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 97232-1274

Refer to NMFS No.: WCRO-2021-01011 August 26, 2021

https://doi.org/10.25923/xj5g-1v68

Charles Mark
Forest Supervisor
Salmon-Challis National Forest
1206 S. Challis Road
Salmon, Idaho 83467

Re: Endangered Species Act Section 7 Formal Consultation and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for the Ongoing Grazing Actions on the Timber Creek Cattle and Horse Allotment, Timber Creek – HUC 1706020404, Lemhi County, Idaho (One project)

Dear Mr. Mark:

Thank you for your letter of April 14, 2021, 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 grazing on the Timber Creek Cattle and Horse Allotment. This consultation was conducted in accordance with the 2019 revised regulations that implement section 7 of the ESA (50 CFR 402, 84 FR 45016).

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 Conservation and Management Act (MSA) [16 U.S.C. 1855(b)] for this action. In this case, NMFS concluded the action would not adversely affect EFH. Therefore, we are hereby concluding EFH consultation.

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. NMFS also concurs with the Salmon-Challis National Forest's (SCNF) determination that the action may affect, but is not likely to adversely affect designated critical habitat for Snake River spring/summer Chinook salmon. Rationale for our conclusions is provided in the attached opinion.

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 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.

Please contact Kimberly Murphy, consulting biologist, in the Southern Snake Branch of the Snake Basin Office at (208) 768-7714 or at kimberly.murphy@noaa.gov 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: K. Povirk – SCNF
K. Krieger – SCNF
D. Garcia – SCNF
S. Fisher – USFWS
C. Colter – SBT

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

Timber Creek Cattle and Horse Allotment

NMFS Consultation Number: WCRO-2021-01011

Action Agency: USDA Forest Service, 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 Basin steelhead (*Oncorhynchus mykiss*)	Threatened	Yes	No	N/A	N/A
Snake River spring/summer Chinook salmon (*Oncorhynchus tshawytscha)*	Threatened	N/A	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	No	No

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

Issued By:

Michael P. Tehan
Assistant Regional Administrator
West Coast Region
National Marine Fisheries Service

Date: *August 26, 2021*

TABLE OF CONTENTS

TABLE OF FIGURES

TABLE OF TABLES

ACRONYMS

Allotment	Timber Creek Grazing Allotment
BA	Biological Assessment
BMP	Best Management Practice
BLM	Bureau of Land Management
CFR	Code of Federal Regulations
CR	Conservation Recommendation
DMA	Designated Monitoring Area
DPS	Distinct Population Segment
DQA	Data Quality Act
EFH	Essential Fish Habitat
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
FMP	Fishery Management Plan
FR	Federal Register
FS	Forest Service
FSH	Forest Service Handbook
FWCA	Fish and Wildlife Coordination Act
GES	Greenline Ecological Status
GGW	Greenline to Greenline Width
HAPC	Habitat Area of Particular Concern
HMs	Head-months
ICTRT	Interior Columbia Technical Recovery Team
IDEQ	Idaho Department of Environment Quality
IDFG	Idaho Department of Fish and Game
ISAB	Independent Scientific Advisory Board
ITS	Incidental Take Statement
MIM	Multiple Indicator Monitoring
MPG	Major Population Group
MSA	Magnuson–Stevens Fishery Conservation and Management Act
NMFS	National Marine Fisheries Service
opinion	Biological Opinion
PBF	Physical or Biological Feature
PCE	Primary Constituent Element
PNC	Potential Natural Community
RHCA	Riparian Habitat Conservation Area
RMO	Riparian Management Objectives
RPA	Reasonable and Prudent Alternative
RPM	Reasonable and Prudent Measure
SCNF	Salmon-Challis National Forest's
U.S.C.	U.S. Code
USFWS	U.S. Fish and Wildlife Service

USGCRP	U.S. Global Change Research Program
VSP	Viable Salmonid Population
W:D	Width to Depth Ratio

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

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, as amended.

We also reviewed the proposed action for potential effects on 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. In this case, NMFS concluded the action would not adversely affect EFH. Thus, consultation under the MSA is not required for this action.

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). The document will be available within two weeks at the NOAA Library Institutional Repository (https://repository.library.noaa.gov/welcome). A complete record of this consultation is on file at NMFS' Snake Basin Office, Boise, Idaho.

1.2 Consultation History

On April 14, 2021, NMFS received a letter from the Salmon-Challis National Forest (SCNF) requesting ESA consultation on the effects of authorizing proposed grazing activities on the Timber Creek Allotment (Allotment). The biological assessment (BA) (USFS 2021) accompanying that letter described proposed livestock grazing activities, the environmental baseline, and the potential effects of those activities on Snake River Basin steelhead and Snake River spring/summer Chinook salmon designated critical habitat. In the BA, the SCNF determined that the proposed action "may affect," and is "likely to adversely affect" Snake River Basin steelhead. The SCNF has also determined that the action "may affect," but is "not likely to adversely affect" Snake River spring/summer Chinook designated critical habitat. This consultation request will replace the previously issued April 18, 2011, NMFS letter of concurrence (NMFS tracking number 2011/01267).

The draft BA for the Timber Creek Grazing Allotment was submitted to the Level 1 Team for review on January 8, 2021. NMFS provided comments to the SCNF on the draft BA on January 20, 2021, and discussed comments on the BA at the January 27, 2021, Level 1 meeting. The SCNF indicated that they would address all NMFS comments and submit another draft BA for additional review. A second draft BA was submitted on March 8, 2021. NMFS provided comments on the draft BA to the SCNF on March 23, 2021 and the SCNF responded on March 26, 2021. The SCNF submitted a revised draft BA on April 6, 2021. Both agencies agreed with the approach to submit a final BA, but NMFS reserved the opportunity to request additional information, if necessary, to complete the consultation. The Allotment BA and request for consultation was received by NMFS on April 14, 2021. Consultation was initiated at that time.

NMFS shared the draft proposed action and proposed conservation measures with the SCNF on July 28, 2021. The SCNF suggested revisions to the draft opinion on August 10, 2021.

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 28 2021, with a request for comments. NMFS did not receive any response.

1.3 Proposed Federal Action

Under the ESA, "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). For purposes of this consultation, the proposed action involves the permitting of livestock grazing on 11,327 acres of SCNF system lands that comprise the Allotment (USFS 2021). This Allotment is located on the Leadore Ranger District in the fifth field Timber Creek hydrologic unit code (HUC) (HUC 1706020404), in Lemhi County, Idaho.

The SCNF currently authorizes grazing up to 60 cow/calf pairs (181 Head Months) from July 1 through September 30. This consultation covers the proposed grazing period from the completion of this signed opinion through the end of the 2035 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 in Condition 3 are met (see Section 2.11) (50 CFR 402.16).

Current Permit: Permitted grazing on this Allotment provides for grazing up to 60 cow/calf pairs (181 head-months (HMs) with a grazing season of 7/1– 9/30. Per direction in Forest Service Handbook (FSH) 2209.13-10, an extension of grazing may be requested outside the dates on the term grazing permit. Extensions are generally granted for no more than two weeks and can occur at the beginning or end of the permitted grazing season, or in a combination of the two time periods. In considering the request, the District Ranger will follow Regional Forester direction as outlined, including compliance with the ESA Section 7 consultation requirements. An approved extension cannot result in more take than would otherwise be allowed. Regional Forester direction also indicates that use of extensions should be an exception rather than a standard practice. On this Allotment, it is not expected that a request for an extension will be received[1].

[1] As clarified by the SCNF in comments received August 10, 2021 on the draft Opinion, the BA did not analyze for an extension in Units with ESA-listed fish or designated critical habitat. Grazing in the Rocky Creek and Trail Creek Units cannot be extended because there is the potential of trampling of steelhead redds (early) and bull trout redds (late) and those effects were not considered in their BA. Therefore, extension in these Units would not meet the requirements of FHS 2209.13-10,

1.3.1. Grazing System

The Timber Creek Allotment is managed as a deferred rotation system (Table 1), in which grazing is delayed in some of the grazing units to provide for plant reproduction, establishment, or restoration of existing plants. As with other rotational grazing systems, move times can be seasonally adjusted if prescribed move dates and or move-triggers have been reached.

The Allotment is divided into 3 Units: Rocky Creek, Short Creek, and Trail Creek (Figure 1). There are no private inholdings, BLM, or state-owned lands within the Allotment boundary.

The Allotment is not accessible by 4-wheeled vehicles and motorized use is limited to motorcycles only. Both the Trail Creek and the Rocky Creek Units have a large willow component with parts of Big Timber Creek that impede access by livestock to the stream. The permittee's cattle due to topography, dense overstory vegetation, and a drift fence do largely not access the upper reaches of Lake Creek and Trail Creek.

The permittee or their rider spend a minimum of one day every two weeks on the Allotment but often increase riding efforts when recreational use increases and the potential for gates to be left open is increased (typically around August 30 when hunting season starts).

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. Adjustments to the on-date may be made if conditions warrant. Annual use indicators will drive when unit moves or the off-date occurs. Permittees are responsible for moving livestock to meet annual use indicators.

Table 1 - Unit Rotations (Figure 1 identifies Unit locations)

Approximate Use Period	Year 1	Year 2	Year 3
July 1 to approx. Aug 1	Trail Creek	Short Creek	Rocky Creek
Approx. Aug 1 to Sept 1	Rocky Creek	Trail Creek	Short Creek
Approx. Sept 1 to Sept 30	Short Creek	Rocky Creek	Trail Creek

1.3.1.1 Livestock Occupancy

Shown below is the potential frequency and duration of livestock to be in each Unit during spawning and incubation. In practice, this can vary as unit moves are guided by managing grazing to not exceed annual use indicators.

which states an approved extension cannot result in more take then would otherwise be allowed. Therefore, if the permittee did request an extension, the Short Creek Unit is the only Unit that could be extended where there would be no further effects to listed species or critical habitat.

Trail Creek Unit

Chinook: Adult and juveniles are not present in this Unit.
Steelhead: Livestock may be in the Unit up to one week prior to July 8, one out of three years.
Bull trout: Livestock may be in the Unit up to 5 weeks after August 15 two of three years.

Rocky Creek Unit

Chinook: Adult and juveniles are not present in this Unit.
Steelhead: Livestock may be in the Unit up to one week prior to July 8, one out of three years.
Bull trout: Livestock will be in this Unit up to 5 weeks after August 15, two of three years.

