Similarly, Appendices are included with this SEIS only if they have changed since publication of the FEIS. Updated Appendices include those containing fire and aerially delivered retardant use and intrusion data for 2012 through 2019; information on screening processes used for aquatic, plant, and wildlife species analyses; lists of federally listed species and determinations; and updated information on the process for evaluating and qualifying long term (aerially delivered) retardants.

1 Purpose of and Need for Action

1.1 Introduction

In October 2011 the Forest Service released the Nationwide Aerial Application of Fire Retardant on National Forest System Lands, Final Environmental Impact Statement (FEIS) (USDA Forest Service 2011a). The FEIS disclosed the environmental impacts that would likely result from use of aerially delivered retardant on National Forest System lands under the proposed action or alternatives to the proposed action.

In May 2020 the Forest Service published the Nationwide Aerial Application of Fire Retardant on National Forest System Lands, Supplemental Information Report (USDA Forest Service 2020a), which recommended preparation of a Supplemental Environmental Impact Statement (SEIS) to analyze for changed assumptions and conditions, complete analysis of potential effects of retardant use on Regional Forester sensitive species, and establish procedures for analysis of new retardant formulations and chemicals. This SEIS has been prepared to address those identified needs.

This document is a supplement to the 2011 FEIS and does not replace it. Information in this document is in addition to information in the FEIS, replacing that information only where explicitly stated. If information is different or contradictory between the two documents, the information in this SEIS supersedes that in the FEIS. References are made throughout this document to corresponding sections of the FEIS in order to aid in comprehension.

1.2 Project Background

Section 1.2 on pages 20-21 of the FEIS summarizes the history of the proposal for use of aerially delivered retardant on National Forest System lands through completion of the FEIS in October 2011.

Endangered Species Act section 7 consultations were initiated with submission of Biological Assessments to the United States Fish and Wildlife Service (USDA Forest Service 2011b) and National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (USDA Forest Service 2011c). Consultations were completed when Biological Opinions were issued by the NOAA National Marine Fisheries Service (US Department of Commerce 2011) and the United States Fish and Wildlife Service (FWS) (USDI Fish and Wildlife Service 2011). Supplemental Endangered Species Act section 7 consultations were carried out in 2015 and in 2017 to address changes to the lists of threatened and endangered species. Consultation documents, including the Biological Opinions, expired on January 1, 2022.

The Record of Decision (ROD) was signed in December 2011 (USDA Forest Service 2011d), implementing FEIS Alternative 3, with modifications resulting from consultation under section 7 of the Endangered Species Act (ESA).

In May 2020 the Forest Service published the Nationwide Aerial Application of Fire Retardant on National Forest System Lands, Supplemental Information Report (USDA Forest Service 2020a). That report evaluated new information and changed conditions that have occurred since the Record of Decision was signed in 2011. Specifically, it identified:

- changes to species listed under the ESA or identified as Regional Forester sensitive species
- changes in retardant formulations and in amounts of aerially delivered retardants used each year
- changes in the avoidance areas mapped under the 2011 decision,
- new information about reporting of aerially delivered retardant intrusions into avoidance areas
- changes to information and assumptions used in analysis in the 2011 FEIS.

Because of these changes and the impending expiration of existing consultation documents, the Supplemental Information Report recommended that the Forest Service develop a new proposed action, complete new consultations for the updated list of species, and prepare a Supplemental Environmental Impact Statement (SEIS) to address new species and other changed conditions.

The Forest Service drafted an updated proposed action and in August 2020 published in the Federal Register a Notice of Intent to prepare a supplemental environmental impact statement (Federal Register Vol. 85 No. 162; Thursday, August 20, 2020; pages 51403-51405). The notice of intent included draft language of the proposed action (Modified Alternative 3).

Consultations with NOAA Fisheries Management (formerly NOAA National Marine Fisheries Service) and the FWS are underway as of the publication of this draft SEIS. Updated analyses and determinations for ESA-listed species are summarized in sections 3.4, 3.5, and 3.6 of Chapter 3 of this SEIS.

1.3 Aerially Delivered Fire Retardant Background

Page 21 of the FEIS provides a summary of the history and context of fire retardant use on National Forest Service lands.

Since 2011, aerially delivered fire retardant has been used according to the direction in the 2011 Record of Decision (USDA Forest Service 2011d). Under the 2011 decision, fire retardant may be applied in avoidance areas only in cases where human life or public safety is threatened and retardant use within avoidance areas could be reasonably expected to alleviate that threat. Clarification of the Record of Decision has been provided in the Implementation Guide for Aerial Application of Fire Retardant, first published in 2012 and subsequently updated as needed (current version May 2019). The decision and the Implementation Guide provide guidance for avoidance area mapping, aerial operations, and reporting and monitoring of intrusions. An updated summary of aerial fire retardant use and other fire management information since 2010 is provided in Section 3.1 (Fire Retardant use in Wildland Fire Management) of this SEIS. Most data used in analyses in the SEIS are from the years 2012 through 2019, unless otherwise noted, reflecting the years during which the 2011 Record of Decision (USDA Forest Service 2011d) has been implemented. Data from 2020 were not yet available for use when the analyses supporting this SEIS were completed.

1.4 Purpose and Need for Action

The overall purpose of and need for action has not changed from the description on page 22 of the FEIS.

The purpose of supplementing the 2011 FEIS is to address new information and changed conditions since the Record of Decision was signed in 2011.

1.5 Scope

The scope of the proposed action and the environmental effects analysis has not changed from the description on pages 22-23 in the FEIS.

1.6 Proposed Action

The Forest Service proposes to continue aerial application of retardant as described in the 2011 Record of Decision (USDA Forest Service 2011d), with some modifications that include:

- wording changes to provide clarity and improve consistency
- updates to definitions of avoidance areas
- replacement of the term ‘misapplication’ with the term ‘intrusion’
- updates to coordination requirements
- updates to intrusion monitoring requirements, and
- procedures for addition of retardant products to the Qualified Products List.

Refer to Chapter 2 of this SEIS for a detailed description of the proposed action (Modified Alternative 3).

1.7 Decision Framework

The decision framework remains the same as described on page 24 of the FEIS.

1.8 Public Involvement

Public involvement through release of the FEIS in 2011 is described in pages 24- 26 of the FEIS.

On August 20, 2020 a notice of intent was published in the Federal Register announcing the intention of the Forest Service to prepare a Supplemental Environmental Impact Statement (Federal Register Vol. 85 No. 162; Thursday, August 20, 2020; pages 51403-51405).

1.9 Issues

The issues discussed on pages 26-28 of the FEIS remain unchanged.

The Supplemental Information Report (USDA Forest Service 2020a) identified new information and changed conditions that are summarized in section 1.2 of this SEIS, and are addressed through modifications to the proposed action, new consultation on species listed under the ESA, and additional or updated analysis. In addition, climate and carbon effects related to wildfires and to aerial fire retardant were identified as an issue, and a section was added to the SEIS accordingly.

2 Alternatives, Including the Proposed Action

This chapter summarizes information about the alternatives considered in detail in the FEIS and adds a detailed description of the modified proposed action (Modified Alternative 3. Information about alternatives not considered in detail remains unchanged from the descriptions and discussions found on pages 38-41 of the FEIS.

2.1 Alternatives Considered in Detail

The FEIS analyzed a total of three alternatives, including a No Action alternative and two Action Alternatives. All alternatives remain the same as in the FEIS, but this SEIS adds Modified Alternative 3, which is based on findings of the Five-Year Review (USDA 2017), the Supplemental Information Report (USDA Forest Service 2020a), and several years of experience implementing the ROD (USDA Forest Service 2011d).

Components of the original three alternatives are summarized below for ease of review; refer to the FEIS for detailed descriptions. Modified Alternative 3 is described below in detail, along with a comparison of Modified Alternative 3 with Alternative 3 as implemented per the ROD (Table 1). This section also includes a comparison of all alternatives, including Modified Alternative 3 (Table 2).

2.1.1 Alternative 1 – No Aerial Application of Fire Retardant (No Action)

Under this alternative, the Forest Service would discontinue the aerial application of fire retardant for fires occurring on National Forest System (NFS) lands. Aerial application of water would continue to be available for use by incident commanders as a fire suppression tool. This constraint on aerial retardant use would apply only to National Forest System lands.

2.1.2 Alternative 2 – Continued Aerial Application of Fire Retardant Under the 2000 Guidelines, Including the 2008 Reasonable and Prudent Alternatives (2011 Proposed Action)

Under this alternative, the Forest Service would continue aerial application of retardant and permanently adopt the 2000 Guidelines for Aerial Delivery of Retardant or Foam Near Waterways (hereafter referred to as the 2000 Guidelines) and the 2008 Reasonable and Prudent Alternatives as identified by the U.S. Fish and Wildlife Service (FWS) and National Oceanic and Atmospheric Administration (NOAA) Fisheries.

The guidelines include 300-foot buffers, in which aerially-delivered fire retardant would not be applied, on either side of waterways. Deviations from the guidelines would be allowed when specified circumstances make alternative line construction unavailable as a tactic, or when the unit administrator determines that life or property is threatened and retardant can alleviate that threat or that the risk of damage to natural resources outweighs the risk of impacts to aquatic life. Refer to pages 30-31 of the FEIS for a full description of this alternative.

2.1.3 Alternative 3 – Continued Aerial Application of Fire Retardant, Using Aerial Application of Fire Retardant Direction and Adopting the 2008 Reasonable and Prudent Alternatives (2011 Preferred Alternative and Decision)

This alternative has been implemented since 2011 when the ROD was signed. It adopts the Aerial Application of Fire Retardant Direction to replace the 2000 Guidelines, and implements the 2008 Reasonable and Prudent Alternatives. Deviation from that direction is allowed if life or public safety is threatened and retardant can alleviate that threat. This alternative consists of four major components:

- Aircraft Operational Guidance to ensure that retardant drops are not made within buffers or established avoidance areas or on certain cultural or historic resources.
- Avoidance Area Mapping Requirements for mapping both aquatic and terrestrial avoidance areas, including protocols for a standardized nationwide map template.
- Annual Coordination Requirements to ensure that the most current information is maintained and is available to pilots and fire managers.
- Reporting and Monitoring Requirements for aerial retardant applications that occur in waterways or other avoidance areas, for determining whether under-reporting of intrusions is occurring and for monitoring impacts of aerial retardant drops that occur on cultural or historic resources.

The ROD also incorporated terms and conditions resulting from ESA section 7 consultation on the preferred alternative.

Refer to pages 2-5 of the ROD for a full description of this alternative as implemented.

2.1.4 Modified Alternative 3: Continued Aerial Application of Fire Retardant, with Modifications (SEIS Proposed Action)

This alternative would allow aerially applied fire retardants, included now or in the future on the Forest Service Qualified Products List, to be used on NFS lands as follows:

- Aerial Retardant drops would be prohibited in aerial retardant avoidance areas (see definition below), which include:
    - Waterways or their buffers, whether mapped or not, when water is present (also referred to as aquatic avoidance areas)
    - All or part of the habitat of Endangered Species Act threatened, endangered, proposed, or candidate species or Regional Forester sensitive species, as mapped per the requirements described in the “Aerial Retardant Avoidance Areas Mapping Requirements” section of this alternative
    - Areas mapped by the local unit
- The above direction would be mandatory nationwide except when human life or public safety are threatened and retardant use in the aerial retardant avoidance area could be reasonably expected to alleviate the fire threat.
- When an intrusion (formerly termed misapplication’; see definition below) occurs for any reason it would be reported, assessed for impacts, monitored, and remediated as necessary.

The definition of 'aerial retardant avoidance area' has been updated to clarify its purpose and ensure consistency in use. An aerial retardant avoidance area (also referred to simply as 'avoidance area') is defined as *an area in which application of aerial fire retardant is prohibited in order to avoid, limit, or mitigate potential impacts to specified resources*.

- The term 'aquatic avoidance area' refers to any avoidance area, whether mapped or not, that is based on the presence of waterways, or as mapped to reduce impacts to Endangered Species Act threatened, endangered, proposed, or candidate species or critical habitat or Regional Forester sensitive species or habitat associated with waterways, waterbodies, or riparian areas.
- The term 'terrestrial avoidance area' refers to any avoidance area that is mapped to protect Endangered Species Act threatened, endangered, proposed, or candidate species or critical habitat or Regional Forester sensitive species or habitat or other resources that are not associated with waterways or riparian areas.

The term 'misapplication' has been replaced by the term 'intrusion' for clarity of meaning. An intrusion is defined as *the intentional or unintentional application of aerial fire retardant into an aerial retardant avoidance area*.

The term 'waterway' in this context includes but is not limited to perennial streams, intermittent streams, lakes, ponds, identified springs, reservoirs, vernal pools, wetlands, peatlands, and riparian vegetation.

In addition to the above direction, this alternative includes five components that provide specific direction for aircraft operations, aerial retardant avoidance area mapping, coordination, reporting and monitoring, and procedures for additions to the Qualified Products List, as described below. Additional information on implementation of these components, as well as guidance on operations planning and on the role and function of resource specialists are found in the Implementation Guide for Aerial Application of Fire Retardant (USDA 2019 or subsequent versions).

Aircraft Operational Guidance

This guidance shall not require pilots to fly in a manner that endangers their aircraft or other aircraft or structures, or that compromises the safety of ground personnel or the public.

Operational guidance to ensure retardant drops are not made within avoidance areas:

Incident commanders and pilots should follow guidance in the current version of the Implementation Guide for Aerial Application of Fire Retardant (USDA 2019 or subsequent versions), which will be updated as needed. This guidance includes:

- Requirements for providing pilots with maps or other information about the location of all avoidance areas on the unit
- Information on performing dry runs or other methods for ensuring retardant is not applied in avoidance areas
- Information on when and how to terminate and resume application of fire retardant when approaching and departing avoidance areas

- Guidance on flight conditions that allow for safe and effective use of retardant, including keeping retardant out of avoidance areas

Operational guidance to limit potential impacts outside of avoidance areas to species listed under the Endangered Species Act or to Regional Forester Sensitive species:

Whenever practical, agency administrators and incident commanders shall use water or other less toxic suppressants in habitats of species listed under the Endangered Species Act or certain Regional Forester sensitive species, where those habitats are not mapped as avoidance areas.

Operational guidance to provide protection of cultural resources, including historic properties, traditional cultural resources, and sacred sites:

These resources cannot be mapped using a national protocol or addressed with a standard prescription that would apply to all instances. Cultural resources specialists, archaeologists, and tribal liaisons would assist on a case-by-case basis in the consideration of effects and alternatives for protection when aerial application of fire retardant is ordered. Incident commanders would consider the effects of aerial applications on known or suspected historic properties, any identified traditional cultural resources, and sacred sites.

Avoidance Area Mapping Requirements

All forests and grasslands would review and update maps annually, following current national mapping protocols described in the Implementation Guide for Aerial Application of Fire Retardant (USDA 2019 or subsequent versions).

Requirements for mapping or identifying aerial retardant avoidance areas are as follows:

- Any waterway (including but not limited to perennial streams, intermittent streams, lakes, ponds, identified springs, reservoirs, vernal pools, wetlands, peatlands, and riparian vegetation) in which water is present at the time of retardant application, and buffers extending no less than 300 feet on either side of a waterway, is considered an avoidance area (also called aquatic avoidance area), whether mapped or not.
- Mapping of waterways that are dry at the time of retardant application is not required, but these may be included in avoidance areas where there is a potential for downstream effects to occur.
- Map avoidance areas where aerial application of fire retardant may impact one or more aquatic or terrestrial Endangered Species Act threatened, endangered, proposed, or candidate plant or animal species or designated critical habitat.
- Map avoidance areas where aerial application of fire retardant may impact certain aquatic or terrestrial Regional Forester sensitive species or their habitat.
- Avoidance areas may be adjusted or established based on local conditions, including to comply with forest plan requirements such as those for Species of Conservation Concern or to protect other biological or cultural resources. Avoidance area buffers around waterways may not be less than 300 feet on either side of a waterway in which water is present but may be increased where needed. Adjustments related to Endangered Species Act threatened, endangered, proposed, and candidate species would be coordinated with the local offices of the United States Department of Interior Fish and Wildlife Service and

National Oceanic and Atmospheric Administration National Marine Fisheries Service (hereafter referred to as the 'Services').

- Consult with local tribes to identify any avoidance areas needed to protect cultural resources or sacred sites.

Annual Coordination

The Forest Service would coordinate annually with:

- Local Services offices
- Aviation managers and pilots
- Cooperators/other agencies

Coordination would ensure that requirements of the provisions of this alternative are met, and would maintain relationships and allow problem resolution to occur at the lowest management level. Guidance on coordination meetings would be provided in the Implementation Guide for Aerial Application of Fire Retardant (USDA 2019 or subsequent versions).

Reporting and Monitoring Requirements

The Forest Service would maintain a database for reporting intrusions of aerially applied fire retardant into avoidance areas. Intrusion reporting requirements are described in the Implementation Guide for Aerial Application of Fire Retardant (USDA 2019 or subsequent versions), and include requirements for upward reporting to the Services for any intrusions into avoidance areas for any threatened, endangered, proposed, or candidate species or critical habitat. The Forest Service would provide to the Services annual reports summarizing retardant use and intrusions, as well as a list of intrusions and a summary of observations and actions for each intrusion.

If a retardant drop occurs on a cultural resource, a traditional cultural property, or a sacred site, then the site condition would be assessed by a qualified archaeologist and reported to the State Historic Preservation Officer and, if appropriate, tribal representatives including the Tribal Historic Preservation Officer. If the affected resource is a sacred site or a traditional cultural property, then tribal notification and consultation would be required as part of the determination of effects. If the effect is found to be adverse, then the agency would consult with the tribe to determine an appropriate course of action to mitigate or resolve the adverse effect.

Procedures for Additions to the Qualified Products List

Private companies submit retardants to the Forest Service for potential addition to the Qualified Products List. New products or new formulations of existing products must meet Forest Service specifications for long-term retardant (United States Department of Agriculture, Forest Service, Specification 5100-304 Long-term Retardant, Wildland Firefighting) to be included on the Qualified Products List. In addition to meeting those specifications, any retardant added to the Qualified Products List would meet the requirements of the Endangered Species Act as follows:

- Products or new formulations do not require additional consultation as long as the maximum extent and duration of effects of the new products do not exceed the effects of other products already considered in the biological assessments and biological opinions for this action. Products will generally meet these criteria when the percentages of retardant

salts, thickeners, coloring agents, and performance ingredients in the total mixed product are similar to those in products for which consultation has been completed. Retardant salts may include diammonium phosphate, monoammonium phosphate, ammonium polyphosphate, and magnesium chloride. The toxicity levels must not exceed those of currently approved products, and there must be no new identified risk factors. The Fish and Wildlife Service and NOAA Fisheries will be notified of additions to the Qualified Products List.

- Products or new formulations that do not meet the above criteria would require re-initiation of consultation with the Services. The product would not be eligible for addition to the Qualified Products List until all required tests and consultations are completed.

In the future, any retardant that is added to the Qualified Products List could be used under the direction provided in this alternative.

2.2 Comparison of Alternatives

Changes between FEIS Alternative 3 and Modified Alternative 3 are displayed in Table 1 below, with explanatory text to aid in understanding differences between the two alternatives. This table is organized to compare corresponding components of the alternatives, which means that components may be organized differently in Table 1 than they appear in the FEIS and in the section 2.1.4 of this document. Wording displayed in Table 1 is summarized for some components; for comparison of the full text of each, refer to the ROD (pp. 2-5) and the FEIS (section 2.1.3, pages 31-33) for the text of the decision and the original Alternative 3, and to section 2.1.4 of this document for the full text of Modified Alternative 3. Comparison of all alternatives, including the No Action Alternative (Alternative 1), FEIS Alternatives 2 and 3, and Modified Alternative 3, is in Table 2 below.

Table 1. Comparison of components of the 2011 decision (Alternative 3, the FEIS Preferred Alternative) and the SEIS Proposed Action (Modified Alternative 3)

	Decision (Alternative 3)	Proposed Action (Modified Alternative 3)	Notes on Modifications
	GENERAL	GENERAL	
Decision to be made	The Selected Alternative approves the use of aerially applied fire retardant	This proposal would allow aerially applied fire retardants, included now or in the future on the Forest Service Qualified Products List, to be used on National Forest System lands.	Adds approval procedure for use of retardants added to the Qualified Products List

	Decision (Alternative 3)	Proposed Action (Modified Alternative 3)	Notes on Modifications
Where decision applies	Aerial retardant drops are not allowed in mapped avoidance areas, or in waterways	Aerial retardant drops are prohibited in avoidance areas …which include … waterways or their buffers, whether mapped or not, when water is present; all or part of [listed or sensitive species] habitat as mapped …or avoidance areas mapped by the local unit.	Clarifies that waterways may not require avoidance if water is not present, and allows for avoidance areas mapped by local units
Exceptions	This national direction is mandatory and would be implemented except in cases where human life or public safety is threatened and retardant use within avoidance areas could be reasonably expected to alleviate that threat.	This national direction is mandatory and would be implemented except where human life or public safety are threatened and retardant use in the avoidance area could be reasonably expected to alleviate the fire threat.	Minor, clarifying edits
Definition: Aerial Retardant Avoidance Areas	A protection area surrounding a listed species' habitat develop[ed to mitigate or avoid possible impacts caused by an action; a no-drop zone for aerial fire retardant.	An aerial retardant avoidance area (also referred to simply as 'avoidance area') is defined as an area in which application of aerial fire retardant is prohibited in order to avoid, limit, or mitigate potential impacts to specified resources.	Definition has been expanded to include any identified area where retardant use is prohibited, in order to provide clarity and consistency in use.
Definitions: Misapplication and Intrusion	The accidental aerial application of fire retardant into a waterway, within the 300-foot buffer, or within an avoidance area or when resources are directed to apply fire retardant into a waterway, within the 300-foot buffer, or within an avoidance area based on allowable exceptions or a transportation accident.	An intrusion is defined as the intentional or unintentional application of aerial fire retardant into an aerial retardant avoidance area.	The term 'misapplication' has been replaced by the term 'intrusion' for clarity of meaning.
	AIRCRAFT OPERATIONAL GUIDANCE	AIRCRAFT OPERATIONAL GUIDANCE	

	Decision (Alternative 3)	Proposed Action (Modified Alternative 3)	Notes on Modifications
Guidance outside of avoidance areas	Whenever practical, as determined by the fire incident commander, the Forest Service will use water or other wildland fire chemical suppressants for direct attack or less toxic approved fire retardants in areas occupied by TEPCS species or their designated critical habitats. Some species and habitats require that only water be used to protect their habitat and populations; these habitats and populations have been mapped as avoidance areas. Incident commanders and pilots are required to avoid aerial application of fire retardant in avoidance areas for TEPCS species or within the 300-foot (or larger) buffers on either side of waterways.	Whenever practical, agency administrators and incident commanders shall use water or other less toxic suppressants in habitats of species listed under the Endangered Species Act or certain Regional Forester sensitive species where those habitats are not mapped as avoidance areas.	Clarifies by keeping guidance for avoidance areas separate. Incorporates agency administrator into guidance. Adds consideration of habitats for sensitive species.
Implementation of guidance in avoidance areas	When approaching an avoidance area mapped for TEPCS species, waterway, or riparian vegetation visible to the pilot, the pilot will …. When flying over a mapped avoidance area, waterway, or riparian vegetation, the pilot will wait one second before applying retardant. Pilots will make adjustments …within the 300-foot or larger buffer or avoidance area.	Incident commanders and pilots should follow guidance in the current version of the Implementation Guide … includ[ing]… requirements for providing pilots with maps or other information about the location of avoidance areas on the unit … information on …methods for ensuring retardant is not applied in avoidance areas … information on when and how to terminate and resume application of fire retardant … guidance on flight conditions	Implementation Guide was developed subsequent to 2011 Decision; Modified Alternative 3 therefore refers to the Implementation Guide where specific methods and protocols are described in detail and can be updated as appropriate.

	Decision (Alternative 3)	Proposed Action (Modified Alternative 3)	Notes on Modifications
Implementation of guidance in culturally or historically significant areas	Cultural resources, … will be given case-by-case consideration when ordering the aerial application of fire retardant. As necessary, incident commanders will consider the effects of aerial applications on known or suspected historic properties, any identified traditional cultural resources, and sacred sites. The Forest Service means to use cultural resources specialists, archaeologists, and tribal liaisons to assist in the Forest Service's consideration of effects and alternatives for protection.	These resources cannot be mapped using a national protocol or addressed with a standard prescription that would apply to all instances. Cultural resources specialists, archaeologists, and tribal liaisons would assist on a case-by-case basis in the consideration of effects and alternatives for protection when aerial application of fire retardant is ordered. Incident commanders would consider the effects of aerial applications on known or suspected historic properties, any identified traditional cultural resources, and sacred sites.	Acknowledges difficulty in establishing national protocol for mapping/identifying cultural resources, and clarifies involvement of resource specialists
Safety	These guidelines do not require helicopter or air tanker pilots to fly in a manner that endangers their aircraft or other aircraft or structures or that compromises the safety of ground personnel or the public.	These guidelines shall not require pilots to fly in a manner that endangers their aircraft or other aircraft or structures, or that compromises the safety of ground personnel or the public.	Primary emphasis on safety of firefighters and public remains unchanged.
	AVOIDANCE AREA MAPPING REQUIREMENTS	AVOIDANCE AREA MAPPING REQUIREMENTS	

	Decision (Alternative 3)	Proposed Action (Modified Alternative 3)	Notes on Modifications
Map updates and map-related coordination (general)	The Forest Service will annually coordinate with FWS and NOAA Fisheries local offices to ensure that any updates that are needed… are mapped…. The Forest Service will coordinate with aviation managers and pilots… and will provide reporting direction to all firefighting fire personnel … Each Forest Supervisor will be responsible for maintaining and updating the avoidance area maps … Terrestrial and waterway avoidance areas are mapped using the best current information… maps can be adjusted … Avoidance maps can be updated by Forest Supervisors for candidate and Forest Service listed sensitive species…	All forests and grasslands would review and update maps annually, following current national mapping protocols described in the Implementation Guide …	Simplifies requirements for updates. Protocols and other implementation details are in implementation guide, which can be updated as needed to incorporate new data and methodologies. Annual coordination requirements have been moved to a separate component of Modified Alternative 3; refer to that section below.
Map updates for listed species	The Forest Service will annually coordinate with FWS and NOAA Fisheries local offices to ensure that any updates that are needed… are mapped using the most up-to-date information. …Avoidance maps can be updated or adjusted for TEPCS species or designated critical habitats by Forest Supervisors in consultation with FWS or NOAA Fisheries as necessary. Mapping changes are allowed if they do not create additional adverse effects … or change the analysis … or determinations	Avoidance Areas may be adjusted for local conditions. … Adjustments related to Endangered Species Act threatened, endangered, proposed, and candidate species would be coordinated with the local offices of the Services	Acknowledges need for flexibility based on local conditions. Simplifies and clarifies per existing agreements with the Services; see also updates and map-related coordination in previous row of this table, as well as separate Annual Coordination component in Modified Alternative 3.

	Decision (Alternative 3)	Proposed Action (Modified Alternative 3)	Notes on Modifications
Mapping discrepancies	When there is a discrepancy between the maps and the language in this decision, the language in this decision controls.	Not applicable	No comparable language as no decision has yet been made on the current proposal.
Aquatic Avoidance Areas	Waterways will be avoided and are given a minimum of a 300-foot buffer … Use the National Hydrography Dataset for mapping …	Refers to any Avoidance Area, whether mapped or not, that is based on the presence of waterways or as mapped to protect [listed or sensitive species or habitat] associated with waterways, waterbodies, or riparian areas. Any waterway … in which water is present at the time of retardant application, and buffers extending no less than 300 feet on either side of a waterway… Mapping of waterways that are dry at the time of retardant application is not required, but these may be included … where there is a potential for downstream effects to occur. Map avoidance areas where aerial application of fire retardant may impact one or more aquatic … [listed] species or designated critical habitat … [or] certain sensitive species or their habitat.	Clarifies terminology, and allows waterways without water to be excluded from Avoidance Areas if there will be no downstream effects. Removes specific data requirement, allowing flexibility to use best available and most current information.

	Decision (Alternative 3)	Proposed Action (Modified Alternative 3)	Notes on Modifications
Terrestrial Avoidance Areas	Terrestrial Avoidance Areas may be used to avoid impacts on a) one or more … TEP plant or animal species or critical habitat where aerial application …may affect habitat and/or populations; of b) any FS terrestrial sensitive or candidate species where aerial application … may result in a trend toward federal listing… or a loss of viability on the planning unit… The FS used …protocols to generate a standardized, national map template … Use FWS and NOAA Fisheries-designated critical habitat layers when available. Use FWS, NOAA Fisheries, and FS species, population, and designated critical habitat information for occupied sites.	Refers to any Avoidance Area that is mapped to protect [listed or sensitive species or habitat] or other resources not associated with waterways or riparian areas. Map avoidance areas where aerial application of fire retardant may impact one or more … terrestrial [listed] species or designated critical habitat …[or] certain … sensitive species or their habitat.	Clarifies terminology. Removes specific data requirement, allowing flexibility to use best available and most current information.
Adjustments to Avoidance Areas	Buffer areas may be increased based on local conditions in coordination with the FWS and NOAA Fisheries local office. [National mapping] protocols will be used for annual updates.	Avoidance Areas may be adjusted for local conditions [but] buffers around waterways in which water is present may not be less than 300 feet on either side of a waterway with water present, but may be increased where needed. Adjustments related to TEPC species would be coordinated with local offices of the Services	Clarifies 300 foot minimum buffer around waterways.
	ANNUAL COORDINATION	ANNUAL COORDINATION	

	Decision (Alternative 3)	Proposed Action (Modified Alternative 3)	Notes on Modifications
	[*From Avoidance Areas Mapping Requirements section*] The Forest Service will coordinate with aviation managers and pilots … and will provide reporting direction to all firefighting fire personnel with suppression responsibilities in the event they discover a misapplication …	The Forest Service would coordinate annually with Local Services offices, aviation managers and pilots, [and] cooperators/other agencies. Coordination would ensure that requirements of the provisions of this alternative are met and would maintain relationships and allow problem resolution to occur at the lowest management level. Guidance on coordination meetings would be provided in an implementation guide.	Clarifies coordination levels and purpose at programmatic level, with details in implementation guide, which can be updated as needed. Refer also to Reporting and Monitoring Requirements section.
	REPORTING AND MONITORING REQUIREMENTS	REPORTING AND MONITORING REQUIREMENTS	

	Decision (Alternative 3)	Proposed Action (Modified Alternative 3)	Notes on Modifications
General reporting requirements	The FS will report to FWS and NOAA Fisheries (as appropriate) all misapplications ... The report ... will determine necessary mitigation measures … and whether there is a need for reinitiation of formal consultation. Depending on the severity of the adverse effect, an appropriate restriction on future aerial application of retardant may be necessary for the reported area…. Reporting and monitoring of misapplications of fire retardant will be outlined within an Implementation Handbook … The monitoring components that are reported annually will: Be conducted in coordination with local FS/FWS/NOAA/USGS offices and appropriate State agencies; Determine the necessary recovery, restoration, or remediation… appropriate contingency measures for protection of TEPCS … amount of follow-up monitoring necessary … [whether] an assessment of cumulative effects for certain species is necessary.	The Forest Service would maintain a database for reporting intrusions…Intrusion reporting requirements are described in the implementation guide …The Forest Service would provide to the Services annual reports summarizing retardant use and intrusions, as well as a list of intrusions and a summary of observations and actions for each intrusion.	Intrusion reporting protocols are detailed in implementation guide, which can be updated as needed to incorporate updates to data and methodologies. Elements specific to coordination needs are now in “Annual Coordination” component of Modified Alternative 3.
Monitoring	To help in determining whether under-reporting of fire retardant misapplication is occurring, the FS will annually assess 5 percent of all fires that are less than 300 acres in size and during which aerially delivered fire retardant had been used and aquatic or terrestrial avoidance areas exist.	Not applicable	Review determined that under-reporting of misapplications is a very small percentage of total fires; review recommended discontinuing.

	Decision (Alternative 3)	Proposed Action (Modified Alternative 3)	Notes on Modifications
	MODIFICATIONS RESULTING FROM ESA SECTION 7 CONSULTATION	MODIFICATIONS RESULTING FROM ESA SECTION 7 CONSULTATION	
Terms and Conditions	The decision incorporated terms and conditions and reasonable and prudent measures provided in Biological Opinions from the Services	*Consultation on Modified Alternative 3 is currently in progress*	No comparable language as no decision has yet been made on the current proposal and consultation is not yet complete.
	PROCEDURES WHEN THERE ARE ADDITIONS TO THE QUALIFIED PRODUCTS LIST	PROCEDURES WHEN THERE ARE ADDITIONS TO THE QUALIFIED PRODUCTS LIST	
	The Decision and FEIS Alternative 3 did not include a clear process for completing Endangered Species Act section 7 consultation for new retardant products.	New products or new formulations of existing products must meet Forest Service specifications for long-term retardant … to be included on the Qualified Products List. [New] products… do not require additional consultation as long as the maximum extent and duration of effects of the new products do not exceed those of other products already considered…The Services will be notified of any additions to the Qualified Products List. Products or new formulations that do not meet the above criteria would require re-initiation of consultation with the Services	After review with the Services, procedures have been agreed on to avoid the need for re-consultation for products that have similar ingredients, and similar toxicity pathways and limits to those already consulted on and approved for use.

Table 2. Comparison of Alternatives, including the No Action Alternative, considered in the FEIS and SEIS, by components

	Alternative 1 – No Retardant	Alternative 2 – Use 2000 Guidelines	Alternative 3- 2011 Decision	Modified Alternative 3 – SEIS Proposed Action
Aerial delivery of retardant	No	Yes	Yes	Yes
Exceptions for retardant use	N/A	Three exceptions: For protection of life and property, when alternative line construction tactics are unavailable, and when damage to natural resources outweighs loss of aquatic life.	One exception: For protection of human life or public safety.	One exception: For protection of human life or public safety.
Aircraft operational guidance	None	2000 Guidelines for Aerial Delivery of Retardant or Foam (Appendix A): 300-foot buffer on all waterways and threatened and endangered T&E terrestrial plant and animal species, as identified in the 2008 RPAs.	New Aerial Application of Fire Retardant Direction: 300-foot buffers on all waterways, riparian vegetation visible to pilots, terrestrial avoidance areas, and other resources (e.g., cultural).	Use Implementation Guide for requirements to provide pilots with avoidance area information, methods for ensuring retardant is not applied in avoidance areas, and guidance on flight conditions.
Avoidance area mapping	None	Terrestrial species for T&E jeopardy species only from 2008 Biological Opinions, 300-feet buffers on all waterways.	Terrestrial T&E species and some sensitive species, 300-feet or more buffers on all waterways.	Waterways when water is present (minimum 300-foot buffer), terrestrial and aquatic TEPC species and critical habitat and some sensitive species and habitat, areas identified by local unit.
Annual coordination with regulatory agencies and other agencies and cooperators	None related to retardant use	Pre-season coordination, 2008 Reasonable and Prudent Alternatives, update and review of avoidance area maps for terrestrial plant and animal species identified within the 2008 Biological Opinion, and 300-foot buffers on waterways.	New Aerial Application of Fire Retardant Direction; annual training briefings, as needed; coordination meetings, as needed.	Annual coordination with local Services offices, aviation managers and pilots, and cooperators/other agencies. Guidance for coordination in implementation guide.

	Alternative 1 – No Retardant	Alternative 2 – Use 2000 Guidelines	Alternative 3- 2011 Decision	Modified Alternative 3 – SEIS Proposed Action
Monitoring	None	Misapplication into waterways, T&E species associated with 2008 Biological Opinions, or if needed during emergency consultation process.	Monitoring of misapplications that occur in avoidance areas on any fire, which may include implementation of trigger points that restrict retardant use if adverse impacts are identified. Monitoring 5% of all fires <300 acres where aerial retardant was applied	Procedures for monitoring effects of intrusions are described in implementation guide; FS provides to the Services a summary of observations and actions for each intrusion
Reporting	None	All misapplications into waterways and any affected threatened endangered or sensitive species.	All misapplications into waterways and any affected TEPCS species. Five percent of fires <300 acres, and all large fires.	All intrusions documented in FS database; required reporting to the Services for any intrusions into habitat for TEPC species or critical habitat and annual summaries of retardant use and intrusions.
Protection of cultural resources	N/A	No	Yes	Yes
Protection for Regional Forester sensitive species	N/A	No for terrestrial plant and animal species. Yes, for Aquatic species with standard 300-foot buffer on all waterways.	Yes, for those terrestrial plant and animal species identified that may trend towards listing or loss of viability on the planning unit. Additional buffers for waterways can be applied at the local level for aquatic species.	Yes, avoidance area mapping requirements include areas where retardant application may impact certain sensitive species or their habitat.
Use of emergency consultation regulations for aerial retardant use (50 CFR 402.05)	No	Yes	No	No

	Alternative 1 – No Retardant	**Alternative 2 – Use 2000 Guidelines**	**Alternative 3- 2011 Decision**	**Modified Alternative 3 – SEIS Proposed Action**
Use of New Products?	No	No. Would require new analysis under NEPA and new consultation under ESA section 7.	No. Process not identified for analysis under NEPA, although process for consultation under ESA section 7 has been developed.	Yes. Procedures outlined for use of products with similar components and toxicity limits, and for consultation on those not meeting criteria.

3 Affected Environment and Environmental Consequences

Chapter 3 of the FEIS (USDA Forest Service 2011, pages 49-166) describes the existing condition and potential effects that could occur from the use of aerial fire retardant on National Forest lands throughout the United States. Chapter 3 of the FEIS also compares the potential effects of Alternatives 1, 2, and 3 on the resources analyzed.

This section describes any changes to the analysis in the FEIS, based on changed conditions discussed in the Supplemental Information Report (USDA Forest Service 2020a), which documented new information and changed conditions occurring since completion of the FEIS in 2011. This section also includes discussion of the effects of implementing Modified Alternative 3. The text in this section is supplemental to, and does not replace the information in the corresponding section of the FEIS unless specifically stated otherwise. Refer to corresponding sections in the FEIS for the full analysis and discussion of potential impacts to each resource.

The Forest Service is in the process of transitioning from identifying Regional Forester Sensitive Species (sensitive species) to identifying Species of Conservation Concern, per the 2012 Planning Rule (77 FR 21161). Previous Forest Service direction required preparation of biological evaluations for sensitive species, that analyzed the potential for Forest Service actions to result in individual species to trend toward listing under the ESA. The FEIS was prepared prior to implementation of the 2012 Planning Rule and included analysis of potential impacts to sensitive species. The Supplemental Information Report (USDA Forest Service 2020a) identified updates to sensitive species lists as a changed condition to be considered in a supplemental analysis; therefore analysis of currently-identified sensitive species is included in this SEIS.

