UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
1201 NE Lloyd Boulevard, Suite 1100
PORTLAND, OREGON 97232

Refer to NMFS No: WCRO-2019-00305

August 13, 2019

Charles Mark
Forest Supervisor
Salmon-Challis National Forest
1206 South Challis
Salmon, Idaho 83467

Re: Endangered Species Act Section 7 Biological Opinion, Concurrence Letter, and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for Livestock Grazing on the Upper Hayden Cattle and Horse Grazing Allotment**,** Upper Hayden Creek 5th field Hydrologic Unit Code 1706020406, Lemhi County, Idaho, (One Project)

Dear Mr. Mark:

Thank you for your letter of dated March 29, 2019 requesting initiation of consultation with NOAA's National Marine Fisheries Service (NMFS) pursuant to section 7 of the Endangered Species Act of 1973 (ESA) (16 U.S.C. 1531 et seq.) for Upper Hayden Cattle and Horse Grazing Allotment. Thank you also for your request for consultation pursuant to the essential fish habitat (EFH) provisions in Section 305(b) of the Magnuson-Stevens Fishery and Conservation Management Act (MSA)(16 U.S.C. 18559b)) for this action.

In this biological opinion (Opinion), NMFS concludes that the action, as proposed, is not likely to jeopardize the continued existence of Snake River Basin steelhead or Snake River spring/summer Chinook salmon. NMFS also concurs with the Salmon-Challis National Forest's (SCNF) determination that the proposed action is not likely to adversely affect critical habitat for Snake River spring/summer Chinook salmon and Snake River Basin steelhead. Rationale for our conclusions is provided in the attached Opinion and concurrence letter.

As required by section 7 of the ESA, NMFS provides an incidental take statement (ITS) with the Opinion. The ITS describes reasonable and prudent measures (RPM) NMFS considers necessary or appropriate to minimize the impact of incidental take associated with this action. The take statement sets forth nondiscretionary terms and conditions, including reporting requirements, that the SCNF, and any permittee who performs any portion of the action must comply with to carry out the RPM. Incidental take from actions that meet these terms and conditions will be exempt from the ESA take prohibition.

Although the SCNF did not make an ESA determination for Southern Resident killer whales (*Orcinus orca*) and their critical habitat, NMFS' analysis identified potential impacts on the whale's prey base. For this reason, and in accordance with NMFS' policy on marine mammals, the attached document concludes the proposed action "may affect," but is "not likely to adversely affect" Southern Resident killer whales and their critical habitat.

This document also includes the results of our analysis of the action's effects on EFH pursuant to section 305(b) of the MSA, and includes nine Conservation Recommendations to avoid, minimize, or otherwise offset potential adverse effects on EFH. These Conservation Recommendations are a non-identical set of the ESA terms and conditions. Section 305(b)(4) of the MSA requires federal agencies to provide a detailed written response to NMFS within 30 days after receiving these recommendations.

If the response is inconsistent with the EFH Conservation Recommendations, the SCNF must explain why the recommendations will not be followed, including the justification for any disagreements over the effects of the action and the recommendations. In response to increased oversight of overall EFH program effectiveness by the Office of Management and Budget, NMFS established a quarterly reporting requirement to determine how many Conservation Recommendations are provided as part of each EFH consultation and how many are adopted by the action agency. Therefore, in your statutory reply to the EFH portion of this consultation, NMFS asks that you clearly identify the number of Conservation Recommendations accepted.

Please contact Mrs. Kimberly Murphy (208) 756-5180 and Mr. Bill Lind (208) 378-5697 if you have any questions concerning this consultation, or if you require additional information.

Sincerely,

Michael P. Tehan
Assistant Regional Administrator
Interior Columbia Basin Office

Enclosure

cc: T. Ford – SCNF
K. Krieger – SCNF
D. Garcia – SCNF
C. Colter – SBT
S. Fisher – USFWS
L. Dlugolecki – USFWS

Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion, Concurrence Letter, and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response

Upper Hayden Cattle and Horse Grazing Allotment

NMFS Consultation Number: WCRO-2019-00305

Action Agency: Salmon-Challis National Forest

Affected Species and NMFS' Determinations:

ESA-Listed Species	Status	Is Action Likely to Adversely Affect Species?	Is Action Likely To Jeopardize the Species?	Is Action Likely to Adversely Affect Critical Habitat?	Is Action Likely To Destroy or Adversely Modify Critical Habitat?
Snake River steelhead (*Oncorhynchus mykiss*)	Threatened	Yes	No	No	N/A
Snake River spring/summer Chinook Salmon (*O. tshawytscha*)	Threatened	Yes	No	No	No
Southern Resident Killer Whale (*Orcinus orca*)	Endangered	No	N/A	No	N/A

Fishery Management Plan That Identifies EFH in the Project Area	Does Action Have an Adverse Effect on EFH?	Are EFH Conservation Recommendations Provided?
Pacific Coast Salmon	Yes	Yes

Consultation Conducted By: National Marine Fisheries Service, West Coast Region

Issued By:

Michael P. Tehan
Assistant Regional Administrator

Date: August 13, 2019

TABLE OF CONTENTS

TABLE OF FIGURES

TABLE OF TABLES

ACRONYMS

ACRONYMS	DEFINITION
Allotment	Upper Hayden Cattle and Horse Grazing Allotment
AOI	Annual Operating Instructions
BA	Biological Assessment
BLM	U. S. Bureau of Land Management
DMA	Designated Monitoring Area
DNA	Deoxyribonucleic Acid
DPS	Distinct Population Segment
DQA	Data Quality Act
EFH	Essential Fish Habitat
ESA	Endangered Species Act
ESU	Evolutionarily Significant Units

ACRONYMS	DEFINITION
FA	Functioning Appropriately
FR	Functioning at Risk
FSR	Forest System Roads
FUR	Functioning at Unacceptable Risk
GES	Greenline Ecological Status
GGW	Greenline-to-Greenline Width
HAPC	Habitat Areas of Particular Concern
HUC	Hydrologic Unit Code
ICTRT	Interior Columbia Technical Recovery Team
IDFG	Idaho Department of Fish and Game
ITS	Incidental Take Statement
MPG	Major Population Group
MIM	Multiple Indicator Monitoring
MPI	Matrix of Pathways and Indicators
MSA	Magnuson-Stevens Fishery Conservation and Management Act
NMFS	National Marine Fisheries Service
O.	*Oncorhynchus*
Opinion	Biological Opinion
PBF	Physical or Biological Features
PCE	Primary Constituent Element
PFMC	Pacific Fishery Management Council
PNC	Potential Natural Community
RHCA	Riparian Habitat Conservation Areas
RMO	Riparian Management Objectives
RPM	Reasonable and Prudent Measures
SCNF	Salmon-Challis National Forest
SRKW	Southern Resident Killer Whale
USBWP	Upper Salmon Basin Watershed Project
USFWS	U.S. Fish and Wildlife Service
VSP	Viable Salmonid Population
W:D	Width:Depth

1. INTRODUCTION

This Introduction section provides information relevant to the other sections of this document and is incorporated by reference into Sections 2 and 3 below.

1.1 Background

The National Marine Fisheries Service (NMFS) prepared the biological opinion (Opinion) and incidental take statement (ITS) portions of this document in accordance with section 7(b) of the Endangered Species Act (ESA) of 1973 (16 U.S.C. 1531 et seq.), and implementing regulations at 50 CFR 402.

We also completed an essential fish habitat (EFH) consultation on the proposed action, in accordance with section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C. 1801 et seq.) and implementing regulations at 50 CFR 600.

We completed pre-dissemination review of this document using standards for utility, integrity, and objectivity in compliance with applicable guidelines issued under the Data Quality Act (DQA) (section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001, Public Law 106-554). A complete record of this consultation is on file at the Snake Basin Office, Boise, Idaho.

1.2 Consultation History

On April 1, 2019, NMFS received a letter dated March 29, 2019, from the Salmon-Challis National Forest (SCNF) requesting ESA consultation on the effects of authorizing proposed grazing activities for a 15-year period of time, from the 2019 grazing season through the end of the 2033 grazing season, on the Upper Hayden Creek Allotment (Allotment). Grazing activities prior to the issuance of this document will be considered in the baseline and grazing going forward will be addressed in the effects section. This Opinion will only cover incidental take that will occur after the issuance of the Opinion. This Allotment is located on the Leadore Ranger District in the Hayden Creek (1706020407) 5th field hydrologic unit code (HUC) in Lemhi County, Idaho.

Snake River spring/summer Chinook salmon (*Oncorhynchus tshawytscha*), Snake River Basin steelhead (*O. mykiss*), and their designated critical habitats occur within the Allotment boundary. The biological assessment (BA) (USFS 2019) described proposed livestock grazing activities, the environmental baseline, and the potential effects of those activities on Snake River spring/summer Chinook salmon, Snake River Basin steelhead, and their designated critical habitats. In the BA, the SCNF determined that the proposed action "may affect, and is "likely to adversely affect" Snake River spring/summer Chinook salmon and Snake River Basin steelhead. The SCNF also determined that the action may affect, but is "not likely to adversely affect" designated critical habitat for these species.

The earliest record of ESA consultation for this action is the Lemhi River section 7 watershed BA that was issued on February 17, 1994, resulting in NMFS issuing a letter of concurrence (#SRB 95-0386) on April 14, 1995. That concurrence letter only addressed effects to Snake

River spring/summer Chinook salmon and their critical habitat within the Allotment. Following listing of Snake River Basin steelhead under the ESA, the SCNF submitted a revised section 7 watershed BA on January 15, 1999, for the Lemhi River section 7 watershed. The letter accompanying that BA included an assessment of the Allotment's impacts to Chinook salmon, their critical habitat, and Snake River Basin steelhead and their proposed critical habitat. NMFS provided an October 22, 1999, concurrence letter for activities in the Lemhi River section 7 watershed (#SRB 99-036). In a May 22, 2003 letter sent to NMFS, the SCNF requested the consultation expiration date (January 15, 2003) be eliminated and aligned with their proposed schedule for updates to the section 7 watershed BA baseline identified in that letter. On July 1, 2003, NMFS agreed to extend the expiration date to coincide with the SCNF schedule to update the watershed BA. According to NMFS records, the section 7 watershed BA for the Lemhi River was not updated at that time. On January 12, 2005, NMFS officially eliminated the watershed BA expiration date. Formal ESA consultation was completed on July 29, 2010 (NMFS tracking number: 2010-00852). No further ESA consultations have been completed on the subject action since the last Opinion was issued on July 29, 2010.

Although the SCNF did not make ESA determinations for Southern Resident killer whales (SRKW) (*Orcinus orca*) and their critical habitat[1], NMFS' review of the action's effects on Chinook salmon and steelhead identified potential impacts on the prey availability for the whales. For this reason, and in accordance with NMFS' guidance on marine mammal consultations (Stelle 2013), this document also provides an analysis of effects, concluding with a determination of "may affect, not likely to adversely affect" for SRKW and their critical habitat (Section 2.12).

NMFS received a draft BA on February 26, 2019, and provided the SCNF with suggested edits during a March 26, 2019, meeting. NMFS provided preliminary consensus on the BA's adequacy during that meeting with the agreement that the recommended edits would be adequately incorporated into the final document. NMFS shared the draft proposed action and proposed conservation measures with the SCNF on July 16, 2019. The SCNF suggested minor revisions to the draft Opinion on July 29, 2019.

The SCNF's proposed authorization of cattle grazing on the Allotment would likely affect tribal trust resources. Because the action is likely to affect tribal trust resources, NMFS contacted the Shoshone-Bannock Tribes pursuant to the Secretarial Order (June 5, 1997). A copy of the draft proposed action and terms and conditions were sent to the Shoshone-Bannock Tribes on July 16, 2019, with a request for comments. NMFS did not receive any response.

1.3 Proposed Federal Action

"Action" means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by federal agencies (50 CFR 402.02). Federal action means any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken by a federal agency (50 CFR 600.910).]

[1] The SRKW were listed as endangered on November 18, 2005 (70 FR 69903); critical habitat was designated on November 29, 2006 (71 FR 69054).

"Interrelated actions" are those that are part of a larger action and depend on the larger action for their justification. "Interdependent actions" are those that have no independent utility apart from the action under consideration (50 CFR 402.02). No interdependent or interrelated actions have been identified for this proposed action.

For purposes of this consultation, the proposed action involves the permitting of livestock grazing on 41,995 acres of SCNF lands that comprise the Allotment (USFS 2019). The SCNF currently authorizes the permittee to annually graze up to 500 cow/calf pairs (1,510 Head Months) from July 1 through September 30. Under Forest Service Handbook direction, permittees can request an extension of the grazing season for up to 2 weeks outside of the permitted season. It is not expected that a request for extension, either prior to July 1st or after September 30th, will be received more than 4 years out of a ten. Extensions will have to be pre-approved and will only occur when livestock are in the Apple Creek Unit, which does not contain ESA-listed fish or designated critical habitat.

This consultation covers the proposed 15-year grazing period from the completion of signed Opinion through the end of the 2033 grazing season, so long as: (1) Grazing activities on the Allotment are consistent with the grazing management described in this document; (2) reissuance of permits will be identical to or more conservative than the grazing management described in this document so as to not trigger the need to reinitiate consultation at that time; and (3) other triggers requiring reinitiation of consultation are not exceeded. This consultation covers the issuance of grazing permits following expiration or waiver as long as conditions 1 and 2 above are met. The regulations for consultation require the action agency to reinitiate consultation if certain triggers are met (see Section 2.11) (50 CFR 402.16).

1.3.1 Grazing System

The Allotment involves six Units (or Pastures) managed in a deferred-rest rotation grazing system. The six Units are: (1) Payne/Ford; (2) Kadletz Creek; (3) Tobias/Mogg; (4) Upper Hayden; (5) Boulder Flat; and (6) Apple Creek (Figure 1 and Table 1). The Lower Boulder Flat Unit of the South Hayden Allotment, approximately 243 acres, sits immediately downstream from the Boulder Flat Unit (locally referred to as no-man's land). This acreage is not an actively grazed unit on the South Hayden Allotment; however, active (supervised) trailing will be authorized through this area as a part of the Allotment permittee's term grazing permit. The process and schedule by which livestock will enter and then be moved through each pasture occurring within the Allotment is described below.

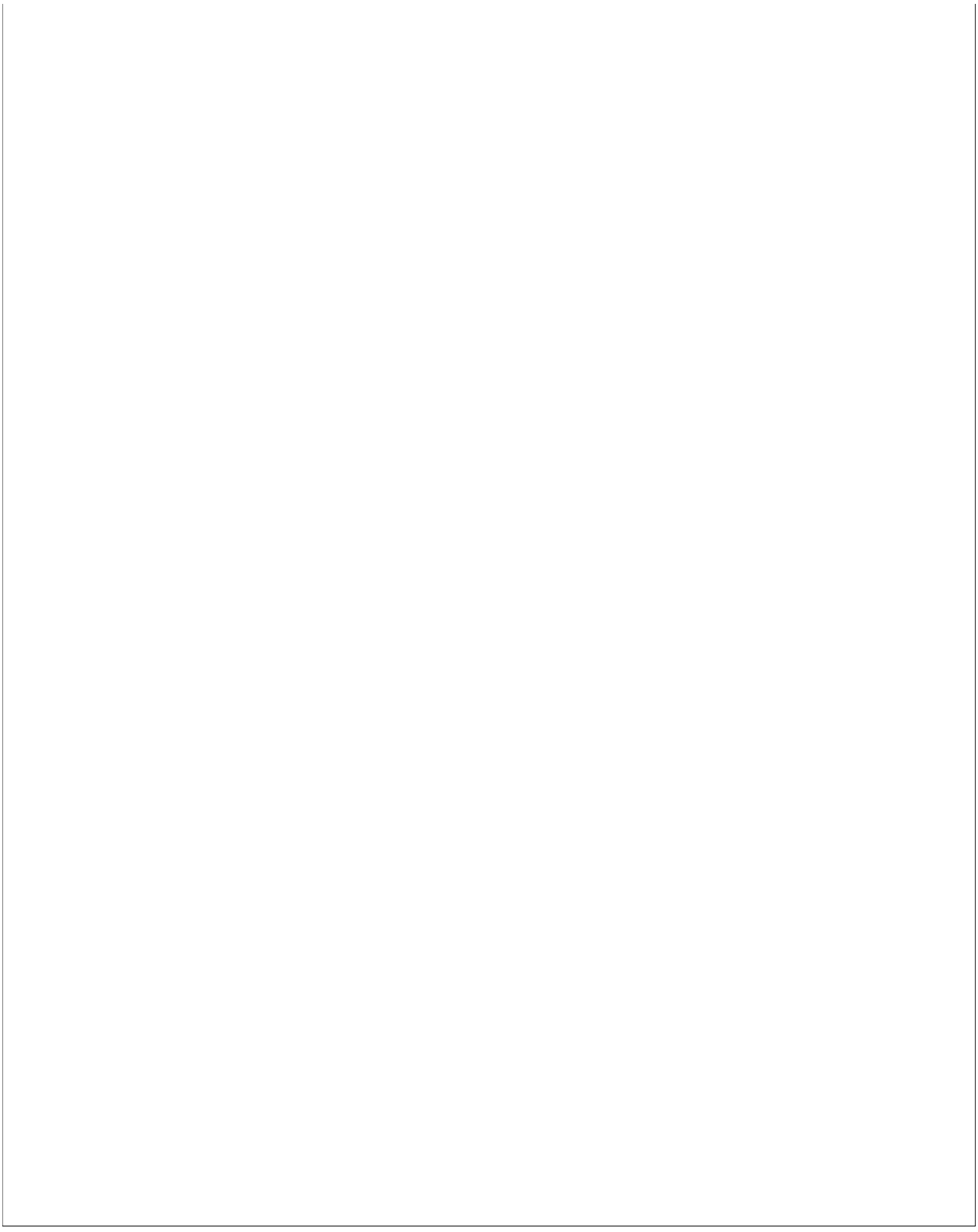


Figure 1. Upper Hayden Allotment Boundary and Pastures.

1.3.1.1 Entry/Exit off the Allotment

The SCNF staff will conduct range readiness monitoring (using bluebunch wheatgrass in the first boot stage or the appearance of Idaho fescue flowerstalks as an indicator) to determine the appropriate on-date. Livestock enter the Allotment from adjacent Bureau of Land Management (BLM) lands on and/or after July 1. Permittees will trail approximately 200 cow/calf pairs through Lower Boulder Flat Unit of the South Hayden Allotment, along Forest System Road (FSR) 60008 (the Hayden Creek Road) two out of every 3 years from the adjacent BLM allotment. In these same years, approximately 300 cow/calf pairs will be trailed from the BLM allotment, across the Meadow Mountain Unit of the South Hayden Allotment into the Boulder Flat Unit in the East Fork of Hayden Creek drainage. One-year out of three, 500 cow/calf pairs will trailed from the BLM allotment across the South Hayden Allotment and enter the Boulder Flat Unit in the East Fork Hayden Creek drainage. Livestock have the potential to be trailed across Hayden, East Fork of Hayden, Apple, Payne, and Ford Creeks, depending on rotation on both the Forest (5-year rotation schedule) and BLM (3-year rotation schedule) allotment. Duration of the move is about 1-day.

When exiting the Allotment, livestock will be trailed from the last Unit in the rotation off the Allotment going through the Apple Creek Unit and off of National Forest System Lands. Livestock will be authorized to actively trail through the Lower Boulder Flat Unit of the South Hayden Allotment, and then to the home ranch. All livestock will be removed from the Allotment by September 30 each year, unless there is a District Ranger extension granted for use to occur in the Apple Creek Unit. On occasion, if stragglers are found near the Hayden Creek Road, a small group of two to six head may be trailed down the road through the Lower Boulder Flat Unit of the South Hayden Allotment to corrals on private property where the cattle are trailered off the Allotment. Streams that have the potential to be crossed during the exit off the allotment include: Ford, Payne, Hayden, Kadletz, and East Fork Hayden Creeks. However, Hayden Creek within the Boulder Flat Unit has the only identified stream crossing which is an unauthorized road crossing that is no longer open to motorized travel.

1.3.1.2 Unit Movements

Annual use indicators (see Section 1.3.4.3) typically drive when each Units move or off date occurs, with Unit move dates being approximate. Permittees are responsible for moving livestock to meet annual use indicators. Annual use indicators will be monitored by SCNF personnel or their representative. Depending on the grazing rotation, livestock are trailed from one Unit to the next. Duration of each move is approximately 1-day.

The following rotations, as described in Table 1, will be used on this Allotment:

Table 1. Upper Hayden Allotment Unit Rotations (see Figure 1 for Unit locations).

Approx.Timeframe[1]	Year 1	Year 2	Year 3	Year 4	Year 5
July 1 (turn-on)	**Boulder Flat** 10 avg. use days up to 500 pair	**Kadletz Creek** 24 avg. use days up to 500 pair	**Apple Creek** 21 avg. use days up to 500 pair *No ESA spp.*	**Boulder Flat** 10 avg. use days up to 500 pair	**Boulder Flat** 10 avg. use days up to 500 pair

Approx.Timeframe[1]	Year 1	Year 2	Year 3	Year 4	Year 5
	Payne/Ford 25 avg. use days up to 500 pair	**Boulder Flat** 10 avg. use days up to 500 pair	**Boulder Flat** 10 avg. use days up to 500 pair	**Kadletz Creek** 24 avg. use days up to 400 pair	**Apple Creek** 21 avg. use days *No ESA spp.*
Early August	**Kadletz Creek** 24 avg. use days up to 500 pair **Tobias/Mogg** 26 avg. use days approx. 400 pair, and **Upper Hayden[2]** 30 avg. use days approx. 100 pair	**Tobias/Mogg** 26 avg. use days approx. 400 pair, and **Upper Hayden[2]** 30 avg. use days approx. 100 pair	**Payne/Ford** 25 avg. use days up to 500 pair	**Tobias Mogg** 26 avg. use days approx. 400 pair, and **Upper Hayden[2]** 30 avg. use days approx. 100 pair	**Tobias/Mogg** 26 avg. use days approx. 400 pair, and **Upper Hayden[2]** 30 avg. use days approx. 100 pair
Early September	**Apple Creek** 21 avg. use days up to 500 pair *No ESA spp.*	**Apple Creek** 21 avg. use days up to 500 pair *No ESA spp.*	**Kadletz Creek** 24 avg. use days up to 500 pair	**Payne/Ford** 25 avg. use days up to 500 pair	**Payne/Ford** 25 avg. use days up to 500 pair
Rest Unit		**Payne/Ford**	**Tobias/Mogg** and **Upper Hayden**	**Apple Creek**	**Kadletz Creek**

1. Number of use days are averages; actual use days and move dates are driven by annual use indicator monitoring results.
2. *The Upper Hayden Unit will be grazed with no more than 100 cow/calf pairs and will be used in conjunction with the Tobias/Mogg Unit.

Livestock are moved from one Unit to the next depending on the grazing rotation and their location within the Unit. Stream crossings may be necessary to facilitate these moves and are typically done with the bulk of the herd on 1-day with supervised trailing. A large group with the bulk of the herd may cross or several smaller groups may cross depending on the location of the cows, number of riders, weather, terrain, etc. Back-riding to pick up animals that did not get gathered during the bulk of the move and subsequent crossings with the smaller bunches will also occur.

Depending on Unit rotations, the streams that will be crossed when livestock are being moved between Units before July 7 include: Payne, Ford, Hayden, and East Fork Hayden Creeks. As previously discussed, Hayden Creek within the Boulder Flat Unit, has the only identified stream crossing.

Depending on Unit rotations, streams that would be crossed when livestock are being moved between units after August 15 include: Ford, Payne, Hayden, East Fork Hayden, and Kadletz Creeks. Again, Hayden Creek is the only identified stream crossing.

When the Apple Creek Unit is used last in the rotation (Years 1 and 2), the Hayden Creek ford in the Boulder Flat Unit will not be crossed when livestock are trailing off the Allotment. When livestock are moved to or from the Payne/Ford Unit, they may trail through a portion of the Lower Boulder Flat Unit of the South Hayden Allotment. All trailing is active and supervised (no overnighting would occur) and is dependent on the rotation schedule. Trailing occurs primarily on upland trails. Livestock may access the meadow area just below the Boulder Flat Unit boundary, but they are there for only a short period, typically less than an hour before being pushed on toward their destination (USFS 2019).

Information on Units approximate annual use days and how many years livestock have the potential to be in Units during spawning and incubation is described below. Average yearly use days were calculated using actual use information reported by permittees and/or annual operating instructions (AOI) schedules since 2010. Livestock moves are guided by the goal of not exceeding annual use indicators; therefore, the average yearly use days may or may not all fall within post-spawning timeframes.

The following narrative describes the potential for exposure to redds by species and grazing Unit. It is reasonable to expect that use days post-spawning will be less when the Unit is used earlier (third) in the rotation rather than fourth or last. For example, with an on-date of July 1, in Year-1, it is reasonable to expect that livestock could be in the Kadletz Creek Unit post-spawning, only a part of the 24-day average use, as compared to Year-3, when they would be present until late September.

1.3.1.3 Applicable to All Units

The following conditions will apply for each Unit rotation used on this Allotment:

- The Upper Hayden Allotment will continue to use a deferred-rest rotation grazing system.

- Range readiness (i.e., bluebunch wheatgrass in the first boot stage or the appearance of Idaho fescue flowerstalks) will be monitored as necessary to determine if the on-date is appropriate. The on-date may be adjusted if conditions warrant. The SCNF staff will do the monitoring to determine the on-date.

- Annual use indicators (Section 1.3.4.3) will typically drive when Unit moves or the off date occurs. Permittees are responsible for moving livestock to meet annual use indicators. Annual use indicators will be monitored by Forest Service personnel or their representative.

1.3.1.4 Payne/Ford Unit

- Three out of 5 years, livestock will be in the Unit after the third week in August during the Chinook spawning and incubation period[2].

- Livestock will not be in the Unit during steelhead spawning and incubation.

1.3.1.5 Kadletz Creek Unit

- Two out of every 5 years, livestock will be in the Unit after the third week of August during the Chinook spawning and incubation period.

- Once every 5 years, livestock will be in the Unit during steelhead incubation (first week of July).

1.3.1.6 Tobias/Mogg Unit

- Four out of 5 years, livestock will be in the Unit after the third week of August during the Chinook spawning and incubation period.

- Livestock will not be in the Unit during steelhead spawning and incubation.

1.3.1.7 Boulder Flat Unit

- Livestock will not be in the Unit during the Chinook spawning and incubation period.

- Three out of 5 years livestock will be in the Unit during steelhead incubation (first week of July).

1.3.1.8 Upper Hayden Unit

- Four out of 5 years, livestock will be in the Unit after the third week of August during the Chinook spawning and incubation period. However, Chinook salmon spawning is not known to occur on streams within this pasture.

- Livestock will not be in the Unit during steelhead spawning and incubation.

- Only 100 cow/calf pairs will be in the Unit any year, the remainder of the herd will be in Tobias/Mogg at the same time.

[2] According to periodicity tables created by the Upper Salmon Basin Watershed Project (USBWP) for Hayden Creek, Chinook salmon spawn from late-August through the end of September. Incubation occurs from late-August through the end of April (USBWP 2005).

1.3.1.9 Apple Creek Unit

There are no ESA-listed fish or streams present on the Apple Creek Unit.

1.3.2 Conservation Measures

In addition to the actions described above, the SCNF indicated the following measures will be implemented to avoid and reduce potential impacts to ESA-listed fish:

1. The Forest will follow the Communication Plan – Implementing Livestock Grazing Consultation on the SCNF (Appendix F of the BA). The Communication Plan could be updated to better address livestock grazing management both within the Forest Service and between the Forest Service and NMFS/U.S. Fish and Wildlife Service (USFWS). The desired outcome of this Communication Plan is to conduct livestock grazing within the scope of this BA and subsequent BO while being consistent and timely in communication when something is observed to the contrary.

2. The Bear Valley Riparian exclosure (Kadletz Creek Unit) will continue to be maintained by the SCNF to exclude livestock grazing. The maintenance of this exclosure is the responsibility of the Forest Service. Any livestock found in the exclosure will be promptly removed by the permittee. On the infrequent to rare occasion when livestock may find a way into the exclosure, any livestock found in the exclosure will be promptly removed by the permittee, and management will address any reasons within their control that allowed livestock to enter (e.g., ongoing fence maintenance). The Communication Plan will be initiated should livestock enter the Bear Valley exclosure after July 1 and before the second week in July (after steelhead egg incubation) and/or after the third week of August (beginning of Chinook salmon spawning).

3. To reduce the likelihood of Chinook salmon redd trampling in Hayden Creek, an exclosure fence is planned for the Boulder Flat Unit and a shorter length of fence is planned for the Lower Boulder Flat Unit of the South Hayden Allotment. The SCNF staff are working with Upper Salmon Basin Watershed Project, Trout Unlimited, and the permittee to identify location and design specifics of the livestock grazing exclosure. This project will be implemented before the start of grazing in 2020. The Boulder Flat exclosure fence will be approximately 1.3 miles (7,100 feet) in length, and will exclude approximately 0.6 miles of Hayden Creek from access by cattle in the Boulder Flat Unit. The horseshoe-shape of the fence will tie in on either side with the cross-fence to create the exclosure around the stream, associated riparian vegetation, and small amounts of uplands. The length of fence in the Lower Boulder Flat Unit of the South Hayden Allotment will be approximately 0.4 miles (2,300 feet) and will run north-south, on the east side of FSR #60008, from the Upper Hayden Allotment boundary cross-fence to the scree face that meets FSR #60008. The fence will tie off into the rock face and will reduce the likelihood of livestock accessing Hayden Creek from the west during all parts of the grazing season. Most of the fence will be jack and pole, although lengths of post and wire fence may be substituted where conditions necessitate a substitution.

4. A deferred-rest rotation grazing system will continue to be used to provide benefits to riparian vegetation and help meet long-term riparian resource objectives for greenline successional status and bank stability.

5. The on-date will be varied, if necessary, so that livestock will be placed on the Allotment at range readiness to reduce potential for streambank alteration and help meet long-term riparian resource objectives for streambank stability.

6. Annual use indicators will help drive when livestock are moved between Units or off the Allotment (within the terms and conditions of the term grazing permit). Annual use indicators will be measured by SCNF personnel.

7. Permittees will continue to salt at least one-fourth mile away from streams. This will help to reduce potential impacts on spawning areas and designated critical habitat.

8. Permittees will continue to distribute livestock away from streams and associated riparian areas, reducing potential impacts on spawning areas and designated critical habitat.

9. Fences and water developments have been placed to reduce livestock use on streams and associated riparian areas. This will continue to reduce impacts on spawning areas and designated critical habitat.

1.3.3 Changes from Existing Management

1. An exclosure fence is planned for the Boulder Flat Unit and a shorter length of fence is planned for the Lower Boulder Flat Unit of the South Hayden Allotment; this fence is planned for construction in 2019 and/or 2020.

2. Unit rotations were adjusted to reduce the number of days livestock are in the Boulder Flat Unit. This was done to minimize potential impacts to Chinook salmon redds after the third week of August. Grazing is not authorized in the Boulder Flat Unit after August 15th.

3. Two fences were installed to prevent vehicles from crossing Hayden Creek on an unauthorized route within the Boulder Flat Unit. These fences have minimized camping and crossing exposure on Hayden Creek in a reach where Chinook salmon redd(s) have been documented.