Short Creek Unit

Chinook: Not present in this Unit.
Steelhead: Not present in this Unit.
Bull trout: Not present in this Unit

Unit Moves. Stream crossings are necessary for moving livestock between Units and they depend on the rotation and location of the livestock within the Unit. Stream crossings are typically made over the course of one or two days, with the bulk of the herd typically crossing streams with riders (supervised trailing). Following or preceding this, several smaller groups may cross depending on the location of the cows, number of riders, weather, terrain and any number of other factors. Back riding to pick up animals that was not gathered during the move date would also occur, with subsequent crossings of these smaller groups.

- During moves prior to July 8, steelhead streams that may be crossed include Big Timber Creek (no Designated Critical Habitat but fish are present).

- During moves after August 15, bull trout streams that may be crossed include Big Timber Creek (Designated Critical Habitat and fish present), Rocky Creek (Designated Critical Habitat and fish present) and Trail Creek (fish present).

- During moves after the 3rd quarter of August, Chinook salmon streams that may be crossed during unit moves include Big Timber Creek (Designated Critical Habitat present but no fish present).

1.3.1.2 Entry/Exit Off the Allotment

- Livestock enter and exit the Allotment along Forest Service (FS) Roads #60105, #64015, #64015-A, #64015-B, and Big Timber Creek motorized trail #6183.1 across the Swan Basin Allotment. Entry onto the Allotment takes part over the course of a day or two and livestock are actively trailed with enough rider(s) to keep the cows on the road and trail.
- No streams with ESA-listed fish species are crossed within the Swan Basin Allotment during livestock entering and exiting the Timber Creek Allotment. Streams that have the potential to be crossed within the Timber Creek Allotment during entry and exit off the Timber Creek Allotment include Big Timber Creek and Rocky Creek. The specific streams crossed in any year are based on the location of livestock in the last Unit being grazed. Exit off the

Allotment is like the move between units; supervised trailing occurs in largest bunches at first and progressively smaller groups over the following days.

- Total Removal from NFS Lands: Livestock will be removed from the Allotment by September 30 unless there is a District Ranger approved extension.

1.3.2 Improvements

New Improvements: No new improvements are being considered in this proposed action.

Existing improvements: Existing improvements, as displayed in Figure 1, will be maintained in accordance with the term grazing permit. For example, fences are maintained to serve their intended purpose; and water troughs are maintained to keep the trough functional and water from overflowing the side.

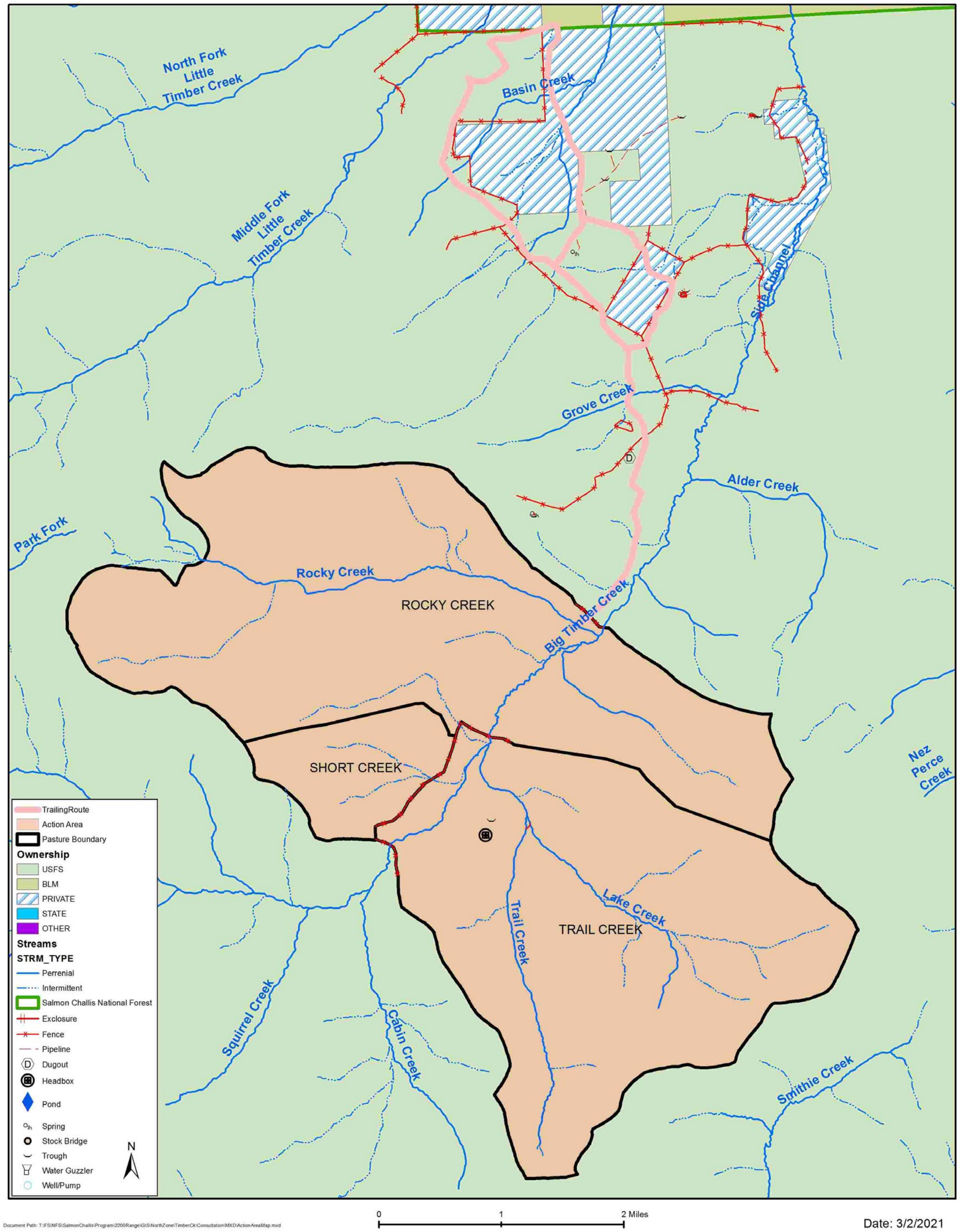
1.3.3 Changes from Existing Management

This proposed action includes the following changes from the management described in the March 16, 2011 BA. This also includes changes that have been implemented based on long-term monitoring results per the Forest's adaptive management process.

- Based on the long-term Multiple Indicator Monitoring (MIM) results, M299 on Big Timber Creek within the Trail Creek Unit, showed an increase in bank stability and an increase in greenline ecological status (GES). The annual indicators have been adjusted to 4-inch residual stubble height and 20% bank alteration, represented by meeting relative resource objectives (GES of 61 and bank stability over 90% in priority watersheds).

- Adjustments were made to the stubble height annual indicator from 6 inches to 4 inches based on long-term monitoring on M300 in 2016, representing an increase in GES to 90, which exceeds the relative resource objective of a GES of 61. Other indicators remain static.

Figure 1- Timber Creek Allotment Action Area



1.3.4 Conservation Measures

The following conservation measures will be described and implemented as part of the term grazing permit(s) on the Timber Creek Allotment to avoid and reduce potential impacts to ESA-listed fish and their habitat within the Allotment:

1. The Forest will follow the Communication Plan – Implementing Livestock Grazing Consultation on the Salmon-Challis North Fork (BA Appendix E). Over the duration of this proposed action, the Communication Plan could be updated to better address livestock grazing management both within the FS and between the FS, NMFS and the U.S. Fish and Wildlife Service (USFWS). The desired outcome of this Communication Plan is to conduct livestock grazing within the scope of this proposed action and subsequent biological or concurrence letter opinion while being consistent and timely in communication when something is observed to the contrary.
2. Per the Grazing System (as described in the BA and Section 1.3.1 of this Opinion), the on date may vary so livestock are placed on the Allotment at range readiness.
3. Livestock moves between Units and off the Allotment are made so-as-to meet annual use indicators (as described in the BA and Section 1.3.5.3 if this Opinion).
4. Permittees will continue to salt at least one-fourth mile away from streams.
5. Permittees will continue to distribute livestock away from perennial streams and associated riparian areas by riding at least once every two weeks.
6. Permittees will maintain improvements associated with their term grazing permit in accordance with the terms and conditions outlined in the permit.
7. As required in the 2011 USFWS Biological Opinion, annual bull trout redd survey monitoring will continue on the Allotment.
8. The Allotment will continue to be monitored using implementation and effectiveness monitoring described in the BA and included in Section 1.3.5.4 of this Opinion.
9. Upland use will be monitored, as needed, in areas where streams with ESA-listed fish and designated critical habitat are adjacent to steep slopes where there exists the potential for erosion effects caused by livestock to impact these streams.

1.3.5 Resource Objectives

1.3.5.1 Resource Objectives and Effectiveness Monitoring

The Allotment is being managed to support the following resource objectives. GES, woody species regeneration, and bank stability are three resource objectives most affected by livestock grazing. Resource objectives are the Forest's description of the desired land, plant, and water resources condition within riparian areas in the Allotment. Some resource objectives are Riparian Management Objectives (RMOs) from PACFISH and its corresponding Biological Opinions (NMFS 1995; NMFS 1998). PACFISH is an interim strategy for managing anadromous fish-producing watersheds that was amended into the Salmon and Challis Forest Plans in 1995 [and 1998].

Effectiveness monitoring for resource objectives will be monitored at a minimum of every 5 years at designated monitoring areas (DMAs) using the MIM technical reference or other best available science as it becomes available. 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).

- Greenline Successional Status: A greenline successional status [a.k.a., GES] value of at least 61 (late seral) or the current value, whichever is greatest (Winward 2000; Gamett et al. 2008).

- 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: The Timber Creek Allotment is within a priority watershed. Within priority watersheds, a bank stability is at least 90% or the current value, whichever is greatest (NMFS 1998).

- Width to Depth Ratio (W:D) (PACFISH). <10, mean wetted width divided by mean depth or by channel type as follows:

    - A Channel: 21
    - B Channel: 27
    - C Channel: 28

- Water Temperature RMO: No measurable increase in maximum water temperature as expressed as the 7-day moving average of daily maximum temperatures measured as the average of the maximum daily temperature of the warmest consecutive 7-day period. For steelhead and Chinook salmon, less than 64°F (17.8°C) in migration and rearing areas. For Chinook salmon and steelhead, less than 60°F (15.6°C) in spawning areas (PACFISH) except in steelhead priority watersheds where the objective is less than 45°F (7.2°C) in steelhead spawning areas during the incubation period (NMFS, 1998). For Bull Trout, less than 59°F (15.0°C) within adult holding habitat and less than 48°F (8.9°C) within spawning and rearing habitat. This objective was established by INFISH and is being applied to areas occupied by bull trout within the area covered by PACFISH.

