West Fork Black's Fork
Wilderness Values Degraded

Watershed Conditions

Uinta Wilderness, Utah

West Fork Black's Fork
East Fork Black's Fork
Lake Fork
Middle Fork Beaver Creek
Burnt Fork

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Report

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Middle Fork Beaver Creek
Wilderness Values Preserved

Introduction

Since 1999, several visits have been made to the West Fork Black's Fork and other watersheds in the Uintas. The purpose of these visits was to document conditions in order to compare the grazed watersheds, West Fork Black's Fork, East Fork Black's Fork and Lake Fork with ungrazed watersheds, Middle Fork Beaver Creek and Burnt Fork. This report is an update of our previous report issued on July 8, 2002.

During August and September, 2000 the Middle Fork Beaver Creek watershed was surveyed for ground cover and residual vegetation. During September 2001, the West Fork Blacks Fork watershed was surveyed for ground cover and residual vegetation. In September, 2002, the East Fork Black's Fork and Lake Fork watersheds were surveyed for ground cover and residual vegetation. During September 2006, sediment core samples were taken from potential Colorado cutthroat trout spawning habitats in the West Fork Black's Fork, East Fork Black's Fork, Middle Fork Beaver Creek and Burnt Fork. During these and other visits, photo points were established and observed conditions documented.

Ground cover surveys were conducted in key areas consisting of sensitive upland portions of high elevation meadows. In these key areas, plot locations were determined using a Garmin GPS 12 handheld global positioning system. Ground cover data were collected using the Beltline Transect method employed by the U.S. Forest Service. This method is described in FSM 2209.21-93-1 (R-4 Amendment) and employs use of a nested frequency plot frame to collect 8 ground cover observations at 20 locations along five radial transects from the plot center for a total of 800 observations for each key area. Plants were clipped at three locations on alternating transects for drying and weighing to determine plant standing crop. Plot clippings were taken from 2' x 2' areas at the end of the belt transects. Plant samples were air dried and weighed. Ocular estimates were made of ground cover conditions at other upland locations.

Sediment core samples were collected in the West Fork Black's Fork, East Fork Black's Fork, Middle Fork Beaver Creek and Burnt Fork during early September, 2006. The McNeil sediment core sampling method was used to collect samples in potential spawning substrates (gravel dominated) in each of these streams. Three samples were taken at each location, processed through sieves to separate the sample into each of nine size fractions and then the volume displacement of each size fraction was measured. The size fractions <6.35 mm and <0.85 mm were compared with established criteria.

With the exception of the sediment core sampling data which was collected in September 2006, the data and photographs used in this report were provided to the Forest Service in March, 2006 for inclusion in the Administrative Record for the West Fork Black's Fork.

Results

Maps of survey locations, topography, soils, geology, vegetation and capability analysis are provided in **Appendix 1**. Photographs and narrative descriptions of survey locations are provided in **Appendix 2**. Tabular data including lat/long and observations for each location surveyed are provided in **Appendix 3**.

Ground Cover and Residual Vegetation: The results of the ground cover surveys are provided in Table 1. Abbreviations are used for the locations such that WF = West Fork Black's Fork, EF = East Fork Black's Fork, MF = Middle Fork Beaver Creek, BF = Burnt Fork, LF = Lake Fork. Transect data provide all ground cover factors (bare, litter, rock, crust, grass, forb), while ocular survey locations provide only the bare ground percent.

Table 1. Ground Cover Percent for Surveyed Locations.

Location	Rock	Crust	Litter	Grass and grasslikes	Forbs	Bare Ground
WF1						50
WF2						50
WF3						50
WF4						60
WF5						60
WF6						50
WF7						70
WF12	3.5	0.0	3.6	2.1	23.3	67.5
WF14	2.1	1.4	19.1	13.1	23.8	40.5
WF15	15.0	0.9	3.6	3.4	13.6	63.5
WF16	7.3	13.6	20.5	14.1	18.8	25.7
WF17	7.1	1.4	9.4	8.8	25.3	48.1
Averages	7.0	3.4	11.3	8.3	20.9	52.9
BF1						0
MF1	1.1	8.1	10.3	61.3	19.3	0
MF3	8.2	18.5	18.0	35.0	19.9	0.1
MF4	5.8	14.5	17.6	46.9	14.9	0.4
Averages	5.0	13.7	15.3	47.7	18.0	0.2
EF1						45
EF2						75
EF3						95
EF8						60
EF9						50
EF11						40
EF13						65
EF14	14.0	17.1	7.0	8.9	13.0	40
EF15	16.9	1.8	17.5	17.9	18.1	27.8
EF23	10.5	1.6	25.6	18.1	15.1	29
Averages	13.8	6.8	16.7	15.0	15.4	52.7
LF1						70
LF2	6.6	0.8	27.8	14.0	13.9	42
LF3						55
Average						55.7

Residual vegetation amounts at transect locations are provided in Table 2.

