Prepared by Sally Cariveau

Big Park Allotment Adaptive Management Strategy (2020)

Rangeland Management in the Park Range Analysis Area EA

The purpose of this document is to **I**) summarize the Park Range EA (2012) **II**) provide the current status of Rangeland grazing administration and monitoring results (2010-2019), **III**) outline adaptive management action items, and **IV**) ensure specialists and line officers concur that next steps for adaptive management action items, and were adequately covered by the Park Range EA.

I. EA Summary (2010)

This section focuses on the initial adaptive management strategy, regarding sensitive streams and riparian areas. The primary issues analyzed in the EA are historic streambank trampling and high sediment load in Newcomb Creek. The key area used for study in this analysis area is Newcomb Creek.

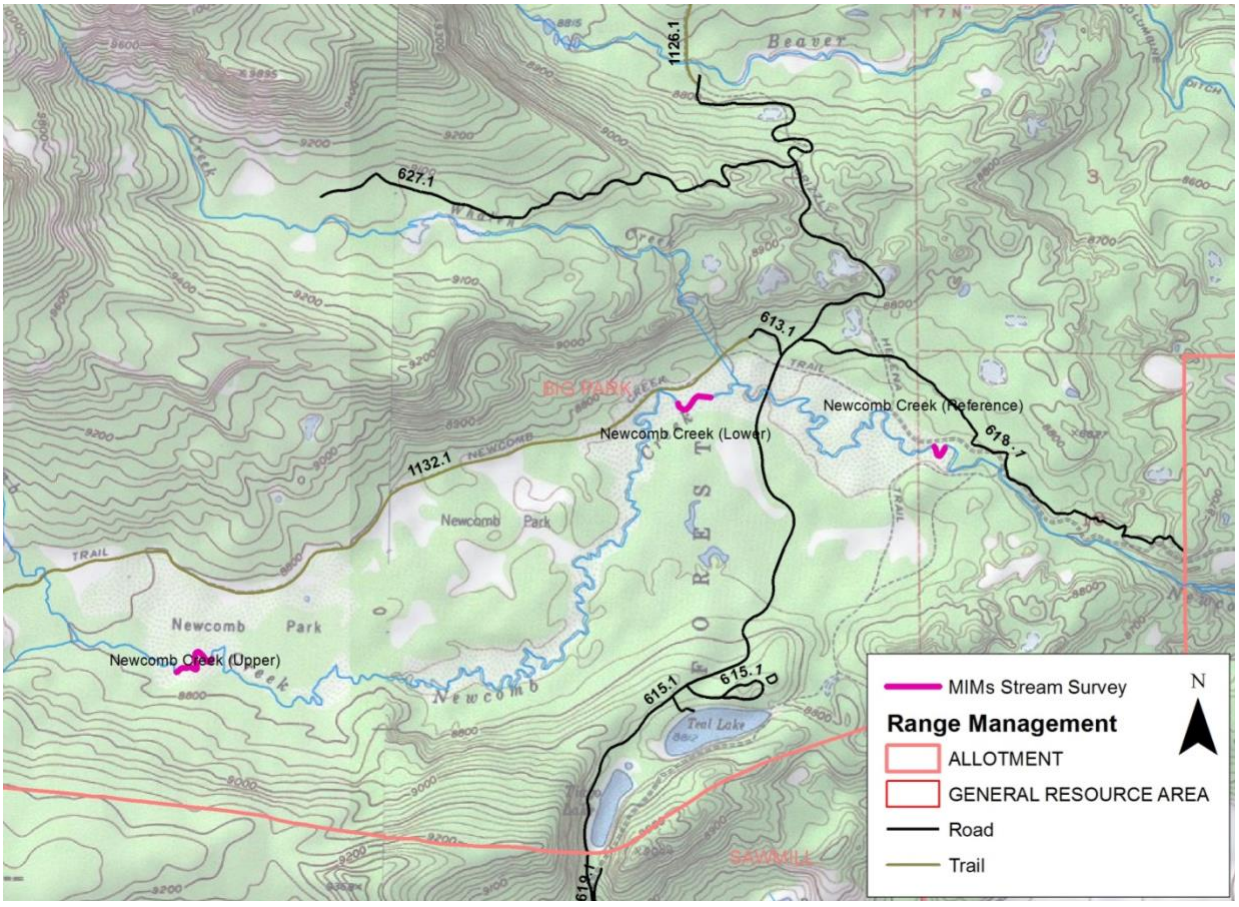


Figure 1: Big Park Allotment in the Park Range Analysis Area and the Newcomb Stream Health Site

***Table 1**: The initial adaptive management strategy (2010) from the Park Range Rangeland Analysis proposed action. It included short and long term riparian monitoring indicators and thresholds. Newcomb Creek has been identified as the key area for long-term and short-term monitoring identified below. No reference reach has been identified for Newcomb Creek so Rosgen geometry is used to determine "reference-like" conditions based on morphology, slope and channel materials.*

Riparian Monitoring Metrics	Riparian Monitoring Thresholds	Threshold Met in Big Park Allotment?	Riparian Adaptive Management Strategy
Bank Trampling	Must not exceed 30% in any year.	**No**, threshold exceeded in 2012 and met in 2019.	If annual monitoring thresholds are not met, revise current year grazing strategy.
Sedge Height	Must be greater than 6" in any year	**No**, exceeds at least once at all 3 sites.	
Bank Stability	Improve towards 74% or more of reference conditions by 3 years	**No**, bank stability decreasing over time.	If long-term monitoring thresholds are not met, implement adaptive management actions including the reduction in season and/or livestock numbers.
Greenline Rating	Improve Green-line stability rating by 1 point within 4 years, and 2 points within 10.	**No**, in 2019 both Newcomb Reference and Upper site both below threshold.	
Proper Functioning Condition (PFC)	Upward trend towards PFC	**No**, last PFC in 2009 (75% FAR) at Newcomb Cr	

***Table 2**: Desired conditions pertinent to stream and riparian areas from the Big Park EA.*

Resource	Desired Condition	Current Condition (2020)
Riparian Areas	Riparian areas function properly, maintain stream health, stability and prevent erosion, and maintain water quality.	The primary issues analyzed in the EA are historic streambank trampling and high sediment load in Newcomb Creek due to unstable banks.
Riparian Vegetation	Stabilizing vegetation that reduces soil erosion, maintains soil productivity and reduces delivery of fine sediment to streams.	No threatened or endangered species were found in the analysis area. Because the majority of the riparian area is in fair condition and not severely depleted or degraded, the proposed action should bring about rapid improvement in the two factors which were identified as in need of improvement – streambank stability and riparian vegetation residual height. (Page 60 EA)
Aquatic Species	Aquatic species such as fish, amphibians, and insects with populations that are productive, diverse, and stable.	The action alternatives have watershed Design Criteria incorporated that are likely to eliminate any impacts to trout habitat and particularly the potential for increased sedimentation in riparian areas, aquatic habitat fragmentation, and loss of stream shading. (Page 35 EA)

Streams	Streams exhibit habitat features with sufficient depth of pools, composition of substrate, and sequence of pools and riffles. Stream stability emphasis is on recovery of impacted reaches of King Solomon Creek.	Newcomb Creek has at-risk stream health due to sedimentation, high width to depth ratio, aggradation and stream bank stability.