The 2012 Planning Rule directs National Forest units to identify Species of Conservation Concern as part of forest plan revisions, and updated direction allows units to identify them outside of plan revision processes. Units identifying Species of Conservation Concern in either process must identify and incorporate into forest plans any components necessary to provide for the ecological conditions necessary to maintain viable populations of each Species of Conservation Concern on the unit. For those units with revised forest plans or that have otherwise adopted the Species of Conservation Concern framework, any application of aerial fire retardant would be consistent with plan components supporting the ecological conditions necessary for maintaining viable populations of Species of Conservation Concern on that unit. For this reason, analysis of potential impacts of the nationwide aerial fire retardant program on Species of Conservation Concern is not required for this SEIS.

The modified proposed action includes guidance for local units to establish avoidance areas "based on local conditions, including to comply with forest plan requirements, such as those for Species of Conservation Concern, or to protect other biological or cultural resources". That guidance allows local units to map avoidance areas for Species of Conservation Concern or their habitats if needed.

3.1 Fire Retardant Use in Wildland Fire Management

The information in this section provides updates to information beginning on page 51 of the FEIS. Information that describes operational use, risks, types of equipment, how aircraft are

assigned, how aerial retardant is applied, and how aerially delivered retardants work and are used remains the same as discussed in the FEIS.

3.1.1 Affected Environment

3.1.1.1 Fire Retardant Operational Use

This section provides updates to information in the FEIS regarding airtankers, and actual use of aerially delivered fire retardant since 2011. Note that aerially delivered fire retardants are also referred to as long-term fire retardants.

Figure 2 in the FEIS (p. 53) shows the location of airtanker and helitanker bases as of 2004. Although some of that information has changed, a complete updated map is not available. Information regarding the location and type of airtanker or helitanker bases is not necessary for updated analyses in this SEIS and does not have an impact on the decision to be made.

As of mid-2021 there are 18 exclusive use and 11 call-when-needed large airtankers under contract by the Forest Service. The Forest Service also has access to 8 Modular Airborne Firefighting Systems (MAFFS), which are portable fire retardant delivery systems that can be inserted into military C-130 aircraft for firefighting response. The Forest Service also uses Single Engine Air Tankers and helicopters for aerial retardant delivery in varying number depending on need.

Approximately 102 million gallons of long-term fire retardant (approximately 56,868 drops) were aerially applied to National Forest System lands in the 2012 - 2019 period. The estimated total acreage that could be affected on average each year by application of aerial fire retardant has increased from a range of 2,358 to 4,715 (0.0024 percent to 0.012 percent of total National Forest System lands) as reported in the FEIS, to between 8,586 and 22,552 acres (0.0092 percent to 0.0117 percent of National Forest System lands) as estimated from 2012 through 2019 (refer to SEIS Appendix C). Forest Service Regions 1, 3, 4, 5, and 6 apply larger amounts of fire retardant compared to other regions. Refer to Figure 1 and Figure 2 below, which replace Figures 3 and 4 on page 57 of the FEIS.

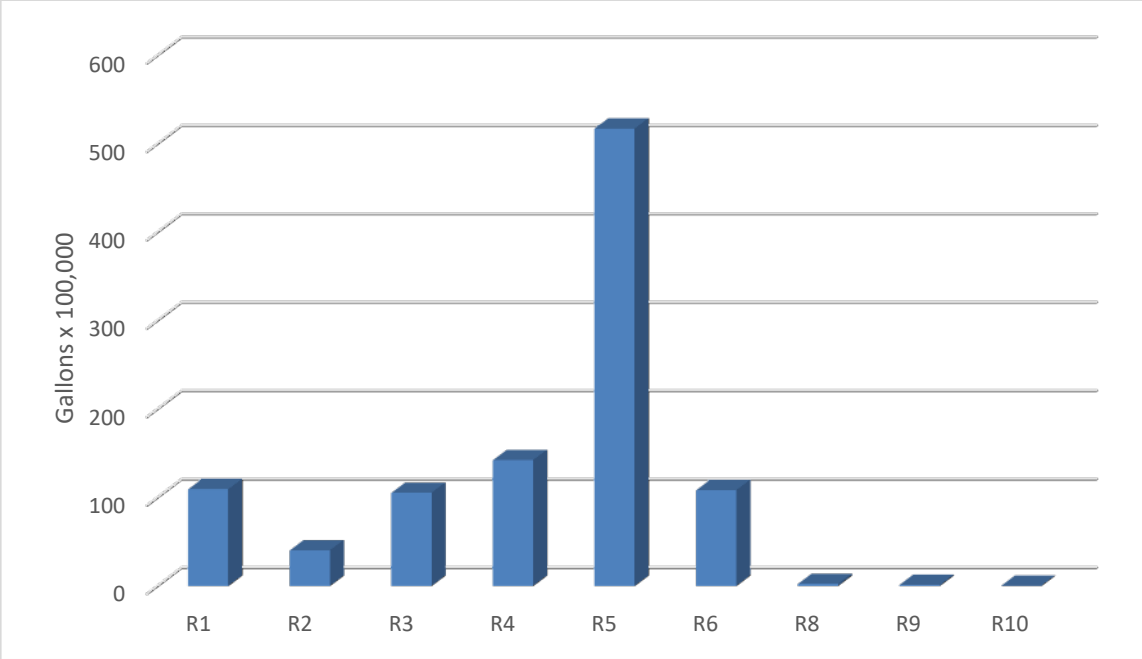

Figure 1. Gallons of aerially applied fire retardant by Forest Service Region, 2012-2019

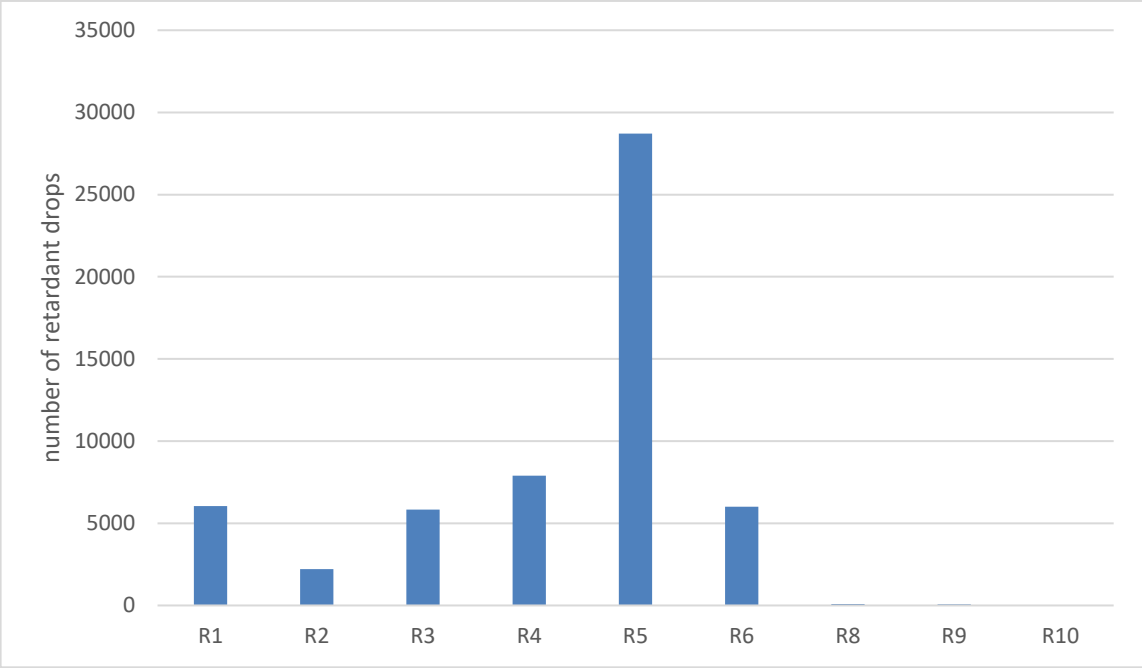

Figure 2. Number of aerial fire retardant drops by Forest Service region, 2012-2019.

3.1.1.2 Long-Term Fire Retardant Use – Background

Information in the FEIS beginning on page 59 remains unchanged except for the following updates:

Fire retardant delivery into aquatic systems has been limited since 2011 by the establishment and use of avoidance areas around waterways. Mapping of avoidance areas, instructions to pilots about avoiding waterways, and guidance on increased communication among pilots, incident

commanders, scouts, and others during fire incidents was provided beginning in 2011 in the Record of Decision (USDA Forest Service 2011d). Detailed guidance on mapping avoidance areas and operational guidance for avoiding them has been available in the Implementation Guide for Aerial Application of Fire Retardant (USDA 2019 or subsequent versions), first published in 2012 updated periodically as needed. Refer to SEIS section 3.1.1.3 below for additional information about this guidance.

Aerially delivered fire retardant formulations currently in use are primarily inorganic fertilizers (ammonium phosphates) or other inorganic salts (magnesium chloride). Refer to the Qualified Products List for up-to-date information about currently approved products. The current specification (Forest Service Specification FS 5100-304d) for long-term retardant chemicals was updated in 2020 and amended in 2021. Over the past 10 years, approved products have reduced ammonia content by 33 percent compared with formulations approved prior to 2011. Fish toxicity requirements were increased in the 2020 revision of the specification in order to encourage a trend toward less toxic products.

3.1.1.3 Fire Retardant Application Guidelines

Information in the FEIS beginning on page 63 remains unchanged except for the following updates.

The Forest Service is currently operating under the Nationwide Aerial Application of Fire Retardant on National Forest System Land Record of Decision (USDA Forest Service 2011d), which replaced use of the 2000 Guidelines referred to in the FEIS (see Appendix A of the FEIS). The 2011 Record of Decision (ROD) approves the use of aerially applied fire retardant and implements an adaptive management approach that protects resources and requires documentation of retardant effects through reporting, monitoring, and application coordination. Aerial retardant drops are not allowed in waterways or buffers surrounding them or in avoidance areas that have been mapped for certain threatened, endangered, proposed, candidate or sensitive species. This national direction is mandatory and is implemented except in cases where human life or public safety is threatened and retardant use within avoidance areas could be reasonably expected to alleviate that threat.

The 2011 ROD included requirements resulting from the Endangered Species Act section 7 consultations (USDI Fish and Wildlife Service 2011 and NOAA National Marine Fisheries Service 2011), providing measures to minimize impacts to listed species. Those measures include requirements to map avoidance areas for some species, and to provide timely information to the Services regarding intrusions and any effects resulting from those intrusions.

Since implementation of the ROD began in 2012, there have been 459 reported intrusions of aerially delivered retardant into avoidance areas (including waterways and their buffers), 248 of which were into waterways. Ninety of the 459 reported intrusions resulted from use of the exceptions to the guidelines, as described above.

Beginning in 2012, the Forest Service has used the Implementation Guide for Aerial Application of Fire Retardant (currently USDA 2019) to provide detailed guidance for implementing the 2011 Record of Decision. This guidance enables Forests and Regions to obtain information needed for retardant use in a single, consistent resource that is regularly updated to reflect any changes in direction, including direction resulting from any supplemental consultation on species listed under the Endangered Species Act. It provides guidance for fire personnel, including

pilots, Fire Management Officers, Incident Commanders, Resource Advisors, or others involved with the use of aerially delivered retardant. It also includes avoidance area mapping procedures and requirements, reporting and monitoring requirements, data management guidance, requirements for re-initiation of consultation with regulatory agencies, and information on internal and external communication and coordination.

3.1.2 Environmental Consequences

The analysis of potential impacts of Alternative 1 in the FEIS (pages 64-67) included information about the average initial attack success rate, average annual flight hours for various aircraft used in aerial retardant delivery, and the percent of wildland fires that have been kept under 300 acres. It is important to note that all of these data are affected by a variety of factors that include such things as weather, climate and climate change, fire location, availability of personnel and other resources, and many others. The updated statistics are provided here for comparison with those used in the FEIS, but the degree to which they may differ under different alternatives is not possible to determine.

- Ten-year average annual flight hours for aircraft associated with federal firefighting efforts, including both aerial retardant and water drops, are as follows: large airtankers average 5,309 hours annually, single engine air tankers average 1,035 hours annually, and helicopters average 34,915 hours annually. Helicopters continue to have the highest frequency of accidents, but that rate has declined to 1.43 accidents per year over the past ten years.
- In 2019 the success rate of keeping wildland fires under 300 acres was 98.72 percent.

The analysis of impacts of Alternatives 2 and 3 would be as described in the FEIS. Modified Alternative 3 would be the same as Alternative 3 but would add direction for addition of new products to the Qualified Products List.

Climate change could result in an increase in the number, size, and severity of wildfires (refer to SEIS section 3.13) but the actual number of flights that will be used in the future to deliver aerial retardant cannot be accurately predicted. Decisions regarding use of aerial retardant are affected by availability of resources (aircraft, personnel, funding, etc.) as well as by safety concerns, management priorities, and other factors.

3.2 Soils

The information presented in this section is in addition to that beginning on page 70 of the FEIS (USDA Forest Service 2011a). This section addresses whether changes in retardant formulations and increased acres receiving retardant drops, as reported in the Supplemental Information Report (USDA Forest Service 2020a), create soil concerns other than those addressed in the FEIS.

The information presented in this document uses the analysis approaches described in the 2011 FEIS and the supporting 2011 soils report (see project record) and incorporates information from ecological risk assessments completed in 2020 (Auxilio Management Services 2020, 2021). Information displayed and discussed in Appendix H in the FEIS, which supports the analysis in the FEIS and in this document, remains unchanged.

3.2.1 Affected Environment

The list of retardants currently approved for use on National Forest System lands has changed since the 2011 soils report and FEIS. The retardant PC D75 was reviewed in the 2011 soils report but is no longer on the Qualified Products List.. This product is therefore not addressed further. New long-term aerial retardant products have been approved that include the same retardant salts that are in products analyzed in the 2011 FEIS.

The estimated total acreage that could be affected on average each year by application of aerial fire retardant has increased from a range of 2,358 to 4,715 (0.0024 percent to 0.012 percent of total National Forest System lands) as reported in the FEIS to between 8,586 and 22,552 acres (0.0092 percent to 0.0117 percent of National Forest System lands) as estimated from 2012 through 2019.

3.2.2 Environmental Consequences

Because the products that have been added to the Qualified Products List have the same retardant salts as those analyzed in the 2011 FEIS, the effects to soils of those retardants are expected to be similar to those described in the FEIS.

Although the total acreage of National Forest System lands on which aerial fire retardant drops occurs has increased since the analysis in the FEIS, an increase the acres on which retardant is applied does not correspond to an increase in nutrients in any particular location on the landscape. Therefore there would not be an increase in the effect to soil quality or productivity in any one location, but instead potentially more locations over which the effects described in the FEIS might occur. Table 2 (page 75) in the FEIS displays the total number of acres (between 2,358 and 4,715) annually in which retardant application could result in fertilizing effects to soil productivity. That would increase to between 8,586 and 22,552 acres on which effects could occur.

Table 2 (page 75) in the FEIS also displayed the estimate of the amount of potential for leaching or erosion of soil and nutrients into waterways that could occur, based on the number of retardant drops that had occurred within the 300-foot buffers (avoidance areas) around waterways between 2008 and 2010. Between 2012 and 2019 the number of intrusions occurring within avoidance areas increased (refer to SEIS Appendix C). Based on that increase, there could be an increase in the total number of locations in which retardant-based nutrients could enter into waterways, depending on site and soil characteristics, weather, and other factors.

The effects of Modified Alternative 3 would be the same as those described in the Final Environmental Impact Statement for Alternative 3, adjusted for the information described above.

3.3 Hydrology

The information presented in this section is in addition to that beginning on page 76 of the FEIS (USDA Forest Service 2011a).

3.3.1 Affected Environment

While conditions may have changed on a fine scale in certain localized areas, the affected environment likely has remained the same as that described in the FEIS, with the following exceptions:

- Table 7 (page 80) in the FEIS displays the number of intrusions into waterways and associated buffers by Forest Service Region for the period from 2008 through 2010. Updated information on intrusions since 2010 can be found in SEIS Appendix D.
- Figure 5 and Table 9 (pages 90-91) in the FEIS display information on the number of fires, aerial retardant drops, and aerial retardant use by Forest Service Region for the period 2000 through 2010. Updated information for the period since 2010 can be found in SEIS Appendix C.

3.3.2 Environmental Consequences

In addition to information in the FEIS, this section adds analysis of Modified Alternative 3 and updated information noted in the Affected Environment section above. The use of aquatic avoidance areas as required in the proposed action, if followed accurately, would protect water quality from degradation. Water quality impacts could occur in the event of accidental or direct application into a waterbody. The risk assessments (Auxilio Management Services 2020, 2021) show that accidental application to a stream has a higher estimated risk to aquatic species than from natural runoff.

The FEIS did not consider the effects of magnesium chloride (MgCl), a retardant salt found in two retardant products that are currently conditionally approved (see Glossary) for use on National Forest System lands, so it is addressed in this SEIS. Most of the literature on environmental effects of MgCl on water quality focuses on the impacts to vegetation and to aquatic organisms, and is based on its use as a road de-icer or for road dust abatement. Impacts described in the literature range from benign to toxic, and depend on the proximity of application to a waterbody, along with the buffering capacity of streamside or lakeshore vegetation. However, the required protective measures (avoidance areas) would be adequate to prevent water quality degradation due to use of retardant products containing MgCl, except in the event of an accidental spill or direct application.

3.4 Aquatic Vertebrates and Invertebrates

The information presented in this section is in addition to that beginning on page 95 of the FEIS. Species lists and details regarding analysis, updated screening procedures, and determinations can be found in SEIS Appendix F and in the Biological Assessments and Biological Evaluation in the project file. For aquatic species and habitats, two Biological Assessments were prepared because some aquatic species fall under the jurisdiction of the National Oceanic and Atmospheric Administration (NOAA) Fisheries and others fall under the jurisdiction of the United States Department of Interior (USDI) Fish and Wildlife Service.

3.4.1 Affected Environment

The list of retardants currently used and considered in this analysis has been updated since the FEIS was completed, and can be found on the current Qualified Products List. All but two of the aerially delivered retardants currently in use on National Forest System lands comprise the same chemicals evaluated for the FEIS. Magnesium chloride was not included in the 2011 analysis but is currently used in two retardant products that are conditionally qualified (see Glossary) for use on National Forest System lands.

3.4.1.1 Threatened, Endangered, and Proposed Aquatic Species and Designated Critical Habitats

The list of species identified as threatened, endangered, proposed, or candidate under the Endangered Species Act has been updated since 2011. There are currently 61 threatened, endangered, or proposed fish species, 10 threatened, endangered, or proposed crustaceans, 65 threatened or endangered bivalve species, and 11 aquatic gastropods that are considered in the current analysis. Designated critical habitat for 20 aquatic species is also considered.

3.4.1.2 Regional Forester Sensitive Species

There are 350 species, including 163 fish species, 64 bivalve species, 79 crustacean species, and 44 aquatic snail (gastropod) species that are identified as Regional Forester Sensitive Species.

3.4.2 Environmental Consequences

Analysis methods, assumptions, and impacts to aquatic species and habitats are the same as those described in the 2011 FEIS beginning on page 95, with the following updates and additions.

3.4.2.1 Methodology and Assumptions

The national screening process used to determine effects to threatened, endangered, proposed, or candidate species in 2011 was used for this analysis, with some updates and clarifications (refer to SEIS Appendix E). Key updates include:

- Retardant application potential has been refined from a single index based on annual number of retardant drops, to categories based on a combination of frequency of use, average amount used, and maximum amount used, based on data from 2012 through 2019.
- The screens for aquatic species and habitats add consideration of whether occurrences or critical habitat for aquatic species are protected with avoidance areas.
- Screens have been added to assess the potential for impacts to designated critical habitats for aquatic species.

The updated analysis process uses data on intrusions from 2012 through 2019 (refer to SEIS Appendix D). The following assumptions update or are in addition to assumptions used in the 2011 analysis:

- The intrusion rate based on total aerial retardant drops is likely to remain close to the 2012-2019 rate of 0.81 percent
- The intrusion rate based on total fires is likely to remain close to the 2012-2019 rate of 0.46 percent (refer to section 3.4.2 and 3.13 about assumptions regarding potential changes in number, size, and severity of fires and the relationship to aerial retardant use and therefore total number of intrusions).

The analysis of sensitive species in 2011 relied on a less formal screening process than the one used for listed species. For the current analysis, a screening process was used that parallels the screens and assumptions used for analysis of listed species, including consideration of the likelihood of retardant use on the unit and in the habitat where the species occurs, and whether occurrences or habitat are protected by avoidance areas (refer to the Biological Evaluation in the project file). Effects determinations for sensitive species relied on information about fires and retardant use by unit and ecoregion, as well as whether a species is widespread and common.

All species that are currently listed as threatened or endangered, that are proposed for listing, are identified as candidates for listing under the ESA, or that are identified as sensitive species were screened regardless of determinations made in 2011. The determinations for some species evaluated in 2011 may have changed due to changes in the screening elements, changes in estimated retardant use where they occur, or other factors. Species lists, occurrences, and descriptions of the screening process can be found in the Biological Assessments and Biological Evaluations in the project file.

Although determinations in the Biological Assessments are intended to meet the requirements of consultation under section 7 of the Endangered Species Act, as in the FEIS those determinations and the analyses supporting them also meet the National Environmental Policy Act requirements for analysis and disclosure of impacts of the proposed action. Determinations for these species and for sensitive species provide information about the potential for impacts to the broad array of wildlife species found on National Forest System lands.

Analysis of the updated species lists was only carried out for the proposed action (Modified Alternative 3) due to the large amount of data and information involved. The relative impacts of Alternatives 1, 2 and 3 on the current list of sensitive species is expected to be similar to that reported in the FEIS.

3.4.2.2 General Effects on Aquatic Vertebrates and Invertebrates, Including Habitat

Information in this section is in addition to information on pages 95-100, and pages 102-105 in the FEIS.

Information on the trend in fire occurrences has been updated to include data from 2012 through 2019 (refer to SEIS Appendix C), as was information on the timing of aerially delivered retardant use (see Tables 10 and 11 and Figures 7-9 on pages 25-28 of the 2021 Biological Assessment for Fish and Wildlife Service Species in the project record). Those data were used to inform the analysis of effects to aquatic species.

Entry of Retardant Chemical Into Waterways

In addition to the information in the 2011 Biological Assessments and on pages 102 through 104 in the FEIS, the analysis for this SEIS considered that the operational protocols included in implementation guidance and in Modified Alternative 3 would reduce the potential for intrusions.

The analysis for this SEIS relies on updated intrusion data (refer to SEIS Appendix D) from the period 2012 through 2019 similar to that displayed in Table 13 (page 102) of the FEIS (note that in the FEIS and its appendices the term ‘misapplication’ is used rather than ‘intrusion’). The updated intrusion data uses a standardized calculation that is slightly different from the previous method used to estimate numbers of aerial retardant drops (see SEIS Appendix C). There were 459 intrusions reported between 2012 and 2019. Intrusions into known habitat of aquatic threatened, endangered, proposed, or candidate species are uncommon (0.2 percent of all retardant drops between 2012 and 2019). Based on intrusion data from the past 8 years the probability of a future intrusion into areas occupied by aquatic threatened, endangered, proposed, and candidate species is expected to remain low.

The updated analysis considered the relatively low potential for entry of any aerially delivered retardants currently in use into waterways through drift, surface runoff, or spills. The risk of spills or drift resulting in aerial retardant entry into waterways is considered to be very low.

Fish Response to Retardant Toxicity

The list of aerial retardant products currently approved for use on National Forest System lands has changed since 2011 (refer to the Qualified Products List). All products qualified for use have been tested for toxicity, and adhere to requirements in the Forest Service specification for long-term retardants (Forest Service Specification FS 5100-304d). Table 3 shows the amount of active retardant ingredients at specified application levels currently qualified for use by the Forest Service, along with toxicity levels to fish.

Table 3. Toxicity to fish and amount of active retardant ingredients in pounds per square foot at specified coverage levels, of fire retardants currently approved for use by the USDA Forest Service

Qualified Retardant[1]	Toxicity to fish (LC_{50})[2]	NH_3 [3] at 4 GPC[4] coverage	P_2O_5 [5] 4 GPC coverage	NH_3 at 8 GPC coverage	P_2O_5 8 GPC coverage
Phos-Check LC-95A-R	386	0.0095	0.0301	0.0190	0.0602
Phos-Check LC-95A-Fx	399	0.0095	0.0273	0.0191	0.0546
Phos-Check LC-95A-W	465	0.0095	0.0276	0.0191	0.0553
Phos-Check MVP-Fx	2,024	0.0053	0.0199	0.0105	0.0399
Phos-Check 259-Fx	860	0.0070	0.0203	0.0140	0.0406
Phos-Check LCE20-Fx	983	0.0073	0.0208	0.0147	0.0415
Conditionally Qualified Retardant[6]	**Toxicity to fish (LC_{50})**	**Mg [5] at 4 GPC coverage**	**Cl [5] at 4 GPC coverage**	**MG at 8 GPC coverage**	**Cl at 8 GPC coverage**
Fortress FR-100	1,762	0.0093	0.0270	0.0185	0.0541

1 Qualified retardants are those that have met all requirements, including both laboratory and field evaluation, in a formal specification and may be used on National Forest System lands.

2 LC_{50} is the concentration of a product in water that results in the death of 50 percent of the aquatic test specimens within a specified time frame. Numbers are milligrams per liter. Higher numbers indicate lower toxicity (i.e. a higher concentration of chemical is required to reach 50 percent lethality)

3 Ammonia shown in pounds per square foot

4 GPC = gallons per 100 square feet

5 Phosphate shown in pounds per square foot

6 Fortress FR-100 is conditionally qualified for use in an Operational Field Evaluation at the time this analysis was carried out. Unlike the other retardants displayed, the retardant salt in Fortress FR-100 is Magnesium chloride (MgCl).

Toxicity to fish and other aquatic organisms was addressed in ecological risk assessments (Auxilio Management Services 2020, 2021), and found to vary by ecoregion. Those assessments relied on information from published studies summarized in the FEIS, as well as additional, more recent research.

The proposed action (Modified Alternative 3) includes provisions for approving new products or new formulations of existing produces. Products that meet the specification and have the same or lower toxicity levels and no new identified risk factors may be approved for use without additional review or evaluation. Products that meet the specification but have higher toxicity levels or new risk factors would be further evaluated before being approved for use. Therefore any new products used under the proposed action would likely have similar or lower risk of toxicity compared to the products listed in Table 3.

Sublethal and Indirect Effects to Aquatic Species

The ecological risk assessment (Auxilio Management Services 2020, 2021) also evaluated potential toxicity to prey species and found that risk to be low. Similarly, the risk of changes to riparian or aquatic vegetation used by aquatic species is estimated to be low. As described above and in SEIS Appendix D, the rate of intrusions into waterways and their buffers has been low and is expected to remain so (refer to section 3.4.2 and 3.13 about assumptions regarding potential changes in number, size, and severity of fires and the relationship to aerial retardant use and therefore total number of intrusions). Therefore, there is a low probability that use of aerially delivered fire retardant would cause changes to riparian or aquatic habitat or prey availability sufficient to cause indirect effects to threatened, endangered, proposed, or candidate species.

3.4.2.3 Effects to Threatened, Endangered, and Proposed Aquatic Species and Designated Critical Habitats

In 2011 the Services issued Incidental Take Statements for a number of threatened or endangered species and designated critical habitats. Incidental take is when the "taking" (defined as actions that would result in death, injury, or significant disruption of behavior; see Glossary) of one of more individuals of a listed species occurs incidental to a lawful agency action as allowed through section 7 consultation (50 CFR 402.02). Incidental take is often identified using measures that serve as surrogates for impacts to individual organisms where those are difficult to estimate. For aquatic species, surrogate measures of incidental take are acres of habitat or miles of stream affected by an intrusion, or the number of drops or intrusions into a specified area. The amount of take that has occurred and the consequences of that take provide some indication of potential impacts to aquatic species and habitats. Since 2012 there have been twenty intrusions that resulted in take (refer to NOAA Fisheries Biological Assessment table BA-8, page 19, and Table 9 on pages 24-25 of the Biological Assessment for Fish and Wildlife Service Species; both documents are available in the project record). Monitoring since 2011 has resulted in no observed mortality resulting from any known intrusions. In cases where the allowed incidental take was met or exceeded, consultation was re-initiated and new incidental take and/or additional terms and conditions or conservation measures were issued by the Services. These processes help to ensure that aerial retardant effects to threatened and endangered species and to aquatic habitats in general are limited.

Of the species considered, the potential impacts of aerial retardant use under Modified Alternative 3 are expected to be as follows (refer to SEIS Appendix F and to the Biological Assessments for details):

- 59 species (34 bivalves, 4 crustaceans, 16 fish, and 6 aquatic gastropods) are expected to have no effects resulting from use of aerially delivered fire retardant because there are no fires, no use of aerial retardant where those species occur (including such things as species occurs in large waterbody or estuary/marine habitat), use of avoidance areas
- 57 species (31 bivalves, 5 crustaceans, 16 fish, and 5 aquatic gastropods) may be affected but are not likely to be adversely affected by the use of aerially delivered retardant, because they occur in circumstances where there is a relatively small potential for exposure. These are species in areas of no or very little retardant use, or where any retardant in habitat would be rapidly diluted (i.e. large rivers), or there would be little or no effect to prey species.

- 32 species (1 crustacean, 30 fish, and 1 aquatic gastropod) are likely to be adversely affected by the use of aerially delivered retardant, based on the fact that mortality or sub-lethal effects could occur even if there is a low certainty of effects.

Of the 56 designated critical habitats evaluated, 23 (18 bivalves and 5 fish) would experience no effect, 18 (12 bivalves and 1 crustacean) would have an affect but not likely to adversely affect (no changes to the physical and biological features of critical habitat, and they are protected with avoidance areas), and 15 (14 fish and 1 aquatic gastropod) would be likely to experience adverse effects (would experience changes to the physical or biological features).

3.4.2.4 Effects to Regional Forester Sensitive Species

Determinations for sensitive species are made at the level of the individual unit. Therefore, although there are a total of 350 aquatic species listed as sensitive across the National Forest system, there are many more determinations because each species receives a determination for each unit on which it is found and is identified as a sensitive species. A summary of determinations for sensitive species will be reported in the final SEIS, and the list of species, analysis process used, and determinations for each species will be provided in the Biological Evaluation in the project record.

3.4.2.5 Cumulative Effects to Aquatic Species and Habitats

In addition to the potential cumulative effects described on pages 101, 104, and 106 of the FEIS, the analysis for this SEIS considered the possible cumulative effects of aerial delivery of retardant on adjoining, non-National Forest System lands, use of salt mixtures for de-icing or dust abatement, and use of fertilizers for agriculture. The cumulative effects of all of these activities is assumed to be low, because of separation in time and space from the use of aerially delivered retardants in firefighting operations.

3.5 Plant Species and Habitats

The information presented in this section is in addition to that beginning on page 108 of the FEIS. Species lists and details regarding analysis, screening procedures, and determinations can be found in SEIS Appendix G and in the Biological Assessment and the Biological Evaluation in the project file.

3.5.1 Affected Environment

Species specific details provided by local Forest Service botanists in the analysis for the 2011 FEIS were retained to the extent possible when completing the current analysis, providing consistency in the information used for effects determinations. All but two of the aerially delivered retardants currently in use on National Forest System lands comprise the same chemicals evaluated in the analyses supporting the 2011 FEIS. Magnesium chloride was not included in the 2011 analysis, but is currently used in two retardant products that are conditionally qualified (see Glossary) for use on National Forest System lands.

3.5.1.1 Threatened, Endangered and Proposed Plant Species and Designated Critical Habitats

A total of 17 federally listed plant species and one federally listed fungus species occur or are suspected of occurring on National Forest System (NFS) lands included in this analysis.

3.5.1.2 Regional Forester Sensitive Species

This analysis addresses 2,436 sensitive species occurring on National Forest System lands where aerially delivered retardant may be used.

The Biological Evaluation in the project record will include species lists, including information on species added to or removed from federal listing or Regional Forester sensitive species lists since the 2011 analysis was completed.

3.5.1.3 Noxious and Non-Native Invasive Plant Species

The estimate of National Forest System acreage infested with non-native invasive plant species has increased from approximately 3.5 million acres as reported in the FEIS, to approximately 4.5 million acres currently. The FEIS reported approximately 753 of these species with known occurrences at that time, compared to approximately 1,100 species currently. Refer to SEIS Appendix G and the Biological Evaluation for details by Forest Service Region.

3.5.2 Environmental Consequences

3.5.2.1 Methodology and Assumptions

Where fire and retardant use statistics from the period prior to 2011 were used in the FEIS, the updated analyses for impacts to federally listed and sensitive plant species relied on data gathered since that time. The following information and assumptions were also updated (refer to the Biological Assessment and Biological Evaluation for more detail):

- Information about the amount of aerially delivered fire retardant used on each National Forest between 2012 and 2029 was used to estimate risk of aerial retardant application and average annual acreage where aerially delivered retardant may be used.
- From 2012 through 2019, intrusions occurred on 0.46 percent of fires, and on 0.8 percent of all aerial retardant drops. If a National Forest or Grassland has more than one retardant drop per year, the chance of an intrusion occurring is greater than 0.1 percent. Intrusions are more likely to occur on units with a high rate of use of aerially delivered fire retardant.
- Although Modified Alternative 3 does not include the requirement to monitor 5% of all small fires where aerially delivered retardant is used, intrusions would be assessed and monitored, and all terms and conditions resulting from ESA section 7 consultations will be followed.
- If an intrusion results in an increase in non-native invasive plant species in an avoidance area, they will be removed in compliance with existing forest or regional plans. If no plans exist, appropriate mitigation, remediation, or control efforts will be developed on a case-by-case basis with the local Service office.
- The acreage of National Forest System land on which aerial retardant is used annually ranges from 1 acre to 367 acres per National Forest (less than 0.025 percent of any individual National Forest), or between 00.000002 percent and 0.0025 percent of the National Forest System land base annually.

The effects determinations for federally listed and sensitive species in the Biological Assessment, Biological Evaluation, and summarized in this SEIS use updated national screening processes (refer to discussion in SEIS section 3.4.2 and to SEIS Appendix E for more information). The updated screening elements are very similar to those used in the 2011 analysis and FEIS, but

they incorporate data gathered since 2011 on aerially delivered fire retardant use and clarify some screening elements. The updated screening elements for sensitive species parallel the screening elements used for federally listed species by considering the probability of fire occurring, of aerially delivered retardant use in habitats where the species occurs, and whether the species occurs in aquatic or terrestrial habitats.

All species that are currently listed as threatened or endangered, that are proposed for listing, are identified as candidates for listing under the ESA, or that are identified as sensitive species were screened regardless of determinations made in 2011. The determinations for some species evaluated in 2011 may have changed due to changes in the screening elements, changes in estimated retardant use where they occur, or other factors. Species lists, occurrences, and descriptions of the screening process can be found in the Biological Assessment.

Analysis of the updated sensitive species lists was only carried out for the proposed action (Modified Alternative 3) due to the large amount of data and information involved. The relative impacts of Alternatives 1, 2 and 3 on the current list of sensitive species is expected to be similar to that reported in the FEIS.

3.5.2.2 Summary of General Effects of Fire Retardant on Plants and Habitats

The following information and summaries are in addition to or clarify information found in the FEIS on pages 110-115 and pages 119-122.

General Effects Considerations

Information on aerially delivered retardant use in different ecoregions, as well as timing of peak fire season within those ecoregions has been updated for this analysis (see Biological Evaluation).

Phytotoxicity

The analysis summarized in this SEIS considered fire retardants approved for use by the Forest Service as of mid-2021. Discussion in the FEIS of the phytotoxic effects of retardants (FEIS pages 110-111) includes information from research on or use of some retardants no longer approved for use on National Forest System lands. Information about the effects of those retardants and constituents remains relevant for this SEIS because the same or similar constituents are included in currently approved long-term retardants, and because that information is useful for understanding the general effects of retardant use on plants and plant communities.

The analysis of potential phytotoxic effects as described in the FEIS is not changed. The updated analysis is summarized here in order to incorporate conclusions based on consideration of additional literature, consider updated statistics on retardant use, and consider the updated proposed action (Modified Alternative 3).

Short-term (1-2 growing seasons) phytotoxic effects may occur if retardant is applied directly on species that are sensitive to the salts used in aerially delivered fire retardants. Avoidance mapping around known occurrences, or other conditions that limit aerial retardant delivery would protect these species from phytotoxic effects by preventing retardant application. Potential phytotoxic effects could occur from an intrusion (including use of the exception), or application on an individual or population that has not been identified or documented and is therefore not protected by an avoidance area. Aerial retardant application occurs on a small percentage of FS

lands annually, estimated to be less than 0.025 percent by any individual forest and less than 0.0025 percent nationwide.

Areas where a narrow endemic or isolated population occurs on a forest would be most vulnerable to impacts resulting from intrusions or use of exceptions, because an entire population or occurrence could be affected at once. It is impossible to predict where or when an intrusion or an exception for retardant use would occur. However, use of avoidance areas that take into consideration this concern (e.g., larger avoidance areas or restrictions on any aerially delivered retardant in the identified area) would provide adequate protections for these populations.

Plant communities likely exist that support federally listed plants or potential habitats, but that have not been identified or documented and are therefore not protected by avoidance areas. No widespread phytotoxic impacts to these native plant communities are expected because only a very small percentage of land is expected to have fire retardant applied to it, retardant is usually applied in linear strips across the landscape (50-75 feet wide), and available literature indicates little or no direct phytotoxic impacts beyond 1 to 2 years after retardant application. Based on the results of research and the likely small amount of acres that would receive retardant, it is expected that available propagule seed-bank sources or other propagule sources nearby would provide long-term revegetation potential for common native plant species that might be impacted in the short-term.

Vegetation Diversity and Retardant Fertilizer Effects

The analysis of these issues for this SEIS considered fire retardants approved for use by the Forest Service as of mid-2021, and for the reasons described above in the section on phytotoxicity this analysis also used information from research on retardants that are no longer in use.

Retardants serve as a source of plant nutrients in the soil, whether applied directly to the ground, deposited on the ground via rainfall, or after being chemically altered during a fire. Individual and plant community responses are extremely complex and highly site specific. From a broad perspective, the amount of retardant applied per forest/region/nationwide is small. This does not preclude impacts to individual species or to ecological communities, particularly threatened and endangered plant species and the ecological communities in which they occur, designated critical habitat areas, or plant species that are considered “narrow endemics”.

Current Forest Service direction, including the use of avoidance areas as described in Modified Alternative 3, would reduce the potential for impacts from fertilizing effects of retardant and consequent changes to native plant diversity. No changes in species diversity are expected to occur where avoidance areas are used. It is impossible to predict where or when an intrusion (including use of the exception) would occur. However, the use of avoidance areas that take into consideration this concern (e.g., larger avoidance areas or restrictions on any aerially delivered retardant in the identified area), combined with the relatively small amount of individual National Forest land where aerially delivered fire retardant is applied annually, provide adequate protections for these populations

Retardant Products Not Previously Analyzed

Magnesium chloride was not included in the 2011 analysis but is currently used in at least two retardant products that are conditionally qualified (see Glossary) for use on National Forest System lands. Information is not available regarding the potential phytotoxicity or impacts to

vegetation diversity that could result from use of magnesium chloride in aerially delivered retardant. Most studies on plant response to this chemical have focused on its use for dust abatement on roads. Those studies have reported damage to tree species, ranging from needle loss to tree mortality, after repeated use along the same roadsides (Goodrich and Jacobi 2012, Goodrich et al. 2009). Repeated application of magnesium chloride based aerial fire retardant in the same location is unlikely. Therefore, impacts are expected to be less severe than those reported for its use in dust abatement but are difficult to otherwise estimate.

