United States Department of Agriculture Forest Service

Alaska Region

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Biological Evaluation and Wildlife Resource Report

Northern Tongass Integrated Weed Management Plan

Tongass National Forest

Hoonah, Juneau, Sitka and Yakutat, Alaska

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EXECUTIVE SUMMARY

The Tongass National Forest proposes to eradicate, control, or contain invasive and other non-native plants ("weeds"). The project area encompasses the Hoonah, Juneau, Sitka and Yakutat Ranger Districts and Admiralty National Monument, Tongass National Forest, Alaska, including adjacent non-Forest Service lands. The action is needed because invasive plants displace native plant communities and cause long-lasting economic and ecological problems within and outside the National Forest.

Based on the effects of the proposed action and alternatives, we have made the following determinations for the following federally-listed species, designated critical habitats, forest sensitive species, migratory birds, and subsistence resources:

Species/Issue	Presence	Direct, indirect and Cumulative Effects[2]		
	Species and/or Habitat Present in Analysis Area[1]	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3
Threatened and Endangered[3]				
Humpback Whale (Mexico DPS)	No	No Effect	No Effect	No Effect
Steller Sea Lion (western SPS)	No	No Effect	No Effect	No Effect
Steller Sea Lion critical habitat	Yes	No Effect	No Effect	No Effect
Gray whale (Western North Pacific DPS)	No	No Effect	No Effect	No Effect
Short-tailed albatross	No	No Effect	No Effect	No Effect
Fin whale	No	No Effect	No Effect	No Effect
Sperm whale	No	No Effect	No Effect	No Effect
Sensitive				
Aleutian Tern	Yes	No Impact	No Impact	No Impact
Black Oystercatcher	Yes	No Impact	No Impact	No Impact
Dusky Canada Goose	Yes	No Impact	No Impact	No Impact
Kittlitz's Murrelet	No	No Impact	No Impact	No Impact
Queen Charlotte Goshawk	Yes	No Impact	No Impact	No Impact
Management Indicator				
Alexander Archipelago Wolf	Yes	Negligible	Negligible	Negligible

American Marten	Yes	Negligible	Negligible	Negligible
Bald Eagle	Yes	Negligible	Negligible	Negligible
Black Bear	Yes	Negligible	Negligible	Negligible
Brown Bear	Yes	Negligible	Negligible	Negligible
Brown Creeper	Yes	Negligible	Negligible	Negligible
Hairy Woodpecker	Yes	Negligible	Negligible	Negligible
Mountain Goat	No	Negligible	Negligible	Negligible
Red-breasted Sapsucker	Yes	Negligible	Negligible	Negligible
Red Squirrel	Yes	Negligible	Negligible	Negligible
River Otter	Yes	Negligible	Negligible	Negligible
Sitka Black-tailed Deer	Yes	Negligible	Negligible	Negligible
Vancouver Canada Goose	Yes	Negligible	Negligible	Negligible
Other				
Migratory Birds	Yes	Negligible	Negligible	Negligible
Subsistence	Yes	Negligible[3]	Negligible[3]	Negligible[3]

[1] "Yes" if the species is known or is likely to occur in the analysis area or in marine waters adjacent to the analysis area. "No" if the species has not been documented or is not likely to occur in the analysis area.

[2] Level of influence of the effects for management indicator species includes "negligible", "minor", "moderate", or "major". Levels of influence are defined in the "Wildlife Resource Report". Determinations are only required for listed and sensitive species. Determinations for threatened and endangered species include "no effect", "not likely to adversely affect", or "likely to adversely affect" (Bosch 2004). Determinations for candidate species include "no effects", "not likely to jeopardize proposed species, or adversely modify proposed critical habitat", or "likely to jeopardize proposed species, or adversely modify proposed critical habitat". Determinations for sensitive species include "no impacts", "beneficial impacts", "may impact individuals but not likely to cause a trend to federal listing or a loss of viability", or "likely to result in a trend to federal listing or a loss of viability" (Bosch 2004).

[3] there is not a significant possibility of a significant restriction on subsistence resources or uses under any alternative

INTRODUCTION

This document meets the Forest Service Manual (FSM) direction that requires the effects of a proposed action to management indicator species (MIS) and threatened, endangered, or sensitive (TES) species are assessed and that the Forest Plan requirements, goals and objectives for these species are met at the project level (FSM 2621.3, 2621.4 and 2672.4). It also meets the requirements for a Biological Evaluation and complies with Section 7 of the Endangered Species Act.

This document addresses current management direction, desired conditions, the affected environment, and effects analysis and determinations for old-growth reserves and MIS, TES and other species considered during project level analysis.

MANAGEMENT DIRECTION

Current management direction on desired conditions for MIS, TES and other wildlife and fish species on the Tongass National Forest (NF) can be found in the following documents:

Bald and Golden Eagle Protection Act of 1940 amended 1978

Endangered Species Act of 1973 (ESA)

Executive Order 13186 - Responsibilities of Federal Agencies to Protect Migratory Birds

Forest Service Handbooks 2609 and 2690

Forest Service Manual 2620 and 2670

Magnuson-Stevens Fishery Conservation and Management Act

Migratory Bird Treaty Act

National Forest Management Act (NFMA)

National Environmental Policy Act (NEPA)

Regional Forester policy and management direction

Species specific recovery plans

Tongass National Forest Land and Resource Management Plan (referred to as the Forest Plan) (USDA Forest Service (FS) 2016)

The Forest Plan provides specific information on how MIS, TES and other wildlife and fish species will be managed. Forest-wide desired conditions and goals are included in Chapter 2 of the Forest Plan. The Forest is organized into Land Use Designations (LUD) for management purposes. Each LUD has specific goals, objectives, desired conditions and management prescriptions that are discussed in Chapter 3 of the Forest Plan. Forest Plan standards and guidelines in Chapter 4 (USDA FS 2016) provide direction for species management. The Forest Plan Final Environmental Impact Statement (FEIS) also addresses MIS and TES species (USDA FS 2016b), migratory birds and other species of concern (USDA FS 2016b).

Project Description

Action Area

The action area includes the Admiralty National Monument, and the Juneau, Hoonah, Sitka and Yakutat Ranger Districts of the Tongass National Forest (Figure 1), and includes adjacent non-Forest Service lands. The entire project area encompasses 8.3 million acres.

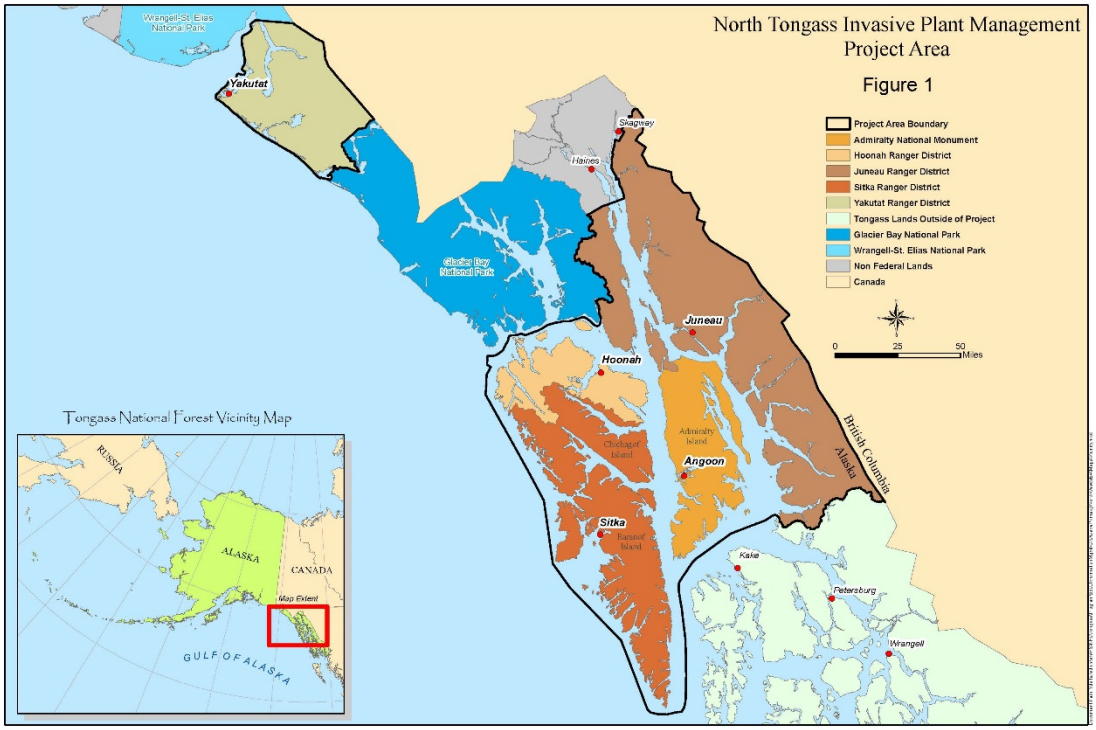

Figure 1. Project Area

Wildlife species habitat can be assessed at different geographic scales. The subunits used for large scale analyses include Biogeographic Provinces (BPs) and Game Management Units (GMUs). BPs are large-scale landscape delineations characterized by similar climatic, geological, and ecological characteristics. GMUs are geographical areas defined by the Alaska Department of Fish and Game (ADFG) to manage wildlife populations. Wildlife Management Areas (WAAs) are subdivisions of GMUs that are used by ADFG for data collection purposes. Value comparison units (VCU) are Forest Service land divisions that usually approximate watersheds. VCUs are the smallest geographic area typically used for analysis therefore a WAA usually encompasses multiple VCUs. WAA, VCU or watershed are the divisions used most often by the Forest Service for project level habitat analyses. For this analysis, the analysis area is the action area as detailed in Figure 1.

Proposed Action

The Forest Service proposes to eradicate, control or contain invasive and other non-native plants (collectively referenced as "weeds" in this document) within the Admiralty National Monument, and the Juneau, Hoonah, Sitka and Yakutat Ranger Districts of the Tongass National Forest (Figure 1). Weeds can displace native plant communities and cause long-lasting economic and ecological problems within and outside the National Forest. They can degrade fish and wildlife habitat, out-compete native plants, impair water quality and watershed health, and adversely affect a wide variety of other resource values such as scenic beauty and recreational opportunities. Weeds can spread rapidly across the landscape to all land ownerships. Field inventories have identified 144 non-native plant species, both invasive and other non-invasive (approximately 1,412 acres of infestation including non-Forest Service lands), within the boundaries of the 8.3 million-acre project area (Figure 2).

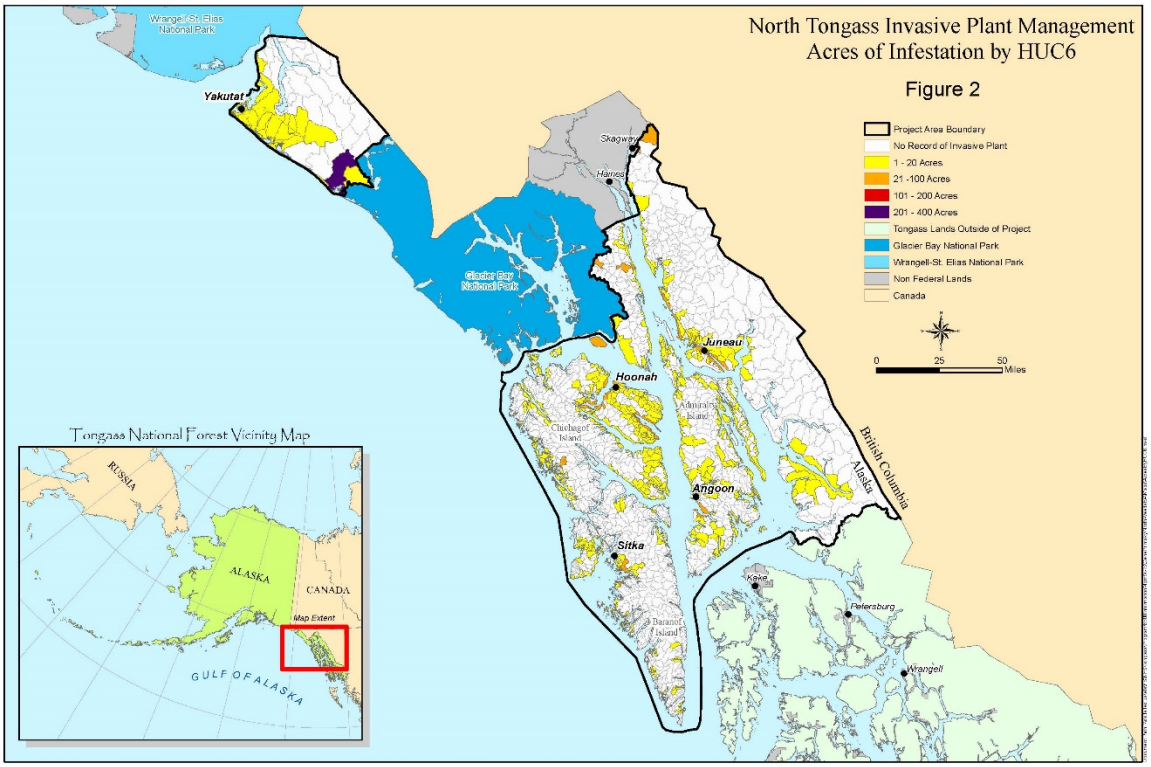

Figure 2. Acres of infestation within the project area

The proposed action would use integrated pest management including manual treatments (e.g., hand pulling and tarping), mechanical treatments (torching, and mowing), and herbicides (spot and broadcast spraying) to eradicate, control, or contain populations of weeds on the Hoonah, Juneau, Sitka and Yakutat Districts and Admiralty National Monument of the Tongass National Forest. The Forest Service is including non-National Forest System Lands in the analysis area to allow for

a comprehensive approach to weed management, and enable future partnerships with other landowners if funding becomes available to local communities through federal grants or other initiatives.

The number of acres proposed for treatment within the project area is based on the current inventory of invasive plants on all five Ranger Districts, the National Monument, and all non-federal lands within this project area; a total of about 1,412 acres of known infestations including 144 non-native plant species, both invasive and other non-invasives, within the boundaries of the 8.3 million-acre project area. Prioritization of treatment is proposed to occur annually using a decision framework that provides a consistent process to determine priorities for treatment of target weeds and the selection of treatment methods, including the use of Early Response Rapid Detection (EDRR). For example, some weeds are not considered "highly invasive" (e.g., black bindweed or field mustard) and may only be treated in sensitive areas such as Wilderness; however, when located along a roadside they may be tolerated and not treated at all. Alternatively, other weed species considered "invasive" (e.g., reed canarygrass or orange hawkweed) may be treated while its population is small and manageable in a riparian area, but may be tolerated as a large infestation along a roadside and not treated at all. This flexibility is needed to effectively evaluate the priorities of managing any weed plant population within the project area.

The project alternatives do not specify an annual acreage cap for treatment of infestations, nor is a maximum treatment acreage provided over the life of the project. Based on the currently known invasive plant infestations in the project area, the current maximum acreage of treatments in the project area would be 1,412 acres. This total acreage could increase or decrease over time as new infestations are found and treated infestations are reduced in area or eradicated. In reality, the total acreage that will actually be treated is likely to be far less than the maximum, due to the fact that not all infestations in all locations are priorities for management, many infestations are in remote areas with difficult access, and the limitations of funding and personnel are likely to constrain treatment activities. The average annual infestation acreage treated across the project area over last five years (2012-2016) is 14.7 acres, or one percent of the total acreage of currently known infestations. It is expected that annual treatment acreages will remain a substantially small proportion of the total infestation acreage under all project alternatives. For example, the annual treatment estimates used for economic analysis for this project are 13 acres for Alternative 1 and 88 Alternatives 2 and 3 (Krosse 2019a.).

Glyphosate, aminopyralid, imazapyr and metsulfuron methyl, four herbicides with different chemical properties and modes of action (how the herbicide kills the plant), were selected for this project and are included in the suite of control methods analyzed for this project. Herbicide use is proposed using ground-based methods, such as spot and selective hand spraying that targets individuals and groups of plants, and broadcast spray (targeting groups of plants) No aerial applications are proposed for this project. Broadcast application would be utilized to treat an entire

area where infestations are over 1 acre in size. These treatment methods and the ultimate selection of them will be based on accessibility, topography, and size of infestation.

Mulching, seeding and planting of desirable vegetation may occur to restore treated sites. In addition, preventative measures detailed in the Tongass National Forest Guidance for Invasive Plant Management Program (Krosse 2017a) would be ongoing and a part of the weed management strategy. Annual monitoring of selected treatment areas would evaluate the effectiveness of the treatment method and possibly modify the management strategy, including the method and type of continued or follow-up treatments needed.

Project design features will be applied during implementation to minimize or eliminate the potential for weed treatments to adversely affect non-target plants, animals, human health, water quality, and aquatic organisms.

Identified Issues (wildlife)

The following issue(s) specific to wildlife were identified during internal and external (i.e. public) scoping (refer to EA for other issues identified):

Herbicide Impacts on Wildlife

Issue Statement: Proposed herbicide use may result in harmful exposure to wildlife.

Background: As stated above, the Proposed Action will minimize potential for herbicide delivery to surface waters and wetlands. However, the risk that some chemicals may reach surface waters cannot be eliminated. Wildlife consuming non-target vegetation, direct contact with herbicides rubbing off on an animals skin/fur, or drinking water that has inadvertently been treated with herbicides is unlikely; however, to mitigate concerns of reaching acute toxicity levels, additional design features will be applied to ensure conservative approaches to exposure are implemented. Treatment extent, rate and method of application, and the properties of the chemicals proposed influence the degree of risk.

Issue Measures:

- Type and extent of herbicide use within specific wildlife habitats.
- Risk of herbicide contamination and effects on eggs.
- Qualitative analysis of the potential for harm to sensitive status wildlife species.

Project Alternatives

Alternative 1 is the No Action; Alternatives 2 and 3 represent the proposed action. The only difference between these two alternatives is that Alternative 2 proposed to use only low to typical application rates for all herbicides (according to label instruction) and also proposes to implement a 100-foot buffer along stream corridors and other waterbodies when broadcast spray methods are to be used. Alternative 3 uses the full range of legal application rates for all chemicals and does

not include the 100-foot buffer along stream corridors and other water bodies when broadcast spray is used.

The no action alternative represents the existing condition and considers the environmental effects if no, or limited invasive plant treatments were to occur in the project area.

Alternatives 2 and 3 address issues raised related to cost and effectiveness of treatments and the ability to eradicate or contain certain populations of invasives with the use of herbicides. All herbicide treatments will be in accordance with State of Alaska and Clean Water Act standards.

Alternative 1 (No Action):

Under the No Action Alternative, the activities proposed in the action alternatives would not be implemented. The No Action Alternative, however, would not preclude future weed management in the project area. This alternative represents the existing condition and the anticipated future conditions and serves as a baseline to compare the effects between alternatives.

If an action alternative is not selected, the continued use of district-level categorical exclusions (CEs) is anticipated to continue to allow limited treatment of invasive plants using herbicides at designated administrative and recreation sites, and Forest Service facilities. There also is potential for limited mechanical treatments near administrative sites, roads or along trails.

Without herbicide as a treatment option, more emphasis would be placed on using hand pulling and mechanical treatments. Infestations of some weed species (e.g. Japanese Knotweed, Reed Canary Grass and Orange Hawkweed) would be more difficult to eradicate without the use of herbicides. This alternative would likely result in the control rather than eradication of weed species in the project area.

Conservation Measures and Project Design Features

This project will adhere to weed best management practices (WBMP) as described in the Tongass National Forest Guidance for Invasive Plant Management Program (Krosse, 2017a). The objective of the Tongass National Forest's Weed Best Management Practices is to prevent the spread of existing weeds (with an emphasis on invasive plants) and prevent new infestations. The basis for these Prevention and Control Measures are National Policy: FSM 2900 (specifically FSM 2903(5)), which directs all National Forest and Grasslands to *ensure that all Forest Service management activities are designed to minimize or eliminate the possibility of establishment or spread of invasive species on the National Forest Systems, or to adjacent areas*.

Project design features will be applied during implementation to minimize or eliminate the potential for weed treatments to adversely affect wildlife. These criteria will be implemented as necessary according to the invasive treatment plan updated annually. In addition to project specific project design features, appropriate Forest-wide Standard and Guidelines (S&G) will be followed

throughout the project to reduce or prevent negative impacts to non-target resource which includes the following:

- Bald Eagles
    - The Bald Eagle Protection Act provides for special management for the bald eagle. Manage bald eagle habitat in accordance with the Interagency Agreement established with USFWS to maintain habitat to support the long-term nesting, perching, and winter roosting habitat capability for bald eagles.
    - If project activities are visible or can be heard from a nest, stay at least 330 feet (100 meters) from the nest, unless the eagles have demonstrated tolerance for similar activities (USFWS Guidelines).
- Brown and Black Bears
    - Minimize adverse impacts to habitat and seek to reduce human/bear conflicts. Avoid area of concentrated bear activity, especially during the fall
    - During annual project planning, evaluate the need for protection of important bear foraging sites (e.g., fishing sites)

Wildlife-Specific Project Design Features:

- If any Threatened, Endangered, Candidate or Forest Service Sensitive wildlife species are present, protective measures my include, but are not limited to, the following; 1) avoid sensitive areas, 2) seasonal restrictions, or 3) treatment methods will be designed to avoid negative impacts.
- Protect active rookeries and raptor nesting habitat. Prevent disturbance during the active nesting season (generally March 1-July 31). Local biologist will be consulted to determine appropriate distances and timing prior to implementation.
- Ground nesting birds shall be considered when planning for all treatment types. If ground nests are discovered, a wildlife biologist will be consulted to determine any mitigation measures. Generally, treatment should be postponed until after the nesting and fledgling season (approximately mid-July).
- Treatments will follow all manufacturer's instructions and safety measures.
- The public will be notified in advance of areas scheduled for herbicide treatments.
- In the event of a wildlife species status changing to TES, additional analysis will be completed to determine potential impacts.

Level of Influence and Determination of Effects

The effects analysis within this document reports the level of influence to describe the intensity of the direct, indirect and cumulative effects of the proposed action on MIS, TES and other species and resources in the analysis area. In compliance with the ESA regulations and FSM 2670 direction, a determination of effect will be completed to assess the impacts of a proposed action to TES species or their habitat. A letter of direction from Bosch (2004) describes the three types of effects for TES species.

Direct and indirect effects can occur as a result of project activities and their connected actions. A direct effect is an effect caused by an action that occurs in the same time and place as the action. An indirect effect is caused by an action but is later in time or farther removed in distance, but is still reasonably foreseeable. Under NEPA, cumulative effects represent the impact on the environment, which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative effects for ESA compliance include the effects of future State or Private activities but not other Federal activities because those actions are subject to future consultation (50 CFR 402.02). Mitigation measures may also be employed where applicable to offset or minimize potential adverse impacts.

The analyses of effects were based on professional judgment using information provided by forest staff, relevant references and technical literature citations, and subject matter experts. Using technical reports from the published literature that described the most susceptible aspects of species life cycle and/or habitat needs as a guide, quantitative and qualitative information was gathered regarding the presence and status of these species within the analysis area. General criteria were developed to assess the intensity or level of influence of the effects. The levels of influence are defined below.

Levels of influence/Determination of Effects for MIS Species:

Negligible: Individuals would not be affected, or the action would affect an individual but the change would be so small that it would not be of any measurable or perceptible consequence to the individuals or populations. Negligible effect would equate with a "no effect" determination for threatened and endangered species and the “no impact” determination for sensitive species.