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

1.3.5.2 Management 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.

1.3.5.3 Annual Use Indicators

Annual Use Indicators: Annual use indicators are used to ensure that grazing does not prevent the attainment of the riparian resource objectives directly affected by livestock grazing. Riparian annual use indicators used on the SCNF generally include greenline stubble height, bank alteration, and woody browse. In general, greenline stubble height is used to regulate grazing impacts on GES, bank alteration is used to regulate grazing impacts on bank stability, and woody browse is used to regulate impacts on woody recruitment. The specific indicators selected for a specific unit should be those that correspond with the riparian resources that are most sensitive to the impacts of livestock grazing. For example, if bank stability was the riparian feature most likely to be impacted by livestock grazing in a unit, then bank alteration would be selected as the annual use indicator for that unit.

Based on the guidelines in Section 1.3.5.5 Adaptive Management, the available data including results from implementation and effectiveness monitoring, and the professional experience of FS personnel, the annual use indicators - for habitat either occupied by ESA-listed fish, or with designated critical habitat - have been established on this Allotment (Table 2).

The annual use indicators will be used until the next effectiveness monitoring for GES, woody regeneration, and bank stability (Section 1.3.5.1) indicate adjustment is needed. Any adjustments to meet these three resource objectives directly affected by livestock grazing will be made using adaptive management (Section 1.3.5.5).

The annual use indicators in Table 2 drive when Unit moves or the off date occurs. Permittees are responsible for moving livestock to meet these annual use indicators.

Triggers. Permittees use triggers to determine when livestock need to be moved from a unit to ensure that annual use indicators are not exceeded. A trigger's numerical value varies from unit to unit, and from year to year for any unit based on the season's growing conditions, amount of precipitation received, how long it may take to move livestock from one unit to the next, etc. As such, triggers are informally customized to the specific circumstances of each unit for that year, but may typically range from five to seven inches, for example for the stubble heights indicator (Table 2). While the FS works with the permittees to help them know how to monitor stubble height, bank alteration and woody browse, trigger monitoring by permittees is informal (not documented) and is not reported. The stated direction in the term grazing permit(s) is for the permittees to ensure annual use indicators are met.

Monitoring Annual Use Indicators (Table 2) will be conducted using MIM protocol (Burton et al. 2011) or other best available science. Monitoring locations identified in Table 2 are key areas, also referred to as DMAs. Each is a representative DMA, and as such 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). DMAs identified in Table 2 are representative of units that have ESA-listed fish and or designated critical habitat.

Key species are preferred by livestock and are an important component of a plant community, serving as an indicator of change (USDI Bureau of Land Management 1999). Season-end annual use indicators will be monitored by FS personnel or a person authorized by the FS. For further discussion of monitoring annual use, see Section 1.3.5.4.

Table 2 - Designated Monitoring Areas and Annual Use Indicators

Location	Unit/ Stream Name	Monitoring Attribute	Annual Use Indicator	Key Species	Estimated Use Trigger
MIM # 299	Trail Creek/ Big Timber Creek	Browse use	30% 20%	Willow Alder	25% 15%
		Greenline stubble	4”	Hydric ssp.	5”
		Bank Alteration	20%	N/A	15%
MIM # 300	Rocky Creek/ Big Timber Creek	Browse Use	50% 30%	Willow Alder	45% 25%
		Greenline Stubble	4”	Hydric ssp.	5”
		Bank Alteration	20%	N/A	15%

1.3.5.4 Monitoring and Reporting

Implementation (Annual) Monitoring. The monitoring protocol uses the MIM method (Burton et al. 2011) or other best available published science. Implementation monitoring will be conducted at DMAs (Table 2). 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. Forest Service personnel will monitor annual use indicators or a person trained and authorized by the FS.

Effectiveness (Long-Term) Monitoring. Effectiveness monitoring for GES, woody regeneration, and bank stability uses the MIM method (Burton et al. 2011) or other best available science as it is adapted by the Forest. Effectiveness monitoring will be conducted a minimum of every five years. This monitoring also takes place at the DMAs in Table 2. DMAs are areas representative of grazing use and reflect what is happening in the overall riparian area as a result of livestock activity (Burton et al. 2011).

The monitoring protocol for the channel geometry is revised from a wetted width/depth measurement (range monitoring prior to 2010) and a bankfull width/depth metric (watershed monitoring 1993–2016) to the greenline-to-greenline width (GGW) measurement as described in the MIM protocol.

Fish Habitat Monitoring. Stream sediment (depth fines) and water temperature will be monitored at established long-term monitoring sites using established protocols at least once every five years. The established long-term monitoring sites are not necessarily located at the DMAs. Frequency of monitoring varies depending on the trend indicated by monitoring results. At a minimum, these two metrics will be monitored once every five years.

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 once every five years. As required in a Biological Opinion, annual bull trout redd survey monitoring will continue on the Allotment.

Reporting. Results from annual opinion Monitoring Reports will be electronically emailed to the respective Regulatory Agency by March 1 each year.

1.3.5.5 Adaptive Management

The adaptive management strategy, described below and depicted in Appendix A, Diagrams one (Long term) and two (Annual), is intended for allotments requiring 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 to be agreed upon with the Services [NMFS and the USFWS] and the FS; and (3) direction from consultation with the Services 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 three 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 use 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 E in the BA).

Ideally, the value associated with the annual use indicator is customized to the specific circumstances in each Unit, and is based on data and experience. 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 recommendations for establishing the values. These recommendations will be used until sufficient data and or experience are available to customize the annual indicator values. The recommendations that apply to this Allotment are:

- Livestock grazing in the uplands and riparian areas will be limited to 50% use on key herbaceous species within representative use areas of the Allotment during the grazing season.

- When the GES is 61 or greater, the end of season median greenline stubble height annual use indicator will be four inches.

- When the GES is less than 61, the end of season median greenline stubble height annual use indicator will be six 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% or greater the bank alteration annual use indicator will be 20%. Outside of priority watersheds, if bank stability is 80% or greater, the annual bank alteration indicator is 20%.

- In priority watersheds, when bank stability is 70-89% the bank alteration annual use indicator will be 10-20%. Outside of priority watersheds, if bank stability is 60-79%, the bank alteration annual indicator is 15%.

- In priority watersheds, when bank stability is less than 70% the bank alteration annual use indicator will be 10%. Outside of priority watersheds, if bank stability is less than 60%, the bank alteration annual indicator is 10%.

We considered, under the ESA, whether or not the proposed action would cause any other activities and determined that it would not.

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 provide 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 reasonable and prudent measures (RPMs) and terms and conditions to minimize such impacts.

The SCNF determined the proposed action will have no effect on Snake River Basin steelhead designated critical habitat or Snake River spring/summer Chinook salmon. No effect" determinations under section 7 of the ESA are the province of action agencies, which may make such findings without seeking the agreement of NMFS. It is NMFS procedure to not provide any written concurrence with a federal action agency's determination that its action will have "no effect" on any ESA-listed species or designated critical habitat. Therefore, effects to Snake River Basin steelhead designated critical habitat and Snake River spring/summer Chinook salmon will not be considered further in this analysis.

The SCNF also determined the proposed action is not likely to adversely affect Snake River spring/summer Chinook salmon designated critical habitat. Our concurrence is documented in the "Not Likely to Adversely Affect" Determinations section (Section 2.12).

2.1 Analytical Approach

This opinion includes a jeopardy analysis. The jeopardy analysis relies upon the regulatory definition of "jeopardize the continued existence of" a listed species, which is "to engage in an action that reasonably 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.

The 2019 regulations define effects of the action using the term "consequences" (50 CFR 402.02). As explained in the preamble to the regulations (84 FR 44976, 44977; August 27, 2019), that definition does not change the scope of our analysis and in this opinion we use the terms "effects" and "consequences" interchangeably.

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

- Evaluate the rangewide status of the species expected to be adversely affected by the proposed action.
- Evaluate the environmental baseline of the species and critical habitat in the action area.
- Evaluate the effects of the proposed action on species and their habitat using an exposure-response approach.
- Evaluate cumulative effects.
- In the integration and synthesis, add the effects of the action and cumulative effects to the environmental baseline, and, in light of the status of the species, analyze whether the proposed action is likely to: directly or indirectly 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.

- If necessary, suggest a reasonable and prudent alternative (RPA) 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' "reproduction, numbers, or distribution" as described in 50 CFR 402.02. The Federal Register notices and notice dates for Snake River Basin steelhead are included in Table 3.

Table 3. - Listing status, of critical habitat designations and protective regulations, and relevant Federal Register decision notices for ESA-listed species considered in this opinion.

Species	Listing Status	Critical Habitat	Protective Regulations
Steelhead (*O. mykiss*)			
Snake River Basin	T 1/05/06; 71 FR 834	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160

Note: Listing status 'T' means listed as threatened under the ESA

This section describes the present status of the Snake River basin steelhead distinct population segment (DPS). NMFS expresses the status of a salmonid evolutionarily significant unit (ESU) or DPS in terms of likelihood of persistence over 100 years (or risk of extinction over 100 years). NMFS uses McElhany 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 (number of adult spawners in natural production areas); (2) productivity (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.

The following section summarizes the status and available information on Snake River Basin steelhead based on the detailed information provided by the ESA Recovery Plan for Snake River Spring/Summer Chinook Salmon & Snake River Basin Steelhead (NMFS 2017a), Status review update for Pacific salmon and steelhead listed under the Endangered Species Act: Pacific Northwest (NWFSC 2015), and 2016 5-year review: Summary and evaluation of Snake River spring-summer Chinook, Snake River Basin steelhead (NMFS 2016)]. These three documents are incorporated by reference here. Additional information (e.g., abundance estimates) has become available since the latest status review (NMFS 2016) and its technical support document (NWFSC 2015). This latest information represents the best scientific and commercial data available and is summarized in the following sections.

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, loss of habitat above the Hells Canyon Dam complex on the mainstem Snake River, 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 status 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 (85 FR 81822). The artificial propagation programs include the Dworshak National Fish Hatchery, Salmon River B-run, South Fork Clearwater B-run, East Fork Salmon River Natural, Tucannon River, and the Little Sheep Creek/Imnaha River programs. The Snake River Basin steelhead listing does not include resident forms of *O. mykiss* (rainbow trout) co-occurring with steelhead.