Table 2. Residual Vegetation

Location	Residual Vegetation lb/acre
WF12	176.5
WF14	266.1
WF15	127.9
WF16	151.0 (rested)
WF17	133.0
Average	170.9
MF1	630.1
MF3	355.8
MF4	609.3
Average	531.7
EF14	90.8
EF15	309.9
EF23	193.1
Average	197.9
LF2	91.3

The data and photographs show major differences in upland ground cover characteristics and residual vegetation between high elevation meadows in the grazed watersheds (East Fork Black's Fork, West Fork Black's Fork and Lake Fork when compared with the ungrazed Middle Fork Beaver Creek watershed. The Middle Fork Beaver Creek watershed has been closed to livestock grazing for over 20 years. Bare ground for locations surveyed averaged 0.2%, ranging from a low of 0 to a high of 0.4%. Grass cover averaged 47.7% with a range of 35% to 61.3%. Forb cover averaged 18% with a range of 14.9% to 19.9%. Residual vegetation averaged 531.7 lb/acre. See photographs in Appendix 2, pages 30 – 37.

The West Fork Blacks Fork has been grazed by 1250 ewe/lamb pairs of domestic sheep from July 6 to September 15 each year with an additional 1400 ewe/lamb pairs trailing through the allotment in July and September each year[1]. The ground cover data collected from the West Fork Blacks Fork locations reflect this annual heavy use. Bare ground for the locations surveyed averaged 52.9%, ranging from a low of 25.7% to a high of 70%. Grass cover averaged 8.3% with a range of 2.1% to 14.1%. Forb cover averaged 20.9% with a range of 13.6% to 25.3%. It should be noted that Unit 1 forbs were dominated by dandelion and yarrow. Residual vegetation in these upland locations at the end of the grazing season in the West Fork Blacks Fork averaged 170.9 pounds per acre, consisting mostly of species non-forage species not generally preferred by sheep. See photographs in Appendix 2, pages 2 – 23.

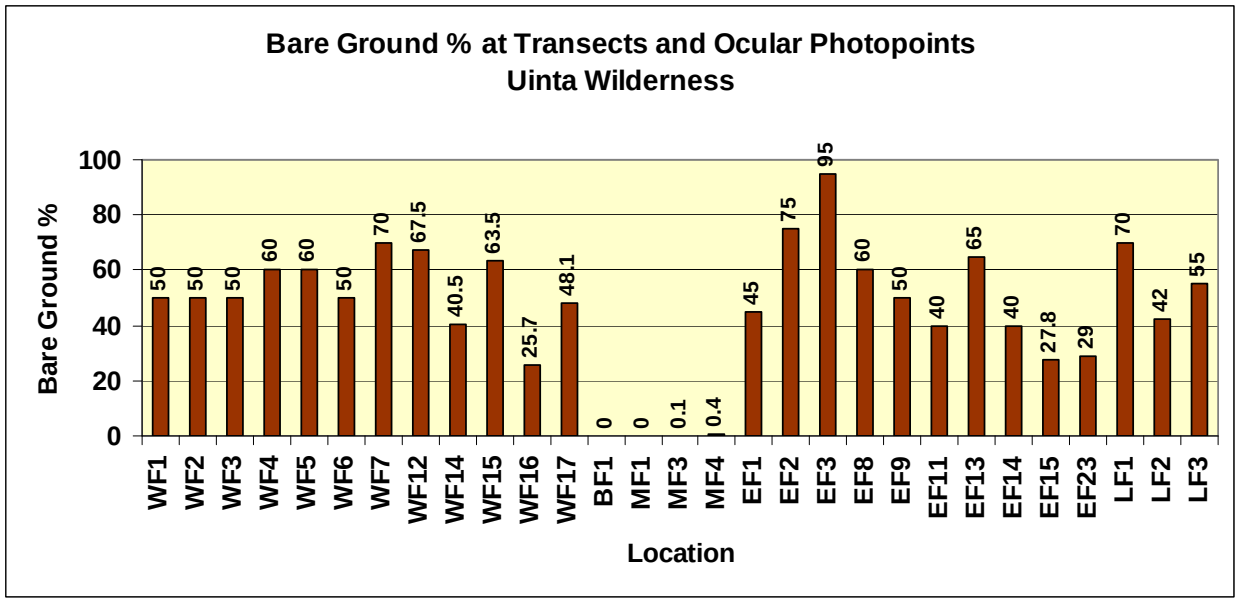
[1] USDA. 1999. Predecisional Environmental Assessment for West Fork Blacks Fork Allotment Management Plan. Wasatch-Cache National Forest.