II. Current State of Grazing Administration and Monitoring

This section provides information on stock use, distribution, water developments, fences and stream and riparian monitoring results (2015).

A. Stock Use and Distribution

There is only one grazing permittee on the Newcomb Creek allotment. The Harvats do not graze any other allotments.

Table 3*: Actual stock use in the Dudley Creek allotment*

Year	Livestock Numbers	Reported Dates	Approximate Days	Permittee Name	Allotment
2015-2022	300 c/c 750 AUMs	7/20-10/3	76	John and Sharon Harvat	Big Park (11,200 acres)

B. Water Development and Fences

Fences are the only range improvements in this analysis area. All fencing is along the Forest boundary and there are no interior drift fences that separate allotments or pastures within an allotment. There are no existing water developments in the Big Park allotment.

C. Stream and Riparian Monitoring Results (1998-2019):

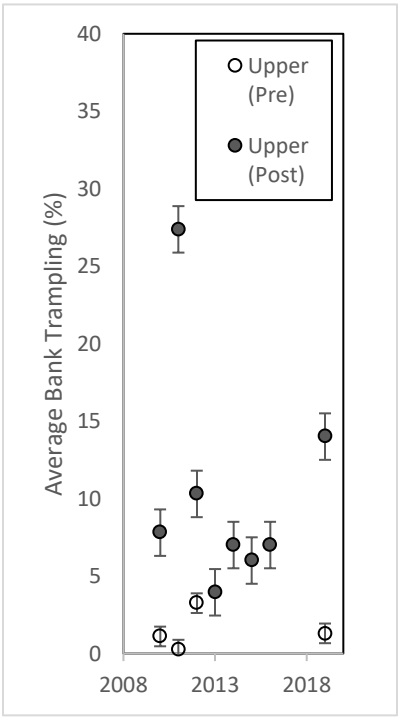
Monitoring in the Big Park allotment began in 1998 with Newcomb Creek being the focus. Three areas have been surveyed on Newcomb Creek: Upper (established in 2013 for riparian vegetation analysis only), Lower (site of Cross Section #1 where stream health data was primarily collected and, Lower which was intended to be a reference reach but is below the at-risk cross section #1 and is typically inundated by beaver.

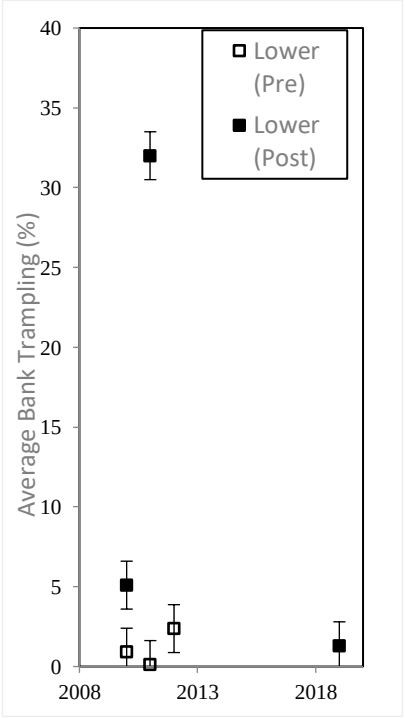
The Big Park allotment includes Butler Creek, Beaver Creek, Whalen Creek and Newcomb Creek. Butler Creek, Beaver Creek and Whalen Creek showed minimal impacts from grazing and are considered to be in proper functioning condition. Newcomb Creek had greater impacts from grazing and a PFC survey in 2009 found this stream to be functional-at-risk relative to its potential, due to increased width to depth ratio, unstable banks throughout the stream system, inadequate vegetative cover of banks, and excessive deposition. Stream health surveys indicate that this reach is an F4 stream type, however the geomorphic setting indicates this should be a C4 stream type. Past down-cutting has resulted in entrenchment and loss of access to the floodplain. Newcomb Creek also has high width/depth ratios, is straighter, contains more fine sediment, and has pools that are shallower and shorter than reference condition. The green-line survey average at all sites and years surveyed had an average rating of 4.8 or poor to moderate, suggesting inadequate riparian vegetation to protect the streambanks from erosion during peak flows. Measurement of bank erosion pins support high rates of bank erosion, which also results in excessive sediment input to the stream system. Stream health is rated as at-risk in this reach.

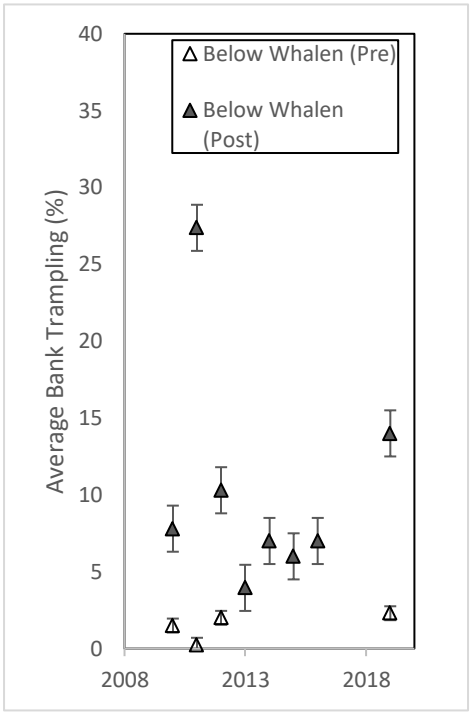
Stream health and riparian survey data indicates that Newcomb Creek has been historically overgrazed by both wildlife and livestock resulting in bank widening and entrenchment and a change in stream type. As a result, streambanks are unstable, there are areas with extensive streambank sloughing, point bars are only minimally revegetating, and the width to depth ratio is higher than would be expected from a stream in this geological setting. The effects of the historic and current grazing appear to be affecting overall stream health throughout the stream system. Although grazing numbers were decreased in 1965, current grazing practices have not allowed the stream system to recover to proper functioning condition and management actions are necessary to improve stream health in this area.

Pre- vs. Post Grazing (2010-2019)

- Pre-Grazing Bank Trampling was between 0 - 3 % at all sites for all 4 years (*Fig. 2*). This suggests the wildlife contribution to bank trampling is insignificant.
- Pre-Grazing Sedge Height at the Below Whalen Creek site is significantly higher than at the Upper and Lower sites. Dissimilar sedge growth rates may suggest a change species, climatic conditions, or legacy effects of heavy grazing.