4. The annual use indicators for Kadletz Creek (M258A) (in the Kadletz Creek Unit) and East Fork of Hayden Creek (M261) (in the Tobias Mogg Unit) have been changed from 4- to 6-inch greenline stubble height as these designated monitoring area (DMA) sites are not meeting or moving toward the resource objectives for Greenline Ecological Status (GES). The previous site on Kadletz Creek (M258) was not meeting protocol for a DMA so a new site was established (M258A) where livestock access is better represented in the monitoring.

5. Multiple indicator monitoring (MIM) site M226 on Hayden Creek in the Boulder Flat Unit may be removed from annual indicator monitoring reporting once the new exclosure fence construction is completed. This new fence will exclude this site from grazing making it unnecessary to monitor annual indicators. Monitoring will not cease on this stream but it may not be a part of the monitoring requirements as part of this consultation. Forest Service personnel will observe livestock impacts above the exclosure on Hayden Creek for 2 years to determine if a new MIM location needs to be established on Hayden Creek in that area. As part of those observances a Forest range specialist and fish biologist will survey Hayden Creek in 2019, above where the exclosure fence will be constructed within the Boulder Flat Unit.

6. The Lower Boulder Flat Unit of the South Hayden Allotment will be used for active trailing only.

7. The monitoring attribute of woody browse use will be added to all DMAs.

8. The annual use indicators for Hayden Creek (M226) (in the Boulder Flat Unit) and Kadletz Creek (M258A) (in the Kadletz Creek Unit) have been changed from 20 percent to 15 percent bank alteration to aid in meeting resource objectives for bank stability.

9. The annual use indicator for Ford Creek (M259A) (in the Payne/Ford Unit), has been changed from 15 percent to 20 percent bank alteration as this site is meeting the resource objectives for bank stability. The site was moved in 2017 to better represent livestock use along the stream. Long-term MIM monitoring will be read at the Ford Creek site in 2019. There are no Chinook salmon or steelhead present in Ford Creek.

10. The MIM site M307 on Squaw Creek (in the Tobias-Mogg Unit) will be removed from the required monitoring list as there is already a MIM site in the Tobias-Mogg Unit. This MIM site is dominated by spruce overstory and gooseberry understory. The riparian area and stream is timbered and substrate is 42 percent small cobble to small boulder. Livestock do not utilize this riparian area except in a few small spots where they water and cross the stream. As such, annual use indicators on the DMA site have been readily met 2010–2017. Monitoring will not cease on this stream but it will not be part of the requirements for monitoring as part of this consultation. This monitoring site will be changed from an annual monitoring to once every 3–5 years. The MIM 261 on East Fork Hayden Creek will be the annual monitoring location for the Tobias-Mogg Unit.

11. The MIM site (M262) on Apple Creek (in the Apple Creek Unit) will be removed from the required monitoring list as there are no ESA fish streams or designated critical habitat within the Apple Creek Unit. Apple Creek is not designated critical habitat and does not support ESA-listed fish. Monitoring will not cease on this stream but it will not be part of the requirements for monitoring as part of this consultation. Past monitoring also indicated that Apple Creek was low flowing and dry in some portions of the DMA.

1.3.4 Resource Objectives, Standards, and Annual Use Indicators

1.3.4.1 Resource Management Objectives

Resource objectives are the SCNF's description of the desired land, plant, and water resource conditions within riparian areas in the allotments. Some resource objectives are Riparian Management Objectives (RMOs) from the PACFISH Opinion (NMFS 1998). The Allotment is being managed to achieve the following resource conditions in riparian areas:

- Greenline Successional Status: A greenline successional status value of at least 61 (late seral) or the current value, whichever is greatest (Winward 2000; Burton et al. 2011).

- Woody Species Regeneration: Sufficient woody recruitment to develop and maintain healthy woody plant populations. A stable trend at sites with desired condition and an upward trend at sites not at desired condition (Winward 2000; Burton et al. 2011).

- Streambank Stability: Within priority watersheds, a bank stability of at least 90 percent or the current value, whichever is greatest (NMFS 1998). The Upper Hayden Allotment is within a priority watershed.

- Water Temperature: No measureable increase in maximum water temperature (7-day moving average of daily maximum temperature measured as the average of the maximum daily temperature of the warmest consecutive 7-day period); <64°F in (Chinook, steelhead) migration and rearing areas, and <60°F in spawning areas except in steelhead priority watersheds with a <45°F in spawning area (PACFISH Opinion) (NMFS 1998).

- Greenline to Greenline Width: is a new RMO at DMA's that replaces the width/depth RMO because greenline-to-greenline width (GGW) is: (a) Sensitive to livestock use; (b) indicates trend when used with greenline composition and bank stability where a stream is over-widened; and (c) possesses good repeatability (Burton et al 2011). The SCNF is now monitoring GGW as a metric that indicates if there are underlying change in channel dimensions. Because there is no established metric or value associated with stream functionality, GGW indicates trend in channel dimension when used with greenline composition and bank stability.

- Sediment: <20 percent surface fine sediment, which is substrate <0.25-inch (6.4 millimeter) in diameter in spawning habitat, or <30 percent cobble embeddedness in rearing habitat.

1.3.4.2 Resource Standards (PACFISH)

The following PACFISH Resource Standards will be applied to management of the Allotment:

- GM-1 – Modify grazing practices (e.g., accessibility of riparian area to livestock, length of grazing season, stocking levels, timing of grazing, etc.) that retard or prevent attainment of RMOs or are likely to adversely affect listed anadromous fish. Suspend

grazing if adjusting practices is not effective in meeting RMOs and avoiding adverse effects on listed anadromous fish.

- GM-2 – Locate new livestock handling and/or management facilities outside of Riparian Habitat Conservation Areas (RHCAs). For existing livestock handling facilities inside the RHCAs, assure that facilities do not prevent attainment of RMOs or adversely affect listed anadromous fish. Relocate or close facilities where these objectives cannot be met.

- GM-3 – Limit livestock trailing, bedding, watering, salting, loading, and other handling efforts to those areas and times that will not retard or prevent attainment of RMOs or adversely affect listed anadromous fish.

1.3.4.3 Annual Grazing Use Indicators

The SCNF proposes the following annual grazing use indicators and monitoring methods for use on the Allotment (Table 2). Annual use indicators will be measured by key species (on uplands) and at DMA sites. Key species are preferred by livestock and an important component of a plant community, serving as an indicator of change (USFS 2019). The MIM protocol (Burton et al. 2011) or other best available science will be used to monitor grazing use at DMAs. Season-end annual use indicators will be monitored by Forest Service personnel or a person authorized by the Forest Service. Permittees are encouraged, by use of triggers, to determine when livestock need to be moved from a unit to meet the annual use indicators. Results from monitoring will be available at (http://www.fs.fed.us/r4/sc/projects/range/index.shtml).

Table 2. Current Annual Use Indicators for the Upper Hayden Grazing Allotment (Endpoint indicators and use triggers will be adjusted as monitoring indicates RMOs are or are not being met).

Key Area Location/DMA #	Pasture Name/Creek Name	Monitoring Attribute	Endpoint Indicator	Key Species	Estimated Use Trigger
MIM/M226	Boulder Flat Unit – Hayden Creek[1]	Greenline stubble	6 inch (in.)	*Carex*	7 in.
		Browse Use	30% 50%	Alder Willow	25% 45%
		Bank Alteration	≤15%	n/a	10%
MIM/M261	Tobias/Mogg Unit– East Fork Hayden Creek	Greenline stubble	6 in.	Hydric *spp*.	7 in.
		Browse Use	30% 50%	Alder Willow	25% 45%
		Bank Alteration	≤20%	n/a	15%
MIM/M260	Boulder Flat Unit– Tobias Creek	Greenline stubble	6 in.	Carex	7 in.
		Browse Use	50%	45 percent	Willow
		Bank Alteration	≤20%	n/a	15%
MIM/M259	Payne/Ford Unit – Ford Creek	Greenline stubble	4 in.	Hydric *spp*.	5 in.
		Browse Use	30% 50%	Alder Willow	25% 45%
		Bank Alteration	≤20%	n/a	15%
MIM/M258A	Kadletz Unit– Kadletz Creek	Greenline stubble	6 in.	*Carex*	7 in.
		Browse Use	50%	Willow	45%
		Bank Alteration	≤15%	n/a	10%

Key Area Location/DMA #	Pasture Name/Creek Name	Monitoring Attribute	Endpoint Indicator	Key Species	Estimated Use Trigger
Upland Areas	All Units	Utilization by Key Species	50%	Upland grass species	45%
Riparian Areas (on DMA)	All Units	Utilization by Key Species	50%	Riparian grass species	45%

[1] The MIM site inside the exclosure will be retained (not removed) and may continue to be monitored. Monitoring at this site will not be part of the monitoring requirements of this consultation.

1.3.4.4 Monitoring

Two types of monitoring will be applied to livestock grazing on the Allotment, implementation and effectiveness monitoring. Both qualitative and quantitative measurements will be taken during this effort.

Implementation (Annual) Monitoring. The DMAs are areas representative of grazing use specific to the riparian area being accessed and reflect what is happening in the overall riparian area as a result of on-the-ground management actions. The monitoring protocol uses the Multiple Indicator Monitoring (MIM) method (Burton et al 2011) or other best available published science. Implementation monitoring will be conducted at designated monitoring areas (DMAs). Each DMA is to be located in an area that is representative of streamside livestock use, reflecting typical use of riparian vegetation and streambanks (Burton et al 2011).

The purpose of monitoring annual use indicators is to identify the relationship between allowed use and attainment of the three riparian resource objectives directly affected by livestock grazing. Per the MIM method, timing of annual use monitoring is based on its purpose. Alteration monitoring is typically conducted within two weeks of livestock having been moved from a Unit. Monitoring residual stubble height, as a protective cover for next spring's flows, is conducted by the end of the grazing season. Season-end annual use indicators will be monitored by Forest Service personnel or a person authorized by the Forest Service.

Effectiveness (Long-Term) Monitoring. Effectiveness monitoring for greenline ecological status, woody regeneration and bank stability will be conducted a minimum of every 5 years at DMAs using the MIM technical reference or other best available science as it becomes available. The DMAs are areas representative of grazing use specific to the riparian area being accessed and reflect what is happening in the overall riparian area as a result of on-the-ground management actions. They should reflect typical livestock use where they enter and use vegetation in riparian areas immediately adjacent to the stream (Burton et al. 2011).

The monitoring protocol for the channel geometry focus indicator is revised from a wetted width/depth measurement (range monitoring prior to 2010) and a bankfull width/depth metric (watershed monitoring 1993–2018) to the GGW measurement as described in the MIM protocol.

Fish Habitat Monitoring. Sediment (depth fines) and water temperature will be monitored at established long-term monitoring sites using established protocols at least once every years. These sites are not necessarily located at the DMAs.

Fish Population Monitoring. Fish population monitoring, which will include determining ESA-listed fish presence and density, will be conducted at long-term monitoring sites within the allotment at least every 5 years. Annual Chinook salmon redd survey monitoring will continue on the Allotment.

Results from annual Opinion Monitoring Reports will be electronically emailed to the respective Regulatory Agency, or their offices, by March 1 each year and will be available at: (http://www.fs.usda.gov/detail/scnf/landmanagement/resourcemanagement/?cid=STELPRDB5308989).

1.3.4.5 Adaptive Management

The adaptive management strategy described below and depicted in Appendix A, Diagrams 1 (Long term) and 2 (Annual), is intended to determine if the Allotment might require grazing management changes and/or further consultation. The adaptive management strategy will be used to ensure: (1) Sites at desired condition remain in desired condition; (2) sites not in desired condition have an upward trend or an acceptable static trend (after consensus with the NMFS, USFWS, and SCNF); and (3) direction from ESA consultation with NMFS and USFWS is met. The overall strategy consists of a long-term adaptive management strategy and an annual adaptive management strategy. The long-term strategy describes how adaptive management will be used to ensure the resource objectives that livestock directly affect are achieved and to maintain consistency with Forest Plan level direction. The annual adaptive management strategy describes how adjustments will be made within the grazing season to ensure annual endpoint indicators and other direction from consultation is met. Both strategies describe when and how regulatory agencies will be contacted in the event direction from consultation is not going to be met (see also Communication Plan, Appendix F in the BA).

Ideally, the value associated with the annual use indicator is customized to the specific circumstances in each Unit. However, customizing this value generally requires a significant amount of data and/or experience with a particular Unit. When sufficient data and/or experience are not available to establish the annual use indicator values, the Forest has provided general guidelines for establishing the values. Bank stability, greenline successional status, width:depth (W:D) and/or greenline to greenline measurement, and woody species regeneration will be monitored every 3 to 5 years to evaluate resource conditions as part of their effectiveness monitoring.

Monitoring results are submitted to NMFS annually. These guidelines will be used until such time as sufficient data and/or experience are available to customize the annual indicator values. The general guidelines are:

- When the greenline ecological status is 61 or greater, the end of season average greenline stubble height annual use indicator will be 4 inches.

- When the greenline ecological status is less than 61, the end of season average greenline stubble height annual use indicator will be 6 inches.

- When there is sufficient woody recruitment to develop and maintain healthy woody plant populations, the woody browse indicator will be 50 percent woody browse on multi-stemmed species and 30 percent woody browse on single-stemmed species.

- When there is not sufficient woody recruitment to develop and maintain healthy woody plant populations, the woody browse indicator will be 30 percent woody browse on multi-stemmed species and 20 percent woody browse on single-stemmed species.

- In priority watersheds, when bank stability is 90 percent or greater, the bank alteration annual use indicator will be 20 percent.

- In priority watersheds, when bank stability is 70 percent to 89 percent, the bank alteration annual use indicator will be 10 percent to 20 percent.

- In priority watersheds, when bank stability is less than 70 percent, the bank alteration annual use indicator will be 10 percent.

2. ENDANGERED SPECIES ACT: BIOLOGICAL OPINION AND INCIDENTAL TAKE STATEMENT

The ESA establishes a national program for conserving threatened and endangered species of fish, wildlife, plants, and the habitat upon which they depend. As required by section 7(a)(2) of the ESA, each federal agency must ensure that its actions are not likely to jeopardize the continued existence of endangered or threatened species, or adversely modify or destroy their designated critical habitat. Per the requirements of the ESA, federal action agencies consult with NMFS and section 7(b)(3) requires that, at the conclusion of consultation, NMFS provides an Opinion stating how the agency's actions would affect listed species and their critical habitats. If incidental take is reasonably certain to occur, section 7(b)(4) requires NMFS to provide an ITS that specifies the impact of any incidental taking and includes non-discretionary RPMs and terms and conditions to minimize such impacts.

The SCNF determined the proposed action is not likely to adversely affect Snake River spring/summer Chinook salmon and Snake River Basin steelhead designated critical habitat. Our concurrence is documented in the "Not Likely to Adversely Affect" Determinations section.

2.1 Analytical Approach

This Opinion includes both a jeopardy analysis and/or an adverse modification analysis. The jeopardy analysis relies upon the regulatory definition of "to jeopardize the continued existence of" a listed species, which is "to engage in an action that would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species"

(50 CFR 402.02). Therefore, the jeopardy analysis considers both survival and recovery of the species.

We use the following approach to determine whether a proposed action is likely to jeopardize listed species:

- Identify the rangewide status of the species expected to be adversely affected by the proposed action.
- Describe the environmental baseline in the action area.
- Analyze the effects of the proposed action on both species and their habitat using an "exposure-response-risk" approach.
- Describe any cumulative effects in the action area.
- Integrate and synthesize the above factors by: (1) Reviewing the status of the species; and (2) adding the effects of the action, the environmental baseline, and cumulative effects to assess the risk that the proposed action poses to species.
- Reach a conclusion about whether species are jeopardized.
- If necessary, suggest a reasonable and prudent alternative to the proposed action.

2.2 Rangewide Status of the Species

This opinion examines the status of each species that would be adversely affected by the proposed action. The status is determined by the level of extinction risk that the listed species face, based on parameters considered in documents such as recovery plans, status reviews, and listing decisions. This informs the description of the species' likelihood of both survival and recovery. The species status section also helps to inform the description of the species' current "reproduction, numbers, or distribution" as described in 50 CFR 402.02.

2.2.1 Status of the Species

This section describes the present condition of the Snake River spring/summer Chinook salmon evolutionarily significant unit (ESU) and the Snake River Basin steelhead distinct population segment (DPS). NMFS expresses the status of a salmonid ESU or DPS in terms of likelihood of persistence over 100 years (or risk of extinction over 100 years). NMFS uses McElhaney et al.'s (2000) description of a viable salmonid population (VSP) that defines "viable" as less than a 5 percent risk of extinction within 100 years and "highly viable" as less than a 1 percent risk of extinction within 100 years. A third category, "maintained," represents a less than 25 percent risk within 100 years (moderate risk of extinction). To be considered viable an ESU or DPS should have multiple viable populations so that a single catastrophic event is less likely to cause the ESU/DPS to become extinct, and so that the ESU/DPS may function as a metapopulation that can sustain population-level extinction and recolonization processes (ICTRT 2007). The risk

level of the ESU/DPS is built up from the aggregate risk levels of the individual populations and major population groups (MPGs) that make up the ESU/DPS.

Attributes associated with a VSP are: (1) Abundance (i.e., number of adult spawners in natural production areas); (2) productivity (i.e., adult progeny per parent); (3) spatial structure; and (4) diversity. A VSP needs sufficient levels of these four population attributes in order to: safeguard the genetic diversity of the listed ESU or DPS; enhance its capacity to adapt to various environmental conditions; and allow it to become self-sustaining in the natural environment (ICTRT 2007). These viability attributes are influenced by survival, behavior, and experiences throughout the entire salmonid life cycle, characteristics that are influenced in turn by habitat and other environmental and anthropogenic conditions. The present risk faced by the ESU/DPS informs NMFS' determination of whether additional risk will appreciably reduce the likelihood that the ESU/DPS will survive or recover in the wild.

2.2.1.1 Snake River Spring/Summer Chinook Salmon

The Snake River spring/summer Chinook salmon ESU was listed as threatened on April 22, 1992 (57 FR 14653). This ESU occupies the Snake River basin, which drains portions of southeastern Washington, northeastern Oregon, and north/central Idaho. Several factors led to NMFS' conclusion that Snake River spring/summer Chinook were threatened: (1) Abundance of naturally produced Snake River spring and summer Chinook runs had dropped to a small fraction of historical levels; (2) short-term projections were for a continued downward trend in abundance; (3) hydroelectric development on the Snake and Columbia Rivers continued to disrupt Chinook runs through altered flow regimes and impacts on estuarine habitats; and (4) habitat degradation existed throughout the region, along with risks associated with the use of outside hatchery stocks in particular areas (Good et al. 2005). On May 26, 2016, in the agency's most recent 5-year review for Pacific salmon and steelhead, NMFS concluded that the species should remain listed as threatened (81 FR 33468).

Current runs returning to the Clearwater River drainages were not included in the Snake River spring/summer Chinook salmon ESU. Lewiston Dam on the lower mainstem of the Clearwater River was constructed in 1927 and blocked Chinook passage until the early 1940s (Matthews and Waples 1991). In the 1940s spring and summer Chinook salmon runs were reintroduced into the Clearwater system via hatchery outplants. As a result, when determining the status of Snake River spring/summer Chinook for ESA listing, NMFS concluded that even if a few native salmon survived the hydropower dams, "the massive outplantings of nonindigenous stocks presumably substantially altered, if not eliminated, the original gene pool" (Matthews and Waples 1991).

Life History. Snake River spring/summer Chinook salmon are characterized by their return times. Runs classified as spring Chinook salmon are counted at Bonneville Dam beginning in early March and ending the first week of June; summer runs are those Chinook adults that pass Bonneville Dam from June through August. Returning adults will hold in deep mainstem and tributary pools until late summer, when they move up into tributary areas and spawn. In general, spring-run type Chinook salmon tend to spawn in higher-elevation reaches of major Snake River tributaries in mid- through late August; and summer-run Chinook salmon tend to spawn lower in

Snake River tributaries in late August and September (although the spawning areas of the two runs may overlap).

Spring/summer Chinook spawn follow a "stream-type" life history characterized by rearing for a full year in the spawning habitat and migrating in early to mid-spring as age-1 smolts (Healey 1991). Eggs are deposited in late summer and early fall, incubate over the following winter, and hatch in late winter and early spring of the following year. Juveniles rear through the summer, and most overwinter and migrate to sea in the spring of their second year of life. Depending on the tributary and the specific habitat conditions, juveniles may migrate extensively from natal reaches into alternative summer-rearing or overwintering areas. Snake River spring/summer Chinook salmon return from the ocean to spawn primarily as 4- and 5-year-old fish, after 2 to 3 years in the ocean. A small fraction of the fish return as 3-year-old "jacks," heavily predominated by males (Good et al. 2005).

***Spatial Structure and Diversity*.** The Snake River ESU includes all naturally spawning populations of spring/summer Chinook in the mainstem Snake River (below Hells Canyon Dam) and in the Tucannon River, Grande Ronde River, Imnaha River, and Salmon River subbasins (57 FR 23458), as well as the progeny of 15 artificial propagation programs (70 FR 37160). The hatchery programs include the South Fork Salmon River (McCall Hatchery), Johnson Creek, Lemhi River, Pahsimeroi River, East Fork Salmon River, West Fork Yankee Fork Salmon River, Upper Salmon River (Sawtooth Hatchery), Tucannon River (conventional and captive broodstock programs), Lostine River, Catherine Creek, Lookingglass Creek, Upper Grande Ronde River, Imnaha River, and Big Sheep Creek programs. The historical Snake River ESU likely also included populations in the Clearwater River drainage and extended above the Hells Canyon Dam complex.

Within the Snake River ESU, the Interior Columbia Technical Recovery Team (ICTRT) identified 28 extant and four extirpated or functionally extirpated populations of spring/summer-run Chinook salmon, listed in Table 3 (ICTRT 2003; McClure et al. 2005). The ICTRT aggregated these populations into five MPGs: Lower Snake River, Grande Ronde/Imnaha Rivers, South Fork Salmon River, Middle Fork Salmon River, and Upper Salmon River. For each population, Table 4 shows the current risk ratings that the ICTRT assigned to the four parameters of a viable salmonid population (spatial structure, diversity, abundance, and productivity).

Spatial structure risk is low to moderate for most populations in this ESU (NWFSC 2015) and is generally not preventing the recovery of the species. Spring/summer Chinook salmon spawners are distributed throughout the ESU albeit at very low numbers. Diversity risk, on the other hand, is somewhat higher, driving the moderate and high combined spatial structure/diversity risks shown in Table 3 for some populations. Several populations have a high proportion of hatchery-origin spawners—particularly in the Grande Ronde, Lower Snake, and South Fork Salmon MPGs—and diversity risk will need to be lowered in multiple populations in order for the ESU to recover (ICTRT 2007; ICTRT 2010; NWFSC 2015).

***Abundance and Productivity*.** Historically, the Snake River drainage is thought to have produced more than 1.5 million adult spring/summer Chinook salmon in some years (Matthews

and Waples 1991), yet by the mid-1990s counts of wild fish passing Lower Granite Dam dropped to less than 10,000 (IDFG 2007). Wild returns have since increased somewhat but remain a fraction of historic estimates. Between 2005 and 2015, the number of wild adult fish passing Lower Granite Dam annually ranged from 8,808 to 30,338 (IDFG 2016). Natural origin abundance has increased over the last 5 years for most populations in this ESU, but the increases have not been large enough to change population viability ratings for abundance and productivity; all but one population (Chamberlain Creek) remain at high risk of extinction over the next 100 years (NWFSC 2015). Many populations in Table 4 will need to see increases in abundance and productivity in order for the ESU to recover.

Table 3. Summary of viable salmonid population parameter risks and overall current status for each population in the Snake River spring/summer Chinook salmon ESU (NWFSC 2015).

MPG	Population	VSP Risk Parameter		Overall Viability Rating
		Abundance/ Productivity	Spatial Structure/ Diversity	
South Fork Salmon River (Idaho)	Little Salmon River	*Insf. data*	Low	High Risk
	South Fork Salmon River mainstem	High	Moderate	High Risk
	Secesh River	High	Low	High Risk
	East Fork South Fork Salmon River	High	Low	High Risk
Middle Fork Salmon River (Idaho)	Chamberlain Creek	Moderate	Low	Maintained
	Middle Fork Salmon River below Indian Creek	*Insf. data*	Moderate	High Risk
	Big Creek	High	Moderate	High Risk
	Camas Creek	High	Moderate	High Risk
	Loon Creek	High	Moderate	High Risk
	Middle Fork Salmon River above Indian Creek	High	Moderate	High Risk
	Sulphur Creek	High	Moderate	High Risk
	Bear Valley Creek	High	Low	High Risk
	Marsh Creek	High	Low	High Risk
Upper Salmon River (Idaho)	North Fork Salmon River	*Insf. data*	Low	High Risk
	Lemhi River	High	High	High Risk
	Salmon River Lower Mainstem	High	Low	High Risk
	Pahsimeroi River	High	High	High Risk
	East Fork Salmon River	High	High	High Risk
	Yankee Fork Salmon River	High	High	High Risk
	Valley Creek	High	Moderate	High Risk
	Salmon River Upper Mainstem	High	Low	High Risk
	Panther Creek			***Extirpated***
Lower Snake (Washington)	Tucannon River	High	Moderate	High Risk
	Asotin Creek			***Extirpated***
Grande Ronde and Imnaha Rivers (Oregon/ Washington)	Wenaha River	High	Moderate	High Risk
	Lostine/Wallowa River	High	Moderate	High Risk
	Minam River	High	Moderate	High Risk
	Catherine Creek	High	Moderate	High Risk
	Upper Grande Ronde River	High	High	High Risk
	Imnaha River	High	Moderate	High Risk
	Lookingglass Creek			***Extirpated***
	Big Sheep Creek			***Extirpated***

2.2.1.2 Snake River Basin Steelhead

The Snake River Basin steelhead was listed as a threatened ESU on August 18, 1997 (62 FR 43937), with a revised listing as a DPS on January 5, 2006 (71 FR 834). This DPS occupies the Snake River basin, which drains portions of southeastern Washington, northeastern Oregon, and north/central Idaho. Reasons for the decline of this species include substantial modification of the seaward migration corridor by hydroelectric power development on the mainstem Snake and Columbia Rivers, and widespread habitat degradation and reduced streamflows throughout the Snake River basin (Good et al. 2005). Another major concern for the species is the threat to genetic integrity from past and present hatchery practices, and the high proportion of hatchery fish in the aggregate run of Snake River Basin steelhead over Lower Granite Dam (Good et al. 2005; Ford 2011). On May 26, 2016, in the agency's most recent 5-year review for Pacific salmon and steelhead, NMFS concluded that the species should remain listed as threatened (81 FR 33468).

Life History. Adult Snake River Basin steelhead enter the Columbia River from late June to October to begin their migration inland. After holding over the winter in larger rivers in the Snake River basin, steelhead disperse into smaller tributaries to spawn from March through May. Earlier dispersal occurs at lower elevations and later dispersal occurs at higher elevations. Juveniles emerge from the gravels in 4 to 8 weeks, and move into shallow, low-velocity areas in side channels and along channel margins to escape high velocities and predators (Everest and Chapman 1972). Juvenile steelhead then progressively move toward deeper water as they grow in size (Bjornn and Rieser 1991). Juveniles typically reside in fresh water for 1 to 3 years, although this species displays a wide diversity of life histories. Smolts migrate downstream during spring runoff, which occurs from March to mid-June depending on elevation, and typically spend 1 to 2 years in the ocean.

Spatial Structure and Diversity. This species includes all naturally-spawning steelhead populations below natural and manmade impassable barriers in streams in the Snake River basin of southeast Washington, northeast Oregon, and Idaho, as well as the progeny of six artificial propagation programs (71FR834). The hatchery programs include Dworshak National Fish Hatchery, Lolo Creek, North Fork Clearwater River, East Fork Salmon River, Tucannon River, and the Little Sheep Creek/Imnaha River steelhead hatchery programs. The Snake River Basin steelhead listing does not include resident forms of *O. mykiss* (rainbow trout) co-occurring with steelhead.

The ICTRT identified 24 extant populations within this DPS, organized into five MPGs (ICTRT 2003). The ICTRT also identified a number of potential historical populations associated with watersheds above the Hells Canyon Dam complex on the mainstem Snake River, a barrier to anadromous migration. The five MPGs with extant populations are the Clearwater River, Salmon River, Grande Ronde River, Imnaha River, and Lower Snake River. In the Clearwater River, the historic North Fork population was blocked from accessing spawning and rearing habitat by Dworshak Dam. Current steelhead distribution extends throughout the DPS, such that spatial structure risk is generally low. For each population in the DPS, Table 4 shows the current risk ratings for the parameters of a VSP (spatial structure, diversity, abundance, and productivity).

The Snake River Basin DPS steelhead exhibit a diversity of life-history strategies, including variations in fresh water and ocean residence times. Traditionally, fisheries managers have classified Snake River Basin steelhead into two groups, A-run and B-run, based on ocean age at return, adult size at return, and migration timing. A-run steelhead predominantly spend 1-year in the ocean; B-run steelhead are larger with most individuals returning after 2 years in the ocean. New information shows that most Snake River populations support a mixture of the two run types, with the highest percentage of B-run fish in the upper Clearwater River and the South Fork Salmon River; moderate percentages of B-run fish in the Middle Fork Salmon River; and very low percentages of B-run fish in the Upper Salmon River, Grande Ronde River, and Lower Snake River (NWFSC 2015). Maintaining life history diversity is important for the recovery of the species.

Table 4. Summary of viable salmonid population parameter risks and overall current status for each population in the Snake River Basin steelhead DPS (NWFSC 2015). Risk ratings with "?" are based on limited or provisional data series.

MPG	Population	VSP Risk Parameter		Overall Viability Rating
		Abundance/ Productivity	Spatial Structure/ Diversity	
Lower Snake River	Tucannon River	High?	Moderate	High Risk?
	Asotin Creek	Moderate?	Moderate	Maintained?
Grande Ronde River	Lower Grande Ronde	N/A	Moderate	Maintained?
	Joseph Creek	Very Low	Low	**Highly Viable**
	Wallowa River	N/A	Low	Maintained?
	Upper Grande Ronde	Low	Moderate	**Viable**
Imnaha River	Imnaha River	Moderate?	Moderate	Maintained?
Clearwater River (Idaho)	Lower Mainstem Clearwater River*	Moderate?	Low	Maintained?
	South Fork Clearwater River	High?	Moderate	High Risk?
	Lolo Creek	High?	Moderate	High Risk?
	Selway River	Moderate?	Low	Maintained?
	Lochsa River	Moderate?	Low	Maintained?
	North Fork Clearwater River			*Extirpated*
Salmon River (Idaho)	Little Salmon River	Moderate?	Moderate	Maintained?
	South Fork Salmon River	Moderate?	Low	Maintained?
	Secesh River	Moderate?	Low	Maintained?
	Chamberlain Creek	Moderate?	Low	Maintained?
	Lower Middle Fork Salmon River	Moderate?	Low	Maintained?
	Upper Middle Fork Salmon River	Moderate?	Low	Maintained?
	Panther Creek	Moderate?	High	High Risk?
	North Fork Salmon River	Moderate?	Moderate	Maintained?
	Lemhi River	Moderate?	Moderate	Maintained?
	Pahsimeroi River	Moderate?	Moderate	Maintained?
	East Fork Salmon River	Moderate?	Moderate	Maintained?
	Upper Mainstem Salmon River	Moderate?	Moderate	Maintained?
Hells Canyon	Hells Canyon Tributaries			*Extirpated*

*Current abundance/productivity estimates for the Lower Clearwater Mainstem population exceed minimum thresholds for viability, but the population is assigned moderate risk for abundance/productivity due to the high uncertainty associated with the estimate.

