Aquatic Species Biological Assessment for the Squaw Creek Cattle Allotment

CHALLIS-YANKEE FORK RANGER DISTRICT

SALMON-CHALLIS NATIONAL FOREST

CUSTER COUNTY, IDAHO

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1 INTRODUCTION

The Challis-Yankee Fork Ranger District of the Salmon-Challis National Forest (SCNF) is proposing to authorize livestock grazing activities associated with the Squaw Creek Allotment. This biological assessment describes the proposed action, discusses the probable impacts of that action on listed species, and makes an effect determination for any listed species that may be affected by the proposed action. This biological assessment forms the basis for any necessary consultation with the Fish and Wildlife Service and the National Marine Fisheries Service (together, the Services) pursuant to Section 7 of the Endangered Species Act (ESA) of 1973 (as amended) and its implementing regulations. This biological assessment replaces all previous consultations associated with this allotment. The regulations for consultation require the action agency to re-initiate consultation if certain triggers are met (50 CFR 402.16). Occasionally during the implementation of a proposed action, changes in circumstances, situations, or information can raise the question as to whether those re-initiation thresholds have been reached. Should that situation occur the SCNF, will assess the changes and any potential impacts to listed species, review the re-initiation triggers, coordinate with the Services for advice (if needed) and arrive at a determination whether re-initiation of consultation is necessary.

2 BACKGROUND INFORMATION

Squaw Creek Allotment is a 52,086 acre allotment located southwest of the town of Challis and north of Clayton in the Upper Salmon River Basin (Figures 1 and 2). The allotment is within three U.S. Geologic Survey 5th field hydrologic unit code (HUC) watersheds: Squaw Creek HUC 1706020109, Salmon River-Slate Creek HUC 1706020108, and Bayhorse Creek-Salmon River HUC 1706020114 (Figure 3). Most of the allotment is in the Squaw Creek Watershed, a SCNF steelhead priority watershed (Figure 3). Most of the Squaw Creek Watershed is public land managed by the SCNF (80%) and the BLM Challis Field Unit (19%). The remaining 1% of the watershed is private land. SCNF management objectives for the Squaw Creek priority watershed are a sustainable, productive fishery and an active cattle allotment.

The perennial fish-bearing streams in this allotment include Squaw, Martin, Cinnabar, Bayhorse, and Cash creeks. The Squaw Creek Allotment has populations of steelhead and bull trout, and designated critical habitat for these species (Figures 5 and 6). There are no Chinook salmon in this allotment, although there is designated Chinook salmon critical habitat (Figure 4).

The dominant stream flow patterns are snowmelt. Peakflows typically occur in early summer; low flows occur during the winter months. The primary natural vegetation types are sagebrush steppe, coniferous forests, deciduous riparian, coniferous riparian, subalpine, and alpine communities. Most of the greenline vegetation is mid-seral.

Significant management actions in the allotment action area include livestock grazing, roading, and dispersed recreation. Other management actions in the allotment watersheds include mining, fire suppression, stream diversions, and private land development.

3 PROPOSED ACTION

3.1 PROJECT AREA

The allotment consists of seven units - Lower Squaw Creek, Riparian Pasture, Trealor Creek, Upper Squaw Creek, Kinnikinic Creek, Happy Hollow, and Juliette. The Happy Hollow, Juliette, and Kinnikinic Creek units are not within fisheries priority watersheds; there is no occupied Chinook salmon, steelhead, or bull trout habitat; and there is no Chinook salmon or steelhead critical habitat in these units (Figures 3-6). There is unoccupied bull trout critical habitat in Bayhorse Creek in the Juliette Unit.

The Lower Squaw Creek, Riparian Pasture, Trealor Creek, and Upper Squaw Creek units are in Squaw Creek, a steelhead priority watershed. There is occupied Chinook salmon habitat in Squaw Creek below the allotment. There is occupied steelhead and bull trout habitat and Chinook salmon, steelhead, and bull trout critical habitats in these units. The steelhead and bull trout populations are considered depressed. These units have not been grazed since 2003 and will be grazed under the proposed action.

The 465 acre Riparian Pasture Unit in the Squaw Creek Watershed will not be grazed as a result of this consultation. The Riparian Pasture Unit includes a 1.6-mile long section of Squaw Creek that contains occupied steelhead and bull trout designated critical habitats, and steelhead spawning habitat (Appendix C: Tables C3 and C5).

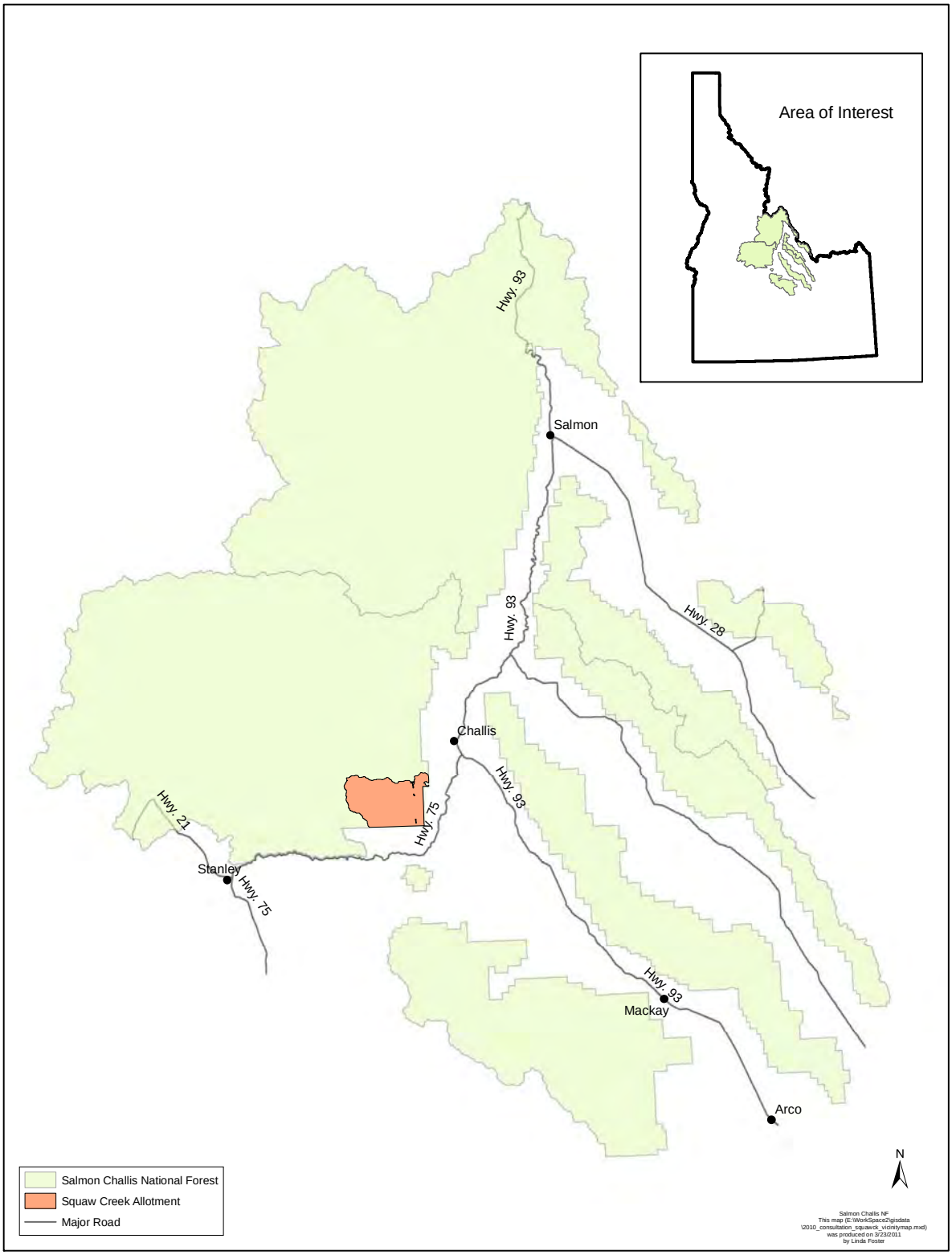

FIGURE 1 – SQUAW CREEK ALLOTMENT VICINITY MAP

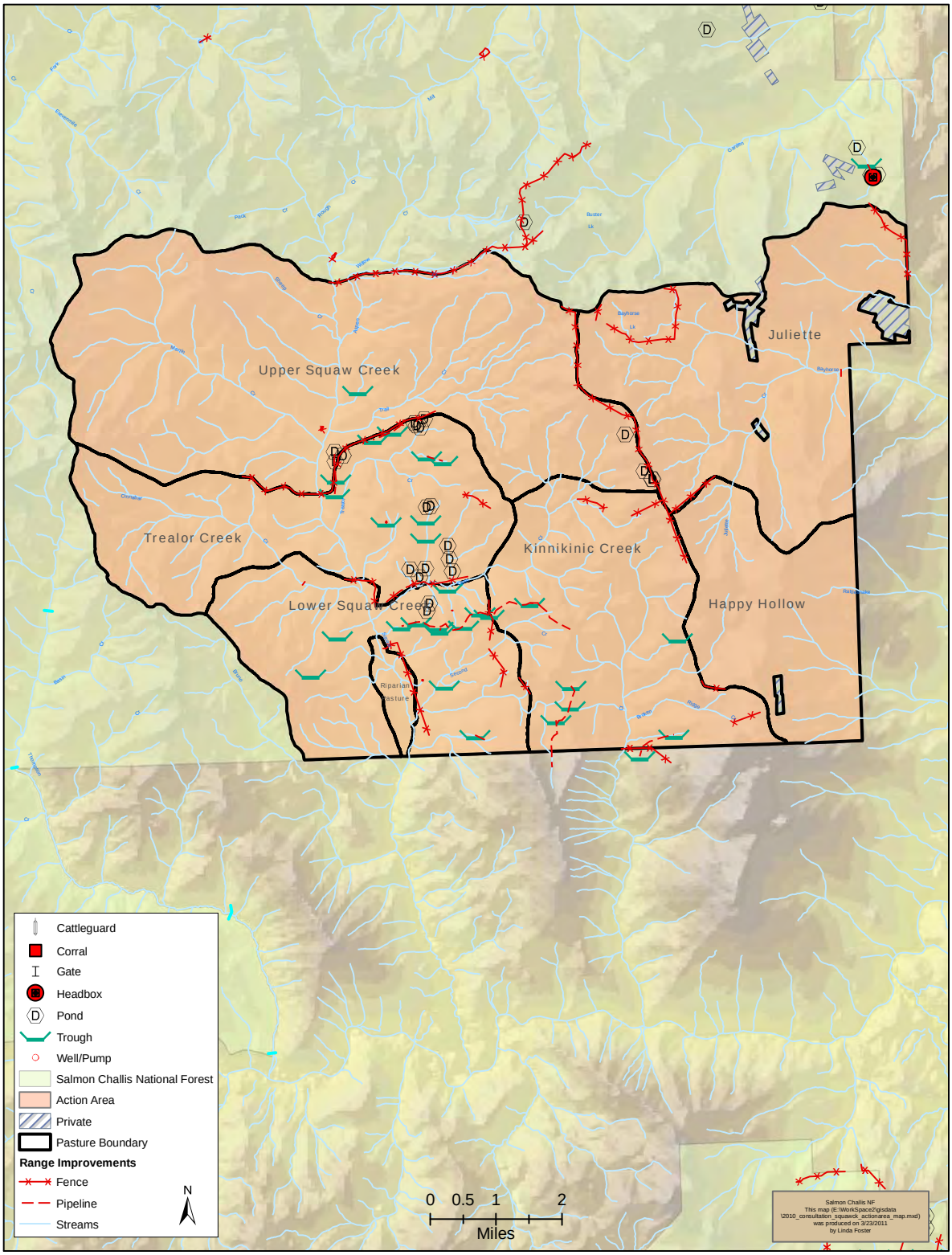

FIGURE 2 – SQUAW CREEK ALLOTMENT ACTION AREA MAP

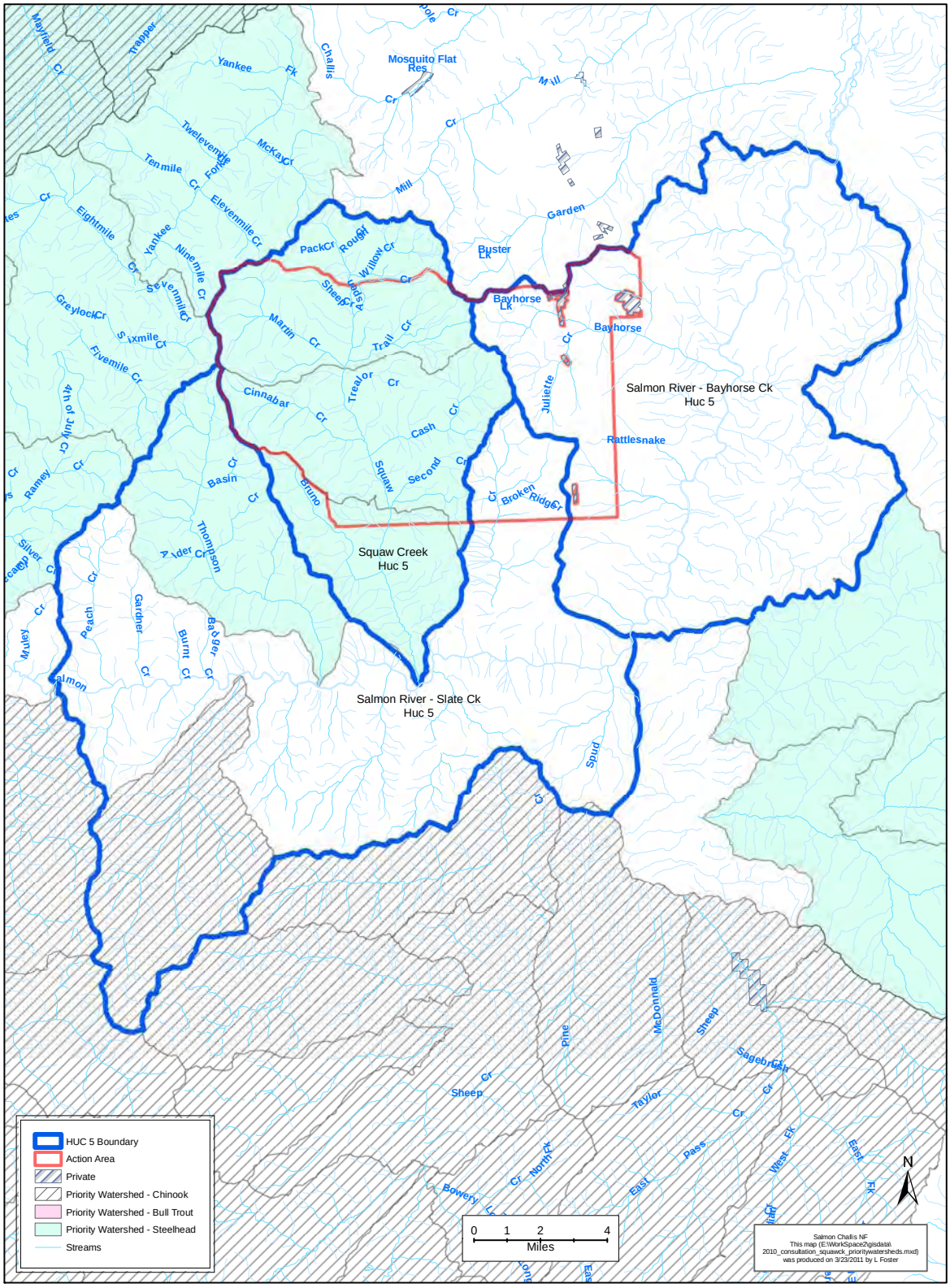

FIGURE 3 – SQUAW CREEK ALLOTMENT PRIORITY WATERSHEDS

3.2 PROPOSED ACTION

3.2.1 CURRENT PERMIT

The Squaw Creek Allotment is currently permitted for 473 cow/calf pairs from June 16 to September 30 (1544 head months) and an additional 202 cow/calf pairs from July 16 to September 30 (for a total of 2055 head months). Three grazing permits are issued for this allotment: permit #30013 expiration date December 31, 2014; permit #30012 expiration date December 31, 2011; and permit #30028 expiration date December 31, 2019.

3.2.2 GRAZING SYSTEM

The allotment consists of the Lower Squaw Creek, Riparian Pasture, Trealor Creek, Upper Squaw Creek, Kinnikinic Creek, Happy Hollow, and Juliette units. Grazing will not occur within the 465 acre Riparian Pasture that includes 1.6 miles of Squaw Creek. The Lower Squaw Creek, Trealor Creek, and Upper Squaw Creek units that have not been grazed since 2003 will be grazed under this proposed action.

A combination of a rest-rotation and deferred rotation grazing system will be used. There are three annual deferred rotations that will be used on this allotment (Tables 1-4). In addition, the Lower Squaw Creek and Trealor Creek units will each be rested one year out of three.

Up to 473 cow/calf pairs will be grazed on this allotment anytime between June 16 and July 15, and up to 675 cow/calf pairs will be grazed anytime between July 16 and September 30. Tables 2-4 show typical dates and numbers. However some adjustments may be made to the rotation as conditions arise, for example moves based on annual use indicators. In any case, livestock must be out of the Upper Squaw Creek unit by August 20th during the first year and off the Upper Squaw Creek unit by August 15 in years 2 and 3 to protect spawning bull trout and their redds.

TABLE 1 –SQUAW CREEK ALLOTMENT UNIT ROTATIONS

Year 1	Year 2	Year 3
Lower Squaw Creek	Trealor Creek	Lower Squaw Creek
Trealor Creek	Upper Squaw Creek [A]	Upper Squaw Creek [A]
Upper Squaw Creek [B]	Kinnikinic Creek	Kinnikinic Creek
Kinnikinic Creek	Happy Hollow	Juliette
Happy Hollow	Juliette	Happy Hollow
Juliette	Lower Squaw Creek (Rest)	Trealor Creek (Rest)
Riparian Pasture (no grazing)		

[A] Livestock will not graze in the Upper Squaw Creek Unit after August 15 during these rotations to protect spawning bull trout and their redds.

[B] Year 1 livestock will be in the Upper Squaw Creek Unit from August 10-20, primarily to have livestock access the next units in the rotation through the eastern third of the Upper Squaw Creek Unit. Livestock will cross Martin Creek once before August 15 to get to the east side of the unit. Herd management will focus on active riding to keep livestock out of the Martin Creek drainage after the crossing to protect spawning bull trout spawning and their redds.

TABLE 2 - YEAR 1 UNIT DEFERRED ROTATION SCHEDULE

Unit	Week/Day in June				Week/Day in July				Week/Day in August				Week/Day in September			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Lower Squaw			16	on	on	15										
Trealor						16	on	on	on	9						
Upper Squaw										10	20					
Kinnikinic											21	31				
Kinnikinic													1	on	on	30
Happy Hollow													1	15		
Juliette															16	30

TABLE 3 - YEAR 2 UNIT DEFERRED ROTATION AND REST ROTATION SCHEDULE

Unit	Week/Day in June				Week/Day in July				Week/Day in August				Week/Day in September			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Trealor			16	on	on	15										
Upper Squaw						16	on	on	on	on	15					
Kinnikinic											16	31				
Kinnikinic													1	on	on	30
Happy Hollow													1	15		
Juliette															16	30
Lower Squaw	Rest															

TABLE 4 - YEAR 3 UNIT DEFERRED ROTATION AND REST ROTATION SCHEDULE

Unit	Week/Day in June				Week/Day in July				Week/Day in August				Week/Day in September			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Lower Squaw			16	on	on	15										
Upper Squaw						16	on	on	on	on	15					
Kinnikinic											16	31				
Kinnikinic													1	on	on	30
Juliette													1	15		
Happy Hollow															16	30
Trealor	Rest															

Red = 473 cow/calf pairs Permit # 30028 and 30013 before 7/16
Yellow = 675 cow/calf pairs Permit # 30013, 30012 and 30028 after 7/16
Blue = 236 cow/calf pairs Permit# 30013
Green = 439 cow/calf pairs Permit # 30028 and 30012 after 7/16

Lower Squaw Creek Unit

Bull Trout: Occupied habitat and designated critical habitat. No spawning habitat.
Steelhead: Occupied spawning habitat and designated critical habitat. Livestock will be in the unit during spawning and incubation up to three weeks for two years out of three.
Chinook salmon: No occupied habitat although there is designated critical habitat.

Trealor Creek Unit

Bull Trout: Occupied habitat and designated critical habitat. No spawning habitat.
Steelhead: Occupied spawning habitat and designated critical habitat. Livestock will be in the unit during spawning and incubation up to three weeks for one year out of three.
Chinook salmon: No occupied habitat although there is designated critical habitat.

Upper Squaw Creek Unit

Bull Trout: Occupied habitat and designated critical habitat. Martin Creek has the only known occupied bull trout spawning habitat in the allotment. Livestock will be in the unit after August 15 in year 1 but active riding will be used to keep livestock out of the Martin Creek drainage to protect spawning bull trout.
Steelhead: Occupied spawning habitat and designated critical habitat. Livestock will not be in the unit during spawning and incubation.
Chinook salmon: No occupied habitat although there is designated critical habitat.

Juliette Unit

Steelhead: No occupied habitat or designated critical habitat.
Bull Trout: No occupied habitat although there is designated critical habitat in Bayhorse Creek.
Chinook salmon: No occupied habitat or designated critical habitat.

Happy Hollow Unit

No ESA listed fish populations or designated critical habitat.

Kinnikinic Creek Unit

No ESA listed fish populations or designated critical habitat.

Unit Management

Year 1

Entry: Livestock will enter the allotment from the BLM to the Lower Squaw Creek Unit either by road or upland trail.

Unit Movement: Livestock will be trailed from the Lower Squaw Creek Unit to the Trealor Creek Unit using established roads or trails. The duration of the move is 1 day for the main herd with up to 3 separate days moving the remainder, each time with a rider and progressively smaller numbers.

Livestock will be trailed from Trealor Creek Unit to the Upper Squaw Creek Unit using established roads or trails. The duration of the move is 1 day for the main herd with up to 3 separate days moving the remainder; each time with a rider and progressively smaller numbers.

Two permittees will trail livestock to the Happy Hollow Unit via the east third of Upper Squaw Creek Unit. These cows will end up in the Juliette Unit. The duration of each move is 2 to 3 days.

The third permittee will trail livestock to the Kinnikinic Unit via the east third of Upper Squaw Creek Unit. Two to three days of riding would be necessary to complete this move.

Exit: Livestock will be trailed from either the Juliette or the Kinnikinic units to BLM lands and then to permittees' home ranches.

Year 2

Entry: Livestock will enter the allotment from the BLM to the Trealor Unit either by established roads or upland trail.

Unit Movement: Livestock will be trailed from the Trealor Unit to the Upper Squaw Creek Unit using established roads or trails. The duration of the move is 1 day for the main herd with up to 3 separate days moving the remainder, each time with a rider and progressively smaller numbers.

Two permittees will trail livestock to the Happy Hollow Unit via the east third of Upper Squaw Creek Unit. These cows will end in the Juliette Unit. The duration of each move is 2 days to 3 days.

The third permittee will trail livestock to the Kinnikinic Unit.

Exit: Livestock will be trailed from either the Juliette or the Kinnikinic units to BLM lands and then to the permittees' home ranches.

Year 3

Entry: Livestock will enter the allotment from the BLM to the Lower Squaw Creek Unit either by road or upland trail.

Unit Movement: Livestock will be trailed from the Lower Squaw Creek Unit to the Upper Squaw Creek Unit using established roads or trails. The duration of the move is 2 days to 3 days for each move.

Two permittees will trail livestock to the Juliette Unit. The cows will end in the Happy Hollow Unit. The duration of the move is 2 days to 3 days for each move.

The third permittee will trail livestock to the Kinnikinic Unit. The duration of the move is 2 days to 3 days for each move.

Exit: Livestock will be trailed from either the Happy Hollow or the Kinnikinic units to the permittees' home ranches.

Total Removal from NFS Lands: All livestock will be removed from the allotment by September 30th.

3.2.3 RESOURCE OBJECTIVES

Resource Objectives and Effectiveness Monitoring: The allotment is being managed to achieve the following resource conditions in riparian areas. 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 (U.S Department of Commerce, National Marine Fisheries Service, 1998). PACFISH is an interim strategy for managing anadromous fish-producing watersheds that was amended into the Salmon and Challis Forest Plans in 1995.

Effectiveness monitoring for resource objectives will be monitored every 3-5 years at Designated Monitoring Areas (DMAs) using the Multiple Indicator Monitoring (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 2008). Results from monitoring will be available at **(http://www.fs.fed.us/r4/sc/projects/range/index.shtml).**

Lower Squaw Creek, Trealor Creek, and Upper Squaw Creek Units

The resource objectives for the Lower Squaw Creek, Trealor Creek, and Upper Squaw Creek units that are within the Squaw Creek steelhead priority watershed are as follows[1]:

[1]The Riparian Pasture Unit is also within the Squaw Creek Watershed however no grazing is proposed for this unit.

Greenline Successional Status: A greenline successional status value of at least 61 (late seral) or the current value, whichever is greatest (Winward 2000; Burton et al. 2010; 2008)

Woody Species Regeneration: Sufficient woody recruitment to develop and maintain healthy woody plant populations (Winward 2000; Burton et al. 2010; 2008)

Bank Stability RMO (PACFISH)[2]: A bank stability of at least 90% or the current value, whichever is greatest.