Minor: Individuals would be affected but the change would be small. Impacts would not be expected to have any long-term effects on species or their habitats, or the natural processes sustaining them. Occasional responses to disturbance by some individuals could be expected, but without interference to reproduction, or other factors affecting population levels. Minor effect would equate with a “not likely to adversely affect" determination for threatened and endangered species and the "may impact individuals but not likely to cause a trend to federal listing or a loss of viability" determination for sensitive species.

Moderate: Individuals would be noticeably affected. The effect could have some long-term consequence to individuals or habitat. Breeding animals of concern are present; animals are present during particularly vulnerable life-stages, such as migration or juvenile states; or interference with activities necessary for survival can be expected on an occasional basis. Frequent response to disturbance by some individuals could be expected, with some negative impacts to feeding, reproduction, or other factors affecting short-term population levels. Moderate effect can equate with a "likely to adversely affect" determination for threatened and endangered species and the "may impact individuals but not likely to cause a trend to federal listing or a loss of viability" determination for sensitive species.

Major: Populations would be affected with a long-term, vital consequence to the individuals, populations, or habitat. Impacts on species, their habitats, or the natural processes sustaining them would be detectable. Population numbers, population structure, genetic variability, and other demographic factors for species might have large, short-term declines with long-term population numbers significantly depressed. Frequent responses to disturbance by some individuals would be expected, with negative impacts to feeding, reproduction, or other factors resulting in a long-term decrease in population levels. Major effect would equate with a "likely to adversely affect" determination for threatened and endangered species and the "likely to result in a trend to federal listing or a loss of viability" determination for sensitive species.

Levels of influence/Determination of Effects for TES Species:

No effect (T&E)/No Impact (Sensitive): the proposed action will not affect listed species or critical habitat.

Not likely to adversely affect (T&E)/May impact individuals but not likely to cause a trend to federal listing or a loss of viability or Beneficial impacts (Sensitive): the effects on listed species are expected to be discountable, or insignificant, or completely beneficial. Beneficial effects are contemporaneous positive effects without any adverse effects to the species. Insignificant effects relate to the size of the impact and should never reach the scale where take occurs. Discountable effects are those extremely unlikely to occur. Based on best judgment, a person would not: (1) be able to meaningfully measure, detect, or evaluate insignificant effects; or (2) expect discountable effects to occur.

Likely to adversely affect (T&E)/Likely to result in a trend to federal listing or a loss of viability (Sensitive) - if any adverse effect to listed species may occur as a direct or indirect result of the proposed action or its interrelated or interdependent actions, and the effect is not: discountable, insignificant, or beneficial (see definition of "is not likely to adversely affect"). In the event the overall effect of the proposed action is beneficial to the listed species, but is also likely to cause some adverse effects, then the proposed action "is likely to adversely affect" the listed species. If incidental take is anticipated to occur as a result of the proposed action, an "is

likely to adversely affect" determination should be made. An "is likely to adversely affect" determination requires the initiation of formal section 7 consultation.

Assumptions

Implementation of this project will adhere to weed best management practices (WBMP) as described in the Tongass National Forest Guidance for Invasive Plant Management Program (Krosse, 2017a). Application rates of herbicides will not exceed what was analyzed and recommended in this report (e.g. low, typical and highest application rates) and approved under the final EA and Decision Notice.

Herbicides

In order to register herbicides for outdoor use, the EPA requires the manufacturers to conduct a safety evaluation on wildlife including toxicity testing on representative species of birds, mammals, freshwater fish, aquatic invertebrates, and terrestrial and aquatic plants. The toxicity data collected can be used in an ecological risk assessment to evaluate the likelihood that adverse ecological effects may occur as a result of herbicide use.

The Forest Service contracts with Syracuse Environmental Research Associates, Inc. (SERA) to conduct the ecological risk assessments for herbicides that may be proposed for use on National Forest System lands. The determination of effects in this report relies on these risk assessments. All toxicity data, exposure scenarios, and assessments of risk are based upon information in the FS/SERA risk assessments and supporting documents unless otherwise noted. Forest Service/SERA risk assessments use peer-reviewed articles from the open scientific literature, current Environmental Protection Agency (EPA) documents available to the public, and Confidential Business Information to evaluate toxicity and risk from the herbicides analyzed. For a background discussion of all toxicological tests and endpoints considered in the risk assessments, refer to SERA 2007a. Definitions of terminology used in the risk assessments are included in Appendix A.

To discern potential effects from the proposed action, we used representative species groups of wildlife, and data from existing laboratory and field studies, to discover which groups of species might be at the greatest risk from herbicide use.

When enough data were available, an exposure scenario was developed, and a quantitative estimate of dose received by the animal type in the scenario was calculated (SERA 2007a). The scenarios used to calculate doses include direct spray of small mammals, birds and mammals eating vegetation or insects sprayed with herbicide, predatory mammals and birds eating small mammals or fish, and small mammals drinking contaminated water. The risk assessments prepared by SERA (2004, 2007b, 2011a,b) contain the detailed analysis of the potential effects of each herbicide.

The quantitative estimates of dose were compared to available toxicity data to determine potential adverse impacts. We used the most sensitive response (i.e. a sub-lethal effect that occurred at the lowest dose) from the most sensitive species to determine the “toxicity indices” for each herbicide.

When a calculated dose was greater than the toxicity index, we stated that there was a potential for adverse effects. This very protective approach constitutes a "worst-case" analysis for potential effects of herbicides.

Whenever sufficient data were available to determine the dose that resulted in no observable adverse effects (NOAEL), the NOAEL was used as the toxicity index. If data were not sufficient to determine a NOAEL, other endpoints of toxicity were used, such as the lowest-adverse-effect level (LOAEL), or the dose that was lethal to 50 percent of the test population (LD50). When a LOAEL or LD50 was used as the toxicity index, standard EPA methods for applying a safety factor to the toxicity index to determine a level of concern were used. For this analysis, the potential for adverse effect was based on the estimated dose exceeding a small fraction of the LOAEL or LD50. Appendices B and C list the toxicity values for mammals and birds used in the risk assessments.

The most recent risk assessments for the proposed herbicides, representing the best available science, were used in this analysis. For herbicides, active ingredients have been tested on only a limited number of species and mostly under laboratory conditions. While laboratory experiments can be used to determine acute toxicity and effects to reproduction, cancer rates, birth defect rates, and other effects that must be considered, laboratory experiments do not account for wildlife in their natural environments. This leads to uncertainty in the risk assessment analysis. Environmental stressors can increase the adverse effects of contaminants, but the degree to which these effects may occur for various herbicides is largely unknown. Various wildlife species may also be more or less sensitive to a particular herbicide than laboratory animals. This leads to uncertainty in the risk assessment analysis.

Most toxicity testing utilizes surrogate species. Surrogate species serve as a substitute for the species of interest, because all species of interest could not be tested. Surrogate species are typically organisms that are easily tested using standardized methods, are readily available, and inexpensive. The physiological requirements for some organisms prohibit their use in toxicity testing because these requirements cannot be met within the test system. Rare or federally listed species are not used for a variety of reasons, including legal restrictions and having only a limited number of individuals available.

Caution should be taken when addressing ecological risk and the use of surrogates when analyzing ecological risks. Some herbicides demonstrate more variation than others in effects among different species, and very limited numbers of species have been tested. Because of the variation of response among species, and the uncertainly with regard to how accurately a surrogate species may represent other wildlife, the SERA risk assessments (2004, 2007b, 2011a,b) use the most sensitive endpoint from the most sensitive species tested as the toxicity index for all wildlife. This does not alleviate concerns over interspecies variations in response.

Additives (adjuvants, surfactants and inert ingredients) and Impurities

Herbicides generally need to be applied with an adjuvant, compounds added to the herbicide formulation to improve its performance. There are several types of adjuvants including surfactants, non-foaming agents and colorants.

Adjuvants are not under the same registration guidelines as herbicides, and the EPA does not register or approve the labeling of adjuvants. The State of Alaska DEC also does not have an approved adjuvant list. This project references the adjuvants approved for aquatic use in the State of Washington (http://www.ecy.wa.gov/programs/wq/pesticides/regpesticides.html).

This project will use only low-risk aquatically approved surfactants (e.g., Agri-Dex®, Class Act® NG®, Competitor®). This feature would eliminate potential impacts from surfactants that have high levels of POEA, which at high levels can have adverse effects to aquatic wildlife species.

Many of the inert ingredients in adjuvants are proprietary in nature and have not been tested on laboratory species. However, confidential business information (i.e., the identity of proprietary ingredients) was used in the preparation of the herbicide risk assessments and adjuvants are considered in the overall effects reported for this project.

Impurities are inadvertent contaminants in the herbicide, usually present as a result of the manufacturing process. The risk assessments describe the impurities and their risks.

General Effects to Wildlife

The following discussions on general effects to wildlife and specific effects from manual/mechanical treatments and herbicides apply to TES, MIS, and migratory birds, and will be referenced in those sections.

All treatment methods have the potential to disturb, temporarily displace, or directly harm various wildlife species. However, impacts from treatments tend to be short term, whereas successful control of invasive plant infestations provides long-term benefits to wildlife, by restoring native habitats. The effects of invasive plant treatments on wildlife are relative to the size and locations of existing and future invasive plant infestations, the type of treatment used, and the timing and duration of the treatments. Treatments of infestations along disturbed roadsides, which are common, are not likely to substantially affect terrestrial wildlife populations, since this vegetation type does not generally provide essential habitat for native wildlife species, and it consists of long, narrow areas spread over large distances. Treatment of large infested areas may create more disturbances for longer periods than treatments of small infestations. Adherence to project design features will minimize disturbance to wildlife.

Invasive plant treatments are not expected to alter native habitat structure or composition for terrestrial wildlife species or birds. Incidental damage or removal of native vegetation immediately adjacent to invasive plants or within the infested weed site may occur during treatments, but would be very limited in distribution and magnitude. In some cases, removal of invasive plants could cause a localized and temporary decrease in the amount of vegetative cover provided. However,

due to the patchy nature of invasive plant infestations, the amount of cover lost would be very small compared to the amount of habitat available, and natural or introduced revegetation would facilitate recovery and eventual improved value of the habitat.

In general, there is low risk from this project to wildlife, because; 1) infestations are currently small and scattered across a large area, 2) invasive plants are concentrated on roads and other disturbed areas that do not provide optimum wildlife habitat, and 3) the expected level of change to high value wildlife habitat is very low. The herbicides proposed for use are not likely to adversely affect any wildlife species.

Effects of EDRR (Alt. 2 and 3)

Treatments under EDRR would be completed in a manner that follows BMPs and, for the action alternatives, Project Design Features developed for this project. This analysis assumes that new infestations will be similar to current infestations, and would continue to grow and spread at similar rates. For instance, the majority of weed sites occur in highly disturbed habitats, such as along roads, and it is expected that that will be the case in the future. It is also assumed that undocumented infestations will show similar results to known, treated infestations within the same site type. The precise location or timing of the treatment may be unpredictable; however, project design features (PDFs), intended to minimize or eliminate adverse effects that could occur, keep effects within those disclosed for the current inventory. Consequently, the effects of adopting EDRR are expected to be the same or within the same range as the effects outlined for the use of herbicides and manual and mechanical treatments as described in the Effects by Alternative section

For the No-Action Alternative, EDRR would not be implemented leading to less timely and effective treatments on new sites, or to no treatment at all.

Effects of Manual and Mechanical Treatments (Alt. 1, 2 and 3)

Small species that lack rapid mobility are vulnerable to crushing from injury from people or equipment. Manual treatments can take longer to implement than herbicide treatments, increasing the length of time of disturbance. Mechanical methods can also generate more noise disturbance than herbicide use.

Effects of Herbicides (Alt. 2 and 3)

The toxicity index (or Hazard Quotient-HQ) of an herbicide acts as a threshold; doses below the index would result in no known (or discountable) effect, and doses substantially above the threshold (i.e. HQ≥1) provide an index as to how much the exposure concentration is over the reference concentration. The level of risk depends on how far above the threshold a particular dose is estimated to be, and the likelihood of the exposure scenario for the particular group of organisms. Due to the nature of the toxicity data, doses only slightly above the toxicity index would still be considered to pose no likely risk.

In order to analyze potential effects from proposed invasive plant treatments on the project area, each species considered in this analysis was assigned to an exposure scenario category (e.g. small

insectivorous birds, large herbivorous mammal, etc.). Results of risk assessments for each herbicide, from the lowest to highest application rate (Appendix D) were then applied to each species within the exposure scenario category to evaluate risk of each herbicide. Professional judgment was used to evaluate the life history traits of each wildlife species of interest to determine the likelihood of exposure to the proposed herbicides. The combinations of likelihood of exposure and dose estimated from exposure scenarios were used to conclude a risk of effect from herbicide treatments.

The effects from the use of herbicide depend on the toxic properties (hazards) of that herbicide, the level of exposure to an herbicide, and duration of that exposure. Exposure of wildlife to herbicides can be reduced by site specific application and appropriate treatment methods. Discussions of and specific HQs are included for each herbicide under consideration, in Appendices E-H. Refer to individual risk assessments (SERA 2004, 2007b, 2011a,b) for a more complete discussion on all toxicological tests and endpoints considered for each proposed herbicide.

Table 1. Exposure scenario results from FS/SERA risk assessments for mammals and birds, using the lowest to maximum application rate, and upper residue rates.

Symbol meanings are as follows:
-- Exposure scenario results in a dose below the toxicity index.
★ Exposure scenario results in a dose that exceeds the toxicity index.

Animal/Scenario Typical Application Rate	Aminopyralid	Glyphosate	Imazapyr	Metsulfuron methyl	Animal/Scenario Maximum Application Rate	Glyphosate	Imazapyr
ACUTE EXPOSURES					**ACUTE EXPOSURES**		
Direct spray, sm. mammal	--	--	--	--	Direct spray, sm. mammal	--	--
Consume contaminated vegetation					**Consume contaminated vegetation**		
small mammal	--	--	--	--	small mammal	★	★
large mammal	--	--	--	--	large mammal	★	--
large bird	--	--	--	--	large bird	★	--

Animal/Scenario Typical Application Rate	Aminopyralid	Glyphosate	Imazapyr	Metsulfuron methyl	Animal/Scenario Maximum Application Rate	Glyphosate	Imazapyr
Small bird	*	--	--	--	Small bird	*	*
Consume contam. water					**Consume contam. water**		
Spill, sm. mammal	--	--	--	--	Spill, sm. mammal	*	--
Consume contam. insects					**Consume contam. insects**		
small mammal	--	--	--	--	small mammal	*	--
small bird	--	--	--	--	small bird	*	--
Consume contam. prey					**Consume contam. prey**		
carnivore (sm. mammal)	--	--	--	--	carnivore (sm. mammal)	*	--
predatory bird (sm. mammal)	--	--	--	--	predatory bird (sm. mammal)	*	--
predatory bird (fish)	--	--	--	--	predatory bird (fish)	*	--
CHRONIC EXPOSURES					**CHRONIC EXPOSURES**		
Consume contam. veg.					**Consume contam. veg.**		
small mammal	--	--	--	--	small mammal	*	--
lg. mammal	--	--	--	--	lg. mammal	*	--
lg. bird	--	--	--	--	lg. bird	*	--
Small bird	--	*	--	--	Small bird	*	
Consume contam. water					**Consume contam. water**		
small mammal	--	--	--	--	small mammal	--	--
Consume contam. insects#					**Consume contam. insects**		
small mammal	--	--	--	--	small mammal	--	--
small bird	--	--	--	--	small bird	--	--

Animal/Scenario Typical Application Rate	Aminopyralid	Glyphosate	Imazapyr	Metsulfuron methyl	Animal/Scenario Maximum Application Rate	Glyphosate	Imazapyr
Consume contam. prey	**Consume contam. prey**						
carnivore (sm. mammal)	--	--	--	--	carnivore (sm. mammal)	--	--
predatory bird (sm. mammal)	--	--	--	--	predatory bird (sm. mammal)	--	--
predatory bird (fish)	--	--	--	--	predatory bird (fish)	--	--

Effects of Invasive plants on wildlife species (Alternative 1)

The effect of invasive plants on wildlife varies. Wildlife species that depend upon native vegetation for food, shelter, or breeding can be adversely affected by invasive plants, particularly if displacement of native plant communities occurs. Some invasive plants, such as knapweed, contain chemical compounds that makes the plant unpalatable go grazing animals. Habitats that become dominated by invasive plants are often not used, or used less, by native and rare wildlife species. Alternatively, some wildlife species use invasive plants for food or cover. However, the few uses that an invasive plant may provide do not outweigh the adverse impacts to an entire ecosystem (Zavaleta 2000). A summary of negative effects of invasive plants on wildlife includes:

- Alteration of habitat structure leading to habitat loss or increased chance of predation (Schmidt and Whelan 1999)
- Change to effective population size through nutritional deficiencies or direct physical mortality
- Poisoning due to direct or indirect ingestion of toxic compounds found or in in invasive plants (some invasive plants are known to be toxic to mammals)
- Altered food web and nutrient cycling (Allison and Vitousek 2004; Ehrenfield 2003; Rimer and Evans 2006)
- Source-sink population demography; with more demographic sinks than sources
- Lack of proper forage quantity or nutritional value at critical life periods

Specifically on the Tongass National Forest, Reed Canarygrass (*Phalaris arundinacea L.*), has a high invasiveness rank (83), has been documented to form dense, persistent, monotypic stands in wetlands, excluding and displacing other plant species, and providing inadequate cover for small

mammals and waterfowl (Alaska Center for Conservation Science 2017). Dense stands promote silt deposition and the consequent constriction of waterways and irrigation canals. Reed canarygrass may also alter soil hydrology. Reed canarygrass has been documented on each district, including Admiralty National Monument, totaling 105 acres (and likely additional undocumented infestations occur).

Past, Present, and Foreseeable Activities Relevant to Cumulative Effects Analysis

Wildlife species are exposed to disturbance from recreationists, timber harvest activities, development, and other sources of disturbance and habitat loss on both federal and non-federal lands. The potential overlap of impacts of invasive plant treatment and past, present, and reasonably foreseeable activities on MIS, TES, and migratory bird species and their habitat was considered in this analysis. A description of all activities are included in a Catalog of Events located in the project record, and available upon request.

THREATENED, ENDANGERED, AND SENSITIVE SPECIES

In compliance with the Forest Plan and ESA, I identified species listed as threatened or endangered and designated as candidate in the analysis area. Federally listed threatened and endangered species are those plant and animal species formally listed by the FWS or NMFS under authority of the ESA of 1973, as amended. An endangered species is defined as one that is in danger of extinction throughout all or a significant portion of its range. A threatened species is defined as one that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. A candidate species is a species for which the FWS has sufficient information to support a proposal to list as endangered or threatened, but for which preparation and publication of a proposal is precluded by higher priority listing actions. Although candidate species have no legal protection under ESA, they are treated as if they are proposed for listing.

Sensitive species are those plant and animal species identified by the Regional Forester for which population viability is a concern on NFS lands within the region. This is evidenced by a significant current or predicted downward trend in population numbers, density, or habitat capability that will reduce a species' existing distribution (FSM 2670.5). The Alaska Region updated the list of sensitive species in 2009.

The Forest Service Manual states that viable populations and habitats of these species will be maintained and distributed throughout their geographic range on NFS lands (FSM 2670.22). As part of the NEPA process, Forest Service activities will be reviewed, through a BE, to determine their potential effect on sensitive species, and impacts to these species will be minimized or avoided (FSM 2670.32). The BE should identify all sensitive species known or suspected to occur in the analysis area or all sensitive species that the project potentially effects (FSM 2672.42). All of the listed sensitive species occur in Southeast Alaska.

I consulted FWS and the NMFS Internet web sites for the preparation of this document because they provide the most current listings as well as occurrence and habitat information. Literature

review revealed additional occurrence and habitat information for listed species. Table 2. Identifies all Endangered, Threatened, and Sensitive Species that are known to occur on the Tongass National Forest. Table 2. also describes presence of species or habitat, species not occurring within Southeast Alaska inside waters, within the vicinity of the project area. Species that will not be affected by project activities will be excluded from further analysis and considered a determination of no effect.

Table 2. Threatened, endangered, and sensitive species, and critical habitat listed by NMFS and USFWS that occur in the vicinity of Northern Tongass Integrated Weed Management Plan

Common and Scientific Names	Status	Species and/or Habitat Present (Y/N)	Rationale for Excluding from Analysis
Short-tailed Albatross (*Phoebastria albatrus)*	Endangered	No	Project activities will not impact any marine habitat or prey species
Humpback whale (Mexico DPS) *Megaptera novaeangliae*	Threatened	No	Project activities will not impact any marine habitat or prey species nor will it create an increase in boat traffic.
Fin Whale *Balaenoptera physalu)*	Endangered	No	Project activities will not impact any marine habitat or prey species nor will it create an increase in boat traffic.
Sperm Whale *Physeter microcephalus*	Endangered	No	Project activities will not impact any marine habitat or prey species nor will it create an increase in boat traffic.
Steller sea lion (Western DPS) *Eumetopias jubatus*	Endangered	Yes	Project activities will not impact any known rookeries or haulout areas nor will it create an increase in boat traffic.
Steller sea lion Critical Habitat	*N/A*	Yes	Project activities will not impact any known rookeries or haulout areas nor will it create an increase in boat traffic.
Kittlitz's Murrelet *Brachyramphus brevirostris*	Sensitive	Yes	Project activities will not impact any marine habitat, prey species, glacial or nesting (alpine) habitat.
Aleutian Tern *Sterna aleutica*	Sensitive	Yes	N/A
Black Oystercatcher *Haemotopus bachmani*	Sensitive	Yes	N/A

Common and Scientific Names	Status	Species and/or Habitat Present (Y/N)	Rationale for Excluding from Analysis
Dusky Canada Goose *Branta Canadensis occidentalis*	Sensitive	Yes	N/A
Queen Charlotte Northern Goshawk *Accipiter gentilis laingi*	Sensitive	Yes	N/A

Environmental Baseline (Existing Condition)

A summary of populations, trends, and threats for all TES species are included in Appendix I

Aleutian Tern

The Aleutian tern breeds in Alaska and Siberia. In Alaska, they are restricted to coastal areas throughout the Aleutian Island as far west as Attu Island, north to the southeast Chukchi Sea and east to the Alaska Peninsula, Yakutat, and Glacier Bay. Aleutian terns feed primarily in shallow waters, including tidal rips, rivers, inshore marine waters and fresh water ponds and marshes, on small fish (e.g. capelin and sand lance), marine invertebrates and some insects (ADFG 2006). They nest in coastal colonies in a variety of habitats including islands, shrub-tundra, grass or sedge meadows, and freshwater coastal marshes (USDI FWS 2006a). Although individuals may migrate through other parts of Southeast Alaska, the southernmost known breeding colonies are located on the Yakutat Ranger District, including a large colony on Black Sand Spit, a colony near the Italio River, and additional smaller nesting areas where use varies by year (Oehlers and Catterson 2012).

Black Oystercatcher

Black Oystercatchers have a small global population (estimates of 8,500 – 11,000 individuals) with distribution from the Aleutian Islands down the Pacific Coast to Baja California. The majority of the population breeds in Alaska, concentrated especially in Prince William Sound and the Kodiak Archipelago. They favor rocky shorelines and forage exclusively on intertidal macroinvertebrates (e.g., limpets and mussels) found in sheltered areas of high tidal variation. Nests are on generally shallow circular depressions lined with shell fragments or pebbles on gravel beaches located just above the high tide line. Some nest may be on cliffs above the high tide line (Tessler 2007).

Black oystercatcher populations appear to be regulated by the availability of quality foraging and nesting habitat. Because they are confined to specific shoreline habitat and congregate during the winter, they are vulnerable to natural and human disturbances. Threats include predation, recreational disturbances, flooding, vessel wakes, and shoreline contamination (Tessler 2007).