Diversity risk for populations in the DPS is either moderate or low. Large numbers of hatchery steelhead are released in the Snake River, and the relative proportion of hatchery adults in natural

spawning areas near major hatchery release sites remains uncertain. Moderate diversity risks for some populations are thus driven by the high proportion of hatchery fish on natural spawning grounds and the uncertainty regarding these estimates (NWFSC 2015). Reductions in hatchery-related diversity risks would increase the likelihood of these populations reaching viable status.

Abundance and Productivity. Historical estimates of steelhead production for the entire Snake River basin are not available, but the basin is believed to have supported more than half the total steelhead production from the Columbia River basin (Mallet 1974, as cited in Good et al. 2005). Historical estimates of steelhead passing Lewiston Dam (removed in 1973) on the lower Clearwater River were 40,000 to 60,000 adults (Ecovista et al. 2003), and the Salmon River basin likely supported substantial production as well (Good et al. 2005). In contrast, at the time of listing in 1997, the 5-year mean abundance for natural-origin steelhead passing Lower Granite Dam, which includes all but one population in the DPS, was 11,462 adults (Ford 2011). Counts have increased since then, with between roughly 23,000 and 44,000 adult wild steelhead passing Lower Granite Dam in the most recent 5-year period (2011–2015) (NWFSC 2015).

Population-specific abundance estimates exist for some but not all populations. Of the populations for which we have data, three (Joseph Creek, Upper Grande Ronde, and Lower Clearwater) are meeting minimum abundance/productivity thresholds and several more have likely increased in abundance enough to reach moderate risk. Despite these recent increases in abundance, the status of many of the individual populations remains uncertain, and four out of the five MPGs are not meeting viability objectives (NWFSC 2015). In order for the species to recover, more populations will need to reach viable status through increases in abundance and productivity.

2.2.3 Climate Change Implications for ESA-listed Species and their Critical Habitat

One factor affecting the rangewide status of Snake River salmon and steelhead, and aquatic habitat is climate change. Several studies have revealed that climate change has the potential to affect ecosystems in nearly all tributaries throughout the Snake River (Battin et al. 2007; ISAB 2007). While the intensity of effects will vary by region (ISAB 2007), climate change is generally expected to alter aquatic habitat (water yield, peak flows, and stream temperature). As climate change alters the structure and distribution of rainfall, snowpack, and glaciations, each factor will in turn alter riverine hydrographs. Given the increasing certainty that climate change is occurring and is accelerating (Battin et al. 2007), NMFS anticipates salmonid habitats will be affected. Climate and hydrology models project significant reductions in both total snow pack and low-elevation snow pack in the Pacific Northwest over the next 50 years (Mote and Salathé 2009) changes that will shrink the extent of the snowmelt-dominated habitat available to salmon. Such changes may restrict our ability to conserve diverse salmon life histories.

In the Pacific Northwest, most models project warmer air temperatures, increases in winter precipitation, and decreases in summer precipitation. Average temperatures in the Pacific Northwest are predicted to increase by 0.1 to 0.6°C (0.2°F to 1.0°F) per decade (Mote and Salathé 2009). Warmer air temperatures will lead to more precipitation falling as rain rather than snow. As the snow pack diminishes, seasonal hydrology will shift to more frequent and severe early large storms, changing stream flow timing which may limit salmon survival (Mantua et al.

2009). The largest driver of climate-induced decline in salmon populations is projected to be the impact of increased winter peak flows, which scour the streambed and destroy salmon eggs (Battin et al. 2007).

Higher water temperatures and lower spawning flows, together with increased magnitude of winter peak flows are all likely to increase salmon mortality. The Independent Scientific Advisory Board (2007) found that higher ambient air temperatures will likely cause water temperatures to rise. Salmon and steelhead require cold water for spawning and incubation. As climate change progresses and stream temperatures warm, thermal refugia will be essential to persistence of many salmonid populations. Thermal refugia are important for providing salmon and steelhead with patches of suitable habitat while allowing them to undertake migrations through or to make foraging forays into areas with greater than optimal temperatures. To avoid waters above summer maximum temperatures, juvenile rearing may be increasingly found only in the confluence of colder tributaries or other areas of cold water refugia (Mantua et al. 2009).

Climate change is expected to make recovery targets for salmon and steelhead populations more difficult to achieve. Climate change is expected to alter critical habitat by generally increasing temperature and peak flows and decreasing base flows. Although changes will not be spatially homogenous, effects of climate change are expected to decrease the capacity of critical habitat to support successful spawning, rearing, and migration. Habitat action can address the adverse impacts of climate change on salmon. Examples include restoring connections to historical floodplains and freshwater and estuarine habitats to provide fish refugia and areas to store excess floodwaters, protecting and restoring riparian vegetation to ameliorate stream temperature increases, and purchasing or applying easements to lands that provide important cold water or refuge habitat (Battin et al. 2007; ISAB 2007).

Ultimately, the effects of climate change on salmon and steelhead across the Pacific Northwest will be determined by the specific nature, level, and rate of change and the synergy between interconnected terrestrial/freshwater, estuarine, nearshore, and ocean environments.

The primary effects of climate change on Pacific Northwest salmon and steelhead include:

- Direct effects of increased water temperatures on fish physiology;
- Temperature-induced changes to streamflow patterns;
- Alterations to freshwater, estuarine, and marine food webs; and
- Changes in estuarine and ocean productivity.

While all habitats used by Pacific salmon will be affected, the impacts and certainty of the change vary by habitat type. Some effects (e.g., increasing temperature) affect salmon at all life stages in all habitats, while others are habitat-specific, such as streamflow variation in freshwater, sea-level rise in estuaries, and upwelling in the ocean. How climate change will affect each stock or population of salmon also varies widely depending on the level or extent of change, the rate of change, and the unique life-history characteristics of different natural

populations (Crozier et al. 2008b). For example, a few weeks' difference in migration timing can have large differences in the thermal regime experienced by migrating fish (Martins et al. 2011).

2.2.3.1 Temperature Effects

Like most fishes, salmon are poikilotherms (cold-blooded animals); therefore, increasing temperatures in all habitats can have pronounced effects on their physiology, growth, and development rates (see review by Whitney et al. 2016). Increases in water temperatures beyond their thermal optima will likely be detrimental through a variety of processes, including increased metabolic rates (and therefore food demand), decreased disease resistance, increased physiological stress, and reduced reproductive success. All of these processes are likely to reduce survival (Beechie et al. 2013; Wainwright and Weitkamp 2013; Whitney et al. 2016).

By contrast, increased temperatures at ranges well below thermal optima (i.e., when the water is cold) can increase growth and development rates. Examples of this include accelerated emergence timing during egg incubation stages, or increased growth rates during fry stages (Crozier et al. 2008a; Martins et al. 2011). Temperature is also an important behavioral cue for migration (Sykes et al. 2009), and elevated temperatures may result in earlier-than-normal migration timing. While there are situations or stocks where this acceleration in processes or behaviors is beneficial, there are also others where it is detrimental (Martins et al. 2012; Whitney et al. 2016).

2.2.3.2 Freshwater Effects

Climate change is predicted to increase the intensity of storms, reduce winter snow pack at low and middle elevations, and increase snowpack at high elevations in northern areas. Middle and lower-elevation streams will have larger fall/winter flood events and lower late-summer flows, while higher elevations may have higher minimum flows. How these changes will affect freshwater ecosystems largely depends on their specific characteristics and location, which vary at fine spatial scales (Crozier et al. 2008b; Martins et al. 2012). For example, within a relatively small geographic area (the Salmon River basin in Idaho), survival of some Chinook salmon populations was shown to be determined largely by temperature, while in others it was determined by flow (Crozier and Zabel 2006). Certain salmon populations inhabiting regions that are already near or exceeding thermal maxima will be most affected by further increases in temperature and, perhaps, the rate of the increases. The effects of altered flow are less clear and likely to be basin-specific (Crozier et al. 2008b; Beechie et al. 2013). However, flow is already becoming more variable in many rivers, and this increased variability is believed to negatively affect anadromous fish survival more than other environmental parameters (Ward et al. 2015). It is likely this increasingly variable flow is detrimental to multiple salmon and steelhead populations, and likely multiple other freshwater fish species in the Columbia River basin as well.

Stream ecosystems will likely change in response to climate change in ways that are difficult to predict (Lynch et al. 2016). Changes in stream temperature and flow regimes will likely lead to shifts in the distributions of native species and provide "invasion opportunities" for exotic

species. This will result in novel species interactions, including predator-prey dynamics, where juvenile native species may be either predators or prey (Lynch et al. 2016; Rehage and Blanchard 2016). How juvenile native species will fare as part of "hybrid food webs," which are constructed from natives, native invaders, and exotic species, is difficult to predict (Naiman et al. 2012).

2.2.3.3 Estuarine Effects

In estuarine environments, the two big concerns associated with climate change are rates of sea level rise and water temperature warming (Wainwright and Weitkamp 2013; Limburg et al. 2016). Estuaries will be affected directly by sea-level rise: as sea level rises, terrestrial habitats will be flooded and tidal wetlands will be submerged (Kirwan et al. 2010; Wainwright and Weitkamp 2013; Limburg et al. 2016). The net effect on wetland habitats depends on whether rates of sea-level rise are sufficiently slow that the rates of marsh plant growth and sedimentation can compensate (Kirwan et al. 2010).

Due to subsidence, sea-level rise will affect some areas more than others, with the largest effects expected for the lowlands, like southern Vancouver Island and central Washington coastal areas (Verdonck 2006; Lemmen et al. 2016). The widespread presence of dikes in Pacific Northwest estuaries will restrict upward estuary expansion as sea levels rise, likely resulting in a near-term loss of wetland habitats (Wainwright and Weitkamp 2013). Sea-level rise will also result in greater intrusion of marine water into estuaries, resulting in an overall increase in salinity, which will also contribute to changes in estuarine floral and faunal communities (Kennedy 1990). While not all anadromous fish species are highly reliant on estuaries for rearing, extended estuarine use may be important in some populations (Jones et al. 2014), especially if stream habitats are degraded and become less productive. Preliminary data indicate that some Snake River Basin steelhead smolts actively feed and grow as they migrate between Bonneville Dam and the ocean (Beckman 2018), suggesting that estuarine habitat is important for this DPS.

2.2.3.4 Marine Effects

In marine waters, increasing temperatures are associated with observed and predicted poleward range expansions of fish and invertebrates in both the Atlantic and Pacific Oceans (Lucey and Nye 2010; Asch 2015; Cheung et al. 2015). Rapid poleward species shifts in distribution in response to anomalously warm ocean temperatures have been well documented in recent years, confirming this expectation at short time scales. Range extensions were documented in many species from southern California to Alaska during unusually warm water associated with "the blob" in 2014 and 2015 (Bond et al. 2015; Di Lorenzo and Mantua 2016) and past strong El Niño events (Pearcy 2002; Fisher et al. 2015). For example, recruitment of the introduced European green crab increased in Washington and Oregon waters during winters with warm surface waters, including 2014 (Yamada et al. 2015). Similarly, the Humboldt squid dramatically expanded its range northward during warm years of 2004–09 (Litz et al. 2011). The frequency of extreme conditions, such as those associated with El Niño events or "blobs" is predicted to increase in the future (Di Lorenzo and Mantua 2016), further altering food webs and ecosystems.

Expected changes to marine ecosystems due to increased temperature, altered productivity, or acidification will have large ecological implications through mismatches of co-evolved species and unpredictable trophic effects (Cheung et al. 2015; Rehage and Blanchard 2016). These effects will certainly occur, but predicting the composition or outcomes of future trophic interactions is not possible with current models.

Wind-driven upwelling is responsible for the extremely high productivity in the California Current ecosystem (Bograd et al. 2009; Peterson et al. 2014). Minor changes to the timing, intensity, or duration of upwelling, or the depth of water-column stratification, can have dramatic effects on the productivity of the ecosystem (Black et al. 2015; Peterson et al. 2014). Current projections for changes to upwelling are mixed: some climate models show upwelling unchanged, but others predict that upwelling will be delayed in spring, and more intense during summer (Rykaczewski et al. 2015). Should the timing and intensity of upwelling change in the future, it may result in a mismatch between the onset of spring ecosystem productivity and the timing of salmon entering the ocean, and a shift toward food webs with a strong sub-tropical component (Bakun et al. 2015).

Columbia River anadromous fishes also use coastal areas of British Columbia and Alaska and midocean marine habitats in the Gulf of Alaska, although their fine-scale distribution and marine ecology during this period are poorly understood (Morris et al. 2007; Pearcy and McKinnell 2007). Increases in temperature in Alaskan marine waters have generally been associated with increases in productivity and salmon survival (Mantua et al. 1997; Martins et al. 2012), thought to result from temperatures that are normally below thermal optima (Gargett 1997). Warm ocean temperatures in the Gulf of Alaska are also associated with intensified downwelling and increased coastal stratification, which may result in increased food availability to juvenile salmon along the coast (Hollowed et al. 2009; Martins et al. 2012). Predicted increases in freshwater discharge in British Columbia and Alaska may influence coastal current patterns (Foreman et al. 2014), but the effects on coastal ecosystems are poorly understood.

In addition to becoming warmer, the world's oceans are becoming more acidic as increased atmospheric carbon dioxide is absorbed by water. The North Pacific is already acidic compared to other oceans, making it particularly susceptible to further increases in acidification (Lemmen et al. 2016). Laboratory and field studies of ocean acidification show that it has the greatest effects on invertebrates with calcium-carbonate shells, and has relatively little direct influence on finfish; see reviews by Haigh et al. (2015) and Mathis et al. (2015). Consequently, the largest impact of ocean acidification on salmon will likely be the influence on marine food webs, especially the effects on lower trophic levels (Haigh et al. 2015; Mathis et al. 2015). Marine invertebrates fill a critical gap between freshwater prey and larval and juvenile marine fishes, supporting juvenile salmon growth during the important early-ocean residence period (Daly et al. 2009, 2014).

2.2.3.5 Uncertainty in Climate Predictions

There is considerable uncertainty in the predicted effects of climate change on the globe as a whole, and on the Pacific Northwest in particular. Many of the effects of climate change (e.g., increased temperature, altered flow, coastal productivity, etc.) will have direct impacts on the

food webs that species rely on in freshwater, estuarine, and marine habitats to grow and survive. Such ecological effects are extremely difficult to predict even in fairly simple systems, and minor differences in life-history characteristics among stocks of salmon may lead to large differences in their response (e.g. Crozier et al. 2008b; Martins et al. 2011, 2012). This means it is likely that there will be "winners and losers," meaning some salmon populations may enjoy different degrees or levels of benefit from climate change while others will suffer varying levels of harm. Climate change is expected to impact anadromous fishes during all stages of their complex life cycle. In addition to the direct effects of rising temperatures, indirect effects include alterations in flow patterns in freshwater and changes to food webs in freshwater, estuarine, and marine habitats. There is high certainty that predicted physical and chemical changes will occur; however, the ability to predict bio-ecological changes to fish or food webs in response to these physical/chemical changes is extremely limited, leading to considerable uncertainty. In additional to physical and biological effects, there is also the question of indirect effects of climate change and whether human "climate refugees" will move into the range of salmon and steelhead, increasing stresses on their respective habitats (Dalton et al. 2013; Poesch et al. 2016).

2.2.3.6 Summary

Climate change is expected to impact Pacific Northwest anadromous fishes during all stages of their complex life cycle. In addition to the direct effects of rising temperatures, indirect effects include alterations in stream-flow patterns in freshwater and changes to food webs in freshwater, estuarine, and marine habitats. There is high certainty that predicted physical and chemical changes will occur; however, the ability to predict bio-ecological changes to fish or food webs in response to these physical/chemical changes is extremely limited, leading to considerable uncertainty. As we continue to deal with a changing climate, management actions may help alleviate some of the potential adverse effects (e.g., hatcheries serving as a genetic reserve and source of abundance for natural populations, increased riparian vegetation to control water temperatures, etc.).

Climate change is expected to make recovery targets for steelhead populations more difficult to achieve. Climate change is expected to alter critical habitat by generally increasing temperature and peak flows and decreasing base flows. Although changes will not be spatially homogenous, effects of climate change are expected to decrease the capacity of critical habitat to support successful spawning, rearing, and migration. Habitat action can address the adverse impacts of climate change on steelhead. Examples include restoring connections to historical floodplains and freshwater and estuarine habitats to provide fish refugia and areas to store excess floodwaters, protecting and restoring riparian vegetation to ameliorate stream temperature increases, and purchasing or applying easements to lands that provide important cold water habitat and cold water refugia (Battin et al. 2007; ISAB 2007).

The 15-year timeframe for implementing the proposed action will occur while climate change-related effects are expected to become more evident within the range of the Snake River Basin steelhead DPS and Snake River spring/summer Chinook salmon ESU. However, the expected improvement in riparian habitat within the action area, should improve resilience of steelhead and Chinook to the adverse effects of climate change.

2.3 Action Area

"Action area" means all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action (50 CFR 402.02). For purposes of this consultation, the Upper Hayden action area is defined as and is coincidental to the Allotment boundary and trailing routes on and off the Allotment (Figure 2). Therefore, these terms are interchanged throughout this Opinion.

Figure 2. Hayden Creek HUC 5 and Priority Watershed.

The action area is used by all freshwater life history stages of threatened Snake River spring/summer Chinook salmon and Snake River Basin steelhead. Streams within the action area are designated critical habitat for Snake River spring/summer Chinook salmon and Snake River Basin steelhead. Designated critical habitat for the Snake River spring/summer Chinook salmon includes all river reaches presently or historically accessible to the species (64 FR 57399) as well as the adjacent 300-foot-wide riparian zone in these reaches. Designated critical habitat for Snake River Basin steelhead includes specific reaches of streams and rivers, as published in the Federal Register (70 FR 52630). The action area, except for areas above natural barriers to fish passage, is also EFH for Chinook salmon (PFMC 1998), and is in an area where environmental effects of the proposed project may adversely affect EFH for this species. The entire Hayden Creek Allotment is also within a priority watershed for Snake River spring/summer Chinook salmon and Snake River Basin steelhead. The ESA-listed fish (Snake River spring/summer Chinook salmon, Snake River Basin steelhead) bearing streams within the Upper Hayden action area include: Bear Valley Creek, Bray Creek, East Fork Hayden Creek, Hayden Creek, Kadletz Creek, West Fork Hayden Creek, and Wright Creek. However, only a portion of these cumulative stream miles are occupied by Chinook salmon and steelhead assessed in this Opinion.

2.4 Environmental Baseline

The "environmental baseline" includes the past and present impacts of all federal, state, or private actions and other human activities in the action area, the anticipated impacts of all proposed federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of state or private actions which are contemporaneous with the consultation in process (50 CFR 402.02).

NMFS describes the environmental baseline in terms of the biological requirements for habitat features and processes necessary to support all life stages of each listed species within the action area. Each listed species considered in this Opinion resides in or migrates through the action area. Thus, for this action area, the biological requirements for salmon and steelhead are the habitat characteristics that support successful completion of spawning, rearing, and freshwater migration.

2.4.1 Upper Hayden Creek

The BA documented baseline conditions for the Upper Hayden action area by applying NMFS' Matrix of Pathways and Indicators (MPI) (NMFS 1996). Although the authors reported conditions for all indicators in the MPI, the analysis concentrated on six "focus indicators"[3] agreed to during the Level I streamlining process. These focus indicators are believed to represent measures best suited for evaluating grazing impacts on individuals and physical or biological features (PBFs) of critical habitat. Table 5 displays the current condition of indicators

[3] The six focus indicators identified by the Salmon-Challis Level 1 Team are: (1) Spawning and incubation; (2) temperature; (3) sediment; (4) GGW; (5) streambank condition; and (6) RHCAs. Spawning and incubation were not identified as indicators in NMFS' MPI (1996), but were acknowledged as critical elements in evaluating potential grazing effects on ESA-listed salmonids.

in the action area, except for the spawning and incubation focus indicator, which is discussed in the following narrative.

Table 5. Baseline condition for the Hayden Creek 5th field HUCs.

Pathway	Indicators	Upper Hayden Creek Watershed Baseline Functionality*
Water Quality	Temperature	FA
	Sediment	FA to FR to FUR
	Chemical Characteristics	FA
Habitat Access	Physical Barriers	FR
Habitat Elements	Substrate Embeddedness	N/A
	LWD	FA-FR
	Pool Frequency and Quality	FA to FR
	Off-channel Habitat	FA
	Refugia	FA
Channel Condition and Dynamics	Greenline to Greenline Width (previously W:D)	FA-FR
	Streambank Condition	FA
	Floodplain Connectivity	FA
Flow/Hydrology	Change in Peak/Base Flows	FR
	Increase in Drainage Networks	FA
Watershed Conditions	Road Density and Location	FR
	Disturbance History	FUR
	RHCAs	FA
	Disturbance Regime	FA
Integration of Species and Habitat Conditions	Habitat Quality and Connectivity	FA

Functioning Appropriately = (FA), Functioning at Risk = (FR) and Functioning at Unacceptable Risk = (FUR)
*See Appendix B-Matrix of Diagnostic Pathways and Indicators in Upper Hayden Allotment BA for explanation of functionality ratings.

Hayden Creek, within the action area, supports limited suitable spawning habitat for Chinook salmon based on the 2009–2018 Idaho Department of Fish and Game (IDFG) Chinook salmon redd counts which includes over 9 miles of Hayden Creek below the action area (USFS 2019). During this survey period IDFG observed 509 Chinook salmon redds and 870 live Chinook salmon in Hayden Creek (USFS 2019). Over that same period of time out of the 509 Chinook salmon redds observed in Hayden Creek only 39 redds, or 8 percent, were observed within the action area. The surveys also identified 870 live Chinook salmon observed in Hayden Creek with 47 live Chinook salmon (6 percent) were observed within the action area.

There are no steelhead redd survey data available for Hayden Creek. The BA indicates that Hayden Creek supports suitable spawning habitat for steelhead within the action area, but it is unclear how much spawning activity is occurring.

2.4.2 Bear Valley Creek

Bear Valley Creek, a tributary to Hayden Creek, is located within the action area. Overall physical habitat quality, including the elements of water quality, flow/hydrology, channel conditions and structural habitat elements is considered good, and connectivity is excellent, with no passage barriers (USFS 2019). Bear Valley Creek supports high quality spawning and rearing habitat for Chinook and steelhead. The IDFG Chinook salmon redd survey data from 2009–2018 shows that currently there are limited numbers of Chinook salmon spawning in Bear Valley Creek. During this survey period IDFG observed 12 Chinook salmon redds and 19 live Chinook salmon in Bear Valley Creek (USFS 2019).

There are no steelhead redd survey data available for Bear Valley Creek. The BA indicates that Bear Valley Creek supports suitable spawning habitat for steelhead within the action area, but it is unclear how much spawning activity is occurring.

2.4.3 East Fork Hayden Creek

East Fork Hayden Creek, a tributary to Hayden Creek, is located within the action area. Overall physical habitat quality, including the elements of water quality, flow/hydrology, channel conditions and structural habitat elements is considered good, and connectivity is excellent, with no road crossing barriers (USFS 2019). There is one irrigation diversion on East Fork Hayden Creek approximately 0.1 miles from the confluence with Hayden Creek. East Fork Hayden Creek, within the action area, supports limited quality spawning habitat for anadromous fish. There are no electrofishing, snorkeling or redd survey data showing juvenile or adult Chinook salmon presence, currently or in the recent past, in East Fork Hayden Creek.

There are no steelhead redd survey data available for East Fork Hayden Creek. However, the BA indicates that East Fork Hayden Creek supports suitable spawning habitat for steelhead within the action area, but it is unclear how much spawning activity is occurring. Juvenile *O. mykiss* have been documented immediately above the diversion in East Fork Hayden Creek. However, no *O. mykiss* have been documented at the SCNF's long-term trend electrofishing monitoring site approximately 3.2 miles upstream from the confluence with Hayden Creek.

2.4.4 Other Hayden Creek Tributaries

Hayden Creek tributaries Bray, Cooper, Kadletz, Mogg, Paradise, West Fork Hayden, and Wright Creeks all have limited suitable spawning and rearing habitat for steelhead. Chinook salmon spawning and rearing habitat is not present (USFS 2019). Spawning and rearing habitat is limited due to higher stream gradients and small stream sizes associated with these headwater tributary streams. Fish habitat conditions for these tributaries, within the action area, are generally in good condition. Overall physical habitat quality, including the elements of water quality, flow/hydrology, channel conditions and structural habitat elements is considered good,

and connectivity is excellent (USFS 2019). The SCNF has replaced two fish passage barrier culverts, Kadletz Creek and Wright Creek, with bridges in 2012.

2.4.5 Water Temperature

Water temperature influences many aspects of salmonid fish life history, including reproduction, growth, and migration (Bjornn and Reiser 1991). PACFISH identifies water temperature criteria for salmon and steelhead species of less than 64°F (17.8°C) for rearing, and less than 60°F (15.6°C) for spawning and incubation. In identified steelhead priority watersheds, PACFISH identifies additional water temperature criteria of less than 45°F (7.2°C) during steelhead spawning periods (NMFS 1998).

Since the previous consultation, seasonal water temperature regimes have been monitored on eight streams within the action area. Overall, observed water temperatures within the Allotment have all fallen within the PACFISH water temperature criteria. There are no streams within the Hayden Creek 5th field HUC action area that are listed on Idaho Department of Environmental Quality's 303(d) list for water temperature (IDEQ 2008). Water temperature conditions in the Upper Hayden Creek watersheds appear to be "FA" for rearing, spawning, and incubation relative to these criteria.

2.4.6 Sediment

Stream sediment conditions can influence fish incubation success as well as rearing habitat quantity and quality, and fish food base productivity (Bjornn and Reiser 1991). The condition of spawning substrate quality affects the biotic potential of the stream, including fish survival and emergence of fish embryos. The SCNF's Watershed Program has collected stream sediment data, using the core sampling methodology, since 1993. Within the action area there are seven core sampling monitoring sites, and three long-term trend sediment monitoring sites (Bear Valley Creek 1A, East Fork Hayden Creek 2R, and Hayden Creek 1A). Core sampling is used in trend monitoring to determine the amount of percent fines within the stream's substrate. Anadromous streams receive a 6-inch deep core sample and results of all assessments are expressed as percent fines less than one-fourth inch in diameter. Analysis of core sampling data correlates measured levels of depth fines in spawning habitats to predicted egg incubation success values determined by Stowell et al. (1983).

Analysis of depth fines also considers drainage geology. The following are the evaluation criteria for stream sediment based wholly or primarily in quartzite geology:

≤20 percent depth fines (<1/4-inch diameter) = FA

21–25 percent depth fines (<1/4-inch diameter) = FR

>25 percent depth fines (<1/4-inch diameter) = FUR

Forest-wide analysis of data collected since 1993 shows a wide range of variability for stream sediment levels. Stream sediment data is highly influenced by natural processes such as geology,

stream gradient, winter snow pack, springtime runoff, and summer time high intensity storms. The variability in stream sediment data shows that in some years at some stations streams may naturally fluctuate between FA, FR, and FUR.

There is one Bear Valley Creek long-term trend sediment monitoring site within the action area, located within the Bear Valley Creek exclosure. The Bear Valley Creek 1A site has been monitored from 1993 to 2018. This site from 2003–2007 was below 20 percent depth fines. From 2008–2017 it has ranged from 20.7 to 32.4. Mean percent fines by depth show a trend line with a slight increase. Bear Valley Creek within the action area is FR (USFS 2019).

There are two East Fork Hayden Creek long-term trend sediment monitoring sites within the action area. The data and trend indicate stream sediment levels are on a decreasing trend at site 1A and at a level where it would be considered "FA." The data and trend indicate stream sediment levels at the second site, 2R, are on an increasing trend and at a level where it would be considered FUR. However, the geomorphology of this reach explains the high sediment levels in this area. This is a low gradient, depositional area below the glacial headlands and is a natural response or depositional reach. The streambanks in this reach have been very stable with excellent, vigorous riparian vegetation. There is no evidence of livestock concentration in this reach or adverse effects on the streambank from livestock (USFS 2019).

There is one Hayden Creek long-term trend sediment monitoring site within the action area. This site has 18 years of recorded monitoring data. The last 2 years of data show sediment levels greater than 20 percent. This site is adjacent to a dispersed recreation camping site which constitutes the some impact to the riparian area at this monitoring site. However, the major contributor to sediment in this depositional reach is associated with an upstream logjam resulting in the formation of a new channel. This logjam and newly formed second channel is located approximately 1,000 feet upstream of the sediment monitoring site (Personal Communication Jeremy Back, SCNF Hydrologist, July 15, 2019). The trend line from 1993–2018 for the Hayden Creek 1A sediment monitoring site shows an increasing trend in mean percent fines by depth and is FR, which is related to natural conditions associated with the logjam.

2.4.7 Greenline to Greenline Width

The GGW is the non-vegetated distance between the greenlines on each side of the stream. It provides an indication of the width of the channel, reflecting disturbance of the streambanks and vegetation. As stream channel margins are disturbed by trampling or excessive vegetation consumption, streams may erode the streambanks, causing a lateral erosion of the streambank and streamside vegetation. This results in a shifting out, or widening of the distance between greenlines within the non-vegetated channel (Burton et al 2011). The GGW reflects influences of grazing and other disturbances on channel dimensions such as width/depth ratios. Because changes rapidly occur at the greenline, the land manager can make an early evaluation of effects (Winward 2000). The GGW provides an indication of the width of the channel, reflecting disturbance of the streambanks and vegetation. The GGW will be monitored at DMA MIM sites. While there is no established metric or value associated with stream functionality, GGW indicates trend in channel dimension (i.e., narrowing or widening) when used with greenline composition and bank stability. The SCNF will also continue to monitor stream sediment, bank

stability and greenline vegetation. Current Allotment GGWs recorded were: Hayden Creek (M226) – 10.87 in 2016; East Fork Hayden Creek (M261) – 5.8 in 2016; Tobias Creek (M260) – 4.94 in 2017; Kadletz Creek (M258A) – 3.38 in 2017; and Ford Creek (M259A) – 3.01 in 2017.

2.4.8 Streambank Condition

Streambank erosion reduces channel stability and the channel's ability to withstand high flows. Eroding streambanks increase turbidity and can contribute large amounts of fine sediment deposition which degrade fish habitat and cause additional stream channel adjustment. The PACFISH objective is 90 percent or greater bank stability in priority watersheds, including all of the action area watersheds. On the Allotment, the SCNF Watershed Program has conducted a variety of long-term streambank stability monitoring at four sites established in 1994. These four sites are Bear Valley Creek 1A, East Fork Hayden Creek 1A, East Fork Hayden Creek 2R, and Hayden Creek 1A. Bank stability data have been above 90 percent at the Bear Valley Creek 1A monitoring site within the Bear Valley Creek exclosure for the last three readings since 2009. Bank stability data have been above 90 percent in East Fork Hayden Creek 2R in all but one reading since 1994, with the last reading in 2016 was at 92 percent. Bank stability data have been above 90 percent in Hayden Creek 1A in seven out of eight readings since 2003, with the last reading in 2015 at 84.7 percent. The variability in streambank stability data shows in some years at some stations streams may naturally fluctuate between FA and FR.

