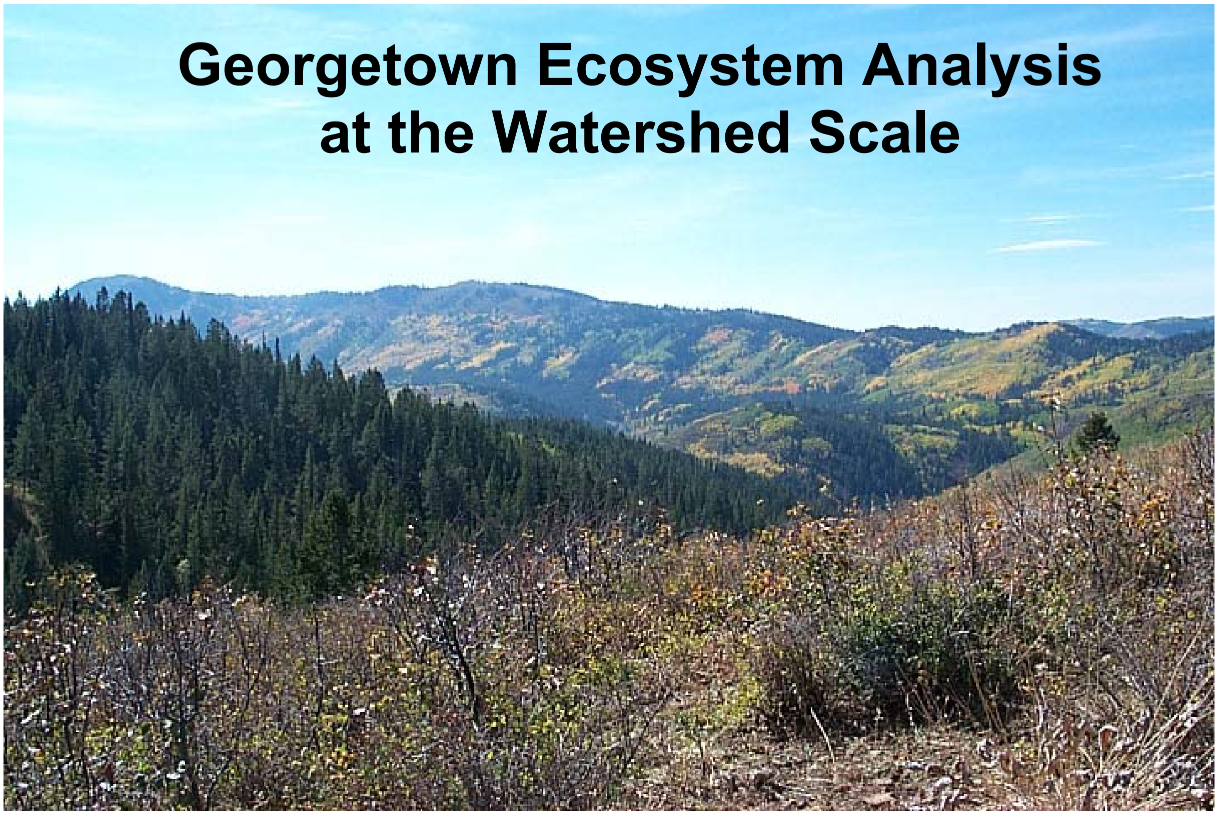

United States
Department of
Agriculture

Forest Service
Caribou – Targhee
National Forest

May 2003

Georgetown

Watershed Analysis

May 2003

Location: Bear Lake & Caribou Counties, Idaho
Lead agency: USDA Forest Service
Caribou - Targhee National Forest

Responsible official: Dennis Duehren, District Ranger
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A watershed analysis is a living document and should edited and added to as information becomes available and as new issues arise. Below is a table that outlines the evolution of this document:

Edition	Comments
	This analysis was started the summer of 2002, analysis began in earnest fall 2002. The majority of the analysis was completed by January 2003.
March 2003	This document had all been compiled but final edits had not been completed.
April 2003	Fire Regime and Condition Class assessment was add.
May 2003	Draft document available
Summer 2003	Final edit made.

Watershed Analysis Overview

The purpose of this document is to document the analysis of the Georgetown watershed, conducted by the Montpelier Ranger District. The district followed the six-step process and addressed the seven core topics outlined in the *Federal Guide for Watershed Analysis.* However, in an attempt to make the document user friendly the steps have been broken down and regrouped for the purpose of this document.

The *Federal Guide for Watershed Analysis* outlines a six-step process that must be followed and seven core topics that should be addressed in a watershed analysis.

The six-steps of a watershed analysis are:
1) Characterization of the watershed,
2) Identification of issues and key questions,
3) Description of current conditions,
4) Description of reference conditions,
5) Synthesis and interpretation of information
6) Recommendations.

The seven core topics are:
1) erosion processes,
2) hydrology
3) vegetation
4) stream channel
5) water quality,
6) species and habitats
7) human uses.

The document is composed of five chapters. They are:

1. Characterization
2. Issues and Key Questions
3. Reference, Current and Condition Trend
4. Interpretation and Opportunities
5. The Answers to the Key Question

Chapter one characterizes the human, aquatic, riparian and terrestrial features, conditions, processes, and interactions within the watershed. The chapter has been broken into the following sections.