3.5.2.3 Effects to Threatened, Endangered and Proposed Plant Species and Designated Critical Habitats

Of the species considered, the potential impacts of aerial retardant use under Modified Alternative 3 are expected to be as follows (refer to SEIS Appendix G and to the Biological Assessment for details, including summaries and determinations for each species considered):

- 66 species are expected to have no effects resulting from use of aerially delivered fire retardant. These species either occur on units that do not use aerially delivered fire retardant, occur in a habitat where aerially delivered retardant is not used, occur on a unit with low likelihood of aerially delivered retardant use and habitat is protected by mapped avoidance areas, or is not known to occur on National Forest System lands.
- 53 species (52 plants and 1 fungi) may be affected but are not likely to be adversely affected by the use of aerially delivered retardant, based on the estimated annual acreage of retardant use on the National Forests on which they occur, or if on a forest with higher estimated use these species occur in habitats with a low probability of receiving retardant application. Most of the occurrences of these species are protected through the use of avoidance areas, reducing the potential for impacts
- 52 species are likely to be adversely affected by the use of aerially delivered retardant, based on the estimated annual acreage of retardant use on the National Forests on which they occur or on their status as narrow endemics or small isolated populations. Occurrences of these species are protected through the use of avoidance areas, reducing the potential for impacts.
- Of the 33 critical habitats evaluated, 4 are expected to have no effects resulting from use of aerially delivered fire retardant, and 29 may be affected but are not likely to be adversely affected by the use of aerially delivered retardant.

3.5.2.4 Effects to Regional Forester Sensitive Species

Determinations for sensitive species are made at the level of the individual unit. Therefore, although there are a total of 2436 plant species listed as sensitive across the National Forest system, there are many more determinations because each species receives a determination for each unit on which it is found and is identified as a sensitive species. A summary of determinations for sensitive species will be reported in the final SEIS, and the list of species, analysis process used, and determinations for each species will be provided in the Biological Evaluation in the project record.

3.5.2.5 Cumulative Effects to Plant Species and Habitats

There are no changes or additions to the effects as discussed in the FEIS beginning on page 119.

3.5.2.6 Effects to Noxious and Non-Native Invasive Plant Species

There are no changes or additions to the effects as discussed in the FEIS beginning on page 120.

3.5.2.7 Cumulative Effects to Non-Native Invasive Plant Species

There are no changes or additions to the effects as discussed in the FEIS beginning on page 121.

3.6 Wildlife Species and Habitats

The information presented in this section is in addition to that beginning on page 124 of the FEIS. Species lists and details regarding analysis, screening procedures, and determinations can be found in SEIS Appendix I and in the Biological Assessment and Biological Evaluation in the project file.

3.6.1 Affected Environment

The list of retardants currently used and considered in this analysis has been updated since the 2011 FEIS and can be found on the current Qualified Products List. All but two of the aerially delivered retardants currently in use on National Forest System lands comprise the same chemicals evaluated in the analysis supporting the FEIS. Magnesium chloride was not included in the 2011 analysis but is currently used in two retardant products that are conditionally qualified (see Glossary) for use on National Forest System lands.

3.6.1.1 Threatened, Endangered and Proposed Wildlife Species and Designated Critical Habitats

The list of species identified as threatened, endangered, proposed, or candidate under the Endangered Species Act has been updated since 2011. As species have been added, supplemental consultations have been carried out to ensure that effects of aerially delivered retardant use on National Forest System lands have been appropriately considered (USDA Forest Service 2015 and 2017). The analysis for this SEIS addresses all species currently listed, regardless of prior consultations (refer to the current Biological Assessment). There are 121 threatened, endangered, or proposed wildlife species that are considered in the current analysis. Designated critical habitat for 45 wildlife species is also considered

3.6.1.2 Regional Forester Sensitive Species

There are 743 wildlife species, including 135 birds, 92 mammals, 71 amphibians, 53 reptiles, 267 insects/springtails (hexapods), 12 centipedes/millipedes (myriapods), 6 worms, 12 arachnids, and 95 terrestrial snails (gastropods) that are identified as Regional Forester sensitive species and that are considered in this analysis. However, the number of occurrences evaluated is much larger, as determinations are made at the level of the individual unit (refer to section 3.6.2.4 below and to the Biological Evaluation).

3.6.2 Environmental Consequences

Analysis methods, assumptions, and impacts to aquatic species and habitats are the same as those described in the 2011 FEIS beginning on page 95, with the following updates and additions.

3.6.2.1 Methodology and Assumptions

The national screening process used to determine effects to wildlife species in 2011 was used as an initial filter for this analysis, with some updates and clarifications (refer to SEIS Appendix E).

Key updates are the same for wildlife as those described in section 3.4.2.1 of this SEIS for aquatic species: updated retardant application potential, consideration of whether avoidance areas are used, and inclusion of screens for designated critical habitats. As in 2011, the wildlife analysis relied on additional screens to consider effects to critical habitat, and to consider individual species characteristics (mobility, potential for disturbance due to aerial retardant delivery, and potential for ingestion of aerial retardant chemicals) that could influence whether and to what degree a species might be impacted by use of aerially delivered retardant. These screens were updated for clarity and to include updated data on aerial retardant use (refer to SEIS Appendix E and to the Biological Assessment for details).

The analysis of sensitive species in 2011 relied on a less formal screening process than the one used for listed species. For the current analysis, a screening process was used that parallels the screens and assumptions used for analysis of listed species, including consideration of the likelihood of retardant use on the unit and in the habitat where the species occurs, and whether occurrences or habitat are protected by avoidance areas (refer to SEIS Appendix E and to the Biological Evaluation). Sensitive wildlife species were also evaluated using the additional screens described above. Effects determinations relied on information about fires and retardant use by unit and ecoregion, and considered groups of wildlife species based on broad habitat types.

The current analysis uses data on intrusions from 2012 through 2019 (refer to SEIS Appendix D). The updated intrusion rates described in section 3.4.2.1 of this SEIS were considered the wildlife analysis as well. (refer to section 3.4.2 and 3.13 for discussion of assumptions regarding potential changes in number, size, and severity of fires and the relationship to aerial retardant use and therefore total number of intrusions).

All species that are currently listed as threatened or endangered, that are proposed for listing, are identified as candidates for listing under the ESA, or that are identified as sensitive species were screened regardless of determinations made in 2011. The determinations for some species evaluated in 2011 may have changed due to changes in the screening elements, changes in estimated retardant use where they occur, or other factors. Species lists, occurrences, and descriptions of the screening process can be found in the Biological Assessments.

Although determinations in the Biological Assessments are intended to meet the requirements of consultation under section 7 of the Endangered Species Act, as in the FEIS those determinations and the analyses supporting them also meet the National Environmental Policy Act requirements for analysis and disclosure of impacts of the proposed action. Determinations for these species and for sensitive species provide information about the potential for impacts to the broad array of wildlife species found on National Forest System lands.

Analysis of the updated species lists was only carried out for the proposed action (Modified Alternative 3) due to the large amount of data and information involved. The relative impacts of Alternatives 1, 2 and 3 on the current lists of threatened, endangered, proposed, candidate, ad sensitive species is expected to be similar to that reported in the FEIS

3.6.2.2 General Effects Common to All Wildlife Species

The effects of aerial retardant chemicals are described would be the same as described on pages 127-130 of the FEIS, with the following additions.

The list of aerial retardant products currently approved for use on National Forest System lands has changed since 2011 (refer to the Qualified Products List.). All products qualified for use have been tested for toxicity, and adhere to requirements in the most recent Forest Service specification for long-term retardants (Forest Service Specification FS 5100-304d). Magnesium chloride (MgCl) was not included in the 2011 analysis but is currently used in two retardants conditionally qualified (see Glossary) for use on National Forest System lands. Little published data is available on the use of MgCl in aerially delivered retardant. Jones (2017) examined the effects of MgCl in road salts on freshwater wetland communities and found potential effects to zooplankton that potentially affected other trophic levels. Toxicity to wildlife species from retardant chemicals, including MgCl, was addressed in ecological risk assessments (Labat Environmental 2017, Auxilio Management Services 2020, 2021). The assessments use procedures similar to those described in the 2011 Biological Assessment and Biological Evaluation, and indicate effects similar to those described in the FEIS (pages 128-129).

The proposed action (Modified Alternative 3) includes provisions for approving new products or new formulations of existing products. Products may be approved if the toxicity levels of the new products do not exceed those of currently approved products, and do not have any new identified risk factors. Therefore, any new products used under the proposed action would have similar or lower risk of toxicity compared to the products listed in Table 3.

3.6.2.3 Effects to Threatened, Endangered and Proposed Species

Determinations for federally listed, proposed, and candidate species were made for the species across its entire range, even though some occurrences may be in areas with little or no retardant use. Of the species considered, the potential impacts of aerial retardant use under Modified Alternative 3 are expected to be as follows (refer to SEIS Appendix I and to the Biological Assessment for details):

- 34 species (5 amphibian, 13 bird, 5 insect, 1 mammal, and 10 reptile) are expected to have no effects resulting from use of aerially delivered fire retardant because they occur on units that do not use aerially delivered retardant, they occur in habitats where use of aerially delivered retardant is unlikely, avoidance areas are used and there is low potential for use of aerially delivered retardant on the unit, or the species or habitat is not known to occur on National Forest System lands.
- 58 species (6 amphibian, 7 bird, 6 insect, 25 mammal, 13 reptile, and 1 arachnid) may be affected but are not likely to be adversely affected by the use of aerially delivered retardant, because they occur in circumstances where there is a relatively small potential for exposure, but some effects could occur due to change in habitat, disturbance, or toxicity.
- 29 species (9 amphibians,4 bird, 1 terrestrial gastropod, 10 insect, and 5 mammal) are likely to be adversely affected by the use of aerially delivered retardant, due to changes in habitat, disturbance, or estimated toxicity .
- Of the 45 critical habitats evaluated, 10 (1 bird, 2 insect, 7 mammal) would experience no effect, 29 (10 amphibian, 8 bird, 3 insect, 5 mammal, 2 reptile, and 1 arachnid) would have an affect but not likely to adversely affect (no changes to the physical and biological features of critical habitat, and they are protected with avoidance areas), and 6 (all insect) would be likely to experience adverse effects (would experience changes to the physical or biological features).

3.6.2.4 Effects to Regional Forester Sensitive Species

Determinations for sensitive species are made at the level of the individual unit. Therefore, although there are a total of 743 wildlife species listed as sensitive across the National Forest system, there are many more determinations because each species receives a determination for each unit on which it is found and is identified as a sensitive species. A summary of determinations for sensitive species will be reported in the final SEIS, and the list of species, analysis process used, and determinations for each species will be provided in the Biological Evaluation in the project record.

3.6.2.5 Cumulative Effects to Wildlife Species and Habitats

There are no changes to the cumulative effects discussed in the FEIS (pages 129-130).

3.7 Social and Economic Considerations

The information presented in this section is in addition to that beginning on page 139 of the FEIS. Information sources, references, and other methodology details are in an updated specialist report in the project file.

3.7.1 Affected Environment

The numbers included in the paragraphs below replace those in the corresponding section of the FEIS on pages 139-140. These numbers also replace the corresponding information in Table 16 on page 140 of the FEIS.

The average number of fires on Forest Service land between fiscal years 2012 and 2019 was 6,598 per year. Average annual suppression costs as of 2019 are estimated to be approximately $1.6 billion per year.

The average annual cost to the Forest Service of retardant use (i.e., cost for airtanker flight time and retardant purchase) on NFS lands is estimated to have ranged from approximately $58 million to $100 million per fiscal year from fiscal year 2012 to fiscal year 2019, or approximately 3.7 percent to 6.3 percent of average total Forest Service suppression costs per year. Tanker flight time accounts for 63 percent of the lower-bound retardant cost estimate, and 36 percent of the upper-bound retardant cost estimate. As described in the FEIS, retardant costs do not include general aviation program operation, support, and acquisition costs; this document adds the clarification that tanker flight time costs discussed in this section also do not include the cost of fuel.

3.7.2 Environmental Consequences

3.7.2.1 Methodology

The overall methodology used for updating the information in this document is the same as that described on pages 140 -141 in the FEIS. The reference to the 2010 Interagency Aerial Supervision Guide on page 141 in the FEIS is updated here to refer to the current Standards for Aerial Supervision (National Wildfire Coordinating Group 2020).

3.7.2.2 Assumptions

This section provides information about assumptions used in analysis updates for this SEIS. The assumptions discussed in the FEIS beginning on page 142 remain unchanged unless specifically

stated here. Refer to the FEIS or to the Social and Economic Considerations specialist reports in the project record for additional information and references. Some discussion in the FEIS refers to information found in other chapters or sections of the FEIS. Where that occurs, the reader should also refer to updated information in the corresponding sections of this SEIS.

Cost

The method of determining costs is the same as described in the FEIS. Cost estimates are updated to include information gathered after 2011.

Retardant Application

Costs of retardant application refers to material costs and flight time, as described in the Affected Environment section. The costs of retardant use under Alternatives 2 and 3 are assumed to be equivalent to the average annual costs of retardant application between 2012 and 2019 ($58 million to $100 million per year) as described in the updated Affected Environment section above. Alternative 3 was selected in the 2011 Record of Decision and has been implemented since that time. Therefore, the costs incurred from 2012 to 2019 are assumed to reflect implementation of that alternative.

There is insufficient evidence to conclude that retardant use and the associated costs under Modified Alternative 3 would differ from the range of costs identified for Alternative 2 or experienced during implementation of Alternative 3.

The average unit cost of retardant is assumed to range from $1.69 to $5.00 per gallon based on the lowest and highest prices for each year for all tanker bases from 2012 to 2019. In future years additional chemicals and products are expected to be used. We anticipate, however, that retardant costs will remain a relatively constant portion of the overall cost (currently between 3.7% and 6.3% of total annual suppression costs). Because flight costs are the largest portion of the overall cost of delivering retardant, if at some point in the future new chemicals reduce the number of flights needed and/or are more expensive per gallon than currently approved chemicals, updated analyses would be necessary to determine any impacts to total costs.

Compliance

Monitoring costs under Alternatives 2 and Modified 3 would be limited to annual reporting and monitoring for emergency consultations and cases in which intrusions occur in threatened or endangered species habitat. Costs to monitor intrusions under these alternatives are assumed to be included in the assessment and consultation activities described below. Costs for monitoring fires under 300 acres under Alternative 3 would be an estimated $150,000 annually, based on the same assumptions used to estimate these costs in the FEIS. This cost would be zero for Modified Alternative 3. Refer to the specialist report in the project record for details regarding how these costs are estimated.

Assessment and consultation costs are expected to occur under Alternatives 2, 3, and Modified Alternative 3 as a consequence of the potential for intrusions to occur. From 2012 to 2019 there were 138 intrusions into threatened or endangered species habitat that required consultation. As such, the expected rate of intrusions is assumed to be 17 per year. As with Alternative 3, Modified Alternative 3 has fewer exceptions than Alternative 2. This decreases the likely number of consultations and their associated costs. However, the overall effect of these changes on annual costs is difficult to project.

Mapping requirements and associated costs are based on the need to complete avoidance mapping for species listed in the 2021 Biological Assessments. Mapping costs for Modified Alternative 3 are assumed to be higher for Alternatives 2 and 3 due to a greater number of species (e.g., including some Regional Forester sensitive species) for which avoidance areas may be mapped.

Costs for other suppression activities are assumed to be the same under Modified Alternative 3 as those described for Alternative 3.

Capacity to Meet Suppression Objectives

There are no changes to the assumptions and information presented in the FEIS.

3.7.2.3 Effects of Alternatives

Table 4 presents information on retardant use, compliance, and suppression costs by alternative, updated from the information found in Table 18 (page 143) of the FEIS.

Table 4. Estimated Annual Costs, by Alternative

	Annual Cost of Aerial Retardant Application (1)	Annualized Cost of Mapping (3)	Annual Cost of Small Fire Monitoring (4)	Annual Cost of Intrusion Assessment and Consultation (5)	Total Cost of Compliance	Other Suppression Costs (2)
Alternative 1	$0	$0	$0	$0	$0	Greater than other Alternatives
Alternative 2	$58 to $100 million	$1,040,000	$0	$210,000	$1,250,000	Approximately $1.48 to $1.53 billion
Alternative 3	Same as Alternative 2	$1,290,000	$150,000	$210,000	$1,650,000	Approximately $1.48 to $1.53 billion, or higher
Modified Alternative 3	Same as Alternative 2	$1,290,000	$0	$210,000	$1,500,000	Approximately $1.48 to $1.53 billion, or higher

The methods and assumptions on which the data in Table 4 is based are the same as those described in footnotes to Table 18 in the FEIS, with the following exceptions: 1) There would be no monitoring of small fires under Modified Alternative 3 as there is under Alternative 3, and 2) costs for alternatives 2 and 3 assume an average of 23 days per year for monitoring and reporting to comply with required effects reporting.

Effects discussed below include only those that differ from the effects described beginning on page 143 of the FEIS.

Effects of Alternative 1

The FEIS provides a discussion about the use of water instead of retardant, the consequent probability of fires escaping early suppression efforts, and the associated costs of fighting those fires.This section updates those estimates as follows:

The incremental cost of an escaped fire is estimated to be approximately $3.1 million, based on large (greater than 300 acres) fire expenditures for 2012 to 2019 (refer to project record for detailed information about annual costs). As discussed in the Affected Environment section of this SEIS and in Table 4, current costs associated with retardant application range from $58 to $100 million per year. The analysis in the FEIS estimated the number of escaped fires that might be avoided and therefore justify (from an economic standpoint) retardant costs, by dividing retardant costs by an average of $3.1 million per escaped fire. That number is estimated to be 22 to 36 escaped fires per year based on current costs. This suggests that the benefits in terms of firefighting expenditures of using retardant would outweigh the cost of not using retardant if the number of escaped fires increased by 22 to 36 fires per year. However, there are costs other than the estimated $3.1 million in firefighting costs associated with escaped fires, as described in the FEIS.

Effects of Alternative 2

The updated estimated costs of implementing Alternative 2 are displayed in Table 4 above. The total costs for compliance ($1.25 million per year) would be about 1.2 percent to 1.8 percent of all direct costs associated with the combined costs of compliance and retardant. The majority ($1.04 million annually) of estimated compliance costs under Alternative 2 would be associated with avoidance area mapping, and the remaining $210,000 estimated annual costs would be associated with assessments, consultations, and monitoring.

Total suppression costs are estimated to average $1.59 billion per year, based on data from 2012 to 2019. Subtracting the costs of retardant, compliance, suppression costs under this alternative are estimated at approximately $1.48 to $1.53 billion per year, as shown in Table 4.

All other effects discussed for Alternative 2 in the FEIS remain the same.

Effects of Alternative 3

Updated cost estimates for implementation of this alternative are shown in Table 4. All other information regarding effects of this alternative discussed in the FEIS would be the same, with updated estimates for compliance costs (approximately $1.65 million per year), and costs associated with assessment, consultation, monitoring of intrusions (approximately $210,000 per year).

Effects of Modified Alternative 3

Estimates of the cost of implementing this alternative are shown in Table 4. Costs would be the same as those for Alternative 3, except that there would be no small fire monitoring under this alternative, reducing the estimated total cost of compliance to approximately $1.5 million per year. Other effects of this alternative would be the same as those described in the FEIS for Alternative 3.

3.7.2.4 Summary of Effects

Table 19 (p. 148) in the FEIS is a summary comparison of alternatives. Table 4 in this document provides updated estimates of those costs, with the addition of estimates for Modified Alternative 3. The information about other suppression costs, capacity to satisfy suppression objectives, and suppression cost efficiency shown in FEIS Table 19 for Alternative 3 would be the same under Modified Alternative 3.

3.8 Public Health and Safety

The information presented in this section is in addition to that presented beginning on page 150 of the FEIS.

3.8.1 Affected Environment

Information regarding the evaluation process, fire retardant use policy and firefighting operations, and programmatic risk assessments of human health hazards remains the same as described in the Final Environmental Impact Statement.

For clarity and currency, note that the specifications for chemicals referred to on page 150 of the FEIS is revised periodically. The current version (Forest Service Specification FS 5100-304d) was updated in January 2020 and amended in May 2021. All references in the FEIS to the specifications for long-term retardant should be interpreted as referring to the appropriate (current) version.

3.8.2 Environmental Consequences

There would be no changes to the effects of Alternatives 1, 2, and 3 as described in the FEIS. The effects of Modified Alternative 3 would be the same as those described in the FEIS for Alternative 3.

3.9 Cultural Resources

The information presented in this section is in addition to that beginning on page 155 of the FEIS.

The FEIS referred to ‘heritage resources’, whereas ‘cultural resources’ is a more accurate term for describing the broad array of resources addressed in this section. Similarly, the terms ‘archeological and cultural resource specialists’ should be used in place of the term ‘heritage resource specialists’.

3.9.1 Affected Environment

This section provides updated information on the number of cultural resources known to occur on National Forest System lands and removes consideration of sites with potential for other types of listing but that do not currently have specific designations. More than 470,000 sites (compared to 380,000 as reported in the FEIS) are currently inventoried on National Forest System lands. There are currently 20 national historic landmarks (compared to 19 as reported in the Final Environmental Impact Statement). All other information presented in the Affected Environment section of the FEIS remains the same.

3.9.2 Environmental Consequences

3.9.2.1 Alternatives 1, 2, and 3

The effects of implementing Alternatives 1, 2, or 3 would remain the same as described in the FEIS.

3.9.2.2 Modified Alternative 3

The effects described for Alternative 3 in the FEIS would also occur if Modified Alternative 3 were to be implemented.

In addition to the effects described in the FEIS, further consideration has been given to the direction included in both Alternative 3 and Modified Alternative 3 for coordination with tribes and cultural resource specialists prior to aerial application of fire retardant. This coordination would likely create management context and actions so that any use of aerial retardant would not adversely affect the integrity of cultural resources or their potential value as data sources.

Both Alternative 3 and Modified Alternative 3 require site assessment by appropriate specialists and consultation with state and/or tribal Historic Preservation Officers when retardant is dropped on a cultural resource. These consultations would likely result in recommendations for actions to resolve or mitigate any adverse effects. The impacts to sacred sites, however, could be unresolvable. If this is the case and in the absence of agreed-on mitigation, the retardant application could result in perceived loss of site integrity and consequently a loss of the resource at that site.

3.10 Scenery Management

The information presented in this section is in addition to that beginning on page 159 of the FEIS. The analysis in the FEIS and the updates in this section use national scenery management direction and description of the visual effects of retardant application to evaluate the potential effects to scenic resources of nationwide retardant use on NFS lands.

3.10.1 Affected Environment

There are no changes to the description of scenery resources found in the FEIS.

3.10.2 Environmental Consequences

This section has been updated to consider recent trends in aerial fire retardant use, as well as additional colorants that may be used.

The increasing amount of aerially-applied fire retardant used annually since 2011 does not alter the effects as described in the FEIS, but there are potentially more acres of NFS land affected each year. The cumulative effects section of this analysis has been updated to consider the potential impacts of more retardant delivery in combination with other actions.

In addition to the effects listed on page 160 of the FEIS, the following effects could occur as a result of colorants used in aerial retardants. In addition to the reddish color discussed in the FEIS, retardants could temporarily stain surfaces shades of red or orange, depending on the type of retardant or colorant used. Retardant may be uncolored, or colored with iron oxide or fugitive (i.e. fading) pigment. Pigment categorized as ‘uncolored’ (i.e. lacking added colorant chemicals) may actually have a slight color due to the other components, but that color is generally not noticeable when applied. Iron oxide colorant is dark red, and remains visible until weathering removes it. Fugitive colorants (red, orange, or pink) are designed to break down under direct sunlight to the point that they are no longer visible. Depending on individual site conditions, that could occur in as little as six weeks, or may take much longer. In most cases, fugitive color would remain visible for several months until faded by sunlight or removed by weathering, or both. Residual retardant would remain visible longest in rocky areas and in areas with little

precipitation. Areas with more porous surfaces and those with more frequent precipitation would have impacts of shorter duration. Most commonly, effects to scenic resources would be short-lived.

In recent years, the use of fugitive colorant has increased as more products have become available. In 2019, forty percent of retardant used contained fugitive colorant. If the trend toward more use of fugitive colorant continues, effects to scenic resources would diminish.

Effects to scenery resources would be cumulative where co-located with other management or suppression activities, or where applied in close proximity to facilities, travel corridors, and other frequently viewed areas. As an example, colored retardant applied along linear features such as roads, trails, or fire lines would affect scenery in combination with, and therefore cumulative to the features themselves, including any vegetation management associated with those features. These cumulative effects would be short term, lasting only until the colorant faded (fugitive) or weathered (iron-oxide) away.

In conclusion, use of colored retardant would have effects to scenic resources by introducing color that is in contrast to the surroundings. These effects would be cumulative if they occur in proximity to other suppression or management activities, or infrastructure. These effects would be temporary, as described above.

3.11 Wilderness Character

The information presented in this section is in addition to that beginning on page 161 of the FEIS. In the FEIS where the term ‘wilderness characteristics’ is used, it should be replaced by the term ‘wilderness character’ as used in this document.

3.11.1 Affected Environment

This section has been updated to reflect changes in descriptions of wilderness character, and to align with current guidance. The text below replaces the corresponding text in the FEIS.

The Wilderness Act (16 U.S.C. 1131-1136, September 3, 1964) allows that “such measure may be taken as may be necessary in the control of fire, insects, and diseases, subject to such conditions as the Secretary deems desirable.”. Use of fire retardant in wilderness or wilderness study areas must be consistent with maintaining the wilderness character of those areas. The Wilderness Act does not specifically define wilderness character. Recent interagency guidance (Landres et al. 2015) concluded that wilderness character is a holistic concept based on the interaction of 1) biophysical environments that are relatively free from modern human manipulation and impact, 2) personal experiences in natural environments that are relatively free from the encumbrances and signs of modern society, and 3) symbolic meanings of humility, restraint, and interdependence that inspire human connection with nature. Taken together, these tangible and intangible values define wilderness character and distinguish wilderness from all other lands. The descriptions below of the five qualities of wilderness character replace those in the Affected Environment section of the FEIS.

Untrammeled

The Wilderness Act states that wilderness is “an area where the earth and its community of life are untrammeled by man,” that “generally appears to have been affected primarily by the forces of nature” and “retain[s] its primeval character and influence.” This means that wilderness is free

from the intentional actions of modern human control or manipulation. A trammeling action is defined as an action or persistent structure that intentionally manipulates the earth and its community of life inside a designated wilderness or inside an area that by agency policy is managed as wilderness. (Landres et al 2015).

Natural

The Wilderness Act states that wilderness is "protected and managed so as to preserve its natural conditions." This means that wilderness ecological systems are substantially free from the effects of modern civilization

Solitude or Primitive and Unconfined Recreation (formerly labelled 'Primitive Recreation and Solitude')

The Wilderness Act states that wilderness has "outstanding opportunities for solitude or a primitive and unconfined type of recreation." This means that wilderness provides outstanding opportunities for recreation in an environment that is relatively free from the encumbrances of modern society, and for the experience of the benefits and inspiration derived from self-reliance, self-discovery, physical and mental challenge, and freedom from societal obligations. This quality focuses on the tangible aspects of the setting that affect the opportunity for people to directly experience wilderness.

Other Features of Value

The Wilderness Act states that wilderness "may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value." This quality captures important elements or "features" of a particular wilderness that are not covered by the other four qualities. Typically these occur in a specific location, such as archaeological, historical, or paleontological features; some, however, may occur over a broad area such as an extensive geological or paleontological area, or a cultural landscape. The 'Other Features of Value' quality directly relates to "personal experiences in natural environments relatively free from the encumbrances and signs of modern society" and "symbolic meanings of humility, restraint, and interdependence that inspire human connection with nature" described in the above definition of wilderness character. This quality may or may not occur within a specific wilderness and is therefore different from the other four qualities that, by law, occur in every wilderness.

Wilderness Study Areas

This designation was not addressed in the FEIS. Wilderness Study Areas (WSAs) were created by federal law and are managed so that no actions permanently affect Congressional discretion to designate (or release) these areas in the future. The mandate is to maintain their presently existing wilderness character and potential for inclusion in the National Wilderness Preservation System.

3.11.2 Environmental Consequences

This section has been updated to reflect changes in the definitions of the qualities of wilderness character that necessitated updates to the analysis, and to include consideration of effects to wilderness study areas. The information in this section is in addition to that in the Environmental Consequences section that begins on page 162 of the FEIS. Unlike the Affected Environment section, only updates or changes are included here.

There are no changes to the effects described for Alternative 1 in the FEIS

Alternatives 2, 3, and Modified 3

The effects to wilderness character would be the same under alternatives 2, 3, and Modified Alternative 3, because the presence of wilderness does not differ among alternatives. The increased amount of aerial fire retardant applied since 2011 does not result in effects different from those described in the FEIS, but potentially more acres are affected each year. Effects to the qualities of wilderness character of these alternatives are updated as follows:

Untrammeled

Delivery of aerial fire retardant into designated wilderness deliberately manipulates the biophysical environment and is considered a 'trammeling' action. Since this quality refers to the intent rather than to the effects of the action, the degree of impact would depend on the number of aerial retardant delivery actions authorized in wilderness.

Natural

Effects discussed under the heading of 'Untrammeled' in the FEIS are more appropriately addressed as impacts to the 'Natural' quality when using current definitions and guidance. Effects of the visual aspect of retardant that were described in this section in the FEIS are more appropriately discussed in the 'Undeveloped' section below.

The presence of fire retardant chemicals could affect ecological processes at the micro scale, including potential introduction or increases in non-native invasive species, changes in nutrient cycling, and changes to vegetation growth rates (refer also to sections on Environmental Consequences to soils and to plants in the FEIS, in this document, and in the project record).To the extent that fire retardant chemicals disrupt natural processes, there would be a negative effect to the 'natural' quality of wilderness. Under some circumstances retardant loads may also physically damage vegetation, which would result in localized impacts. Effects to the 'natural' quality would be site specific and would depend on the amount of retardant applied, vegetation characteristics, terrain, and post-fire weather.

Undeveloped

The use of colorants in aerial retardant products results in the visible presence of fire retardant in wilderness, particularly when dropped in highly visible locations. The duration and intensity of this effect depends on the terrain and climate where it is dropped and the weather that occurs subsequent to the drop. If the use of fugitive colorant increases, these effects would be expected to decrease. The retardant delivery method is a connected action that introduces mechanized transport over wilderness. Increases in the amount of retardant used would increase the presence of mechanized transport over wilderness. Retardant delivery also involves a mechanized process (dropping of materials and supplies from aircraft) that is considered a degradation to the undeveloped quality even when it occurs as part of an emergency incident. The degree of this effect would be dependent on how many retardant drops are delivered.

Solitude or Primitive and Unconfined Recreation

This section removes text in the FEIS regarding the potential for enhancement of visitor experience due to retardant drops, as that is inconsistent with this wilderness character. Other effects described in the FEIS remain unchanged, adding that closures that could occur during fire retardant application could also degrade this character because closures restrict unconfined

recreation. That effect may be indistinguishable from the effect of closures that could be in place during fire management activities in the area where retardant is being used.

Other Features of Value

Because not all wilderness areas have identified features of value, impacts would vary. Potential effects may include coloration, damage resulting from application, and changes in nutrients that affect vegetation. Long-term impacts would be slight and would usually be mitigated through the use of fire resource advisors who provide guidance on specific wilderness areas during fire incidents.

Cumulative Effects

The number and degree of current and projected aerial fire retardant drops would not have long-lasting effects on the wilderness character of the National Wilderness Preservation System as a whole. However, within individual wilderness areas cumulative effects could occur to any of the five wilderness character qualities if other management actions that affect those qualities occur in spatial or temporal proximity to retardant drops. The degree of cumulative effect would vary depending on the scope and scale of actions. Any cumulative effects would be temporary due to the short-term nature of retardant use.

3.12 Air Quality

There are no changes to the Affected Environment or to the Environmental Consequences discussed in the FEIS.

3.13 Climate

The 2011 FEIS addressed the issue of climate change and predicted impacts to wildfire frequency, severity, and size to a limited degree in some resource-specific analyses. This section is intended to supplement the FEIS with information about climate change, wildfires, and aerial retardant use. The information in this section is necessarily broad and does not lend itself to the format of describing affected environment followed by environmental consequences. Instead, this section describes the relationships between climate and fire, and the implications for fire retardant use.

Greenhouse gases are gases in the earth's atmosphere that that trap thermal energy that radiates from the earth's surface. Accumulation of these gases results in warming of the earth's atmosphere (global warming), a phenomenon commonly referred to as the "greenhouse effect.". The molecules resulting from human actions and that contribute most to this effect and to global climate change include carbon dioxide, methane, and nitrous oxide.

Climate change is currently driving warming temperatures in varied ecosystems across the United States. Average temperatures are projected to continue increasing into the 21st century, although the magnitude of future warming will vary by geographic area and the rate of continued greenhouse gas emissions. The extent, frequency, and severity of wildfires can all be directly influenced by warming temperatures. If warmer average temperatures are accompanied by drier conditions, as predicted for much of the western U.S., both natural and human-caused ignitions may result in a larger number of fires that remain active over a longer period each year. This may be exacerbated in areas where warming conditions have led to drought-stressed vegetation, and where fuel loads are dense. Some models predict wetter conditions in the northeastern U.S., but

most large fires occur in the western U.S. (refer to SEIS Appendix C) and likely will continue to do so.

Wildfires also impact carbon uptake and storage on National Forests. Carbon makes up about one-half of the dry weight of trees and vegetation. Wildfires release carbon in the form of carbon dioxide directly into the atmosphere through the process of combustion. If forests regenerate following disturbances such as wildfire, carbon dioxide is removed from the atmosphere and sequestered back into living biomass. Carbon dioxide emissions from wildfires in the United States (including Alaska) vary from year-to-year, ranging from about 20-160 Teragrams (Tg) carbon dioxide (from 1990-2018) or up to 2 percent of the equivalent of the nation's total greenhouse gas emissions (U.S. Environmental Protection Agency 2020). From 1991-2011 an average of about 29 Tg carbon dioxide was emitted annually from wildfires on National Forest System lands (Birdsey et al 2019). The amount of vegetation and burnable materials or "fuel loads" are strongly related with increasing fire severity and greater tree mortality.

Application of fire retardant is a currently a key component of fire management and suppression strategies. We assume that in many cases water would be used if retardants were not (refer to FEIS Alternative 1, summarized in SEIS section 2.1.1 and in SEIS Table 2), and that water is less effective and would result in increases in total acreage burned (refer to FEIS section 3.1.3, pages 64-65). Fire retardants can help reduce both the extent and severity of wildfires and result in less net emissions of carbon into the atmosphere. The extent to which emission might be reduced with avoided emission from wildfires, however, is highly speculative and uncertain. In addition, extracting the effects of aerially applied fire retardants from a larger suppression effort, such as engines, hose and sprinkler systems, ground-based retardant use, fire lines, etc. is not possible.

There are also greenhouse gas emissions associated with the deployment of aerially delivered fire retardants. The direct emissions of greenhouse gases from aerial application of fire retardant will occur mainly from the combustion of aviation gasoline by fixed wing and rotary aircraft. Most emissions from combustion of aviation gasoline are in the form of carbon dioxide, with smaller contributions from methane and nitrous oxide. Emission factors for combustion of aviation gasoline are presented in Table 5, below. Table 6 presents the estimated greenhouse gas emissions from combustion of aviation gasoline in metric tons of carbon dioxide equivalents (CO_2e), calculated using both 20-year and 100-year global warming potentials from the Intergovernmental Panel on Climate Change 5th Assessment Report (Pachauri and Meyer 2014). Emissions are also displayed in teragrams (Tg) of carbon. One teragram is equal to one million metric tons of carbon or 3.7 million metric tons of carbon dioxide. The numbers used in Table 6 were estimated and calculated using Forest Service data on fuel consumption and flight-hours.

Table 5. Emission factors for combustion of aviation gasoline, by greenhouse gas type

Greenhouse Gas	Emission Factor[1] (kg Greenhouse Gas/gallon)
Carbon Dioxide (CO_2)	8.31
Methane (CH_4)	0.00706
Nitrous Oxide (N_20)	0.00011

1 United States Environmental Protection Agency Center for Corporate Climate Leadership. Emission Factors for Greenhouse Gas Inventories (2014).

Table 6. Estimated greenhouse gas emissions from fuel consumption related to aerial retardant delivery

Calendar Year	Tanker Flight Hours	Helicopter Flight Hours	Fuel Consumption[1] (gallons)	Emissions (MT CO_2e[2], 20-yr)	Emissions (MT CO_2e, 100-yr)	Emissions (Tg C)[3]
2012	3,465	379	810,936	7,243	6,923	0.002
2013	2,820	578	684,298	6,112	5,842	0.002
2014	3,484	339	811,698	7,250	6,929	0.002
2015	4,945	294	1,135,158	10,139	9,691	0.003
2016	6,278	1,012	1,498,759	13,387	12,795	0.003
2017	8,426	744	1,956,287	17,474	16,700	0.004
2018	7,888	752	1,836,283	16,402	15,676	0.004
2019	4,170	51	939,609	8,393	8,021	0.002

1 Fuel consumption is based on consumption rate of 224 gallons per flight hour for tankers (fixed wint) and 90 gallons per flight hour for helicopters.
2 MT = metric tons, CO2e = carbon dioxide equivalents (see text)
3 One teragram (Tg) is equal to 1 million metric tons of carbon

Global warming potentials (GWP) provide a ratio used to compare the global impacts of different gases; specifically to measure how much energy the emissions of one ton of gas will absorb over a specified period of time relative to the emissions of one ton of carbon dioxide. The global warming potentials account for the intensity of an individual greenhouse gas's heat-trapping effect and its longevity in the atmosphere (Pachauri and Meyer 2014). From 2012 to 2019, the average annual direct greenhouse gas emissions associated with aviation gasoline combustion were 10,322 metric tons of carbon dioxide equivalent (100-year GWP). These emissions are equivalent to those from approximately 2,200 cars driven for one year. For reference and scale, in 2019, greenhouse gas emissions associated with fossil fuel combustion in the United States were estimated to be 5,392 million metric tons of CO_2e (U.S. Environmental Protection Agency 2021).

Emissions were estimated through 2029 (Table 7), using past data to project average yearly increases in flight hours. We projected for the years 2020 through 2029 a linear increase in greenhouse gas emissions an averaging approximately 20,000 metric tons per year of carbon dioxide equivalent (100-year GWP). These projected annual emissions are equivalent to those from approximately 4,400 passenger cars driven for one year.