2.4.9 Riparian Habitat Conservation Areas

The condition of riparian vegetation can strongly influence aquatic habitat quality and fish productivity. Removal of riparian vegetation can result in negative impacts to fish populations (Platts and Nelson 1989). The analysis of riparian conservation areas focuses on GES and woody species recruitment. The SCNF Plan forest-wide GES objective is 61 or greater. An ecological status rating greater than 86 is indicative of a potential natural community (PNC) (Winward 2000).

Since monitoring sites were established within the Allotment in the early 1990s, grazing management has evolved within the Allotment. All sites will be managed with a monitoring attribute for streambank alteration endpoint indicator not to exceed 20 percent (see Table 2). The GES and trends are discussed in the following summary by tributary:

Hayden Creek (M226): Since 2009 bank stability has remained below the desired RMO of 90 percent (85 percent and 83 percent), but the GES rating has increased from mid to late seral. Annual indicators for both greenline stubble height and bank alteration have been met every year since 2010. The downward trend on Hayden Creek in 2007, and static trend in 2009, were primarily attributed to the 2003 Tobias Fire. Aerial imagery and on-the-ground inspections found that a log jam caused from falling trees burned in the Tobias Fire, in conjunction with high run-off in 2016 and 2017, are causing portions of the main channel to move and reestablish in a new location. In order to aid site recovery after the logjam and high flow events, the monitoring attribute to be applied is stubble height, with an endpoint indicator of 6 inches along with a bank alteration indicator of 15 percent. Once the new proposed fence is completed in the Boulder Flat Unit, this section will be excluded from livestock grazing.

East Fork Hayden Creek (M261): The GES rating at this monitoring location in 2017 was mid seral, down from a reading of PNC in 2009. Bank stability increased from 90 to 100 percent between these two readings. The streamside riparian area is dominated by willows. Livestock have limited access to the stream. Due to the willow dominance, the selected monitoring attribute to manage the site is woody browse use, with an endpoint indicator not to exceed 30 percent for alder and 50 percent for willow. The monitoring attribute of greenline stubble height with an endpoint indicator of no less than 6 inches will be used along with a bank alteration indicator of 20 percent.

Tobias Creek (M260): The GES rating at this site was late seral when read in 2016, which is down from a reading of PNC in 2009. Bank stability increased to 95 percent. The streamside riparian area is woody and bouldered with under growth of *Carex spp*. Livestock do not use the riparian area except in small water gaps. Due to well-established *Carex* under growth, the selected monitoring attribute to manage the site will be a 6-inch greenline stubble height, 20 percent bank alteration, and 50 percent browse use on willows.

Kadletz Creek (M258A): A new monitoring site was established on Kadletz Creek in 2017 as the previous site did not meet parameters outlined in the MIM protocol. This new site is located downstream from the previous site. The GES rating at the monitoring location on this stream is mid seral. The baseline conditions at the new location are at mid seral, therefore indicators for this site will be a 6-inch greenline stubble height, 15 percent bank alteration, and 50 percent browse use on willows.

Ford Creek (M259A): A new site was established on Ford Creek in 2017 that better represents livestock use. The GES rating for this new DMA is late seral. The stream is very woody and bouldered. Due to woody dominance, the best monitoring attribute to manage this site is browse use with an annual indicator not to exceed 50 percent. The monitoring attribute of greenline stubble height with an indicator no less than 4 inches will also be used. The MIM will be read at the Ford Creek site in 2019.

2.4.10 Chinook Salmon Presence in Action Area

Chinook salmon adults enter the upper Lemhi River during the summer and spawn during late August and early September (Bjornn 1978). The SCNF and IDFG fish surveys indicate that Chinook salmon occur within the Allotment. Spawning periodicity data developed by the USBWP identify a general initiation date for Chinook salmon spawning activity in the Hayden Creek drainage beginning in the third week of August. Incubation of eggs can occur through the end of April (USBWP 2005).

Within the Upper Hayden Creek watershed, Chinook salmon are currently present in a 4.29-mile reach of Bear Valley Creek and an approximately 2.77-mile reach of mainstem Hayden Creek to the confluence with Cooper Creek (USFS 2019). During the last 9 years, the SCNF has completed Chinook salmon redd surveys in Hayden Creek, within the action area, finding the following number of redds per year: 2010–2012 (0), 2013 (1), 2014 (2), 2015 (5), 2016 (1) and 2017–2018 (0). During the last 6 years, the IDFG has completed Chinook salmon redd surveys in Bear Valley Creek, finding the following number of redds per year: 2013 (0), 2014 (2), 2015

(8), 2016 (0), 2017 (2), and 2018 (0) (USFS 2019). There was one Chinook salmon redd in 2014 and two Chinook salmon redds in 2015 that are believed to have been trampled by livestock near the Hayden Creek ford crossing in the Boulder Flat Unit. However, the Boulder Flat Unit will no longer be grazed after August 15. The Forest Servicewill continue to work with permittee to reduce the potential for future livestock trampling near the ford crossing on Hayden Creek. Since 2015 there has been no documented livestock trampling of Chinook salmon redds within the action area. Within the 4.29 miles of Bear Valley Creek where Chinook salmon spawn, there is approximately 1.2 stream miles located within the Bear Valley Creek exclosure, located entirely within the Kadletz Creek Unit. This exclosure is three sided, but functions as a complete exclosure due to the combination of other fences along a northeastern ridge, talus slopes, and steep terrain. There is also a drift fence that parallels Bear Valley Creek in the lower reaches of the Payne/Ford Unit that helps keep cows in the upland away from Bear Valley Creek. Once the Boulder Flat exclosure fence is installed it will exclude 0.6 miles of Hayden Creek from livestock access in the Boulder Flat Unit. No Chinook salmon have been documented spawning in East Fork Hayden Creek. However, there was a redd documented in 2007, located near the confluence of Hayden Creek and East Fork Hayden Creek.

In total, there is an estimated 7.07 miles of Chinook salmon rearing and spawning habitat (Table 6) and 8.8 miles of Chinook salmon designated critical habitat within the action area. Figure 3 is an illustration of what the SCNF considers the starting and ending points for spawning habitat. The habitat within these stream reaches do not provide 100 percent available spawning habitat. Some reaches within each of these streams lack suitable Chinook salmon spawning habitat (i.e., stream gradient to steep, substrate inadequately sized). Stream miles referenced in the Upper Hayden BA reflect continuous mapping reaches and therefore are likely a significant overestimate of actual spawnable area within the Allotment's streams.

Figure 3. Presence, spawning, and designated critical habitat for Chinook salmon in the Upper Hayden Allotment.

The Lemhi River Chinook salmon population is present in the action area. Lemhi River Chinook are one of eight populations in the MPG and is one of just two very-large sized populations. As such, it is identified as one of five populations that will likely need to be viable for the MPG to be viable (NMFS 2017). The most recent 5-year status review (NWFSC 2015) reported the 5-year geometric mean natural adult abundance as 143, substantially less than the targeted minimum abundance threshold of 2,000 adults. That value was higher than the previous 5-year period, suggesting some improvement in abundance was occurring at that time. Productivity of the population is estimated as 1.30 (standard error = 0.23), also higher than the previous review but lower than the threshold productivity of 1.34 recruits per spawner. Both values result in high abundance productivity risk for the population. The Lemhi Chinook population also remains at high risk for spatial structure loss and diversity loss, primarily as a result of disconnected habitats and historical hatchery influence, respectively. For these reasons the population is at more than 25 percent risk of extinction in the next 100 years. Improvement in all four VSP parameters is necessary for the population to be viable.

Table 6. Streams and Stream Miles by Unit Supporting Chinook Spawning within Upper Hayden Allotment.

Allotment Unit	Tributary Name	Stream Miles Supporting Chinook Spawning
Boulder Flat	Hayden Creek	1.61 miles total
Kadletz Creek	Bear Valley Creek	2.71 miles total
Payne/Ford	Bear Valley Creek	1.58 miles total
Tobias/Mogg	Hayden Creek	1.17 miles total
Grand Totals:		7.07 miles total

2.4.11 Snake River Basin Steelhead Presence in Action Area

The SCNF and IDFG electrofishing survey data have documented juvenile rainbow trout/steelhead presence within the action area. There is known presence of naturally reproducing steelhead within the Hayden Creek drainage. However, relatively little is known about steelhead spawning areas or the status or trend of adult steelhead populations within the drainage. Steelhead spawning surveys are very difficult to effectively or safely accomplish because of the time of the year steelhead spawn. Steelhead spawn at a time when higher elevation streams on National Forest System lands are difficult to get to because of snow and ice conditions both on the roads and in the riparian areas. When steelhead are spawning streams are on the rise, and most of the time, turbid making it difficult to see redds. Data developed by the USBWP Technical Team identifies a general spawning periodicity for steelhead in the Hayden Creek drainage ranging from the third week of March through the second week of June, with egg incubation through the first week of July (USBWP 2005).

Steelhead have the potential to spawn in suitable steelhead spawning habitat within seven streams within the Allotment (Bear Valley Creek, Bray Creek, East Fork Hayden Creek, Hayden Creek, Kadletz Creek, West Fork Hayden Creek, and Wright Creek) (Table 7 and Figure 4). Table 7 is an estimate of what the SCNF considers the starting and ending points for spawning habitat for steelhead. As with Chinook salmon spawning habitat, the habitat within these stream reaches does not provide 100 percent available steelhead spawning habitat. Some stream reaches have too steep of a stream gradient, too large or too small substrate, or other characteristics

rendering habitat unsuitable for steelhead spawning. Table 7 stream miles reflect continuous mapping reaches and therefore are likely a significant overestimate of actual spawnable area within the Allotment. A breakdown of steelhead stream miles by Allotment Unit can be seen in Table 7.

Snake River steelhead in the action area belong to the Lemhi Population, which is intermediate-sized and one of 12 populations in the MPG. The minimum threshold for this intermediate sized population is 1,000 adults at a minimum productivity of 1.14 recruits per spawner. The current status is 'maintained' with a target status of viable (NMFS 2016). Although there are insufficient data to generate adult abundance and productivity estimates (NMFS 2016), 3 years of passive integrated transponder tag data provide some insight into current abundance. For the 2010–2012 return years, an estimated 428 to 680 natural origin adults returned to the Lemhi River (NWFSC 2015). Spatial structure risk is low and diversity risk is rated moderate due to historical hatchery influence. Returns are still well below minimum abundance and the population is tentatively rated as moderate risk of extinction (i.e., 10–25 percent risk of extinction in 100 years).

Table 7. Streams and Stream Miles by Unit Supporting Steelhead Spawning within Upper Hayden Allotment.

Allotment Unit	Tributary Name	Stream Miles Supporting Steelhead Spawning
Boulder Flat	East Fork Hayden Creek	0.16 miles total
	Hayden Creek	1.61 miles total
Kadletz Creek	Bear Valley Creek	2.75 miles total
	Kadletz Creek	0.25 miles total
	Wright Creek	0.45 miles total
Payne/Ford	Bear Valley Creek	1.58 miles total
Tobias/Mogg	East Fork Hayden Creek	0 miles total
	Hayden Creek	3.0 miles total
Upper Hayden	Bray Creek	2.54 miles total
	Hayden Creek	5.02 miles total
	West Fork Hayden Creek	2.58 miles total
Grand Totals:		19.93 miles total

Figure 4. Presence, spawning, and designated critical habitat for steelhead in the Upper Hayden Allotment.

2.5 Effects of the Action

Under the ESA, "effects of the action" means the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline (50 CFR 402.02). Indirect effects are those that are caused by the proposed action and are later in time, but still are reasonably certain to occur. Effects of the action that reduce the ability of a listed species to meet its biological requirements may increase the likelihood that the proposed action will result in jeopardy to that listed species or in destruction or adverse modification of a designated critical habitat. This section will evaluate the effects of the action starting from the time of the issuance of this Opinion through 2033.

2.5.1 Effects on Listed Species

Cattle grazing has the potential to affect ESA-listed fishes by disturbing rearing, holding, or spawning salmonids, and also by trampling incubating redds as cows wade through or cross instream habitats. Adult steelhead are not likely to be present on the Allotment during livestock grazing season. In Upper Hayden Creek, steelhead generally spawn from March through May, and grazing does not begin on the Allotment until July 1st or later. The proposed action therefore has the potential to only affect steelhead redds and juveniles. Spring/summer Chinook spawning and incubation period occurs mid-August to mid-September. The proposed action therefore has the potential to affect Chinook adults, juveniles, and redds. Although the proposed action also has the potential to affect steelhead and Chinook through impacts to habitat, habitat-related effects are all expected to be minor or very unlikely to occur for this Allotment as described below and in Section 2.12.

2.5.1.1 Habitat-related Effects

ESA-listed fish could be affected by the action if it degrades the available habitat in the action area. Effects of grazing on habitat relate to physical effects on the environment that further inhibit the completion of a specific life stage of the listed species. Effects to habitat and the PBFs are thoroughly discussed in Section 2.12 below. Because the effects on critical habitat will be minor or very unlikely to occur, the habitat-related effects to species are also expected to be minor and/or very unlikely to occur.

These determinations are in large part due to RMOs currently being met, or close to being met in the areas proposed to be grazed. In addition, the SCNF has also now included more conservative annual use indicators, and move triggers that are tied to an adaptive management process, changes to Unit rotations, eliminated grazing on the Boulder Flat Unit after August 15, and a new Boulder Flat riparian exclosure fence along Hayden Creek. These measures are more restrictive to cattle use and also require more focused monitoring attention than previous grazing use. The adaptive management strategy further assures us that short-term habitat impacts will be quickly identified with an appropriate management response to avoid repeat exceedances, which may otherwise cause habitat-related harm. For these reasons it is reasonable to anticipate maintenance of the current proper functioning conditions while also allowing for continued upward trends at near natural rates.

2.5.1.2 Disturbance

Cattle grazing adjacent to streams, or when crossing, drinking or loafing near streams, are reasonably certain to startle or disturb juvenile steelhead or Chinook salmon rearing in the action area. The SCNF and permittees will employ the following measures to reduce the amount of time cows spend in riparian areas: maintaining off-stream water sources; placing salt at least ¼-mile from streams; weekly herding of cows out of riparian areas; using road bridges and designated fords in most cases to move livestock across streams when changing pastures; and maintaining fencing along 1.2 miles of riparian exclosure fence along Bear Valley Creek. In addition, the future Boulder Flat exclosure fence (expected to be constructed before the start of grazing in 2020) will be an additional 1.3 miles in length, and will exclude approximately 0.6 miles of Hayden Creek from access by cattle. Despite these measures, cows are likely to spend time adjacent to unfenced, accessible streams reaches on the Allotment, particularly in later summer.

For juvenile steelhead and juvenile/adult Chinook salmon, disturbance can lead to behavioral changes that can result in indirect effects through alteration in feeding success, increased exposure to predators, or displacement into less suitable habitat. Although these effects can result in injury or death, most fish affected by this action will generally be expected to be able to access nearby cover and avoid injury or morality (behavioral effect only). Within the action area both streambank condition and large woody debris are either FA or FR (Table 8), indicating that sufficient escape cover to protect fish in the short term is likely available from wood or overhanging banks. NMFS expects behavioral modifications will be infrequent and minor because habitat conditions in the action area should provide suitable escape cover.

2.5.1.3 Redd Trampling

Livestock grazing along steelhead and Chinook salmon spawning streams has the potential to result in trampling of redds and may impact incubating eggs/embryos. The grazing period for the Allotment starts on July 1, leaving an approximate 1-week window when steelhead redds are vulnerable to trampling. Spring/summer Chinook spawning and incubation period begins mid-August to mid-September, leaving their redds vulnerable for up to 5 weeks depending on the year's rotation schedule.

There is no available direct information on how much mortality would be produced by cattle trampling of redds. However, Roberts and White (1992) reported that a single fisherman wading over trout redds resulted in up to 43 percent embryo mortality. The authors suggested that ''...wading by cattle would result in mortality of eggs and pre-emergent fry at least equal to that demonstrated for human wading.'' Redd trampling is only likely to occur when livestock grazing overlaps with known spawning and incubation periods in the action area, and where topography and riparian vegetation allow cattle access to a particular stream reach. Additionally, redd trampling by livestock is only possible where topography and riparian vegetation allow cattle to access spawning areas within streams (i.e., spatial overlap). Factors which can lessen the degree of effects from grazing include active measures to keep cattle off stream channels such as fencing, off channel salting, employment of riders, or natural inaccessibility of stream channels due to topography or dense riparian vegetation. All these factors either exist in the

action area or are being employed to reduce redd trampling potential. A discussion regarding the likelihood of trampling occurring by species and pasture follows.

Snake River Basin Steelhead Redd Trampling. Comparing the spawning and incubation periods identified in the baseline section with the proposed pasture rotation dates for this Allotment, NMFS concludes there is potential for steelhead redds (with incubating eggs, embryos and/or maturing alevin) to be trampled by livestock during the first week of July. With approximately 19.93 miles of suitable steelhead spawning habitat available throughout the Allotment, there is potential for steelhead eggs to still be incubating in seven streams (4.33 miles of Bear Valley Creek, 9.62 miles of Hayden Creek, 2.54 miles of Bray Creek, 0.16 miles of East Fork Hayden Creek, 0.25 miles of Kadletz Creek, 2.58 miles of West Fork Hayden Creek, and 0.45 miles of Wright Creek) when livestock first enter the action area. However, the potential for livestock trampling of steelhead redds is limited to two Units (i.e., Kadletz Creek and Boulder Flat Unit) where cattle and incubating steelhead eggs occur coincidently in early July (July 1–7). Redds are likely to be exposed on Bear Valley, Kadletz, and Wright Creeks on the Kadletz Creek Unit, and on Hayden and East Fork Hayden Creek on the Boulder Flat Unit. This occurs in four out of 5 years, years 1, 2, 4, and 5. Also, as stated above, redd trampling by livestock is only possible where topography and riparian vegetation allow cattle to access spawning areas within streams.

To estimate the number of steelhead redds which could be accessible to livestock trampling in the Allotment (Kadletz and Boulder Flat Units) during July, NMFS used the SCNF estimated steelhead spawning stream miles (by grazing Unit). Bear Valley Creek exclosure prevents livestock from entering 1.2 miles of the Bear Valley Creek stream course. To address this, NMFS deducted stream miles within the exclosure that are not accessible to livestock from the SCNF estimated miles of steelhead spawning streams (by grazing Unit) (Table 8).

Table 8. Steelhead spawning habitat within Upper Hayden Allotment Potentially Accessible to Livestock Trampling.

Year	Grazing Unit	Stream Name	Total Spawning Habitat (mi)	Spawning Habitat Accessible to Livestock (mi)
1	Boulder Flat[1]	East Fork Hayden Ck.	0.16	0.16
		Hayden Creek	1.61	1.01
2	Kadletz Creek[2]	Bear Valley Creek	2.75	1.55
		Kadletz Creek	0.25	0.25
		Wright Creek	0.45	0.45
3	Apple	N/A	0	0
4	Boulder Flat[1]	East Fork Hayden Ck.	0.16	0.16
		Hayden Creek	1.61	1.01
5	Boulder Flat[1]	East Fork Hayden Ck.	0.16	0.16
		Hayden Creek	1.61	1.01

[1] Access based on estimates for total spawning habitat miles presented in the biological assessment excluding the 0.6 miles of the Boulder Flat exclosure on Hayden Creek within the Boulder Flat Unit.
[2] Access based on estimates for total spawning habitat miles presented in the biological assessment excluding the 1.2 miles of the Bear Valley Creek exclosure within the Kadletz Creek Unit.

Due to less suitable spawning habitat when compared to Bear Valley Creek, NMFS estimates that potential trampling of steelhead redds is possible but less likely to occur in 1.01 miles of

Hayden Creek and 0.16 miles of East Fork Hayden Creek in the Boulder Flat Unit in years 1, 4, and 5. In year-2, the potential for trampling occurs in 1.55 miles of Bear Valley Creek within the Kadletz Creek Unit for 1 week (July 1–7), when cattle first arrive on that Unit. The Bear Valley Creek exclosure, located entirely within the Kadletz Creek Unit, prevents cattle from accessing another 1.2 miles of Bear Valley Creek where the most suitable steelhead spawning habitat occurs within the Allotment. Steelhead redds potentially occurring in 0.25 miles of Kadletz Creek and 0.45 miles of Wright Creek may also be vulnerable to livestock trampling within Kadletz Creek Unit year-2 as well. In year-3, there is no potential for trampling of steelhead redds within the Apple Creek Unit.

In addition to random trampling events while grazing, cattle also have the potential to trample redds when being intentionally trailed through streams in the Allotment. On years when cattle are grazed on the Payne/Ford, Kadletz Creek, or Boulder Flat Units first, livestock are trailed across Hayden Creek in the Boulder Flat area around the first of July. Cattle are trailed across Hayden Creek at a ford crossing that is located on an existing road prism on the lower reaches of this stream. Livestock fording this crossing through active trailing have little opportunity for dispersal above or below this ford site. Oftentimes, the substrate found within vehicle and livestock fords is compacted to the point that it is not suitable, nor desirable, to spawning steelhead. Still, if steelhead redd(s) were constructed at this crossing area there would be a high potential that the redd(s) would be trampled while cattle were using the crossing to access the Allotment during the first week of July. This same crossing is used every year to actively trail livestock from the last Unit in the rotation each year. However, there is no potential to harm steelhead eggs in late September when this half day move is conducted because steelhead are spring spawners and incubating redds are not present in gravels at this time.

There is no record of steelhead redd data for streams in this action area. Steelhead spawning (redd) survey information compiled by IDFG from 1990 to 1998 for other portions of the upper Salmon River basin was used to estimate potential steelhead densities for streams within the Allotment (NMFS 2010). Considering these redd densities, NMFS estimated an average density of 1.3 redds per mile for streams in this Allotment with high quality steelhead spawning habitat (i.e., Hayden and Bear Valley Creeks). Although Kadletz, East Fork Hayden, and Wright Creeks also support Snake River Basin steelhead spawning, these streams are smaller and relatively high gradient. As a result, the majority of these streams' habitats are rated as "low" intrinsic potential for steelhead spawning and rearing (ICBTRT 2007). Therefore, NMFS assumes redd densities in these areas are likely to be at least 50 percent lower and has applied a 0.65 redds per mile estimate to these streams.

Using this information, NMFS estimated the number of steelhead redds that are potentially vulnerable to livestock trampling by Unit. As illustrated in Table 7, a maximum of seven (6.6) steelhead redds are potentially vulnerable to trampling within the Kadletz and Boulder Flat Units, spread out over the 5-year grazing cycle. Because the first week of July is the only time where grazing and steelhead redd incubation overlap, redd vulnerability will vary across the 5-year cycle. Up to two steelhead redds will be potentially exposed annually to redd trampling in years 1, 4, and 5, while up to three will be exposed in year-2 (Table 9). No redds will be exposed to trampling in the third year of the rotation when cattle first graze the Apple Creek Unit.

Table 9. Maximum steelhead redds potentially vulnerable to livestock trampling by Unit.

Year	Unit Name	Stream Name	Stream Miles in Unit Accessible to Livestock	Intrinsic Steelhead Spawning Potential	Maximum Redds Per Mile	Maximum Redds Per Stream Segment	Maximum # Redds Vulnerable Per Unit
1	Boulder Flat	E.F. Hayden Cr.	0.16	Low	0.65	0.1	1.4
		Hayden Creek	1.01	High	1.3	1.3	
2	Kadletz Creek	Bear Valley Cr.	1.55	High	1.3	2.0	2.4
		Kadletz Cr.	0.25	Low	0.65	0.16	
		Wright Cr.	0.45	Low	0.65	0.29	
4	Boulder Flat	E.F. Hayden Cr.	0.16	Low	0.65	0.1	1.4
		Hayden Creek	1.01	High	1.3	1.3	
5	Boulder Flat	E.F. Hayden Cr.	0.16	Low	0.65	0.1	1.4
		Hayden Creek	1.01	High	1.3	1.3	

NMFS does not expect all (100 percent) redds to be trampled simply because they may be accessible to livestock. Gregory and Gamett (2009) reported that cattle trampled 12 percent to 78 percent of simulated bull trout redds while on federal grazing allotments during their study. Applying these rates to the steelhead spawning streams within the Allotment, NMFS calculated the number of steelhead redds that could potentially be trampled by Unit within the Allotment by year (Table 10). In total, using the higher trampling rate of 78 percent as a worst-case scenario, up to five steelhead redds potentially exposed to trampling over the 5-year grazing cycle would be trampled.

Table 10. Unit Rotations and Potential Steelhead Redd Trampling by Livestock.

Year	Unit Name	Stream Name	Maximum # Redds Vulnerable Per Unit	Potential Range of Redd Trampling (percent)[1]	Maximum # Redds Trampled by Year
1	Boulder Flat	E.F. Hayden Creek	1.4	12 to 78	0 to 1
		Hayden Creek			
2	Kadletz Creek	Bear Valley Creek	2.4		0 to 2
		Kadletz Creek			
		Wright Creek			
3	Apple	N/A	0	N/A	0
4	Boulder Flat	E.F. Hayden Creek	1.4	12 to 78	0 to 1
		Hayden Creek			
5	Boulder Flat	E.F. Hayden Creek	1.4		0 to 1
		Hayden Creek			

[1] Gregory and Gamett (2009).

NMFS analysis indicates the potential for steelhead redd trampling exists only in the Kadletz Creek and Boulder Flat Units, with the greatest potential occurring on the Kadletz Creek Unit in year-2 of the 5-year grazing rotation. Although the analysis estimated between zero to five steelhead redds could be trampled over a 5-year grazing period in the Allotment, the potential *annual* impacts from livestock trampling is more pertinent to steelhead conservation and recovery. Steelhead redds within the Kadletz Creek and Boulder Creek Units are only vulnerable to trampling for a brief period (approximately 1-week) in early July. Our analysis estimated that no more than one redd would be exposed to trampling in years 1,4, and 5, and no more than two would be exposed in year-2 of the 5-year grazing cycle. Consequently, a different cohort of steelhead would potentially be affected in each of the 4 years that redds are vulnerable

to trampling by livestock. For this reason, NMFS estimated the trampling potential and effects by Unit and year to better gauge the potential impacts to the Lemhi River steelhead population.

NMFS has considered and displayed this entire range to include a worst-case scenario but cautions that these numbers should not be viewed as absolute numbers that are likely to be achieved. Instead, these numbers can be used to gauge the relative magnitude of the potential impact. NMFS believes these numbers significantly overestimate likely redd trampling and provide a worst-case scenario for at least two reasons. First, the relatively high stream flows typical of early July discourage cattle from entering streams in most instances. More typically, the high stream flows during early July limit cattle entry to drinking at the stream edges but not crossing the stream. McInnis and McIver (2009) reported cattle presence (hoof prints) along the greenline was 59 percent higher in late summer pastures (90 percent) than early summer pastures (53 percent). Within the Allotment, 1.2 miles of the highest quality habitat is protected by the Bear Valley Creek exclosure which is located entirely within the Kadletz Creek Unit. It is conceivable that the two redds comprising the worst-case scenario for Kadletz Creek Unit would occur within the Bear Valley Creek exclosure and be completely protected from livestock trampling. In reality, steelhead spawning within Bear Valley Creek may occur disproportionally within the Bear Valley Creek exclosure leaving fewer redds vulnerable to livestock trampling outside of the exclosure. An exclosure fence will be installed prior to grazing the Allotment in 2020, constructed along Hayden Creek excluding livestock from a 0.6-mile reach within the Boulder Flat Unit. The fence will be completed before grazing on the Allotment in 2020.

To estimate the population level effects of potential redd trampling, NMFS converted these numbers to adult equivalents lost from the population to determine potential population level effects. Roberts and White's (1992) study of angler related trampling, the only available surrogate for livestock trampling, documented highly variable egg mortality, dependent on the developmental stage of eggs/pre-emergent fry trampled (Range = 0 percent to 43 percent for single trampling events). Pre-emergent fry, the stage likely to be present during trampling, had approximately 19 percent mortality. Their study evaluated trampling of synthesized trout redds, whose egg burial depth is shallower than steelhead, so their results may or may not be directly germane to anadromous fish exposed to livestock trampling.

For this analysis, NMFS assumes that each steelhead redd contains roughly 5,000 eggs, and steelhead egg-fry survival is estimated to be approximately 29.3 percent under natural conditions (Quinn 2005). If trampling were to kill 19 percent of the pre-emergent fry in a redd (Roberts and White 1992), each trampled redd could result in approximately 278 fewer fry. Assuming fry-to-smolt survival approximates 13.5 percent (Quinn 2005), approximately 38 fewer steelhead smolts would be produced per trampled redd. Applying a conservative smolt-to-adult survival rate of 0.8 percent (USFWS 1998) results in less than one fewer adult equivalent (0.3) per trampled redd. Therefore, in years 1, 4, and 5, when no more than one redd is trampled annually, it is unlikely that the trampling will translate into the loss of a returning adult equivalent in any given year (i.e., 0.3 per year). However, at this rate, the equivalent of one adult is expected to be lost to the population over the three year period of grazing. The 0.6 adult equivalents that could potentially be lost in year-2, when up to two redds could be trampled, if rounded up to one, would result in an additional adult equivalent lost for grazing in that particular year of the 5-year

cycle. Trampling of redds is not expected to occur in year-3. A 5-year grazing cycle could result in the loss of up to two adult equivalents.

Snake River Spring/summer Chinook Redd Trampling. Comparing the spawning and incubation periods for Chinook salmon identified by the USBWP Technical Team for the Hayden Creek drainage with the proposed pasture rotation dates included in the proposed action, there is temporal overlap in presence between livestock and Chinook salmon within the Allotment. While there can be periodic disturbance to migrating and staging Chinook salmon in Hayden Creek and Bear Valley Creek when cattle are first trailed into the Allotment at the beginning of July, there is no potential for livestock trampling of Chinook salmon redds that early in the grazing season because they do not occur at this time. This will be discussed in more detail below. Because Chinook salmon spawning and incubation periods overlap with proposed grazing dates applied to the Allotment, there is potential for livestock to trample Chinook salmon redds in those Units where cattle and salmon occur coincidently each year. As presented in the BA, the total stream miles supporting Chinook salmon spawning and incubation within the Allotment is approximately 7.07 miles (2.78 miles of Hayden Creek and 4.29 miles of Bear Valley Creek). However, review of redd survey data collected by the IDFG from 2001 through 2018 suggests that actual Chinook spawning has been more limited than what has been portrayed in the BA's stream spawning miles (Figure 5). These data demonstrate that since 2001 Chinook redds have only been documented in approximately the lower 1.8 miles of Hayden Creek on the Allotment, and in approximately the lower 1.5 miles of Bear Valley Creek on the Allotment.