Water Temperature RMO (PACFISH): No measureable increase in maximum temperature.[3] For steelhead and Chinook salmon, <64°F in migration and rearing areas and <60°F in spawning areas except in steelhead spawning areas within steelhead priority watersheds during the spawning and incubation period where the RMO is <45°F.[4] For bull trout, maximum water temperatures below 59°F within adult holding habitat and below 48°F within spawning and rearing habitats.[5]

Width to Depth Ratio RMO (PACFISH): <10 or by channel type as follows[6]:

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

Sediment RMO (PACFISH)[7]: Areas where Chinook salmon, steelhead, and bull trout spawn within priority watersheds, <20% surface fine sediment which is substrate <0.25 inches (6.4 mm) in diameter in spawning habitat or <30% cobble embeddedness in rearing habitat. All other areas, no more than a two percent increase over existing levels and where existing levels are at 30% or above new activities that would create additional stream sedimentation would not be allowed (Challis National Forest Land Resource Management Plan).

Happy Hollow, Juliette, and Kinnikinic Creek Units

The resource objectives for the Happy Hollow, Juliette, and Kinnikinic Creek units that are not within a fisheries priority watershed are as follows:

Greenline Successional Status: A greenline successional status value of at least 61 (late seral) or the current value, whichever is greatest (Winward 2000, Burton et al. 2010; 2008)

Woody Species Regeneration: Sufficient woody recruitment to develop and maintain healthy woody plant populations (Winward 2000; Burton et al. 2010; 2008)

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[2] The PACFISH environmental assessment established a riparian management objective for bank stability of 80%. However, during consultation this standard was increased to 90% within priority watersheds.

[3] In this case, maximum water temperature is expressed as the 7-day moving average of daily maximum temperature measured as the average of the maximum daily temperature of the warmest consecutive 7-day period.

[4] The PACFISH environmental assessment established a riparian management objective for water temperature of <64°F in migration and rearing areas and <60°F in spawning areas. However, during consultation this standard was changed to <45°F in steelhead spawning areas within steelhead priority watersheds during the spawning and incubation period.

[5] This standard was established by INFISH and is being applied to areas occupied by bull trout within the area covered by PACFISH.

[6] These values are based on the mean values observed for streams in natural condition within the Salmon River (Overton et al. 1995).

[7] The PACFISH environmental assessment did not include a riparian management objective for sediment. However, during consultation a riparian management objective for sediment was established within Chinook salmon, steelhead, and bull trout spawning areas within priority watersheds. In all other areas, the objective established by the Land Resource Management Plan for the Challis National Forest applies.

Bank Stability RMO (PACFISH): A bank stability of at least 80% or the current value, whichever is greatest.

Water Temperature RMO (PACFISH): No measureable increase in maximum temperature[8]. For steelhead and Chinook salmon, <64°F in migration and rearing areas and <60°F in spawning areas. For bull trout, maximum water temperatures below 59°F within adult holding habitat and below 48°F within spawning and rearing habitats.[9]

Width to Depth Ratio RMO (PACFISH): <10 or by channel type as follows[10]:

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

Sediment RMO (PACFISH): None required by PACFISH, but see Challis National Forest Land and Resource Management Plan below.

3.2.4 MANGEMENT STANDARDS AND GUIDELINES

The following are forest plan standards and guidelines that apply to the management of livestock grazing relative to listed fish and their habitats:

PACFISH

GM-1 - Modify grazing practices (e.g. accessibility of riparian area to livestock, length of grazing season, stocking levels, timing of grazing) 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 (PACFISH).

The PACFISH environmental assessment defines "Adverse Effects" to include "…short or long-term, direct or indirect management-related, impacts of an individual or cumulative nature, such as mortality, reduced growth or other adverse physiological changes, harassment of fish, physical disturbance of redds, reduced reproduction success, delayed or premature migration, or other adverse behavioral changes to listed anadromous salmonids at any life stage."

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.

Land Resource Management Plan for the Challis National Forest – Forest-Wide Direction

- Protect anadromous fish spawning areas from disturbance by livestock and other activities.
- Utilize grazing systems on allotments which provide for deferment or rest whenever possible. Season-long grazing or common use will be allowed only where resources can sustain such use.

[8] In this case, maximum water temperature is expressed as the 7-day moving average of daily maximum temperature measured as the average of the maximum daily temperature of the warmest consecutive 7-day period.
[9] This standard was established by INFISH and is being applied to areas occupied by bull trout within the area covered by PACFISH.
[10] These values are based on the mean values observed for streams in natural condition within the Salmon River (Overton et al. 1995).

- Range improvements will be maintained annually by permittees to standards adequate for public safety and established use, and control and proper distribution of livestock. Maintenance will be completed before livestock are allowed on the allotment.
- Rehabilitate existing stock driveways where damage is occurring. Relocate them outside riparian areas if possible.
- Browse utilization within the riparian ecosystem will not exceed 50 percent of new leader production.
- Ensure that all management-induced activities meet State water quality standards, and Forest water quality goals, including sediment constraints.
- Impacts of activities may not increase fine sediment by depth (within critical reaches) of perennial streams by more than 2 percent over existing levels. Where existing levels are at 30% or above new activities that would create additional stream sedimentation would not be allowed. If these levels are reached or exceeded, activities that are contributing sediment will be evaluated and appropriate action will be taken to bring fine sediment within threshold levels.
- Retain at a minimum, 75 percent of natural stream shade provided by woody vegetation.
- Discourage livestock concentrations in riparian areas and within 100 feet of lakes and perennial streams. Restrict livestock grazing in identified problem areas where necessary.
- Livestock driveways and trailing areas will be located away from riparian or streamside areas.

Land Resource Management Plan for the Challis National Forest – Management Area Specific Direction

- Emphasize habitat management to improve streambank cover and stability.
- Incorporate riparian guidelines in range management.

3.2.5 ANNUAL USE INDICATORS

Annual use indicators are used to ensure that grazing does not prevent the attainment of the resource objectives. Riparian annual use indicators used on the Salmon-Challis National Forest generally include greenline stubble height, bank alteration, and woody browse. In general, greenline stubble height is used to regulate grazing impacts on greenline ecological status, 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 3.7, available data, and professional experience, the various indicators for this allotment have been established (Table 5).

TABLE 5 – SQUAW CREEK ALLOTMENT ANNUAL USE INDICATORS

Unit	Annual Use Indicators			
	Average Greenline Stubble Height (*Carex* spp.)	% Bank Alteration	% Woody Browse (willow, alder, aspen)	% Upland Utilization
Lower Squaw Creek	6 inches	10	30[A] or 50[B]	50
Trealor Creek	6 inches	20	30[A] or 50[B]	50
Upper Squaw Creek	6 inches	20	30[A] or 50[B]	50
Kinnikinic Creek	6 inches	20	30[A] or 50[B]	50
Happy Hollow	4 inches	20	30[A] or 50[B]	50
Juliette	6 inches	20	30[A] or 50[B]	50

[A] Single-stemmed species such as aspen [B] Multi-stemmed species such as willow and alder

Annual use indicators will be measured in the upland by key species and at key areas at DMA greenlines annually. Key areas are monitoring sites chosen to reflect the effects of grazing over a larger area (Burton et al. 2010; 2008). Key species are preferred by livestock and an important component of a plant community, serving as an indicator of change (Coulloudon et al, 1999). The Interagency Technical Reference or other best available science would be used to monitor grazing use. The MIM Interagency Technical Bulletin (Burton et al. draft 2010; 2008) or other best available science would be used to monitor grazing use at DMAs. Annual use indicators will be monitored by the Forest Service. Triggers will be used by permittees as a tool to help ensure annual use indicators are met. Results from monitoring will be available at (http://www.fs.fed.us/r4/sc/projects/range/index.shtml).

3.3 IMPROVEMENTS

Existing Improvements: Existing improvements include fences, off-channel ponds, and troughs with associated headboxes and pipelines (Figure 2). These improvements will be maintained in accordance with the term grazing permit.

New Improvements: No improvements are proposed as part of this consultation.

Potential Future Improvement: No potential future improvements were identified in this consultation.

3.4 CHANGES FROM EXISTING MANAGEMENT

The proposed action includes the following changes from existing management:

Livestock grazing will be authorized in the Lower Squaw Creek, Trealor, and Upper Squaw Creek Units in the Squaw Creek Watershed. These units have not been grazed since 2003.

The 465 acre Riparian Pasture will not be grazed at this time. Livestock are kept out of this unit by a combination of natural barrier and existing fence.

Annual woody browse indicators of 30% on single stem species and 50% on multi-stem species (willow, alder, and aspen) will be added to all units to ensure livestock impacts to woody species are limited.

All units except for the Lower Squaw Creek Unit will have a 20% bank alteration annual indicator added to limit livestock impacts on bank stability and trampling.

Lower Squaw Creek Unit will have a 10% bank alteration annual indicator added due to bank stability less than the 90% RMO at the monitoring site.

A *Carex* spp. 6-inch stubble height annual indicator will be added to Lower Squaw Creek, Trealor Creek, and Upper Squaw Creek units to limit livestock impacts on riparian vegetation.

The *Carex* spp. stubble height annual indicator will be changed from 4-inches to 6-inches in Bayhorse Creek within the Juliette Unit and in the Kinnikinic Unit due to low greenline ecological status at these monitoring sites.

The Kinnikinic Unit will be grazed last every year; this is a change from season-long grazing. The Juliette and Happy Hollow units will be grazed last every year in September; this is a change from a two unit deferred rotation where each unit was grazed for approximately two months. These changes will allow for seed set and are expected to improve the herbaceous vegetation.

3.5 CONSERVATION MEASURES

The following measures will be implemented as part of the Squaw Creek Allotment's annual operating instructions to avoid and reduce potential impacts to ESA listed fishes and designated critical habitats.

A three unit deferred rotation and rest-rotation grazing system will be used.

The Lower Squaw Creek and Trealor Creek units will be rested one year out of every three years to protect fish habitat and steelhead redds, and to allow the area to recover and improve riparian and aquatic habitat.

Upper Squaw Creek Unit will be used August 10-20 during the first year of the rotation, primarily to move livestock to the east side of the unit to access the next units in the rotation. Livestock will cross Martin Creek once before August 15 to get to the east side of the unit. Herd management will focus on active riding to keep livestock out of the Martin Creek drainage after the crossing to protect spawning bull trout and their redds. Martin Creek is the only known occupied bull trout spawning habitat in the allotment.

The second and third years of the rotation, livestock will be off the Upper Squaw Creek Unit after August 15 to protect spawning bull trout and their redds.

The Riparian Pasture Unit will not be grazed to protect fish habitat and steelhead redds. Livestock are kept out of this unit by a combination of natural barrier and existing fence.

The on-date will be varied depending on range readiness to reduce bank alteration and impacts to vegetation along the greenline.

All units will have annual woody browse indicators of 30% on single stem species (aspen) and 50% on multi-stem species (willow, alder) to ensure livestock impacts to woody species are limited.

All units will have an upland grass utilization indicator of 50% to ensure livestock impacts to grass species are limited.

Lower Squaw Creek, Trealor Creek, and Upper Squaw Creek units will have a 6-inch *Carex* spp. stubble height annual indicator to improve riparian vegetation.

The stubble height indicator in the Juliette and Kinnikinic Units will be increased from 4 to 6-inches to improve riparian vegetation.

The Happy Hollow Unit *Carex* spp. stubble height indicator will continue to be 4-inches.

All units except for the Lower Squaw Creek Unit will have a 20% bank alteration annual indicator to limit livestock impacts on bank stability and trampling.

Lower Squaw Creek Unit will have a 10% bank alteration annual indicator due to bank stability less than the 90% RMO at the monitoring site.

The annual use indicators will dictate when livestock are moved between units or off the allotment. These indicators are designed to help us meet our long-term riparian resource objectives for riparian vegetation and bank stability, particularly in designated critical habitat and potential spawning areas. The annual use indicators will be monitored by Forest Service personnel.

Permittees will continue to salt at least ¼ mile away from creeks to reduce potential impacts on spawning areas and designated critical habitat.

Permittees will continue to distribute livestock away from streams and associated riparian areas by frequent riding to aid in meeting the annual use indicators.

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

Unit moves will be made utilizing uplands and roads to the extent feasible.

3.6 MONITORING

Implementation and effectiveness monitoring will be conducted at designated monitoring areas (DMAs). Each DMA is located in an area that is representative of grazing use in a riparian complex that is most sensitive to management influences and where the potential to achieve the resource objectives is present. The DMA will be located away from areas compounded by other land uses which make it difficult to establish the cause and effect relationship of livestock grazing on streams. Monitoring at DMAs

will be completed using the MIM Interagency Technical Bulletin (Burton et al. draft 2010) or other best available science. Results from monitoring will be available at (http://www.fs.fed.us/r4/sc/projects/range/index.shtml).

There are seven established MIM sites in this allotment: Lower Squaw Creek Unit (M72), Riparian Pasture Unit (M284), Trealor Creek Unit on Squaw Creek (M71), Upper Squaw Creek Unit (M285) on Squaw Creek, Upper Squaw Creek Unit on Martin Creek (M330), Kinnikinic Creek Unit (M69), and Juliette Unit on Bayhorse Creek (M66) (Appendix C: Figure 1; Table C11).

Implementation Monitoring: The designated annual use indicators in Table 5 will be monitored utilizing MIM protocols or other best available science at DMAs within each unit at the end of the grazing season to ensure that the standards have been met. Permittees are encouraged, by use of triggers identified in the annual operating instructions, to determine when livestock need to be moved from the unit. The specific triggers for moving livestock from the unit will be based on the time needed to move the livestock from the unit and may vary between units and years.

Effectiveness Monitoring: The status of the greenline successional status, bank stability, and woody recruitment resource objectives will be monitored every three to five years to evaluate resource conditions. Width to depth and temperature may be monitored from time to time but will not be part of the same schedule as the other effectiveness monitoring. The monitoring locations are shown in Appendix C: Figure C1 and include sites other than DMAs (e.g. for water temperature).

3.7 INTERDEPENDENT ACTIONS

Interdependent actions are actions that have “no independent utility apart from the action under consideration” (50 CFR§402.02). The Forest has not identified any interdependent actions associated with the proposed action. There are activities associated with the proposed action that could potentially affect fish and could be considered interdependent actions. These include livestock grazing on the adjacent BLM allotment, grazing and other agriculture activities on private property that is owned by the permittees and diverting water from streams on private and national forest lands for agricultural purposes. However, we believe that these activities would continue to occur in a manner similar to the way they are currently occurring whether or not livestock graze on this allotment. Therefore, these activities will not be considered as interdependent actions.

3.8 INTERRELATED ACTIONS

Interrelated actions are actions that “are part of a larger action and depend on the larger action for their justification” (50 CFR§402.02). The Forest has not identified any interrelated actions associated with the proposed action.

3.9 ADAPTIVE MANAGEMENT

The adaptive management strategy described below and depicted in Appendix E is intended for allotments requiring consultation. It 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 and the Forest Service; 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 resource objectives previously stated 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.

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 indicators values, the forest has provided default recommendations for establishing the values. These recommendations will be used until such time as sufficient data and/or experience are available to customize the annual indicator values. The recommendations that apply to this allotment are:

- When the greenline ecological status is 61 or greater, the end of season median greenline stubble height will be 4 inches.
- When the greenline ecological status is less than 61, the end of season median greenline stubble height will be 6 inches.
- For the units in the Squaw Creek priority watershed - Lower Squaw Creek, Trealor Creek, and Upper Squaw Creek - when bank stability is 90% or greater, the bank alteration indicator will be 20%.
- For the units in the Squaw Creek priority watershed - Lower Squaw Creek, Trealor Creek, and Upper Squaw Creek - when bank stability is 70-89%, the bank alteration indicator will be set at a value between 10 and 20% depending on the circumstances specific to that unit.
- For the units in the Squaw Creek priority watershed - Lower Squaw Creek, Trealor Creek, and Upper Squaw Creek - when bank stability is less than 70%, the bank alteration indicator will be 10%.
- When there is sufficient woody recruitment to develop and maintain healthy woody plant populations, the woody browse indicator will be 50% woody browse on multi-stemmed species and 30% 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% woody browse on multi-stemmed species and 20% woody browse on single-stemmed species.

4 ESA ACTION AREA DESCRIPTION

The ESA action area is defined as “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). In other words, this is the area where the action and any interdependent and interrelated actions will result in direct or indirect effects to listed species or designated critical habitat. Our analysis indicates that the proposed action has the potential to generate direct or indirect affects to aquatic species and aquatic habitats on NFS lands within the boundaries of the Squaw Creek Allotment (Figure 2).

Priority watersheds are those watersheds that have been identified per direction in the 1995 PACFISH Biological Opinion that require a different management strategy because of their importance to listed fishes. The Lower Squaw Creek, Riparian Pasture, Trealor Creek, Upper Squaw Creek units are within the Squaw Creek steelhead priority watershed (Figure 3).

5 LISTED SPECIES REVIEW

5.1 SPECIES OCCURRENCE

The current species lists issued by the U.S. Fish and Wildlife Service (last updated December 13, 2010) and by the National Oceanic and Atmospheric Administration (last updated January 25, 2011) identifies four ESA listed fish species as occurring on and adjacent to the SCNF. These are:

Snake River Sockeye Salmon (Endangered) (Federal Register 56FR58619)
Snake River Spring/Summer Chinook Salmon (Threatened) (Federal Register 57FR14653)
Snake River Steelhead (Threatened) (Federal Register 62FR43937)
Bull Trout (Threatened) (Federal Register 63FR31647)

Lower Squaw Creek Unit

- There are no Chinook salmon in the Lower Squaw Creek Unit (Figure 4; Appendix C: Table C7).
- There are 2.5 miles of occupied steelhead habitat in Cash and Squaw Creeks and approximately 1.5 miles of steelhead spawning habitat in Squaw Creek within this unit (Figure 5; Appendix C: Table C5).

- There is 1.5 miles of occupied bull trout habitat in Squaw Creek within this unit (Figure 6; Appendix C: Table C3). There is no bull trout spawning habitat in the unit.
- Two years out of three livestock will be in the Squaw Creek drainage during the steelhead spawning and incubation periods for up to 3 weeks.

Riparian Pasture Unit

- There are no Chinook salmon in the Riparian Pasture Unit (Figure 4; Appendix C: Table C7).
- There are 1.6 miles of occupied steelhead spawning habitat in Squaw Creek within this unit (Figure 5; Appendix C: Table C5).
- There is 1.6 miles of occupied bull trout habitat in Squaw Creek within this unit (Figure 6; Appendix C: Table C3). There is no bull trout spawning habitat in the unit.
- This unit will not be grazed, and no other actions will occur in this unit.

Trealor Creek Unit

- There are no Chinook salmon in the Trealor Creek Unit (Figure 4; Appendix C: Table C7).
- There are approximately 1.9 miles of occupied steelhead habitat in Cash and Squaw creeks and approximately 1.5 miles of steelhead spawning habitat in Squaw Creek within this unit (Figure 5; Appendix C: Table C5).
- There is approximately 1.5 miles of occupied bull trout spawning habitat in Squaw Creek within this unit (Figure 6; Appendix C: Table C3). There is no bull trout spawning habitat in the unit.
- One year out of three livestock will be in the Squaw Creek drainage during the steelhead spawning and incubation periods for up to 3 weeks.

Upper Squaw Creek Unit

- There are no Chinook salmon in the Upper Squaw Creek Unit (Figure 4; Appendix C: Table C7).
- This unit has approximately 1.4 miles of occupied steelhead habitat and 0.7 miles of steelhead spawning habitat in Squaw Creek (Figure 5; Appendix C: Table C5).
- There is approximately 3/4 mile of occupied bull trout habitat in Squaw Creek, and 2.3 miles of occupied bull trout spawning habitat in Martin Creek (Figure 6; Appendix C: Table C3). Martin Creek has the only known occupied bull trout spawning habitat in the allotment.
- Upper Squaw Creek Unit will be used August 10-20 during the first year of the rotation, primarily to move livestock to the east side of the unit to access the next units in the rotation. Livestock will cross Martin Creek once before August 15 to get to the east side of the unit. Herd management will focus on active riding to keep livestock out of the Martin Creek drainage after the crossing to protect spawning bull trout and their redds. Martin Creek is the only known occupied bull trout spawning habitat in the allotment.
- The second and third years of the rotation, livestock will be off the Upper Squaw Creek Unit after August 15 to protect spawning bull trout and their redds.

Happy Hollow Unit

- There is no occupied Chinook salmon, steelhead, and bull trout habitat in this unit (Figures 4-6; Appendix C: Tables C3, 5, and 7).

Juliette Unit

- There is no occupied Chinook salmon, steelhead, and bull trout habitat in this unit (Figures 4-6; Appendix C: Tables C3, 5, and 7).

Kinnikinic Creek Unit

- There is no occupied Chinook salmon, steelhead, and bull trout habitat in this unit (Figures 4-6; Appendix C: Tables C3, 5, and 7).

Salmon River

- The mainstem Salmon River is a migration corridor for spawning sockeye salmon and smolts to and from Redfish Lake in the Upper Salmon Basin. The mainstem Salmon River is not part of the action area. Sockeye salmon but do not use the creeks within the action area for any part of their life cycle (Federal Register 56FR58619).

5.2 CRITICAL HABITAT

5.2.1 SNAKE RIVER SPRING/SUMMER CHINOOK SALMON

Critical habitat has been designated for Snake River spring/summer Chinook salmon and includes "river reaches presently or historically accessible…to Snake River spring/summer Chinook salmon" (Federal Register 58FR68543). The SCNF has mapped Chinook salmon critical habitat designations within Forest streams following the process identified in Appendix D. It should be emphasized that this process is not to "designate" Chinook salmon critical habitat but to portray the Salmon-Challis National Forest's interpretation of those areas that have already been designated by the rule. Utilizing this process, the Forest has identified approximately 1.7 miles of Chinook salmon critical habitat in Squaw Creek within the Lower Squaw Creek Unit, 1.6 miles in Squaw Creek within the Riparian Pasture Unit, 1.5 miles in Squaw Creek within the Trealor Unit, and 0.25 mile and 1.1 mile in Martin and Squaw creeks in the Upper Squaw Creek Unit (Figure 4; Appendix C: Table C7).

The total Chinook salmon critical habitat in the allotment action area is approximately 6.14 miles. None of the designated critical Chinook salmon habitat in this allotment is occupied.

5.2.2 SNAKE RIVER BASIN STEELHEAD

Critical habitat has been designated for Snake River Basin steelhead (Federal Register 70FR52630). The total steelhead critical habitat in the action area is approximately 9.3 miles. Squaw Creek Watershed is a steelhead priority watershed.

Squaw Creek has approximately 7.4 miles of occupied steelhead designated critical habitat and approximately 1.9 miles of unoccupied critical habitat. Approximately 1.6 miles of the occupied steelhead critical habitat is in Squaw Creek within the Riparian Pasture Unit (Figure 5; Appendix C: Table C5).

Cash Creek that forms the boundary between the Lower Squaw Creek and Trealor Creek units has 0.5 mile of occupied steelhead critical habitat, and another 0.9 mile of occupied steelhead habitat that is not designated critical habitat (Figure 5; Appendix C: Tables C4 and C5).

Cinnabar Creek has 1.1 miles of unoccupied steelhead critical habitat within the Lower Squaw Creek Unit (Figure 5; Appendix C: Tables C4 and C5).

5.2.3 COLUMBIA RIVER BULL TROUT

Bull trout critical habitat has been designated (Federal Register 75FR63898). The total bull trout critical habitat in the action area is approximately 17.2 miles.

There is approximately 5.3 miles of occupied bull trout critical habitat in Squaw Creek within the Lower Squaw Creek, Riparian Pasture, Trealor Creek, and Upper Squaw Creek units (Figure 6; Appendix C: Tables C2 and C3). There is another 2.7 miles of unoccupied bull trout critical habitat in Squaw Creek within the Upper Squaw Creek Unit.

There is approximately 2.3 miles of occupied bull trout critical habitat in Martin Creek within the Upper Squaw Creek Unit (Figure 6; Appendix C: Tables C2 and C3). There is another 2.9 miles of unoccupied bull trout critical habitat in Martin Creek.

Bayhorse Creek has approximately 4 miles of unoccupied bull trout critical habitat within the Juliette Unit (Figure 6; Appendix C: Tables C2 and C3) (IDFG 2005).

The Forest desires to assess the potential impact to the Primary Constituent Elements (PCEs) of designated bull trout critical habitat defined on page 2360 of the referenced Federal Register notice. The Forest would like to demonstrate that potential impacts to the PCEs have been assessed and considered where bull trout are present in the proposed action area (Appendix E).

5.2.4 SOCKEYE SALMON

Critical habitat has been designated for Snake River sockeye salmon (Federal Register 58FR68543). This designation does not include any waters within the action area.

