USDA United States Department of Agriculture

# Nationwide Aerial Application of Fire Retardant on National Forest System Lands

## Final Supplemental Environmental Impact Statement

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Nationwide Aerial Application of Fire Retardant
Final Supplemental Environmental Impact Statement


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**Abstract:** This Supplemental Environmental Impact Statement (SEIS) supplements portions of the Nationwide Aerial Application of Fire Retardant on National Forest System Land, 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 Nationwide Aerial Application of Fire Retardant on National Forest System Land, 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 2011 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 the Nationwide Aerial Application of Fire Retardant on National Forest System Land, 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 (2011 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 it 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. A draft SEIS was prepared that addressed those changes, and was released for public comment in February 2022. Fifteen letters were received containing a total of 138 individual comments. This final SEIS incorporates the concerns and suggestions from those comments as appropriate. Responses are found in SEIS Appendix Q – Response to Comments on the Draft Supplemental Environmental Impact Statement.

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 2021. Data used in updates to the 2011 FEIS analyses of impacts to resources, and in consultations with the USDI Fish and Wildlife Service and with USDC NOAA Fisheries include data only through 2019, reflecting what was available at the time those analyses were carried out.
- 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 (USDA Forest Service 2021a, 2021b, 2021c, 2021d, 2021e, 2022a, 2022b, and 2022c) provided to the USDI Fish and Wildlife Service and to USDC NOAA National Marine Fisheries Service. 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 191 aquatic species were analyzed, with determinations of no effect for 66 species; may affect but not likely to adversely affect for 71 species; and may affect, likely to adversely affect for 54 species. Critical habitats for 80

aquatic species were also analyzed, 23 of which would experience no effect, 21 of which may be affected but are not likely to be adversely affected, and 36 of which would be likely to experience adverse effects.

- A total of 194 plant species were analyzed, with determinations of no effect for 66 species; may affect but not likely to adversely affect for 76 species; and may affect, likely to adversely affect for 52 species. Critical habitats for 35 plant species were also analyzed, 4 of which would experience no effect, and 31 of which may be affected but are not likely to be adversely affected.
- A total of 145 wildlife species were analyzed, with determinations of no effect for 40 species; may affect but not likely to adversely affect for 69 species; and may affect, likely to adversely affect for 35 species. The proposed action is not likely to jeopardize the continued existence of one experimental non-essential population. Critical habitats for 51 wildlife species were also analyzed, 15 of which would experience no effect, 29 of which may be affected but are not likely to be adversely affected, and 7 of which would be likely to experience adverse effects.

- Analysis of impacts to Regional Forester sensitive species has been completed for 3,516 species: 342 aquatic species, 2,454 plant species, and 720 terrestrial wildlife species. No sensitive species were found to trend toward federal listing due to aerial fire retardant use.

The Glossary and Literature Cited sections of this SEIS include only information that has changed or been added since the 2011 FEIS and 2011 Record of Decision were published. Similarly, appendices are included with this SEIS only if they have changed since publication of the 2011 FEIS. Updated appendices include those containing fire and aerially delivered retardant use and intrusion data for 2012 through 2021; information on screening processes used for aquatic, plant, and wildlife species analyses; lists of federally listed species and determinations; updated information on the process for evaluating and qualifying long term (aerially delivered) retardants, and responses to comments on the draft SEIS.

# 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 (2011 FEIS) (USDA Forest Service 2011a). The 2011 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 late 2019, noting that Endangered Species Act Section 7 consultations on the 2011 Nationwide Aerial Application of Fire Retardant on National Forest System Lands, Record of Decision were due to expire in a year, the Forest Service undertook a review of the 2011 decision and supporting documentation. As an outcome of that review, 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). The report identified a number of conditions that had changed since the 2011 Record of Decision was issued, and it 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 2011 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 2011 FEIS. References are made throughout this document to corresponding sections of the 2011 FEIS in order to aid in comprehension.

A note on section numbers and organization: efforts were made to ensure that section numbers and headings correspond to those in the 2011 FEIS. However, because not all information in the 2011 FEIS needed to be updated or brought forward into this SEIS, some section numbers in this SEIS may be different than those in the 2011 FEIS. The grouping of information into chapters, the organization of information within chapters, and major section numbers remain the same.

A note on hyperlinks: because this SEIS supplements but does not replace the 2011 FEIS it necessarily includes numerous references to information in the 2011 FEIS, 2011 Record of Decision, and 2020 Supplemental Information Report. To facilitate access to those documents and others key to information or updates in this SEIS, some citations include hyperlinks to the cited documents. To avoid visual distraction, frequently cited documents do not include hyperlinks at each point where they are cited, but are linked at the first citation within a major SEIS section, or where it may be useful to the reader to quickly access the cited document. Some additional documents may include links in the Literature Cited section of this SEIS. A List of Hyperlinked Document Web Addresses is provided at the end of this SEIS.

## 1.2 Project Background

Section 1.2 on pages 20-21 of the 2011 FEIS summarizes the history of the proposal for use of aerially delivered retardant on National Forest System lands through completion of the 2011 FEIS in October 2011. This section provides information for the period since that time.

For ease in reading, throughout this document the United States Department of the Interior Fish and Wildlife Service is referred to as the Fish and Wildlife Service, the United Stated Department of Commerce National Oceanic and Atmospheric Administration National Marine Fisheries Service is referred to as NOAA Fisheries, and collectively the Fish and Wildlife Service and NOAA Fisheries are referred to as 'the Services'.

Endangered Species Act section 7 consultations were initiated with submission of biological assessments to the Fish and Wildlife Service (USDA Forest Service 2011b) and NOAA Fisheries (USDA Forest Service 2011c). Consultations were completed when Biological Opinions were issued by the NOAA Fisheries (USDC NOAA Fisheries 2011) and the Fish and Wildlife Service (USDI Fish and Wildlife Service 2011). Supplemental Endangered Species Act section 7 consultations were carried out to address changes to the lists of threatened and endangered species and critical habitat, changes in the proposed action (mapping), and exceeding incidental take. Consultation documents, including the Biological Opinions, covered a ten-year period ending December 31, 2021.

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

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 Endangered Species Act 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, and
- 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 (USDA Forest Service 2020c). The notice of intent included draft language of the proposed action (Modified Alternative 3).

In April 2021 the Forest Service submitted to NOAA Fisheries a biological assessment for National Forests with Aquatic Species Under the Jurisdiction of NOAA Fisheries on National Forest System Lands (USDA Forest Service 2021a). In November 2021 the Forest Service submitted to the Fish and Wildlife Service a Biological Assessment for National Forests with Species Under the Jurisdiction of Fish and Wildlife Service on National Forest System Lands

(USDA Forest Service 2021c). Both of these biological assessments included analysis of effects of the Nationwide Aerial Application of Fire Retardant on National Forest System Lands, and specifically the effects of Modified Alternative 3 to federally listed threatened, endangered, and candidate species occurring on National Forest Lands. Addendum biological assessments were submitted to the Fish and Wildlife Service on 16 November 2021, 6 December 2021, 11 March 2022, and 30 June 2022, and to NOAA Fisheries on 13 July 2021 (USDA Forest Service 2021b, 2021d, 2021e, 2022a, 2022b, and 2022c) to address changes in the status of some listed species and to include information about newly qualified retardant chemicals that had occurred since the original biological assessments were submitted. A brief summary of information from the biological assessments is included in the final SEIS.

The Forest Service received a Programmatic Biological Opinion on the National Program for the Aerial Application of Long-Term Fire Retardants from NOAA Fisheries in February 2022, and received a Final Biological and Conference Opinion on the Nationwide Aerial Application of Fire Retardant on National Forest System Land from the Fish and Wildlife Service in February 2023. These biological opinions included reasonable and prudent measures, terms and conditions, and conservation recommendations that are discussed in the 2023 Record of Decision.

In February 2022 the Forest Service published the Nationwide Aerial Application of Fire Retardant on National Forest System Lands Draft Supplemental Environmental Impact Statement (draft SEIS) (USDA Forest Service 2022) and began a 45-day public comment period. Fifteen letters were received, and comments in those letters were reviewed and incorporated into the final SEIS as appropriate. Details regarding the letters, review process and content analysis, and how comments were addressed along with responses to comments are in SEIS Appendix Q.

### 1.2.1 Changes Between Draft and Final

The final SEIS has been updated to include the following:

- Aerial fire retardant use and intrusion data have been updated to include data through 2021. Analyses of effects to resources, as well as Endangered Species Act Section 7 consultation on federally listed and proposed species were completed prior to the 2020 and 2021 data becoming available. The assumptions used in the analyses and determinations were reviewed relative to the updated information and no changes were needed in the assumptions, analysis, conclusions, or determinations.

- A section on connected actions has been added (section 2.3) to describe the use of and potential impacts from airtanker bases where aerial fire retardants that are used on National Forest System lands are mixed and loaded, and jettison areas where aerial fire retardant may be dropped when needed to ensure safe landing of aircraft.

- A discussion of information regarding effectiveness of aerially delivered fire retardant has been added to section 3.1.

- A discussion of potential effects of magnesium chloride-based retardants on soils has been added to section 3.2.

- Information on Environmental Justice and Civil Rights found in the 2011 FEIS has been updated and added to section 3.7 (Social and Economic Considerations).

- Updates to information regarding conformance with laws and regulations (section 3.18) have been moved to the 2023 Record of Decision, in order to avoid unnecessary duplication and to ensure completeness.
- Clarifications, edits, and minor updates have been made in response to public comments on and internal review of the draft SEIS.
- The following appendices have been updated since the draft SEIS was released:
    - SEIS Appendix B: Updated Implementation Status of the 2008 Reasonable and Prudent Alternatives
    - SEIS Appendix C: Fire and Retardant Use Information 2012 through 2021
    - SEIS Appendix D: Fire Retardant Intrusions on National Forest System Lands from 2012 through 2021
    - SEIS Appendix E: Species Analysis Screening Process
    - SEIS Appendix F: Federally Listed Species Considered and Effects Determinations
- SEIS Appendix Q (Response to Comments on the Draft Supplemental Environmental Impact Statement) has been added

## 1.3 Aerially Delivered Fire Retardant Background

Page 21 of the 2011 FEIS provides a summary of the history and context of fire retardant use on National Forest System 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 2011 Record of Decision has been provided in the Implementation Guide for Aerial Application of Fire Retardant (hereafter referred to as the Implementation Guide), 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. Data from subsequent years were not yet available for use when the analyses supporting this SEIS were completed. Where possible, information on aerial fire retardant use and intrusions has been updated to include data through 2021.

## 1.4 Purpose and Need for Action

The overall purpose of and need for action has not changed from the description in the 2011 FEIS. In brief, there is a need for an effective tool for wildland firefighting that can reduce or limit the spread, intensity, and size of fires in order to increase firefighter and public safety,

support other firefighting actions, and enable fast response to fires in remote locations. The purpose of the proposed action is to provide standards for the use of aerial fire retardant that balance the need to protect certain species with the need to use aerial fire retardant as a firefighting tool. Refer to the 2011 FEIS, page 22 for the full text of the purpose and need.

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 in the 2011 FEIS. The proposed action and alternatives are limited to National Forest System lands throughout the United States. Environmental effects have been analyzed at a nationwide, programmatic scale commensurate with the scope of the proposed action. Refer to the 2011 FEIS, pages 22-23, for a more complete description of the scope of the proposed action and analysis.

## 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 approving the use of new aerial retardant products in compliance with Endangered Species Act requirements.

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 2011 FEIS.

## 1.8 Public Involvement

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

Public involvement in the SEIS process is as follows. 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 (USDA Forest Service 2020c). On February 11, 2022, a notice of availability of the Nationwide Aerial Application of Fire Retardant on National Forest System Lands Draft Supplemental Environmental Impact Statement was published in the Federal Register (USDA Forest Service 2022). This notice initiated a 45-day public comment period on the Draft SEIS. The Forest Service sent notification of its availability to everyone on

the mailing list from the 2011 FEIS, as well as to others added since that time. The Forest Service received 14 comment letters from individuals, organizations, agencies, and business owners during the comment period, and one letter was received after the comment period had ended; that letter was considered along with the others. Details regarding the comments and how they were addressed can be found in SEIS Appendix Q.

## 1.9 Issues

The issues discussed on pages 26-28 of the 2011 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 Endangered Species Act, and additional or updated analysis. Additional issues identified and addressed in the SEIS include climate and carbon (section 3.13), aerial fire retardant effectiveness (section 3.1), and effects of aerial fire retardant at airtanker bases and jettison sites (section 2.3, connected actions). Approval and use of new retardant products was identified as an issue in public comments to the draft SEIS; that issue is addressed in Modified Alternative 3 (SEIS section 2.1.4), analysis of impacts to resources (SEIS Chapter 3), and in responses to comments (SEIS Appendix Q).

# 2 Alternatives, Including the Proposed Action

This chapter summarizes information about the alternatives considered in detail in the 2011 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 2011 FEIS.

## 2.1 Alternatives Considered in Detail

The 2011 FEIS analyzed a total of three alternatives, including a No Action alternative and two Action Alternatives. All alternatives remain the same as in the 2011 FEIS, but this SEIS adds Modified Alternative 3, which is based on findings of the Five-Year Review (USDA 2018), the Supplemental Information Report (USDA Forest Service 2020a), and several years of experience implementing the Record of Decision (USDA Forest Service 2011d).

Components of the original three alternatives are summarized below for ease of review; refer to the 2011 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 Record of Decision (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 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 Fish and Wildlife Service and 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 2011 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 2012, after the 2011 Record of Decision 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 2011 Record of Decision also incorporated terms and conditions resulting from Endangered Species Act 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 National Forest System 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 certain 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 that threat.

- When an intrusion (formerly termed misapplication'; see definition below) occurs for any reason it would be reported, and if necessary it would be assessed for impacts, monitored, and remediated.

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 water, 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, and peatlands.

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 approving use of new aerial retardant products in compliance with Endangered Species Act requirements, 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 Forest Service 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 pilots, 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 Forest Service 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 should 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 Forest Service 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, and peatlands) 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.
- 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, as identified in consultations.
- 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 the need 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 United States Department of the Interior Fish and Wildlife Service (Fish and Wildlife Service) and the United States Department of Commerce National Oceanic and Atmospheric Administration National Marine Fisheries Service (NOAA Fisheries).

- Consult annually 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:

- The Fish and Wildlife Service and NOAA Fisheries (collectively, 'the Services')
- Aviation managers and pilots
- Cooperators/other agencies

Coordination would ensure that requirements 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 Forest Service 2019 or subsequent versions).

## Reporting 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 Forest Service 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 described in the Implementation Guide.

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 cultural resource specialist 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.

## Consultation 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 5100-304d 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 amount of retardant salts

when delivered at standard coverage levels, and the percentage of thickeners, coloring agents, and performance ingredients in the total mixed product do not exceed those established in completed consultations. The toxicity levels of new products must not exceed those of products with completed consultations, and there must be no risk factors that have not previously been identified and assessed in completed consultations. The Services will be notified of additions to the Qualified Products List and will be provided appropriate supporting information.

- 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 2011 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 2011 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 2011 Record of Decision (pp. 2-5) and the 2011 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), 2011 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 2011 FEIS Preferred Alternative) and the SEIS Proposed Action (Modified Alternative 3)**

| | 2011 Decision (Alternative 3) | Proposed Action (Modified Alternative 3) | Notes on Modifications |
|---|---|---|---|
| **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 procedure for use of retardants added to the Qualified Products List |
| **Where proposed action 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 |

| | 2011 Decision (Alternative 3) | Proposed Action (Modified Alternative 3) | Notes on Modifications |
|---|---|---|---|
| **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 that threat. | Minor, clarifying edits |
| **Definition: Aerial Retardant Avoidance Areas** | A protection area surrounding a listed species' habitat developed 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** | A misapplication is defined as 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. |

| | 2011 Decision (Alternative 3) | Proposed Action (Modified Alternative 3) | Notes on Modifications |
|---|---|---|---|
| **Aircraft Operational Guidance: implementation 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 should 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.<br>Incorporates agency administrator into guidance and acknowledges discretion of agency administrator and incident commander in making this decision.<br>Adds consideration of habitats for sensitive species. |
| **Aircraft Operational Guidance: implementation 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. |

| | 2011 Decision (Alternative 3) | Proposed Action (Modified Alternative 3) | Notes on Modifications |
|---|---|---|---|
| **Aircraft Operational Guidance: implementation 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 resource 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. … Consult with local Tribes to identify any avoidance areas needed to protect cultural resources or sacred sites. | Acknowledges difficulty in establishing national protocol for mapping/identifying cultural resources, clarifies involvement of resource specialists and requirements to work with Tribes at a local level |
| **Aircraft Operational Guidance: 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. |

| | 2011 Decision (Alternative 3) | Proposed Action (Modified Alternative 3) | Notes on Modifications |
|---|---|---|---|
| **Avoidance Area Mapping Requirements: 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 …<br><br>Consult with local Tribes to identify any avoidance areas needed to protect cultural or sacred sites. | 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.<br><br>Adds requirement to consult with Tribes regarding mapping.<br><br>Annual coordination requirements have been moved to a separate component of Modified Alternative 3; refer to that section below. |
| **Avoidance Area Mapping Requirements: 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 USDI Fish and Wildlife Service, and the USDC National Oceanic and Atmospheric Administration National Marine Fisheries Service | Acknowledges need for flexibility based on local conditions.<br><br>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. |

| | 2011 Decision (Alternative 3) | Proposed Action (Modified Alternative 3) | Notes on Modifications |
|---|---|---|---|
| **Avoidance Area Mapping Requirements: Mapping discrepancies** | When there is a discrepancy between the maps and the language in this decision, the language in this decision controls. | Not applicable; refer to Record of Decision | The Record of Decision includes documentation of the final direction. |
| **Avoidance Area Mapping Requirements: Aquatic Avoidance Areas** | Waterways will be avoided and are given a minimum of a 300-foot buffer …<br><br>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.<br><br>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…<br><br>Mapping of waterways that are dry at the time of retardant application is not required.<br><br>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.<br><br>Removes specific data requirement, allowing flexibility to use best available and most current information. |

| | 2011 Decision (Alternative 3) | Proposed Action (Modified Alternative 3) | Notes on Modifications |
|---|---|---|---|
| **Avoidance Area Mapping Requirements: 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…<br><br>The FS used …protocols to generate a standardized, national map template …<br><br>Use FWS and NOAA Fisheries-designated critical habitat layers when available.<br><br>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 …threatened, endangered, proposed, or candidate species or critical habitat or …sensitive species or habitat or other resources … not associated with waterways or riparian areas.<br><br>Map avoidance areas where aerial application of fire retardant may impact one or more … terrestrial … endangered, threatened, proposed, or candidate … species or designated critical habitat …[or] certain … sensitive species or their habitat. | Clarifies terminology.<br><br>Removes specific data requirement, allowing flexibility to use best available and most current information. |
| **Avoidance Area Mapping Requirements: Adjustments to Avoidance Areas** | Buffer areas may be increased based on local conditions in coordination with the FWS and NOAA Fisheries local office.<br><br>[National mapping] protocols will be used for annual updates. | Avoidance areas may be adjusted for local conditions [but] 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 threatened, endangered, proposed, or candidate species would be coordinated with the Services. | Clarifies 300 foot minimum buffer around waterways. |

| | 2011 Decision (Alternative 3) | Proposed Action (Modified Alternative 3) | Notes on Modifications |
|---|---|---|---|
| **Annual Coordination** | [*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 the Fish and Wildlife Service and NOAA Fisheries, aviation managers and pilots, [and] cooperators/other agencies.<br><br>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. | Clarifies coordination levels and purpose at programmatic level, with details in Implementation Guide, which can be updated as needed.<br><br>Refer also to Reporting and Monitoring Requirements section. |

| | 2011 Decision (Alternative 3) | Proposed Action (Modified Alternative 3) | Notes on Modifications |
|---|---|---|---|
| **Reporting Requirements: General** | 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….<br><br>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.<br><br>Elements specific to coordination needs are now in “Annual Coordination” component of Modified Alternative 3. |
| **Reporting Requirements: 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. |

| | 2011 Decision (Alternative 3) | Proposed Action (Modified Alternative 3) | Notes on Modifications |
|---|---|---|---|
| **Modifications Resulting from ESA Section 7 Consultation: Terms and Conditions** | The 2011 decision incorporated terms and conditions and reasonable and prudent measures provided in Biological Opinions from the Services | Terms and conditions from the Biological Opinions are described in the Record of Decision | Terms and conditions from the Biological Opinions are not part of alternatives, but are requirements added to the selected alternatives and described in direction incorporated into the Record of Decision |
| **Consultation Procedures for Additions to the Qualified Products List** | The 2011 decision and 2011 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.<br><br>[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.<br><br>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 2011 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 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 the Services, 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.<br>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.<br>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 components and toxicity limits evaluated in completed consultations, and for consultation on those not meeting criteria. |

## 2.3 Connected Actions

Comments on the draft SEIS raised concerns about the potential effects of aerial retardant at airtanker bases where aerial fire retardant is prepared and loaded onto airtankers for use on National Forest System lands. Activities directly involving aerial retardant at airtanker bases are a connected action because they are closely related and will not proceed unless the proposed action or one of the action alternatives (i.e. alternatives involving use of aerially delivered retardants) occurs (50 CFR 1508.25 (a)(1)(ii)), and because they are an interdependent part of a larger action that depends on the larger action for justification (50 CFR 1508.25 (a)(1)(iii)). The connected action is confined to activities directly involving aerially delivered retardants (see below) and does not include general aircraft operations because aircraft are used for a variety of firefighting purposes not related to the proposed action or alternatives to the proposed action.

Actions involving aerial retardant at airtanker bases include storage, mixing, loading, and cleanup. Specific methods used for each of those actions vary depending on the type of aircraft operating from the base, location and infrastructure on and related to the base, and other factors.

Each permanent airtanker base has procedures in place to limit the potential for environmental or human health exposure, including:

- Most airtanker bases are surrounded by perimeter fencing that prevents larger wildlife and humans from entering the area and incurring risk from aircraft or direct exposure to retardant chemicals.
- Systems for spill containment at all locations where retardant is stored and handled to keep retardant from entering waterways or moving into vegetated areas.
- Systems for dust abatement for dry concentrates that limit the amount of particulate matter in the air to protect human health as required by Occupational Safety and Health Administration regulations. These systems also reduce the potential for drift of dry concentrate in the wind.
- Systems for containment of wash-down water. Wash down water discharged into a city sewer system is processed through a wastewater treatment plant. Wash down water in holding tanks, and the solid matter left in evaporation ponds, are removed by a contracted company and transported to an appropriate disposal facility.

- The Environmental Protection Agency, Toxics Release Inventory Program, established under section 313 of the Emergency Planning and Community Right-To-Know Act (42 U.S.C 11023) requires annual reporting of the amount of ammonia (in pounds) processed through or spilled at those bases that meet the reporting criteria (more than 10 full time equivalent employees and more than 25,000 pounds of ammonia or approximately 1 million gallons of retardant).

Airtanker bases also identify jettison areas where airtankers can release their load in case of emergency, or prior to landing if the retardant load is cancelled after take-off. The latter occurs for airtankers that cannot land loaded, or for tankers that exceed their maximum landing weight without releasing all or part of the load. Identified jettison areas may be on the airport grounds, usually near the runway, or may be some distance from the airport. The Forest Service requires that each airtanker base it manages document the frequency of jettisons and the amount of each load jettisoned. The Forest Service also works to gather that information from airtanker bases managed by other entities.

The height of an aircraft when jettisoning a load depends on several factors, including the reason for the jettison and the requirements of the specific jettison area. When retardant is dropped at altitudes generally higher than 500 feet above ground or vegetation level, retardant dissipates and evaporates prior to reaching the ground, spreading over a large area at undetectable levels. Drop heights for jettisons due to mechanical failure or emergency are usually between 500 to 1,000 feet above ground or vegetation level. Drop heights for jettisons to reduce weight for landing or for cancelled requests are often used as training exercises, and usually occur below 500 feet above ground or vegetation level.

The Forest Service analyzed potential effects of aerial fire retardant use to threatened, endangered, and proposed species in the vicinity of airtanker bases and jettison areas associated with aerial fire retardant use on National Forest System lands. That information was provided in Endangered Species Act section 7 consultations with the Services, and is summarized along with other information on potential effects to aquatic and terrestrial species in sections 3.4 and 3.6 of this document.

# 3 Affected Environment and Environmental Consequences

Chapter 3 of the 2011 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 System lands throughout the United States. Chapter 3 of the 2011 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 2011 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 2011 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 2011 FEIS unless specifically stated otherwise. Refer to corresponding sections in the 2011 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 (USDA Forest Service 2012a). 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 Endangered Species Act. The 2011 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 needed 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 2011 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 2011 FEIS.

## 3.1.1 Affected Environment

### 3.1.1.1 Fire Retardant Operational Use

This section provides updates to information in the 2011 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 2011 FEIS (p. 53) shows the location of airtanker and helitanker bases as of 2004. Information about airtanker bases has been moved to section 2.3 Connected Actions, and expanded and updated to include information about spill containment and jettison areas.

As of July 2023 there are 12 exclusive use and 19 call-when-needed large airtankers under contract by the Forest Service. The Forest Service also has access to 6 Modular Airborne Firefighting Systems, 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 146 million gallons of long-term fire retardant (approximately 81,386 drops) were aerially applied to National Forest System lands in the 2012 - 2021 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 2011 FEIS, to between 9,831 and 25,820 acres (0.0105 percent to 0.0134 percent of National Forest System lands) as estimated from 2012 through 2021 (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 2011 FEIS.

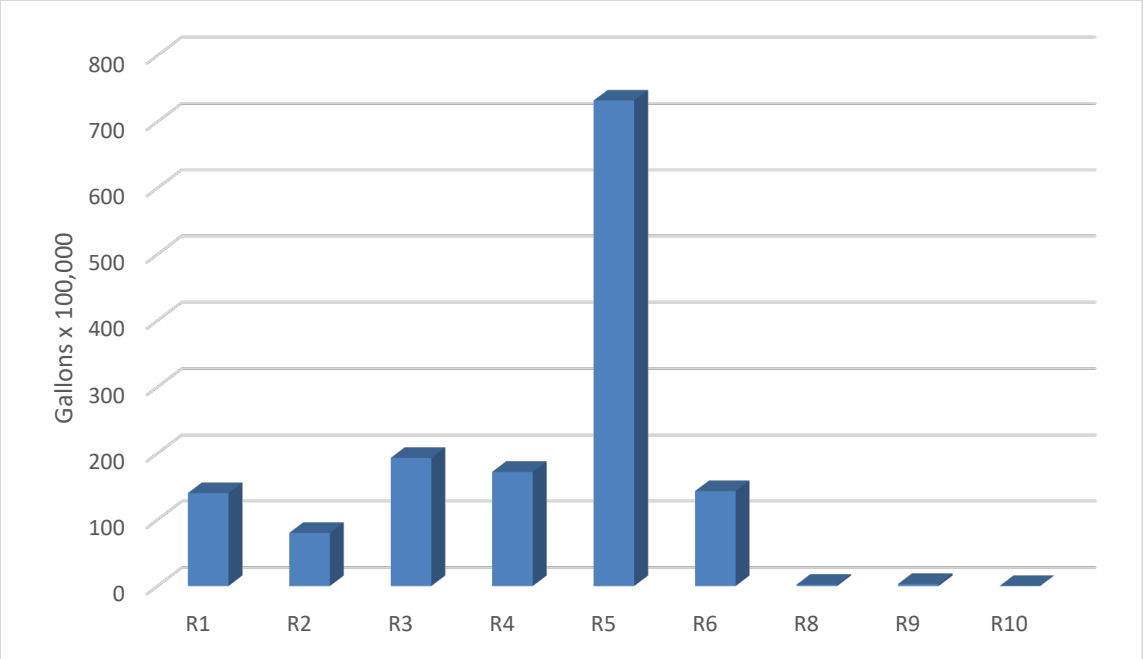


**Figure 1. Gallons of aerially applied fire retardant by Forest Service Region, 2012-2021**

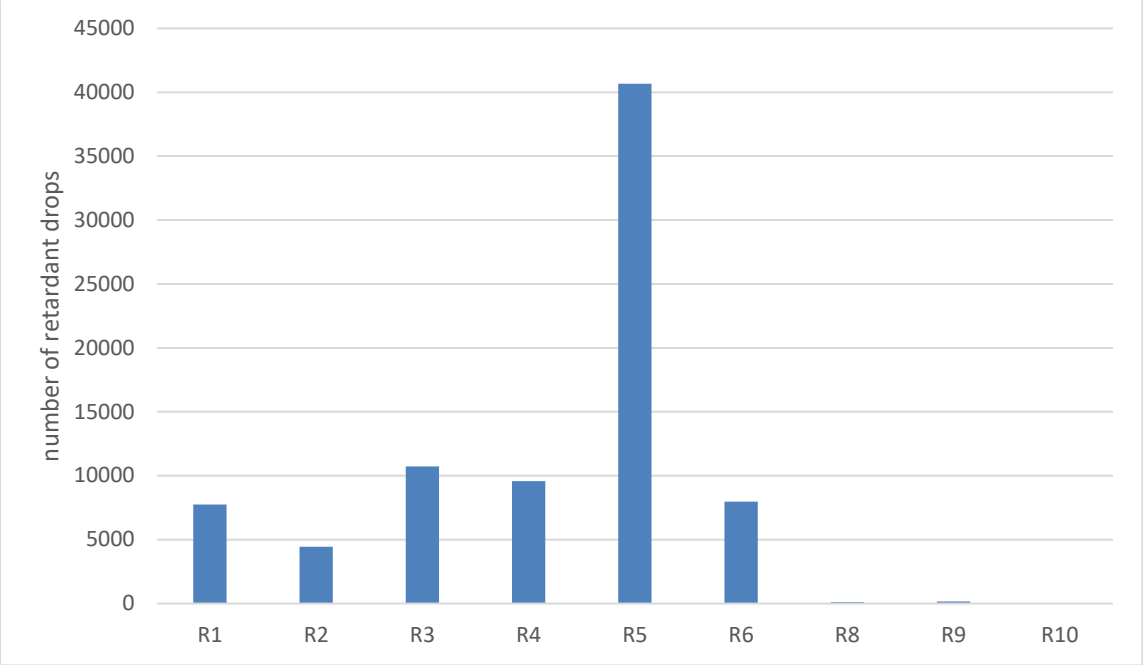


**Figure 2. Number of aerial fire retardant drops by Forest Service region, 2012-2021.**

### 3.1.1.2 Long-Term Fire Retardant Use – Background

Information in the 2011 FEIS beginning on page 59 remains unchanged except for the following updates:

### *General*

Fire retardant delivery into aquatic systems has been limited since 2012 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 Forest Service 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 more than 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.

### *Effectiveness*

Section 3.1 of the 2011 FEIS describes fire retardant use in wildland fire management, and includes discussion of the varied objectives for which aerially delivered fire retardant is used. Appendix O of the 2011 FEIS is a compilation and summary of testimonials and information from fire professionals regarding the use and effectiveness of aerial fire retardants. Since the 2011 FEIS was completed, additional information has become available regarding the effectiveness of aerial fire retardants in achieving the objectives for which they are used. The following information is in addition to that provided in the 2011 FEIS.

A critical consideration in measuring, reporting, analyzing, and interpreting information regarding aerial fire retardant effectiveness is that definitions of effectiveness vary, as do definitions of the parameters used in measuring and reporting effectiveness, and the assumptions made in any analysis. Calkin et al. (2014) for example, reconstructing data from past fires in an effort to develop a cost-effectiveness model for large airtanker use, defined ‘initial attack’ as the first operational period, and categorized retardant drops based on that timeframe. They also assumed that containment success was a “reasonable measure of effectiveness” in initial attack operations. Other definitions of initial attack and its objectives differ to varying degrees from that used by Calkin et al. (2014). The ‘Terminology’ section of the InciWeb site defines initial attack as “actions taken by the first resources to arrive at a wildfire to protect lives and property, and prevent further extension of the fire”. The Interagency Standards for Fire and Fire Aviation Operations defines initial attack as “An aggressive action to put the fire out by the first resources to arrive ”. Plucinski et al. (2007) discuss ‘first attack’ as “aggressive early suppression activities” aimed at minimizing the area burned and maximizing likelihood of containment. The Forest Service’s Aerial Firefighting Use and Effectiveness (USDA Forest Service 2020d) study defines initial and extended attack as well as ‘large fire’ based on combinations of timeframe, firefighting actions, and fuel types. These sources illustrate that initial attack can be defined using a specified timeframe (e.g., the first operational period, as in Calkin et al. (2014)), as simply the first set of resources and actions arriving at a fire, as a combination of timeframe and type of action (e.g., ‘early’ and ‘aggressive’, per Plucinski et al. (2007)), or combinations of

those and other factors (e.g., USDA Forest Service 2020d). These definitions also each identify a different purpose or goal of initial attack. The sources quoted above identify initial attack success variously as successful containment, maximizing likelihood of containment, protection of life and property, prevention of fire spread, putting the fire out, and minimizing the area burned. The variability in how firefighting operations and their success are measured illustrate the need for caution when interpreting different reports or analyses of aerial fire retardant effectiveness.

Calkin et al. (2014) reported that in the two years covered by their study, an average of 24 percent of fires in the dataset (33 percent in 2010 and 15 percent in 2011) that received drops from large airtankers were contained within the first operational period. These results should be interpreted with caution, however, for several reasons. First, the study was unable to address the potential contribution of other firefighting resources, and was therefore unable to estimate the contribution of large airtankers to containment or lack of it. In other words, large airtanker drops of fire retardant may have met specific tactical objectives such as cooling a fire edge or slowing fire spread but other firefighting actions may not have succeeded in meeting their objectives. The reverse may also be true, further illustrating the difficulty of assigning cause and contribution, and therefore measuring effectiveness, of individual resources when using data from real fire incidents. Other limitations of the Calkin et al. (2014) study include that it was limited to large airtanker data, the need to categorize data retroactively, lack of information about specific drop objectives, exclusion of a relatively large amount of data from their analysis, and the need to make broad assumptions because of limited available information.

Another consideration when analyzing and interpreting data regarding aerial fire retardant effectiveness is potential data biases regarding which fires receive aerial fire retardant. Calkin et al. (2014) stated that their data is "strongly suggestive" that large airtanker use in initial attack situations occurs on fires that are more difficult to contain. Other published and reported information (e.g., Plucinski 2019a and 2019b; see also 2011 FEIS page 461, Response to PC 2), supports that conclusion, and cautions about the potential for incorrect conclusions regarding retardant effectiveness: if retardant is used largely on fires that are more likely to escape, the data will therefore show that fires on which retardant is used escape more often than those where it is not used. This observation is not evidence of the effectiveness of aerial fire retardant but rather evidence that retardant is used as a tool more frequently on certain types of fires than on others. For this and other reasons discussed below, comparison of broad outcomes for fires on which aerial fire retardant was used with those on which it was not used generally cannot provide accurate information about retardant effectiveness.

In Plucinski's comprehensive review of studies into the effectiveness of fire suppression efforts, he noted that experimental programs can be difficult to carry out, and variables remain difficult to control (Plucinski 2019a). Controlled experiments are usually limited to studies designed to evaluate chemical effects at the flame scale because of the ability to control variables in a laboratory setting, but information from these studies can be difficult to apply to wildfire operations (Plucinski 2019a).

Attempts to compare outcomes of fires or of specific operations where aerially delivered retardant was used with situations where it was not used have not resulted in useful information. Calkin et al. (2014) noted that they could not compare the outcome of a retardant drop with an outcome if the drop had not been made, due largely to a wide array of interacting variables that "present considerable analytical challenges" in evaluating the effectiveness of suppression actions. This issue increases many-fold when attempting to make comparisons at a larger scale

than that of individual retardant drops. Fire suppression involves multiple, interacting suites of tactics, objectives, and resources that shift during the course of firefighting operations, making it difficult to tie specific objectives to specific outcomes (Plucinski 2019a and 2019b). Small changes in some variables can have large impacts on outcomes (Plucinski 2019b). Wildfire suppression actions are difficult to observe and measure operationally and datasets are difficult to acquire due to the dynamic and unplanned nature of wildfires, safety and access issues, and others. Useful results from suppression operations have been limited and some efforts to obtain them have at times had to be abandoned because of the lack of ability to obtain data (Plucinski 2019a).

In his review, Plucinski (2019a) noted that metrics used to evaluate effectiveness have often been related to stopping or slowing fire progression, but they should instead reflect objectives that may include slowing fire spread until other resources arrive, increasing fireline holding time, influencing the direction of fire spread, protecting specific resources, reducing fire intensity to assist ground firefighters, and others (e.g., USDA Forest Service 2020d, Plucinski 2019a and 2019b, USDA Forest Service 2011a, Plucinski et al. 2007). Appendix Q of the 2011 FEIS includes discussion of the different objectives for which aerial fire retardant is used (Responses to PC 1, PC 2, PC 12, PC 13, and PC 87; pages 459, 460, 473-475, and 521).

The Aerial Firefighting Use and Effectiveness (AFUE) Report (USDA Forest Service 2020d) documented the use and effectiveness of aerial drops from 2015 through 2018, using data from 272 incidents in 18 states. The study included data from various types of aircraft, with each drop analyzed on the basis of objectives and outcomes. The study defined its use of the terms ‘initial attack’, ‘extended attack’, and ‘large fire’ based on a combination of size, fuel type, and response type.

The AFUE study developed two performance measures to summarize patterns of results, and developed a method of analyzing unknown outcomes to estimate probability of success for those as a range from worst to best cases. The performance measures identify the portion of drops with known outcomes that interact with the fire (interaction percentage), and the number of effective drops out of the total number of drops that had known and interacting outcomes (probability of success). For the latter, ‘effective’ was based on the degree of alignment between the objective of a drop and its outcome. The 2020 report (USDA Forest Service 2020d) differentiates aircraft types but does not show all results as comparisons between water and retardant. Airtankers use long-term retardant almost exclusively, scoopers use water exclusively, and helicopters use water predominantly; the largest helicopters use long-term retardant for roughly 10 percent of the reported drops. Some conclusions can be drawn based on type of aircraft used.

Findings from the AFUE study include:

- Airtankers are used for a variety of objectives that can be related to aircraft type, fire type, presence or absence of ground engagement, and other factors. Delaying fire spread was a common objective for all aircraft (41 percent of all drop objectives). Airtankers were used more than other types of aircraft for halting fire advance (42 percent to 47 percent of airtanker drops) and providing point protection for values at risk (8 percent of airtanker drops).

- Airtankers make more drops on large fires (fires that persist for many days) than during initial or extended attack operational phases, although drops from single engine

airtankers were associated with initial attack more than drops from large or very large air tankers.

- Probability of success was calculated for three different classes of aircraft (airtanker, helicopter, and scooper) as well as for the two to three different types of aircraft within each class (for example, single engine airtanker, large airtanker, and very large airtanker). It was calculated as either a point estimate based on known outcomes, or as a range of probabilities that factor in unknown drop outcomes as either all ineffective or all effective. Probability of success is expressed as a value at or between 0 and 1.

- The point estimate of probability of success for all aircraft and all drops together was 0.82.

- Probability of success for all airtanker types considered together ranged from 0.64 to 0.74; for all helicopter types considered together ranged from 0.74 to 0.88; and for all scooper types considered together ranged from 0.72 to 0.90. The effectiveness of each of those aircraft classes was measured based on meeting or exceeding different sets of objectives while facing many different variables.

The 2020 report summarizes performance based on objectives, also summarizing across terrain, fuel, fire condition, and ground engagement. The information from the AFUE study is complex, reflecting the complexity of firefighting operations and fires themselves.

In sum, a number of studies have addressed questions about the effectiveness of aerial fire retardant. Those studies have used a variety of data types and sources to answer a number of different questions, including flame-scale studies of chemical interaction with fire, coarse-grained information correlating airtanker use and initial attack success, evaluations of cost-effectiveness, measures of probability of success for specific objectives, and others. It is clear from these studies, added to information in the 2011 FEIS and elsewhere, that aerial fire retardant is a tool that can be used effectively to achieve a variety of firefighting objectives. It is also clear that due to the dynamic and constantly shifting nature of wildfires, specific firefighting tactics can be difficult to evaluate individually, and that carefully planned studies such as the AFUE (USDA Forest Service 2020d) study, that specify parameters and methods in detail and that collect data from firefighting operations as they occur, can provide critical information to help managers refine use of firefighting tools.

#### 3.1.1.3 Fire Retardant Application Guidelines

This information was in section 3.1.2 of the 2011 FEIS, but has been placed as a subsection of section 3.1.1 (Affected Environment) here because it describes part of the existing situation. Information in the 2011 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 2011 FEIS (see Appendix A of the 2011 FEIS). The 2011 Record of Decision approved 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 Record of Decision included requirements resulting from the Endangered Species Act section 7 consultations (USDI Fish and Wildlife Service 2011 and NOAA Fisheries 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.

From implementation of the 2011 Record of Decision in 2012 through 2021, there have been 561 reported intrusions of aerially delivered retardant into avoidance areas (including waterways and their buffers), 259 of which were into waterways. Ninety-eight of the 561 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 (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 2011 FEIS analysis (pages 64-67) of the potential impacts of Alternative 1, which called for no aerial application of fire retardant, included information about potential effects on several aspects of firefighting, including exposure of ground personnel, air operations, and others. That analysis discussed potential impacts to use of ground personnel that could in turn affect initial attack tactics and success. As part of that analysis, the 2011 FEIS included information about the average initial attack success rate (also described in terms of the percent of all fires kept under 300 acres). Similarly, average annual flight hours for various aircraft used in aerial retardant delivery was discussed in the 2011 FEIS as a factor that could differ under different alternatives. The updated statistics are provided here for comparison with those used in the 2011 FEIS, but the degree to which they may differ under different alternatives is not possible to determine; 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.

- Ten-year average (2012 through 2021) 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 is the same as what was described in the 2011 FEIS. The effects of Modified Alternative 3 would be the same as those described for Alternative 3. The addition in Modified Alternative 3 of consultation procedures for adding new products to the Qualified Products List would not change the analysis as described in the 2011 FEIS.

The 2011 Record of Decision included specific direction under the heading 'Reporting and Monitoring', to help in determining whether under-reporting of fire retardant intrusions was occurring. This direction required the Forest Service to annually assess 5 percent of all fires less than 300 acres in size where aerially delivered fire retardant was used and where avoidance areas were present. From 2012 through 2018, 245 assessments were completed. Those assessments identified 35 intrusions, of which 28 were documented in the reporting system and 7 were not. If the 7 un-reported intrusions are added to the intrusions reported for the same timeframe, the percent of total fires with intrusions increases from 0.48 percent to 0.49 percent. Under-reporting of retardant intrusions occurs on a very small percent of fires. The purpose of this monitoring was to determine the amount of under-reporting that was occurring. That purpose has been achieved and there is no longer a need to continue monitoring.

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 2011 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 2011 FEIS.

The information presented in this document uses the analysis approaches described in the 2011 FEIS and the supporting 2011 soils report (see project file) and incorporates information from ecological risk assessments (Auxilio Management Services 2020, 2021a, 2021b, 2021c). Information displayed and discussed in Appendix H in the 2011 FEIS, which supports the analysis in the 2011 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 2011 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, and include magnesium chloride-based retardants. The analysis in this section has been updated to include information about potential impacts of those retardants.