To estimate the number of Chinook salmon redds which could be exposed to livestock trampling in the Allotment, NMFS first acknowledged the Bear Valley Creek exclosure (located entirely within the Kadletz Creek Unit). This exclosure prevents cattle from accessing approximately 1.2 miles of Bear Valley Creek. Considering the 2001–2018 IDFG redd survey data, Chinook salmon spawning has rarely been observed to extend upstream into this exclosure (Figure 5). This exclosure is three sided but there are other fences along a northeastern ridge, talus slopes and steep terrain that allow this three-sided fence to function as a total exclosure. Most Chinook salmon spawning in Bear Valley Creek appears to have been limited to the reach of stream in the Payne/Ford Unit, where there is a drift fence that parallels Bear Valley Creek to help keep cows in the upland away from Bear Valley Creek. These fences, along with natural inaccessibility of stream channels (due to topography or dense riparian vegetation), all reduce livestock access to sections of stream channel and thereby lessen redd trampling potential. Table 11 identifies the amount of total spawning/accessible spawning habitat as estimated by the SCNF in the BA, refined further for our analysis based on IDFG redd survey data for the previous 18-year period.

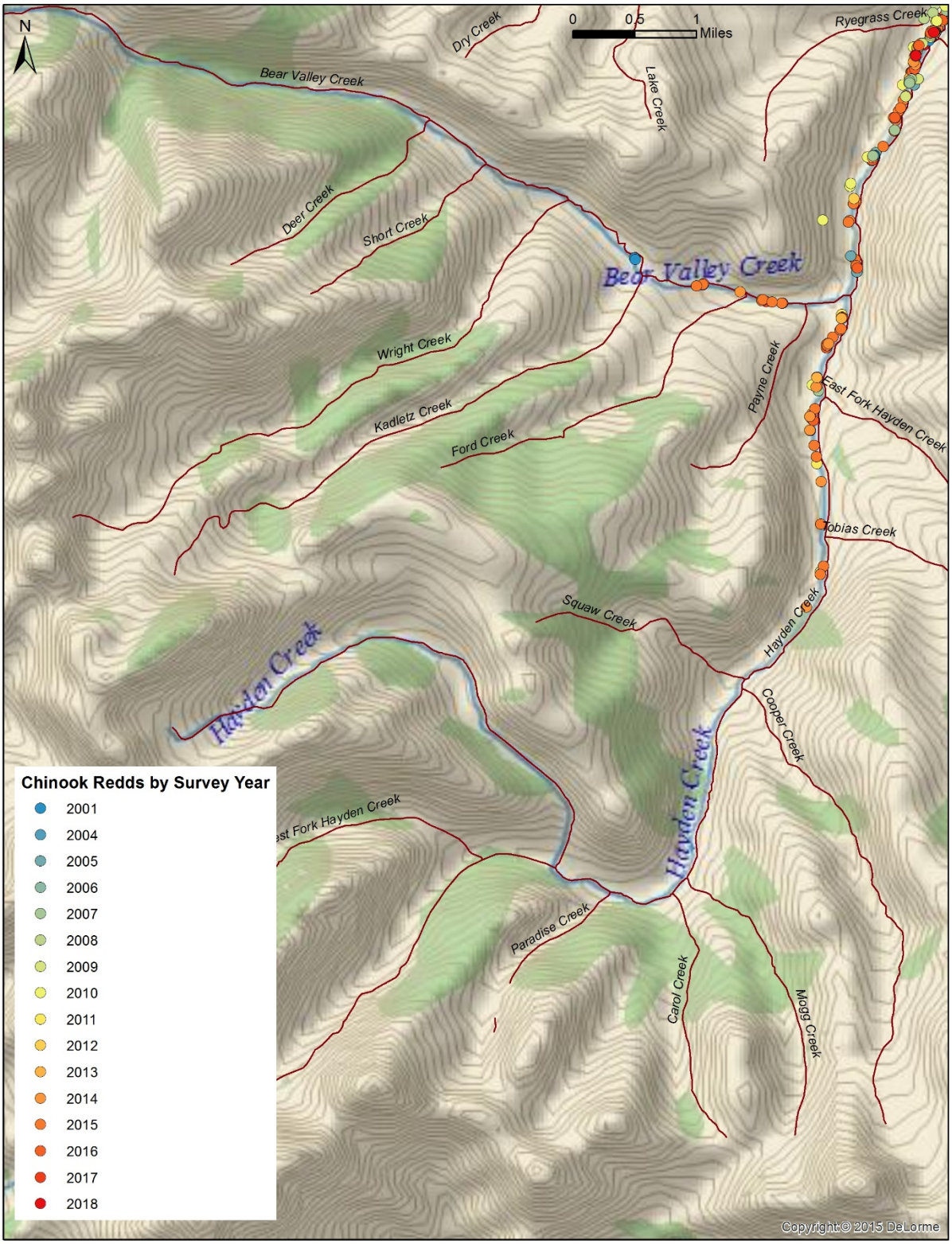


Figure 5. Chinook salmon spawning redd surveys from 2001-2018.

Table 11. The IDFG Hayden Creek Chinook Redd Survey Data from 2001–2018.

Year	Grazing Unit	Stream Name	Total Spawning Habitat	SCNF Estimate Spawning Habitat Accessible to Livestock (mi)[1]	NMFS' Revised Estimate Spawning Habitat Accessible(mi.)[3]
1	Kadletz Creek	Bear Valley Creek	2.71	1.51	0.25
	Tobias/Mogg	Hayden Creek	1.17	1.17	0.25
2	Tobias/Mogg	Hayden Creek	1.17	1.17	0.25
3	Payne/Ford	Bear Valley Creek	1.58	1.58[2]	1.25
	Kadletz Creek	Bear Valley Creek	2.71	1.51	0.25
4	Tobias/Mogg	Hayden Creek	1.17	1.17	0.25
	Payne/Ford	Bear Valley Creek	1.58	1.58[2]	1.25
5	Tobias/Mogg	Hayden Creek	1.17	1.17	0.25
	Payne/Ford	Bear Valley Creek	1.58	1.58[2]	1.25

[1] Access based on estimates for total spawning habitat miles presented in the BA excluding the 1.2 miles of the Bear Valley Creek exclosure within the Kadletz Creek Unit.
[2] Access to Bear Valley Creek is discouraged by the use of a drift fence within the Payne/Ford Unit.
[3] Based on NMFS' interpretation of IDFG Redd Survey Data (2001–2018).

By applying the accessibility estimates as revised by NMFS, we estimate that potential for livestock trampling of Chinook salmon redds occur both in approximately 0.25 miles of Bear Valley Creek (Kadletz Unit) and in approximately 0.25 miles of Hayden Creek (Tobias/Mogg) in year-1. In year-2, trampling potential is limited to 0.25 miles of Hayden Creek (Tobias/Mogg). In year-3, cattle have access to approximately 1.25 miles of Bear Valley Creek (Payne/Ford Unit) and 0.25 miles of Bear Valley Creek (Kadletz Unit). In year-4, cattle have access to approximately 0.25 miles of Hayden Creek (Tobias/Mogg Unit) and 1.25 miles of Bear Valley Creek (Payne/Ford Unit). Cattle have access to approximately 0.25 miles of Hayden Creek (Tobias/Mogg) and 1.25 miles of Bear Valley Creek (Payne/Ford Unit) in year-5.

In summary, for Bear Valley Creek, Units where grazing overlaps Chinook salmon spawning and incubation are primarily located in the Payne/Ford, Tobias/Mogg, and Kadletz Creek Units. Redd trampling could occur in the: (1) Payne/Ford Unit in years 3, 4, and 5 of the 5-year grazing cycle, when cattle will be grazing between 2 and 5 weeks after the third week in August; (2) Redd trampling could occur within the Kadletz Unit in year-3, when cattle are present for up to 3 weeks after the third week in August; and (3) Tobias/Mogg in all but year-3, when cattle are present for up to 3 or 4 weeks in early August.

In Hayden Creek, Chinook salmon spawning over the last 18 years has been limited to the lower 2 miles of Hayden Creek on the Allotment (Figure 5). No Chinook salmon spawning has been observed upstream of this point; therefore, no livestock trampling of Chinook salmon redds will occur in the Upper Hayden Unit. The Units along Hayden Creek where grazing could affect Chinook salmon spawning and incubation habitat include the Boulder Flat and Tobias/Mogg Units. Redd trampling of Chinook salmon redds in Hayden Creek could occur in the Tobias/Mogg Unit four out of 5 years (years 1, 2, 4, and 5), when cattle are present after the third week in August. Boulder Flat Unit will no longer be grazed after August 15, virtually eliminating the risk of Chinook salmon redd trampling in this Unit. Based on historical spawning surveys, the likelihood of Chinook spawning and incubation within other streams in the area is very unlikely to occur though they may support juvenile rearing.

In addition to random trampling events while grazing, cattle also have the potential to trample redds when being intentionally trailed through streams in the action area. Livestock are trailed across Hayden Creek in the Boulder Flat area. This crossing is used to move cattle on to the Allotment. The duration of the entry move is about 1-day. While this early July move has some potential to disturb migrating or holding Chinook salmon in Hayden Creek, this trailing occurs over a month before Chinook salmon typically begin spawning and no potential for trampling Chinook salmon redds exists.

There are also potential impacts to spawning Chinook salmon and/or redds with incubating eggs from active trailing across Hayden Creek while trailing livestock from the Allotment to the home ranch at the end of September each year. This crossing is used six out of 10 years to actively trail livestock from the last Unit in the rotation, off the Allotment, through the BLM allotment, and then to the home ranch by September 30 each year. Duration of either move is less than one-half day. The cattle cross Hayden Creek at a ford crossing located on an existing road prism on the lower reaches of this stream within the action area. Fording this crossing through active trailing presents little opportunity for dispersal of livestock above or below this actual ford site where redds have been documented. Oftentimes, the substrate found within vehicle and livestock fords has become compacted to the point that it not suitable, nor desirable, to spawning salmon. However, if a Chinook salmon redd(s) was constructed at this ford there would be a high potential that the redd(s) would be trampled while cattle trail off of the Allotment before September 30.

During the last 9 years, the SCNF has completed Chinook salmon redd surveys in Hayden Creek. Although it is not clear whether SCNF redd surveys are reflected in Figure 5, the SCNF found the following number of redds per year within the action area portion of Hayden Creek: 2010–2012 (0), 2013 (1), 2014 (2), 2015 (5), 2016 (1) and 2017–2018 (0). Between 2011 and 2018 the SCNF completed Chinook salmon redd surveys in Bear Valley Creek, and did not find redds in 2011, 2012, 2013, 2015, or 2017 (USFS 2019).

In an effort to estimate the quantity of Chinook salmon redds that may be present within the Allotment, NMFS considered the SCNF spawning survey data to estimate a maximum density of 0.71 redds per mile (the highest number of 5 redds total observed in 2015 across 7.06 miles of suitable spawning habitat for Chinook salmon) in the action area. This density is based on the highest number of Chinook redds observed between 2010 and 2018 along the combined 4.29 miles of Bear Valley Creek and 2.77 miles of Hayden Creek. Using this information, NMFS estimated the number of Chinook salmon redds that are potentially vulnerable to livestock trampling by Unit. As illustrated in Table 12, a maximum of five Chinook salmon redds are potentially vulnerable to trampling over the 5-year grazing cycle. However, in any given year, no more than two redds are expected to be vulnerable to trampling when cattle will graze during the spawning and incubation period.

Table 12. Maximum Chinook salmon redds potentially vulnerable to livestock trampling by Unit.

Year	Grazing Unit	Stream Name	Spawning Habitat Accessible to Livestock (mi)	Max. Density Redds (#/mi.)	Max. # Redds Per Stream Segment	Max. # Vulnerable Redds per Year (rounded to whole number)
1	Kadletz Creek	Bear Valley Creek	0.25	0.71	0.177	1
	Tobias/Mogg	Hayden Creek	0.25	0.71	0.177	
2	Tobias/Mogg	Hayden Creek	0.25	0.71	0.177	1
3	Payne/Ford	Bear Valley Creek	1.25	0.71	0.887	1
	Kadletz Creek	Bear Valley Creek	0.25	0.71	0.177[1]	
4	Tobias/Mogg	Hayden Creek	0.25	0.71	0.177	1
	Payne/Ford	Bear Valley Creek	1.25	0.71	0.887	
5	Tobias/Mogg	Hayden Creek	0.25	0.71	0.177	1
	Payne/Ford	Bear Valley Creek	1.25	0.71	0.887	

1. Grazing in the Kadletz Creek Unit is not likely to occur after August 24th in year-3.

NMFS does not expect all (100 percent) redds to be trampled simply because they may be accessible to livestock. Gregory and Gamett (2009) reported that cattle trampled 12 percent to 78 percent of simulated bull trout redds while on federal grazing allotments during their study. NMFS has calculated the entire range of redds potentially trampled by livestock to include a worst-case scenario. Applying these rates, NMFS calculated the maximum range of Chinook salmon redds potentially trampled to no more than one a year across all Units comprising the Allotment (Table 12).

Considering redd survey data and the information presented in Table 13, NMFS estimates that Chinook salmon redd trampling on all years would be at or near zero (assuming the lower rate of 12 percent livestock trampling). However, it could approach one redd in each year of the rotation if the higher range of 78 percent described by Gregory and Gammett (2009) is more accurate. However, NMFS believes these numbers may significantly overestimate likely redd trampling and provide an extreme worst-case scenario for several reasons. The redd density estimate was applied equally across all miles of stream within the Allotment, despite redds typically being concentrated in only the highest quality habitat. Although the precise number would be unknown, some to all of the Chinook redds in Bear Valley Creek could occur within the Bear Valley Creek exclosure (constructed to protect the best spawning habitat) and not be subjected to any potential trampling. The drift fence on the Payne/Ford Unit may further reduce potential interaction between cattle and redds in years 3, 4, and 5. Also, the redd density used was based on the SCNF maximum observed spawning rates in the action area, a density that's only occurred once in 9 years, and a density only likely to occur during higher Chinook return years. Most recent years have seen no Chinook salmon returning to Allotment streams. NMFS has displayed the entire range of potential trampling to include a worst-case scenario calculating the SCNF maximum range of redds potentially trampled by livestock. However, these numbers should be used to gauge the relative size of the potential impact and should not be viewed as absolute numbers that are likely to be achieved.

Table 13. Maximum Chinook salmon redds potentially trampled by livestock by Unit.

Year	Grazing Unit	Stream Name	Max. # Vulnerable Redds per Year	Potential Range of Redd Trampling (percent)[1]	Maximum # Redds Trampled by Year
1	Kadletz Creek	Bear Valley Creek	1	12 to 78	0 to 0.78
	Tobias/Mogg	Hayden Creek			
2	Tobias/Mogg	Hayden Creek	1		0 to 0.78
3	Payne/Ford	Bear Valley Creek	1		0 to 0.78
	Kadletz Creek	Bear Valley Creek			
4	Tobias/Mogg	Hayden Creek	1		0 to 0.78
	Payne/Ford	Bear Valley Creek			
5	Tobias/Mogg	Hayden Creek	1		0 to 0.78
	Payne/Ford	Bear Valley Creek			
	Kadletz Creek	Bear Valley Creek			

[1] Gregory and Gamett (2009).

To determine the potential population level effects and to complete a jeopardy analysis, NMFS converted the number of redds potentially trampled to adult equivalents using reasonable life stage survival estimates. Average Chinook egg-fry survival is approximately 38 percent (Quinn 2005) under natural conditions. Assuming each Chinook redd contains roughly 5,400 eggs (Quinn 2005), egg-fry survival per adult female is estimated at 2,052 fry. If trampling kills at least 10 percent of the eggs in a redd (Roberts and White 1992), each trampling could result in roughly 205 fewer fry. Quinn (2005) estimates Chinook fry to smolt survival at 10.1 percent, which would result in 21 fewer smolts per trampled redd. Smolt-to-adult returns are estimated as 0.031 percent for spring/summer Chinook salmon. Applying this percentage to the calculated number of lost smolts, it is reasonable to assume that the action may result in one fewer adult (0.62) spring/summer Chinook salmon per redd trampled returning to the action area. This considered, there will be about one fewer returning adult every 2 years as a result of grazing the Allotment; resulting in up to three adult Chinook salmon not returning to the action area every 5 years of the grazing cycle. Chinook salmon generally exhibit a 4- or 5-year life cycle in this region; therefore, trampling from 1-year to the next will affect different cohorts.

Summary. As previously described, the proposed action both temporally and spatially overlaps spawning and incubation periods of Snake River Basin steelhead and Snake River Chinook salmon. Proposed mineral placements, use of riders, drift and exclosure fences, and application of annual use indicators combine to minimize the likelihood of redd trampling by cattle. However, these proposed measures do not completely ensure that steelhead and/or Chinook redds will not be trampled by cattle on this Allotment.

NMFS estimated that up to one Snake River Basin steelhead redd could be trampled in years 1, 4, and 5. When no more than one redd is trampled annually. It is unlikely that the trampling will translate into the loss of a returning adult equivalent in any given year (i.e., 0.3 per year). At this rate, the equivalent of one adult is expected to be lost to the population for these 3 years of grazing (3 years times 0.3 per year). The estimated 0.6 adult equivalents potentially lost in year-2 when up to two redds could be trampled, if rounded up to one, would result in an additional adult equivalent lost for grazing in that particular year of the 5-year cycle. This considered, trampling of redds could result in up to two fewer adults returning each fifth year of

grazing, spread across multiple year classes, is unlikely to affect overall abundance of Snake River Basin steelhead.

For Snake River spring/summer Chinook salmon, redds could be trampled in each year of the 5-year cycle. The trampling and number of returning adults affected is not expected to translate into the loss of a returning adult equivalent in any given year (i.e., 0.62 per year) of the grazing cycle, but is likely to translate to an adult being lost to the population for every 2 years the Allotment is grazed. This considered, trampling of redds resulting in up to three fewer adults returning each 5 years of grazing, spread across multiple year classes, is unlikely to affect overall abundance of Snake River spring/summer Chinook salmon.

The number of fish affected is expected to be too small and the type of effects too minor to produce any observable effect on the VSP parameters of any of the listed species. This is true given wide annual variability in adult and juvenile returns and seasonal variations in habitat use. Additionally, impacts to the Chinook salmon populations will be spread amongst at least ten to 15-year classes. This further reduces the likelihood of any appreciable population level impacts on the VSP parameters. The action will not appreciably modify the VSP parameters for the affected Lemhi River populations of Snake River spring/summer Chinook salmon or Snake River Basin steelhead. Because the action will not appreciably modify the VSP parameters at the population scale, the action will not appreciably reduce abundance, productivity, spatial structure, or diversity of the Snake River spring/summer Chinook salmon ESU or the Snake River Basin steelhead DPS.

2.6 Cumulative Effects

"Cumulative effects" are those effects of future state or private activities, not involving federal activities, that are reasonably certain to occur within the action area of the federal action subject to consultation (50 CFR 402.02). Future federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA. Because the action area occurs entirely on federal land, all future activities in the action area will likely be implemented, permitted, or funded by the SCNF and will require separate consultation pursuant to section 7 of the ESA. NMFS is not aware of any specific private, state, local, or tribal actions that are reasonably certain to occur in the future that will affect the action area. Therefore, there will be no cumulative effects for the proposed action.

2.7 Integration and Synthesis

The Integration and Synthesis section is the final step in our assessment of the risk posed to species as a result of implementing the proposed action. In this section, we add the effects of the action (Section 2.5) to the environmental baseline (Section 2.4) and the cumulative effects (Section 2.6), taking into account the status of the species (Section 2.2), to formulate the agency's Opinion as to whether the proposed action is likely to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing its numbers, reproduction, or distribution.

Species. The number of fish affected is expected to be too small and the type of effects too minor to produce any observable effect on the VSP parameters of either of the ESA-listed species. This is true given wide annual variability in adult and juvenile returns and seasonal variations in habitat use. Additionally, impacts to the Chinook salmon and steelhead populations will be spread amongst at least 10-year classes. This further reduces the likelihood of any appreciable population level impacts on the VSP parameters. The action will not modify the VSP parameters for the affected Lemhi River populations of Snake River spring/summer Chinook salmon or Snake River Basin steelhead. The action will also not appreciably reduce the likelihood of survival and recovery, abundance and productivity, or spatial structure/diversity of the Snake River spring/summer Chinook salmon ESU or the Snake River Basin steelhead DPS.

Climate change has been affecting environmental conditions in the action area for at least 50 years. We determine that the available data regarding environmental conditions relied upon to describe the environmental baseline for this consultation capture that change caused by global processes that has already occurred and its impacts on ESA-listed salmonids and their designated critical habitats. Climate change cannot be meaningfully predicted for such a time scale given the intrinsic climate fluctuations that occur on interannual-to-decadal timescales masking any signal from climate change over that time. Thus, the effects of the proposed action described in this opinion fully incorporate our consideration of climate change for application of the ESA jeopardy and critical habitat standards.

2.8 Conclusion

After reviewing and analyzing the current status of the listed species, the environmental baseline within the action area, the effects of the proposed action, any effects of interrelated and interdependent activities, and cumulative effects, it is NMFS' Opinion that the proposed action is not likely to jeopardize the continued existence of Snake River Basin steelhead or Snake River spring/summer Chinook salmon.

2.9 Incidental Take Statement

Section 9 of the ESA and federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. "Harm" is further defined by regulation to include significant habitat modification or degradation that actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding, or sheltering (50 CFR 222.102). On an interim basis, NMFS interprets "harass" to mean "Create the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering." "Incidental take" is defined by regulation as takings that result from, but are not the purpose of, carrying out an otherwise lawful activity conducted by the federal agency or applicant (50 CFR 402.02). Section 7(b)(4) and section 7(o)(2) provide that taking that is incidental to an otherwise lawful agency action is not considered to be prohibited taking under the ESA if that action is performed in compliance with the terms and conditions of this ITS.

2.9.1 Amount or Extent of Take

The proposed action is reasonably certain to result in incidental take of ESA-listed species. NMFS is reasonably certain the incidental take described here will occur because livestock will graze alongside streams during the redd incubation periods for Chinook salmon and steelhead, and while juveniles for both species are present during summer rearing. In the Opinion, NMFS determined that incidental take is reasonably certain to occur from redd trampling. NMFS expects minor behavioral modifications for listed fish from direct interactions with cows grazing in streams will be infrequent and minor because habitat conditions in the action area should provide suitable escape cover.

2.9.1.1 Steelhead Redd Trampling

Through implementation of the proposed action, livestock trailing and grazing is expected to occur in the same time and place as Snake River Basin steelhead egg/embryo incubation for approximately 1-week in two pastures. The proposed pasture-Unit rotation, location of drift/exclosure fences, targeted riding, salt placements, and move-triggers/annual use standards all help make the likelihood of Snake River Basin steelhead redd trampling extremely low, but the potential for redds to be trampled by livestock still exists.

Redd trampling rates are expected to differ slightly between years, ranging from zero in some years, to one or two in other years. For steelhead, redd trampling appears most likely to occur in years 1, 4, and 5 on the Boulder Flat Unit, and in year-2 on the Kadltez Creek Unit. Despite NMFS estimating the number of redds that could be trampled in the preceding Opinion, the number of trampled redds will not be used to establish the amount of take for steelhead in this Opinion, as it cannot be readily monitored by field personnel within this Allotment. Steelhead redds are constructed in the early spring, and while some redds may be visible early in the season, access to these streams by SCNF personnel is extremely difficult at this time of year due to snow and ice. Peak flows occur approximately during the middle of the spawning period. Ice shelves along stream margins, high flows, and turbid water make redd inventory in the action area inaccurate and impractical to complete. In addition, substrate around and in any redds identified before peak flows are likely to be reorganized or covered by substrate deposits following runoff, making redds essentially invisible after flows drop. Thus, it would be impractical to determine how many redds are present in the action area, let alone accurately determine how many of those redds are subsequently trampled by cattle each grazing season. Because circumstances causing take are likely to arise, but cannot be quantitatively measured in the field, the extent of incidental take is described, pursuant to 50 CFR 402.14[I].

Similarly, it is difficult for NMFS to quantify the extent of take for steelhead and the action as proposed. There is no known forage utilization or channel measurement indicator that directly correlates to redd trampling rates. However, redd trampling is most likely to occur when cattle concentrate in riparian areas, with trampling occurring when cows cross or enter streams to water. Streambank alteration provides an indication of the amount of time cattle spend in riparian zones, increasing with both the number of cows present and with the time spent by those cows in riparian areas. Streambank alteration is already proposed as both a move-trigger and annual use indicator. As such, alteration levels will be measured during routine Allotment monitoring along greenlines within individual Unit DMAs and elsewhere in individual Units.

Therefore, NMFS will use percent streambank alteration as the extent of take for steelhead in this Opinion.

The SCNF proposed bank alteration limits of less than 10 percent, 15 percent, or 20 percent, depending on how close bank stability levels are to RMOs within individual Units. The proposed action indicates that the permittee should begin moving cattle at identified move-trigger points, which will be set at levels 5 percent below the limit to ensure the end of season values meet maximum allowed use levels (Table 2). In this Opinion, NMFS determined that the proposed move-triggers and annual use standards would help reduce cattle presence in streamside areas such that trampling would be limited to no more than one Snake River Basin steelhead redd per year in years 1, 4, and 5 of the grazing rotation, and no more than two in year 2 of the rotation. Therefore, NMFS has established the extent of incidental take limit authorized by this Opinion as: (1) <10 percent in Units where bank stability is less than 75 percent of the RMO; (2) <15 percent in Units where bank stability is 75 percent to 99 percent of the RMO; or (3) <20 percent in Units where the bank stability RMO is being met. This extent of take is not coextensive with the proposed action, because grazing is not intended or expected to reach the specified extent of streambank alteration.

2.9.1.2 Chinook Redd Trampling

Also, through implementation of the proposed action, livestock trailing and grazing is expected to occur in the same time and place as spring/summer Chinook salmon spawning and incubation between the third week of August and the end of September in three Units (Kadletz Creek, Payne/Ford, and Tobias/Mogg Units).

For incidental take of Chinook salmon associated with redd trampling, the number of redds trampled will be used as the amount of take, as it can be effectively monitored by field personnel within this Allotment. Chinook salmon redds are constructed in the fall, are comparatively large, clearly visible, and constructed during low streamflows and at times when stream are readily accessible by field personnel. Thus, it is reasonable to determine how many redds are present in the action area, at which time surveyors should be able to determine how many, if any, of those redds have been trampled by cattle each grazing season.

In this Opinion, it was determined that the annual trampling of a Chinook salmon redd would translate to approximately 0.62 fewer adult Chinook salmon returning to the action area, and the corresponding the loss of up to three returning adults for each 5-year grazing cycle avoided jeopardy. Therefore, the amount of take authorized for Chinook salmon on the Allotment will be exceeded if the number of cattle trampled redds exceeds one in any given year of grazing.

Allotment monitoring will be critical to ensure: (1) All assumptions used to develop this take statement are accurate; (2) the SCNF does not exceed the amount of take authorized; and (3) implementation of the action results in the intended effects and allows for rapid change in grazing management when effects differ from what was anticipated. The BA indicated annual monitoring reports would be available online at: http://www.fs.fed.us/r4/sc/projects/range/index.shtml. If at any time the level or method of take exempted from take prohibitions in this Opinion is exceeded reinitiation of consultation is

required. Reinitiation of consultation is also required if any of the proposed or required monitoring of this incidental take statement are not readily available at the above website or by request of NMFS.

2.9.2 Effect of the Take

In the Opinion, NMFS determined that the amount or extent of anticipated take, coupled with other effects of the proposed action, is not likely to result in jeopardy to the species.

2.9.3 Reasonable and Prudent Measures

"Reasonable and prudent measures" are nondiscretionary measures that are necessary or appropriate to minimize the impact of the amount or extent of incidental take (50 CFR 402.02). The SCNF has the continuing duty to regulate the activities covered in this incidental take statement where discretionary federal involvement or control over the action has been retained or is authorized by law. The protective coverage of section 7(o)(2) will lapse if the SCNF fails to exercise its discretion to require adherence to terms and conditions of the ITS, or to exercise that discretion as necessary to retain the oversight to ensure compliance with these terms and conditions. Similarly, if any applicant fails to act in accordance with the terms and conditions of the ITS, protective coverage will lapse.

NMFS believes that full application of conservation measures included as part of the proposed action, together with use of the RPMs and terms and conditions described below, are necessary and appropriate to minimize the impact of incidental take of listed species due to completion of the proposed action.

The SCNF shall:

1. Minimize incidental take resulting from livestock grazing on the Allotment.

2. Ensure completion of a monitoring and reporting program to confirm that the terms and conditions in this ITS are effective in avoiding and minimizing incidental take from permitted activities and that the extent of take was not exceeded.

2.9.4 Terms and Conditions

The terms and conditions described below are non-discretionary, and the SCNF or any applicant must comply with them in order to implement the RPMs (50 CFR 402.14). The SCNF or any applicant has a continuing duty to monitor the impacts of incidental take and must report the progress of the action and its impact on the species as specified in this ITS (50 CFR 402.14). If the SCNF and its cooperators, including the permittee, if any, to whom a term and condition is directed does not comply with the following terms and conditions, protective coverage for the proposed action would likely lapse.

1. The following terms and conditions implement RPM 1:

    a. The SCNF shall ensure that the proposed action described in the BA and this Opinion, as modified by this Opinion's Terms and Conditions, and including all described conservation measures, monitoring, and adaptive management strategy, is implemented.

    b. The extent of incidental take is not exceeded by ensuring **s**treambank alteration levels, along streams where Snake River Basin steelhead redd trampling is expected to occur (Boulder Flat, and Kadletz Creek Units), does not exceed the following levels at any time during the identified Snake River Basin steelhead incubation period for the action area (March 15 to July 7):

        (1) 10 percent in Units where streambank stability conditions are less than 75 percent of the identified RMO for that Unit;

        (2) 15 percent in Units where bank stability conditions are 75 percent to 99 percent of the identified RMO for that Unit;

        (3) 20 percent in Units where the bank stability RMO is being met.

    c. Appropriately trained SCNF staff will monitor streambank alteration levels, using the same protocols identified in the proposed action, at each Unit's DMA. The monitoring shall occur within three weeks of moving cattle off each Unit.

    d. To further reduce steelhead redd trampling potential within the Boulder Flat or Kadletz Creek Units, the SCNF shall implement one of the following:

        (1) Immediately trigger the proposed adaptive management process (Appendix A) if streambank alteration at the end of the Snake River Basin steelhead incubation period (July 7) is: (1) >5 percent when bank stability is less than 75 percent of the RMO; (2) >10 percent when bank stability is 75 percent to 99 percent of the RMO; or (3) >15 percent when the bank stability RMO is being met.

            (a) Once, triggered, the adaptive management strategy shall be used to further reduce the potential for cattle/steelhead redd interactions, including but not limited to adjusting in-season move-triggers, season of use, cattle numbers, and/or implementation of additional minimization/avoidance measures.

        (2) Construct additional exclosures and/or annually install temporary electric fencing in the Kadletz Creek and Boulder Flat Units where necessary to prevent cattle access to Bear Valley Creek, Hayden Creek, and East Fork Hayden Creek.