- Location and Description.
- Hydrologic and Stream Processes.
- Soil Geology and Landtype Associations
- Vegetation.
- Species and Habitats.
- Human Uses.

Chapter two displays the issues and key questions identified in step two. Because the analysis is issue-driven, only the core topics and watershed-specific problems or issues/concerns are addressed in this document. The for some of the issues/questions the IDT (Interdisciplinary Team) has identified indicators that will be used to describe and display the ecological processes and effects at work within the watershed. These indicators will be used through out the remainder of the document to establish how well or poorly the ecological processes are functioning, and determine the conditions under which management activities should and should not take place.

There were five issues identified during the analysis process that the team felt needed to be addressed by this analysis iteration. These issues will serve as section headings and the indicator as subsections headings throughout the remainder of the document. The issues and the indicators are outline below:

1. **Vegetation Dynamics --** The "Caribou Nation Forest and Surrounding Area Sub-Regional Properly Functioning Condition Assessment" and other similar broad scale assessments have indicated that existing vegetation distribution, structure, and composition are outside the historic range of variability across much of the Montpelier Ranger District. Therefore, the vegetation within the Georgetown watershed assessment area is likely also outside historic ranges, which has the potential to adversely affect ecosystem function.

   Issue Indicators:
   - **Non-Forested Vegetation**
     - **Structure**
     - **Regime**
     - **Noxious Weeds**
   - **Forest Vegetation**
     - Structure
     - Density
     - Species Composition
     - Disturbance Regimes

2. **Hydrologic Processes and Water Quality –** Hydrologic processes and water quality within the watershed may be being impacted by past and present activities.

   Issue Indicators:
     - Specific indicators not developed, organized by topic rather than indicators.

3. **Soil Productivity –** Is soil productivity being maintained now in the watershed?

   Issue Indicators:
     - Specific indicators not developed, organized by topic rather than indicators.

4. **Native Fish Habitat –** Bonneville Cutthroat Trout populations, distribution and available habitat has been altered by humans uses, which may have reduced species sustainability.

   Issue Indicators:
   - Population and Presence
   - Barriers
   - Non Native Species

5. **Wildlife Habitat –** The viability of some wildlife species may have been impacted by past and present activities.

   Issue Indicators:
   - Specific indicators not developed, organized by topic rather than indicators.

Chapter three presents information and data on the indicators or topics relevant to the issues and key questions developed in chapter 2. The IDT developed and displays the reference condition, current condition and trend for each indicator.

Chapter four puts the indicators or ecosystem elements into a context that can be understood, displayed and compared. In this chapter the indicators for each issue have been integrated and displayed by reporting units, i.e. cover type, HUC, or by species. This was an attempt to describe the ecological processes at work within the watershed. We believe that reporting resource indicators, in terms of the appropriate reporting unit is the best way to synthesize the data in chapter 3 and characterize it into a "So What?" context.

The definition of synthesis in the *Federal Guide for Watershed Analysis is: "*The integration of separate ecosystem elements to understand the whole system: a primary goal of watershed analysis." Each resource specialist interpreted the trend for the reporting unit i.e. cover type, HUC, or species, and described what caused the trend and what some of the results of the current trend may be. Indicators are all interrelated and a good interpretation cannot be done without discussing all the indicators at once.

Chapter four also outlines opportunities/recommendations for management action(s) that can be taken to reverse or change the current trend. It also outlines data gaps and limitations of the data used.

In Chapter 5 the IDT revisited the issues and key questions and put together short answers to each question. This chapter is intended to serve as an executive summary or quick reference of the findings of the watershed analysis.