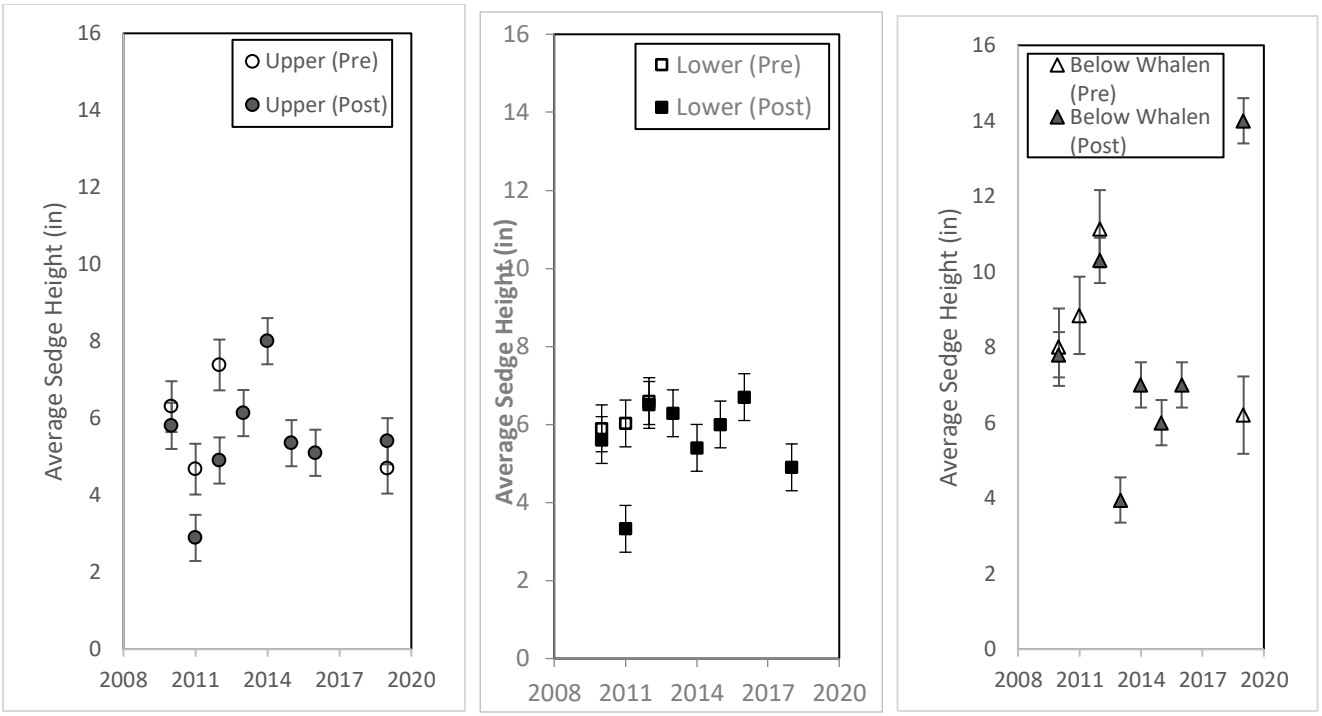
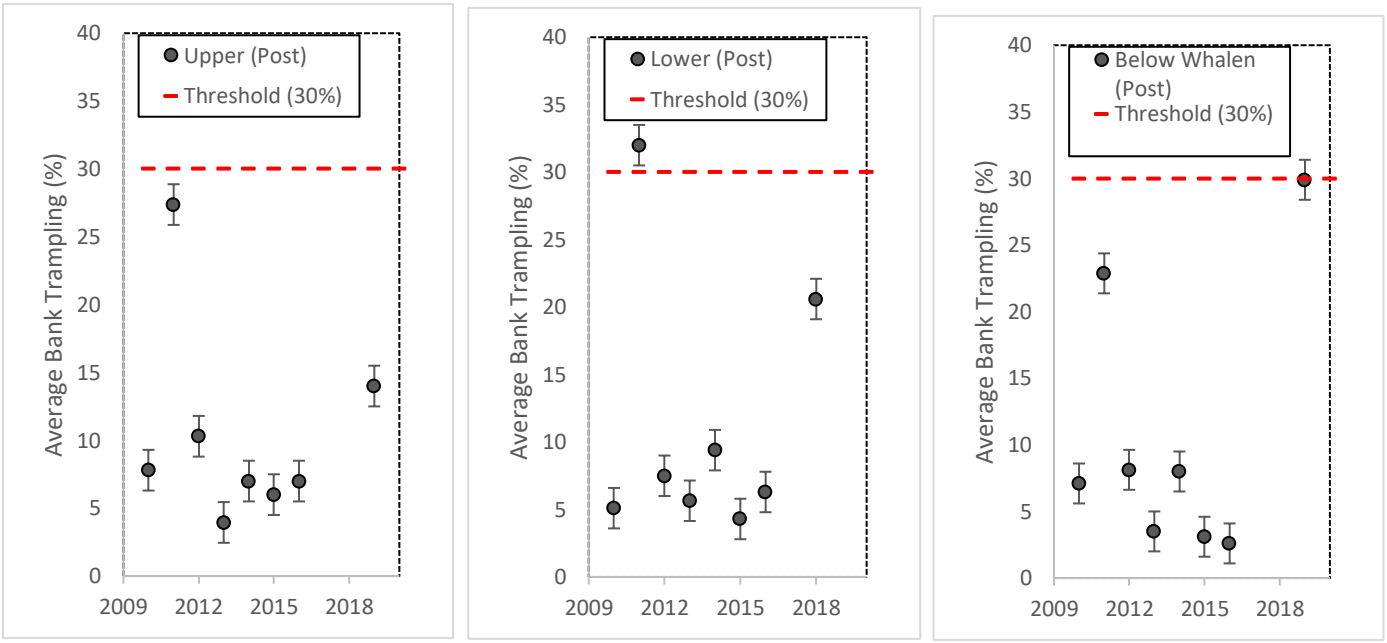


***Figure 2**: Pre vs. Post Grazing Bank Trampling and Sedge Height at Newcomb Creek. Error bars indicate the 95% confidence interval.*

Short-term Monitoring (2010 – 2015):

- Post-Grazing Bank Trampling and Sedge Heights indicate some of the desirable stream and riparian conditions are not being met. In 2011, all sites exceeded the Bank Trampling and Sedge Height thresholds (*Fig. 3*).
- Thresholds were established from best available data and the Watershed Conservation Practices Handbook (FSH 2509.25).