According to the Rangeland Health EIS, the East Fork Black's Fork is grazed by 1350 ewe/lamb pairs[2]. The Rangeland Health EIS did not present any information on trailing of additional sheep or seasons. The ground cover data collected from East Fork Black's Fork locations also reflect heavy use by sheep. Bare ground for the locations surveyed averaged 52.7%, ranging from a low of 27.8% to a high of 95%. Grass cover averaged 15.0% with a range of 8.9% to 18.1%. Forb cover averaged 15.4% with a range of 13.0% to 18.1%. Residual vegetation in upland meadows at the end of the grazing season in the East Fork Black's Fork averaged 197.9 pounds per acre. See photographs in Appendix 2, pages 39 – 58.

Ground cover was surveyed at three locations in the Lake Fork watershed in the Ashley National Forest because this area is grazed by sheep trailed through the West Fork Black's Fork. No information is available at this writing as to numbers of sheep or seasons. Bare ground averaged 55.7%. At the transect location, grass cover was 14.0% and forb cover was 13.9%. Residual vegetation at the end of the grazing season was 91.3 lb/acre. See photographs in Appendix 2, pages 60 - 63.

Bare ground data are illustrated in Figure 1.

Figure 1. Bare Ground Percent in Uinta Watersheds.



Determination of Capable Acres: In 1964, the R-4 Range Analysis Handbook was published, reflecting the passage of the Multiple Use and Sustained Yield Act[3]. That handbook prescribed a systematic determination of capability (then called suitability) for grazing allotments and detailed methodologies for assessing capability, determining range condition, setting stocking rates and measuring use by livestock and wildlife. Capability criteria included consideration of slope, distance to water, soil erosion

[2] USDA. 1996. FEIS Rangeland Health and Record of Decision. Wasatch-Cache National Forest.
[3] Iverson, Floyd. 1964. R-4 Range Analysis Handbook.

hazard, ground cover and forage production. In 1998, Region 4 published guidance for Forest Plan revisions[4]. That guidance included these criteria:

1. Areas with less than 30% slopes (for cattle) and less than 45% slopes (for sheep).
2. Areas producing more than or having the potential to produce an average of 200 pounds of forage per acre on an air dry basis over the planning period.
3. Areas with naturally resilient soils (not unstable or highly erodible soils).
4. Areas where ground cover is sufficient to protect soil from erosion – the minimum percentage cover will be 60% unless local data is available for use in setting more specific ground cover requirements.
5. Areas accessible to livestock (without such factors as dense timber, rock or other physical barriers).
6. Areas within one mile of water or where the ability to provide water exists.

The FEIS[5] for the Wasatch-Cache National Forest Revised Forest Plan completed capability analysis using the following criteria.

1. Capable of producing at leas 200 pounds per acre on an annual basis. Spruce, fir, pine, Douglas fir, oak and barren areas were identified as not being capable.
2. Having a dominant land slope gradient of less than 45% for sheep.
3. Within one mile of surface water.

The distance to water criteria, ground cover minimum and soil erosion hazard prescribed in the 1964 R4 Handbook and the Region 4 Guidance published in 1998 were not used in the Forest Plan capability analysis.

We obtained the Forest Service GIS layers for the Wasatch-Cache National Forest including the data for the watersheds described in this report. A capability analysis was performed based on the three Forest Plan criteria summarized above. The vegetation maps in Appendix 1 show the vegetation types in the West Fork Black's Fork and other watersheds surveyed in this report. The overall summary of vegetation types in the WFBF are provided in Table 3.

Inspection of Table 3 provides insight into the capability of the West Fork Black's Fork watershed for grazing. Most lands fall into the non-forage producing categories of barren (44%) and conifer. The criteria were applied in a GIS analysis, producing the result shown in Table 4. See photographs in Appendix 2 for illustrations of the barren lands in the WFBF and EFBF (pp 9, 10, 11, 18, 20, 52, 53, 60, 61).

Using the WCNF's own criteria, only 854 of 14,787 acres or 5.8% of the area of the West Fork Black's Fork allotment were determined as capable. See the Capability Map in Appendix 1, which illustrates the patchy and unconnected nature of the small isolated capable lands. Remember that these capable acres do not reflect soil erosion hazard or ground cover condition as should be the case.

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[4] USDA. 1998. Rangeland Capability and Suitability Determinations for Forest Plan Revisions R-4 Revised 2/20/98.

[5] USDA. 2003. Final Environmental Impact Statement Wasatch Cache National Forest. Intermountain Region Forest Service, Wasatch Cache National Forest.

Soil map unit descriptions were obtained from the Wasatch Cache National Forest[6]. Table 5 summarizes the soil map units for the West Fork Black's Fork, showing that 75.8% of the land that has been classified as to erosion hazard is in the high to very high soil erosion hazard class or 56.7% of the entire allotment area. These are shown in Appendix 1 Soil Maps.

Table 3. Summary of Vegetation Types for the West Fork Black's Fork.