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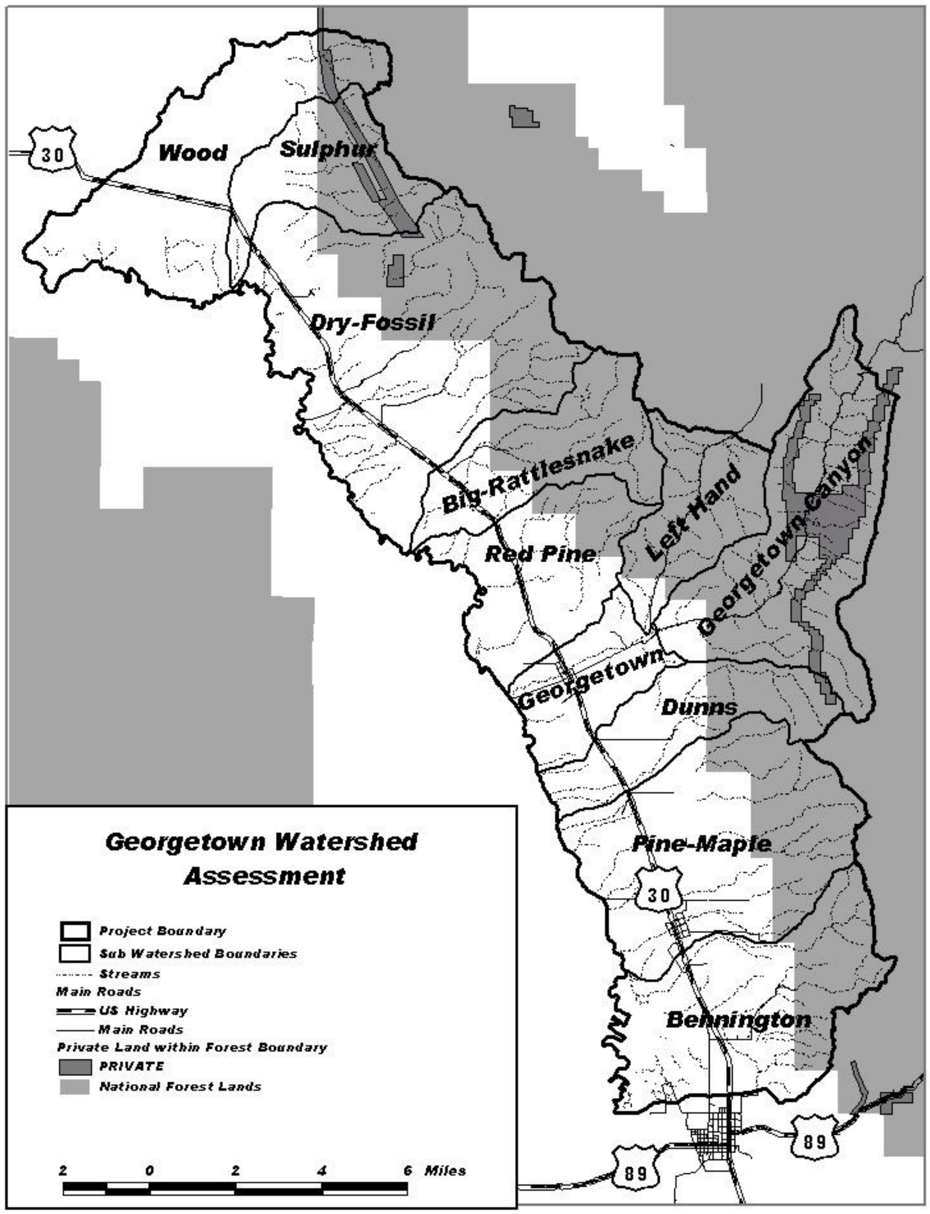
1.0 Characterization of the Watershed

1.1 Location and Description

The Georgetown watershed assessment area is 124,092 acres and is comprised of portions of several USGS 5th level hydrologic unit codes (HUC). For the purpose of this analysis the district combined these HUCs to analyze the entire Montpelier to Soda front-range in one document. Sub watersheds were also delineated generally based on the USGS 6th HUCs, and assigned names to provide smaller reporting units.

Sub Watershed	Acres
Bennington	13,414
Pine-Maple	17,000
Georgetown Canyon	14,929
Dunns	7,018
Georgetown	5,124
Left Hand	6,156
Red Pine	8,771
Big-Rattlesnake	8,133
Dry-Fossil	23,611
Sulphur	6,675
Wood	13,262
Total	**124,092**



The analysis area is composed of drainages that drain from east to west into the Bear River off from the Aspen Range. Meade peak is the highest point in the analysis area at 9,957 feet the lowest point is the Bear River where it leaves the analysis area at approximately 5,680 feet above sea level. The dominant man made geographical features within the analysis area are highway 30, and the three towns located along the highway (Montpelier, Bennington and Georgetown).

1.2 Hydrologic and Stream Processes

For any given location there are four primary components that regulate landscape development or expression. These four components frame the fundamental signature of a landscape and must be described to properly evaluate a watershed's function. These components/characteristics are parent geology, topography, geography, and climate. The long-term interaction of these components creates three dominant landscape features: soils, hydrography, and vegetation (McCammon, 1999). This hydrologic analysis describes the first three components and the landscape features under the heading "Drainage Basin Description" and the fourth component under "Climate". These components and features are then subject to a variety of natural and human-related disturbances that occur at varied frequencies and magnitudes across the landscape. These interactions and the resulting conditions are described in subsequent chapters under the headings "Watershed Conditions" and "Riparian Conditions". Finally, watershed and riparian conditions can affect the balance between the multiple processes acting to form and maintain the physical channel and water quality. These processes and conditions are discussed in subsequent chapters in the sections titled "Stream Conditions" and “Water Quality.”

1.2.1 DRAINAGE BASIN DESCRIPTION

The Soda-Montpelier Front consists of several west aspect drainages located in the “Bear Lake Subbasin.” This is an area of steep to moderately steep (30-60%) mountains that rise from semi-arid sagebrush plains and wide alluvial valleys. Elevations range from 5680 to 9957 feet. The geology is almost exclusively sedimentary with siltstone, mudstone, sandstone, limestone, and shale being the primary types. These parent materials are considered unstable as they experience periodic mass wasting and have moderate to high erosion rates. When subject to erosive forces these rock types break down into silt and fine sand sized particles. This is important since these particles can be readily transported down the steep slopes to the valley bottoms. In general terms the processes of extensive folding, faulting, mass failures, and erosion formed the topography seen today.