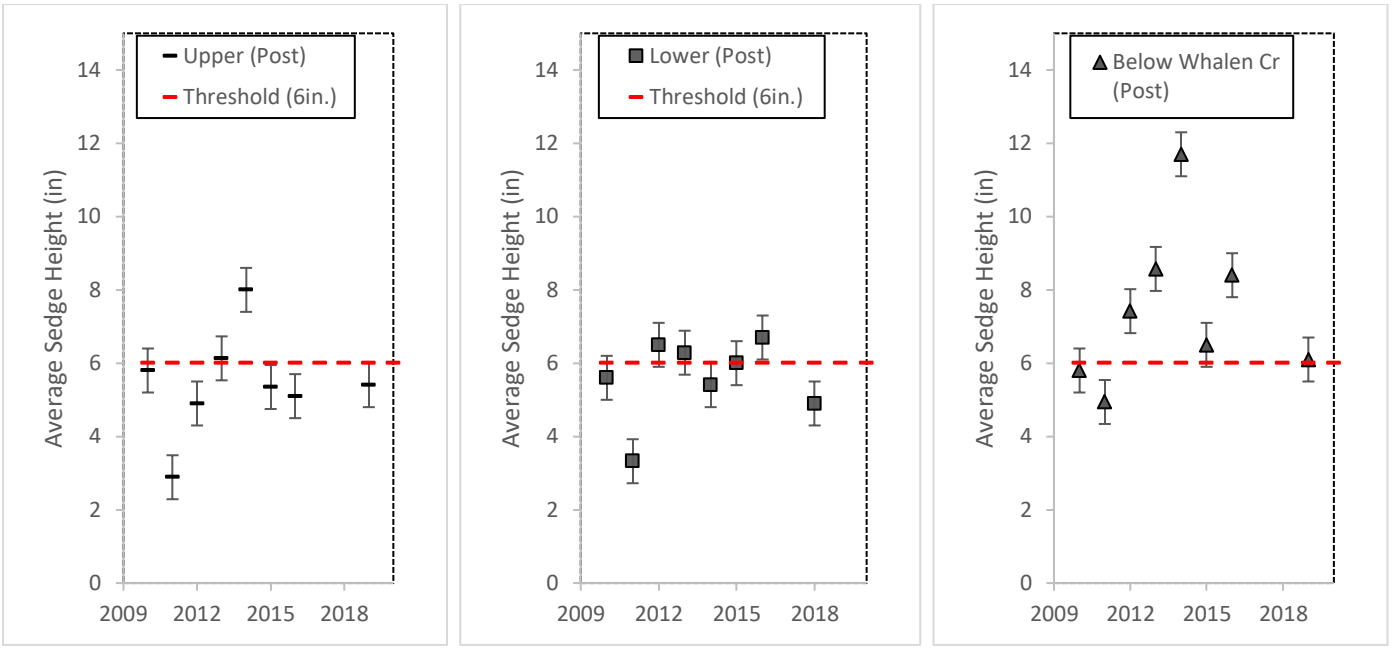
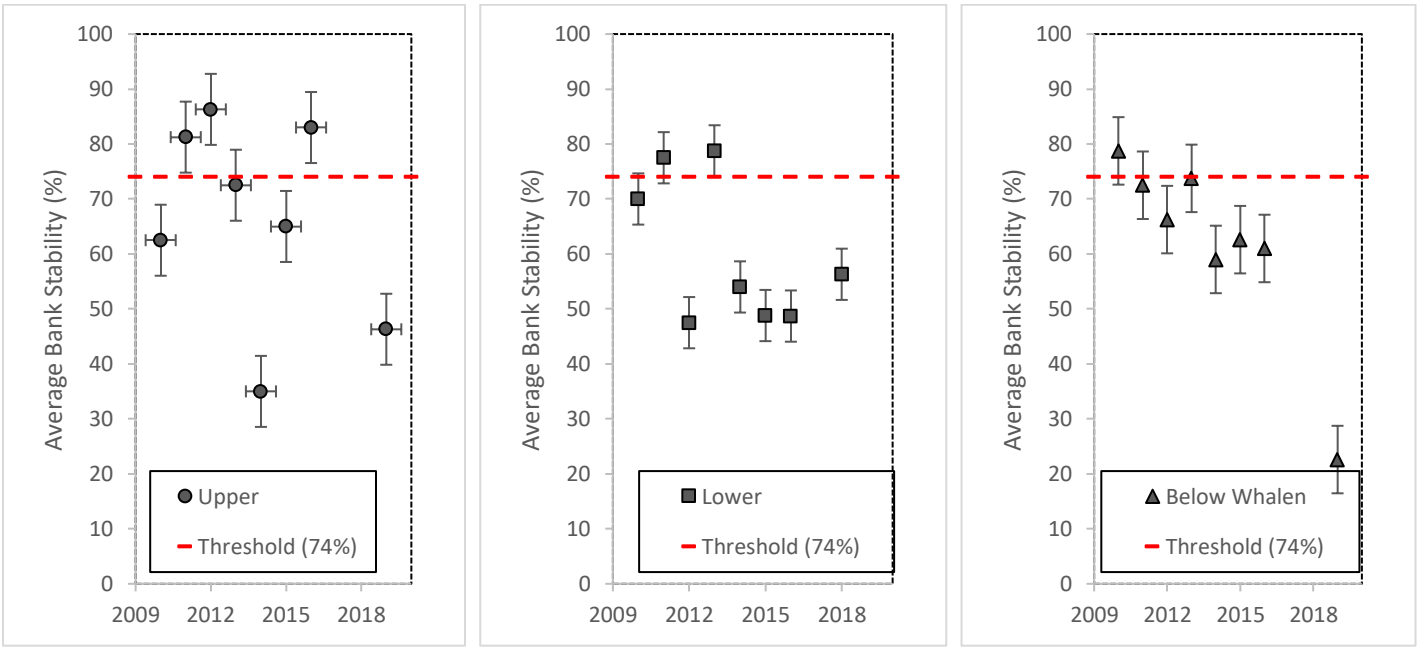


Figure 3: *Bank Trampling and Sedge Heights for Upper, Lower, and *Below Whalen Creek (*formerly the Reference) at Newcomb Creek. The red lines are bank trampling and sedge height thresholds*

Long-term Monitoring (2010 – 2015):

- Bank Stability Ratings indicate some of the desirable stream and riparian conditions are not being met. The Bank Stability threshold was exceeded for all 3 sites in 2014 and 2015 (*Fig. 4*).
- Greenline Stability Ratings indicate some of the desirable stream and riparian conditions are not being met. Greenline Stability Ratings at the Upper and Lower sites have a downward trend. The Greenline Stability Rating at the Lower site has been below its threshold for 2 consecutive surveys.