	Pasture					
Vegetation Type	**001**	**002**	**003**	**04a**	**04b**	***Total***
AC (Aspen conifer)	28.0	0	0	0	0	*28.0*
AL (Alpine)	0.0	1.3	86.4	105.5	13.7	*207.0*
BA (Barren)	20.2	946.8	2,955.8	1,547.4	1,042.3	*6,512.4*
LP (Lodgepole)	2.1	0	0	0	0	*2.1*
MC2 (Mixed conifer 2)	2,208.0	1,108.4	0	0	7.6	*3,324.0*
SF (Spruce fir)	232.4	1,251.9	1,659.8	238.7	617.3	*4,000.0*
SG (Sagebrush grass)	79.2	0.0	0.0	0.0	0.0	*79.2*
WA (Water)	0.0	0.0	0.0	14.3	0.0	*14.3*
WM (Wet meadow)	179.8	183.7	131.7	67.1	57.6	*619.8*
Total	*2,749.7*	*3,492.0*	*4,833.7*	*1,972.9*	*1,738.6*	***14,786.8***

Table 4. Capable Acres for the West Fork Black's Fork

Vegetation Type	**Pasture 1**	**Pasture 2**	**Pasture 3**	**Pasture 4a**	**Pasture 4b**	***Total Capable Acres***
AC (Aspen conifer)	28	0	0	0	0	*28*
AL (Alpine)	0	0	68	104	14	*186*
SF (Spruce fir)	0	0	1	0	0	*1*
SG (Sagebrush grass)	30	0	0	0	0	*30*
WM (Wet meadow)	180	180	128	66	54	*609*
Total Capable Acres	*239*	*181*	*197*	*171*	*67*	***854***

The trailing of sheep over Red Knob Pass entails herding them over steep, non-capable slopes that are classed as very high erosion hazard (Soil Map Unit 502, for example). See Appendix 1 Soil maps. The geomorphic maps and descriptions also show these as extremely steep erosional slopes[7]. See Appendix 1 Geomorphology maps. See Appendix 2 photos (pp 60 – 62).

Erosion: The preceding capability analysis shows that most of the land in the West Fork Black's Fork allotment is at elevated risk of erosion. The same is true of the East Fork Black's Fork which is grazed by sheep belonging to a WFBF permittee. The Soil Maps and Geomorphology Maps in Appendix 2 and their descriptions clearly depict

[6] Wasatch-Cache National Forest. 2006. Map Unit Descriptions Soil Survey Area UT 647 North Slope Uinta Mountains.
[7] Munroe, Jeffrey S. 2000. Legend for North Slope Geomorphic Mapping

this risk. Mont E. Lewis, in his 1970 report[8] on the Uinta Mountains, provided numerous examples of grazing-induced erosion in these sensitive areas.

Table 5. Soil Map Units and Erosion Hazard for the WFBF.

	Pasture						
LTA Code	**001**	**002**	**003**	**04a**	**04b**	***Total***	**Erosion Hazard**
102	60.0	0	0	0	0	*60.0*	slight
104	285.0	240.2	142.0	0	0	*667.1*	slight
208	88.6	0.0	0.0	0	0	*88.6*	slight
221	69.6	0.0	0	0	0	*69.6*	slight
222	772.7	503.5	380.3	0	3.1	*1,659.7*	slight
223	320.7	516.2	259.1	0	0.0	*1,096.0*	high
225	890.6	639.1	832.3	4.8	2.8	*2,369.5*	very high
484	63.8	0.0	0.0	0.0	0.0	*63.8*	very high
501	0.0	165.1	3.8	0.0	0.0	*168.8*	moderate to high
502	146.0	967.0	2,223.9	410.7	491.4	*4,239.0*	very high
503	0.0	0.0	362.1	221.3	240.3	*823.7*	no description
520	52.7	0.0	264.8	152.1	0.0	*469.6*	very high
525	0.0	0.0	307.4	832.8	383.4	*1,523.6*	no description
531	0.0	460.9	53.1	276.8	555.6	*1,346.3*	no description
Unknown	0.0	0.0	5.0	74.5	62.0	141.5	
Total	*2,749.7*	*3,492.0*	*4,833.7*	*1,972.9*	*1,738.6*	***14,786.8***	

Photographs in Appendix 2 (pp 7, 8, 12, 14, 20, 40, 42, 43, 45, 47, 48, 54 as well as others) show examples of reduced ground cover, accelerated erosion and soil pedestaling in the WFBF, while photos (App 2, pp 35, 37) show healing upland erosion features in the Middle Fork Beaver Creek after over two decades of rest from sheep grazing.