The Interior Columbia Technical Recovery Team (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, Dworshak Dam blocked the historic North Fork population from accessing spawning and rearing habitat. 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.

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). The Clearwater River drainage alone may have historically produced 40,000 to 60,000 adults (Ecovista et al. 2003), and historical harvest data suggests that steelhead production in the Salmon River was likely higher than in the Clearwater (Hauck 1953). In contrast, at the time of listing in 1997, the 5-year geomean abundance for natural-origin steelhead passing Lower Granite Dam, which includes all but one population in the DPS, was 11,462 adults (Ford 2011). Abundance began to increase in the early 2000s, with the single year count and the 5-year geomean both peaking in 2015 at 45,789 and 34,179, respectively (ODFW and WDFW 2021). Since 2015, the numbers have declined steadily with only 9,634 natural-origin adult returns counted for the 2020-run year (ODFW and WDFW 2021).

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) were meeting minimum abundance/productivity thresholds based on information included in the 2015 status review; however, since that time, abundance has substantially decreased. Only the 5-year (2014-2018) geometric mean of natural-origin spawners of 1,786 for the Upper Grande Ronde population appears to remain above the minimum abundance threshold established by the ICTRT (Williams 2020). 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.

Snake River Basin steelhead in the action area belong to the Lemhi River population, which is intermediate-sized and one of 12 populations in the MPG. Within the Allotment, steelhead have historically used mainstem Big Timber Creek and its tributaries. Currently, there is an estimated 2.96 miles of steelhead presence in Big Timber Creek.

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

Major Population Group	**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. Note: Shaded rows are populations that may be affected by the action.

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

Climate change is affecting aquatic habitat and the rangewide status of Snake River Basin steelhead. The U. S. Global Change Research Program reports average warming of about 1.3°F from 1895 to 2011, and projects an increase in average annual temperature of 3.3°F to 9.7°F by 2070 to 2099 (CCSP 2014). Climate change has negative implications for ESA listed anadromous fishes and their habitats in the Pacific Northwest (CIG 2004; Scheuerell and

Williams 2005; Zabel et al. 2006; ISAB 2007). According to the Independent Science Advisory Board (ISAB), these effects will cause the following:

- Warmer air temperatures will result in diminished snowpack and a shift to more winter/spring rain and runoff, rather than snow that is stored until the spring/summer melt season;
- With a smaller snowpack, watersheds will see their runoff diminished earlier in the season, resulting in lower flows in the June through September period, while more precipitation falling as rain rather than snow will cause higher flows in winter, and possibly higher peak flows; and,

- Water temperatures are expected to rise, especially during the summer months when lower flows co-occur with warmer air temperatures.

These changes will not be spatially homogeneous across the entire Pacific Northwest. Low-lying areas are likely to be more affected. Climate change may have long-term effects that include, but are not limited to, depletion of important cold-water habitat, variation in quality and quantity of tributary rearing habitat, alterations to migration patterns, accelerated embryo development, premature emergence of fry, and increased competition among species.

Climate change is predicted to cause a variety of impacts to Pacific salmon (including steelhead) and their ecosystems (Mote et al. 2003; Crozier et al. 2008a; Martins et al. 2012; Wainwright and Weitkamp 2013). The complex life cycles of anadromous fishes, including salmon, rely on productive freshwater, estuarine, and marine habitats for growth and survival, making them particularly vulnerable to environmental variation. 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).

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).

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 to other freshwater fish species in the Columbia River basin.

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 either be 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).

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 will, 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.

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 (*Carcinus maenas*) increased in Washington and Oregon waters during winters with warm surface waters, including 2014 (Yamada et al. 2015). Similarly, the Humboldt squid (*Dosidicus gigas*) 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).

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).

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 Chinook 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 actions can address the adverse impacts of climate change on Chinook salmon and 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 proposed action will therefore likely occur while climate change-related effects are expected to become more evident within the range of the Snake River Basin steelhead DPS. The grazing permit for this Allotment will run through the end of 2035. Climate change predicts warmer drier climates in much of the Northwest. One of the potential limiting factors in action area streams is water temperature due to yearly variations in seasonal air temperatures and annual snowpack levels. Restricting cattle use of riparian areas will help minimize the effects cattle have on the shade cover of streams, which will help minimize the effects on water temperature. However, it is assumed that streams will continue to increase in temperature with climate change in the future, which will hinder the recovery of anadromous fish in the action area streams.

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).

The Allotment is located within the Timber Creek 5th field HUC (HUC 1706020404), on the Leadore Ranger District of the SCNF. This location is approximately 12 air miles southwest of Leadore, Idaho on NFS lands. This Allotment contains 11,327 acres of NFS lands with no private in holdings.

For purposes of this consultation, the action area is defined as all NFS lands and streams within the Allotment boundary and trailing routes on and off the Allotment (Figure 1). The entire Allotment is within a priority watershed for Snake River spring/summer Chinook salmon and Snake River Basin steelhead. Big Timber Creek is the only stream within the Allotment with Snake River Basin steelhead presence.

2.4 Environmental Baseline

The "environmental baseline" refers to the condition of the listed species or its designated critical habitat in the action area, without the consequences to the listed species or designated critical habitat caused by the proposed action. 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 consultations, and the impact of State or private actions which are contemporaneous with the consultation in process. The consequences to listed species or designated critical habitat from ongoing agency activities or existing agency facilities that are not within the agency's discretion to modify are part of the environmental baseline (50 CFR 402.02).

The action area is used by all freshwater life history stages of threatened Snake River Basin steelhead. Habitat conditions have been influenced by several activities occurring within the action area, including but not necessarily limited to: road development, livestock grazing, and recreation (e.g., hunting, fishing, hiking, trail riding, etc.). Environmental baseline conditions in the action area are described further below.

2.4.1 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, three new water temperature stations have been established within the action area. They are Big Timber Creek 15.9 (T555), Rocky Creek 0.2 (T556), and Trail Creek 0.3 (T557). These continuous monitoring thermographs were installed in the stream in 2019 and the data is scheduled to be retrieved in 2021. Those three thermographs will then be placed back into the stream with multiple years' worth of yearlong data being collected again in 3 to 5 years.

At this time, with no water temperature data collected within the action area, the nearest downstream water temperature data from the Big Timber Creek 11.9 miles (T507) site (within the Swan Basin Allotment) will be used. Overall, observed water temperature regimes within the Big Timber Creek 11.9 miles (T507) monitoring site have fallen within the PACFISH water temperature criteria. There are no streams within the Timber Creek 5th field HUC action area that are listed on Idaho Department of Environmental Quality's (IDEQ) 303(d) list for water temperature (IDEQ 2020). The SCNF indicated that water temperature conditions within the action area are *Functioning Appropriately* for rearing, spawning, and incubation, which is in all areas of the Allotment.

2.4.2 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, stream sediment levels have not been monitored. In 2021, the SCNF plans to establish a new core sampling monitoring site within the Swan Basin Allotment near the water temperature-monitoring site Big Timber Creek T507. This new core-sampling site will then be used to monitor Big Timber Creek stream sediment levels for the Timber Creek Allotment, Swan Basin Allotment, and Cove Creek Allotment. The SCNF currently has an established sediment monitoring station in Big Timber Creek in the vicinity of Basin Creek. This monitoring site (BD23) is on Bureau of Land Management (BLM) lands just downstream of the Cove Creek Allotment and approximately seven stream miles downstream of the action area. Monitoring operations at this site between 1993 and 2020 have identified a significant decrease in levels of fines from 33 percent in 1994 to 22 percent in 2018.

Functionality criteria for instream sediment reflect goal levels identified in the Salmon National Forest Plan, as modified by geologic setting. 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 volcanic and quartzite geologies:

≤25 percent depth fines (<1/4-inch diameter) = FA

26–29 percent depth fines (<1/4-inch diameter) = FR

>30 percent depth fines (<1/4-inch diameter) = FUR

All sites monitored since 2010 are *Functioning Appropriately* because they all fall below the <25% depth fines goal.

2.4.3 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. Large portions of Big Timber Creek within the action area are inaccessible or lightly used by livestock. Analysis of recent monitoring reports, stream photos, high percent stable streambank stability readings, and local knowledge in the BA indicate that the GGW is functioning appropriately.

2.4.4 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 the action area watershed. On the Allotment, the SCNF Watershed Program has conducted long-term streambank stability monitoring at two sites. These data indicate that the Big Timber Creek bank stability at Big Timber Creek (M299) was 93% in 2019, an increase from 87% in 2014. Streambank stability was also monitored twice (2011 and 2016) since the 2011 BA in Big Timber Creek (M300), within the Rocky Creek Unit, and was determined to be 98% stable and 93% stable respectively.

2.4.5 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).

There are two monitoring sites on the Allotment. In 2010, the SCNF began collecting bank alteration, stubble height, and woody browse data. The DMA on Big Timber Creek (M299) on the Trail Creek Unit, which is used on a deferred rotation system, has been read twice since the 2011 BA was completed. The 2019 data show the stream narrowed in width (22.4 feet in 2014 to 20.5 feet in 2019); increased in bank stability (87% in 2014 to 93% in 2019); and increased in GES (49 in 2014 to 76 in 2019). A review of annual indicators at this DMA show that stubble height ranged from five to 16 inches and averaged 10 inches. Bank alteration averaged 7%, and woody use averaged 10%. All indicators have been met in each year apart from stubble height in 2011 when it was five inches and the indicator was six inches.

The DMA on Big Timber Creek (M300), on the Rocky Creek Unit, improved from 80% bank stability in 2011 to 90% in 2016 with 50% of the vegetation considered hydric. Vegetation composition indicates a heavy *Carex* component which is echoed in the bank stability ratings. This improvement in bank stability is also reflected in the improvement of woody species recruitment, which has increased significantly the number of seedling/young. GGW has been reduced over time from 22.5 feet in 2007 to 20.4 feet in 2016. The stubble height annual indicator ranged from six inches to 16 inches, and averaged 10 inches at this DMA. Bank alteration average ranged from 12% to 1%, and averaged 5% overall. Woody use ranged from 8% to 19%, with an average of 11%.