Populations were affected by the 1989 Exxon Valdez oil spill in Prince William Sound. Recovery has been slow and oil still lingers in nesting areas. Extensive data collection has occurred the past five years from Kodiak Island to British Columbia, showing these long-lived birds have high site fidelity but low reproductive rates and high inter-annual variability in nest success (USDA FS 2009).

Dusky Canada Goose

Dusky Canada geese compose one of the smallest populations of geese in North America. It is recognized as being unique to a small part of the Gulf of Alaska including the Copper River Delta and Prince William Sound. The dusky Canada goose population nests primarily on the Copper River Delta of Alaska's south central coast and winters primarily in southwestern Washington and western Oregon (Bromley and Rothe 2003). Primary foraging habitat during nesting includes tidal mud flats and adjacent areas that include horsetails (*Equisetum* spp.) and sedge (*Carex* spp.) and other plant species (Bromley and Rothe 2003, p. 32).

The subpopulation that nests primarily on the Copper River Delta of Alaska's south-central coast is experiencing decline and uncertainty. Productivity has declined primarily as a result of long-term changes to habitat as a result of the 1964 earthquake and high rates of predation (Bromley and Rothe 2003).

Queen Charlotte Northern Goshawk

The Queen Charlotte goshawk is recognized as a distinct subspecies of the northern goshawk (*Accipiter gentilis*) that occurs only in coastal areas of British Columbia and in Southeast Alaska. It was classified as a subspecies based on differences in morphological traits and color variations; the Queen Charlotte goshawk being darker and often smaller then northern goshawks from other regions. Because it is difficult to distinguish between the Queen Charlotte and northern goshawk, this document will refer to both as "goshawks".

Within Southeast Alaska and on the Tongass NF, the goshawk is a year-round resident and may occupy different or overlapping winter and breeding territories (USDA FS 2008b, p. 3-226). Goshawks inhabit forested lands favoring dense stands of conifer or deciduous old-growth for nesting and foraging habitat. Nest trees are generally located in Sitka spruce or western hemlock trees in mature to old-growth forest types. Therefore productive old-growth (POG) forest is an important component of goshawk habitat.

Analysis of Effects

This section includes an analysis of the direct and indirect effects of the proposed action, and any interrelated and interdependent actions (see definition below), on the species and/or critical habitat. Factors considered in this analysis include: proximity of the action, distribution, and timing, nature of the effect, duration, disturbance frequency, disturbance intensity, and disturbance severity.

Definitions:

Interrelated Activity*: An interrelated activity is an activity that is part of the proposed action and depends on the proposed action for its justification.*

Interdependent Activity *An interdependent activity is an activity that has no independent utility apart from the action under consultation.*

Cumulative effect as defined by NEPA *[40 C.F.R. §1508.7], are the impacts on the environment which result from the incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions.*

Risk assessments were completed for those species which could be impacted by the proposed project.

Analysis is based upon previous surveys as mentioned above, professional knowledge, and the assumptions and general effects to wildlife previously described (pages 15-22).

Alternative 1 – No Action

No herbicide treatments are proposed with Alternative 1 with the exception of very minor (less than 20 acres per year) at administrative sites and recreation sites as approved by a Decision Memo signed in October 2016 for Categorical Exclusions (36 CFR 220.6 (d)) on the four ranger districts and one national monument; therefore, there would be a very limited direct, indirect, or cumulative effects to wildlife species related to herbicide use. Any effects to this minor use are analyzed in Alternatives 2 and 3. This alternative represents the existing condition and expected future conditions and serves as a baseline to compare the effects between alternatives.

Direct/Indirect Effects:

The Sensitive species with potential to be affected by this project, **Aleutian Tern, Black Oystercatcher, Dusky Canada Goose, and Queen Charlotte Goshawk**, have been grouped as the No Action alternative would affect these species in similar ways. Currently none of the Sensitive Species described above are being measurably affected by any known invasive plant species. Known infestations encompass approximately 1,412 acres across an 8.3 million acre project area. This amounts to a very small fraction of the total available habitat for these species. At this time there are no measurable direct/indirect effects to **Aleutian Tern, Black Oystercatcher, Dusky Canada Goose, or Queen Charlotte Goshawk** or their habitat. Therefore, the No Action Alternative would have no impact on population numbers or viability. Current management practices and direction for these species would remain the same.

There could be future effects, as detailed above, if invasive species infestations were allowed to persist. Known infestation would likely increase in size and without treatment could reduce habitat and decrease forage for some species; consequently, some individuals could be affected, however these effects are expected to be minimal.

In summary, because there are currently no known measurable effects from existing invasive plant species, Alternative 1 will have no impacts on any of the Sensitive Species under consideration in

this analysis. However, as infestations continue to spread, measurable effects could occur for some species beyond the timeline of this analysis.

CUMULATIVE EFFECTS:

Cumulatively, the effects of combining the No Action Alternative with past, present, or reasonably foreseeable actions, is unlikely to lead to negative cumulative effects to **Aleutian Tern, Black Oystercatcher, Dusky Canada Goose,** and **Queen Charlotte Goshawk**, because of; 1) the limited scope of treatment areas, 2) effects from herbicide will be minimal 3) no loss of habitat is expected to occur, 4) the removal of invasive plants may benefit some species, and 5) treatment is expected to be short-term in duration and area and thus unlikely to occur in the same time and space as other activities in the project area.

All Alternatives – manual and mechanical treatments

Each alternative considers the use of manual and mechanical treatments. Alternative 1 proposed only a minor usage of herbicides (consistent with current use) and Alternative 2 and 3 consider all treatment options for all lands within the project area.

We plan on using a combination of manual treatments (e.g., hand pulling and tarping) and mechanical treatments (torching, and mowing), in an effort to reduce, control, or eradicate populations of weeds on the Northern Tongass. Alternative 1 proposed to primarily treat infestation with manual and mechanical methods, while Alternatives 2 and 3 propose to treat more acres using herbicide. Existing infestations and new infestations would be treated. Prioritization of treatment is proposed to occur annually using a decision framework that provides a consistent process to determine priorities for treatment of target weeds and the selection of treatment methods, including the use of Early Response Rapid Detection (EDRR).

Mulching, seeding and planting of desirable vegetation may occur to restore treated sites. In addition, preventative measures detailed in the Tongass National Forest Guidance for Invasive Plant Management Program (Krosse 2017a) would be ongoing and a part of the weed management strategy.

The Sensitive species with potential to be affected by this project, **Aleutian Tern, Black Oystercatcher, Dusky Canada Goose, and Queen Charlotte Goshawk**, have been grouped as manual and mechanical treatments would affect these species in similar ways (see Section on Sensitive Species).

DIRECT/INDIRECT EFFECTS:

There would be minor direct/indirect effects to **Aleutian Tern, Black Oystercatcher, Dusky Canada Goose, and Queen Charlotte Goshawk** individuals as a result of manual and mechanical treatments because hand and mechanical treatments along with EDRR would create a disturbance; however, these effects would not be measurable. All of the above mentioned species have potential habitat and/or do occur within the proposed project area. Dusky Canada Geese are not known to nest in the project area, however some individuals likely migrate through during spring and fall. Black oystercatchers are associated with marine habitat, which is not likely to be affected. Most

treatment sites are no larger than an acre in size and treatments would be short term in duration. All noises and disturbances caused by hand and mechanical treatment would be short term and have no lasting or measurable effects to any wildlife species. Annual treatment is expected to be approximately 13 acres for Alternative 1 and 88 acres for Alternatives 2 and 3. Since the proposed treatments would be short term and not permanently displace any wildlife species there would be negligible effects as a result of implementing this alternative. Current management practices and direction for these species would remain the same.

Manual and mechanical treatments would not affect any habitat for the above mentioned species because project activities would only target invasive and non-native plants. Currently there is no known use by the above mentioned species on invasive plants for habitat or forage. Known infestations encompass approximately 1,412 acres across an 8.3 million acre project area; this amounts to a very small fraction of the total available habitat for these species. Alternatively, removal of invasive plants may provide benefits to some species.

By restricting treatments to hand and mechanical methods, the treatment of some invasive species would likely be less effective, require more effort and entries, thus overall costing more. Complete eradication of invasive plant populations is unlikely and spread of many invasive plants would have similar effects to the no action alternative. This is especially true for those species in which herbicides have been found to be the one effective method of eradication. This could potentially have a long-term adverse effect on native wildlife.

Since the proposed treatments using manual and mechanical treatment methods would be short term and limited in scope/area, and not permanently displace any wildlife species, there would be negligible effects as a result of implementing these treatment options. Because there not expected to be any measurable negative effects, and removal of invasive plants may have beneficial effects and is expected to have no impact for **Aleutian Tern, Black Oystercatcher, Dusky Canada Goose, and Queen Charlotte Goshawk**

CUMULATIVE EFFECTS:

Cumulatively, the effects of manual and mechanical treatments with past, present, or reasonably foreseeable actions, is unlikely to lead to negative cumulative effects to **Aleutian Tern, Black Oystercatcher, Dusky Canada Goose,** and **Queen Charlotte Goshawk**, because of; 1) the limited scope of treatment areas, 2) disturbance effects will be minimal 3) no loss of habitat is expected to occur, 4) the removal of invasive plants may benefit some species, and 5) treatment is expected to be short-term in duration and area and thus unlikely to occur in the same time and space as other activities in the project area.

Alternatives 2 and 3 – Integrated management including herbicide

The Proposed Action is to use an integrated method of treatment which would be the same as alternative 1, but with more acres of potential herbicide usage. For any affects associated with

hand, mechanical, and EDRR, please refer to the effects analysis for manual and mechanical treatments (above); this section will only include the effects of herbicide.

Black Oystercatcher, Dusky Canada Goose, Aleutian Tern, and Queen Charlotte Goshawk, have been grouped as Alternatives 2 and 3 and would affect these species in similar ways; where differences occur those will be described.

DIRECT/INDIRECT EFFECTS:

None of the HQs for any of the proposed herbicides reaches a level of concern for large bird species at the lowest to highest applicate rates (Table 1) under any acute exposure scenario. Only acute exposure scenarios are considered in this analysis since chronic exposure assumes a 90-day consumption scenarios for eating contaminated vegetation and fruit, which is highly unlikely given that treatments will occur once or twice a year in the same location for this project. However, HQs exceed 1.0 for small birds (10g) consuming vegetation contaminated by Aminopyralid (Acute exposure- Table 1, Appendix H) and Glyphosate (acute exposure-Table 1, Appendix E). Acute exposures is a single exposure of multiple brief exposures occurring within a short time (e.g. 24 hours or less) and consuming nothing but the treated vegetation.

The sensitive species being considered range in weight from 83-140 g (Aleutian Tern; North 2013) to 2.7-3.6 kg (Dusky Canada Goose; Alaska Department of Fish and Game 2017a). Black Oystercatchers average 500-700 g (Cornell Lab of Ornithology 2017), whereas Queen Charlotte Goshawks average 827 g (males) to 1074 g (females; Titus et al. 1994). Consequently, all of these species fall between the exposure scenarios considered for small (10g) and large (4 kg) birds.

Conservatively, applying the small bird exposure scenario to these 4 species, the use of herbicides (Aminopyralid and glyphosate) could exceed the threshold for concern. However, at least in the case of Aminopyralid, the exposure scenario for the exclusive consumption of contaminated grass by a small bird should be viewed as an extreme worst-case scenario, since it is highly improbably that a small bird would only consume contaminated vegetation over a 24 hour period in a forest ecosystem setting. Furthermore, the NOAEL dosages for Aminopyralid are based on gavage administration, to which birds appear to be much more sensitive than through dietary administration.

Doses substantially above a threshold are considered to possibly pose some risk. The level of risk depends on how far above the threshold a particular dose is estimated to be, and the likelihood of the exposure scenario for the particular group of organisms. Due to the nature of the toxicity data, doses only slightly above the toxicity index would still be considered to pose no likely risk. In this scenario, the highest HQs for acute exposures are 38.0 for chronic exposure to vegetation contaminated by glyphosate and acute exposure (HQ of 13) to vegetation contaminated by Aminopyralid. As previously stated, these two scenarios are highly unlikely and do not represent the treatment scenario that would be applied to this project.

With the exception of Dusky Canada Goose, vegetation is not part of the primary diet for any of the Sensitive Species under consideration. Consumption of contaminated vegetation would primarily be inadvertent, and is therefore a highly unlikely scenario. Although Dusky Canada geese do forage on vegetation such as horsetails (*Equisetum* spp.) and sedge (*Carex* spp.), this species is only expected to be passing though the project area during migration, so exposure to and consumption of contaminated vegetation is highly unlikely. Furthermore, this is the heaviest of the sensitive species under consideration, approaching the "large bird" assessment category, for which HQs were well below the level of concern for both herbicides.

Known infestations encompass approximately 1,142 acres across an 8.3 million acre project area. This amounts to a very small fraction of the total available habitat for these species, and only a small amount (≤ 88 acres per year) is expected to be treated annually, again minimizing scenarios for exposure of Sensitive Species to contaminated vegetation. Effects to individuals due to disturbance are expected to be minimal, as described under manual and mechanical treatment methods for all alternaitves.

Because of the worst-case scenario exposures for the herbicides under consideration, minimal exceedance of the threshold for concern, low probability of the exposure scenarios, and limited treatment areas relative to the overall project area, the use of herbicides in addition to the effects described for hand and mechanical treatments is not expected to cause any measurable effects to Black Oystercatcher, Aleutian Tern, Dusky Canada Goose, or Queen Charlotte Goshawk. The use of herbicide is also highly unlikely to be used in and therefore impact the marine habitat associated with Black Oystercatchers and Aleutian Terns.

In summary, effects from herbicides on the sensitive species under consideration are expected to be minimal. Consequently, in addition to the effects of hand and mechanical treatments previously described, Alternatives 2 and 3 are expected to have no impact for **Black Oystercatcher, Dusky Canada Goose, Aleutian Tern, or Queen Charlotte Goshawk.**

CUMULATIVE EFFECTS:

Cumulatively, the effects of combining Alternatives 2 and 3 with past, present, or reasonably foreseeable actions, is unlikely to lead to negative cumulative effects to **Aleutian Tern, Black Oystercatcher, Dusky Canada Goose,** and **Queen Charlotte Goshawk**, because of; 1) the limited scope of treatment areas, 2) effects from herbicide will be minimal 3) no loss of habitat is expected to occur, 4) the removal of invasive plants may benefit some species, and 5) treatment is expected to be short-term in duration and area and thus unlikely to occur in the same time and space as other activities in the project area.

Table 3. Summary of determinations for R10 Sensitive Species for the Northern Tongass Integrated Weed Management Plan.

Species	Alt. 1 – No Action	Alts. 2 and 3-
Aleutian Tern	No impact	No impact
Black Oystercatcher	No impact	No impact
Dusky Canada Goose	No impact	No impact
Queen Charlotte Goshawk	No impact	No impact

MANAGEMENT INDICATOR SPECIES

Environmental Baseline

Management Indicator Species (MIS) are those wildlife species whose responses to land management activities reflect responses of other species with similar habitat requirements. Under the MIS concept, the responses to management activities of relatively few species are studied and monitored; in order to predict the impacts to entire assemblages of species and associated habitats MIS are used to assess population viability and biological diversity. They are also used to help establish management goals for game species and other species of public interest.

Thirteen wildlife MIS (Table 4) have been identified for the Tongass NF (USDA FS 2008b, pp. 3-230 to 3-241). All of the wildlife MIS species are associated with spruce and hemlock forests of Southeast Alaska comprising 98 percent of the POG forests of the Tongass NF. POG forest may provide important cover and forage habitat for wildlife as a result of the dense canopy, which reduces snow accumulations in the understory during the winter but is open enough to provide understory vegetation during the spring, summer, and fall. Six of the MIS also specifically use stream (riparian) habitats and five of the species use estuarine habitats. Appendix J describes the basis for MIS selection, habitat preference, and consideration for effects analysis for each MIS species.

A review of Forest MIS was conducted using existing historic data, GIS layers and databases, communication with other biologist, literature reviews, and information in the 2008 Forest Plan Final Environmental Impact Statement (FEIS). Three management indicator species were chosen to be analyzed for this project (Bald Eagle, River Otter, and Sitka Black-tailed Deer). Table 4 identifies all MIS known to occur on the Tongass National Forest, describes the presence of species

and/or habitat within the project area, and rationale for those excluded from further analysis (equating to a "negligible" effect).

Table 4. Description of the occurrence of wildlife management indicator species (MIS) in the analysis area and considerations for effects analysis

Species Scientific Name	Species and/or Habitat Present	Excluded from analyses Rational
Alexander Archipelago Wolf *Canis lupis ligoni*	Present	Project activities will not affect road density or deer habitat
American Marten *Martes americana*	Present	Project activities will not impact any old growth mature habitat.
Bald Eagle *Haliaeetus leucocephalus*	Present	
Black Bear *Ursus americanus*	Present	Project activities will not impact denning habitat or road density
Brown Bear *Ursus arctos horribilis*	Present	Project activities will not impact any old growth mature habitat.
Brown Creeper *Certhia americana*	Present	Project activities will not impact any old growth mature habitat.
Hairy Woodpecker *Picoides villosus*	Present	Project activities will not impact any habitat in the form of large diameter snags and/or dying trees.
Mountain Goat *Oreamnos americanus*	Present	Project activities will not impact any cliff, alpine and/or subalpine habitat.
Red-breasted Sapsucker *Sphyrapicus ruber*	Present	Project activities will not impact any snag or old growth habitat.
Red Squirrel *Tamiasciurus hudsonicus*	Present	Project activities will not impact any snag or old growth habitat.
River Otter *Lutra canadensis*	Present	
Sitka Black-tailed Deer *Odocoileus hemionus sitkensis*	Present	
Vancouver Canada Goose *Branta Canadensis fulva*	Present	Project activities will not impact nesting and brooding habitat.

Bald Eagle

The bald eagle (*Haliaeetus leucocephalus*) was selected as a MIS because of its use of coastal areas for foraging and nesting. Eagles breeding in coastal Alaska remain in the vicinity of their nest sites throughout the year; immature eagles wander more widely in search of food (United States Fish and Wildlife Service [USFWS] 2009). Most bald eagles nest in old-growth trees within 328 feet (100 meters) of saltwater shorelines. Bald eagles in Alaska may begin attending to nest building in preparation for nesting in early February (USFWS 2007a). Egg laying occurs between April and June with a peak in late April and early May (USFWS 2007a). Hatching and rearing young occurs starting in mid-May through mid-September while fledging occurs in August through mid-October (USFWS 2007a). Young birds stay in the vicinity of the nest for about six weeks after fledging because they are dependent on their parents for food (USFWS 2007a).

Because they forage primarily on fish, key habitats include riparian and shoreline areas. Changes in POG forest especially along the shoreline provide a general measure of effects. Forest Plan standards and guidelines require the protection of beach fringe habitat and managing bald eagle habitat in accordance with an Interagency Agreement between the Forest Service and USFWS (USDA FS 2008a). Based on agreement with the USFWS, the Tongass manages bald eagle habitat consistent with the National Bald Eagle Management Guidelines (USFWS 2007). This plan provides recommendations for avoiding habitat alterations and disturbance (including repeated human activity) within 330-660-feet (depending on the activity type) of bald eagles nests and that aircraft avoid flying within 1,000-feet of nests during the breeding season. For non-motorized recreation (e.g. hiking, camping, fishing, hunting, birdwatching, canoeing, kayaking), and motorized watercraft, the Plan recommends a 330 foot buffer during the breeding season. Not all bald eagles react to disturbance in the same way. This variability may be related to differences in visibility, duration of disturbance, noise levels, and tolerance or habituation to human activities (USFWS 2007a).

Sitka Black-tailed Deer

The Sitka black-tailed deer (*Odocoileus hemionus sitkensis*) was selected as a Tongass MIS because it is an important game and subsistence species in Southeast Alaska. They were selected as an MIS for this analysis because they are an important subsistence species, and the Forest Service authorizes guided deer hunts.

River Otter

The river otter (*Lutra canadensis*) was selected as an MIS because of its association with coastal and freshwater aquatic environments. River otters from Southeast Alaska are morphologically distinct from those found in the Interior. *L. c. mira* is a subspecies endemic to Southeast Alaska and coastal British Columbia and was once considered a separate species. The Forest Plan has standard and guidelines that protect key river otter habitat components (USDA FS 2008b). Changes in shoreline and riparian habitats provide a general measure of effects. River otters are considered an indicator of wetland habitats that contain high water quality and quantity.

River otters are known to occur within the proposed project area especially within 100 ft. of a shoreline where they spend most of their activity. They may occur at low densities in areas but there is suitable habitat available.

Analysis of Effects
Direct/Indirect and Cumulative Effects

Alternative 1 – No Action

No herbicide treatments are proposed with Alternative 1 with the exception of very minor (less than 20 acres per year) at administrative sites and recreation sites as approved by a Decision Memo signed in October 2016 for Categorical Exclusions (36 CFR 220.6 (d)) on the four ranger districts and one national monument; therefore, there would be a very limited direct, indirect, or cumulative

effects to wildlife species related to herbicide use. Any effects to this minor use are analyzed in Alternatives 2 and 3. This alternative represents the existing condition and expected future conditions and serves as a baseline to compare the effects between alternatives.

The MIS species under consideration for this analysis, **Bald Eagle, River Otter, and Sitka Black-tailed Deer** have been grouped as the No Action alternative would affect these species in similar ways, where differences occur it will be described.

DIRECT/INDIRECT EFFECTS:

Currently none of the above species are being measurably affected by any known invasive plant species. Known infestations encompass approximately 1,412 acres across an 8.3 million acre project area. This amounts to a very small fraction of the total available habitat for these species. At this time there are no measurable direct/indirect effects to**, Bald Eagles, River Otters and Sitka Black-tailed deer** individuals or their habitat. Therefore, the No Action Alternative would not adversely affect population numbers or viability. Current management practices and direction for these species would remain the same.

There could be future effects, as described previously, if invasive species infestations were allowed to persist. Known infestation would likely increase in size and without treatment could reduce habitat and decrease forage for some species; consequently, some individuals could be affected, however these effects are expected to be minimal.

In summary, effects from Alternative 1 are expected to be negligible for all MIS species analyzed. However, as infestations continue to spread, measurable effects could occur for some species beyond the timeline of this analysis.

CUMULATIVE EFFECTS:

Cumulatively, the effects of combining the No Action Alternative with past, present, or reasonably foreseeable actions, is unlikely to lead to negative cumulative effects to **Bald Eagles, River Otters and Sitka Black-tailed Deer**, because of; 1) the limited scope of treatment areas, 2) effects from herbicide will be minimal 3) no loss of habitat is expected to occur, 4) the removal of invasive plants may benefit some species, and 5) treatment is expected to be short-term in duration and area and thus unlikely to occur in the same time and space as other activities in the project area.

All Alternatives – Manual and Mechanical Treatments (Alts 1, 2 and 3)

All Alternatives – manual and mechanical treatments

Each alternative considers the use of manual and mechanical treatments. Alternative 1 proposed only a minor usage of herbicides (consistent with current use) and Alternative 2 and 3 consider all treatment options for all lands within the project area.

We plan on using a combination of manual treatments (e.g., hand pulling and tarping) and mechanical treatments (torching, and mowing), in an effort to reduce, control, or eradicate

populations of weeds on the Northern Tongass. Alternative 1 proposed to primarily treat infestation with manual and mechanical methods, while Alternatives 2 and 3 propose to treat more acres using herbicide. Existing infestations and new infestations would be treated. Prioritization of treatment is proposed to occur annually using a decision framework that provides a consistent process to determine priorities for treatment of target weeds and the selection of treatment methods, including the use of Early Response Rapid Detection (EDRR).