Squaw Creek Chinook

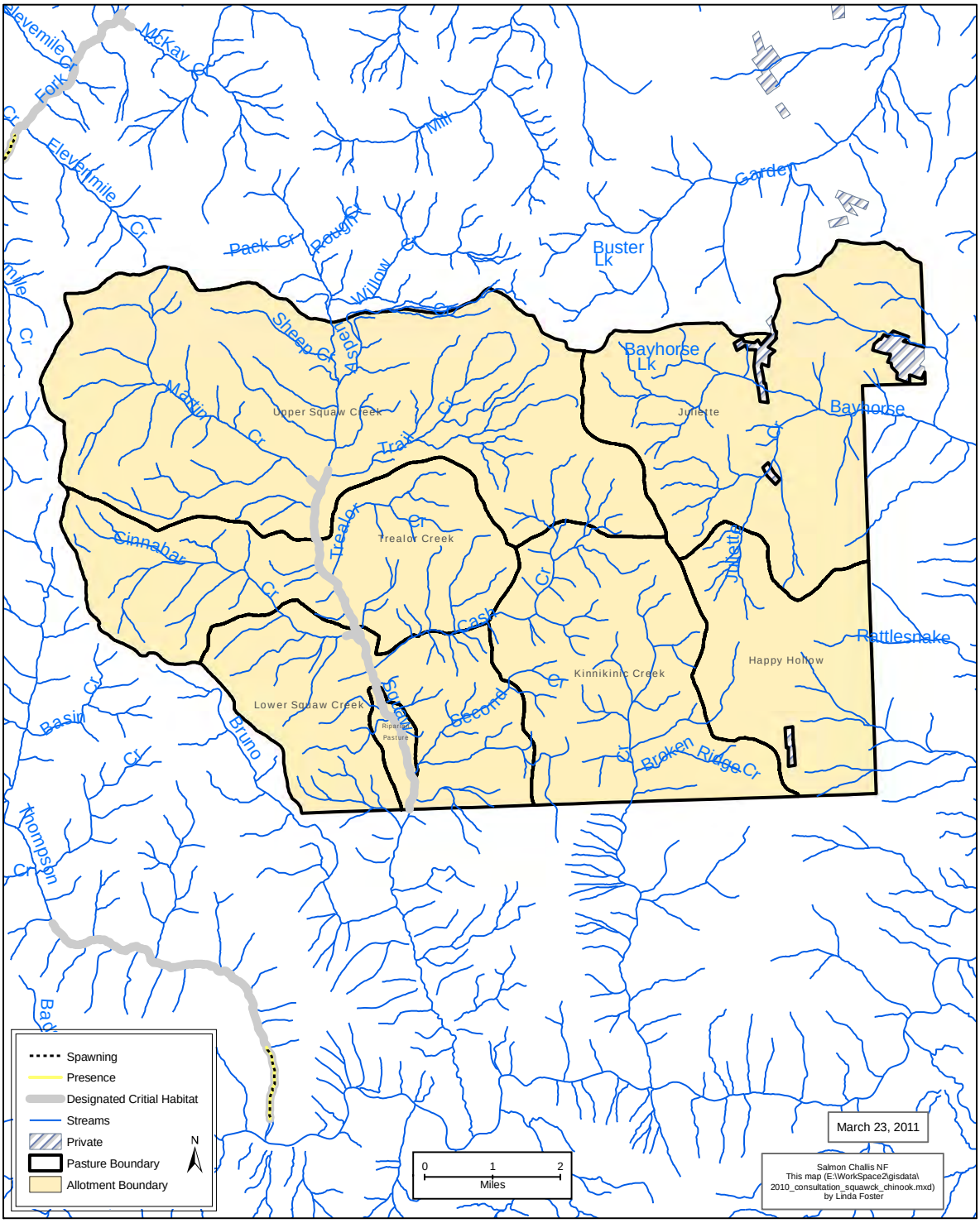

FIGURE 4 – CHINOOK SALMON DISTRIBUTION AND DESIGNATED CRITICAL HABITAT

Squaw Creek Steelhead

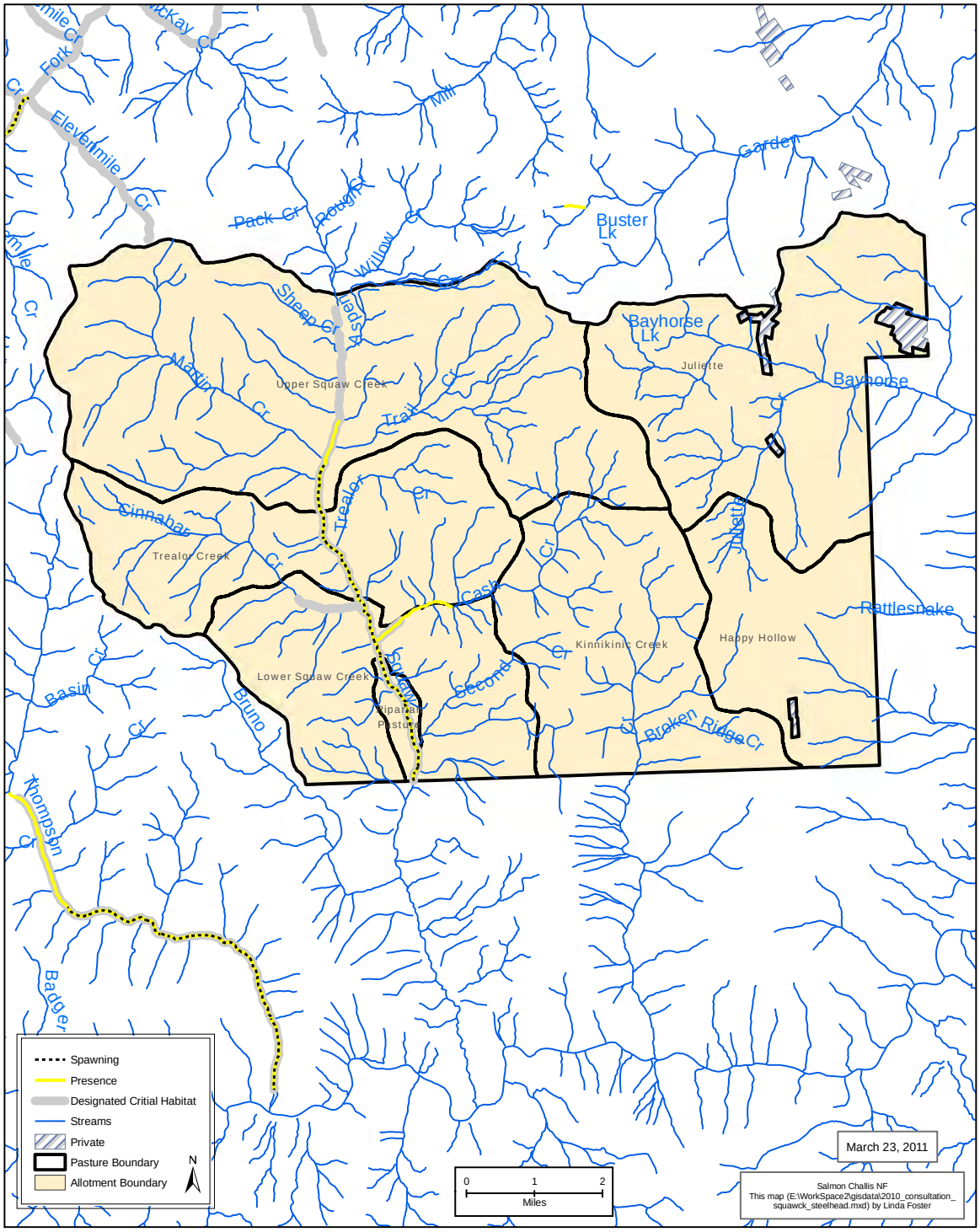

FIGURE 5 – STEELHEAD DISTRIBUTION AND DESIGNATED CRITICAL HABITAT

Squaw Creek Bull Trout

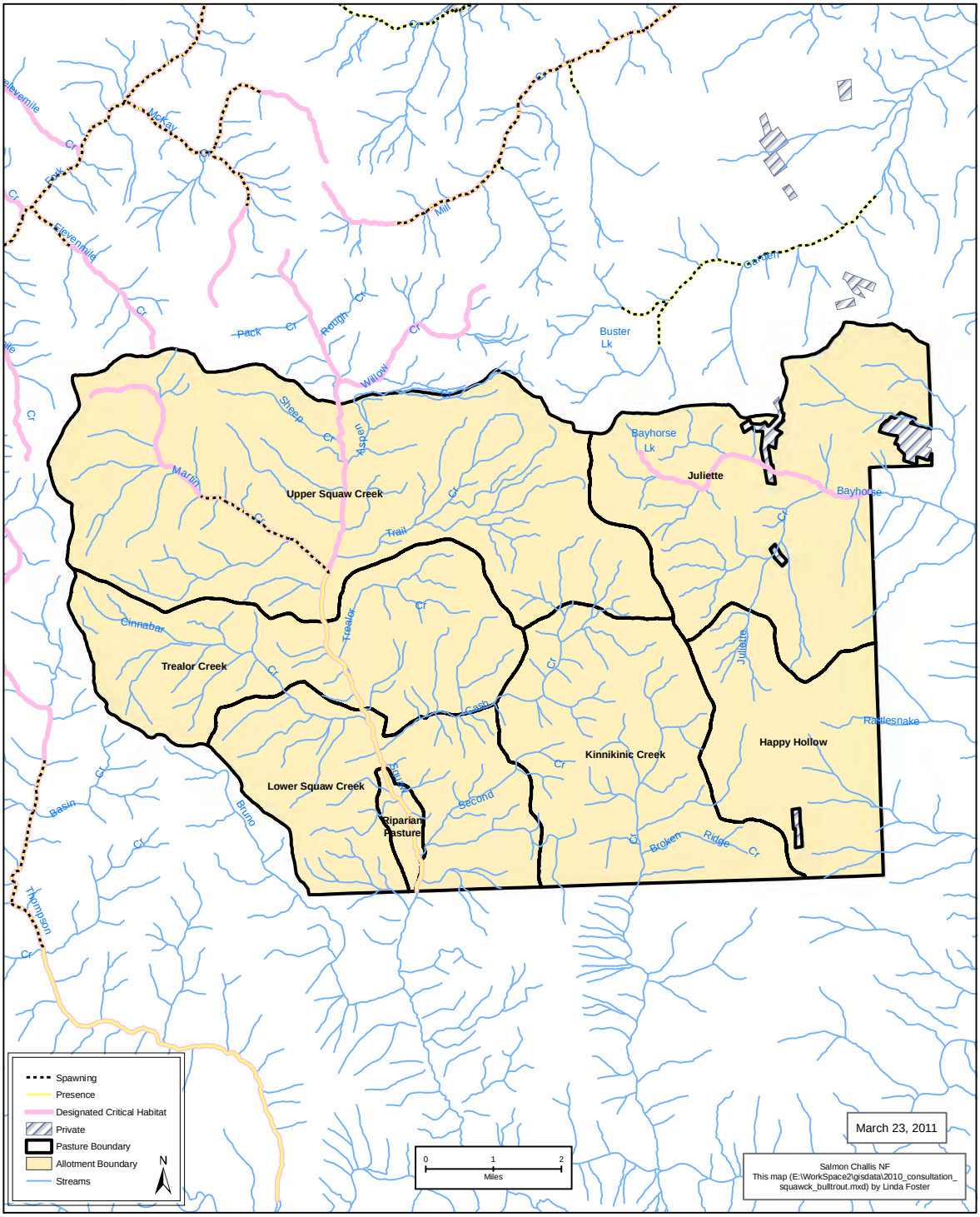

FIGURE 6 – BULL TROUT DISTRIBUTION AND DESIGNATED CRITICAL HABITAT

6 ENVIRONMENTAL BASELINE DESCRIPTION

Most of the Squaw Creek Allotment action area is within the Squaw Creek priority watershed (5th field HUC 1706020112) (Figure 3). The rest of the allotment is in the Salmon River-Slate Creek (HUC 1706020108) and Bayhorse Creek-Salmon River (HUC 1706020114) non-priority watersheds (Figure 3). The Squaw Creek Watershed and Bayhorse Creek-Salmon River Watershed have ESA listed fish populations or designated critical habitat. The environmental baselines for these watersheds are described in Appendix B.

Below is a general summary of baseline conditions within the action area. While the baseline matrix included in Appendix B reflects aquatic/riparian condition and trend at the watershed scale, the baseline descriptions provided below focus only on baseline conditions within the action area. This is done to focus analysis emphasis on those habitat parameters most likely to be influenced by grazing activities and set the context for analyzing the effects of the proposed action on these conditions. As these characterizations reflect the more localized site-specific conditions of the action area, identified condition and/or functionality assessments may vary from those identified for the larger watershed-scale baseline (Appendix B).

6.1 GENERAL DESCRIPTION OF LISTED FISH POPULATIONS

This section provides a general description of the distribution, status, and trend of listed fish populations within the action area.

The Squaw Creek Allotment action area encompasses five perennial streams which support populations of, and/or have designated critical habitat for listed fish species – Squaw Creek, Martin Creek, Cash Creek, Cinnabar Creek, and Bayhorse Creek. There is no occupied Chinook salmon habitat in the allotment. The steelhead and bull trout populations in the allotment are considered depressed.

All other perennial and intermittent/ephemeral stream reaches that will be grazed under the proposed permit action do not contain listed fish or designated critical habitat and are not part of the action area.

6.1.1 CHINOOK SALMON

There are no Chinook salmon in Squaw Creek Allotment action area (Figure 4; Appendix C: Table C7).

6.1.2 STEELHEAD

Squaw Creek has approximately 7.4 miles of occupied steelhead habitat. Approximately 1.6 miles of the occupied habitat is in Squaw Creek within the Riparian Pasture (Figure 5; Appendix C: Table C5).

Cash Creek that forms the boundary between the Lower Squaw Creek and Trealor Creek units has another 1.4 miles of occupied steelhead habitat (Figure 5; Appendix C: Tables C4 and C5).

This is the only occupied steelhead habitat in the allotment, although there is occupied steelhead habitat in Bayhorse Creek below the Forest boundary.

Sampling completed by the Forest Service in 2009 indicates the *O. mykiss* (rainbow trout/steelhead) densities are low in this watershed (Appendix C: Table C1). The *O. mykiss* densities in Squaw Creek ranged from 0.5 to 2.6 fish $\geq$70mm per 100m^2. The densities in Martin Creek ranged from 0-0.5 *O. mykiss* $\geq$70mm per 100m^2.

6.1.3 BULL TROUT

There is approximately 5.3 miles of occupied bull trout habitat in Squaw Creek within the Lower Squaw Creek, Riparian Pasture, Trealor Creek, and Upper Squaw Creek units (Figure 6; Appendix C: Tables C2 and C3).

There is approximately 2.3 miles of occupied bull trout habitat in Martin Creek within the Upper Squaw Creek Unit (Figure 6; Appendix C: Tables C2 and C3). This is the only stream with a spawning bull trout population in the allotment.

Sampling completed by IDFG and the Forest Service indicates the bull trout densities remained extremely low from 2003-2009 (Appendix B: Table B1). In 2009, the Forest Service found 0.4 bull trout $\geq$70mm per 100m^2 (Appendix C: Table C1).

6.2 GENERAL DESCRIPTION OF HABITAT CONDITIONS

This section provides a general description of the status and trend of listed species habitat within the action area. More specific information on habitat conditions, including specific habitat data, is provided later in the document and in Appendices B and C.

Habitat conditions within the Squaw Creek Watershed of the Squaw Creek Allotment action area are in relatively good condition because the units have been rested since 2003. However, impacts associated with anthropogenic activities have impacted some areas in this watershed as well as in the other units in the allotment. Grazing, irrigation diversions, mining, and recreation are the dominant uses in the allotment watersheds. The road density is moderate but many of the roads are in the valley bottoms and the riparian conservation areas. Bayhorse Lake is a popular fishing and camping area on upper Bayhorse Creek in the Bayhorse-Salmon River Watershed (Figure 3).

Squaw Creek beneficial uses are cold water biota, salmonid spawning, primary contact recreation, secondary contact recreation, special resources water, and agricultural water supply. Streamflow regimes in the Squaw Creek Watershed, Bayhorse-Salmon River, and Salmon River-Slate Creek watersheds have been impacted by irrigation diversions, which alter the natural flow processes.

6.3 MAJOR LIMITING FACTORS

Numerous anthropogenic activities including the Thompson Creek Mine, historic mines, road construction, livestock grazing, fire suppression, stream diversions, and private land development have affected fish habitat within the allotment watersheds. This appears to have reduced the ability of the watersheds to support bull trout, steelhead, and Chinook salmon (Appendix B).

More specific details on status and trends of habitat within the action area are provided below.

6.4 GRAZING FOCUS INDICATORS

A Framework to assist in Making Endangered Species Act Determinations of Effect for Individual or Grouped Actions at the Subpopulation Watershed Scale is a tool that was developed to assist in describing the condition of watersheds and streams which listed Chinook salmon, steelhead, and bull trout depend on (Appendix 9 in Lee et al. 1997). It is commonly referred to as the Matrix of Pathways and Indicators, and at its most basic level, is a table which identifies the important elements or indicators of listed salmonid habitat. This table assists biologists to consistently organize and assess current conditions and evaluate how those indicators may be impacted by a proposed action (Lee et al. 1997).

The Forest has included a matrix for this allotment in Appendix B. Because the Matrix of Pathways and Indicators was developed to operate at several spatial scales (Lee et al. 1997) the Forest has selected six indicators from the matrix table as their “focus indicators” and the analysis of livestock impacts to fish and designated habitat will be based on these focus indicators. The focus indicators are 1) spawning and incubation, 2) temperature, 3) sediment, 4) width: depth ratio, 5) streambank condition, and 6) riparian conservation areas. These are the indicators that the Forest can easily monitor, have the most specificity with long running data sets, and most closely reflect the aquatic/riparian baseline pathway and indicator elements considered most likely to be impacted by grazing activities within a watershed.

The Forest has utilized this “Focus Indicator” set to characterize the condition of the habitat for listed fish species in the occupied streams in this allotment. If stream specific information is not available, then observational information or information from similar streams was used. If one (or several) of the focus

indicators showed a habitat condition was potentially limiting the ability of listed fish species to thrive; the Forest presented an opinion of the most likely causal factor for that limiting condition. By identifying those potentially limiting factors, the Forest and the Service can focus their analysis on the specific indicators

These indicators encompass the recently published designated bull trout critical habitat and the PCEs of designated bull trout critical habitat and therefore our analysis of these elements will serve as an analysis of impacts to designated critical habitat.

A description of the condition of the Focus Indicators within the action area is provided below.

6.4.1 SPAWNING AND INCUBATION

6.4.1.1 CHINOOK SALMON SPAWNING AND INCUBATION

There is no Chinook salmon spawning and incubation in the Squaw Creek Allotment action area (Figure 4; Appendix C: Table C7).

6.4.1.2 STEELHEAD SPAWNING AND INCUBATION

The Squaw Creek Allotment action area supports steelhead spawning and incubation in approximately 5.3 miles of Squaw Creek in the Lower Squaw Creek, Riparian Pasture, Trealor Creek, and Upper Squaw Creek units (Figure 5; Appendix C: Table C7). This approximate length reflects continuous mapping of the stream, and is likely a significant overestimate of actual quantity of spawning habitat because suitable combinations of depth, velocity, and spawning substrate for steelhead spawning are not continuous.

The USBWP Technical Team instream work window and fish periodicity document specifies a steelhead spawning period for the Squaw Creek Watershed of March 15 to June 15 (USBWP 2005). Steelhead incubation is likely to extend through the first week of July.

6.4.1.3 BULL TROUT SPAWNING AND INCUBATION

The Squaw Creek Allotment action area supports bull trout spawning, and incubation in approximately 2.3 miles of Martin Creek in the Upper Squaw Creek Unit (Figure 6; Appendix C: Table C3). This approximate length reflects continuous mapping of the stream, and is likely a significant overestimate of actual quantity of spawning habitat because suitable combinations of depth, velocity, and spawning substrate for bull trout spawning are not continuous.

The USBWP Technical Team instream work window and fish periodicity document specifies a bull trout spawning period for the Squaw Creek Watershed of August 15 to October 15 (USBWP 2005). Bull trout incubation is likely to extend through April of the following year.

6.4.2 WATER TEMPERATURE

Water temperature influences many aspects of salmonid life history including reproduction, growth, and migration. PACFISH water temperature criteria for salmon and steelhead is less than 64ºF (17.8ºC) for rearing and migration, and less than 60ºF (15.6ºC) for spawning areas (Table 6). The PACFISH (NMFS 1996) and INFISH (USFWS 1998a) bull trout maximum water temperature criteria is less than 59ºF (15.0ºC) for adult holding habitat and less than 48ºF (8.9ºC) in spawning and rearing habitats (Table 6).

TABLE 6 - PACFISH AND INFISH TEMPERATURE CRITERIA (SOURCE: NMFS 1996; USFWS 1998A)

Species	Life Stage	Temperature Criteria
Chinook Salmon and Steelhead	rearing and migration	≤64ºF or 17.8ºC
	spawning	≤60ºF or 15.6ºC
Bull Trout	adult holding	≤59ºF or 15.0ºC
	spawning and rearing	≤48ºF or 8.9ºC

In 2009, the SCNF collected HOBO water temperature data at two sites in Squaw Creek from July 1 through September 30 (Appendix C: Figures C1 and C2; Table C8). The results from this temperature monitoring are summarized below.

Squaw Creek at the Forest Boundary (T34)

The warmest 7-day moving maximum temperature recorded in Squaw Creek at the bottom of the Riparian Pasture Unit (T34 at the forest boundary) was 17.9˚C, which met the PACFISH and INFISH criteria for Chinook salmon and steelhead rearing and migration, and did not meet the criteria for Chinook salmon spawning and bull trout spawning and rearing (Table 6; Appendix C: Table C8).

The mean temperature from July 1 through September 30 was 11.2˚C which did not meet bull trout spawning and rearing criteria (Table 6). After October 1 temperatures consistently met bull trout spawning criteria (Appendix C: Figure C32).

Squaw Creek below Martin Creek (T35)

The warmest 7-day moving maximum temperature recorded in Squaw Creek below Martin Creek (T35) in the Upper Squaw Creek Unit was 14.5˚C, which met the PACFISH criteria for Chinook salmon and steelhead migration, rearing, and spawning, and the INFISH criterion for adult bull trout holding (Table 6; Appendix C: Table C8).

The mean temperature from July 1 through September 30 was 9.4˚C although not optimal, generally met bull trout spawning and rearing criteria (Table 6). After October 1 temperatures consistently met spawning criteria (Appendix C: Figure C33).

6.4.3 SEDIMENT

Instream sediment can influence fish incubation success, rearing habitat quantity and quality, and macroinvertebrate production (Bjornn and Reiser 1991). The resource objective for sediment is to have less than 20% fines (<0.25 inches in diameter) in priority watersheds; and less than 30% in non-priority watersheds.

The Forest Watershed Program has monitored Squaw Creek substrate through core sediment sampling intermittently since 1995. From 1995 through 2003 the fine sediment at depth ranged from 23.5 to 34.0%, or functioning at risk to unacceptable risk (Appendix C: Figure C1; Table C9) (SCNF Watershed Program data).

The Squaw Creek Watershed portion of this allotment has been rested since 2003. Sediment data was collected at this site during the rest period in 2004, 2007, and 2008. In 2004, the fine sediment at depth was 34% (Appendix C: Table C9). In 2007 and 2008, it was 16.4 and 29.0%, respectively. This monitoring site (BD118) is on Squaw Creek at the southern boundary of the allotment within Riparian Pasture (Appendix C: Figure C1). There are no other sediment monitoring sites in the allotment.

6.4.4 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% or greater bank stability in priority watersheds, including the Squaw Creek Watershed. The Forest streambank stability objective for the units in the non-priority watersheds is 80% or greater.

The Forest Watershed Program has monitored Squaw Creek bank stability at the BD118 monitoring site since 1995 (Appendix C: Figure C1; Table C10). When this unit was grazed (1995 through 2003), the bank stability was 62.5% in 1995 and 94.5% in 2003. Most years from 1995 through 2003 this indicator met the PACFISH RMO of 90% or greater.[11]

In 2004, the first year this unit was rested, the bank stability was 83.5% (Appendix C: Table C10). In 2007 and 2008, bank stability at this site met RMOs (100 and 89.5%, respectively). This monitoring site is on Squaw Creek near the southern boundary of the allotment, and within the Riparian Pasture (Appendix C: Figure C1). Livestock are kept out of this area by a combination of natural barrier and existing fence, and this area will not be grazed under the proposed action. Therefore, there will be no livestock streambank impacts at this site for the term of the permit.

In 2009, the bank stability at the Lower Squaw Creek Unit (M72) and the Riparian Pasture Unit (M284) MIM sites (77 and 86%, respectively) that have been rested since 2003 did not meet the priority watershed RMO (Appendix C: Figure C1; Table C11). The Riparian Pasture Unit MIM site is upstream of the watershed monitoring site (BD118) on Squaw Creek. Livestock are kept out of this unit by a combination of natural barrier and existing fence, and this unit will not be grazed under the proposed action. Therefore, there will be no livestock streambank impacts at this site for the term of the permit.

In 2009, the bank stability at the Trealor Creek Unit (M71) MIM site on Squaw Creek was 92%, and met the priority watershed RMO (Appendix C: Figure C1; Table C11). This unit has been rested since 2003.

In 2009, the bank stability at the Upper Squaw Creek Unit (M285) MIM site on Squaw Creek was 91%, and met the priority watershed RMO (Appendix C: Figure C1; Table C11). In 2010, the bank stability at the Upper Squaw Unit MIM site (M330) on Martin Creek was 100%. These units have been rested since 2003.