2.4.6 Snake River Basin Steelhead Presence in Action Area

The SCNF and Idaho Department of Fish and Game (IDFG) electrofishing survey data have documented juvenile steelhead presence within the action area. The IDFG has detected multiple life stages of steelhead in Big Timber Creek below Carey Act Dam over the past decade using PIT tags and a series of detection arrays. Juvenile steelhead PIT tagged in Big Timber Creek have been detected through the Federal Columbia River Power System (FCRPS). Adult steelhead have been tracked migrating through the FCRPS and entering lower Big Timber Creek below the Carey Act Dam. At this time, there have been no steelhead redd surveys conducted and no documentation of steelhead spawning within the action area. As such, 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 NFS 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 conditions make it difficult to see redds. Data developed by the Upper Salmon Basin Watershed Project Technical Team identifies a general spawning periodicity for steelhead within Lemhi River tributaries. The data do not identify a specific spawning periodicity for Big Timber Creek. However, the Big Timber Creek drainage is similar in elevation and precipitation to the nearby Hayden Creek drainage for which data are available. With this information, spawning periodicity likely ranges 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 Big Timber Creek. The habitat within this stream reach does not provide 100 percent available steelhead spawning habitat. Some stream sections have too steep of a stream gradient, too large or too small substrate, or other characteristics rendering habitat unsuitable for steelhead spawning. In total, there is an estimated 2.96 miles of potential spawning and rearing habitat for steelhead in Big Timber Creek within the action area. These stream miles reflect continuous mapping reaches and therefore are likely a significant overestimate of actual spawnable area within the Allotment. There is no designated critical habitat for steelhead within the action area.

As previously stated in Section 2.2.1, climate change has the potential to affect ecosystems in nearly all tributaries throughout the Snake River. Given the increasing certainty that climate change is occurring and is accelerating, NMFS anticipates steelhead and their associated habitat within the action area will be affected. Climate change is expected to alter aquatic habitat by impacting streamflow and temperature regimes. These effects, in combination with other baseline conditions within the Lemhi Basin, may lower juvenile salmonid survival rates by impacting juvenile growth, movement, and survival (Walters et al. 2013). Additionally, the effects of climate change are expected to decrease the capacity of habitat within the action area to support successful spawning, rearing, and migration.

The impact of grazing on riparian habitat within the action area has the potential to accelerate stream temperature increases caused by climate change. Overgrazing of riparian vegetation and stream widening due to bank alteration from livestock could result in less shading and shallow stream reaches, therefore causing an increase in water temperature. Additionally, 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. However, management techniques for the proposed action will either maintain or improve riparian habitat within the action area. Therefore, the proposed action is not expected to significantly contribute to the broader adverse effects of climate change to steelhead.

2.5 Effects of the Action

Under the ESA, "effects of the action" are all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action (see 50 CFR 402.17). In our analysis, which describes the effects of the proposed action, we considered 50 CFR 402.17(a) and (b). There are no known additional actions that are expected to occur as a result of this proposed action. This section will evaluate the effects of the action starting from the time of the issuance of this Opinion through 2035.

2.5.1 Effects on Listed Species

Livestock grazing has the potential to affect Snake River Basin steelhead by disturbing rearing salmonids and 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 Big Timber Creek, steelhead generally spawn from March through mid-June with steelhead incubation starting the 3rd week in March and ending the 1st week in July. Grazing does not begin on the Allotment until July 1 or later. The proposed action therefore has the potential to only affect steelhead redds and juveniles on the Trail Creek and Rocky Creek Units when these Units are grazed first, two out of three years (Years 1 and 3) of the grazing rotation. Although the proposed action also has the potential to affect steelhead through impacts to habitat, habitat-related effects are all expected to be minor or very unlikely to occur for this Allotment as described below.

2.5.1.1 Habitat-related Effects

Snake River Basin steelhead 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 physical or biological features (PBFs) are thoroughly discussed for Chinook salmon in Section 2.12 below. Grazing affects instream habitat similarly for all salmonids; therefore, habitat-related effects to steelhead are identical to those described in Section 2.12 below for Chinook salmon. Because the effects on salmonid habitat (i.e., water quality, substrate, natural cover/shelter, riparian vegetation, and forage) 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 in the areas proposed to be grazed. In addition, the SCNF has also included conservative annual use indicators and move triggers that have proven to be effective at maintaining habitat conditions and an adaptive management process. 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.

2.5.1.2 Disturbance

Cattle grazing adjacent to streams, or when crossing, drinking or loafing near streams, could startle or disturb the juvenile steelhead 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: three year grazing rotation strategy, maintaining off-stream water sources; placing salt at least ¼-mile from streams; bi-weekly herding of cows out of riparian areas; using forage utilization standards; and low livestock stocking densities. Despite these measures, cows are likely to spend time adjacent to unfenced, accessible stream reaches on the Allotment, particularly in later summer when it is dry and there is less available forage.

For juvenile steelhead, 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 mortality (behavioral effect only). Within the action area both streambank condition and large woody debris are functioning appropriately 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 will not result in harm because habitat conditions in the action area should provide suitable escape cover nearby.

2.5.1.3 Steelhead Redd Trampling

Steelhead spawning habitat on the Allotment occurs on Big Timber Creek within the Trail and Rocky Units (Table 5). In Big Timber Creek, steelhead generally spawn from March through mid-June with steelhead incubation starting the third week in March and ending the first week in July. Grazing does not begin on the Allotment until July 1 or later, leaving an approximate one week window when steelhead redds are vulnerable to trampling. The proposed action therefore has the potential to only affect steelhead redds on the Trail Creek and Rocky Creek Units two out of three years of the grazing rotation (Table 5), the years when one of these two Units are grazed first.

Table 5 - Steelhead spawning habitat within Big Timber Creek Allotment potentially accessible to livestock trampling.

Year	Grazing Unit	Stream Name	Total Spawning Habitat (mi)	Spawning Habitat Accessible to Livestock (mi)
1	Trail Creek	Big Timber Ck.	1.37	1.37
2	Short Creek	N/A	0	0
3	Rocky Creek	Big Timber Ck.	1.59	1.59

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 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 that can lessen the degree of effects from grazing include active measures to keep cattle off stream channels such as 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.

To estimate the number of steelhead redds which could be accessible to livestock trampling in the Allotment during early July, NMFS used the SCNF estimated suitable steelhead spawning and incubation habitat stream miles (Table 6). There is no record of steelhead redd data for streams in this action area. Therefore, 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 Big Timber Creek within the Allotment (IDFG 1999). Additionally, although there is no record of steelhead redd data, Big Timber Creek has a high intrinsic potential for spawning and rearing steelhead (NMFS 2006). Considering the redd densities and intrinsic potential for this stream reach, NMFS estimated an average density of approximately 1.3 redds per mile for this section of Big Timber Creek.

Table 6. - Maximum steelhead redds potentially vulnerable to livestock trampling by Year.

Year	Grazing Unit	Stream Name	Total Spawning Habitat (mi)	Spawning Habitat Accessible to Livestock (mi)	Maximum Redds Per Mile	Maximum Redds Per Stream Segment
1	Trail Creek	Big Timber Ck.	1.37	1.37	1.3	1.78
2	Short Creek	N/A	0	0	N/A	N/A
3	Rocky Creek	Big Timber Ck.	1.59	1.59	1.3	2.07

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. Because permittees and the SCNF intend to reduce livestock use of riparian areas as much as possible via routine riding, upland water, the presence of an abundance of quality upland food sources early in the grazing season, and other management techniques, NMFS assumed a potential trampling rate of 12 percent, which is the lowest rate identified by Gregory and Gamett (2009) for the lowest stocking intensity index of pastures evaluated. This assumption is considered reasonable since Gregory and Gamett's (2009) study included streams within allotments where grazing use was focused near or adjacent to at-risk redds, and exposure risk in this Allotment occurs when cattle drift away from the upland grazing areas and reach the channel primarily during watering or channel crossings.

When livestock are moved onto the Allotment in early July, they have historically favored upland/off-stream water and food sources away from Big Timber Creek within the off portion of the Allotment. Additionally, 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). Salt licks will also be kept at least ¼ mile away from all streams. The SCNF low stocking density (i.e., approximately 60 HMs) and routine riding should further reduce riparian use minimizing trampling potential. For steelhead, this estimate may still be high as bull trout are fall spawners, and cattle use of riparian areas is higher in late summer/fall than spring/early summer (Parsons et al. 2003; McInnis and McIver 2009). Applying these rates to Big Timber Creek within the Allotment, NMFS calculated the number of steelhead redds that could potentially be trampled within Big Timber Creek using the trampling rate of 12 percent. Therefore, NMFS estimates that up to one (0.21) steelhead redd could potentially be exposed and trampled during Year 1 and up to one (0.25) in Year 3, with most years likely resulting in zero redds exposed or trampled. No redds are expected to be trampled in Year 2 of the three year grazing rotation because steelhead are not found in streams on the Short Creek Unit.

Although NMFS was able to estimate the approximate number of steelhead redds vulnerable to trampling on the Allotment on an annual basis, the likelihood of such an event occurring is reduced due to site conditions during spawning and incubation, accessibility of livestock to the stream, the short duration of grazing overlap with the steelhead redd incubation period, and proposed management techniques for the action. For these reasons, trampling of up to one steelhead redd, in Year 1 and 3 of the grazing rotation, for the next 15 years is used only to gauge the relative risk of the potential impact and should not be viewed as an absolute number of redd trampling events likely to occur.

To estimate the population level effects of potential redd trampling, NMFS converted these numbers to adult equivalents lost from the population. Roberts and White's (1992) study of angler related 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, with up to one steelhead redd being trampled in Year 1 and Year 3, we estimate that this will result in about one fewer returning adult steelhead (0.3 adult equivalent x 2 years = 0.6 adult equivalent) for every three years the Allotment is grazed.

Although we were able to estimate the numbers of steelhead redds that could be affected each year by grazing, the small size of steelhead redds, combined with high spring stream flows, turbid conditions associated with those higher stream flows, and difficulty with FS personnel accessing sites to look for redds or redd trampling make it extremely difficult to tally either the number of redds present or the number of redds actually trampled in any given year. Therefore, NMFS instead looks to streambank alteration as an indication of potential for redd trampling. Redd trampling is most likely to occur when cattle concentrate in riparian areas, with trampling occurring when cows cross or enter streams to water. Similarly, the likelihood of redd trampling increases with both the number of livestock present and with the time spent by those livestock in riparian areas. Streambank alteration, which is already being monitored, provides an indication of the amount of time cattle are spending in riparian zones, increasing with both the number of livestock present and with the time spent by those livestock in riparian areas.

Summary. As previously described, the proposed action both temporally and spatially overlaps spawning and incubation periods of Snake River Basin steelhead. Proposed mineral placements, use of riders, use of preferred upland grazing and water sources in the early season, 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 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 and Year 3 of the grazing rotation. This will result in approximately one fewer adult steelhead returning every three years from grazing under the proposed action. The likelihood of livestock trampling the maximum number of redds (one) is low.