(3) Delay initial turnout of cattle on Kadletz Creek and Boulder Flat Units in years 1, 2, 4, and 5 by 1-week (i.e., July 8) to avoid the final week of the steelhead incubation period.

e. Each Unit with potential Snake River Basin steelhead (i.e., Boulder Flat and Kadletz Creek), which is also located in an area where the risk of cattle trampling of redds exists, shall contain at least one DMA, provided there is a suitable MIM location available.

f. The Allotment permittee or their employees shall receive training to appropriately implement the move triggers identified in the proposed action.

g. Annual meetings shall be conducted with the permittee to discuss specific actions necessary to protect spawning areas in stream reaches with the potential for cattle interaction with Snake River Basin steelhead spawning fish and/or redds (i.e., Boulder Flat, and Kadletz Creek Units).

h. Riding shall occur (1 to multiple days per week) to encourage livestock distribution away from potential Snake River Basin steelhead spawning habitats in the Kadletz Creek (year-2) and Boulder Flat (years 1, 4, and 5) Units, whenever cattle are grazing these Units during the steelhead incubation period (March 15 to July 7).

i. Riders take all practicable measures to keep cattle on established ford crossings during trailing operations between Units and on/off the Allotment.

j. The SCNF and their permittees shall ensure that all exclosures, drift fences, and water developments that reduce cattle use adjacent to streams with ESA-listed fish species are properly maintained and functioning as intended.

k. Turnout dates and annual use indicators shall be outlined in the AOI to the permittee.

l. Ensure the amount of incidental take is not exceeded by conducting salmon redd surveys in Units where Snake River Chinook salmon redd trampling is expected to occur (i.e., Bear Valley and Hayden Creek mainstem reaches within the Tobias/Mogg, Kadletz Creek, and Payne/Ford Units), trampling does not exceed one total trampled redd annually (i.e., any grazing from August 23 to April 30 of the following year).

m. Redd surveys shall be conducted once per week when Tobias/Mogg, Kadletz Creek, or Payne/Ford Units are grazed after August 23, beginning in each Unit the week cattle are to be moved onto the Unit, and ending after cattle have been removed from each Unit.

n. To further reduce Snake River Chinook redd trampling potential within mainstem Bear Valley and Hayden Creek (i.e., Kadletz Creek, Tobias/Mogg , and Payne/Ford Units), the Chinook salmon redds found during redd surveys shall be flagged, and temporary fencing shall be used to protect redds where cattle appear to have access to stream segments including those redds. The fencing shall be maintained on the Unit until cattle are removed from the Unit at the end of the grazing season. Fencing is not required in areas where there is no risk of livestock trampling.

o. Each Unit with potential Snake River Chinook salmon (Boulder Flat, Kadletz Creek, Tobias/Mogg, and Payne/Ford) shall contain at least one DMA on a stream where Chinook salmon are present, provided there is a suitable MIM location available, which is also located in an area where the risk of cattle trampling of redds exists.

p. The Forest will continue to work with permittee to reduce the potential for future livestock trampling near the ford crossing on Hayden Creek within the Boulder Flat Unit.

q. Annual meetings are conducted with the permittee to discuss specific actions necessary to protect spawning areas in stream reaches with the potential for cattle interaction with Snake River Basin Chinook salmon spawning fish and/or redds (Kadletz Creek, Tobias/Mogg, and Payne/Ford Units).

r. Frequent (twice per week) riding is implemented sequentially in the Kadletz Creek (years 1 and 3), Tobias/Mogg (years 1, 2, 4, and 5), and Payne/Ford (years 3, 4, and 5) Units, whenever cattle are grazing these Units during the Chinook salmon spawning and incubation period (August 23 through April 30 of the following year). Intent of riding will be to reduce cattle use within and adjacent to potential Snake River Chinook spawning habitats in these Units.

2. To implement RPM #2 (monitoring and reporting), the SCNF shall ensure that:

a. Each Allotment Unit's DMA or key area is annually monitored to determine compliance with all identified annual use indicators in the proposed action. The report shall also identify any modifications to move-triggers or annual indicators that result from implementing the adaptive management strategy.

b. An end-of-year report is available to NMFS by March 1 of each year. The following shall be included in the report:

(1) Overview of proposed action and actual management (livestock numbers, on-off dates for each Unit, etc.).

(2) Date and location of any specific SCNF implementation monitoring data collected, including monitoring required under term and condition 1 above.

(3) Results from all implementation and effectiveness monitoring identified as part of the proposed action and this Opinion, including required annual use indicator monitoring (e.g., stubble height, riparian shrub utilization, and streambank alteration), photo point monitoring, seral condition, streambank stability, water temperature, sediment, and GGW.

(4) Discussion of any unauthorized use and/or any maintenance issues related to fences or water developments.

(5) Brief review of Allotment management and compliance successes and failures.

(6) Any relevant information that becomes available regarding Snake River Basin steelhead or Snake River spring/summer Chinook salmon habitat trends and/or spawning locations that would modify the assumptions made in this Opinion or result in effects not considered.

(7) A clear description of compliance with the terms and conditions contained in this ITS.

(8) Any management recommendations for subsequent years.

c. The SCNF shall submit post-project report to:

National Marine Fisheries Service
Attention: WCRO-2019-00305
800 East Park Boulevard
Plaza IV, Suite 220
Boise, Idaho 83712-7743

2.10 Conservation Recommendations

Section 7(a)(1) of the ESA directs federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of the threatened and endangered species. Specifically, conservation recommendations are suggestions regarding discretionary measures to minimize or avoid adverse effects of a proposed action on listed species or critical habitat or regarding the development of information (50 CFR 402.02). The following recommendations are discretionary measures that NMFS believes are consistent with this obligation and therefore should be carried out by the SCNF:

1. To mitigate the effects of climate change on ESA-listed salmonids, follow recommendations by the Independent Scientific Advisory Board (2007) to plan now for

future climate conditions by implementing protective tributary, and mainstem mitigation measures. In particular, implement measures to protect or restore riparian buffers, wetlands, and floodplains; remove stream barriers; and to ensure late summer and fall tributary streamflows.

2. Continue to work with the permittees to adjust the timing and/or rotation of Allotment Units to better protect accessible stream reaches during periods of steelhead and/or Chinook salmon spawning/incubation periods. Where feasible, give preference to grazing Units with inaccessible stream reaches (i.e., fenced, or less accessible because of steep topography or dense riparian vegetation) during these critical timeframes.

3. Water quantity is a limiting factor for anadromous fish in the Upper Salmon River drainage. Both the overall production and productivity of ESA-listed fish and their habitat are affected by the number and length of streams, volume and quality of flow among stream reaches, and volume of the underlying aquifer. Changes in the consumptive use of water can affect ESA-listed salmonids and their habitat in downstream reaches. The SCNF should continue to utilize their authorities to conserve and recover aquatic habitats throughout the Upper Salmon River drainage to support species recovery.

4. Install trail cameras at both ends of the drift fence on the Payne/Ford Unit for three grazing seasons to determine if livestock are moving around the drift fence and accessing Bear Valley Creek. Report how many cattle are observed walking around the drift fence along with the dates that they are observed doing so to inform whether adaptive management changes need to be made regarding that fence. Provide this information in annual reports to NMFS.

   Please notify NMFS if the SCNF, or another entity, carries out these recommendations so that we will be kept informed of actions that minimize or avoid adverse effects and those that benefit listed species or their designated critical habitats.

2.11 Reinitiation of Consultation

This concludes formal consultation on the Upper Hayden Creek Grazing Allotment. As 50 CFR 402.16 states, reinitiation of formal consultation is required where discretionary federal agency involvement or control over the action has been retained or is authorized by law and if: (1) The amount or extent of incidental taking specified in the ITS is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this Opinion; (3) the agency action is subsequently modified in a manner that causes an effect on the listed species or critical habitat that was not considered in this Opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. To reinitiate consultation, contact NMFS Southern Snake Branch Office and refer to consultation number: WCRO-2019-00305.

2.12 "Not Likely to Adversely Affect" Determinations

2.12.1 Effects on Critical Habitat

The designations of critical habitat for species use the term PCE or essential features. The new critical habitat regulations (81 FR 7414) replace this term with PBFs. The shift in terminology does not change the approach used in conducting our analysis, which is the same regardless of whether the original designation identified PCEs, PBFs, or essential features. In this section, we use the term PBF to mean PCE or essential feature, as appropriate for the specific critical habitat.

2.12.1.1 Snake River Basin Steelhead and Snake River Spring/summer Chinook Designated Critical Habitat

Numerous symposia and publications have documented the potential detrimental effects of livestock grazing on stream and riparian habitats (Johnson et al. 1985; Menke 1977; Meehan and Platts 1978; Cope 1979; American Fisheries Society 1980; Platts 1981; Peek and Dalke 1982; Ohmart and Anderson 1982; Kauffman and Krueger 1984; Clary and Webster 1989; Gresswell et al. 1989; Kinch 1989; Chaney et al. 1990; Belsky et al. 1997). These publications describe a series of synergistic effects that can occur when cattle over-graze riparian areas, including: (1) Woody and hydric herbaceous vegetation along a stream can be reduced or eliminated; (2) streambanks can collapse due to livestock trampling; (3) without vegetation to slow water velocities, hold the soil, and retain moisture, erosion of streambanks can result; (4) the stream can become wider and shallower, and in some cases downcut; (5) the water table can drop; and (6) hydric, deeply rooted herbaceous vegetation can die out and be replaced by upland species with shallower roots and less ability to bind the soil. The resulting instability in water volume, increased summer water temperature, loss of pools and habitat adjacent to and connected to streambanks, and increased substrate fine sediment and cobble-embeddedness may potentially affect Chinook salmon and steelhead critical habitat in the action area.

However, when grazing activities are well-managed, stream and riparian impacts can be greatly reduced, and recovery can occur over time. The focus of the proposed action is to meet the SCNF's multiple use mission, in this case providing cattle forage while maintaining proper functioning ecologic conditions or improving conditions which are currently *at risk.* This is consistent with the intent of NMFS 1998 consultation on PACFISH. The proposed action, including established pasture rotations, range improvements, in-season move triggers, annual utilization standards, and adaptive management strategy have been established specifically for the Allotment with the intent that PACFISH standards and objectives will be met and the above described potential adverse effects to critical habitat will be avoided. Before analyzing potential effects on the PBFs of critical habitat, a brief summary of key elements of the proposed action that were designed specifically to avoid habitat-related effects follows.

Effects of Trailing on Critical Habitat. There is one designated livestock crossing area, at a ford crossing along an existing road prism, on the lower reaches of Hayden Creek within the action area. This crossing is used six out of 10 years to move livestock off the Allotment. This ford crossing is closed to all motorized vehicles. The use of this ford crossing will occur while moving from the Payne/Ford Unit through the Boulder Flat Unit while exiting the Allotment to

the home ranch which occurs during the time of Chinook salmon spawning and incubation. Duration of move is less than a half day. Other streams that have the potential to be crossed during the exit off the Allotment include: Ford Creek, Payne Creek, Hayden Creek, Kadletz Creek, and East Fork Hayden Creek. Most of the trailing routes are in the uplands and affords no access to streams or designated critical habitat for most of the route.

Livestock trailing is supervised by multiple riders limiting opportunities for cattle to access Hayden Creek or its riparian areas outside of the road prism. As livestock cross Hayden Creek a small turbidity pulse is likely to occur. This short duration and low intensity turbidity plume will have insignificant effects on water quality and will resuspend or introduce only minor levels of sediment from/to Hayden Creek. Given Hayden Creek water quality is high, and sediment levels are FA throughout most of the watershed, the use of the ford one time a year will have insignificant effects on critical habitat. This portion of the route follows a well maintained gravel road and affords very little access to streams. There are a few places along the route where streams may be accessible to trailing livestock. However, livestock are actively being pushed along the route and will not be grazing or loitering along streams for any significant period of time. Although livestock are likely to occasionally access streams along the route and are likely to trample small areas of bank, introducing small quantities of sediment, the brief nature and limited occurrences of livestock reaching water will result in only insignificant effects to critical habitat along the trailing route.

Monitoring and Adaptive Management Strategy. The proposed action included a monitoring and adaptive management program to evaluate annual livestock use. This program will help the SCNF ensure that the action is being implemented as intended. The program will also allow the SCNF to quantitatively track resource responses to ongoing use through the remaining term of the consultation. Perhaps even more importantly, the strategy should result in rapid modification of existing management to minimize potential for repeat or long-term negative effects. As such, NMFS believes the adaptive management strategy is critical to integrate both annual and long-term monitoring data into daily, annual, and long-term grazing management decisions. Should monitoring indicate that implementation is not occurring as described (i.e., annual use criteria are not met, permit terms and conditions, or RMOs are not being met), use of the adaptive management strategy should ensure that either the permit administration or the grazing plan will be quickly and appropriately adjusted. Doing so should ensure RMOs are maintained and/or achieved during the consultation term.

The SCNF has committed to regular Allotment use supervision. Their staff will work directly with the permittee's rider, who is onsite weekly during spawning and incubation periods. This increased presence is likely to quickly identify potential grazing issues and result in rapid on-the-ground changes in Allotment administration. Over the past several years, the SCNF has provided NMFS with annual grazing reports for allotments across the Forest. Those reports and discussions with the Level 1 Team demonstrate that where monitoring or use supervision identifies potential implementation issues, the SCNF quickly made changes to grazing administration to ensure problems were corrected. The reports also demonstrate that the SCNF is capable of meeting established use criteria at allotment DMAs and committed to making necessary changes where criteria or grazing instructions are not met. This demonstrates the SCNF's success in implementing the adaptive management and monitoring program over their

entire grazing management area and increases our confidence that similar management will continue for the duration of this consultation.

Below is a brief summary of the key elements of the proposed strategy, which were designed to reduce habitat-related effects to insignificant levels.

In-Season/End-of-Season Grazing Use Criteria and Permit Terms and Conditions. The SCNF will monitor the stubble height of grasses, sedges and rushes, riparian woody shrub use, and streambank alteration levels to determine when cattle should be moved from individual Units (see Section 1.3.3.3). Literature presented in the BA and summarized here indicates that the proposed use standards can reasonably be expected to limit significant resource damage while still allowing for recovery of annual grazing disturbances prior to the next years grazing. Therefore, this should promote maintenance of properly functioning conditions where RMOs are already being met or promote achievement of properly functioning conditions over time. The proposed MIM and adaptive management strategy should avoid instances where an improper or insensitive standard is continually met and yet still leads to a downward trend in one of the RMOs and, ultimately, degraded habitat conditions.

Erhart and Hansen (1997) found mixed success when only one use standard/management objective was applied on an allotment, but noted improved success when multiple indicators were employed. By concurrently monitoring multiple annual indicators the SCNF is able to require the permittee to move cattle based on the most sensitive indicator for a given year. This is important as annual variability in precipitation and air temperature can cause wide discrepancies in forage availability and thus annual livestock foraging habits. Therefore, employing a suite of environmental monitoring indicators is expected to enable the SCNF and the permittee to remove cattle from a particular Unit in response to the most sensitive indicator for that year. This process is expected to prevent substantial negative riparian impacts from occurring and should maintain current conditions where they are FA and allow indicators that are FR to recover at near natural rates.

Livestock effects to critical habitat are directly tied to the amount of time they spend in riparian areas, with effects increasing with the amount of time spent there. To minimize use of riparian areas, the SCNF developed the proposed grazing rotation and conservation measures. The grazing rotation was designed to capitalize on the natural features of the Allotment that preclude cattle use, and to take advantage of cattle preferences for upland areas during early spring to reduce time spent near streams where topography does not constrain use (Leonard et al. 1997; Ehrhart and Hanson 1997; Kinch 1989; Parsons et al. 2003; Wyman et al. 2006; and McInnis and McIver 2009). Conservation measures, including the use of part time riders, deploying mineral and/or salt supplements, fencing, and application of annual use standards all further reduce time spent in riparian areas. The SCNF's Allotment BA determined the action would be "Not Likely to Adversely Affect" designated critical habitat for Snake River Basin steelhead and spring/summer Chinook salmon.

Stubble height has a direct relationship to the health of herbaceous riparian plants and the ability of the vegetation to provide streambank protection; to filter out and trap sediment from overbank

flows; and in small streams to provide overhead cover (University of Idaho Stubble Height Review Team 2004; Roper 2016; Saunders and Fausch 2009). On monitoring sites across 17 National Forest and four BLM units in the Interior Columbia River basin, Goss (2013) found a linear relationship between increasing stubble height and multiple components of high quality salmonid habitat: increasing residual pool depth, increasing streambank stability, increasing percent undercut banks, and decreasing streambank angle. This suggests that across stream and riparian conditions evaluated within the Interior Columbia River basin, the higher the stubble height the greater the likelihood stream conditions favored by salmonids will be present (Goss 2013).

Multiple studies have evaluated minimum stubble heights necessary to protect stream habitat from the impacts of livestock grazing. Most studies have reported stubble height of the entire greenline graminoid and herbaceous community—as opposed to a subset of key plant species—because it is simpler to evaluate, avoids controversy over which species to monitor, and is likely more informative of actual streambank conditions than knowing the height of a subset of plant species (Roper 2016). Using the PACFISH-INFISH Opinion monitoring data from federal lands in the Columbia basin, Goss (2013) found that stubble height was related to streambank disturbance, and streambank disturbance began to increase substantially when stubble heights fell below 10 inches. Bengeyfield (2006) found that a 4-inch stubble height did not initiate an upward trend in stream channel morphology at sites on the Beaverhead-Deerlodge National Forest in Montana, based on 7 to 9 years of monitoring. Clary (1999) found that while 5-inch stubble height at the end of the growing season resulted in improvements in most measured aquatic and riparian conditions in an Idaho meadow after 10 years, 6.5-inch stubble height was needed to improve all measured habitat metrics. Pelster et al. (2004) found that during summer and fall grazing greater than 40 percent of cattle diets were willow when stubble heights were less than 8 inches; they suggested that stubble heights greater than 8 inches were needed to reduce willow consumption during these critical periods. Willows enhance salmonid habitat by providing fish with cover, modulating stream temperatures, and contributing leaf detritus and terrestrial insects that expand food sources (Bryant et al. 2006; Clary and Leininger 2000; Murphy and Meehan 1991). This reinforces the idea that higher stubble heights lead to improved fish habitat.

After reviewing the available scientific literature, including all of the studies mentioned above, Roper (2016) strongly recommended 6 inches as a starting point for a stubble height objective, measured at the end of the growing season, for small to medium sized cold water streams inhabited by salmon and trout. This is consistent with Clary and Webster (1989), who suggested a 6-inch starting point for stubble height objectives in the presence of ESA-listed or sensitive fish. Roper (2016) acknowledges that 4 inches or 8 inches could be appropriate stubble height objectives for some stream sites, but that site-specific data would be necessary to support these more liberal or conservative objectives. The scientific literature therefore suggests that the SCNF's proposed stubble height objective of 6 inches will likely be effective in minimizing livestock damage to streambanks on the Allotments if permittee compliance rates remain high and the SCNF does not decrease the stubble height to 4 inches.

Riparian vegetation controls bank stability, sediment input, and terrestrial invertebrate inputs (forage) to action area streams. Cattle grazing can adversely affect riparian vegetation, and thus

indirectly affect these indicators if managed poorly. Research shows plant health is maintained at moderate use levels, but repeated heavy to extreme grazing use is detrimental to plant health (Cowley and Burton 2005). The SCNF developed the proposed move triggers/endpoint indicators with this in mind. Triggers/indicators are variable depending upon whether the RMO for woody species is being met and whether the species present are single or multi-stemmed. For example, willows, which are generally multi-stemmed, will have move triggers/endpoint indicators of 50 percent when RMOs are being met and 30 percent when not meeting the RMO.

Single-stemmed species such as alders will have move triggers/endpoint indicators of 30 percent and 20 percent when meeting or not meeting RMOs, respectively. Exceeding 50 percent nipping is likely to reduce vegetation vigor and modify normal growth form and age class structure which could subsequently affect habitat conditions. Successful monitoring at DMAs, which by definition are representative of conditions across the Units, within and between years should result in cattle moving to the next Unit prior to exceeding established standards. As such the expected riparian shrub use should not affect long-term health of riparian vegetation and should be insignificant.

Hall and Bryant (1995) suggested livestock start to shift their preference to willows and other woody species at a 3-inch stubble height. This level of utilization equates to roughly 65 percent use. This level of use is more than the move triggers/endpoint indicators allow for key upland and riparian areas regardless of the seral status of the area. As a result, cattle use of woody species within riparian areas is expected to be minimal from late spring to early summer. Riders, salt, and fences help keep cattle on upland ridges and further minimize riparian vegetation use. For these reasons riparian shrub use is expected to be insignificant across the action area and the high quality ecological condition of action area riparian zones should be maintained or improved.

Streambank alteration is another move trigger/endpoint indicator that is being used across the northwest to manage allotments. Streambank alteration provides an indicator of the amount of time livestock spend in riparian zones, increasing with both the number of cows present and the time spent by those cows in riparian areas. The streambank alteration standard measures the amount of annual bank disturbance caused by livestock grazing, the levels of which can then be related to streambank stability and riparian vegetation conditions within the greenline (Cowley et al. 2006). Excessive bank trampling can lead to increased channel widths, decreased depths, and slower water velocity. These channel changes can cause mid-channel sediment deposition, which can further erode and reduce water storage in streambanks, resulting in vegetation transitioning from willows and sedges to drier species. These impacts all reduce the quality of fish habitat. Bengeyfield (2006) found bank alteration levels to be the most sensitive annual indicator of those they used.

Cowley (2002) suggested that the maximum allowable streambank alteration that maintains streambank stability is 30 percent, and that applying a 20 percent streambank alteration standard should allow streambanks meeting desired conditions to recover. Cowley (2002) cited additional studies to support a recommendation that “Ten percent or less alteration would seem to allow for near optimal recovery and should not retard or prevent attainment of resource management objectives (RMOs).” The SCNF proposes a 15 to 20 percent maximum streambank alteration standard during in-season and end-of-season grazing. Based on Cowley (2002) and baseline data

showing that most streambanks in the Allotment are in the desired condition, we expect this standard to prevent negative impacts to streambanks from grazing; maintain properly functioning conditions in streams and riparian areas on the Allotment where they currently occur; and allow for stream habitat recovery and an upward trend where habitat indicators are not currently properly functioning. However, where habitat indicators are not properly functioning, continued grazing has the potential to retard the rate of habitat recovery compared to no grazing. A more protracted recovery period could result in greater sediment delivery, wider stream channels, reduced vegetative vigor, and higher water temperatures in the action area for a longer period of time than would occur absent grazing.

Streambank alteration is used to evaluate the amount of annual disturbance caused by livestock grazing, the levels of which can then be related to streambank stability and riparian vegetation conditions within the greenline (Cowley and Burton 2005). Bank trampling can lead to increased channel widths, decreased depths, and slower water velocity. These channel changes can cause sediment deposition mid-channel, which can further erode streambanks, reduce water storage in streambanks, resulting in changes to vegetation composition from willows and sedges to drier species. These impacts all reduce the quality of fish habitat. Bengeyfield (2006) reported that bank alteration levels were the most sensitive annual indicator they employed. On streams over-widened by historical overgrazing, they noted that between forage utilization, stubble height, and streambank alteration, streams managed for streambank alteration were the only streams consistently showing significant improvement after a 4- to 6-year period. They concluded that streambank alteration was the only standard that initiated the upward trend in stream channel shape that they believed was necessary to achieve riparian function. However, their study streams were predominately meadow systems. The Allotment contains some meadow streams (particularly Bear Valley Creek) and reaches, but the majority of streams are wooded or lie in narrow valleys. Therefore, use of a combination of move triggers/endpoint indicators will be appropriate for this Allotment.

Because channel conditions, which influence fish productivity, are directly affected by cattle and indirectly influenced by riparian vegetation, it is important to monitor both streambank alteration and vegetation utilization on this Allotment. The proposed multi-indicator monitoring should avoid instances where an improper or insensitive standard is continually met and yet still leads to a downward trend in one of the RMOs and ultimately degraded habitat conditions. Cowley (2002) suggested the maximum allowable streambank alteration which maintained streambank stability was 30 percent. They further suggested that if 30 percent streambank alteration was the minimum necessary to maintain streambank conditions, that applying a 20 percent streambank alteration standard should allow for making significant progress in areas not meeting desired conditions. Streambank alterations of 20 percent or less are proposed for this Allotment. Meeting this standard is anticipated to allow complete recovery of alterations prior to the next year's grazing. Consistently limiting disturbance to less than 20 percent is expected to allow for an upward trend of stream conditions with stream widths narrowing and depths increasing over time, as demonstrated by Bengeyfield (2006). Further, the selected upland/riparian move triggers/endpoint indicators have been shown to prevent significantly accelerated streambank deterioration (Buckhouse et al. 1981). Other conservation measures will also aid in ensuring effects to streambank stability are inconsequential. For example, adjusting the cattle on date according to range readiness will allow soil moistures to decrease resulting in decreased

susceptibility of streambanks to alteration, shearing, and widening. No more than 20 percent bank alteration would be allowed at any site regardless of current status.

Proposed monitoring, including adoption of appropriate in-season move triggers and annual use indicators, will enable the SCNF to move cattle off the Allotment before excessive cattle use could initiate bank instabilities or lead to other potential adverse habitat effects. However, it is important to note that a one-time exceedance of an annual use indicator does not automatically mean that adverse effects have occurred. If an exceedance occurs, the SCNF will first determine why the indicator was not met, and secondly determine if any effects not previously considered occurred as a result of the exceedance. If and when such an exceedance occurs, the SCNF proposes to modify Allotment administration through the identified adaptive management process (Appendix A). Allotment modifications would be designed to reduce the likelihood of an additional exceedance. Should an exceedance result in effects not considered in this consultation, NMFS expects the SCNF will pursue reinitiation of consultation.

Although specific changes to Allotment administration are impossible to identify before a problem occurs, typical changes can include modifying stocking rates, changing seasons of use, mineral site adjustments, or increased riding or fencing of site specific problem areas during subsequent season(s). Successful implementation of adaptive management can reasonably be anticipated to modify grazing practices such that the magnitude of potential adverse effects is sufficiently minimized.

Critical habitat within the action area has an associated combination of PBFs essential for supporting freshwater rearing, migration, and spawning Chinook salmon and steelhead. The critical habitat elements potentially affected by the proposed action include water quality, substrate, natural cover/shelter, riparian vegetation, and forage.

In general, grazing can adversely affect streams and riparian areas where they have access. Cattle can directly trample streambanks while trailing, feeding, or loafing in streamside areas, and cattle can overutilize riparian vegetation. Riparian vegetation influences stream shade, streambank stability, water retention, and primary production of the adjacent streams. The effects of these modifications can include streambank damage, removal of shade-providing vegetation, reduced primary productivity, widening of stream channels, introduction of fine sediment, and channel incision. The SCNF has structured the proposed action, including multiple conservation measures, to reduce the potential for these potential adverse effects to occur. Under the proposed action, grazing impacts will be avoided by implementing the proposed grazing rotation and other conservation measures, successful monitoring and implementation of the annual use standards, and subsequent adaptive management to ensure RMOs are consistently achieved or maintained.

Livestock effects to critical habitat are directly tied to the amount of time they spend in riparian areas, with effects increasing with the amount of time spent there. To minimize use of riparian areas, the SCNF developed the proposed grazing rotation and conservation measures. The grazing rotation was designed to capitalize on the natural features of the Allotment that preclude cattle use, and to take advantage of cattle preferences for upland areas during early spring to reduce time spent near streams where topography does not constrain use (Leonard et al. 1997;

Ehrhart and Hanson 1997; Kinch 1989; Parsons et al. 2003; Wyman et al. 2006; and McInnis and McIver 2009). Conservation measures, including the use of part time riders, deploying mineral supplement, fencing, and application of annual use standards all further reduce time spent in riparian areas. The SCNF's Allotment BA determined the action would be "Not Likely to Adversely Affect" designated critical habitat for Snake River Basin steelhead and Snake River spring/summer Chinook salmon. The following discussion on PBFs applies to freshwater spawning, rearing, and migration sites within the action area.

PBF's - Freshwater spawning, rearing, and migration sites.

Water Quality – Habitat impacts associated with this Allotment are likely to include a few areas of denuded streambank on each Unit up to a few feet wide where cattle access streams to drink or cross. Early in the season cattle do not typically loiter in riparian areas and they are expected to access streams to drink or cross in the same areas to avoid breaking new trail. Denuded areas associated with watering and crossing sites are likely to result in a slight increase in turbidity for a short distance downstream during rainstorms or runoff events. However, given background levels of turbidity during runoff events, it would be very difficult to distinguish between turbidity resulting from these minor grazing impacts and background turbidity. Cattle grazing is likely to lead to a slight increase in nutrients; however, impacts will be localized and immeasurable as a result of proposed measures designed to limit cattle use in riparian areas and the wide distribution of cattle across the Allotment over each year. In addition, recovering riparian vegetation will function to trap and utilize nutrients deposited in riparian areas preventing the majority of waste from entering the water column.

Shade provided by vegetation can be important in keeping stream temperatures cool for salmonids (Zoellick 2004). Li et al. (1994) and Zoellick (2004) found that trout abundance decreased as solar input and water temperature increased. Water temperature is primarily affected by stream shade and channel geometry. Livestock grazing can directly increase water temperature if riparian vegetation removal results in increased solar exposure. Indirect effects could occur if livestock remove significant quantities of vegetation, either through foraging or trampling. Reduced riparian vegetation can result in increased streambank instability which in turn leads to over-widened streams. Over-widened streams, or high W:D, expose a greater surface area of shallower water to the sun. This can further increase water temperatures.

Within the Allotment, riparian conditions are generally static, and width to depth ratios are within the natural range of variability. Water temperatures are meeting RMOs across the Allotment. These data suggest recent livestock grazing within the Allotment has not resulted in detectable effects to water temperatures within the action area.

The proposed action includes measures (including salting, and use of riders to keep livestock away from critical stream reaches), which should result in livestock having even less potential to impact stream temperatures than has occurred in the past. Proposed annual use standards serve to reduce potential livestock impact on water temperatures by minimizing riparian vegetation use and livestock impact to streambanks to insignificant levels within the Allotment. Further, successful use of the described adaptive management program is expected to prevent site-specific impacts or a onetime annual use standard from leading to long-term habitat degradation.

For these reasons, the proposed action is expected to have only insignificant effects on water quality in the action area.

Substrate – Available data from grazed areas of the action area indicates sediment levels in gravels are meeting SCNF standards for volcanic geologies and are improving. Because the proposed action is nearly identical to the grazing that has occurred during the recent past, it is reasonable to anticipate similar effects in the future. Cattle will cross, water, and graze along some stream reaches in the Allotment and there will undoubtedly be minor instances of sediment introduction at crossings, watering sites, or where foraging activities result in low levels of streambank alteration. These introductions are likely to cause minor and temporary increases in substrate fine sediment in low velocity areas immediately downstream. As the available monitoring data suggest, these increases are not expected to be measurable. In addition, the use of riders, mineral deployment, and the described annual use indicators are expected to prevent measurable degradation of streambank conditions, which would otherwise lead to elevated sediment levels. These measures should ensure that the existing FA sediment conditions within grazed areas of the Allotment are retained. NMFS also anticipates a long-term reduction in sedimentation as riparian conditions, as well as streambank stability, continue improving over time. Any short-term effects would be insignificant.