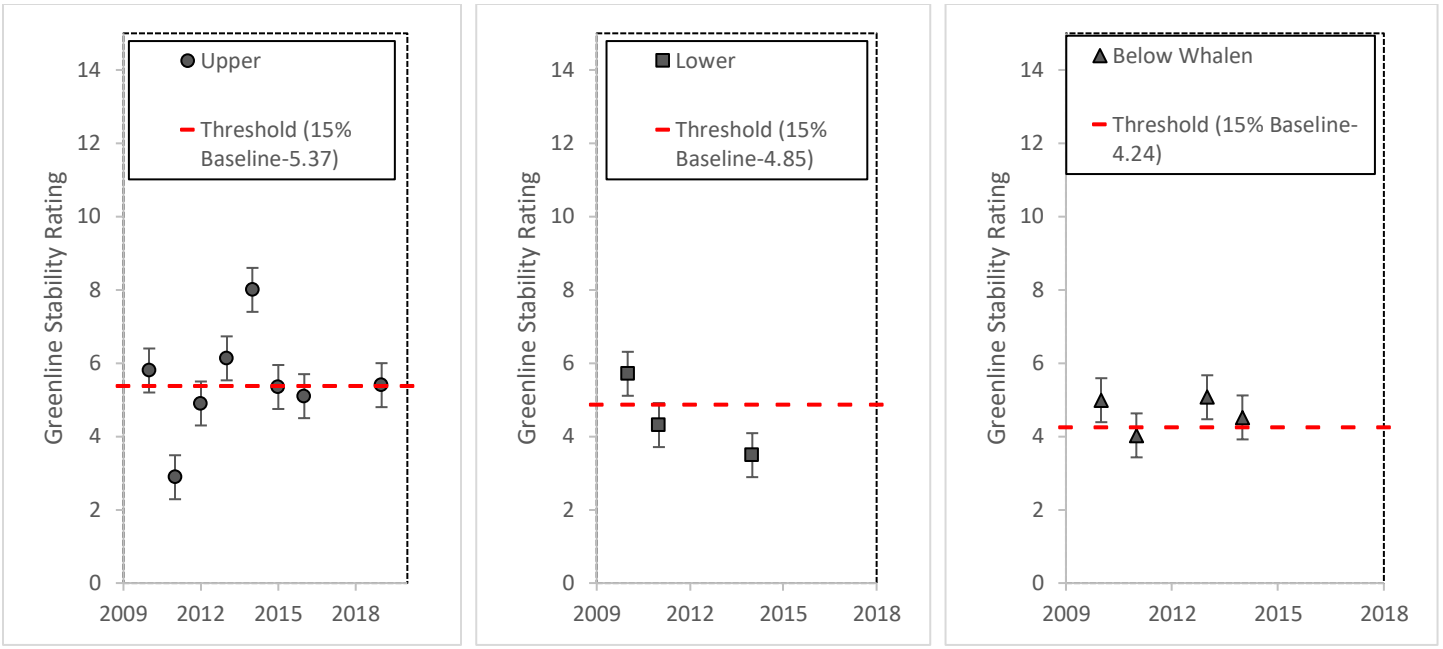


*Figure 4 - Bank Stability and Greenline Stability for Upper, Lower, and *Below Whalen Creek (*formerly the Reference) at Newcomb Creek. The red lines are Bank Stability and Greenline Stability thresholds. Greenline Stability thresholds are based on the 2010 surveys*

Monitoring Summary:

- Pre- vs. Post-Grazing data suggest wildlife has an insignificant effect to bank trampling. Average Sedge Heights are significantly higher at the site Below Whalen Creek, which may suggest the Upper and Lower sites have limited early-season growth due to a legacy of heavier grazing.

- Short-term trends indicate post-grazing conditions at Newcomb Creek are less than optimal. In 2011, thresholds for Bank Trampling and Sedge Height were exceeded.

- Long-term trends suggest that Newcomb Creek is not on a trajectory towards maintaining or improving long-term stream health and riparian ecosystem conditions. Greenline Stability Rating at the Lower site is on a downward trend and has decreased by more than 15% from its baseline condition. The Greenline Stability Rating at the Upper site is on a downward trend and is at the threshold.

Appendix:

Table 1: Metrics and Confidence Interval (95%) to determine long-term stream health and riparian ecosystem conditions (N = # of site surveys)

Metric	Management Threshold	N	CI
Greenline Stability Rating (MIMs)	*A decline >15% of the baseline condition is unacceptable*	56	0.4
Avg. Bank Trampling (MIMs)	*20% in any one year. 15-20% shall be compared to photos to determine any adverse impacts to geomorphology/ecology*	171	1.5 (%)
Avg. Sedge Height (MIMs)	*> 6 inches*	171	0.6 (in)

Avg. Bank Stability (MIMs)	*>74% of reference condition*	171	3 (%)

Table 4: Pre- and post-grazing data at the Newcomb Creek monitoring sites

	Stream name	Date	Year	Generalized Timing	Avg. sedge height (in)	Avg. Bank Trampling (%)	Avg. Bank Stability (%)	Green-line
	Newcomb Creek - Lower	7/20/2010	2010	Pre	5.9	1	76	5.71
	Newcomb Creek - Lower	7/6/2011	2011	Pre	6.0	0	79	4.31
	Newcomb Creek - Lower	7/10/2012	2012	Pre	6.6	2	49	
	Newcomb Creek - Reference	7/20/2010	2010	Pre	8.0	2	78	4.99
	Newcomb Creek - Reference	7/27/2011	2011	Pre	8.8	0	83	4.03
	Newcomb Creek - Reference	7/10/2012	2012	Pre	11.1	2	51	
	Newcomb Creek - Reference	7/10/2019	2019	Pre	6.2	2	73	3.74
	Newcomb Creek - Upper	7/15/2010	2010	Pre	6.3	1	81	6.32
	Newcomb Creek - Upper	7/18/2011	2011	Pre	4.7	0	85	5.9
	Newcomb Creek - Upper	7/10/2012	2012	Pre	7.4	3	69	
	Newcomb Creek - Upper	7/10/2019	2019	Pre	4.7	1	61	
	Newcomb Creek - Lower	9/30/2010	2010	Post	5.6	5	70	
	Newcomb Creek - Lower	9/28/2011	2011	Post	3.3	32	78	
	Newcomb Creek - Lower	10/3/2012	2012	Post	6.5	8	48	
	Newcomb Creek - Lower	9/10/2013	2013	Post	6.3	6	79	
	Newcomb Creek - Lower	9/23/2014	2014	Post	5.4	9	54	3.49
	Newcomb Creek - Lower	9/29/2015	2015	Post	6.0	4	49	
	Newcomb Creek - Lower	9/28/2016	2016	Post	6.7	6	49	