There is no bank stability data for the Juliette MIM site (M66) on Bayhorse Creek (Appendix C: Table C11).

6.4.5 WIDTH TO DEPTH RATIO

The relationship of stream width to water depth expressed as a ratio influences the amount and quality of aquatic habitat. Channel widening results in shallower depth, decreased cover, and increased water temperature. The Forest Plan objectives for width to depth ratios are: 28 in C-channels; 27 in B-channels; and 21 in A-channel types.

The 2009 Squaw Creek width to depth ratios at the Lower Squaw Creek Unit, the Riparian Pasture Unit, the Trealor Creek Unit, and the Upper Squaw Creek unit MIM sites all met PACFISH RMOs.

No additional width to depth data has been collected in this allotment.

6.4.6 RIPARIAN HABITAT CONSERVATION AREAS

Riparian vegetation can strongly influence aquatic habitat quality and fish productivity because it provides stream shade, high flow velocity breaks, woody debris recruitment, streambank stability, hiding cover for fish, organic detritus, substrate for macroinvertebrates, and pools. The analysis of riparian conservation

[11] In 1996 the bank stability reading was 100% which is most likely a difference between field personnel than an actual change since the 1995 reading of 62.5% (Appendix C: Table C10).

areas focuses on greenline ecological status (GES) and woody species recruitment. The Forest Plan forest-wide GES objective is 61 or greater. An ecological status rating greater than 86 is indicative of a potential natural community (Winward 2000).

The Forest plan objectives for woody vegetation are to develop and maintain healthy woody plant populations with multiple seral stages; retain at a minimum 75% stream shade provided by woody vegetation; and browse utilization in riparian areas will not exceed 50% of new leader production. These objectives can be evaluated by examining the percentage of woody plants that are young seedlings and saplings.

In 2009 the Lower Squaw Creek MIM site (M72) GES was 60 (mid-seral) and for practical purposes met the Forest Plan objective of 61% (Appendix C: Figure C1; Table C11). Woody species abundance was 48% seedlings-young plants with 104 seedlings per acre, indicating regeneration is occurring. This unit has been rested since the 2009 reading, and the trend has up since 2003 when the GES was 21 (early seral).

In 2009, the Riparian Pasture MIM site (M284) GES was 54 (mid-seral) and did not meet the Forest Plan objective (Appendix C: Figure C1; Table C11). Woody species abundance was 46% seedlings-young plants with 131 seedlings per acre, indicating regeneration is occurring. This unit will not be grazed under the proposed action.

In 2009, the Trealor Creek Unit MIM site (M71) GES was 53 (mid-seral) and did not meet the Forest Plan objective (Appendix C: Figure C1; Table C11). Woody species abundance was 37% seedlings-young plants with 124 seedlings per acre, indicating regeneration is occurring. This unit has been rested since the 2009 reading, and presumably the trend has been upward since 2009.

In 2009, the Upper Squaw Creek Unit MIM site on Squaw Creek (M285) GES was 49 (mid-seral) and did not meet the Forest Plan objective (Appendix C: Figure C1; Table C11). Woody species abundance was 36% seedlings-young plants with 61 seedlings per acre, indicating regeneration is occurring. This unit has been rested since the 2009 reading and presumably the trend has been upward since 2009.

In 2010, the Upper Squaw Creek Unit MIM site on Martin Creek (M330) GES was 98 (PNC[12]) and met the Forest Plan objective (Appendix C: Figure C1; Table C11). Woody species abundance was 15% seedlings-young plants with 91 seedlings per acre, indicating regeneration is occurring. This unit has been rested since the 2010 reading and presumably the trend has been upward since 2009.

In 2003, the Juliette Unit MIM site (M66) GES was 35 (early seral) and did not meet the Forest Plan objective (Appendix C: Figure C1; Table C11). Woody species abundance was 42% seedlings-young plants with 229 seedlings per acre, indicating regeneration was occurring. This MIM site has not been read since 2003. The unit has been grazed an alternating (one year early, one year late) seven weeks since 2005.

6.4.7 ANNUAL USE INDICATORS AND OBJECTIVES AND THEIR RELATIONSHIP TO FOCUS INDICATORS

Annual use indicators were selected because of their documented ability to maintain and/or achieve riparian objectives described in section 3.2.5 (Table 7). There is considerable overlap; the riparian system effectively integrates vegetation cover, flow regimes, sediment, and nutrients (DeBano 1989). The goal is to manage livestock grazing so as not to prevent the attainment and maintenance of healthy aquatic and riparian communities (Gamett et al. 2008).

Livestock will affect riparian vegetation and physical conditions differently depending on many factors, including the site's physical characteristics and conditions, the stage of plant development, the nature of the plant communities in both the riparian zone and the uplands, and current weather. There are tradeoffs in potential impacts with regard to time of grazing (Erhart and Hansen 1997). These are grazing and livestock management considerations, and while important to implementing sound riparian grazing management, are generally excluded from the following discussion.

12 Potential natural community

The focus of this section is on the annual use indicators and how managing by them will help maintain or achieve the riparian resource objectives and grazing focus indicators.

Annual Use Indicators and Vegetation in Riparian Areas. How much and what type of vegetation exists in a riparian plant community, particularly on the greenline, determines how well the riparian system performs its function of reducing flow velocity, trapping sediment, building banks and protecting against erosion. The susceptibility of streambanks to damage is influenced by vegetation. Woody vegetation has an essential role in maintaining riparian function; reducing browsing pressure on riparian trees and shrubs is a significant benefit. Roots and rhizomes of herbaceous vegetation provide much of the compressive strength and soil stability for streambanks in meadow situations such as on the Challis National Forest (Clary and Kinney 2000).

Streamside vegetation strongly includes the quality of habitat for anadromous and resident coldwater fishes including shade to prevent adverse water temperatures fluctuations, roots that lend stability to overhanging banks, and the capability to filter sediment and debris (Kauffman and Krueger 1984).

Stubble height on the greenline is directly related to the health of herbaceous plants (Burton et al. 2008). Dense vegetation on the floodplain during spring flooding events to trap sediment plus vigorous plant growth to stabilize sediment deposits is critical for bank building and maintenance. Residual herbaceous vegetation of six inches in a 20 year comparison study in southwestern Montana resulted in dense vigorous riparian vegetation as well as a diversity of age classes of vigorous woody riparian species (Myers 1989). In Idaho, maintaining stubble heights of 4 to 5.5 inches allowed streambank recovery (Clary 1999). Shorter stubble heights (up to six inches) are most effective in improving sediment entrapment during the deposition phase while even longer lengths retain a larger portion of deposited sediment (Clary and Leininger 2000). Four inch stubble height in either late June or early July resulted in no difference in bank angle or stream width compared to no grazing in the Sawtooth Valley (Clary and Kinney 2000).

TABLE 7 – RELATIONSHIP MATRIX

Focus Indicator	Riparian Resource Objective	Related Element Affected by Livestock Grazing	Related Annual Use Indicator
Streambank Condition	Greenline Successional Status	Greenline Status	Greenline Stubble
	Woody Species Regeneration	Woody Species Regeneration	Browse Use
	Bank Stability	Greenline Status, Woody Species Regeneration, Current Year Alteration	Stubble Height, Browse Use, Bank Alteration
Temperature	Water Temperature	Greenline Status, Woody Species Regeneration, Vegetation Overhang	Greenline Stubble, Browse Use, Bank Alteration
Width to Depth	Width to Depth Ratio	Greenline Status, Current Year Alteration	Greenline Stubble, Browse Use, Bank Alteration
Sediment	Sediment	Greenline Status, Bank Stability, Current Year Alteration	Greenline Stubble, Browse Use, Bank Alteration
Riparian Conservation Areas	Greenline Successional Status	Greenline Status	Greenline Stubble

	Woody Species Regeneration	Woody Species Regeneration	Browse Use
	Bank Stability	Greenline Status, Woody Species Regeneration, Current Year Alteration	Stubble Height, Browse Use, Bank Alteration
Spawning and Incubation	N/A	N/A	N/A

Most measurements of streamside variables moved closer to those beneficial for salmonid fisheries when pastures were grazed to four inches of graminoid stubble height; virtually all measurements improved when pastures were grazed to six inches stubble height, or when pastures were not grazed (Clary 1999).

The residual stubble or regrowth should be at least four to six inches in height to provide sufficient herbaceous forage biomass to meet the requirements of plant vigor maintenance, bank, and sediment entrapment (Clary and Webster 1989). This is a recommended grazing practice for Rosgen B channel types with medium to fine easily eroded soil materials and most Rosgen C channel types, in mid seral conditions. Special situations may require stubble heights of greater than six inches (Clary and Webster 1989; Myers 1989).

Cattle are destructive to willow stands when they congregate in them (Kovalchik and Elmore 1991; Schulz and Leininger 1990). When herbaceous forage quality diminishes, by either utilization or curing, cattle switch from grazing to browsing (Hall and Bryant 1995; Clary and Leininger 2000). The degree to which browsing of willows is compatible with maintaining willow stands depends on the relative number of willows present. Where willow browsing is light and seedling survival is high the vigor of willows is high (Kovalchik and Elmore 1991). There is a loop between vigorous willow [and sedge] regrowth, excellent streambank protection, and soil and water relationships favorable to continued willow [and sedge] production (Kovalchik and Elmore 1991).

Resistance of common riparian woody plants to defoliation has not been investigated. However, genera commonly represented in riparian areas such as dogwood, maple, cottonwood, willow, and birch appear to be more resistant to foliage and twig removal than genera common to xeric uplands (Clary and Webster 1989). Many upland species can tolerate 50-60% use, including desirable browse species such as antelope bitterbrush, rose, and aspen (Ehrhart and Hansen 1997). Less than half of heavily clipped or browsed willow stems survive into the following year (Smith 1980 and Kindschy 1989 as cited in Kovalchik and Elmore). Willow use is most critical (most likely to occur) when grazing extends into the hot summer season or fall (Myers 1989; Clary and Webster 1989; Kovalchik and Elmore 1991). Removing cattle before 45-50% forage use improves the response of willows (Edwards 2009; Kovalchik and Elmore 1991). The Bureau of Land Management (BLM) has concluded that exceeding 50% use of current year browse leaders would likely reduce woody vegetation vigor, modify normal growth form, and in the longer-term diminish the age class structure, all of which could affect riparian habitat conditions. Where there is current upward trend of ecological condition it is expected to continue by managing for no more than 50% browse use (USDI BLM 2009).

A study on Stanley Creek in central Idaho (Clary and Kinney 2000) applied three levels of forage use - moderate (50%), light (25%), and no grazing - on mountain meadows in the last half of June. Results were an increase in willow height and cover. Other studies cited in Clary and Kinney show that by maintaining an adequate herbaceous forage supply, and controlling the period of grazing, impacts on the willow community are reduced.

<u>Annual Use Indicators and Streambank Alteration</u>. Grazing along streambanks does as much or more damage to stream-riparian habitats through bank alteration as through changes in vegetation biomass. Overuse by cattle can easily destabilize and break down streambanks as vegetation is weakened and hoofs shear bank segments (Clary and Kinney 2000). A major resource management need is to consider the maintenance of streambank structure and channel form as key factors in fisheries habitat and hydrologic function.

It is widely known that bank alteration by trampling, shearing, and exposure of bare soil can be an important source of stream channel and riparian area degradation (Clary and Webster 1989; Belsky et al. 1999). Impacts of bank alteration may include channel widening (and loss access to floodplains by peak flows), loss of riparian vegetation (which then makes banks more vulnerable to further erosion), localized lowering of water tables in riparian areas (and loss of water storage in floodplains and stream channels), and changes in sediment transport capacity of stream channels (Clary and Webster 1989).

Literature such as Clary and Webster (1989) often refers to the indirect effect on streambank trampling. A number of other authors who reviewed the literature summarized that careful control of grazing duration and season results in maintenance of the streambank vegetation and limitation of trampling, hoof slide, and accelerated streambank cave-in (Erhart and Hansen 1997; Clary and Leininger 2000).

Some researchers have concluded that bank alteration, taking natural channel stability into account, is the most important factor to consider in evaluating physical stream channel conditions and impacts from land use. Streambank alterations of 20% or less are expected to allow for upward trend of streams with stream widths narrowing and depths increasing (Bengeyfield 2006).

In southwestern Montana, stream channels narrowed and deepened when streambank disturbance from cattle did not exceed 30 feet per 100 feet of stream reach (Dallas 1997 cited in Mosley et al. 1997). Based on Cowley's literature review, "it appears that 70 percent unaltered streambanks (i.e. 30 percent altered streambanks) is the minimum level that would maintain stable conditions. All of [the] authors consider both natural and accelerated alteration in the totals". Cowley suggested that 80% unaltered streambanks should allow for "making significant progress" toward stream channel improvement, and that this value should be the maximum allowable streambank alteration (Cowley 2002 cited in Simon 2008).

7 ANALYSIS OF EFFECTS

This section contains the effects analysis. The effects of the proposed action are described below and summarized in Table 5. This analysis emphasizes effects to the six focus indicators previously identified as being susceptible to impacts of grazing activities in the Squaw Creek Allotment.

7.1 DIRECT AND INDIRECT EFFECTS

Direct effects are those effects that are a direct result of the action. Indirect effects are "caused by the proposed action and are later in time, but still are reasonably certain to occur" (50 CFR§402.02).

Direct effects of livestock grazing may occur when livestock enter streams occupied by listed salmonids to loaf, drink, or cross the stream. Livestock entering fish-spawning areas can trample redds, and destroy or dislodge embryos and alevins (Belsky et al. 1997; Gamett et al. 2009).

Improperly managed grazing can additionally have adverse indirect effects to streams and riparian areas (Menke 1977; Clary and Webster 1989; Belsky et al. 1997). These effects can include modifications to stream temperatures, sediment levels, width to depth ratios, bank stability, and riparian vegetation.

A variety of conservation measures can be implemented to minimize or eliminate potential grazing related effects to listed fish and their aquatic and riparian habitats. These include:

> Strategic Rotation: Unit rotation strategies designed to move livestock off streams during critical spawning periods can avoid direct impact to spawning fish or their incubating redds.
> Fencing: Fencing sensitive riparian areas can be an effective way of protecting riparian resources, fish habitat and fish populations. Platts (1991) found that, in 20 of 21 studies, stream and riparian habitats improved when grazing was prohibited in fenced riparian zones.
> Herding: Utilizing riders to keep livestock away from riparian areas can avoid direct impacts to spawning fish and incubating redds.
> Salting: Placing salt or mineral supplements in upland areas can decrease the amount of time livestock spend in riparian areas. Ehrhart and Hansen (1997) provide evidence that salt used in conjunction with alternate water sources can help distribute livestock over open range.

Annual Use Indicators: Establishing annual use indicators and moving livestock when these indicators are approached or reached can help avoid many of the adverse effects that livestock grazing can have on fish and riparian and aquatic habitats.

The proposed annual indicators in Table 5 will be implemented to meet the PACFISH RMOs in the Squaw Creek Allotment. The relevant measures have been integrated into the grazing strategy for the allotment to reduce the potential for adverse effects to listed fishes and aquatic and riparian habitats within the action area. Utilization levels may also vary the on/off dates within the parameters of the authorized use.

Upland salting will be used to encourage livestock use out of riparian conservation areas. The constructed ponds and troughs will provide off-stream watering opportunities (Figure 2).

Range readiness will guide the date of entry into the action area. In most years range is ready for grazing by the authorized on-date. In those years where weather brings range readiness into question, the allotment will be monitored to verify the appropriate on-date.

Information on the effectiveness of the proposed conservation measures is limited. Erhart and Hansen (1997) found mixed success when only one technique was applied. However, when applied collectively, this suite of measures has been shown to be effective in minimizing direct livestock impact to spawning habitats and avoiding indirect impacts to aquatic and associated riparian habitats.

The likely impacts of the proposed action on the six focus indicators – spawning and incubation, water temperature, fine sediment at depth, streambank condition, channel width to depth ratio, and riparian habitat conservation areas are discussed below.

7.1.1 SPAWNING AND INCUBATION

Livestock wading through streams can trample salmonid redds (Gregory and Gamett 2009; Ballard and Krueger 2005a; Ballard and Krueger 2005b) which may result in the death of eggs and alevins which are developing in the gravel. Gregory and Gamett (2009) estimated that livestock grazing under routine conditions on national forest lands could trample up to 78% of bull trout redds. This level of trampling could result in a significant reduction in egg and alevin survival and could significantly reduce the size of the bull trout population.

Potential effects of the proposed action to listed fish spawning and incubation in the Squaw Creek Allotment are discussed individually below.

7.1.1.1 CHINOOK SALMON

There is no occupied Chinook spawning habitat in the Squaw Creek Allotment. Therefore, the proposed grazing permit will have no potential to affect Chinook salmon spawning or incubation.

7.1.1.2 STEELHEAD

Squaw Creek Watershed is a steelhead priority watershed (Figure 3). The proposed permit action will establish a Riparian Pasture Unit that includes 1.6 miles of Squaw Creek that is occupied steelhead spawning habitat (Figures 2 and 5; Appendix C: Table C5). Livestock are kept out of this unit by a combination of natural barrier and existing fence. No livestock grazing or trailing will occur in this unit.

There is another 3.7 miles of the occupied steelhead spawning habitat in Squaw Creek within the Lower Squaw Creek, Trealor Creek, and Upper Squaw Creek units ((Figures 2 and 5; Appendix C: Table C7). There is no steelhead spawning habitat in the other units (Figure 5).

Livestock will not be in the Upper Squaw Creek Unit during the March 15-July 7 steelhead spawning or incubation periods (Tables 2-4) (USBWP 2005). Therefore, livestock grazing will have no potential to affect steelhead spawning or incubation in ¾ mile of occupied spawning habitat in this unit.

There is 3.1 miles of occupied steelhead spawning habitat in the Lower Squaw Creek and Trealor Creek units (Appendix C: Table C5). Cattle will enter one unit or the other about June 16[13] every year under the 3-year rest rotation and deferred rotation system (Tables 2-4). The interagency Upper Salmon Basin Watershed Project Technical Team (USBWP 2005) determined steelhead incubation may occur through July 7. So there is potential for livestock to trample steelhead redds in one or the other of these units for up to three weeks every year.

7.1.1.3 BULL TROUT

There is 2.3 miles of occupied bull trout spawning habitat in Martin Creek within the Upper Squaw Creek Unit (Figure 6; Appendix C: Table C3). This is the only known occupied bull trout spawning habitat in the allotment.

Upper Squaw Creek Unit will be used August 10-20 during the first year of the rotation, primarily to move livestock to the east side of the unit to access the next units in the rotation. Livestock will cross Martin Creek once before August 15 to get to the east side of the unit. Herd management will focus on active riding to keep livestock out of the Martin Creek drainage after the crossing to protect spawning bull trout and their redds. Because the Martin Creek drainage does not have any large meadows, is heavily timbered, and the topography is steep, the active riding is expected to be an effective method for keeping livestock out of Martin Creek after the August 15 initiation of bull trout spawning.

The second and third years of the rotation, livestock will be off the Upper Squaw Creek Unit after August 15 to protect spawning bull trout and their redds.

Data collected from a reach of Martin Creek in 2001 indicated that only 2 bull trout redds had been completed by August 31 (Yankee Fork Ranger District, file data). If this is typical of other years, prohibiting livestock grazing in the Martin Creek drainage after August 15 would mean that few, if any bull trout redds would be susceptible to trampling by livestock.

Livestock will not be in the Upper Squaw Creek Allotment before June 16 (Tables 2-4). The June 16 on-date will have no effect on incubating bull trout which may be in the gravel through April 21.

7.1.1.4 WATER TEMPERATURE

Stream temperatures can have a significant impact on bull trout distribution and abundance. Gamett (2002) evaluated the relationship between bull trout distribution and abundance in the Little Lost River Subbasin and found that bull trout were always present in stream reaches where the July-September mean temperature was less than 10°C and never present where the mean temperature was greater than 12°C.

Gamett also found that bull trout densities were highest where the July-September mean temperature was 7.0-7.9°C and dropped sharply as the mean temperature increased (Table 8). This suggests that even small increases in stream temperature could result in dramatic decreases in bull trout abundance.

13 The on-date will be based on range readiness.

TABLE 8 - BULL TROUT DENSITIES AT A RANGE OF TEMPERATURES (SOURCE: GAMETT 2002)

Bull Trout Density (fish>700mm/100 m^2)	July-September mean temperature (°C)
15	7.0-7.9
10.1	8.0-8.9
1.6	9.0-9.9
0.4	10.0-10.9
0.1	11.0-12.0
0	>12.0

Livestock grazing can modify stream temperatures (Armour et al. 1994). Stream temperatures are controlled by a complex interaction between stream shading, width to depth ratio, ground water input, water volume, air temperature, and source water temperature. Livestock can have significant impacts on stream shading, width to depth ratios, groundwater input, and water volume and through these mechanisms they can impact stream temperatures. Subsequently, summer stream temperatures are often higher in grazed areas compared to ungrazed areas (Platts 1991). Isaak and Hubert (2001) found that cattle density was inversely related to maximum summer stream temperatures. Stream temperature modeling completed by Gamett (2002) indicated that changes in water temperature brought about by modifications to streamside shading could have significant impacts on bull trout populations. This work evaluated how water temperature and bull trout abundance might change in a hypothetical stream typical of some streams in the Little Lost River basin when stream shade was reduced from 90 to 10%, and found that such a change could increase the maximum water temperature observed on August 1 from 10.4 to 21.6°C. This reduction would reduce the probability of bull trout being present from 100 to 6% and would reduce the number of salmonids that were bull trout from 88 to 7%.

Although biologists typically consider the effects of livestock grazing on summer stream temperatures, the impact of livestock grazing on winter temperatures should not be overlooked. While livestock grazing can result in higher summer stream temperatures it can also cause lower stream temperatures in the winter (Armour et al. 1994). This can occur when livestock grazing results in a loss of cover or when livestock grazing increases the width to depth ratio thereby increasing the surface to volume ratio. Either of these affects can reduce the ability of a stream to buffer itself against cold winter air temperatures and can lead to increased icing and a subsequent loss of habitat.

Livestock grazing on this allotment has likely modified stream channels and riparian vegetation along several streams in a manner that has resulted in increased stream temperatures (Appendix B; Appendix C: Table C8; Figures C32 &33). These impacts have likely resulted in small increases in water temperatures in these streams. Even small increases in summer stream temperature can reduce bull trout abundance in streams (Table 4) (Gamett 2002). Therefore, small increases in stream temperature that have may have resulted from livestock grazing may reduce the ability of streams to support bull trout during the summer months.

Squaw Creek Watershed Units

The July 1 through September 30, 2009 maximum 7-day moving maximum (17.9˚C) and mean (11.2˚C) water temperatures in Squaw Creek, at the Forest boundary (T34), did not meet the PACFISH and INFISH criteria for Chinook salmon spawning and bull trout spawning and rearing (Appendix C: Table C8). After October 1 temperatures consistently met bull trout spawning criteria (Appendix C: Figure C32). This monitoring site is within the Riparian Pasture Unit.

The warmest 7-day moving maximum temperature recorded in Squaw Creek below Martin Creek (T35) in the Upper Squaw Creek Unit (14.5˚C) met the PACFISH criteria for Chinook salmon and steelhead migration, rearing, and spawning, and the INFISH criterion for adult bull trout holding (Appendix C: Table C8). The mean temperature from July 1 through September 30 was 9.4˚C although not optimal, generally

met bull trout spawning and rearing criteria. After October 1 temperatures consistently met bull trout spawning criteria (Appendix C: Figure C33).

All of the units in the Squaw Creek Watershed have been rested since 2003. The GES at all of the mainstem Squaw Creek MIM sites was “mid-seral” in 2009 (Appendix C: Table C11). The Martin Creek GES was PNC in 2010 (Appendix C: Table C11).

No livestock impacts will occur in the Riparian Pasture Unit under the proposed permit action. Therefore, the GES is expected to trend upward to PNC in this unit, which will increase stream shade and reduce temperatures in this 1.6 mile segment of Squaw Creek.

The proposed rest-rotation and deferred rotation grazing system, stubble height, and woody browse utilization standard are also expected to continue the upward GES trend and canopy cover along Squaw Creek in the Upper Squaw Creek, Trealor Creek, and Lower Squaw Creek units, and maintain the GES and canopy cover in Martin Creek.

Juliette Unit

Temperature data is not available for Bayhorse Creek in the Juliette Unit. In 2009, the Bayhorse Creek MIM site (M66) was early seral (Appendix C: Table C11). The Juliette Unit has not been rested and will continue to be grazed as part of the proposed action. This unit will be grazed last every year for approximately 2 weeks in September (Tables 2-4); this is a change from the previous Juliette-Happy Hollow two unit deferred rotation system where each unit was grazed for approximately two months annually. This grazing rotation and the woody browse utilization standard are expected to improve the GES and canopy cover in this unit.

Temperature monitoring is not proposed as part of this action.

The Squaw Creek Allotment MIM site greenline monitoring will identify any downward trends in riparian vegetation, RMOs, or other focus indicators that may be caused by livestock or other factors. A downward trend would initiate modification of the proposed grazing system and/or conservation measures. The proposed allotment management changes, monitoring, and adaptive management are expected to result in generally upward GES trends across the allotment over time. However livestock grazing will likely result in some continued, localized impacts to riparian vegetation that may prevent some portions of the streams from achieving the GES RMOs of ≥61% (late seral) and properly functioning water temperatures. These impacts may adversely affect Chinook salmon, steelhead, and bull trout designated critical habitat in the Squaw Creek Watershed units that were mid-seral in 2009 and did not meet Chinook salmon, steelhead, and bull trout temperature requirements, and the bull trout designated habitat in the Juliette Unit that was early seral when it was last read in 2003.