Photographs in Appendix 2 (pp 3, 4, 9, 22 – 27, 30, 32, 43, 43, 45, 51 - 54) show denuded and destabilized stream banks from sheep trampling and grazing, loss of undercut banks and in-stream habitat and scouring of stream banks from high flows induced from lack of ground cover and stabilizing vegetation in upper basins. The Forest Service has attributed the stream bank damage in the West Fork Black's Fork to century old tie-hacking, or avalanche debris. Yet, in the East Fork Black's Fork, the same scouring features occur in upper elevation meadows above where any tie hacking or avalanche debris occurred. The lack of these erosional features in the ungrazed watersheds of Burnt Fork and Middle Fork Beaver Creek also refute these claims that grazing is not the cause of these riparian problems, but instead, it is other activities.

Lakes in the West Fork Black's Fork and East Fork Black's Fork are being rapidly filled with sediment due to accelerated erosion of adjacent uplands from sheep grazing and trampling. Photos in Appendix 2 (pp 36 and 42) illustrate the heavy sediment load into Lake EJOD from grazing and trampling of surrounding barren lands and a

[8] Lewis, Mont E. 1970. Alpine Rangelands of the Uinta Mountains Ashley and Wasatch National Forests Region 4. Mont E. Lewis, Range Conservationist, U.S. Forest Service.

small lake in the EFBF being rapidly filled by sediment from gullies and denuded slopes grazed by sheep. Mont E. Lewis in his report provided the example of a lake that had been nearly "cut in two" by the delta of an intermittent stream. As Lewis stated, "The drainage originates on the heavily grazed Kabell Ridge."

Spawning Habitat for Colorado River Cutthroat Trout: Sample results from sediment core samples collected in September, 2006 are provided in Table 6. Photographs of the sample locations are provided in Appendix 2 (pp 24, 28, 38, 59).

Table 6. Sediment Fines and Predicted Survival of Salmonids to Emergence

Sample Description	(<6.35 mm) Fines %	(<0.85 mm) Fines %	Survival Egg to Emergence %
Burnt Fork A	31.3	10.6	
Burnt Fork B	26.0	11.1	
Burnt Fork C	19.7	7.0	
Average	**25.7**	**9.5**	**44.0**
East Fork Black's Fork A	35.5	10.4	
East Fork Black's Fork B	31.4	12.0	
East Fork Black's Fork C	21.3	8.6	
Average	**29.4**	**10.3**	**34.8**
Middle Fork Beaver Creek A	27.0	10.7	
Middle Fork Beaver Creek B	15.9	9.5	
Middle Fork Beaver Creek C	35.8	11.5	
Average	**26.2**	**10.6**	**42.7**
West Fork Black's Fork A	37.0	14.9	
West Fork Black's Fork B	40.0	16.2	
West Fork Black's Fork C	33.8	13.3	
Average	**36.9**	**14.8**	**19.8**

Salmonid species such as Colorado River cutthroat trout require clean, sediment-free substrate for successful spawning[9]. Two criteria based on sediment size fractions are used for evaluating spawning habitat condition. The first of these is the percent of subsurface sediment <0.85 mm, which is considered "intrusive fines" which fill the interstices between gravel particles[10]. The second is the percent of subsurface sediment <6.35 mm which is considered "trapping fines", which impact the ability of fry to escape the substrate material in which the eggs were buried[11]. Idaho DEQ has set thresholds for these criteria of 10% <0.85mm and 27% <6.35 mm[12]. The Bridger Teton National Forest has determined that to be in compliance with the Forest Plan water quality standard and Wyoming DEQ, fine sediments <6.4 mm must be less than 20%.

[9] Chapman, D. W. 1988. Critical Review of Variables Used to Define Effects of Fines in Redds of Large Salmonids. Trans. Am. Fish. Soc. 117:1-21.
[10] McNeil, W. J. and W. H. Ahnell. 1964. Success of pink salmon spawning relative to size of spawning bed materials. U.S. fish and Wildlife Service Spec. Sci. Rep. Fish. No. 469:15.
[11] Kondolf, G. M. 2000. Assessing Salmonid Spawning Gravel Quality. Trans. Am. Fish. Soc. 129:262-281.
[12] Idaho DEQ. 2003. Guide to Selection of Sediment Targets for Use in Idaho TMDLs.

Inspection of the sample results above show that the ungrazed watersheds, Burnt Fork and Middle Fork Beaver Creek meet the 27% criteria for sediment fines <6.35 mm. The grazed watersheds, West Fork Black's Fork and East Fork Black's Fork exceed this criterion. Middle Fork Beaver Creek, Burnt Fork, East Fork Black's Fork either meet or very slightly exceed the criterion for fines <0.85mm, while the West Fork Black's Fork was clearly above the criterion.