Mulching, seeding and planting of desirable vegetation may occur to restore treated sites. In addition, preventative measures detailed in the Tongass National Forest Guidance for Invasive Plant Management Program (Krosse 2017a) would be ongoing and a part of the weed management strategy.

The following species: **Bald Eagle, River Otter and Sitka black-tailed Deer** have been grouped and would be affected in similar ways; where differences occur it will be described.

DIRECT/INDIRECT EFFECTS:

There would be minor direct/indirect effects to **Bald Eagles, River Otters and Sitka Black-tailed Deer** individuals as a result of implementing manual and mechanical treatments because hand and mechanical treatments along with EDRR would create a noise disturbance and temporary displacement. All of the above mentioned species have potential habitat and/or do occur within the proposed project area. Treatment methods would last few days at a time thus creating only a short term disturbance. Annual manual and mechanical treatments is expected to be less than 25 acres, also minimizing disturbance impacts. This disturbance is not expected to any lasting impact to any wildlife species. Although manual and mechanical treatments would create a disturbance, this disturbance would be short term and not measurably affect **Bald Eagles, River Otters, and Sitka black-tailed deer populations.** Current management practices and direction for these species would remain the same.

Manual and mechanical treatments would not affect any habitat for the above mentioned species because project activities would only target invasive and non-native plants. Currently there is no known substantial use by the above mentioned species on invasive plants for habitat or forage. Known infestations encompass approximately 1,142 acres across an 8.3 million acre project area. This amounts to a very small fraction of the total available habitat for these species. Total manual and mechanical treatment area is expected to be small ($\leq$ 25 acres per year) relative to the project area and acres of infestation. Given the limited distribution and size of the weed infestations in the coastal and freshwater aquatic environments within the project area, the proposed weed treatments are not expected to affect shoreline, riparian or wetland river otter habitat. Similarly, given the limited distribution and size of the weed infestations within the project area, the proposed weed treatments are not expected to affect the quantity, quality and distribution of winter habitat for Sitka black-tailed deer or other old-growth dependent species. Furthermore, removal of invasive plants may have beneficial effects for some species.

Without the use of herbicides the treatment of some invasive species would likely be less effective, require more effort and entries, thus overall costing more. Complete eradication of invasive plant

populations is unlikely and spread of many invasive plants would have similar effects to the no action alternative. This is especially true for those species in which herbicides have been found to be the one effective method of eradication. This could potentially have a long-term adverse effect on native plants and wildlife.

In summary, because there are not expected to be any measureable negative effects and potentially beneficial effects from removal of invasive plants, the implementation of manual and mechanical treatments is expected to result in negligible effects to **Bald Eagles, River Otter, and Sitka Black-tailed Deer**.

CUMULATIVE EFFECTS:

Cumulatively, the effects of combining all the manual and mechanical treatments with past, present, or reasonably foreseeable actions, is unlikely to lead to negative cumulative effects to **Bald Eagles, River Otter, and Sitka Black-tailed Deer** because of; 1) the limited scope of treatment areas, 2) disturbance effects will be minimal 3) no loss of habitat is expected to occur, 4) the removal of invasive plants may benefit some species, and 5) treatment is expected to be short-term in duration and area and thus unlikely to occur in the same time and space as other activities in the project area.

ALTERNATIVES 2 AND 3

The Proposed Action is to use an integrated method of treatment which would be an approximate 88 acre target per year, but with the added use of herbicide. For any affects associated with hand, mechanical and EDRR please refer to the effects analysis for manual and mechanical treatments (above discussion); this section will only include the effects of herbicide.

Prioritization of treatment is proposed to occur annually using a decision framework that provides a consistent process to determine priorities for treatment of target weeds and the selection of treatment methods, including the use of Early Detection Rapid Response (EDRR). Mulching, seeding and planting of desirable vegetation may occur to restore treated sites. Specific design features would be applied to minimize or eliminate the potential for invasive plant treatments to adversely affect non-target plants, animals, human health, water quality, and aquatic organisms. In addition, preventative measures detailed in the Tongass National Forest Guidance for Invasive Plant Management Program (Krosse 2017a) would be ongoing and a part of the weed management strategy. Acreage treated is estimate to be ≤88 acres per year.

River Otter and Sitka Black-tailed Deer have been grouped as implementation of Alternatives 2 and 3 would affect these species in similar ways, where differences occur it will be described. Effects to the **Bald Eagle** are considered separately.

DIRECT/INDIRECT EFFECTS

None of the HQs for any of the proposed herbicides reach approach a level of concern for small or large mammals when used at the typical application rate (Table 1, Appendices E-H). When using

the maximum application rate HQs for the proposed herbicides reaches levels of concern for mammals and birds consuming contaminated foliage.

None of the HQs for any of the proposed herbicides reaches a level of concern for large bird species (4 kg) at the typical or maximum applicate rate (Table 1), including the consumption of contaminated fish (as in the case of Bald Eagle). HQs do, however, exceed 1.0 for small birds (10g) consuming vegetation contaminated by Aminopyralid (Acute exposure- Table 1, Appendix H) and Glyphosate (chronic exposure-Table 1, Appendix E). Adult Bald eagles weigh 3.6-6.4 kg (ADF&G 2017b) and forage primarily on fish, with key habitats including riparian and shoreline areas. Effects to their primary prey and associated habitat (i.e. Essential Fish Habitat) are expected to be minimal to negligible (Johnson 2018a, b). Consequently, due to their body size, diet, and habitat, and minimal expected effects to their prey and associated habitat, Bald Eagles do not fall within any exposure scenarios which would cause concern.

Conservatively, applying the small bird exposure scenario to these 4 species, the use of herbicides (Aminopyralid and glyphosate) could exceed the threshold for concern. However, at least in the case of Aminopyralid, the exposure scenario for the exclusive consumption of contaminated grass by a small bird should be viewed as an extreme worst-case scenario, since it is highly improbably that a small bird would only consume contaminated vegetation over a 24 hour period in a forest ecosystem setting. Furthermore, the NOAEL dosages for Aminopyralid are based on gavage administration, to which birds appear to be much more sensitive than through dietary administration.

Doses substantially above a threshold are considered to possibly pose some risk. The level of risk depends on how far above the threshold a particular dose is estimated to be, and the likelihood of the exposure scenario for the particular group of organisms. Due to the nature of the toxicity data, doses only slightly above the toxicity index would still be considered to pose no likely risk. In this scenario, the highest HQs for acute exposures are 38.0 for chronic exposure to vegetation contaminated by glyphosate and acute exposure (HQ of 13) to vegetation contaminated by Aminopyralid. As previously stated, these two scenarios are highly unlikely and do not represent the treatment scenario that would be applied to this project.

Known infestations encompass approximately 1,142 acres across an 8.3 million acre project area. This amounts to a very small fraction of the total available habitat for these species. Total treatment is not expected to exceed 88 acres in any year. Furthermore, removal of invasive plants may have beneficial effects for some species. Effects to individuals due to disturbance are expected to be minimal, as described under Alternative 3

In summary, because there is no concern for herbicides applied at the typical or maximum application rate for any MIS species, disturbance effects will be minimal due to the limited and scope and duration of proposed treatments, and prey and habitat are not expected to be affected,

the implementation of Alternative 2 is expected to result in negligible effects to **Bald Eagles, River Otters, and Sitka Black-tailed Deer**.

CUMULATIVE EFFECTS:

Cumulatively, the effects of combining Alternatives 2 and 3 with past, present, or reasonably foreseeable actions, is unlikely to lead to negative cumulative effects to **Bald Eagles, River Otters, and Sitka Black-tailed Deer**, because of; 1) the limited scope of treatment areas, 2) effects from herbicide will be minimal 3) no loss of habitat or affects to prey are expected to occur, 4) the removal of invasive plants may benefit some species, and 5) treatment is expected to be short-term in duration and area and thus unlikely to occur in the same time and space as other activities in the project area.

MIGRATORY BIRDS

Neotropical migratory birds (referred to as migratory birds) are far ranging species that require a diversity of habitats for foraging, breeding, and wintering. Many of the 295 species of birds that occur regularly in Alaska are migratory, some coming from as far away as Central or South America to their nesting, breeding, and rearing grounds in Alaska. Approximately 236 species of birds occur regularly in Southeast Alaska. Roughly 160 species are known or suspected to breed in Southeast Alaska (Armstrong 1995). Migratory birds that occur but generally only winter in or migrate through Southeast Alaska include species of seabirds, gulls, and shorebirds.

The Migratory Bird Treaty Act of 1918 (amended in 1936 and 1972) prohibits the taking of migratory birds, unless authorized by the Secretary of Interior. Executive Order 13186 (Responsibilities of Federal Agencies to Protect Migratory Birds) provides for the conservation of migratory birds and their habitats and requires the evaluation of the effects of Federal actions on migratory birds, with an emphasis on species of concern. Federal agencies are required to support the intent of the migratory bird conventions by integrating bird conservation principles, measures, and practices into agency activities and by avoiding or minimizing, to the extent practicable, adverse impacts on migratory birds when conducting agency actions.

Environmental Baseline

The Tongass NF has identified 40 bird species of management concern that may occur on the Forest (Appendix K). This list was derived from Boreal Partners in Flight (1999) and FWS (2002) species of concern lists. Bird species occupy a variety of habitats across the forest. The Boreal Partners in Flight 2008 list was also referenced. Fourteen of these species use hemlock/spruce/ cedar forest as primary habitat for known or probable breeding. Another eight species use spruce/hemlock/cedar forest as secondary habitat. Depending on the species, other important habitats may include shrub thickets, marshes, cliff bluffs and screes, moraines, alluvia and barrier islands, beach and tidal flats, rocky shores and reefs and inshore and offshore waters.

Analysis of Effects

Direct effects to migratory birds can result from disturbances that adversely affect individuals or young including removing active bird nests or causing nest abandonment. Indirect effects result from a reduction in perching, foraging and nesting habitat.

The magnitude of effects would vary depending on the bird species, the amount of habitat affected, and the season in which disturbance would occur. Migratory birds would be most susceptible to impacts from activities occurring in suitable nesting habitat during the nesting/fledging period; which generally begins in mid-April and ends about mid-July when young birds have fledged (Appendix L). Changes in vegetation types can be used to assess effects to bird species. POG habitat can be used to assess changes in nesting habitat for migratory bird species that use hemlock/spruce/cedar forest as primary or secondary habitats. Effects to birds can be minimized by altering the season of activity, retaining snags, maintaining the integrity of breeding sites, considering key winter and migration areas, and minimizing pollution or detrimental alteration of habitats (USDA FS 2008c). The FWS recommends time periods to avoid vegetation clearing (Appendix J; USDI FWS 2006). For this analysis, effects to migratory birds will be considered collectively (not by individual species), unless otherwise noted.

Alternative 1- No Action

No herbicide treatments are proposed with Alternative 1 with the exception of very minor (less than 20 acres per year) at administrative sites and recreation sites as approved by a Decision Memo signed in October 2016 for Categorical Exclusions (36 CFR 220.6 (d)) on the four ranger districts and one national monument; therefore, there would be a very limited direct, indirect, or cumulative effects to wildlife species related to herbicide use. Any effects to this minor use are analyzed in Alternatives 2 and 3. This alternative represents the existing condition and expected future conditions and serves as a baseline to compare the effects between alternatives.

Direct/Indirect Effects

Currently none of the migratory bird species that utilize the project area are being measurably affected by any known invasive plant species. Known infestations encompass approximately 1,412 acres across an 8.3 million acre project area. This amounts to a very small fraction of the total available habitat for these species. At this time there are no measurable direct/indirect effects to any migratory bird species or their habitat. Therefore, the No Action Alternative would not adversely affect population numbers or viability. Current management practices and direction for these species would remain the same.

There could be future effects, as detailed above, if invasive species infestations were allowed to persist. Known infestation would likely increase in size and without treatment could reduce habitat and decrease forage for some species.

In summary, effects from Alternative 1 are expected to be negligible for migratory birds.

CUMULATIVE EFFECTS:

Cumulatively, the effects of combining the no Action Alternative with past, present, or reasonably foreseeable actions, is unlikely to lead to negative cumulative effects to migratory birds, because of; 1) the limited scope of treatment areas, 2) effects from herbicide will be minimal 3) no loss of habitat is expected to occur, 4) the removal of invasive plants may benefit some species, and 5) treatment is expected to be short-term in duration and area and thus unlikely to occur in the same time and space as other activities in the project area.

ALTERNATIVES 2 AND 3 - INTEGRATED MANAGEMENT INCLUDING HERBICIDE

The Proposed Action is to use an integrated method of treatment. For any affects associated with hand, mechanical and EDRR please refer to the effects analysis manual and mechanical treatment in the sections above; this section will only include the effects of herbicide.

Prioritization of treatment is proposed to occur annually using a decision framework that provides a consistent process to determine priorities for treatment of target weeds and the selection of treatment methods, including the use of Early Response Rapid Detection (EDRR). Mulching, seeding and planting of desirable vegetation may occur to restore treated sites. Specific design features would be applied to minimize or eliminate the potential for invasive plant treatments to adversely affect non-target plants, animals, human health, water quality, and aquatic organisms. In addition, preventative measures detailed in the Tongass National Forest Guidance for Invasive Plant Management Program (Krosse 2017a) would be ongoing and a part of the weed management strategy. Acreage treated is estimated at 88 acres per year.

DIRECT/INDIRECT EFFECTS

None of the HQs for any of the proposed herbicides reaches a level of concern for large bird species at the typical or maximum application rate (Table 1). However, HQs exceed 1.0 for small birds (10g-such as songbirds) consuming vegetation contaminated by Aminopyralid (Acute exposure-Table 1, Appendix H) and Glyphosate (chronic exposure-Table 1, Appendix E). However, at least in the case of Aminopyralid, the exposure scenario for the exclusive consumption of contaminated grass by a small bird should be viewed as an extreme worst-case scenario. Furthermore, the NOAEL dosages for Aminopyralid are based on gavage administration, to which birds appear to be much more sensitive than through dietary administration.

Conservatively, applying the small bird exposure scenario to these 4 species, the use of herbicides (Aminopyralid and glyphosate) could exceed the threshold for concern. However, at least in the case of Aminopyralid, the exposure scenario for the exclusive consumption of contaminated grass by a small bird should be viewed as an extreme worst-case scenario, since it is highly improbably that a small bird would only consume contaminated vegetation over a 24 hour period in a forest ecosystem setting. Furthermore, the NOAEL dosages for Aminopyralid are based on gavage administration, to which birds appear to be much more sensitive than through dietary administration.

Doses substantially above a threshold are considered to possibly pose some risk. The level of risk depends on how far above the threshold a particular dose is estimated to be, and the likelihood of the exposure scenario for the particular group of organisms. Due to the nature of the toxicity data, doses only slightly above the toxicity index would still be considered to pose no likely risk. In this scenario, the highest HQs for acute exposures are 38.0 for chronic exposure to vegetation contaminated by glyphosate and acute exposure (HQ of 13) to vegetation contaminated by Aminopyralid. As previously stated, these two scenarios are highly unlikely and do not represent the treatment scenario that would be applied to this project. While these HQs do exceed 1.0, they are not substantially above this threshold.

Migratory birds of management concern on the Tongass National Forest utilize a variety of habitats (as previously described) and food sources. While primary diet for many species consists of insects or other non-plant foods, some birds also consume seeds, berries, or other terrestrial vegetation. Consumption of contaminated vegetation by insectivores or other non-plant specialists would primarily be inadvertent; therefore it is unlikely that these species would ingest a quantity sufficient for concern. The species of concern include shorebirds (Surfbirds, Red knot, Black Turnstone, etc.), sea birds (Black-Footed Albatross, Arctic Tern, Caspian Tern, etc.), and other water birds (Yellow-billed Loon), for which the probability of consuming contaminated vegetation is very low, as is the case with predatory birds included in the list (Peregrine Falcon and Western Screech-owl). The most likely scenario for concern is, therefore, for those species whose primary diet is terrestrial vegetation.

Known infestations encompass approximately 1,142 acres across an 8.3 million acre project area. This amounts to a very small fraction of the total available habitat for these species, and only a small amount ($\leq$ 88 acres per year) is expected to be treated annually, minimizing scenarios for exposure of migratory birds to contaminated vegetation. While some individuals may be affected, no lasting effects to any migratory bird species are anticipated. Furthermore, Alternatives 2 and 3 would not affect any habitat for the above mentioned species because project activities would only target invasive and non-native plants. Currently there is no known use by the above mentioned species on invasive plants for habitat or forage. Alternatively, removal of invasive plants may provide benefits to some species. Disturbance effects are expected to be minimal, similar as described under manual and mechanical treatments.

As described in the Project Design Features, the wildlife biologist will be notified of any ground nesting birds detected in a potential treatment area so that mitigation measures can be implemented, which will minimize risk to individual birds.

Given the worst-case scenario exposures, the HQs only moderately exceeding the threshold for concern, the minimal annual treatment area, Project Design Features, and the low probability of exposure for most species, effects from herbicides on migratory birds are expected to be minimal. Consequently, in addition to the effects of hand and mechanical treatments previously described, effects to migratory birds from Alternatives 2 and 3 are expected to be negligible.

CUMULATIVE EFFECTS:

Cumulatively, the effects of combining Alternatives 2 and 3 with past, present, or reasonably foreseeable actions, is unlikely to lead to negative cumulative effects to migratory birds, because of; 1) the limited scope of treatment areas, 2) effects from herbicide will be minimal 3) no loss of habitat is expected to occur, 4) the removal of invasive plants may benefit some species, and 5) treatment is expected to be short-term in duration and area and thus unlikely to occur in the same time and space as other activities in the project area.

SUBSISTENCE ANALYSIS

This analysis tiers directly to the Forest Plan standards and guidelines for subsistence (USDA FS 2016a 4-65 to 4-66), the Forest Plan FEIS (2016b 3-417-3-431) and complies with the requirements in FSH 2090.23 (Subsistence management). The FEIS contains in-depth discussions on the history of subsistence use and community information. Under the Alaska National Interest Lands Conservation Act of 1980 (ANILCA), only rural Alaska residents qualify for subsistence hunting and fishing on federal lands. Alaska residents living in urban areas can harvest under sport, personal use, or commercial regulations, but not under ANILCA subsistence regulations. Following the Alaska Supreme Court's 1989 ruling in McDowell v. State of Alaska, all Alaska residents qualify as subsistence users on state lands while federal lands are managed for a rural preference consistent with ANILCA. Since all rural residents qualify for subsistence priority, ANILCA subsistence activities are not the same as Native cultural and traditional use even though overlap occurs.

AFFECTED ENVIRONMENT

Subsistence hunting, fishing, trapping and gathering activities are a major focus of life for many Southeast Alaska residents. Nearly all rural Alaska communities depend on subsistence resources to meet some portion of their nutritional needs or to perpetuate cultural customs and traditions. Southeast Alaska subsistence resources include terrestrial wildlife (such as deer, moose, mountain goat, black and brown bear, furbearers, and small game), waterfowl (including ducks, geese, and seabirds), marine mammals (harbor seal), salmon, other finfish, marine invertebrates, plants, and firewood. Chapter 3, Subregional Overview and Communities, of the Forest Plan FEIS (USDA FS 2016b, pp. 3-525 to 3-695) provides descriptions of communities, including their histories, population trends, economic bases, and subsistence resources used.

The Forest Plan provides a comprehensive analysis of subsistence resources and potential effects, both Tongass-wide and for each rural community of Southeast Alaska. The Forest Plan determined that the primary subsistence resource likely to be significantly affected by Forest Plan actions was Sitka black-tailed deer. Deer are considered the "indicator" for potential subsistence resource consequences concerning the abundance and distribution of the resources (USFS 2016b, 3-426) and will be the primary species addressed in this analysis. Biological background and potential effects to Sitka black-tailed deer are described previously under the MIS section.

CONSIDERATIONS IN EFFECTS ANALYSIS

The Effects Analysis uses a finding in compliance with Title VIII of ANILCA to describe the direct, indirect and cumulative effects of the proposed action (and alternatives if appropriate) on deer subsistence resources in the analysis area. Under ANILCA, if we conclude that land management activities (from a specific project or cumulatively for a geographic area) may impose a significant possibility of a significant restriction on subsistence resources or uses, additional analyses and findings are required. Such a finding requires that the proposed action 1) be modified to remove the significant restriction, 2) be dropped, or 3) proceed with the stipulation that formal subsistence hearings be held and subsequent findings published. The analysis and finding are assessed as defined in the Subsistence Management and Use Handbook, Forest Service Handbook (FSH) 2609.23.

Compliance with Title VIII of ANILCA requires that the needs of rural residents be given priority when managing wildlife and fisheries resources in Alaska. Section 810 of ANILCA requires a federal agency having jurisdiction over public lands in Alaska to analyze the potential effects of proposed land use activities on subsistence uses and needs, and to include a distinct finding on whether the proposed action may significantly restrict subsistence uses. Subsistence analyses usually focus on three factors relating to fish and wildlife resources: 1) abundance and distribution of the resource; 2) access to the resource; and 3) competition for the resource.

ABUNDANCE AND DISTRIBUTION

The abundance and distribution of deer is generally based on assessing the number and location of deer available for hunter harvest. The abundance and distribution of deer on the Tongass is described in the 2016 Forest Plan (USDA FS 2016b, pp. 3-426 to 3-427).

ACCESS

Subsistence users typically hunt and fish in traditional areas surrounding their communities. Appendix H to the 1997 Forest Plan Final EIS describes traditional household deer hunting areas for the 32 communities in Southeast Alaska. Many of these communities are not located on the Alaska road system and tend to be compact, centralized places surrounded by undeveloped land with limited infrastructure (USDA FS 2016b, p. 3-427). Because of the limited access, road building, generally a byproduct of timber harvesting and, to a much lesser extent, mining, is an important agent of change in Southeast Alaska. These road networks provide greater access to areas previously unconnected and can affect subsistence both positively and negatively by providing access, dispersing hunting and fishing pressure, and creating the potential for increased competition. While road systems tend to bring more people into an area, they also give subsistence

hunters access to previously remote regions and provide a greater opportunity for subsistence harvest (USDA FS 2008b, p. 3-419).

COMPETITION

Subsistence resources are not distributed or used evenly across the Forest. Where resources are confined to island groups or river systems and access is costly or nonexistent, use of the resources is low. Where the resource is abundant, and a community is present but access by other communities is costly, the resource tends to be used primarily by the community that resides in the area. Where resources are abundant and access is available to local and other communities of Southeast Alaska, competition for resources may exist.

Increased competition may result when less expensive access to the area or within the area is provided. Such is the case when road systems are established to local communities. When areas historically not used for subsistence purposes are made available because of easier, more cost-effective access, the new area then tends to be used. When communities with road access to abundant resources are connected to the ferry systems or to commercial air services, competition for the resources may be generated from outside communities with lower abundance of the same resource.

EFFECTS ANALYSIS

EFFECTS COMMON TO ALL ALTERNATIVES

ABUNDANCE AND DISTRIBUTION

Effects to Sitka Black-tailed deer are expected to be negligible under all alternatives. No measurable effects to the deer population are expected. As previously described, no measurable effects to other subsistence resources including terrestrial wildlife, waterfowl, and marine plants are expected. No adverse effects to Essential Fish Habitat are expected (Johnson 2018b), effects to salmon and other finfish are expected to be minimal (Johnson 2018a, b) and project activities will not impact marine habitat. The effects of this project on rare and sensitive plants under all three project alternatives are expected to be minor (Turner 2018). Furthermore, none of the alternatives will result in any changes to the availability of firewood. Consequently, the abundance and distribution of deer and other subsistence resources is not expected to change under any Alternative.