7.1.2 SEDIMENT

Increased sediment in streams can reduce the survival of salmonid eggs and alevins that are incubating in the stream substrate. For example, Reiser and White (1988) evaluated the impact of fine (<0.84 mm) and coarse (0.84-4.6 mm) sediment on the survival of Chinook salmon and steelhead eggs in the laboratory. They found that the survival of steelhead eggs was about 85% when fine sediment was 0% but when fine sediment was 10% survival dropped to about 25%. Almost no eggs survived when fine sediments were 30%. Survival of Chinook salmon eggs was about 65% when fine sediment was 0% but survival was only about 10% when fine sediment was 10%. Like the steelhead, almost not eggs survived when fine sediments were 30%. Experiments with course sediments also showed a sharp decline in the survival of both Chinook salmon and steelhead eggs as sediment levels increased from 0 to 30%. Similarly, Phillips et al. (1975) found that the survival of steelhead and coho salmon eggs dropped sharply as the amount of fines (1-3 mm) in the substrate increased. Although data relating to relationship between sediment and the survival of bull trout eggs are not available, increased sediment levels undoubtedly reduces the survival of bull trout eggs.

Sediment can also have impacts on trout abundance. For example, Watson and Hillman (1997) found that bull trout densities were negatively correlated with the amount of surface fines (<2 mm). Similarly, Zoellick and Cade (2006) found that redband trout densities in southwestern Idaho were often greater

than 40 fish per 100 m^2 where surface fines (<2 mm) were less than 20% but that densities were never greater than 40 fish per 100 m^2 when surface fines were greater than 40%.

Livestock grazing can significantly increase stream sediment levels. This is done through impacts to upland vegetation thereby increasing sediment generated from the uplands and by impacts that reduce bank stability thereby increasing sediment generated by bank erosion. Subsequently, streams in grazed areas typically have more fine sediment than streams in ungrazed areas (Platts 1991). Lusby (1970) evaluated sediment production in grazed and ungrazed watersheds in Colorado and found that sediment production was about 45% less in ungrazed watersheds compared to grazed watersheds. Dahlem (1979) studied changes in stream sediment levels following the elimination of cattle grazing in the Mahogany Creek watershed in Nevada. Dahlem found that just two years after livestock were removed from the watershed, the amount of stream bottom covered by silt had declined from 27 to 11% and that spawning gravels increased from 52 to 70%. Hubert et al. (1985) compared sections of a Wyoming stream that were grazed with those that had not been grazed for four years. They found that the substrate in sections of the stream that were grazed was 22% silt whereas the substrate in sections of stream that had not been grazed for four years was just 13% silt. Since livestock grazing can lead to increased sediment levels in streams and subsequently impact fish populations it is important to consider the effect of livestock grazing on stream sediment levels.

Livestock grazing has likely resulted in modified upland vegetation, riparian vegetation, and streambanks condition in a manner that has resulted in increased instream sediment levels in Squaw Creek, as indicated by the 2009 MIM site data (Appendix C: Table C11). These impacts have likely resulted in measurable increases in sediment levels and reduced the ability of Squaw Creek Watershed to support Chinook salmon, steelhead, and bull trout. As a result, all of the units in the Squaw Creek Watershed have been rested since 2003.

The only sediment monitoring site in this allotment is in Squaw Creek in the Riparian Pasture Unit (BD118) (Appendix C: Figure C1). Prior to 2004 the sediment levels at this site (24-34%) did not meet the PACFISH objective for priority watersheds (<20%) (Appendix C: Figure C1; Table C9). Sediment data was also collected at this site in 2007 and 2008 during the rest period. In 2007, the sediment level met the PACFISH objective (16.4%); in 2008, it did not (29%). In 2007, the bank stability at BD118 was 100%; in 2008 it was 89.5%. In 2009, bank stability at the Riparian Pasture Unit MIM site (M284) was 86% (Appendix C: Figure C1; Table C11). No grazing or trailing will be permitted in the Riparian Pasture Unit so no livestock impacts will occur during the term of the permit.

The other units in the Squaw Creek Watershed will be grazed under the proposed action. In 2009 the bank stabilities on Squaw Creek in the Trealor Creek Unit (M71) and the Upper Squaw Creek Unit (M285), and Martin Creek in the Upper Squaw Creek Unit met the priority watershed RMO ($\geq$90%). Bank erosion is a potentially large source of sediment delivery. The 20% bank alteration standard will be applied to the Squaw Creek units that currently meet the priority watershed bank stability RMO, and the Juliette Unit to maintain or improve riparian and streambank conditions. The Lower Squaw Creek and Trealor units will also be rested every third year to reduce potential streambank erosion and riparian vegetation impacts that may be caused by over-use and early or late season use.

Bank stability in the Lower Squaw Creek Unit (M72) did not meet the priority watershed RMO in 2009 (Appendix C: Figure C1; Table C11). This unit will have a 10% bank alteration standard until bank stability is $\geq$90%.

All units in the allotment will have a 30-50% woody riparian browse utilization standard to limit livestock impacts to woody riparian species that stabilize streambanks (Table 5). The grazing season flexibility will also prevent overgrazing of seedlings and saplings which limits age class diversity and regeneration (BLM 2009b).

All the units in the Squaw Creek Watershed and the Juliette Unit will also have a 6-inch *Carex* spp. stubble height indicator to protect riparian areas and streambanks, a potentially large source of sediment delivery.

The existing structural improvements in the Squaw Creek Allotment include a network of constructed off-channel ponds and water troughs (Figure 2). These improvements, frequent riding, and salting ¼ mile

from streams will continue to encourage upland utilization and decrease impacts on riparian areas and perennial streambanks. Livestock will still continue to use access corridors to the perennial streams and "loaf" in riparian conservation areas which will create localized impacts to riparian vegetation and streambanks however the majority of woody riparian vegetation is expected to remain stable and provide bank stabilization due to moving cattle out of a unit based on annual use indicators.

The upland range utilization may cause soil erosion and increase sediment delivery because livestock grazing during periods of high soil moisture promotes plant uprooting rather than nipping, and may compact wet soil and create an impervious surface that delays seedling emergence and diminishes capillary movement of water through soils (BLM 2009a). As a result, overland runoff may occur and increase sediment delivery to streams. To reduce upland impacts, livestock will be managed so that no more than 50% nipping on the current year leaders of upland browse occurs to maintain normal growth form and age class structure. An upland grass utilization indicator of 50% is also applied to promote healthy herbaceous vegetation cover. In addition, the 3-year rest-rotation and deferred rotation grazing system and the flexible on-date based on range readiness will protect soil during wet weather periods, allow for seed set, and allow for vegetation regrowth during the spring and fall growing seasons in the Squaw Creek Watershed (Tables 2-4). The Juliette Unit will not have as much opportunity for regrowth because it will be grazed during the fall growing season; however deferred grazing of herbaceous species until after seed set will provide for carbohydrate storage in the roots.

In summary, the streams that were previously impacted by livestock in the Squaw Creek Watershed have improved due to seven years of rest (2004-2010). The proposed changes in range management including a 3-year rest-rotation and deferred grazing system, frequent riding, fencing, upland salting, off-channel water developments, no grazing in the Riparian Pasture Unit, and management that is responsive to results from annual and long-term MIM monitoring are generally expected to maintain or improve streambank conditions in the Squaw Creek Watershed and the Juliette Unit.

The only sediment monitoring site in this allotment is in Squaw Creek in the Riparian Pasture Unit (BD118). In 2009, the sediment level at this site was 29% and did not meet the PACFISH objective (<20%). Sediment monitoring will continue at this site (BD118) to reflect watershed trends based on sediment transport from the upper reaches of Squaw Creek. Bank stability monitoring and the greenline stubble height, woody browse use, and bank alteration annual use indicator monitoring will also be used as surrogate indicators of instream sediment conditions at the MIM sites. There are six established MIM sites in the Squaw Creek and Juliette units (Appendix C: Figure 1; Table C11). The MIM site greenline monitoring will identify the MIM sites that do not meet currently meet RMOs and any downward trends in bank stability that may be caused by livestock or other factors. A downward trend in bank stability, RMOs, or any other focus indicators would initiate modification of the proposed grazing system and/or conservation measures, or other adaptive management actions. Therefore, the proposed allotment management changes, monitoring, and adaptive management are expected to result in generally upward trends across the allotment over time, however livestock grazing will likely result in some continued, localized impacts to bank stability.

These impacts may prevent some units from achieving the fine sediment RMO of <20% in the Squaw Creek Watershed and <30% in the Juliette Unit, and adversely affect the Chinook salmon, steelhead, and bull trout designated critical habitat in the Squaw Creek Watershed units and the bull trout designated habitat in the Juliette Unit. If the fine sediment levels in Bayhorse Creek (Juliette Unit) are 20-30% the proposed actions are likely to adversely affect the bull trout critical habitat and limit the stream's ability to support bull trout, even though the Forest objective for non-priority watersheds (<30%) is met.

7.1.3 WIDTH TO DEPTH RATIO

Fish abundance is often negatively correlated with width to depth ratio (Lanka et al. 1987; Scarnecchia and Bergersen 1987). Kozel et al. (1989) studied several streams in Wyoming and found a negative correlation between width to depth ratio and trout biomass. Similarly, Dunham et al. (2002) studied several streams in Nevada and found that Lahontan cutthroat trout densities were often greater than 30 fish per 100 m^2 when width to depths ratios were less than 20 but were generally less than 30 fish per 100 m^2 when width to depth ratios were greater than 30.

Livestock grazing can increase width to depth ratios (Platts 1991; Riedel et al. 2006). Hubert et al. (1985) compared sections of a Wyoming stream that were “heavily grazed” and “lightly grazed” and found that the width to depth ratio in the heavily grazed section was 43 while in the lightly grazed section it was 21. On another stream they compared sections of stream that were grazed with those that had not been grazed for four years. They found that the width to depth ratio in the grazed sections was 37, whereas the width to depth ratio in the ungrazed sections was 28.

Clary (1999) studied the effect of livestock grazing on width to depth ratios in Stanley Creek in Idaho. He evaluated the changes in width to depth ratios that occurred when grazing was changed from season-long, heavy use (60-65% utilization in dry meadows) to either grazing in late June with medium use (35-50% utilization in dry meadows); grazing in late June with light use (20-25% utilization in dry meadows); and no grazing. He found that there was a significant decrease in width to depth ratios with all three grazing strategies but that the decrease was greatest in the ungrazed areas.

Overton et al. (1994) compared width to depth ratios in sections of grazed and ungrazed streams in California. In Coyote Valley Creek, they found that two rested sections of stream had width to depth ratios of 3 and 3.5, whereas the three grazed sections had width to depth ratios of 6.8, 7.4, and 7.6. In Silver King Creek, they found that two rested sections had width to depth ratios of 21.4 and 15.4, whereas two grazed sections had width to depth ratios of 27.7 and 16.4. Two ungrazed streams similar to Silver King Creek had width to depth ratios of 15.3 and 14.6.

Livestock grazing can cause significant increases in sediment delivery due to bank erosion and decrease sediment transport capability by increasing the width to depth ratio in depositional, response reaches. As bank stability declines, the banks are more susceptible to lateral erosion which can lead to a wider, shallower stream and an increasing width to depth ratio (Platts and Nelson 1989). Channel adjustment and sediment transport may continue upstream or downstream of the impacted area due to channel aggrading or downcutting and increased deposition or scour.

The bank stability data indicates that livestock grazing has likely resulted in elevated width to depth ratios in some streams on this allotment however, the width to depth ratios were functioning appropriately at the Squaw Creek MIM sites were functioning appropriately in 2009 (Appendix C: Table C11). Width to depth data has not been collected at the Juliette Unit MIM site. MIM site effectiveness monitoring will identify the MIM sites that do not meet currently meet RMOs or downward trends in riparian vegetation, streambank conditions, or channel morphology that may be caused by the proposed grazing, or other factors that may increase channel width to depth ratios in the action area. A downward trend in the width to depth ratios, RMOs, or other focus indicators may initiate modification of the proposed grazing system and conservation measures, or other adaptive management actions.

Therefore, the proposed grazing permit actions, including annual use indicator monitoring, and adaptive management are expected to maintain the width to depth ratios in the Squaw Creek Watershed units that are all currently within the range of properly functioning condition based on Rosgen channel type, and not adversely affect this indicator in the Chinook salmon, steelhead, and bull trout critical habitat in these units.

The proposed actions may adversely affect the width to depth ratio in bull trout critical habitat in Bayhorse Creek (Juliette Unit) if this indicator is not currently within the range of properly functioning condition based on Rosgen channel type.

7.1.4 STREAMBANK CONDITION

Bank stability can have important effects on fish populations. Zoellick and Cade (2006) found that redband trout densities in southwestern Idaho were often greater than 40 fish per 100m^2 in stream reaches where bank stability exceeded 80% but were rarely greater than 40 fish per 100m^2 when bank stability was less than 80%.

Livestock grazing can significantly reduce bank stability. This occurs when livestock modify the abundance or composition of riparian vegetation in a manner that makes the bank more vulnerable to erosion or when livestock directly impact the bank through bank trampling. Subsequently, streams in grazed areas often have lower bank stabilities than streams in ungrazed areas (Platts 1991). Riedel et al.

(2006) evaluated the impact of livestock grazing on bank stability in the Nemadji River Watershed in Minnesota and found that grazing "significantly reduced streambank stability." Overton et al. (1994) compared bank stabilities in sections of grazed and ungrazed streams in California. In Coyote Valley Creek, they found that two rested sections of stream had bank stabilities of 92.8 and 98.9% whereas three grazed sections had bank stabilities of 62.2, 45.6, and 42.5%. In Silver King Creek, they found that the two rested sections had bank stabilities of 82.4 and 63.7%, whereas the two grazed sections had bank stabilities of 60 and 60.2%. Two ungrazed streams similar to Silver King Creek had bank stabilities of 91.5 and 100%.

Hubert et al. (1985) compared sections of a Wyoming stream that were grazed with those that had not been grazed for four years. They found that banks in grazed sections had 23% bare soil, whereas the banks in sections that had not been grazed for four years had just 12% bare soil. Since livestock grazing can reduce bank stability and subsequently impact fish populations it is important to consider the effect of livestock grazing on bank stability.

Livestock grazing has likely modified riparian vegetation and streambanks in a manner that has resulted in measurable reductions in bank stability, increased sedimentation, and reduced the ability of the streams in the Squaw Creek Watershed to support Chinook salmon, steelhead, and bull trout. However, all of the units in the Squaw Creek Watershed have been rested since 2003, and no grazing or trailing will be permitted in the Riparian Pasture Unit. The other units in the Squaw Creek Watershed will be grazed under the proposed action. In 2009 the bank stabilities on Squaw Creek in the Trealor Creek Unit (M71) and the Upper Squaw Creek Unit (M285), and Martin Creek in the Upper Squaw Creek Unit met the priority watershed RMO ($\geq$90%). The 20% bank alteration standard will be applied to these units that currently meet the priority watershed RMO and the Juliette Unit to maintain or improve riparian and streambank conditions. The Lower Squaw Creek and Trealor units will also be rested every third year to reduce potential streambank and riparian vegetation impacts that are caused by over-use and early or late season use.

Bank stability in the Lower Squaw Creek Unit (M72) did not meet the priority watershed RMO in 2009 (Appendix C: Figure C1; Table C11). This unit will have a 10% bank alteration standard until bank stability is $\geq$90%.

Bank stability data has not been collected at the Juliette Unit MIM site.

All units in the allotment will have a 30-50% woody riparian browse utilization standard to limit livestock impacts to woody riparian species (Table 5). The grazing season flexibility will also prevent overgrazing of seedlings and saplings which limits age class diversity and regeneration (BLM 2009b). In the willow, boulder, and cobble dominated reaches, the woody browse criteria is an appropriate indicator to trigger movement of livestock and prevent a downward trend in riparian condition. Clary and Lenninger (2000) support this modification by stating: "Alternatively, woody plant utilization should be used as a management guide in situations where streambank stability is controlled by substrate or the stream is deeply incised."

All the units in the Squaw Creek Watershed and the Juliette Unit will also have a 6-inch *Carex* spp. stubble height indicator to protect riparian areas, streambanks, and designated critical habitat.

The existing improvements in the Squaw Creek Allotment include fences and an extensive network of constructed off-channel ponds and water troughs (Figure 2). These improvements, frequent riding, and upland salting will continue to encourage upland utilization and decrease impacts on riparian areas and perennial streambanks. However, livestock will still continue to use access corridors to the perennial streams and loaf in the riparian conservation area which will create localized impacts to riparian vegetation and streambanks. The majority of woody riparian vegetation is expected to remain stable and provide bank stabilization.

In summary, the streambanks that were previously impacted by livestock in the Squaw Creek Watershed have improved due to seven years of rest (2004-2010). The proposed changes in range management including a 3-year rest-rotation and deferred grazing system, frequent riding, fencing, upland salting, off-channel water developments, the Riparian Pasture Unit, and MIM monitoring are generally expected to maintain or improve streambank conditions in the Squaw Creek Watershed and the Juliette Unit over

time, however livestock grazing will likely result in some continued, localized impacts to bank stability and riparian vegetation. These impacts may prevent some portions of streams from maintaining or achieving the bank stability RMOs of ≥90% in the Squaw Creek Watershed and ≥80% in the Juliette Unit.

The MIM site greenline monitoring will identify any MIM sites that do not meet currently meet RMOs and any downward trends in bank stability that may be caused by livestock or other factors. A downward trend in bank stability, RMOs, or any focus indicator would initiate modification of the proposed grazing system and/or conservation measures, or other adaptive management actions.

The streambanks that currently meet PACFISH RMOs in the Trealor Creek and Upper Squaw Creek units are expected to be maintained so that bank conditions will not adversely affect the Chinook salmon, steelhead, and bull trout critical habitat in these units.

The proposed actions may adversely affect the Chinook salmon, steelhead, and bull trout critical habitat in the Lower Squaw Creek Unit that did not meet the PACFISH bank condition RMOs in 2009.

The proposed actions may also adversely affect bull trout critical habitat in Bayhorse Creek (Juliette Unit). There is no bank stability data for this unit but if the streambank conditions are not currently within the range of natural conditions (Overton et al. 1995), the proposed actions are likely to adversely affect the bull trout critical habitat and limit the stream's ability to support bull trout even if the Forest objective for non-priority watersheds (≥80%) is met.

7.1.5 RIPARIAN CONSERVATION AREAS

Modifications to riparian habitat can have significant impacts on fish populations. Changes in riparian vegetation caused by livestock grazing can: 1) increase the ability of livestock to access the stream thereby increasing redd trampling, 2) increase summer water temperatures, 3) decrease winter water temperatures, 4) increase sedimentation, 4) increase width to depth ratios, 5) reduce bank stability, 6) reduce cover for fish, and 7) reduce macroinvertebrate productivity. All of these modifications can have negative impacts on fish populations.

Boussu (1954) studied the effects of cover on trout abundance in a Montana stream and found that when willow cover was added to sections of stream that fish numbers more than doubled and fish biomass more than tripled compared to pre-treatment levels. In sections of stream where cover was removed, post-treatment fish numbers remained relatively unchanged but post-treatment fish biomass declined by nearly half. Likewise, Kozel et al. (1989) found a positive correlation between the amount of overhanging vegetation along the stream and trout biomass in several Wyoming streams.

Livestock grazing can have important impacts on riparian vegetation (Armour et al.1994). Schulz and Lenninger (1990) studied the effects of cattle grazing on riparian vegetation in the Sheep Creek Watershed in Colorado and found considerable differences in the riparian vegetation between grazed and ungrazed areas. For example, they found considerable differences in the composition of some plants species between grazed and ungrazed areas, and that vascular vegetation provided 26% more ground cover in ungrazed areas. They also observed about five times as much bare ground in the ungrazed areas. The mean standing crop of vegetation was 2,410 kg/ha in ungrazed areas and 1,217 kg/ha inside caged plots within the grazed areas.

Clary (1999) studied the effect of livestock grazing on riparian vegetation on Stanley Creek in Idaho. He evaluated the response of riparian vegetation when grazing was changed from season-long, heavy use to either grazing in late June with medium us; grazing in late June with light use; and no grazing. He found that there was a significant increase in late seral species in both lightly grazed and ungrazed areas, whereas late seral species decreased in the areas with medium use.

Livestock grazing can also have a pronounced impact on woody species. For example, Schulz and Leininger (1990) found 5.5 times more shrub cover and 8.5 times more willow cover in ungrazed areas compared to grazed areas. They also found that willows were older and larger in ungrazed areas compared to grazed areas. Clary (1999) found that willow cover increased by 29% in areas with medium use; 37% in areas with light use; and 56% in areas that were not grazed. Hubert et al. (1985) compared sections of a Wyoming stream that were grazed with those that had not been grazed for four years and

found that while woody vegetation was abundant in both grazed and ungrazed areas, cottonwoods were not present in the grazed area and present along the ungrazed sections of stream. Gunderson (1968) studied the effects of livestock grazing on riparian and stream habitat in Rock Creek, Montana and found that stream cover provided by overhanging brush was twice as high in ungrazed areas compared to grazed areas.

The best protection against excessive streambank erosion and lateral channel adjustment is preservation of adequate woody, deep-rooted, or rhizomatous vegetative cover to dissipate the erosive forces acting upon the channel banks during periods of high streamflows. A riparian-wetland area is considered to be properly functioning when adequate vegetation, landform, or large woody debris is present to:

- dissipate stream energy associated with high flow, thereby reducing erosion and improving water quality;
- filter sediment, capture bedload, and aid floodplain development;
- improve floodwater retention and groundwater recharge;
- develop root masses that stabilize streambanks against cutting action;
- develop diverse ponding and channel characteristics to provide the habitat and the water depth, duration, and temperature necessary for fish production, waterfowl breeding, and other uses; and
- support greater biodiversity (USDI BLM et al. 1998).

Livestock grazing has likely affected riparian vegetation to varying degrees over most of this allotment however all of the units in the Squaw Creek Watershed have been rested since 2003. The GES at all of the mainstem Squaw Creek MIM sites were mid-seral, or below the Forest objective (late seral or PNC) in 2009 (Appendix C: Table C11). These units have been rested since the MIM sites were read in 2009, and the trend is expected to be upward. In 2010, the Martin Creek GES was PNC (Appendix C: Table C11). No livestock impacts will occur in the Riparian Pasture Unit under the proposed permit action. Therefore, the GES is expected to trend toward PNC in this unit, which will increase stream shade and reduce temperatures in this 1.6 mile segment of Squaw Creek.

In 2003, the Bayhorse Creek GES was early seral (Appendix C: Table C11).

All the units in the allotment will have a 30-50% woody riparian browse utilization standard to limit livestock impacts to woody riparian species (Table 5). The grazing season flexibility will also prevent overgrazing of seedlings and saplings which limits age class diversity and regeneration (BLM 2009b). In the willow, boulder, and cobble dominated reaches, the woody browse criteria is an appropriate indicator to trigger movement of livestock and prevent a downward trend in riparian condition. Clary and Lenninger (2000) support this modification by stating: “Alternatively, woody plant utilization should be used as a management guide in situations where streambank stability is controlled by substrate or the stream is deeply incised.”

All the units in the Squaw Creek Watershed and the Juliette Unit will also have a 6-inch *Carex* spp. stubble height indicator to protect riparian areas, streambanks, and designated critical habitat. These utilization standards and the proposed rest-rotation and deferred rotation grazing system, are expected to improve the GES and canopy cover in these units so that the GES trends will be upward. In addition, the 3-year rest-rotation and deferred rotation grazing system and the flexible on-date based on range readiness will protect soil during wet weather periods, allow for seed set, and allow for vegetative regrowth during the spring and fall growing seasons in the Squaw Creek Watershed (Tables 2-4).

The Juliette Unit will be grazed last every year for approximately 2 weeks in September; this is a change from the previous Juliette-Happy Hollow two unit deferred rotation system where each unit was grazed for approximately two months annually. Deferred grazing of herbaceous species until after seed set will provide for carbohydrate storage in the roots, and the woody browse utilization standard is expected to improve the GES and canopy cover in this unit.

The existing improvements in the Squaw Creek Allotment include fences and an extensive network of constructed off-channel ponds and water troughs (Figure 2). These improvements, frequent riding, and upland salting will continue to encourage upland utilization and decrease impacts on riparian areas and perennial streambanks. However, livestock will still continue to use access corridors to the perennial

streams and loaf in riparian areas during the heat of the day which will create localized impacts to riparian vegetation. The majority of woody riparian vegetation is expected to remain stable and provide bank stabilization.

In summary, the riparian conservation areas that were previously impacted by livestock in the Squaw Creek Watershed have improved due to seven years of rest (2004-2010). The proposed 6-inch *Carex* spp. utilization standard will apply to all of the Squaw Creek Watershed units and the Juliette Unit that have designated critical habitat to reduce the impacts on riparian vegetation. Livestock will be off the Squaw Creek units by August 21 to allow for fall regrowth. The Juliette Unit will not have as much opportunity for regrowth because it will be grazed during the fall growing season; however deferred grazing of herbaceous species until after seed set will provide for carbohydrate storage in the roots.