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 2011 FEIS to between 9,831 and 25,820

acres (0.0105 percent to 0.0134 percent of National Forest System lands) as estimated from 2012 through 2021 (refer to SEIS Appendix C for data and information on calculation methodology).

## 3.2.2 Environmental Consequences

Because most of 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 2011 FEIS. This section adds information about magnesium chloride-based retardants that were not included in the 2011 FEIS.

### 3.2.2.1 Magnesium-chloride based retardants

Research and literature are limited with respect to the environmental effects of magnesium chloride on soil functions. Most of the available information pertains to its use as a de-icer or dust suppressant used on native surface and on paved roads, and focuses on impacts to water quality, vegetation, crop productivity, or aquatic organisms. Most discussion of soils addresses the movement of magnesium chloride from roads onto roadside soils. Nevertheless, this information is useful for estimating potential effects to soils. It is important to note, however, that use of magnesium chloride as a dust suppressant or de-icer involves repeated applications within a season and over consecutive years throughout the life of roadside vegetation. Studies based on those uses involve higher concentrations of salts than that resulting from drops of magnesium chloride-based aerial fire retardants. Repeated application of aerial retardant on the same location during a season or over a period of consecutive years is extremely unlikely.

#### *General Effects of Magnesium Chloride on Soils*

Magnesium chloride is a salt compound composed of magnesium and chloride ions. These are both essential nutrients found in soils and are important for normal plant growth. Chloride tends not to bind with silicates in soils and is not altered by soil organisms, so its movement within soil is largely determined by water flows (White and Broadley 2001) and can be easily leached out of the soil matrix. Plants need only very small amounts of chloride, generally supplied by rainfall in amounts sufficient for proper plant functioning and growth. Chloride-deficient plants are rarely observed. However, high concentrations of chloride can be toxic to plants with impacts ranging from reduced plant growth, to leaf scorching and needle tip burn, to dehydration and branch and tree die-back. Dry conditions that cause water stress and dehydration may aggravate chloride toxicity and cause more extensive damage. Some plants may be affected more than others; some plants usually found in or near salt marshes and saline arid environments may have some tolerance, but most plants are not considered to be salt tolerant.

Magnesium in soil originates from source rock material containing silicates; clay and silty soils tend to have higher magnesium contents than sandy soils (Gransee et al. 2013). Magnesium in soils with clay and organic matter is not very mobile, released only through weathering, which is a long-term, slow process. However, in some soils, magnesium can be very mobile and easily leaches out of the soil matrix. Magnesium in plants is essential for carbon fixation and photosynthesis (Jacob et al. 2009). The availability of magnesium to plants depends on factors related to the source rock material, including its weathering and other site-specific climatic factors (Gransee et al. 2013). High concentrations of magnesium chloride ions in the soil may be toxic or may inhibit the ability of some plants to access water and nutrients in the soil solution (Goodrich et al. 2009). High concentration of magnesium in soils may displace calcium and potassium (Goodrich et al. 2009), which are also necessary for plant growth.

In one study of the use of magnesium chloride as a dust suppressant, soil chloride fluctuated in roadside soils with increased application rates, precipitation, slope, and topography. Soil chloride and magnesium concentrations were similarly distributed between upper (0 to 30.5 cm) and lower (30.5 to 61cm) soil horizon samples. Nutritional and physical changes to soils were generally negligible and pH was not affected (Goodrich et al. 2009). As magnesium chloride application rates increased along nonpaved roads, either through applying a higher rate per application or applying a constant rate of a product more than once, soil chloride concentrations increased. Trees along roadsides and in drainage areas took up magnesium and chloride ions from the soil solution and accumulated them over time, often to toxic concentrations (Goodrich et al. 2009).

A study by the Colorado Department of Transportation found that application of magnesium chloride de-icer is highly unlikely to contribute to environmental degradation at distances greater than 20 yards from the roadway (Lewis 1999). The study also found that even close to the roadway the potential for magnesium chloride-caused damage was minimal. The literature review that preceded field and laboratory studies showed that magnesium and chloride are unlikely to produce adverse effects except under unusual circumstances and that while chloride may damage roadside vegetation, it is often diluted by runoff to the extent that it is unlikely to exceed the concentrations that are known to be harmful to aquatic life (Lewis 1999).

### *Potential Effects of Magnesium Chloride Aerial Fire Retardants*

The nationwide, programmatic scope of this decision makes it difficult to determine whether magnesium chloride would have direct or indirect effects on soil resources. There is vastly different geology, parent material, soil type and properties, as well as vastly different landscape positions and climate conditions across the National Forest system lands where magnesium chloride-based aerial fire retardants could be used. It is possible, though, to make some broad statements of potential effect, based on some assumptions regarding aerial fire retardant drops. Where retardant has largely remained on the canopy (generally closed-canopy forests) it may not contribute to magnesium chloride input to soil unless it remains unaffected by fire and a heavy precipitation event occurs shortly after application. Where retardant has been intercepted by vegetation and/or surface litter, which is assumed in the majority of drops, retardant components could be absorbed by plants, or subject to rainfall/wash-off or surface runoff and contribute to salts/nutrients leaching into the soil. In open-canopy vegetation types (e.g., juniper, sagebrush, manzanita and other shrubs generally at lower elevations and drier conditions) more retardant could land directly onto and subsequently leach into the soil.

In eastern forests elevated levels of acid deposition has led to acidification of soils in many regions, with losses of magnesium through leaching a concern (Watmough 2005). Soil acidity also impairs magnesium uptake by plants (Gransee et al 2013). These conditions have been associated with tree nutrient deficiencies, growth decline, and increased susceptibility to drought, freezing, and insect defoliation (Watmough 2005). Magnesium chloride-based fire retardant may have a positive effect, however slight, by adding magnesium to the acidic soil matrix.

In western-montane forests, even when there is a temporary absence of forest cover, leaching losses generally are minimal, due to relatively dry soil conditions especially in the aridic, xeric, and ustic moisture regimes. Leaching losses may be important on some of the moister sites with cryic temperature regimes (Harvey et al. 1991). A magnesium chloride-based fire retardant could have a positive effect, however slight, when adding magnesium to the moister sites with cryic temperature regimes. It may not influence other soil types as magnesium could be adsorbed onto

surfaces and chloride could be leached. Adding additional salt to soil in some arid and semiarid regions can negatively influence soil water uptake by plants.

Mobilization and leaching of magnesium and chloride in soil resources depends on soil texture, cation exchange capacity, site specific climatic factors, and soil acidity. Soils with higher risk for magnesium deficiency include 1) sandy soils, due to their high infiltration rate, 2) soils with low organic matter and clay particles for retention of magnesium and therefore increased leaching potential, and 3) high calcium ions in the soil matrix because magnesium is held less strongly to soil than calcium, which is another plant nutrient. A magnesium chloride-based fire retardant could have a positive effect, however slight, by adding magnesium to soil matrix.

The soil resource may be subject to increased magnesium and chloride ions in the soil matrix after application of magnesium chloride-based aerial retardant. However, due to the very limited number of applications at a specific site and the very limited area of applications, negligible impacts to the soil resource would be expected and any negative impacts would be at the site-specific location of a retardant application.

#### 3.2.2.2 All Aerially Delivered Retardants

Although the total acreage of National Forest System lands on which aerial fire retardant drops occurs has increased since the analysis in the 2011 FEIS, an increase of 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 at which the effects described in the 2011 FEIS might occur. Table 2 (page 75) in the 2011 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 9,831 and 25,820 acres on which effects could occur.

Table 2 (page 75) in the 2011 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 2021 the number of intrusions occurring within avoidance areas increased (refer to SEIS Appendix D). 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 2011 FEIS 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 2011 FEIS (USDA Forest Service 2011a).

Page 76 of the 2011 FEIS states that a determination was made by the Environmental Protection Agency (EPA) that a National Pollutant Discharge Elimination System (NPDES) permit was not required for use of aerially delivered fire retardant on National Forest System lands. The Forest Service re-initiated discussion with the EPA regarding the potential need for a NPDES permit, and at the time this SEIS is being prepared the agencies are in the process of developing a NPDES permit for the nationwide use of aerially delivered fire retardants. In February 2023 the

Forest Service and the Environmental Protection Agency entered into a Federal Facilities Compliance Agreement, the objective of which is to "cause the Forest Service to come into and remain in full compliance with all applicable Federal, state, and local laws and regulations … as required by… the Clean Water Act" (U.S. Environmental Protection Agency and USDA Forest Service, 2023).The agreement establishes requirements, including reporting of intrusions of aerially delivered fire retardant into waterways or their buffers. That agreement will remain in effect until the NPDES permit is in place.

### 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 2011 FEIS, with the following exceptions:

- Table 7 (page 80) in the 2011 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 2011 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 2011 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 or the 300-foot buffer. 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 2011 FEIS did not consider the effects of magnesium chloride, a retardant salt found in some retardant products currently on the Qualified Products list but not in products on the list as of 2011, so it is addressed in this SEIS. Most of the literature on environmental effects of magnesium chloride 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 magnesium chloride, except in the event of an accidental spill or direct application.

Modified Alternative 3 differs from the alternative selected in the 2011 Record of Decision by not requiring waterways without water, including dry intermittent streams, to be included in avoidance areas. In 2012, after consultation with the Fish and Wildlife Service, and consistent with provisions in the 2011 Nationwide Aerial Fire Retardant Biological Opinions, dry intermittent waterways (such as dry washes, arroyos, intermittent and ephemeral streams) were eliminated from avoidance area mapping in Forest Service Region 3. Similar action was taken by the Forest Service Pacific Northwest Region (Washington and Oregon) in mid-2012 (USDA

Forest Service 2012) and by individual National Forests in Forest Service Region 5 (California) (USDA Forest Service 2013), all in consultation with the Fish and Wildlife Service and/or NOAA Fisheries. Research based on experimental studies of runoff after retardant application in proximity to streams concluded "it is unlikely that fire retardant delivery from leaching or surface runoff will cause more than sublethal effects to fish" (Crouch et al. 2006). Intrusions into dry streams documented in recent consultations (USDC NOAA Fisheries 2022) indicated no observed mortality to fish. The most recent ecological risk assessment (Auxilio Management Services 2021c) considered a broad range of substrates, used daily rainfall data over 3 years, and included a 5-year storm event within 24 hours of retardant application, and assessed the potential for retardant to move from the edge of the application area into water. It indicated no measurable risk to aquatic species from runoff of long-term retardants analyzed in that assessment. The assessed situation is very similar to use of aerially delivered retardant in a dry stream followed by rainfall. The United States Geological Survey investigated the toxicity of retardants after aging on dry substrate. They applied retardant chemical to substrate and then at certain periods of time after application, they added water and fish in a rough simulation of water and fish entering a dry stream to which retardant has been applied. They found that toxicity of retardants declined over time, with the degree and rate of decrease depending on substrate, amount of time, and retardant formulation (Puglis et al. 2023). Individual national forests retain the option of including dry streams in mapped avoidance areas if local circumstances indicate a need to do so. Additional information is included in SEIS Appendix Q.

## 3.4 Aquatic Vertebrates and Invertebrates

The information presented in this section is in addition to that beginning on page 95 of the 2011 FEIS. Species lists and details regarding analysis, updated screening procedures, and determinations can be found in SEIS Appendix F and in the biological assessments (USDA Forest Service 2021a, 2021b, 2021c, 2021d, 2021e, 2022a, 2022b, and 2022c) and biological evaluations (USDA Forest Service 2023a and 2023b) in the project file. For aquatic species and habitats, two biological assessments (USDA Forest Service 2021a and 2021c) were prepared because some aquatic species fall under the jurisdiction of NOAA Fisheries and others fall under the jurisdiction of the 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 2011 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 2011 FEIS. Magnesium chloride was not included in the 2011 analysis but is used in some retardant products that are currently on the Qualified Products List that could be used 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 101 threatened, endangered, or proposed fish species, 11 threatened, endangered, or proposed crustaceans, 69 threatened or endangered bivalve species, and 10 aquatic gastropods that are considered in the current analysis. Candidate species are addressed along with sensitive species (refer to section

3.4.1.2 and to the biological evaluation (USDA Forest Service 2023a and 2023b) in the project file). Designated critical habitat for 80 aquatic species is also considered.

#### 3.4.1.2 Regional Forester Sensitive Species

Lists of Regional Forester sensitive species have been updated since 2011. Lists were obtained in 2019 for this analysis. There are 342 species, including 159 fish species (one of which is also identified as a candidate species for potential federal listing), 60 bivalve species, 80 crustacean species, and 43 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 0.81percent
- 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).

Information about retardant use and intrusions has been updated to include data through 2021 elsewhere in the SEIS, but only data through 2019 was available at the time the analysis summarized here was completed. The intrusion rate through 2021 based on total aerial retardant drops is 0.69 percent, and based on total fires is 0.44 percent. This updated information supports the assumptions used in the analysis here.

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. For aquatic sensitive species the analysis assumed that all aquatic species and habitats are in avoidance areas. Determinations rely

on the likelihood of retardant use on the unit, as well as on whether the species occurs on more than one unit, or more than one location within a unit.

All species that are currently listed as threatened or endangered, that are proposed for listing, are identified as candidates for listing under the Endangered Species Act, or that are identified as sensitive species were screened regardless of determinations made in 2011 or subsequent consultations. 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 (including such things as species distribution or abundance, new information about threats and stressors, etc.). Species lists, occurrences, and descriptions of the screening process can be found in the biological assessments (USDA Forest Service 2021a and 2021c) and biological evaluations (USDA Forest Service 2023a and 2023b) 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 2011 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.

#### 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 2011 FEIS.

Information on the trend in fire occurrences has been updated to include data from 2012 through 2019 (refer to SEIS Appendix C, which is updated through 2021), 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 (USDA Forest Service 2021c) in the project file). 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 (USDA Forest Service 2011b and 2011c) and on pages 102 through 104 in the 2011 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 2011 FEIS (note that in the 2011 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 2012 through 2019, 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 current 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 5100-304). Information about results from testing is maintained on the Wildland Fire Chemicals website (https://www.fs.usda.gov/rm/fire/wfcs/product-performance-and-test-results.php). Table 3a is similar to Table 11 in the 2011 FEIS, showing the measured toxicity to fish of retardants currently on the Qualified Products List.

**Table 3a. Summary of toxicity to fish of fire retardants currently approved for use by the USDA Forest Service**

| Qualified Retardant[1] | Toxicity to fish ($LC_{50}$)[2] |
|---|---|
| Phos-Check LC-95A-R | 386 |
| Phos-Check LC-95A-Fx | 399 |
| Phos-Check LC-95A-W | 465 |
| Phos-Check MVP-Fx | 2,024 |
| Phos-Check 259-Fx | 860 |
| Phos-Check LCE20-Fx | 983 |
| Fortress FR-100 | 1,762 |
| Fortress FR-200-LLX | 3,672 |

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 LC50 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)

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 2011 FEIS, as well as additional, more recent research.

Under the proposed action (Modified Alternative 3), new retardants could be approved without further consultation if they meet all requirements in the specification, have the same or lower toxicity levels as those displayed in Table 3a, and if assessments do not identify any new risk factors that have not been evaluated in completed consultations. Any new products that do not meet all of those criteria would require, at a minimum, re-initiation of consultation.

Table 3b displays the limits for retardant ingredients that were established based on products that have been analyzed in completed consultations. Products that use new ingredients not listed in

Table 3b would be analyzed and limits on those ingredients would be established after consultation is completed.

**Table 3b. Upper limits for amount of active ingredients in qualified retardants[1], expressed as pounds per square foot at specified coverage levels, of fire retardants currently approved for use by the USDA Forest Service**

| Ammonium phosphate based retardants | $NH_3$ [2] at 4 GPC[3] coverage | $P_2O_5$ [4] 4 GPC coverage | $NH_3$ at 8 GPC coverage | $P_2O_5$ 8 GPC coverage |
|---|---|---|---|---|
| Phos-Check LC-95A-R | 0.0095 | 0.0301 | 0.0190 | 0.0602 |
| Phos-Check LC-95A-Fx | 0.0095 | 0.0273 | 0.0191 | 0.0546 |
| Phos-Check LC-95A-W | 0.0095 | 0.0276 | 0.0191 | 0.0553 |
| Phos-Check MVP-Fx | 0.0053 | 0.0199 | 0.0105 | 0.0399 |
| Phos-Check 259-Fx | 0.0070 | 0.0203 | 0.0140 | 0.0406 |
| Phos-Check LCE20-Fx | 0.0073 | 0.0208 | 0.0147 | 0.0415 |
| **Magnesium phosphate based retardants** | **Mg [5] at 4 GPC coverage** | **Cl [6] at 4 GPC coverage** | **MG at 8 GPC coverage** | **Cl at 8 GPC coverage** |
| Fortress FR-100 | 0.0093 | 0.0270 | 0.0185 | 0.0541 |
| Fortress FR-200 LLX | 0.0094 | 0.0275 | 0.0188 | 0.0549 |

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 Ammonia shown in pounds per square foot
3 GPC = gallons per 100 square feet
4 Phosphate shown in pounds per square foot
5 Magnesium shown in pounds per square foot
6 Chloride shown in pounds per square foot

### *Sublethal and Indirect Effects to Aquatic Species*

The ecological risk assessment (Auxilio Management Services 2020, 2021a, 2021b, 2021c) also evaluated potential toxicity to prey species, including representative macroinvertebrate 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 or 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. From 2012 through 2019 there were twenty intrusions that resulted in take (USDA Forest Service 2021a, 2021c). 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.

As a result of public comment on the draft SEIS, the use of airtanker bases and jettison areas was identified as a connected action (see section 2.3). Species found in or adjacent to those areas were included in an addendum consultation (USDA Forest Service 2022c) that assessed effects associated with aerial fire retardant operations at airtanker bases and jettison areas. The potential for effects due to toxicity and disturbance for those species would be as described in the 2011 FEIS and as updated in the SEIS. The summary of determinations below includes the additional species.

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 (USDA Forest Service 2021a and 2021c) for details):

- 66 species (36 bivalves, 4 crustaceans, 20 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), and use of avoidance areas limits the probability of retardant entering habitat.
- 71 species (33 bivalves, 6 crustaceans, 29 fish, and 3 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.
- 54 species (1 crustacean, 52 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 80 designated critical habitats evaluated, 23 (12 bivalves and 11 fish) would experience no effect, 21 (14 bivalves, 2 crustaceans, and 5 fish) may be affected but are not likely to be adversely affected (no changes to the physical and biological features of critical habitat, and they are protected with avoidance areas), and 36 (35 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 342 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. No species were found to trend toward federal listing as a result of aerial fire retardant use. Details regarding

determinations for each species are in the biological evaluation (USDA Forest Service 2023b) in the project file.

#### 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 2011 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 are assumed to be minimal, 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 2011 FEIS. Species lists and details regarding analysis, screening procedures, and determinations can be found in SEIS Appendix F and in the biological assessment (USDA Forest Service 2021c) and the biological evaluation (USDA Forest Service 2023a) 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 it is used in some retardant products that are currently on the Qualified Products List and could be used on National Forest System lands.

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

A total of 193 federally listed plant species and one federally listed fungus species occur or are suspected of occurring on National Forest System lands included in this analysis.

#### 3.5.1.2 Regional Forester Sensitive Species

Lists of Regional Forester sensitive species have been updated since 2011. Lists were obtained in 2019 for this analysis. This analysis addresses 2,454 sensitive plant species occurring on National Forest system lands where aerially delivered retardant may be used.

The biological evaluation (USDA Forest Service 2023a) in the project file includes species lists and determinations for species on each National Forest, all of which has been updated 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 2011 FEIS, to approximately 4.5 million acres currently. The 2011 FEIS reported approximately 753 of these species with known occurrences at that time, compared to approximately 1,100 species currently. Refer to SEIS Appendix F and the biological evaluation (USDA Forest Service 2023a) 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 2011 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; note that information about retardant use and intrusions has been updated to include data through 2021 elsewhere in the SEIS, but only data through 2019 was available at the time the analysis summarized below was completed (refer to the biological assessment (USDA 2021c) and biological evaluation (USDA Forest Service 2023a) for more detail):

- Information about the amount of aerially delivered fire retardant used on each National Forest between 2012 and 2019 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 Endangered Species Act section 7 consultations will be followed.
- If an intrusion results in an increase in non-native invasive plant species in an avoidance area, invasive plants will be removed in compliance with existing forest or regional plans. If no plans exist, appropriate mitigation, remediation, or control efforts will be considered 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 is less than 0.2 percent of any individual National Forest, and less than 0.02 percent of the National Forest System land base annually.

The effects determinations for federally listed and sensitive species in the biological assessment (USDA Forest Service 2021c), biological evaluation (USDA Forest Service 2023a), 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 2011 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 Endangered Species Act, or that are identified as sensitive species were screened regardless of determinations made in 2011 or subsequent consultations. 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 (including such things as species distribution or abundance, new information about

threats and stressors, etc.). Species lists, occurrences, and descriptions of the screening process can be found in the biological assessment (USDA 2021c).

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 2011 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 2011 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, USDA Forest Service 2023a).

##### *Phytotoxicity*

The analysis summarized in this SEIS considered fire retardants approved for use by the Forest Service as of mid-2021. Discussion in the 2011 FEIS of the phytotoxic effects of retardants (2011 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 2011 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 National Forest System lands annually, estimated to be less than 0.2 percent by any individual forest and less than 0.02 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 some retardant products that are on the Qualified Products List that could be used on National Forest System lands. Information is not available regarding the potential 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). However, high concentrations of chloride in soils can be toxic to plants with impacts ranging from reduced plant growth, to leaf scorching and needle tip burn, to dehydration and branch and tree die-back (refer to section 3.3.2 regarding potential impacts to soils). Some plants may be affected more than others. Accumulations in soil are unlikely, however because 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 F and to the biological assessment (USDA 2021c) 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.
- 76 species (75 plants and 1 fungus) 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 35 critical habitats evaluated, 4 are expected to have no effects resulting from use of aerially delivered fire retardant, and 31 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 2,454 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. No species were found to trend toward federal listing as a result of aerial fire retardant use. Details regarding determinations for each species are in the biological evaluation (USDA Forest Service 2023a) in the project file.

#### 3.5.2.5 Cumulative Effects to Plant Species and Habitats

There are no changes or additions to the effects as discussed in the 2011 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 2011 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 2011 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 2011 FEIS. Species lists and details regarding analysis, screening procedures, and determinations can be found in SEIS Appendix F and in the biological assessment (USDA Forest Service 2021c and addendums USDA Forest Service 2021d, 2021e, 2022a, 2022b, and 2022c) and biological evaluation (USDA Forest Service 2023b) 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 2011 FEIS. Magnesium chloride was not included in the 2011 analysis but is used in some retardant products that are currently on the Qualified Products List and could be used 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 (e.g., USDA Forest Service 2017 and others). The analysis for this SEIS addresses all species currently listed, regardless of prior consultations (refer to the biological assessment (USDA Forest Service 2021c, and addendums USDA Forest Service 2021d, 2021e, 2022a, 2022b, and 2022c)). There are 145 threatened, endangered, or proposed wildlife species that are considered in the current analysis. Designated critical habitat has been updated since 2011, and critical habitat for 80 wildlife species is considered in this analysis.

#### 3.6.1.2 Regional Forester Sensitive Species

Lists of Regional Forester sensitive species have been updated since 2011. Lists were obtained in 2019 for this analysis. There are 720 wildlife species, including 134 birds, 89 mammals (including one candidate for federal listing), 67 amphibians, 48 reptiles, 260 insects/springtails (hexapods) (including one candidate for federal listing), 12 centipedes/millipedes (myriapods), 6 worms, 12 arachnids, and 93 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 (USDA Forest Service 2023b) in the project file).

## 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 in 2011, with some updates and clarifications (refer to SEIS Appendix E), was used to determine effects to wildlife species for this analysis. 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 (USDA 2021c) 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 (USDA Forest Service 2023b)). 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 in 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). Note that information about retardant use and intrusions has been updated elsewhere in the SEIS and appendices to include data through 2021, but only data through 2019 was available at the time the analysis summarized here was completed.

All species that are currently listed as threatened or endangered, that are proposed for listing, are identified as candidates for listing under the Endangered Species Act, or that are identified as sensitive species were screened regardless of determinations made in 2011 or subsequent consultations. 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 (including such things as species distribution or abundance, new information about threats and stressors, etc.). Species lists, occurrences, and descriptions of the screening process can be found in the biological assessment (USDA Forest Service 2021c, and addendums USDA Forest Service 2021d, 2021e, 2022a, 2022b, and 2022c).

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 2011 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, including species protected under the Migratory Bird Treaty Act.

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, and sensitive species is expected to be similar to that reported in the 2011 FEIS.

#### 3.6.2.2 General Effects Common to All Wildlife Species

The effects of aerial retardant chemicals would be the same as described on pages 127-130 of the 2011 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 current 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 was not included in the 2011 analysis but is used in some retardants currently on the Qualified Products List that could be used on National Forest System lands. Little published data is available on the use of magnesium chloride in aerially delivered retardant. Jones (2017) examined the effects of magnesium chloride 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 magnesium chloride, was addressed in ecological risk assessments (Labat Environmental 2017 and Auxilio Management Services 2020 [ammonium phosphate-based retardants] and Auxilio Management Services 2021 [ammonium phosphate and magnesium chloride based retardants]). The assessments use procedures similar to those described in the 2011 biological assessment (USDA Forest Service 2011b) and 2011 biological evaluation, and indicate effects similar to those described in the 2011 FEIS (pages 128-129).

Under the proposed action (Modified Alternative 3), new retardants could be approved without further consultation if they meet all requirements in the specification, have the same or lower toxicity levels as those displayed in Table 3a (section 3.4.2), and if assessments do not identify any new risk factors that have not been evaluated in completed consultations. Any new products that do not meet all of those criteria would require, at a minimum, re-initiation of consultation. Table 3b (section 3.4.2) displays the limits for retardant ingredients that were established based on products that have been analyzed in completed consultations. Products that use new ingredients not listed in Table 3b would be analyzed and limits on those ingredients would be established after consultation is completed.

#### 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 F and to the biological assessment (USDA Forest Service 2021c, and addendums USDA Forest Service 2021d, 2021e, 2022a, 2022b, and 2022c) for details):

- 40 species (5 amphibian, 13 bird, 6 insect, 6 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.

- 69 species (5 amphibian, 11 bird, 7 insect, 31 mammal, 13 reptile, 1 arachnid, and 1 terrestrial gastropod) 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.
- 35 species (13 amphibians, 4 bird, 1 terrestrial gastropod, 11 insect, and 6 mammal) are likely to be adversely affected by the use of aerially delivered retardant, due to changes in habitat, disturbance, or estimated toxicity.
- One experimental non-essential bird population is not likely to be jeopardized by the use of aerial fire retardant.
- Of the 51 critical habitats evaluated; 15 (2 amphibian, 3 bird, 2 insect, 8 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 7 (6 insect, 1 amphibian) 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 716 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. No species were found to trend toward federal listing as a result of aerial fire retardant use. Details regarding determinations for each species are provided in the biological evaluation (USDA Forest Service 2023b) in the project file.

#### 3.6.2.5 Effects to Species Protected Under the Migratory Bird Treaty Act and Bald and Golden Eagle Protection Act

This section supplements information in section 3.6.2 of the 2011 FEIS.

The North American Bird Conservation Initiative has found that large-scale habitat loss from fire is a primary risk for birds and that restoration of natural fire regimes is critical for sustaining long term health of the ecosystems they use, particularly considering climate change (North American Bird Conservation Initiative 2011, 2022). Analysis for species listed under the Endangered Species Act and for sensitive species provides information about the potential for impacts to the broad array of wildlife species found on National Forest System lands, including species protected under these acts. While there is potential for aerial retardant drops to cause short-term impacts to migratory birds and eagles as described in the 2011 FEIS (section 3.6.2) biological assessment (USDA Forest Service 2021c), and in the biological evaluation (USDA Forest Service 2023b), most birds can flee areas where retardant could be dropped. Modified Alternative 3 allows for avoidance areas to be "adjusted or established based on local conditions, including … to protect other biological or cultural resources" (refer to section 2.1.4 of this document). Potential impacts from retardant are not expected to cause population level declines.

Over the long term, aerial application of fire retardant may help prevent wildfires from consuming avian species habitat at large scales.

#### 3.6.2.6 Cumulative Effects to Wildlife Species and Habitats

There are no changes to the cumulative effects discussed in the 2011 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 2011 FEIS. Information sources, references, and other methodology details are in an updated specialist report in the project file.

The Environmental Justice section of the 2011 FEIS (page 149) has been updated as described below. Refer also to the Environmental Justice and Civil Rights report in the project file.

### Economic Considerations

### 3.7.1 Affected Environment

The numbers included in the paragraphs below replace those in the corresponding section of the 2011 FEIS on pages 139-140. These numbers also replace the corresponding information in Table 16 on page 140 of the 2011 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 National Forest System 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 2011 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

The overall methodology used for updating the information in this document is the same as that described on pages 140 -141 in the 2011 FEIS. The reference to the 2010 Interagency Aerial Supervision Guide on page 141 in the 2011 FEIS is updated here to refer to the current Standards for Aerial Supervision (National Wildfire Coordinating Group 2020).

This section provides information about assumptions used in analysis updates for this SEIS. The assumptions discussed in the 2011 FEIS beginning on page 142 remain unchanged unless specifically stated here. Refer to the 2011 FEIS or to the Social and Economic Considerations specialist reports in the project file for additional information and references. Some discussion in the 2011 FEIS refers to information found in other chapters or sections of the 2011 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 2011 FEIS. Cost estimates are updated to include information gathered through 2019, reflecting the data available at the time this analysis was completed.

### 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 2011 FEIS. This cost would be zero for Modified Alternative 3. Refer to the specialist report in the project file 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 were reported to the Fish and Wildlife Service and NOAA Fisheries. 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 biological assessments (USDA Forest Service 2021a, 2021b, 2021c, 2021d, 2021e, 2022a, 2022b, 2022c). 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 2011 FEIS.

### 3.7.2.1 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 2011 FEIS.

**Table 4. Estimated Annual Costs, by Alternative**

| | Annual Cost of Aerial Retardant Application | Annualized Cost of Mapping | Annual Cost of Small Fire Monitoring | Annual Cost of Intrusion Assessment and Consultation | Total Cost of Compliance | Other Suppression Costs |
|---|---|---|---|---|---|---|
| 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 on page 143 of the 2011 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 2011 FEIS.

### *Effects of Alternative 1*

The 2011 FEIS provides a discussion about the use of water instead of retardant, the consequent greater 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 the project file 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 2011 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 2011 FEIS (section 3.7.2, pages 143-144).

### *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 of estimated compliance costs under Alternative 2 would be associated with avoidance area mapping ($1.04 million annually), 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 2011 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 2011 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 2011 FEIS for Alternative 3.

### 3.7.2.2 Summary of Economic effects

Table 19 (p. 148) in the 2011 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 2011 FEIS Table 19 for Alternative 3 would be the same under Modified Alternative 3.

## Environmental Justice and Civil Rights (Social Considerations)

The information in this section updates and supplements information in the 2011 FEIS (section 3.7, page 149) and in the Social and Economics Considerations section (section 3.7) of the draft SEIS.

Environmental justice refers to the just treatment and meaningful involvement of all people, regardless of income, race, color, national origin, Native American Tribal affiliation, or disability, in agency decision making and other Federal activities that affect human health and the environment so that people: (1) are fully protected from disproportionate and adverse human health and environmental effects (including risks) and hazards, including those related to climate change, the cumulative impacts of environmental and other burdens, and the legacy of racism or other structural or systemic barriers; and (2) have equitable access to a healthy, sustainable, and resilient environment in which to live, play, work, learn, grow, worship, and engage in cultural and subsistence practices (Executive Order 14096, 2023). Executive Order 12898 and Departmental Regulation 5600-002 direct the Forest Service to identify and address, as

appropriate, disproportionately high and adverse human health or environmental effects on minority and low-income populations (Executive Order 12898, 1994).

This analysis considers the potential civil rights impacts of the proposed action and alternatives for persons, groups, or classes of persons protected under Federal law, regulation or policy from discrimination. Environmental justice and civil rights are distinct areas of consideration regarding the impacts of federal decisions, but they are integrated in this analysis because they rely on the same data and similar methods.

### 3.7.3 Methodology

The proposed action would apply to future wildland fire locations on National Forest System lands throughout the United States, and has the potential to impact people residing in proximity to National Forest System lands where aerial retardant may be used. Because the locations of future fires and of aerial retardant use are unknown, this analysis considers the potential for impacts of the programmatic decision on fire response personnel and residents of counties containing National Forest System lands (hereafter referred to as 'NFS footprint counties'). This analysis considers the demographic characteristics of counties to identify potential effects on minority and low-income populations, protected classes, and Tribes. County-level data from the American Community Survey were used. This data uses 5-year estimates derived from pooled survey data from 2017 through 2021. The demographics of NFS footprint counties were compared to a baseline of the demographics of the total U.S, including Puerto Rico, population. Refer to the report in the project file for additional details regarding methodology and data used in this analysis.

### 3.7.4 Affected Environment

In aggregate, the demographic characteristics of NFS footprint counties are very similar to the demographic characteristics of the total population of the U.S. and Puerto Rico, with some exceptions. The largest difference between the racial composition of NFS footprint counties and the reference population is in the percentage of people who identify as Black or African American alone: while 12.5 percent of the U.S./Puerto Rico population is Black or African American alone, only 5.9 percent of people in NFS footprint counties are in this category. Demographic differences between the population of NFS footprint counties and the U.S./Puerto Rico population are most pronounced in terms of ethnicity. While an estimated 19.2 percent of the U.S./Puerto Rico population is Hispanic or Latino of any race, an estimated 26.0 percent of the population of NFS footprint counties identify as Hispanic or Latino of any race. The poverty rate, age and sex distribution, and proportion of people with disabilities in NFS footprint counties are each very similar to demographic patterns in the total U.S./Puerto Rico population. Refer to the specialist report in the project file for details of the data described above. Based on a threshold of 5 percentage points in a meaningfully greater analysis (United States Environmental Protection Agency 2016), the aggregate population of NFS footprint counties is considered an environmental justice population based on the percentage of Hispanic or Latino individuals in these counties.

An historical legacy of purposeful actions by the Federal government separated Native Americans from their lands and communities, interrupting cultural and religious practices that had been practiced for countless generations and were integral to their survival. Sacred sites and their associated values and cultural and religious practices represent a vulnerability specific to Tribes and individual Native Americans when actions on National Forest System lands are

proposed. Unique pathways of risk or vulnerabilities specific to other environmental justice communities that apply generally to the entire affected environment have not been identified.

## 3.7.5 Environmental Consequences

This analysis includes discussion of potential impacts of the No Action alternative (no use of aerially delivered fire retardant) and discussion of potential impacts of the action alternatives (2011 FEIS Alternative 2, 2011 FEIS Alternative 3, and Modified Alternative 3) considered together.

Retardant has been applied to between 9,831 and 25,820 acres, or less than 0.0134 percent of National Forest System lands on average annually between 2012 and 2021 (refer to section 3.1.1 of this SEIS). The potential for direct exposure of humans to aerially applied fire retardant is therefore low.

### 3.7.5.1 Alternative 1: No Aerial Application of Fire Retardant (No Action)

Under the No Action alternative, there would be no aerial application of fire retardant on NFS lands, and thus no impacts, environmental justice concerns, or civil rights implications from aerial retardant use. This analysis assumes that without use of aerially delivered fire retardant, there is potential for larger and longer duration fires, which may translate to increased risk of exposure to fire for firefighters and the general public (refer to 2011 FEIS section 3.1.3). Adverse impacts to natural resources or public infrastructure on National Forest System lands or other public or private property that result from wildfire events on those lands may disproportionately affect those who identify as Hispanic or Latino, since these individuals are disproportionately represented in the aggregate of counties containing National Forest System lands. However, because impacts are based on the location of individual fires, which are not evenly distributed across National Forest System lands, the demographic characteristics of populations actually impacted by fire events would vary and cannot be specifically predicted.

### 3.7.5.2 Alternatives 2 and 3 (Aerial Application of Fire Retardant), and Modified Alternative 3: Continued Aerial Application of Fire Retardant, with Modifications (SEIS Proposed Action)

Under Alternative 2 as described in the 2011 FEIS, Alternative 3 as described in the 2011 FEIS and the 2011 Record of Decision, and Modified Alternative 3 (the SEIS proposed action), aerially delivered fire retardants could be applied on National Forest System lands as a component of firefighting operations. These alternatives are largely similar, with Alternative 3 and Modified Alternative 3 including some additional restrictions on retardant application and requirements for intrusion reporting as compared to Alternative 2.

Under all three action alternatives, decisions about application of fire retardant would apply across all National Forest System lands regardless of the race, ethnicity, gender, age, or disability status of potentially affected individuals. The proposed action and the other action alternatives do not contain requirements related to eligibility, benefits, or services that would apply differently to members of any protected classes, or that would prevent minorities, women, or persons with disabilities from benefiting from use of aerially delivered fire retardant or from receiving information from the Forest Service about the use of aerial fire retardant. There is no indication that low-income or minority populations or members of any protected groups have been disproportionately impacted by or benefitted from aerial application of fire retardants on National Forest System lands thus far.

Adverse and beneficial impacts associated with aerial application of fire retardants may have the potential to disproportionately affect individuals who are Hispanic or Latino because these populations are estimated to be disproportionately represented in the aggregate of counties containing National Forest System lands. However, because impacts depend on the location of individual fires, which are not evenly distributed, the demographic characteristics of populations actually impacted by fire events would vary and cannot be specifically predicted.

Environmental justice impacts tend to be highly localized geographically and typically occur close to project activities. While the environmental justice and civil rights implications of localized applications of fire retardant are impossible to anticipate for a programmatic decision, potential vulnerabilities of low-income and minority populations and protected classes related to their physical proximity to National Forest System lands, subsistence harvest of food products on National Forest System lands, and access to cultural resources and sacred sites can be considered.

Reported rates of aerial application of fire retardant suggest that the potential for direct exposure to fire retardant in communities in the vicinity of National Forest System lands is low (see SEIS section 3.1.1.1), and made lower because fire areas are generally closed to public access during firefighting operations. All long-term fire retardants used by the Forest Service are evaluated for toxicity before being placed on the Qualified Products List. A programmatic health risk assessment of long-term fire retardants used in wildland firefighting determined that retardants pose negligible health risk to people entering areas where retardant has been applied (e.g., for recreation, hunting, or research) (Auxilio Management Services, 2021c; see FEIS Section 3.8 and SEIS section 3.8). Some low-income populations rely on subsistence harvest of fish, wildlife, plants, and other forest products from National Forest System lands. The health risk assessment concluded that dermal exposure to retardants present on harvested food presents negligible risk to people. However, use of some retardants may lead to temporary increases in nitrate levels in soils and subsequent concentration of nitrates in vegetation and other food products (Auxilio Management Services, 2021c). Associated health risks from ingested nitrates are highest for infants, and all individuals are advised against consuming garden or wildland foods from areas where retardants have been applied (Auxilio Management Services, 2021c).

Provisions in Alternative 3 and Modified Alternative 3 geographically limit the use of retardants and therefore minimize its potential impacts on parts of the human environment. Both alternatives require use of avoidance areas in which application of aerial fire retardant is prohibited in order to avoid, limit, or mitigate potential impacts to specified resources. These resources include waterways, which provide critical ecosystem services to surrounding communities, and also include cultural resources. Sacred sites and their associated values and cultural and religious practices represent a vulnerability specific to Tribes and individual Native Americans from actions on National Forest System lands. Modified Alternative 3 requires annual consultation with Tribes to identify avoidance areas needed to protect cultural resources or sacred sites, which can include fish, wildlife, plants, and related habitats. It also clarifies that cultural resources cannot be mapped or addressed based on a nationwide protocol or prescription, and thus stresses the need for interaction at the local level (see SEIS Appendix Q, CS26 – Tribal Consultation), consistent with the meaningful engagement dimension of environmental justice. These provisions address some of the unique pathways of exposure for Tribes and Native American or Alaska Native individuals that arise from cultural relationships with sites on National Forest System lands. Under Modified Alternative 3, in the event of a retardant drop that impacts Tribal resources, the Forest Service will consult with the Tribe to

determine an appropriate course of action to mitigate or resolve the adverse effect. The proposed action is responsive to information gathered through Tribal consultation on the 2011 FEIS, public comment on the draft SEIS (see SES Appendix Q), and lessons learned through implementation of the 2011 decision. Tribal concerns raised regarding aerial application of fire retardants and analysis of potential impacts to cultural resources are addressed by Modified Alternative 3.

No other unique pathways of risk or vulnerabilities specific to other communities with environmental justice concerns or protected classes pertinent to aerial application of fire retardants across all National Forest System lands have been identified.

#### 3.7.5.3 Cumulative Effects of Alternatives 2, 3, and Modified Alternative 3

While repeated application of aerial retardant on the same location during a season or over a period of consecutive years is extremely unlikely (SEIS Section 3.2.2.1), effects from the aerial application of fire retardant will interact with other management actions undertaken in the same location and timeframe. For example, impacts to subsistence foods from aerial application of fire retardants in areas already impacted by vegetation management could further reduce access to these forest products for low-income communities. Any cumulative effects are expected to be temporary due to the short-term nature of retardant use.

## 3.8 Public Health and Safety

The information presented in this section is in addition to that presented beginning on page 150 of the 2011 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 2011 FEIS.

For clarity and currency, note that the specifications for chemicals referred to on page 150 of the 2011 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 2011 FEIS to the specifications for long-term retardant should be interpreted as referring to the appropriate (current at the time) version.

### 3.8.2 Environmental Consequences

Two magnesium chloride-based retardant products were evaluated in a Health Risk Assessment (Auxilio Management Services 2021c). The assessment concluded, “for typical and maximum exposures, all products as a whole and individual ingredients were predicted to pose negligible risk to fire-fighting personnel”, as well as to anyone exposed in the unlikely event of an accidental drenching or to people entering areas where retardant has been applied.

The Forest Service is identifying information, conducting additional corrosion and material performance studies, and carrying out an Integrated Operational Field Evaluation to obtain information about potential interactions of magnesium chloride-based retardants with other retardants.

There are no changes to the effects of Alternatives 1, 2, and 3 as described in the 2011 FEIS. The effects of Modified Alternative 3 would be the same as those described in the 2011 FEIS for Alternative 3.

# 3.9 Tribal and Cultural Resources

The information presented in this section is in addition to that beginning on page 155 of the 2011 FEIS. The 2011 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'.

The 2011 FEIS did not identify Tribal resources and concerns separately from general cultural resources and concerns. The term 'cultural resources' can refer to a broad array of resources that include buildings, landmarks, archeological sites and artifacts, resources of significance to Tribes or other entities, and others. Tribal resources, however, are specific to Tribal entities and may include archeological, historic, and modern resources as well as plants, animals, natural sites, and other resources of significance to Tribes. Due to the nationwide, programmatic scale of this analysis and decision, the Forest Service has not analyzed these separately from other cultural resources that could potentially be impacted by aerially delivered fire retardant. Refer also to section 3.7 (Environmental Justice and Civil Rights), and refer to the 2023 Record of Decision for information regarding conformance with law, regulation, and policy pertaining to Tribal rights and resources. Refer also to the response to Concern Statement 26 in SEIS Appendix Q.