Table 7. Projected greenhouse gas emissions from fuel consumption related to aerial retardant delivery estimated through 2029

Calendar Year	Tanker Flight Hours	Helicopter Flight Hours	Fuel Consumption[1] (gallons)	Emissions (MT CO_2e[2], 20-yr)	Emissions (MT CO_2e, 100-yr)	Emissions (Tg C)[3]
2020	7,672	546	1,769,379	15,804	15,105	0.004
2021	8,225	552	1,893,879	16,916	16,168	0.004
2022	8,778	558	2,018,379	18,028	17,231	0.005
2023	9,330	564	2,142,879	19,140	18,293	0.005
2024	9,883	570	2,267,379	20,252	19,356	0.005
2025	10,436	576	2,391,879	21,364	20,419	0.005
2026	10,989	582	2,516,379	22,476	21,482	0.006
2027	11,542	588	2,640,879	23,589	22,545	0.006
2028	12,095	594	2,765,379	24,701	23,608	0.006

Calendar Year	Tanker Flight Hours	Helicopter Flight Hours	Fuel Consumption[1] (gallons)	Emissions (MT CO_2e[2], 20-yr)	Emissions (MT CO_2e, 100-yr)	Emissions (Tg C)[3]
2029	12,647	600	2,889,879	25,813	24,670	0.007

1 Fuel consumption is based on consumption rate of 224 gallons per flight hour for tankers (fixed wing) and 90 gallons per flight hour for helicopters.
2 MT = metric tons, CO2e = carbon dioxide equivalents (see text)
3 One teragram (Tg) is equal to 1 million metric tons of carbon

It is challenging and impractical to quantitatively estimate the net greenhouse gas emissions resulting from aerial application of fire retardants. Estimating potential greenhouse gas emissions, such as those from avoided wildfire or from the application of fire-retardant versus water is highly uncertain and scientific understanding is incomplete. The projections through 2029 assume that the number of flights needed for wildfire suppression efforts would increase in a linear fashion based on past increases. That assumption also relies on the assumption that the number, size, and severity of fires will similarly increase. The actual number of flights that will be used in the future to deliver aerial retardant cannot be predicted. Decisions regarding use of aerial retardant are affected by availability of resources (aircraft, personnel, funding, etc.) as well as by safety concerns, management priorities, and other factors. If aerial retardants are not used the number of flights might increase (refer to FEIS Table 2, p. 41, and FEIS section 3.1.3, page 65), because water is less effective at reducing fire spread, but the possible increased number of flights is not possible to estimate. Greenhouse gas emissions from wildfires might increase as water is less effective at controlling fire spread and severity. Because use of retardant is more efficient at reducing fire spread and severity than use of water alone, it is possible that use of aerial retardants could decrease emissions when compared to use of water alone.

3.14 Short-term Uses and Long-term Productivity

NEPA requires consideration of "the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity" (40 CFR 1502.16). As declared by the Congress, this includes using all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans (NEPA Section 101). The FEIS did not directly address short-term uses and long-term productivity, so they are addressed here.

The proposed action and alternatives provide a framework for a nationwide program that does not require an on-the-ground action to occur, and therefore does not compel short-term uses. Actions taken within the framework of the program could result in short-term uses and long-term productivity that vary by resource, and that depend on whether, as well as when and where aerial retardant is used. Relationships between short-term uses and long-term productivity are therefore addressed as appropriate in the effects section for each resource in the FEIS, in the corresponding SEIS section if needed, and in the Biological Assessments.

3.15 Irreversible and Irretrievable Commitments of Resources

Irreversible commitments of resources are those that cannot be regained, such as the extinction of a species or the removal of mined ore. Irretrievable commitments are those that are lost for a

period of time such as the temporary loss of timber productivity in forested areas that are kept clear for use as a power line rights-of-way or road. The FEIS did not directly address irreversible and irretrievable commitments of resources, so they are addressed here

The proposed action and alternatives provide a framework for a nationwide program that does not require an on-the-ground action to occur, and therefore does not compel commitments of resources. Actions taken within the framework of the program could result in commitment of resources that vary by resource and that depend on whether, as well as when and where aerial fire retardant is used. Information about irreversible or irretrievable commitments are therefore addressed as appropriate in the effects section for each resource in the FEIS, in the corresponding SEIS section if needed, and in the Biological Assessments.

3.16 Unavoidable Adverse Effects

The FEIS did not directly address unavoidable adverse effects, so they are addressed here

Selection of Alternative 1 (no use of aerially delivered retardants) would result in no adverse effects from aerial fire retardants, but would result in adverse effects to certain resources as a result of fire occurring on more acres of National Forest System lands than would occur with the use of aerially delivered retardants. Potential adverse effects are discussed in the FEIS (or updated in the corresponding SEIS section) for each resource as appropriate. Selection of Alternatives 2, 3, or Modified Alternative 3 could result in unavoidable adverse effects related to the use of aerially delivered retardants as described in specific resource sections of the FEIS (see also Table 2 on page 41 of the FEIS) or updated corresponding sections of the SEIS. Unavoidable adverse effects are likely to be related to delivery of aerial retardants into avoidance areas when exceptions are used; Alternative 2 has more allowed exceptions and therefore more potential for unavoidable adverse effects.

3.17 Other Required Disclosures

NEPA at 40 CFR 1502.25(a) directs "to the fullest extent possible, agencies shall prepare draft environmental impact statements concurrently with and integrated with …other environmental review laws and executive orders." These disclosures were addressed primarily in the ROD rather than in the FEIS, but for completeness updates to the disclosures in the ROD are discussed here.

3.17.1 Compliance with Laws and Regulations

Beginning on page 21 the ROD discusses compliance with laws and regulations. For most of these, there would be no change from the information in the ROD. The only updates needed are as follows:

- National Forest Management Act – The Forest Service signed a new planning rule, per the provisions of the National Forest Management Act, after the ROD was signed and implemented. The proposed national aerial retardant program does not directly affect existing forest land management plans, does not affect development of new or revised plans under the 2012 rule, and does not affect projections of goods and services. Implementation of the proposed program does not compel on-the-ground action, will occur in compliance with existing or revised plans, and will contribute to the ability of the Forest Service to manage land for existing desired conditions and outputs.

- Endangered Species Act – Consultation with regulatory agencies is being conducted on current lists of threatened, endangered, and proposed species. Information regarding the outcomes of consultations will be documented in Biological Opinions that will become part of the project record, in a final SEIS, and in the updated Record of Decision.
- Clean Water Act – There would be no change to information in ROD, but refer to updated Hydrology section in SEIS for additional details regarding potential impacts to hydrologic systems.

3.17.2 Incomplete or Unavailable Information

Incomplete or unavailable information is discussed as needed for individual resources in the appropriate sections of the FEIS or updated corresponding sections of the SEIS. Analyses for the SEIS used information on fire occurrence and retardant use through calendar year 2019. Information for 2020 was compiled after resource reports were reviewed and updated for the SEIS. That information is included in the project record for reference.

4 Preparers and Contributors

4.1 Interdisciplinary Team Members

Preparers of the FEIS are listed in section 4.1 (beginning on page 168) of the FEIS. As required by 40CFR 1502.18, Table 5 below lists the preparers and contributors to the SEIS, along with their agency affiliation, role, and summary of qualifications.

Table 8. Supplemental Environmental Impact Statement preparers and contributors

Name	Affiliation	Role	Experience and Qualifications
David A. Austin	San Bernardino National Forest, FS1	Aquatic and Terrestrial wildlife species review, update and BA2 for consultation under ESA3 section 7 Wildlife Biologist for the 2011 FEIS and consultations	Wildlife, Fish, Botany, and Range Program Manager, 8 years (FS) Wildlife and Fisheries Biologist with 35 years FS experience B.S. in Wildlife Management, Humboldt State University
Allison Borchers	Enterprise Program, FS	Social and economics resources review and update	Economist with 5 years FS experience PhD. in Resource Economics, University of Delaware
Wendy Clark	Wildland Fire Chemicals/Aerial Delivery Program, NTDP4, FS (detail)	Lead Technical Writer/Editor	Wildlife/Planning Biologist with 25 years federal experience (FS, NPS) Wildlife Technician, 9 years' experience with various universities, state agencies and NPS M.S. Ecology and Evolutionary Biology, University of Minnesota B.A. Biology, Knox College
Laura Conway	Wildland Fire Chemicals/Aerial Delivery Program, NTDP, FS	Project Manager and ID Team Leader	Wildlife and Fisheries Biologist, with 31 years FS experience B.S. in Wildlife and Fisheries Biology, University of California, Davis
Jacob Deal	FS Office of Sustainability and Climate / Region 8 Biological and Physical Resources, FS	Greenhouse gas emissions and climate change	FS Greenhouse Gas specialist for 3.5 years M.S. in Chemical Engineering PhD in Systems Engineering, University of South Alabama
Mary Emerick	Enterprise Program, FS	Wilderness review and update	Natural Resource Specialist with 32 years federal experience (USFWS, NPS, BLM; 20 years USFS BA in Writing/English Michigan State University Graduate coursework in natural resources, University of Oregon

[1] USDA Forest Service
[2] Biological Assessment
[3] Endangered Species Act
[4] National Technology and Development Program

Name	Affiliation	Role	Experience and Qualifications
Linn Gassaway	Lassen NF, FS	Cultural resources review and update	Heritage Program Manager, 5 years, FS Archaeologist, 27 years' experience (FS, NPS, Private) Fire Achaeology 24 years' federal experience (FS and NPS) M.A. in Anthropology, San Francisco State University B.A. in Anthropology, University of California, Berkely
Hunter Jones	Wildland Fire Chemicals Program, NTDP, FS	Public health and safety review and update	Chemist/Project Manager with 6 years FS experience Analytical chemist, inorganics, 5 years' experience with Department of the Navy B.S. in Chemistry, ACS Certified, University of Montana
Duncan McKinley	Natural Resource Management Specialist, FS Office of Sustainability and Climate	Vegetation ecology and carbon, review and update	Ecologist and Specialist with 13 years FS experience; BS, MS, PhD in Biology (MS and PhD emphasis in Ecology)
Terry Miller	Enterprise Program, FS	Botanical species and habitats review, update and BA for consultation under ESA section 7	Botanist with 20 years of FS experience M.S. in Forest Resources, University of Idaho, Moscow B.A. in Plant Biology, Southern Illinois University, Carbondale
Jeff O'Connell	Enterprise Program, FS	Hydrology review and update	Hydrologist with 19 years federal experience (BLM, FS, NRCS, BOR) B.S. in Geology M.S. in Geology
David Sheehan	Enterprise Program, FS	Scenery resources review and update	Landscape Architect and Recreation Manager with 6 years FS experience M.L.A., Virginia Tech B.S. in Parks, Recreation, and Tourism Management, North Carolina State University
Kyle Stetler	Enterprise Program, FS	Social and economics resources review and update	Economist and Policy Analyst with 12 years FS and other federal experience M.S. in Forestry-Economics, University of Montana
Kristen Waltz	Enterprise Program, FS	Social and economics resources review and update	Economist with 8 years FS experience M.S. in Resource Economics, University of Delaware

Name	Affiliation	Role	Experience and Qualifications
Stacey Weems	Enterprise Program, FS	Soils review and update	Soil Scientist with 14 years FS experience M.S. in Soil Science, New Mexico State University B.S. in Geology, emphasis Hydrogeology, Iowa State University
John D. Williamson	Mt. Hood National Forest, FS	Aquatic species review, update and BA for consultation under ESA section 7	Assistant District Fish Biologist with 11 years FS experience M.S. Fish and Wildlife Biology, Colorado State University B.S. General Science and Philosophy, University of Oregon
Shirley Zylstra	Wildland Fire Chemicals/Aerial Delivery Program, NTDP, FS	Wildland Fire Chemicals/Aerial Delivery Program Leader	Physical scientist with 25 years FS fire chemicals program experience M.S. Environmental Toxicology, Colorado State University

5 Distribution of the Environmental Impact Statement

Refer to section 4.2 on pages 169 -179 of the FEIS for a list of Federal agencies, federally recognized tribes, State and local governments, organizations, and individuals to whom copies of the 2011 FEIS was sent when it was published.

This draft supplemental environmental impact statement is available to the public via the Interagency Wildland Fire Chemicals Policy and Guidance website. Email notification of the document's availability was sent to organizations and individuals from the FEIS distribution list for whom current contact information could be obtained.

Email notification of the document's availability, or a thumb drive with a copy of the document was sent to the following agencies. Some agencies do not require notification or receipt of a copy if notification has been published in the Federal Register; those agencies do not appear in this list.

Agency	Hard Copy	Thumb Drive	Web Access
Deputy Director USDA APHIS PPD/EAD			X
National Environmental Coordinator Natural Resources Conservation Services			X
National Agricultural Library Acquisitions and Serials Branch	X		
National Oceanic and Atmospheric Administration NEPA Coordinator			X
Chief of Naval Operations Energy and Environmental Readiness Division			X
U.S. Army Corps of Engineers Northwestern Division			X
U.S. Environmental Protection Agency[1]		X	
Northwest Power Planning Council			X

Agency	Hard Copy	Thumb Drive	Web Access
Division Administrator Federal Highway Administration for 42 states and territories where the project occurs[2]			X

1 Includes all 10 Environmental Protection Agency regional offices

2 Alabama, Alaska, Arizona, Arkansas, California, Colorado, Florida, Georgia, Idaho, Illinois, Indiana, Kansas, Kentucky, Louisiana, Maine, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, Nevada, New Hampshire, New Mexico, North Carolina, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, Puerto Rico, South Carolina, South Dakota, Tennessee, Texas, Utah, Vermont, Virginia, Washington, West Virginia, Wisconsin, Wyoming

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Glossary

This glossary only includes terms that were not included in the FEIS, and terms that were included in the FEIS glossary but for which definitions have been updated or changed.

Aerial retardant avoidance area (also 'avoidance area'): an area identified on maps or by other means in which application of aerial fire retardant is prohibited in order to avoid or limit potential impacts to specified resources.

Aquatic avoidance area: any avoidance area, whether mapped or not, that is based on the presence of waterways, or as mapped to protect Endangered Species Act threatened, endangered, proposed, or candidate species or critical habitat or Regional Forester sensitive species or habitat associated with waterways, waterbodies, or riparian areas.

Avoidance area: see **aerial retardant avoidance area**

Conditionally qualified product: a fire retardant product that complies with all requirements in the specification for laboratory evaluation but has not yet completed the operational field evaluation that is required for full qualification (see Qualified Products List)

Incidental Take: any taking that is in compliance with the terms and conditions specified in a written statement provided under section 7 of the ESA, and is therefore not considered to be a prohibited taking of the species concerned.

Interim qualified product: A product that complies with all interim requirements in Appendix A of the specification (Forest Service Specification FS 5100-304d), but requires final results and a field evaluation for full qualification (see Qualified Products List).

Intrusion: the intentional or unintentional application of aerial fire retardant into an aerial retardant avoidance area

Qualified product: A fire retardant product that complies with all requirements of a formal specification. Qualified products may be used on National Forest System lands (see Qualified Products List).

Take : Per the Endangered Species Act (ESA) section 3(19), take is "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct" regarding a species listed as threatened or endangered under the ESA.

- Harass means an intentional or negligent act or omission which creates the likelihood of injury by… significantly disrupt[ing] normal behavior patterns (50 CFR 17.3)
- Harm means an act which actually kills or injures wildlife. Such acts may include …habitat modification or degradation when it actually kills or injures wildlife by …impairing essential behavioral patterns (50 CFR 17.3)

Terrestrial avoidance area: any avoidance area that is mapped to protect Endangered Species Act threatened, endangered, proposed, or candidate species or critical habitat or Regional Forester sensitive species or habitat or other resources that are not associated with waterways or riparian areas.

Waterway: This term as used in this document includes but is not limited to perennial streams, intermittent streams, lakes, ponds, identified springs, reservoirs, vernal pools, wetlands, peatlands, and riparian vegetation.

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Appendices

The appendices included in this SEIS are only those for which information has changed from that included in the FEIS. All Appendices retain the same designator as in the FEIS, but those that are updated and included here have the added 'SEIS' designator. The table below provides a crosswalk of the FEIS appendix and information about whether it has been updated and included in the SEIS.

FEIS to SEIS Appendix Tracking

All Appendixes in the FEIS were tiled 'Appendix A', etc. All Appendixes included in the SEIS are titled 'SEIS Appendix C', etc. to indicate that they contain supplemental or updated information.

Appendix	FEIS Title	SEIS Title	Information
A	2000 Guidelines for Aerial Delivery of Retardant or Foam Including the 2008 Reasonable and Prudent Alternatives	NA	This information was replaced by the 2011 Record of Decision, and is found in the Implementation Guide for Aerial Application of Fire Retardant (https://www.fs.usda.gov/managing-land/fire/chemicals)
B	Implementation of the Reasonable and Prudent Alternatives	NA	The information in this appendix has not changed. Current guidelines for retardant use are in the 2011 Record of Decision and in the Implementation Guide for Aerial Application of Fire Retardant (https://www.fs.usda.gov/managing-land/fire/chemicals)
C	Fire and Retardant Use Information	Fire and Retardant Use Information 2012 through 2019	This appendix updates and supplements FEIS Appendix C with data collected after the 2011 Record of Decision was signed
D	Misapplication of Fire Retardant Data Analysis on Forest Service lands	Fire Retardant Intrusions on National Forest System Lands from 2012 through 2019	This appendix updates and supplements FEIS Appendix D with data collected after the 2011 Record of Decision was signed
E	National Screens for Federally Listed Species and Forest Service Listed Sensitive Species	Species Analysis Screening Process	This appendix updates FEIS Appendix E, replacing the screening information used for the 2011 analysis with updated information used in the current analysis
F	Fish and Aquatic Invertebrate Species List and Effects	Federally Listed Species Considered and Effects Determinations	This appendix updates FEIS Appendixes F, G, and I, replacing the species lists and determinations with current information
G	Plant Species Lists and Effects Determinations	NA	Updated information on plant species is incorporated into SEIS Appendix F
H	Fire Retardant Soil Risk Rating Indicators	NA	The information in this appendix has not changed
I	Wildlife Species Lists and Effects Determinations	NA	Updated information on wildlife species is incorporated into SEIS Appendix F

Appendix	FEIS Title	SEIS Title	Information
J	Suppression Chemicals and Delivery Systems	NA	FEIS Appendix J repeated guidance found in the Interagency Standards for Fire and Fire Aviation Operations (Red Book) as of 2010. Current information is found in Chapter 12 of the updated Red Book (https://www.nifc.gov/standards/guides/red-book)
K	Retardant Avoidance Map Examples for Alternative 5	NA	The 2011 Record of Decision selected Alternative 3. The most recent avoidance area maps developed under that decision can be found on the National Interagency Fire Center data server: https://ftp.wildfire.gov/public/base_info/retardant_avoidance_areas/Maps/
L	Forest Service Wildland Fire Chemical Program and Process	Forest Service Wildland Fire Chemical Program and Long-Term Retardant Qualification	This appendix updates FEIS Appendix L with current information regarding the approval process for long-term fire retardants
M	Guidance for Pilots	NA	Updated guidance for pilots is found in the current Implementation Guide for Aerial Application of Fire Retardant (https://www.fs.usda.gov/managing-land/fire/chemicals)
N	Retardant Avoidance Map Examples for Alternative 3	NA	The most recent avoidance area maps developed under the guidance provided in the 2011 Record of Decision can be found on the National Interagency Fire Center data server: https://ftp.wildfire.gov/public/base_info/retardant_avoidance_areas/Maps/
O	Fire Professionals Comments on Retardant Effectiveness Summary	NA	The information in this appendix has not changed
P	Table of Avoidance Area Percentages by Forest	Table of Avoidance Area Percentages by Forest	This appendix updates FEIS Appendix P with current information regarding the amount of National Forest System land mapped within avoidance areas.
Q	Response to Comments	NA	The information in this appendix has not changed. Information regarding responses to comments received on the Draft SEIS will be provided as an appendix to the Final SEIS.
R	New Aerial Application of Fire Retardant Direction	NA	Information in this appendix has not changed; detailed guidance for aerial application of fire retardant is found in the 2011 Record of Decision and in the Implementation Guide for Aerial Application of Fire Retardant (https://www.fs.usda.gov/managing-land/fire/chemicals). Updates to this information will be included in the Record of Decision associated with the Final SEIS, and the Implementation Guide will be updated as needed.

SEIS Appendix C – Fire Retardant Use Information 2012 through 2019

Table C-1. Estimated area of fire retardant application on National Forest System Lands, 2012 through 2019 (8 years)

Region	National Forest System (NFS) acres	Number of fires	Estimated number of retardant drops	Total gallons of retardant	Average gallons of retardant per year	Estimated acres impacted at 4 GPC [1]	Estimated acres impacted at 8 GPC [1]	Maximum estimated percent NFS land impacted at 4 GPC [1]	Maximum estimated percent NFS land impacted at 8 GPC [1]
Region 1	25,449,819	6,398	6,055	10,898,227	1,362,278	1056-2401	914-1890	0.0094%	0.0074%
Region 2	22,056,205	4,116	2,205	3,969,286	496,161	385-874	333-688	0.0040%	0.0031%
Region 3	20,530,401	8,665	5,824	10,482,975	1,310,372	878-1997	878-1572	0.0097%	0.0077%
Region 4	31,786,447	5,080	7,906	14,230,632	1,778,829	1056-2401	914-1890	0.0076%	0.0059%
Region 5	20,261,051	10,415	28,713	51,683,580	6,460,448	5007-11387	4335-8964	0.0562%	0.0442%
Region 6	25,114,875	9,893	6,009	10,816,422	1,352,053	1048-2383	907-1876	0.0095%	0.0075%
Region 8	13,425,610	4,867	93	167,817	20,977	16-37	14-29	0.0003%	0.0002%
Region 9	12,177,242	3,234	63	113,092	14,137	11-25	9-20	0.0002%	0.0002%
Region 10	22,148,457	115	0	0	0	0	0	0.0000%	0.0000%
Total	192,950,107	52,783	56,868	102,362,031	12,795,254	9916-22552	8586-17753	0.0117%	0.0092%

[1] - Gallons per 100 square feet; acres are the estimated total acres impacted on average each year, and percent is the estimated percent of National Forest land impacted on average each year

Table C-2. Estimated area of fire retardant application on National Forest System lands by Forest, 2012 through 2019 (8 years)

Region	Forest	National Forest System (NFS) acres	Number of fires	Estimated number of retardant drops	Total gallons of retardant	Average gallons of retardant per year	Estimated acres impacted at 4 GPC [1]	Estimated acres impacted at 8 GPC [1]	Maximum estimated percent NFS land impacted at 4 GPC [1]	Maximum estimated percent NFS land impacted at 8 GPC [1]
1	Beaverhead-Deerlodge	3,393,381	497	369	664,125	83,016	64-146	56-115	0.0043%	0.0034%
1	Bitterroot	1,594,659	552	324	582,587	72,823	56-128	49-101	0.0080%	0.0063%
1	Custer Gallatin	3,040,134	540	176	317,046	39,631	31-70	27-55	0.0023%	0.0018%
1	Dakota Prairie grasslands	1,257,901	128	6	10,477	1,310	1-2	1-2	0.0002%	0.0002%
1	Flathead	2,414,162	463	56	100,701	12,588	10-22	8-17	0.0009%	0.0007%
1	Helena-Lewis and Clark	2,856,442	370	724	1,302,675	162,834	126-287	109-226	0.0100%	0.0079%

Region	Forest	National Forest System (NFS) acres	Number of fires	Estimated number of retardant drops	Total gallons of retardant	Average gallons of retardant per year	Estimated acres impacted at 4 GPC [1]	Estimated acres impacted at 8 GPC [1]	Maximum estimated percent NFS land impacted at 4 GPC [1]	Maximum estimated percent NFS land impacted at 8 GPC [1]
1	Idaho-Panhandle	2,498,072	758	484	870,343	108,793	84-192	73-151	0.0077%	0.0060%
1	Kootenai	2,243,219	687	387	697,339	87,167	68-154	58-121	0.0069%	0.0054%
1	Lolo	2,216,287	1,023	2,796	5,033,651	629,206	488-1109	422-873	0.0500%	0.0394%
1	Nez Perce - Clearwater	3,935,562	1,380	733	1,319,283	164,910	128-291	111-229	0.0074%	0.0058%
2	Arapaho & Roosevelt	1,597,940	404	123	221,819	27,727	21-49	19-38	0.0031%	0.0024%
2	Bighorn	1,105,310	106	19	33,452	4,182	3-7	3-6	0.0006%	0.0005%
2	Black Hills	1,251,148	589	161	289,091	36,136	28-64	24-50	0.0051%	0.0040%
2	Grand Mesa Uncompahgre and Gunnison	2,965,320	252	61	109,297	13,662	11-24	9-19	0.0008%	0.0006%
2	Medicine Bow-Routt	2,892,559	540	474	853,602	106,700	83-188	72-148	0.0065%	0.0051%
2	Nebraska	1,054,075	173	6	11,532	1,442	1-3	1-2	0.0003%	0.0002%
2	Pike and San Isabel	2,757,586	890	304	547,857	68,482	53-121	46-95	0.0044%	0.0034%
2	Rio Grande	1,838,862	114	97	173,871	21,734	17-38	15-30	0.0021%	0.0016%
2	San Juan	1,865,618	620	269	484,464	60,558	47-107	41-84	0.0057%	0.0045%
2	Shoshone	2,439,091	157	291	523,740	65,468	51-115	44-91	0.0047%	0.0037%
2	White River	2,288,696	271	400	720,561	90,070	70-159	60-125	0.0069%	0.0055%
3	Apache-Sitgreaves	2,015,925	1,093	131	235,089	29,386	23-52	23-41	0.0026%	0.0020%
3	Carson	1,491,916	508	46	83,413	10,427	8-18	8-14	0.0012%	0.0009%
3	Cibola	1,879,318	500	452	813,951	101,744	79-179	79-141	0.0095%	0.0075%
3	Coconino	1,844,098	1,787	298	537,088	67,136	52-118	52-93	0.0064%	0.0050%
3	Coronado	1,719,928	609	1,179	2,123,058	265,382	206-468	206-368	0.0272%	0.0214%
3	Gila	3,269,965	812	466	838,779	104,847	81-185	81-145	0.0057%	0.0044%
3	Kaibab	1,543,675	805	61	110,178	13,772	11-24	11-19	0.0016%	0.0012%
3	Lincoln	1,095,603	298	293	527,713	65,964	51-116	51-92	0.0106%	0.0084%
3	Prescott	1,257,034	364	1,138	2,048,302	256,038	198-451	198-355	0.0359%	0.0282%
3	Santa Fe	1,546,059	600	339	610,190	76,274	59-134	59-106	0.0087%	0.0069%
3	Tonto	2,866,880	1,289	1,420	2,555,214	319,402	248-563	249-443	0.0196%	0.0155%

Region	Forest	National Forest System (NFS) acres	Number of fires	Estimated number of retardant drops	Total gallons of retardant	Average gallons of retardant per year	Estimated acres impacted at 4 GPC [1]	Estimated acres impacted at 8 GPC [1]	Maximum estimated percent NFS land impacted at 4 GPC [1]	Maximum estimated percent NFS land impacted at 8 GPC [1]
4	Ashley	1,378,472	145	35	63,315	7,914	6-14	5-11	0.0010%	0.0008%
4	Boise	2,204,674	695	1,506	2,710,760	338,845	263-597	227-470	0.0271%	0.0213%
4	Bridger-Teton	3,432,162	300	714	1,284,666	160,583	124-283	108-223	0.0082%	0.0065%
4	Caribou-Targhee	2,899,406	324	63	113,397	14,175	11-25	10-20	0.0009%	0.0007%
4	Dixie	1,632,111	358	737	1,326,390	165,799	128-292	111-230	0.0179%	0.0141%
4	Fishlake	1,709,014	309	195	350,182	43,773	33-75	29-59	0.0044%	0.0035%
4	Humboldt-Toiyabe	6,253,933	810	1,205	2,169,855	271,232	210-478	182-376	0.0076%	0.0060%
4	Manti-La Sal	1,340,351	363	184	331,292	41,412	32-73	28-57	0.0054%	0.0043%
4	Payette	2,310,111	486	875	1,574,718	196,840	153-347	132-273	0.0150%	0.0118%
4	Salmon-Challis	4,355,403	383	440	791,114	98,889	77-174	66-137	0.0040%	0.0031%
4	Sawtooth	2,111,959	250	416	749,524	93,691	73-165	63-130	0.0078%	0.0062%
4	Uinta-Wasatch-Cache	2,158,851	657	1,536	2,765,419	345,677	128-291	111-229	0.0135%	0.0106%
5	Angeles	668,279	1,110	2,099	3,777,882	472,235	366-832	317-655	0.1254%	0.0980%
5	Cleveland	426,804	625	1,297	2,334,163	291,770	226-514	196-405	0.1204%	0.0949%
5	Eldorado	615,035	434	787	1,416,203	177,025	137-312	119-246	0.0507%	0.0400%
5	Inyo	1,987,906	367	494	889,980	111,248	86-196	75-154	0.0099%	0.0077%
5	Klamath	1,505,983	767	2,288	4,118,014	514,752	399-907	345-714	0.0602%	4.7400%
5	LTBMU	154,268	332	1	2,075	259	0	0	0.0000%	0.0000%
5	Lassen	1,154,416	329	333	599,516	74,940	58-132	50-104	0.0114%	0.0090%
5	Los Padres	1,780,182	253	5,160	9,287,593	1,160,949	900-2046	779-1611	0.1149%	0.0905%
5	Mendocino	918,349	136	412	741,948	92,744	72-163	62-129	0.0177%	0.0140%
5	Modoc	1,679,173	709	1,071	1,927,851	240,981	187-425	162-334	0.0253%	0.0199%
5	Plumas	1,205,685	794	1,021	1,838,511	229,814	178-405	154-319	0.0336%	0.0265%
5	San Bernardino	673,294	1,069	3,313	5,962,980	745,373	578-1314	500-1034	0.1952%	0.1536%
5	Sequoia	1,114,954	436	2,097	3,773,826	471,728	366-831	317-655	0.0745%	0.0587%
5	Shasta-Trinity	2,139,325	999	1,927	3,467,858	433,482	336-764	291-601	0.0357%	0.0281%
5	Sierra	1,316,193	504	3,712	6,681,406	835,176	647-1472	560-1159	0.1118%	0.0881%

Region	Forest	National Forest System (NFS) acres	Number of fires	Estimated number of retardant drops	Total gallons of retardant	Average gallons of retardant per year	Estimated acres impacted at 4 GPC [1]	Estimated acres impacted at 8 GPC [1]	Maximum estimated percent NFS land impacted at 4 GPC [1]	Maximum estimated percent NFS land impacted at 8 GPC [1]
5	Six Rivers	1,167,659	438	785	1,412,888	176,611	137-311	119-245	0.0266%	0.0210%
5	Stanislaus	898,739	440	1,475	2,655,013	331,877	257-585	223-460	0.0651%	0.0512%
5	Tahoe	854,807	673	442	795,873	99,484	77-175	67-138	0.0205%	0.0161%
6	Columbia River Gorge	83,339	138	10	17,248	2,156	2-4	1-3	0.0048%	0.0036%
6	Colville	1,104,904	355	242	434,907	54,363	42-96	36-75	0.0087%	0.0068%
6	Deschutes and Ochoco	2,338,099	1,856	719	1,294,840	161,855	125-285	109-225	0.0122%	0.0096%
6	Fremont-Winema	2,253,654	809	248	445,661	55,708	43-98	37-77	0.0043%	0.0034%
6	Gifford Pinchot	1,357,447	262	114	204,580	25,573	20-45	17-35	0.0033%	0.0026%
6	Malheur	1,722,070	787	526	946,825	118,353	92-209	79-164	0.0121%	0.0095%
6	Mt. Baker-Snoqualmie	1,762,266	384	0	0	0	0	0	0.0000%	0.0000%
6	Mt Hood	1,015,873	644	56	100,219	12,527	10-22	8-17	0.0022%	0.0017%
6	Okanogan-Wenatchee	4,010,517	1,003	1,653	2,975,955	371,994	288-656	250-516	0.0164%	0.0129%
6	Olympic	632,646	59	0	0	0	0	0	0.0000%	0.0000%
6	Rogue River-Siskiyou	1,719,305	721	1,118	2,012,446	251,556	195-443	169-349	0.0258%	0.0203%
6	Siuslaw	630,204	122	0	0	0	0	0	0.0000%	0.0000%
6	Umatilla	1,404,806	547	393	707,359	88,420	69-156	59-123	0.0111%	0.0088%
6	Umpqua	986,610	593	233	419,817	52,477	41-92	35-73	0.0093%	0.0074%
6	Wallowa-Whitman	2,403,487	733	610	1,098,137	137,267	106-242	92-190	0.0101%	0.0079%
6	Willamette	1,689,648	880	88	158,428	19,804	15-35	13-27	0.0021%	0.0016%
8	Chattahoochee-Oconee	867,578	283	10	17,420	2,178	2-3	1-3	0.0005%	0.0003%
8	Cherokee	660,211	208	11	19,954	2,494	2-4	2-3	0.0006%	0.0005%
8	Daniel Boone	709,856	383	0	0	0	0	0	0.0000%	0.0000%
8	El Yunque	28,805	0	0	0	0	0	0	0.0000%	0.0000%
8	Francis Marion & Sumter	635,197	251	0	0	0	0	0	0.0000%	0.0000%
8	George Washington and Jefferson	1,799,145	185	0	0	0	0	0	0.0000%	0.0000%

Region	Forest	National Forest System (NFS) acres	Number of fires	Estimated number of retardant drops	Total gallons of retardant	Average gallons of retardant per year	Estimated acres impacted at 4 GPC [1]	Estimated acres impacted at 8 GPC [1]	Maximum estimated percent NFS land impacted at 4 GPC [1]	Maximum estimated percent NFS land impacted at 8 GPC [1]
8	Kisatchie	608,535	326	0	0	0	0	0	0.0000%	0.0000%
8	Land Between the Lakes NRA	171,239	29	0	0	0	0	0	0.0000%	0.0000%
8	NFs in Alabama	671,667	302	0	0	0	0	0	0.0000%	0.0000%
8	NFs in Florida	1,203,415	679	55	99,660	12,458	10-22	8-17	0.0018%	0.0014%
8	NFs in Mississippi	1,191,206	563	0	0	0	0	0	0.0000%	0.0000%
8	NFs in North Carolina	1,256,188	685	11	19,583	2,448	2-4	2-3	0.0003%	0.0002%
8	NF in Texas	677,696	289	6	11,200	1,400	1-2	1-2	0.0003%	0.0003%
8	Ouachita	1,783,951	418	0	0	0	0	0	0.0000%	0.0000%
8	Ozark-St. Francis	1,160,921	266	0	0	0	0	0	0.0000%	0.0000%
9	Allegheny	513,794	51	0	0	0	0	0	0.0000%	0.0000%
9	Chequamegon-Nicolet	1,525,127	146	0	0	0	0	0	0.0000%	0.0000%
9	Chippewa	672,128	253	6	10,796	1,350	1-2	1-2	0.0003%	0.0003%
9	Green Mountain and Finger Lakes	427,053	32	0	0	0	0	0	0.0000%	0.0000%
9	Hiawatha	898,451	98	0	0	0	0	0	0.0000%	0.0000%
9	Hoosier	204,274	104	0	0	0	0	0	0.0000%	0.0000%
9	Huron-Manistee	978,891	859	0	0	0	0	0	0.0000%	0.0000%
9	Mark Twain	1,507,887	848	10	18,170	2,271	2-4	2-3	0.0003%	0.0002%
9	Midewin	18,225	10	0	0	0	0	0	0.0000%	0.0000%
9	Monongahela	920,783	40	0	0	0	0	0	0.0000%	0.0000%
9	Ottawa	998,994	48	0	0	0	0	0	0.0000%	0.0000%
9	Shawnee	286,311	125	0	0	0	0	0	0.0000%	0.0000%
9	Superior	2,173,267	227	47	84,126	10,516	8-19	7-15	0.0009%	0.0007%
9	Wayne	244,258	348	0	0	0	0	0	0.0000%	0.0000%
9	White Mountain	807,799	45	0	0	0	0	0	0.0000%	0.0000%
10	Chugach	5,400,752	48	0	0	0	0	0	0.0000%	0.0000%

Region	Forest	National Forest System (NFS) acres	Number of fires	Estimated number of retardant drops	Total gallons of retardant	Average gallons of retardant per year	Estimated acres impacted at 4 GPC [1]	Estimated acres impacted at 8 GPC [1]	Maximum estimated percent NFS land impacted at 4 GPC [1]	Maximum estimated percent NFS land impacted at 8 GPC [1]
10	Tongass	16,747,705	67	0	0	0	0	0	0.0000%	0.0000%

[1] - Gallons per 100 square feet

SEIS Appendix D – Fire Retardant Intrusions on National Forest System Lands from 2012 through 2019

Year	Region	Forest/Unit	Fire Name	Exposure Method	Accidental (Number of Drops)[5]	Exception (Number of Drops)	Intrusion reports[6]	Drops	Number of Drops Direct to water[7]	Number of Drops in Buffer only[3]	Number of Drops in Terrestrial TES Avoidance Areas	Estimated gallons into water	Estimated gallons into buffer	Estimated gallons into Terrestrial Avoidance Areas
2012	R1	Nez Perce	Mallard Fire	airtanker[8]	1		1	1		1			100	
2012	R1	Nez Perce	McGuire Complex	SEAT	1		1	1	1			500		
2012	R2	Arapaho Roosevelt	High Park	SEAT	1		1	1	1			600		
2012	R2	Pike-San Isabel	Waldo Canyon	helicopter	5		2	5	1	4		2	1500	
2012	R2	Grand Mesa-Uncompahgre-Gunnison	Twin Basin	airtanker	1		1	1	1			2200		
2012	R2	San Juan	HD-4	SEAT		6	1	6		6			4179	
2012	R2	San Juan	Vallecito	SEAT	10		1	10		10			50000	
2012	R3	Prescott	Gladiator	airtanker	1		1	1	1			2000		
2012	R3	Tonto	Comet	helicopter		3	3	3	3			12000		
2012	R3	Tonto	Poco	SEAT	2		2	2		2			3500	
2012	R4	Boise	Avelene	SEAT		1	1	1	1			100		
2012	R4	Boise	Bearskin	SEAT	2		1	2		2			800	
2012	R4	Boise	Trinity Ridge	airtanker	6		5	6	3	3		13	unknown	
2012	R4	Bridger-Teton	Chall Cr	SEAT	3		3	3		3			31	
2012	R4	Bridger-Teton	Forest Park	airtanker	1		1	1			1			1000

[5] An intrusion report may consist of more than one drop, or released retardant load. The total number of drops is the sum of accidental plus exception drops. Exception drops are those that occur when human life or public safety are threatened and retardant use in an avoidance area could be reasonably expected to alleviate the fire threat.
[6] The number of intrusion reports is the number of intrusion events that occur on a fire; an intrusion may consist of more than one drop at a given site. Not all drops at a site are in exactly the same location (e.g. some may be in the water and others in the buffer only).
[7] Drops in 'buffer only' are those that did not enter water. Drops directly into water may also affect the buffer surrounding the water. For that reason the sum of drops directly in water and those in the buffer only may be greater than the total number of drops.
[8] 'Airtanker' refers to fixed-wing aircraft that can deliver more than 2,000 gallons of retardant. 'SEAT' refers to single engine airtankers, which can deliver up to 800 gallons of fire retardant