ACCESS

There are no proposed road access changes (road construction or closures) under any of the Alternatives. Therefore, no effects to access of subsistence resources are expected. Roads are a primary vector for the spread of weeds and are one of the more heavily infested site types; however, none of the proposed treatments would affect subsistence access. While some infested sites may

be temporarily unavailable treatments are being implemented, these areas are minimal in size compared to the overall project area, and particularly in the case of herbicide treatments under the Proposed Action, the public will be notified in advance so they can plan their subsistence gathering activities accordingly.

COMPETITION

Since none of the alternatives are expected to result in a change to the abundance and distribution of subsistence species or firewood, and access also will not be affected, none of the alternatives will result in increased competition for subsistence resources.

EFFECTS SPECIFIC TO ALTERNATIVES 2 AND 3- INTEGRATED MANAGEMENT INCLUDING HERBICIDE (PROPOSED ACTION)

As previously described, the use of herbicides is expected to have negligible effects on any wildlife or plant (Turner 2018) species used for subsistence purposes. Furthermore, none of the exposure scenarios for humans ("ecological exposure scenario"), which includes contact with contaminated vegetation and consumption of contaminated fish, fruit, vegetation, and water, indicate a level of concern for any of the herbicides when applied at the typical or maximum application rates (Krosse 2019b, SERA 2004, 2007b, 2011a,b)

SUMMARY OF EFFECTS TO SUBSISTENCE

None of the alternatives are anticipated to result in measurable effects to any subsistence resource; therefore, no changes to abundance and distribution of any subsistence resource are expected. There are no proposed road access changes (road construction or closures) under any of the Alternatives. Therefore, no effects to access of subsistence resources are expected. Because there are no changes expected to abundance and distribution of, or access to subsistence resources, none of the alternatives will result in increased competition for subsistence resources. Consequently, there is not a significant possibility of a significant restriction on subsistence resources or uses under any alternative.

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APPENDICES

APPENDIX A

Terminology used in Herbicide Risk Assessments

Terminology
Acute exposure- A single exposure of multiple brief exposures occurring within a short time (e.g. 24 hours of less in humans) **Acute toxicity**- Any harmful effect produced in an organism through an acute exposure to one or more chemicals. **Chronic Exposure**-Exposures that occur over the average lifetime or for a significant fraction of the lifetime of a species. Chronic exposure studies evaluate the carcinogenic potential of chemicals and other long-term health effects. **Dose** - the actual quantity of a chemical administered to, or absorbed by, an organism. **Gavage** - a method of dose administration; the substance is placed directly in the stomach. **Exposure** - the amount of chemical in contact with an animal. **EEC-** Estimated/expected environmental concentration: The estimated or expected pesticide concentration in an environmental media based on a particular set of assumption and/or models. **HQ-** Hazard Quotient: The ratio of the estimated level of exposure to a substance from a specific pesticide application to the reference dose for that substance, or some other index of acceptable exposure or toxicity (e.g. toxicity index). A HQ less than or equal to one is presumed to indicate an acceptably low level of risk for that specific application. **LD_{50} (lethal dose50)** - The dose of a chemical calculated to cause death in 50% of a defined experimental animal population over a specified observation period. The observation period is typically 14 days. **LOC-** Level of Concern: The concentration in media or some other estimate of exposure above which there may be effects. **NOEL or NOEC**- No observed effect level/concentration: exposure level at which there are no statistically or biological significant differences in the frequency or severity of adverse effects between the exposed populations and its appropriate control.

Toxicity index- The benchmark dose used in this analysis to determine a potential adverse effect when it is exceeded. Usually a NOEL, but when data are lacking other values may be used. For example a value equal to $1/20^{th}$ of the known LC50 may be used as a toxicity index.
LOAEL- Lowest observable adverse effect level
NOEL/NOEC = No-observed-effect level/No-observed-effect concentration; no effects attributable to treatment.
NOAEL =*No-observed-adverse-effect level*: An exposure level at which there are no statistically or biologically significant increases in the frequency or severity of adverse effects between the exposed population and its appropriate control; some effects may be produced at this level, but they are not considered as adverse, or as precursors to adverse effects. In an experiment with several NOAELs, the regulatory focus is primarily on the highest one, leading to the common usage of the term NOAEL as the highest exposure without adverse effects.
Surfactant = surface acting agent; any substance that when dissolved in water or an aqueous solution reduces its surface tension or the interfacial tension between it and another liquid.
Surrogate = a substitute; lab animals are substituted for humans or other wildlife in toxicity testing.
Toxicity index = in this document, it is the dose of herbicide used to determine the potential for an adverse effect to wildlife. It is the lowest dose reported to cause the most sensitive effect in the most sensitive species tested, and is usually a reported NOAEL for a sub-lethal effect, but may be an LD_{50} (or a portion thereof) when data is lacking.
a.e. = acid equivalent
a.i. = active ingredient
kg = kilogram, equivalent to 1000 grams or 2.2 pounds
g = gram, equivalent to 1000 milligrams or about 0.035 ounce (28 g = 1 ounce)
mg = milligram; 0.001 gram.
mg/L = milligrams per liter; equivalent to ppm.
mg/kg = milligrams per kilogram; equivalent to ppm.
ppm = part(s) per million; equivalent to mg/L and mg/kg.
ppb = part(s) per billion

APPENDIX B

Toxicity values for mammals used in the effects analysis. Indices represent the most sensitive endpoint from the most sensitive species for which adequate data are available.

Herbicide	Duration	Endpoint	Dose	Species
Glyphosate	Acute	NOAEL	500 mg/kg	Rabbit
	Chronic	NOAEL	500 mg/kg/day	Rabbit
Imazapyr	Acute	NOAEL	250 mg/kg	Dog
	Chronic	NOAEL	250 mg/kg/day	Dog
Metsulfuron methyl	Acute	NOAEL[1]	25 mg/kg	Rat
	Chronic	NOAEL	25 mg/kg/day	Rat
Aminopyralid	Acute	NOAEL	104 mg/kg	Rabbit
	Chronic	NOAEL	50 mg/kg/day	Rat

1 The acute NOAEL of 24 mg/kg is very close to the chronic NOAEL, so chronic value is used for acute exposures as well.

Source: SERA 2004, 2007b, 2011a,b

APPENDIX C

Toxicity values <u>for birds</u> used in the effects analysis. Values represent the most sensitive endpoint from the most sensitive species for which adequate data are available.

Herbicide	Duration	Endpoint	Dose	Species
Glyphosate	Acute	NOAEL	1500 mg/kg	Mallard & Quail
	Chronic	NOAEL	58 mg/kg	Quail
Imazapyr	Acute	NOAEL	2510 mg/kg	Mallard & Quail
	Chronic	NOAEL	610 mg/kg/day	Mallard & Quail
Metsulfuron methyl	Acute	NOAEL	1043 mg/kg	Quail
	Chronic	NOAEL	120 mg/kg/day	Mallard & Quail
Aminopyralid	Acute	NOAEL	14 mg/kg	Quail
	Chronic	NOEC	184 mg/kg/day	Mallard

Source: SERA 2004, 2007b, 2011a,b

APPENDIX D

Application rates of proposed herbicides used to treat invasive plants.

Herbicide	Typical Application Rate lb. ai/ac*	Lowest Application Rate lb. ai/ac	Highest Application Rate lb. ai/ac
Glyphosate	2	0.5	8
Imazapyr	0.45	0.03	1.25
Metsulfuron Methyl	0.03	0.013	0.15
Aminopyralid	0.078	0.039	0.39

* pounds of active ingredient per acre

Source: SERA 2004, 2007b, 2011a,b

APPENDIX E

GLYPHOSATE

The following information is from SERA 2011a, unless otherwise noted.

Glyphosate is a herbicide used in Forest Service programs primarily in conifer release, site preparation, and noxious weed control. The toxicity of technical grade glyphosate is relatively well characterized for terrestrial species. Several standard toxicity studies in experimental mammals were conducted as part of the registration process for glyphosate; additionally, there is a large body of published information regarding the toxicity of glyphosate to mammals. The preponderance of available data indicates that the mammalian toxicity of Glyphosate is low, and very few specific hazards can be identified.

There are differences among the toxicities of technical grade glyphosate, glyphosate formulations that do not contain a surfactant, and some glyphosate formulations that contain polyoxyethyleneamine (POEA) surfactants. While the available information does not permit formulation-specific toxicity values, an attempt is made to discriminate between less toxic and more toxic formulations, when possible. The toxicity of the original Roundup and similar formulations containing POEA surfactants is far greater than the toxicity of technical grade glyphosate, Rodeo, or other formulations that do not contain surfactants. For this project and purposes of this analysis, only the less toxic formulations (Aquamaster or Rodeo formulation, "technical grade glyphosate"), without POEA, are considered/described.

There appears to be no notable differences in sensitivity to Glyphosate among mammals. The limited data suggest, however, that larger mammals may be somewhat more sensitive than smaller mammals, based on repeated sublethal dosing. Under laboratory testing conditions on mammals and birds, the primary negative effect was weight loss. This effect may be associated with taste aversion, toxicity, or a combination of these factors.

The current Forest Service risk assessment uses the NOAEL of 500 g/kg bw/day, based on studies on rabbits, to characterize risks for mammals associated with applications of less toxic glyphosate applications for both acute and chronic exposures (Appendix B). For acute exposure to birds, a NOAEL of 1500 mg a.e./kg wb based on bobwhite quail and mallards is used, whereas a NOAEL of 58 mg a.e./kg bw based on quail is used for acute exposures (Appendix C).

In birds, a relatively standard set of acute dietary studies are available for both technical grade glyphosate and glyphosate formulations. These studies demonstrate that there are no differences in the toxicity of technical grade glyphosate and glyphosate formulations to birds. The EPA classifies glyphosate as practically nontoxic to birds. Three reproductive studies submitted to the U.S. EPA/OPP concluded that no adverse effects on reproduction in mallards and quail are associated with dietary concentrations of up to 833 ppm. Several field studies have reported no

adverse effects on birds. Most of the studies involving Rodeo applications noted an increase in bird abundance due to increases in open water habitat. Similarly, effects on bird populations following terrestrial applications of glyphosate appear to be secondary to changes in habitat.

Most field studies provide no suggestion of adverse effects on mammalian populations, other than secondary effects which can be attributed to changes in vegetation. Most of the field studies, however, are not specifically focused and do not measure endpoints which might be associated with the toxicity of glyphosate. Two notable exceptions were studies on deer mice and voles (Ritchie et al. 1987 and Sullivan 1990), in which no adverse effects in small mammals could be associated with the Roundup spray.

For the standard application rate of 2 lb. a.e./acre (Appendix D), none of the HQs reach a level of concern (i.e. HQ≥1) for mammals (Tables E1 and E2). The highest HQs for mammals are for non-accidental acute exposures- consumption of contaminated vegetation, and range from 0.1 and 0.6 for a large and small mammal consuming contaminated vegetation (short grass), respectively, 0.2 for a small mammals consuming contaminated tall grass, to 0.3 for a small mammal consuming contaminated broadleaf foliage. Similarly, in birds, highest HQs for non-accidental acute exposures include consumption of contaminated vegetation, ranging from 0.2 for a small bird consuming contaminated tall grass to 0.5 for a small bird consuming contaminated short grass. Higher HQs are noted for chronic exposures in birds, with HQs approaching levels of concern for small birds consuming contaminated broadleaf foliage (HQ=1.0) and small bird consuming contaminated short grass (HQ=2). Consequently, appropriate protective measures may need to be taken when using glyphosate in the habitat of species likely to be affected.

Table E1

Summary of Hazard Quotients (Toxicity) for Mammals-Glyphosate (Standard Application Rate)

Application Rate:	W2	lb a.e./acre		
Scenario	**Receptor**	**Hazard Quotients**	**Toxicity Value**	
Accidental Acute Exposures				
Direct Spray				
first-order absorption	Small mammal (20g)	9E-04	**500**	NOAEL
100% absorption	Small mammal (20g)	1E-01	**500**	NOAEL
Contaminated Water				
Spill	Small mammal (20g)	3E-03	**500**	NOAEL
Spill	Larger Mammal (400g)	2E-03	**500**	NOAEL
Spill	Canid (5 kg)	2E-03	**500**	NOAEL
Spill	Large Mammal (70 kg)	1E-03	**500**	NOAEL
Consumption of contaminated Fish				
Spill	Large Mammalian Carnivore (70 kg)	3E-04	**500**	NOAEL
Spill	Canid (5 kg)	4E-04	**500**	NOAEL
Non-Accidental Acute Exposures				
Contaminated Fruit [Lowest Residue Rates]				
	Small mammal (20g)	6E-02	**500**	NOAEL
	Larger Mammal (400g)	1E-02	**500**	NOAEL
	Large Mammal (70 kg)	8E-03	**500**	NOAEL
Contaminated Broadleaf Foliage				
	Small mammal (20g)	0.3	**500**	NOAEL
	Larger Mammal (400g)	7E-02	**500**	NOAEL
	Large Mammal (70 kg)	4E-02	**500**	NOAEL
Contaminated Tall Grass				
	Small mammal (20g)	0.2	**500**	NOAEL
	Larger Mammal (400g)	6E-02	**500**	NOAEL
	Large Mammal (70 kg)	3E-02	**500**	NOAEL
Contaminated Short Grass [Highest Residue Rate]				
	Small mammal (20g)	0.6	**500**	NOAEL
	Larger Mammal (400g)	0.1	**500**	NOAEL
	Large Mammal (70 kg)	7E-02	**500**	NOAEL
Contaminated Water				
	Small mammal (20g)	6E-06	**500**	NOAEL
	Larger Mammal (400g)	5E-06	**500**	NOAEL
	Canid (5 kg)	4E-06	**500**	NOAEL
	Large Mammal (70 kg)	3E-06	**500**	NOAEL
Contaminated Insects				
	Small mammal (20g)	8E-02	**500**	NOAEL
	Larger Mammal (400g)	2E-02	**500**	NOAEL
Consumption of small mammal (after direct spray) by predator				
	Canid (5 kg)	1E-02	**500**	NOAEL
Consumption of contaminated Fish				
	Large Mammalian Carnivore (70 kg)	7E-07	**500**	NOAEL

	Canid (5 kg)	1E-06	**500**	NOAEL
Chronic/Longer Term Exposures				
Contaminated Fruit [Lowest Residue Rates]				
	Small mammal (20g)	1E-02	**500**	NOAEL
	Larger Mammal (400g)	2E-03	**500**	NOAEL
	Large Mammal (70 kg)	1E-03	**500**	NOAEL
Contaminated Broadleaf Foliage				
	Small mammal (20g)	5E-02	**500**	NOAEL
	Larger Mammal (400g)	1E-02	**500**	NOAEL
	Large Mammal (70 kg)	6E-03	**500**	NOAEL
Contaminated Tall Grass				
	Small mammal (20g)	4E-02	**500**	NOAEL
	Larger Mammal (400g)	9E-03	**500**	NOAEL
	Large Mammal (70 kg)	5E-03	**500**	NOAEL
Contaminated Short Grass [Highest Residue Rate]				
	Small mammal (20g)	9E-02	**500**	NOAEL
	Larger Mammal (400g)	2E-02	**500**	NOAEL
	Large Mammal (70 kg)	1E-02	**500**	NOAEL
Contaminated Water				
	Small mammal (20g)	1E-07	**500**	NOAEL
	Larger Mammal (400g)	8E-08	**500**	NOAEL
	Canid (5 kg)	6E-08	**500**	NOAEL
	Large Mammal (70 kg)	5E-08	**500**	NOAEL
Consumption of contaminated Fish				
	Large Mammalian Carnivore (70 kg)	1E-08	**500**	NOAEL
	Canid (5 kg)	2E-08	**500**	NOAEL

Summary of Hazard Quotients (Toxicity) for the Mammals

G01V6Mam

Application Rate:	**8**	**lb a.e./acre**			
					G01V6Mam
Scenario	**Receptor**	**Hazard Quotients**			**Toxicity Value**
		Central	**Lower**	**Upper**	
Accidental Acute Exposures					
Direct Spray					
first-order absorption	Small mammal (20g)	4E-03	1E-03	9E-03	**500** NOAEL
100% absorption	Small mammal (20g)	0.4	0.2	0.8	**500** NOAEL
Contaminated Water					
Spill	Small mammal (20g)	1E-02	8E-04	4E-02	**500** NOAEL
Spill	Larger Mammal (400g)	8E-03	6E-04	3E-02	**500** NOAEL
Spill	Canid (5 kg)	6E-03	5E-04	2E-02	**500** NOAEL
Spill	Large Mammal (70 kg)	5E-03	4E-04	2E-02	**500** NOAEL
Consumption of contaminated Fish					
Spill	Large Mammalian Carnivore (70 kg)	1E-03	9E-06	3E-02	**500** NOAEL
Spill	Canid (5 kg)	2E-03	1E-05	4E-02	**500** NOAEL
Non-Accidental Acute Exposures					
Contaminated Fruit [Lowest Residue Rates]					
	Small mammal (20g)	0.3	3E-02	0.9	**500** NOAEL
	Larger Mammal (400g)	6E-02	8E-03	0.2	**500** NOAEL
	Large Mammal (70 kg)	3E-02	5E-03	0.1	**500** NOAEL
Contaminated Broadleaf Foliage					
	Small mammal (20g)	**1.2**	0.1	**6**	**500** NOAEL
	Larger Mammal (400g)	0.3	3E-02	**1.4**	**500** NOAEL
	Large Mammal (70 kg)	0.2	2E-02	0.8	**500** NOAEL

Contaminated Tall Grass					
Small mammal (20g)	1.0	1E-01	**5**	**500**	NOAEL
Larger Mammal (400g)	0.2	2E-02	**1.2**	**500**	NOAEL
Large Mammal (70 kg)	0.1	1E-02	0.7	**500**	NOAEL
Contaminated Short Grass [Highest Residue Rate]					
Small mammal (20g)	**2**	0.2	**11**	**500**	NOAEL
Larger Mammal (400g)	0.5	6E-02	**3**	**500**	NOAEL
Large Mammal (70 kg)	0.3	3E-02	**1.4**	**500**	NOAEL
Contaminated Water					
Small mammal (20g)	3E-05	3E-06	2E-04	**500**	NOAEL
Larger Mammal (400g)	2E-05	2E-06	1E-04	**500**	NOAEL
Canid (5 kg)	1E-05	2E-06	1E-04	**500**	NOAEL
Large Mammal (70 kg)	1E-05	1E-06	9E-05	**500**	NOAEL
Contaminated Insects					
Small mammal (20g)	0.3	3E-02	**1.6**	**500**	NOAEL
Larger Mammal (400g)	7E-02	7E-03	0.4	**500**	NOAEL
Consumption of small mammal (after direct spray) by predator					
Canid (5 kg)	4E-02	1E-02	7E-02	**500**	NOAEL
Consumption of contaminated Fish					
Large Mammalian Carnivore (70 kg)	3E-06	3E-08	1E-04	**500**	NOAEL
Canid (5 kg)	4E-06	5E-08	2E-04	**500**	NOAEL
Chronic/Longer Term Exposures					
Contaminated Fruit [Lowest Residue Rates]					
Small mammal (20g)	4E-02	6E-03	0.1	**500**	NOAEL
Larger Mammal (400g)	9E-03	1E-03	3E-02	**500**	NOAEL
Large Mammal (70 kg)	5E-03	7E-04	2E-02	**500**	NOAEL
Contaminated Broadleaf Foliage					
Small mammal (20g)	0.2	2E-02	1.0	**500**	NOAEL
Larger Mammal (400g)	4E-02	4E-03	0.2	**500**	NOAEL
Large Mammal (70 kg)	3E-02	3E-03	0.1	**500**	NOAEL
Contaminated Tall Grass					
Small mammal (20g)	0.2	2E-02	0.8	**500**	NOAEL
Larger Mammal (400g)	4E-02	4E-03	0.2	**500**	NOAEL
Large Mammal (70 kg)	2E-02	2E-03	0.1	**500**	NOAEL
Contaminated Short Grass [Highest Residue Rate]					
Small mammal (20g)	0.4	4E-02	**1.8**	**500**	NOAEL
Larger Mammal (400g)	8E-02	9E-03	0.4	**500**	NOAEL
Large Mammal (70 kg)	5E-02	5E-03	0.2	**500**	NOAEL
Contaminated Water					
Small mammal (20g)	4E-07	2E-07	1E-05	**500**	NOAEL
Larger Mammal (400g)	3E-07	2E-07	1E-05	**500**	NOAEL
Canid (5 kg)	3E-07	1E-07	8E-06	**500**	NOAEL
Large Mammal (70 kg)	2E-07	9E-08	6E-06	**500**	NOAEL
Consumption of contaminated Fish					
Large Mammalian Carnivore (70 kg)	5E-08	2E-09	8E-06	**500**	NOAEL
Canid (5 kg)	7E-08	3E-09	1E-05	**500**	NOAEL

Table E2

Summary of Hazard Quotients (Toxicity) for Birds- Glyphosate (Standard Application Rate)

Application Rate:	2	lb a.e./acre		
Scenario	**Receptor**	**Hazard Quotients**	**Toxicity Value**	
Accidental Acute Exposures				
Contaminated Water				
Spill	Small bird (10g)	2E-03	**1500**	NOAEL
Spill	Large Bird (4 kg)	2E-04	**1500**	NOAEL
Consumption of contaminated Fish				
Spill	Fish-eating bird (2.4 kg)	2E-04	**1500**	NOAEL
Non-Accidental Acute Exposures				
Contaminated Fruit [Lowest Residue Rates]				
	Small bird (10g)	5E-02	**1500**	NOAEL
	Large Bird (4 kg)	5E-03	**1500**	NOAEL
Contaminated Broadleaf Foliage				
	Small bird (10g)	0.3	**1500**	NOAEL
	Large Bird (4 kg)	3E-02	**1500**	NOAEL
Contaminated Tall Grass				
	Small bird (10g)	0.2	**1500**	NOAEL
	Large Bird (4 kg)	2E-02	**1500**	NOAEL
Contaminated Short Grass [Highest Residue Rate]				
	Small bird (10g)	0.5	**1500**	NOAEL
	Large Bird (4 kg)	5E-02	**1500**	NOAEL
Contaminated Water				
	Small bird (10g)	4E-06	**1500**	NOAEL
	Large Bird (4 kg)	5E-07	**1500**	NOAEL
Contaminated Insects				
	Small bird (10g)	6E-02	**1500**	NOAEL
Consumption of small mammal (after direct spray) by predator				
	Carnivorous bird (640 g)	4E-03	**1500**	NOAEL
Consumption of contaminated Fish				
	Fish-eating bird (2.4 kg)	4E-07	**1500**	NOAEL
Chronic/Longer Term Exposures				
Contaminated Fruit (Lowest Residue Rate)				
	Small bird (10g)	0.2	**58**	NOAEL
	Large Bird (4 kg)	2E-02	**58**	NOAEL
Contaminated Broadleaf Foliage				
	Small bird (10g)	**1.0**	**58**	NOAEL
	Large Bird (4 kg)	0.1	**58**	NOAEL
Contaminated Tall Grass				
	Small bird (10g)	0.8	**58**	NOAEL
	Large Bird (4 kg)	9E-02	**58**	NOAEL
Contaminated Vegetation (Short Grass - Highest Residue Rate)				
	Small bird (10g)	**2.0**	**58**	NOAEL
	Large Bird (4 kg)	0.2	**58**	NOAEL
Contaminated Water				