## 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 2011 FEIS) are currently inventoried on National Forest System lands. There are currently 20 national historic landmarks (compared to 19 as reported in the 2011 FEIS). All other information presented in the Affected Environment section of the 2011 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 2011 FEIS.

### 3.9.2.2 Modified Alternative 3

The effects described for Alternative 3 in the 2011 FEIS would also occur if Modified Alternative 3 were to be implemented.

In addition to the effects described in the 2011 FEIS, further consideration has been given to the direction included in Modified Alternative 3 for coordination with Tribes and cultural resource specialists prior to aerial application of fire retardant. Modified Alternative 3 requires consultation with local Tribes "to identify any avoidance areas needed to protect cultural resources or sacred sites." (refer to section 2.1.4, 'Avoidance Area Mapping Requirements', in this document). This coordination would likely create management context and actions so that

any use of aerial retardant would not adversely affect the integrity of cultural or Tribal 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 2011 FEIS. The analysis in the 2011 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 National Forest System lands.

## 3.10.1 Affected Environment

There are no changes to the description of scenery resources found in the 2011 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 2011 FEIS, but there are potentially more acres of National Forest System 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 2011 FEIS, the following effects could occur as a result of colorants used in aerial retardants. In addition to the reddish color discussed in the 2011 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 (fading) pigment (refer to the “Long Term Retardant Fact Sheet” on the Wildland Fire Chemicals – Long-Term Fire Retardant website). Pigment categorized as ‘uncolored’ (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, fifty percent of retardant used contained fugitive colorant, and in 2022 eighty percent of retardant used contained fugitive colorant (see project file). If the trend toward more use of fugitive colorant continues, effects to scenic resources would diminish.

Effects to scenic 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 2011 FEIS. In the 2011 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 2011 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 2011 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 2011 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 2011 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 2011 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 2011 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 2011 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 2011 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 2011 FEIS, in this document, and in the project file).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 2011 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 2011 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 2011 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 2011 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 (Abatzoglou and Williams 2016). Many forested regions in the western U.S. are expected to experience more high-severity wildlfires as a result of climate change, as well (Westerling et al.

2006). 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. Increasing fire severity, or more land burned at higher severity can release more carbon dioxide with greater mortality of vegetation and as soils are increasingly heated and burned. Regeneration of trees and reforestation efforts are often less successful after an area has burned as high severity (Stevens-Ruman and Morgan, 2019), therefore changing the potential of carbon dioxide to be removed from the atmosphere and sequestered as before the fire.

Application of fire retardant is 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 2011 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 2011 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 5$^{th}$ 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. Note that information about retardant use and intrusions has been updated elsewhere in the SEIS and appendices to include data through 2021, but only data through 2019 was available at the time the analysis summarized here was completed.

**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) (https://www.epa.gov/climateleadership/ghg-emission-factors-hub) .

**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 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

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 time period corresponding to data used in other analyses in this document, 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 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 |
| 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 impractical and unrealistic to attempt a quantitative estimate of the net amount of greenhouse gas emissions related to aerial retardant delivery. Attempting to estimate potential emissions from avoided wildfire or from the application of retardant versus water, particularly when use of water may increase if retardant were not available, is hampered by incomplete scientific understanding and a high level of uncertainty. It is therefore not possible to put the estimates in Table 7 in the context of what might be generated in the absence of aerial retardant use, or under various alternatives for retardant use.

The projections through 2029 (Table 7) 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 2011 FEIS Table 2, p. 41, and 2011 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 2011 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 2011 FEIS, in the corresponding SEIS section if needed, and in the biological assessments (USDA Forest Service 2021a, 2021b, 2021c, 2021d, 2021e, 2022a, 2022b, 2022c).

## 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 2011 FEIS did not explicitly address irreversible and irretrievable commitments of resources, so that information is provided here for all alternatives, including those considered in the 2011 FEIS as well as for Modified Alternative 3 as analyzed in the SEIS.

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 2011 FEIS, in the corresponding SEIS section if needed, and in the biological assessments (USDA Forest Service 2021a, 2021b, 2021c, 2021d, 2021e, 2022a, 2022b, and 2022c).

## 3.16 Unavoidable Adverse Effects

The 2011 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 2011 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 2011 FEIS (see also Table 2 on page 41 of the 2011 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 intrusions occur. Alternative 2 has more allowed exceptions and therefore more potential for unavoidable adverse effects.

# 3.17 Other Required Disclosures

## 3.17.1 Compliance with Laws and Regulations

The National Environmental Policy Act at 40 CFR 1502.25(a) directs that "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 discussed in the 2011 Record of Decision rather than in the 2011 FEIS. To avoid unnecessary duplication and to ensure completeness, updates to this information are in the 2023 Record of Decision.

## 3.17.2 Incomplete or Unavailable Information

Incomplete or unavailable information is discussed as needed for individual resources in the appropriate sections of the 2011 FEIS or updated corresponding sections of the final SEIS. Analyses for the SEIS used information on fire occurrence and retardant use through calendar year 2019. Information for 2020 and 2021 was compiled after resource reports were reviewed and updated for the SEIS. That information has been updated where possible in the final SEIS and is also included in the project file.

# 4 Preparers and Contributors

## 4.1 Interdisciplinary Team Members

Preparers of the 2011 FEIS are listed in section 4.1 (beginning on page 168) of the 2011 FEIS. As required by 40 CFR 1502.18, Table 8 below lists the preparers and contributors to the SEIS, along with their agency affiliation, role, and summary of qualifications.

**Table 9. Supplemental Environmental Impact Statement preparers and contributors**

| Name | Affiliation | Role | Experience and Qualifications |
|---|---|---|---|
| | | | |
| David A. Austin | San Bernardino National Forest, FS[1] | Aquatic and Terrestrial wildlife species review, update and BA[2] for consultation under Endangered Species Act section 7<br>Wildlife Biologist for the 2011 FEIS and consultations | Wildlife, Fish, Botany, and Range Program Manager, 8 years (FS)<br>Wildlife and Fisheries Biologist with 35 years FS experience<br>B.S. in Wildlife Management, Humboldt State University |
| Jessica Barnes | Social Science and Economics Branch, FS Policy Office | Environmental Justice and Civil Rights review and update | Social scientist with 1.5 years of FS experience; >6 years applying interdisciplinary social science to resource management<br>BA in Sociology and Biology; Masters of Public Health; PhD in Forestry and Environmental Resources |
| Allison Borchers | Enterprise Program, FS | Social and economics resources review and update | Economist with >5 years FS experience<br>PhD. in Resource Economics, University of Delaware |
| Wendy Clark | Wildland Fire Chemicals/Aerial Delivery Program, NTDP[3], FS (detail) | Lead Technical Writer/Editor | Wildlife/Planning Biologist with >25 years federal experience (FS, NPS)<br>Wildlife Technician, 9 years' experience with various universities, state agencies and NPS<br>M.S. Ecology and Evolutionary Biology, University of Minnesota<br>B.A. Biology, Knox College |
| Laura Conway | Wildland Fire Chemicals/Aerial Delivery Program, NTDP, FS | Project Manager and Interdisciplinary Team Leader | Wildlife and Fisheries Biologist, with >31 years FS experience<br>B.S. in Wildlife and Fisheries Biology, University of California, Davis |

[1] USDA Forest Service
[2] Biological Assessment
[3] National Technology and Development Program

| Name | Affiliation | Role | Experience and Qualifications |
|---|---|---|---|
| | | | |
| 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<br>M.S. in Chemical Engineering<br>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 FS<br>BA in Writing/English Michigan State University<br>Graduate coursework in natural resources, University of Oregon |
| Linn Gassaway | Lassen NF, FS | Cultural resources review and update | Heritage Program Manager, 5 years, FS<br>Archaeologist, >27 years' experience (FS, NPS, Private)<br>Fire Archaeology 24 years' federal experience (FS and NPS)<br>M.A. in Anthropology, San Francisco State University<br>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<br>Analytical chemist, inorganics, >5 years' experience with Department of the Navy<br>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 Endangered Species Act section 7 | Botanist with >20 years of FS experience<br>M.S. in Forest Resources, University of Idaho, Moscow<br>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)<br>B.S. in Geology<br>M.S. in Geology |
| David Sheehan | Enterprise Program, FS | Scenery resources review and update | Landscape Architect and Recreation Manager with >6 years FS experience<br>M.L.A., Virginia Tech<br>B.S. in Parks, Recreation, and Tourism Management, North Carolina State University |

| Name | Affiliation | Role | Experience and Qualifications |
|---|---|---|---|
| | | | |
| Kyle Stetler | Enterprise Program, FS | Social and economics resources review and update | Economist and Policy Analyst with >12 years FS and other federal experience<br>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<br>M.S. in Resource Economics, University of Delaware |
| Stacey Weems | Enterprise Program, FS | Soils review and update | Soil Scientist with >14 years FS experience<br>M.S. in Soil Science, New Mexico State University<br>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 Endangered Species Act section 7 | Assistant District Fish Biologist with >11 years FS experience<br>M.S. Fish and Wildlife Biology, Colorado State University<br>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<br>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 2011 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.

The draft and final supplemental environmental impact statements are 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 |
| 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

# Index

# Glossary

This glossary only includes terms that were not included in the FEIS, and terms that were included in the 2011 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 water, 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 product')

**Incidental Take**: any taking that is in compliance with the terms and conditions specified in a written statement provided under section 7 of the Endangered Species Act, 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 5100-304), but requires final results and a field evaluation for full qualification (see 'Qualified product').

**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 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 Endangered Species Act.

- 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, and peatlands.

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# List of Hyperlinked Document Web Addresses

- American Community Survey - https://www.census.gov/programs-surveys/acs
- Interagency Standards for Fire and Fire Aviation Operations (2023) - https://www.nifc.gov/sites/default/files/redbook-files/RedBookAll.pdf
- Interagency Wildland Fire Chemicals Policy and Guidance (includes links to the following documents, and will include links to the final SEIS, 2023 Record of Decision, and related documents, as well as updated versions of the Implementation Guide) - https://www.fs.usda.gov/managing-land/fire/chemicals
    - Implementation Guide for Aerial Application of Fire Retardant - https://www.fs.usda.gov/sites/default/files/2019-06/2019_afr_imp_guide.pdf
    - Nationwide Application of Fire Retardant on National Forest System Land, Final Environmental Impact Statement (2011) - https://www.fs.usda.gov/sites/default/files/media_wysiwyg/wfcs_final_feis_0.pdf
    - Nationwide Aerial Application of Fire Retardant on National Forest System Land, Record of Decision (2011) - https://www.fs.usda.gov/sites/default/files/media_wysiwyg/wfcs_rod_12_15_11_0.pdf
    - Nationwide Aerial Application of Fire Retardant on National Forest System Land, Supplemental Information Report (2020) - https://www.fs.usda.gov/sites/default/files/2021-06/RetardantSIRFINAL.pdf
- InciWeb Terminology - https://inciweb.nwcg.gov/terminology
- Retardant Avoidance Area Maps - https://ftp.wildfire.gov/public/base_info/retardant_avoidance_areas/Maps/
- Wildland Fire Chemicals and Aerial Delivery Systems (links to sites for Long-Term Retardants and other information and resources) - https://www.fs.usda.gov/rm/fire/wfcs/
    - Long-term Retardants website (links to current versions of Qualified Products List, Forest Service Specification, product performance information, and other resources specifically for long-term retardants) - https://www.fs.usda.gov/rm/fire/wfcs/long_term_fire_retardants.php
        - Product Performance and Test Results (long-term retardants) - https://www.fs.usda.gov/rm/fire/wfcs/performance_and_test.php
        - Long-Term Retardant Qualified Products List (December 8, 2022) - https://www.fs.usda.gov/rm/fire/wfcs/documents/2022-1208_qpl_lt-ret.pdf
        - Specification 5100-304d Long-term Retardant (January 7, 2020; Amended May 6, 2021) -

https://www.fs.usda.gov/rm/fire/wfcs/documents/5100-304d_LTR_Final_010720_with%20Amendment%201.pdf

# Appendices

The appendices included in this SEIS are only those for which information has changed from that included in the 2011 FEIS. All appendices retain the same designator as in the 2011 FEIS, but those that are updated and included here have the added 'SEIS' designator. The table below provides a crosswalk showing each 2011 FEIS appendix and information about whether it has been updated and included in the SEIS.

## FEIS to SEIS Appendix Tracking

All appendices in the 2011 FEIS were titled 'Appendix A', etc. All appendices included in the SEIS are titled 'SEIS Appendix C', etc. to indicate that they contain supplemental or updated information.

| Appendix | 2011 FEIS Title | SEIS Title | Information |
|---|---|---|---|
| A | 2000 Guidelines for Aerial Delivery of Retardant or Foam Including the 2008 Reasonable and Prudent Alternatives | NA | This appendix describes parts of Alternative 2 (2011 FEIS section 2.1.2) and has not changed. |
| B | Implementation of the 2008 Reasonable and Prudent Alternatives | Updated Implementation Status of the 2008 Reasonable and Prudent Alternatives | Implementation status of most elements has changed and the appendix has been updated. Refer also to the 2023 Record of Decision (section titled 'Background') for information about implementation status of the 2008 Reasonable and Prudent Alternatives. |
| C | Fire and Retardant Use Information | Fire and Retardant Use Information 2012 through 2021 | This appendix updates and supplements 2011 FEIS Appendix C with data collected after the 2011 Record of Decision was signed. Updates have been made since the draft SEIS was published. |
| D | Misapplication of Fire Retardant Data Analysis on Forest Service lands | Fire Retardant Intrusions on National Forest System Lands from 2012 through 2021 | This appendix updates and supplements 2011 FEIS Appendix D with data collected after the 2011 Record of Decision was signed. Updates have been made since the draft SEIS was published. |
| E | National Screens for Federally Listed Species and Forest Service Listed Sensitive Species | Species Analysis Screening Process | This appendix updates 2011 FEIS Appendix E, replacing the screening information used for the 2011 analysis with updated information used in the current analysis. Updates have been made since the draft SEIS was published. |
| F | Fish and Aquatic Invertebrate Species List and Effects | Federally Listed Species Considered and Effects Determinations | This appendix updates 2011 FEIS Appendices F, G, and I, replacing the species lists and determinations with current information. Updates have been made since the draft SEIS was published. |
| 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. |

| Appendix | 2011 FEIS Title | SEIS Title | Information |
|---|---|---|---|
| I | Wildlife Species Lists and Effects Determinations | NA | Updated information on wildlife species is incorporated into SEIS Appendix F. |
| J | Suppression Chemicals and Delivery Systems | NA | 2011 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 and is not updated nor repeated here. |
| 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 2011 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. |
| 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. Refer to updated section 3.1.1.2 of the SEIS and to Appendix Q for additional information regarding retardant effectiveness. |
| P | Table of Avoidance Area Percentages by Forest | Table of Avoidance Area Percentages by Forest | This appendix updates 2011 FEIS Appendix P with current information regarding the amount of National Forest System land mapped within avoidance areas. |
| Q | Response to Comments | Response to Comments on the Draft Supplemental Environmental Impact Statement | The information in the FEIS Appendix Q has not changed because it pertains to comments on the original draft EIS. Responses to comments received on the draft SEIS are provided as SEIS Appendix Q in the final SEIS. |
| R | New Aerial Application of Fire Retardant Direction | NA | Updated direction is included as Appendix A to the 2023 Record of Decision. |

# SEIS Appendix B – Updated Implementation Status of the 2008 Reasonable and Prudent Alternatives

## Background

In 2007 the Forest Service prepared an Environmental Assessment and in 2008 issued a Decision Notice/Finding of No Significant Impact regarding the use of aerial fire retardant on National Forest System lands. As part of that process, the Forest Service carried out Endangered Species Act Section 7 consultation with the USDI Fish and Wildlife Service (Fish and Wildlife Service) and the USDC National Oceanic and Atmospheric Administration National Marine Fisheries Service (NOAA Fisheries). The Fish and Wildlife Service and NOAA Fisheries issued biological opinions that included reasonable and prudent alternatives, which the Forest Service included in its Decision Notice. Implementation of those reasonable and prudent alternatives began upon implementation of the Decision Notice in February 2008.

The 2008 reasonable and prudent alternatives were subsequently included as part of Alternative 3 in the 2011 Nationwide Aerial Application of Fire Retardant on National Forest System Land Final Environmental Impact Statement (2011 FEIS). Alternative 3 was the selected alternative implemented when the 2011 Nationwide Aerial Application of Fire Retardant on National Forest System Land, Record of Decision was signed. Since the 2011 FEIS was published and the 2011 Record of Decision was signed, the status of the 2008 Reasonable and Prudent Alternatives has changed.

The status, as of the publication of this SEIS, of each reasonable and prudent alternative accepted in 2008 by the Forest Service is described below. The wording of the reasonable and prudent alternatives is retained here as written in 2008 with minor edits for clarity, and includes the following abbreviations:

- RPA – reasonable and prudent alternative
- NFMS – National Marine Fisheries Service, known currently as NOAA Fisheries
- USFS – United States Forest Service, also referred to as the Forest Service

### Fish and Wildlife Service

#### *RPA Sub-Element*

Coordinate with local Fish and Wildlife Service offices each year to the onset of the fire season to ensure that 1) the most up-to-date detailed maps or descriptions of areas on National Forest System lands that are designated critical habitat or occupied by species listed in Table 1 of the 2008 Biological Opinion (USDI Fish and Wildlife Service 2008); 2) this information is incorporated in local planning and distributed to appropriate resources by the local Fire Management Officer; 3) maps and information are made available to incident commanders and fire teams for the purpose of avoiding application of retardants to areas designated critical habitat or occupied by species listed in Table 1 of the 2008 Biological Opinion (USDI Fish and Wildlife Service 2008), whenever possible, including the use of best available technologies to avoid areas designated critical habitat or occupied by species found in Table 1 of the 2008 Biological Opinion (USDI Fish and Wildlife Service 2008); 4) any other appropriate conservation measures are included to avoid the likelihood of jeopardizing species or adversely modifying or destroying critical habitat, such measures may include enhancement of populations or other appropriate contingency measures.

### *Status*

Requirements to update avoidance area maps annually were included as part of the selected alternative (Alternative 3) in the 2011 Record of Decision and are retained in Modified Alternative 3 (refer to section 2.1.4 of the final Supplemental Environmental Impact Statement (SEIS)). Protocols for updating maps are incorporated into the Implementation Guide for Aerial Application of Fire Retardant (Implementation Guide). The Implementation Guide includes guidance for reinitiation of consultation, and direction for annual coordination meetings between the Forest Service and other agencies, including Fish and Wildlife Service offices. Specific to each item in the sub-element:

1) Avoidance Area maps are updated each year. The request to update maps includes direction to coordinate with local Fish and Wildlife Service offices and to use the most up-to-date information available.

2) Maps are completed by April 1 each year (March 1 for Arizona and New Mexico) and made available through numerous electronic sources. Links to the maps are located on the Interagency Wildland Fire Chemicals Policy and Guidance website. Information on avoidance area maps and their use is included in the Implementation Guide.

3) See 2 above. In addition, Agency Administrators are instructed to include specific direction regarding use of retardant on an incident in the letter of delegation provided to the incident commander. Additional information regarding implementation of avoidance areas is included in the Implementation Guide.

4) The biological opinions resulting from Endangered Species Act section 7 consultations and reinitiations may include conservation measures and other direction that would contribute to enhancing populations and to avoiding the likelihood of jeopardizing species. Annual coordination meetings with the Fish and Wildlife Service may include discussion of additional avoidance areas or other measures necessary to protect species or habitats from impacts of aerial fire retardant use.

### *RPA Sub-Element*

Wherever practical, the Forest Service will prioritize fuels reduction projects for lands in the National Forest System that are in close vicinity to areas designated critical habitat or occupied by species listed in Table 1 in the 2008 Biological Opinion (USDI Fish and Wildlife Service 2008), so as to reduce the need to use aerially applied fire retardants.

### *Status*

In January 2022, the Forest Service launched a robust, 10-year strategy to address the wildfire crisis in the places where it poses the most immediate threats to communities. The strategy, called “Confronting the Wildfire Crisis: A Strategy for Protecting Communities and Improving Resilience in America’s Forests,” (USDA Forest Service 2022e) combines a historic investment of congressional funding with years of scientific research and planning into a national effort that will dramatically increase the scale and pace of forest health treatments over the next decade. Through the strategy, the agency will work with states, Tribes and other partners to addresses wildfire risks to critical infrastructure, protect communities, and make forests more resilient. This strategy considers threatened and endangered species and their habitats.

### *RPA Sub-Element*

Whenever practical, the Forest Service will use water or other less toxic fire retardants than those described in the proposed action within areas designated as critical habitat or occupied by species listed in Table 1 of the 2008 Biological Opinion (USDI Fish and Wildlife Service 2008).

### *Status*

The 2011 Record of Decision includes the following direction:

- 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 threatened, endangered, proposed, candidate or sensitive (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.

- Aerial retardant drops are not allowed in mapped avoidance areas for threatened, endangered, proposed, candidate or sensitive (TEPCS) species or in waterways. 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 direction is maintained in Modified Alternative 3 of the SEIS.

### *RPA Sub-Element*

If areas designated as critical habitat or occupied by species listed in Table 1 of the 2008 Biological Opinion (USDI Fish and Wildlife Service 2008) are exposed to fire retardant, then the Forest Service will initiate emergency consultation pursuant to regulations at 50 CFR 402.05 implementing section 7 of the Endangered Species Act of 1973, as amended. As part of the emergency consultation, the following measures may apply:

a. Conduct monitoring in coordination with the local Fish and Wildlife Service office of the direct, indirect, and cumulative impacts of the fire retardant application on listed species. Fish and Wildlife Service-approved monitoring protocols and reporting frequency will be developed. Monitoring for aquatic species may include water quality.

b. If appropriate, and in consultation with the Fish and Wildlife Service, include measures to prevent or compensate for population declines due to application of fire retardant.

c. During monitoring, all non-native plant species will be removed from areas of concern as appropriate for the area and listed species affected, as determined in consultation with the appropriate Fish and Wildlife Service office. Appropriate weed control methods will be developed in coordination with the local Fish and Wildlife Service office.

### *Status*

The 2011 Record of Decision and Modified Alternative 3 both require that when an intrusion (formerly termed misapplication) occurs for any reason it would be reported, and if necessary it would be assessed for impacts, monitored, and remediated. Annual reports of all intrusions and information regarding retardant use are sent to the Fish and Wildlife Service and to NOAA Fisheries each year. Endangered Species Act consultation with the Fish and Wildlife Service and NOAA Fisheries completed in 2011 provided Incidental Take Statements and determined that the proposed action was not likely to jeopardize any species. New consultations were initiated in 2021 (USDA Forest Service 2021a, 2021c) resulting in new Incidental Take Statements and findings of not likely to jeopardize any species (USDC NOAA Fisheries 2022, USDI Fish and Wildlife Service 2023). Requirements of the Terms and Conditions in the biological opinions issued by the Fish and Wildlife Service and NOAA Fisheries include reporting to and coordination with those agencies.

## National Marine Fisheries Service (NOAA Fisheries)

### *RPA Sub-Element*

Provide evaluations on the two fire retardant formulations, LC 95-A and 259R, for which acute toxicity tests have not been conducted, using standard testing protocols. Although direct fish toxicity tests have not been conducted on three additional formulations, G75-W, G75-F, LV-R, studies are not warranted in light of the fact the USFS intends to phase out their use of these formulations by 2010. All formulations expected to be in use beyond 2010 shall be evaluated using, at a minimum, the established protocols to assess acute mortality to fish. Evaluations must be completed and presented to NMFS no later than two years from the date of this Opinion. Depending on the outcome of these evaluations and after conferring with NMFS, the USFS must make appropriate modifications to the program that would minimize the effects on NMFS' listed resources (e.g., whether a retardant(s) should be withdrawn from use and replaced with an alternative retardant(s)).

### *Status*

The specification for long-term retardant USDA Forest Service Specification 5100-304 includes requires for toxicity testing of all products prior to qualification.

### *RPA Sub-Element*

Engage in toxicological studies on long-term fire retardants approved for current use in fighting fires, to evaluate acute and sublethal effects of the formulations on NMFS' listed resources. The toxicological studies will be developed and approved by both the USFS and NMFS. The studies should be designed to explore the effects of fire retardant use on: unique life stages of anadromous fish such as smolts and buried embryo/alevin life stages ranging in development from spawning to yolk sac absorption and the onset of exogenous feeding (approximately 30 days post-hatch); and anadromous fish exposed to fire retardants under multiple stressor conditions expected during wildfires, such as elevated temperature and low dissolved oxygen. Within 12 months of accepting the terms of this Opinion, USFS provide NMFS with a draft research plan to conduct additional toxicological studies on the acute and sublethal effects of the fire retardant formulations. Depending on the outcome of these studies described per the research plan and after conferring with NMFS, the USFS must make appropriate modifications to the program that would minimize the effects on NMFS' listed resources (e.g., whether a retardant(s) should be withdrawn from use and replaced with an alternative retardant(s)).

### *Status*

The Forest Service continues to work with United States Geological Survey Columbia Environmental Research Center to complete studies on the effects of long-term retardant to aquatic species. These studies have resulted in the development of a spill calculator to determine the extent and duration of effects in impacted streams (Rehman, Jackson and Puglis 2021). The results of a study looking at short-term, pulsed exposure of fire chemicals to rainbow trout and fathead minnow have also been published recently (Puglis, Iacchetta and Mackey 2022). Additional studies have concluded, and published papers are expected in the next year. The Forest Service has entered into a new agreement with the Columbia Environmental Research Center to complete additional studies.

### *RPA Sub-Element*

Develop guidance that directs the US Forest Service to conduct an assessment of site conditions following wildfire where fire retardants have entered waterways, to evaluate the changes to on site water quality and changes in the structure of the biological community. The field guidance shall require monitoring of such parameters as macro-invertebrate communities, soil and water chemistry, or other possible surrogates for examining the direct and indirect effects of fire retardants on the biological community within and

downstream of the retardant drop area as supplemental to observations for signs of dead or dying fish. The guidance may establish variable protocols based upon the volume of retardants expected to have entered the waterway, but must require site evaluations commensurate with the volume of fire retardants that entered the waterway.

### *Status*

The Forest Service began assessing intrusions in 2012 and will continue to do so as required by the 2011 Record of Decision and subsequently the 2023 Record of Decision and Terms and Conditions of the Biological Opinions (USDC NOAA Fisheries 2022, USDI Fish and Wildlife Service 2023).

### *RPA Sub-Element*

Provide policy and guidance to ensure that USFS local unit resource specialist staff provide the local NMFS Regional Office responsible for section 7 consultations with a summary report of the site assessment that identifies: (a) the retardant that entered the waterway, (b) an estimate of the area affected by the retardant, (c) a description of whether the retardant was accidentally dropped into the waterway or whether an exception to the 2000 Guidelines was invoked and the reasons for the accident or exception, (d) an assessment of the direct and indirect impacts of the fire retardant drop, (e) the nature and results of the field evaluation that was conducted following control and abatement of the fire, and any on site actions that may have been taken to minimize the effects of the retardant on aquatic communities.

### *Status*

The Forest Service provides annual reports to the Fish and Wildlife Service and to NOAA Fisheries that provide retardant use data, and intrusion reports and assessments.

### *RPA Sub-Element*

Provide NMFS  Headquarters' Office of Protected Resources with a biannual summary (every two years) that evaluates the cumulative impacts (as the Council on Environmental Quality has defined that term pursuant to the National Environmental Policy Act of 1969) of their continued use of long-term fire retardants including: (a) the number of observed retardant drops entering a waterway, in any subwatershed and watershed; (b) whether the observed drops occurred in a watershed inhabited by NMFS' listed resources; (c) an assessment as to whether listed resources were affected by the misapplication of fire retardants within the waterway; (d) the USFS' assessment of cumulative impacts of the fire retardant drops within the subwatershed and watershed and the consequences of those effects on NMFS' listed 139 resources. The evidence the USFS shall use for this evaluation would include, but is not limited to: (i) the results of consultation with NMFS' Regional Offices and the outcome of the site assessment described in detail in the previous element of this RPA (Element 4) and (ii) the results of new fish toxicity studies identified within Element 2; and (d) any actions the USFS took or intends to take to supplement the 2000 Guidelines to minimize the exposure of listed fish species to fire retardants, and reduce the severity of their exposure.

### *Status*

The Forest Service provides annual reports to the Services that provide retardant use data, and intrusion reports and assessments. In addition, requirements of the new Biological Opinions (USDC NOAA Fisheries 2022, USDI Fish and Wildlife Service 2023) require annual meetings to review the reports and require a review of information collected every five years.

# SEIS Appendix C – Fire Retardant Use Information 2012 through 2021

The estimate of acres impacted by retardant drops was calculated for the 2011 analysis assuming that each aerial retardant drop results in even coverage on the ground. Testing carried out by the Forest Service indicates, however, that aerial retardant drops do not result in even coverage, and that coverage pattern is dependent on aircraft. This means that the 2011 analysis method underestimated the total acreage impacted by aerial fire retardant. For the data from 2012 through 2021, calculations of acreage impacted were adjusted for coverage patterns. Those calculations use the best information available to estimate and report a range from minimum to maximum acres impacted. Overall, the method used since 2012 overestimates the acres impacted.

**Table C-1. Estimated area of fire retardant application on National Forest System Lands, 2012 through 2021 (10 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 | 6,988 | 7,760 | 13,967,539 | 1,396,754 | 1082-2462 | 937-1938 | 0.0097% | 0.0076% |
| Region 2 | 22,056,205 | 4,711 | 4,435 | 7,982,193 | 798,219 | 619-1407 | 536-1108 | 0.0064% | 0.0050% |
| Region 3 | 20,530,401 | 10,093 | 10,724 | 19,302,404 | 1,930,240 | 1496-3402 | 1295-2678 | 0.0166% | 0.0130% |
| Region 4 | 31,786,447 | 5,693 | 9,568 | 17,222,866 | 1,722,287 | 1335-3036 | 1156-2390 | 0.0095% | 0.0075% |
| Region 5 | 20,261,051 | 11,739 | 40,673 | 73,211,171 | 7,321,117 | 50674-12903 | 4913-10158 | 0.0637% | 0.0501% |
| Region 6 | 25,114,875 | 10,998 | 7,971 | 14,348,351 | 1,434,835 | 1112-2529 | 963-1991 | 0.0101% | 0.0079% |
| Region 8 | 13,425,610 | 5,396 | 102 | 183,027 | 18,303 | 14-32 | 12-25 | 0.0002% | 0.0002% |
| Region 9 | 12,177,242 | 3,772 | 154 | 277,128 | 27,713 | 21-49 | 19-38 | 0.0004% | 0.0003% |
| Region 10 | 22,148,457 | 131 | 0 | 0 | 0 | 0 | 0 | 0.0000% | 0.0000% |
| Total | 192,950,107 | 59,521 | 81,386 | 146,494,679 | 14,649,468 | 11353-25820 | 9831-20326 | 0.0134% | 0.0105% |

[1] Gallons per 100 square feet

**Table C-2. Estimated area of fire retardant application on National Forest System lands by Forest, 2012 through 2021 (10 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 | Maximum estimated percent NFS land impacted at 4 GPC | Maximum estimated percent NFS land impacted at 8 GPC |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Beaverhead-Deerlodge | 3,393,381 | 584 | 745 | 1,340,535 | 134,054 | 104-236 | 90-186 | 0.0070% | 0.0055% |
| 1 | Bitterroot | 1,594,659 | 606 | 338 | 608,688 | 60,869 | 47-107 | 41-84 | 0.0067% | 0.0053% |
| 1 | Custer Gallatin | 3,040,134 | 585 | 418 | 752,008 | 75,201 | 58-133 | 50-104 | 0.0044% | 0.0034% |
| 1 | Dakota Prairie Grasslands | 1,257,901 | 142 | 30 | 54,721 | 5,472 | 4-10 | 4-8 | 0.0008% | 0.0006% |
| 1 | Flathead | 2,414,162 | 512 | 76 | 135,987 | 13,599 | 11-24 | 9-19 | 0.0010% | 0.0008% |
| 1 | Helena-Lewis and Clark | 2,856,442 | 405 | 1,071 | 1,927,137 | 192,714 | 149-340 | 129-267 | 0.0119% | 0.0094% |
| 1 | Idaho Panhandle | 2,498,072 | 808 | 662 | 1,190,821 | 119,082 | 92-210 | 80-165 | 0.0084% | 0.0066% |
| 1 | Kootenai | 2,243,219 | 766 | 481 | 866,172 | 86,617 | 67-153 | 58-120 | 0.0068% | 0.0054% |
| 1 | Lolo | 2,216,287 | 1,121 | 2,938 | 5,289,242 | 528,924 | 410-932 | 355-734 | 0.0421% | 0.0331% |
| 1 | Nez Perce - Clearwater | 3,935,562 | 1,459 | 1,001 | 1,802,228 | 180,223 | 140-318 | 121-250 | 0.0081% | 0.0064% |
| 2 | Arapaho-Roosevelt and Pawnee NG[2] | 1,597,940 | 462 | 949 | 1,708,420 | 170,842 | 132-301 | 115-237 | 0.0188% | 0.0148% |
| 2 | Bighorn | 1,105,310 | 122 | 27 | 48,223 | 4,822 | 4-8 | 3-7 | 0.0008% | 0.0006% |
| 2 | Black Hills | 1,251,148 | 673 | 178 | 320,144 | 32,014 | 25-56 | 21-44 | 0.0045% | 0.0036% |
| 2 | Grand Mesa Uncompahgre and Gunnison | 2,965,320 | 286 | 61 | 109,297 | 10,930 | 8-19 | 7-15 | 0.0006% | 0.0005% |
| 2 | Medicine Bow-Routt and | 2,892,559 | 590 | 1,014 | 1,824,530 | 182,453 | 141-322 | 122-253 | 0.0111% | 0.0088% |

[1] Gallons per 100 square feet
[2] National Grassland

| 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 | Maximum estimated percent NFS land impacted at 4 GPC | Maximum estimated percent NFS land impacted at 8 GPC |
|---|---|---|---|---|---|---|---|---|---|---|
| | Thunder Basin NG[2] | | | | | | | | | |
| 2 | Nebraska, Samuel R. McKelvie NFs and Oglala, Buffalo Gap and Fort Pierre NGs[2] | 1,054,075 | 188 | 17 | 30,917 | 3,092 | 2-5 | 2-4 | 0.0005% | 0.0004% |
| 2 | Pike-San Isabel, Cimmaron Comanche NG[2] | 2,757,586 | 972 | 362 | 651,690 | 65,169 | 51-115 | 44-90 | 0.0042% | 0.0033% |
| 2 | Rio Grande | 1,838,862 | 125 | 97 | 173,871 | 17,387 | 13-31 | 12-24 | 0.0017% | 0.0013% |
| 2 | San Juan | 1,865,618 | 815 | 343 | 617,915 | 61,792 | 48-109 | 41-86 | 0.0058% | 0.0046% |
| 2 | Shoshone | 2,439,091 | 174 | 310 | 558,824 | 55,882 | 43-98 | 38-78 | 0.0040% | 0.0032% |
| 2 | White River | 2,288,696 | 303 | 1,077 | 1,938,362 | 193,836 | 150-342 | 130-269 | 0.0149% | 0.0118% |
| 3 | Apache-Sitgreaves | 2,015,925 | 1,509 | 459 | 826,629 | 82,663 | 64-146 | 55-115 | 0.0072% | 0.0057% |
| 3 | Carson | 1,491,916 | 551 | 96 | 172,873 | 17,287 | 13-30 | 12-24 | 0.0020% | 0.0016% |
| 3 | Cibola | 1,879,318 | 608 | 502 | 904,294 | 90,429 | 70-159 | 61-125 | 0.0085% | 0.0067% |
| 3 | Coconino | 1,844,098 | 1,989 | 446 | 803,144 | 80,314 | 62-142 | 54-111 | 0.0077% | 0.0060% |
| 3 | Coronado | 1,719,928 | 666 | 2,806 | 5,051,501 | 505,150 | 391-890 | 339-701 | 0.0518% | 0.0408% |
| 3 | Gila | 3,269,965 | 895 | 608 | 1,093,930 | 109,393 | 85-193 | 73,152 | 0.0059% | 0.0046% |
| 3 | Kaibab | 1,543,675 | 855 | 517 | 931,092 | 93,109 | 72-164 | 62-129 | 0.0106% | 0.0084% |
| 3 | Lincoln | 1,095,603 | 449 | 305 | 549,331 | 54,933 | 43-97 | 49-76 | 0.0088% | 0.0070% |
| 3 | Prescott | 1,257,034 | 416 | 1,537 | 2,766,792 | 276,679 | 214-488 | 186-384 | 0.0388% | 0.0305% |
| 3 | Santa Fe | 1,546,059 | 697 | 501 | 901,865 | 90,187 | 70-159 | 61-125 | 0.0103% | 0.0081% |
| 3 | Tonto | 2,866,880 | 1,461 | 2,945 | 5,300,953 | 530,095 | 411-934 | 356-736 | 0.0326% | 0.0257% |
| 4 | Ashley | 1,378,472 | 180 | 53 | 95,029 | 9,503 | 7-17 | 6-13 | 0.0012% | 0.0010% |

| 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 | Maximum estimated percent NFS land impacted at 4 GPC | Maximum estimated percent NFS land impacted at 8 GPC |
|---|---|---|---|---|---|---|---|---|---|---|
| 4 | Boise | 2,204,674 | 746 | 1,697 | 3,054,958 | 305,496 | 237-538 | 205-424 | 0.0244% | 0.0192% |
| 4 | Bridger-Teton | 3,432,162 | 340 | 733 | 1,319,534 | 131,953 | 102-233 | 89-183 | 0.0068% | 0.0053% |
| 4 | Caribou-Targhee | 2,899,406 | 374 | 63 | 113,397 | 11,340 | 9-20 | 8-16 | 0.0007% | 0.0005% |
| 4 | Dixie | 1,632,111 | 407 | 822 | 1,478,916 | 147,892 | 115-261 | 99-205 | 0.0160% | 0.0126% |
| 4 | Fishlake | 1,709,014 | 351 | 251 | 452,646 | 45,265 | 35-80 | 30-63 | 0.0047% | 0.0037% |
| 4 | Humboldt-Toiyabe | 6,253,933 | 892 | 1,753 | 3,155,071 | 315,507 | 245-556 | 212-438 | 0.0089% | 0.0070% |
| 4 | Manti-La Sal | 1,340,351 | 404 | 357 | 643,162 | 64,316 | 50-113 | 43-89 | 0.0085% | 0.0067% |
| 4 | Payette | 2,310,111 | 548 | 910 | 1,638,649 | 163,865 | 127-289 | 110-227 | 0.0125% | 0.0098% |
| 4 | Salmon-Challis | 4,355,403 | 409 | 549 | 988,110 | 98,811 | 77-174 | 66-137 | 0.0040% | 0.0031% |
| 4 | Sawtooth | 2,111,959 | 291 | 778 | 1,400,045 | 140,005 | 109-247 | 94-194 | 0.0117% | 0.0092% |
| 4 | Uinta-Wasatch-Cache | 2,158,851 | 751 | 1,602 | 2,883,349 | 288,335 | 223-508 | 193-400 | 0.0235% | 0.0185% |
| 5 | Angeles | 668,279 | 1,264 | 3,849 | 6,927,779 | 692,778 | 537-1221 | 465-961 | 0.1827% | 0.1438% |
| 5 | Cleveland | 426,804 | 689 | 1,577 | 2,838,984 | 283,898 | 220-500 | 191-394 | 0.1172% | 0.0923% |
| 5 | Eldorado | 615,035 | 487 | 2,419 | 4,354,187 | 435,419 | 337-767 | 292-604 | 0.1248% | 0.0982% |
| 5 | Inyo | 1,987,906 | 415 | 716 | 1,288,450 | 128,845 | 100-227 | 86-179 | 0.0114% | 0.0090% |
| 5 | Klamath | 1,505,983 | 841 | 3,012 | 5,421,503 | 542,150 | 420-956 | 364-752 | 0.0634% | 0.0499% |
| 5 | Lake Tahoe Basin MU[3] | 154,268 | 382 | 1 | 2,075 | 208 | 0 | 0 | 0.0002% | 0.0002% |
| 5 | Lassen | 1,154,416 | 402 | 723 | 1,301,620 | 130,162 | 101-229 | 87-181 | 0.0199% | 0.0156% |
| 5 | Los Padres | 1,780,182 | 292 | 6,142 | 11,055,944 | 1,105,594 | 857-1949 | 742-1534 | 0.1095% | 0.0862% |
| 5 | Mendocino | 918,349 | 185 | 918 | 1,652,880 | 165,288 | 128-291 | 111-229 | 0.0317% | 0.0250% |
| 5 | Modoc | 1,679,173 | 752 | 1,313 | 2,363,924 | 236,392 | 183-417 | 159-328 | 0.0248% | 0.0195% |
| 5 | Plumas | 1,205,685 | 903 | 2,182 | 3,928,414 | 392,841 | 304-692 | 264-545 | 0.0574% | 0.0452% |