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 and 402.17(a)]. 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. The action area occurs entirely on federal land, and 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. Recreation, including activities like trail riding, hiking, fishing, and hunting are expected to continue to occur in the action area, likely at rates similar to those occurring today. NMFS is not aware of any other 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.

Some continuing non-Federal activities are reasonably certain to contribute to climate effects within the action area. However, it is difficult if not impossible to distinguish between the action area's future environmental conditions caused by climate change that are properly part of the environmental baseline *vs.* cumulative effects. Therefore, all relevant future climate-related environmental conditions in the action area are described in the environmental baseline (Section 2.4).

2.7 Integration and Synthesis

The Integration and Synthesis section is the final step in our assessment of the risk posed to species and critical habitat 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.

Many individual steelhead populations are not meeting recovery plan abundance and productivity targets, and the species remains threatened with extinction. Snake River Basin steelhead in the action area belong to the Lemhi River Population. The current status of this population is 'maintained' with a target status of viable (NMFS 2016). There are insufficient data to generate adult abundance and productivity estimates for the population (NMFS 2016). However, during 2016-2020, abundance of this population is presumed to have declined substantially, as it has for the DPS as a whole. 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.

Furthermore, climate factors will likely make it more challenging to increase abundance and recover the species (NMFS 2017a). Climate change is expected to alter aquatic habitat by impacting streamflow and temperature regimes. These effects, in combination with other baseline conditions within the Lemhi Basin, may lower juvenile salmonid survival rates by impacting spawning, rearing, and migration for steelhead. However, due to management techniques proposed for the action, livestock grazing in the action area is not expected to significantly contribute to the broader adverse effects of climate change to steelhead.

Regarding the effects of the proposed action, steelhead in the action area could potentially experience adverse effects associated with redd trampling, disturbance, and habitat-related effects. However, the effects of disturbance are expected to be infrequent and minor because of the proposed conservation measures, limited livestock accessibility to the stream, low stocking density, and ability of fish to find cover within the stream reach if disturbed. The effects of habitat-related impacts are also expected to be minor and/or very unlikely to occur due to RMOs currently being met in the areas proposed to be grazed, as well as application of conservative annual use indicators and move triggers that have proven effective at maintaining habitat conditions, and implementation of an adaptive management process when and where necessary. The baseline conditions of habitat in the action area are expected to be maintained or to improve over the course of the 15-year action. The main effect to Snake River Basin steelhead will be from the potential trampling of redds. The following adverse effects are expected:

- Up to one Snake River Basin steelhead redd could be trampled in Years 1 and 3 of each three-year grazing rotation on the Allotment (i.e, 10 out of 15 years).

The estimated trampling of up to one Snake River Basin steelhead redd in Years 1 and 3 , of each three year grazing rotation, will result in approximately one fewer adult steelhead (0.6) returning every three years from grazing under the proposed action. However, the likelihood of livestock trampling the maximum number of redds (one) either in Year 1 or 3 is low on the Allotment.

Using 2010-2012 natural origin adult return estimates from the status review (NWFSC 2015), the maximum loss of up to one adult steelhead every three years from the Lemhi River population represents less than 1% of the estimated run population size (428 to 680). Effects to individual fish may potentially affect the attributes associated with a VSP (i.e., abundance, productivity, spatial structure, and genetic diversity that support the species' ability to maintain itself naturally at a level to survive environmental stochasticity). However, the anticipated level of effects to individuals are not anticipated to result in tangible impacts to Snake River Basin steelhead for the Lemhi River population. This is due to the low number of steelhead redds present within the action area and low numbers of livestock being able to access areas of suitable spawning habitat given the wide annual variability in adult and juvenile returns and seasonal variations in habitat use. The population scale loss of one individual adult every three years will not affect the abundance and productivity of the Lemhi River population. Similarly, the affect will not change the spatial structure or diversity of the population. The current status of the Lemhi River population is maintained, and the effects of the action will not change this status. Similarly, the effect at the scale of the MPG (Salmon River MPG will not change). The proposed action also supports recovery of this population (and consequently the MPG) because of efforts to improve riparian and instream function over time, which will support increased productivity.

The action area occurs entirely on federal land, and 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. Therefore, there will be no cumulative effects for the proposed action.

When considering the status of the species, environmental baseline, and cumulative effects, adding in the potential effects from the proposed action will not appreciably increase the risk of extinction for any populations included in the Snake River Basin steelhead DPS. Because the VSP criteria for the populations will not be negatively influenced, neither the current viability nor the recovery potential of the MPGs and ESU/DPS will be appreciably diminished.

2.8 Conclusion

After reviewing and analyzing the current status of the listed species and critical habitat, the environmental baseline within the action area, the effects of the proposed action, the effects of other activities caused by the proposed action, and cumulative effects, it is NMFS' opinion that the proposed action is not likely to jeopardize the continued existence of Snake River Basin steelhead.

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). "Harass" is further defined by interim guidance as to "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 steelhead. In the opinion, NMFS determined that incidental take is reasonably certain to occur from redd trampling.

2.9.1.1 Steelhead Redd Trampling

Through implementation of the proposed action, grazing is expected to occur in the same time and place as Snake River Basin steelhead egg/embryo incubation for approximately one to three weeks. The proposed off-channel salt placements, preferred upland grazing and water usage in the early season, bi-weekly riding, and conservative move-triggers/annual use standards, as well as inaccessible reaches of the stream for livestock, 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 in other years. 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 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 may potentially 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, NMFS will not identify the amount of take, but will identify a surrogate for incidental take, consistent with 50 CFR 402.14(i).

Similarly, it is difficult for NMFS to quantify the extent of take for steelhead. 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 livestock present and with the time spent by those livestock in riparian areas. Similarly, the likelihood of redd trampling increases with both the number of livestock present and with the time spent by those livestock 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 the Unit DMA and elsewhere in the Allotment. Therefore, NMFS will use percent streambank alteration as the surrogate for take for steelhead in this opinion.

The SCNF proposed bank alteration limits of 20 percent or less. 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 Year 1 and 3 of the grazing rotation. Therefore, NMFS has established the extent of incidental take limit as:

> In the Trail Creek and Rocky Creek Units, during periods of spawning and incubation (3rd week of March to July 8), bank alteration shall not exceed: (1) 10 percent where bank stability is <70%; (2) 15 percent where bank stability is 70% to 89%; or (3) 20 percent where the bank stability RMO is being met (i.e., >90%).

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 (i.e., due to monitoring and move triggers). In addition, bank alteration monitoring is typically conducted within two weeks of livestock having been moved from a Unit, which means regular monitoring for bank alteration occurs at the end of a Unit's grazing, which could take place several weeks or months after the completion of steelhead spawning and incubation. This incidental take limit requires that real-time, early season bank alteration levels be monitored where grazing overlaps the steelhead spawning and incubation period to ensure exceedances do not occur. Therefore, bank alteration monitoring should occur no later than the July 8 conclusion of steelhead redd incubation. This monitoring is in addition to bank alteration monitoring typically conducted within two weeks of livestock being removed from a Unit.

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 measures that are necessary or appropriate to minimize the impact of the amount or extent of incidental take (50 CFR 402.02).

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

In order to be exempt from the prohibitions of section nine of the ESA, the Federal action agency must comply (or must ensure that any applicant complies) with the following terms and conditions. The SCNF or any applicant/permittee 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 entity 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 extent of incidental take is not exceeded by ensuring streambank alteration levels, along Big Timber Creek where Snake River Basin steelhead redd trampling could occur (i.e., Trail Creek and Rocky Creek Units), does not exceed the following levels at any time during the identified Snake River Basin steelhead incubation period for the action area (the 3rd week in March through July 8):

   (1) 10% in Units where streambank stability conditions are less than 70%;

   (2) 15% in Units where bank stability conditions are 70% to 89%;

   (3) 20% in Units where the bank stability RMO is being met (i.e., >90%).

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

   (c) To further reduce steelhead redd trampling potential on the Allotment within Big Timber Creek, the SCNF shall implement one of the following:

   i. Immediately trigger the proposed adaptive management process (Appendix A) if streambank alteration at the end of the Snake River Basin steelhead incubation period (July 8) in the Trail Creek or Rocky Creek Units is: (1) >5% when bank stability is less than 70%; (2) >10% when bank stability is 70% to 89%; or (3) >15% when bank stability RMO is being met (i.e., >90%).

1. 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.

ii. Or., do not turn livestock out on the Trail Creek or Rocky Creek Units before July 8 in Years 1 and 3 of the grazing rotation to avoid the steelhead incubation period.

(d) Riding shall occur (1 to multiple days per week) to encourage livestock distribution away from potential Snake River Basin steelhead spawning habitats, whenever cattle are grazing the Trail Creek or Rocky Creek Units during the steelhead incubation period (the 3rd week in March to July 8).

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

(f) 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.

(g) The SCNF and their permittees shall ensure that all water developments that reduce cattle use adjacent to streams with ESA-listed fish species are properly maintained and functioning as intended.

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

(a) Each 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:

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

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

iii. 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.

iv. Discussion of any unauthorized use and/or any maintenance issues related to fences or water developments as it pertains to Units with ESA-listed fish species or designated critical habitat.

v. Brief review of Allotment management and compliance successes and failures as it pertains to Units with ESA-listed fish species or designated critical habitat.

vi. 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.

vii. A clear description of compliance with the terms and conditions and any exceedances of the extent of take contained in this ITS.

viii. Any management recommendations for subsequent years.

(c) The SCNF shall submit post-project report to:

- nmfswcr.srbo@noaa.gov

Or:

National Marine Fisheries Service
Attention: WCRO-2021-01011
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).

1. To mitigate the effects of climate change on ESA-listed salmonids, follow recommendations by the ISAB (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 permittee to adjust the timing of the Allotment to better protect accessible stream reaches during periods of steelhead spawning/incubation periods. Where feasible, give preference to grazing areas with inaccessible stream reaches (i.e., 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. Core sampling data should be collected from the new monitoring site on the Swan Basin Allotment, as mentioned in the BA, beginning in the 2022 grazing season or earlier. Data from this site should be collected every five years or less and incorporated into monitoring reporting.

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 for the Timber Creek Cattle and Horse Grazing Allotment.

As 50 CFR 402.16 states, reinitiation of consultation is required and shall be requested by the Federal agency or by NMFS 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 identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the biological opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action.