	Small bird (10g)	2E-06		**58**	NOAEL
	Large Bird (4 kg)	2E-07		**58**	NOAEL
Consumption of contaminated Fish					
	Fish-eating bird (2.4 kg)	2E-07		**58**	NOAEL

Summary of Hazard Quotients (Toxicity) for the Birds (highest application rate) G01V6Brd

Application Rate:	**8**	**lb a.e./acre**			G01V6Brd	
Scenario	**Receptor**	**Hazard Quotients**			**Toxicity Value**	
		Central	**Lower**	**Upper**		
Accidental Acute Exposures						
Contaminated Water						
Spill	Small bird (10g)	7E-03	5E-04	3E-02	**1500**	NOAEL
Spill	Large Bird (4 kg)	9E-04	7E-05	4E-03	**1500**	NOAEL
Consumption of contaminated Fish						
Spill	Fish-eating bird (2.4 kg)	6E-04	5E-06	1E-02	**1500**	NOAEL
Non-Accidental Acute Exposures						
Contaminated Fruit [Lowest Residue Rates]						
	Small bird (10g)	0.2	3E-02	0.7	**1500**	NOAEL
	Large Bird (4 kg)	2E-02	3E-03	8E-02	**1500**	NOAEL
Contaminated Broadleaf Foliage						
	Small bird (10g)	**1.0**	0.1	**5**	**1500**	NOAEL
	Large Bird (4 kg)	0.1	1E-02	0.6	**1500**	NOAEL
Contaminated Tall Grass						
	Small bird (10g)	0.8	8E-02	**4**	**1500**	NOAEL
	Large Bird (4 kg)	9E-02	9E-03	0.5	**1500**	NOAEL
Contaminated Short Grass [Highest Residue Rate]						
	Small bird (10g)	**1.9**	0.2	**9**	**1500**	NOAEL
	Large Bird (4 kg)	0.2	2E-02	**1.0**	**1500**	NOAEL
Contaminated Water						
	Small bird (10g)	2E-05	2E-06	1E-04	**1500**	NOAEL
	Large Bird (4 kg)	2E-06	3E-07	2E-05	**1500**	NOAEL
Contaminated Insects						
	Small bird (10g)	0.2	2E-02	**1.2**	**1500**	NOAEL
Consumption of small mammal (after direct spray) by predator						
	Carnivorous bird (640 g)	2E-02	5E-03	3E-02	**1500**	NOAEL
Consumption of contaminated Fish						
	Fish-eating bird (2.4 kg)	2E-06	2E-08	6E-05	**1500**	NOAEL
Chronic/Longer Term Exposures						
Contaminated Fruit (Lowest Residue Rate)						
	Small bird (10g)	0.8	0.1	**3**	**58**	NOAEL
	Large Bird (4 kg)	9E-02	1E-02	0.3	**58**	NOAEL
Contaminated Broadleaf Foliage						
	Small bird (10g)	**4**	0.4	**21**	**58**	NOAEL
	Large Bird (4 kg)	0.5	5E-02	**2**	**58**	NOAEL
Contaminated Tall Grass						
	Small bird (10g)	**3**	0.3	**17**	**58**	NOAEL
	Large Bird (4 kg)	0.4	4E-02	**2.0**	**58**	NOAEL
Contaminated Vegetation (Short Grass - Highest Residue Rate)						
	Small bird (10g)	**8**	0.8	**38**	**58**	NOAEL
	Large Bird (4 kg)	0.9	9E-02	**4**	**58**	NOAEL
Contaminated Water						

Small bird (10g)	7E-06	3E-06	2E-04	**58**	NOAEL
Large Bird (4 kg)	1E-06	5E-07	3E-05	**58**	NOAEL
Consumption of contaminated Fish					
Fish-eating bird (2.4 kg)	7E-07	3E-08	1E-04	**58**	NOAEL

APPENDIX F

METSULFURON METHYL

The following information is from SERA 2004, unless otherwise noted.

Metsulfuron methyl is an effective and potent herbicide, used primarily to control many annual and perennial weeds and woody plants. The Forest Service uses Metsulfuron methyl primarily for control of noxious weeds. The risk assessment applies only to ground broadcast applications. When used in directed foliar applications (i.e., backpack), offsite drift could be reduced substantially but the extent of this reduction cannot be quantified.

The mammalian toxicity of metsulfuron methyl is relatively well characterized in experimental mammals; however, there is relatively little information regarding nontarget wildlife species. It is likely that the most sensitive effects in wildlife species will be the same as those in experimental mammals. In standard experimental toxicity studies, Metsulfuron methyl has low acute oral toxicity.

The mode of action of Metsulfuron methyl in mammals is not well understood. The most consistent toxic effect observed in mammals from exposure is body weight loss; furthermore, there is some information suggesting that Metsulfuron methyl may influence glucose and cholesterol metabolism. Other than these effects, Metsulfuron methyl does not appear to cause specific target organ toxicity in mammals. Several acute toxicity studies and two reproduction studies are available on the toxicity of metsulfuron methyl to birds, with the major effect again being decreased body weight gain.

Acute and subchronic studies on Metsulfuron methyl have been conducted in bobwhite quail and mallard ducks. The most relevant studies for assessing the longer-term toxicity of Metsulfuron methyl demonstrated that dietary levels of up to 1000 ppm had no effect on body weight, food consumption, or reproductive performance on these bird species. Thus, for both bobwhite quail and mallard ducks, the NOAEL for chronic dietary exposure is 1000 ppm, the highest dose tested. Results of all acute exposure studies in birds show that Metsulfuron methyl has very low toxicity, with LD50 values exceeding 2250 mg/kg/ by gavage and exceeding 5620 ppm in the diet.

For mammals, the dose-response assessment for Metsulfuron methyl is based on the same data as the human health risk assessment; a chronic NOAEL of 25 mg/kg/day based on rats for both acute and chronic exposures (Appendix B). Birds appear to be substantially less sensitive to Metsulfuron methyl than mammals with an acute NOAEL of 1043 mg/kg/day and a chronic NOAEL of 120/mg/kg/day (Appendix C).

For the standard application rate of 0.03 lb. a.e/acre (Appendix D), none of the HQs for acute or chronic exposure scenarios approach a level of concern (Tables F1 and F2) in mammals or birds. The highest HQ for the typical application rate is 0.2 for a small mammal consuming contaminated

vegetation. This scenario assumes that the vegetation is treated and that the animal stays in the treated areas consuming nothing but the contaminated vegetation; thus this should be considered a conservative scenario. Consequently, there is no evidence that effects are likely from the application of Metsulfuron methyl at the standard application rate. Higher (≥0.1) HQs are noted at the upper application rate; however, none of the HQs reach or exceed the level of concern (HQ≥1).

In summary, the evidence presented in the risk analysis suggests that no adverse effects in mammals or birds are plausible using typical or worst-case chronic exposure assumptions at the typical application rate of 0.03 lb. a.e./acre, or the maximum application rate of 0.15 lb. a.e./acre.

Table F1

Summary of Hazard Quotients (Toxicity) for Mammals-Metsulfuron Methyl (Standard Application Rate)

Application Rate:	0.03	lb a.i./acre		
Scenario	**Receptor**	**Hazard Quotients**	**Toxicity Value**	
Accidental Acute Exposures				
Direct Spray				
first-order absorption	Small mammal (20g)	6E-05	25	NOAEL
100% absorption	Small mammal (20g)	3E-02	25	NOAEL
Contaminated Water				
Spill	Small mammal (20g)	2E-04	25	NOAEL
Spill	Larger Mammal (400g)	1E-04	25	NOAEL
Spill	Canid (5 kg)	9E-05	25	NOAEL
Spill	Large Mammal (70 kg)	7E-05	25	NOAEL
Consumption of contaminated Fish				
Spill	Large Mammalian Carnivore (70 kg)	7E-06	25	NOAEL
Spill	Canid (5 kg)	1E-05	25	NOAEL
Non-Accidental Acute Exposures				
Contaminated Fruit [Lowest Residue Rates]				
	Small mammal (20g)	2E-02	25	NOAEL
	Larger Mammal (400g)	4E-03	25	NOAEL
	Large Mammal (70 kg)	2E-03	25	NOAEL
Contaminated Broadleaf Foliage				
	Small mammal (20g)	9E-02	25	NOAEL
	Larger Mammal (400g)	2E-02	25	NOAEL
	Large Mammal (70 kg)	1E-02	25	NOAEL
Contaminated Tall Grass				
	Small mammal (20g)	7E-02	25	NOAEL
	Larger Mammal (400g)	2E-02	25	NOAEL
	Large Mammal (70 kg)	1E-02	25	NOAEL
Contaminated Short Grass [Highest Residue Rate]				
	Small mammal (20g)	0.2	25	NOAEL
	Larger Mammal (400g)	4E-02	25	NOAEL
	Large Mammal (70 kg)	2E-02	25	NOAEL
Contaminated Water				
	Small mammal (20g)	4E-07	25	NOAEL
	Larger Mammal (400g)	3E-07	25	NOAEL
	Canid (5 kg)	2E-07	25	NOAEL
	Large Mammal (70 kg)	2E-07	25	NOAEL
Contaminated Insects				
	Small mammal (20g)	2E-02	25	NOAEL
	Larger Mammal (400g)	5E-03	25	NOAEL
Consumption of small mammal (after direct spray) by predator				
	Canid (5 kg)	3E-03	25	NOAEL
Consumption of contaminated Fish				
	Large Mammalian Carnivore (70 kg)	1E-08	25	NOAEL
	Canid (5 kg)	2E-08	25	NOAEL
Chronic/Longer Term Exposures				

Contaminated Fruit [Lowest Residue Rates]			
Small mammal (20g)	8E-03	25	NOAEL
Larger Mammal (400g)	2E-03	25	NOAEL
Large Mammal (70 kg)	1E-03	25	NOAEL
Contaminated Broadleaf Foliage			
Small mammal (20g)	4E-02	25	NOAEL
Larger Mammal (400g)	9E-03	25	NOAEL
Large Mammal (70 kg)	5E-03	25	NOAEL
Contaminated Tall Grass			
Small mammal (20g)	3E-02	25	NOAEL
Larger Mammal (400g)	7E-03	25	NOAEL
Large Mammal (70 kg)	4E-03	25	NOAEL
Contaminated Short Grass [Highest Residue Rate]			
Small mammal (20g)	7E-02	25	NOAEL
Larger Mammal (400g)	2E-02	25	NOAEL
Large Mammal (70 kg)	9E-03	25	NOAEL
Contaminated Water			
Small mammal (20g)	4E-08	25	NOAEL
Larger Mammal (400g)	3E-08	25	NOAEL
Canid (5 kg)	2E-08	25	NOAEL
Large Mammal (70 kg)	2E-08	25	NOAEL
Consumption of contaminated Fish			
Large Mammalian Carnivore (70 kg)	1E-09	25	NOAEL
Canid (5 kg)	2E-09	25	NOAEL

Risk Characterization for Terrestrial Animals at Central Application Rate

Application Rate: **0.15** **lbs/acre**

Application Rate Factor: **1** **unitless**

Exposure Worksheet: **G01** **TrToxSum**

Scenario	Receptor	Hazard Quotient			Toxicity Value	
		Central	Lower	Upper		
Acute/Accidental Exposures (mg/kg/event)					G01-1App	
Direct Spray						
first-order absorption	Small mammal	3E-04	4E-05	2E-03	25	NOAEL
100% absorption	Small mammal	0.1	0.1	0.1	25	NOAEL
100% absorption	Honey Bee	9E-02	9E-02	9E-02	270	NOAEL
Contaminated Vegetation						
Fruit	Small Mammal	8E-03	8E-03	2E-02	25	NOAEL
Grass	Large Mammal	0.1	0.1	0.3	25	NOAEL
Grass	Large Bird	4E-03	4E-03	1E-02	1043	NOAEL
Contaminated Water						
Accidental spill	Small Mammal	2E-03	2E-04	8E-03	25	NOAEL
Expected Peak Conc.		2E-06	9E-08	9E-06	25	NOAEL
Contaminated Insects						
	Small Mammal	0.1	0.1	0.4	25	NOAEL
	Small Bird	5E-03	5E-03	2E-02	1043	NOAEL
Consumption of contaminated Fish						

Accidental spill	Fish-eating bird	5E-06	3E-07	4E-05	1043	NOAEL
Consumption of contaminated small mammal						
	Carnivorous mammal	1E-02	1E-02	1E-02	25	NOAEL
	Carnivorous bird	5E-04	5E-04	5E-04	1043	NOAEL
Chronic/Longer Term Exposures (dose in mg/kg/day)						
Contaminated Vegetation						
On-site	Small Mammal	3E-04	2E-04	1E-03	25	NOAEL
Off-Site		3E-06	9E-07	3E-05	25	NOAEL
On-Site	Large Mammal	1E-02	4E-03	0.1	25	NOAEL
Off-Site		4E-04	3E-04	2E-03	25	NOAEL
On-Site	Large Bird	4E-03	1E-03	4E-02	120	NOAEL
Off-Site		1E-04	8E-05	7E-04	120	NOAEL
Contaminated Water						
Water consumption	Small Mammal	2E-07	9E-08	4E-07	25	NOAEL
Consumption of contaminated Fish						
chronic	Fish-eating bird	5E-08	1E-08	2E-07	120	NOAEL

Table F2

Summary of Hazard Quotients (Toxicity) for Birds-Metsulfuron Methyl (Standard Application Rate)

Application Rate:	0.03	lb a.i./acre		
Scenario	**Receptor**	**Hazard Quotients**	**Toxicity Value**	
Accidental Acute Exposures				
Contaminated Water				
Spill	Small bird (10g)	7E-06	**1043**	NOAEL
Spill	Large Bird (4 kg)	1E-06	**1043**	NOAEL
Consumption of contaminated Fish				
Spill	Fish-eating bird (2.4 kg)	3E-07	**1043**	NOAEL
Non-Accidental Acute Exposures				
Contaminated Fruit [Lowest Residue Rates]				
	Small bird (10g)	1E-03	**1043**	NOAEL
	Large Bird (4 kg)	1E-04	**1043**	NOAEL
Contaminated Broadleaf Foliage				
	Small bird (10g)	5E-03	**1043**	NOAEL
	Large Bird (4 kg)	6E-04	**1043**	NOAEL
Contaminated Tall Grass				
	Small bird (10g)	4E-03	**1043**	NOAEL
	Large Bird (4 kg)	5E-04	**1043**	NOAEL
Contaminated Short Grass [Highest Residue Rate]				
	Small bird (10g)	1E-02	**1043**	NOAEL
	Large Bird (4 kg)	1E-03	**1043**	NOAEL
Contaminated Water				
	Small bird (10g)	2E-08	**1043**	NOAEL
	Large Bird (4 kg)	2E-09	**1043**	NOAEL
Contaminated Insects				
	Small bird (10g)	1E-03	**1043**	NOAEL
Consumption of small mammal (after direct spray) by predator				
	Carnivorous bird (640 g)	9E-05	**1043**	NOAEL
Consumption of contaminated Fish				
	Fish-eating bird (2.4 kg)	6E-10	**1043**	NOAEL
Chronic/Longer Term Exposures				
Contaminated Fruit (Lowest Residue Rate)				
	Small bird (10g)	4E-03	**120**	NOAEL
	Large Bird (4 kg)	4E-04	**120**	NOAEL
Contaminated Broadleaf Foliage				
	Small bird (10g)	2E-02	**120**	NOAEL
	Large Bird (4 kg)	2E-03	**120**	NOAEL
Contaminated Tall Grass				
	Small bird (10g)	2E-02	**120**	NOAEL
	Large Bird (4 kg)	2E-03	**120**	NOAEL
Contaminated Vegetation (Short Grass - Highest Residue Rate)				
	Small bird (10g)	4E-02	**120**	NOAEL
	Large Bird (4 kg)	4E-03	**120**	NOAEL
Contaminated Water				

Small bird (10g)	1E-08	**120**	NOAEL
Large Bird (4 kg)	2E-09	**120**	NOAEL
Consumption of contaminated Fish			
Fish-eating bird (2.4 kg)	5E-10	**120**	NOAEL

APPENDIX G

IMAZAPYR

The following information/section is from SERA 2011b, unless otherwise noted..

Imazapyr is a herbicide used in Forest Service vegetation management programs to control a variety of grasses, broadleaf weeds, vines, and brush species. Impazapyr is an effective herbicide for the control of both terrestrial and aquatic vegetation. While some adverse effects on nontarget plants may be anticipated, there are no data that indicates that applications of Imazapyr will pose any substantial risk to humans or other mammals. The U.S. EPA/OPP classifies Imazapyr as *practically non-toxic* to mammals, birds, honeybees, fish, and aquatic invertebrates. None of the expected (non-accidental) exposures to these groups of animals raise substantial concern; indeed, most accidental exposures raise only minimal concern. As with most ecological risk assessments, the largely benign assessment of the hazards or lack of hazards to most groups of nontarget species is tempered by the fact that toxicity data are available on only a few species.

While the toxicity of Imazapyr to plants is relatively understood, it is not clear what, if any, specific toxicity Imazapyr may cause in mammalian wildlife. Acute, subchronic, and chronic toxicity studies on Imazapyr do not demonstrate adverse effects that are unequivocally attributable to exposure. This uncertainly or a lack of knowledge has a relatively minor impact on the risk assessment, because the available toxicity studies are relatively complete (chronic studies in three mammalian species (dogs, rats, and mice) and several reproductive studies in rats and rabbits) and indicate that Imazapyr is not likely to be associated with adverse effects at relatively high-dose levels.

The standard array of studies to assess the acute, subchronic, and chronic toxicity of pesticides, including effects on reproduction and development, indicate that Imazapyr causes adverse effects in mammals only at doses of 1000 mg a.e./kg or more. However, for the current Forest Service risk assessment, the more conservative NOAEL value from a chronic study in canids is used (Appendix B). For chronic toxicity in birds, a dose of 610 mg a.e./kg bw/day for bobwhite quail used (Appendix C)

As with mammals, the available avian studies on Imazapyr indicate a low order of toxicity in birds. The current Forest Service risk assessment adopts the approach taken in U.S. EPA/OPP and uses the gavage NOAEL of 2510 mg a.e./kg bw in quail and mallards to characterize risks associated with acute exposures to Imazapyr (Appendix C). Similarly, longer term reproduction studies on Imazapyr acid indicate no adverse effects following exposures to dietary concentrations of up to 2000 ppm a.e. A field study (Brooks et al. 1995) reported that no changes in bird populations were observed after Imazapyr was applied at about 3.7 lb a.e./acre. More recently, Welch et al.

(2004) indicates that Imazapyr can improve bobwhite quail habitat by controlling hardwood invasion in pine stands.

The exposure assessment for mammals considers five nontarget animals of varying sizes: small (20g) and medium (400g) sized omnivores, a 5kg canid, a 70kg herbivore, and a 70 kg carnivore. Four standard avian receptors are considered: a 10 g passerine, a 640 g predatory bird, a 2.4 kg piscivorous bird, and a 4 kg herbivorous bird. Because of presumed differences in diet, all of the mammalian and avian receptors are not considered in all of the exposure scenarios.

For both aquatic and terrestrial applications, none of the HQs for mammals approach a level of concern (i.e. HQ≥1; Tables G1 and G2). Similarly, none of the HQs for aquatic or terrestrial applications reach a level of concern for birds. The highest HQ for birds, 0.1, is for a small bird consuming contaminated vegetation (short grass, which has the highest residue rate). However, this is still well below the level of concern, and this exposure scenario for the exclusive consumption of contaminated grass by a small bird should be viewed as an extreme worst-case scenario.

Table G1

Summary of Hazard Quotients (Toxicity) for Mammals-Imazapyr (Standard Application Rate)

Application Rate:	0.45	lb a.e./acre		
Scenario	**Receptor**	**Hazard Quotients**	**Toxicity Value**	
Accidental Acute Exposures				
Direct Spray				
first-order absorption	Small mammal (20g)	4E-04	**738**	NOAEL
100% absorption	Small mammal (20g)	1E-02	**738**	NOAEL
Contaminated Water				
Spill	Small mammal (20g)	2E-04	**738**	NOAEL
Spill	Larger Mammal (400g)	2E-04	**738**	NOAEL
Spill	Canid (5 kg)	3E-04	**250**	NOAEL
Spill	Large Mammal (70 kg)	9E-05	**738**	NOAEL
Consumption of contaminated Fish				
Spill	Large Mammalian Carnivore (70 kg)	2E-05	**738**	NOAEL
Spill	Canid (5 kg)	9E-05	**250**	NOAEL
Non-Accidental Acute Exposures				
Contaminated Fruit [Lowest Residue Rates]				
	Small mammal (20g)	1E-02	**738**	NOAEL
	Larger Mammal (400g)	2E-03	**738**	NOAEL
	Large Mammal (70 kg)	1E-03	**738**	NOAEL
Contaminated Broadleaf Foliage				
	Small mammal (20g)	5E-02	**738**	NOAEL
	Larger Mammal (400g)	1E-02	**738**	NOAEL
	Large Mammal (70 kg)	6E-03	**738**	NOAEL
Contaminated Tall Grass				
	Small mammal (20g)	4E-02	**738**	NOAEL
	Larger Mammal (400g)	8E-03	**738**	NOAEL
	Large Mammal (70 kg)	5E-03	**738**	NOAEL
Contaminated Short Grass [Highest Residue Rate]				
	Small mammal (20g)	9E-02	**738**	NOAEL
	Larger Mammal (400g)	2E-02	**738**	NOAEL
	Large Mammal (70 kg)	1E-02	**738**	NOAEL
Contaminated Water				
	Small mammal (20g)	2E-06	**738**	NOAEL
	Larger Mammal (400g)	1E-06	**738**	NOAEL
	Canid (5 kg)	3E-06	**250**	NOAEL
	Large Mammal (70 kg)	8E-07	**738**	NOAEL
Contaminated Insects				
	Small mammal (20g)	1E-02	**738**	NOAEL
	Larger Mammal (400g)	3E-03	**738**	NOAEL
Consumption of small mammal (after direct spray) by predator				
	Canid (5 kg)	5E-03	**250**	NOAEL
Consumption of contaminated Fish				
	Large Mammalian Carnivore (70 kg)	2E-07	**738**	NOAEL

	Canid (5 kg)	8E-07	**250**	NOAEL
Chronic/Longer Term Exposures				
Contaminated Fruit [Lowest Residue Rates]				
	Small mammal (20g)	4E-03	**738**	NOAEL
	Larger Mammal (400g)	9E-04	**738**	NOAEL
	Large Mammal (70 kg)	5E-04	**738**	NOAEL
Contaminated Broadleaf Foliage				
	Small mammal (20g)	2E-02	**738**	NOAEL
	Larger Mammal (400g)	4E-03	**738**	NOAEL
	Large Mammal (70 kg)	3E-03	**738**	NOAEL
Contaminated Tall Grass				
	Small mammal (20g)	2E-02	**738**	NOAEL
	Larger Mammal (400g)	4E-03	**738**	NOAEL
	Large Mammal (70 kg)	2E-03	**738**	NOAEL
Contaminated Short Grass [Highest Residue Rate]				
	Small mammal (20g)	4E-02	**738**	NOAEL
	Larger Mammal (400g)	8E-03	**738**	NOAEL
	Large Mammal (70 kg)	5E-03	**738**	NOAEL
Contaminated Water				
	Small mammal (20g)	6E-07	**738**	NOAEL
	Larger Mammal (400g)	5E-07	**738**	NOAEL
	Canid (5 kg)	1E-06	**250**	NOAEL
	Large Mammal (70 kg)	3E-07	**738**	NOAEL
Consumption of contaminated Fish				
	Large Mammalian Carnivore (70 kg)	6E-08	**738**	NOAEL
	Canid (5 kg)	3E-07	**250**	NOAEL