These data provide more meaning when the percent survival of trout to emergence is calculated. Irving and Bjorn of Idaho DEQ developed an empirical relationship based on measurements of emergence and sediment content[13]. The equation follows:

$Y = 101.7/(1 + e(-2.2+0.1x))$ where Y = survival and x = sediment fines <6.35mm

This equation was used to calculate the survival rates shown in Table 6. The West Fork Black's Fork had the lowest survival from egg to emergence, at 19.8%. The East Fork Black's Fork was next at 34.8% with the ungrazed watersheds of Middle Fork Beaver Creek at 42.7% and Burnt Fork at 44.0%.

Discussion

The differences in ground cover between the ungrazed Middle Fork Beaver Creek and the grazed West Fork Black's Fork, East Fork Black's Fork and Lake Fork are stark, with ground cover in the grazed watersheds greatly reduced below potential as demonstrated by data and observations in the ungrazed Middle Fork Beaver Creek. The Rangeland Health EIS and ROD cited earlier show that potential ground cover for alpine grasslands is 97 – 100%. Data provided in the Pre-decisional EA for the West Fork Black's Fork for a key area showed that bare ground percent increased from 5% in 1961 to 39.5% in 1997. The average ground cover across all grazed upland locations surveyed for this study is less than 50%, with grasses and forbs greatly reduced in cover and production in the grazed watersheds in comparison to the ungrazed watersheds.

Plot clippings in the grazed and ungrazed watersheds were compared showing residual amounts in . The vegetation production in the Middle Fork Beaver Creek averaged 531.7 pounds/acre and ranged from 355.8 to 630.1 pounds per acre. These figures agree with Holechek et al (1998), which gives a range of 445 to 623 pounds/acre[14]. End of season residual vegetation in the West Fork Blacks Fork averaged 170.9 pounds/acre with a range of 127.9 to 266.1 pounds per acre. Comparing means, the residual vegetation in the West Fork Blacks Fork watershed is 170.9/531.7 or 32% of that in the Middle Fork Beaver Creek. Plot WF16 from Unit 4B, which was rested in 2001, was 151 pounds, indicating that current production is greatly reduced from potential.

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[13] Irving, D.B., and T.C. Bjornn. 1984. Effects of Substrate Size Composition on Survival of Kokanee Salmon and Cutthroat and Rainbow Trout Embryos. Idaho Cooperative Fishery Research Unit, University of Idaho, Moscow. Technical Report 84-6.

[14] Holechek, Jerry L., Rex D. Piper and Carlton H. Herbel. 1998. Range Management Principles and Practices. Prentice-Hall, New Jersey. 542p.

Capability analysis using the criteria and data from the Wasatch Cache National Forest showed that only 5.8% of the WFBF allotment is capable for sheep. This analysis did not include consideration of soil erosion, ground cover and distance to water, which the Intermountain Region has identified since 1964 as critical components of such an analysis. If the soil erosion hazard and ground cover criteria of 60% minimum were considered, there would be no capable acres in the West Fork Black's Fork. Recall that ground cover at the 12 locations we surveyed in the WFBF averages 47.1%.

Consider what Mont E. Lewis, Range Conservationist, reported regarding grazing capability in the Uinta Mountains over 25 years ago. In his survey of the Uinta Mountains, Lewis pointed out the following factors that must be considered in determining whether grazing is suitable or not. *"Soils with a high or moderately high erosion index are very susceptible to erosion. If a protective ground cover of vegetation and litter cannot be maintained under grazing use, the area should be classed as unsuitable and closed to livestock use. Soils on shale areas of the Uinta alpine are in this classification. … Slopes over 20% should be heavily sodded before they are considered as suitable for grazing. …In the better developed plant communities, observations show grazing use to be a most important factor contributing to reduced ground cover and sod breaking. Sheep trails cutting through the sod were obvious in the heavily used portions of the range. Site analysis and grazing impact studies indicate that serious erosion problems develop when about 30% of the soil becomes bare."* Lewis also indicated that wet meadows are not usually preferred by sheep and that *"Unsuitable areas on steeper slopes and on shale outcrops must be given full protection from grazing livestock, even though intermingled areas of suitable range remain ungrazed."* Clearly, the Forest Service has ignored this long standing set of recommendations specific to the Uinta Mountains and continued to allow sheep grazing in spite of the clear unsuitability and the resulting damage.

The Universal Soil Loss Equation (Ruhe, 1975) predicts that for a given slope and soil, increased runoff and erosion are directly related to reduced ground cover[15]. Dr. Paul Packer, retired research scientist for the U.S. Forest Service provided results of watershed research relating watershed characteristics to runoff and erosion in northern Utah forests[16]. This manuscript was provided to the Evanston Ranger District in a previous comment letter. It shows that when ground cover falls below potential and slope increases, overland flow increases rapidly, accompanied by soil erosion. At slopes of 35%, soil erosion is seven times greater than on slopes of 5%. The paper also indicates that trampling of more than 10% of the soil surface at ground cover of 70 – 75% increases soil erosion beyond limits affording protection.