Forage – More than half of some fish's food originates from terrestrial sources (Baxter et. al. 2005; Saunders and Fausch 2007). Their other food source is aquatic with many prey species feeding on terrestrial leaf litter. Aquatic invertebrates also depend heavily on terrestrial vegetation inputs. Therefore, riparian vegetation is very important to fish growth and survival in natal streams. Saunders and Fausch (2007) reported grazing management can influence terrestrial invertebrate inputs and demonstrated that short duration high-intensity grazing management resulted in large growth and abundance increases of fish when compared to season-long grazing management. Saunders and Fausch (2009) observed no difference in invertebrate biomass entering streams between sites managed for rotation grazing and ungrazed sites. The proposed action utilizes a rotational grazing scheme with moderate intensities over short durations. As a result, the action is expected to have effects consistent with the cited literature and thus impacts to this PBF will be insignificant.

Natural Cover – Salmonids appear to prefer spawning in close proximity of overhead cover (Bjornn and Reiser 1991) and overhead cover protects juvenile salmonids from predation. Cover can also influence livestock access to streams, reducing trampling where cover is high or riparian vegetation is thick (Gregory and Gamett 2009). There will be a slight, short-term (1 to 6 months) reduction in overhead vegetative cover at each access point and in individual riparian areas receiving actual grazing use. However, these effects are expected to be very localized, and not at a scale that would influence cover on a stream reach scale. Also, considering the prescribed riparian vegetation utilization standards, grazed riparian vegetation is expected to grow back prior to the start of the following grazing season. Available literature indicates the proposed utilization levels will allow maintenance of vegetation where currently meeting RMOs. Where riparian areas are not meeting RMOs, the SCNF proposes more restrictive utilization standards be applied, which should result in improvement of riparian conditions at near natural rates in these areas. Because riparian conditions have shown demonstrable improvements or maintenance of appropriately functioning conditions in the action area under past grazing, it is

reasonable to assume these patterns will continue and the action will have only insignificant effects on cover.

No information currently exists documenting the amount or locations of undercut banks available to fish as cover in the action area. However, current bank stability ratings are meeting RMOs in all areas accessible to livestock use. This suggests that recent grazing activities have not reduced the available quantity of undercut banks providing cover for ESA-listed fish in the action area. NMFS anticipates this condition to persist for the term of the proposed action and any reduction of undercut banks that does occur would be minor and insignificant at the stream reach or watershed scales.

Riparian Vegetation – Similar to those PBFs described above, riparian vegetation impacts from the proposed livestock grazing are expected to be insignificant. Although cattle will consume and trample some riparian vegetation, the proposed conservation measures and annual utilization standards should greatly limit potential disturbance. Cattle use of riparian vegetation will be limited to 50 percent browse on multi-stemmed species and 30 percent browse on single-stemmed species when the RMO for woody species is being met. A more restrictive 30 percent browse on multi-stemmed species and 20 percent browse on single-stemmed species will be applied to Units when the RMO is not being met. Almost all DMAs are currently meeting RMOs for riparian vegetation and will utilize the higher utilization standards. This level of use has been consistently demonstrated to allowing for a stable trend where currently at PNC, or a trend toward late seral status where not at PNC. As such, there is a discountable likelihood of reducing riparian vegetation under the proposed action.

The SCNF has incorporated several conservation measures (e.g., fencing, off-stream water sources and salt placement, established pasture rotations, herding, and forage utilization standards and monitoring) into grazing management on the Allotment in order to limit the impacts of livestock on designated critical habitat. Based on available scientific literature, NMFS expects that the proposed 15 to 20 percent maximum streambank alteration standard and 6-inch minimum stubble height will allow for stream habitat recovery and an upward trend at near natural rates for degraded PBFs.

The SCNF's other conservation measures are also expected to help maintain or achieve late seral status or PNC. A deferred rotation grazing system should ensure no one site is consistently grazed early or late in the season. This will allow for benefits of early and late grazing season to occur regularly, and ensure any detrimental impacts due to early or late season grazing are minimized. For example, when a Unit is grazed first, browse on willows will be less (Hall and Bryant 1995; Kovalchik and Elmore 1991), and when the Unit is deferred the following season, upland and riparian herbaceous plants will be allowed to achieve maximum growth before grazing. Waiting for appropriate range conditions to turn livestock out (range readiness) will result in less potential impacts to soils and better distribution of livestock. For example, soil moistures will have decreased when range conditions are adequate resulting in less soil disturbance. At the same time, herbaceous plants in the uplands should still be fairly palatable, resulting in livestock spending less time in riparian areas. Salting at least one-fourth mile away from creeks and riding for improved distribution of livestock will also help minimize cattle presence and potential impacts along streams and in riparian areas. Salt placed away from creeks

will tend to encourage cattle to utilize other areas of the Allotment besides riparian areas. Riding would also serve the same purpose. These measures are expected to reduce negative impacts on riparian vegetation to insignificant levels while continuing to improve their seral status.

Information obtained from annual indicator monitoring will provide data and information to determine whether the current season's livestock grazing is meeting the intended criteria for livestock use in riparian areas. These data will provide information needed to refine and make annual changes to livestock grazing management practices necessary to continue to meet RMOs or to continue an upward trend toward the RMO (adaptive management).

NMFS anticipates that only insignificant effects to critical habitat are likely to occur under the proposed action. Primary reasons for this conclusion include: (1) Habitat and riparian conditions are functioning at or near potential in almost all SCNF-managed reaches, which have been under less restrictive grazing practices in the recent past; (2) stream channels most sensitive to livestock grazing are generally excluded from grazing or occur in units where late season grazing is not proposed; (3) the SCNF has demonstrated their ability to effectively apply the proposed monitoring and adaptive management strategy to identify potential livestock overutilization and prescribe effective management responses; and (4) there is limited livestock access to sensitive stream reaches designated as critical habitat (due to topography and existing fences). Limiting the action's impacts to the minor levels described will maintain habitat conditions where they currently meet objectives and allow continued improvement in the limited sites that are below objectives. As a result of successfully implementing the proposed action, including conservation measures and monitoring, as described in the BA and this Opinion and based on the best available information, NMFS concurs with the SCNF's findings that the subject action is not likely to adversely affect designated critical habitat for Snake River spring/summer Chinook salmon and Snake River Basin steelhead.

2.12.2 Effects on Southern Resident Killer Whales (*Orcinus orca*)

On November 18, 2005, NMFS listed the SRKW DPS as endangered under the ESA (70 FR 69903). The SRKW DPS (*Orcinus orca*) is composed of a single population that ranges as far south as central California and as far north as Southeast Alaska. Although the entire DPS has the potential to occur along the outer coast at any time during the year, occurrence along the outer coast is more likely from late autumn to early spring. The SRKWs have been repeatedly observed feeding off the Columbia River plume in March and April during peak spring Chinook salmon runs (Krahn et al. 2004; Zamon et al. 2007; Hanson et al. 2008; and Hanson et al. 2010). For this reason, the eastern Pacific Ocean, where SRKW overlap with Chinook salmon from the Columbia River basin is also included in the action area due to potential impacts on the whale's prey base.

The final listing rule identified several potential factors that may have resulted in the decline or may be limiting recovery of SRKW including: quantity and quality of prey, toxic chemicals which accumulate in top predators, and disturbance from sound and vessel traffic. The rule further identified oil spills as a potential risk factor for the small population of SRKW. The final recovery plan includes more information on these potential threats to SRKW (73 FR 4176).

NMFS designated critical habitat for the SRKW DPS on November 29, 2006 (71 FR 69054). Designated critical habitat for SRKW includes approximately 2,560 square miles of Puget Sound, excluding areas with water less than 20 feet deep relative to extreme high water. The SRKWs spend considerable time in the Georgia Basin from late spring to early autumn, with concentrated activity in the inland waters of Washington State around the San Juan Islands, and typically move south into Puget Sound in early autumn (NMFS 2008). While these are seasonal patterns, SRKW have the potential to occur throughout their range (from Central California north to the Queen Charlotte Islands) at any time during the year.

Southern Resident killer whales consume a variety of fish species (22 species) and one species of squid (Ford et al. 1998; Ford et al. 2000; Ford and Ellis 2006; Hanson et al. 2010; Ford et al. 2016), but salmon are identified as their primary prey. Southern Residents are the subject of ongoing research, including direct observation, scale and tissue sampling of prey remains, and fecal sampling. Scale and tissue sampling from May to September indicate that their diet consists of a high percentage of Chinook salmon (monthly proportions as high as >90 percent) (Hanson et al. 2010; Ford et al. 2016). The diet data also indicate that the whales are consuming mostly larger (i.e., older) Chinook salmon. Deoxyribonucleic acid (DNA) quantification methods are also used to estimate the proportion of different prey species in the diet from fecal samples (Deagle et al. 2005). Ford et al. (2016) confirmed the importance of Chinook salmon to the Southern Residents in the summer months using DNA sequencing from whale feces. Salmon and steelhead made up to 98 percent of the inferred diet, of which almost 80 percent were Chinook salmon. Coho salmon (*O. kisutch*) and steelhead are also found in the diet in spring and fall months when Chinook salmon are less abundant. Specifically, coho salmon contribute to over 40 percent of the diet in late summer, which is evidence of prey shifting at the end of summer towards coho salmon (Ford et al. 1998; Ford and Ellis 2006; Hanson et al. 2010; Ford et al. 2016). Less than 3 percent each of chum salmon (*O. keta*), sockeye salmon (*O. nerka*), and steelhead were observed in fecal DNA samples collected in the summer months (May through September). Prey remains and fecal samples collected in inland waters during October through December indicate that Chinook and chum salmon are primarily contributors to the whales' diet (NWFSC unpubl. data). Observations of whales overlapping with salmon runs (Wiles 2004; Zamon et al. 2007; Krahn et al. 2009), and collections of prey and fecal samples have also occurred in the winter months. Preliminary analysis of prey remains and fecal samples sampled during the winter and spring in coastal waters indicated that the majority of prey samples were Chinook salmon (80 percent of prey remains and 67 percent of fecal samples were Chinook salmon), with a smaller number of steelhead, chum salmon, and halibut (NWFSC unpubl. data). The occurrence of K and L pods off the Columbia River in March suggests the importance of Columbia River spring-run stocks of Chinook salmon in their diet (Hanson et al. 2013) at that time of year. Chinook salmon genetic stock identification from samples collected in winter and spring in coastal waters included 12 U.S. west coast stocks, and over half of the Chinook salmon consumed originated in the Columbia River (NWFSC unpubl. data) for the K and L pods (primarily fall-run stocks). Based on genetic analysis of feces and scale samples, Chinook salmon from Fraser River stocks dominate the diet of Southern Residents in the summer (Hanson 2011).

The proposed action will not have any direct effects on SRKW; however, it may indirectly affect the quantity of prey available to them. As described in the above Opinion and ITS, the proposed

action may result in the loss of up to one Chinook salmon every year (0.62 per year, or up to three every 5 years of the grazing cycle) in which a Chinook redd is trampled. The ocean range of Snake River spring/summer Chinook salmon (Weitkamp 2010) overlaps with the known range and designated critical habitat of SRKW. The loss of up to one returning adult Chinook salmon annually from any given brood year could reduce the SRKW's available prey base when the affected brood would otherwise have been present in the Pacific Ocean.

Given the total quantity of prey available to SRKWs, the reduction in prey due to the proposed action will be extremely small in any given year. Because so few of the SRKW prey will be affected by the action, the effect to the prey base PBF is insignificant. The above Opinion did not identify any potential for the proposed action to influence the quality (size) and/or quality (contaminant levels) of Chinook salmon. NMFS finds that the proposed action will not have anything more than minimal effects on productivity, diversity, or distribution of ESA-listed Chinook salmon, and therefore the effects to the quantity of prey available to the whales in the long term across their vast range is expected to be very small. For these reasons, the proposed action will have an insignificant effect on SRKW, and therefore, NMFS finds that the proposed action may affect, but is not likely to adversely affect SRKW.

3. MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT ESSENTIAL FISH HABITAT RESPONSE

Section 305(b) of the MSA directs federal agencies to consult with NMFS on all actions or proposed actions that may adversely affect EFH. The MSA (Section 3) defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." Adverse effect means any impact that reduces quality or quantity of EFH, and may include direct or indirect physical, chemical, or biological alteration of the waters or substrate and loss of (or injury to) benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality or quantity of EFH. Adverse effects on EFH may result from actions occurring within EFH or outside of it and may include site-specific or EFH-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810). Section 305(b) also requires NMFS to recommend measures that can be taken by the action agency to conserve EFH.

This analysis is based, in part, on the EFH assessment provided by the SCNF and descriptions of EFH for Pacific coast salmon (PFMC 1999) contained in the fishery management plans developed by the Pacific Fishery Management Council (PFMC) and approved by the Secretary of Commerce.

3.1 Essential Fish Habitat Affected by the Project

The PFMC designated EFH for Chinook salmon, coho salmon, and Puget Sound pink salmon (PFMC 2014). The proposed action and action area for this consultation are described in the Introduction to this document. The entire action area is designated as EFH for Chinook salmon. The proposed action will affect EFH for spawning, rearing, and migration life-history stages of Chinook salmon.

The PFMC has identified five habitat areas of particular concern (HAPC), which warrant additional focus for conservation efforts due to their high ecological importance. Three of the five HAPC are applicable to freshwater within the action area and include: (1) Complex channels and floodplain habitats; (2) thermal refugia; and (3) spawning habitat.

The proposed action and action area for this consultation are described in the Introduction to this document. The action area includes areas designated as EFH for various life-history stages of Chinook salmon which is coincident with critical habitat in the action area. Based on information provided in the BA, and the analysis of effects presented in the ESA portion of this document, NMFS concludes that the proposed action may adversely affect Pacific Coast salmon EFH. The affected habitat includes approximately 8.8 miles of streams designated as critical habitat for Chinook salmon. When accounting for average stream widths plus 600 feet of potential riparian width on each stream, there are about 640 acres of EFH on the Allotment.

3.2 Adverse Effects on Essential Fish Habitat

Because the action area's designated critical habitat is identical to EFH for spring/summer Chinook salmon the effects are also the same. Effects to critical habitat were discussed in the previous Opinion (Section 2.11) and are incorporated by reference for the effects to EFH. In the preceding Opinion, NMFS determined the action's effects to critical habitat, and thus to EFH, would be insignificant. To summarize the conclusions in the Opinion, the following adverse effects to EFH may occur as a result of the SCNF's proposed grazing authorization:

1. Bank stability could be degraded from livestock altering streambanks, which could lead to increased sediment levels, lower channel complexity, modified forage base, and poor spawning conditions.

2. Riparian vegetation could be degraded from excess utilization by livestock. Overgrazing of riparian vegetation could potentially increase water temperature, further reduce bank stability, modify primary productivity, and reduce habitat and channel complexity.

3. Sediment may be delivered to or resuspended in Hayden Creek when livestock trail across the designated ford.

Proposed unit rotations, limited livestock access to EFH, end-of-season use indicators, successful adaptive management, and active herding/trailing all contribute to limiting the potential effects of the action on EFH to low levels.

3.3 Essential Fish Habitat Conservation Recommendations

1. The SCNF should ensure project implementation adheres to the proposed action as described within the BA and the previous Opinion. Particular emphasis should be placed on ensuring the proposed monitoring and adaptive management strategy is implemented as described. Doing so will reduce livestock impacts to action area riparian vegetation and streambanks, which will reduce potential adverse effects on EFH.

2. The SCNF and permittees should ensure all exclosures, fences, and/or water developments that reduce cattle use adjacent to streams are properly maintained and functioning as intended.

3. The SCNF should require the permittee to routinely evaluate and document resource conditions (e.g., bank alteration, stubble height, riparian shrub, and upland vegetation utilization) in each Unit and begin moving livestock at the appropriate move trigger to avoid exceeding annual use criteria. If adopted, the SCNF should ensure the permittee receives appropriate training in the current protocol.

4. To minimize adverse effects to anadromous fish that may occur from unauthorized livestock use of SCNF lands in the action area, the SCNF should perform regular use supervision within the Allotment. Where unauthorized use is identified, the SCNF should ensure appropriate corrective actions are immediately taken which prevent future unauthorized use from occurring, where they have the authority to do so.

5. The SCNF should locate and then require the permittee to use an alternative trailing route to cross Hayden Creek. Any alternative route should avoid having to ford Hayden Creek and thus eliminate the potential for sediment delivery or resuspension by trailing livestock.

6. In general, NMFS has a strong preference that at least one DMA is located on all Units that have a stream occupied by ESA-listed fish species. Therefore, the SCNF should consider establishing a DMA on Bear Valley Creek within the Ford/Payne Unit.

7. The SCNF should relocate dispersed recreation sites causing resource damage on Hayden and Bear Valley Creeks to outside of riparian areas to reduce the potential for sediment introduction to the stream.

8. The SCNF should maintain a 6-inch end of season stubble height in Tobias Mogg (Years 1, 2, 3, and 4), Payne Ford (Years 2, 3, and 4), and Kadletz Creek (Years 1 and 3) Units when grazed after August 1st.

9. The SCNF should install trail cameras at both ends of the drift fence on the Payne/Ford Unit for three grazing seasons to determine if livestock are moving around the drift fence and accessing Bear Valley Creek. Report how many cattle are observed walking around the drift fence along with the dates that they are observed doing so to inform whether adaptive management changes need to be made regarding that fence. Provide this information in annual reports to NMFS.

Fully implementing these EFH Conservation Recommendations would protect, by avoiding or minimizing the adverse effects described in Section 3.2, above, approximately 640 acres of designated EFH for Pacific coast salmon.

3.4 Statutory Response Requirement

As required by section 305(b)(4)(B) of the MSA, the SCNF must provide a detailed response in writing to NMFS within 30 days after receiving an EFH Conservation Recommendation. Such a response must be provided at least 10 days prior to final approval of the action if the response is inconsistent with any of NMFS' EFH Conservation Recommendations unless NMFS and the federal agency have agreed to use alternative time frames for the federal agency response. The response must include a description of measures proposed by the agency for avoiding, minimizing, mitigating, or otherwise offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with the Conservation Recommendations, the federal agency must explain its reasons for not following the recommendations, including the scientific justification for any disagreements with NMFS over the anticipated effects of the action and the measures needed to avoid, minimize, mitigate, or offset such effects (50 CFR 600.920(k)(1)).

In response to increased oversight of overall EFH program effectiveness by the Office of Management and Budget, NMFS established a quarterly reporting requirement to determine how many conservation recommendations are provided as part of each EFH consultation and how many are adopted by the action agency. Therefore, we ask that in your statutory reply to the EFH portion of this consultation, you clearly identify the number of conservation recommendations accepted.

3.5 Supplemental Consultation

The SCNF must reinitiate EFH consultation with NMFS if the proposed action is substantially revised in a way that may adversely affect EFH, or if new information becomes available that affects the basis for NMFS' EFH Conservation Recommendations (50 CFR 600.920(l)).

4. DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

The DQA specifies three components contributing to the quality of a document. They are utility, integrity, and objectivity. This section of the Opinion addresses these DQA components, documents compliance with the DQA, and certifies that this Opinion has undergone pre-dissemination review.

4.1 Utility

Utility principally refers to ensuring that the information contained in this consultation is helpful, serviceable, and beneficial to the intended users. The intended users of this Opinion are the SCNF and the Upper Hayden Creek Allotment permittees. Individual copies of this Opinion were provided to the SCNF. The format and naming adheres to conventional standards for style.

4.2 Integrity

This consultation was completed on a computer system managed by NMFS in accordance with relevant information technology security policies and standards set out in Appendix III, 'Security

of Automated Information Resources,' Office of Management and Budget Circular A-130; the Computer Security Act; and the Government Information Security Reform Act.

4.3 Objectivity

Information Product Category: Natural Resource Plan

Standards: This consultation and supporting documents are clear, concise, complete, and unbiased; and were developed using commonly accepted scientific research methods. They adhere to published standards including NMFS' ESA Consultation Handbook, ESA regulations, 50 CFR 402.01 et seq., and the MSA implementing regulations regarding EFH, 50 CFR 600.

Best Available Information: This consultation and supporting documents use the best available information, as referenced in the References section. The analyses in this Opinion/EFH contain more background on information sources and quality.

Referencing: All supporting materials, information, data and analyses are properly referenced, consistent with standard scientific referencing style.

Review Process: This consultation was drafted by NMFS staff with training in ESA and MSA implementation, and reviewed in accordance with West Coast Region ESA quality control and assurance processes.

5. REFERENCES

American Fisheries Society. 1980. Western Division. Position paper on management and protection of western riparian stream ecosystems. 24 p.

Asch, R. 2015. Climate change and decadal shifts in the phenology of larval fishes in the California Current ecosystem. PNAS:E4065-E4074, 7/9/2015.

Back, J. 2019. Personal communication to K. Murphy on July 15, 2019, via in person discussion.

Bakun, A., B. A. Black, S. J. Bograd, M. García-Reyes, A. J. Miller, R. R. Rykaczewski, and J. Sydeman. 2015. Anticipated Effects of Climate Change on Coastal Upwelling Ecosystems. Current Climate Change Reports 1:85-93. DOI: 10.1007/s40641-015-0008-4, 3/7/2015.

Battin, J., and coauthors. 2007. Projected impacts of climate change on salmon habitat restoration. Proceedings of the National Academy of Sciences of the United States of America 104(16):6720-6725.

Baxter, C. V., K. D. Fausch, and W. C. Saunders. 2005. Tangled webs: reciprocal flows of invertebrate prey link streams and riparian zones. Freshwater Biology 50:201-220.

Beckman, B. 2018. Estuarine growth of yearling Snake River Chinook salmon smolts. Progress report. Northwest Fisheries Science Center, Seattle, Washington, 7/3/2018.

Beechie, T., H. Imaki, J. Greene, et al. 2013. Restoring Salmon Habitat for a Changing Climate. River Research and Application 29:939-960.

Belsky, J., A. Matzke, and S. Uselman. 1997. Survey of livestock influences on stream and riparian ecosystems in the western United States. Oregon Natural Desert Association. 38 p.

Bengeyfield, P. 2006. Managing cows with streams in mind. Rangelands, 28(1). pp. 3-6.

Bjornn, T. C. and D. W. Reiser. 1991. Habitat requirements of salmonids in streams. Pages 83–138 *in* W.R. Meehan, editor. Influences of forest and rangeland management on salmonid fishes and their habitats. American Fisheries Society, Special Publication 19. Bethesda, Maryland.

Black, B., J. Dunham, B. Blundon, J. Brim Box, and A. Tepley. 2015. Long-term growth-increment chronologies reveal diverse influences of climate forcing on freshwater and forest biota in the Pacific Northwest. Global Change Biology 21:594-604. DOI: 10.1111/gcb.12756.

Bograd, S., I. Schroeder, N. Sarkar, X. Qiu, W. J. Sydeman, and F. B. Schwing. 2009. Phenology of coastal upwelling in the California Current. Geophysical Research Letters 36:L01602. DOI: 10.1029/2008GL035933.

Bond, N. A., M. F. Cronin, H. Freeland, and N. Mantua. 2015. Causes and impacts of the 2014 warm anomaly in the NE Pacific. Geophysical Research Letters 42:3414–3420. DOI: 10.1002/2015GL063306.

Bryant, L., W. Burkhardt, T. Burton, W. Clary, R. Henderson, D. Nelson, W. Ririe, K. Saunders, and R. Wiley. 2006. Using stubble height to monitor riparian vegetation. Rangelands 28(1): 23-28.

Bjornn, T. C. 1978. Survival, production, and yield of trout and Chinook salmon in the Lemhi River, Idaho. University of Idaho, College of Forestry, Wildlife and Range Sciences Bulletin 27, Moscow, Idaho, USA.

Burton, T. A., S. J. Smith, and E. R. Cowley. 2011. Riparian area management: Multiple indicator monitoring (MIM) of stream channels and streamside vegetation. Technical Reference 1737-23. BLM/OC/ST-10/003+1737+REV. U.S. Department of the Interior, Bureau of Land Management, National Operations Center, Denver, CO. 155 pp.

Chaney, E., W. Elmore, and W. S. Platts. 1990. Livestock grazing on western riparian areas. Report prepared for U.S. Environmental Protection Agency by Northwest Resource Information Center, Inc., Eagle, Idaho. 45 p.

Cheung, W., N. Pascal, J. Bell, L. Brander, N. Cyr, L. Hansson, W. Watson-Wright, and D. Allemand. 2015. North and Central Pacific Ocean region. Pages 97-111 in N. Hilmi, D. Allemand, C. Kavanagh, and et al, editors. Bridging the Gap Between Ocean Acidification Impacts and Economic Valuation: Regional Impacts of Ocean Acidification on Fisheries and Aquaculture. DOI: 10.2305/IUCN.CH.2015.03.en.

Clary, W. P. and B. F. Webster. 1989. Managing grazing of riparian areas in the Intermountain Region. General Technical Report INT-263, U.S. Dept. of Agriculture, USFS, Intermountain Research Station, Ogden, Utah. 11 p.

Clary, W. P. 1999. Stream channel and vegetation responses to late spring cattle grazing. Journal of Range Management 52:218-227.

Clary, W. P and W. C. Leininger. 2000. Stubble height as a tool for management of riparian areas. Journal of Range Management. 53 (6): 563-573.

Cope, O. B. (ed.). 1979. Proceedings of the forum - grazing and riparian/stream ecosystems. Trout Unlimited. 94 p.

Coutant, C. C., and R. R. Whitney. 2006. Hydroelectric system development: effects on juvenile and adult migration. Pages 249-324 *in* R. N. Williams, editor. Return to the River- Restoring Salmon to the Columbia River. Elsevier Academic Press, Amsterdam.

Cowley, E. R. 2002. Guidelines for Establishing Allowable Levels of Streambank Alteration. Bureau of Land Management. Idaho State Office. March, 2002

Cowley, E. R. and T. A. Burton. 2005. Monitoring Streambanks and Riparian Vegetation – Multiple Indicators. Tech. Bull. No. 2005-002. USDI, BLM, Idaho State Office. Boise, ID. http://www.id.blm.gov/techbuls/05_02/doc.pdfCowley, E.R. 2002. Monitoring Current Year Streambank Alteration. Idaho State Office, Bureau of Land Management. 16p.

Cowley, E. R., T. A. Burton, and S. J. Smith. 2006. Monitoring streambanks and riparian vegetation—multiple indicators. Boise, ID, USA: U.S. Department of Interior, Bureau of Land Management. Technical Bulletin No. 2005-2. 29 p.

Crozier, L. and R. W. Zabel. 2006. Climate impacts at multiple scales: evidence for differential population responses in juvenile Chinook salmon. Ecology 75:1100-1109. DOI: 10.1111/j.1365-2656.2006.01130.x.

Crozier, L. G., R. W. Zabel, and A. F. Hamlet. 2008a. Predicting differential effects of climate change at the population level with life-cycle models of spring Chinook salmon. Global Change Biology 14:236-249. DOI: 10.1111/j.1365-2486.2007.01497.x.

Crozier, L. G., A. P. Hendry, P. W. Lawson, T. P. Quinn, et al. 2008b. Potential responses to climate change for organisms with complex life histories: evolution and plasticity in Pacific salmon. Evolutionary Applications 1:252-270. DOI: 10.1111/j.1752-4571.2008.00033.x.

Dalton, M., P. W. Mote, and A. K. Stover. 2013. Climate change in the Northwest: implications for our landscapes, waters and communities. Island Press, Washington, D.C.

Daly, E. A., R. D. Brodeur, and L. A. Weitkamp. 2009. Ontogenetic Shifts in Diets of Juvenile and Subadult Coho and Chinook Salmon in Coastal Marine Waters: Important for Marine Survival? Transactions of the American Fisheries Society 138(6):1420-1438.

Daly, E. A., J. A. Scheurer, R. D. Brodeur, L. A. Weitkamp, B. R. Beckman, and J. A. Miller. 2014. Juvenile Steelhead Distribution, Migration, Feeding, and Growth in the Columbia River Estuary, Plume, and Coastal Waters. Marine and Coastal Fisheries: Dynamics, Management, and Ecosystem Science 6(1):62-80.

Deagle, B. E., D. J. Tollit, S. N. Jarman, et al. 2005. Molecular scatology as a tool to study diet: analysis of prey DNA in scats from captive Steller sea lions. Molecular Ecology 14:1831- 1842. DOI: 10.1111/j.1365-294X.2005.02531.x.

Di Lorenzo, E. and N. Mantua. 2016. Multi-year persistence of the 2014/15 North Pacific marine heatwave. Nature Climate Change 1-7. DOI:10.1038/nclimate3082, 7/11/2016.

Ecovista, Nez Perce Tribe Wildlife Division, and Washington State University Center for Environmental Education. 2003. Draft Clearwater Subbasin Assessment, Prepared for Nez Perce Tribe Watersheds Division and Idaho Soil Conservation Commission. 463 p.

Ehrhart, R. C. and P. L. Hansen. 1997. Effective cattle management in riparian zones: a field survey and literature review. USDI, Bureau of Land Management, Montana State Office. November.

Everest, F. H. and D. W. Chapman. 1972. Habitat selection and spatial interaction by juvenile Chinook salmon and steelhead trout in two Idaho streams. Journal of the Fisheries Research Board of Canada 29(1):91-100.

Fisher, J., W. Peterson, and R. Rykaczewski. 2015. The impact of El Niño events on the pelagic food chain in the northern California Current. Global Change Biology 21: 4401-4414. DOI: 10.1111/gcb.13054, 7/1/2015.

Foreman, M., W. Callendar, D. Masson, J. Morrison, and I. Fine. 2014. A Model Simulation of Future Oceanic Conditions along the British Columbia Continental Shelf. Part II: Results and Analyses. Atmosphere-Ocean 52(1):20-38. DOI: 10.1080/07055900.2013.873014.

Ford, J. K. B., G. M. Ellis, L. G. Barrett-Lennard, et al. 1998. Dietary specialization in two sympatric populations of killer whales (*Orcinus orca*) in coastal British Columbia and adjacent waters. Canadian Journal of Zoology 76:1456-1471.

Ford, J. K. B., G. M. Ellis, and K. C. Balcomb. 2000. Killer whales: the natural history and genealogy of Orcinus orca in British Columbia and Washington. Second edition. UBC Press, Vancouver, British Columbia.

Ford, J. K. B. and G. M. Ellis. 2006. Selective foraging by fish-eating killer whales Orcinus orca in British Columbia. Marine Ecology Progress Series 316:185-199. DOI: 10.3354/meps316185, 7/3/2006.

Ford, M.J. (ed.). 2011. Status review update for Pacific salmon and steelhead listed under the Endangered Species Act: Pacific Northwest. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-113, 281 p.

Ford, M. J., J. Hempelmann, M. Hanson, et al. 2016. Estimation of a Killer Whale (Orcinus orca) Population's Diet Using Sequencing Analysis of DNA from Feces. PLoS ONE 11(1):e0144956. DOI: 10.1371/journal.pone.0144956, 1/6/2016.

Gargett, A. 1997. Physics to Fish: Interactions Between Physics and Biology on a Variety of Scales. Oceanography 10(3):128-131.

Good, T.P., R.S. Waples, and P. Adams (editors). 2005. Updated status of federally listed ESUs of West Coast salmon and steelhead. U.S. Dept. Commerce, NOAA Tech. Memo. NMFS-NWFSC-66, 598 p.

Goss, L. 2013. Understanding the relationships between livestock disturbance, the protocols used the measure that disturbance, and stream conditions. All Graduate Plan B and Other Reports. Paper 258.

Gregory, J.S. and B.L. Gamett. 2009. Cattle trampling of simulated bull trout redds. North American Journal of Fisheries Management 29:361.