Year	Region	Forest/Unit	Fire Name	Exposure Method	Accidental (Number of Drops)[5]	Exception (Number of Drops)	Intrusion reports[6]	Drops	Number of Drops Direct to water[7]	Number of Drops in Buffer only[3]	Number of Drops in Terrestrial TES Avoidance Areas	Estimated gallons into water	Estimated gallons into buffer	Estimated gallons into Terrestrial Avoidance Areas
2012	R4	Dixie	Reserve	airtanker	1		1	1	1			3000		
2012	R4	Dixie	Shingle	airtanker	10		10	10	1	8	1	500	5000	200
2012	R4	Salmon-Challis	Halstead	airtanker	2		2	2	2			240		
2012	R4	Uinta-Wasatch-Cache	Pumpkin	airtanker	2		2	2	1	1		2000	999	
2012	R4	Uinta-Wasatch-Cache	Quail	airtanker	4		2	4		4			unknown	
2012	R5	Angeles	Williams	airtanker		4	1	4		4			8400	
2012	R5	Lake Tahoe Basin	ELKS	airtanker	1		1	1	1			unknown		
2012	R5	Lassen	Mill-LNF	airtanker	10		1	10		10			7000	
2012	R5	Mendocino	Board	airtanker		1	1	1		1			5	
2012	R5	Mendocino	Mill	airtanker		3	3	3	1	2		5	2	
2012	R5	Mendocino	North Pass	airtanker	4		4	4		4			11.3	
2012	R5	San Bernardino	Devore	airtanker		11	3	11	11			15900		
2012	R5	San Bernardino	Lawler	airtanker		3	1	3		3			3000	
2012	R5	San Bernardino	LYTLE	airtanker	1		1	1		1			200	
2012	R5	Sequoia	South Fire	airtanker		1	1	1		1			50	
2012	R5	Shasta-Trinity	Creek	airtanker	1		1	1		1			500	
2012	R5	Shasta-Trinity	Garden	airtanker	1		1	1		1			300	
2012	R5	Shasta-Trinity	SHF Stafford	helicopter		2	2	2	2			2558		
2012	R5	Sierra	Bear	airtanker	1		1	1		1			1000	
2012	R5	Six Rivers	Dillon	airtanker		4	2	4	3	1		3000	10	
2012	R5	Six Rivers	Ruth Dam Fire	airtanker		1	1	1		1			1200	

Year	Region	Forest/Unit	Fire Name	Exposure Method	Accidental (Number of Drops)[5]	Exception (Number of Drops)	Intrusion reports[6]	Drops	Number of Drops Direct to water[7]	Number of Drops in Buffer only[3]	Number of Drops in Terrestrial TES Avoidance Areas	Estimated gallons into water	Estimated gallons into buffer	Estimated gallons into Terrestrial Avoidance Areas
2012	R6	Gifford Pinchot	Cascade Creek	airtanker	1		1	1		1			235.6	
2012	R6	Malheur	Parish Cabin Fire	SEAT	4		3	4	3	1		1420	320	
2012	R6	Okanogan Wenatchee	Goat	airtanker	2		1	2		2			6000	
2013	R1	Beaverhead/ Deerlodge	Moose Meadows	airtanker	1		1	1	1			69		
2013	R1	Custer	Rock Creek	airtanker	2		2	2	1	1		2760	124.8	
2014	R1	Lolo	Colt Lake	SEAT	1		1	1	1			100		
2013	R3	Apache-Sitgreaves	East Fork	SEAT	1		1	1		1			240	
2013	R3	Prescott	Doce	airtanker		3	1	3		3			1000	
2013	R4	Boise	Elk Complex	SEAT		1	1	1		1			1	
2013	R4	Boise	Pine Creek	airtanker	1		1	1	1			2400		
2013	R4	Boise	Pony Complex	airtanker	2		2	2		2			800-1000	
2013	R4	Boise	Summit	SEAT	11		5	11	9	2		3850	750	
2013	R4	Bridger-Teton	Packer	airtanker	1		1	1		1			400	
2013	R4	Caribou-Targhee	Lead Draw	SEAT	1		1	1	1			10		
2014	R4	Dixie	Basin	SEAT	2		1	2		2			1600	
2014	R4	Dixie	Bull Mountain	SEAT	3		1	3		3			2000	
2014	R4	Dixie	Scar	airtanker	1		1	1		1			6000	
2013	R4	Humboldt-Toiyabe	Smith Ranch	Seat	2		1	2		2			900	
2013	R4	Payette	Thunder City	Seat	1		1	1	1			10		
2013	R4	Salmon-Challis	Lodgepole	airtanker	1		1	1	1			75		

Year	Region	Forest/Unit	Fire Name	Exposure Method	Accidental (Number of Drops)[5]	Exception (Number of Drops)	Intrusion reports[6]	Drops	Number of Drops Direct to water[7]	Number of Drops in Buffer only[3]	Number of Drops in Terrestrial TES Avoidance Areas	Estimated gallons into water	Estimated gallons into buffer	Estimated gallons into Terrestrial Avoidance Areas
2013	R4	Sawtooth	210 Road Fire	airtanker	1		1	1	1			991		
2013	R5	Angeles	Madre	airtanker	1		1	1	1			2000		
2013	R5	Angeles	Powerhouse	unknown	3		3	3		3			18808	
2013	R5	Cleveland	Chariot	airtanker		2	1	2			2			1850
2013	R5	Cleveland	San Juan	airtanker	1		1	1		1			15	
2013	R5	Los Padres	White	airtanker	1		1	1		1			50	
2013	R5	Mendocino	Daves	airtanker	1	2	3	3		3			165	
2013	R5	Mendocino	Sale	airtanker		2	1	2		2			20	
2013	R5	Modoc	Rail Fire	airtanker	2		1	2		2			3000	
2013	R5	Plumas	Game 2	airtanker	3		1	3		3			3989	
2013	R5	San Bernardino	Hathaway	unknown		6	1	6		6			unknown	
2013	R5	San Bernardino	Mountain	airtanker		12	5	12	1	7	4	50	5200	5200
2013	R5	Sequoia	Angora Fire	Airtanker and SEAT	8		1	8		8			66612	
2013	R5	Sequoia	Fish Fire	airtanker	4		2	4	4			4860		
2013	R5	Six Rivers	Corral Complex	airtanker	6		6	6	4	2		4800-7200	3600-5400	
2013	R5	Stanislaus	Power	airtanker	5		4	5	2	3		300	700	
2013	R5	Tahoe	Buckeye	airtanker	2		1	2		2			unknown	
2013	R6	Mt. Hood	Government Flat Complex	airtanker	2		2	2	1	1		1500	200	
2014	R2	Medicine Bow Routt	Owen	airtanker	4		1	4	4			8000		
2014	R3	Apache Sitgreaves	San Juan	airtanker	2		1	2	2			11595		
2014	R4	Boise	Bull Creek	SEAT	1		1	1	1			100		

Year	Region	Forest/Unit	Fire Name	Exposure Method	Accidental (Number of Drops)[5]	Exception (Number of Drops)	Intrusion reports[6]	Drops	Number of Drops Direct to water[7]	Number of Drops in Buffer only[3]	Number of Drops in Terrestrial TES Avoidance Areas	Estimated gallons into water	Estimated gallons into buffer	Estimated gallons into Terrestrial Avoidance Areas
2014	R4	Boise	Control Creek	SEAT	1		1	1	1			714		
2014	R4	Humboldt Toiyabe	Woodchuck	SEAT	1		1	1		1			7008	
2014	R4	Payette	Rush Fire	SEAT		1	1	1	1			150		
2014	R4	Payette	Weasel Springs	SEAT	1		1	1		1			800	
2014	R4	Sawtooth NRA	Hell Roaring	airtanker	1		1	1		1			2.5	
2014	R5	Klamath	Leef Fire	airtanker	1		1	1	1			1100		
2014	R5	Klamath	Log Fire	helicopter	1		1	1	1			unknown		
2014	R5	Klamath	Man Fire	unknown	1		1	1	1			unknown		
2014	R5	Klamath	White's Fire	helicopter	3		3	3	3			unknown		
2014	R5	Klamath	Happy Camp	helicopter	3		2	3	3			301		
2014	R5	Lake Tahoe Basin	Kingsbury	airtanker		2	1	2	2			16800		
2014	R5	Lassen	Black	airtanker	1		1	1		1			1000	
2014	R5	Lassen	Day	airtanker	2		2	2	2			5900		
2014	R5	Modoc	Modoc July Complex	SEAT	3		1	3		3			1820	
2014	R5	Modoc	Mud	airtanker	1		1	1		1			unknown	
2014	R5	San Bernardino	Tahquitz	airtanker	2		1	2	2			2400		
2014	R5	Sequoia	Way	airtanker	3		3	3		3			350	
2014	R5	Shasta-Trinity	Oregon	airtanker	5		1	5	5			unknown		
2014	R5	Shasta-Trinity	SMMU Lightning Sand Incident	airtanker	1		1	1		1			93	
2014	R5	Sierra	Courtney	airtanker	1		1	1		1			100	
2014	R6	Okanogan-Wenatchee	Carlton-Complex	airtanker		1	1	1		1			unknown	

Year	Region	Forest/Unit	Fire Name	Exposure Method	Accidental (Number of Drops)[5]	Exception (Number of Drops)	Intrusion reports[6]	Drops	Number of Drops Direct to water[7]	Number of Drops in Buffer only[3]	Number of Drops in Terrestrial TES Avoidance Areas	Estimated gallons into water	Estimated gallons into buffer	Estimated gallons into Terrestrial Avoidance Areas
2014	R6	Okanogan-Wenatchee	Mills Canyon	airtanker		6	1	6			6			30000
2014	R6	Wallowa Whitman	Badger Butte II	SEAT	1		1	1	1			200		
2014	R6	Wallowa Whitman	Cougar	SEAT	3		1	3	3			40		
2015	R4	Ashley	Memorial	SEAT	1		1	1		1			70	
2015	R4	Boise	Cougar	SEAT	1		1	1	1			800		
2015	R4	Boise	Pine	airtanker	1		1	1	1			2419		
2015	R4	Boise	Walker	airtanker	3		1	3	3			4088		
2015	R4	Boise	Wolf Fire	SEAT	2		1	2	2			500-600		
2015	R4	Dixie	Oak Grove	airtanker	3		1	3		3			3000	
2015	R4	Payette	Boulder Meadows	SEAT	2		1	2	2			500-600		
2015	R4	Payette	Rapid	airtanker	6		4	6	3	3		91200	9000	
2015	R4	Sawtooth	Royal	SEAT	1		1	1	1			1		
2015	R5	Angeles	Cabin Fire	airtanker		1	1	1	1			47550		
2015	R5	Eldorado	Kyburz	airtanker	3		2	3	3			2000		
2015	R5	Los Padres	Chorro	airtanker	3		3	3		3			3600	
2015	R5	Los Padres	Cuesta	SEAT	3		1	3	3			9		
2015	R5	Mendocino	Boardman	airtanker	1	5	3	6	6			5864		
2015	R5	Mendocino	Deer	airtanker		3	3	3	3			2965		
2015	R5	San Bernardino	Green	airtanker	2		1	2	2			333		
2015	R5	San Bernardino	Lake	airtanker		3	3	3	2		1	300-750		2
2015	R5	Sequoia	Rough	airtanker	8		7	8	4	4		5500	2600	
2015	R5	Shasta-Trinity	Castle	airtanker	3		1	3	3			2880		
2015	R5	Shasta-Trinity	Fork Complex	airtanker	2		2	2	1	1		2800	2800	

Year	Region	Forest/Unit	Fire Name	Exposure Method	Accidental (Number of Drops)[5]	Exception (Number of Drops)	Intrusion reports[6]	Drops	Number of Drops Direct to water[7]	Number of Drops in Buffer only[3]	Number of Drops in Terrestrial TES Avoidance Areas	Estimated gallons into water	Estimated gallons into buffer	Estimated gallons into Terrestrial Avoidance Areas
2015	R5	Shasta-Trinity	River Complex	unknown	3		1	3	3			8380		
2015	R5	Shasta-Trinity	Saddle	airtanker	2		1	2	2			1980		
2015	R5	Shasta-Trinity	South Complex	SEAT	1		1	1	1			800		
2015	R5	Six Rivers	Mad River	airtanker	4	4	5	8	7	1		unknown	unknown	
2015	R5	Six Rivers	Route Complex	airtanker	1		1	1		1			unknown	
2015	R5	Tahoe	Burnett	airtanker	1		1	1		1			500	
2015	R6	Malheur	Canyon Creek Complex	airtanker	2		2	2	2			20		
2016	R1	Custer	North	SEAT	2		1	2	2			1000		
2016	R1	Lolo	Copper King	SEAT	1		1	1	1			750		
2016	R3	Apache-Sitgreaves	Juniper	SEAT	1		1	1	1			50		
2016	R4	Boise	Buck Fire	airtanker	2		2	2	2			1955		
2016	R4	Boise	Pioneer	airtanker	9		9	9	7	2		7978	2465	
2016	R4	Caribou-Targhee	Peterson Hollow	airtanker	1		1	1	1			1575		
2016	R4	Caribou-Targhee	South Mink Wildfire	airtanker	1		1	1	1			100		
2016	R4	Caribou-Targhee	Toponce Creek Fire	airtanker	6		1	6	6			14525		
2016	R4	Dixie	Aspen	airtanker	10		1	10		10			28000	
2016	R4	Dixie	Pine Canyon	airtanker	6		1	6		6			16800	
2016	R4	Dixie	Saddle	Airtanker, seat, helo	5	41	9	46	1		45	700		105483
2016	R4	Sawtooth	Dry Creek Fire	airtanker	2		2	2	2			16		
2016	R4	Uinta-Wasatch-Cache	Sheep Creek	airtanker	2		1	2	2			300-500		

Year	Region	Forest/Unit	Fire Name	Exposure Method	Accidental (Number of Drops)[5]	Exception (Number of Drops)	Intrusion reports[6]	Drops	Number of Drops Direct to water[7]	Number of Drops in Buffer only[3]	Number of Drops in Terrestrial TES Avoidance Areas	Estimated gallons into water	Estimated gallons into buffer	Estimated gallons into Terrestrial Avoidance Areas
2016	R5	Cleveland	Holy	airtanker	1		1	1		1			2400	
2016	R5	Cleveland	Three Sisters	airtanker	2		1	2	2			2000		
2016	R5	Inyo	Horseshoe	airtanker	1		1	1		1			3150	
2016	R5	Inyo	Marina	airtanker	2		1	2	2			1200		
2016	R5	Lassen	Lemm Fire	SEAT	4		1	4	4			700		
2016	R5	Lassen	Potato	airtanker	2		1	2		2			500	
2016	R5	Los Padres	Pine Fire	airtanker	10		1	10		10			1500	
2016	R5	Los Padres	Rey fire	Airtanker, helicopter, unknown	12		9	12	6	6		6000-6300	2100-2300	
2016	R5	Los Padres	Sherpa	airtanker	3		1	3		3			2000	
2016	R5	Los Padres	Soberanes Fire	airtanker	1		1	1	1			unknown		
2016	R5	Mendocino	Alder	airtanker		3	1	3	3			221.5		
2016	R5	San Bernardino	Blue Cut	airtanker	2	6	3	8		6	2		15700	3000
2016	R5	San Bernardino	Horn	airtanker	1		1	1		1			1000	
2016	R5	San Bernardino	Pilot	airtanker		2	1	2			2			12000
2016	R5	Shasta-Trinity	Gillman	airtanker		4	2	4	3	1		812	812	
2016	R5	Stanislaus	Old Fire	airtanker	3		1	3		3			50	
2016	R6	Wallowa-Whitman	Sheep	airtanker	1		1	1	1			600		
2016	R8	National Forests of North Carolina	Silver Mine Creek	airtanker		1	1	1		1			450	
2017	R1	Beaverhead-Deerlodge	Morgan	airtanker	3		1	3		3			4380	
2017	R1	Custer	Sartin Draw	airtanker	6		1	6		6			6800	
2017	R4	Boise	Whitehawk	helicopter	2		1	2	1	1		715	unknown	

Year	Region	Forest/Unit	Fire Name	Exposure Method	Accidental (Number of Drops)[5]	Exception (Number of Drops)	Intrusion reports[6]	Drops	Number of Drops Direct to water[7]	Number of Drops in Buffer only[3]	Number of Drops in Terrestrial TES Avoidance Areas	Estimated gallons into water	Estimated gallons into buffer	Estimated gallons into Terrestrial Avoidance Areas
2017	R1	Helena-Lewis and Clark	Arrastra Creek	airtanker	1		1	1	1			2000		
2017	R1	Helena-Lewis and Clark	Alice Creek	airtanker	1		1	1	1			1000		
2017	R1	Helena-Lewis and Clark	Park Creek	airtanker	1		1	1		1			881	
2017	R1	Lolo	Lolo Peak	helicopter		2	1	2	2			1800		
2017	R1	Lolo	HWY 200 Complex	airtanker	1		1	1	1			3800		
2017	R1	Lolo	Rice Ridge	airtanker	10		8	10	10			29850		
2017	R1	Lolo	Sapphire	SEAT	2		1	2	2			1600		
2017	R1	Lolo	Sunrise	helicopter	11		2	11		11			3250	
2017	R2	Grand Mesa - Uncompahgre-Gunnison	Carson	SEAT	1		1	1	1			710		
2017	R2	Medicine Bow-Routt	Keystone	airtanker		4	1	4	4			10		
2017	R3	Prescott	Goodwin	airtanker	2		1	2		2			1000	
2017	R3	Tonto	Picadilla	airtanker	1		1	1		1			3500	
2017	R4	Boise	Wapiti	SEAT	1		1	1	1			51		
2017	R4	Humboldt-Toiyabe	Quinn Fire	SEAT	1		1	1		1			700	
2017	R5	Klamath	Klamath Fire	airtanker		1	1	1	1			3500		
2017	R5	Klamath	Little	airtanker	2		2	2	2			2028		
2017	R5	Klamath	Marble	airtanker	2		2	2	2			5710		
2017	R5	Klamath	Salmon-August Complex	airtanker		2	1	2	2			21000		
2017	R5	Klamath	Ukonom Spot 1	airtanker	4		1	4	4			157.5		
2017	R5	Los Padres	Thomas	airtanker	4		3	4	2	2		4000	1000	

Year	Region	Forest/Unit	Fire Name	Exposure Method	Accidental (Number of Drops)[5]	Exception (Number of Drops)	Intrusion reports[6]	Drops	Number of Drops Direct to water[7]	Number of Drops in Buffer only[3]	Number of Drops in Terrestrial TES Avoidance Areas	Estimated gallons into water	Estimated gallons into buffer	Estimated gallons into Terrestrial Avoidance Areas
2017	R5	Los Padres	Whittier	airtanker	3		2	3		3			300	
2017	R5	Mendocino	Skeleton	airtanker	4		3	4	4			3563		
2017	R5	Mendocino	Slides	airtanker	1		1	1	1			1138		
2017	R5	Plumas	Minerva 5	airtanker	4		4	4	4			unknown		
2017	R5	San Bernardino	Dollar	airtanker	1		1	1		1			500	
2017	R5	San Bernardino	Holcomb T	airtanker		10	4	10		1	9		3000	12500
2017	R5	San Bernardino	Rouse	airtanker		3	1	3		3			1400	
2017	R5	Shasta-Trinity	Buck	airtanker	1		1	1	1			20		
2017	R5	Sierra	Railroad	airtanker	19		19	19	17	2		79523	8592	
2017	R5	Six Rivers	Ruth Complex	airtanker	3	10	2	13		13			43000	
2017	R6	Deschutes	Milli	airtanker	1		1	1	1			140		
2017	R6	Fremont-Winema	Devils Lake	airtanker	1		1	1	1			1000		
2018	1	Bitterroot	Reynolds Lake	airtanker	2		1	2	2			1500		
2018	1	Kootenai	OU3MR Highway 37	airtanker	3		3	3	3			600		
2018	1	Nez Perce-Clearwater	Rattlesnake	SEAT	1		1	1		1			100	
2018	2	Medicine Bow-Routt	Badger Creek	airtanker	3	18	4	21	3	18		3000	12000	
2018	2	Pike-San Isabel	Shooting Range	airtanker	1		1	1	1			1000		
2018	2	White River	Two Elk fire	SEAT	1		1	1	1			150		
2018	3	Gila	Ranch	airtanker	2		2	2	2			9119		
2018	4	Boise	German	SEAT	10		1	10		10			2927	
2018	4	Boise	Wren	airtanker	5		1	5		5			1830	
2018	4	Bridger-Teton	Roosevelt	airtanker	34		7	34	9	15	10	71000	60000	30000

Year	Region	Forest/Unit	Fire Name	Exposure Method	Accidental (Number of Drops)[5]	Exception (Number of Drops)	Intrusion reports[6]	Drops	Number of Drops Direct to water[7]	Number of Drops in Buffer only[3]	Number of Drops in Terrestrial TES Avoidance Areas	Estimated gallons into water	Estimated gallons into buffer	Estimated gallons into Terrestrial Avoidance Areas
2018	4	Dixie	West Valley	airtanker	1		1	1		1			300	
2018	4	Sawtooth	Wapiti	airtanker	1		1	1		1			619	
2018	4	Sawtooth	Wildcat	airtanker		1	1	1	1			4000		
2018	4	Uinta-Wasatch Cache	Pole Creek	airtanker, helicopter	5		5	5		5			unknown	
2018	5	Angeles	Fork Fire	airtanker	2		2	2	2			500		
2018	5	Klamath	Petersburg	helicopter	1		1	1		1			unknown	
2018	5	Lassen	Lakes	SEAT		2	1	2		2			1600	
2018	5	Lassen	Parade	SEAT		6	1	6			6			1600
2018	5	Lassen	Roxie	helicopter	2		1	2	2			1400		
2018	5	Lassen	Whaleback	airtanker	1		1	1	1			50		
2018	5	Lassen	Wilson	airtanker		1	1	1	1			1500		
2018	5	Los Padres	Adams	airtanker	2		1	2	2			3500		
2018	5	Mendocino	Eel	airtanker	7		7	7	3	4		2603	1397	
2018	5	Mendocino	Open	airtanker	3		2	3	3			415		
2018	5	Mendocino	Ranch	airtanker	30		22	30	21	9		11920.5	1701.5	
2018	5	San Bernardino	Cranston	airtanker	6	4	6	10		8	2		24000	5000
2018	5	San Bernardino	Kenbrook	airtanker		3	1	3		3			600	
2018	5	Shasta Trinity	Kerlin	airtanker		10	1	10	10			15000		
2018	5	Six Rivers	Signboard	airtanker	1		1	1		1			unknown	
2018	5	Tahoe	North	airtanker	6		3	6	6			unknown		
2018	6	Okanogan-Wenatchee	Cougar Creek	airtanker	2		1	2	2			500		
2018	6	Rogue River-Siskiyou	Klondike West	airtanker	1		1	1			1			20000
2018	6	Rogue River-Siskiyou	Nachez	helicopter	6		1	6	6			2400		

Year	Region	Forest/Unit	Fire Name	Exposure Method	Accidental (Number of Drops)[5]	Exception (Number of Drops)	Intrusion reports[6]	Drops	Number of Drops Direct to water[7]	Number of Drops in Buffer only[3]	Number of Drops in Terrestrial TES Avoidance Areas	Estimated gallons into water	Estimated gallons into buffer	Estimated gallons into Terrestrial Avoidance Areas
2018	6	Umatilla	Wilson Prairie	airtanker	10		2	10	10			121800		
2018	8	Mark Twain	Rozell	airtanker		1	1	1		1			2799	
2019	1	Nez Perce - Clearwater	Crab	airtanker	1		1	1	1			300		
2019	3	Tonto	Woodbury	airtanker	2		1	2	2			14175		
2019	4	Boise	Nine Fire	airtanker	2		1	2	2			1850		
2019	4	Bridger-Teton	Boulder Lake	unknown	1		1	1	1			unknown		
2019	4	Humboldt-Toiyabe	Corta	airtanker	1		1	1		1			100	
2019	4	Humboldt-Toiyabe	Cherry Fire	SEAT	2		1	2	2			1400		
2019	4	Payette	Nethker Fire	unknown	3		3	3	3			unknown		
2019	4	Salmon-Challis	Vader Fire	airtanker	unknown		1	unk	unk			unknown		
2019	5	Cleveland	Meadow	airtanker		1	1	1			1			650
2019	5	Inyo	Taboose	unknown	2		2	2	1	1		200	100	
2019	5	Klamath	Lime	airtanker	1		1	1	1			unknown		
2019	5	Lassen	Potato Fire	SEAT		4	1	4		4			2000	
2019	5	San Bernardino	Bautista	airtanker	3	10	4	13			13			18800
2019	5	Stanislaus	Pond Fire	airtanker	1		1	1	1			2000		
2019	8	NFs in Florida	Powerline	helicopter		2	1	2			2			1000
TOTAL					607	246	459	853	376	369	108	761282.5	95707.7	248285

SEIS Appendix E – Species Analysis Screening Processes

The information in this appendix describes the process used to analyze effects to listed and sensitive aquatic, wildlife and plant species. This appendix restates information found in the Nationwide Aerial Application of Fire Retardant on National Forest System Land Biological Assessment for Fish and Wildlife Service Species and the Wildlife Biological Evaluation for Nationwide Aerial Application of Fire Retardant on National Forest System Lands. Refer to the source document for further information. This information has been updated since the 2011 Final Environmental Impact Statement (USDA Forest Service 2011a).

National Effects Screening Process

Information and Assumptions Used in the National Effects Screening Process

Because the proposed action is programmatic across the entire National Forest System, a screening process was developed in order to standardize the process by which species determinations were made. The process was developed for the consultation completed in 2011 and updated for use in the current consultation. In order to develop the screen and to be consistent in how it was applied, the following information was developed, and assumptions used.

Retardant Application Potential

The occurrence of past fires and retardant drops provide a baseline and indicator for considering when and where retardant may be used in the future (refer to the Biological Assessment Table 10, Table 11, Table 12, and Figure 6). That information was summarized for use in the national screens as follows; complete data by National Forest is available in a separate report (USDA Forest Service 2020d).

Retardant application potential is described as ‘very low’, ‘low’, ‘moderate’ or ‘high’ based on the average annual retardant use by forest between 2012 and 2019 (USDA Forest Service 2020d, appendix G) and the maximum amount (maximum total gallons of retardant used in any given year from 2012 through 2019). These category assignments may be adjusted for a specific unit based on the percent of National Forest System land on which aerially delivered retardant is used annually, on average, along with the frequency (number of years retardant was used over the 8-year period) of use for that unit. This adjustment takes into consideration that smaller units could experience greater impact if a larger proportion of the land base is affected by retardant annually. Refer to Biological Assessment appendix G for lists of all National Forests and their retardant application potential.

- ‘Very low’ retardant application potential:
  - annual average of less than 25,000 gallons,
  - maximum of 100,000 gallons,
  - average aerial retardant used on up to 0.01 of forest unit annually, and
  - frequency of generally less than 0.375.
- ‘Low’ retardant application potential:
  - less than 50,000 gallons on average annually,
  - less than 200,000 gallons maximum,
  - average aerial retardant used on up to 0.01 of forest unit annually, and
  - generally less than 0.625 frequency.
- ‘Moderate’ retardant application potential:
  - less than 150,000 gallons on average annually, and

- less than 500,000 gallons maximum,
- average aerial retardant used on up to 0.01 of forest unit annually, and
- generally between 0.5 to 0.8 frequency.

- 'High' retardant application potential:
  - 150,000 gallons on average annually,
  - greater than 500,000 gallons maximum,
  - average aerial retardant used on more than 0.01 of forest unit annually, and
  - greater than 0.8 frequency.

Other Assumptions

- Fire season statistics since 2012 provide a reasonable representation of the rate of retardant delivery in the next 10 to 15 years relative to the Forest Service land base even though past or future decades could have more fires (Geier-Hayes 2011).
- Where avoidance areas are identified for known species occurrences or critical habitat, we assume that those avoidance areas would provide protection from adverse impacts. Designated critical habitat where the aerial application of fire retardant does not affect or change primary constituent elements, or the physical and biological features of critical habitat, does not require protection or avoidance mapping.
- Based on 8 years of intrusion data, out of an estimated 56,868 retardant drops there were 248 intrusions into water (0.43 percent) and 164 intrusions into the waterway buffer only (0.29 percent). There were 47 intrusions into terrestrial avoidance areas (0.08 percent). Overall, there were 459 intrusions into avoidance areas (0.81 percent). The intrusion rate is not expected to increase.
- Intrusions into avoidance areas are assumed to have a higher potential to occur on those units that have a high rate of use of aerially applied retardant.

In addition to those assumptions, the following Forest Service actions would occur after an intrusion into an aerial retardant avoidance area:

- If assessment or monitoring at an intrusion site determines that effects occurred to threatened, endangered, proposed or candidate species or critical habitat, the Forest Service would consider whether additional restrictions to aerial retardant use are needed. The Forest Service would discuss potential changes in retardant use, including buffer size changes, with the Fish and Wildlife Service and NOAA Fisheries.
- All retardant intrusion locations will be reported to the Forest resource specialist and / or the assigned Burned Area Emergency Rehabilitation team. The potential for non-native invasive plant species issues will be assessed by these entities, and additional measures included in forest plans would be implemented as needed.

Additional information, including other data on past retardant use, intrusions, fire history, and other information that was used in analyses and determinations is described as needed for each group (wildlife, aquatic species, and plants) or for individual species as needed.

National Effects Screens for Federally Listed Species

Table E-1 displays the standardized process used for evaluating all listed species and habitats for potential effects of aerial retardant use. Additional analysis may have been used to arrive at determinations, as described for each species group or individual species in the appropriate sections below.

Table E-1. National effects screening process for analyzing aerial retardant impacts to federally listed species and critical habitat

Impact[1]	National Screening Factor Aerially Applied Retardant	Aerial Retardant Application Potential
NE	Species/habitat occur in areas with no fires, therefore no potential retardant use. Examples: cliffs, caves, estuaries, marshes, lakes, ocean shoreline, sand dunes.	none
NE	Species occurs near, but not on national forest lands and effects from aerial retardant use on forest lands are not possible	low - high
NE	No retardant use recorded on forests where species occur, are suspected, or critical habitat is designated.	none
NE	Use of aerial fire retardant does not impact or change the Primary Constituent Elements, or physical and biological features of critical habitat.	low
Aquatics		
NLAA	Species occurs on forest with very low aerial retardant use and is protected with an avoidance area	very low
NLAA	Critical habitat is protected with avoidance area mapping, or use of aerial retardant would result in discountable or immeasurable changes to primary constituent elements or the physical and biological features of critical habitat	low-moderate
LAA	Species occurs on forest with moderate to high aerial retardant use.	moderate - high
LAA	Changes to primary constituent elements, or physical and biological features of critical habitat, are anticipated.	moderate-high
Terrestrial		
NLAA	Species is not an isolated population and aerial fire retardant is applied on less than 0.01 percent of forest landbase on average annually where species occurs or is suspected of occurring.	low
NLAA	Species occurs or is suspected of occurring on a forest with more than 0.01 percent of its landbase impacted by aerial retardant on average annually but occurs in habitats with very low likelihood of retardant application. Examples include alpine habitat, talus/scree slopes, desert,	low - moderate
NLAA	Critical habitat is protected with avoidance area mapping or use of aerial retardant would result in discountable or immeasurable changes to primary constituent elements or the physical and biological features of critical habitat.	low - high
LAA	Aerial fire retardant is applied on more than 0.01 percent of forest landbase on average annually where species occurs or is suspected.	moderate - high
LAA	Species is a small isolated population[2] and occurs on any forest where aerial retardant application is likely to occur – recognizing potential impact to these species from an intrusion or invoking an exception.	low - high
LAA	Changes to primary constituent elements, or physical and biological features of critical habitat, are anticipated.	low - high

[1]NE = No Effect; NLAA = may affect, not likely to adversely affect; LAA = may affect, likely to adversely affect

[2] A small, isolated population is a population in which the number of individuals is low, and the area occupied is geographically limited, such as occurring on a single National Forest or within a single drainage.

Wildlife Effects Screening Process

General information about the wildlife screening process

As part of the analysis framework established for the 2011 biological assessments (USDA Forest Service 2011b), a National Effects Screening Process (as described previously) was developed for all Endangered Species Act (ESA) listed threatened, endangered, proposed and candidate species, and designated or proposed critical habitat. The national screens represent a coarse filter consideration of species

distribution, habitat, and probability of retardant application where species occur. The screening process was further refined for wildlife species (see below).

In order to be consistent with the previous analyses and consultation documents, (USDA Forest Service 2011b, USDA Forest Service 2011c, USDI Fish and Wildlife Service 2011, USDA Forest Service 2017, USDI Fish and Wildlife Service 2017, USDA Forest Service 2018, USDI Fish and Wildlife Service 2018), this analysis applied the same coarse filter and fine filter screening processes. The screens have been updated to reflect recent information about retardant use, and have been edited for clarity, including incorporating edits from supplemental consultations and comments from the Fish and Wildlife Service.

The wildlife effects screening process (also referred to in this document as "wildlife screens") was developed to provide a consistent approach to considering the potential impacts of aerial retardant on a wide variety of wildlife species and habitats. Potential impacts of aerial retardant use on wildlife species are influenced by the likelihood of exposure through direct application or ingestion, as well as through disturbance caused by aircraft used to deliver retardant. Direct exposure is influenced by the ability of individuals of species to avoid areas where fires are burning or where retardant may be used, as well as their ability to avoid using areas in which retardant has been applied. Large, mobile, wide-ranging species such as lynx, fisher, or grizzly bear are much less likely to be affected by aerial application of retardant than species such as small rodents or amphibians, many of which are dependent on localized or highly specific habitats. Direct exposure is also influenced by the likelihood of an animal ingesting retardant through consumption of treated foliage or predation on other species (such as insects or small mammals) that may have retardant on them or that may have ingested retardant. Risk of ingestion is based on a species' preferred forage or prey and how widely individuals range in search of forage or prey. The risk of an animal being affected by ingested retardant is dependent on the amount consumed and the species' physiological response to retardant chemicals. Potential for impacts due to ingestion were identified in a risk assessment (Auxilio Management Services 2021) that was considered in the wildlife screening process. Finally, aerial retardant application could result in disturbance to species in the area due to the presence (sight and/or sound) of low-flying aircraft used to deliver retardant. The degree of potential effects from that disturbance depend on the frequency and duration of flights as well as whether a particular species is at a vulnerable time (such as breeding or nesting). The wildlife screens add consideration of the potential impacts described in the above paragraph, as displayed in Figure E-1, Figure E-2, Figure E-3, and Figure E-4 (Wildlife Screening Process screens). Terminology, assumptions, and other information for each screen is described in the following sections.

Although the analysis of wildlife species incorporated use of the wildlife screens, other information was used as needed to arrive at determinations for each species or critical habitat. Such things as whether a species is widely distributed or occurs as a local endemic, whether it is restricted to specific habitats, timing of retardant use relative to critical life history stages, foraging habits, and other species-specific or habitat-specific information was considered where needed, and documented in the individual species effects discussions.

Information and assumptions common to all wildlife screens

The wildlife screening process relied on the same assumptions used for the National Screening Process (refer to the 'Effects Analysis Process – Analysis Process Used' section of the Biological Assessment for details). Assumptions used in the wildlife screens also include:

- Aerial fire retardant use will be similar in the future to use from 2012 through 2019.
- Aerial retardant drops are not allowed in avoidance areas, except where human life or public safety is threatened and retardant use in the avoidance area could be reasonably expected to mitigate that

threat. Use of avoidance areas reduces likelihood that aerial retardant use will impact species or habitats, but the degree to which potential impacts might still occur would vary based on the species or habitat and the type of effect being considered.

- The rate of intrusions would remain low, similar to the rate observed from 2012 through 2019.

In addition to the assumptions described above, the wildlife screens incorporate consideration of retardant application potential, defined in the 'Effects Analysis Process – Analysis Process Used' section of the Biological Assessment. For all wildlife screens, where a species or designated critical habitat occurs on more than one unit that differs in retardant application potential, the highest retardant application potential of those units is used for the screening process. This approach is intended to ensure a conservative approach to compliance with the Endangered Species Act.

All designated or proposed critical habitat is screened through wildlife screen 1, and the determinations reached by using this screen apply only to critical habitat. All species are screened through wildlife screen 2 (mobility). Based on the outcome of wildlife screen 2, some species may also require assessment through wildlife screen 3 (disturbance) and wildlife screen 4 (ingestion). If screens 3 and 4 are applied after screen 2, the more conservative determination is used; for example, if use of screen 2 leads to a May Affect, Not Likely to Adversely Affect, but use of screen 3 leads to a May Affect, Likely to Adversely Affect determination, then the May Affect, Likely to Adversely Affect determination is used for the species as a whole.

Wildlife screen 1: Effects to Critical Habitat ()

This screen applies only when critical habitat is designated or proposed for a species. This screen was updated from the corresponding one used in 2011, adding consideration of physical and biological features. Use of the screen includes the following information and assumptions:

- If avoidance areas for designated or proposed critical habitat potentially affected by aerial fire retardant are required or recommended, guidelines would be developed by the local unit to ensure that the primary constituent elements or physical and biological features of the critical habitat are protected.
- Annual coordination will occur between local units of the Forest Service and the Fish and Wildlife Service; these efforts will help in reducing impacts to species and habitats by discussing, prior to each fire season, changes to designated critical habitats, monitoring needs, and any new information.
- The screen considers the potential effects of aerial retardant use on the primary constituent elements or physical and biological features of the designated critical habitat, and also considers the effectiveness of mapped avoidance areas at reducing impacts to those elements and features.