[3] Management Unit

| 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 | Maximum estimated percent NFS land impacted at 4 GPC | Maximum estimated percent NFS land impacted at 8 GPC |
|---|---|---|---|---|---|---|---|---|---|---|
| 5 | San Bernardino | 673,294 | 1,290 | 3,529 | 6,352,501 | 635,250 | 492-1120 | 426-881 | 0.1663% | 0.1309% |
| 5 | Sequoia | 1,114,954 | 469 | 3,304 | 5,946,489 | 594,649 | 461-1048 | 399-825 | 0.0940% | 0.0740% |
| 5 | Shasta-Trinity | 2,139,325 | 1,083 | 3,837 | 6,905,999 | 690,600 | 535-1217 | 463-958 | 0.0569% | 0.0448% |
| 5 | Sierra | 1,316,193 | 540 | 4,129 | 7,432,670 | 743,267 | 576-1310 | 499-1031 | 0.0995% | 0.0784% |
| 5 | Six Rivers | 1,167,659 | 475 | 940 | 1,692,073 | 169,207 | 131-298 | 114-235 | 0.0255% | 0.0201% |
| 5 | Stanislaus | 898,739 | 509 | 1,524 | 2,744,036 | 274,404 | 213-484 | 184-381 | 0.0538% | 0.0424% |
| 5 | Tahoe | 854,807 | 761 | 556 | 1,001,643 | 100,164 | 78-177 | 67-139 | 0.0207% | 0.0163% |
| 6 | Columbia River Gorge | 83,339 | 149 | 10 | 17,248 | 1,725 | 1-3 | 1-2 | 0.0036% | 0.0029% |
| 6 | Colville | 1,104,904 | 377 | 405 | 728,785 | 72,879 | 56-128 | 49-101 | 0.0116% | 0.0092% |
| 6 | Deschutes and Ochoco | 2,338,099 | 2,117 | 899 | 1,617,786 | 161,779 | 125-285 | 109-224 | 0.0122% | 0.0096% |
| 6 | Fremont-Winema | 2,253,654 | 891 | 723 | 1,300,709 | 130,071 | 101-229 | 87-180 | 0.0102% | 0.0080% |
| 6 | Gifford Pinchot | 1,357,447 | 305 | 114 | 204,580 | 20,458 | 16-36 | 14-28 | 0.0027% | 0.0021% |
| 6 | Malheur | 1,722,070 | 887 | 633 | 1,140,058 | 114,006 | 88-201 | 77-158 | 0.0117% | 0.0092% |
| 6 | Mt. Baker-Snoqualmie | 1,762,266 | 418 | 0 | 0 | 0 | 0 | 0 | 0.0000% | 0.0000% |
| 6 | Mt Hood | 1,015,873 | 739 | 139 | 251,085 | 25,109 | 19-44 | 17-35 | 0.0044% | 0.0034% |
| 6 | Okanagon-Wenatchee | 4,010,517 | 1,104 | 1,924 | 3,462,891 | 346,289 | 268-610 | 232-480 | 0.0152% | 0.0120% |
| 6 | Olympic | 632,646 | 69 | 0 | 0 | 0 | 0 | 0 | 0.0000% | 0.0000% |
| 6 | Rogue River-Siskiyou | 1,719,305 | 760 | 1,127 | 2,028,595 | 202,860 | 157-358 | 136-281 | 0.0208% | 0.0164% |
| 6 | Siuslaw | 630,204 | 139 | 0 | 0 | 0 | 0 | 0 | 0.0000% | 0.0000% |
| 6 | Umatilla | 1,404,806 | 633 | 892 | 1,604,747 | 160,475 | 124-283 | 108-223 | 0.0201% | 0.0158% |
| 6 | Umpqua | 986,610 | 611 | 344 | 619,281 | 61,928 | 48-109 | 42-86 | 0.0111% | 0.0087% |

| 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 | Maximum estimated percent NFS land impacted at 4 GPC | Maximum estimated percent NFS land impacted at 8 GPC |
|---|---|---|---|---|---|---|---|---|---|---|
| 6 | Wallowa-Whitman | 2,403,487 | 821 | 645 | 1,161,151 | 116,115 | 90-205 | 78-161 | 0.0085% | 0.0067% |
| 6 | Willamette | 1,689,648 | 978 | 117 | 211,435 | 21,144 | 16-37 | 14-29 | 0.0022% | 0.0017% |
| 8 | Chattahoochee-Oconee | 867,578 | 285 | 10 | 17,420 | 1,742 | 1-3 | 1-2 | 0.0004% | 0.0003% |
| 8 | Cherokee | 660,211 | 232 | 11 | 19,954 | 1,995 | 2-4 | 2-3 | 0.0005% | 0.0004% |
| 8 | Daniel Boone | 709,856 | 404 | 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 and Sumter | 635,197 | 266 | 0 | 0 | 0 | 0 | 0 | 0.0000% | 0.0000% |
| 8 | George Washington and Jefferson | 1,799,145 | 208 | 0 | 0 | 0 | 0 | 0 | 0.0000% | 0.0000% |
| 8 | Kisatchie | 608,535 | 406 | 0 | 0 | 0 | 0 | 0 | 0.0000% | 0.0000% |
| 8 | Land Between the Lakes NRA[4] | 171,239 | 30 | 0 | 0 | 0 | 0 | 0 | 0.0000% | 0.0000% |
| 8 | National Forests in Alabama | 671,667 | 325 | 0 | 0 | 0 | 0 | 0 | 0.0000% | 0.0000% |
| 8 | National Forests in Florida | 1,203,415 | 767 | 64 | 114,870 | 11,487 | 9-20 | 8-16 | 0.0017% | 0.0013% |
| 8 | National Forests in Mississippi | 1,191,206 | 673 | 0 | 0 | 0 | 0 | 0 | 0.0000% | 0.0000% |
| 8 | National Forests in North Carolina | 1,256,188 | 707 | 11 | 19,583 | 1,958 | 2-3 | 1-3 | 0.0003% | 0.0002% |

[4] National Recreation Area

| 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 | Maximum estimated percent NFS land impacted at 4 GPC | Maximum estimated percent NFS land impacted at 8 GPC |
|---|---|---|---|---|---|---|---|---|---|---|
| 8 | National Forests in Texas | 677,696 | 349 | 6 | 11,200 | 1,120 | 1-2 | 1-2 | 0.0003% | 0.0002% |
| 8 | Ouachita | 1,783,951 | 447 | 0 | 0 | 0 | 0 | 0 | 0.0000% | 0.0000% |
| 8 | Ozark-St. Francis | 1,160,921 | 297 | 0 | 0 | 0 | 0 | 0 | 0.0000% | 0.0000% |
| 9 | Allegheny | 513,794 | 58 | 0 | 0 | 0 | 0 | 0 | 0.0000% | 0.0000% |
| 9 | Chequamegon-Nicolet | 1,525,127 | 160 | 0 | 0 | 0 | 0 | 0 | 0.0000% | 0.0000% |
| 9 | Chippewa | 672,128 | 297 | 6 | 10,796 | 1,080 | 1-2 | 1-2 | 0.0003% | 0.0002% |
| 9 | Green Mountain and Finger Lakes | 427,053 | 36 | 0 | 0 | 0 | 0 | 0 | 0.0000% | 0.0000% |
| 9 | Hiawatha | 898,451 | 119 | 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 | 1030 | 0 | 0 | 0 | 0 | 0 | 0.0000% | 0.0000% |
| 9 | Mark Twain | 1,507,887 | 949 | 10 | 18,170 | 1,817 | 1-3 | 1-3 | 0.0002% | 0.0002% |
| 9 | Midewin | 18,225 | 11 | 0 | 0 | 0 | 0 | 0 | 0.0000% | 0.0000% |
| 9 | Monongahela | 920,783 | 49 | 0 | 0 | 0 | 0 | 0 | 0.0000% | 0.0000% |
| 9 | Ottawa | 998,994 | 53 | 0 | 0 | 0 | 0 | 0 | 0.0000% | 0.0000% |
| 9 | Shawnee | 286,311 | 136 | 0 | 0 | 0 | 0 | 0 | 0.0000% | 0.0000% |
| 9 | Superior | 2,173,267 | 291 | 138 | 248,162 | 24,816 | 19-44 | 17-34 | 0.0020% | 0.0016% |
| 9 | Wayne | 244,258 | 398 | 0 | 0 | 0 | 0 | 0 | 0.0000% | 0.0000% |
| 9 | White Mountain | 807,799 | 81 | 0 | 0 | 0 | 0 | 0 | 0.0000% | 0.0000% |
| 10 | Chugach | 5,400,752 | 54 | 0 | 0 | 0 | 0 | 0 | 0.0000% | 0.0000% |
| 10 | Tongass | 16,747,705 | 77 | 0 | 0 | 0 | 0 | 0 | 0.0000% | 0.0000% |

# SEIS Appendix D – Fire Retardant Intrusions on National Forest System Lands from 2012 through 2021

The Forest Service carried out a detailed review of the intrusion data that was included in Appendix D of the 2022 draft Supplemental Environmental Impact Statement (SEIS) and found many significant errors. Those included major inaccuracies resulting from the difficulties involved in estimating gallons of retardant dropped in different portions of avoidance areas (i.e., into water versus buffer), and contradictions between data and the photos and narrative information submitted with intrusion reports. The Forest Service has corrected errors where possible, and updated Appendix D accordingly. Other changes to Appendix D include:

- Removed estimates of gallons of retardant falling into water versus buffer. The estimates in the draft SEIS Appendix D were found to be incorrect; the review determined that these estimates cannot be made with reasonable accuracy from the available data.
- Removed information about the number of drops involved for each intrusion. Those data included errors, and are not used to estimate intrusion rates or potential effects of the intrusion.
- Clarified column labels. The total number of intrusions (which can comprise more than one drop) for each fire is the sum of accidental intrusions and those occurring due to use of the life and safety exception.
- Indicated the number of intrusions, rather than number of drops, that entered water, buffer only, or terrestrial TES avoidance areas. It is difficult and often not possible to estimate the number of drops or portions of drops that fall within water vs. buffer, and past attempts at making those estimates have been inaccurate. The number or portion of drops is not used in estimating intrusion rates or impacts.
- Added data from 2020 and 2021 that was not yet compiled when the draft SEIS was published.

| Year | Region | Forest/Unit | Fire Name | Exposure Method[1] | Accidental Intrusions | Intrusions due to exception | Total Number of Intrusions[2] | Number of Intrusions that Entered Water[3] | Number of Intrusions that Entered the Buffer only[3] | Number of Intrusions that Entered Terrestrial TES Avoidance Areas | Approximate total number of gallons in the Avoidance Area |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2012 | R1 | Nez Perce-Clearwater | Mallard Fire | airtanker | 1 | 0 | 1 | 0 | 1 | 0 | 100 |
| 2012 | R1 | Nez Perce-Clearwater | McGuire Complex | SEAT | 1 | 0 | 1 | 1 | 0 | 0 | 500 |
| 2012 | R2 | Arapahoe-Roosevelt and Pawnee NG[4] | High Park | SEAT | 1 | 0 | 1 | 1 | 0 | 0 | 600 |

[1] '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
[2] The total number of intrusions 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).
[3] Intrusions that entered water also affect the buffer surrounding the water. Intrusions that entered the 'buffer only' are those that did not enter water.
[4] National Grassland

| Year | Region | Forest/Unit | Fire Name | Exposure Method[1] | Accidental Intrusions | Intrusions due to exception | Total Number of Intrusions[2] | Number of Intrusions that Entered Water[3] | Number of Intrusions that Entered the Buffer only[3] | Number of Intrusions that Entered Terrestrial TES Avoidance Areas | Approximate total number of gallons in the Avoidance Area |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2012 | R2 | Pike and San Isabel | Waldo Canyon | helicopter | 2 | 0 | 2 | 1 | 1 | 0 | 1502 |
| 2012 | R2 | Grand Mesa Umpcompaghre and Gunnison | Twin Basin | airtanker | 1 | 0 | 1 | 1 | 0 | 0 | 2200 |
| 2012 | R2 | San Juan | HD-4 | SEAT | 0 | 1 | 1 | 0 | 1 | 0 | 4179 |
| 2012 | R2 | San Juan | Vallecito | SEAT | 1 | 0 | 1 | 0 | 1 | 0 | 50000 |
| 2012 | R3 | Prescott | Gladiator | airtanker | 1 | 0 | 1 | 0 | 1 | 0 | 2000 |
| 2012 | R3 | Tonto | Comet | helicopter | 0 | 3 | 3 | 0 | 3 | 0 | 12000 |
| 2012 | R3 | Tonto | Poco | SEAT | 2 | 0 | 2 | 0 | 2 | 0 | 3500 |
| 2012 | R4 | Boise | Avelene | SEAT | 0 | 1 | 1 | 0 | 1 | 0 | 100 |
| 2012 | R4 | Boise | Bearskin | SEAT | 1 | 0 | 1 | 0 | 1 | 0 | 800 |
| 2012 | R4 | Boise | Trinity Ridge | airtanker | 5 | 0 | 5 | 2 | 3 | 0 | 13 |
| 2012 | R4 | Bridger-Teton | Chall Cr | SEAT | 3 | 0 | 3 | 0 | 3 | 0 | 31 |
| 2012 | R4 | Bridger-Teton | Forest Park | airtanker | 1 | 0 | 1 | 0 | 0 | 1 | 1000 |
| 2012 | R4 | Dixie | Reserve | airtanker | 1 | 0 | 1 | 0 | 1 | 0 | 3000 |
| 2012 | R4 | Dixie | Shingle | airtanker | 10 | 0 | 10 | 0 | 9 | 1 | 5700 |
| 2012 | R4 | Salmon-Challis | Halstead | airtanker | 2 | 0 | 2 | 2 | 0 | 0 | 240 |
| 2012 | R4 | Uinta-Wasatch-Cache | Pumpkin | airtanker | 2 | 0 | 2 | 1 | 1 | 0 | 2999 |
| 2012 | R4 | Uinta-Wasatch-Cache | Quail | airtanker | 2 | 0 | 2 | 0 | 2 | 0 | unknown |
| 2012 | R5 | Angeles | Williams | airtanker | 0 | 1 | 1 | 0 | 1 | 0 | 8400 |
| 2012 | R5 | Lake Tahoe Basin MU[5] | ELKS | airtanker | 1 | 0 | 1 | 0 | 1 | 0 | unknown |
| 2012 | R5 | Lassen | Mill-LNF | airtanker | 1 | 0 | 1 | 0 | 1 | 0 | 7000 |
| 2012 | R5 | Mendocino | Board | airtanker | 0 | 1 | 1 | 0 | 1 | 0 | 5 |

[5] Management Unit

| Year | Region | Forest/Unit | Fire Name | Exposure Method[1] | Accidental Intrusions | Intrusions due to exception | Total Number of Intrusions[2] | Number of Intrusions that Entered Water[3] | Number of Intrusions that Entered the Buffer only[3] | Number of Intrusions that Entered Terrestrial TES Avoidance Areas | Approximate total number of gallons in the Avoidance Area |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2012 | R5 | Mendocino | Mill | airtanker | 0 | 3 | 3 | 1 | 2 | 0 | 7 |
| 2012 | R5 | Mendocino | North Pass | airtanker | 4 | 0 | 4 | 0 | 4 | 0 | 11.3 |
| 2012 | R5 | San Bernardino | Devore | airtanker | 0 | 3 | 3 | 3 | 0 | 0 | 15900 |
| 2012 | R5 | San Bernardino | Lawler | airtanker | 0 | 1 | 1 | 0 | 1 | 0 | 3000 |
| 2012 | R5 | San Bernardino | LYTLE | airtanker | 1 | 0 | 1 | 0 | 1 | 0 | 200 |
| 2012 | R5 | Sequoia | South Fire | airtanker | 0 | 1 | 1 | 0 | 1 | 0 | 50 |
| 2012 | R5 | Shasta-Trinity | Creek | airtanker | 1 | 0 | 1 | 0 | 1 | 0 | 500 |
| 2012 | R5 | Shasta-Trinity | Garden | airtanker | 1 | 0 | 1 | 0 | 1 | 0 | 300 |
| 2012 | R5 | Shasta-Trinity | SHF Stafford | helicopter | 0 | 2 | 2 | 0 | 2 | 0 | 2558 |
| 2012 | R5 | Sierra | Bear | airtanker | 1 | 0 | 1 | 0 | 1 | 0 | 1000 |
| 2012 | R5 | Six Rivers | Dillon | airtanker | 0 | 2 | 2 | 0 | 2 | 0 | 3010 |
| 2012 | R5 | Six Rivers | Ruth Dam Fire | airtanker | 0 | 1 | 1 | 0 | 1 | 0 | 1200 |
| 2012 | R6 | Gifford Pinchot | Cascade Creek | airtanker | 1 | 0 | 1 | 0 | 1 | 0 | 235.6 |
| 2012 | R6 | Malheur | Parish Cabin Fire | SEAT | 3 | 0 | 3 | 2 | 1 | 0 | 1740 |
| 2012 | R6 | Okanogan-Wenatchee | Goat | airtanker | 1 | 0 | 1 | 0 | 1 | 0 | 6000 |
| 2013 | R1 | Beaverhead-Deerlodge | Moose Meadows | airtanker | 1 | 0 | 1 | 1 | 0 | 0 | 69 |
| 2013 | R1 | Custer Gallatin | Rock Creek | airtanker | 2 | 0 | 2 | 1 | 1 | 0 | 2884.8 |
| 2013 | R3 | Apache-Sitgreaves | East Fork | SEAT | 1 | 0 | 1 | 0 | 1 | 0 | 240 |
| 2013 | R3 | Prescott | Doce | airtanker | 0 | 1 | 1 | 0 | 1 | 0 | 1000 |
| 2013 | R4 | Boise | Elk Complex | SEAT | 0 | 1 | 1 | 0 | 1 | 0 | 1 |
| 2013 | R4 | Boise | Pine Creek | airtanker | 1 | 0 | 1 | 0 | 1 | 0 | 2400 |
| 2013 | R4 | Boise | Pony Complex | airtanker | 2 | 0 | 2 | 0 | 2 | 0 | 800-1000 |

| Year | Region | Forest/Unit | Fire Name | Exposure Method[1] | Accidental Intrusions | Intrusions due to exception | Total Number of Intrusions[2] | Number of Intrusions that Entered Water[3] | Number of Intrusions that Entered the Buffer only[3] | Number of Intrusions that Entered Terrestrial TES Avoidance Areas | Approximate total number of gallons in the Avoidance Area |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2013 | R4 | Boise | Summit | SEAT | 5 | 0 | 5 | 4 | 1 | 0 | 4600 |
| 2013 | R4 | Bridger-Teton | Packer | airtanker | 1 | 0 | 1 | 0 | 1 | 0 | 400 |
| 2013 | R4 | Caribou-Targhee | Lead Draw | SEAT | 1 | 0 | 1 | 1 | 0 | 0 | 10 |
| 2013 | R4 | Humboldt-Toiyabe | Smith Ranch | Seat | 1 | 0 | 1 | 0 | 1 | 0 | 900 |
| 2013 | R4 | Payette | Thunder City | Seat | 1 | 0 | 1 | 1 | 0 | 0 | 10 |
| 2013 | R4 | Salmon-Challis | Lodgepole | airtanker | 1 | 0 | 1 | 1 | 0 | 0 | 75 |
| 2013 | R4 | Sawtooth | 210 Road Fire | airtanker | 1 | 0 | 1 | 1 | 0 | 0 | 991 |
| 2013 | R5 | Angeles | Madre | airtanker | 1 | 0 | 1 | 1 | 0 | 0 | 2000 |
| 2013 | R5 | Angeles | Powerhouse | unknown | 3 | 0 | 3 | 0 | 3 | 0 | 18808 |
| 2013 | R5 | Cleveland | Chariot | airtanker | 0 | 1 | 1 | 0 | 0 | 1 | 1850 |
| 2013 | R5 | Cleveland | San Juan | airtanker | 1 | 0 | 1 | 0 | 1 | 0 | 15 |
| 2013 | R5 | Los Padres | White | airtanker | 1 | 0 | 1 | 0 | 1 | 0 | 50 |
| 2013 | R5 | Mendocino | Daves | airtanker | 1 | 2 | 3 | 0 | 3 | 0 | 165 |
| 2013 | R5 | Mendocino | Sale | airtanker | 0 | 1 | 1 | 0 | 1 | 0 | 20 |
| 2013 | R5 | Modoc | Rail Fire | airtanker | 1 | 0 | 1 | 0 | 1 | 0 | 3000 |
| 2013 | R5 | Plumas | Game 2 | airtanker | 1 | 0 | 1 | 0 | 1 | 0 | 3989 |
| 2013 | R5 | San Bernadino | Hathaway | unknown | 0 | 1 | 1 | 0 | 1 | 0 | unknown |
| 2013 | R5 | San Bernardino | Mountain | airtanker | 0 | 5 | 5 | 1 | 3 | 1 | 10450 |
| 2013 | R5 | Sequoia | Angora Fire | Airtanker and SEAT | 1 | 0 | 1 | 0 | 1 | 0 | 66612 |
| 2013 | R5 | Sequoia | Fish Fire | airtanker | 2 | 0 | 2 | 0 | 2 | 0 | 4860 |
| 2013 | R5 | Six Rivers | Corral Complex | airtanker | 6 | 0 | 6 | 4 | 2 | 0 | 8400-12600 |
| 2013 | R5 | Stanislaus | Power | airtanker | 3 | 0 | 3 | 1 | 2 | 0 | 850 |
| 2013 | R5 | Tahoe | Buckeye | airtanker | 1 | 0 | 1 | 0 | 1 | 0 | unknown |

| Year | Region | Forest/Unit | Fire Name | Exposure Method[1] | Accidental Intrusions | Intrusions due to exception | Total Number of Intrusions[2] | Number of Intrusions that Entered Water[3] | Number of Intrusions that Entered the Buffer only[3] | Number of Intrusions that Entered Terrestrial TES Avoidance Areas | Approximate total number of gallons in the Avoidance Area |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2013 | R6 | Mt. Hood | Government Flat Complex | airtanker | 2 | 0 | 2 | 1 | 1 | 0 | 1700 |
| 2014 | R1 | Lolo | Colt Lake | SEAT | 1 | 0 | 1 | 1 | 0 | 0 | 100 |
| 2014 | R2 | Medicine Bow-Routt and Thunder Basin NG[4] | Owen | airtanker | 1 | 0 | 1 | 1 | 0 | 0 | 8000 |
| 2014 | R3 | Apache-Sitgreaves | San Juan | airtanker | 1 | 0 | 1 | 1 | 0 | 0 | 11595 |
| 2014 | R4 | Boise | Bull Creek | SEAT | 1 | 0 | 1 | 1 | 0 | 0 | 100 |
| 2014 | R4 | Boise | Control Creek | SEAT | 1 | 0 | 1 | 1 | 0 | 0 | 714 |
| 2014 | R4 | Dixie | Basin | SEAT | 1 | 0 | 1 | 0 | 1 | 0 | 1600 |
| 2014 | R4 | Dixie | Bull Mountain | SEAT | 1 | 0 | 1 | 0 | 1 | 0 | 2000 |
| 2014 | R4 | Dixie | Scar | airtanker | 1 | 0 | 1 | 0 | 1 | 0 | 6000 |
| 2014 | R4 | Humboldt - Toiyabe | Woodchuck | SEAT | 1 | 0 | 1 | 0 | 1 | 0 | 7008 |
| 2014 | R4 | Payette | Rush Fire | SEAT | | 1 | 1 | 1 | 0 | 0 | 150 |
| 2014 | R4 | Payette | Weasel Springs | SEAT | 1 | 0 | 1 | 0 | 1 | 0 | 800 |
| 2014 | R4 | Sawtooth NRA[6] | Hell Roaring | airtanker | 1 | 0 | 1 | 0 | 1 | 0 | 2.5 |
| 2014 | R5 | Klamath | Leef Fire | airtanker | 1 | 0 | 1 | 0 | 1 | 0 | 1100 |
| 2014 | R5 | Klamath | Log Fire | helicopter | 1 | 0 | 1 | 1 | 0 | 0 | unknown |
| 2014 | R5 | Klamath | Man Fire | unknown | 1 | 0 | 1 | 1 | 0 | 0 | unknown |
| 2014 | R5 | Klamath | White's Fire | helicopter | 3 | 0 | 3 | 2 | 1 | 0 | unknown |
| 2014 | R5 | Klamath | Happy Camp | helicopter | 2 | 0 | 2 | 2 | 0 | 0 | 302 |

[6] National Recreation Area

| Year | Region | Forest/Unit | Fire Name | Exposure Method[1] | Accidental Intrusions | Intrusions due to exception | Total Number of Intrusions[2] | Number of Intrusions that Entered Water[3] | Number of Intrusions that Entered the Buffer only[3] | Number of Intrusions that Entered Terrestrial TES Avoidance Areas | Approximate total number of gallons in the Avoidance Area |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2014 | R5 | Lake Tahoe Basin MU[7] | Kingsbury | airtanker | 0 | 1 | 1 | 1 | 0 | 0 | 16800 |
| 2014 | R5 | Lassen | Black | airtanker | 1 | 0 | 1 | 0 | 1 | 0 | 1000 |
| 2014 | R5 | Lassen | Day | airtanker | 2 | 0 | 2 | 0 | 2 | 0 | 5900 |
| 2014 | R5 | Modoc | Modoc July Complex | SEAT | 1 | 0 | 1 | 0 | 1 | 0 | 1820 |
| 2014 | R5 | Modoc | Mud | airtanker | 1 | 0 | 1 | 0 | 1 | 0 | unknown |
| 2014 | R5 | San Bernardino | Tahquitz | airtanker | 1 | 0 | 1 | 0 | 1 | 0 | 2400 |
| 2014 | R5 | Sequoia | Way | airtanker | 3 | 0 | 3 | 0 | 3 | 0 | 350 |
| 2014 | R5 | Shasta-Trinity | Oregon | airtanker | 1 | 0 | 1 | 0 | 1 | 0 | unknown |
| 2014 | R5 | Shasta-Trinity | SMMU Lightning Sand Incident | airtanker | 1 | 0 | 1 | 0 | 1 | 0 | 93 |
| 2014 | R5 | Sierra | Courtney | airtanker | 1 | 0 | 1 | 0 | 1 | 0 | 100 |
| 2014 | R6 | Okanagon-Wenatchee | Carlton-Complex | airtanker | 0 | 1 | 1 | 1 | 0 | 0 | unknown |
| 2014 | R6 | Okanagon-Wenatchee | Mills Canyon | airtanker | 0 | 1 | 1 | 0 | 0 | 1 | 30000 |
| 2014 | R6 | Wallowa - Whitman | Badger Butte II | SEAT | 1 | 0 | 1 | 1 | 0 | 0 | 200 |
| 2014 | R6 | Wallowa - Whitman | Cougar | SEAT | 1 | 0 | 1 | 1 | 0 | 0 | 40 |
| 2015 | R4 | Ashley | Memorial | SEAT | 1 | 0 | 1 | 0 | 1 | 0 | 70 |
| 2015 | R4 | Boise | Cougar | SEAT | 1 | 0 | 1 | 1 | 0 | 0 | 800 |
| 2015 | R4 | Boise | Pine | airtanker | 1 | 0 | 1 | 1 | 0 | 0 | 2419 |
| 2015 | R4 | Boise | Walker | airtanker | 1 | 0 | 1 | 1 | 0 | 0 | 4088 |
| 2015 | R4 | Boise | Wolf Fire | SEAT | 1 | 0 | 1 | 1 | 0 | 0 | 500-600 |
| 2015 | R4 | Dixie | Oak Grove | airtanker | 1 | 0 | 1 | 0 | 1 | 0 | 3000 |

[7] Management Unit

| Year | Region | Forest/Unit | Fire Name | Exposure Method[1] | Accidental Intrusions | Intrusions due to exception | Total Number of Intrusions[2] | Number of Intrusions that Entered Water[3] | Number of Intrusions that Entered the Buffer only[3] | Number of Intrusions that Entered Terrestrial TES Avoidance Areas | Approximate total number of gallons in the Avoidance Area |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2015 | R4 | Payette | Boulder Meadows | SEAT | 1 | 0 | 1 | 1 | 0 | 0 | 5850 |
| 2015 | R4 | Payette | Rapid | airtanker | 4 | 0 | 4 | 3 | 1 | 0 | 100200 |
| 2015 | R4 | Sawtooth | Royal | SEAT | 1 | 0 | 1 | 1 | 0 | 0 | 1 |
| 2015 | R5 | Angeles | Cabin Fire | airtanker | 0 | 1 | 1 | 0 | 1 | 0 | 47550 |
| 2015 | R5 | Eldorado | Kyburz | airtanker | 2 | 0 | 2 | 2 | 0 | 0 | 2000 |
| 2015 | R5 | Los Padres | Chorro | airtanker | 3 | 0 | 3 | 0 | 3 | 0 | 3600 |
| 2015 | R5 | Los Padres | Cuesta | SEAT | 1 | 0 | 1 | 1 | 0 | 0 | 9 |
| 2015 | R5 | Mendocino | Boardman | airtanker | 1 | 2 | 3 | 3 | 0 | 0 | 5864 |
| 2015 | R5 | Mendocino | Deer | airtanker | 0 | 3 | 3 | 3 | 0 | 0 | 2965 |
| 2015 | R5 | San Bernardino | Green | airtanker | 1 | 0 | 1 | 1 | 0 | 0 | 333 |
| 2015 | R5 | San Bernardino | Lake | airtanker | 0 | 3 | 3 | 2 | 0 | 1 | 752 |
| 2015 | R5 | Sequoia | Rough | airtanker | 6 | 0 | 6 | 2 | 4 | 0 | 8100 |
| 2015 | R5 | Shasta-Trinity | Castle | airtanker | 1 | 0 | 1 | 1 | 0 | 0 | 2880 |
| 2015 | R5 | Shasta-Trinity | Fork Complex | airtanker | 2 | 0 | 2 | 1 | 1 | 0 | 5600 |
| 2015 | R5 | Shasta-Trinity | River Complex | unknown | 1 | 0 | 1 | 0 | 1 | 0 | 8380 |
| 2015 | R5 | Shasta-Trinity | Saddle | airtanker | 1 | 0 | 1 | 1 | 0 | 0 | 1980 |
| 2015 | R5 | Shasta-Trinity | South Complex | SEAT | 1 | 0 | 1 | 1 | 0 | 0 | 800 |
| 2015 | R5 | Six Rivers | Mad River | airtanker | 4 | 1 | 5 | 4 | 1 | 0 | unknown |
| 2015 | R5 | Six Rivers | Route Complex | airtanker | 1 | 0 | 1 | 0 | 1 | 0 | unknown |
| 2015 | R5 | Tahoe | Burnett | airtanker | 1 | 0 | 1 | 0 | 1 | 0 | 500 |
| 2015 | R6 | Malheur | Canyon Creek Complex | airtanker | 2 | 0 | 2 | 2 | 0 | 0 | 20 |
| 2016 | R1 | Custer Gallatin | North | SEAT | 1 | 0 | 1 | 1 | 0 | 0 | 1000 |

| Year | Region | Forest/Unit | Fire Name | Exposure Method[1] | Accidental Intrusions | Intrusions due to exception | Total Number of Intrusions[2] | Number of Intrusions that Entered Water[3] | Number of Intrusions that Entered the Buffer only[3] | Number of Intrusions that Entered Terrestrial TES Avoidance Areas | Approximate total number of gallons in the Avoidance Area |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2016 | R1 | Lolo | Copper King | SEAT | 1 | 0 | 1 | 1 | 0 | 0 | 750 |
| 2016 | R3 | Apache-Sitgreaves | Juniper | SEAT | 1 | 0 | 1 | 1 | 0 | 0 | 50 |
| 2016 | R4 | Boise | Buck Fire | airtanker | 2 | 0 | 2 | 2 | 0 | 0 | 1955 |
| 2016 | R4 | Boise | Pioneer | airtanker | 9 | 0 | 9 | 6 | 3 | 0 | 10443 |
| 2016 | R4 | Caribou-Targhee | Peterson Hollow | airtanker | 1 | 0 | 1 | 1 | 0 | 0 | 4-9 |
| 2016 | R4 | Caribou-Targhee | South Mink Wildfire | airtanker | 1 | 0 | 1 | 1 | 0 | 0 | 100 |
| 2016 | R4 | Caribou-Targhee | Toponce Creek Fire | airtanker | 1 | 0 | 1 | 1 | 0 | 0 | 14525 |
| 2016 | R4 | Dixie | Aspen | airtanker | 1 | 0 | 1 | 0 | 1 | 0 | 28000 |
| 2016 | R4 | Dixie | Pine Canyon | airtanker | 1 | 0 | 1 | 0 | 1 | 0 | 16800 |
| 2016 | R4 | Dixie | Saddle | Airtanker, seat, helicopter | 2 | 7 | 9 | 1 | 3 | 5 | 106183 |
| 2016 | R4 | Sawtooth | Dry Creek Fire | airtanker | 2 | 0 | 2 | 2 | 0 | 0 | 16 |
| 2016 | R4 | Uinta-Wasatch-Cache | Sheep Creek | airtanker | 1 | 0 | 1 | 1 | 0 | 0 | 300-500 |
| 2016 | R5 | Cleveland | Holy | airtanker | 1 | 0 | 1 | 0 | 1 | 0 | 2400 |
| 2016 | R5 | Cleveland | Three Sisters | airtanker | 1 | 0 | 1 | 1 | 0 | 0 | 2000 |
| 2016 | R5 | Inyo | Horseshoe | airtanker | 1 | 0 | 1 | 0 | 1 | 0 | 3150 |
| 2016 | R5 | Inyo | Marina | airtanker | 1 | 0 | 1 | 1 | 0 | 0 | 1200 |
| 2016 | R5 | Lassen | Lemm Fire | SEAT | 1 | 0 | 1 | 1 | 0 | 0 | 700 |
| 2016 | R5 | Lassen | Potato | airtanker | 1 | 0 | 1 | 0 | 1 | 0 | 500 |
| 2016 | R5 | Los Padres | Pine Fire | airtanker | 1 | 0 | 1 | 0 | 1 | 0 | 1500 |

| Year | Region | Forest/Unit | Fire Name | Exposure Method[1] | Accidental Intrusions | Intrusions due to exception | Total Number of Intrusions[2] | Number of Intrusions that Entered Water[3] | Number of Intrusions that Entered the Buffer only[3] | Number of Intrusions that Entered Terrestrial TES Avoidance Areas | Approximate total number of gallons in the Avoidance Area |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2016 | R5 | Los Padres | Rey fire | Airtanker, helicopter, unknown | 9 | 0 | 9 | 1 | 8 | 0 | 8600 |
| 2016 | R5 | Los Padres | Sherpa | airtanker | 1 | 0 | 1 | 0 | 1 | 0 | 2000 |
| 2016 | R5 | Los Padres | Soberanes Fire | airtanker | 1 | 0 | 1 | 1 | 0 | 0 | unknown |
| 2016 | R5 | Mendocino | Alder | airtanker | 0 | 1 | 1 | 0 | 1 | 0 | 221.5 |
| 2016 | R5 | San Bernardino | Blue Cut | airtanker | 1 | 2 | 3 | 0 | 2 | 1 | 18700 |
| 2016 | R5 | San Bernardino | Horn | airtanker | 1 | 0 | 1 | 0 | 1 | 0 | 1000 |
| 2016 | R5 | San Bernardino | Pilot | airtanker | 0 | 1 | 1 | 0 | 0 | 1 | 12000 |
| 2016 | R5 | Shasta-Trinity | Gillman | airtanker | 0 | 2 | 2 | 1 | 1 | 0 | 1624 |
| 2016 | R5 | Stanislaus | Old Fire | airtanker | 1 | 0 | 1 | 1 | 0 | 0 | 50 |
| 2016 | R6 | Wallowa-Whitman | Sheep | airtanker | 1 | 0 | 1 | 1 | 0 | 0 | 600 |
| 2016 | R8 | National Forests of North Carolina | Silver Mine Creek | airtanker | 0 | 1 | 1 | 0 | 1 | 0 | 450 |
| 2017 | R1 | Beaverhead-Deerlodge | Morgan | airtanker | 1 | 0 | 1 | 1 | 0 | 0 | 4380 |
| 2017 | R1 | Custer Gallatin | Sartin Draw | airtanker | 1 | 0 | 1 | 0 | 1 | 0 | 6800 |
| 2017 | R1 | Helena-Lewis and Clark | Alice Creek | airtanker | 1 | 0 | 1 | 1 | 0 | 0 | 1000 |
| 2017 | R1 | Helena-Lewis and Clark | Arrastra Creek | airtanker | 1 | 0 | 1 | 1 | 0 | 0 | 2000 |
| 2017 | R1 | Helena-Lewis and Clark | Park Creek | airtanker | 1 | 0 | 1 | 0 | 1 | 0 | 881 |
| 2017 | R1 | Lolo | Lolo Peak | helicopter | 0 | 1 | 1 | 1 | 0 | 0 | 1800 |
| 2017 | R1 | Lolo | HWY 200 Complex | airtanker | 1 | 0 | 1 | 1 | 0 | 0 | 3800 |
| 2017 | R1 | Lolo | Rice Ridge | airtanker | 8 | 0 | 8 | 8 | 0 | 0 | 29850 |
| 2017 | R1 | Lolo | Sapphire | SEAT | 1 | 0 | 1 | 1 | 0 | 0 | 1600 |

| Year | Region | Forest/Unit | Fire Name | Exposure Method[1] | Accidental Intrusions | Intrusions due to exception | Total Number of Intrusions[2] | Number of Intrusions that Entered Water[3] | Number of Intrusions that Entered the Buffer only[3] | Number of Intrusions that Entered Terrestrial TES Avoidance Areas | Approximate total number of gallons in the Avoidance Area |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2017 | R1 | Lolo | Sunrise | helicopter | 2 | 0 | 2 | 1 | 1 | 0 | 3250 |
| 2017 | R2 | Grand Mesa Uncompagre and Gunnison | Carson | SEAT | 1 | 0 | 1 | 1 | 0 | 0 | 710 |
| 2017 | R2 | Medicine Bow-Routt and Thunder Basin NG[4] | Keystone | airtanker | 0 | 1 | 1 | 1 | 0 | 0 | 10 |
| 2017 | R3 | Prescott | Goodwin | airtanker | 1 | 0 | 1 | 0 | 1 | 0 | 1000 |
| 2017 | R3 | Tonto | Picadilla | airtanker | 1 | 0 | 1 | 0 | 1 | 0 | 3500 |
| 2017 | R4 | Boise | Wapiti | SEAT | 1 | 0 | 1 | 1 | 0 | 0 | 51 |
| 2017 | R4 | Boise | Whitehawk | helicopter | 1 | 0 | 1 | 1 | 0 | 0 | 715 |
| 2017 | R4 | Humboldt-Toiyabe | Quinn Fire | SEAT | 1 | 0 | 1 | 0 | 1 | 0 | 700 |
| 2017 | R5 | Klamath | Klamath Fire | airtanker | 0 | 1 | 1 | 0 | 1 | 0 | 3500 |
| 2017 | R5 | Klamath | Little | airtanker | 2 | 0 | 2 | 1 | 1 | 0 | 2028 |
| 2017 | R5 | Klamath | Marble | airtanker | 2 | 0 | 2 | 1 | 1 | 0 | 5710 |
| 2017 | R5 | Klamath | Salmon-August Complex | airtanker | 0 | 1 | 1 | 0 | 1 | 0 | 21000 |
| 2017 | R5 | Klamath | Ukonom Spot 1 | airtanker | 1 | 0 | 1 | 1 | 0 | 0 | 157.5 |
| 2017 | R5 | Los Padres | Thomas | airtanker | 3 | 0 | 3 | 1 | 2 | 0 | 5000 |
| 2017 | R5 | Los Padres | Whittier | airtanker | 2 | 0 | 2 | 1 | 1 | 0 | 300 |
| 2017 | R5 | Mendocino | Skeleton | airtanker | 3 | 0 | 3 | 3 | 0 | 0 | 3563 |
| 2017 | R5 | Mendocino | Slides | airtanker | 1 | 0 | 1 | 1 | 0 | 0 | 1138 |
| 2017 | R5 | Plumas | Minerva 5 | airtanker | 4 | 0 | 4 | 4 | 0 | 0 | unknown |
| 2017 | R5 | San Bernardino | Dollar | airtanker | 1 | 0 | 1 | 0 | 1 | 0 | 500 |
| 2017 | R5 | San Bernardino | Holcomb T | airtanker | 0 | 4 | 4 | 0 | 1 | 3 | 15500 |

| Year | Region | Forest/Unit | Fire Name | Exposure Method[1] | Accidental Intrusions | Intrusions due to exception | Total Number of Intrusions[2] | Number of Intrusions that Entered Water[3] | Number of Intrusions that Entered the Buffer only[3] | Number of Intrusions that Entered Terrestrial TES Avoidance Areas | Approximate total number of gallons in the Avoidance Area |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2017 | R5 | San Bernardino | Rouse | airtanker | 0 | 1 | 1 | 0 | 1 | 0 | 1400 |
| 2017 | R5 | Shasta-Trinity | Buck | airtanker | 1 | 0 | 1 | 1 | 0 | 0 | 20 |
| 2017 | R5 | Sierra | Railroad | airtanker | 19 | 0 | 19 | 13 | 6 | 0 | 88115 |
| 2017 | R5 | Six Rivers | Ruth Complex | airtanker | 1 | 1 | 2 | 0 | 2 | 0 | 43000 |
| 2017 | R6 | Deschutes | Milli | airtanker | 1 | 0 | 1 | 1 | 0 | 0 | 140 |
| 2017 | R6 | Fremont-Winema | Devils Lake | airtanker | 1 | 0 | 1 | 1 | 0 | 0 | 1000 |
| 2018 | 1 | Bitterroot | Reynolds Lake | airtanker | 1 | 0 | 1 | 1 | 0 | 0 | 1500 |
| 2018 | 1 | Kootenai | OU3MR Highway 37 | airtanker | 3 | 0 | 3 | 3 | 0 | 0 | 600 |
| 2018 | 1 | Nez Perce-Clearwater | Rattlesnake | SEAT | 1 | 0 | 1 | 0 | 1 | 0 | 100 |
| 2018 | 2 | Medicine Bow-Routt and Thunder Basin NG[4] | Badger Creek | airtanker | 1 | 3 | 4 | 1 | 3 | 0 | 15000 |
| 2018 | 2 | Pike-San Isabel, Cimmaron Comanche NG[4] | Shooting Range | airtanker | 1 | 0 | 1 | 1 | 0 | 0 | 1000 |
| 2018 | 2 | White River | Two Elk fire | SEAT | 1 | 0 | 1 | 1 | 0 | 0 | 150 |
| 2018 | 3 | Gila | Ranch | airtanker | 2 | 0 | 2 | 2 | 0 | 0 | 9119 |
| 2018 | 4 | Boise | German | SEAT | 1 | 0 | 1 | 0 | 1 | 0 | 2927 |
| 2018 | 4 | Boise | Wren | airtanker | 1 | 0 | 1 | 0 | 1 | 0 | 1830 |
| 2018 | 4 | Bridger-Teton | Roosevelt | airtanker | 7 | 0 | 7 | 4 | 2 | 1 | 161000 |
| 2018 | 4 | Dixie | West Valley | airtanker | 1 | 0 | 1 | 0 | 1 | 0 | 300 |
| 2018 | 4 | Sawtooth | Wapiti | airtanker | 1 | 0 | 1 | 0 | 1 | 0 | 619 |
| 2018 | 4 | Sawtooth | Wildcat | airtanker | 0 | 1 | 1 | 1 | 0 | 0 | 4000 |

| Year | Region | Forest/Unit | Fire Name | Exposure Method[1] | Accidental Intrusions | Intrusions due to exception | Total Number of Intrusions[2] | Number of Intrusions that Entered Water[3] | Number of Intrusions that Entered the Buffer only[3] | Number of Intrusions that Entered Terrestrial TES Avoidance Areas | Approximate total number of gallons in the Avoidance Area |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2018 | 4 | Uinita-Wasatch Cache | Pole Creek | airtanker, helicopter | 5 | 0 | 5 | 0 | 5 | 0 | unknown |
| 2018 | 5 | Angeles | Fork Fire | airtanker | 2 | 0 | 2 | 2 | 0 | 0 | 500 |
| 2018 | 5 | Klamath | Petersburg | helicopter | 1 | 0 | 1 | 0 | 1 | 0 | unknown |
| 2018 | 5 | Lassen | Lakes | SEAT | 0 | 1 | 1 | 0 | 1 | 0 | 1600 |
| 2018 | 5 | Lassen | Parade | SEAT | 0 | 1 | 1 | 0 | 0 | 1 | 1606 |
| 2018 | 5 | Lassen | Roxie | helicopter | 1 | 0 | 1 | 1 | 0 | 0 | 1400 |
| 2018 | 5 | Lassen | Whaleback | airtanker | 1 | 0 | 1 | 1 | 0 | 0 | 50 |
| 2018 | 5 | Lassen | Wilson | airtanker | 0 | 1 | 1 | 1 | 0 | 0 | 1500 |
| 2018 | 5 | Los Padres | Adams | airtanker | 1 | 0 | 1 | 1 | 0 | 0 | 3500 |
| 2018 | 5 | Mendocino | Eel | airtanker | 7 | 0 | 7 | 2 | 5 | 0 | 4000 |
| 2018 | 5 | Mendocino | Open | airtanker | 2 | 0 | 2 | 2 | 0 | 0 | 415 |
| 2018 | 5 | Mendocino | Ranch | airtanker | 22 | 0 | 22 | 13 | 9 | 0 | 13622 |
| 2018 | 5 | San Bernardino | Cranston | airtanker | 4 | 2 | 6 | 0 | 5 | 1 | 29000 |
| 2018 | 5 | San Bernardino | Kenbrook | airtanker | 0 | 1 | 1 | 0 | 1 | 0 | 600 |
| 2018 | 5 | Shasta-Trinity | Kerlin | airtanker | 0 | 1 | 1 | 1 | 0 | 0 | 15000 |
| 2018 | 5 | Six Rivers | Signboard | airtanker | 1 | 0 | 1 | 0 | 1 | 0 | unknown |
| 2018 | 5 | Tahoe | North | airtanker | 3 | 0 | 3 | 3 | 0 | 0 | unknown |
| 2018 | 6 | Okanogan-Wenatchee | Cougar Creek | airtanker | 1 | 0 | 1 | 1 | 0 | 0 | 500 |
| 2018 | 6 | Rogue River-Siskiyou | Klondike West | airtanker | 1 | 0 | 1 | 0 | 0 | 1 | 20000 |
| 2018 | 6 | Rogue River-Siskiyou | Nachez | helicopter | 1 | 0 | 1 | 1 | 0 | 0 | 2400 |
| 2018 | 6 | Umatilla | Wilson Prairie | airtanker | 2 | 0 | 2 | 2 | 0 | 0 | 121800 |
| 2018 | 8 | Mark Twain | Rozell | airtanker | 0 | 1 | 1 | 0 | 0 | 1 | 2799 |
| 2019 | 1 | Nez Perce - Clearwater | Crab | airtanker | 1 | 0 | 1 | 1 | 0 | 0 | 300 |