Other research validates the relationship between livestock grazing, reduced ground cover and increased runoff and soil erosion. A 20 year study by the U. S. Geological Survey in Colorado evaluated the difference in sediment yield and runoff in watersheds grazed by livestock and afterwards when grazing was halted. Complete grazing exclusion resulted in a reduction of 40% of runoff over the 20-year period, and

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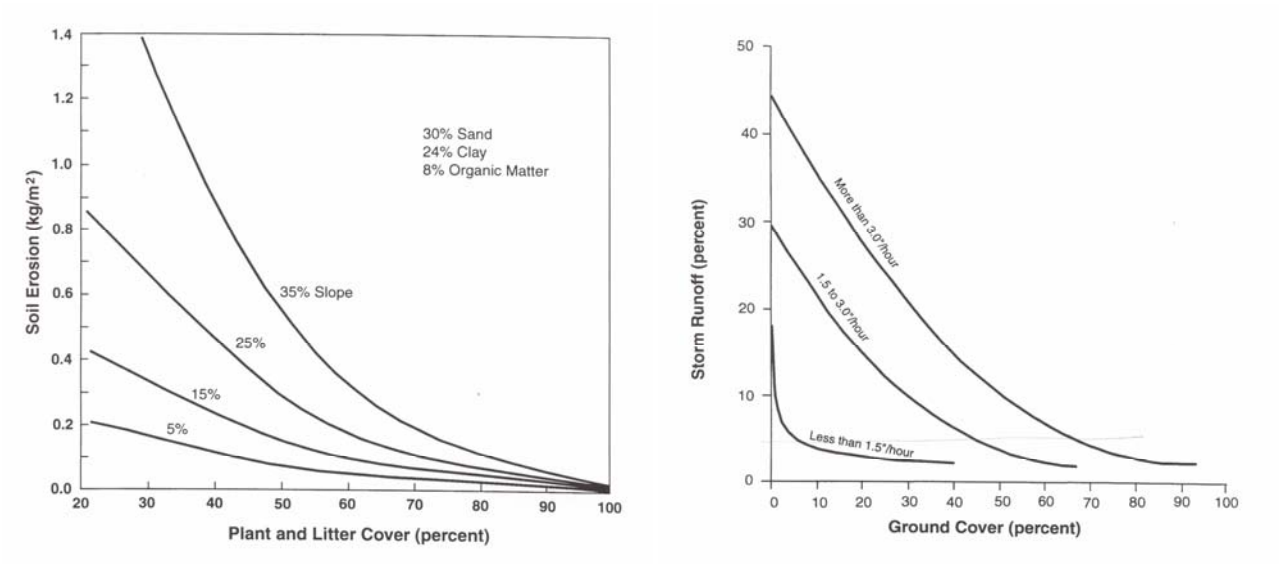
[15] Ruhe, Robert V. 1975. Geomorphology: Geomorphic Processes and Surficial Geology. Houghton Mifflin Co. Boston. 246p.
[16] Packer, Paul E. undated. Requirements for Watershed Protection on Western Mountain Lands. Research Forester, Retired, U.S. Forest Service.

sediment yield decreased by 63 percent[17]. Peak storm runoff from a 120 hectare basin in Arizona was estimated to be 2 to 3 times greater when heavily grazed than when lightly grazed[18]. In a case study recently completed for the Bear River Range in Idaho, we have found that at the 60% ground cover capability criteria allowed by the Intermountain Region, erosion is 15 times greater than at potential ground cover conditions[19].