Primary drainages include Bennington, Georgetown, Sulphur, and Wood creeks. Smaller streams also exist for short distances before being dewatered for irrigation. These are primarily snowmelt systems where the stream network can be greatly expanded as ephemeral drainages contribute flow during times of peak melt. In general, the channels flow through alternating broad and narrow valley bottoms. The broad valley bottoms are low gradient, alluvial areas having cross sections that can be described as either “flat” or “U” shaped. When well vegetated, these valley bottoms are very effective in filtering sediments produced on the adjacent slopes. The narrow valley bottoms are higher gradient areas having cross sections that can be described as “V” shaped. Sediments produced in these areas are readily transported down slopes to the streams below. Mass wasting is also a concern in these areas.

1.2.2 CLIMATE - PRECIPITATION

Expressions of Climate, such as precipitation, play a vital role in determining the character of the physical landscape. In fact, precipitation is the dominant driver of hillslope and hydrologic processes in mountainous watersheds. While precipitation is the dominant driver, it is difficult to predict exact conditions and the consequences of various events due to the highly stochastic nature of this element.

Data Sources/Data Gaps

- Data was obtained from the "Montpelier Ranger Station, Idaho (106053)" and "Soda Springs Airport, Idaho (108535)" National Weather Service Stations.
- Data was obtained from the Slug Creek Divide Snotel Site.

Assumptions

- The Montpelier and Soda Springs Stations were assumed to represent average conditions in the lower drainages (6171 feet).
- The Slug Creek site was assumed to represent average conditions in the mid-upper portion of the drainages (7225 feet).

Analysis Results

Montpelier and Soda Springs (these stations behave alike so they're discussed together).

While precipitation is distributed evenly throughout the year, its type varies seasonally. It's primarily snow between mid-November and mid-March; a rain-snow mix in early November and between late March and early April; and rain between mid-April and early November. Snow begins accumulating in late November reaching a maximum in February. At this point, the average maximum temperature well exceeds freezing and melt begins. This lower portion of the watershed is generally snow free by mid-April. If snowmelt is delayed, rainfall in May and June can have a strong influence on peak flows since these are the months of maximum precipitation (20% of the annual total). Tables 1 and 2 summarize the climate data for these stations.

Table 1.2-1 ***Climatic Data from Montpelier, ID***

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Ave Max Temp (F)	**31.8**	**35.6**	**43.0**	**55.1**	**65.9**	**75.7**	**85.9**	**84.8**	**74.2**	**62.0**	**44.0**	**33.1**	**57.6**
Ave PCP (in)	**1.27**	**1.18**	**1.24**	**1.25**	**1.50**	**1.48**	**0.87**	**0.96**	**1.32**	**1.14**	**1.28**	**1.25**	**14.74**
Ave Total Snowfall (in)	**13.4**	**11.8**	**9.4**	**3.9**	**0.8**	**0.1**	**0**	**0**	**0.2**	**1.6**	**7.1**	**13.3**	**61.6**
Ave Snow Depth (in)	**10**	**12**	**6**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**5**	**--**

Table 1.2-2 ***Climatic Data from Soda Springs Airport, Idaho***

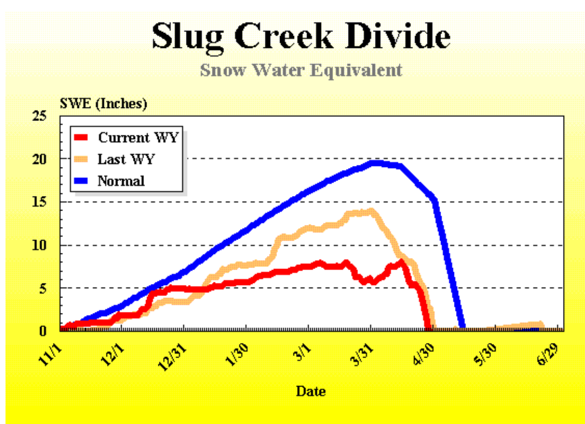
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Ave Max Temp (F)	**27.6**	**31.9**	**40.9**	**53.8**	**62.7**	**74.3**	**83.4**	**81.2**	**71.6**	**58.5**	**40.7**	**30.4**	**54.9**
Ave PCP (in)	**1.01**	**1.11**	**1.25**	**1.26**	**2.17**	**1.52**	**1.43**	**1.58**	**1.41**	**1.43**	**1.41**	**1.11**	**16.71**
Ave Total Snowfall (in)	**11.7**	**9.1**	**8.3**	**2.8**	**0.6**	**0**	**0**	**0**	**0.1**	**0.9**	**5.4**	**9.0**	**47.7**
Ave Snow Depth (in)	**7**	**8**	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**4**	**--**

Slug Creek Divide

Unlike the lower sites, there is a large seasonal influence on total precipitation with 62% occurring between Nov 1-March 31 in the form of snow. Precipitation then tapers off reaching a low from July through September. The maximum snow water accumulation occur generally occurs about April 15th with the area being snow free snow free by mid-May. The period of maximum melt is between May 1st and May 15th. Table 3 summarizes the climate data for the Slug Creek Divide Station.