| Year | Region | Forest/Unit | Fire Name | Exposure Method[1] | Accidental Intrusions | Intrusions due to exception | Total Number of Intrusions[2] | Number of Intrusions that Entered Water[3] | Number of Intrusions that Entered the Buffer only[3] | Number of Intrusions that Entered Terrestrial TES Avoidance Areas | Approximate total number of gallons in the Avoidance Area |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2019 | 3 | Tonto | Woodbury | airtanker | 1 | 0 | 1 | 1 | 0 | 0 | 14175 |
| 2019 | 4 | Boise | Nine Fire | airtanker | 1 | 0 | 1 | 1 | 0 | 0 | 1850 |
| 2019 | 4 | Bridger-Teton | Boulder Lake | unknown | 1 | 0 | 1 | 1 | 0 | 0 | unknown |
| 2019 | 4 | Humboldt-Toiyabe | Corta | airtanker | 1 | 0 | 1 | 0 | 1 | 0 | 100 |
| 2019 | 4 | Humboldt-Toiyabe | Cherry Fire | SEAT | 1 | 0 | 1 | 1 | 0 | 0 | 1400 |
| 2019 | 4 | Payette | Nethker Fire | unknown | 3 | 0 | 3 | 3 | 0 | 0 | unknown |
| 2019 | 4 | Salmon-Challis | Vader Fire | airtanker | 1 | 0 | 1 | 1 | 0 | 0 | unknown |
| 2019 | 5 | Cleveland | Meadow | airtanker | | 1 | 1 | 0 | 0 | 1 | 650 |
| 2019 | 5 | Inyo | Taboose | unknown | 2 | 0 | 2 | 1 | 1 | 0 | 300 |
| 2019 | 5 | Klamath | Lime | airtanker | 1 | 0 | 1 | 1 | 0 | 0 | unknown |
| 2019 | 5 | Lassen | Potato Fire | SEAT | 0 | 1 | 1 | 0 | 1 | 0 | 2000 |
| 2019 | 5 | San Bernardino | Bautista | airtanker | 1 | 3 | 4 | 0 | 0 | 4 | 18800 |
| 2019 | 5 | Stanislaus | Pond Fire | airtanker | 1 | 0 | 1 | 1 | 0 | 0 | 2000 |
| 2019 | 8 | National Forests in Florida | Powerline | helicopter | 0 | 1 | 1 | 0 | 0 | 1 | 1000 |
| 2020 | 1 | Custer Gallatin | Bridger Foothills | airtanker | 9 | 0 | 9 | 3 | 6 | 0 | unknown |
| 2020 | 1 | Custer Gallatin | King | SEAT | 1 | 0 | 1 | 1 | 0 | 0 | unknown |
| 2020 | 1 | Helena-Lewis and Clark | Fields Gulch | airtanker | 1 | 0 | 1 | 1 | 0 | 0 | 2500 |
| 2020 | 3 | Gila | Good | SEAT | 2 | 0 | 2 | 2 | 0 | 0 | 320 |
| 2020 | 3 | Gila | Turkey | airtanker, SEAT | 3 | 0 | 3 | 1 | 2 | 0 | 920 |
| 2020 | 3 | Tonto | Sears | SEAT | 0 | 2 | 2 | 0 | 2 | 0 | 3538 |
| 2020 | 4 | Boise | Pumpkin | airtanker | 4 | 0 | 4 | 4 | 0 | 0 | 57178 |

| Year | Region | Forest/Unit | Fire Name | Exposure Method[1] | Accidental Intrusions | Intrusions due to exception | Total Number of Intrusions[2] | Number of Intrusions that Entered Water[3] | Number of Intrusions that Entered the Buffer only[3] | Number of Intrusions that Entered Terrestrial TES Avoidance Areas | Approximate total number of gallons in the Avoidance Area |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2020 | 4 | Uinta-Wasatch-Cache | Upper Provo | SEAT | 1 | 0 | 1 | 1 | 0 | 0 | 2100 |
| 2020 | 5 | San Bernardino | ElDorado | airtanker | 1 | 2 | 3 | 0 | 2 | 1 | 2800 |
| 2020 | 5 | San Bernardino | Pitman | airtanker | 1 | 0 | 1 | 0 | 0 | 1 | unknown |
| 2020 | 5 | San Bernadino | Kare | SEAT | 0 | 1 | 1 | 0 | 1 | 0 | 500 |
| 2020 | 5 | Cleveland | Valley | airtanker | 1 | 0 | 1 | 1 | 0 | 0 | 5000 |
| 2020 | 5 | Sequoia | Ant | airtanker | 1 | 0 | 1 | 1 | 0 | 0 | unknown |
| 2020 | 5 | Sequoia | SQF Complex | airtanker, helicopter | 31 | 0 | 31 | 15 | 16 | 0 | 11600 |
| 2020 | 5 | Sierra | Bullfrog | airtanker | 1 | 0 | 1 | 0 | 1 | 0 | 1000-4999 |
| 2020 | 5 | Six Rivers | Red Salmon | airtanker | 1 | 0 | 1 | 1 | 0 | 0 | unknown |
| 2020 | 6 | Ochoco | Frog | airtanker | 1 | 0 | 1 | 0 | 1 | 0 | 0-999 |
| 2020 | 6 | Umatilla | Hagar | airtanker | 1 | 0 | 1 | 1 | 0 | 0 | 1000 |
| 2021 | 1 | Custer Gallatin | Ash | SEAT | 1 | 0 | 1 | 0 | 1 | 0 | unknown |
| 2021 | 1 | Custer Gallatin | Horse Creek | airtanker | 1 | 0 | 1 | 1 | 0 | 0 | 1000-4999 |
| 2021 | 1 | Custer Gallatin | Robertson Draw | SEAT | 6 | 0 | 6 | 0 | 6 | 0 | 5200 |
| 2021 | 1 | Lolo | West Lolo | airtanker | 1 | 0 | 1 | 1 | 0 | 0 | 2440 |
| 2021 | 1 | Nez Perce – Clearwater | Dixie | airtanker | 1 | 0 | 1 | 1 | 0 | 0 | unknown |
| 2021 | 3 | Apache-Sitgreaves | Leonard Canyon | SEAT | 1 | 0 | 1 | 0 | 1 | 0 | 2182 |
| 2021 | 3 | Tonto | Telegraph | airtanker, SEAT | 0 | 2 | 2 | 0 | 2 | 0 | 1000-5999 |
| 2021 | 4 | Bridger-Teton | Shale Creek | SEAT | 1 | 0 | 1 | 0 | 1 | 0 | 0-999 |
| 2021 | 4 | Payette | Creek | unknown | 1 | 0 | 1 | 1 | 0 | 0 | 0-999 |
| 2021 | 4 | Salmon-Challis | Trail Creek | airtanker | 2 | 0 | 2 | 0 | 2 | 0 | 0-1999 |
| 2021 | 4 | Sawtooth | Jakes Gulch | airtanker | 1 | 0 | 1 | 0 | 1 | 0 | 4180 |
| 2021 | 5 | San Bernardino | Bonita | airtanker | 1 | 0 | 1 | 1 | 0 | 0 | 5000-9999 |

| Year | Region | Forest/Unit | Fire Name | Exposure Method[1] | Accidental Intrusions | Intrusions due to exception | Total Number of Intrusions[2] | Number of Intrusions that Entered Water[3] | Number of Intrusions that Entered the Buffer only[3] | Number of Intrusions that Entered Terrestrial TES Avoidance Areas | Approximate total number of gallons in the Avoidance Area |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2021 | 5 | San Bernardino | Cary | airtanker | | 1 | 1 | 0 | 0 | 1 | 13000 |
| 2021 | 5 | San Bernardino | South | airtanker | 1 | 0 | 1 | 1 | 0 | 0 | 1000-4999 |
| 2021 | 5 | Eldorado | Caldor | unknown | 1 | 0 | 1 | 0 | 1 | 0 | unknown |
| 2021 | 5 | Eldorado | Twin | unknown | 1 | 0 | 1 | 1 | 0 | 0 | unknown |
| 2021 | 5 | Inyo | Dexter | airtanker | 2 | 0 | 2 | 0 | 0 | 2 | 0-1999 |
| 2021 | 5 | Inyo | Inyo | helicopter | 1 | 0 | 1 | 1 | 0 | 0 | unknown |
| 2021 | 5 | Los Padres | Alisal | airtanker | 1 | 0 | 1 | 1 | 0 | 0 | 1000-4999 |
| 2021 | 5 | Los Padres | Willow | airtanker | 1 | 0 | 1 | 0 | 1 | 0 | 0-999 |
| 2021 | 5 | Plumas | Dixie | helicopter, unknown | 2 | 0 | 2 | 1 | 1 | 0 | unknown |
| 2021 | 5 | Sierra | Blue | airtanker | 1 | 0 | 1 | 1 | 0 | 0 | 0-999 |
| 2021 | 6 | Stanislaus | Henry | airtanker | 0 | 2 | 2 | 0 | 2 | 0 | 456-1455 |
| 2021 | 6 | Fremont – Winema | Bootleg | SEAT | 1 | 0 | 1 | 1 | 0 | 0 | 0-999 |
| 2021 | 6 | Malheur | Black Butte | SEAT, unknown | 2 | 0 | 2 | 1 | 1 | 0 | 730 |
| 2021 | 6 | Malheur | Delintment | airtanker | 1 | 0 | 1 | 1 | 0 | 0 | unknown |
| 2021 | 6 | Okanogan – Wenatchee | Twenty-five Mile | airtanker | 1 | 0 | 1 | 0 | 1 | 0 | unknown |
| 2021 | 6 | Umatilla | Lovelett Corral | airtanker | 1 | 0 | 1 | 0 | 1 | 0 | 1000-4999 |
| TOTAL 2012 through 2021 | | | | | 463 | 98 | 561 | 259 | 270 | 32 | 1,718,451 |

# SEIS Appendix E – Species Analysis Screening Processes

The information in this appendix describes the process used to analyze effects to federally-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 (USDA Forest Service 2021c), the Botanical Biological Evaluation for Nationwide Aerial Application of Fire Retardant on National Forest System Lands (USDA Forest Service 2023a) and the Terrestrial and Aquatic Species Biological Evaluation for Nationwide Aerial Application of Fire Retardant on National Forest System Lands (USDA Forest Service 2023b). Refer to the source documents for further information. This information has been updated since the 2011 Nationwide Aerial Application of Fire Retardant on National Forest System Lands Final Environmental Impact Statement (USDA Forest Service 2011a) was published.

## 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 consultations 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 and assumptions were developed and applied.

#### *Retardant Application Potential*

The occurrence of past fires and retardant drops provides a baseline and indicator for considering when and where retardant may be used in the future (refer to the biological assessment (USDA Forest Service 2021c) Table 10, Table 11, Table 12, and Figure 6). That information was summarized for use in the national screens as described below; complete data by National Forest is available in a separate report (USDA Forest Service 2020e).

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 2020e) and the maximum amount (maximum total gallons) of retardant used in any given year from 2012 through 2019, as follows:

‘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.

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. That 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 Appendix G of the biological assessment (USDA Forest Service 2021c) for lists of all National Forests and their retardant application potential.

### *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.

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/oror 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 System lands, and effects from aerial retardant use on National Forest System 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 |

[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.

| Impact[1] | National Screening Factor Aerially Applied Retardant | Aerial Retardant Application Potential |
|---|---|---|
| LAA | Changes to primary constituent elements, or physical and biological features of critical habitat, are anticipated. | low - high |

## Wildlife Effects Screening Process

### *General information about the wildlife screening process*

As part of the analysis framework established for the 2011 biological assessment (USDA Forest Service 2011b), a National Effects Screening Process (as described previously) was developed for all Endangered Species Act 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, USDA Forest 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 a 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 (USDA Forest Service 2021c) 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 (USDA Forest Service 2021c). 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 (Figure E-1)*

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.

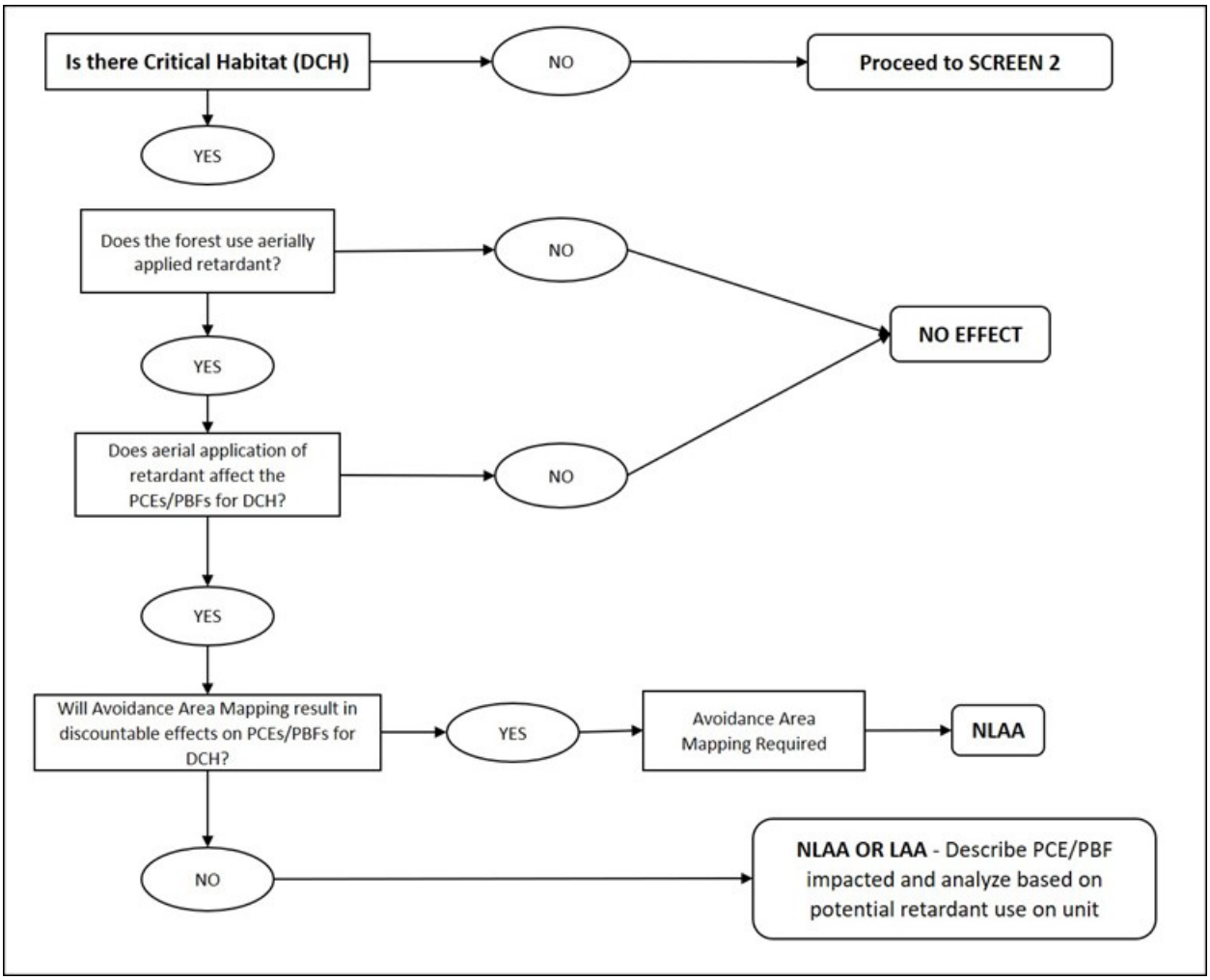


**Figure E-1. Wildlife screen 1: effects to critical habitat**

### *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 (USDA Forest Service 2021c) 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 to limit potential impacts during those times.

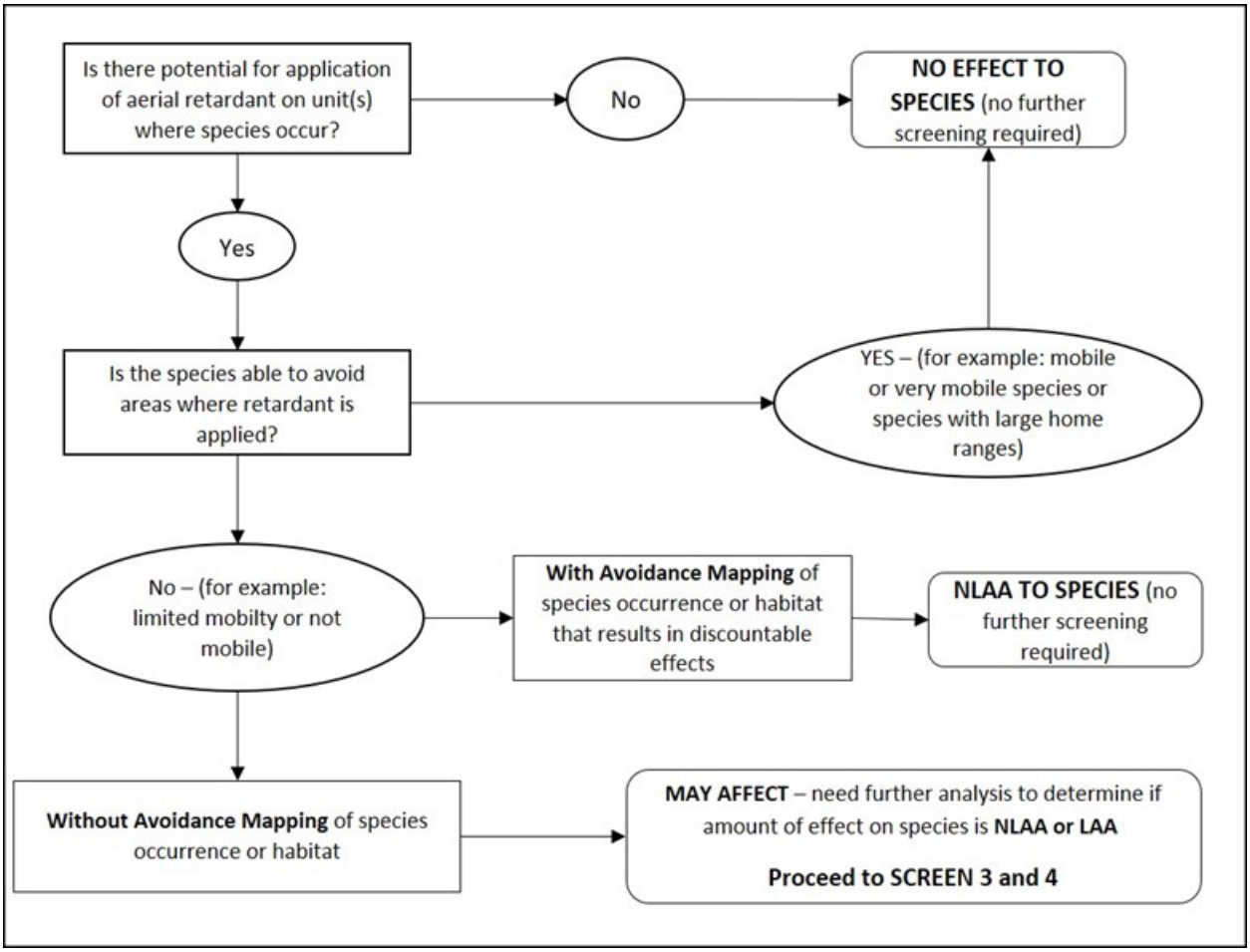


**Figure E-2. Wildlife screen 2: mobility of individuals**

### *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 (USDA Forest Service 2021c) 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.

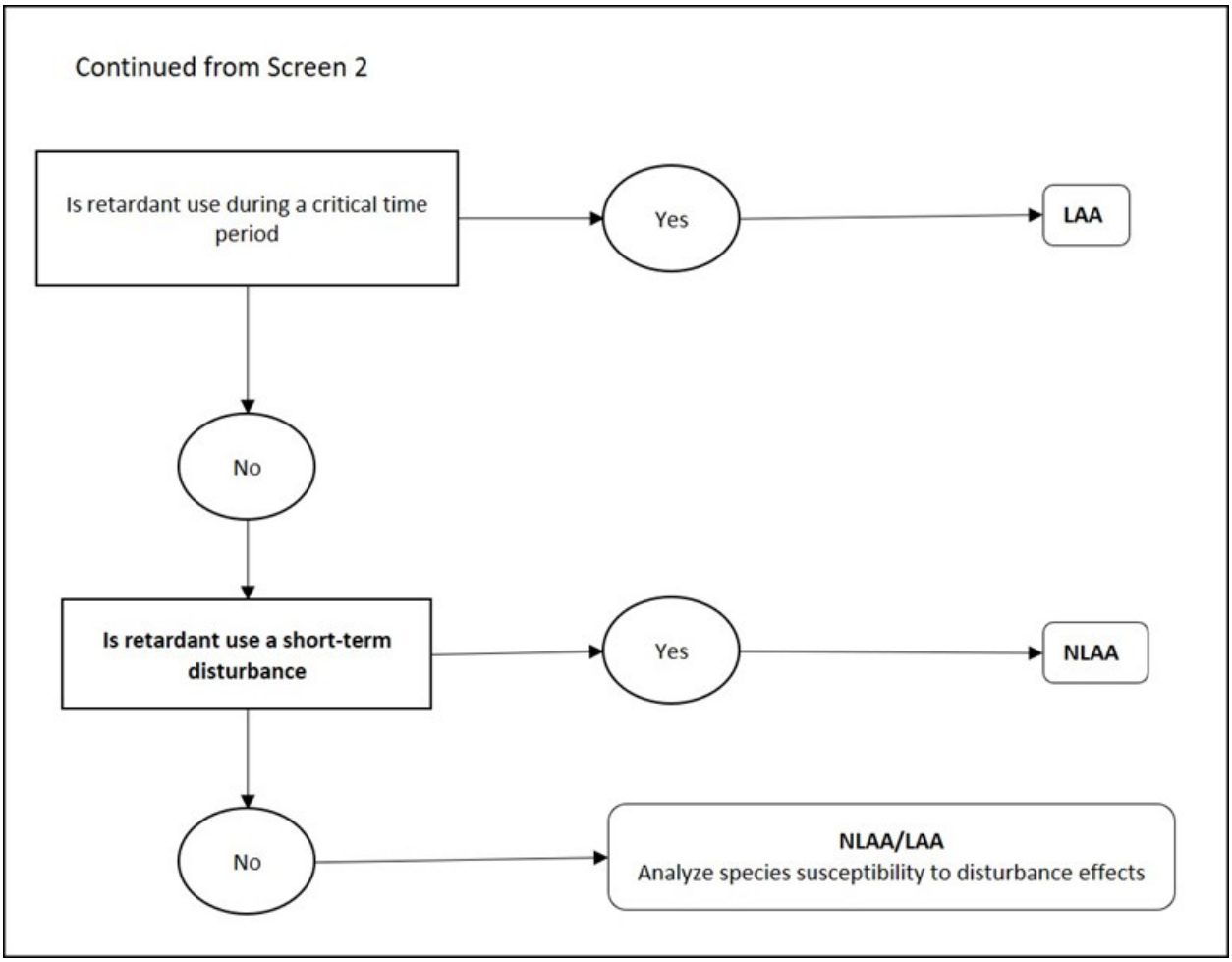


**Figure E-3. Wildlife screen 3: disturbance from low-flying aircraft**

### *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) for more details.

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.

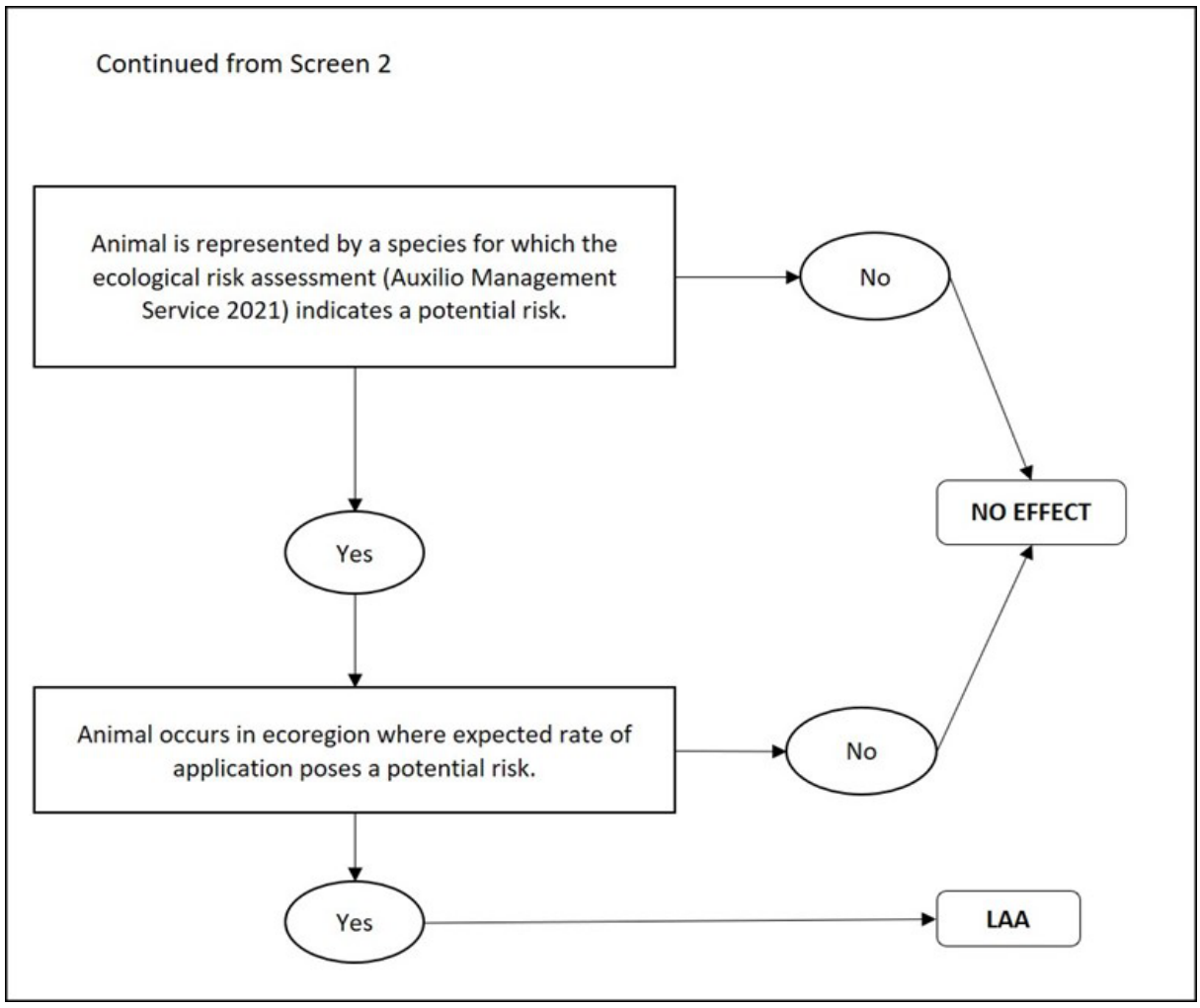


**Figure E-4. Wildlife screen 4: ingestion of retardant**

## 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 species on a forest that doesn't aerially apply fire retardant, but the same species occurring on another forest that uses aerial application of fire retardant could have a "May Impact Individuals and Habitat" determination. Table E-2 shows the process to standardize impacts determinations for sensitive terrestrial and aquatic species addressed in this analysis.

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

| Aerial Retardant Application Potential | National Screening Factor for Aerially Applied Retardant | Impact[1] |
|---|---|---|
| none | Species/habitat occur in areas with no fires, therefore no potential retardant use. Examples: cliffs, caves, estuaries, marshes, lakes, ocean shoreline, sand dunes. | NI |
| none | Species occurs near, but not on National Forest System lands and effects from retardant use on National Forest System lands are not anticipated. | NI |
| none | No retardant use recorded on forests where species occur or are suspected | NI |
| **Aquatic Habitats** | | |
| very low to low | Species occurs on forest with very low or low retardant application potential | MIIH |
| moderate to high | Species occurs on forest with greater than low retardant application potential. | MIIH or WII: use Aquatic Effects screen |
| **Terrestrial Habitats** | | |
| very low to high | 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 retardant is generally not used in species habitat. Examples include desert, dense forest canopy, alpine, talus/scree slopes. | NI |
| very low to high | 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 retardant may be used in species habitat. Species populations are not isolated. | MIIH |
| very low to high | 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 retardant may be used in species habitat. Species populations are isolated. | MIIH or WII: use Terrestrial Effects screens |
| very low to high | Species occurs or is suspected of occurring on a forest with greater than 0.01 percent of its land base impacted by retardant on average annually, and retardant is generally not used in species habitat. | MIIH |
| very low to high | Species occurs or is suspected of occurring on a forest with greater than 0.01 percent of its land base impacted by retardant on average annually, and retardant may be used in species habitat. | MIIH or WII: use Terrestrial Effects screens |

## Sensitive Terrestrial/Aquatic Species Impact Screens

Terrestrial and aquatic wildlife impacts screens were developed as a fine filter to supplement the National Effects Screening Process, to provide a consistent approach when additional consideration is needed, similar to the process used in the biological assessment for Fish and Wildlife Service Species (USDA Forest Service 2021c). Where there is uncertainty in determinations after the National Effects Screens

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

were applied, as when the screen leads to an either/or decision, or when additional considerations are warranted, the terrestrial or aquatic screens were used. The terrestrial screens use information on species mobility, potential disturbance to species based on event timing and duration, and potential for ingestion and toxicity based on information in risk assessments. The aquatic screen uses information about species distribution at two scales to help reach a determination of effect.

In addition to the information and assumptions listed for the National Effects Screens above, the following information and assumptions were used in applying the terrestrial and aquatic screens.

### *General Assumptions:*

- The mitigation measures of avoidance mapping for habitat and populations will include established trigger points (at local level) for restricting the use of retardants within watersheds where retardant has caused adverse impacts to a species or population.

- Yearly pre-season coordination meetings will occur and help in reducing impacts to species and habitats by discussing changes in new population information and monitoring needs for species prior to season use.

### *Sensitive Terrestrial Screen 5: Mobility (Figure E-5)*

Terrestrial screen 1 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, 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 to limit potential impacts during those times. Additional assumptions used in this screen include:

- Species with limited mobility whose habitats are included in avoidance areas are less likely to be affected by aerial retardant drops than those whose habitats are not in avoidance areas.

Burrowing species are likely to take refuge underground during a wildfire and therefore they may also avoid direct exposure to aerial retardant drops.

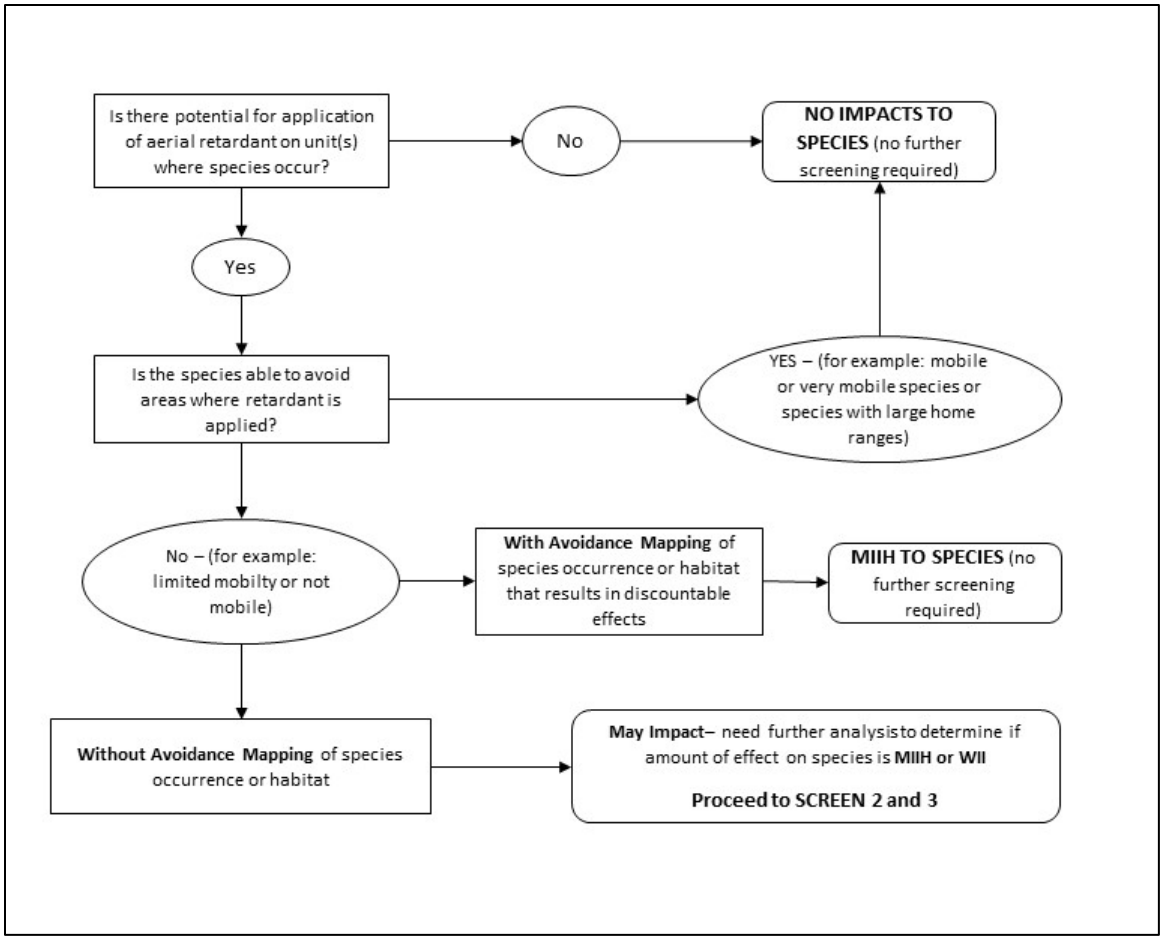


**Figure E-5. Sensitive Terrestrial Screen 5: Mobility**

### *Sensitive Terrestrial Screen 6: Disturbance (Figure E-6)*

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; 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.

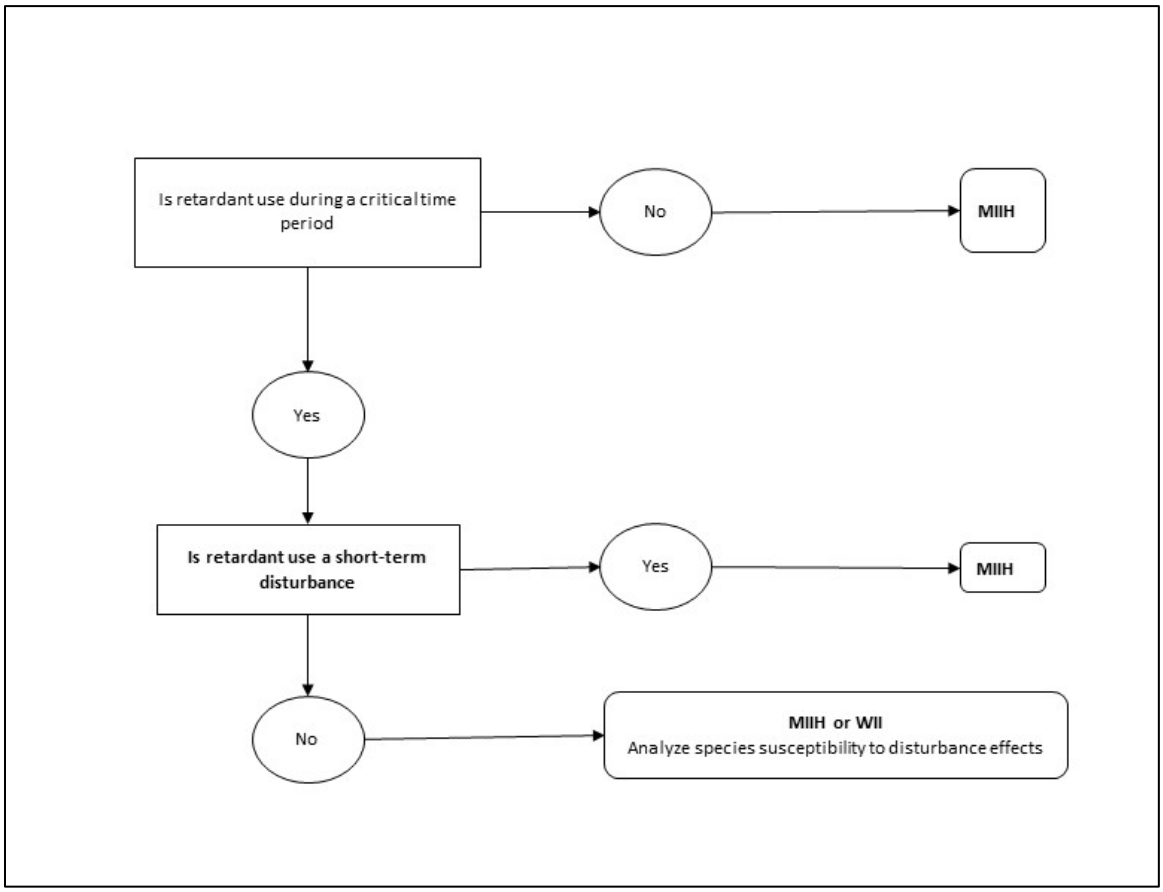


**Figure E-6 Sensitive Terrestrial Screen 6: Disturbance**

### *Sensitive Terrestrial Screen 7: Ingestion (Figure E-7)*

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) for more details.

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.

Additional assumptions included in terrestrial screen 3 include:

- Permanent or persistent exposures through terrestrial environmental pathways are not expected because the application "footprint" of these chemicals is expected to be limited relative to the foraging areas and other habitats used by individual animals, and because the ingredients generally degrade in the environment (Auxilio Management Services 2021).

Bioaccumulation was evaluated in simple predator-prey scenarios. Permanent or persistent exposures are unlikely because retardant is rarely used more than once in the same place and it degrades and dissipates under normal environmental conditions, so long-term biomagnification in the terrestrial food web was not evaluated (Auxilio Management Services 2021).

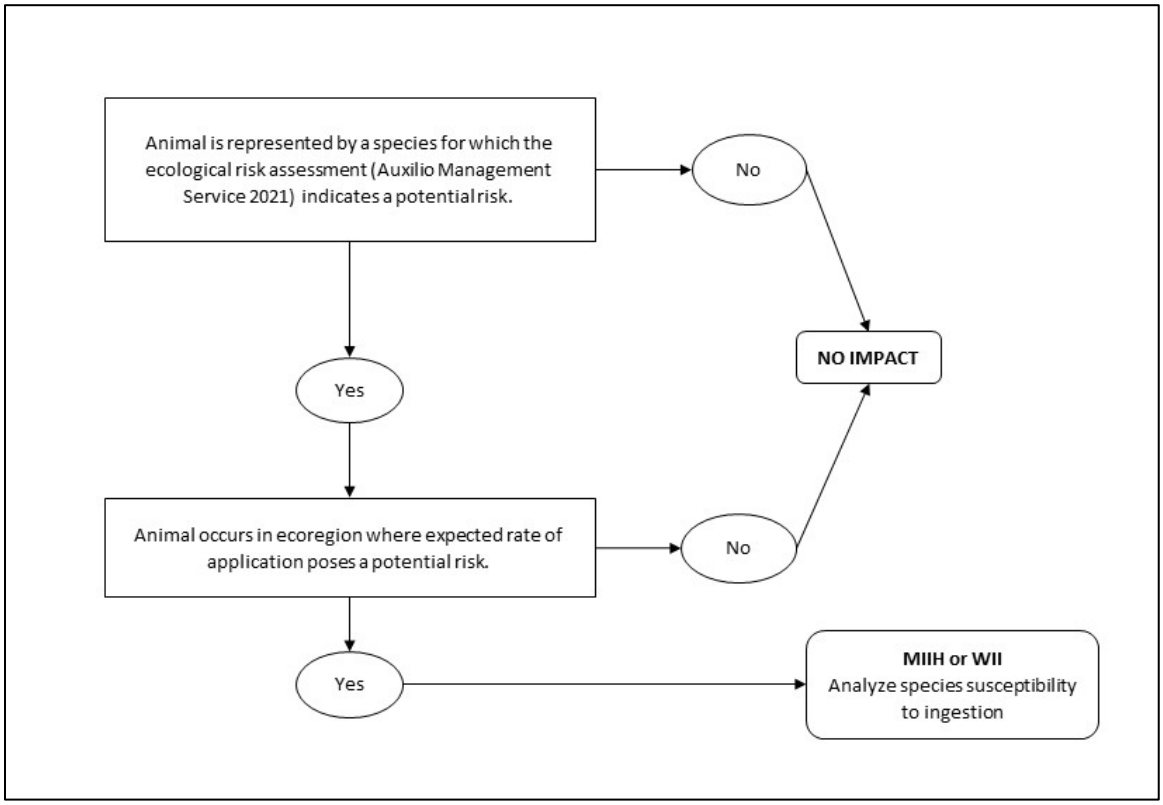


**Figure E-7. Sensitive Terrestrial Screen 7: Ingestion**

### *Sensitive Aquatic Screen (Figure E-8)*

The fine filter screen for aquatic species and habitats incorporates the following assumptions:

- All aquatic species and habitat are in avoidance areas.
- Retardant intrusion into water is rare (refer to SEIS Appendix D), but in general aquatic species in the vicinity of an intrusion are not able to avoid retardant when one occurs.

There are no identified risks from run-off of current long-term retardant products (Auxilio Management Services 2021), however some movement of wet retardant from vegetation to the stream may occur from post-application rain events.