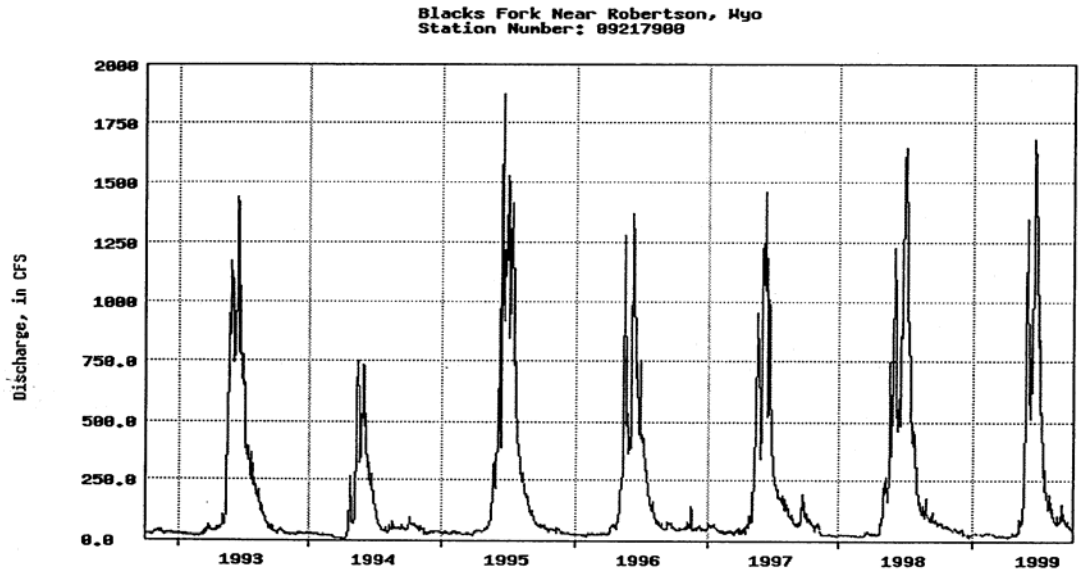
Charts from Packer Manuscript

When the low percent ground cover, highly erodible soils, steep slopes and lack of residual vegetation at the end of the grazing season in the WFBF are taken into account, it is clear that severe erosive forces are at work here. The stream sediment samples taken in the ungrazed and grazed watersheds clearly show these differences in erosion. The loss of vegetative cover and grazing until vegetation is dormant, without allowing time for regrowth, leaves the watershed with little resistance to overland flow during spring snowmelt or summer storms. Observations in both the WFBF and Middle Fork Beaver Creek watersheds during August and September make it clear that upland vegetation is going dormant by mid-August. To continue grazing these areas until mid-September is clearly not in accord with sound range management principles and does not allow protection of the watershed during snowmelt. While camped on a tributary of the West Fork Blacks Fork in 1999, a flash flood resulted from a rainfall of less than 0.1". Figure 2 is a hydrograph of the Blacks Fork downloaded from the U.S. Geological Survey website showing extremes of peak

[17] Lusby, Gregg C. 1979. Effects of Grazing on Runoff and Sediment Yield from Desert Rangeland at Badger Wash in Western Colorado, 1953 – 1973. Geological Survey Water Supply Paper 1532-1.
[18] Trimble, S.W. and A.C. Mendel. 1995. The cow as a geomorphic agent, a critical review. Geomorphology 13:233-253.
[19] Brawer, Judi, John Carter, Amy Haak and Matt Mayfield. 2006. Spatial Analysis of Forest Service Capability Criteria for Watershed Management and Soil Conservation. Presentation at the International Soil and Water Conservation Conference, Keystone, Colorado.

flows during snowmelt that illustrate the lack of the watershed's ability to retain water.

Figure 2. Black's Fork Hydrograph



The Forest Service blames gophers and snowbeds for reduced ground cover, blames tie hacking and avalanche debris for stream scouring in the West Fork Black's Fork. The ground cover data and photographs we have provided across wide areas of the grazed and ungrazed drainages in the Uintas clearly illustrate that gophers and snowbeds are not at fault for reduced ground cover. The presence of scoured banks in the East Fork Black's Fork upstream of any tie hacking activities or avalanche debris blockages clearly illustrate these are not the cause of bank scouring in the WFBF as do the recovering streams in the Middle Fork Beaver Creek and Burnt Fork. The extreme flows induced by lack of ground cover in the upper watersheds are the cause.

The Forest Service should acknowledge these facts, that it is sheep grazing on sensitive, highly erodible soils and steep slopes that have reduced ground cover, reduced plant community productivity, increased erosion and runoff and flood forces, leading to the bank scouring and impairment of cutthroat trout spawning habitat. If what the Forest Service claims were true, then they would acknowledge that the gophers, snowbeds, tie-hacking and avalanche blockages are adding to the risk of grazing to the watershed beyond any acceptable level and they would close the West Fork Black's Fork to grazing.

The photographs provided in Appendix 2 show the differences between similar areas in the currently grazed West Fork Blacks Fork, East Fork Black's Fork, Lake Fork and the long-term ungrazed Middle Fork Beaver Creek. These photos illustrate what confronts wilderness visitors as they travel along the trails, meadows, streams and forests in the West Fork Blacks Fork. They are confronted with wet meadows where domestic sheep and herder's horses have trampled the wet meadows into mudholes; upland stretches where a wide strip has been laid bare, the trail widened and adjacent

areas denuded of vegetation; stream crossings where sheep and herder's horses have trampled banks out of existence over an area much wider than the trail itself; forest understory turned to dust and lacking herbaceous vegetation; meadows stripped of their wildflowers and grasses; bare and eroding uplands and slopes; ground littered with sheep and horse manure, where one must move sheep manure to find a place big enough to place a backpacking tent. On top of this, there is the constant smell of sheep manure instead of clean, cool air and flowers. Couple this with the constant bleating of sheep instead of the singing of birds and chattering of squirrels and you have the visual, olfactory and auditory impressions of the West Fork Blacks Fork – **A Wilderness Area That is Not!**