Table 1.2-3 ***Climatic Data from Slug Creek Divide, ID***

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Ave PCP (in)	**4.5**	**3.5**	**3.2**	**2.5**	**2.4**	**1.7**	**1.1**	**1.1**	**1.1**	**1.9**	**3.9**	**4.3**	**31.2**
SWE – mid month (in)	**9.4**	**14.2**	**17.9**	**19.1**	**0.0 (5/1=15.2)**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**1.4**	**4.9**	**--**

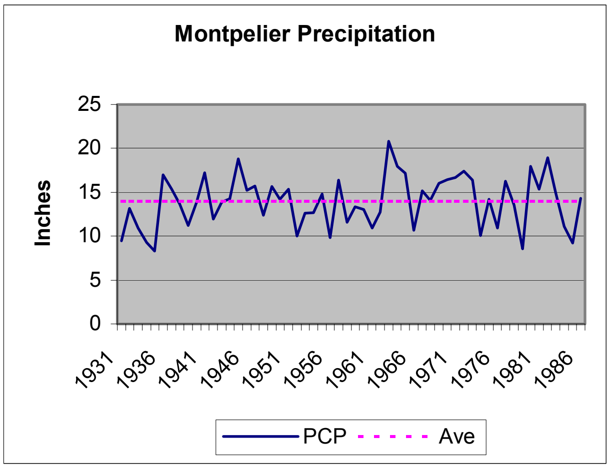


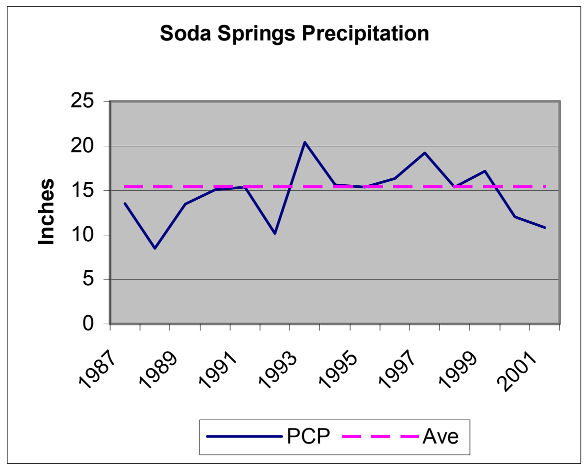
Summary

This entire area is typical of a snowmelt-dominated system. As with many mountainous watersheds, winter precipitation increases with elevation forming deep snow packs. As a result, water is stored until being released by snowmelt. This moisture then provides the primary source of ground, soil, and surface water. It also provides water for high spring flows, as available water is high, soils approach saturation, and evapotranspiration rates (losses) are low. Site-specific conditions increase the risk of moderate sized floods because the period of maximum snowmelt (May 1st – May 15th) corresponds to the period of maximum precipitation in both the upper and lower elevation sites. Finally, elevation does not appear to affect total precipitation during the summer months.

While there are no firm patterns, precipitation appears cyclical with approximately nine years of droughty conditions followed by approximately seven years of wet (figure 2-1). It appears we are coming out of a seven year wet period and are now finishing our second year or drier times.

Figure 2-1: Precipitation Trends (while the sampling location changed, both sites were found to behave in a similar manner).





1.3 Soil Geology and Landtype Associations

Data Sources

- A Hierarchical Stratification of Ecosystems of the Caribou National Forest, USDA Forest Service, Caribou National Forest. 1997.
- Soil Survey of the Caribou National Forest, Idaho 1990 (USDA Forest Service)
- GIS layers in the Caribou-Targee National Forest GIS database

The best summary for descriptions of the geology, soils, topography, geomorphic processes and disturbance factors, both natural and human caused, can be found in "A Hierarchical Stratification of Ecosystems of the Caribou National Forest. A more detailed description of the vegetation type for each soil family comes from "Soil Survey of the Caribou National Forest".

Georgetown Watershed falls into two subsections. The Preuss Ridges and Hills comprise about 63.9% of the land within the Forest Service boundary. This subsection consists of ridges, rolling hills and short narrow valleys. Geology from the Mesozoic era formed sedimentary bedrock, which has been modified by fluvial, gravitational and residual processes. .The Webster Ridges and Valleys, to the east make up 36.1%. This subsection divides the Salt River and Blackfoot River basins. These ridges and valleys were formed from the late Paleozoic to Mesozoic age sedimentary rock. It is very similar, in many ways, with the rest of the watershed area in the Preuss Ridges and Hills Subsection with the main exception of the presence large Phosphoria deposits. The ridges and valleys have also been subjected to gravitational, fluvial and residual process. The climate differs from other subsections, which along with the different soils, creates different vegetation patterns.

Below is a summary of the land types or soil types and associated landforms found within this sub-section.

Preuss Stable Mountainsides/Aspen-Douglas fir-alpine fir Landtype Association (M331Df 33)

This LTA consists of mountainsides, ridges and valley sideslopes on the Preuss Mountain Range. A combination of uplift, block faulting, fluvial and residual geomorphic processes have helped shape these moderately dissected landforms. Other landforms that are included in this LTA are scarp-dip sideslopes and benches.