GES data has been collected at MIM sites in the Squaw Creek Watershed units and the Juliette Unit. The MIM site greenline monitoring will identify the MIM sites that do not meet currently meet RMOs and any downward trends in riparian vegetation that may be caused by livestock or other factors. A downward trend in GES, RMOs, or any focus indicator would initiate modification of the proposed grazing system, conservation measures, or other adaptive management actions. Therefore, the proposed changes in range management including a 3-year rest-rotation and deferred grazing system, frequent riding, fencing, upland salting, off-channel water developments, the Riparian Pasture Unit, annual use indicator monitoring, and adaptive management are generally expected to maintain or improve the riparian conservation areas in the Squaw Creek Watershed units and the Juliette Unit. However livestock grazing will likely result in some continued, localized impacts to riparian vegetation that may prevent some units from maintaining or achieving the GES RMOs of $\geq$61% or late seral. These impacts may adversely affect Chinook salmon, steelhead, and bull trout designated critical habitat in the Squaw Creek Watershed units that were mid-seral in 2009, and bull trout designated habitat in the Juliette Unit that was early seral when it was last read in 2003.

7.2 CUMULATIVE EFFECTS

Cumulative effects as used for Section 7 consultation under the Endangered Species Act are “those effects of *future State or private activities*, not involving Federal activities, that are *reasonably certain to occur* within the action area” (50 CFR§402.02, emphasis added). This definition should not be confused with the broader definition that is used under the National Environmental Policy Act and other environmental laws. In this context, cumulative effects apply only to future state and private activities that are reasonably certain to occur. Furthermore, if an activity is currently occurring and will likely continue to occur in the future with similar effects, it is not considered under cumulative effects because it has already been considered in the description of baseline conditions. There are no known future State or private activities that will occur in the action area that are not already occurring.

7.3 SUMMARY OF EFFECTS

There is no occupied Chinook salmon habitat in the Squaw Creek Allotment, so there is no potential for livestock to directly impact Chinook salmon.

The bull trout population in the Squaw Creek drainage is very depressed and Martin Creek in the Upper Squaw Creek Unit has the only known occupied bull trout spawning habitat in the allotment. Bull trout spawn in this unit between August 15 and October 15; incubation extends through April of the following year (USBWP 2005). Data collected from a reach of Martin Creek in 2001 indicated that only 2 bull trout redds had been completed by August 31 (Yankee Fork Ranger District, file data). If this is typical of other years, only a few bull trout redds may be susceptible to trampling by livestock prior to August 31. Therefore, there is a very small potential for livestock to directly impact spawning bull trout or their incubating eggs in the first year of the rotation when cattle are in this unit through August 20, primarily to move livestock to the east side of the unit to access the next units in the rotation. Livestock will cross Martin Creek once before August 15 to get to the east side of the unit. Herd management will focus on active riding to keep livestock out of the Martin Creek drainage after the crossing to protect spawning bull trout and their redds. Because the Martin Creek drainage does not have any large meadows, is heavily

timbered, and the topography is steep, the active riding is expected to be an effective method for keeping livestock out of Martin Creek.

The second and third years of the rotation, livestock will be off the Upper Squaw Creek Unit after August 15 to protect spawning bull trout and their redds.

There is a spawning population of steelhead in Squaw Creek within the Riparian Pasture, Lower Squaw, Trealor, and Upper Squaw Creek units. Steelhead spawn in these units between March 15 and June 15, and incubation extends through July 7 (USBWP 2005). There is no potential for livestock to impact spawning steelhead or their incubating eggs in the Riparian Pasture because livestock will be excluded from this unit by a combination of fencing and topography. There is also no potential for livestock to impact spawning steelhead or their incubating eggs in the Upper Squaw Creek Unit because livestock will not be on this unit before July 16 or after August 20 (Tables 2-4). There is potential for livestock to trample steelhead redds in the Lower Squaw Creek and Trealor Creek units because livestock will enter one or the other of these units on or about June 16 annually, which is three weeks prior to the end of the steelhead incubation period (Tables 2-4).

There is a potential for livestock to impact Chinook salmon, steelhead, and bull trout designated critical habitats in the Squaw Creek Watershed units, and bull trout designated critical habitat in the Juliette Unit. It is expected that livestock impacts to the temperature, sediment, streambank conditions, and riparian conservation areas indicators will not be beneficial, insignificant, or discountable in some locations within the allotment action area.

Table 9 summarizes effects of proposed Squaw Creek Allotment cattle grazing operations on aquatic/riparian Pathways and Indicators, including the six identified focus indicators (highlighted) addressed in the Effects section of this document.

TABLE 9 – EFFECTS SUMMARY

Pathway	Indicators	Functionality Of Baseline[14]	Response Column A Will the proposed action or any interrelated or interdependent actions likely generate any direct or indirect effects to this indicator?			Response Column B Are these effects expected to exceed beneficial, insignificant, or discountable?		
			CH	SH	BT	CH	SH	BT
Subpopulation Characteristics	Subpopulation Size	FUR	N/A	N/A	YES	N/A	N/A	YES
	Growth and Survival (including incubation survival)	FUR	N/A	N/A	YES	N/A	N/A	YES
	Life History Diversity and Isolation	FUR	N/A	N/A	YES	N/A	N/A	YES
	Persistence and Genetic Integrity	FUR	N/A	N/A	YES	N/A	N/A	YES
Water Quality	Temperature	FUR	YES	YES	YES	YES	YES	YES
	Sediment	FUR	YES	YES	YES	YES	YES	YES
	Chemical Characteristics	FA	NO	NO	NO	NO	NO	NO
Habitat Access	Physical Barriers	FR	NO	NO	NO	NO	NO	NO
Habitat Elements	Substrate Embed.	Unknown	YES	YES	YES	YES	YES	YES
	LWD	FA	NO	NO	NO	NO	NO	NO
	Pool Frequency and Quality	FA	NO	NO	NO	NO	N/A	NO
	Off-channel Habitat	FA	NO	NO	NO	NO	NO	NO
	Refugia	FA	NO	NO	NO	NO	NO	NO
Channel Condition and Dynamics	Width to Depth Ratio	FA	NO	NO	NO	NO	NO	NO
	Streambank Condition	FR	YES	YES	YES	YES	YES	YES
	Floodplain Connectivity	FA	NO	NO	NO	NO	NO	NO

[14]The unshaded rows pertain to the overall conditions in the Squaw Creek Watershed as shown in Appendix B. Shaded rows pertain to the specific focus indicators in the action area.
FA = Functioning appropriately
FR = Functioning at risk
FUR = Functioning at unacceptable risk

Pathway	Indicators	Functionality Of Baseline[14]	Response Column A Will the proposed action or any interrelated or interdependent actions likely generate any direct or indirect effects to this indicator?			Response Column B Are these effects expected to exceed beneficial, insignificant, or discountable?		
			CH	SH	BT	CH	SH	BT
Flow/Hydrology	Change in Peak/Base Flows	FR	NO	NO	NO	NO	NO	NO
	Increase in Drainage Networks	FA	NO	NO	NO	NO	NO	NO
Watershed Conditions	Road Density and Location	FUR	NO	NO	NO	NO	NO	NO
	Disturbance History	FR	YES	YES	YES	YES	YES	YES
	Riparian Conservation Areas	FR	YES	YES	YES	YES	YES	YES
	Disturbance Regime	FR	NO	NO	NO	NO	NO	NO
Integration of Species and Habitat Conditions	Habitat Quality and Connectivity	FR	YES	YES	YES	YES	YES	YES

8 EFFECTS DETERMINATION

The effects determination for each species was made using the above analysis and the effects determination key (Table 9). These determinations are based only on the Squaw Creek priority watershed units and the Juliette Unit that have ESA listed fish populations or designated critical habitat. The specific determinations are identified below and summarized in Table 10.

The "Species" column in Table 10 displays determination of effects to the ESA listed species. A "No Effect" (NE) determination is made if the species is not present in the action area or the proposed action or any interrelated or interdependent actions will not affect any individuals. A "May Affect- Not Likely to Adversely Affect" (NLAA) determination is made if the proposed action or any interrelated or interdependent actions may affect but will likely not adversely affect any individuals. A "May Affect- Likely to Adversely Affect" (LAA) determination is made if the proposed action or any interrelated or interdependent actions will result in take of individuals.

The "Habitat" column in Table 10 displays determination of effects to proposed or designated critical habitat of ESA listed species. A "NE" determination is made if the action area does not contain designated critical habitat or all of the responses associated with habitat in "Response Column A" of Table 4 are "NO." A "NLAA" determination is made if all of the responses associated with habitat in "Response Column B" are "NO." A "LAA" determination is made if any of the responses associated with habitat in "Response Column B" are "YES."

8.1 SNAKE RIVER SPRING/SUMMER CHINOOK SALMON

The Squaw Creek Allotment does not have a current Chinook salmon population. Therefore, the proposed action will have "NO EFFECT" on Chinook salmon.

There are approximately 6.1 miles of unoccupied Chinook salmon designated critical habitat within the Squaw Creek Watershed portion of the allotment action area (Appendix C: Table C6). The Chinook

salmon designated critical habitat and riparian conservation areas that were previously impacted by livestock in the Squaw Creek Watershed units have improved due to seven years of rest (2004-2010). The Squaw Creek Watershed units that have Chinook salmon critical habitat will be grazed under the proposed action with the exception of the Riparian Pasture Unit. However, the temperature data, fine sediment data, bank stability data, and GES data indicate that PACFISH RMOs for water temperature, bank stability, bank alteration, and riparian conservation areas have not been met in some locations (Appendix C: Tables C8-11).

There are five MIM sites in the Squaw Creek Watershed (Appendix C: Figure 1). The grazed units will have a 30-50% browse utilization standard to limit livestock impacts to woody riparian species. The Upper Squaw Creek and Trealor will also have a 20% bank alteration standard to protect streambanks. The Lower Squaw Creek Unit will have a 10% bank alteration standard due to bank stability less than the 90% RMO at the monitoring site.

All the Squaw Creek units will have a 6-inch *Carex* spp. stubble height indicator to protect riparian areas and streambanks. Livestock will be off the Squaw Creek units by August 21 annually (Table 5). The rest-rotation and deferred rotation grazing system and the flexible on-date based on range readiness will protect soil during wet weather periods, allow for seed set, and vegetative regrowth during the spring and fall growing seasons (Tables 2-4). The grazing season flexibility will also prevent overgrazing of seedlings and saplings which limits age class diversity and regeneration (BLM 2009b).

The existing improvements in the Squaw Creek Allotment include fences and an extensive network of constructed off-channel ponds and water troughs (Figure 2). These improvements, frequent riding, and upland salting will continue to encourage upland utilization and decrease impacts on riparian areas and perennial streambanks. However, livestock will continue to use access corridors to the perennial streams and to loaf in riparian areas during the heat of the day which will create localized impacts to riparian vegetation and streambanks.

The proposed utilization standards, improvements, and the proposed rest-rotation and deferred rotation grazing system are generally expected to maintain or promote continued upward trends in the RMOs when grazing is reinitiated. The MIM site monitoring and annual use indicator monitoring will identify the sites that do not meet currently meet RMOs or any downward trends that may be caused by livestock or other factors. A downward trend in RMOs or any focus indicator would initiate modification of the proposed grazing system, conservation measures, or other adaptive management actions. However livestock grazing will likely result in some continued, localized impacts that may prevent some reaches or riparian conservation areas from maintaining or achieving the RMOs. These impacts may limit the ability of Squaw Creek to support Chinook salmon. Therefore, the proposed action is “LIKELY TO ADVERSELY AFFECT” Chinook salmon designated critical habitat.

8.2 SNAKE RIVER STEELHEAD

The steelhead population in Squaw Creek is depressed, and the Squaw Creek Watershed is a steelhead priority watershed (Figure 3). The Riparian Pasture Unit includes 1.6 miles of Squaw Creek that is occupied steelhead spawning habitat (Figures 2 and 5; Appendix C: Table C5). Livestock are kept out of this unit by a combination of natural barrier and existing fence; no livestock grazing or trailing will occur in this unit.

There is another 3.7 miles of the occupied steelhead spawning habitat in Squaw Creek within the Lower Squaw Creek, Trealor Creek, and Upper Squaw Creek units ((Figures 2 and 5; Appendix C: Table C7). There is no steelhead habitat in the other units (Figure 5).

Livestock will not be in the Upper Squaw Creek Unit during the March 15-July 7 steelhead spawning or incubation periods (Tables 2-4) (USBWP 2005). Therefore, livestock grazing will have no potential to affect steelhead spawning or incubation in ¾ mile of occupied spawning habitat in this unit.

There is 3.1 miles of occupied steelhead spawning habitat in the Lower Squaw Creek and Trealor Creek units (Appendix C: Table C5). Cattle will enter either one unit or the other on or about June 16[15], each year under the 3-year rest rotation and deferred rotation system (Tables 2-4). So there is potential for livestock to trample steelhead redds in one or the other of these units for up to three weeks each year. Therefore, the proposed action is "LIKELY TO ADVERSELY AFFECT" steelhead.

The total steelhead critical habitat in the allotment action area is 9.3 miles, all of it within the Squaw Creek Watershed. The steelhead designated critical habitat and riparian conservation areas that were previously impacted by livestock in the Squaw Creek Watershed have improved due to seven years of rest (2004-2010). The units in the Squaw Creek Watershed will be grazed under the proposed action with the exception of the Riparian Pasture Unit. However, the temperature data, fine sediment data, bank stability data, and GES data indicate that PACFISH and INFISH RMOs for water temperature, bank stability, bank alteration, and riparian conservation areas have not been met in some locations (Appendix C: Tables C8-11).

There are five MIM sites in the Squaw Creek Watershed units (Appendix C: Figure 1). The grazed units will have a 30-50% browse utilization standard to limit livestock impacts to woody riparian species. The Upper Squaw Creek and Trealor units will also have a 20% bank alteration standard to protect streambanks. The Lower Squaw Creek Unit will have a 10% bank alteration standard due to bank stability less than the 90% RMO at the monitoring site.

All the Squaw Creek Watershed units will have a 6-inch *Carex* spp. stubble height indicator to protect riparian areas and streambanks. Livestock will be off the Squaw Creek units by August 21 annually (Table 5). The rest-rotation and deferred rotation grazing system and the flexible on-date based on range readiness will protect soil during wet weather periods, allow for seed set, and vegetative regrowth during the spring and fall growing seasons (Tables 2-4). The grazing season flexibility will also prevent overgrazing of seedlings and saplings which limits age class diversity and regeneration (BLM 2009b).

The existing improvements in the Squaw Creek Allotment include fences and an extensive network of constructed off-channel ponds and water troughs (Figure 2). These improvements, frequent riding, and upland salting will continue to encourage upland utilization and decrease impacts on riparian areas and perennial streambanks. However, livestock will continue to use access corridors to the perennial streams and to loaf in riparian areas during the heat of the day which will create localized impacts to riparian vegetation and streambanks.

The proposed utilization standards, improvements, and the proposed rest-rotation and deferred rotation grazing system are generally expected to maintain or promote continued upward trends in the RMOs when grazing is reinitiated. The MIM site monitoring and annual use indicator monitoring will identify the sites that do not meet currently meet RMOs or any downward trends that may be caused by livestock or other factors. A downward trend in RMOs or any focus indicator would initiate modification of the proposed grazing system, conservation measures, or other adaptive management actions. However livestock grazing will likely result in some continued, localized impacts that may prevent some reaches or riparian conservation areas from maintaining or achieving the RMOs. These impacts may limit the ability of Squaw Creek or its tributaries to support steelhead. Therefore, the proposed action is "LIKELY TO ADVERSELY AFFECT" steelhead designated critical habitat.

8.3 COLUMBIA RIVER BULL TROUT

The bull trout population in the Squaw Creek drainage is very depressed and Martin Creek in the Upper Squaw Creek Unit has the only known occupied bull trout spawning habitat in the allotment. Bull trout spawn in this unit between August 15 and October 15, and incubation extends through April of the following year (USBWP 2005). Data collected from a reach of Martin Creek in 2001 indicated that only 2 bull trout redds had been completed by August 31 (Yankee Fork Ranger District, file data). If this is typical of other years, a few bull trout redds may be susceptible to trampling by livestock prior to August 31. The second and third years of the rotation, livestock will be off the Upper Squaw Creek Unit after

15 The on-date will be based on range readiness.

August 15 to protect spawning bull trout and their redds, so no direct effects are expected to occur during these years.

There is a very small potential for livestock to directly impact spawning bull trout or their incubating eggs during the first year of the rotation because cattle will be in this unit through August 20, primarily to move livestock to the east side of the unit to access the next units in the rotation. Livestock will cross Martin Creek once before August 15 to get to the east side of the unit. Herd management will focus on active riding to keep livestock out of the Martin Creek drainage after the crossing to protect spawning bull trout and their redds. Because the Martin Creek drainage does not have any large meadows, is heavily timbered, and the topography is steep, the active riding is expected to be an effective method for keeping livestock out of Martin Creek. However, even with active riding there is a very small chance that livestock will get into the Martin Creek drainage, and redds may be trampled so redd trampling is "LIKELY TO ADVERSELY AFFECT" bull trout in the Upper Squaw Creek Unit one year out of three.

The Squaw Creek Watershed has approximately 13.2 miles of designated bull trout critical habitat. The critical habitat and riparian conservation areas that were previously impacted by livestock in the Squaw Creek Watershed have improved due to seven years of rest (2004-2010). The units in the Squaw Creek Watershed will be grazed under the proposed action with the exception of the Riparian Pasture Unit. Bayhorse Creek in the Juliette Unit has approximately 4 miles of unoccupied bull trout critical habitat (Figure 6; Appendix C: Tables C2 and C3). The Juliette Unit will be grazed last every year for approximately 2 weeks in September; this is a change from the previous Juliette-Happy Hollow two unit deferred rotation system where each unit was grazed for approximately two months annually. However, the temperature data, fine sediment data, bank stability data, and GES data indicate that PACFISH and INFISH RMOs for water temperature, bank stability, bank alteration, and riparian conservation areas have not been met in some Squaw Creek locations (Appendix C: Tables C8-11). MIM site data for Bayhorse Creek in the Juliette Unit is either dated or lacking.

There are five MIM sites in the Squaw Creek Watershed units that were read in 2009 or 2010, and one in the Juliette Unit that was read in 2003 (Appendix C: Figure 1). The grazed units will have a 30-50% browse utilization standard to limit livestock impacts to woody riparian species. The Upper Squaw Creek, Trealor Creek, and Juliette units will also have a 20% bank alteration standard to protect streambanks. The Lower Squaw Creek Unit will have a 10% bank alteration standard due to bank stability less than the 90% RMO at the monitoring site.

All the Squaw Creek units and the Juliette Unit will have a 6-inch *Carex* spp. stubble height indicator to protect riparian areas and streambanks. Livestock will be off the Squaw Creek units by the end of August (Table 5). Livestock will not be on the Juliette Unit prior to September. The rest-rotation and deferred rotation grazing system and the flexible on-date based on range readiness will protect soil during wet weather periods, allow for seed set, and vegetative regrowth during the spring and/or fall growing seasons (Tables 2-4). The grazing season flexibility will also prevent overgrazing of seedlings and saplings which limits age class diversity and regeneration (BLM 2009b).

The existing improvements in the Squaw Creek Allotment include fences and an extensive network of constructed off-channel ponds and water troughs (Figure 2). These improvements, frequent riding, and upland salting will continue to encourage upland utilization and decrease impacts on riparian areas and perennial streambanks. However, livestock will continue to use access corridors to the perennial streams and to loaf in riparian areas during the heat of the day which will create localized impacts to riparian vegetation and streambanks.

The proposed utilization standards, improvements, and the proposed rest-rotation and deferred rotation grazing system are generally expected to maintain or promote upward trends in the RMOs. The MIM site monitoring and annual use indicator monitoring will identify the sites that do not meet currently meet RMOs or any downward trends that may be caused by livestock or other factors. A downward trend in RMOs or any focus indicator would initiate modification of the proposed grazing system, conservation measures, or other adaptive management actions. However livestock grazing will likely result in some continued, localized impacts that may prevent some reaches or riparian conservation areas from maintaining or achieving the RMOs. These impacts may limit the ability of Squaw Creek or its tributaries to support bull trout.

Water temperature is arguably the most critical factor that affects bull trout distribution (Table 8) and there is no temperature data for Bayhorse Creek, and temperature monitoring is not proposed. Temperature may be monitored from time to time in Bayhorse Creek but it will not be part of the same schedule as the other effectiveness monitoring.

Even if the fine sediment levels in Bayhorse Creek meet the Forest objective for non-priority watersheds (<30%) and bank stability meets the Forest objective for non-priority watersheds (≥80%) the stream's ability to support bull trout may be limited.

Therefore, the proposed action is "LIKELY TO ADVERSELY AFFECT" bull trout designated critical habitat in the Squaw Creek Watershed units and the Juliette Unit.

8.4 SNAKE RIVER SOCKEYE SALMON

The action area does not contain sockeye salmon or sockeye salmon designated critical habitat. Therefore, the proposed action will have "NO EFFECT" on sockeye salmon or their designated critical habitat.

8.5 ESSENTIAL FISH HABITAT

The Magnuson-Stevens Fishery Conservation and Management Act requires federal agencies to evaluate the impact of actions authorized, funded, or undertaken by the agency that may adversely affect the essential fish habitat of commercially harvested species. Chinook salmon is the only commercial species within the scope of this action. The proposed action "MAY ADVERSELY AFFECT" Chinook salmon essential fish habitat.

TABLE 10 – EFFECTS DETERMINATION SUMMARY

	Chinook Salmon		**Steelhead**		**Bull Trout**	
	Species	Designated Critical Habitat/EFH	Species	Designated Critical Habitat	Species	Designated Critical Habitat
Determination	No Effect	Likely to Adversely Affect/May Adversely Affect	Likely to Adversely Affect	Likely to Adversely Affect	Likely to Adversely Affect	Likely to Adversely Affect

APPENDIX A: REFERENCES

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APPENDIX B: WATERSHED BASELINES
WITH
MATRICES OF DIAGNOSTIC PATHWAYS AND INDICATORS

TABLE B1. STATUS OF BASELINE CONDITIONS FOR THE SQUAW CREEK WATERSHED

Agency: USDA Forest Service, Salmon-Challis National Forest	**5th Field HUC and Name:** 1706020109, Squaw Creek
Unit: Challis-Yankee Fork Ranger District	**Spacial Scale of Matrix:** One 5th HUC
Fish Species Present: Chinook Salmon, Steelhead, Bull Trout	**Designated Critical Habitat Present:** Chinook Salmon, Steelhead, Bull Trout
Anadromous Species Population: Salmon River Lower Mainstem below Redfish Lake	**Anadromous Species Subpopulation:** Squaw Creek
Bull Trout Core Area: Upper Salmon River	**Local Population:** Squaw Creek
Management Actions: Baseline	**Updated:** May 4, 2011

Pathway	Indicators	Functionality Of Baseline	Description
Subpopulation Characteristics	Subpopulation Size	Functioning at Unacceptable Risk	Sampling completed in 2003 by IDFG and in 2009 by the Forest Service indicate that bull trout are present in Martin Creek and Squaw Creek near the confluence with Martin Creek. However, bull trout densities are extremely low in these areas. Bull trout were not found in any other streams in the Squaw Creek drainage. Sampling suggests that there are probably less than 50 adult bull trout in the Squaw Creek drainage.
	Growth and Survival	Functioning at Unacceptable Risk	Bull trout densities remained very low from 2003 to 2009.
	Life History Diversity and Isolation	Functioning at Unacceptable Risk	It is unknown if migratory bull trout use this watershed. Bull trout distribution appears to be confined to Martin Creek and Squaw Creek near Martin Creek. Martin Creek appears to be the only stream in the watershed supporting bull trout reproduction.
	Persistence and Genetic Integrity	Functioning at Unacceptable Risk	It appears the watershed contains only one local spawning population which is in Martin Creek.
Water Quality	Temperature	Functioning at Unacceptable Risk	Temperature data are not available for tributary streams. Water temperature data were collected from two locations in Squaw Creek in 2009. In Squaw Creek below Martin Creek, the maximum 7-day moving maximum was 14.5°C. In Squaw Creek at the Forest boundary, the maximum 7-day moving maximum was 17.9°C.
	Sediment	Function at Unacceptable Risk	The Forest Service has a long-term sediment monitoring site in Squaw Creek above the Forest boundary. This site was last sampled in 2008 and depth fines were 29%.
	Chemical Characteristics	Appropriately	No known sources of chemical contamination are present in Squaw Creek above Bruno Creek.