Summary of Hazard Quotients (Toxicity) for the Terrestrial Animals (highest application rate) G01V6

Application Rate:	**1.5**	**lb a.e./acre**			G01V6
Scenario	**Receptor**	**Hazard Quotients**			**Toxicity Value**
		Central	**Lower**	**Upper**	
Accidental Acute Exposures					
Direct Spray					
first-order absorption	Small mammal (20g)	1E-03	5E-04	3E-03	**738** NOAEL
100% absorption	Small mammal (20g)	5E-02	5E-02	5E-02	**738** NOAEL
Contaminated Water					
Spill	Small mammal (20g)	7E-04	3E-05	5E-03	**738** NOAEL
Spill	Larger Mammal (400g)	5E-04	2E-05	4E-03	**738** NOAEL
Spill	Canid (5 kg)	1E-03	5E-05	9E-03	**250** NOAEL
Spill	Large Mammal (70g)	3E-04	1E-05	2E-03	**738** NOAEL
Spill	Small bird (10g)	4E-04	1E-05	3E-03	**2510** NOAEL
Spill	Large Bird (4 kg)	5E-05	2E-06	4E-04	**2510** NOAEL
Consumption of contaminated Fish					
Spill	Large Mammalian Carnivore (70 kg)	7E-05	3E-07	3E-03	**738** NOAEL
Spill	Canid (5 kg)	3E-04	1E-06	1E-02	**250** NOAEL
Spill	Fish-eating bird (2.4 kg)	3E-05	1E-07	2E-03	**2510** NOAEL
Non-Accidental Acute Exposures					
Contaminated Fruit (Lowest Residue Rate)					
	Small mammal (20g)	3E-02	4E-03	0.1	**738** NOAEL
	Larger Mammal (400g)	7E-03	1E-03	3E-02	**738** NOAEL

Large Mammal (70g)	4E-03	6E-04	2E-02	**738**	NOAEL
Small bird (10g)	2E-02	3E-03	8E-02	**2510**	NOAEL
Large Bird (4 kg)	2E-03	3E-04	9E-03	**2510**	NOAEL
Contaminated Vegetation (Short Grass - Highest Residue Rate)					
Small mammal (20g)	0.3	3E-02	**1.4**	**738**	NOAEL
Larger Mammal (400g)	7E-02	7E-03	0.3	**738**	NOAEL
Large Mammal	4E-02	4E-03	0.2	**738**	NOAEL
Small bird (10g)	0.2	2E-02	**1.0**	**2510**	NOAEL
Large Bird (4 kg)	2E-02	3E-03	0.1	**2510**	NOAEL
Contaminated Water					
Small mammal (20g)	6E-06	3E-09	8E-05	**738**	NOAEL
Larger Mammal (400g)	4E-06	2E-09	6E-05	**738**	NOAEL
Canid (5 kg)	1E-05	5E-09	1E-04	**250**	NOAEL
Large Mammal (70g)	3E-06	1E-09	3E-05	**738**	NOAEL
Small bird (10g)	3E-06	1E-09	4E-05	**2510**	NOAEL
Large Bird (4 kg)	4E-07	2E-10	6E-06	**2510**	NOAEL
Contaminated Insects					
Small mammal (20g)	4E-02	4E-03	0.2	**738**	NOAEL
Larger Mammal (400g)	9E-03	9E-04	5E-02	**738**	NOAEL
Small bird (10g)	3E-02	3E-03	0.1	**2510**	NOAEL
Consumption of small mammal (after direct spray) by predator					
Canid (5 kg)	2E-02	2E-02	2E-02	**250**	NOAEL
Carnivorous bird (640 g)	2E-03	2E-03	2E-03	**2510**	NOAEL
Consumption of contaminated Fish					
Large Mammalian Carnivore (70 kg)	6E-07	3E-11	4E-05	**738**	NOAEL
Canid (5 kg)	3E-06	1E-10	2E-04	**250**	NOAEL
Fish-eating bird (2.4 kg)	3E-07	1E-11	2E-05	**2510**	NOAEL
Chronic/Longer Term Exposures					
Contaminated Fruit (Lowest Residue Rate)					
Small mammal (20g)	1E-02	1E-03	6E-02	**738**	NOAEL
Larger Mammal (400g)	3E-03	2E-04	1E-02	**738**	NOAEL
Large Mammal (70g)	2E-03	1E-04	7E-03	**738**	NOAEL
Small bird (10g)	4E-02	3E-03	0.2	**610**	NOAEL
Large Bird (4 kg)	4E-03	3E-04	2E-02	**610**	NOAEL
Contaminated Vegetation (Short Grass - Highest Residue Rate)					
Small mammal (20g)	0.1	7E-03	0.7	**738**	NOAEL
Larger Mammal (400g)	3E-02	2E-03	0.2	**738**	NOAEL
Large Mammal (70g)	2E-02	1E-03	9E-02	**738**	NOAEL
Small bird (10g)	0.4	2E-02	**2**	**610**	NOAEL
Large Bird (4 kg)	4E-02	2E-03	0.2	**610**	NOAEL
Contaminated Water					
Small mammal (20g)	2E-06	9E-10	4E-05	**738**	NOAEL
Larger Mammal (400g)	2E-06	7E-10	3E-05	**738**	NOAEL
Canid (5 kg)	4E-06	2E-09	6E-05	**250**	NOAEL
Large Mammal (70g)	9E-07	4E-10	2E-05	**738**	NOAEL
Small bird (10g)	5E-06	2E-09	8E-05	**610**	NOAEL
Large Bird (4 kg)	6E-07	3E-10	1E-05	**610**	NOAEL
Consumption of contaminated Fish					
Large Mammalian Carnivore (70 kg)	2E-07	9E-12	2E-05	**738**	NOAEL
Canid (5 kg)	9E-07	4E-11	9E-05	**250**	NOAEL
Fish-eating bird (2.4 kg)	4E-07	2E-11	4E-05	**610**	NOAEL

Table G2

Summary of Hazard Quotients (Toxicity) for Birds- Imazapyr (Standard Application Rate)

Application Rate:	0.45	lb a.e./acre		
Scenario	**Receptor**	**Hazard Quotients**	**Toxicity Value**	
Accidental Acute Exposures				
Contaminated Water				
Spill	Small bird (10g)	1E-04	**2510**	NOAEL
Spill	Large Bird (4 kg)	2E-05	**2510**	NOAEL
Consumption of contaminated Fish				
Spill	Fish-eating bird (2.4 kg)	1E-05	**2510**	NOAEL
Non-Accidental Acute Exposures				
Contaminated Fruit [Lowest Residue Rates]				
	Small bird (10g)	6E-03	**2510**	NOAEL
	Large Bird (4 kg)	7E-04	**2510**	NOAEL
Contaminated Broadleaf Foliage				
	Small bird (10g)	3E-02	**2510**	NOAEL
	Large Bird (4 kg)	4E-03	**2510**	NOAEL
Contaminated Tall Grass				
	Small bird (10g)	3E-02	**2510**	NOAEL
	Large Bird (4 kg)	3E-03	**2510**	NOAEL
Contaminated Short Grass [Highest Residue Rate]				
	Small bird (10g)	6E-02	**2510**	NOAEL
	Large Bird (4 kg)	7E-03	**2510**	NOAEL
Contaminated Water				
	Small bird (10g)	1E-06	**2510**	NOAEL
	Large Bird (4 kg)	1E-07	**2510**	NOAEL
Contaminated Insects				
	Small bird (10g)	8E-03	**2510**	NOAEL
Consumption of small mammal (after direct spray) by predator				
	Carnivorous bird (640 g)	6E-04	**2510**	NOAEL
Consumption of contaminated Fish				
	Fish-eating bird (2.4 kg)	9E-08	**2510**	NOAEL
Chronic/Longer Term Exposures				
Contaminated Fruit (Lowest Residue Rate)				
	Small bird (10g)	1E-02	**610**	NOAEL
	Large Bird (4 kg)	1E-03	**610**	NOAEL
Contaminated Broadleaf Foliage				
	Small bird (10g)	6E-02	**610**	NOAEL
	Large Bird (4 kg)	7E-03	**610**	NOAEL
Contaminated Tall Grass				
	Small bird (10g)	5E-02	**610**	NOAEL
	Large Bird (4 kg)	5E-03	**610**	NOAEL
Contaminated Vegetation (Short Grass - Highest Residue Rate)				
	Small bird (10g)	0.1	**610**	NOAEL
	Large Bird (4 kg)	1E-02	**610**	NOAEL
Contaminated Water				
	Small bird (10g)	1E-06	**610**	NOAEL
	Large Bird (4 kg)	2E-07	**610**	NOAEL
Consumption of contaminated Fish				

	Fish-eating bird (2.4 kg)	1E-07		**610**	NOAEL	

Summary of Hazard Quotients (Toxicity) for the Terrestrial Animals G01V6

Application Rate:	1.5	lb a.e./acre			G01V6	
Scenario	Receptor	Hazard Quotients			Toxicity Value	
		Central	Lower	Upper		
Accidental Acute Exposures						
Direct Spray						
first-order absorption	Small mammal (20g)	No exposure assessment.				
100% absorption	Small mammal (20g)	No exposure assessment.				
Contaminated Water						
Spill	Small mammal (20g)	#NAME?	#NAME?	#NAME?	**738**	NOAEL
Spill	Larger Mammal (400g)	#NAME?	#NAME?	#NAME?	**738**	NOAEL
Spill	Canid (5 kg)	#NAME?	#NAME?	#NAME?	**250**	NOAEL
Spill	Large Mammal (70g)	#NAME?	#NAME?	#NAME?	**738**	NOAEL
Spill	Small bird (10g)	#NAME?	#NAME?	#NAME?	**2510**	NOAEL
Spill	Large Bird (4 kg)	#NAME?	#NAME?	#NAME?	**2510**	NOAEL
Consumption of contaminated Fish						
Spill	Large Mammalian Carnivore (70 kg)	#NAME?	#NAME?	#NAME?	**738**	NOAEL
Spill	Canid (5 kg)	#NAME?	#NAME?	#NAME?	**250**	NOAEL
Spill	Fish-eating bird (2.4 kg)	#NAME?	#NAME?	#NAME?	**2510**	NOAEL
Non-Accidental Acute Exposures						
Contaminated Fruit (Lowest Residue Rate)						
	Small mammal (20g)	No exposure assessment.				
	Larger Mammal (400g)	No exposure assessment.				
	Large Mammal (70g)	No exposure assessment.				
	Small bird (10g)	No exposure assessment.				
	Large Bird (4 kg)	No exposure assessment.				
Contaminated Vegetation (Short Grass - Highest Residue Rate)						
	Small mammal (20g)	No exposure assessment.				
	Larger Mammal (400g)	No exposure assessment.				
	Large Mammal	No exposure assessment.				

Small bird (10g)	No exposure assessment.					
Large Bird (4 kg)	No exposure assessment.					
Contaminated Water						
Small mammal (20g)	4E-05	1E-05	1E-04	**738**	NOAEL	
Larger Mammal (400g)	3E-05	8E-06	8E-05	**738**	NOAEL	
Canid (5 kg)	6E-05	2E-05	2E-04	**250**	NOAEL	
Large Mammal (70g)	2E-05	5E-06	5E-05	**738**	NOAEL	
Small bird (10g)	2E-05	6E-06	6E-05	**2510**	NOAEL	
Large Bird (4 kg)	3E-06	8E-07	8E-06	**2510**	NOAEL	
Contaminated Insects						
Small mammal (20g)	No exposure assessment.					
Larger Mammal (400g)	No exposure assessment.					
Small bird (10g)	No exposure assessment.					
Consumption of small mammal (after direct spray) by predator						
Canid (5 kg)	No exposure assessment.					
Carnivorous bird (640 g)	No exposure assessment.					
Consumption of contaminated Fish						
Large Mammalian Carnivore (70 kg)	4E-06	1E-07	6E-05	**738**	NOAEL	
Canid (5 kg)	2E-05	5E-07	3E-04	**250**	NOAEL	
Fish-eating bird (2.4 kg)	2E-06	5E-08	3E-05	**2510**	NOAEL	
Chronic/Longer Term Exposures						
Contaminated Fruit (Lowest Residue Rate)						
Small mammal (20g)	No exposure assessment.					
Larger Mammal (400g)	No exposure assessment.					
Large Mammal (70g)	No exposure assessment.					
Small bird (10g)	No exposure assessment.					
Large Bird (4 kg)	No exposure assessment.					
Contaminated Vegetation (Short Grass - Highest Residue Rate)						
Small mammal (20g)	No exposure assessment.					
Larger Mammal (400g)	No exposure assessment.					

	Large Mammal (70g)	No exposure assessment.				
	Small bird (10g)	No exposure assessment.				
	Large Bird (4 kg)	No exposure assessment.				
Contaminated Water						
	Small mammal (20g)	2E-05	4E-06	9E-05	**738**	NOAEL
	Larger Mammal (400g)	2E-05	3E-06	7E-05	**738**	NOAEL
	Canid (5 kg)	4E-05	7E-06	2E-04	**250**	NOAEL
	Large Mammal (70g)	1E-05	2E-06	4E-05	**738**	NOAEL
	Small bird (10g)	5E-05	9E-06	2E-04	**610**	NOAEL
	Large Bird (4 kg)	7E-06	1E-06	3E-05	**610**	NOAEL
Consumption of contaminated Fish						
	Large Mammalian Carnivore (70 kg)	2E-06	4E-08	5E-05	**738**	NOAEL
	Canid (5 kg)	1E-05	2E-07	2E-04	**250**	NOAEL
	Fish-eating bird (2.4 kg)	5E-06	8E-08	1E-04	**610**	NOAEL

APPENDIX H

AMINOPYRALID

The following information is from SERA 2007, unless otherwise noted.

Aminopyralid is a relatively new herbicide that has been registered by the U.S. E.P.A. for the control of invasive weeds. Both the USFS and NPS have begun using Aminopyralid in their weed management programs. The U.S. EPA has judged hat Aminopyralid appears to be a *reduced risk* herbicide. Because aminopyralid is a relatively new product, it lacks the long history of laboratory and field studies available for many other commonly used herbicides. All of the information on the toxicity of aminopyralid that was available for use in SERA's (2007) risk assessment came from studies submitted to the U.S. EPA in support of aminopyralid registration. Therefore, the amount of information and variety of information sources available to assess the risks of this herbicide are small compared to some older common herbicides.

Standard experimental toxicity studies in mammals indicate aminopyralid has low acute and chronic oral toxicity. Likely adverse effects in mammalian wildlife species are expected to be the same as those in experimental mammals receiving high doses (e.g., gastrointestinal changes, weight loss, and short term loss of coordination). Other than these effects, Aminopyralid does not appear to cause specific target organ toxicity in animals.

Results of laboratory testing indicates that birds are not more sensitive than mammals to Aminopyralid in terms of acute lethality. In terms of nonlethal effects, however, birds may be more sensitive to aminopyralid than mammals. Birds had adverse reactions more readily when herbicides were administered directly into the stomach (gavage), vs. when consumed as part of the diet. Notwithstanding this classification, one study noted adverse but sublethal effects in bobwhite quail over the range of doses tested (63-2250 mg a.e./kg bw/day. Effects included decreased responsiveness, incoordination, lower limb weakness, and other signs of toxicity that were more severe with increasing dose. Adverse effects to birds included incoordination, even at some of the lowest doses administered via gavage (63 mg a.e. /kg bw/day), but no mortality occurred in laboratory experiments with dosages as high as 2250 mg a.e. /kg bw/day. Exposures in the wild would only occur orally or dermally, so results of gavage experiments may not be as meaningful (SERA 2007). Aminopyralid is classified by the U.S. EPA as *practically non-toxic* to avian species by acute oral exposure. However, if sublethal effects that like those seen in the gavage studies occur in the wild, it could render animals with a loss of coordination that could temporarily increase their risk of predation.

For terrestrial mammals, the dose-response assessment for Aminopyralid is based on the same data for human health, i.e. an acute gavage NOAEL of 104 mg/kg/bw and a chronic dietary NOAEL of 50 mg/kg/day (Appendix B). Birds appear to be more sensitive than mammals to Aminopyralid with an acute NOAEL of 14 mg a.e./kg/day from a gavage study (Appendix C). In terms of longer-

term toxicity, however, the toxicity value for birds is 184 mg a.e./kg/bw/day, somewhat higher than the corresponding value in mammals. Birds appear to be much more sensitive to Aminopyralid after gavage administration than after dietary administration. Basing the acute NOAEL for birds on a gavage study should be considered a conservative approach.

The risk characterization for mammals indicates no evidence that adverse effects are plausible in large or small mammals. None of the HQs for any species under any scenario approach a level of concern (Table H1). The highest HQ is 0.1 for a small mammal consuming contaminated vegetation (short grass), however this is still well below the level of concern. This risk characterization for mammals is consistent with the risk characterization presented by the U.S. EPA, which found no basis for asserting that adverse effects in mammals are plausible.

The risk characterization for birds is similar to that of mammals for chronic exposures in that no HQs approach the level of concern (Table H2). However, higher HQs are noted for acute exposure, most notably for birds consuming contaminated vegetation. HQs exceeding 1.0 are 1.1 and 2.0 for a small bird consuming contaminated broadleaf foliage and short grass, respectively. Other relatively high HQs range from 0.1 for a large bird consuming contaminated broadleaf foliage to 0.8 for a small bird consuming contaminated tall grass. HQs dramatically increase at the upper application rate, including HQs of 4, 5, and 10 for a small bird consuming contaminated tall grass, broadleaf foliage, and short grass, respectively. The exposure scenario for the exclusive consumption of contaminated grass by a small bird should be viewed as an extreme worst-case scenario. Furthermore, the NOAEL dosages are based on gavage administration, to which birds appear to be much more sensitive than through dietary administration. While this conservative approach is acknowledged, the approach is maintained in the risk assessment because of the lack of any field studies on the potential effects of Aminopyralid in birds. The most substantial uncertainty in the risk characterization for birds is the use of any gavage toxicity values rather than dietary toxicity values for deriving HQs.

Appropriate protective measures may need to be taken when using Aminopyralid in the habitat of species likely to be affected.

Table H1

Summary of Hazard Quotients (Toxicity) for Mammals-Aminopyralid (Standard Application Rate)

Application Rate:	0.078	lb a.e./acre		
Scenario	**Receptor**	**Hazard Quotients**	**Toxicity Value**	
Accidental Acute Exposures				
Direct Spray				
first-order absorption	Small mammal (20g)	2E-04	**104**	NOAEL
100% absorption	Small mammal (20g)	2E-02	**104**	NOAEL
Contaminated Water				
Spill	Small mammal (20g)	5E-04	**104**	NOAEL
Spill	Larger Mammal (400g)	4E-04	**104**	NOAEL
Spill	Canid (5 kg)	3E-04	**104**	NOAEL
Spill	Large Mammal (70 kg)	2E-04	**104**	NOAEL
Consumption of contaminated Fish				
Spill	Large Mammalian Carnivore (70 kg)	1E-04	**104**	NOAEL
Spill	Canid (5 kg)	1E-04	**104**	NOAEL
Non-Accidental Acute Exposures				
Contaminated Fruit [Lowest Residue Rates]				
	Small mammal (20g)	1E-02	**104**	NOAEL
	Larger Mammal (400g)	3E-03	**104**	NOAEL
	Large Mammal (70 kg)	2E-03	**104**	NOAEL
Contaminated Broadleaf Foliage				
	Small mammal (20g)	6E-02	**104**	NOAEL
	Larger Mammal (400g)	1E-02	**104**	NOAEL
	Large Mammal (70 kg)	7E-03	**104**	NOAEL
Contaminated Tall Grass				
	Small mammal (20g)	5E-02	**104**	NOAEL
	Larger Mammal (400g)	1E-02	**104**	NOAEL
	Large Mammal (70 kg)	6E-03	**104**	NOAEL
Contaminated Short Grass [Highest Residue Rate]				
	Small mammal (20g)	0.1	**104**	NOAEL
	Larger Mammal (400g)	2E-02	**104**	NOAEL
	Large Mammal (70 kg)	1E-02	**104**	NOAEL
Contaminated Water				
	Small mammal (20g)	1E-05	**104**	NOAEL
	Larger Mammal (400g)	8E-06	**104**	NOAEL
	Canid (5 kg)	6E-06	**104**	NOAEL
	Large Mammal (70 kg)	5E-06	**104**	NOAEL
Contaminated Insects				
	Small mammal (20g)	1E-02	**104**	NOAEL
	Larger Mammal (400g)	3E-03	**104**	NOAEL
Consumption of small mammal (after direct spray) by predator				
	Canid (5 kg)	2E-03	**104**	NOAEL
Consumption of contaminated Fish				
	Large Mammalian Carnivore (70 kg)	2E-06	**104**	NOAEL
	Canid (5 kg)	3E-06	**104**	NOAEL
Chronic/Longer Term Exposures				

Contaminated Fruit [Lowest Residue Rates]			
Small mammal (20g)	5E-03	**50**	NOAEL
Larger Mammal (400g)	1E-03	**50**	NOAEL
Large Mammal (70 kg)	7E-04	**50**	NOAEL
Contaminated Broadleaf Foliage			
Small mammal (20g)	3E-02	**50**	NOAEL
Larger Mammal (400g)	6E-03	**50**	NOAEL
Large Mammal (70 kg)	3E-03	**50**	NOAEL
Contaminated Tall Grass			
Small mammal (20g)	2E-02	**50**	NOAEL
Larger Mammal (400g)	5E-03	**50**	NOAEL
Large Mammal (70 kg)	3E-03	**50**	NOAEL
Contaminated Short Grass [Highest Residue Rate]			
Small mammal (20g)	5E-02	**50**	NOAEL
Larger Mammal (400g)	1E-02	**50**	NOAEL
Large Mammal (70 kg)	6E-03	**50**	NOAEL
Contaminated Water			
Small mammal (20g)	9E-06	**50**	NOAEL
Larger Mammal (400g)	7E-06	**50**	NOAEL
Canid (5 kg)	5E-06	**50**	NOAEL
Large Mammal (70 kg)	4E-06	**50**	NOAEL
Consumption of contaminated Fish			
Large Mammalian Carnivore (70 kg)	2E-06	**50**	NOAEL
Canid (5 kg)	3E-06	**50**	NOAEL

Table H2

Summary of Hazard Quotients (Toxicity) for Birds-Aminopyralid (Standard Application Rate)