	Newcomb Creek - Lower	9/29/2018	2018	Post	4.9	21	56	
	Newcomb Creek - Reference	9/30/2010	2010	Post	5.8	7	79	
	Newcomb Creek - Reference	9/28/2011	2011	Post	4.9	23	73	
	Newcomb Creek - Reference	10/31/2012	2012	Post	7.4	8	66	
	Newcomb Creek - Reference	9/10/2013	2013	Post	8.6	4	74	5.07
	Newcomb Creek - Reference	9/23/2014	2014	Post	11.7	8	59	4.52
	Newcomb Creek - Reference	9/29/2015	2015	Post	6.5	3	63	
	Newcomb Creek - Reference	9/28/2016	2016	Post	8.4	3	61	
	Newcomb Creek - Reference	9/25/2019	2019	Post	6.1	30	23	
	Newcomb Creek - Upper	9/30/2010	2010	Post	5.8	8	63	
	Newcomb Creek - Upper	9/28/2011	2011	Post	2.9	27	81	
	Newcomb Creek - Upper	10/10/2012	2012	Post	4.9	10	86	
	Newcomb Creek - Upper	9/23/2013	2013	Post	6.1	4	73	
	Newcomb Creek - Upper	9/23/2014	2014	Post	8.0	7	35	
	Newcomb Creek - Upper	9/29/2015	2015	Post	5.4	6	65	5.35
	Newcomb Creek - Upper	9/28/2016	2016	Post	5.1	7	83	
	Newcomb Creek - Upper	9/25/2019	2019	Post	5.4	14	46	4.24

RED indicates does NOT meet threshold

Greenline Stability Rating	
0 to 2	Very Poor
3 to 4	Poor
5 to 6	Moderate
7 to 8	Good

Table 5: Stream Health Monitoring Summary. See "Stream survey site" location on Figure 1. No reference reach has been identified for Newcomb Creek so Rosgen geometry is used to determine "reference-like" conditions based on similar morphology, slope and channel materials. The subscripts in parenthesis indicate the Rosgen thresholds for each stream type parameter

Stream Health Parameter		**Existing-Newcomb Creek X Section #1 above road 2019 Data**		**Reference-Expected Rosgen "C4"type channel** 2002
Watershed Setting	*Area:* *Lat/Long* *Avg Elev (ft)* *Land Uses* *WCC (HUC6)* *Land Uses*	7143 acres 3363724,4495295 8100' cattle allotment, roads, timber 101800010502		
Flow Regime	*Developments* *Q2, Q25,Q100*	None		
Valley	*Slope* *Confinement*	0.004 Unconfined		<.02 (average=.0037)
Channel	*Bank Materials*	Glacial/ Alluvial, Sedge-Dominated		Broad, Gentle Alluvial Valleys
Entrenchment	*Degree* *Ratio*	Entrenched 1.55		Slightly Entrenched Entrenchment>2.2 (Avg=2.9)
Width-to-Depth Ratio	*Degree* *Ratio*	High-Very High 26.71 (data range 26.71 in 2019 to 47.1 in 2001)		Moderate to High W/D ratio>12

Sinuosity	*Degree Ratio*	Low 1.07 (2000) 2.03 (2013)		Moderate to High Sinuosity >1.2
Slope	*Degree Ratio*	Very Gentle 0.005		Very Gentle -Low Slope .001-.02
Sediment	*Class Size (mm)*	Coarse Grave D50=18		Gravel (fine to very coarse) D50 Range =8-64
Rosgen Stream Type		F4		C4
BLM PFC Rating		FAR- trend unknown (75% FAR)		PFC
BLM Greenline Rating		3.74 (poor)		
Stream Condition Survey		At-Risk: Over-widened, entrenching and unstable banks,		Robust: Deep, narrow channel with stable bed/banks. Banks have extensive riparian vegetation (densely-rooted sedge mats).
Stream Sensitivity		High (C4)		High (C4)
Stream Adjustment		Current Management: Highly sensitive C4 channel will remain unstable due to bank disturbance. If bank disturbance is removed the channel has potential to return to an E type channel with a new, incised floodplain.		Rates of lateral adjustment are influenced by the presence and condition of riparian vegetation. The C4 stream type, characterized by the presence of point-bars, is very susceptible to shifts in both lateral and vertical stability caused by direct channel disturbance and changes in the flow and sediment regimes of the watershed.

2010

2019

Figure 5: Newcomb Creek Lower MIMS reach (looking downstream) taken at similar times of the year.

9/29/2000

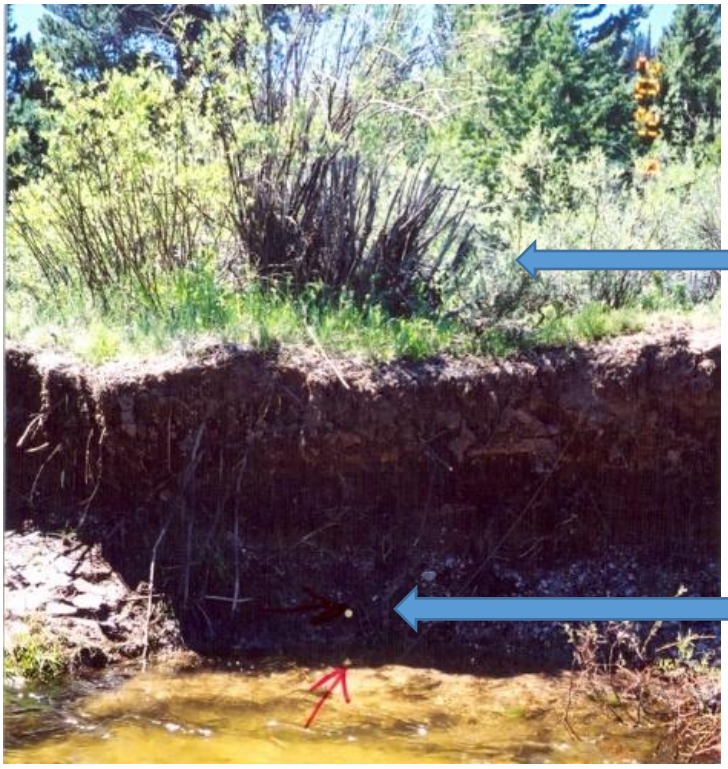
9/25/2019

Figure 6: Newcomb Creek Lower Riffle Cross Section #1 Photo Comparison (looking downstream). Photos taken at similar time of year show high Width to Depth ratio. Point bar is growing suggesting excess sediment from slumping banks cannot be flushed by flows so point bar grows, flows are then constricted by growing point bar and additional velocity is pointed toward already slumping bank causing the cycle to repeat.