2.12 "Not Likely to Adversely Affect" Determinations

2.12.1 Effects on Designated Critical Habitat for Snake River Spring/summer Chinook Salmon

The SCNF determined that the proposed action was not likely to adversely affect (NLAA) Snake River spring/summer Chinook salmon designated critical habitat within the action area. The designations of critical habitat for ESA-listed salmonids use the term primary constituent element (PCE) or essential features. The 2016 critical habitat regulations (50 CFR 424.12) replaced these terms 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 opinion, we use the term PBF to mean PCE or essential feature, as appropriate for the specific critical habitat.

In evaluating the condition of designated critical habitat, NMFS examines the condition and trends of PBFs, which are essential to the conservation of the ESA-listed species because they support one or more life stages of the species. Proper function of these PBFs is necessary to support successful adult and juvenile migration, adult holding, spawning, incubation, rearing, and the growth and development of juvenile fish. Modification of PBFs may affect freshwater spawning, rearing or migration in the action area. Generally speaking, sites required to support one or more life stages of the ESA-listed species (i.e., sites for spawning, rearing, migration, and foraging) contain PBF essential to the conservation of the listed species (e.g., spawning gravels, water quality and quantity, side channels, or food) (Table 7). Potential effects to designated critical habitat and PBFs will be discussed in more detail below.

Table 7. - Essential physical and biological features for spring/summer Chinook salmon life stages and associated sites.

Site	Essential Physical and Biological Features	Species Life Stage
Spawning and juvenile rearing	Spawning gravel, water quality and quantity, cover/shelter (Chinook only), food, riparian vegetation, space (Chinook only), water temperature and access (sockeye only)	Juvenile and adult
Migration	Substrate, water quality and quantity, water temperature, water velocity, cover/shelter, food[a], riparian vegetation, space, safe passage	Juvenile and adult

[a] Food applies to juvenile migration only.

Table 8 describes the geographical extent within the Snake River of critical habitat for Snake River spring/summer Chinook salmon. Critical habitat includes the stream channel and water column with the lateral extent defined by the ordinary high-water line, or the bankfull elevation where the ordinary high-water line is not defined. In addition, critical habitat for the Chinook salmon includes the adjacent riparian zone, which is defined as the area within 300 feet of the line of high water of a stream channel or from the shoreline of standing body of water (58 FR 68543). The riparian zone is critical because it provides shade, streambank stability, organic matter input, and regulation of sediment, nutrients, and chemicals.

Table 8. - Geographical extent of designated critical habitat within the Snake River for ESA-listed salmon and steelhead.

Evolutionarily Significant Unit (ESU)/ Distinct Population Segment (DPS)	Designation	Geographical Extent of Critical Habitat
Snake River spring/summer Chinook salmon	58 FR 68543; December 28, 1993 64 FR 57399; October 25, 1999	All Snake River reaches upstream to Hells Canyon Dam; all river reaches presently or historically accessible to Snake River spring/summer Chinook salmon within the Salmon River basin; and all river reaches presently or historically accessible to Snake River spring/summer Chinook salmon within the Hells Canyon, Imnaha, Lower Grande Ronde, Upper Grande Ronde, Lower Snake–Asotin, Lower Snake–Tucannon, and Wallowa subbasins.

2.12.2 Effects on Critical Habitat

Numerous 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 reductions in riparian vegetation and natural cover, 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 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 1995 and 1998 consultations 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. Streams that have the potential to be crossed within the Timber Creek Allotment during entry and exit off the Timber Creek Allotment include Big Timber and Rocky Creeks. Big Timber, Rocky, and Trail Creeks could potentially be crossed during Unit moves. The SCNF has identified 1.75 miles of Big Timber Creek, within the action area, as supporting designated critical habitat for Chinook salmon.

Livestock trailing is supervised by multiple riders limiting opportunities for cattle to access riparian areas outside of the areas identified for stream crossing. As livestock cross streams, a small turbidity pulse is likely to occur following each instance. However, each short duration and low intensity turbidity pulse will have insignificant effects on water quality and will resuspend or introduce only minor levels of sediment. Given water quality is high, and sediment levels are functioning appropriately throughout most of the watershed, minimal use of fords by supervised trailing will have short-term insignificant effects on short stretches of critical habitat (i.e., a few meters). 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 includes 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 one day every two weeks throughout the grazing season, but often increase riding efforts when recreational use increases and the potential for gates to be left open is increased (typically in the fall when hunting season starts, August 30 archery for deer). This permittee 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). 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 functioning appropriately and allow indicators that are functioning at risk to recover at near natural rates.

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 FS 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 seven to nine 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 eight inches; they suggested that stubble heights greater than eight 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 six 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 four inches or eight 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 four inches will likely be effective in minimizing livestock damage to streambanks on the Allotment, if permittee compliance rates remain high, because streambank conditions are currently meeting RMOs.

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 when RMOs are being met and 20 percent when 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." The SCNF proposes a 20 percent maximum streambank alteration standard during in-season and end-of-season grazing. Based on Cowley (2002) and baseline data showing that streambanks in the Allotment are in the desired condition, we expect this standard to effectively minimize negative impacts to streambanks from grazing; maintaining properly functioning conditions in streams and riparian areas on the Allotment. 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.

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 a combination of meadow, wooded, and narrow valley streams. Therefore, use of a combination of move triggers/endpoint indicators will be appropriate for this Allotment.

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. 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 over utilize 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 adverse effects to occur. Under the proposed action, adverse 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 following discussion on PBFs applies to potential effects of the proposed action on unoccupied salmon freshwater spawning, rearing, and migration sites within the action area.

<u>PBF's - Freshwater Spawning, Rearing, and Migration Sites.</u>

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 have improved since the 2011 BA, and W:D are within the natural range of variability. Water temperatures in Big Timber Creek just below the Allotment boundary are meeting PACFISH RMOs. Since the 2011 BA, three new water temperature stations have been established within the Allotment (i.e., Big Timber Creek 15.9 (T555), Rocky Creek 0.2 (T556) and Trail Creek 0.3 (T557)). These continuous monitoring thermographs were installed in the stream in 2019 and the data is scheduled to be retrieved in 2021. Temperature data at the sites is scheduled to be collected again in 3 to 5 years. 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.

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.

Substrate – Available data from grazed areas downstream of the action area indicates sediment levels in gravels are meeting SCNF standards for granitic, volcanic, and sedimentary geologies within Big Timber Creek. Because the proposed action is nearly identical to the grazing that has occurred during the recent past and an additional Big Timber Creek core sampling monitoring site will be established to provide further tracking of sediment levels, 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 functioning appropriately 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.

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 (one to six 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 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. Should riparian areas develop that are not meeting RMOs, the SCNF proposes to use adaptive management to prescribe more restrictive utilization standards, 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 Chinook 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 scale.

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. 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.

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 20 percent maximum streambank alteration standard and 4-inch minimum stubble height will maintain stream habitat conditions that are currently functioning appropriately.

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 (through adaptive management) should they become degraded.

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.

3. 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.

3.1 Utility

Utility principally refers to ensuring that the information contained in this consultation is helpful, serviceable, and beneficial to the intended users. The intended user of this opinion is the SCNF. Other interested users could include permittees and others interested in the conservation of the affected ESU/DPS. Individual copies of this opinion were provided to the SCNF. The document will be available within 2 weeks at the NOAA Library Institutional Repository (https://repository.library.noaa.gov/welcome). The format and naming adheres to conventional standards for style.

3.2 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.

3.3 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 the 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 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 reviewed in accordance with West Coast Region ESA quality control and assurance processes.

4. 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.

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., M.W. Wiley, M. H. Ruckelshaus, R. N. Palmer, E. Korb, K. K. Bartz, and H. Imaki. 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.

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., D. R. Craddock, and D. R. Corley. 1968. Migration and survival of Redfish Lake, Idaho, sockeye salmon, *Oncorhynchus nerka*. Transactions of the American Fisheries Society. 97:360–373.

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.

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. and B. F. Webster. 1990. Riparian grazing guidelines for the Intermountain Region. Rangelands 12(4):209-212.

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.

Climate Change Science Program (CCSP). 2014. Climate Change Impacts in the United States. Third National Climate Assessment. U.S. Global Change Research Program. DOI:10.7930/J0Z31WJ2.

Climate Impacts Group (CIG). 2004. Overview of Climate Change Impacts in the U.S. Pacific Northwest, 7/29/2004.

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.

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.

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.

Felts, E. A., B. Barnett, M. Davison, C. J. Roth, J. R. Poole, R. Hand, M. Peterson, and E. Brown. 2019. Idaho adult Chinook Salmon monitoring. Annual report 2018. Idaho Department of Fish and Game Report 19–10.

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.

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. https://www.westcoast.fisheries.noaa.gov/publications/status_reviews/salmon_steelhead/multiple_species/5-yr-sr.pdf

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.

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.

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.

Hauck, F. R. 1953. The Size and Timing of Runs of Anadromous Species of Fish in the Idaho Tributaries of the Columbia River. Prepared for the U.S. Army Corps of Engineers by the Idaho Fish and Game Department, April 1953. 16 pp.

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.

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.

ICTRT (Interior Columbia Technical Recovery Team). 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.

IDEQ. 2020. Idaho's 2018/2020 Integrated Report, Final. IDEQ. Boise, Idaho. 142 p. October 2020

ISAB (Independent Scientific Advisory Board). 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.

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 occurrences of Humboldt Squid in the northern California Current System. California Cooperative Oceanic Fisheries Investigations Report. December 2011 Vol. 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.

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.

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.

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, 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., E. A. Parson, A. F. Hamlet, et al. 2003. Preparing for Climatic Change: The Water, Salmon, and Forests of the Pacific Northwest. Climatic Change 61:45-88.

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. 1995. Endangered Species Act Section 7 Consultation Biological Opinion for Implementation of Interim Strategies for Managing Anadromous Fish-producing Watersheds in Eastern Oregon and Washington, Idaho, and Portions of California (PACFISH). January 23, 1995

NMFS. 2006. Intrinsic potential for spawning and rearing, steelhead. National Marine Fisheries Service, NW Fisheries Science Center, Seattle, Washington.

NMFS. 2016. 2016 5-year review: Summary and evaluation of Snake River sockeye, Snake River spring-summer Chinook, Snake River fall-run Chinook, Snake River basin steelhead. NOAA Fisheries, West Coast Region. 138 p.