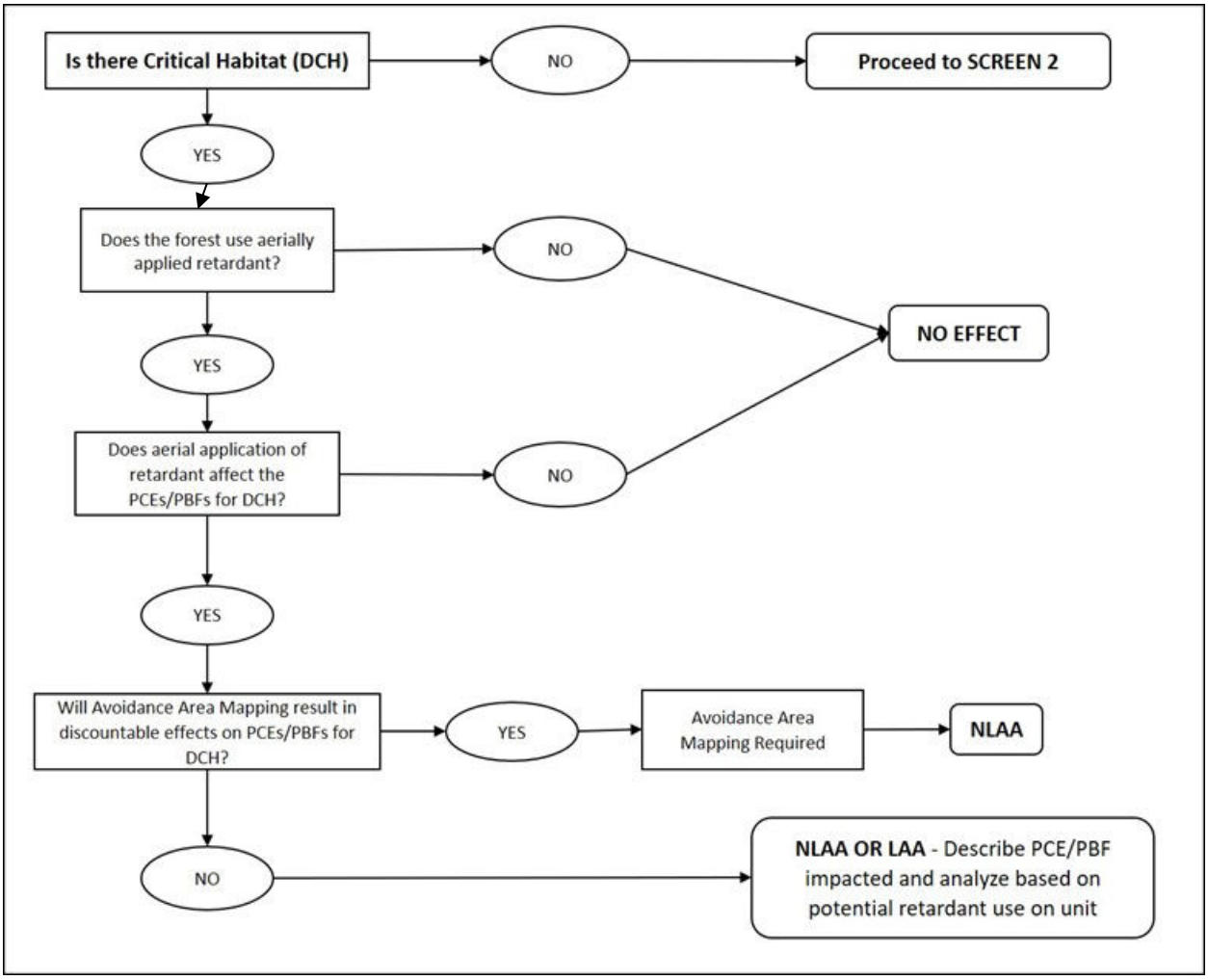

Figure E-1. Wildlife screen 1: effects to critical habitat

Wildlife screen 2: Mobility of Individuals (Figure E-2)

Wildlife screen 2 addresses whether individuals of a species can potentially move away from areas impacted by aerial retardant, in the context of the retardant application potential of national forest units on which they occur. For consistency in applying the screen, home range sizes were considered in relation to the average acreage of individual retardant drops. The following definitions were used to estimate mobility of the individuals of a species:

- Not mobile: Species is small or slow (such as a turtle or caterpillar) and home range is less than ten acres.
- Limited: Individuals are small (such as a ground squirrel) and are capable of moving out of the way of an approaching danger but have small to moderate home ranges (ten to 100 acres) that could be mostly impacted by one or more retardant drops.
- Mobile: Individuals are medium to large in size (such as deer) and relatively large daily movements are common. Individual home ranges are greater than one hundred acres.
- Very mobile: Individuals are medium to large in size and move regularly or rapidly (such as coyote). Individual home ranges are generally larger than 1000 acres.

When using this screen, consideration is given to whether individuals of a mobile or very mobile species are able to avoid aerial retardant based on the timing of retardant use on the national forest units where they occur (refer to Biological Assessment Table 10, Table 11, and Table 12) and the season or life history stage of that species. For example, nesting birds, young non-volant bats, larval insects, and others may be unable to avoid aerial retardant use that occurs during those seasons or life stages. Where local units deem it necessary, avoidance areas may be mapped for to limit potential impacts during those times.

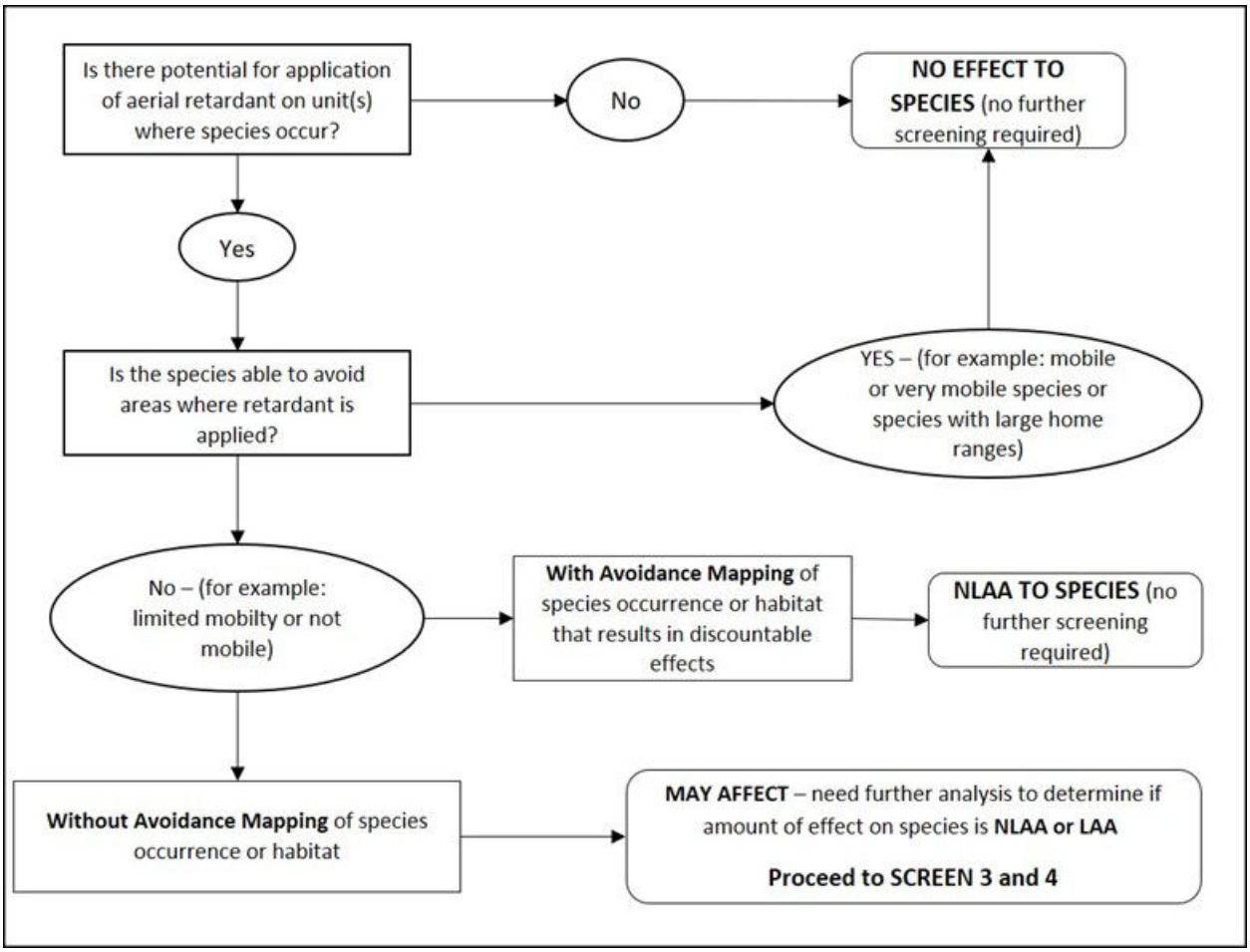

Figure E-2. Wildlife screen 2: mobility of individuals

Wildlife screen 3: disturbance from low-flying aircraft (Figure E-3)

The use of aircraft to deliver fire retardant has the potential to disturb some species due to noise or the visual impact of approaching aircraft or falling retardant. Disturbance can involve at a minimum some expenditure of energy that would not otherwise be used, or may involve movement away from preferred foraging or other habitat, movement away from or abandonment of nests or dens leaving young vulnerable to mortality, displacement of individuals into home ranges of other individuals, or other impacts.

Use of this screen involves the assumption that the effect of potential disturbance is influenced by the duration of the disturbance, and by the timing of when it occurs (i.e., during nesting, denning, or other time periods of critical importance to individuals of the species). Expected timing of aerial retardant use is based on retardant use data gathered since 2000 for each Forest Service Region (refer to Biological

Assessment Table 10, Table 11, and Table 12); that timing is used to determine whether aerial retardant use is likely to occur during a species' critical time period(s).

Disturbance from aircraft is categorized as short-term or long-term. Short-term disturbance is one to three flyovers at altitudes below 500 feet above ground level occurring over a 48-hour period or less. Long-term disturbance is more than three flyovers occurring over a period longer than 48 hours. Duration of disturbance or of a fire incident cannot be predicted in advance. Therefore, this screen uses retardant application potential as an indicator of the likelihood of short or long-term disturbance as follows:

- Units with very low or low retardant application potential are assumed to primarily experience short-term disturbance
- Units with moderate or high retardant application potential are assumed to likely experience long-term disturbance.

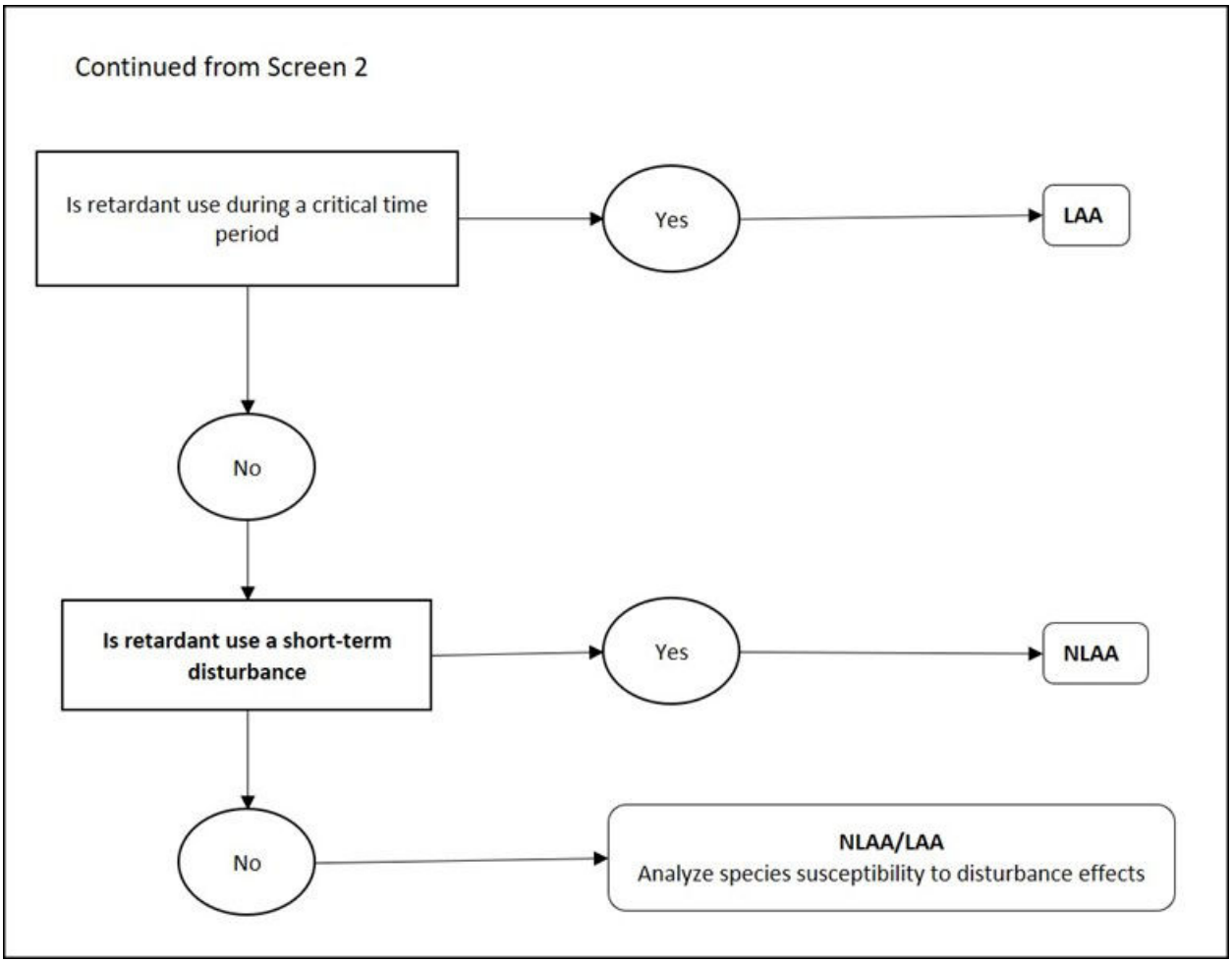

Figure E-3. Wildlife screen 3: disturbance from low-flying aircraft

Wildlife screen 4: Ingestion of retardant (Figure E-4)

Retardant chemicals may be ingested directly, through consumption of vegetation or prey coated with retardant or consumption of water with retardant in it, or indirectly through consumption of prey that has consumed retardant. The potential for individuals of a species to ingest retardant, and the potential for retardant chemicals to affect individuals if consumed, was summarized in an ecological risk assessment

(Auxilio Management Services 2021). That assessment used data on wildlife species selected to represent a range of taxonomic classes, body sizes, foraging habitat, and diets, for which parameters are generally available. The risk assessment determined an estimated dose for each species based on the above factors, compared it to the published LD50 (the dose at which 50 percent of the sample dies after an established period of time), and used a method established by the Environmental Protection Agency's Office of Pesticides Programs to assign a risk quotient to each species. Risk of negative effects was indicated at levels one-tenth the LD50 for a given species. Refer to the ecological risk assessment (Auxilio Management Services 2021).

Potential direct impacts of aerial retardant application vary based on ecoregion, because of differing vegetation types and other factors. Use of this screen involves identifying whether a species is represented by one for which risk was predicted in the ecological risk assessment, and then identifying whether the species occurs in an ecoregion in which the rate of application would result in the predicted risk.

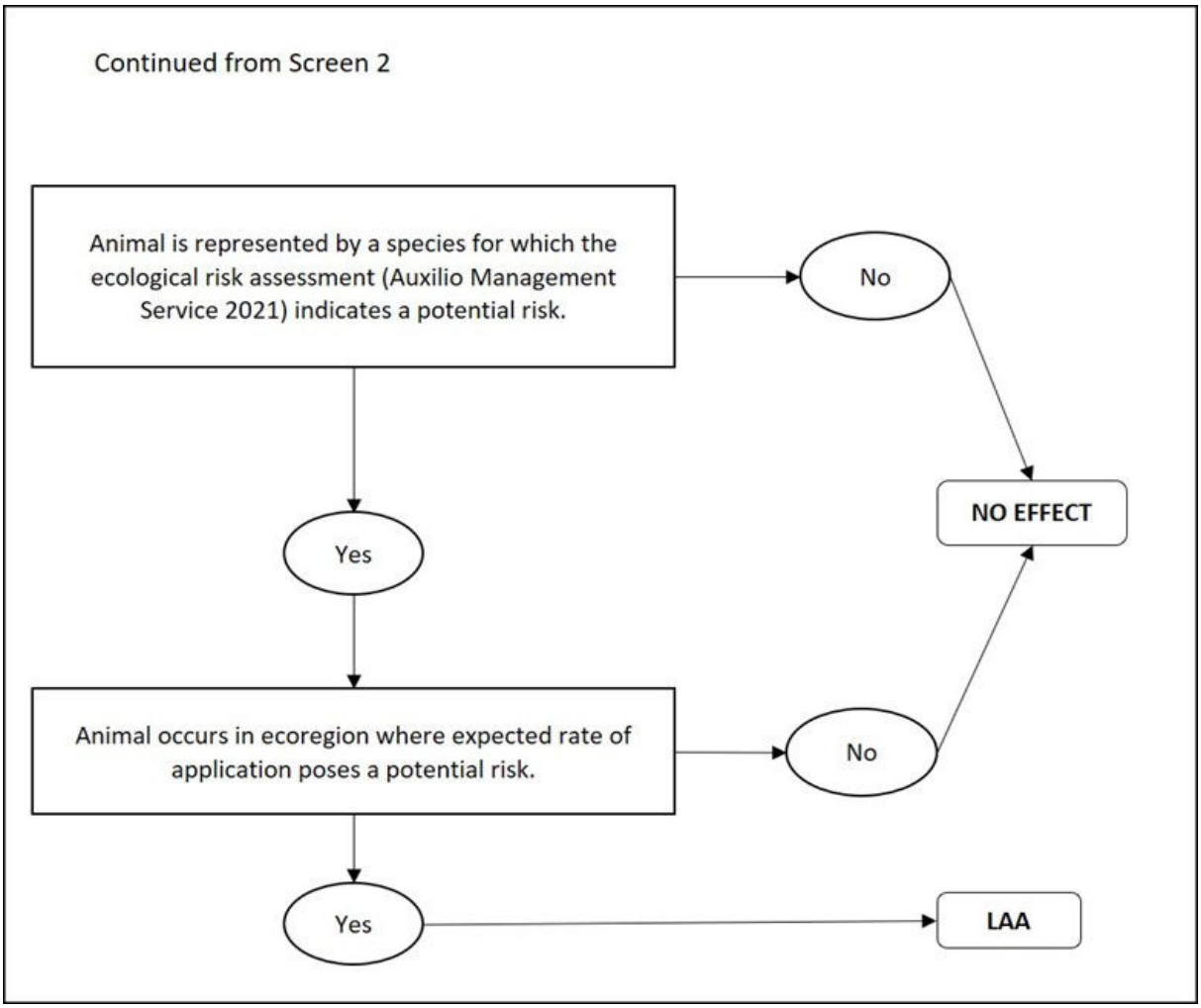

Figure E-4. Wildlife screen 4: ingestion of retardant

Impacts Screening Process For Forest Service Sensitive Species

A two-part impacts screening process has been developed for sensitive species. The first step, a National Impacts Screening Process, was developed as a coarse filter for all sensitive species to determine the impacts based on the potential use of aerial application of fire retardant on wildlife, plant, and aquatic

species and habitats. Unit-specific determinations have been made. For example, a "No Impact" determination is warranted for a forest that doesn't aerially apply fire retardant, but another forest within the range of that species that uses aerial application of fire retardant could have a "May Impact Individuals and Habitat" determination. Tables 2 and 3 show the process to standardize impacts determinations for sensitive terrestrial and aquatic species, respectively, addressed in this analysis.

Table E-2. National impacts screening process for sensitive terrestrial species

Impacts Determination[1]	National Screening Factor for Aerially Applied Retardant	Retardant Application Potential
NI	Species/habitat occur in areas with no fires, therefore no potential retardant use. Examples: alpine habitat, cliffs, caves, estuaries, marshes, lakes, ocean shoreline, sand dunes.	none
NI	Species occurs near, but not on national forest lands and indirect effects from retardant use on forest lands are not anticipated.	none
NI	No retardant use recorded on forests where species occur or are suspected.	none
Aquatic Habitats		
NI	Species occurs on forest with very low retardant use and is protected with an avoidance area	very low
MIIH	Species occurs on forest with greater than very low retardant use and is protected with an avoidance area.	low-mod
Terrestrial Habitats		
NI	Species occurs or is suspected of occurring on a forest with less than 0.01 percent of its land base impacted by retardant on average annually, and occurs in habitats with very low likelihood of retardant application. Examples include desert, dense forest canopy, alpine, talus, shorelines.	very low
MIIH	Species is not an isolated population and fire retardant is applied aerially on less than 0.01 percent of forest land base on average annually where species occurs or is suspected of occurring and in habitats with greater than a very low likelihood of retardant application.	low
MIIH	Species occurs or is suspected of occurring on a forest with more than 0.01 percent of its land base impacted by retardant on average annually, but occurs in habitats with very low likelihood of retardant application. Examples include desert, dense forest canopy, alpine, talus, shorelines.	low-mod
MIIH	Fire retardant is applied on more than 0.01 percent of forest land base on average annually where species occurs or is suspected and in habitats with greater than a very low likelihood of retardant application.	mod-high
MIIH or WII	Species is a small isolated population and occurs on any forest where retardant application is likely to occur and in habitats with greater than a very low likelihood of retardant application. Determination will be based on additional information, such as species ecology and/or potential implementation of avoidance areas.	low-high

[1]NI: Will not impact; MIIH: May impact individuals and habitat – no trend toward listing; WII: Will impact individuals and habitat – trend toward listing

Table E-3. National impacts screening process for sensitive aquatic species (amphibians, aquatic insects, aquatic gastropods, bivalves)[9]

State Rank	Average Annual Retardant Use	Future potential Use	Impacts Determination
S1-S5	No use	None	NI
S3-S5	very low use (less than 15,000 gallons) and greater than or equal to 20 occurrences	low-moderate	NI
S1-S2	very low use (less than 15,000 gallons)	Low	MIIH
S1-S5	low to moderate-high use (15,000 – 150,000 gallons)	Low-high	MIIH
S4-S5	high use (greater than 150,000 gallons)	High	MIIH
S1-S3	high use (greater than 150,000 gallons) and less than 20 occurrences	High	MIIH or WII

[9] This screening process for sensitive aquatic species is consistent with the process used in the separate fish and crayfish biological evaluation.

Appendix F – Lists of Species Considered and Effects

Table F-1. List of Species Considered During the Endangered Species Act Consultation with U.S. Fish and Wildlife Service for Nationwide Aerial Application of Fire Retardant on National Forest System Lands

- Common name or Scientific name in parentheses indicates an alternate name. DPS = distinct population segment, ESU = evolutionarily significant unit.
- Status: E = endangered, T = threatened, PE = proposed endangered, PT = proposed threatened, XN = experimental nonessential population, T(S/A) = threatened due to similar appearance, SC = species of concern, CH = critical habitat, PCH = Proposed critical habitat. Status depicted in parentheses () indicate that it does not occur on National Forest Systems lands. It may still be analyzed for indirect impacts.
- Determination: NE = no effect, NLAA = may affect but is not likely to adversely affect, LAA = may affect and is likely to adversely affect
- Forest names in all capital letters are units where designated or proposed critical habitat occurs. Forest name in parentheses () indicate that it does not occur on National Forest Systems lands. It may still be analyzed for indirect impacts. Refer to main document for an explanation of retardant application potential categories.

Category	Common Name	Scientific Name	Status	Determination	Region 1	Region 2	Region 3	Region 4	Region 5	Region 6	Region 8	Region 9	Region 10
amphibian	California tiger salamander - central population	*Ambystoma californiense*	T, (CH)	NLAA, na					high application potential: Sequoia				
amphibian	Frosted Flatwoods salamander	*Ambystoma cingulatum*	T, CH	NLAA, NLAA							no use: FRANCIS MARION; very low application potential: NATIONAL FORESTS IN FLORIDA		
amphibian	Sonora tiger salamander	*Ambystoma tigrinum stebbinsi*	E	LAA			low application potential: Apache-Sitgreaves; high application potential: Coronado						
amphibian	Arroyo toad	*Anaxyrus californicus*	E, CH	LAA, NLAA					high application potential: ANGELES, CLEVELAND, LOS PADRES, SAN BERNARDINO				

Category	Common Name	Scientific Name	Status	Determination	Region 1	Region 2	Region 3	Region 4	Region 5	Region 6	Region 8	Region 9	Region 10
amphibian	Yosemite toad	*Anaxyrus canorus*	T, CH	LAA, NLAA				high application potential: TOIYABE	very low application potential: Lake Tahoe Basin Management Unit; high application potential: ELDORADO, INYO, SIERRA, STANISLAUS				
amphibian	Wyoming toad	*Bufo baxteri*	E	NE		moderate application potential: Medicine Bow-Routt							
amphibian	Ozark hellbender	*Cryptobranchus alleganiensis bishopi*	E	NLAA							no use: Ozark	very low application potential: Mark Twain	
amphibian	eastern hellbender - Missouri DPS	*Cryptobranchus alleganiensis alleganiensis*	E	NLAA								very low application potential: Mark Twain	
amphibian	black warrior waterdog	*Necturus alabamensis*	E, CH	NE							no use: NATIONAL FORESTS IN ALABAMA		
amphibian	Neuse River waterdog	*Necturus lewisi*	T	NLAA							very low application potential: National Forests in North Carolina		
amphibian	Jemez Mountains salamander	*Plethodon neomexicanus*	E, CH	NLAA, NLAA			moderate application potential: SANTA FE						
amphibian	Cheat Mountain salamander	*Plethodon netting*	T	NE								no use: Monongahela	
amphibian	Shenandoah salamander	*Plethodon shenandoah*	E	NE							no use: George Washington and Jefferson		

Category	Common Name	Scientific Name	Status	Determination	Region 1	Region 2	Region 3	Region 4	Region 5	Region 6	Region 8	Region 9	Region 10
amphibian	California red-legged frog	*Rana draytonii*	T, CH	LAA, NLAA					moderate application potential: Mendocino; high application potential: ANGELES, Cleveland, ELDORADO, LOS PADRES, PLUMAS, San Bernardino, Shasta-Trinity, Sierra, Stanislaus, TAHOE				
amphibian	Chiricahua leopard frog	*Rana chiracahuensis*	T, CH	LAA, NLAA			low application potential: APACHE-SITGREAVES; moderate application potential: Cibola, COCONINO, GILA; high application potential: CORONADO, TONTO						
amphibian	Mountain yellow-legged frog - northern California DPS	*Rana muscosa*	E, CH	LAA, NLAA					high application potential: INYO, SEQUOIA, Sierra				
amphibian	Mountain yellow-legged frog - southern California DPS	*Rana muscosa*	E, CH	LAA, NLAA					high application potential: ANGELES, SAN BERNARDINO				

Category	Common Name	Scientific Name	Status	Determination	Region 1	Region 2	Region 3	Region 4	Region 5	Region 6	Region 8	Region 9	Region 10
amphibian	Oregon spotted frog	*Rana pretiosa*	T, CH	LAA, NLAA						no use: Mt. Baker - Snoqualmie; very low application potential: MT. HOOD; low application potential: GIFFORD PINCHOT, WILLAMETTE; moderate application potential: FREMONT-WINEMA; high application potential: DESCHUTES			
amphibian	Sierra Nevada yellow-legged frog	*Rana sierrae*	E, CH	LAA, NLAA				high application potential: TOIYABE	very low application potential: LAKE TAHOE BASIN MANAGEMENT UNIT; moderate application potential: LASSEN; high application potential: ELDORADO, INYO, PLUMAS, SIERRA, STANISLAUS, TAHOE				
amphibian	dusky gopher frog	*Rana sevosa or Lithobates sevosus*	E, CH	NE							no use: NATIONAL FORESTS IN MISSISSIPPI		
arachnid	spruce-fir moss spider	*Microhexura montivaga*	E, CH	NLAA, NLAA							no use: Jefferson; very low application potential: CHEROKEE, NATIONAL FOREST IN NORTH CAROLINA		

Category	Common Name	Scientific Name	Status	Determination	Region 1	Region 2	Region 3	Region 4	Region 5	Region 6	Region 8	Region 9	Region 10
bird	Puerto Rican sharp-shinned hawk	*Accipiter striatus venator*	E	NE							no use: El Junque		
bird	Puerto Rican parrot	*Amazona vittata*	E	NE							no use: El Junque		
bird	Florida scrub-jay	*Aphelocoma coerulescens*	T	NLAA							very low application potential: National Forests in Florida		
bird	marbled murrelet	*Brachyramphus marmoratus*	T, CH	LAA, NLAA					high application potential: KLAMATH (habitat only), Los Padres, Shasta-Trinity (historic), SIX RIVERS	no use: MT. BAKER-SNOQUALMIE, OLYMPIC, SIUSLAW; low application potential: GIFFORD-PINCHOT; high application potential: SISKIYOU			
bird	Puerto Rican broad-winged hawk	*Buteo platypterus brunnescens*	E	NE							no use: El Junque		
bird	rufa red knot	*Calidris canutus rufa*	T	NE	very low application potential: Dakota Prairie Grasslands							no use: Hiawatha	
bird	ivory-billed woodpecker	*Campephilus principalis*	E	NE							no use: Ozark		
bird	Gunnison sage grouse	*Centrocercus minimus*	T, CH	NLAA, NLAA		very low application potential: GRAND MESA UNCOMPAHGRE AND GUNNISON, Rio Grande; moderate application potential: Pike-San Isabel, San Juan							

Category	Common Name	Scientific Name	Status	Determination	Region 1	Region 2	Region 3	Region 4	Region 5	Region 6	Region 8	Region 9	Region 10
bird	piping plover	*Charadrius melodus*	T, E, CH	NE	very low application potential: Dakota Prairie Grasslands	low application potential: Arapahoe - Roosevelt; moderate application potential: Medicine Bow-Routt, Pike San Isabel					no use: Ouachita; very low application potential: National Forests in North Carolina	no use: HIAWATHA, HURON-MANISTEE	
bird	western snowy plover	*Charadrius nivosus nivosus*	T, CH	NE						No use: SIUSLAW			
bird	western yellow-billed cuckoo	*Coccyzus americanus*	T, CH	NLAA, NLAA	moderate application potential: Bitterroot; high application potential: Lolo	very low application potential: (Grand Mesa Uncompahgre and Gunnison), Nebraska, (Rio Grande); low application potential: (Arapaho-Roosevelt), Pawnee; moderate application potential: (Medicine Bow-Routt), Thunder Basin, San Juan, (Shoshone)	very low application potential: Carson; low application potential: Apache-Sitgreaves; moderate application potential: COCONINO, GILA, Santa Fe; high application potential: CORONADO, PRESCOTT, TONTO	very low application potential: Ashley, Targhee; low application potential: Fishlake, Manti-La Sal; moderate application potential: Salmon-Challis, Sawtooth; High application potential: Boise, Bridger-Teton, Humboldt-Toiyabe, Dixie, Payette, Uinta-Wasatch-Cache	high application potential: Angeles, Cleveland, Los Padres, Modoc, Sequoia, Shasta-Trinity, Six Rivers	very low application potential: Columbia River Gorge; low application potential: Colville			
bird	southwestern willow flycatcher	*Empidonax traillii extimus*	E, CH	NLAA, NLAA		very low application potential: Rio Grande; moderate application potential: San Juan	very low retardant use: CARSON; low retardant use: APACHE-SITGREAVES; moderate application potential: GILA; high application potential: TONTO	low application potential: Manti-La Sal; high application potential: Toiyabe	high application potential: ANGELES, CLEVELAND, LOS PADRES, SAN BERNARDINO, SEQUOIA				

Category	Common Name	Scientific Name	Status	Determination	Region 1	Region 2	Region 3	Region 4	Region 5	Region 6	Region 8	Region 9	Region 10
bird	northern Aplomado falcon	*Falco femoralis septentrionalis*	XN	NLJ			moderate application potential: Cibola, Gila, Lincoln; high application potential: Coronado						
bird	whooping crane	*Grus americana*	E	NE	very low application potential: Dakota Prairie grasslands	very low application potential: Nebraska and Samuel R. McKelvie; low application potential: Arapahoe & Roosevelt; moderate application potential: Medicine Bow-Routt, Pike and San Isabel		very low application potential: Targhee; high application potential: Bridger-Teton					
bird	Mississippi sandhill crane	*Grus canadensis pulla or Antigone canadensis pulla*	E	NE							no use: National Forests in Mississippi		
bird	California condor	*Gymnogyps californianus*	E, CH, XN	NLAA, NE, NLJ			very low application potential: Kaibab; low application potential: Apache-Sitgreaves; moderate application potential: Coconino; high application potential: Prescott, Tonto	high application potential: Dixie	high application potential: Angeles, LOS PADRES, San Bernardino, SEQUOIA, Sierra				

Category	Common Name	Scientific Name	Status	Determination	Region 1	Region 2	Region 3	Region 4	Region 5	Region 6	Region 8	Region 9	Region 10
bird	wood stork	*Mycteria americana*	T	NE							no use: National Forests in Alabama, Francis Marion and Sumter; very low application potential: Chattahoochee-Oconee, National Forests in Florida, National Forests in North Carolina		
bird	red-cockaded woodpecker	*Picoides borealis*	E	NLAA							no use: National Forests in Alabama, Francis Marion and Sumter, Kisatchie, National Forests in Mississippi, Ouachita; very low application potential: Chattahoochee-Oconee, National Forests in Florida, National Forests in North Carolina		
bird	Coastal California gnatcatcher	*Polioptila californica californica*	T, CH	LAA, NLAA					high application potential: ANGELES, CLEVELAND, San Bernardino				
bird	Yuma Ridgways rail	*Rallus obsoletus (longirostris) yumanensis*	E	NE			moderate application potential: Coconino; high application potential: Tonto						
bird	Elfin-woods warbler	*Setophaga angelae*	T	NE							no use: El Junque		
bird	roseate tern	*Sterna dougallii*	E	NE							very low application potential: National Forests in North Carolina		

Category	Common Name	Scientific Name	Status	Determination	Region 1	Region 2	Region 3	Region 4	Region 5	Region 6	Region 8	Region 9	Region 10
bird	northern spotted owl	*Strix occidentalis caurina*	T, CH	LAA, NLAA					moderate application potential: LASSEN, MENDOCINO; high application potential: KLAMATH, MODOC, SHASTA-TRINITY, SIX RIVERS	no use: MT. BAKER-SNOQUALMIE, SIUSLAW, OLYMPIC; very low application potential: COLUMBIA RIVER GORGE, MT. HOOD; low application potential: GIFFORD PINCHOT, WILLAMETTE; moderate application potential: Fremont-Winema, UMPQUA; high application potential: DESCHUTES, OKANOGAN-WENATCHEE, ROGUE RIVER-SISKIYOU			

Category	Common Name	Scientific Name	Status	Determination	Region 1	Region 2	Region 3	Region 4	Region 5	Region 6	Region 8	Region 9	Region 10
bird	Mexican spotted owl	*Strix occidentalis lucida*	T, CH	LAA, NLAA		very low application potential: Grand Mesa Uncompahgre and Gunnison, Rio Grande; low application potential: Arapaho & Roosevelt; moderate application potential: PIKE AND SAN ISABEL, San Juan, White River	very low application potential: CARSON, KAIBAB; low application potential: APACHE-SITGREAVES; moderate application potential: CIBOLA, COCONINO, GILA, LINCOLN, SANTA FE; high application potential: CORONADO, PRESCOTT, TONTO	low application potential: Fishlake, Manti-La Sal; high application potential: Dixie					
bird	least Bell's vireo	*Vireo bellii pusillus*	E, CH	NLAA, NLAA					high application potential: Angeles, Cleveland, LOS PADRES, San Bernardino, Sequoia				
bivalve	Cumberland elktoe	*Alasmidonta atropurpurea*	E, CH	NE, NE							no use: DANIEL BOONE		
bivalve	Appalachian elktoe	*Alasmidonta raveneliana*	E, CH	NLAA, NLAA							very low application potential: CHEROKEE, NATIONAL FORESTS IN NORTH CAROLINA		
bivalve	fat three-ridge mussel	*Amblema neislerii*	E, CH	NLAA, NLAA							very low application potential: NATIONAL FORESTS IN FLORIDA		
bivalve	Ouachita rock pocketbook	*Arkansia wheeleri*	E	NLAA							no use: Ouachita; very low application potential: National Forest and Grasslands in Texas		

Category	Common Name	Scientific Name	Status	Determination	Region 1	Region 2	Region 3	Region 4	Region 5	Region 6	Region 8	Region 9	Region 10
bivalve	spectaclecase	*Cumberlandia monodonta*	E	NLAA							no use: Ozark, Ouachita, George Washington and Jefferson	no use: Shawnee; very low application potential: Mark Twain	
bivalve	fanshell	*Cyprogenia stegaria*	E, XN	NE							no use: Daniel Boone, George Washington and Jefferson	no use: Hoosier, Shawnee, Wayne	
bivalve	dromedary pearlymussel	*Dromus dromas*	E, XN	NE, NE							no use: George Washington and Jefferson		
bivalve	purple bankclimber	*Elliptoideus sloatianus*	T, CH	NLAA, NLAA							very low application potential: NATIONAL FORESTS IN FLORIDA		
bivalve	Cumberlandian combshell	*Epioblasma brevidens*	E, XN, CH	NE, NE							no use: DANIEL BOONE, JEFFERSON		
bivalve	oyster mussel	*Epioblasma capsaeformis*	E, XN, CH	NLAA, NE							no use: DANIEL BOONE, JEFFERSON; very low application potential: Cherokee		
bivalve	Curtis pearlymussel	*Epioblasma florentina curtisi*	E	NLAA								very low application potential: Mark Twain	
bivalve	tan riffleshell	*Epioblasma florentina walkeri*	E	NLAA							no use: Daniel Boone; very low application potential: Cherokee		
bivalve	upland combshell	*Epioblasma metastriata*	E, CH	NLAA, NE							no use: NATIONAL FORESTS IN ALABAMA; very low application potential: Cherokee		

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bivalve	southern acornshell	*Epioblasma othcaloogensis*	E, CH	NLAA, NE							no use: NATIONAL FORESTS IN ALABAMA; very low application potential: Cherokee		
bivalve	southern combshell	*Epioblasma penita*	E	NE							no use: National Forests in Alabama		
bivalve	green-blossom pearlymussel	*Epioblasma torulosa gubernaculum*	E	NE							no use: George Washington and Jefferson		
bivalve	northern riffleshell	*Epioblasma torulosa rangiana*	E	NE							no use: Daniel Boone	no use: Allegheny	
bivalve	snuffbox mussel	*Epioblasma triquetra*	E	NLAA							no use: Daniel Boone, George Washington and Jefferson, Ozark	no use: Allegheny, Wayne; very low application potential: Mark Twain	
bivalve	shiny pigtoe	*Fusconaia cor*	E, XN	NE, NE							no use: George Washington and Jefferson		
bivalve	finerayed pigtoe	*Fusconaia cuneolus*	E, XN	NLAA							no use: George Washington and Jefferson; very low application potential: Cherokee		
bivalve	finelined pocketbook	*Hamiota altilis*	T, CH	NLAA, NLAA							no use: NATIONAL FORESTS IN ALABAMA; very low application potential: CHATTAHOOCHEE, Cherokee		
bivalve	southern sandshell	*Hamiota australis*	T	NE							no use: National Forests in Alabama		
bivalve	orangenacre mucket	*Hamiota perovalis*	T, (CH)	NE, na							no use: National Forests in Alabama		
bivalve	shinyrayed pocketbook	*Hamiota (Lampsilis) subangulata*	E, (CH)	NLAA, na							very low application potential: National Forests in Florida		