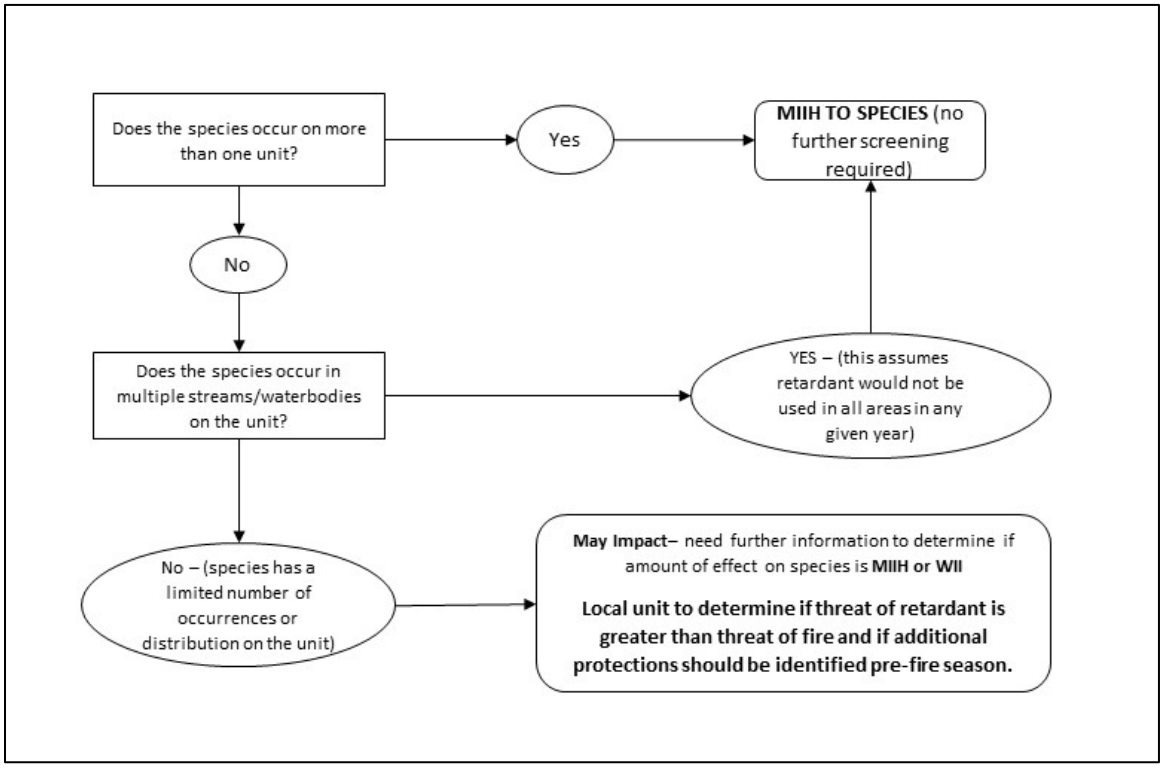


**Figure E-8. Sensitive Aquatic Species Screen**

# SEIS Appendix F – Lists of Species Considered and Effects

The tables in this appendix display the species for which consultation was completed with the U.S. Fish and Wildlife Service (Table F-1) and with the National Oceanic and Atmospheric Administration National Marine Fisheries Service (NOAA Fisheries, Table F-2). The species considered under the Endangered Species Act and marine Mammal Act are displayed in Table F-3. Table F-4 displays those species associated with airtanker bases that were considered during consultations. The following information applies to all tables:

- Common name or scientific name in parentheses indicates an alternate name. DPS = Distinct Population Segment, ESU = Evolutionarily Significant Unit
- Abbreviations for Status are: 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. Where status is depicted in parentheses () it means that the species does not occur on National Forest System lands, but it may be analyzed for indirect impacts.
- Abbreviations for Determination are: NE = no effect, NLAA = may affect but is not likely to adversely affect, LAA = may affect and is likely to adversely affect. Were two determinations are provided, the first is for the species and the second is for critical habitat.
- Forest names in all capital letters indicate units where designated or proposed critical habitat occurs. Forest names in parentheses () indicate that the associated species does not occur on National Forest System lands, but may be analyzed in association with that unit for potential indirect effects. Refer to the main SEIS document for an explanation of categories for retardant application potential.

**Table F-1. 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**

| 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** | | | | |
| 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,** | | | | |

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | **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, 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** | | |
| amphibian | foothill yellow-legged frog south Sierra DPS | *Rana boylii* | PE | LAA | | | | | high application potential: **Sierra Sequoia, Eldorado, Stanislaus, Tahoe** | | | | |
| amphibian | foothill yellow-legged frog south coast DPS | *Rana boylii* | PE | LAA | | | | | high application potential: **Los Padres** | | | | |
| amphibian | foothill yellow-legged frog north Feather DPS | *Rana boylii* | PT | LAA | | | | | high application potential: **Plumas** | | | | |
| amphibian | California red-legged frog | *Rana draytonii* | T, CH | LAA, NLAA | | | | | moderate application potential: **Mendocino**; high application | | | | |

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | 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** | | | | |
| 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** | | | |

| 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 | 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, 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** | | |
| 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** | | |

| 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 | 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** | | | | | | | |
| bird | piping plover | *Charadrius melodus* | T/E, CH | NE, 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, 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** | | | |

| 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 | 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** | | | | |
| 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/XN CH | NLAA/NLJ, NE | | | 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 | Mount Ranier white-tailed ptarmigan | *Lagopus leucura rainierensis* | PT | NLAA | | | | | | no use: **Mt. Baker-Snoqualmie**; low application potential: **Gifford Pinchot;** High application potential: **Okanogan-Wenatchee** | | | |
| 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** | | | |
| 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,** | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | **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** | | |
| bivalve | spectaclecase | *Cumberlandia monodonta* | E | NLAA | | | | | | | no use: **Ozark, Ouachita, George Washington and Jefferson** | no use: **Shawnee**; very low application potential: **Mark Twain** | |
| bivalve | western fanshell | *Cyprogenia aberti* | PT, PCH | NLAA, NLAA | | | | | | | | very low application potential: **Mark Twain** | |
| bivalve | Ouachita fanshell | *Cyprogenia c.f. aberti* | PT, PCH | NE, NE | | | | | | | no use: **Ouachita** | | |
| 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 | | | | | | | 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** | | |

| 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 | 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** | | |
| 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 | | | | | | | 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 | Atlantic pigtoe | *Fusconaia masoni* | T, CH | NLAA, NLAA | | | | | | | no use: **GEORGE WASHINGTON and JEFFERSON;** very low application | | |

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | potential: **NATIONAL FORESTS IN NORTH CAROLINA** | | |
| 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** | | |
| bivalve | cracking pearlymussel | *Hemistena lata* | E, XN | 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 | | | | | | | 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** | | |

| 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 | 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** | | |
| 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** | | |

| 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 | southern pigtoe | *Pleurobema georgianum* | E, CH | NLAA, NLAA | | | | | | | no use: **NATIONAL FORESTS IN ALABAMA**; very low application potential: **CHATTAHOOCHEE** | | |
| 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 | | | | | | | 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** | | |
| bivalve | fluted kidneyshell | *Ptychobranchus subtentum* | E, CH | NLAA, NLAA | | | | | | | no use: **DANIEL BOONE, GEORGE WASHINGTON AND JEFFERSON;** very low application | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | 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 | | | | | | | no use: **Ouachita** | | |
| bivalve | round ebonyshell | *Reginaia rotulata* | E, CH | NE, NE | | | | | | | no use: **NATIONAL FORESTS IN ALABAMA** | | |
| bivalve | Cumberland monkeyface | *Quadrula intermedia* | E/XN | NE | | | | | | | no use: **George Washington and Jefferson** | | |
| bivalve | Appalachian monkeyface | *Quadrula sparsa* | E/XN | 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** | | |
| crustacean | Conservancy fairy shrimp | *Branchinecta conservatio* | E, (CH) | NLAA, na | | | | | 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 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** | | | | |
| fish | Warner sucker | *Catostomus warnerensis* | T, (CH) | NLAA, na | | | | | | moderate application potential: **Fremont-Winema** | | | |

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 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, na | | | | 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** | | | |
| 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: | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | **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** | | | | |
| 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** | | very low application potential: | | | | | |

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | **Uncompahgre and Gunnison;** low application potential: **Arapaho & Roosevelt;** moderate application potential: **Medicine Bow-Routt, San Juan, White River** | | **Ashley, Fishlake, Manti-La Sal;** high application potential: **Bridger-Teton, Dixie, Uinta-Wasatch-Cache** | | | | | |
| 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),** | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | **(Stanislaus), (Tahoe)** | | | | |
| 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** | | |

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 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** | | |
| fish | goldline darter | *Percina aurolineata* | T, (PCH) | NLAA, na | | | | | | | no use: **National Forests in Alabama;** very low application potential: | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | **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** | | | | | | |
| 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** | | | | | |
| fish | bull trout | *Salvelinus confluentus* | T, CH | LAA, LAA | Low application potential: **FLATHEAD;** moderate application potential: | | | moderate application potential: **SALMON-CHALLIS, SAWTOOTH;** | | no use: **MT. BAKER-SNOQUALMIE, OLYMPIC;** very low application potential: | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | **BEAVERHEAD-DEERLODGE, BITTERROOT, HELENA-LEWIS AND CLARK, IDAHO-PANHANDLE, KOOTENAI;** high application potential: **LOLO, NEZ PERCE-CLEARWATER** | | | high application potential: **BOISE, HUMBOLDT, PAYETTE** | | **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** | | | |
| 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, 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** | | | | | | |

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 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** | | | | | |
| 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* | T, (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** | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 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** | | |
| 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** | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| insect | Smith's blue butterfly | *Euphilotes enoptes smithi* | E, PCH | LAA, LAA | | | | | high application potential: **Los Padres** | | | | |
| insect | Sacramento Mountains checkerspot butterfly | *Euphydryas anicia cloudcrofti* | PE | LAA | | | moderate application potential: **Lincoln** | | | | | | |
| 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* | T, CH | 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** | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 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** | | | | |
| 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 | gray wolf | *Canis lupis* | E/T, CH | NLAA, NE | | | | | high application potential: **Klamath, Modoc, Shasta TrinitySix Rivers** | no use: **Mt. Baker-Snoqualmie**; very low application potential: **Columbia River Gorge**; low retardant application potential: **Gifford Pinchot;** moderate application potential: **Fremont-Winema, Umpqua, Umatilla**; high application potential: **Deschutes, Malheur, Ochoco, Okanogan-Wenatchee, Rogue River, Walowa-Whitman** | | no use: **Ottawa, Hiawatha;** very low application potential: **CHIPPEWA, SUPERIOR (threatened in Minnesota)** | |
| mammal | Mexican wolf | *Canis lupis baileyi* | E/XN | NLAA | | | very low application potential: **Kaibab;** low | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 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** | |
| 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* | T | 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** | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mammal | ocelot | *Leopardus pardalis* | E | NLAA | | | high application potential: **Coronado** | | | | | | |
| mammal | Mexican long-nosed bat | *Leptonycteris nivalis* | E | NLAA | | | high application potential: **Coronado** | | | | | | |
| 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 Isabe**l | | high application potential: **Bridger-Teton, Wasatch-Cache** | | | | | |
| 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 | no use: **Hoosier, Shawnee;** very low application potential: **Mark Twain** | |

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | potential: **Chattahoochee-Oconee, Cherokee, National Forests in Florida, National Forests in North Carolina** | | |
| 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** | |
| 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,** | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | **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** | | |
| 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,** | 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** | | | |

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | **Kootenai;** high application potential: **Lolo** | | | | | | | | |
| 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** | | | |
| 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** | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| plant | marsh sandwort | *Arenaria paludicola* | E | NE | | | | | high application potential: **San Bernardino** | | | | |
| 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, 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, na | | | | | 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** | | | | |
| 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** | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | **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** | | | | |
| 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: | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | **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** | |
| 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** | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 | mountain golden heather | *Hudsonia montana* | T, CH | NLAA, NLAA | | | | | | | very low application potential: **NATIONAL FORESTS IN NORTH CAROLINA** | | |
| plant | Texas prairie dawn | *Hymenoxys texana* | E | NE | | | | | | | very low application potential: **National Forests and Grasslands in Texa**s | | |
| 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** | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 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** | | |
| 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, CH | NLAA, NLAA | | | | | | high application potential: **Rogue River-Siskiyou** | | | |
| plant | Kincaid's lupine | *Lupinus oreganus var. kincaidii* | T, (CH) | NLAA, na | | | | | | moderate application potential: **Umpqua** | | | |
| plant | rough-leaved loosestrife | *Lysimachia asperulifolia* | E | NLAA | | | | | | | very low application potential: **National** | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | **Forests in North Carolina** | | |
| 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** | |
| plant | beardless chinchweed | *Pectis imberbis* | E, CH | NLAA, NLAA | | | | | | | | | |

| 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 | 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** | | | | | | | |
| 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** | | |

| 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 | whitebark pine | *Pinus albicaulis* | 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, 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** | | |
| 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: | very low application potential: **Nebraska and Samuel R. McKelvie;** | | | | | | | |

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | **Dakota Prairie Grasslands** | 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** | | | | |
| 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** | | |

| 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 | 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** | | |
| 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** | | | | |

| 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 | 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** | | | |
| 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** | | | | | | |
| plant | Ute ladies'-tresses orchid | *Spiranthes diluvialis* | T | NLAA | | low application potential: **Arapahoe-Roosevelt;** moderate application | | very low application potential: **Caribou-Targhee;** low application | | low application potential: **Colville;** moderate application potential: | | | |

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | potential: **Medicine Bow-Routt, Pike-San Isabel, White River** | | potential: **Fishlake;** moderate application potential: **Salmon-Challis, Sawtooth;** high application potential: **Boise, Uinta-Wasatch-Cache** | | **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** | | |
| 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: | | |

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | **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** | | |
| 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 | | |

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | 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** | | | | |
| 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** | | |

| 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 | eastern massassauga | *Sistrurus catenatus* | T | NE | | | | | | | | no use: H**uron-Manistee, Midewin** | |
| reptile | flattened musk turtle | *Sternotherus depressus* | T | NE | | | | | | | no use: **National Forests in Alabama** | | |
| 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, CH | NLAA, NLAA | | | low application potential: **Apache-Sitgreaves;** moderate application potential: **COCONINO, Gila;** high application potential: **CORONADO, PRESCOTT, TONTO** | | | | | | |

**Table F-2. Species Considered During the Endangered Species Act Consultation with NOAA Fisheries for Nationwide Aerial Application of Fire Retardant on National Forest System Lands**

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| fish | shortnose sturgeon | *Acipenser brevirostrum* | E | NLAA | | | | | | | no use: **Francis Marion and Sumter;** very low application potential: **National Forests in North Carolina** | | |
| fish | green sturgeon - southern DPS | *Acipenser mediosteris* | T, CH | LAA, LAA | | | | | moderate application potential: **Mendocino;** high application potential: **Six Rivers** | no use: **Siuslaw;** very low application potential: **Columbia River Gorge, Mt. Hood;** low application potential: **Gifford Pinchot;** high application potential: **Rogue River-Siskiyou** | | | no use: **Chugach, Tongass** |
| fish | Atlantic sturgeon – South Atlantic DPS, Carolina DPS, Chesapeake Bay DPS | *Acipenser oxyrinchus* | E/T, CH | NLAA, NLAA | | | | | | | no use: **Francis Marion and Sumter;** very low application potential**: National Forests in Florida, National Forests in North Carolina** | | |
| fish | gulf sturgeon | *Acipenser oxyrinchus desotoi* | T, CH | NLAA, NLAA | | | | | | | no use: **National Forests in Alabama, National Forests in Mississippi;** very low application potential**: National Forests in Florida** | | |
| fish | chum salmon - Hood Canal summer ESU | *Oncorhynchus keta* | T, CH | NE, NE | | | | | | no use: **Olympic** | | | no use: **Chugach, Tongass** |
| fish | chum salmon - Columbia River ESU | *Oncorhynchus keta* | T, CH | LAA, LAA | | | | | | very low application potential: **Columbia River Gorge** | | | no use: **Chugach, Tongass** |
| fish | coho salmon - Oregon coast ESU | *Oncorhynchus kisutch* | T, CH | LAA, NE | | | | | | no use: **Siuslaw**; very low application potential: **Columbia River Gorge**; moderate application | | | no use: **Chugach, Tongass** |

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | potential: **Umpqua**; high application potential: **Rogue River Siskiyou** | | | |
| fish | coho salmon - Southern Oregon Northern California Coast ESU | *Oncorhynchus kisutch* | T, CH | LAA, LAA | | | | | moderate application potential: **Mendocino**; high application potential: **Klamath, Shasta-Trinity, Six Rivers** | high application potential: **Rogue River Siskiyou** | | | |
| fish | coho salmon - Lower Columbia River ESU | *Oncorhynchus kisutch* | T, CH | LAA, LAA | | | | | | very low application potential: **Columbia River Gorge, Mt. Hood**; low application potential: **Gifford Pinchot** | | | no use: **Chugach, Tongass** |
| fish | steelhead - Snake River DPS | *Oncorhynchus mykiss* | T, CH | LAA, LAA | high application potential: **Nez Perce Clearwater** | | | moderate application potential: **Salmon-Challis**, **Sawtooth**; high application potential: **Boise, Payette** | | very low application potential: **Columbia Rover Gorge**; moderate application potential: **Umatilla**; high application potential: **Wallowa-Whitman** | | | no use: **Chugach, Tongass** |
| fish | steelhead - Upper Columbia River DPS | *Oncorhynchus mykiss* | T, CH | LAA, LAA | | | | | | very low application potential: **Columbia River Gorge**; high application potential: **Okanogan-Wenatchee** | | | no use: **Chugach, Tongass** |
| fish | steelhead - Upper Willamette River DPS | *Oncorhynchus mykiss* | T, CH | LAA, LAA | | | | | | low application potential: **Willamette** | | | no use: **Chugach, Tongass** |

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| fish | steelhead - southern California DPS | *Oncorhynchus mykiss* | E, CH | LAA, LAA | | | | | high application potential: **Cleveland** | | | | |
| fish | steelhead - California Central Valley DPS | *Oncorhynchus mykiss* | T, CH | LAA, LAA | | | | | moderate application potential: **Lassen, Mendocino**; high application potential: **Eldorado**, **Shasta-Trinity**, **Sierra** | | | | |
| fish | steelhead - south-central California coast DPS | *Oncorhynchus mykiss* | T, CH | LAA, LAA | | | | | high application potential: **Los Padres** | | | | |
| fish | steelhead - Northern California DPS | *Oncorhynchus mykiss* | T, CH | LAA, LAA | | | | | moderate application potential: **Mendocino, Six Rivers** | | | | |
| fish | steelhead - Lower Columbia River DPS | *Oncorhynchus mykiss* | T, CH | LAA, LAA | | | | | | very low application potential: **Columbia River Gorge, Mt. Hood**; low application potential: **Gifford Pinchot** | | | no use: **Chugach, Tongass** |
| fish | steelhead - Middle Columbia River DPS | *Oncorhynchus mykiss* | T, CH | LAA, LAA | | | | | | no use: **Mt. Baler Snoqualmie**; very low application potential: **Columbia River Gorge, Mt. Hood;** low application potential: **Gifford Pinchot**; moderate application potential: **Umatilla**; high application potential: **Deschutes and Ochoco, Malheur,** | | | no use: **Chugach, Tongass** |

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | **Okanogan-Wenatchee, Wallowa-Whitman** | | | |
| fish | steelhead - Puget Sound DPS | *Oncorhynchus mykiss* | T, CH | NE, NE | | | | | | no use: **Mt. Baker-Snoqualmie, Olympic** | | | no use: **Chugach, Tongass** |
| fish | sockeye salmon - Snake River ESU | *Oncorhynchus nerka* | E, CH | LAA, LAA | high application potential: **Nez Perce-Clearwater** | | | moderate application potential: **Salmon-Challis, Sawtooth**; high application potential: **Payette** | | very low application potential: **Columbia River Gorge**; high application potential: **Wallowa-Whitman** | | | no use: **Chugach, Tongass** |
| fish | sockeye salmon - Ozette Lake ESU | *Oncorhynchus nerka* | T, CH | NE, NE | | | | | | no use: **Olympic** | | | |
| fish | chinook salmon - Snake River fall run ESU | *Oncorhynchus tshawytscha* | T, CH | LAA, LAA | high application potential: **Nez Perce-Clearwater** | | | high application potential: **Payette** | | very low application potential: **Columbia River Gorge**; moderate application potential: **Umatilla**; high application potential: **Wallowa-Whitman** | | | no use: **Chugach, Tongass** |
| fish | chinook salmon - Snake River spring/summer-run ESU | *Oncorhynchus tshawytscha* | T, CH | LAA, LAA | high application potential: **Nez Perce-Clearwater** | | | moderate application potential: **Salmon-Challis, Sawtooth**; high application potential: **Boise, Payette** | | very low application potential: **Columbia River Gorge**; moderate application potential: **Umatilla**; high application potential: **Wallowa-Whitman** | | | no use: **Chugach, Tongass** |
| fish | chinook salmon - Sacramento River winter-run ESU | *Oncorhynchus tshawytscha* | E, CH | LAA, LAA | | | | | moderate application potential: **Mendocino** | | | | |

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| fish | chinook salmon - Central Valley spring-run ESU | *Oncorhynchus tshawytscha* | T, CH | LAA, LAA | | | | | moderate application potential: **Lassen, Mendocino**; high application potential: **Eldorado, Shasta-Trinity** | | | | |
| fish | chinook salmon - California Coastal ESU | *Oncorhynchus tshawytscha* | T, CH | LAA, LAA | | | | | moderate application potential: **Mendocino**; high application potential: **Six Rivers** | | | | |
| fish | chinook salmon - Upper Columbia River spring ESU | *Oncorhynchus tshawytscha* | E, CH | LAA, LAA | | | | | | very low application potential: **Columbia River Gorge**; high application potential: **Okanogan-Wenatchee** | | | no use: **Chugach, Tongass** |
| fish | chinook salmon - Lower Columbia River ESU | *Oncorhynchus tshawytscha* | T, CH | LAA, none | | | | | | very low application potential: **Columbia River Gorge, Mt. Hood**; low application potential: **Gifford Pinchot** | | | no use: **Chugach, Tongass** |
| fish | chinook salmon - Puget Sound ESU | *Oncorhynchus tshawytscha* | T, CH | NE, NE | | | | | | no use: **Mt Baker-Snoqualmie, Olympic** | | | no use: **Chugach, Tongass** |
| fish | chinook salmon - Upper Willamette River ESU | *Oncorhynchus tshawytscha* | T, CH | LAA, LAA | | | | | | very low application potential: **Mt. Hood**; low application potential: **Willamette** | | | no use: **Chugach, Tongass** |
| fish | Pacific eulachon - southern DPS | *Thaleichthys pacificus* | T, CH | LAA, LAA | | | | | | no use: **Siuslaw**; very low application potential: **Columbia River Gorge**; low application | | | |

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | potential: **Gifford Pinchot**; high application potential: **Rogue River - Siskiyou** | | | |

**Table F-3. Species Considered under the Endangered Species Act and Marine Mammal Act for Nationwide Aerial Application of Fire Retardant on National Forest System Lands**

| Category | Common Name | Scientific Name | Status | Determination |
|---|---|---|---|---|
| mammal | fin whale | *Balaenoptera physalus* | E | NE |
| mammal | Beluga whale - Cook Inlet DPS | *Delphinapterus leucas* | E, (CH) | NE, NE |
| mammal | stellar sea lion - western DPS | *Eumetopias jubatus* | E, (CH) | NE, NE |
| mammal | humpback whale - Mexico DPS | *Megaptera novaeangliae* | T, (CH) | NE, NE |
| mammal | killer whale - southern resident DPS | *Oricinus orca* | E, (CH) | NLAA, NLAA |
| mammal | sperm whale | *Physeter macrocephalus* | E | NE |

**Table F-4. Species Associated with Airtanker Bases Considered During the Endangered Species Act Consultation with US Fish and Wildlife Service for Nationwide Aerial Application of Fire Retardant on National Forest System Lands**

| Category | Common Name | Scientific Name | Status | Determination |
|---|---|---|---|---|
| amphibian | California tiger salamander – central population[19] | *Ambystoma californiense* | T, CH | LAA, LAA |
| bird | eastern black rail | *Laterallus jamaicensis jamaicensis* | T | NLAA |
| bird | California clapper rail | *Rallus longirostris obsoletus* | E | NLAA |
| bird | California least tern | *Sterna antillarum browni* | E | NLAA |
| crustacean | San Diego fairy shrimp[19] | *Branchinecta sandiegonensis* | E, CH | NLAA, NLAA |
| crustacean | California freshwater shrimp | *Syncaris pacifica* | E | NLAA |
| fish | beautiful shiner | *Cyprinella Formosa* | T, (CH) | NLAA, na |
| fish | Pecos gambusia | *Gambusia nobilis* | E | NLAA |
| fish | Virgin River chub | *Gila seminuda* | E, (CH) | NLAA, na |
| fish | delta smelt[19] | *Hypomesus transpacificus* | T, (CH) | NLAA, na |
| fish | Big Spring spinedace | *Lepidomeda mollispinis pratensis* | T, (CH) | NLAA, na |
| fish | peppered chub | *Macrhybopsis tetranema* | E, (CH) | NLAA, na |
| fish | smalleye shiner | *Notropis buccula* | E, (CH) | NE, na |
| fish | sharpnose shiner | *Notropis oxyrhynchus* | E, (CH) | NE, na |
| fish | Pecos bluntnose shiner | *Notropis simus pecoensis* | E, (CH) | NLAA, na |

[19] These species occur on National Forest System lands and also at airtanker bases, and were analyzed for all actions. The determinations may have changed due to additional/different effects at airtanker bases.

| | | | | |
|---|---|---|---|---|
| fish | Topeka shiner | *Notropis topeka* | E, (CH) | NLAA, na |
| fish | woundfin | *Plagopterus argentissimus* | E, (CH) | NLAA, na |
| insect | Carson wandering skipper | *Pseudocopaedes eunus obscurus* | E | NLAA |
| mammal | wood bison | *Bison bison atthabascae* | E | NLAA |
| mammal | Columbia Basin pygmy rabbit | *Brachylagus idahoensis* | E | LAA |
| mammal | giant kangaroo rat | *Dipodomys ingens* | E | NLAA |
| mammal | Fresno kangaroo rat | *Dipodomys nitratoides exilis* | E, (CH) | NLAA, na |
| mammal | Tipton kangaroo rat | *Dipodomys nitratoides nitratoides* | E | NLAA |
| plant | Sonoma alopercus | *Alopercus aequalis* var. *sonomensis* | E | NLAA |
| plant | San Diego ambrosia | *Ambrosia pumila* | E, (CH) | NLAA, na |
| plant | San Jacinto Valley crownscale | *Atriplex coronate notatior* | E | NLAA |
| plant | Sonoma sunshine | *Blennosperma bakeri* | E | NLAA |
| plant | white sedge | *Carex albida* | E | NLAA |
| plant | Hoover's spurge | *Chamaesyce hooveri* | T | NLAA |
| plant | Sonoma spineflower | *Chorizanthe valida* | E | NLAA |
| plant | Pennell's Bird's-beak | *Cordylanthus tenuis* ssp. *cappillaris* | E | NLAA |
| plant | yellow larkspur | *Delphinium luteum* | E | NE |
| plant | Lompoc yerba santa | *Eriodictyon capitatum* | E | NLAA |
| plant | San Diego button celery | *Eryngium aristulatum* var. *parishii* | E | NLAA |
| plant | Pine Hill flannelbush | *Fremontodendron californicum* ssp. *decumbens* | E | NLAA |
| plant | Pecos sunflower | *Helianthus paradoxus* | T | NLAA |
| plant | Burke's goldfields | *Lasthenia burkei* | E | NLAA |
| plant | Contra Costa goldfields | *Lasthenia conjugens* | E | NLAA |
| plant | Pitkin marsh lily | *Lilium pardalinum* ssp. *pitkinense* | E | NLAA |
| plant | Butte County meadowfoam | *Limnanthes flocossa* ssp. *californica* | E, CH | NLAA, NLAA |
| plant | large-flowered wooly meadowfoam | *Limnanthes pumila* | E | NLAA |
| plant | Sebastapol meadowfoam | *Limnanthes vinculans* | E | NLAA |

| | | | | |
|---|---|---|---|---|
| plant | Cook's lomatium[19] | *Lomatium cookie* | E, CH | NLAA, NLAA |
| plant | willowy monardella | *Monardella viminea* | E, (CH) | NLAA, na |
| plant | spreading navarretia | *Navarretia fossalis* | T, (CH) | NLAA, na |
| plant | many-flowered navarretia | *Navarretia leucocephala ssp. plientha* | E | NLAA |
| plant | Knowlton's cactus | *Pediocactus knowltonii* | E | NLAA |
| plant | showy Indian clover | *Trifolium amoenum* | E | NLAA |
| reptile | giant garter snake | *Thamnophis gigas* | T | NLAA |

# 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". 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.

## 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 (information is available on the Wildland Fire Chemical Systems website). 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 website.

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
- Quality assurance

An Operational Field Evaluation is carried out 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 Chemical Systems website. 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.usda.gov/rm/fire/wfcs/. 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 as of 2020. The information is formatted differently than in the 2011 Nationwide Aerial Application of Fire Retardant on National Forest System Land 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[1] 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% |

[1] Threatened, Endangered, Proposed, or Candidate Species

| 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[1] avoidance areas |
|---|---|---|---|---|---|---|
| | **Grand Mesa, Uncompahgre and Gunnison** | 2,965,320 | 36% | 9.9% | 25.5% | 2.27% |
| | **Medicine Bow-Routt and Thunder Basin NG[2]** | 2,892,559 | 49% | 11.7% | 37.1% | 0.42% |
| | **Nebraska, Samuel R. McKelvie NFs and Oglala, Buffalo Gap and Fort Pierre NGs[2]** | 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[2]** | 1,597,940 | 36% | 11.1% | 24.2% | 1.50% |
| | **Pike-San Isabel, Cimmaron Comanche NG[2]** | 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% |

[2] National Grassland

| 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[1] avoidance areas |
|---|---|---|---|---|---|---|
| | **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% |
| | **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% |
| | **Lake Tahoe Basin MU[3]** | 154,269 | 17% | 16.6% | 0.0% | 2.91% |

[3] Management Unit

| 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[1] avoidance areas |
|---|---|---|---|---|---|---|
| | **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% |
| | **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% |

| 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[1] avoidance areas |
|---|---|---|---|---|---|---|
| | **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[4] of Alabama** | 671,667 | 30% | 15.5% | 14.4% | 0.00% |
| | **Daniel Boone** | 709,856 | 30% | 13.3% | 17.0% | 0.18% |
| | **Chattahoochee-Oconee** | 867,578 | 24% | 16.8% | 7.0% | 1.90% |
| | **Cherokee** | 660,211 | 37% | 34.8% | 2.3% | 0.00% |
| | **NFs[4] of Florida** | 1,203,415 | 12% | 11.9% | 0.6% | 0.00% |
| | **Kisatchie** | 608,535 | 37% | 9.1% | 23.9% | 5.44% |
| | **NFs[4] 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[4] 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% |
| | **NFs[4] and Grasslands of Texas** | 677,696 | 30% | 10.9% | 18.8% | 0.06% |
| | **Land Between the Lakes NRA[5]** | 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% |

[4] National Forests
[5] National Recreation Area

| 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[1] avoidance areas |
|---|---|---|---|---|---|---|
| | **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% |
| | **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%** |

# SEIS Appendix Q – Response to Comments on the Draft Supplemental Environmental Impact Statement

## Introduction

On 11 February 2022 the United States Environmental Protection Agency published in the Federal Register a Notice of Availability for the Draft Supplemental Environmental Impact Statement (draft SEIS) titled "Draft Supplement, USFS, NAT, Nationwide Aerial Application of Fire Retardant on National Forest System Land" (United States Environmental Protection Agency 2022). This notice began the 45-day comment period, which ended on 29 March 2022. The Forest Service received 14 comment letters from individuals, organizations, agencies, and business owners during the comment period. Comments were received directly into the Forest Service Comment Analysis and Response Application (CARA) or were received via email or United States Postal Service and subsequently entered into the CARA system. One letter was received after the comment period had ended; that letter was entered into the CARA system and was considered along with the others.

## Content Analysis Process and Summary

Each letter received was given an individual letter number, read in its entirety by a content analysis specialist, and catalogued as shown in Table Q-1 below. Letters were categorized as 'unique' if their text was different from that of other letters, even if all or part of the general content was the same. Letters were categorized as 'form' letters if the text was the same as that in other letters, and as 'form plus' if they included additional, unique text. 'Master form' letters are the first letter in a series of form letters; the entire text of a master form letter is not always included in all form letters derived from it. Categorization in this manner allows the Forest Service to identify comments that are unique and to be efficient in summarizing similar or identical comments.

**Table Q-1. Commenters, letter numbers, and associated concern statement (CS) numbers**

| Name | Organization[1] | Letter Type[2] | Letter Number | Concern Statement Number(s) |
|---|---|---|---|---|
| Baker, Kimberly | Klamath Forest Alliance and EPIC | Form | 14 | NA[3] |
| Buckley, John | Central Sierra Environmental Resource Center | Unique | 5 | 6, 7, 21, 30 |
| Callahan, Jay | NA | Unique | 2 | 1, 7, 8, 9, 26 |
| Cook, Jeff | Billings Flying Service | Master Form | 8 | 13, 14, 24 |
| Draughon, Jennifer | Neptune Aviation | Unique | 13 | 13, 14, |
| Goldberg, Edward | Perimeter Solutions | Unique | 9 | 2, 13, 14, 15, 19, 21, 22, 23, 24, 25, 27, 28, 29, 30 |

[1] Letters from individuals who did not identify affiliation with an organization are indicated by 'NA' for Not Applicable
[2] Letter types are as follows: Unique = letters that contain different text from different commenters, although content may be the same as in other letters; Master Form = First letter in a set of forms, text is repeated in subsequent form letters; Form = Letters with the same text submitted by different commenters, may not repeat Master Form entirely; and Form Plus = form letter with additional, potentially unique comments.
[3] Letter consisted entirely of a copy of Letter 6, with no original comments added

| Name | Organization[1] | Letter Type[2] | Letter Number | Concern Statement Number(s) |
|---|---|---|---|---|
| Gould, John | 10 Tanker Air Carrier | Form Plus | 7 | 13 |
| Hastert, Chris | Santa Maria Airport | Form Plus | 10 | 13, 14 |
| Heiken, Doug | Oregon Wild | Unique | 15 | 4, 5, 10, 12, 13, 16, 17, 18, 23 |
| Isley, Matt | Erickson Aero Tanker | Form | 12 | 13, 14 |
| McKinlay, Brielle | NA | Unique | 4 | 3, 5, 10, 11, 12 |
| Runco, Amelia | NA | Unique | 1 | 3 |
| Saad, Madison | NA | Unique | 3 | 9 |
| Stahl, Andy | Forest Service Employees for Environmental Ethics | Master Form | 6 | 5, 16, 17, 18, 20, 23, 30 |
| Tomiak, Robert | United States Environmental Protection Agency | Unique | 11 | 9, 12, 13, 23, 26, 27 |

The 15 letters received included 138 unique comments, grouped into six major subject categories (Alternatives; Analysis; Compliance with the National Environmental Policy Act; Compliance with Other Law, Regulation, and Policy; Editorial; and New Retardants). Comments within each category were grouped and summarized according to specific issues. For example, several comments in the Analysis category expressed specific concerns about the 2011 Nationwide Aerial Fire Retardant on National Forest System Lands Final Environmental Impact Statement (2011 FEIS) (USDA Forest Service 2011a) and Supplemental Environmental Impact Statement (SEIS) analysis of aerial fire retardant effectiveness; those comments were summarized under a single label titled 'Retardant Effectiveness'. One or more Concern Statements (CS) were developed summarizing all comments grouped under a common label.

After the initial read and coding by a content analysis specialist, letters were read by the project leader and the writer-editor and where needed, adjustments were made to coding, category assignments, labels, or concern statements. This process ensured that all comments were captured as completely and accurately as possible.

Table Q-2 summarizes subject categories, labels, and number of comments associated with each.

**Table Q-2. Draft Supplemental Environmental Impact Statement content analysis summary**

| Category | Labels | Number of Comments |
|---|---|---|
| Alternatives | • Retain elements from 2011 Record of Decision/Alternative 3<br>• Chemical prevention<br>• Mechanical prevention<br>• Aerial application of water<br>• Limits to retardant use<br>• Reduce intrusions into avoidance areas<br>• Avoidance area exception<br>• Safer, less toxic retardants<br>• Monitoring | 35 unique comments from 8 different letters |
| Analysis | • General<br>• Existing retardants<br>• Impacts of intrusions in buffers<br>• Magnesium chloride toxicity and environmental impacts<br>• Magnesium chloride impacts to aircraft and infrastructure<br>• Magnesium chloride impacts to public health and safety<br>• Carbon/climate<br>• Retardant effectiveness indicators<br>• Retardant effectiveness<br>• Threatened and endangered species | 63 unique comments from 11 different letters |
| Compliance with Law, Regulation, and Policy | • Clean Water Act/National Pollutant Discharge Elimination System permit<br>• Endangered Species Act consultation on new retardants<br>• Other regulations | 13 unique comments from 3 different letters |
| Compliance with National Environmental Policy Act (NEPA) | • General<br>• Magnesium chloride analysis<br>• Public involvement<br>• Tribal consultation | 16 unique comments from 5 different letters |
| Editorial | • Corrections<br>• Suggested edits<br>• Update data | 8 unique comments from 2 different letters |
| New retardants | • Approval process | 4 unique comments from 3 different letters |

The project file contains tables tracking each individual comment to the concern statement into which it was incorporated, and includes information about supporting materials (i.e. published literature, reports) submitted with comment letters. This documentation allows individuals to identify how their comments were addressed. Each unique comment is of equal value whether expressed multiple times (i.e., in form letters) or a single time by one individual.

## Comment Response Process

Substantive comments are those that are specific, address the adequacy of the environmental impact statement or the merits of the alternatives or both, and provide as much detail as possible (per 40 CFR

1503.3). The Forest Service may respond to comments through one or more of the following actions, as described in 40 CFR 1503.4:

- Modifying alternatives, including the proposed action
- Developing and analyzing alternatives not given detailed consideration in the draft SEIS
- Supplementing, improving, or modifying analysis in the draft SEIS
- Making factual corrections
- Explaining why comments do not warrant further response

Some comments may require more than one response (for example a comment may require consideration as a modification to an alternative as well as identifying a need to supplement analysis).

Each Concern Statement (CS) was reviewed and an appropriate response was identified. During this process the draft SEIS and the 2011 FEIS, including 2011 FEIS Appendix Q (responses to comments on the 2011 Draft Environmental Impact Statement) were reviewed. Where needed and appropriate, additional published literature, reports, data, or other information was also reviewed. Any new information used is included in the literature cited section in the final SEIS. A response was developed and/or reviewed for each Concern Statement by subject-matter experts. Additional review was carried out as needed.

## Concern Statements and Responses

Concern Statements (CS) and their responses are organized below according to categories as identified in Table SEIS Q-2. To help with organization and tracking, concern statements were assigned a number (e.g., CS-1) during the review process; although we attempted to keep Concern Statement numbers in order based on categories, some numbers may appear out of sequence below if they were re-categorized as a result of final review.

For brevity and consistency, the following terms are used in Concern Statements and in Responses. Citations for documents listed here are not included in the text of comments or responses, but are provided here.

- 2011 FEIS – Nationwide Aerial Application of Fire Retardant on National Forest System Land Final Environmental Impact Statement (USDA Forest Service 2011a)
- 2011 Record of Decision - Nationwide Aerial Application of Fire Retardant on National Forest System Land: Record of Decision (USDA Forest Service 2011d)
- 2020 Supplemental Information Report – Nationwide Aerial Application of Fire Retardant on National Forest System Lands, Supplemental Information Report (USDA Forest Service 2020a)
- Draft SEIS - Nationwide Aerial Application of Fire Retardant on National Forest System Lands, Draft Supplemental Environmental Impact Statement (USDA Forest Service 2022d).
- Implementation Guide - Implementation Guide for Aerial Application of Fire Retardant, current version 2019 (USDA Forest Service 2019).
- Fish and Wildlife Service – refers to the United States Department of the Interior Fish and Wildlife Service
- NOAA Fisheries – refers to the United States Department of Commerce National Oceanic and Atmospheric Administration National Marine Fisheries Service.

- Qualified Products List – refers to the list: "Long-Term Retardant for Wildland Fire Management, Qualified by US Forest Service in Accordance with Forest Service Specification 5100-304d", current version available on the Wildland Fire Chemical Systems website

- Specification – Refers to the Forest Service Specification for Long-Term Retardant. The version used for reference at the time the final SEIS was completed is Forest Service Specification 5100-304d; the Long-Term Fire Retardants website will provide a link to the version that is current at the time the website is accessed. Links in the text below refer to whichever is appropriate in the context of the response.

## Alternatives

**CS 1 – Retain Elements from 2011 Record of Decision/Alternative 3**

Comments request that the Forest Service retain specific components from the 2011 Alternative 3 and 2011 Record of Decision, as described in items 1 through 4 below, with responses after each item.

1. Continue the ban on aerial retardant drops in waterways regardless of whether water is present, and continue to map those waterways for avoidance.

   **Response:**

   The wording in Modified Alternative 3 specifying that aerial retardant avoidance areas include "waterways and their buffers, whether mapped or not, when water is present" updates and standardizes national direction consistent with adjustments made in identification and/or mapping of avoidance areas in at least three Forest Service Regions.

   The 2020 Supplemental Information Report stated, "Between 2012 and 2014, 30 to 43 percent of the reported misapplications [intrusions] were in dry intermittent streams with no anticipated effects to threatened, endangered, proposed, or sensitive species." In early 2012 a Forest Service multidisciplinary team in Forest Service Region 3 (Arizona and New Mexico) reviewed avoidance area maps that had been based on the National Hydrologic Dataset and "found them to be unduly restrictive because areas are identified as containing water when they are actually dry areas" (USDI Fish and Wildlife Service 2012). The team found that these concerns applied across "most National Forests in the Southwestern Region". After consultation with the Fish and Wildlife Service, and consistent with provisions in the 2011 Nationwide Aerial Fire Retardant Biological Opinions (USDI Fish and Wildlife Service 2011; USDC NOAA National Marine Fisheries Service 2011), dry intermittent waterways (such as dry washes, arroyos, intermittent and ephemeral streams) were eliminated from avoidance area mapping in Forest Service Region 3. Similar action was taken by the Forest Service Pacific Northwest Region (Washington and Oregon) in mid-2012 (USDA Forest Service 2012b) and by individual National Forests in Forest Service Region 5 (California) (USDA Forest Service 2013), all in consultation with the Fish and Wildlife Service and/or NOAA Fisheries These consultations state that open water and a 300-foot buffer surrounding it will be avoided at all times in applications of aerial fire retardant, regardless of whether the water or buffers appear on avoidance area maps. Dry waterways (referred to as intermittent streams, or intermittent waterways in some consultation documents) that are within designated critical habitat for certain listed species would continue to be mapped as avoidance areas, as determined during consultation and coordination with the Services. Waterways with water present continue to be buffered by a minimum of 300 feet, which includes the dry waterway upstream of the extant water.

   Application of retardant into dry waterways may be similar to application in terrestrial areas away from waterways with water. The probability for retardant or residue to move downstream into water is dependent on distance to water, time since application, dry streambed characteristics, and the timing and nature of weather events that result in re-watering of the affected stream.