Gresswell, R. E., B. A. Barton, and J. L. Kershner (eds.). 1989. Practical approaches to riparian resource management: an educational workshop. May 8 -11, 1989, Billings, Montana. USDI Bureau of Land Management: BLM-MT-PT-89-001-4351. 193 p.

Haigh, R., D. Ianson, C. A. Holt, H. E. Neate, and A. M. Edwards. 2015. Effects of Ocean Acidification on Temperate Coastal Marine Ecosystems and Fisheries in the Northeast Pacific. PLoS ONE 10(2):e0117533. DOI:10.1371/journal.pone.0117533, 2/11/2015.

Hall, F. C., and L. Bryant. 1995. Herbaceous stubble height as a warning of impending cattle grazing damage to riparian areas. Gen. Tech. Rep. PNW-GTR-362. Portland, OR. U.S. Department of agriculture, Forest Service, Pacific Northwest Research Station. 9 p.

Hanson, M. B., and C. K. Emmons. 2008. Annual residency patterns of Southern Resident killer whales in the inland waters of Washington and British Columbia. October 2, 2008. Unpublished report. NWFSC, Seattle, Washington.

Hanson, M. B., R. W. Baird, J. K. B. Ford, J. Hempelmann-Halos, D. M. Van Doornik, J. R. Candy, C. K. Emmons, G. S. Schorr, B. Gisborne, K. L. Ayres, S. K. Wasser, K. C. Balcomb, K. Balcomb-Bartok, J. G. Sneva, and M. J. Ford. 2010b. Species and stock identification of prey consumed by endangered Southern Resident killer whales in their summer range. Endangered Species Research 11:69–82. DOI: 10.3354/esr00263.

Hanson, B. 2011. Southern Residence Killer Whale diet as determined from prey remains and fecal samples. In: Evaluating the Effects of Salmon Fisheries on Southern Resident Killer Whales: Workshop 1, September 21-23, 2011. NOAA Fisheries and DFO (Fisheries and Oceans Canada) Seattle, Washington.

Hanson, M. B., J. A. Nystuen, and M. O. Lammers. 2013. Assessing the coastal occurance of endangered killer whales using autonomous passive acoustic recorders. Journal of the Acoustical Society of America 134(5):3486-3495. DOI: 0001-4966/2013/134(5)/3486/10/, 11/1/2013.

Healey, M. C. 1991. Life history of chinook salmon (*Oncorhynchus tshawytscha*). Pages 80 *in* C. Groot, and L. Margolis, editors. Pacific salmon life histories. University of British Columbia Press, Vancouver, Canada.

Hollowed, A. B., N. A. Bond, T. K. Wilderbuer, W. T. Stockhausen, Z. T. A'mar, R. J. Beamish, J. E. Overland, et al. 2009. A framework for modelling fish and shellfish responses to future climate change. ICES Journal of Marine Science 66:1584-1594. DOI:10.1093/icesjms/fsp057.

Interior Columbia Technical Recovery Team (ICTRT). 2003. Working draft. Independent populations of Chinook, steelhead, and sockeye for listed evolutionarily significant units within the Interior Columbia River domain. NOAA Fisheries. July.

ICTRT. 2007. Viability Criteria for Application to Interior Columbia Basin Salmonid ESUs, Review Draft March 2007. Interior Columbia Basin Technical Recovery Team: Portland, Oregon. 261 pp.

ICTRT. 2010. Status Summary – Snake River Spring/Summer Chinook Salmon ESU. Interior Columbia Technical Recovery Team: Portland, Oregon.

Idaho Department of Environmental Quality (IDEQ). 2008. Surface Water: Final 2008 Integrated Report.

Idaho Department of Fish and Game (IDFG). 2007. Annual returns to Lower Granite Dam, Idaho Department of Fish and Game data provided to NMFS by Peter Hassemer, December 2007. IDFG: Boise, Idaho.

IDFG. 2016. "Hatchery and Wild Chinook Salmon Return to Lower Granite Dam." Follow Idaho Salmon Home (F.I.S.H) website, http://216.206.157.62/idaho/web/apps/MAIN_LGRchinadultreturn_spsu_wild.php, accessed 6-3-16.

Independent Scientific Advisory Board (ISAB). 2007. Climate change impacts on Columbia River Basin fish and wildlife. ISAB Climate Change Report, ISAB 2007-2, Northwest Power and Conservation Council, Portland, Oregon.

Johnson, R. R., C. D. Ziebell, D. R. Patton, P. F. Folliet, and R. H. Hamre (Tech. Coordinators). 1985. Riparian ecosystem and their management: reconciling conflicting uses; first North America riparian conference; April 16-18. Tucson, Arizona. USDA Forest Service Gen. Tech. Rpt. Rm-120. 523 p.

Jones, K. K., T. J. Cornwell, D. L. Bottom, L. A. Campbell, and S. Stein. 2014. The contribution of estuary-resident life histories to the return of adult Oncorhynchus kisutch. Journal of Fish Biology 85:52–80. DOI:10.1111/jfb.12380.

Kauffman, J. B. and W. C. Krueger. 1984. Livestock impacts on riparian ecosystems and streamside management implications - a review. Journal of Range Management 37(5):430-438.

Kennedy, V. S. 1990. Anticipated Effects of Climate Change on Estuarine and Coastal Fisheries. Fisheries 15(6):16-24.

Kinch, G. 1989. Riparian area management: grazing management in riparian areas. U.S. Bureau of Land Management, Denver, Colorado. Tech. Ref. 737-4. 44 p.

Kirwan, M. L., G. R. Guntenspergen, A. D'Alpaos, J. T. Morris, S. M. Mudd, and S. Temmerman. 2010. Limits on the adaptability of coastal marshes to rising sea level. Geophysical Research Letters 37:L23401. DOI: 10.1029/2010GL045489, 12/1/2010.

Kovalchik, B. L., and W. Elmore. 1991. Effects of cattle grazing systems on willow dominated plant associations in central Oregon. ln: Proceedings-Symposium on ecology and management of riparian shrub commUnities. Compiled by Warren P Clary, E. Durant McArthur, Don Bedunah, and Carl L.Wambolt. May 29-31 1991, Sun Valley, ID. USDA Forest Service General Technical Report INT-289, Intermountain Research Station, Ogden, UT. pp. 111-119.

Krahn, M. M., M. J. Ford, W. F. Perrin, P. R. Wade, R. P. Angliss, M. B. Hanson, B. L. Taylor, G. M. Ylitalo, M. E. Dahlheim, J. E. Stein, R. S. Waples. 2004. 2004 Status Review of Southern Resident Killer Whales (*Orcinus orca*) under the Endangered Species Act. US Department of Commerce, NOAA Tech. Memo. NMFS-NWFSC-62, Seattle, WA, xvii+73pp.

Lemmen, D. S., F. J. Warren, T. S. James, and C. S. L. Mercer Clarke (Eds.). 2016. Canada's Marine Coasts in a Changing Climate. Ottawa, ON: Government of Canada.

Leonard, S., G. Kinch, V. Elsbernd, M. Borman, and S. Swanson. 1997. Riparian area management. TR 1737 14. Grazing management for riparian wetland areas. USDI Bureau of Land Management and USDA Forest Service. 63 p.

Li, H. W., G. A. Lamberti, T. N. Pearsons, C. K. Tait, J. L. Li, J. C. Buckhouse. 1994. Cumulative Effects of Riparian Disturbances along High Desert Trout Streams of the John Day Basin, Oregon. Transactions of the American Fisheries Society 1994; 123: 627-640.

Limburg, K., R. Brown, R. Johnson, B. Pine, R. Rulifson, D. Secor, K. Timchak, B. Walther, and K. Wilson. 2016. Round-the-Coast: Snapshots of Estuarine Climate Change Effects. Fisheries 41(7):392-394, DOI: 10.1080/03632415.2016.1182506.

Litz, M. N., A. J. Phillips, R. D. Brodeur, and R. L. Emmett. 2011. Seasonal occurences of Humbolt Squid in the Northern California Current System. CalCOFI Reports 52:97-108.

Lucey, S. and J. Nye. 2010. Shifting species assemblages in the Northeast US Continental Shelf Large Marine Ecosystem. Marine Ecology Progress Series, Marine Ecology Progress Series 415:23-33. DOI: 10.3354/meps08743.

Lynch, A. J., B. J. E. Myers, C. Chu, L. A. Eby, J. A. Falke, R. P. Kovach, T. J. Krabbenhoft, T. J. Kwak, J. Lyons, C. P. Paukert, and J. E. Whitney. 2016. Climate Change Effects on North American Inland Fish Populations and Assemblages. Fisheries 41(7):346-361. DOI: 10.1080/03632415.2016.1186016, 7/1/2016.

Mantua, N. J., S. Hare, Y. Zhang, et al. 1997. A Pacific interdecadal climate oscillation with impacts on salmon production. Bulletin of the American Meteorological Society 78:1069-1079, 1/6/1997.

Mantua, N., I. Tohver, and A. Hamlet. 2009. Impacts of climate change on key aspects of freshwater salmon habitat in Washington State. Climate Impacts Group, University of Washington, Seattle, Washington.

Martins, E. G., S. G. Hinch, D. A. Patterson, M. J. Hague, S. J. Cooke, K. M. Miller, M. F. Lapointe, K. K. English, and A. P. Farrell. 2011. Effects of river temperature and climate warming on stock-specific survival of adult migrating Fraser River sockeye salmon (*Oncorhynchus nerka*). Global Change Biology 17(1):99–114. DOI:10.1111/j.1365-2486.2010.02241.x.

Martins, E. G., S. G. Hinch, D. A. Patterson, M. J. Hague, S. J. Cooke, K. M. Miller, D. Robichaud, K. K. English, and A. P. Farrell. 2012. High river temperature reduces survival of sockeye salmon (*Oncorhynchus nerka*) approaching spawning grounds and exacerbates female mortality. Canadian Journal of Fisheries and Aquatic 69:330–342. DOI: 10.1139/F2011-154.

Matthews, G. M. and R. S. Waples. 1991. Status Review for Snake River Spring and Summer Chinook Salmon. U.S. Dept. of Commerce, NOAA Tech. Memo., NMFS-F/NWC-200.

Mathis, J. T., S. R. Cooley, N. Lucey, S. Colt, J. Ekstrom, T. Hurst, C. Hauri, W. Evans, J. N. Cross, and R. A. Feely. 2015. Ocean acidification risk assessment for Alaska's fishery sector. Progress in Oceanography 136:71-91.

McClure, M., T. Cooney, and ICTRT. 2005. Updated population delineation in the interior Columbia Basin. May 11, 2005 Memorandum to NMFS NW Regional Office, Co-managers, and other interested parties. NMFS: Seattle, Washington. 14 p.

McElhany, P., M. H. Ruckelshaus, M. J. Ford, T. C. Wainwright, and E. P. Bjorkstedt. 2000. Viable salmonid populations and the recovery of evolutionarily significant units. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-NWFSC-42, Seattle, Washington, 156 p.

McInnis, M. L. and J. D. McIver. 2009. Timing of Cattle Grazing Alters Impacts on Streambanks in an Oregon Mountain Watershed. Journal of Soil and Water Conservation. Volume 64, No. 6.

Meehan, W. R. and W. S. Platts. 1978. Livestock grazing and the aquatic environment. Journal of Soil and Water Conservation November - December 1978:274-278.Menke, J. (ed.). 1977. Symposium on livestock interactions with wildlife, fish and the environment. Sparks, Nevada. USDA Forest Service Pacific Southwest Forest and Range Experiment Station. Berkeley, California.

Menke, J. (ed.). 1977. Symposium on livestock interactions with wildlife, fish and the environment. Sparks, Nevada. USDA Forest Service Pacific Southwest Forest and Range Experiment Station. Berkeley, California.

Morris, J. F. T., M. Trudel, J. Fisher, S. A. Hinton, E. A. Fergusson, J. A. Orsi, and J. Edward V. Farley. 2007. Stock-Specific Migrations of Juvenile Coho Salmon Derived from Coded-Wire Tag Recoveries on the Continental Shelf of Western North America. American Fisheries Society Symposium 57:81-104.

Mote, P. W. and E. P. Salathé. 2009. Future climate in the Pacific Northwest. Climate Impacts Group, University of Washington, Seattle, Washington.

Murphy, M. L. and W. R. Meehan. 1991. Stream ecosystems. Pages 17-46. *In*: Meehan, editor. Influences of forest and rangeland management on salmonid fishes and their habitats. American Fisheries Society Special Publication 19, Bethesda, MD.

Naiman, R. J., J. R. Alldredge, D. A. Beauchamp, P. A. Bisson, J. Congleton, C. J. Henny, N. Huntly, R. Lamberson, C. Levings, E. N. Merrill, W. G. Pearcy, B. E. Rieman, G. T. Ruggerone, D. Scarnecchia, P. E. Smouse, and C. C. Wood. 2012. Developing a broader scientific foundation for river restoration: Columbia River food webs. Proceedings of the National Academy of Sciences of the United States of America 109(52):21201-21207.

NMFS (National Marine Fisheries Service). 1996. Making Endangered Species Act Determinations of Effect for Individual and Grouped Actions at the Watershed Scale. Habitat Conservation Program, Portland, Oregon.

NMFS. 1998. Section 7 Consultation on the Effects of Continued Implementation of Land and Resource Management Plans on Endangered Species Act Listed Salmon and Snake River Basin steelhead in the Upper Columbia and Snake River Basins (PACFISH). Northwest Region. Seattle, Washington.

NMFS. 2008. Recovery Plan Module Mainstem Columbia River Hydropower Projects, September 24, 2008. NMFS: Portland, Oregon. 40 p.

NMFS. 2008b. Recovery plan for southern resident killer whales (*Orcinus orca*). Prepared by the National Marine Fisheries Service, Northwest Regional Office.

NMFS. 2010. Endangered Species Act Section 7 Formal Consultation and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for Livestock Grazing on the Upper Hayden Creek Cattle and Horse Grazing Allotment, Upper Hayden Creek 5th field Hydrologic Unit Code (HUC) 1706020406, Lemhi County, Idaho, (Tracking Number 2010/00852)

NMFS. 2016. Proposed ESA Recovery Plan for Snake River Spring/Summer Chinook Salmon *(Oncorhynchus tshawytscha)* & Snake River Steelhead *(Oncorhynchus mykiss)*, October 2016. NOAA Fisheries West Coast Region. 262 p.

NMFS. 2017. ESA Recovery Plan for Snake River Spring/Summer Chinook & Steelhead. NMFS.

Northwest Fisheries Science Center (NWFSC). 2015. Status review update for Pacific salmon and steelhead listed under the Endangered Species Act: Pacific Northwest. 356 p.

Ohmart, R. D. and B. W. Anderson. 1982. North American desert riparian ecosystems. P. 433-466. *In*: G. L. Bender, ed., Reference Handbook on the Deserts of North America. Greenwood Press, Westport, Connecticut.

Pacific Fishery Management Council (PFMC). 1999. Description and identification of essential fish habitat for the Coastal Pelagic Species Fishery Management Plan. Appendix D to Amendment 8 to the Coastal Pelagic Species Fishery Management Plan. Pacific Fishery Management Council, Portland, Oregon. December.

PFMC. 2014. Appendix A to the Pacific Coast Salmon Fishery Management Plan, as modified by Amendment 18. Identification and description of essential fish habitat, adverse impacts, and recommended conservation measures for salmon.

Parsons, C. T., P. A. Momont, T. Delcurto, M. McInnis, and M. L. Porath. 2003. Cattle distribution patterns and vegetation use in mountain riparian areas. Journal of Range Management. Volume 56: 334-341.

Pearcy, W. G. 2002. Marine nekton off Oregon and the 1997–98 El Niño. Progress in Oceanography 54:399–403.

Pearcy, W. G. and S. M. McKinnell. 2007. The Ocean Ecology of Salmon in the Northeast Pacific Ocean-An Abridged History. American Fisheries Society 57:7-30.

Peek, J. M. and P. D. Dalke. 1982. Wildlife - livestock relationships symposium; Proceedings 10. (ed). April 20-22, 1982, Coeur d'Alene, Idaho. Univ. of Idaho Forest, Wildlife, and Range Experiment Station. Moscow, Idaho.

Pelster, A. J., S. Evans, W. C. Leininger, M. J. Trlica, and W. P. Clary. 2004. Steer diets in a montane riparian community. Journal of range management. 57: 546-552.

Peterson, W., J. Fisher, J. Peterson, C. Morgan, B. Burke, and K. Fresh. 2014. Applied Fisheries Oceanography Ecosystem Indicators of Ocean Condition Inform Fisheries Management in the California Current. Oceanography 27(4):80-89. 10.5670/oceanog.2014.88.

Platts, W. S. 1981. Influence of forest and rangeland management on anadromous fish habitat in western North America -effects of livestock grazing. USDA Forest Service Gen. Technical Report PNW-124. 25 p.

Platts, W.S and R.L. Nelson. 1989. Stream Canopy and its relation to salmonid biomass in the Intermountain West. North American Journal of Fisheries Management 9:446-457.

Poesch, M. S., L. Chavarie, C. Chu, S. N. Pandit, and W. Tonn. 2016. Climate Change Impacts on Freshwater Fishes: A Canadian Perspective. Fisheries 41:385-391.

Quinn, T. P. 2005. The Behavior and Ecology of Pacific Salmon & Trout. University of Washington Press.

Rehage J. S. and J. R. Blanchard. 2016. What can we expect from climate change for species invasions? Fisheries 41(7):405-407. DOI: 10.1080/03632415.2016.1180287.

Roberts, B. C., and R. G. White. 1992. Effects of angler wading on survival of trout eggs and pre-emergent fry. North American Journal of Fisheries Management 12:450–459.

Roper, B. B. 2016. Setting stubble height standards for riparian areas grazed by cattle in areas with Endangered Species Act listed or sensitive salmon and trout species. National Stream and Aquatic Center, USDA Forest Service. 7pp.

Rykaczewski, R., J. P. Dunne, W. J. Sydeman, et al. 2015. Poleward displacement of coastal upwelling-favorable winds in the ocean's eastern boundary currents through the 21st century. Geophysical Research Letters 42:6424-6431. DOI:10.1002/2015GL064694.

Saunders, W. C. and K. D. Fausch. 2007. Improved Grazing Management Increases Terrestrial Invertebrate Inputs that Feed Trout in Wyoming Rangeland Streams. Transactions of the American Fisheries Society 2007; 136: 1216-1230.

Saunders, W. C. and K. D. Fausch. 2009. A Field Test of Effects of Livestock Grazing Regimes on Invertebrate Food Webs that Support Trout in Central Rocky Mountain Streams. Department of Fish, Wildlife, and Conservation Biology Colorado State University Fort Collins, CO. September 2009.

Stelle, W. 2013. Memo to Northwest Region Assistant Regional Administrators Re: Guidance on ESA Consultation for Southern Resident Killer Whales and Other Listed Marine Mammals. National Marine Fisheries Service, Seattle Washington.

Stowell, R., A. Espinosa, T. C. Bjornn, W. S. Platts, D. C. Burns, and J. S. Irving. 1983. Guide for Predicting Salmonid Response to Sediment Yields in Idaho Batholith Watersheds. August 1983.

Sykes, G. E., C. J. Johnson, and J. M. Shrimpton. 2009. Temperature and Flow Effects on Migration Timing of Chinook Salmon Smolts. Transactions of the American Fisheries Society 138:1252-1265.

U. S. Fish and Wildlife Service (USFWS). 1998. Proceedings of the Lower Snake River Compensation Plan Status Review Symposium. Boise Idaho. February 3-5, 1998. Compiled by USFWS, LSRCP Office, Boise ID.

U. S. Forest Service (USFS). 2019. Biological Assessment for Upper Hayden C&H Allotment. Leadore Ranger District, Salmon Challis N.F., Salmon, Idaho. 172 p.

University of Idaho Stubble Height Review Team. 2004. University of Idaho Stubble Height Study Report. Submitted to Idaho State Director BLM and Regional Forester Region 4, U.S. Forest Service. University of Idaho Forest, Wildlife and Range Experiment Station Moscow, ID. 33p.

Upper Salmon Basin Watershed Project (USBWP). 2005. Upper Salmon Basin instream work windows for chinook salmon, steelhead, bull trout, and westslope cutthroat trout. IDFG, NOAA Fisheries, USFS Salmon-Challis National Forest, BLM Challis Resource Area, USFWS, and USBWP interagency team.

Verdonck, D. 2006. Contemporary vertical crustal deformation in Cascadia. Tectonophysics 417(3):221-230. DOI: 10.1016/j.tecto.2006.01.006.

Wainwright, T. C. and L. A. Weitkamp. 2013. Effects of Climate Change on Oregon Coast Coho Salmon: Habitat and Life-Cycle Interactions. Northwest Science 87(3):219-242.

Ward, E. J., J. H. Anderson, T. J. Beechie, G. R. Pess, and M. J. Ford. 2015. Increasing hydrologic variability threatens depleted anadromous fish populations. Global Change Biology 21(7):2500-2509.

Weitkamp, L. A. 2010. Marine Distributions of Chinook Salmon from the West Coast of North America Determined by Coded Wire Tag Recoveries. Transactions of the American Fisheries Society 139:147-170.

Whitney, J. E., R. Al-Chokhachy, D. B. Bunnell, C. A. Caldwell, et al. 2016. Physiological Basis of Climate Change Impacts on North American Inland Fishes. Fisheries 41(7):332-345. DOI: 10.1080/03632415.2016.1186656.

Wiles, G. J. 2004. Washington State Status Report for the Killer Whale. Washington Department of Fish and Wildlife, Olympia, 3/1/2004.

Winward, A. H. 2000. Monitoring the vegetation resources in riparian areas. Gen. Tech. Rep. RMRS-GTR-47. Fort Collins, CO: U.S. Department of Agriculture Forest Service. April, 2000.

Wyman, S., D. Bailey, M. Borman, S. Cote, J. Eisner, W. Elmore, B. Leinard, S. Leonard, F. Reed, S. Swanson, L. Van Riper, T. Westfall, R. Wiley, and A. Winward. 2006. Riparian area management: grazing management processes and strategies for riparian-wetland areas. United States Department of the Interior, Bureau of Land Management, Technical Reference 1737-20:1–105.

Yamada, S., W. T. Peterson, and P. M. Kosro. 2015. Biological and physical ocean indicators predict the success of an invasive crab, *Carcinus maenas*, in the northern California Current. Marine Ecology Progress Series 537:175-189. DOI: 10.3354/meps11431.

Zamon, J. E., T. J. Guy, K. Balcomb, and D. Ellifrit. 2007. Winter observation of southern resident killer whales (*Orcinus orca*) near the Columbia River plume during the 2005 Chinook salmon (*Oncorhynchus tshawtscha*) spawning migration. Northwestern Naturalist, 88(3): 193-198.

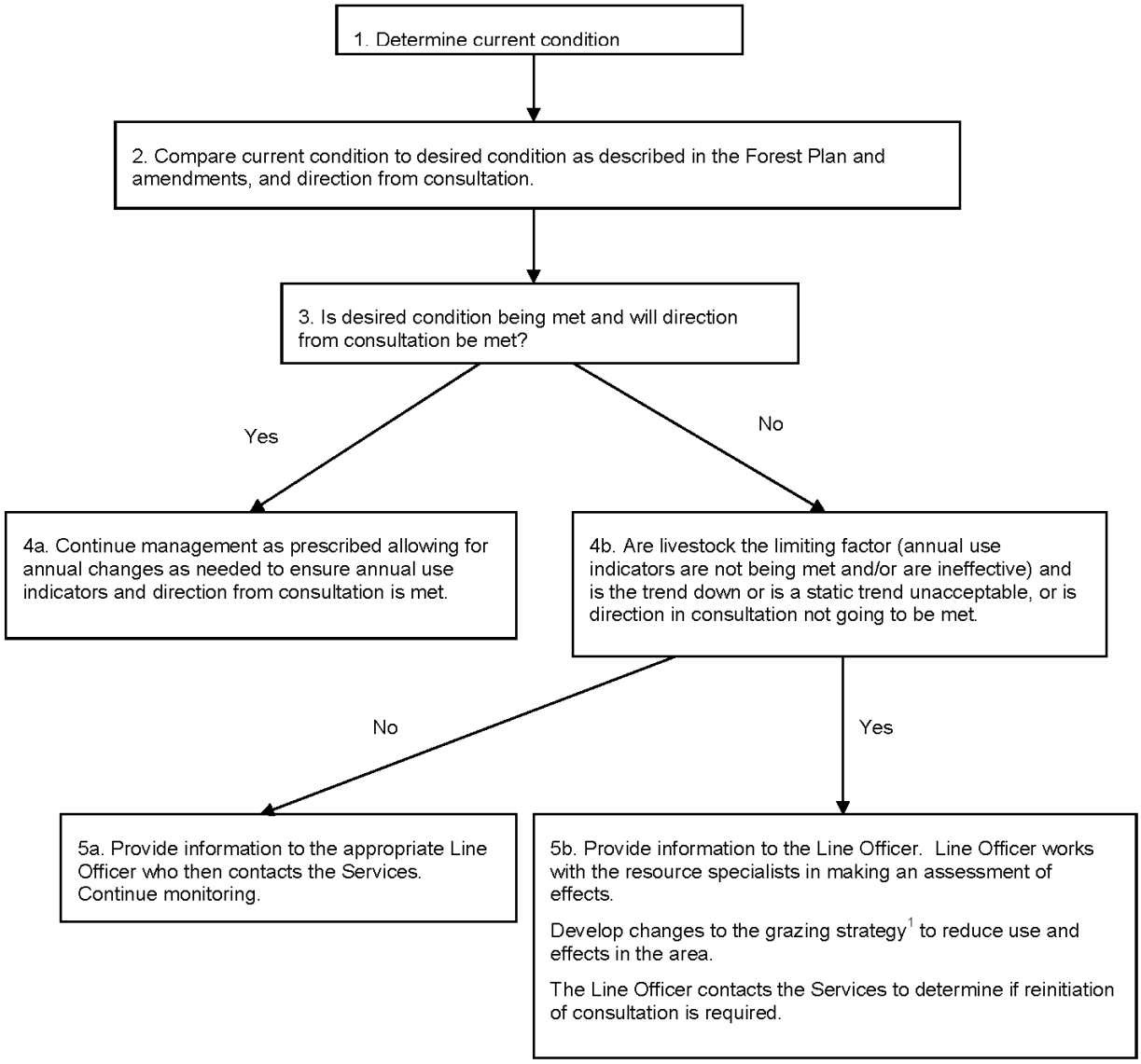
Zoellick, B. W. 2004. Density and biomass of redband trout relative to stream shading and temperature in southwestern Idaho. Western North American Naturalist. 64(1). pp. 18-26.

6. APPENDIX A

Salmon Challis National Forest

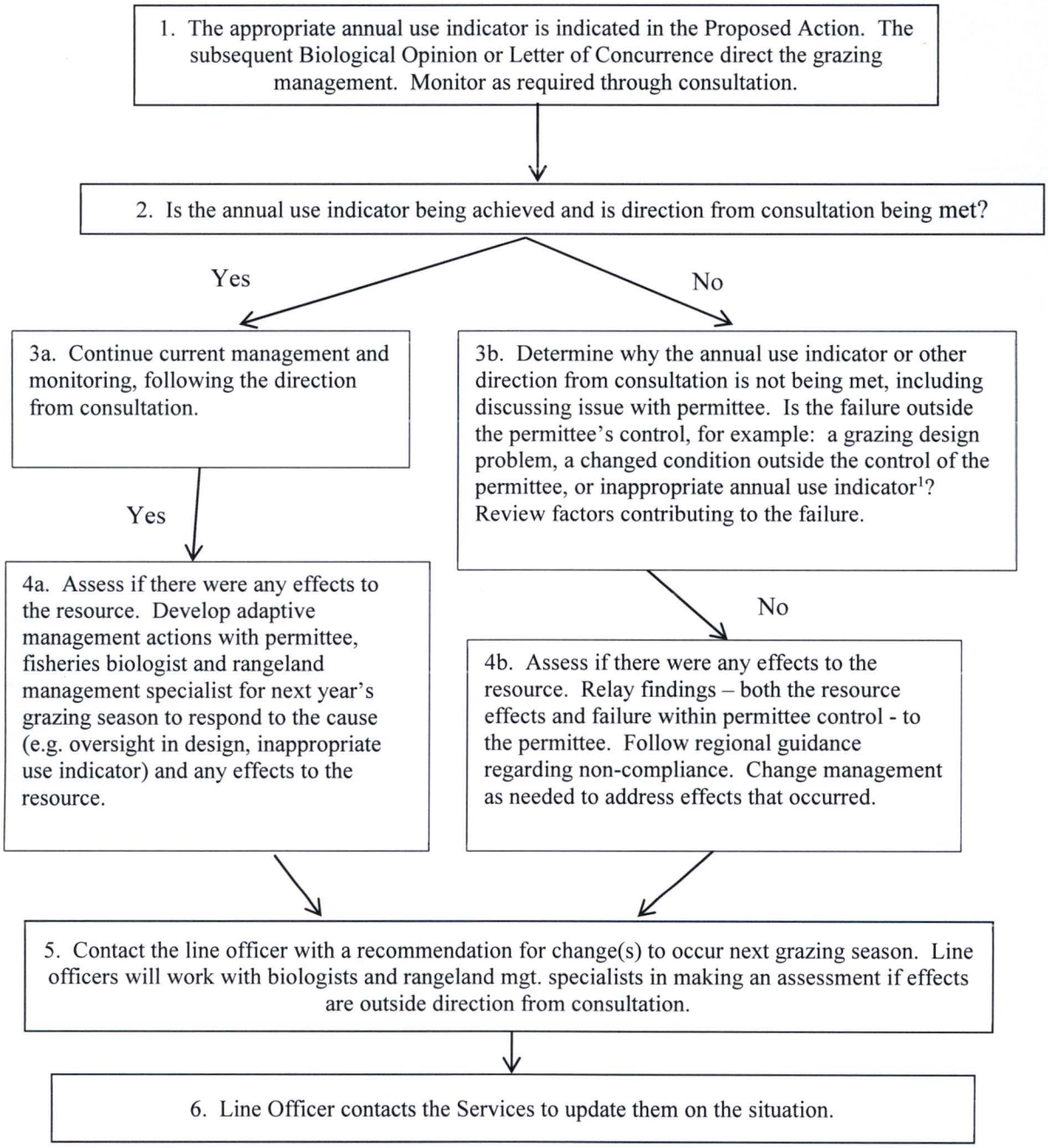
Adaptive Management Strategy for Grazing Allotments

Diagram 1.0 – Implementation of Long-Term Adaptive Management Strategy for Allotments Requiring Consultation.



[1]Management actions will initially reduce use in the area. It is expected this may occur in any number of ways including but not limited to changing the season of use, reducing numbers, changing amount of use on annual indicator, changing herding practices, changing salting practices and/or reconstructing/constructing range improvements. If use can't be reduced and livestock continue to be the limiting factor total removal of livestock from the area may be necessary. Effectiveness of changed management will be monitored through adjusted annual use indicators and effectiveness monitoring.

Diagram 2.0 – Implementation of Annual Adaptive Management Strategy for Allotments Requiring Consultation.



An inappropriate annual use indicator is an indicator that does not most accurately identify the weak link or first attribute that would indicate excessive livestock impacts. In this situation, reviewing the monitoring location and/or changing to a more appropriate indicator will help achieve tor maintain desired conditions.