NMFS. 2017a. ESA Recovery Plan for Snake River Spring/Summer Chinook & Steelhead. NMFS. https://www.westcoast.fisheries.noaa.gov/publications/recovery_planning/salmon_steelhead/domains/interior_columbia/snake/Final%20Snake%20Recovery%20Plan%20Docs/final_snake_river_spring-summer_chinook_salmon_and_snake_river_basin_steelhead_recovery_plan.pdf

NWFSC (Northwest Fisheries Science Center). 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.

ODFW and WDFW. 2021. 2021 Joint Staff Report: Stock Status and Fisheries for Spring Chinook, Summer Chinook, Sockeye, Steelhead, and other Species. Joint Columbia River Management Staff. 107 pp.

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. A field test of effects of livestock grazing regimes on invertebrate food webs that support trout in central rocky mountain streams. Annual Report, Colorado State University, Fort Collins, CO.

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.

Scheuerell, M. D. and J. G. WIlliams. 2005. Forecasting climate-induced changes in the survival of Snake River spring/summer Chinook salmon (Oncorhynchus tshawytscha). Fisheries Oceanography 14(6):448–457.

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.

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 Technical Team, 2005. Upper Salmon River Recommended Instream Work Windows and Fish Periodicity. For River Reaches and Tributaries Above the Middle Fork Salmon River Including the Middle Fork Salmon River Drainage. Revised November 30, 2005.

USDI Bureau of Land Management (BLM). 1999 Sampling Vegetation Attributes. Interagency Technical Reference 1734-4. Cooperative Extension Service. P 163.

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.

USFS. 2021. Aquatic Species Biological Assessment for Livestock Grazing on the Timber Creek Cattle and Horse Allotment. Leadore Ranger District. Salmon-Challis National Forest. Lemhi County, Idaho. April 14, 2021.

Walters. A.W., K.K. Bartz, and M.M. McClure. 2013. Interactive effects of water diversion and climate change for juvenile chinook salmon in the Lemhi River Basin. Conservation Biology, December 2013.Williams, M. 2020. Geomean data sheet with five year averages for Interior salmon and steelhead populations (UCR and MCR steelhead, Chinook, SR steelhead, sockeye, fall Chinook). Communication to L. Krasnow (NMFS) from M. Williams (NOAA Affiliate, NWFSC), 2/14/2020.

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.

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.

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.

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.

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.

Zabel, R. W., M. D. Scheuerell, M. M. McClure, et al. 2006. The Interplay Between Climate Variability and Density Dependence in the Population Viability of Chinook Salmon. Conservation Biology 20(1):190-200, 2/1/2006.

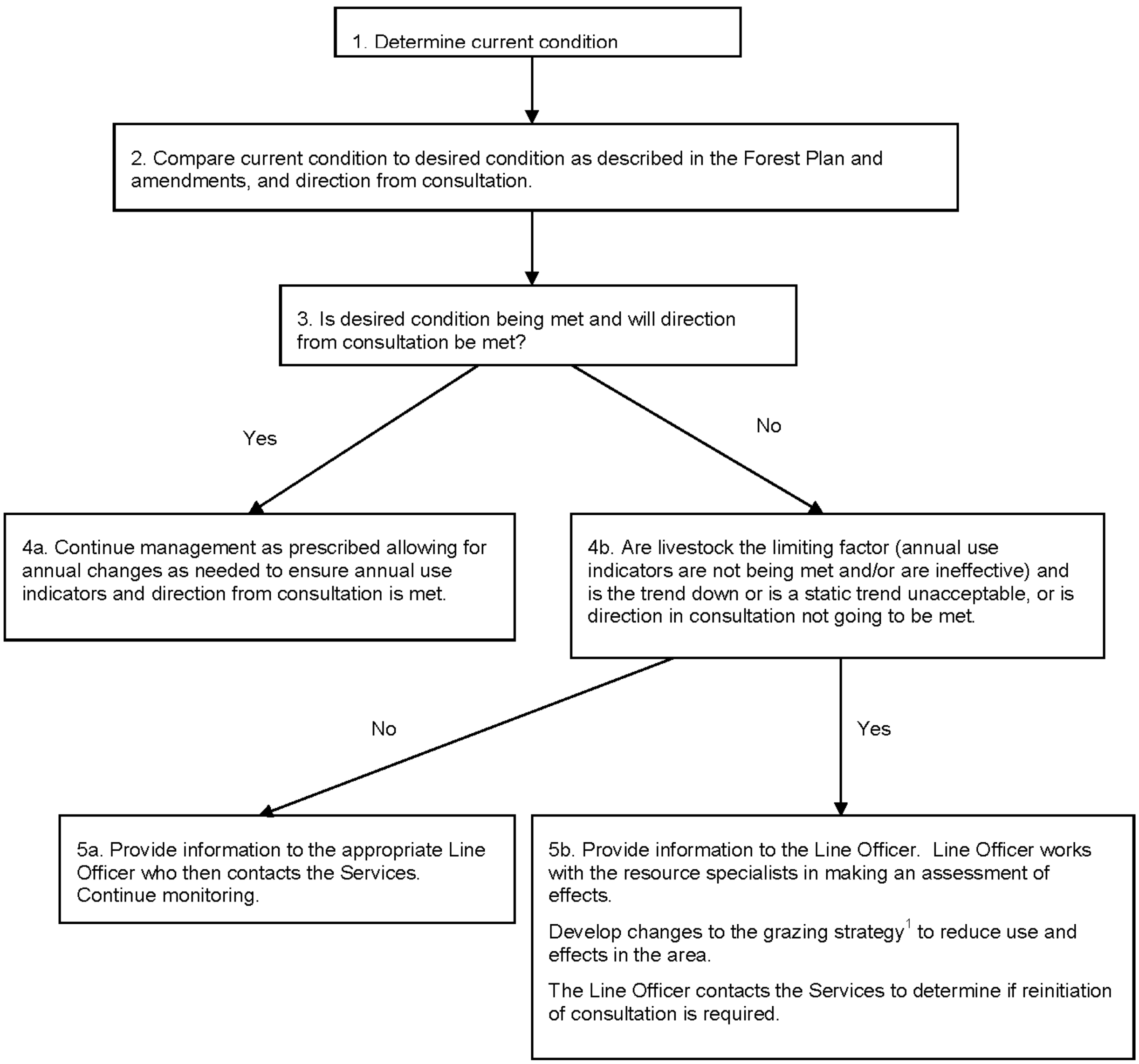
Zoellick, B. W. 2004. Density and biomass of redband trout relative to stream shading and temperature in southwestern Idaho. Western North American Naturalist. 64(1). pp. 18-26.

5. APPENDIX A

Salmon Challis National Forest

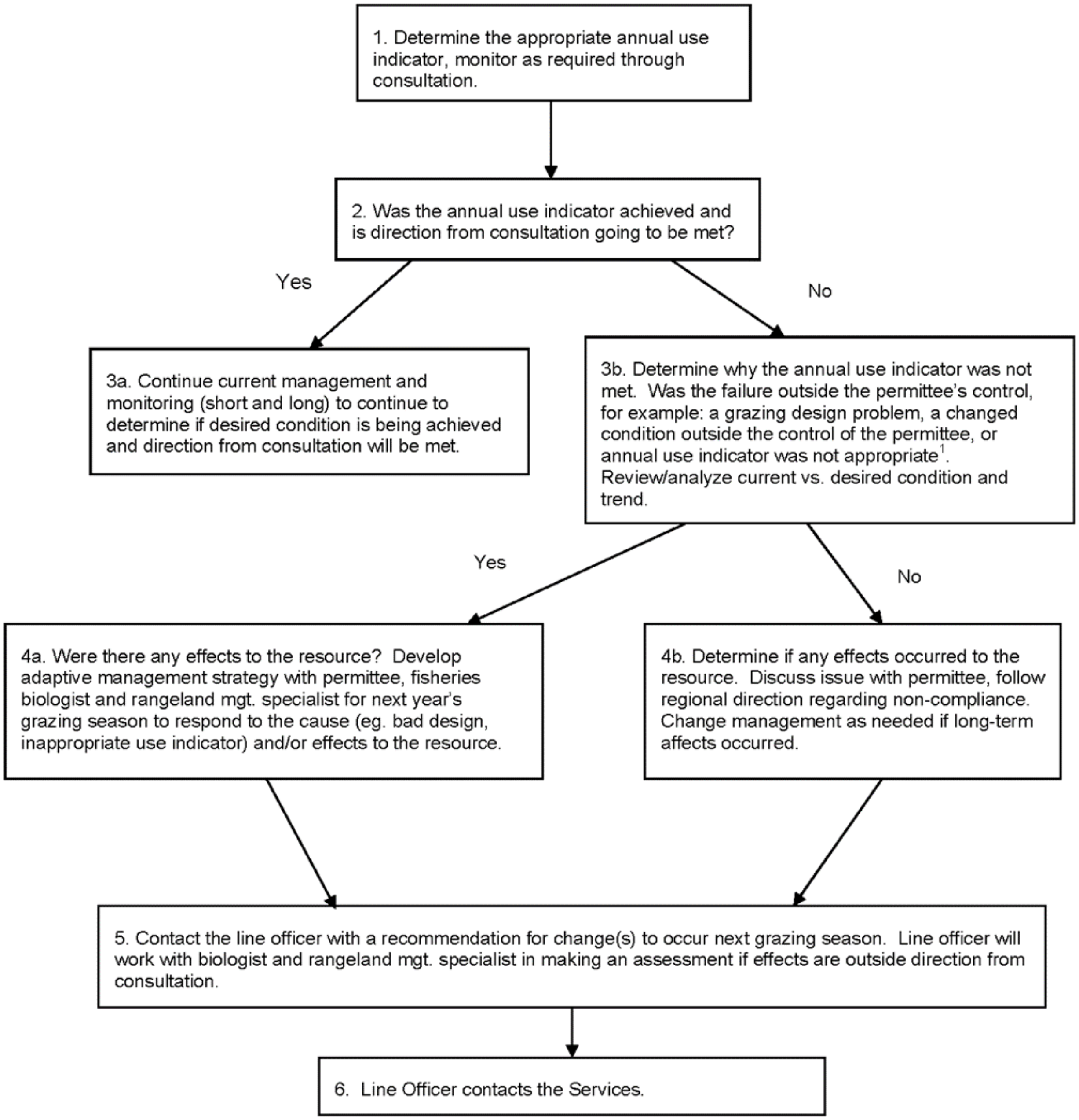
Adaptive Management Strategy for Grazing Allotments

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.



[1]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, changing to a more appropriate indicator will help achieve or maintain desired conditions.