Habitat Access	Physical Barriers	Functioning at Risk	There are no known man-made barriers on the mainstem of Squaw Creek. The IDFG evaluated diversions within the Squaw Creek watershed in 2003. They identified six diversions and none were barriers to fish movement. The Forest Service evaluated diversions on the Yankee Fork Ranger District, which includes national forest lands within the Squaw Creek drainage, in 2006 and did not identify any stream diversions on national forest lands. There are some barriers created by culverts on roads on some of the small tributaries to Squaw Creek.
Habitat Elements	Substrate Embed.	Unknown	Recent data are not available for this indicator.
	LWD	Appropriately	Recent data are not available for this indicator but based on the observations of Forest fish staff (B. Gamett and J. Bartel) this indicator appears to be similar to natural conditions on national forest lands.
	Pool Frequency and Quality	Appropriately	Recent data are not available for this indicator but based on the observations of Forest fish staff (B. Gamett and J. Bartel) this indicator appears to be similar to natural conditions on national forest lands.
	Off-channel Habitat	Appropriately	Recent data are not available for this indicator but based on the observations of Forest fish staff (B. Gamett and J. Bartel) this indicator appears to be similar to natural conditions on national forest lands.
	Refugia	Appropriately	Recent data are not available for this indicator but based on the observations of Forest fish staff (B. Gamett and J. Bartel) this indicator appears to be similar to natural conditions on national forest lands.
Channel Condition and Dynamics	Width to Depth Ratio	Appropriately	Wetted width to depth ratios were collected by the Forest Service at four MIM sites on Squaw Creek on national forest lands in 2009. Width to depth ratios ranged from 15.8-20.6 which is similar to streams in natural conditions.
	Streambank Condition	Functioning at Risk	Bank stability data were collected by the Forest Service at four MIM sites on Squaw Creek on national forest lands in 2009. Bank stability at these sites ranged from 77-92%. Bank stability data were also collected by the Forest Service at a MIM site on Martin Creek in 2009. Bank stability at this site was 100%.
	Floodplain Connectivity	Appropriately	Recent data are not available for this indicator but based on the observations of Forest fish staff (B. Gamett and J. Bartel) this indicator appears to be similar to natural conditions on national forest lands.
Flow/Hydrology	Change in Peak/Base Flows	Functioning at Risk	There appears to be little to no change in peak/base flows in the watershed above the confluence of Squaw Creek and Bruno Creek. However, the Thompson Creek impoundment dam on Bruno Creek has likely impacted peak/base flows in that watershed. Likewise, diversions in the lower end of the watershed have modified peak/base flows.
	Increase in Drainage Networks	Appropriately	There appears to be little to no change in peak/base flows in the watershed.
Watershed Conditions	Road Density and Location	Function at Unacceptable Risk	Moderate road density but many roads are in the valley bottom and are within the RHCA.
	Disturbance	Functioning at	Several anthropogenic activities have altered the disturbance history in this watershed. This includes

	History	Risk	the Thompson Creek Mine, road construction, livestock grazing, fire suppression, stream diversions, and development.
	Riparian Conservation Areas	Functioning at Risk	Riparian vegetation data were collected by the Forest Service at four MIM sites on Squaw Creek on national forest lands in 2009. Greenline ecological status ranged from 49-60 at these sites, which is mid-seral. Riparian vegetation data were also collected by the Forest Service at a MIM site on Martin Creek in 2009. Greenline ecological status was 98 at this site, which is potential natural community. Woody species appeared to be doing well at all of these sites.
	Disturbance Regime	Functioning at Risk	Several anthropogenic activities have altered the ability of this watershed to handle natural disturbances. The activities include the Thompson Creek Mine, road construction, livestock grazing, fire suppression, stream diversions, and development.
Integration of Species and Habitat Conditions	Habitat Quality and Connectivity	Functioning at Risk	Numerous anthropogenic activities have affected fish habitat within this watershed. This appears to have reduced the ability of the watershed to support bull trout, steelhead, and Chinook salmon.

TABLE B2. STATUS OF BASELINE CONDITIONS FOR THE BAYHORSE CREEK 6TH FIELD HUC.

Agency: USDA Forest Service, Salmon-Challis National Forest	**5th Field HUC and Name: 1706020114, Bayhorse Creek-Salmon River**
Unit: Challis-Yankee Fork Ranger District	**Spacial Scale of Matrix:** One 6th HUC Bayhorse Creek
Fish Species Present: Chinook Salmon, Steelhead, Bull Trout	**Designated Critical Habitat Present:** Chinook Salmon, Steelhead, Bull Trout
Anadromous Species Population: Salmon River Lower Mainstem below Redfish Lake	**Anadromous Species Subpopulation:**
Bull Trout Core Area: Upper Salmon River	**Local Population:** not within a local population
Management Actions: Baseline	**Updated:** May 13, 2011

Pathway	Indicators	Functionality Of Baseline	Description
Subpopulation Characteristics	Subpopulation Size	Functioning at Unacceptable Risk	Sampling completed in 2005 by the U.S. Department of Energy Bonneville Power Administration found no bull trout within the Bayhorse Creek indicating the possible complete absence of resident or fluvial populations of the species anywhere within the watershed.
	Growth and Survival	Functioning at Unacceptable Risk	No bull trout have been found within Bayhorse Creek.
	Life History Diversity and Isolation	Functioning at Unacceptable Risk	No bull trout have been found within Bayhorse Creek.
	Persistence and Genetic Integrity	Functioning at Unacceptable Risk	No bull trout population exists within Bayhorse Creek. One bull trout was found in a BLM survey at the mouth of the creek. This may have been a fluvial fish seeking thermal refuge from the Salmon River. No brook trout have been found in the system either.
Water Quality	Temperature	Functioning Appropriately	Recent temperature data is not available on national forest lands. BLM data indicate from 1998 to 2009 Bayhorse Creek's annual maximum 7 day average temperature remained near the Chinook/steelhead spawning threshold, and below the Chinook/steelhead rearing threshold, both of which are above those for bull trout (range = 55.2 - 61.8 ^{o}F). From annual temperature maxima at this point

			in the drainage (≈ 0.50 miles from Salmon R. confluence), it is evident that Bayhorse Creek requires seasonal cooling to meet bull trout spawning and rearing thresholds. The amount of cooling necessary in this ≈ 8.5 mile long drainage is expected to decrease with increased upstream distance. Fine scale (daily) temperature data from 2008 indicates the site is consistently below Chinook/steelhead trout spawning temperature. Instream temperature becomes suitable for bull trout rearing by about the first week in September. The bull trout spawning threshold is met approximately a month later. Based on 2008 data, instream temperature may be within a few degrees of the spawning threshold several days earlier. Bayhorse's temperature regime appears stable and functioning appropriately for listed salmonids. Observed fish presence provides further support for temperature functionality in Bayhorse Creek.
	Sediment	Unknown	Recent data are not available for this indicator on national forest lands.
	Chemical Characteristics	Functioning Appropriately	No known sources of chemical contamination are present in Bayhorse Creek
Habitat Access	Physical Barriers	Functioning Appropriately	Numerous irrigation diversions exist on mainstem Bayhorse Creek, but the stream flows year-round to the Salmon River and all diversions are screened.
Habitat Elements	Substrate Embed.	Unknown	Recent data are not available for this indicator.
	LWD	Functioning Appropriately	Recent data are not available for this indicator but based on general information from the BLM and Bonneville Power Administration this indicator appears to be similar to natural conditions on national forest lands.
	Pool Frequency and Quality	Functioning Appropriately	Recent data are not available for this indicator but based on general information from the BLM and Bonneville Power Administration this indicator appears to be similar to natural conditions on national forest lands.
	Off-channel Habitat	Functioning Appropriately	Recent data are not available for this indicator but based on general information from the BLM and Bonneville Power Administration this indicator appears to be similar to natural conditions on national forest lands.
	Refugia	Functioning Appropriately	Recent data are not available for this indicator but based on general information from the BLM and Bonneville Power Administration this indicator appears to be similar to natural conditions on national forest lands.
Channel Condition and Dynamics	Width to Depth Ratio	Functioning Appropriately	Recent data are not available for this indicator but based on general information from the BLM and Bonneville Power Administration this indicator appears to be similar to natural conditions on national forest lands.

	Streambank Condition	Functioning at Unacceptable Risk	Bank stability data has not been collected within this watershed on national forest lands. Pictures taken during a MIM inventory in 2003 indicates that bank alteration is high leading to reduced bank stability.
	Floodplain Connectivity	Functioning Appropriately	Recent data are not available for this indicator but based on general information from the BLM and Bonneville Power Administration this indicator appears to be similar to natural conditions on national forest lands.
Flow/Hydrology	Change in Peak/Base Flows	Functioning Appropriately	Water quantity is reduced due to irrigation withdrawals, but still provides a base flow suitable to maintain all life stages of listed fish species.
	Increase in Drainage Networks	Functioning Appropriately	Bayhorse Creek has sustained year-round connectivity to the Salmon River. Even though there is water withdrawal it provides a base flow suitable to maintain migratory populations of all listed fish species.
Watershed Conditions	Road Density and Location	Functioning at Risk	Moderate road density but many roads are in the valley bottom and are within the RHCA.
	Disturbance History	Functioning at Risk	Several anthropogenic activities have altered the disturbance history in this watershed. This includes mining, road construction, livestock grazing, fire suppression, stream diversions, and development.
	Riparian Conservation Areas	Functioning at Unacceptable Risk	Riparian vegetation data were collected by the Forest Service at a MIM site on Juliette Creek on national forest lands in 2003. Greenline ecological status was 35 at this site, which is early seral.
	Disturbance Regime	Functioning at Risk	Several anthropogenic activities have altered the ability of this watershed to handle natural disturbances. The activities include the mining, road construction, livestock grazing, fire suppression, stream diversions, and development.
Integration of Species and Habitat Conditions	Habitat Quality and Connectivity	Functioning at Risk	Numerous anthropogenic activities have affected fish habitat within this watershed. This appears to have reduced the ability of the watershed to support bull trout, steelhead, and Chinook salmon.

APPENDIX C: MONITORING DATA AND SUMMARIES

Squaw Creek Monitoring

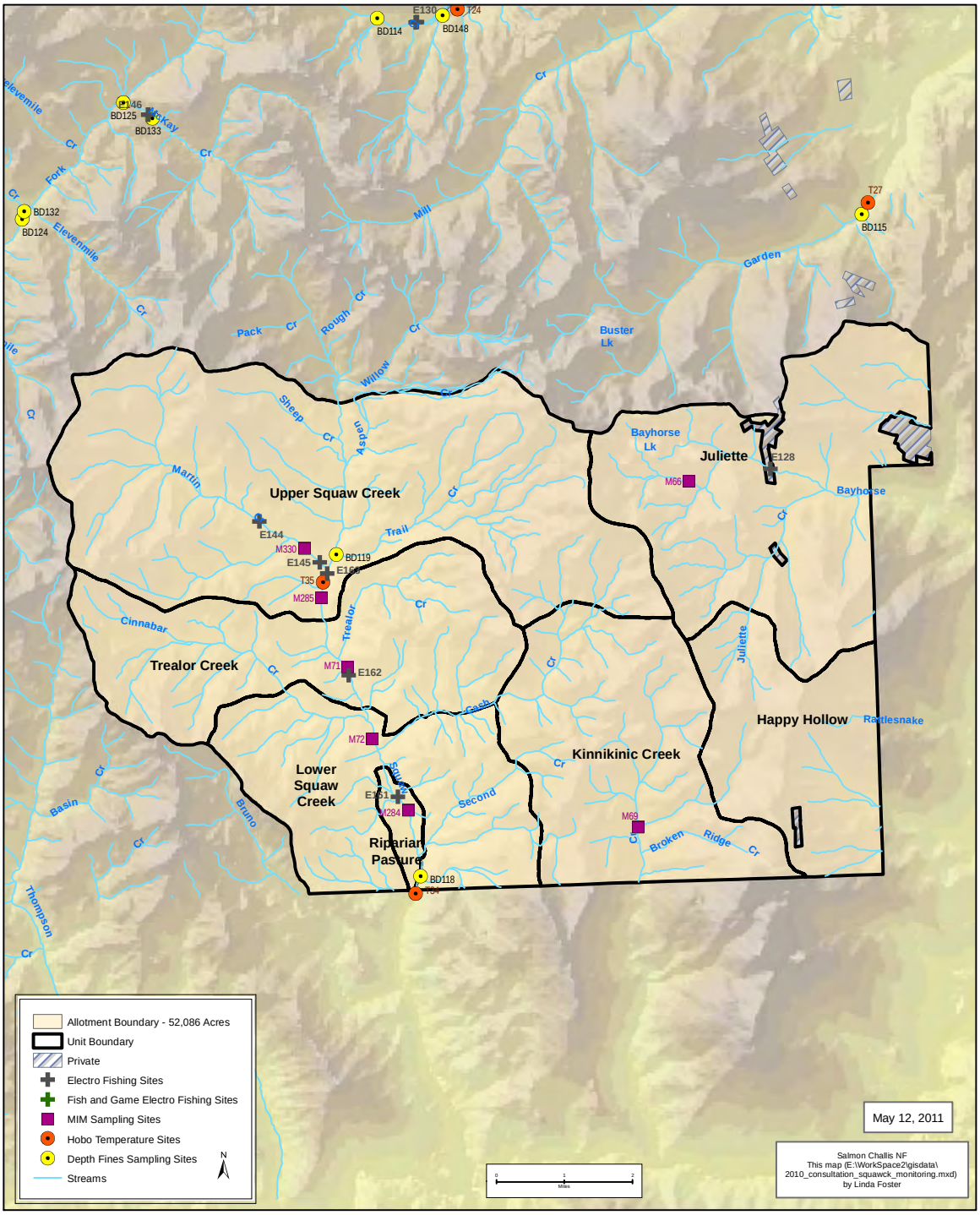

FIGURE C1 – SQUAW CREEK ALLOTMENT MONITORING SITES

FIGURE C2. LOWER SQUAW CREEK UNIT SITE M72 LOOKING UPSTREAM FROM BOTTOM OF THE REACH (JULY 23, 2009)

FIGURE C3. LOWER SQUAW CREEK UNIT SITE M72 LOOKING DOWNSTREAM FROM BOTTOM OF THE REACH (JULY 23, 2009)

FIGURE C4. LOWER SQUAW CREEK UNIT SITE M72 LOOKING DOWNSTREAM FROM TOP OF THE REACH (JULY 23, 2009)

FIGURE C5. LOWER SQUAW CREEK UNIT SITE M72 LOOKING DOWNSTREAM FROM TOP OF THE REACH (JULY 23, 2009)

FIGURE C6. LOWER SQUAW CREEK UNIT SITE M72 LOOKING LEFT TO RIGHT AT TOP OF THE REACH (JULY 23, 2009)

FIGURE C7. LOWER SQUAW CREEK UNIT SITE M72 LOOKING RIGHT TO LEFT AT TOP OF THE REACH (JULY 23, 2009)

FIGURE C8. SQUAW CREEK IN THE RIPARIAN PASTURE UNIT SITE M284 LOOKING UPSTREAM FROM BOTTOM OF THE REACH (JULY 23, 2009)

FIGURE C9. SQUAW CREEK IN THE RIPARIAN PASTURE UNIT SITE M284 LOOKING DOWNSTREAM STREAM FROM BOTTOM OF THE REACH (JULY 23, 2009)

FIGURE C10. SQUAW CREEK IN THE RIPARIAN PASTURE UNIT SITE M284 LOOKING DOWNSTREAM STREAM FROM TOP OF THE REACH (JULY 23, 2009)

FIGURE C11. SQUAW CREEK IN THE RIPARIAN PASTURE UNIT SITE M284 LOOKING UPSTREAM STREAM FROM TOP OF THE REACH (JULY 23, 2009)

FIGURE C12. SQUAW CREEK IN THE TREALOR CREEK UNIT SITE M71 LOOKING DOWNSTREAM STREAM FROM BOTTOM OF THE REACH (JULY 21, 2009)

FIGURE C13. SQUAW CREEK IN THE TREALOR CREEK UNIT SITE M71 LOOKING UPSTREAM STREAM FROM BOTTOM OF THE REACH (JULY 21, 2009)

FIGURE C14. SQUAW CREEK IN THE TREALOR CREEK UNIT SITE M71 LOOKING DOWNSTREAM STREAM FROM TOP OF THE REACH (JULY 21, 2009)

FIGURE C15. SQUAW CREEK IN THE TREALOR CREEK UNIT SITE M71 LOOKING UPSTREAM STREAM FROM TOP OF THE REACH (JULY 21, 2009)

FIGURE C16. UPPER SQUAW CREEK UNIT SITE M285 LOOKING UPSTREAM STREAM FROM BOTTOM OF THE REACH (JULY 21, 2009)

FIGURE C17. UPPER SQUAW CREEK UNIT SITE M285 LOOKING DOWNSTREAM STREAM FROM BOTTOM OF THE REACH (JULY 21, 2009)

FIGURE C18. UPPER SQUAW CREEK UNIT SITE M285 LOOKING UPSTREAM STREAM FROM TOP OF THE REACH (JULY 21, 2009)

FIGURE C19. UPPER SQUAW CREEK UNIT SITE M285 LOOKING DOWNSTREAM STREAM FROM TOP OF THE REACH (JULY 21, 2009)

FIGURE C20. MARTIN CREEK IN THE UPPER SQUAW CREEK UNIT SITE M330 (SEPTEMBER 2010)

FIGURE C21. MARTIN CREEK IN THE UPPER SQUAW CREEK UNIT SITE M330 (SEPTEMBER 2010)

FIGURE C22. MARTIN CREEK IN THE UPPER SQUAW CREEK UNIT SITE M330 (SEPTEMBER 2010)

FIGURE C23. MARTIN CREEK IN THE UPPER SQUAW CREEK UNIT SITE M330 (SEPTEMBER 2010)

FIGURE C24. KINNIKINIC CREEK UNIT SITE M69 (SEPTEMBER 2010)

FIGURE C25. KINNIKINIC CREEK UNIT SITE M69 (SEPTEMBER 2010)

FIGURE C26. KINNIKINIC CREEK UNIT SITE M69 (SEPTEMBER 2010)

FIGURE C27. KINNIKINIC CREEK UNIT SITE M69 (SEPTEMBER 2010)

FIGURE C28. BAYHORSE CREEK IN THE JULIETTE UNIT SITE M66 (SEPTEMBER 2010)

FIGURE C29. BAYHORSE CREEK IN THE JULIETTE UNIT SITE M66 (SEPTEMBER 2010)

FIGURE C30. BAYHORSE CREEK IN THE JULIETTE UNIT SITE M66 (SEPTEMBER 2010)

FIGURE C31. BAYHORSE CREEK IN THE JULIETTE UNIT SITE M66 (SEPTEMBER 2010)

TABLE C1 - SELECTED DATA FROM FISH POPULATION MONITORING SITES ON THE SQUAW CREEK ALLOTMENT (DATA ARE AVAILABLE FROM THE LOST RIVER RANGER DISTRICT OFFICE)

Stream (Site ID)	Date	Length (m)	Mean Width (m)	Abundance (Fish ≥ 70 mm/100 m^2)					
				All Trout	Rainbow Trout	Brook Trout	Bull Trout	Cutthroat Trout	Brook x Bull Trout
Martin Creek (E144)	8/13/2009	100	2.6	14.6	-	-	0.4[1]	14.2	-
Martin Creek (E145)	7/29/2009	100	5.9	2.0	0.5	-	-	1.5	-
Squaw Creek (E161)	7/29/2009	100	7.4	2.7	2.6	-	-	0.1[2]	-
Squaw Creek (E162)	7/29/2009	100	7.4	2.0	1.2	-	-	0.8	-
Squaw Creek (E163)	7/29/2009	100	6.5	1.4	0.5[3]	-	-	0.9[4]	-

[1]The removal pattern for bull trout was 0 fish on the first pass, 0 fish on the second pass and 1 fish on the third pass. Therefore, we assumed the population estimate to be the number of fish captured.

[2]The removal pattern for cutthroat trout was 0 fish on the first pass, 1 fish on the second pass and 0 fish on the third pass. Therefore, we assumed the population estimate to be the number of fish captured.

[3]The removal pattern for rainbow trout was 0 fish on the first pass, 1 fish on the second pass, 2 fish on the third pass and 0 fish on the fourth pass. Therefore, we assumed the population estimate to be the number of fish captured.

[4]The removal pattern for cutthroat trout was 1 fish on the first pass, 0 fish on the second pass, 4 fish on the third pass and 1 fish on the fourth pass. Therefore, we assumed the population estimate to be the number of fish captured.

TABLE C2 - BULL TROUT PRESENCE, SPAWNING, AND PROPOSED CRITICAL HABITAT BY STREAM

Stream	**Bull Trout Present (miles)**	**Bull Trout Spawning (miles)**	**Bull Trout Critical Habitat (miles)**
Bayhorse Creek	0.00	0.00	4.04
Martin Creek	2.29	2.29	5.22
Squaw Creek	5.30	0.00	7.94
Totals	7.59	2.29	17.22

TABLE C3 - BULL TROUT PRESENCE, SPAWNING, AND PROPOSED CRITICAL HABITAT BY UNIT

***Unit*-Stream**	**Bull Trout Present (miles)**	**Bull Trout Spawning (miles)**	**Bull Trout Critical Habitat (miles)**
Juliette Unit	0.00	0.00	4.04
Bayhorse Creek	0.00	0.00	4.04
Lower Squaw Creek Unit	1.48	0.00	1.48
Squaw Creek	1.48	0.00	1.48
Riparian Pasture Unit	1.56	0.00	1.55
Squaw Creek	1.56	0.00	1.55
Trealor Creek Unit	1.52	0.00	1.52
Squaw Creek	1.52	0.00	1.52
Upper Squaw Creek Unit	3.03	0.00	8.61
Martin Creek	2.29	2.29	5.22
Squaw Creek	0.74	0.00	3.39
Totals	7.59	2.29	17.22

TABLE C4 - STEELHEAD PRESENCE, SPAWNING, AND PROPOSED CRITICAL HABITAT BY STREAM

Stream	Steelhead Present (miles)	Steelhead Spawning (miles)	Steelhead Critical Habitat (miles)
Cash Creek	1.38	0.00	0.50
Cinnabar Creek	0.00	0.00	1.07
Squaw Creek	5.98	5.30	7.70
Totals	7.36	5.30	9.27

TABLE C5 - STEELHEAD PRESENCE, SPAWNING, AND PROPOSED CRITICAL HABITAT BY UNIT

***Unit*-Stream**	Steelhead Present (miles)	Steelhead Spawning (miles)	Steelhead Critical Habitat (miles)
Lower Squaw Creek Unit	2.50	1.48	3.06
Cash Creek	1.02	0.00	0.50
Cinnabar Creek	0.00	0.00	1.07
Squaw Creek	1.48	1.48	1.48
Riparian Pasture Unit	1.56	1.56	1.56
Squaw Creek	1.56	1.56	1.56
Trealor Creek Unit	1.89	1.52	1.52
Cash Creek	0.37	0.00	0.00
Squaw Creek	1.52	1.52	1.52
Upper Squaw Creek Unit	1.42	0.74	3.14
Martin Creek	0.00	0.00	0.00
Squaw Creek	1.42	0.74	3.14
Totals	7.36	5.30	9.27

TABLE C6 - CHINOOK SALMON PRESENCE, SPAWNING, AND PROPOSED CRITICAL HABITAT BY STREAM

Stream	**Chinook Salmon Present (miles)**	**Chinook Salmon Spawning (miles)**	**Chinook Salmon Critical Habitat (miles)**
Cinnabar Creek	0.00	0.00	0.25
Martin Creek	0.00	0.00	0.25
Squaw Creek	0.00	0.00	5.64
Totals	0.00	0.00	6.14

TABLE C7 - CHINOOK SALMON PRESENCE, SPAWNING, AND PROPOSED CRITICAL HABITAT BY UNIT

***Unit*-Stream**	**Chinook Present (miles)**	**Chinook Spawning (miles)**	**Chinook Critical Habitat (miles)**
Lower Squaw Creek Unit	0.00	0.00	1.73
Cinnabar Creek	0.00	0.00	0.25
Squaw Creek	0.00	0.00	1.48
Riparian Pasture Unit	0.00	0.00	1.56
Squaw Creek	0.00	0.00	1.56
Trealor Creek Unit	0.00	0.00	1.52
Squaw Creek	0.00	0.00	1.52
Upper Squaw Creek Unit	0.00	0.00	1.33
Martin Creek	0.00	0.00	0.25
Squaw Creek	0.00	0.00	1.08
Totals	0.00	0.00	6.14

TABLE C8 - SELECTED STREAM TEMPERATURE DATA FROM THE SQUAW CREEK ALLOTMENT (DATA ARE AVAILABLE FROM THE LOST RIVER RANGER DISTRICT OFFICE)

Stream (Site ID)	Year	Temperature		
		Maximum (°C)	7-day Moving Maximum (°C)	Mean (°C) (July 1-Sept 30)
Squaw Creek at Forest boundary (T34)	2009	19.6	17.9	11.2
Squaw Creek below Martin Creek (T35)	2009	15.4	14.5	9.3