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bivalve	cracking pearlymussel	*Hemistena lata*	E, XN	NE, NE							no use: Jefferson (XN on Cherokee with very low retardant application potential)		
bivalve	pink mucket	*Lampsilis abrupta*	E	NLAA							no use: Daniel Boone, George Washington and Jefferson, Ozark	no use: Shawnee, Wayne; very low application potential: Mark Twain	
bivalve	Arkansas fatmucket	*Lampsilis powellii*	T	NE							no use: Ouachita		
bivalve	Neosho mucket	*Lampsilis rafinesqueana*	E, CH	NE, NE							no use: OZARK		
bivalve	speckled pocketbook	*Lampsilis streckeri*	E	NE							no use: Ozark		
bivalve	Carolina heelsplitter	*Lasmigona decorata*	E, CH	NE, NE							no use: SUMTER		
bivalve	birdwing pearlymussel	*Lemiox rimosus*	E, XN	NE, NE							no use: George Washington and Jefferson		
bivalve	scaleshell mussel	*Leptodea leptodon*	E	NLAA							no use: Ouachita, Ozark	very low application potential: Mark Twain	
bivalve	Louisiana pearlshell	*Margaritifera hembeli*	T	NE							no use: Kisatchie		
bivalve	Alabama pearlshell	*Margaritifera marrianae*	E	NE							no use: National Forests in Alabama		
bivalve	Alabama moccasinshell	*Medionidus acutissimus*	T, CH	NLAA, NLAA							no use: NATIONAL FORESTS IN ALABAMA; very low application potential: CHATTAHOOCHEE, Cherokee		
bivalve	coosa moccasinshell	*Medionidus parvulus*	E, CH	NLAA, NE							no use: NATIONAL FORESTS IN ALABAMA; very low application potential: Cherokee		

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bivalve	Ochlockonee moccasinshell	*Medionidus simpsonianus*	E, (CH)	NLAA, na							very low application potential: National Forests in Florida		
bivalve	littlewing pearlymussel	*Pegias fabula*	E	NLAA							no use: Daniel Boone, George Washington and Jefferson; very low application potential: National Forests in North Carolina		
bivalve	orangefoot pimpleback	*Plethobasus cooperianus*	E	NE								no use: Hoosier, Shawnee	
bivalve	sheepnose mussel	*Plethobasus cyphyus*	E	NLAA							no use: George Washington and Jefferson	no use: Allegheny, Hoosier, Shawnee, Wayne; very low application potential: Mark Twain	
bivalve	clubshell	*Pleurobema clava*	E	NE								no use: Allegheny, Shawnee	
bivalve	James spinymussel	*Pleurobema collina*	E	NE							no use: George Washington and Jefferson		
bivalve	southern clubshell	*Pleurobema decisum*	E, CH	NLAA, NLAA							no use: NATIONAL FORESTS IN ALABAMA; very low application potential: CHATTAHOOCHEE		
bivalve	dark pigtoe	*Pleurobema furvum*	E, CH	NE, NE							no use: NATIONAL FORESTS IN ALABAMA		
bivalve	southern pigtoe	*Pleurobema georgianum*	E, CH	NLAA, NLAA							no use: NATIONAL FORESTS IN ALABAMA; very low application potential: CHATTAHOOCHEE		

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bivalve	Georgia pigtoe	*Pleurobema hanleyianum*	E, CH	NLAA, NLAA							no use: NATIONAL FORESTS IN ALABAMA; very low application potential: CHATTAHOOCHEE, CHEROKEE		
bivalve	ovate clubshell	*Pleurobema perovatum*	E, CH	NLAA, NE							no use: NATIONAL FORESTS IN ALABAMA; very low application potential: Cherokee		
bivalve	rough pigtoe	*Pleurobema plenum*	E, XN	NE, NE							no use: George Washington and Jefferson	no use: Hoosier, Shawnee	
bivalve	oval pigtoe	*Pleurobema pyriforme*	E, (CH)	NLAA, na							very low application potential: National Forests in Florida		
bivalve	fuzzy pigtoe	*Pleurobema strodeanum*	T	NE							no use: National Forests in Alabama		
bivalve	slabside pearlymussel	*Pleuronaia dolabelloides*	E, CH	NLAA, NLAA							no use: GEORGE WASHINGTON AND JEFFERSON; very low application potential: CHEROKEE		
bivalve	fat pocketbook	*Potamilus capax*	E	NE							no use: Ozark	no use: Hoosier, Shawnee	
bivalve	inflated (Alabama) heelsplitter	*Potamilus inflatus*	T	NE							no use: National Forests in Alabama		
bivalve	triangular (rayed) kidneyshell	*Ptychobranchus greenii (P. foremanianus)*	E, CH	NLAA, NLAA							no use: NATIONAL FORESTS IN ALABAMA; very low application potential: CHATTAHOOCHEE, Cherokee		
bivalve	southern kidneyshell	*Ptychobranchus jonesi*	E	NE							no use: National Forests in Alabama		

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bivalve	fluted kidneyshell	*Ptychobranchus subtentum*	E, CH	NLAA, NLAA							no use: DANIEL BOONE, GEORGE WASHINGTON AND JEFFERSON; very low application potential: CHEROKEE		
bivalve	rabbitsfoot	*Quadrula cylindrica cylindrica*	T, CH	NLAA, NLAA							no use: OUACHITA, Ozark	no use: Allegheny, Shawnee; very low application potential: MARK TWAIN	
bivalve	rough rabbitsfoot	*Quadrula cylindrica strigillata*	E, (CH)	NE, na							no use: JEFFERSON		
bivalve	winged mapleleaf	*Quadrula fragosa*	E, XN	NE, NE							no use: Ouachita		
bivalve	Cumberland monkeyface	*Quadrula intermedia*	E, XN	NE, NE							no use: George Washington and Jefferson		
bivalve	Appalachian monkeyface	*Quadrula sparsa*	E, XN	NE, NE							no use: George Washington and Jefferson		
bivalve	Choctaw bean	*Villosa choctawensis*	E	NE							no use: National Forests in Alabama		
bivalve	rayed bean	*Villosa fabalis*	E	NE								no use: Allegheny, Wayne	
bivalve	purple bean	*Villosa perpurpurea*	E, (CH)	NE, na							no use: Jefferson		
bivalve	Cumberland bean	*Villosa trabalis*	E, XN	NLAA							no use: Daniel Boone, George Washington and Jefferson; very low application potential: Cherokee, National Forests in North Carolina		
crustacean	Madison Cave isopod	*Antrolana lira*	T	NE							no use: George Washington and Jefferson		

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crustacean	Conservancy fairy shrimp	*Branchinecta conservatio*	E, (CH)	NLAA, na					high application potential: LOS PADRES				
crustacean	vernal pool fairy shrimp	*Branchinecta lynchi*	T, CH	NLAA, NLAA					high application potential: Los Padres				
crustacean	San Diego fairy shrimp	*Branchinecta sandiegonensis*	E, (CH)	NLAA, na					high application potential: Cleveland				
crustacean	Benton County Cave crayfish	*Cambarus aculabrum*	E	NE							no use: Ozark		
crustacean	Big Sandy crayfish	*Cambarus callainus*	T	NE							no use: George Washington and Jefferson		
crustacean	Hell Creek Cave crayfish	*Cambarus zophonastes*	E	NE							no use: Ozark		
crustacean	vernal pool tadpole shrimp	*Lepidurus packardi*	E, (CH)	NLAA, na					high application potential: Sequoia				
crustacean	Shasta crayfish	*Pacifastacus fortis*	E	LAA					moderate application potential: Lassen; high application potential: Modoc				
crustacean	Riverside fairy shrimp	*Streptocephalus woottoni*	E, (CH)	NLAA, na					high application potential: Angeles				
fish	white sturgeon - Kootenai River population	*Acipenser transmontanus*	E, (CH)	NLAA, na	moderate application potential: Idaho-Panhandle, Kootenai								
fish	Zuni bluehead sucker	*Catostomus discobolus yarrowi*	E, CH	LAA, LAA			moderate application potential: CIBOLA						
fish	Santa Ana sucker	*Catostomus santaanae*	T, CH	LAA, LAA					high application potential: ANGELES, SAN BERNARDINO				

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fish	Warner sucker	*Catostomus warnerensis*	T, (CH)	NLAA, NLAA						moderate application potential: Fremont-Winema			
fish	shortnose sucker	*Chasmistes brevirostris*	E, CH	LAA, LAA					high application potential: MODOC	moderate application potential: FREMONT-WINEMA			
fish	June sucker	*Chasmistes liorus*	E, (CH)	NLAA, NLAA				high application potential: Uinta-Wasatch-Cache					
fish	blackside dace	*Chrosomus cumberlandensis*	T	NE							no use: Daniel Boone, George Washington and Jefferson		
fish	pygmy sculpin	*Cottus paulus*	T	NE							no use: National Forests in Alabama		
fish	railroad valley springfish	*Crenichthys nevadae*	T, (CH)	LAA, na				high application potential: Toiyabe					
fish	blue shiner	*Cyprinella caerulea*	T	LAA							no use: National Forests in Alabama; very low application potential: Chattahoochee-Oconee, Cherokee		
fish	desert pupfish	*Cyprinodon macularius*	E, (CH)	LAA, na			moderate application potential: Coconino; high application potential: Tonto						
fish	Lost River sucker	*Deltistes luxatus*	E, CH	LAA, LAA					high application potential: MODOC	moderate application potential: FREMONT-WINEMA			

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fish	spotfin chub	*Erimonax monachus*	T, XN, CH	NLAA, NLAA							no use: George Washington and Jefferson; very low application potential: Cherokee, NATIONAL FORESTS IN NORTH CAROLINA		
fish	slender chub	*Erimystax cahni*	T	NE							no use: George Washington and Jefferson		
fish	Etowah darter	*Etheostoma etowahae*	E	NLAA							very low application potential: Chattahoochee-Oconee		
fish	yellowcheek darter	*Etheostoma moorei*	E, (CH)	NE, na							no use: Ozark		
fish	candy darter	*Etheostoma osburni*	E, CH	NE, NE							no use: George Washington and Jefferson	no use: Monongahela	
fish	duskytail darter	*Etheostoma percnurum*	E, XN	NLAA							no use: Daniel Boone, George Washington and Jefferson; very low application potential: Cherokee		
fish	rush darter	*Etheostoma phytophilum*	E, (CH)	NE, na							no use: National Forests in Alabama		
fish	Kentucky Arrow darter (Cumberland Plateau darter)	*Etheostoma spilotum*	T, CH	NE, NE							no use: Daniel Boone		
fish	Cumberland darter	*Etheostoma susanae*	E, CH	NE, NE							no use: Daniel Boone		
fish	Unarmored 3-spine stickleback (Shay Creek stickleback)	*Gasterosteus aculeatus williamsoni*	E	LAA					high application potential: Angeles, San Bernardino				
fish	Owens tui chub	*Gila (Siphateles) bicolor snyderi*	E, CH	LAA, LAA					high application potential: INYO				

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fish	humpback chub	*Gila cypha*	T, (CH)	LAA, na		very low application potential: Grand Mesa Uncompahgre and Gunnison, Rio Grande; low application potential: Arapaho & Roosevelt; moderate application potential: Medicine Bow-Routt, San Juan, White River		very low application potential: Ashley, Fishlake, Manti-La Sal; high application potential: Bridger-Teton, Dixie, Uinta-Wasatch-Cache					
fish	Sonora chub	*Gila ditaenia*	T, CH	LAA, LAA			high application potential: CORONADO						
fish	bonytail chub	*Gila elegans*	E, (CH)	LAA, na		very low application potential: Grand Mesa Uncompahgre and Gunnison; low application potential: Arapaho & Roosevelt; moderate application potential: Medicine Bow-Routt, San Juan, White River		very low application potential: Ashley, Fishlake, Manti-La Sal; high application potential: Bridger-Teton, Dixie, Uinta-Wasatch-Cache					

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fish	Gila chub	*Gila intermedia*	E, CH	LAA, LAA			low application potential: APACHE-SITGREAVES; moderate application potential: COCONINO, GILA; high application potential: CORONADO, PRESCOTT, Tonto						
fish	Chihuahua chub	*Gila nigrescens*	T, (CH)	LAA, na			moderate application potential: Gila						
fish	Yaqui chub	*Gila purpurea*	E, (CH)	LAA, na			high application potential: Coronado						
fish	Rio Grande silvery minnow	*Hybognathus amarus*	E, (CH)	NLAA, na			moderate application potential: (Cibola), (Santa Fe)						
fish	delta smelt	*Hypomesus transpacificus*	T, (CH)	NE, na					very low application potential: (Lake Tahoe Basin Management Unit), moderate application potential: (Lassen), (Mendocino); high application potential: (Eldorado), (Plumas), (Sequoia), (Shasta-Trinity), (Sierra), (Stanislaus), (Tahoe)				

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fish	Yaqui catfish	*Ictalurus pricei*	T, (CH)	LAA, na			moderate application potential: (Coronado)						
fish	Little Colorado spinedace	*Lepidomeda vittata*	T, CH	LAA, LAA			low application potential: APACHE-SITGREAVES; moderate application potential: COCONINO, Gila						
fish	spikedace	*Meda fulgida*	E, CH	LAA, LAA			low application potential: APACHE-SITGREAVES; moderate application potential: COCONINO, GILA; high application potential: Coronado, Prescott, TONTO						
fish	Palezone shiner	*Notropis albizonatus*	E	NE							no use: Daniel Boone		
fish	Cahaba shiner	*Notropis cahabae*	E	NE							no use: National Forests in Alabama		
fish	Arkansas River shiner	*Notropis girardi*	T, (CH)	NLAA, na			moderate application potential: (Cibola - near Black Kettle National Grassland)						
fish	smoky madtom	*Noturus baileyi*	E, CH	NLAA, NLAA							very low application potential: CHEROKEE		
fish	yellowfin madtom	*Noturus flavipinnis*	T, CH	NLAA, NE							no use: JEFFERSON; very low application potential: Cherokee		

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fish	Little Kern golden trout	*Oncorhynchus aguabonita whitei*	T, CH	LAA, LAA					high application potential: SEQUOIA				
fish	Apache trout	*Oncorhynchus apache*	T	LAA			very low application potential: Kaibab; low application potential: Apache-Sitgreaves						
fish	Lahontan cutthroat trout	*Oncorhynchus clarki henshawi*	T	LAA				high application potential: Humboldt-Toiyabe	very low application potential: Lake Tahoe Basin Management Unit; high application potential: Inyo, Sierra, Stanislaus, Tahoe				
fish	Paiute cutthroat trout	*Oncorhynchus clarki seleniris*	T	LAA				high application potential: Toiyabe	high application potential: Inyo, Sierra				
fish	greenback cutthroat trout	*Oncorhynchus clarki stomias*	T	LAA		low application potential: Arapaho & Roosevelt; moderate application potential: Pike and San Isabel							
fish	Gila trout	*Oncorhynchus gilae gilae*	E	LAA			low application potential: Apache-Sitgreaves; moderate application potential: Gila; high application potential: Prescott, Tonto						
fish	amber darter	*Percina antesella*	E, (CH)	NLAA, na							very low application potential: Chattahoochee-Oconee, Cherokee		

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fish	goldline darter	*Percina aurolineata*	T, (PCH)	NLAA, na							no use: National Forests in Alabama; very low application potential: Chattahoochee-Oconee		
fish	pearl darter	*Percina aurora*	T, CH	NE, NE							no use: NATIONAL FORESTS IN MISSISSIPPI		
fish	conasauga logperch	*Percina jenkinsi*	E, CH	NLAA, NLAA							very low application potential: Chattahoochee-Oconee, CHEROKEE		
fish	leopard darter	*Percina pantherina*	T	NE							no use: Ouachita		
fish	Roanoke logperch	*Percina rex*	E	NE							no use: George Washington and Jefferson		
fish	snail darter	*Percina tanasi*	T	NLAA							very low application potential: Cherokee		
fish	Gila topminnow	*Poeciliposis occidentalis occidentalis*	E	LAA			moderate application potential: Coconino; high application potential: Coronado, Prescott, Tonto						

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fish	Colorado pikeminnow	*Ptychocheilus lucius*	E, XN, (CH)	LAA, na		very low application potential: (Grand Mesa Uncompahgre and Gunnison); low application potential: (Arapaho & Roosevelt); moderate application potential: (Medicine Bow-Routt), (San Juan), (White River)	moderate application potential: Coconino; high application potential: Prescott, Tonto	very low application potential: (Ashley); low application potential: (Fishlake, Manti-LaSal); high application potential: (Bridger-Teton), (Dixie), (Uinta-Wasatch-Cache)					
fish	Kendall Warm Springs dace	*Rhinichthys osculus thermalis*	E	NLAA				high application potential: Bridger-Teton					

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fish	bull trout	*Salvelinus confluentus*	T, CH	LAA, LAA	Low application potential: FLATHEAD; moderate application potential: BEAVERHEAD-DEERLODGE, BITTERROOT, HELENA-LEWIS AND CLARK, IDAHO-PANHANDLE, KOOTENAI; high application potential: LOLO, NEZ PERCE-CLEARWATER			moderate application potential: SALMON-CHALLIS, SAWTOOTH; high application potential: BOISE, HUMBOLDT, PAYETTE		no use: MT. BAKER-SNOQUALMIE, OLYMPIC; very low application potential: COLUMBIA RIVER GORGE, MT. HOOD; low application potential: COLVILLE, GIFFORD PINCHOT, WILLAMETTE; moderate application potential: FREMONT-WINEMA, UMATILLA; high application potential: DESCHUTES AND OCHOCO, MALHEUR, OKANOGAN-WENATCHEE, WALLOWA-WHITMAN			

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fish	pallid sturgeon	*Scaphirhynchus albus*	E	NLAA	very low application potential: Dakota Prairie Grasslands	moderate application potential: (Pike-San Isabel National Forest and Comanche or Cimmaron National Grasslands), Medicine Bow-Routt and Thunder Basin Grasslands, Arapahoe-Roosevelt and Pawnee Grassland		high application potential: Bridger-Teton			no use: National Forests in Mississippi, Ozark		
fish	Alabama sturgeon	*Scaphirhynchus suttkusi*	E, CH	NE							no use: NATIONAL FORESTS IN ALABAMA		
fish	loach minnow	*Tiaroga cobitis*	E, CH	LAA, LAA			low application potential: APACHE-SITGREAVES; moderate application potential: COCONINO, GILA						
fish	razorback sucker	*Xyrauchen texanus*	E, CH	LAA, LAA		very low application potential: GRAND MESA UMPCOMPAHGRE AND GUNNISON; low application potential: Arapahoe-Roosevelt; moderate application potential: Medicine Bow-Routt, White River	moderate application potential: COCONINO; high application potential: PRESCOTT, TONTO	very low application potential: Ashley; low application potential: Fishlake, Manti LaSal; high application potential: Bridger-Teton, Dixie, Uinta-Wasatch-Cache					

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fungi	rock gnome lichen	*Gymnoderma lineare*	E	NLAA							no use: George Washington and Jefferson; very low application potential: Chattahoochee-Oconee, Cherokee, National Forests in North Carolina		
gastropod	Tumbling Creek cavesnail	*Antrobi culveri*	E, (CH)	NLAA, na								very low application potential: Mark Twain	
gastropod	Anthony's riversnail	*Athearnia anthonyi*	E, XN	NLAA, NLJ							very low application potential: Cherokee		
gastropod	lacy elimia	*Elimia crenatella*	T	NE							no use: National Forests in Alabama		
gastropod	Morro shoulderband (banded dune) snail	*Helminthoglypta walkeriana*	E, (CH)	LAA, na					high application potential: LOS PADRES				
gastropod	round rocksnail	*Leptoxis ampla*	T	NE							no use: National Forests in Alabama		
gastropod	painted rocksnail	*Leptoxis taeniata*	T	NE							no use: National Forests in Alabama		
gastropod	flat pebblesnail	*Lepyrium showalteri*	E	NE							no use: National Forests in Alabama		
gastropod	cylindrical lioplax	*Lioplax cyclostomaformis*	E	NE							no use: National Forests in Alabama		
gastropod	noonday globe	*Patera (Mesodon) clarki nantahala*	T	NLAA							very low application potential: National Forests in North Carolina		
gastropod	Three Forks springsnail	*Pyrgulopsis trivialis*	E, CH	LAA, LAA			low application potential: APACHE						
gastropod	Alamosa springsnail	*Tryonia alamosae*	E	NLAA			moderate application potential: near Cibola						
gastropod	Tulotoma snail	*Tulotoma magnifica*	T	NE							no use: National Forests in Alabama		

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insect	Uncompahgre fritillary	*Boloria acrocnema*	E	NE		very low application potential: Grand Mesa Uncompahgre and Gunnison, Rio Grande; moderate application potential: Pike-San Isabel, San Juan, White River							
insect	rusty-patched bumblebee	*Bombus affinis*	E	NLAA							no use: George Washington and Jefferson	no use: Monongahela, Midewin; very low application potential: Chippewa	
insect	Franklin's bumble bee	*Bombus franklini*	E	LAA					high application potential: Klamath, Shasta-Trinity, Six Rivers	moderate application potential: Umpqua, Winema; high application potential: Rogue River-Siskiyou			
insect	Hungerford's crawling water beetle	*Brychius hungerfordi*	E	NE								no use: Huron-Manistee	
insect	valley elderberry longhorn beetle	*Desmocerus californicus dimorphus*	T	NLAA					moderate application potential: Lassen, Mendocino; high application potential: Eldorado, Plumas, Sequoia, Shasta-Trinity, Sierra, Tahoe				
insect	Smith’s blue butterfly	*Euphilotes enoptes smithi*	E, PCH	LAA, LAA					high application potential: Los Padres				

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insect	quino checkerspot butterfly	*Euphydryas editha quino*	E, CH	LAA, LAA					high application potential: CLEVELAND, SAN BERNARDINO				
insect	Taylor's checkerspot	*Euphydryas editha taylori*	E, CH	NE, NE						no use: OLYMPIC			
insect	Kern primrose sphinx moth	*Euproserpinus euterpe*	T	LAA					high application potential: Los Padres				
insect	Hermes Copper butterfly	*Hermelycaena (Lycaena) hermes*	PT, PCH	LAA, LAA					high application potential: CLEVELAND				
insect	Dakota skipper	*Hesperia dacotae*	T, CH	NLAA, NLAA	very low application potential: Dakota Prairie Grasslands								
insect	Pawnee montane skipper	*Hesperia leonardus montana*	T, PCH	LAA, LAA		moderate application potential: Pike-San Isabel							
insect	Mt Charleston blue butterfly	*Icaricia shasta charlestonensis*	E, CH	LAA, LAA				high application potential: TOIYABE					
insect	meltwater lednian stonefly	*Lednia tumana*	T	LAA	very low application potential: Flathead								
insect	Karner blue butterfly	*Lycaeides melissa samuelis*	E	NE								no use: Huron-Manistee	
insect	Mitchell's satyr	*Neonympha mitchellii*	E	NE							no use: National Forests in Alabama		
insect	American burying beetle	*Nicrophorus americanus*	T	NLAA		very low application potential: Black Hills, Nebraska and Samuel R. McKelvie					no use: Ouachita, Ozark	no use: Wayne	
insect	powesheik skipperling	*Oarisma powesheik*	E, CH	NLAA, NLAA	very low retardant use: Dakota Prairie Grasslands								
insect	Laguna Mountains skipper	*Pyrgus ruralis lagunae*	E, CH	LAA, LAA					high application potential: CLEVELAND				

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insect	Hine's emerald dragonfly	*Somatochlora hineana*	E, CH	NLAA, NLAA								no use: HIAWATHA, Midewin; very low application potential: MARK TWAIN	
insect	Oregon silverspot butterfly	*Speyeria zerene hippolyta*	T, CH	NE, NE						no use: SIUSLAW			
insect	western glacier stonefly	*Zapada glacier*	T	LAA	low application potential: Custer-Gallatin								
mammal	Mexican wolf	*Canis lupis baileyi*	E, XN	NLAA			very low application potential: Kaibab; low application potential: Apache-Sitgreaves; moderate application potential: Cibola, Coconino, Gila, Lincoln; high application potential: Coronado, Prescott, Tonto						
mammal	Ozark big-eared bat	*Corynorhinus townsendii ingens*	E	NLAA							no use: Ozark; very low application potential: Mark Twain		
mammal	Virginia big-eared bat	*Corynorhinus townsendii virginianus*	E, CH	NLAA, NE							no use: Daniel Boone, George Washington and Jefferson; very low application potential: Cherokee, National Forests in North Carolina	no use: MONONGAHELA	

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mammal	Utah prairie dog	*Cyonomys parvidens*	T	LAA				low application potential: Fishlake; high application potential: Dixie					
mammal	San Bernardino Merriam's kangaroo rat	*Dipodomys merriami parvus*	E, CH	LAA, NLAA					high application potential: SAN BERNARDINO				
mammal	Stephens' kangaroo rat	*Dipodomys stephensi*	E	NLAA					high application potential: Cleveland, San Bernardino				
mammal	southern sea otter	*Enhydra lutris nereis*	T	NLAA					high application potential: Los Padres				
mammal	Carolina northern flying squirrel	*Glaucomys sabrinus coloratus*	E	NLAA							no use: George Washington and Jefferson; very low application potential: Cherokee, National Forests in North Carolina		
mammal	ocelot	*Leopardus pardalis*	E	NLAA			high application potential: Coronado						
mammal	Mexican long-nosed bat	*Leptonycteris nivalis*	E	NLAA			high application potential: Coronado						

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mammal	Canada lynx	*Lynx canadensis*	T, CH	NLAA, NE	very low application potential: FLATHEAD; low application potential: CUSTER-GALLATIN; moderate application potential: Beaverhead-Deerlodge, Bitterroot, HELENA-LEWIS AND CLARK, Idaho-Panhandle, KOOTENAI; high application potential: LOLO, Nez Perce-Clearwater	very low application potential: Bighorn, Grand Mesa Uncompahgre Gunnison, Rio Grande; low application potential: Arapahoe-Roosevelt; moderate application potential: Medicine Bow-Routt, Pike-San Isabel, San Juan, SHOSHONE, White River	very low application potential: Carson; moderate application potential: Santa Fe	very low application potential: Ashley, Targhee; moderate application potential: Sawtooth; high application potential: Boise, BRIDGER-TETON, Payette, Uinta-Wasatch-Cache		low application potential: Colville; moderate application potential: Umatilla; high application potential: Malheur, OKANOGAN-WENATCHEE, Wallowa-Whitman		no use: Hiawatha, White Mountain; very low application potential: Chippewa, SUPERIOR	
mammal	Pacific marten - coastal DPS	*Martes caurina*	T	NLAA					high application potential: Six Rivers	no use: Siuslaw; high application potential: Rogue River-Siskiyou			
mammal	black-footed ferret	*Mustela nigripes*	E	NLAA	very low application potential: Dakota Prairie Grasslands	very low application potential: Nebraska and Samuel R. McKelvie; moderate application potential: Medicine Bow-Routt, Pike-San Isabel		high application potential: Bridger-Teton, Wasatch-Cache					

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mammal	gray bat	*Myotis grisescens*	E	NLAA							no use: National Forests in Alabama, Daniel Boone, George Washington and Jefferson, Ozark, Land Between the Lakes; very low application potential: Chattahoochee-Oconee, Cherokee, National Forests in Florida, National Forests in North Carolina	no use: Hoosier, Shawnee; very low application potential: Mark Twain	
mammal	northern long-eared bat	*Myotis septentrionalis*	T	NLAA	very low application potential: Dakota Prairie Grasslands; low application potential: Custer Gallatin	very low application potential: Black Hills, Nebraska and Samuel R. McKelvie; moderate application potential: Medicine Bow-Routt					no use: National Forests in Alabama, Daniel Boone, Francis Marion and Sumter, Kisatchie, National Forests in Mississippi, George Washington and Jefferson, Ouachita, Ozark, Land Between the Lakes; very low application potential: Chattahoochee-Oconee, National Forests in North Carolina	no use: Allegheny, Chequamegon-Nicolet, Green Mountain and Finger Lakes, Hiawatha, Hoosier, Huron-Manistee, Monongahela, Midewin, Ottawa, Shawnee, Wayne, White Mountain; very low application potential: Chippewa, Mark Twain, Superior	

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mammal	Indiana bat	*Myotis sodalis*	E, CH	NLAA, NE							no use: National Forests in Alabama, Daniel Boone, National Forests in Mississippi, GEORGE WASHINGTON and Jefferson, Ouachita, Ozark, Land Between the Lakes; very low application potential: Chattahoochee-Oconee, CHEROKEE, NATIONAL FORESTS IN NORTH CAROLINA	no use: Allegheny, Green Mountain and Finger Lakes, HOOSIER, Huron-Manistee, MONONGAHELA, Shawnee, WAYNE; very low application potential: MARK TWAIN	
mammal	Peñasco least chipmunk	*Neotamias minimus atristriatus*	PE/PCH	NLAA, NLAA		moderate application potential: LINCOLN							
mammal	peninsular bighorn sheep	*Ovis canadensis nelsoni*	E, (CH)	NLAA, na					high application potential: SAN BERNARDINO				
mammal	Sierra Nevada bighorn sheep	*Ovis canadensis sierra*	E, CH	NLAA, NE				high application potential: Toiyabe	high application potential: INYO, SEQUOIA, SIERRA, STANISLAUS				
mammal	jaguar	*Panthera onca*	E, CH	NLAA, NE			high application potential: CORONADO						
mammal	fisher - Southern Sierra Nevada DPS	*Pekania pennanti*	E	NLAA					high application potential: Sequoia, Sierra, Stanislaus				
mammal	Florida panther	*Puma concolor coryi*	E	NE							very low application potential: National Forests in Florida		

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mammal	woodland caribou	*Rangifer tarandus caribou*	E, CH	NLAA, NE	moderate application potential: IDAHO-PANHANDLE					low application potential: COLVILLE			
mammal	north Idaho ground squirrel	*Urocitellus (Spermophilus) brunneus*	T	LAA				high application potential: Boise, Payette					
mammal	Mt. Graham red squirrel	*Tamisciurus hudsonicus grahamensis*	E, CH	NLAA, NE			high application potential: CORONADO						
mammal	West Indian manatee	*Trichechus manatus*	T, CH	NLAA, NLAA							no use: Francis Marion; very low application potential: Apalachicola and OCALA in National Forests in Florida, Croatan in National Forests in North Carolina		
mammal	grizzly bear	*Ursus arctos horribilis*	T	NLAA	very low application potential: Flathead; low application potential: Custer-Gallatin; moderate application potential: Beaverhead-Deerlodge, Bitterroot, Helena-Lewis and Clark, Idaho-Panhandle, Kootenai; high application potential: Lolo	moderate application potential: Shoshone		very low application potential: Targhee; high application potential: Bridger-Teton		no use: Mt. Baker-Snoqualmie; low application potential: Colville, Gifford Pinchot; high application potential: Okanogan-Wenatchee			
mammal	San Joaquin kit fox	*Vulpes macrotis mutica*	E	NLAA					high application potential: Sequoia				
mammal	Sierra Nevada red fox - Sierra Nevada DPS	*Vulpes vulpes necator*	E	NLAA					high application potential: Inyo, Stanislaus	high application potential: Humboldt-Toiyabe			

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mammal	New Mexico meadow jumping mouse	*Zapus hudsonius luteus*	E, CH	LAA, NLAA		very low application potential: Rio Grande; moderate application potential: San Juan	low application potential: APACHE-SITGREAVES; moderate application potential: Gila, LINCOLN, SANTA FE						
mammal	Preble's meadow jumping mouse	*Zapus hudsonius preblei*	T, CH	LAA, NLAA		low application potential: ARAPAHOE-ROOSEVELT; moderate application potential: Medicine Bow-Routt, PIKE-SAN ISABEL							
plant	San Diego thornmint	*Acanthomintha ilicifolia*	T, CH	LAA, NLAA					high application potential: CLEVELAND				
plant	northern wild monkshood	*Aconitum novemboracense*	T	NE								no use: Wayne	
plant	sensitive joint-vetch	*Aeschynomene virginica*	T	NE							very low application potential: National Forests in North Carolina		
plant	Munz's onion	*Allium munzii*	E, CH	LAA, NLAA					high application potential: CLEVELAND				
plant	Price’s potato-bean	*Apios priceana*	T	NE							no use: National Forests in Alabama, Land Between the Lakes		
plant	McDonald's rock cress	*Arabis macdonaldiana*	E	LAA					high application potential: Klamath, Six Rivers	high application potential: Rogue River-Siskiyou			
plant	marsh sandwort	*Arenaria paludicola*	E	NE					high application potential: San Bernardino				

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plant	Bear Valley sandwort	*Arenaria ursina*	T, CH	LAA, NLAA					high application potential: SAN BERNARDINO				
plant	Sacramento prickly poppy	*Argemone pleiacantha spp. Pinnatisecta*	E	LAA			moderate application potential: Lincoln						
plant	Mead's milkweed	*Asclepias meadii*	T	NLAA								no use: Shawnee; very low application potential: Mark Twain	
plant	American hart's-tongue fern	*Asplenium scolopendrium var. americanum*	T	NE								no use: Hiawatha	
plant	Cushenbury milk-vetch	*Astragalus albens*	E, CH	LAA, NLAA					high application potential: SAN BERNARDINO				
plant	Applegate's milk-vetch	*Astragalus applegatei*	E	NE					high application potential: Klamath				
plant	Braunton's milk-vetch	*Astragalus brauntonii*	E, CH	LAA, NLAA					high application potential: ANGELES, CLEVELAND, San Bernardino				
plant	Coachella Valley milk-vetch	*Astragalus lentiginosus var. coachellae*	E, CH	NE					high application potential: SAN BERNARDINO				
plant	heliotrope milkvetch	*Astragalus montii*	T, CH	LAA, NE				low application potential: MANTI-LASAL					
plant	Osterhout milkvetch	*Astragalus osterhoutii*	E	NLAA		low application potential: Arapahoe-Roosevelt; moderate application potential: Medicine Bow-Routt							
plant	triple-ribbed milk-vetch	*Astragalus tricarinatus*	E	LAA					high application potential: San Bernardino				

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plant	Encinitas baccharis	*Baccharis vanessae*	T	LAA					high application potential: Cleveland				
plant	Nevin's barberry	*Berberis nevinii*	E, CH	LAA, NLAA					high application potential: Angeles, CLEVELAND, San Bernardino				
plant	Virginia round-leaf birch	*Betula uber*	T	NE							no use: George Washington and Jefferson		
plant	shale barren rockcress	*Arabis (Boechera) serotina*	E	NLAA							no use: George Washington and Jefferson	no use: Monongahela	
plant	Florida bonamia	*Bonamia grandiflora*	T	NLAA							very low application potential: National Forests in Florida		
plant	thread-leaved brodiaea	*Brodiaea filifolia*	T, CH	LAA, NLAA					high application potential: Angeles, CLEVELAND, San Bernardino				
plant	capá rosa	*Callicarpa ampla*	E	NE							no use: El Junque		
plant	Mariposa pussypaws	*Calyptridium (Cistanthe) pulchellum*	T	LAA					high application potential: Sierra				
plant	Stebbins' morning glory	*Calystegia stebbinsii*	E	LAA					high application potential: Tahoe				
plant	ash-grey paintbrush	*Castilleja cinerea*	T, CH	LAA, NLAA					high application potential: SAN BERNARDINO				
plant	California jewelflower	*Caulanthus californicus*	E	LAA					high application potential: Los Padres, Sequoia				
plant	Vail Lake ceanothus	*Ceanothus ophiochilus*	T, CH	LAA, NLAA					high application potential: CLEVELAND				
plant	purple amole (Camatta Canyon amole)	*Chlorogalum purpureum (var. reductum)*	T, CH	LAA, NLAA					high application potential: LOS PADRES				

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plant	La Graciosa thistle	*Cirsium loncholepis*	T, (CH)	NE					high application potential: Los Padres				
plant	Pitcher's thistle	*Cirsium pitcheri*	T	NE								no use: Hiawatha, Huron-Manistee	
plant	Wright's marsh thistle	*Crisium wrightii*	PT, PCH	LAA, NLAA			moderate application potential: LINCOLN						
plant	Sacramento Mountains thistle	*Cirsium vinaceum*	T	LAA			moderate application potential: Lincoln						
plant	Springville clarkia	*Clarkia springvillensis*	T	LAA					high application potential: Sequoia				
plant	Alabama leather flower	*Clematis socialis*	E	NE							no use: National Forests in Alabama		
plant	small sweet-scented pigeonwings	*Clitoria fragrans*	T	NE							very low application potential: National Forests in Florida		
plant	Pima pineapple cactus	*Coryphantha scheeri var. robustispina*	E	NLAA			high application potential: Coronado						
plant	Lee pincushion cactus	*Coryphantha sneedii var. leei*	T	LAA			moderate application potential: Lincoln						
plant	Sneed pincushion cactus	*Coryphantha sneedii var. sneedii*	E	LAA			moderate application potential: Lincoln						
plant	leafy prairie-clover	*Dalea foliosa*	E	NE							no use: National Forests in Alabama	no use: Midewin	
plant	slender-horned spineflower	*Dodecahema leptoceras*	E	LAA					high application potential: Angeles, Cleveland, San Bernardino				

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plant	smooth purple coneflower	*Echinacea laevigata*	E	NLAA							no use: Francis Marion and Sumter, George Washington and Jefferson; very low application potential: Chattahoochee-Oconee, National Forests in North Carolina		
plant	Kuenzler hedgehog cactus	*Echinocereus fendleri var. kuenzleri*	E	NLAA			moderate application potential: Lincoln						
plant	Arizona hedgehog cactus	*Echinocereus triglochidiatus var. arizonicus*	E	NLAA			high application potential: Tonto						
plant	Kern mallow	*Eremalche kernensis (Eremalche parryi* ssp. *kernensis)*	E	NE					high application potential: Los Padres				
plant	Santa Ana River woolly-star	*Eriastrum densifolium* ssp. *sanctorum*	E	LAA					high application potential: San Bernardino				
plant	Parish's daisy	*Erigeron parishii*	T, CH	LAA, NLAA					high application potential: SAN BERNARDINO				
plant	Zuni fleabane	*Erigeron rhizomatous*	T	NLAA			moderate application potential: Cibola						
plant	Southern Mountain buckwheat	*Eriogonum kennedyi* var. *austromontanum*	T, CH	LAA, NLAA					high application potential: SAN BERNARDINO				
plant	scrub buckwheat	*Eriogonum longifolium var. gnaphalifolium*	T	NLAA							very low application potential: National Forests in Florida		
plant	Cushenbury buckwheat	*Eriogonum ovalifolium var. vineum*	E, CH	LAA, NLAA					high application potential: SAN BERNARDINO				

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plant	uvillo	*Eugenia haematocarpa*	E	NE							no use: El Junque		
plant	Penland alpine fen mustard	*Eutrema penlandii*	T	NLAA		moderate application potential: Pike-San Isabel, White River							
plant	Mexican flannelbush	*Fremontodendron mexicanum*	E, CH	NE, NE					high application potential: CLEVELAND				
plant	Gentner mission-bells	*Fritillaria gentneri*	E	NLAA					high application potential: Klamath	high application potential: Rogue River-Siskiyou			
plant	geocarpon	*Geocarpon minimum*	T	NE							no use: Ozark		
plant	spreading avens (cliff avens)	*Geum radiatum*	E	NLAA							very low application potential: Cherokee, National Forests in North Carolina		
plant	Bartram stonecrop	*Graptopetalum bartramii*	T	LAA			high application potential: Coronado						
plant	showy stickseed	*Hackelia venusta*	E	LAA						high application potential: Okanogan-Wenatchee			
plant	Harper's beauty	*Harperocallis flava*	E	NLAA							very low application potential: National Forests in Florida		
plant	Todsen’s pennyroyal	*Hedeoma todsenii*	E	LAA			moderate application potential: Lincoln						
plant	Roan Mountain bluet	*Hedyotis (Houstonia) purpurea var. montana*	E	NLAA							very low application potential: Cherokee		
plant	Virginia sneezeweed	*Helenium virginicum*	T	NLAA							no use: George Washington and Jefferson	very low application potential: Mark Twain	