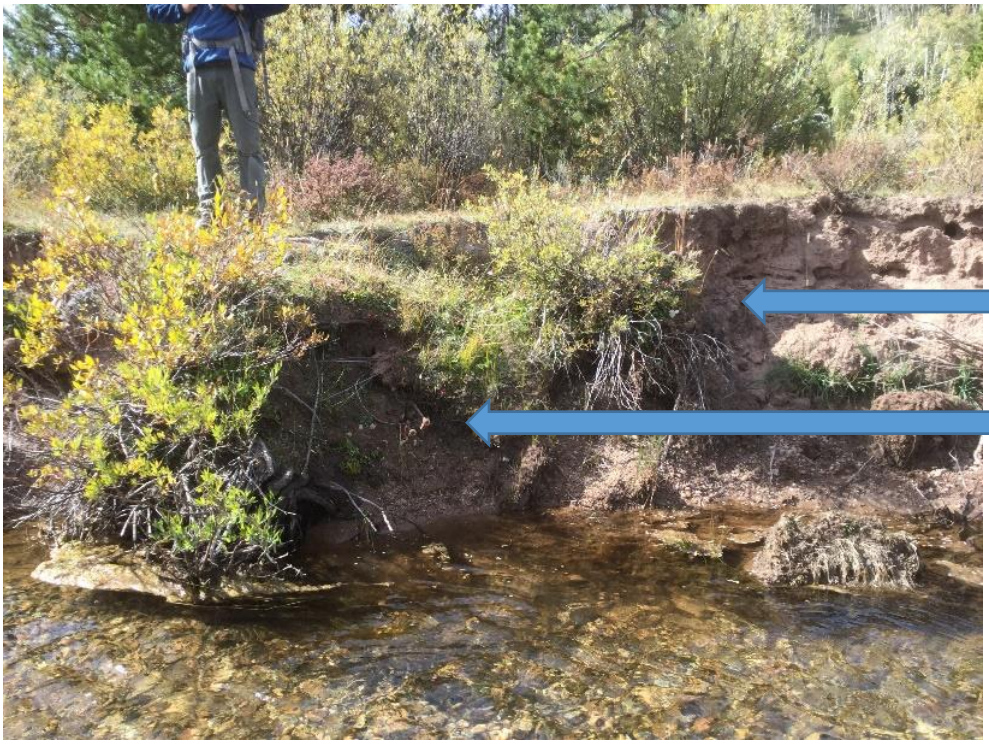
6/12/2002

2013

Figure 7: Newcomb Creek Lower Riffle Cross Section #1 Photo Comparison (looking at left bank). Note how the raw, slumping bank is growing in size.



6/2002



9/2019

Figure 8: Newcomb Creek Erosion Pin (Lower Erosion Pin Site just below riffle #1 cross section) Photo Comparison (looking at left bank).

Fall 2010

Fall 2015

Figure 8: Newcomb Creek Upper MIM site.

Figure 9: Newcomb Creek Upper MIM site.

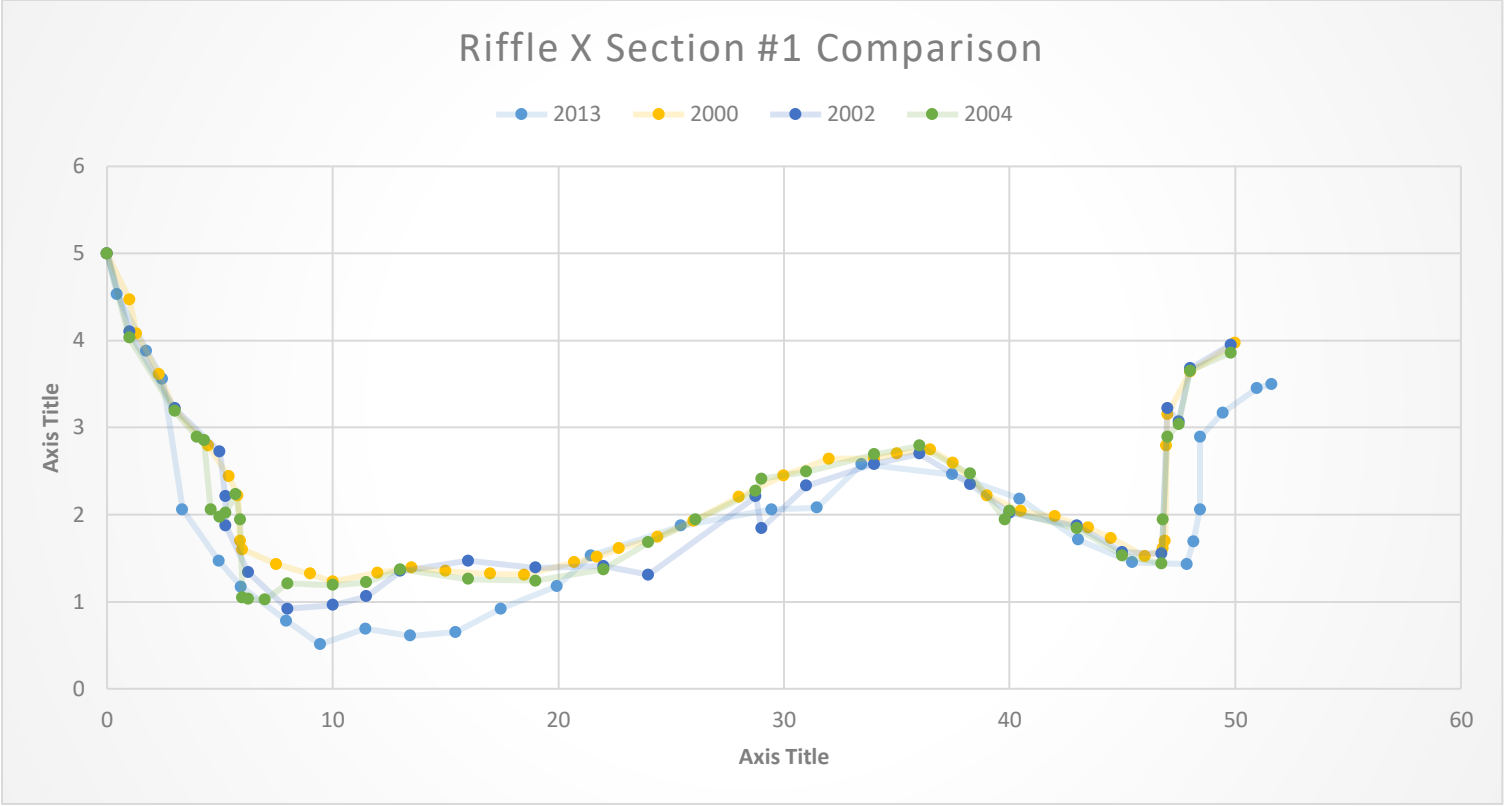


Figure 9: The riffle cross section at the 3' distance shows the bank sloughing over the years. In 2002 the left edge of bank was at 5.9', in 2013 the edge of bank was at 3.35' meaning the bank had sloughed 2.5' in 11 years at the erosion pin elevation.