Parent materials are sedimentary rock such as sandstone, limestone, siltstone, mudstone and dolomite. Metamorphosed sedimentary rocks such as quartzite and shale are also found. These rock formations weather into Mollic Cryoborafts and Argic Cryoborolls, both with a loamy and gravelly loam texture. The geologic formations forming these soils are Wells, Phosphoria and Dinwoody.

M331Df 33 is located on the eastern edge of the watershed, starting at Bennington Creek sub-watershed and ending at Dunn's Creek sub-watershed where the head of Montpelier Creek and Dunn's Creek are separated by a ridge.

Preuss Stable Mountainsides / Aspen-Douglas fir-alpine fir Landtype Association (M331Df 33)

Soil Association (Family)	Soil No.	Landform	Vegetation Type	Sediment Delivery
Harkness-Blaine	317	Mountainside	Lodgepole pine (moderately dense) some subalpine fir, scattered aspen pockets, chokecherry, snowberry	0.015
Povey-Alpon-Ketchum	380	Mountainside	Aspen, lodgepole pine, subalpine fir, Douglas-fir, chokecherry, snowberry, big sagebrush, bitterbrush	0.015
Farlow-Starley-Povey	383	Mountainside	Douglas-fir, mountain mahogany, aspen, big sagebrush, mountain maple snowberry	0.020
Judkins-Cloud Peak-Farlow	551	Valley Sideslope	Aspen, lodgepole pine, subalpine fir, Douglas-fir, snowberry, serviceberry, huckleberry, currant	0.003
Starley-Dranyon-Swede	552	Valley Sideslope	Aspen, Douglas-fir, lodge-pole pine., subalpine fir, snowberry, big sagebrush, ceanothus, serviceberry.	0.010
Cloud Peak-Jughandle-Swede	656	Valley Sideslope	Douglas-fir, lodgepole pine, subalpine fir, snowberry, huckleberry, Mountainlover	0.018
Blaine-Judkins-Swede	870	Mountainside	Subalpine fir, lodgepole pine, spruce, aspen, rose, snowberry, buffaloberry, ceanothus, currant	0.015

Aspen Range Canyons and Foothills/Douglas fir-alpine fire- Mountain Mahogany Sagebrush Landtype Association (M331-Df-34)

This LTA consists of canyons, canyon sides, and foothills on the west slope of the Aspen and Preuss Mountain Ranges. Toeslopes and fans are also present along the lower slopes. Fluvial processes have created a moderately to strongly dissected landscape. This has the highest rates of erosion and slope instability of any other landtype in the watershed.

The Aspen Range occurs along the transition between the Basin and Range and Overthrust physiographic Provinces. Thrust faulting, folding and normal faulting coexists. Overall erosion rates are high. Sandstone, limestone, dolomite and shale compose the parent material for soils. These soils are classified as Typic Cryoborolls, and Mollic Cryoboralfs, both with loamy-skeletal (rock fragments) profiles. Geologic formations are similar to the other landtype Association within the Preuss Ridges and Hills subsection are Wells; Phosphoria, Dinwoody and Twin Creeks Formation. M331-Df-34 is located on the western side of the watershed and extends from Bennington Creek sub-watershed, north to the Sulphur Creek sub-watershed

Aspen Range Canyons and Foothills/Douglas fir-alpine fire- Mountain Mahogany Sagebrush Landtype Association (M331-Df-34)

Soil Association (Family)	Soil No.	Landform	Vegetation Type	Sedimen t Delivery
Farlow-Starley-Povey	400	Canyon sideslopes	Subalpine fir, Douglas-fir, mountain mahogany, aspen, some juniper, maple, bitterbrush, big sagebrush	.020
Judkins-Farlow-Swede	404	Canyon sideslopes	Subalpine fir, Douglas-fir, lodgepole pine, huckleberry, choke cherry, service-berry	.020
Starkey-Povey-Farlow	405	Canyon sideslopes	Douglas-fir, subalpine fir, some juniper Mountain mahogany, big sagebrush, maple, snowberry, serviceberry,	.020
Blaine-Judkins-Richvale	406	Canyon sideslopes	Douglas-fir, subalpine fir, maple, service-berry, snowberry	.030
Devoe-Blaine-Farlow	407	Canyon sideslopes	Douglas-fir, subalpine fir, aspen, big sagebrush, mountain mahogany, snow- berry, bitterbrush	.030
Farlow-Judkins-Starley	470	Dissected foothills	Subalpine-fir, Douglas-fir, aspen, snow-berry, chokecherry	.030
Farlow-Starley-Starman	472	Rocky foothills	Few aspens stands, mountain mahogany, juniper, big sagebrush, snowberry	.020

Webster Mountainsides, Canyons and Basins/Alpine fire – Douglas-fir – Mountain mahogany – Sagebrush Landtype Association. Landtype Association (M331Dg 33)

This landtype occurs on the eastern portion of the watershed (Dunn Creek Canyon to upper Georgetown Canyon). It is a mountainous landscape with narrow canyons and uplands. The basic geomorphic processes forming the landscape are fluvial and gravitational, similar to the processes forming the other LTA's in the watershed. This LTA is moderately dissected by streams having dendritic and parallel stream patterns