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plant	Schweinitz's sunflower	*Helianthus schweinitzii*	E	NLAA							very low application potential: North Carolina		
plant	swamp-pink	*Helonias bullata*	T	NLAA							no use: George Washington and Jefferson; very low application potential: Chattahoochee-Oconee, National Forests in North Carolina		
plant	dwarf-flowered heartleaf	*Hexastylis naniflora*	T	NE							very low application potential: National Forests in North Carolina		
plant	Neches River rose mallow	*Hisbiscus dasycalyx*	T, CH	NLAA, NLAA							very low application potential: National Forests and Grasslands in Texas		
plant	mountain bluet	*Houstonia montana*	E	NLAA							very low application potential: National Forests of North Carolina		
plant	water howellia	*Howellia aquatilis*	T	NLAA	very low application potential: Flathead; moderate application potential: Idaho-Panhandle; high application potential: Lolo, Nez Perce-Clearwater				moderate application potential: Mendocino; high application potential: Six Rivers	very low application potential: Columbia River Gorge, Mt. Hood; low application potential: Gifford Pinchot; high application potential: Okanogan-Wenatchee			
plant	mountain golden heather	*Hudsonia montana*	T, CH	NLAA, NLAA							very low application potential: NATIONAL FORESTS IN NORTH CAROLINA		

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plant	Texas prairie dawn	*Hymenoxys texana*	E	NE							very low application potential: National Forests and Grasslands in Texas		
plant	Sintenis' holly (Cuero de Sapo)	*Ilex sintenisii*	E	NE							no use: El Junque		
plant	Peter's mountain-mallow	*Iliamna corei*	E	NE							no use: George Washington and Jefferson		
plant	Pagosa skyrocket	*Ipomopsis polyantha*	E, CH	NLAA, NLAA		moderate application potential: San Juan							
plant	Holy Ghost ipomopsis	*Ipomopsis sancti-spiritus*	E	LAA			moderate application potential: Santa Fe						
plant	Dwarf Lake iris	*Iris lacustris*	T	NE								no use: Hiawatha	
plant	Louisiana quillwort	*Isoetes louisianensis*	E	NE							no use: National Forests in Alabama, National Forests in Mississippi		
plant	small whorled pogonia	*Isotria medeoloides*	T	NLAA							no use: Francis Marion and Sumter, George Washington and Jefferson; very low application potential: Chattahoochee-Oconee, Cherokee, National Forests in North Carolina	no use: Allegheny, Monongahela, Wayne, White Mountain	
plant	Webber ivesia	*Ivesia webberi*	T, CH	LAA, NLAA				high application potential: Toiyabe	high use potential: Plumas, Tahoe				
plant	fleshy-fruit gladecress	*Leavenworthia crassa*	E	NE							no use: National Forests in Alabama		

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plant	Luquillo Mountain babyboot orchid	*Lepanthes eltoroensis*	E	NE							no use: El Junque		
plant	slick-spot peppergrass	*lepidium papilliferum*	T	NE				high application potential: Boise					
plant	Missouri bladderpod	*Lesquerella (Physaria) filiformis*	T	NE							no use: Ozark		
plant	San Bernardino Mountains bladderpod	*Lesquerella (Physaria) kingii* ssp. *bernardina*	E, CH	LAA, NLAA					high application potential: SAN BERNARDINO				
plant	lyrate bladderpod	*Lesquerella lyrata*	T	NE							no use: National Forests in Alabama		
plant	white bladderpod	*Lesquerella pallida*	E	NLAA									
plant	Heller's blazing star	*Liatris helleri*	T	NLAA							very low application potential: National Forests in North Carolina		
plant	Huachuca water umbel	*Lilaeopsis schaffneriana* spp. *recurva*	E, CH	LAA, NLAA			high application potential: CORONADO						
plant	western lily	*Lilium occidentale*	E	NE						no use: Siuslaw			
plant	pondberry	*Lindera melissifolia*	E	NE							no use: Francis Marion and Sumter, National Forests in Alabama, National Forests in Mississippi		
plant	Cook's lomatium	*Lomatium cookii*	E	NE						high application potential: Rogue River-Siskiyou			
plant	Kincaid's lupine	*Lupinus oreganus var. kincaidii*	T, (CH)	NLAA, NE						moderate application potential: Umpqua			
plant	rough-leaved loosestrife	*Lysimachia asperulifolia*	E	NLAA							very low application potential: National Forests in North Carolina		

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plant	white birds-in-a-nest	*Macbridea alba*	T	NLAA							very low application potential: National Forests in Florida		
plant	Mohr's Barbara's buttons	*Marshallia mohrii*	T	NE							no use: National Forests in Alabama		
plant	Cumberland sandwort	*Minuartia cumberlandensis*	E	NE							no use: Daniel Boone		
plant	Macfarlane's four-o'clock	*Mirabilis macfarlanei*	T	LAA	high application potential: Nez Perce-Clearwater					high application potential: Wallowa-Whitman			
plant	Britton's beargrass	*Nolina brittoniana*	E	LAA							very low application potential: National Forests in Florida		
plant	Houghton's goldenrod	*Oligoneuron (Solidago) houghtonii*	T	NE								no use: Hiawatha	
plant	Bakersfield cactus	*Opuntia (basilaris var.) treleasel*	E	LAA					high application potential: Sequoia				
plant	California orcutt grass	*Orcuttia californica*	E	NE					high application potential: Cleveland, Los Padres				
plant	slender orcutt grass	*Orcuttia tenuis*	T, CH	LAA, NLAA					moderate application potential: LASSEN; high application potential: MODOC				
plant	Canby's dropwort	*Oxypolis canbyi*	E	NE							no use: Francis Marion and Sumter		
plant	Cushenbury oxytheca	*Oxytheca parishii var goodmaniana (Acanthoscyphus parishii var. goodmaniana)*	E, CH	LAA, NLAA					high application potential: SAN BERNARDINO				
plant	Fassett's locoweed	*Oxytropis campestris var. chartacea*	T	NE								no use: Chequamegon-Nicolet	

Category	Common Name	Scientific Name	Status	Determination	Region 1	Region 2	Region 3	Region 4	Region 5	Region 6	Region 8	Region 9	Region 10
plant	beardless chinchweed	*Pectis imberbis*	E, CH	NLAA, NLAA									
plant	San Rafeal cactus	*Pediocactus despainii*	E	NE				low application potential: Fishlake					
plant	Fickeisen plains cactus	*Pediocactus peeblesianus var. fickeiseniae*	E, CH	NLAA, NLAA			very low application potential: KAIBAB						
plant	winkler cactus	*pediocactus winkleri*	T	NE				low application potential: Manti-LaSal					
plant	blowout penstemon	*Penstemon haydenii*	E	NLAA		very low application potential: Nebraska; moderate application potential: Medicine Bow-Routt							
plant	Penland beardtongue	*Penstemon penlandii*	E	NE		low application potential: Arapahoe-Roosevelt; moderate application potential: Medicine Bow-Routt							
plant	clay phacelia	*Phacelia argillacea*	E	LAA				low application potential: Manti-LaSal; high application potential: Uinta					
plant	North Park phacelia	*Phacelia formosula*	E	NE		moderate application potential: Medicine Bow-Routt							

Category	Common Name	Scientific Name	Status	Determination	Region 1	Region 2	Region 3	Region 4	Region 5	Region 6	Region 8	Region 9	Region 10
plant	DeBeque phacelia	*Phacelia submutica*	T, CH	NLAA, NLAA		very low application potential: Grand Mesa Uncompahgre Gunnison; moderate application potential: White River							
plant	Yreka phlox	*Phlox hirsuta*	E	LAA					high application potential: Klamath				
plant	Godfrey's butterwort	*Pinguicula ionantha*	T	NLAA							very low application potential: National Forests in Florida		
plant	whitebark pine	*Pinus albicaulis*	PT	NLAA	very low application potential: Flathead; low application potential: Custer Gallatin; moderate application potential: Beaverhead-Deerlodge, Bitterroot, Helena-Lewis and Clark, Idaho Panhandle, Kootenai; high application potential: Lolo, Nez Perce-Clearwater			very low application potential: Targhee; moderate application potential: Salmon-Challis, Sawtooth; high application potential: Boise, Bridger-Teton, Humboldt-Toiyabe, Payette	very low application potential: Lake Tahoe Basin Management Unit; moderate application potential: Lassen, Mendocino; high application potential: Eldorado, Inyo, Klamath, Modoc, Plumas, Sequoia, Shasta-Trinity, Sierra, Six Rivers, Stanislaus, Tahoe	no use: Mt. Baker-Snoqualmie, Olympic; very low application potential: Mt. Hood; low application potential: Colville, Gifford Pinchot, Willamette; moderate application potential: Fremont-Winema, Umatilla, Umpqua; high application potential: Deschutes, Malheur, Ochoco, Okanogan-Wenatchee, Rogue River-Siskiyou, Wallowa-Whitman			
plant	Ruth's golden-aster	*Pityopsis ruthii*	E	NLAA							very low application potential: Cherokee		

Category	Common Name	Scientific Name	Status	Determination	Region 1	Region 2	Region 3	Region 4	Region 5	Region 6	Region 8	Region 9	Region 10
plant	rough popcorn flower	*Plagiobothrys hirtus*	E	NE						moderate application potential: Umpqua			
plant	white fringeless orchid	*Platanthera integrilabia*	T	NLAA							no use: Daniel Boone, National Forests in Alabama; very low application potential: Chattahoochee-Oconee, Cherokee, National Forests in North Carolina		
plant	eastern prairie white-fringed orchid	*Platanthera leucophaea*	T	NE								no use: Midewin	
plant	western prairie fringed orchid	*Platanthera praeclara*	T	NLAA	very low application potential: Dakota Prairie Grasslands	very low application potential: Nebraska and Samuel R. McKelvie; moderate application potential: Medicine Bow-Routt, Pike-San Isabel							
plant	chupacallos	*Pleodendron macranthum*	E	NE							no use: El Junque		
plant	San Bernardino bluegrass	*Poa atropurpurea*	E, CH	LAA, NLAA					high application potential: CLEVELAND, SAN BERNARDINO				
plant	Lewton's polygala	*Polygala lewtonii*	E	NLAA							very low application potential: National Forests in Florida		
plant	Maguire's primrose	*Primula cusickiana* var. *maguirei*	T	NLAA				high application potential: Wasatch-Cache					
plant	San Joaquin Adobe sunburst	*Pseudobahia peirsonii*	T	NE					high application potential: Sequoia				

Category	Common Name	Scientific Name	Status	Determination	Region 1	Region 2	Region 3	Region 4	Region 5	Region 6	Region 8	Region 9	Region 10
plant	harperella	*Ptilimnium nodosum*	E	NE							no use: National Forests in Alabama, Ouachita		
plant	Arizona cliffrose	*Purshia subintegra*	E	NLAA			moderate application potential: Coconino; high application potential: Tonto						
plant	Leedy's roseroot	*Rhodiola integrifolia* ssp. *Leedyi*	T	NLAA		very low application potential: Black Hills							
plant	Chapman's rhododendron	*Rhododendron minus var. chapmanii*	E	NLAA									
plant	Florida gooseberry	*Ribes echinellum*	T	NE							no use: Francis Marion and Sumter		
plant	Gambel's watercress	*Rorippa gambellii*	E	NE					high application potential: San Bernardino				
plant	bunched arrowhead	*Sagittaria fasciculata*	E	NE							very low application potential: National Forests in North Carolina		
plant	Kral’s water-plantain	*Sagittaria secundifolia*	T	NE							no use: National Forests in Alabama		
plant	green pitcher plant	*Sarracenia oreophila*	E	NE							no use: National Forests in Alabama; very low application potential: Chattahoochee-Oconee, National Forests in North Carolina		
plant	mountain sweet pitcher plant	*Sarracenia rubra* ssp. *jonesii*	E	NE							very low application potential: National Forests in North Carolina		

Category	Common Name	Scientific Name	Status	Determination	Region 1	Region 2	Region 3	Region 4	Region 5	Region 6	Region 8	Region 9	Region 10
plant	Alabama canebrake pitcher plant	*Sarracenia rubra* ssp. *alabamensis*	E	NE							no use: National Forests in Alabama		
plant	American chaffseed	*Schwalbea americana*	E	NE							no use: Francis Marion and Sumter, National Forests in Alabama		
plant	northeastern bulrush	*Scirpus ancistrochaetus*	E	NE							no use: George Washington and Jefferson	no use: Allegheny	
plant	Colorado hookless cactus	*Sclerocactus glaucus*	T	NLAA		very low application potential: Grand Mesa Uncompahgre Gunnison; moderate application potential: White River							
plant	Florida skullcap	*Scutellaria floridana*	T	NLAA							very low application potential: National Forests in Florida		
plant	large flowered skullcap	*Scutellaria montana*	T	NE							very low application potential: Chattahoochee-Oconee		
plant	San Francisco peaks ragwort	*Senecio franciscanus*	T, CH	NLAA, NE			moderate application potential: COCONINO						
plant	Layne's butterweed	*Senecio layneae*	T	LAA					high application potential: Eldorado, Plumas, Tahoe				
plant	Keck's checker-mallow	*Sidalcea keckii*	E, (CH)	NE, na					high application potential: Sequoia, Sierra				
plant	Nelson's checkermallow	*Sidalcea nelsoniana*	T	NE						no use: Siuslaw			

Category	Common Name	Scientific Name	Status	Determination	Region 1	Region 2	Region 3	Region 4	Region 5	Region 6	Region 8	Region 9	Region 10
plant	Wenatchee Mountains checker-mallow	*Sidalcea oregana var. calva*	E, CH	LAA, NLAA						high application potential: OKANOGAN-WENATCHEE			
plant	Pedate checker-mallow	*Sidalcea pedata*	E	LAA					high application potential: San Bernardino				
plant	Spalding's catchfly	*Silence spaldingii*	T	LAA	very low application potential: Flathead; moderate application potential: Idaho-panhandle, Kootenai; high application potential: Lolo, Nez Perce-Clearwater					moderate application potential: Umatilla; high application potential: Wallowa-Whitman			
plant	white irisette	*Sisyrinchium dichotomum*	E	NE							very low application potential: National Forests in North Carolina		
plant	Blue Ridge goldenrod	*Solidago spithamaea*	T	NLAA							very low application potential: Cherokee, National Forests in North Carolina		
plant	Virginia spiraea	*Spiraea virginiana*	T	NLAA							no use: Daniel Boone, George Washington and Jefferson; very low application potential: Cherokee, National Forests in North Carolina	no use: Monongahela, Wayne	
plant	Canelo Hills ladies- tresses	*Spiranthes delitescens*	E	LAA			high application potential: Coronado						

Category	Common Name	Scientific Name	Status	Determination	Region 1	Region 2	Region 3	Region 4	Region 5	Region 6	Region 8	Region 9	Region 10
plant	Ute ladies'-tresses orchid	*Spiranthes diluvialis*	T	NLAA		low application potential: Arapahoe-Roosevelt; moderate application potential: Medicine Bow-Routt, Pike-San Isabel, White River		very low application potential: Caribou-Targhee; low application potential: Fishlake; moderate application potential: Salmon-Challis, Sawtooth; high application potential: Boise, Uinta-Wasatch-Cache		low application potential: Colville; moderate application potential: Umatilla; high application potential: Okanogan-Wenatchee, Wallowa-Whitman			
plant	Navasota ladies'-tresses	*Spiranthes parksii*	E	NLAA							very low application potential: National Forests and Grasslands in Texas		
plant	Palo de Jazmín	*Styrax portoricensis*	E	NE							no use: El Junque		
plant	California taraxacum	*Taraxacum californicum*	E, CH	LAA, NLAA					high application potential: SAN BERNARDINO				
plant	Palo Colorado	*Ternstroemia luquillensis*	E	NE							no use: El Junque		
plant	El Yunque Colorado	*Ternstroemia subsessilis*	E	NE							no use: El Junque		
plant	lakeside daisy	*Hymenoxys (Tetraneuris) herbacea*	T	NE								no use: Hiawatha	
plant	Slender-petaled mustard	*Thelypodium stenopetalum*	E	LAA					high application potential: San Bernardino				
plant	Alabama streak-sorus fern	*Thelypteris pilosa var. alabamensis*	T	NE							no use: National Forests in Alabama		

Category	Common Name	Scientific Name	Status	Determination	Region 1	Region 2	Region 3	Region 4	Region 5	Region 6	Region 8	Region 9	Region 10
plant	last chance townsendia	*Townsendia aprica*	T	LAA				low application potential: Fishlake; high application potential: Dixie					
plant	running buffalo clover	*Trifolium stoloniferum*	E	NLAA							no use: Daniel Boone	no use: Monongahela, Wayne; very low application potential: Mark Twain	
plant	persistent trillium	*Trillium persistens*	E	NE							very low application potential: Chattahoochee-Oconee		
plant	relict trillium	*Trillium reliquum*	E	NLAA							no use: Sumter; very low application potential: Oconee		
plant	Greene's tuctoria (orcutt grass)	*Tuctoria greenei*	E, CH	LAA, NLAA					moderate application potential: LASSEN; high application potential: Modoc				
reptile	American alligator	*Alligator mississippiensis*	TSA	NE							no use: Francis Marion and Sumter, Ouachita, Ozark; very low application potential: National Forests in Florida		
reptile	loggerhead sea turtle	*Caretta caretta*	E, T, (PCH)	NLAA, na						high application potential: Siskiyou	no use: Francis Marion; National Forests in Mississippi; very low application potential: National Forests in North Carolina		

Category	Common Name	Scientific Name	Status	Determination	Region 1	Region 2	Region 3	Region 4	Region 5	Region 6	Region 8	Region 9	Region 10
reptile	green sea turtle - East Pacific DPS	*Chelonia mydas*	T, (CH)	NLAA, na					high use potential: Los Padres		no use: Francis Marion; very low application potential: National Forests in North Carolina		
reptile	bog turtle	*Clemmys muhlenbergii*	TSA	NE							very low application potential: Chattahoochee-Oconee, Cherokee		
reptile	New Mexican ridge-nosed rattlesnake	*Crotalus willardi obscurus*	T	NLAA			high application potential: Coronado						
reptile	leatherback sea turtle	*Dermochelys coriacea*	E, (CH)	NLAA, na					high application potential: Los Padres, Six Rivers	high application potential: Siskiyou	no use: Francis Marion; National Forests in Mississippi; very low application potential: National Forests in North Carolina		
reptile	eastern indigo snake	*Drymarchon couperi*	T	NLAA							no use: National Forests in Alabama, National Forests in Mississippi; very low application potential: National Forests in Florida		
reptile	Puerto Rican boa	*Epicrates inornatus*	E	NE							no use: El Junque		
reptile	Hawksbill sea turtle	*Eretmochelys imbricata*	E (CH)	NLAA, na							no use: National Forests in Alabama; very low application potential: National Forests in Florida, National Forests in North Carolina		
reptile	blunt-nosed leopard lizard	*Gambelia sila*	E	NLAA					high application potential: Los Padres				

Category	Common Name	Scientific Name	Status	Determination	Region 1	Region 2	Region 3	Region 4	Region 5	Region 6	Region 8	Region 9	Region 10
reptile	desert tortoise	*Gopherus agassizii*	T, (CH)	NLAA, na				high application potential: Toiyabe	high application potential: San Bernardino				
reptile	gopher tortoise	*Gopherus polyphemus*	T	NE							no use: National Forests in Mississippi		
reptile	yellow-blotched map turtle	*Graptemys flavimaculata*	T	NE							no use: National Forests in Mississippi		
reptile	Kemp's ridley sea turtle	*Lepidochelys kempii*	E, (PCH)	NLAA, na							no use: Francis Marion; National Forests in Mississippi; very low application potential: National Forests in North Carolina		
reptile	olive ridley sea turtle	*Lepidochelys olivacea*	T	NLAA					high application potential: Los Padres, Six Rivers	high application potential: Siskiyou			
reptile	black pinesnake	*Pituophis melanoleucus lodingi*	T	NE							no use: National Forests in Mississippi		
reptile	Louisiana pinesnake	*Pituophis ruthveni*	T	NE							no use: Kisatchie		
reptile	sand skink	*Plestiodon (Neospes) reynoldsi*	T	NE							very low retardant use: National Forests in Florida		
reptile	eastern massassauga	*Sistrurus catenatus*	T	NE								no use: Huron-Manistee, Midewin	
reptile	flattened musk turtle	*Sternotherus depressus*	T	NE							no use: National Forests in Alabama		

Category	Common Name	Scientific Name	Status	Determination	Region 1	Region 2	Region 3	Region 4	Region 5	Region 6	Region 8	Region 9	Region 10
reptile	northern Mexican gartersnake	*Thamnophis eques megalops*	T, CH	NLAA, NLAA			low application potential: Apache-Sitgreaves; moderate application potential: COCONINO, Gila; high application potential: CORONADO, PRESCOTT, TONTO						
reptile	narrow-headed gartersnake	*Thamnophis rufipunctatus*	T, PCH	NLAA, NLAA			low application potential: Apache-Sitgreaves; moderate application potential: COCONINO, Gila; high application potential: CORONADO, PRESCOTT, TONTO						

SEIS Appendix L – Forest Service Wildland Fire Chemical Program and Long-Term Retardant Qualification

Policy and Guidance

The Forest Service Directives provide policy and procedures for the use of wildland fire chemicals on National Forest System lands and on National Grasslands. Most of the direction for approval and use of wildland fire chemicals is found in Forest Service Handbook 5109.16 – Equipment, Supplies and Chemicals. The Director of Fire and Aviation Management oversees the fire chemical evaluation and qualification program, ensuring that products are evaluated in accordance with an established specification (Forest Service Specification 5100-304), as amended at the time of product submission. The director is also charged with approving and maintaining a list (the Qualified Products List) of qualified fire chemicals that may be used for wildland firefighting on National Forest System lands. The handbook requires consultation with the USDI Fish and Wildlife Service and the NOAA Fisheries Service for potential impacts to federally listed species, and it requires that annual summaries of intrusions (application of retardant into avoidance areas, such as waterways) are prepared and transmitted to those agencies.

Direction for the use of wildland fire chemicals, including reference to the current Qualified Products List, is provided in the Interagency Standards for Fire and Fire Aviation Operations, commonly known as the "Red Book" (https://www.nifc.gov/standards/guides/red-book). The Red Book is also used by agencies within the United States Department of the Interior. The Qualified Products List is available to other agencies or organizations and is a valuable tool facilitating interagency firefighting operations. Detailed guidance for use of aerial retardants on National Forest System Lands is found in the Implementation Guide for Aerial Application of Fire Retardant (https://www.fs.usda.gov/managing-land/fire/chemicals).

Wildland Fire Chemicals Program

The Forest Service implemented the Wildland Fire Chemical Systems program to ensure the agency has products available that have relatively low environmental impact and that are effective in meeting firefighting needs. The program includes requirements to ensure the health and safety of firefighters and the public, and to ensure integrity and safety of equipment. The Wildland Fire Chemical Systems Program at the National Technology and Development Program (formerly the Missoula Technology and Development Center) was created to provide fire chemicals evaluation and program oversight.

There are currently three categories of fire chemicals with formal specifications developed to address firefighting needs. These are: long-term retardants, Class A foams, and water enhancers (gels). Each category has identified uses and specifications, as well as separate Qualified Products Lists. This appendix includes information specific to long-term (aerially delivered) fire retardant chemicals.

Process

Generally, private companies submit retardant products for evaluation and eventual inclusion on the Qualified Products List. Per United States Department of Agriculture regulations, Federal Acquisition Regulations, and the Office of Management and Budget, the Forest Service is required to publish the requirements for information to be submitted by the proposed manufacturer/submitter, testing procedures, specifications, and the Qualified Products List. This information is available from the Wildland Fire Chemical Systems Program and is posted on their website at https://www.fs.fed.us/rm/fire/wfcs/long-term-fire-retardants.php.

Wildland fire chemicals are evaluated extensively before qualifying them for use by federal firefighting agencies. Evaluations include tests to determine:

- Health, safety, and environmental effects, including risk assessments

- Fire-retarding effectiveness
- Optimum mixing
- Physical properties
- Material effects, including corrosion, abrasion, and other material effects
- Product stability
- Visibility
- Air drop characteristics
- Operational Field Evaluation
- Quality assurance

The Operational Field Evaluation takes place after lab evaluations have been completed with the intent of evaluating the new product in a real-world situation. The Operational Field Evaluation is usually the last step before a product becomes fully qualified. The entire process of product testing and evaluation typically takes about 18-20 months to complete. Costs are paid by the product supplier. All tests are performed on a sample of the product provided by the supplier and kept under Forest Service control or disbursed by the Forest Service when outside laboratories are used for specialized testing needs. All reports and findings are sent directly to the Forest Service to maintain a chain of custody throughout the evaluation process.

A product is placed on the Qualified Products List only if it meets or exceeds the established requirements defined in the specification and measured in the Forest Service laboratory or approved outside laboratory. The Qualified Products Lists for long-term retardants and other categories of wildland fire chemicals are available via the Wildland Fire Chemicals website (https://www.fs.fed.us/rm/fire/wfcs/wildland-fire-chemicals.php). Revisions and/or additions to the Qualified Products Lists are made on the 5th of each month.

The specification is reviewed periodically for any needed updates or changes. The review process includes notification to existing manufacturers, cooperating agencies, and the public for submission of suggested changes. Wildland Fire Chemicals Program personnel also periodically review the Environmental Protection Agency list of known and suspect carcinogens and extremely hazardous substances, in order to ensure that no currently formulated wildland fire chemicals contain any of those ingredients. Program personnel also routinely review regulatory and other standards published by the Environmental Protection Agency or other organizations to ensure that chemical concerns and product testing methods and technology remain current. Human health and ecological risk assessments are performed on all newly qualified products, ensuring the most recent guidelines and information on environmental concerns are included.

The following timeline illustrates how the qualification and review process has changed to incorporate concerns and new information regarding environmental and human safety:

- 1974 – Based on published studies, pilots were advised to prevent retardant entering waterways
- 1982 – Requirements for mammalian toxicity testing were added to the specification
- 1992 – Incorporation of requirements of Human Health and Ecological Risk Assessments
- 1995 – Initiation of required reporting to the Environmental Protection Agency on distribution and use related to ammonia content
- 1996 – Addition of review for chemicals identified by the Environmental Protection Agency as carcinogenic or hazardous

- 2000 – First formal guidance for the use of retardant and avoidance of application in waterways or sensitive habitat. Aquatic toxicity performance requirements were added to the specification for certain fire chemicals.
- 2008 – Consultation with the USDI Fish and Wildlife Service and NOAA Fisheries resulted in improved reporting requirements that are made available to the public
- 2011 – Record of Decision for the Nationwide Aerial Application of Fire Retardant on National Forest System Land implements additional direction for mapping of avoidance areas, reporting and monitoring of intrusions, and detailed implementation guidance

Information regarding interagency wildland fire chemicals policy and guidance can be found at: https://www.fs.usda.gov/managing-land/fire/chemicals.

Information on wildland fire chemical systems and aerial delivery systems can be found at: https://www.fs.fed.us/rm/fire/wfcs/index.php. This site includes links to information on all categories of retardant chemicals as well as testing requirements and procedures, specifications, Qualified Products Lists, and other policy and guidance.

SEIS Appendix P – Table of Avoidance Area Percentages by Forest

Table P-1. This table displays the percent of each Region's and Forest's total acres that are within aerial retardant avoidance areas. The information is formatted differently than in the 2011 Final Environmental Impact Statement (USDA Forest Service 2011a); it is updated to show changes due to mapping since 2011. These changes are not due to the modified alternative. The column titled Forest percentage in avoidance areas is the total amount of the forest or region; the remaining three columns are breakdowns for perennial drainages, intermittent drainages, and threatened, endangered, proposed, candidate and sensitive species. The breakdown columns do not total the forest percentage because of overlap of some acres in categories.

Region	National Forest	Acres total	Forest percentage in avoidance areas	Forest percentage in perennial drainage avoidance areas	Forest percentage in intermittent drainage avoidance areas	Forest percentage in TEPCS avoidance areas
1	Beaverhead-Deerlodge	3,393,381	22%	10.8%	10.9%	0.37%
	Bitterroot	1,594,659	23%	13.8%	9.2%	0.43%
	Custer-Gallatin	3,040,134	18%	9.7%	8.3%	0.23%
	Dakota Prairie Grasslands	1,257,901	29%	2.8%	25.3%	0.80%
	Flathead	2,414,162	25%	13.3%	11.1%	16.28%
	Helena-Lewis and Clark	2,856,442	23%	9.2%	13.6%	0.19%
	Idaho-Panhandle	2,498,072	25%	11.8%	13.2%	0.09%
	Kootenai	2,243,219	22%	8.5%	13.5%	0.54%
	Lolo	2,216,287	23%	8.2%	14.3%	0.18%
	Nez-Perce Clearwater	3,935,562	25%	16.4%	8.5%	0.45%
Region 1 SUBTOTAL		**25,449,819**	**23%**	**11.0%**	**11.9%**	**1.85%**
2	Bighorn	1,105,310	17%	12.5%	4.1%	0.00%
	Black Hills	1,251,148	15%	6.1%	7.6%	1.16%
	Grand Mesa, Uncompahgre and Gunnison	2,965,320	36%	9.9%	25.5%	2.27%
	Medicine Bow-Routt and Thunder Basin NG	2,892,559	49%	11.7%	37.1%	0.42%

Region	National Forest	Acres total	Forest percentage in avoidance areas	Forest percentage in perennial drainage avoidance areas	Forest percentage in intermittent drainage avoidance areas	Forest percentage in TEPCS avoidance areas
	Nebraska, Samuel R. McKelvie NFs and Oglala, Buffalo Gap and Fort Pierre NGs	1,054,075	4%	3.6%	0.0%	0.02%
	Rio Grande	1,838,862	37%	7.9%	29.2%	0.01%
	Arapahoe-Roosevelt and Pawnee NG	1,597,940	36%	11.1%	24.2%	1.50%
	Pike-San Isabel, Cimmaron Comanche NG	2,757,586	43%	6.8%	36.3%	0.83%
	San Juan	1,865,618	43%	9.4%	33.2%	1.66%
	Shoshone	2,439,091	46%	14.7%	31.1%	0.00%
	White River	2,288,696	41%	11.4%	25.6%	6.98%
Region 2 SUBTOTAL		**22,056,205**	**37%**	**9.9%**	**26.6%**	**1.51%**
3	**Apache-Sitgreaves**	2,015,925	4%	4.1%	0.2%	2.52%
	Carson	1,491,916	4%	3.7%	0.0%	0.14%
	Cibola	1,879,318	6%	0.7%	2.2%	3.24%
	Coconino	1,844,098	3%	0.9%	2.0%	1.10%
	Coronado	1,719,928	2%	0.7%	0.6%	1.09%
	Gila	3,269,965	4%	2.3%	1.2%	1.99%
	Kaibab	1,543,675	1%	0.4%	0.6%	0.01%
	Lincoln	1,095,603	2%	0.8%	0.0%	1.69%
	Prescott	1,257,034	2%	1.2%	0.4%	0.40%
	Santa Fe	1,546,059	5%	4.8%	0.2%	0.16%
	Tonto	2,866,880	7%	2.6%	4.1%	2.29%
Region 3 SUBTOTAL		**20,530,401**	**4%**	**2.1%**	**1.3%**	**1.51%**
4	**Ashley**	1,378,472	29%	20.8%	8.5%	0.00%

Region	National Forest	Acres total	Forest percentage in avoidance areas	Forest percentage in perennial drainage avoidance areas	Forest percentage in intermittent drainage avoidance areas	Forest percentage in TEPCS avoidance areas
	Boise	2,204,674	26%	16.1%	9.8%	6.81%
	Bridger-Teton	3,432,162	28%	14.5%	13.1%	0.21%
	Caribou-Targhee	2,899,406	10%	8.9%	1.2%	0.00%
	Dixie	1,632,111	25%	4.2%	20.8%	0.07%
	Fishlake	1,709,014	29%	5.8%	18.7%	6.03%
	Humboldt-Toiyabe	6,253,933	6%	3.5%	1.8%	1.52%
	Manti-La Sal	1,340,351	31%	6.0%	18.5%	9.20%
	Payette	2,310,111	23%	14.0%	8.8%	0.11%
	Salmon-Challis	4,355,403	24%	10.9%	12.6%	0.00%
	Sawtooth	2,111,959	21%	13.0%	7.9%	0.06%
	Uinta-Wasatch-Cache	2,158,851	9%	7.5%	1.6%	0.20%
Region 4 SUBTOTAL		**31,786,447**	**19%**	**9.7%**	**8.8%**	**1.54%**
5	**Angeles**	668,279	6%	3.5%	0.0%	3.79%
	Cleveland	426,804	11%	5.7%	0.0%	7.43%
	Eldorado	615,035	15%	14.1%	0.0%	2.28%
	Inyo	1,987,906	9%	6.9%	0.0%	3.37%
	Klamath	1,505,983	48%	11.7%	0.0%	47.51%
	Lassen	1,154,416	17%	4.9%	0.0%	13.26%
	LTBMU	154,269	17%	16.6%	0.0%	2.91%
	Los Padres	1,780,182	15%	3.0%	0.0%	14.79%
	Mendocino	918,349	25%	8.6%	0.0%	19.97%
	Modoc	1,679,173	6%	3.2%	0.0%	3.34%
	Plumas	1,205,685	11%	10.5%	0.0%	0.87%
	San Bernardino	673,294	9%	2.9%	0.0%	7.41%
	Sequoia	1,114,954	18%	11.6%	0.0%	7.92%
	Shasta-Trinity	2,139,325	32%	13.6%	0.0%	24.31%

Region	National Forest	Acres total	Forest percentage in avoidance areas	Forest percentage in perennial drainage avoidance areas	Forest percentage in intermittent drainage avoidance areas	Forest percentage in TEPCS avoidance areas
	Sierra	1,316,193	22%	18.7%	0.0%	5.39%
	Six Rivers	1,167,659	46%	12.6%	0.0%	45.29%
	Stanislaus	898,739	14%	13.0%	0.0%	2.06%
	Tahoe	854,807	15%	14.8%	0.0%	1.80%
Region 5 SUBTOTAL		**20,261,052**	**20%**	**9.5%**	**0.0%**	**13.90%**
6	**Columbia River Gorge**	83,339	22%	17.8%	0.1%	4.54%
	Colville	1,104,904	14%	13.2%	0.0%	0.80%
	Deschutes	1,612,411	12%	9.8%	1.8%	3.68%
	Fremont-Winema	2,253,654	4%	4.1%	0.0%	0.23%
	Gifford Pinchot	1,357,447	51%	16.6%	33.5%	2.27%
	Malheur	1,722,070	11%	11.0%	0.1%	0.04%
	Mt. Baker - Snoqualmie	1,762,266	30%	29.9%	0.0%	1.83%
	Mt. Hood	1,015,873	19%	19.3%	0.0%	0.05%
	Ochoco	725,688	13%	12.0%	0.2%	2.13%
	Okanogan-Wenatchee	4,010,517	12%	11.4%	0.2%	0.40%
	Olympic	632,646	26%	24.3%	0.0%	2.51%
	Rogue River-Siskiyou	1,719,305	25%	24.2%	0.0%	1.05%
	Siuslaw	630,204	32%	31.5%	0.0%	0.11%
	Umatilla	1,404,806	13%	12.2%	0.4%	0.07%
	Umpqua	986,610	18%	18.2%	0.0%	0.12%
	Wallowa-Whitman	2,403,487	14%	14.2%	0.1%	0.07%
	Willamette	1,689,648	20%	19.1%	0.0%	0.63%
Region 6 SUBTOTAL		**25,114,875**	**18%**	**15.5%**	**2.0%**	**0.88%**
8	**NFs of Alabama**	671,667	30%	15.5%	14.4%	0.00%
	Daniel Boone	709,856	30%	13.3%	17.0%	0.18%

Region	National Forest	Acres total	Forest percentage in avoidance areas	Forest percentage in perennial drainage avoidance areas	Forest percentage in intermittent drainage avoidance areas	Forest percentage in TEPCS avoidance areas
	Chattahoochee-Oconee	867,578	24%	16.8%	7.0%	1.90%
	Cherokee	660,211	37%	34.8%	2.3%	0.00%
	NFs of Florida	1,203,415	12%	11.9%	0.6%	0.00%
	Kisatchie	608,535	37%	9.1%	23.9%	5.44%
	NFs of Mississippi	1,191,206	43%	21.2%	20.6%	1.68%
	George Washington and Jefferson	1,799,145	55%	8.1%	18.3%	39.55%
	Ouachita	1,783,951	25%	6.9%	18.4%	0.00%
	Ozark-St. Francis	1,160,921	26%	5.7%	20.1%	1.13%
	NFs of North Carolina	1,256,188	47%	34.7%	5.9%	9.07%
	Francis Marion and Sumter	635,197	40%	27.9%	9.5%	4.01%
	NF&G of Texas	677,696	30%	10.9%	18.8%	0.06%
	Land Between the Lakes NRA	171,239	35%	13.3%	21.8%	0.00%
	El Yunque	28,805	22%	21.6%	0.6%	0.00%
Region 8 SUBTOTAL		**13,425,610**	**34%**	**15.5%**	**14.0%**	**6.86%**
9	**Allegheny**	513,794	21%	11.7%	9.6%	0.00%
	Chequamegon-Nicolet	1,525,127	13%	10.9%	1.4%	0.44%
	Chippewa	672,128	14%	13.2%	1.1%	0.00%
	Green Mountain and Finger Lakes	427,053	27%	27.0%	0.0%	0.00%
	Hiawatha	898,451	43%	40.5%	1.4%	1.33%
	Hoosier	204,274	62%	52.6%	9.4%	0.00%
	Huron-Manistee	978,891	47%	18.4%	3.3%	32.98%

Region	National Forest	Acres total	Forest percentage in avoidance areas	Forest percentage in perennial drainage avoidance areas	Forest percentage in intermittent drainage avoidance areas	Forest percentage in TEPCS avoidance areas
	Mark Twain	1,507,887	27%	3.8%	23.2%	0.68%
	Midewin	18,225	23%	12.9%	9.8%	0.00%
	Monongahela	920,783	22%	9.4%	12.2%	0.00%
	Ottawa	998,994	45%	36.6%	7.9%	0.29%
	Shawnee	286,311	30%	13.0%	16.9%	0.00%
	Superior	2,173,267	23%	22.0%	0.7%	0.02%
	Wayne	244,258	34%	10.3%	24.0%	0.00%
	White Mountain	807,799	21%	10.8%	10.5%	0.00%
Region 9 SUBTOTAL		**12,177,242**	**28%**	**18.2%**	**7.3%**	**2.92%**
10	**Chugach**	5,400,752	23%	14.5%	0.1%	14.93%
	Tongass	16,747,705	0%	0.0%	0.0%	0.00%
Region 10 SUBTOTAL		**22,148,457**	**6%**	**3.6%**	**0.0%**	**3.64%**
TOTAL		**192,950,108**	**20%**	**10.1%**	**7.9%**	**3.48%**