Table 6:

Lower Erosion Pin Site Upstream of riffle X Section	2001	2002	2003	2004	2009	2013	2019
Upper Erosion Pin	erosion pins placed	2.14" bank lost	rebar gone- Unknown amount lost (Approx 1')	erosion pins replaced	27.24" lost	24" lost	10.8" lost
Total Amount of Bank Lost Since 2001							**64.06" (5.34')**
Lower Erosion Pin	erosion pins placed	.08" bank lost	rebar gone- Unknown amount lost (Approx 1')	erosion pins replaced	25.54" lost	25.2" lost	7.8" lost
Total Amount of Bank Lost Since 2001							**60.12" (5.01')**
Toe Pin:	toe pin placed	.3" aggrading	1.15" aggradation	minimal change	Not Measured	1.2" Scour	Not measured
Aggradation/Scour Since 2001							**.25" Aggradation**
Upper Erosion Pin Site (Above Riffle X Section)	2001	2002	2003	2004	2009	2013	2019
Upper Erosion Pin	erosion pin placed	.1" bank lost	Minimal	Minimal	Not measured		Not measured
Total Amount of Bank Lost Since 2001							**.1" Bank Lost**
Lower Erosion Pin	erosion pin placed	.4" bank lost	Minimal	Minimal	Not measured		Not measured
Total Amount of Bank Lost Since 2001							**.4" Bank Lost**
Toe Pin:	toe pin placed	.85" scour	1.2" scour	Miminal	3.14" Aggradation	Toe Pin Gone.	Not measured
Aggradation/Scour Since 2001							**More than 2.75" Aggradation**

Erosion Pins were placed in two separate sites (Upper and Lower)in 2001 to quantify streambank retreat. Erosion Pins were placed in actively eroding areas showing little evidence of livestock interference, as determined by field personnel. These sites were selected based on bank height, bank slope, evidence of recent failure, and surface conditions. Pins were installed perpendicular to the horizontal bank surface, The Upper erosion pin in each cross section was placed at bankfull level, approximating maximum scour. The lower erosion pin was places at the top of water level to show measurements at base flow. A toe pin was also placed at the base of the bank slope to measure aggradation or degredation of sediment. Significant bank loss of over 5' at the Lower Erosion Pin site as well as aggradation shows the loss of bank and subsiquent sediment influx causing aggradation.

Entrainment calculation at the riffle cross-section in 2001 also indicates aggradation.

III. Adaptive Management Checklist (2020)

This checklist tracks the progress of implementing adaptive management action items.

Adaptive Management Action Item	Planned Date	Actual Date
1. Move the on-date from July 5 to July 20 and the latest off date of October 5 (to ensure livestock are removed before the peak of the recreational hunting season). Use Colburn Draw, Spring Creek, Beaver Creek and Newcomb Creek pastures in a deferred system.	**2010**	**Currently Used**
2. Meeting allowable use levels is thought to be critical in order to trend toward desired conditions. Livestock will be moved from the grazing unit, pasture or allotment when utilization exceeds allowable use guidelines as described in the Forest Plan. Maximum allowable utilization on riparian woody species (especially in willow) in key areas will be light use (<40%) of the current year's growth. Livestock will be removed when they switch preference and begin to make significant use of riparian shrubs.		
3. If allowable use levels (herbaceous or woody species) cannot be achieved and monitoring indicates that we are not moving toward desired condition in the other key areas of the allotment then: **1.** Install a short drift fence along the Agua Fria road from the Forest boundary, and cattle guard to control cattle movement. **2.** Install a drift fence across Newcomb Creek to control cattle movement up and down this Park. **3.** Use Colburn Draw, Spring Creek, and Beaver Creek pastures first 3 out if 5 grazing seasons, and use Newcomb Creek no earlier than August 1. **4.** Apply a different livestock grazing strategy. **5.** Change herding and riding practices and 6. Construct range structural improvements including fences (as well as a riparian fence around Newcomb Creek), stock trails, and small water developments if the need becomes apparent.		
4. Short-term riparian monitoring by Hydro crew will include: bank alteration and sedge height.	Annually first 3 years of implementation; every other year thereafter.	**Commitment Met** 7/20/2010 9/30/2101 7/27/2011 9/28/2011 7/10/2012 10/03/2012 9/10/2013 9/23/2014 9/29/2015 9/28/2016 7/10/2019
5. Long-term monitoring by Hydro crew to include: green-line, bank stability, PFC & bankfull width and woody age structures	Evaluate year 1, 4, 7 and 10	**Commitment Met** 7/20/2010 7/6/2011 9/10/2013 9/23/201 9/25/2019
6. Range crew will reread 2 existing permanent cover/frequency transects on Newcomb Creek.	Re-take photo points every 5 years. Reread cover & frequency transects every 10 yrs	
7. If Range's photo point monitoring shows and uncertain or declining trend for a riparian area, add additional long-term riparian monitoring (by Hydro crew) including stream channel cross sections and green-line transects.	Re-take photo points every 5 years. Reread cover & frequency transects every 10 years	
8. Long-term upland monitoring by Range crew will include rereading 2 existing permanent cover/frequency transects on Newcomb Creek	Re-take photo points every year for the first 3 years after implementation, every 5 years after. Reread cover/frequency and greenline transects at least every 10 years.	
9. Range or Hydro crew will set up photo points on Sunday Creek to determine effectiveness of electric fence exclosure.	Retake Photo points every year for first 3 years after implementation; every 5 years thereafter.	

IV. Specialist and Line Officer Concurrence that the Dudley Creek Allotment Adaptive Management Strategy (2020) was Adequately Analyzed by the Rangeland Management in the Whiskey Creek Analysis Area, (2014).

Below documents the concurrence with specialists and the District Ranger that the effects of the proposed adaptive management actions were adequately analyzed by the Rangeland Management in the Whiskey Creek Analysis Area Environmental Assessment (2014).

Specialists Concur the 2012 Whiskey Creek EA covers the proposed action items outlined in the Dudley CAllotment Adaptive Management Strategy:

EA Resource	Additional Notes	Specialist Signature, Date, Name and Title
Rangeland and Forest Vegetation		Erik Taylor, Rangeland Management Specialist
Watershed, Hydrology, and Water Quality		Tyler Carleton, Hydrologist
Soils		Ryan Adams, Soil Scientist
Cultural Resources		Jason Strahl, Archaeologist
Aquatics: Fisheries and Amphibians		Rick Henderson, Fishery Biologist
Wildlife		Missy Dressen, Wildlife Biologist
Rare Plants		Marti Aitken, Botonist

District Ranger approves the King Solomon Allotment Adaptive Management Strategy

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Tara Umphries, District Ranger Hahns-Peak Rabbit Ears District Date