The November 2021 ecological risk assessment (Auxilio Management Services 2021c) considered a broad range of substrates, used daily rainfall data over 3 years, and included a 5-year storm event within 24 hours of retardant application, and assessed the potential for retardant to move from the edge of the application area into water. It indicated no measurable risk to aquatic species from runoff of currently approved long-term retardants.

Research based on experimental studies of runoff after retardant application in proximity to streams concluded "it is unlikely that fire retardant delivery from leaching or surface runoff will cause more than sublethal effects to fish" (Crouch et al. 2006). Intrusions into dry streams documented in recent consultations (USDC NOAA Fisheries 2019) indicated no observed mortality to fish.

The United States Geological Survey investigated the toxicity of retardants after aging on dry substrate. They applied retardant chemical to substrate and then at certain periods of time after application, they added water and fish in a rough simulation of water and fish entering a dry stream to which retardant has been applied. They found that toxicity of retardants declined over time, with the degree and rate of decrease depending on substrate, amount of time, and retardant formulation (Puglis et al. 2023).

Local Forest Service units have the option of mapping dry or intermittently dry streams as avoidance areas if there are resources present that should be protected from potential application of aerial fire retardant.

2. Maintain the explicit direction and protocols for inter-agency review of map updates.

   **Response:**

   Explicit direction and protocols for inter-agency review of map updates are included in the 2019 Implementation Guide, which was not yet developed at the time of the 2011 Record of Decision. Databases, map layers, and methods for mapping avoidance areas may change over time as new information and different technologies become available. Terms and conditions in the 2023 Fish and Wildlife Service Biological Opinion (USDI Fish and Wildlife Service 2023) require interagency coordination for avoidance area mapping. Specific requirements for mapping avoidance areas may change based on additional Endangered Species Act Section 7 consultations. Specific direction and protocols for avoidance area mapping are in the Implementation Guide rather than the 2023 Record of Decision, allowing the protocols for maps, updates, and reviews to be updated as needed.

3. Continue the prohibition on using any fire suppressant that is toxic in critical habitats.

   **Response:**

   The specific prohibition the comment is referring to is unclear, as neither the 2011 Record of Decision nor Modified Alternative 3 as described in the draft SEIS include the wording in the comment. Modified Alternative 3 would prohibit use of aerial fire retardant in avoidance areas, which include habitat for certain species listed under the Endangered Species Act, and it states that fire managers should use water or less toxic suppressants in habitats for certain species. These components of Modified Alternative 3 remain unchanged from the 2011 Record of Decision. Potential toxicity of aerial fire retardants is discussed in the analysis section of the 2011 FEIS and the final SEIS. Potential for toxicity is one of the reasons that avoidance areas may be used in habitat for species listed under the Endangered Species Act.

4. Maintain the annual assessment of misapplications.

   **Response:**

   The purpose of the annual assessment of misapplications (intrusions) required in the 2011 Record of Decision was to determine whether under-reporting of intrusions was occurring. The data collected from this effort was reported in the 2020 Supplemental Information Report, which stated that under-reporting of intrusions occurs on a very small percentage (0.015 percent) of all fires. Continuation of

this requirement would not provide a different or more precise estimate of intrusion under-reporting, nor would it provide information that would increase or improve the rate of reporting of intrusions. In addition, intrusion reporting is required for all size fires, and this requirement will be emphasized in the Implementation Guide and training.

**CS 2 -Chemical Prevention**

Commenters recommend approval and use of preventive ground-based applications of phosphate-based retardants, including annual pre-treatment using long-term retardant. Use of these measures could reduce impacts to sensitive resources due to precision in application.

**Response:**

Ground-based application of fire retardant is currently available as one of many tools that can be used in firefighting operations. Several retardant formulations are approved for ground-based application, as identified on the Qualified Products List. This method of application is generally limited to areas where vehicle or large equipment access is feasible, whereas aerially delivered retardant can be used for a variety of objectives in more remote or difficult to access areas.

Ground-based retardant application has the potential to be used more precisely and over a smaller or more defined area than aerially delivered retardant, but coverage levels may vary widely. Ground-based application would be expected to result in the same type, but potentially different scale or intensity of environmental effects as those described in the 2011 FEIS and the final SEIS. Impacts would depend on location, type and quantity of retardant applied, coverage levels, and other factors.

The location of future fire starts is impossible to know, so preventive (pre-treatment) applications of fire retardant chemicals would be limited to previously identified sites, structures, or facilities (e.g., powerline corridors). Although several retardant formulations are listed as approved for pre-treatment use (refer to Qualified Products List) this use is not part of emergency firefighting operations. Therefore use on National Forest System lands would require site-specific analysis per the National Environmental Policy Act and other laws, regulations, and policies. Repeated application of fire retardant chemicals in the same locations each year, at potentially different coverage levels than achieved by aircraft, could have different impacts than those described in the 2011 FEIS and the final SEIS.

The purpose of and need for this project is to ensure that the Forest Service has access to an effective tool for wildland firefighting that meets objectives described in the 2011 FEIS (section 1.4). Those objectives include constraining fire size and activity in remote or rugged locations where ground access is limited, enabling rapid response to fires occurring in remote locations, and others. Wildland fire suppression operations will continue to require the use of many different firefighting tools and tactics. The analyses in the 2011 FEIS and the final SEIS are limited to the use of aerially delivered fire retardant (refer to 2011 FEIS Appendix Q, Public Concern 49 Response), and are not intended to evaluate other firefighting tools, which are addressed through other decision processes.

**CS 3 – Mechanical Prevention**

Commenters recommend preventive measures such as employing planned burns and hiring more people to do the work on the ground to clear dead trees, and suggest that these measures will reduce the need for use of retardants.

**Response:**

The scope of the decision to be made is limited to the use of aerially delivered fire retardant on National Forest System lands (refer to section 1.5 of the 2011 FEIS; also 2011 FEIS Appendix Q, PC 49 and others). The purpose of and need for this action is to ensure that the Forest Service has access

to an effective tool for wildland firefighting that can accomplish objectives outlined in section 1.4 of the 2011 FEIS. Therefore, the analysis did not include evaluation of other tools or tactics that may be used to prevent, minimize, or fight fire on National Forest System lands.

The Forest Service commonly carries out actions designed to reduce fuel loading and manage or minimize risks of wildland fire. Individual national forests identify the location, nature, and scope of fuels reduction projects based on specific conditions, needs, and risks on local units. Reduction of fuels through mechanical treatment or planned burning does not remove the possibility of wildland fire in every area, nor is it possible or appropriate to carry out those treatments on all National Forest System lands. It is therefore important to ensure that a variety of tools, including use of aerially delivered retardants, are available for fighting or managing wildland fire.

**CS 4 – Aerial Application of Water**

Commenters suggest a new alternative that uses aerial application of water only, including in exceptional circumstances in which human life and safety are at risk. The impacts of using only water should be analyzed.

**Response:**

The 2011 FEIS considered an alternative (Alternative 1 – No Action) that would not allow use of aerially-delivered retardant on National Forest System lands. The potential impacts of this alternative were analyzed in the appropriate sections of the 2011 FEIS. With respect to firefighting, the effects of allowing only water to be aerially delivered as reported in the 2011 FEIS include: reduced effectiveness of aerial resources (many objectives cannot be met with water alone), greater exposure of ground personnel to risks, increased air operations (it takes more water than retardant to accomplish certain objectives), increased risks to air personnel (because of more flights), increased ground operations that could include more ground disturbance in order to achieve objectives, conflicting suppression requirements among agencies, and un-met public expectations (2011 FEIS Section 3.1.3).

Other effects of this alternative, according to analyses in the 2011 FEIS, are related to the potential for more acres to burn and/or for fires to burn at greater severity if a key firefighting tool (aerially delivered retardant) is no longer available (refer also to 2011 FEIS Appendix Q, PC 3). Those impacts are summarized in sections 3.2.2 through 3.12.2 of the 2011 FEIS and include potential for: increased soil nutrient leaching and erosion; increased sedimentation; increased water temperature; risks of disease, parasites, or introduction of invasive species through increased use of equipment to pump or scoop water; soil changes leading to loss of plant diversity; disturbance or displacement of wildlife species, including from increased aircraft use; and others.

The 2011 FEIS also states that possible increases in fire number or size could benefit ecosystems or their components that evolved with and are dependent on fire, depending on the frequency, size, and severity of fires. Some of the benefits to those systems may be offset at times due to the likely greater use of air resources and ground-disturbing firefighting tactics if aerial retardant is not used.

This alternative was not selected because it "would promote significantly reduced effectiveness of aerial resources … in fighting wildfires, which can result in more acres burned. Therein lies potential for increased loss of structures and increased exposure of incident responders to fireline hazards… [E]liminating the fire retardant tool would impact efficiency and timeliness in containing fires and result in a greater loss to natural resources, watersheds, and public and private property." (2011 Record of Decision). The 2011 Record of Decision also found that adopting this alternative would have required changes in agreements and operating plans shared with cooperators, which would result in confusion as to boundaries and authorities and could have a negative impact on timely and effective emergency response.

**CS 5 – Limits to Retardant Use**

Commenters suggest one or more new alternatives, described in items 1 through 4 below, with responses after each item.

1. Strictly limits the aerial application of fire retardant to exceptional circumstances where the benefits are assured to be high magnitude and the risks are assured to be low magnitude.

   **Response:**

   This alternative was considered in the 2011 FEIS, but was eliminated from detailed study (2011 FEIS, Section 2.3, Alternative 7). The 2011 FEIS states, "It is not possible to develop detailed site-specific guidance for evaluating and weighing various risks and effectiveness of fire retardant necessary to satisfy Alternative 7 because too many factors are involved that vary across incidents." In other words, it is not possible to establish a consistent measure of benefit or effectiveness for all potential objectives, nor to provide guidance about how to consistently weigh those against the potential for a specific impact to occur. The Forest Service minimizes the potential risks of aerial retardant through the use of avoidance areas. Avoidance areas are mapped by local units, assuring that any local or site-specific concerns are addressed. Managers use decision-support processes to guide and document wildland fire management decisions. These processes involve assessment of hazards and risks, potential actions, and values to be protected, and are considered along with objectives, timeframes, safety, and other factors that are part of the principles of fire suppression (refer to the 2011 FEIS Section 3.1.1 and 2011 FEIS Appendix Q, PC 86.

2. Allows use of aerial retardant on any National Forest System lands only when human life or public safety is at risk.

   **Response:**

   As described in the 2011 FEIS (section 2.3) for Alternative 9, an alternative cannot be designed where fire retardant could be used only if human life or public safety is at risk and that would meet the purpose and need as described in the 2011 FEIS (section 1.4). Fire starts are unpredictable and fire characteristics are extremely variable. Fires of any size can have a wide range of characteristics depending on weather, terrain, fuel types and amounts, and many other factors. The purpose of and need for this project is to ensure that the Forest Service has access to an effective tool for wildland firefighting that meets objectives described in section 1.4 of the 2011 FEIS; an alternative as described in this comment would not meet the purpose of and need for this action.

3. Limits the maximum amount that can be used in one area.

   **Response:**

   The 2011 Record of Decision and the 2023 Record of Decision do not include an alternative that would establish a maximum amount of retardant allowed in any one area. Section 3.1.1 of the 2011 FEIS describes fire retardant use and standard coverage levels. Because of the manner in which retardant works, the dynamics of fire behavior, and the fact that fire rarely burns in the same area in subsequent years, it is uncommon for aerially delivered fire retardant to be applied more than once in any given location. Appendix B of the 2021 Nationwide Aerial Application of Fire Retardant on National Forest System Lands Biological Assessment for Fish and Wildlife Service Species (USDA Forest Service 2021c) includes maps of intrusions for the period 2012 through 2019, and shows that intrusions rarely if ever occur in the same location or even within habitat for a particular species on a national forest or adjoining unit(s).

4. Requires mitigation for adverse effects of repeated exposure.

**Response**:

Refer to item 2 above regarding the rarity of repeat exposures. Impacts of retardant chemicals vary according to the characteristics of the site where retardant is applied, as well as weather, species present, and other factors. Largely because of the variability in impacts, as well as the variability in conditions where and when retardant is applied, it is not possible to determine where and under what circumstances mitigations may be needed or to develop them at a nationwide, programmatic scale. Consultations with the Fish and Wildlife Service and NOAA Fisheries require assessment and reporting of all intrusions. If repeat exposures occur, potential actions or mitigations are developed for individual species usually at a local scale.

**CS 6 – Reduce Intrusions into Avoidance Areas**

Commenters refer to the intrusion data (total gallons of retardant, and number of intrusions) provided in the draft SEIS, and state that Modified Alternative 3 does not make meaningful changes that would reduce the number of intrusions and the risks to affected species. Commenters suggest that the Forest Service develop incentives and/or consequences to avoid accidental intrusions into avoidance areas.

**Response:**

Intrusions occur on only 0.44 percent of all fires and represent only 0.69 percent of all aerial fire retardant drops. Most intrusions (roughly 83 percent of intrusions, and 0.57 percent of all aerial fire retardant drops) are categorized as 'accidental', and a small number (roughly 17 percent of intrusions, or 0.12 percent of all aerial retardant drops) occur using the exception for protecting life and safety (refer to SEIS Appendix D).

Aircraft operational guidance described in the 2011 FEIS was designed to ensure that retardant drops are not made within avoidance areas (refer to 2011 FEIS Section 2.1.3). A requirement of the 2011 Record of Decision was improved monitoring and reporting of aerial application of fire retardant, leading to a better understanding of intrusion frequency and circumstances. In 2012 the Forest Service developed the Implementation Guide for Aerial Application of Fire Retardant (Implementation Guide) that is updated periodically, has developed an on-line reporting system, and has developed and implemented training for firefighting personnel at all levels involved with aerial retardant use and intrusion reporting and monitoring. The Implementation Guide provides detailed information about mapping avoidance areas, guidance for communicating information and maps to incident personnel and to pilots, recommendations for pilot practice to gauge timing of drops, and other guidance to help ensure that retardant drops do not enter avoidance areas. Neither the guidelines nor the Implementation Guide 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.

Because of the nature of fires and firefighting operations, it is not possible to entirely eliminate the possibility of intrusions occurring, but the measures discussed above have kept the rate of intrusions well below one percent of all aerial retardant drops. Consultation with the Fish and Wildlife Service and NOAA Fisheries include requirements for reporting and monitoring intrusions into habitats of listed species that could be negatively impacted by aerial retardant intrusions. Those requirements include, where needed, actions to limit or prevent harm to those species. Required annual reporting and review of intrusions and species information ensure continued protection of species and habitats from potential negative impacts of intrusions.

**CS 7 – Avoidance Area Exception**

Commenters express concern that the language, including the definition of "public safety", in the exception allowed in Modified Alternative 3 is not precise enough to appropriately constrain use of retardant in avoidance areas. Commenters suggested clarification indicating that protection of property alone does not constitute “human life or safety”. Commenters also suggested the following wording: "The above direction would be mandatory nationwide except when the following criteria is clearly met: a) human life or public safety are threatened and retardant use in the avoidance area can be reasonably expected to alleviate the fire threat, and; b) the wildfire is burning in such a location on the landscape that there is an imminent risk of the wildfire actively threatening a community, high value infrastructure or facilities, or exceptional natural resource values." Commenters stated that both conditions in the suggested wording must be met, helping to ensure that if use of the exception is needed it will only be where public safety is at risk protecting a community, high value infrastructure or facilities, or exceptional natural resource values rather than to protect firefighters in remote, high-risk areas where those values (except possibly exceptional natural resource values) occur.

**Response to CS 7**

The Forest Service has not adopted the wording suggested in the comment but will update the Implementation Guide to better assist fire managers in meeting the intent of the exception, and will require specific information about the use of exceptions so that their use can be more easily reviewed. The wording suggested in the comment would not account for the often rapidly changing nature of fire and therefore of operations, objectives, and resource needs, as well as the need to assess threats to human life and public safety rapidly and at times with incomplete information. Managers use decision-support processes to guide and document wildland fire management decisions, but firefighter and public safety is always the first priority in every fire management activity (National Interagency Fire Center 2023). Decisions about firefighting operations involve assessment of hazards and risks, potential actions, and values to be protected, and are considered along with objectives, timeframes, and other factors that are part of the principles of fire suppression (refer also to the 2011 FEIS Section 3.1.1 and 2011 FIES Appendix Q, PC 86).

**CS 8 – Safer, Less Toxic Retardants**

Commenters request that the Forest Service specifically declare preference for new fire retardants that are less toxic than those in present use, and choose less toxic retardants even if they are marginally less effective.

**Response to CS 8**

The 2011 FEIS included consideration of Alternative 9: Do Not Use Retardant Until a New, Less Toxic Retardant is Developed (2011 FEIS Section 2.3). That alternative was eliminated from detailed study because “regardless of the alternative selected, the Forest Service may continue to pursue less toxic formulations …[and] make future decisions on changes to the fire retardant program. … The environmental analysis in this document and subsequent decision would not prohibit a future decision on the use of new products.” Refer also to 2011 FEIS Appendix Q, PC 14.

Declaring a preference for specific retardant chemicals or qualities is outside the scope of the decision to be made. The purpose of and need for this project is to ensure that the Forest Service has access to an effective tool for wildland firefighting that meets objectives described in section 1.4 of the 2011 FEIS. The Forest Service may continue to pursue less toxic formulations of fire retardants, using evaluation and decision processes described briefly below and in Appendix L of the final SEIS.

New products proposed for use are evaluated using a process that includes evaluation of toxicity as well as other factors, including fire-retarding effectiveness (refer to the Wildland Fire Chemicals

Systems website). The long-term retardant specification (Specification 5100-304) identifies chemicals of concern, unacceptable ingredients, requirements for environmental review and risk assessment, toxicity limits, and other conditions that must be met in order for a retardant chemical formulation to be approved for use. The specification is updated periodically to incorporate new information; it was recently updated (in 2020, amended 2021) to require less toxic formulations than had previously been allowed. Any products that do not meet updated specifications are removed from the Qualified Products List.

For additional information refer also to 2011 FEIS Appendix Q, response to PC 5, PC 14, PC 48, and PC 60.

**CS 9 – Monitoring**

Commenters recommend continued or additional monitoring, rather than discontinuing intrusion monitoring as recommended in the draft SEIS, Table 1. Monitoring suggestions are described in items 1 through 4 below, with responses after each item.

1. The potential for downstream impacts creates a need for periodic review of downstream toxicity levels and potential effects such as algal blooms.

   **Response:**

   The purpose of the annual assessment of misapplications (intrusions) required in the 2011 Record of Decision was to determine whether under-reporting of intrusions was occurring; it did not assess nor monitor impacts of intrusions. The data collected from this effort was reported in the 2020 Supplemental Information Report, which stated that under-reporting of intrusions occurs on a very small percentage (0.01 percent) of all retardant drops. Continuation of this requirement would not likely change the estimate of intrusion under-reporting, nor would it provide information that would increase or improve the rate of reporting of intrusions. Refer also to the response to CS7, part 3.

   The potential for downstream impacts resulting from retardant intrusions has been and continues to be studied. Field assessments and monitoring of intrusions will continue according to requirements in Endangered Species Act Section 7 consultations and ongoing coordination with the Fish and Wildlife Service and NOAA Fisheries. Those assessments add to the body of information about potential downstream effects of retardant intrusions. However, field data can be difficult to collect because of safety and access issues in areas that are often remote, may have active fire, or where fire has created hazardous conditions. Data collection can rarely occur until some time after an intrusion has occurred and any impacts to water quality have changed as a result of streamflow, weather or other factors.

   Scientific studies in field and experimental situations have provided information regarding chemical response of retardants in water, including downstream impacts and potential effects of runoff and leaching. Updated analyses in the final SEIS as well as in recent Endangered Species Act Section 7 consultations (e.g. USDC NOAA Fisheries 2019) incorporate information from research on the persistence and characteristics of retardant chemicals downstream of the site of application. These studies also address impacts to a variety of aquatic species. Ecological risk assessments, which are used in consultations as well as in evaluations of retardant chemicals, are periodically updated to incorporate new information.

   The Forest Service has worked with the United States Geological Survey to develop a spill calculator (Rehmann et al. 2021) to estimate the length of stream affected by an intrusion and the exposure time of species in the affected reach, based on specific conditions. This tool is periodically updated and refined based on new information, to improve its utility and predictive capability.

2. Monitoring in watersheds for which the Forest Service has a pre-fire "baseline", such as those in the Aquatic and Riparian Effectiveness Monitoring Plan in the Northwest Forest Plan.

   **Response:**

   Although gathering field data from watersheds with available baseline data may provide some information about overall impacts of fire, it is rarely if ever possible to quantify the relative contributions to changes in water chemistry, soils, and other factors from retardant versus from fire in field situations (refer to response to PC 18, Appendix Q, 2011 FEIS). Fires contribute to changes in soil chemistry, erosion (2011 FEIS section 3.2.2, page 73), increased sedimentation, water turbidity, nutrients, and water temperature (2011 FEIS section 3.3.2, page 88) and other effects due to ash, release of nutrients from burned vegetation or loss of vegetation (also see Crouch et al. 2006, Graham 2003, and others). Other firefighting activities, such as line building, tree felling, and others may contribute to those effects in fires where retardant is used as well as in fires where it is not used. All of these changes can affect aquatic organisms (2011 FEIS section 3.4.2, page 101), plants (2011 FEIS section 3.5.2, pages 114-115), and wildlife (2011 FEIS section 3.6.2, page 130), making it difficult to determine which impacts are due to retardant and which are due to fire. The November 2021 Ecological Risk Assessment (Auxilio Management Service 2021c) reviewed available research and noted, for example, that the vegetative community response to burning “was more dramatic than was the response to chemical application”. Also, as noted in part 1 of this response, field data collection is often not possible until some period of time after retardant use, by which time any impacts to water quality caused by an aerial fire retardant intrusion may no longer be present or measurable.

   The location and amount of retardant use is unpredictable, and intrusions represent only a small percentage of total retardant use and occur on only a small percentage of fires (refer to final SEIS Appendix D). The opportunity to gather data from watersheds that have existing baseline data is therefore likely to be limited. The November 2021 Ecological Risk Assessment (Auxilio Management Service 2021c) observed, “the nationwide utility of data developed on environmental fate at individual sites would be limited, due to significant influence of site-specific parameters (such as soil type, climate, slope and other variables)”. The nature and relevance of existing baseline data will change with updated Forest and Regional plans, consultation requirements, and other decisions. For all of these reasons it is not practical to require the specific monitoring suggested in the comment as part of a nationwide, programmatic decision expected to be in place for a decade or more. Rather, ongoing coordination with the Fish and Wildlife Service, NOAA Fisheries, United States Geological Survey and others are an appropriate means to develop and implement area-specific assessment and monitoring and identify research opportunities.

3. Monitoring related to unique environmental conditions, such as salmon spawning.

   **Response:**

   Consultations under section 7 of the Endangered Species Act beginning in 2011 and continuing through 2023 have resulted in requirements for assessment and monitoring of intrusions specific to individual species or habitats, including specified life stages when appropriate (e.g., USDC NOAA Fisheries 2022). The need for and usefulness of monitoring related to certain habitats, areas tied to certain life stages, or other specific sites is best identified at a local level, through coordination between the Forest Service unit and the local or regional Fish and Wildlife Service or NOAA Fisheries office(s).

4. Adjusting cost estimates provided in draft SEIS section 3.7.2 to include monitoring for intrusions occurring in waterbodies or their 300-foot buffers.

   **Response:**

   Based on the information provided in part 1 of this response, the information in SEIS Section 3.7.2.3, Table 4 has not been changed. The cost displayed there for intrusion assessment and consultation includes the estimated cost of monitoring and assessment required by existing and future consultations.

## Analysis

**CS 10 – General Analysis**

Commenters state that the SEIS should address in its analysis the items listed in numbers 1 through 7 below. Responses are provided after each item.

1. Impacts of aircraft used to deliver aerial retardant.

   **Response:**

   The draft SEIS added a section on Climate (Section 3.13) that includes discussion of the potential impacts of aircraft used to deliver aerial retardant. The discussion in that section addresses potential greenhouse gas emissions, based on estimated flight hours projected through 2029. Those estimates are based on past rates of increase in aircraft use and assume that future use will follow a similar trajectory. The analysis also notes that factors that are difficult to predict, such as resource availability, funding, and others will influence the amount of aircraft use related to retardant delivery in the future. The analysis of Alternative 1 (no retardant use) in the 2011 FEIS indicates that not using retardant could result in changes, including potential increases, in the use of aircraft to deliver water or in use of other types of firefighting equipment or tactics.

   Analyses of impacts to some wildlife species documented in the project file, 2011 biological assessments (USDA Forest Service 2011b and 2011c), and summarized in the 2011 FEIS and updated in the final SEIS include, where appropriate, consideration of potential impacts of aircraft used in retardant delivery.

2. Adverse effects of chemicals in the environment, including residual effects in soil and effects on avoidance areas.

   **Response:**

   2011 FEIS Sections 3.2 through 3.6, section 3.8, the corresponding sections in the final SEIS, and supporting information in the project file all discuss adverse effects of retardant chemicals on soils, hydrology, aquatic organisms, plant species and habitats, wildlife species and habitats, and public health and safety. In particular, sections 3.2 (Soils) and 3.5 (Plant Species and Habitats) in the 2011 FEIS, corresponding updated sections in the final SEIS, and supporting information in the project file summarize information about potential residual effects of long-term retardant chemicals in soils wherever those chemicals are applied (i.e., within or outside avoidance areas).

3. Maximum retardant amount allowed in any one area.

   **Response:**

   The 2011 Record of Decision and the 2023 Record of Decision do not establish a maximum amount of retardant allowed in any one area. Section 3.1.1 of the 2011 FEIS describes fire retardant use and

standard coverage levels. Because of the manner in which retardant works, the dynamics of fire behavior, and the fact that fire rarely burns in the same area in subsequent years, it is uncommon for aerially delivered fire retardant to be applied more than once in any given location. Appendix B of the 2021 Nationwide Aerial Application of Fire Retardant on National Forest System Lands Biological Assessment for Fish and Wildlife Service Species (USDA Forest Service 2022c) includes maps of intrusions for the period 2012 through 2019, and shows that intrusions rarely if ever occur in the same location or even within habitat for a particular species on a national forest or adjoining unit(s).

4. Impacts of retardant intrusions into avoidance areas and any mitigations for adverse effects of repeat exposure.

   **Response:**

   General impacts of retardants are described in Chapter 3 of the 2011 FEIS and have been updated as needed in corresponding sections of the final SEIS. The impacts described there include potential effects to soils, plants, aquatic organisms and habitats, and terrestrial organisms and habitats. Potential effects to species and habitats of retardant in avoidance areas where threatened, endangered, or proposed species may be present is described in the 2021 biological assessments (USDA Forest Service 2021a, 2021b, 2021c, 2021d, 2021e, 2022a, 2022b, and 2022c) and the 2022 and 2023 Biological Opinions (USDC NOAA Fisheries 2022, USDI Fish and Wildlife Service 2023). The response to part 3 of this comment observes that repeated applications of aerially delivered fire retardant in a specific area are rare. As explained in the 2011 FEIS and the final SEIS, impacts of retardant chemicals vary according to the characteristics of the site where retardant is applied, as well as weather, species present, and other factors. Largely because of the variability in impacts, as well as the variability in conditions where and when retardant is applied, it is not possible to determine where and under what circumstances mitigations may be needed or to develop them at a nationwide, programmatic scale. Consultations with the Fish and Wildlife Service and NOAA Fisheries require assessment and reporting of all intrusions. For individual intrusions as well as repeated exposures, should they occur, potential actions or mitigations are developed for individual species usually at a local scale.

5. Effectiveness of avoidance areas and other mitigations.

   **Response:**

   Intrusions into aerial retardant avoidance areas are rare, indicating that use of avoidance areas is an effective means of protecting species and habitats from potential impacts of aerial fire retardant chemicals. During the period 2012 through 2021 less than 1 percent (approximately 0.69 percent) of all aerial retardant drops were involved in intrusions (refer to SEIS Appendix D). The analysis in the 2011 Fish and Wildlife Service and NOAA Fisheries biological assessments (USDA Forest Service 2011b, USDA Forest Service 2011c) and in subsequent consultations, including those completed in 2022 and 2023 (USDA Forest Service 2021a, 2021b, 2021c, 2021d, 2021e, 2022a, 2022b, and 2022c; USDC NOAA Fisheries 2022, USDI Fish and Wildlife Service 2023), all indicate that use of avoidance areas reduces the potential for adverse impacts to most federally listed species. Determinations of adverse effects to some listed species are based on the small possibility of intrusions into avoidance areas. Data from the national intrusion reporting database show that many intrusions have no impact on species or habitats, due to the nature of the drop(s) involved and/or to site characteristics.

6. Risk-benefit analysis using information on impacts of unintended intrusions.

   **Response:**

   The 2011 FEIS Appendix Q, Response to PC 31 states that effects of direct exposure to retardant depend on site-specific characteristics, retardant drop and chemical characteristics, fire characteristics and conditions, and species or habitat present. Objectives for, and therefore benefits of retardant drops vary and may change during the course of a fire or a flight, and may change as new retardants are developed and as other firefighting tools and strategies evolve. For these reasons, attempting to use past data to develop risk-benefit analyses would not be appropriate across the entire nationwide program, or to predict future risks versus future benefits. The response to PC 31 in Appendix Q of the 2011 FEIS provides an explanation of how the potential benefits of using aerial retardant are weighed at a programmatic scale against the potential risks of impacts to certain resources.

7. Effects of retardant in dry streams, including downstream and later in time.

   **Response:**

   Refer to the response to CS 1, part 1, which provides a discussion of the use of retardant in dry streams. A summary of information regarding the potential impacts of dropping retardant into dry streams has been added to section 3.3.2 the final SEIS.

**CS 11 –Existing Retardants**

Commenters question what analysis and testing is done for existing products, including specific items identified in numbers 1 and 2 below. Responses are provided after each item.

1. Whether they are tested continuously to determine long-term effects.

   **Response:**

   All products proposed for use as long-term fire retardants are evaluated using a process that includes evaluation of toxicity as well as other factors, including fire-retarding effectiveness (refer to the Wildland Fire Chemical Systems website). The long-term retardant specification (Specification 5100-304) identifies chemicals of concern, unacceptable ingredients, requirements for environmental review and risk assessment, toxicity limits, and other conditions that must be met in order for a retardant chemical formulation to be approved for use. The specification is updated periodically to incorporate new requirements. Any products that do not meet updated specifications are removed from the Qualified Products List.

   Section 3.4.3.2 of the specification requires that a risk assessment be performed prior to a product being placed on the Qualified Products List. Ecological Risk Assessments for existing products have evaluated "the toxicological effects associated with chemical exposure" (Auxilio Management Services 2021c) of terrestrial wildlife and plant species and aquatic organisms at varying application rates based on direct exposure to a retardant drop, exposure due to runoff of retardant into a stream, and exposure due to an accidental spill. The assessment also evaluated risks from potential longer-term exposure.

   The Forest Service has entered in an agreement with the United States Geological Survey, Columbia Environmental Research Center to conduct research regarding environmental impacts of firefighting chemicals. Results of multiple research studies have been recently published (Puglis et al. 2023, Puglis et al. 2022, Rehmann et al. 2021) or are expected to be published over the next two years. These studies will provide additional information about the potential impacts of aerial fire retardants,

including: influence of the duration of exposure and application rate on toxicity to trout; influence of substrate and duration of weathering on toxicity in a simulated runoff event; effects of ultraviolet exposure on chemical toxicity; and others as funds allow (refer to pages 299-30 of the 2021 Nationwide Aerial Application of Fire Retardant on National Forest System Lands Biological Assessment for Fish and Wildlife Service Species (USDA Forest Service 2021c)).

2. Whether impacts were assessed for spawning timeframes.

**Response:**

The 2021 Nationwide Aerial Application of Fire Retardant on National Forest System Lands Biological Assessment for NOAA Fisheries Species (USDA Forest Service 2021a and 2021b) and the 2021 Nationwide Aerial Application of Fire Retardant on National Forest System Lands Biological Assessment for Fish and Wildlife Service Species (USDA Forest Service 2021c, 2021d, 2021e, 2022a, 2022b and 2022c) considered potential impacts of aerial fire retardants on spawning areas.

### CS 12 – Impacts of Intrusions in Buffers

Commenters recommend discussions of environmental consequences of intrusions in the final SEIS, including consequences in the buffer. For instance, in final SEIS Section 3.3.2 (Hydrology Environmental Consequences) commenter recommends making the following addition: "Water quality impacts could occur in the event of accidental or direct application into a waterbody or the 300-foot buffer."

**Response:**

Intrusions are defined in the final SEIS as the intentional or unintentional application of aerial fire retardant into an aerial retardant avoidance area. Avoidance areas include waterways and 300-foot buffers surrounding them, as well as larger buffers where those exist for certain species, and terrestrial areas established for protection of federally listed and some sensitive species. Required intrusion reporting includes information about whether the retardant was applied in a waterway, buffer, or both. Any required assessment or monitoring of intrusions include the buffer area if needed.

The analysis of effects of aerial fire retardant in the 2011 FEIS and updated in the final SEIS includes evaluation of the potential for runoff from buffer or other areas into water. Analysis included consideration of the November 2021 ecological risk assessment (Auxilio Management Services 2021c), which considered a broad range of substrates, used daily rainfall data over 3 years, and included a 5-year storm event within 24 hours of retardant application, indicated no measurable risk to aquatic species from runoff of currently approved long-term retardants. Research based on experimental studies of runoff after retardant application in proximity to streams concluded “it is unlikely that fire retardant delivery from leaching or surface runoff will cause more than sublethal effects to fish” (Crouch et al. 2006). Although these studies and others indicate little or no risk to aquatic species, the language in section 3.3.2 of the final SEIS has been updated as suggested.

### CS 13 – Magnesium chloride Toxicity and Environmental Impacts

Commenters state that the Forest Service must provide adequate analysis of the potential impacts of magnesium chloride-based retardants on the environment. Commenters suggest that topics described in items 1 through 7 below should be analyzed and disclosed. An introductory response regarding the overall process for approval of aerial fire retardants is provided directly below, and responses are provided after that for each specific concern identified in items 1 through 7. Commenters provided references and literature in support of their comments.

**Response:**

The Forest Service evaluates wildland fire chemicals through a process that is independent of the decision regarding the programmatic use of aerial fire retardants on National Forest System lands. Appendix L of the 2011 FEIS and the updated Appendix L in the final SEIS describe the Forest Service fire chemical program and the process by which all long-term retardants, including magnesium chloride-based products, are evaluated for potential addition to the Qualified Products List. Only those aerial fire retardants that have been through the evaluation process and included on the Forest Service Qualified Products List may be used on National Forest System lands.

The final SEIS and supporting materials in the project file address the potential environmental impacts of magnesium chloride-based retardants for each resource. Responses to the specific concerns raised in comments are as follows:

1. Methods for analyzing and assessing risks

   **Response:**

   The methods used for analyzing and assessing risks of all long-term retardants, including those containing magnesium chloride, are detailed in the long-term retardant specification (Specification 5100-304). The ecological risk assessments (Auxilio Management Services 2021a, 2021b, and 2021c) reviewed available information regarding magnesium chloride, and found that the low toxicity/ecotoxicity of magnesium and magnesium chloride indicated that assessment of those chemicals individually was not needed. The risk assessment evaluated potential risk based on the overall toxicity of each fire retardant formulation in its entirety (i.e., including any chemicals used as thickeners, coloring agents, corrosion inhibitors, stabilizers, or others) in which magnesium chloride is present. In addition to the risk assessment, analysis of potential impacts or risks of magnesium chloride-based retardants or other retardants is included in Chapter 3 of the final SEIS, and in the 2021 Nationwide Aerial Application of Fire Retardant on National Forest System Land Biological Assessments for Fish and Wildlife Service Species (USDA Forest Service 2021c, 2021d, 2021e, 2022a, 2022b, 2022c) and for NOAA Fisheries Species (USDA Forest Service 2021a and 2021b, and the 2023 Nationwide Aerial Application of Fire Retardant on National Forest System Land Biological Opinion for Fish and Wildlife Service Species (USDI Fish and Wildlife Service 2023) and the 2022 Nationwide Aerial Application of Fire Retardant on National Forest System Land Biological Opinion for NOAA Fisheries Species (USDC NOAA Fisheries 2022). Supporting information cited in each of those documents is included in the project file.

2. Impacts to aquatic macroinvertebrates, which are more sensitive than rainbow trout (the species required by the Specification 5100-304d).

   **Response:**

   The ecological risk assessments (Auxilio Management Services 2021a, 2021b and 2021c) assessed potential risks associated with magnesium chloride-based fire retardants and included evaluation of *Daphnia* species as a representative aquatic invertebrate. The risk assessments identified an “additive risk quotient”, which is the sum of risk associated with all components of the product, for *Daphnia magna* when applied at 6 gallons per square foot directly into a small stream. There was no risk associated with runoff. Overall, potential toxicity to aquatic prey species, including macroinvertebrates, was found to be low. This information was considered and included in the final SEIS.

3. Phytotoxicity, including studies based on season of application related to plant phenology, and coverage levels.

   **Response:**

   The final SEIS updated the analysis of plant species and habitats to address potential effects of magnesium chloride-based retardants, noting that most information currently available is based on road salts, which are used very differently than aerial fire retardants (i.e. applied repeatedly in the same areas). The final SEIS section on Soils (section 3.2) has been updated and includes information about potential effects to plants of magnesium chloride-based retardants. That section also notes that most currently available information is from studies of magnesium chloride used as road de-icers or for dust abatement, which are used differently and likely have greater impacts than aerial fire retardants. The ecological risk assessments (Auxilio Management Services 2021a, 2021b and 2021c) reviewed available information about impacts of long-term retardants on vegetation and reported, "vegetative community response to burning was more dramatic than was the response to chemical application".

4. Anticipated water concentrations after application (Table 3 of the draft SEIS).

   **Response:**

   Concentration of aerial fire retardant in water after application (intrusion) varies both temporally and spatially based on coverage level, location within the drop area (coverage does not occur evenly throughout a drop area), time since the drop occurred, vegetation canopy, stream/waterbody width/size, stream/waterbody depth, stream/waterbody flow rate and volume, and other highly site-specific factors. Furthermore, each individual chemical in a retardant product has specific characteristics that influence its behavior in the environment, including its concentration and movement in water. The Forest Service uses a spill calculator to estimate the characteristics of intrusions and identify the length of stream for which assessment of effects should occur, but the spill calculator cannot specify the concentration of retardant chemicals at a particular point in time for a particular location in a stream or other waterbody.

   Table 3a in the final SEIS provides an update to Table 11 in the 2011 FEIS. Table 3a in the final SEIS shows the toxicity levels to fish of products on the current Qualified Products List. In the draft SEIS, Table 3 also included information on the maximum amount, in pounds per square foot, of active retardant ingredient in each qualified product based on coverage level. For clarity, that information has been moved to Table 3b in the final SEIS.

5. Width of buffer zones adequate to prevent runoff of the most mobile forms of magnesium chloride.

   **Response:**

   An initial version of the ecological risk assessment (Auxilio Management Services 2021a), cited in the draft SEIS, incorrectly reported runoff results for some retardants evaluated. The assessment was corrected, and per Table A-3 and A-5 in the corrected assessment (Auxilio Management Services 2021b), there was no risk from runoff identified for any of the retardants evaluated, including the magnesium chloride-based product. Therefore, there is no reason to apply a different buffer width for those retardants.

6. Short and long-term effects, particularly to listed species as well as effects to water, soils, plants, aquatic life, and wildlife when applied in other, non-avoidance-mapped areas.

   **Response:**

   The potential effects of magnesium chloride-based retardants are discussed in the final SEIS and supporting materials (including the 2021 Ecological Risk Assessments) in the project file, as well as in the 2021 biological assessments and 2022 and 2023 Biological Opinions noted above. Analyses in those documents include discussion of potential impacts of retardant products, including magnesium chloride-based products, on resources in general and are not limited to impacts of application in avoidance areas only.

   Refer also to the response to CS 11 regarding recent research and anticipated results of additional studies into the environmental impacts of firefighting chemicals.

7. Toxicity to federally listed species at airports (commenters mention the California tiger salamander and the vernal pool fairy shrimp).

   **Response:**

   The potential for effects to federally listed species in the vicinity of airports where aerial fire retardant is handled and in identified jettison areas has been included in the 2021 biological assessments and the 2022 and 2023 Biological Opinions noted above. The final SEIS has been updated to include that information.

**CS 14 – Magnesium Chloride Impacts to Aircraft and Infrastructure**

Commenters state that the analysis fails to consider the impacts of allowing the use of magnesium chloride-based retardants on aircraft and other infrastructure, which could result in potentially dangerous outcomes. Commenters refer to reports and literature (included with comment letters) indicating corrosion and difficult to clean residues in aircraft resulting from mixing of magnesium chloride-based retardants with phosphate-based retardants. Commenters also express concern about the use of magnesium chloride on airport infrastructure, and refer to Environmental Protection Agency and Federal Aviation Administration prohibitions on the use of magnesium choride-based products as a de-icer at airports.

**Response:**

The Forest Service evaluates wildland fire chemicals through a process that is independent of the decision regarding the programmatic use of aerial fire retardants on National Forest System lands. Appendix L of the 2011 FEIS and the updated Appendix L in the final SEIS describe the Forest Service fire chemical program and the process by which all long-term retardants, including magnesium chloride-based products, are evaluated for potential addition to the Qualified Products List. Only those aerial fire retardants that have been through the evaluation process and included on the Forest Service Qualified Products List may be used on National Forest System lands.

The methods used for evaluating all long-term retardants, including those containing magnesium chloride, are detailed in the long-term retardant specification (Specification 5100-304). The process of evaluating products for inclusion on the Qualified Products List includes tests to assess potential for corrosion. All products must meet standards for effects on metallic and non-metallic materials (section 3.8 of the long-term retardant specification) in order to be included on the Qualified Products List. The evaluation process also may include an operational field evaluation (section 3.12 of the long-term retardant specification), in which products are used in actual firefighting situations and during which additional questions or concerns, such as those identified in the comment and its supporting materials, may be identified. The Forest Service is identifying information, conducting

additional corrosion and material performance studies, and carrying out an Integrated Operational Field Evaluation to obtain information about potential interactions of magnesium chloride-based retardants with other retardants. Decisions regarding purchase and use of products on the Qualified Products List are made in compliance with Forest Service and interagency policies, regulations, and guidance. Decisions regarding the use of specific products at individual tanker bases or airports are made through separate processes specific to those sites.

The purpose of the 2011 Record of Decision and the 2023 Record of Decision is not to identify specific aerial fire retardants that can or cannot be used on National Forest System lands; those decisions are made separately according to requirements established in the specification and processes described in Appendix L of the 2011 FEIS, as updated in the final SEIS. The purpose of this decision is to ensure that the Forest Service has an effective firefighting tool (aerial fire retardants in general) to use for certain objectives, and to provide standards for its use that will balance that need with the need to protect critical or sensitive resources (refer to 2011 FEIS section 1.4).

**CS 15 – Magnesium Chloride Impacts to Public Health and Safety**

Commenters state that the Forest Service must provide adequate analysis of the potential impacts of magnesium chloride-based retardants on public health and safety, including impacts to personnel involved with loading and mixing, and personnel on firelines. Commenters also express concern about impacts related to mixing magnesium chloride-based products with other types of retardant, including effects to personnel involved in cleaning aircraft as well as possible effects on integrity of aircraft. Commenters cite regulations and other documents in support of this concern.