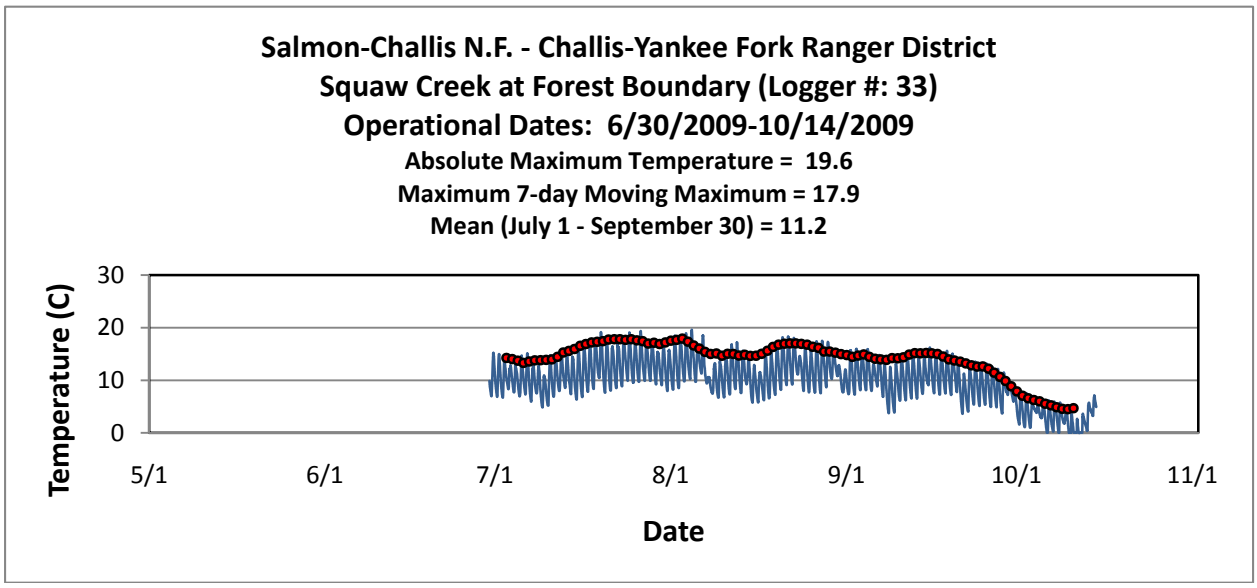

FIGURE C32. SQUAW CREEK 2009 WATER TEMPERATURE AT THE FOREST BOUNDARY (T34)

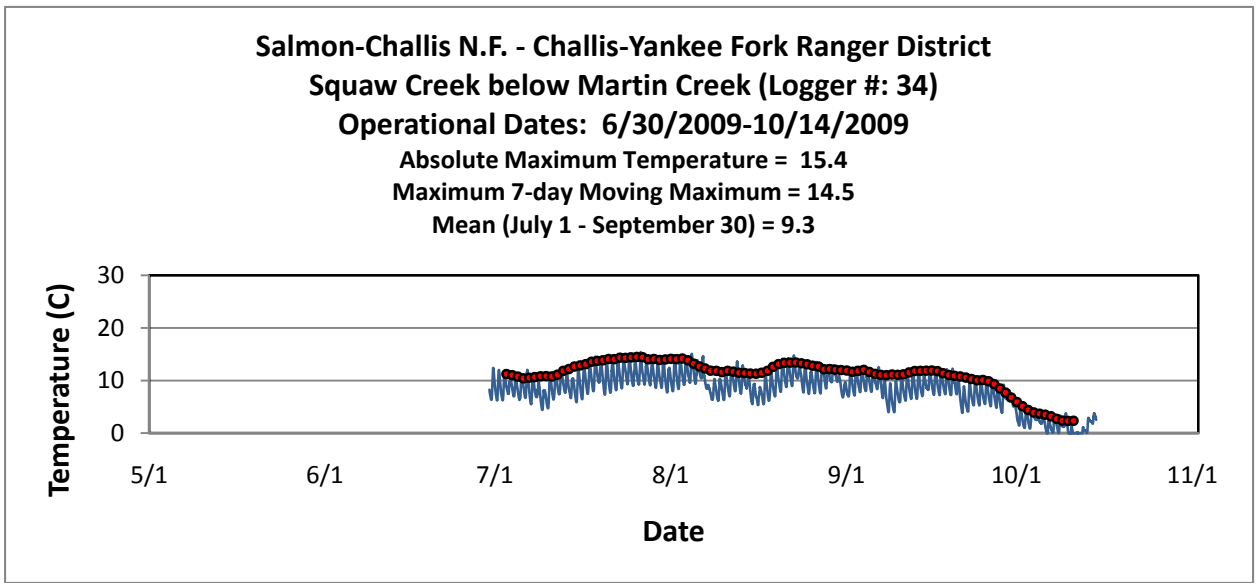

FIGURE C33. SQUAW CREEK 2009 WATER TEMPERATURE BELOW MARTIN CREEK (T35)

Table C9 - Depth fine (< 0.25 inches) data from the squaw Creek Allotment (data are available from the Lost River Ranger District office)

Stream (Site ID)	Depth Fines (< 0.25 inches) (%)															
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Squaw Creek 1A (BD118)	25.9	24.2	27.4	23.5	30.5	34.0	23.5	33.9	31.5	33.9			16.4	29.0		
Trail Creek 1R (BD119)		27.0														

Table C10 – bank stability data from the squaw Creek Allotment (data are available from the Lost River Ranger District office)

Stream (Site ID)	Bank Stability (%)															
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Squaw Creek 1A (BD118)	62.5	100.0	90.5	77.0	93.0	88.5	91.0	93.0	94.5	83.5			100.0	89.5		
Trail Creek 1R (BD119)		91.5														

TABLE C11 - MULTIPLE INDICATOR MONITORING (MIM) DATA FROM THE SQUAW CREEK ALLOTMENT (DATA ARE AVAILABLE FROM THE CHALLIS-YANKEE FORK RANGER DISTRICT OFFICE)

Unit MIM Site ID	Stream	Year	Width to Depth Ratio	Bank Stability (%)	Woody Species Abundance			GES[A]	Trend in GES[B]
					Total (#/acre)	Seedling/Young (#/%)	Mature/Dead (#/%)		
Lower Squaw Creek M-72	Squaw Creek	2003	N/A	N/A		N/A	N/A	ES/21	Base
		2009	17.04	77%	104	50/48%	54/ 52%	MS/60	Up
Riparian Pasture M-284	Squaw Creek	2009	15.83	86%	131	60/46%	71/ 54%	MS/54	Base
Trealor Creek M-71	Squaw Creek	2009	20.55	92%	124	46/37%	78/ 63%	MS/53	Base
Upper Squaw Creek M-285	Squaw Creek	2009	18.75	91%	61	22/36%	39/ 64%	MS/49	Base
Upper Squaw Creek M-330	Martin Creek	2010	N/A	100%	91	14/15%	77/ 84%	PNC/98	Base
Kinnikinic Creek M-69	Kinnikinic Creek	2003	N/A	N/A	162	56/35%	106/65%	MS/47	Base
Juliette M-66	Bayhorse Creek	2003	N/A	N/A	229	96/42%	133/58%	ES/35	Base

[A] Greenline ecological status where 0-15=Very Early Seral (VES), 16-40=Early Seral (ES), 41-60=Mid Seral (MS), 61-85=Late Seral (LS), ≥86 Potential Natural Community (PNC)

[B] Greenline ecological status trend where an increase of 10 points or more is considered an upward trend, a decrease of 10 points or more is considered a downward trend, and a change of less than 10 points is considered a static trend.

APPENDIX D: PROTOCOL FOR MAPPING CHINOOK SALMON CRITICAL HABITAT

PROTOCOL FOR MAPPING CHINOOK SALMON CRITICAL HABITAT CURRENTLY DESIGNATED ON THE SALMON-CHALLIS NATIONAL FOREST

This document summarizes the process that will be used by the Salmon-Challis National Forest (SCNF) to map Chinook salmon critical habitat (CSCH) as currently designated by NOAA Fisheries on the SCNF. Critical habitat has been designated for Snake River spring/summer Chinook salmon and includes "river reaches presently or historically accessible…to Snake River spring/summer Chinook salmon" (Federal Register 58(247):68543-68554). However, this designation did not provide a detailed description of the specific areas included in the designation. Such a description is essential when completing site specific consultations to determine if CSCH is present within the action areas. The purpose of this project is to create a GIS layer that delineates the specific areas that are designated as CSCH in this rule. It should be emphasized that this process is not to "designate" CSCH but to portray the SCNFs interpretation, using the identified process, of those areas that have already been designated by the rule. For the purposes of the project, we assume CSCH to be all areas currently or historically occupied by Chinook salmon. This process includes only those areas within the administrative boundary of the SCNF.

The process will use the NHD stream layer as the base layer. By default, all streams will initially be considered to not be CSCH. The following steps will then be used to map designated CSCH.

Step 1: Add reaches identified by the Intrinsic Potential Model.

An Intrinsic Potential Model (IPM) developed by the National Marine Fisheries Service (Cooney and Holzer 2006) has been used to model potential spawning and rearing habitat within the SCNF. All stream reaches identified by the IPM shall be mapped as CSCH.

Step 2: Remove reaches that were inappropriately identified by the IPM.

The IPM has the potential to identify streams or portions of streams where Chinook salmon could not have occurred. This step involves identifying these reaches and removing them from the CSCH layer. Forest fish staff will review stream reaches selected by the IPM and identify those that were inappropriately included. This may include, but not be limited to, stream reaches that are a) ephemeral, b) above natural barriers, or c) too small to support Chinook salmon. Documentation supporting the removal of each stream reach must be provided.

Step 3: Add reaches where Chinook salmon have occurred based on redd data, but have not been identified in previous steps as CSCH.

Chinook salmon redd surveys have been conducted by various organizations. These data will be reviewed by Forest fish staff and all sites where Chinook salmon redds have occurred that have not already been identified as CSCH shall be mapped. Documentation supporting the inclusion of each stream reach must be provided.

Step 4: Add reaches where Chinook salmon have been observed during SCNF fisheries assessments, but have not been identified in previous steps as CSCH.

The SCNF has conducted various fisheries assessments and resulting data contain site-specific information regarding Chinook presence in streams. These data may include, but not be limited to, a) general fish population assessments, b) fish population monitoring, c) project specific monitoring, d) observation by Forest Service personnel, and e) R1/R4 surveys. These data will be reviewed by Forest fish staff and all sites where Chinook salmon have occurred that have not already been identified as CSCH shall be mapped. Documentation supporting the inclusion of each stream reach must be provided.

Step 5: Add reaches where Chinook salmon have been observed during fisheries assessments conducted by external organizations, but have not been identified in previous steps as CSCH.

Various organizations other than the SCNF have conducted fisheries assessments and resulting data are valuable for identifying areas where Chinook salmon have occurred within the SCNF. Such organizations may include, but not be limited to a) the Idaho Department of Fish and Game, b) the Department of Environmental Quality, and c) Native American Tribes. These data will be reviewed by Forest fish staff

and all sites where Chinook salmon have occurred that have not already been identified as CSCH shall be mapped. Documentation supporting the inclusion of each stream reach must be provided.

Step 6: Add reaches that may provide or may have provided tributary refugia to Chinook salmon but have not been identified in previous steps as CSCH.

Chinook salmon may occupy portions of tributary streams that are not directly associated with spawning areas. Chinook salmon can encounter water temperature or turbidity conditions that are temporarily less than optimal or are lethal (Torgersen et al. 1999; Scrivener et al. 1993). When this occurs, the fish may move to tributary streams that have more suitable conditions but that the fish would not otherwise occupy. We refer to these areas as tributary refugia.

It is important to know how far Chinook salmon may move up tributary refugia. However, most of the information that we found (e.g. Scrivener et al. 1994; Malsin et al. 1996-1999; Murray and Rosenau 1989) was not directly applicable to the set of conditions present on the SCNF in central Idaho. Those studies with data most closely representing conditions found in central Idaho show that fish seeking refugia primarily use confluence areas (Strange 2007; Torgersen et al. 1999). Since we were not able to locate information on use-patterns in tributary refugia, we used professional judgment to estimate how far up these tributaries Chinook salmon might move. Based on our review of fish population and stream habitat data from the Salmon River basin, we concluded that Chinook salmon likely do not move more than 0.25 miles up a tributary if the only reason they are in the stream is to seek refugia.

Although the previous steps in this process have likely identified most stream reaches that are tributary refugia, it is possible that some of these areas have still not yet been included. This step allows the addition of tributary refugia using the following set of criteria as a guideline for mapping. Professional judgment shall be used and documentation supporting the addition of each stream reach must be provided.

- **Proximity to CSCH:** The tributary must connect to a stream or river currently included as CSCH.
- **Watershed Size:** An evaluation of the smallest tributaries where Chinook salmon presence was confirmed within the SCNF can be useful in estimating the lower limits to watershed size constraining use of streams by Chinook. The average lower limit to watershed size where Chinook were present or presumed likely to use as refuge on the South Zone of the SCNF was approximately seven square miles. This value or a value that is appropriate for a given geographic area may be used to identify tributaries where it is reasonable to assume that Chinook salmon can access and use as refuge.
- **Fish-Bearing Streams:** Streams accessible to other salmonids can reasonably be assumed to be accessible to Chinook. Tributaries that contain other salmonids and are not smaller that the lower limit to watershed size shall be considered for inclusion as CSCH for 0.25 miles upstream from the confluence. Tributaries meeting this criterion, but exhibiting barriers to migration at the confluence shall be considered for exclusion from CSCH.
- **Non-Fish-Bearing Streams:** Streams inaccessible to other salmonids can reasonably be assumed to be inaccessible to Chinook and shall generally be considered for exclusion from CSCH. Streams lacking fish occurrence data shall be evaluated for inclusion in or exclusion from CSCH based upon the watershed size and professional judgment.

Step 7: Add reaches that, based on professional judgment, may be currently or may have been historically occupied by Chinook salmon, but have not been identified in previous steps as CSCH.

It is possible that the previous steps have not identified all reaches that either currently contain or historically contained Chinook salmon. This step allows Forest fish staff to use professional judgment to identify any additional CSCH that may have been missed in the previous steps. Documentation supporting the addition of each stream reach must be provided.

Step 8: Add reaches that are downstream from CSCH identified in the previous steps.

Since Chinook salmon migrate to the Pacific Ocean, they will occur at least seasonally in all areas downstream of the stream reaches identified as CSCH in the previous steps. Therefore, all reaches downstream of areas identified in the previous steps as CSCH shall also be mapped as CSCH.

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APPENDIX E: BULL TROUT DESIGNATED CRITICAL HABITAT

PRIMARY CONSTITUENT ELEMENTS

Primary Constituent Elements of Critical Habitat

The Forest has utilized six focus indicators to characterize the condition of the habitat for listed fish species on streams within allotments on the SCNF. These are: 1) spawning and incubation, 2) temperature, 3) sediment, 4) channel width to depth ratio, 5) streambank condition, and 6) riparian conservation areas. These indicators also serve to form the basis for potential impacts to the Primary Constituent Elements (PCEs) for Chinook salmon, steelhead, and bull trout designated critical habitat.

The following are the specific PCEs for the designated bull trout critical habitat (January13, 2010, Federal Register 75FR2270) and examples of habitat indicators that can be used to assess the condition of the PCEs. Many of the Forest "focus indicators" match the examples (highlighted in the Associated Habitat Indicators). They have been thoroughly addressed within the environmental baseline conditions and the site specific effects analysis. Therefore, they form the basis for the Forest's determination for effects to the species and potential critical habitat.

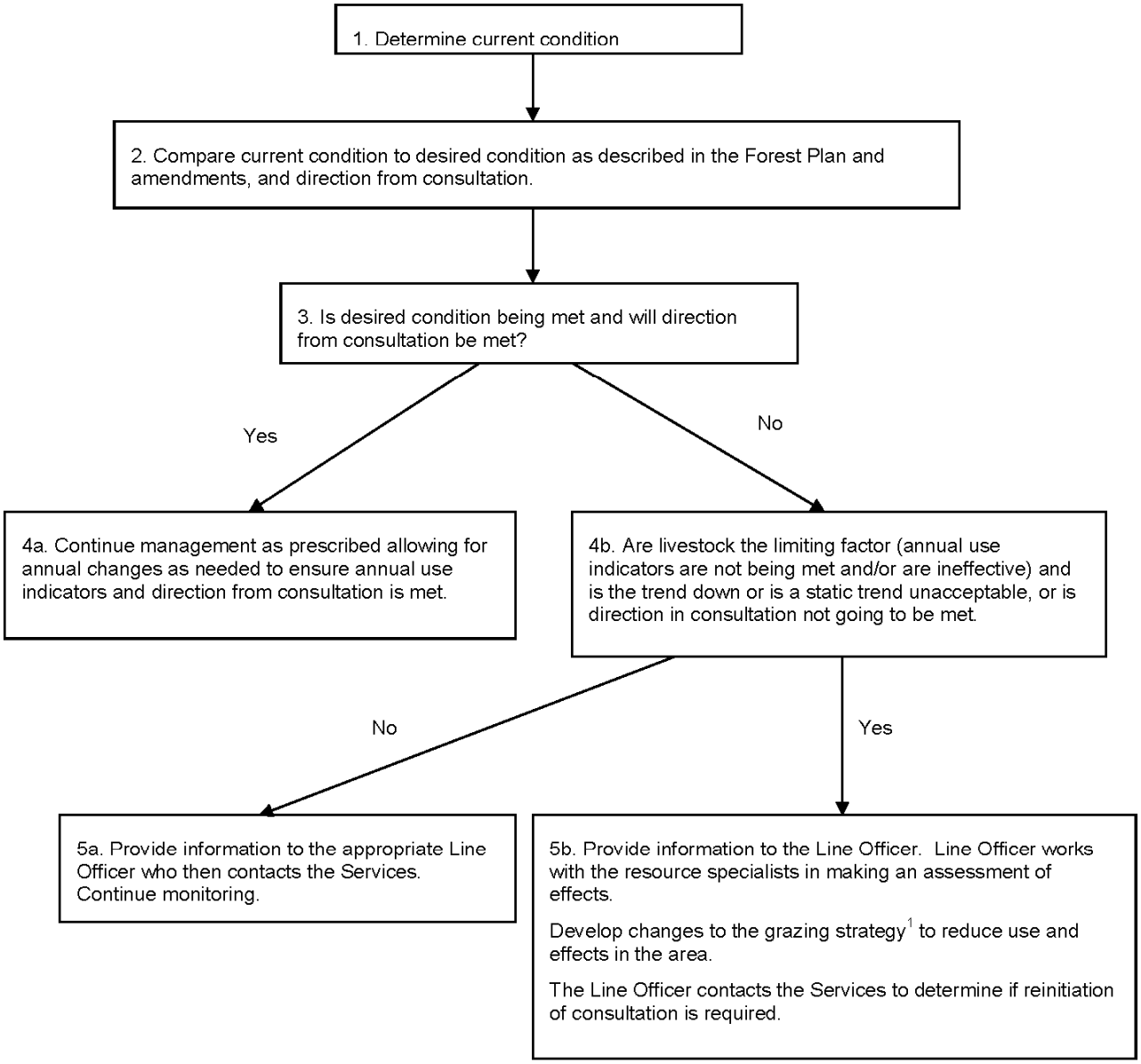
TABLE E1 – DESIGNATED BULL TROUT CRITICAL HABITAT PRIMARY CONSTITUENT ELEMENTS

PCE #	PCE Description	Associated Habitat Indicators
1.	Springs, seeps, groundwater sources, and subsurface water connectivity (hyporehic flows) to contribute to water quality and quantity and provide thermal refugia.	floodplain connectivity, change in peak/base flows, increase in drainage network, **riparian conservation areas**, chemical contamination/nutrients
2.	Migratory habitats with minimal physical, biological, or water quality impediments between spawning, rearing, overwintering, and freshwater and marine foraging habitats, including but not limited to permanent, partial, intermittent, or seasonal barriers.	life history diversity and isolation, persistence and genetic integrity, **temperature**, chemical contamination/nutrients, physical barriers, **average wetted width/maximum depth ratio in scour pools in a reach**, change in peak/base flows, refugia
3.	An abundant food base, including terrestrial organisms of riparian origin, aquatic macroinvertebrates, and forage fish.	growth and survival, life history diversity and isolation, **riparian conservation areas**, floodplain connectivity (importance of aquatic habitat condition indirectly covered by previous seven PCEs)
4.	Complex river, stream, lake, reservoir, and marine shoreline aquatic environments and processes with features such as large wood, side channels, pools, undercut banks and substrates, to provide a variety of depths, gradients, velocities, and structure.	large woody debris, pool frequency and quality, large pools, off channel habitat, refugia, **average wetted width/maximum depth ratio in scour pools in a reach**, **streambank condition**, floodplain connectivity, **riparian conservation areas**
5.	Water temperatures ranging from 2 to 15°C (36 to 59°F), with adequate thermal refugia available for temperatures at the upper end of this range. Specific temperatures within this range will vary depending on bull trout life-history stage and form; geography; elevation; diurnal and seasonal variation; shade, such as that provided by riparian habitat; and local groundwater influence.	**temperature**, refugia, **average wetted width/maximum depth ratio in scour pools in a reach**, streambank **condition**, change in peak/base flows, **riparian conservation areas**, floodplain connectivity
6.	Substrates of sufficient amount, size, and composition to ensure success of egg and embryo overwinter survival, fry emergence, and young-of-the-year and juvenile survival. A minimal amount (e.g., less than 12%) of fine substrate less than 0.85 mm (0.03 in.) in diameter and minimal embeddedness of these fines in	**sediment**, **substrate embeddedness**, large woody debris, pool frequency and quality

	larger substrates are characteristic of these conditions.	
7.	A natural hydrograph, including peak, high, low, and base flows within historic and seasonal ranges or, if flows are controlled, they minimize departures from a natural hydrograph.	change in pea k/base flows, increase in drainage network, disturbance history*, disturbance regime. (* Information relative to disturbance history is often found in the baseline narrative)
8.	Sufficient water quality and quantity such that normal reproduction, growth, and survival are not inhibited.	**sediment**, chemical contamination/nutrients, change in peak/base flows
9.	Few or no nonnative predatory (e.g., lake trout, walleye, northern pike, smallmouth bass; inbreeding (e.g., brook trout); or competitive (e.g., brown trout) species present.	persistence and genetic integrity, physical*barriers* (* Information relative to disturbance history is often found in the baseline narrative)

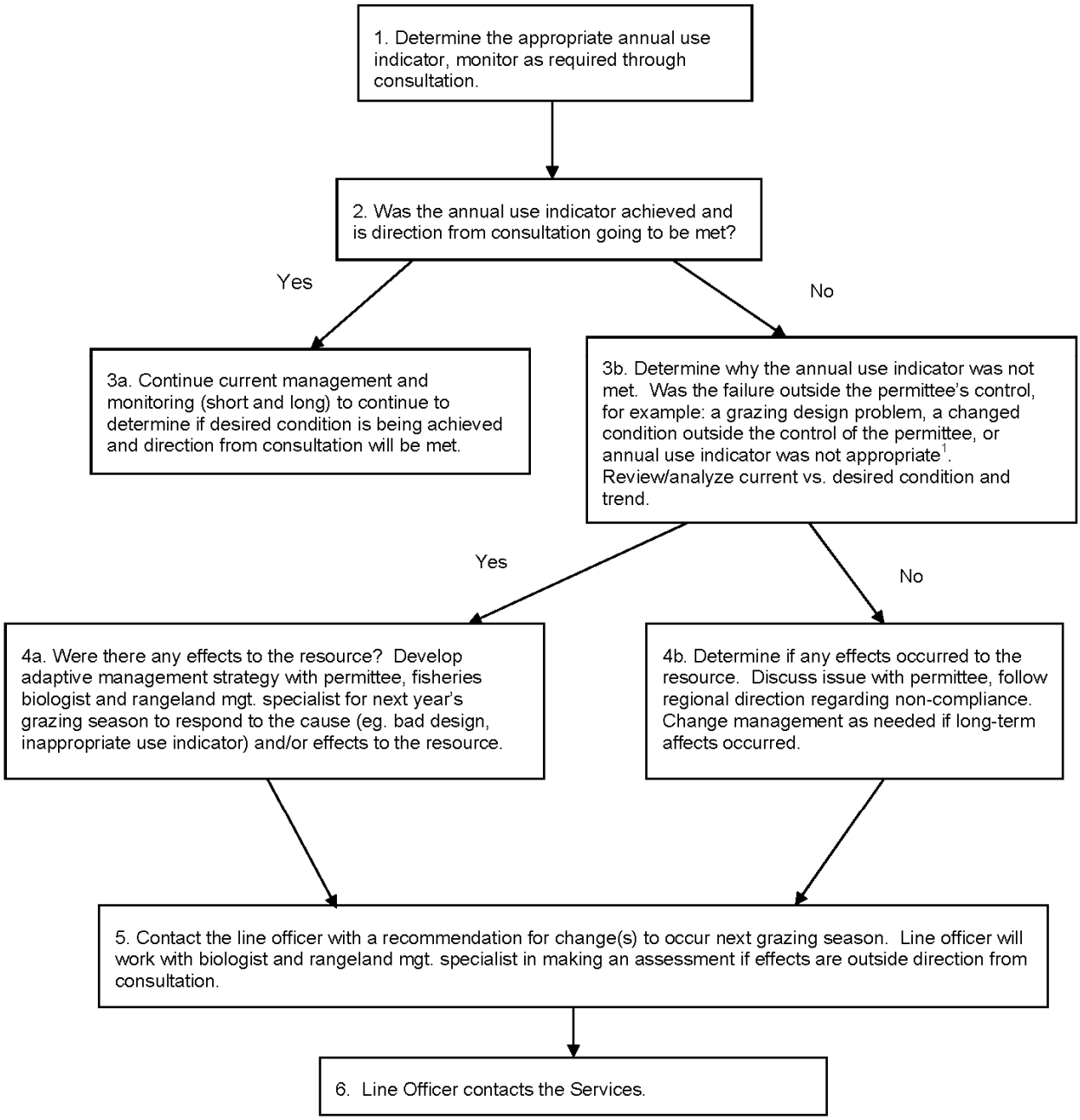
APPENDIX F: ADAPTIVE MANAGEMENT DIAGRAMS

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.