The parent materials are sandstone, limestone, chert and shale from the Wells, Phosphoria, Dinwoody and Thaynes Formation. These form soils that classify as Mollic Cryoboralfs and Argic Cryoborborolls. These soils have a loamy-skeletal profile with mixed mineralogy. They range from shallow (0 – 20 inches) on the sideslopes and canyons, to very deep (greater than 20 inches)

Landtype Association (M331Dg 33)

Soil Association (Family)	Soil No.	Landform	Vegetation Type	Sediment Delivery
Blaine-Dranyon	301	Uplands & basins	Big sagebrush, choke-cherry, snowberry, rose, bitterbrush	.015
Povey-Alpon-Ketchum	380	Mountainsides	Aspen, lodgepole pine, sub-alpine fir, Douglas-fir, choke cherry, big sagebrush, bitter-brush	.015
Judkins-Farlow-Swede	404	Canyon sideslopes	Douglas-fir, subalpine fir, lodgepole pine, huckleberry, serviceberry Mountainlover, snowberry, chokecherry	.020
Starley-Povey-Farlow	405	Canyon sideslopes	Douglas-fir, subalpine fir, some juniper, mountain mahogany, big sagebrush, maple, snowberry, serviceberry	.020
Judkins-Cloud Peak-Farlow	551	Valley/Mt. sideslopes	Aspen, lodgepole pine, subalpine fir, snowberry, big sagebrush, chokecherry	.003
Starke-Dranyon-Swede	552	Valley/Mt. sideslopes	Aspen, lodgepole pine, subalpine fir, mt. maple, serviceberry, snowberry, big sagebrush	.010
Cloud Peak-Jughandle-Swede	656	Valley/Mt. sideslopes	Douglas-fir, lodgepole pine, subalpine fir, snowberry, huckleberry, Mountainlover	.018
Blaine-Judkins-Swede	870	Mountainsides	Subalpine fir, lodgepole pine, spruce, aspen, rose, snowberry, buffaloberry, ceanothus, currant	.015

Webster Ridgelands and Escarpments/Sagebrush-Alpine Rangeland Landtype Association (M331 Dg 31)

This lanldtype is adjacent to Georgetown Canyon and extends north to Grays Lake. It consists of north-south trending ridge tops and escarpments, created by thrust faulting. Later normal faulting was superimposed over the western edge of the thrust belt by Cenozoic age Basin and Range exentional faulting. Glaciations followed on the high ridge tops and formed that present day topography.

Bedrock consists of sandstone, limestone, chert and shale from the Lodgepole, Limestone, Mission Canyon Limestone, Wells, Phosphoria, Dinwoody, Thaynes, Ankerah and Twin Creek formation.

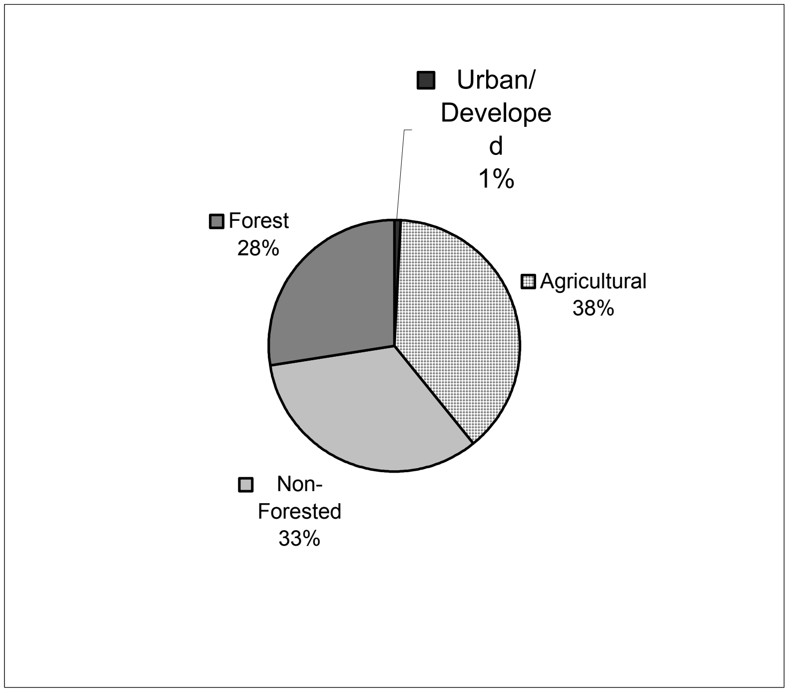
Webster Ridgelands and Escarpments / Sagebrush-Alpine Rangeland Landtype

Soil Association (Family).	Soil No.	Landform	Vegetation Types	Sediment Delivery
Blaine-Nisual-Swede	200	Ridgetops	Mosaic of mountain brush, complex of Douglas-fir, subalpine fir, aspen, big sagebrush, low sagebrush, snowberry, pachistima, chokecherry and serviceberry	0.18
Farlow-Judkins-Starley	201	Ridgetops	Mosaic of mountain brush, aspen, subalpine-fir, Douglas-fir, big sagebrush, bitterbrush, snow- berry, Ceanothus, current	0.18

			and Mountainlover	

1.4 Vegetation

Four general vegetation classes and eleven vegetation types have been used to characterize the vegetation within the watershed. The vegetation data used in this section is the result of combining several different vegetation data sets. Two broad scale data sets were used for the area outside the National Forest boundary, they were a USDAFS classified satellite GIS (geographic information system) cover and USGS land use GIS cover. For the area inside the forest boundary the data colleted for the Soda/Montpelier Front Ecological Assessment was used. The following sections break each class down by vegetation type and ownership.