**Response:**

The Forest Service evaluates wildland fire chemicals through a process that is independent of the decision regarding the programmatic use of aerial fire retardants on National Forest System lands. Appendix L of the 2011 FEIS and the updated Appendix L in the final SEIS describe the Forest Service fire chemical program and the process by which all long-term retardants, including magnesium chloride-based products, are evaluated for potential addition to the Qualified Products List. Only those aerial fire retardants that have been through the evaluation process and included on the Forest Service Qualified Products List may be used on National Forest System lands.

The methods used for evaluating all long-term retardants, including those containing magnesium chloride, are detailed in the long-term retardant specification (Specification 5100-304). The process of evaluating products for inclusion on the Qualified Products List includes submission of health and safety information, including completion of a health risk assessment. Two magnesium chloride-based products were included in a health risk assessment (Auxilio Management Services 2021c), which evaluated potential risk based on route of exposure, including contact with skin, inhalation of vapors or aerosol particles, or through consumption in food or water. The assessment concluded, “for typical and maximum exposures, all products as a whole and individual ingredients were predicted to pose negligible risk to fire-fighting personnel”, as well as to people potentially involved in accidental drenching, or to people entering areas where retardant has been applied. Information from the health risk assessment has been updated in Section 3.8 of the final SEIS. The Forest Service is identifying information, conducting additional corrosion and material performance studies, and carrying out an integrated operational field evaluation to obtain information about potential interactions of magnesium chloride-based retardants with other retardants.

The purpose of the 2011 Record of Decision and the 2023 Record of Decision is not to identify specific aerial fire retardants that can or cannot be used on National Forest System lands; those decisions are made separately according to requirements established in the specification and

processes described in Appendix L of the 2011 FEIS, as updated in the final SEIS. The purpose of this decision is to ensure that the Forest Service has an effective firefighting tool (aerial fire retardants in general) to use for certain objectives, and to provide standards for its use that will balance that need with the need to protect critical or sensitive resources (refer to 2011 FEIS section 1.4).

**CS 16– Carbon/Climate**

Commenters state that effects related to carbon emissions and climate change, such as emissions from retardant delivery aircraft, and changing frequency and/or severity of fires, have not been addressed in the draft SEIS.

**Response:**

The 2011 FEIS included limited discussion of climate change (e.g., section 3.3.3, Alternative 2 discussion of "Risk by Region"). Both the draft and final SEIS, however, include an entire section (Section 3.13) discussing climate change and its potential impacts to wildfires and to aerial retardant use. The final SEIS notes that some predictions point toward a larger number of fires that remain active over a longer period each year, and that many forested regions in the west are expected to experience more high-severity wildfires as a result of climate change. The final SEIS also discusses available information regarding potential carbon releases from wildfires, and estimates emissions from aircraft used in retardant delivery (Section 3.13 Table 5, Table 6, and Table 7).

**CS 17 – Retardant Effectiveness Indicators**

Commenters question the use of initial attack success rate as an appropriate measure of aerial fire retardant effectiveness, specifically citing page 27 of the draft SEIS.

**Response:**

The intent of the SEIS (refer to page 1 of the final SEIS) is to supplement and update information in the 2011 FEIS that may have changed since the 2011 FEIS was completed. Page 27 of the final SEIS states that information on initial attack success rate was included in the SEIS for the purpose of updating data and statistics included in the 2011 FEIS. It goes on to state that initial attack success rate is mentioned in the 2011 FEIS (pages 65 and 67) as one of several factors that could be affected by use of aerially delivered retardant; wording in the final SEIS has been updated to clarify how the updated data relate to the information presented in the 2011 FEIS.

Neither the 2011 FEIS nor the final SEIS identify or discuss the overall initial attack success rate as a means to determine aerial retardant effectiveness. The 2011 FEIS includes information about initial attack success rate in a section titled "Greater Exposure of Ground Personnel", discussing the potential for Alternative 1 (No Action) to affect safety of ground personnel. The discussion there states that potential constraints on use of ground personnel resulting from use of water only (no aerial retardant use at all) in that alternative, in addition to other potential operational changes resulting from use of water only, could result in changes to overall initial attack success rate. Agency-wide initial attack success rate is referenced because it could potentially be affected at the programmatic, nationwide scale of the action and the analysis.

Initial attack success rate was not used in the 2011 FEIS nor in the draft or final SEIS as a measure of aerial fire retardant effectiveness. Refer also to the 2011 FEIS Appendix Q (Response to Comments), which states, "Interpreting a correlation between fire retardant use and initial attack success is very difficult, especially using data collected from highly variable fire behavior conditions" (2011 FEIS pages 460-461, Response to PC 2). The Response to that comment also states that aerial retardant is more likely to be used for initial attack on fires that have "high risk of

extreme behavior and high fire spread rates", which could lead to erroneous conclusions about the effectiveness of aerial fire retardant in initial attack (2011 FEIS page 461). Refer to section 3.1 of the final SEIS for an updated discussion of aerial fire retardant effectiveness, and see also the response to CS 18 below.

**CS 18 – Retardant Effectiveness**

Commenters state that the Forest Service should disclose information regarding retardant effectiveness, including specific items identified in numbers 1 through 6 below. Commenters cited and submitted documents in support of their comments. A brief response is provided regarding the general topic, and individual responses are provided after each numbered item below.

**Response:**

Since the 2011 FEIS was completed, additional information has become available regarding the effectiveness of aerial retardants in achieving the objectives for which they are used. Section 3.1 of the final SEIS has been updated to include a summary and discussion of that information.

1. How aerial fire retardant effectiveness is measured (see also CS 17).

**Response:**

Section 3.1.1.2 of the final SEIS has been updated to include a discussion of efforts, including recent work by the Forest Service, to define and measure effectiveness. Several studies have used a variety of data types and sources to answer different questions about fire retardant effectiveness at different scales for different purposes. Some of those studies include flame-scale studies of chemical interaction with fire, coarse-grained evaluations of past data correlating airtanker use and initial attack success, efforts to develop measures of cost-effectiveness, studies developing and reporting measures of probability of success for specific objectives, and others. Fire suppression involves multiple, interacting suites of tactics, objectives, and resources that change during the course of a fire, making attempts to tie objectives to outcomes difficult at best (Plucinski 2019a and 2019b).

2. Whether aerial fire retardant is effective for accomplishing objectives.

**Response:**

The 2011 FEIS discussed the varied objectives involved in the use of aerial fire retardant in section 3.1.1. Effectiveness of aerial fire retardant is specifically discussed in 2011 FEIS Appendix O and in 2011 FEIS Appendix Q, Responses to PC 1, PC 2, PC 12, PC 13, and PC 87. Section 3.1.1.2 of the final SEIS has been updated to include recent information about aerial fire retardant effectiveness.

There is not a single metric nor method by which to measure effectiveness of aerial fire retardant. The final SEIS discusses findings of some studies, but also describes the limitations in measuring and reporting on aerial fire retardant effectiveness, including differing definitions of effectiveness and the parameters used to measure it, difficulty of applying laboratory findings to field situations, the complexity and often rapidly changing nature of firefighting operations, and the numerous variables (fuels, terrain, climate, weather, other firefighting resources and operations, and many others) that contribute to firefighting outcomes. Useful results from suppression operations have been limited and some efforts to obtain them have at times had to be abandoned because of the lack of ability to obtain data (Plucinski 2019a).

The Aerial Firefighting Use and Effectiveness (AFUE) Report (USDA Forest Service 2020d) analyzed aircraft drops (water and fire retardant) on the basis of known objectives and measured outcomes. Some of the report's findings are summarized in the final SEIS and include information on interaction

percentage (the portion of drops that have known outcomes and that are known to have interacted with the fire) as well as probability of success (the number of effective drops out of the total drops with known, interacting outcomes); 'effective' in this study is based on the degree of alignment between the objective of a drop and its outcome. The 2020 AFUE report summarizes performance based on objectives, also summarizing across terrain, fuel, fire condition, and ground engagement.

3. Comparison of initial attack success for fires that receive retardant and those that do not, as well as for fires that ignite within avoidance areas compared to those that ignite elsewhere.

**Response:**

The 2011 FEIS (Section 3.1.1; Response to PC 2 on pages 461-462; Response to PC 54 on page 500; Response to PC 89 on page 522) discusses the problems involved in attempting to analyze data from fire incidents or to carry out experiments, actively or using past fire data, as suggested by the commenter. The final SEIS discusses studies showing that experimental programs can be difficult to carry out and variables remain difficult to control. Efforts to obtain data during wildfire suppression operations have been limited or abandoned due to the dynamic and unplanned nature of wildfires, safety issues, and others. Aerial retardant may be used more often on fires that are inherently more difficult to contain (e.g., Calkin et al. 2014), precluding valid comparisons with fires on which it is not used. Commenters suggest comparing fires that ignite within avoidance areas with those that ignite outside of those areas, but that suggestion incorrectly assumes, among other things, that: 1) the most meaningful measure of retardant effectiveness is its use immediately after ignition (refer to response to CS 17 and to items 1 and 2 above), 2) fires igniting in avoidance areas will not spread during initial attack to areas where use of retardant is allowed, and 3) fuel type and other factors are the same within and outside avoidance areas, which is unlikely to be true since the large majority of avoidance areas are centered around waterways. In a comprehensive review of wildfire suppression effectiveness, Plucinski (2019a) noted that metrics used to evaluate effectiveness have often been related to stopping or slowing fire progression, but they should instead address the numerous specific objectives for which individual aerial fire retardant drops are used. Calkin et al. (2014) noted that use of past fire data prevented them from being able to associate retardant drops with specific objectives, which led to the coarse-grained approach they used when categorizing drops and defining effectiveness. The Forest Service AFUE report (USDA Forest Service 2020d), however, provides information about probability of success based on specific aerial drop objectives documented at the time that those drops were made (refer to item 2 above). Some results from the AFUE report have been included in the final SEIS.

4. Initial attack success rate for each national forest rather than nationwide data, because some National Forests use little or no aerial fire retardant, so that aerial retardant effectiveness can be compared among National Forests.

**Response:**

Comparison of data from national forests that use aerial fire retardant with those that do not would be limited by the same issues described in item 3 above. In addition, there is enormous variation among national forests regarding fuel types, weather, climate, terrain, and other variables that affect the outcome of fires and firefighting operations. As an extremely general example of the lack of utility of this approach, it would be entirely incorrect to state that use of aerial retardant on a fire in dry, Douglas-fir habitat in the mountain west was responsible for an outcome that differed from that of a fire in a predominantly deciduous forest in the southeast where aerial fire retardant was not used.

5. Whether information on effectiveness is "extremely difficult" to obtain as worded in the 2011 FEIS, or "not possible to obtain" based on wording in the SEIS, and disclose why those data are difficult or not possible to obtain.

**Response:**

The commenter questioned use of the term "extremely difficult" in the 2011 FEIS (used only in 2011 FEIS Appendix Q, page 461) versus the term "not possible to determine" used on page 27 of the draft SEIS, alleging that the use of different terms in different documents represents a change of opinion by the Forest Service regarding the ability to determine and compare initial attack success rates. Page 461 of the 2011 FEIS states "However, as noted, it is *extremely difficult to accomplish this kind of controlled experimentation* [emphasis added] given the high degree of variability …". This statement addresses the use of controlled experimentation as suggested in the 2011 DEIS comment to which it responds. The text in section 3.1.2 of the final SEIS states "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 determin*e [emphasis added].". The commenter therefore alleges erroneously that the statements refer to the same issue, when in fact one refers to the difficulty of carrying out controlled experiments and the other refers to the ability to determine whether certain statistics would vary by alternative.

The commenter also mentions 40 CFR 1502.21, which addresses incomplete or unavailable information "relevant to reasonably foreseeable significant adverse impacts". The 2011 FEIS, final SEIS, biological assessments (USDA Forest Service 2021a, 2021b, 2021c, 2021d, 2021e, 2022a, 2022b, and 2022c) and supporting materials incorporate the best available scientific information regarding potential adverse impacts of aerially delivered fire retardants on a variety of resources, including federally listed wildlife, aquatic, and plant species. The information used in those effects analyses and determinations is discussed and referenced in those documents and in supporting materials in the project file. Any information that is incomplete or unavailable and that would contribute to the analysis of impacts is discussed in the relevant analyses in the 2011 FEIS, final SEIS, biological assessments (USDA Forest Service 2021a, 2021b, 2021c, 2021d, 2021e, 2022a, 2022b, and 2022c), and supporting materials.

6. Whether the Forest Service can make a reasoned choice between the no action alternative and the action alternatives without disclosing information about aerial fire retardant effectiveness.

**Response:**

The purpose of and need for the action is described in 2011 FEIS section 1.4. It states that the Forest Service "needs an effective tool for wildland firefighting that can" meet certain criteria that include certain impacts on fire spread, intensity, and direction, and enable other fire management response to occur quickly and safely. The purpose also includes providing standards to protect critical or sensitive resources. All action alternatives meet the purpose and need, and describe different possible constraints on use of aerially delivered fire retardant.

As described in 2011 FEIS section 3.1 and 2011 FEIS Appendix Q, in section 3.1 of the final SEIS, and in items 1-5 of this CS response, there is no simple or single overarching measure of aerial retardant effectiveness. Aerial fire retardant is a tool that is used to accomplish a variety of objectives at a variety of scales, as described in the 2011 FEIS, final SEIS, and elsewhere as cited in those documents. As with other firefighting tools (e.g., line building, tree felling, burning, etc.), aerial fire retardant is one tool used to achieve specific objectives in the context of specific situations and operations. Because fire retardant can have adverse effects on some sensitive resources, the Forest Service must provide standards for its use that balance the need to protect those sensitive resources with the need to use fire retardant to achieve various firefighting objectives, including the protection of life, property, and other values or resources. The alternatives considered in the 2011 FEIS and the 2011 Record of Decision, and in the final SEIS and

2023 Record of Decision vary in the degree of protection afforded to sensitive resources, effects on the efficient and timely response of firefighting operations, and overall potential effects on outcomes. Information about the effects of different alternatives is described in detail throughout 2011 FEIS Chapter 3, and is updated in final SEIS Chapter 3. Both the 2011 Record of Decision and the 2023 Record of Decision describe the rationale for choosing the selected alternative rather than any of the others considered.

The decision is a programmatic, nationwide action, and therefore is analyzed at that scale. Decisions about use of aerial fire retardant for individual fire incidents or operations are made by Incident Commanders and Agency Administrators based on specific conditions, but any use of aerially delivered fire retardant must be in conformance with the direction described in the current Record of Decision.

**CS 19 – Threatened and Endangered Species**

Commenters suggest that analysis of impacts to threatened and endangered species should include topics identified in numbers 1 through 3 below. Individual responses are provided after each numbered item.

1. Clarification about what "other factors" were involved in updating determinations for species evaluated in 2011.

   **Response:**

   As stated in the final SEIS, specific information used for determinations of all threatened, endangered, or proposed species is described in the biological assessments (USDA Forest Service 2021a, 2021b, 2021c, 2021d, 2021e, 2022a, 2022b, and 2022c. The Fish and Wildlife Service biological assessment (USDA Forest Service 2021c) states, “All analyses used the most recent available information on fire occurrence, retardant use, species status and distribution, threats, and others.” The specifics of the screening process and analysis are described in the biological assessments (sections 5.2.1 and 5.2.4 in the Fish and Wildlife Service biological assessment (USDA Forest Service 2021c) and Table BA-13 in the NOAA Fisheries biological assessment (USDA Forest Service 2021a)). As described there, the analysis that informed species determinations included retardant application potential, use of avoidance areas, data on intrusion rates, potential for effects to critical habitat, animal mobility, potential for disturbance by aircraft, potential for ingestion of retardant, and species-specific biology and ecology where appropriate. As noted in the final SEIS, all species currently listed as threatened, endangered, or proposed for listing were screened and determinations were made regardless of determinations made in 2011 or in subsequent consultations. Therefore any of the information used in screening and analysis that had changed or had become available since the 2011 and subsequent determinations were made may have resulted in different determinations.

2. Consider that of use of new formulations may use more raw materials and therefore have more environmental effects.

   **Response:**

   It is not clear what “more raw materials” the comment is referring to. Aerial fire retardants currently on the Qualified Products List all have similar concentrations of retardant salts (refer to page 311, Appendix A of the Fish and Wildlife Service biological assessment (USDA Forest Service 2021c)), and all products on that list must meet all requirements in the specification.

3. Consider effects on threatened and endangered species occurring at airports where retardant is managed.

**Response:**

The potential for effects to federally listed species in the vicinity of airports where aerial fire retardant is handled and in identified jettison areas has been included in the 2021 biological assessments (USDA Forest Service 2021a and 2021c) and the Biological Opinions (USDC NOAA Fisheries 2022, USDI Fish and Wildlife Service 2023) noted above. The final SEIS has been updated to include that information as well.

## Compliance with Law, Regulation, and Policy (non-NEPA)

**CS 20 – Clean Water Act/National Pollution Discharge Elimination System (NPDES) Permit**

Commenters state the Forest Service is required to obtain a National Pollution Discharge Elimination System (NPDES) permit for aerial application of fire retardant in order to comply with the Clean Water Act. Commenters state that the fact that retardant is dropped in waterways as a consequence of intrusions or exceptions is a point source discharge of a pollutant that requires a permit because the Forest Service intends to continue in this practice. Commenters state that the "may affect" and "likely to adversely affect" determinations included in the analysis and Endangered Species Act Section 7 consultations support the conclusion that the Forest Service discharges a pollutant into waterways. Commenters question whether past communication from the Environmental Protection Agency exempts the Forest Service from obtaining a NPDES permit for this activity.

**Response:**

The 2011 FEIS noted that the U.S. Environmental Protection Agency, which administers NPDES permits, determined at that time that a NPDES permit was not required for continued use of aerial retardant (refer to 2011 FEIS Section 3.3.1 and 2011 FEIS Appendix Q). Although prohibition on use of retardant in or near waterways and requirements for reporting any retardant drops that occur there, as described in the 2011 FEIS and 2011 Record of Decision, have been in place since January 2012, the Forest Service responded to this comment on the draft SEIS by re-initiating discussion with the Environmental Protection Agency regarding the need for a NPDES permit.

While the Forest Service and the Environmental Protection Agency were in the process of determining procedures and requirements for obtaining a NPDES permit, a lawsuit was filed against the Forest Service regarding the lack of an existing NPDES permit. The Court held that the Forest Service was in violation of the Clean Water Act (CWA) when it discharged fire retardant into waters of the United States, but the Court declined to enjoin the Forest Service's use of fire retardant to fight fires, stating that "the objective of the CWA is likely to be achieved here in due course" (FSEEE v. Forest Service, Case 9:2022-cv-00168-DLC). The court directed the Forest Service to submit progress updates as it works with the Environmental Protection Agency through the permit process, which may take 30 months or longer.

In February 2023 the Forest Service and the Environmental Protection Agency entered into a Federal Facilities Compliance Agreement, the objective of which is to "cause the Forest Service to come into and remain in full compliance with all applicable Federal, state, and local laws and regulations … as required by… the Clean Water Act" (U.S. Environmental Protection Agency and USDA Forest Service 2023). The agreement requires the Forest Service to seek a NPDES permit, and until one is in place to follow the direction in the 2011 Record of Decision, use identified best practices during retardant application and when intrusions occur, and submit a written status report and summary of intrusions to the Environmental Protection Agency annually. The provisions of the agreement will remain in place until the NPDES permit is issued.

According to the Environmental Protection Agency (https://www.epa.gov/npdes accessed 12 January 2022), a NPDES permit identifies and limits the types of substances that can be discharged into waters of the United States, establishes monitoring and reporting requirements, and includes other provisions as needed to "ensure that the discharge does not hurt water quality or people's health". A NPDES permit does not prevent entry of pollutants into waterways, but requires certain practices to limit potential impacts.

The 2011 FEIS, and the modifications to the proposed action described in the final SEIS and in the 2023 Record of Decision prohibit use of retardant in waterways and surrounding buffers, except in circumstances where human life and safety are threatened. The decisions also establish monitoring and reporting requirements for intrusions that occur. The 2011 FEIS (refer to 2011 FEIS Appendix Q, PC 38) states that the Forest Service strives for 100 percent accuracy in aerial application of fire retardant, but conditions that occur during firefighting operations result in retardant occasionally being dropped into waterways. Intrusions into water represent 0.32 percent of all retardant drops, from 2012 through 2021 (final SEIS Appendix D). When an intrusion is reported into water, only a portion of the retardant load actually enters the water, with the remainder of the load falling on the adjacent banks or upland areas, or intercepted by overhead vegetation.

Finally, the comment states that species determinations are evidence that retardants are 'pollutants'. Pollutants are defined by the Clean Water Act. Effects determinations made by the Forest Service regarding impacts of the retardant program on federally listed species are specific to Endangered Species Act Section 7 consultation procedures, and are unrelated to whether aerial fire retardants are considered pollutants under the Clean Water Act.

**CS 21 – Endangered Species Act Consultation on New Retardants**

Commenters expressed concerns about the 'streamlined' consultation component of new product approval. Specific concerns include topics identified in numbers 1 through 3 below. A response is provided below regarding the overall concern, and individual responses are then provided after each numbered item.

**Response:**

New retardant formulations proposed for use by the Forest Service must meet all requirements of the specification (Specification 5100-304) in order to be included on the Qualified Products List and approved for use on National Forest System lands. Section 3.4.3.3 of the current specification (Specification 5100-304d) states "A new product may be included in an environmental consultation with the Federal regulatory agencies … The extent of the consultation will be based on the similarities and differences to other products from the same submitter."

According to the 2020 Supplemental Information Report, the 2011 Record of Decision (USDA Forest Service 2011d) did not include a clear process for completing Endangered Species Act Section 7 consultation and National Environmental Policy Act analysis for new retardant products. Discussions with NOAA Fisheries and the Fish and Wildlife Service indicated a need to establish appropriate procedures for consultation of new products, recognizing that most products recently added to the Qualified Products List "have the same general toxicity mechanism and effects as those considered in 2011" (USDA Forest Service 2020a).

In 2013, the Forest Service submitted to NOAA Fisheries (USDA Forest Service 2013) a detailed process for re-initiation of consultation for the aerial application of long-term fire retardant on all National Forest System lands. The process provided a decision framework for re-initiation of consultation when new retardant formulations were submitted for approval. It stated that if new retardant products contained the same constituent ingredients within the same constituent boundaries, had the same or lower measured toxicity levels as those products, and had no new or

additional identified risks when compared to products that have already completed Endangered Species Act section 7 consultation, then no additional consultation is required. NOAA Fisheries received notification letters when new formulations of retardants were approved. This process was also followed with the Fish and Wildlife Service. This process and the 2013 document was the basis for the process described in the "Consultation Re-initiation Framework" in the 2021 biological assessments (USDA Forest Service 2021a, Appendix B; USDA Forest Service 2021c, Appendix A).

In the Biological Assessments for Nationwide Aerial Application of Fire Retardant on National Forest System Land (USDA Forest Service 2021a, and 2021c) the Forest Service provided information to the Fish and Wildlife Service and to NOAA Fisheries about composition of currently approved retardant formulations. The biological assessments establish "the upper limit of retardant salts that can be used in newly developed retardants without the need for re-initiation of consultation" (USDA Forest Service 2021a and 2021c, Table 2) as well as the upper limit for percentages of thickeners, colorants, and performance ingredients in new products without the need for re-initiation (USDA Forest Service 2021c page 13). Furthermore, the biological assessments state that for any new formulations, "the toxicity levels must not exceed those of currently approved products", the "maximum extent and duration of effects from new products cannot exceed effects of products" already approved, and there must be no new risks not already assessed in completed consultations, in order to be approved without re-initiation.

1. The words "are similar" in Modified Alternative 3 are not clearly definable nor easily calculated nor measured, and do not address synergistic effects of the retardant formulation as a whole; products that "are similar" may have different risks entirely.

   **Response:**

   The text of Modified Alternative 3 (Proposed Action) has been updated in the final SEIS to clarify the requirement that new products must meet specified criteria for type, concentration, and percentage of components to be considered for approval without re-initiation of consultation. It now reads: "Products will generally meet these requirements when the amount of retardant salts when delivered at standard coverage levels, and the percentage of thickeners, coloring agents, and performance ingredients in the total mixed product do not exceed those established in completed consultations. The toxicity levels of new products must not exceed those of products with completed consultations, and there must be no risk factors that have not previously been identified and assessed in completed consultations."

2. Modified Alternative 3 states that new consultation is not required if the "extent and duration of effects…do not exceed the effects of other products already considered", but that cannot be known without studies on phytotoxicity, soil contamination, corrosion, or others.

   **Response:**

   New products must meet all the requirements in the specification regardless of whether they require re-initiation of consultation. The specification requires extensive testing of concentrate and mixed product, as well as completion of human health and ecological risk assessments, and mammalian and aquatic toxicity tests of both concentrate and mixed product. The requirements ensure that products have been evaluated for effects of individual products as a whole, and include potential synergistic or additive effects among ingredients. Risk assessments determine additive risks of individual ingredients in products where there were no data indicating synergistic effects (Auxilio Management Services 2021c). The updated text of Modified Alternative 3, which parallels wording in the 2021 biological assessments (USDA Forest Service 2021a and 2021c), clarifies that if testing of new products indicates type or degree of risks not previously assessed in consultation, re-initiation would be required.

3. Consider requiring a "mini-consultation" with the Fish and Wildlife Service and NOAA Fisheries for any new products, allowing those agencies to evaluate whether a "full consultation" may be needed and whether to request additional information or safety analysis before use by the Forest Service.

**Response:**

When new products meet criteria for inclusion on the Qualified Products List, the Forest Service evaluates whether the product meets the criteria stated above and described in the 2021 biological assessments (USDA Forest Service 2021a and 2021c). If the product meets those criteria, the Forest Service sends a letter notifying the Fish and Wildlife Service and NOAA Fisheries indicating that the product has been accepted on the Qualified Products List (refer to USDA Forest Service 2021a Appendix B or USDA Forest Service 2021c Appendix A). The Forest Service provides to the Fish and Wildlife Service and NOAA Fisheries copies of risk assessments and toxicity information at that time, and Modified Alternative 3 has been updated to reflect this. The Fish and Wildlife Service and NOAA Fisheries have the option to require re-initiation if appropriate.

**CS 22 – Other Regulations**

Commenters state that the draft SEIS fails to document whether magnesium chloride based retardants comply with the Clean Water Act, Safe Drinking Water Act, and EPA regulations cited in the FEIS and as discussed there for ammonium phosphate-based retardants.

**Response:**

Section 3.3.1 of the 2011 FEIS discusses the use of aerially delivered fire retardant with respect to the regulatory framework for protection of water resources in the United States. The purpose of the Safe Drinking Water Act (42 U.S.C. Chapter 6A, Subchapter XII) is to protect the quality of drinking water in the United States, and the purpose of the Clean Water Act (33 U.S.C. §1251 et. seq.) is to restore and maintain the chemical, physical, and biological integrity of the Nation’s waters. The Forest Service prohibits dropping aerial fire retardant in waterways or in buffers surrounding waterways (refer to the 2011 Record of Decision (USDA Forest Service 2011d) and to final SEIS section 2.1.4, Modified Alternative 3). Local units may choose to map additional areas as avoidance areas or adjust the size of avoidance areas if necessary to protect specific identified resources. The Forest Service strives for 100 percent accuracy in aerial application of fire retardant, but conditions that occur during firefighting operations result in retardant occasionally being dropped into waterways. Intrusions into water represent 0.32 percent of all retardant drops, from 2012 through 2021 (final SEIS Appendix D). When an intrusion occurs, only a portion of the retardant load actually enters the water, with the remainder of the load falling on the adjacent banks or upland areas, or intercepted by overhead fuels.

The Forest Service specification for long-term fire retardants (Specification 5100-304) establishes requirements that include, among other things, limits on toxicity, acceptable and unacceptable chemicals, and others. All requirements in the specification must be met in order for a long-term retardant to be included on the Qualified Products List, and only retardants on the Qualified Products List may be used on National Forest System lands. At the time this response is being written there are two fully qualified magnesium chloride-based retardants on the Qualified Products List, meaning that they have met the same requirements for use as other long-term fire retardants, including requirements specific to public health and human safety.

At the time this document is being prepared the Forest Service is working with the Environmental Protection Agency to obtain a National Pollutant Discharge Elimination System permit. The process is expected to take approximately 30 months. In the interim, the Forest Service and the Environmental Protection Agency have entered into a Federal Facility Compliance Agreement that

specifies requirements regarding use of aerially delivered fire retardant (US Environmental Protection Agency and USDA Forest Service 2023). Refer also to the 2011 FEIS section 3.3.1, to section 3.17.1 of the final SEIS, and to the response to CS 20 above.

## Compliance with National Environmental Policy Act (NEPA)

**CS 23 – General**

Commenters suggest changes to the SEIS to allow it to better meet the requirements of the National Environmental Policy Act, including topics identified in numbers 1 through 3 below. Individual responses are provided after each numbered item.

1. Recommend that the final SEIS discuss how the Forest Service determines whether there will be downstream effects when deciding to exclude dry waterways from avoidance areas in Modified Alternative 3.

   **Response:**

   Refer to response to CS 1. Information regarding potential effects of retardant drops in dry waterways is discussed there and has been added to section 3.3.2 of the final SEIS.

2. Clearly state the purpose and need, rather than relying on the FEIS to do so.

   **Response:**

   Section 1.1 of the SEIS states that the SEIS is a supplement to the 2011 FEIS and does not replace it, and "Information in this document is *in addition to* [emphasis added] information in the FEIS, replacing that information only where explicitly stated." Little, if any of the information in the draft or final SEIS can be understood or appropriately considered separately from the 2011 FEIS. For efficiency and to avoid potential confusion, the final SEIS references the 2011 FEIS in describing the purpose and need rather than re-stating it. To help with comprehension, however, a brief summary of the purpose and need has been added to section 1.4 of the final SEIS.

3. Consider impacts of retardants on general forest lands rather than just in avoidance areas.

   **Response:**

   The 2011 FEIS and the final SEIS include analyses of potential impacts of aerial fire retardant on a number of resources in general, and not specific to avoidance areas or intrusion impacts. As an example, 2011 FEIS section 3.4, as updated in final SEIS section 3.4 includes a section titled "General Effects on Aquatic Vertebrates and Invertebrates, Including Habitats". That section summarizes research and other information regarding potential toxicity to fish, macroinvertebrates, and mollusks, along with sublethal and ecological effects, and general indirect effects, none of which is specific to listed species or to avoidance areas. Other resource sections (e.g., section 3.2 regarding soils, section 3.6 regarding wildlife, etc.) provide similar discussion of the potential impacts of retardant to each resource in general, regardless of whether exposure occurs in an avoidance area or elsewhere. Refer also to the response to CS 10.

**CS 24 – Magnesium Chloride Analysis**

Commenters state that the draft SEIS fails to meet the intent of the National Environmental Policy Act by failing to adequately analyze the environmental and human health impacts of magnesium chloride-based retardants, which were not addressed in the 2011 FEIS on which the SEIS depends for most of its analysis. See concern statements CS-13, CS-14, and CS-15 for specific analysis concerns.

**Response:**

The purpose of the 2011 Record of Decision (USDA Forest Service 2011d) and the current decision to be made is not to identify specific aerial fire retardants that can or cannot be used on National Forest System lands; those decisions are made separately according to requirements established in the specification and processes described in 2011 FEIS Appendix L, as updated in the final SEIS. The purpose of this decision is to ensure that the Forest Service has an effective firefighting tool (aerial fire retardants in general) to use for certain objectives, and to provide standards for its use that will balance that need with the need to protect critical or sensitive resources (refer to 2011 FEIS section 1.4, USDA Forest Service 2011a).

The Forest Service evaluates wildland fire chemicals through a process that is independent of the decision regarding the programmatic use of aerial fire retardants on National Forest System lands. 2011 FEIS Appendix L and final SEIS Appendix L describe the Forest Service fire chemical program and the process by which all long-term retardants, including magnesium chloride-based products, are evaluated for potential addition to the Qualified Products List. Only those aerial fire retardants that have been through the evaluation process and included on the Forest Service Qualified Products List may be used on National Forest System lands.

Magnesium chloride-based retardants were developed and placed on the Qualified Products List after the 2011 FEIS was completed and the 2011 Record of Decision was signed. In order to inform the current decision to be made, the final SEIS includes information regarding the potential effects of magnesium chloride-based aerial fire retardants on various resources, including soils (section 3.2) aquatic species and habitats (section 3.4), plant species and habitats (section 3.5), wildlife species and habitats (section 3.6), public health and safety (section 3.8) and others, with supporting material in the project file. The potential effects of magnesium chloride-based aerial fire retardants are also discussed with respect to toxicity and environmental impacts in the response to CS 13, aircraft and infrastructure in the response to CS 14, and public health in the response to CS 15 in this appendix.

**CS 25 – Public Involvement**

Commenters state that there have been substantial changes in the substance and nature of the environmental issues over the last 11 years, and that the Forest Service should therefore conduct new scoping to ensure meaningful public involvement in the process. Commenters state that the purpose and need is not stated in the draft SEIS and the 2011 FEIS is not posted to the project website making it too difficult for the public to comment. Commenters state that each substantive issue in comments should be incorporated as part of purpose and need, used to develop alternative actions, analyzed as part of effects analysis, and/or considered for mitigation.

**Response:**

The Forest Service prepared and released a Supplemental Information Report in 2020 (USDA Forest Service 2020a) that reviewed "any new information and/or changed conditions since the final Environmental Impact Statement was completed in 2011". The report reviewed and included information on changes in: species considered, amount of retardant chemical used annually, approved chemicals, mapped avoidance areas, potential changes based on monitoring information, and analysis assumptions. In August 2020 the Forest Service published in the Federal Register a Notice of Intent to prepare a Supplemental Environmental Impact Statement (USDA Forest Service 2020c), and subsequently prepared a draft SEIS that updated information identified in the Supplemental Information Report and included updated findings from research and other sources.

The Forest Service opened a 45-day public comment period on the draft SEIS in early 2022 by sending notification of its availability to everyone on the mailing list from the 2011 FEIS and to

others added since that time. The public comment period allowed for public review of the draft SEIS and supporting information. Fourteen letters were received during the comment period and one was received after it had closed, compared to the 58 letters received in response to the 2011 draft EIS. As described at the beginning of this appendix, comments were sorted according to major subject categories (Alternatives, Analysis, Compliance, Editorial, and New Retardants). Each of the 138 unique comments identified from the letters received was analyzed to determine the appropriate response, which could include modification of alternatives, creating and analyzing new alternatives, supplementing or modifying analysis, making factual corrections, or explaining why a particular comment may not warrant further response. The responses in this appendix indicate the category of each comment and how it has been addressed.

The SEIS is intended to supplement the 2011 FEIS, and therefore reference to the 2011 FEIS is necessary for complete information and analysis. To help with comprehension, a brief summary of the purpose and need has been added to section 1.4 of the final SEIS.

**CS 26 – Tribal Consultation**

Commenters encourage the Forest Service to consult with Tribes who may be impacted by the project and incorporate feedback from the Tribes when making decisions regarding the project. Commenters note that previous consultations were disclosed in the 2011 FEIS and recommends the final SEIS describe the issues raised during the current consultations and how those issues were addressed. Commenters also support inclusion of culturally sensitive locations in avoidance area maps.

**Response:**

During the process of preparing the 2011 FEIS and 2011 Record of Decision, the Forest Service carried out consultations with Tribal governments as detailed in the 2011 FEIS (section 1.8, page 25) and in the 2011 Record of Decision. Through that process the Forest Service and Tribal governments had the opportunity to discuss the use of and concerns regarding aerially delivered fire retardants. Information from this process was used to refine aspects of the preferred alternative that related to cultural issues, and to improve the analysis of potential impacts to cultural resources (2011 Record of Decision page 19).

The final SEIS is a supplement to the 2011 FEIS that adds and updates information rather than replacing it, unless explicitly stated. Modified Alternative 3, as described in the final SEIS, differs very little from the selected alternative described in the 2011 Record of Decision (refer to SEIS section 2.2, Table 1). As in the 2011 selected alternative, Modified Alternative 3 allows avoidance areas to be adjusted or established based on local conditions, and requires consultation with local Tribes to identify any avoidance areas needed to protect cultural areas or sacred sites. Modified Alternative 3 clarifies that cultural resources cannot be mapped or addressed based on a nationwide protocol or prescription, and stresses interaction at the local level. Tribal governments that were involved in the 2011 process were notified of the availability of the 2022 draft SEIS and were provided an opportunity to have input into the updates.

**CS 31 – Adequacy of Information to Inform Decision-Making**

Commenters suggest that the 2011 FEIS and draft SEIS analyses do not provide enough information, including information about effectiveness of aerial retardants, to distinguish between the No Action and the Action alternatives.

**Response:**

As described throughout this appendix, information in the final SEIS has been added or updated in response to comments received on the draft SEIS. Information about effectiveness of aerially

delivered fire retardants has been expanded and updated in section 3.1 of the final SEIS. Table 2 in final SEIS section 2.2 provides a detailed comparison of components of alternatives considered in the 2011 FEIS and final SEIS.

## Editorial

**CS 27 – Corrections**

Section 3.6.2.2 on page 41 of the draft SEIS incorrectly references the Labat Environmental (2017) and Auxilio Management Services (2020) reports as having addressed magnesium chloride; those only addressed phosphate-based products. Only the Auxilio Management Services 2021 risk assessments addressed magnesium chloride. The text and references need to be corrected, along with analysis if it relied on the idea that the 2017 or 2020 risk assessments addressed magnesium chloride.

**Response:**

The text in the final SEIS has been corrected and updated. Analyses in the final SEIS of the potential effects of retardants, including magnesium chloride-based retardants, on various resources relied on information that included the 2021 risk assessment.

**CS 28 – Suggested Edits**

Commenters recommend the following edits to the SEIS:

1. (reference draft SEIS section 2.1.4, page 8) Recommend this statement be replaced with the following sentence: “Whenever practical, agency administrators and incident commanders may use water in habitats of species listed under the Endangered Species Act or certain Regional Forester sensitive species, whether those habitats are mapped or are not mapped.

   **Response:**

   The wording in the final SEIS has been updated to say “… agency administrators and incident commanders should use water…”. This wording reflects the intent of the direction as well as the needed discretion allowed to fire managers.

2. (reference draft SEIS section 2.1.4, page 9) Add Local Services Offices definition in the glossary

   **Response:**

   The text in the final SEIS has been updated to specify that ‘Services’ means the USDI Fish and Wildlife Service and NOAA Fisheries Service

3. (reference draft SEIS section 3.2.2, page 28, paragraph 3) There is a reference to Table 2 and it should be Table 4.

   **Response:**

   The text in the final SEIS has been corrected.

4. (reference draft SEIS section 3.5.2.1 page 35) Change 2029 to 2019

   **Response:**

   The text in the final SEIS has been corrected.

5. Include Fortress FR-200 in Table 3 of the draft SEIS (page 32) as Table 3 only lists Fortress FR-100 as a conditionally qualified product when the draft SEIS mentions there are two conditionally qualified magnesium chloride products.

   **Response:**

   The text in the final SEIS has been corrected.

**CS 29 – Update Data**

Commenters request that the SEIS include data through at least 2020, to ensure the most recent information is used.

**Response:**

Information in the final SEIS has been updated to include data through 2021. Some analyses continue to rely on data through 2019 based on what was available when they were carried out. The 2012 through 2019 information is a robust, multi-year dataset, and trends in retardant use and rates of intrusions are expected to continue.

## New Retardants

**CS 30 –Approval Process**

Commenters state that the procedures for addition of retardant to the Qualified Products List are not identified as stated in the draft SEIS, and use of new retardants appears to be based on the premise that if products are similar or have a lesser environmental effect they are included on the Qualified Products List. Specific concerns include topics identified in numbers 1 and 2 below. A response is provided below regarding the overall concern, and individual responses are then provided after each numbered item.

**Response:**

The Forest Service evaluates wildland fire chemicals through a process that is independent of the decision regarding the programmatic use of aerial fire retardants on National Forest System lands. The 2011 FEIS Appendix L and final SEIS Appendix L describe the Forest Service fire chemical program and the process by which all long-term retardants are evaluated for potential addition to the Qualified Products List. Only those aerial fire retardants that have been through the evaluation process and included on the Forest Service Qualified Products List may be used on National Forest System lands.

1. Approval and use of new products should be based on studies and data analysis specific to the new chemicals, and should include studies on phytotoxicity, effects on hydrology, soils, and vegetation including when applied in non-avoidance areas; and synergistic effects of retardant formulations as a whole.

   **Response:**

   New retardant formulations proposed for use by the Forest Service must meet all requirements of the specification (Specification 5100-304) in order to be included on the Qualified Products List and approved for use on National Forest System lands. The specification requires extensive testing of concentrate and mixed product, as well as submission of a risk assessments that include information on phytotoxicity and mammalian and aquatic toxicity tests of both concentrate and mixed product. The requirements ensure that products have been evaluated for effects of individual products as a whole, and include potential synergistic or additive effects among ingredients. Risk assessments determine additive risks of individual ingredients in products where there were no data indicating

synergistic effects (Auxilio Management Services 2021c). Analyses of retardants as required in the specification and as described in the 2011 FEIS, the final SEIS, and in the biological assessments (USDA Forest Service 2021a, 2021b, 2021c, 2021d, 2021e, 2022a, 2022b, and 2022c) and Biological Opinions (USDC NOAA Fisheries 2022 and USDI Fish and Wildlife Service 2023) discuss potential impacts to resources in general and are not limited to impacts of application in avoidance areas only. Refer also to responses to CS 11, CS 13, and CS 21.

2. The SEIS should also clarify the meaning of "no new identified risk factors" and "are similar" and explain how these are determined.

   **Response:**

   Section 3.4.3.3 of the current specification (Specification 5100-304d) states “A new product may be included in an environmental consultation with the Federal regulatory agencies … The extent of the consultation will be based on the similarities and differences to other products from the same submitter.” As described in the 2020 Supplemental Information Report, most products recently added to the Qualified Products List “have the same general toxicity mechanism and effects as those considered in 2011”. In the biological assessments for Nationwide Aerial Application of Fire Retardant on National Forest System Land (USDA Forest Service 2021a, 2021b, 2021c, 2021d, 2021e, 2022a, 2022b, 2022c) the Forest Service provided information to the Services about composition of currently approved retardant formulations. The biological assessments establish “the upper limit of retardant salts that can be used in newly developed retardants without the need for re-initiation of consultation” (USDA Forest Service 2021c, Table 2) as well as the upper limit for percentages of thickeners, colorants, and performance ingredients in new products without the need for re-initiation (USDA Forest Service 2021c page 13). Furthermore, the biological assessments state that for any new formulations, “the toxicity levels must not exceed those of currently approved products”, and the “maximum extent and duration of effects from new products cannot exceed effects of products” already approved, in order to be approved without re-initiation. The text of Modified Alternative 3 (Proposed Action) has been updated to clarify the requirement that new products must meet specified criteria for type, concentration, and percentage of components to be considered for approval without re-initiation of consultation. Refer also to the response to CS 21.

## Additional Literature Cited in Responses

Literature cited in this appendix that was not also cited in the draft SEIS is listed in the Literature Cited section of the final SEIS.