Application Rate:	0.078	lb a.e./acre		
Scenario	**Receptor**	**Hazard Quotients**	**Toxicity Value**	
Accidental Acute Exposures				
Contaminated Water				
Spill	Small bird (10g)	7E-03	**14**	NOAEL
Spill	Large Bird (4 kg)	9E-04	**14**	NOAEL
Consumption of contaminated Fish				
Spill	Fish-eating bird (2.4 kg)	1E-03	**14**	NOAEL
Non-Accidental Acute Exposures				
Contaminated Fruit [Lowest Residue Rates]				
	Small bird (10g)	0.2	**14**	NOAEL
	Large Bird (4 kg)	2E-02	**14**	NOAEL
Contaminated Broadleaf Foliage				
	Small bird (10g)	**1.1**	**14**	NOAEL
	Large Bird (4 kg)	0.1	**14**	NOAEL
Contaminated Tall Grass				
	Small bird (10g)	0.8	**14**	NOAEL
	Large Bird (4 kg)	1E-01	**14**	NOAEL
Contaminated Short Grass [Highest Residue Rate]				
	Small bird (10g)	**2.0**	**14**	NOAEL
	Large Bird (4 kg)	0.2	**14**	NOAEL
Contaminated Water				
	Small bird (10g)	2E-04	**14**	NOAEL
	Large Bird (4 kg)	2E-05	**14**	NOAEL
Contaminated Insects				
	Small bird (10g)	0.2	**14**	NOAEL
Consumption of small mammal (after direct spray) by predator				
	Carnivorous bird (640 g)	2E-02	**14**	NOAEL
Consumption of contaminated Fish				
	Fish-eating bird (2.4 kg)	3E-05	**14**	NOAEL
Chronic/Longer Term Exposures				
Contaminated Fruit (Lowest Residue Rate)				
	Small bird (10g)	3E-03	**184**	NOAEL
	Large Bird (4 kg)	4E-04	**184**	NOAEL
Contaminated Broadleaf Foliage				
	Small bird (10g)	2E-02	**184**	NOAEL
	Large Bird (4 kg)	2E-03	**184**	NOAEL
Contaminated Tall Grass				
	Small bird (10g)	1E-02	**184**	NOAEL
	Large Bird (4 kg)	2E-03	**184**	NOAEL
Contaminated Vegetation (Short Grass - Highest Residue Rate)				
	Small bird (10g)	3E-02	**184**	NOAEL
	Large Bird (4 kg)	4E-03	**184**	NOAEL
Contaminated Water				
	Small bird (10g)	5E-06	**184**	NOAEL
	Large Bird (4 kg)	6E-07	**184**	NOAEL

Consumption of contaminated Fish				
	Fish-eating bird (2.4 kg)	8E-07	**184**	NOAEL

APPENDIX I

Threatened, Endangered, and Sensitive Wildlife Species and critical habitat within the Tongass National Forest.[1]

Species	Status	Habitat and Range	Occurrence on Tongass	Population Trends and Threats
Short-Tailed Albatross (*Phoebastria albatrus*)	Endangered	Forages offshore and in shelf-break waters throughout the north Pacific Ocean and Bering Sea. Frequent visitor to the productive waters in shelf-break areas along the outer coast of Alaska. Breeds on islands in Japan and Taiwan and recently on Midway Island.	May forage in nearshore waters adjacent to the outer coast of the Tongass, particularly where the continental shelf break is close to shore.	The population of this species continues to grow at between 5 and 8% per year from about 1,200 individuals in 2000. Historical declines from feather overexploitation. Current threats include commercial-fisheries bycatch, oil and other sea contaminants, invasive predators in nesting areas, extreme weather, and volcanic activity at their primary breeding colony on Torishima Island, Japan.
Humpback Whale *(Megaptera novaeangliae)* Mexico DPS	Threatened	Uncommon in the inside waters of the Alexander Archipelago and regularly sighted in coastal waters of southeast Alaska. Migrate seasonally from northern latitude feeding areas in summer to low-latitude breeding areas in winter.	Common in marine waters, including shallow coastal areas around the Tongass.	Mexico DPS whales have a 6.1% probability of occurrence off Southeast Alaska. Humpback whales off Southeast Alaska are most likely to be from the Hawaii DPS (93.9% probability). Observed recent positive population-growth rates in the proposed Hawaii DPS. Fishing gear entanglement is considered to be a medium threat to the Hawaii DPS.
Fin Whale *(Balaenoptera physalus)*	Endangered	Typically off-shore marine waters of the Bering Sea, Chukchi Sea, Cook Inlet, Gulf of AK, Aleutian Islands and Southeast AK; two sightings in lower Clarence Strait (Dahlheim et al. 2009)	May occur seasonally in marine waters around Tongass, but in proximity to the open ocean.	The present status of populations in the North Pacific Ocean basins relative to their pre-whaling population size is uncertain. Although the full range of the Alaska (Northeast Pacific) stock of fin whales has not been surveyed, a rough estimate of the size of the population west of the Kenai Peninsula is 5,700. Threats include collisions with vessels, entanglement in fishing gear, reduced prey abundance due to overfishing, habitat degradation, and disturbance from low-frequency noise.

[1] Information compiled from National Marine Fisheries Service (NMFS) online species lists dated April 2014 and 02/18/2014, NMFS interactive online range and critical habitat maps, Goldstein et al. 2009, and NMFS Humpback Whale guidance Sept 2016. Information on TE fish from NMFS 2015a, 2015b.

Species	Status	Habitat and Range	Occurrence on Tongass	Population Trends and Threats
Sperm Whale *(Physeter macrocephalus)*	Endangered	Typically off-shore marine waters of the Bering Sea, Gulf of AK, Southeast AK and Aleutian Islands.	May occur seasonally in marine waters around Tongass, but in proximity to the open ocean.	Assuming sperm whale populations are growing at about 1.1%/year, the estimated global population is at about 32% of historical numbers. Because more sperm whale hunting was occurring in the Pacific Ocean during the 1940s-1970s than in the Atlantic Ocean, the current status in the Pacific is likely worse than the global estimate of 32%.
Steller Sea Lion (*Eumetopias jubatus*) Western DPS	Endangered	Rock, reef, and beach haulouts and rookeries and surrounding nearshore waters along the coasts of the Bering Sea, Aleutian Islands, Cook Inlet, Gulf of Alaska and southeast Alaska. From breeding colonies west of 144° W longitude, but regularly move across to northern areas of southeast Alaska.	May occur in marine waters around Tongass. Likely north of Sumner Strait; not likely in southern portions of Tongass.[2]	The Western DPS declined by 75% between 1976 and 1990, and decreased another 40% between 1991 and 2000. Since the 1970s, the most significant drop in numbers occurred in the eastern Aleutian Islands and the western Gulf of Alaska. Causal factors may include disease, incidental take in fishing gear, illegal shooting, and changes in prey abundance.
Steller Sea Lion (*Eumetopias jubatus*) Critical Habitat	Critical Habitat	Includes a terrestrial zone, an aquatic zone, and an air zone that extend 3,000 feet landward, seaward, and above, respectively, from each major rookery and major haulout designated as critical habitat in southeast Alaska.	Designated at 3 major rookeries on the outer coast, and 11 major haulouts, 7 on the outer coast and 4 on inside channels of the Tongass. Two other major haul-outs designated in southeast Alaska, Cape Fairweather and Graves Rock, but these are within Glacier Bay National Park.	(Not applicable)

[2]From phone conversation with Jon Kurland of NMFS on 10/01/2015 and NMFS online document titled Occurrence of Western Distinct Population Segment Steller Sea Lions East of 144° W. Longitude dated 12/18/2013.

Species	Status	Habitat and Range	Occurrence on Tongass	Population Trends and Threats
Queen Charlotte goshawk (*Accipiter gentilis laingi*)	FS Sensitive	Nests and forages in coastal rainforests of British Columbia and southeast Alaska. Primarily use medium- and high-volume forests and avoid non-forested, clearcut, and dense-regrowth areas. Also use mature young growth with adequate structure (>45-100 years old, depending on temperatures and site productivity, USFWS 2007b), and may nest in such stands where old growth is limited.	Occurs as a year-round resident on the Tongass.	A subspecies of the northern goshawk. British Columbia DPS was listed as threatened under the ESA due to estimated 35-45% productive old-growth habitat loss from clearcut logging in British Columbia. The Alaska DPS in southeast Alaska was not listed, in part due to protections in the 1997 and 2008 Forest Plans, which included designation of substantial areas of forest in no-harvest status and use of goshawk standards and guidelines in portions open to timber harvest. Range-wide population of about 500 breeding pairs and an unknown number of non-breeders estimated in 2007 from habitat capability and observed nest-occupancy rates, with about 300-400 of these breeding pairs in Alaska DPS. Primary threat is clearcut timber harvest impacts on nest sites, prey abundance and prey availability, and associated loss and degradation of suitable habitat.
Black oystercatcher (*Haematopus bachmani*)	FS Sensitive	Sheltered rocky shorelines and tidal flats with prolific intertidal invertebrates along the North American Pacific coast from the Aleutian Islands to Baja California.	Occurs in low densities in intertidal areas around the Tongass.	Small global population estimates at 8,500 – 11,000, but majority (65%) breed in Alaska. Dramatic decline of Sitka Sound population (48 pairs to 2). Concerns of low reproductive rates and variable nest survival due to natural and human-induced factors.
Aleutian tern (*Sterna aleutica*)	FS Sensitive	Breeds in loose colonies in coastal sites at heads of bays, reefs, islands, estuaries, and river mouths within Alaska and eastern Siberia. In Alaska, breeds in the Aleutian islands, north to the southeastern Chukchi Sea and east to Yakutat and Glacier Bay (Walton et al. 2012). Winters in the eastern Pacific.	Large breeding colony on Black Sand Spit in the Yakutat Forelands on the Tongass, which supports about one third of Alaska's population.	Substantially reduced size or disappearance of colonies in Kodiak, Prince William Sound, Yakutat, and Icy Bay. Yakutat Colony on Tongass declined from 3,000 in 1980 to 513-2,700 during 2001-2007.[4] Suspected causes of range-wide declines from isostatic rebound, structural changes in vegetation, changes in prey populations, and human disturbance.

Species	Status	Habitat and Range	Occurrence on Tongass	Population Trends and Threats
Kittlitz's murrelet (*Brachyramphus brevirostris*)	FS Sensitive	Occurs year-round in marine waters of Alaska and eastern Russia, generally offshore during nonbreeding and nearshore during breeding season. Nests solitarily on unvegetated scree slopes, cliffs and rock ledges in coastal uplands and mountains, often in vicinity of tidewater glaciers.	Core breeding area in Yakutat Bay. Also likely in smaller densities in marine waters and near tidewater glaciers on the Tongass.	Steep population declines in Prince William Sound, Malaspina Forelands, and Kenai Fjords, as well as declines in Glacier, Kachemak, and Icy Bays, most likely caused by glacial retreat and oceanic regime shifts. Gillnet fisheries and oil spills may also be factors.
Dusky Canada Goose (*Branta canadensis occidentalis*)	FS Sensitive	The dusky is a subspecies of Canada goose that breeds only in the Copper River Delta area on the south-central coast of Alaska and on islands in the Prince William Sound and Gulf of Alaska.	Uncommon, mainly during migration along outer coastal estuaries and lakes.	Goose has very specific habitat preferences and a limited geographic breeding range. Increased predation by brown bears, wolves, coyotes and bald eagles has had a major impact on dusky production. Productivity of dusky Canada geese is being affected by gradual long-term habitat changes, annual conditions such as weather, increased levels of predation, and an increasing average age of the population. Canada geese generally do not nest until their third year of life.

APPENDIX J

Description of the habitat and occurrence of wildlife management indicator species (MIS) in the analysis area and considerations for effects analysis

Species	Basis for MIS Selection, habitat preference	Associated POG Habitat Project Level Indicator/Measurement
Alexander Archipelago Wolf	Population viability concerns in some areas of the Tongass NF. This species inhabits the mainland and the larger islands south of Frederick (MacDonald & Cook, 2007)where its densities are closely tied to the population levels of their prey (primarily Sitka black-tailed deer). Important components of wolf management include maintaining core area habitats with low road density, maintaining wolf harvest within sustainable limits through regulations, and providing adequate deer habitat to support an abundant and stable deer population (USDA FS 2008b, p. 3-238). Human access on roads may result in wolf mortality by both legal and non-legal harvest. The Forest Plan provides standards and guidelines to maintain sustainable wolf populations, protect den sites, provide prey habitat and manage road access	Deer/wolf interactions, fragmentation. Measured by deer/mi ^{2} and road density
American Marten	Forest management activities were expected to affect population abundance, and marten pelts represented significant economic value to local residents. Coastal habitats (beach fringe) and riparian areas have the highest habitat value for marten, followed by upland habitats below 1,500 feet in elevation. Marten favor larger-sized old-growth forests because they intercept snow, provide cover and denning sites, and provide habitat for prey species used by marten. Due to lower snow accumulation, habitats at lower elevations have higher value for wintering marten (USDA FS 2008b, p. 3-234). Human access on roads may result in marten mortality by both legal trapping and non-legal harvest. The legacy standards and guidelines in the Forest Plan aid in providing habitat for marten	Winter acres of high POG ≤1500 feet; non-winter all POG
Bald Eagle	Use of coastal areas for foraging and nesting. Most bald eagles nest in old-growth trees within 328 feet (100 meters) of saltwater shorelines. Because they forage primarily on fish, key habitats include riparian and shoreline areas. Forest Plan standards and guidelines require the protection of beach fringe habitat, and habitat	POG within beach and estuary fringe buffer; disturbance

Species	Basis for MIS Selection, habitat preference	Associated POG Habitat Project Level Indicator/Measurement
	surrounding nests is managed in accordance with an interagency agreement established with the FWS.	
Black Bear	Importance for hunting and for recreation and tourism. They are present throughout the mainland and on the islands south of Frederick Sound. Black bears will use habitats from sea level to the alpine but appear to prefer estuarine, riparian, and forested coastal habitats	Denning habitat – acres of POG Foraging habitat – POG within 500 feet of anadromous fish streams and all habitats except stem exclusion Changes in road access
Brown Bear	Important both for hunting (including both guided and non-guided hunting) and to the recreation and tourism industry of Southeast Alaska. Brown bears use areas from sea level to the alpine and are habitat generalists. The late-summer season has been identified as the most critical or limiting period for brown bears when they must build up energy reserves that are adequate to survive the winter and successfully reproduce. During this season, many brown bears concentrate along low elevation valley bottoms and salmon streams, with most use occurring within 500 feet of streams, where their efforts focus on consuming large quantities of fish. Cover for visual obscurity, provided by riparian buffers, is important for minimizing interactions among bears and between humans and bears. Increases in human activity due to an expanding road system in an area may result in increased direct human-induced deaths of bears	Denning habitat – acres of POG Foraging habitat – POG within 500 feet of anadromous fish streams and all habitats except stem exclusion Changes in road access
Brown Creeper	Close association with large diameter old-growth trees. Brown creepers are a permanent resident throughout Southeast Alaska. Because populations may be limited by the availability of old-growth and mature forests used as nesting and foraging sites, they may be affected by activities that reduce large, mature trees	Changes in POG, especially SD67
Hairy Woodpecker	Primary cavity excavators and the species that depend on them (USDA FS 2008b, p.3-240). Hairy woodpeckers are a permanent resident throughout Southeast Alaska and use old-growth forest habitats with snags and dying trees for foraging and nesting.	Changes in POG, especially SD67
Mountain Goat	Represent species using cliffs, alpine and subalpine, and old-growth forest habitats. The quantity and quality of winter habitat is the most limiting factor for mountain	Changes in POG forest, especially in lower to mid elevations and adjacent to cliffs, and level of aircraft activities

Species	Basis for MIS Selection, habitat preference	Associated POG Habitat Project Level Indicator/Measurement
	goats. Mature old-growth stands intercept snow and provide thermal cover and forage.	
Red-breasted Sapsucker	Represent primary cavity excavators and the species that depend on them. They are well distributed throughout Southeast Alaska during the spring, summer, and early fall, and occur in lower elevations during the late fall and winter. They use a wide variety of forested habitats but require the presence of snags during the breeding season. They are weak excavators and require rotted or soft substrates in order to create cavities for nesting and roosting. They use a wide variety of forested habitats but require the presence of snags during the breeding season and are indicative of low volume POG	Changes in POG
Red Squirrel	Require forests with cone-producing trees and cavities in trees and snags for nesting and denning. The root systems of large spruce trees also provide habitat for den sites. Red squirrels may also use young growth stands because cone production typically begins 40 years after timber harvest	Changes in POG forest and succession of young growth forests
River Otter	Association with coastal and freshwater aquatic environments and the immediately adjacent (within 100 to 500 feet) upland habitats. Beach characteristics affect the availability of food and cover, and adjacent upland vegetation is important in providing cover for otters. Old-growth forests provide canopy cover, large-diameter trees and snags, and burrow and den sites. Beach, Estuary, and Riparian standards and guidelines protect most, if not all, of the key otter habitat components, thus greatly reducing risk to this species and others that rely on such habitats	Changes in shoreline and riparian habitats
Sitka Black-tailed Deer	Important game and subsistence species in Southeast Alaska. Although deer will utilize a wide range of habitat from shoreline to alpine, they are associated with old-growth forests. This species represents those that use lower elevation (below 800 feet elevation) POG forest habitats during the winter. Research conducted in Southeast Alaska indicates that low-elevation, high volume old-growth habitats are particularly important to deer, especially during severe winters (Schoen & Kirchoff, 1990). These mature old-growth stands intercept snow, provide thermal cover, and support the	Habitat available in a deep snow winter - acres of high-POG ≤800 feet elevation; average winter habitat - acres of POG ≤1500 feet; acres summer habitat - includes all terrestrial habitats except stem exclusion forest. Measured by percent of historical condition total deer remaining

Species	Basis for MIS Selection, habitat preference	Associated POG Habitat Project Level Indicator/Measurement
	largest biomass of herb and shrub forage for deer (Alaback, 1982). The quantity, quality, distribution and arrangement of winter habitat are considered the most important limiting factors for Sitka black-tailed deer in Southeast Alaska	
Vancouver Canada Goose	Association with wetlands (both forested and non-forested) in the estuary, riparian, and upland areas of the Forest. Vancouver Canada geese are highly mobile and are found throughout the islands of Southeast Alaska. Nesting and brood-rearing habitats are potentially affected by various forest management activities, though timber harvest in these areas has generally been minimal because these sites are fairly unproductive. Additionally, riparian and wetland standards and guidelines, which include the use of various best management practices, are designed to minimize impacts to and maintain the function of these habitats	Acres of forested muskeg, UF, and hydric POG (SD4H, SD5H)

APPENDIX K

This table represents a list of the Tongass National Forest Neotropical migratory bird species of concern as developed by the Regional Office in 2002. This list was derived from Boreal Partners in Flight (1999) and U.S. Fish and Wildlife Service Bird Species of Concern Lists (2002). Information on abundance and habitats was adapted from Isleib and Kessel (1973).

Common Name	Scientific Name	Occurrence[1]	Abundance	Habitat[2]													
				Tundra	Shrub Thickets	Hemlock/ Sitka Spruce/ Cedar Forest	Muskeg	Mixed Decicuous/ Spruce Woodlands	Marsh	Lacustrine Waters	Fluviatile Waters	Cliffs Bluffs & Screes	Moraines, Alluvia & Barrier Islands	Beaches & Tidal Flats	Rocky Shores & Reefs	Inshore waters	Offshore Waters
American Dipper	*Cinclus mexicanus*	B	Fairly common							x	xx	xx*	x				
Arctic Tern	*Sterna paradisaea*	B	Fairly common				x		xx*	x	x	xx*	xx*	xx	xx	xx	xx
Black Swift	*Cypseloides niger*	B	Rare									x+					
Black Turnstone	*Arenaria melanocephala*	W, M	Fairly common										x	x	xx		
Black-footed Albatross	*Phoebastria nigripes*	B, M	Common													x	xx
Blackpoll Warbler	*Dendroica striata*	M	Rare 1		x	xx+											
Blue Grouse	*Dendragapus obscurus*	B, W	Common		x	xx*		xx*									
Caspian Tern	*Sterna caspia*		Casual													x	
Chestnut-backed Chickadee	*Poecile rufescens*	B, W	Abundant		x	xx*											

Common Name	Scientific Name	Occurrence[1]	Abundance	Habitat[2]													
				Tundra	Shrub Thickets	Hemlock/ Sitka Spruce/ Cedar Forest	Muskeg	Mixed Decicuous/ Spruce Woodlands	Marsh	Lacustrine Waters	Fluviatile Waters	Cliffs Bluffs & Screes	Moraines, Alluvia & Barrier Islands	Beaches & Tidal Flats	Rocky Shores & Reefs	Inshore waters	Offshore Waters
Golden-crowned Kinglet	*Regulus satrapa*	B, W	Common		x	xx#		xx+									
Golden-crowned Sparrow	*Zonotrichia atricapilla*	M, B	Fairly common		xx#	x	x	x	x								
Gray-cheeked Thrush	*Catharus minimus*	B	Rare		x	x		xx*									
Hammond's Flycatcher	*Empidonax hammondii*	B	Uncommon			x		x+									
Long-billed Curlew	*Numenius americanus*		Accidental														
MacGillivray's Warbler	*Oporornis tolmiei*	B	Uncommon		xx*	x		x									
Marbled Godwit	*Limosa fedoa beringiae*	M	Rare 1											x			
Northern Shrike	*Lanius excubitor*	W	Uncommon	x	xx	x		xx	xx								
Northwestern Crow	*Corvus caurinus*	B, W	Abundant			xx*		x	x			x	xx	xx	xx	x	
Olive-sided Flycatcher	*Contopus cooperi*	B	Uncommon		x	x		xx*									
Pacific-slope Flycatcher	*Empidonax difficilis*	B	Common			xx*		xx*									

Common Name	Scientific Name	Occurrence[1]	Abundance	Habitat[2]													
				Tundra	Shrub Thickets	Hemlock/ Sitka Spruce/ Cedar Forest	Muskeg	Mixed Decicuous/ Spruce Woodlands	Marsh	Lacustrine Waters	Fluviatile Waters	Cliffs Bluffs & Screes	Moraines, Alluvia & Barrier Islands	Beaches & Tidal Flats	Rocky Shores & Reefs	Inshore waters	Offshore Waters
Peregrine Falcon	*Falco peregrinus pealei*	B, W, M	Uncommon						x			xx*	x		x	x	
Red Knot	*Calidris canutus*	M	Rare 1											xx	x		
Red-breasted Sapsucker	*Sphyrapicus ruber*	B	Abundant			xx*	x	x									
Rock Sandpiper	*Calidris ptilocnemis*	W	Uncommon											x	xx		
Rufous Hummingbird	*Selasphorus rufus*	M, B	Common		x	xx*		x									
Short-billed Dowitcher	*Limnodromus griseus*	B, M	Locally common						xx*				x	xx	x		
Steller's Jay	*Cyanocitta stelleri*	B, W	Abundant		x	xx*		x						x			
Surfbird	*Aphriza virgata*	W, M	Uncommon											x	xx		
Townsend's Warbler	*Dendroica townsendi*	B	Common		x	xx*		xx*									
Varied Thrush	*Ixoreus naevius*	M, B, W	Abundant	x	xx*	xx*	x	xx*	x			x	x	x	x		
Vaux's Swift	*Chaetura vauxi*	M, B*	Uncommon			x#											
Western Screech-Owl	*Otus kennicottii*	B, W	Uncommon			xx#											

Common Name	Scientific Name	Occurrence[1]	Abundance	Habitat[2]													
				Tundra	Shrub Thickets	Hemlock/ Sitka Spruce/ Cedar Forest	Muskeg	Mixed Decicuous/ Spruce Woodlands	Marsh	Lacustrine Waters	Fluviatile Waters	Cliffs Bluffs & Screes	Moraines, Alluvia & Barrier Islands	Beaches & Tidal Flats	Rocky Shores & Reefs	Inshore waters	Offshore Waters
Western Wood-pewee	*Contopus sordidulus*	B	Uncommon		x	x		xx*									
Whimbrel	*Numenius phaeopus*	M	Rare 1						x				x	xx	x		
Yellow-billed Loon	*Gavia adamsii*	W	Uncommon													x	x

[1] Occurrence: 1 = Migration Only, B=Breeding, W=Winter, M=Migration, and *=no record, but thought to breed in the area

[2] Habitats are described as preference: xx = primary; x = secondary; * = breeding; # = probable breeding; + = possible breeding. Minor habitat preferences are not included.

APPENDIX L

U.S. Fish and Wildlife Service recommended time periods for avoiding vegetation clearing to minimize impacts to birds in Southeast Alaska (USDI FWS 2006).