1.4.1 Agricultural and Urban Vegetation

Approximately 39% of the analysis area can be characterized as either agricultural or urban/developed vegetation. Nearly all of this vegetation/land use type is located off national forest land. The exception is the land developed as a mine leases.

The most distinguishing characteristic of this vegetation group is the obvious influence of human management. Vegetation composition and structure have been directly influenced by human activity every year since the area was settled.

Table 1.4-1 Jurisdictional break down of the agricultural and developed vegetation types.

Vegetation Type (% of analysis area)	Jurisdiction	Percent	Description
Agricultural (38%)	Non-Forest Service	100%	Consists of crops such as: alfalfa, barely and wheat as well as CRP (land set a side program administered by NRCS called Crop Reserve Program) and pasture. The vegetation closest to urban/developed areas tends to be irrigated crops such as alfalfa and barely, while the lands further removed are dominated by dry farm type crops like barley, wheat and CRP.
Urban/Developed (1%)	Forest Service	4%	Phosphate mine
	Non-Forest Service	96%	Ornamental trees and lawns.

1.4.2 Forest Vegetation

Approximately 28% of the analysis area can be characterized as forested vegetation (FV) and as typical for high elevation forest in the intermountain west. The Caribou National Forest manages approximately 82% of the acres that are classified as forested vegetation. For the purpose of analysis in this document forested vegetation within the analysis area has been broken into four cover types aspen, Douglas-fir, lodgepole and subalpine fir/mixed conifer.

Table 1.4-2 Forest cover types. For more general information on tree species/cover types see http://na.fs.fed.us/spfo/pubs/silvics_manual/table_of_contents.htm

Cover Type (% of FV)	Jurisdiction	Description
Aspen (40%)	73% FS 27% Non FS	Quaking aspen is found on more acres than any other tree species within the analysis area. Aspen can vary form an early seral to persistent seral species. It can also occur as a climax species, occupying sites below the limit of conifers.
Douglas-fir (38%)	93% FS 7% Non FS	Rocky Mountain Douglas-fir is found throughout the analysis area. At the lower drier edge of its zone, it is confined to north slopes and shaded areas and is often the climax species for the site. At the higher levels, it can grow on any aspect including sunny rocky south and west exposures. On cooler moist sites it is an early seral species with subalpine fir and Engelmann spruce as climax species. Aspen is often an important early seral species in this type.
Lodgepole (17%)	76% FS 24% Non FS	Lodgepole pine is a pioneer species that requires a disturbance that exposes bare mineral soil to regenerate. In most stands in this type lodgepole is the seral species with subalpine fir being the climax species. However in other stands lodgepole can be considered as persistent seral due to the fire return interval. Aspen may be found as a minor component of the type.
Mixed Conifer (5%)	100% FS	Stands that currently have a mix of conifer species or are currently dominated by subalpine fir have been included in this type. In this type subalpine fir is the dominant climax species with occasional Engelmann spruce. Aspen, lodgepole pine and Douglas-fir often occur in various ratios in the early seral stage.

FS = Forest Service

The Caribou National Forest Sub Regional Properly Functioning Condition (PFC) Assessment and the draft Forest Plan EIS state that at the forest level all of the forested cover types are out side of properly functioning and desired future conditions. The PFC assessment states that at the sub-regional scale the aspen, Douglas-fir and mixed conifer types are at high to moderate risk and that lodgepole is at low risk. The PFC document looked at structure, composition and disturbance regime to develop the ratings.

1.4.3 Non-Forested Vegetation

Approximately 33% of the analysis area can be characterized as non-forested vegetation (NFV). The Caribou National Forest manages approximately 56% of the acres that are classified as non-forested vegetation. For the purpose of analysis in this document non-forested vegetation has been broken into four cover types sagebrush/grass, mountain shrub, mountain brush and riparian/water.

Table 1.4-3 Non-Forest cover types

Cover Type (% NFV)	Jurisdiction	Description
Sagebrush/ Grass (81%)	54% FS 46% Non FS	Areas that are currently dominated by sagebrush have been included in this type. Sagebrush is found on more acres than other species within the analysis area (more than 33,000 acres or over 27%). This type is dominated by the presence of big sagebrush however many sagebrush taxa may be represented. This type may have a variety of other brush species represented but they will generally represent less than 10% of the canopy cover. This type generally has an associated herbaceous layer of perennial grasses and forbs in varying amounts. Grass and forb species composition is strongly influences by physical and chemical soil characteristics and by grazing pressure.
Mountain Shrub (15%)	62% FS 38% Non FS	Areas included in this type are currently dominated by curlleaf mountain mahogany, rocky mountain juniper or bigtooth maple. This type covers a broad ecological spectrum from moderate to deep well drained soils to shallow rocky soils on ridge tops and southerly exposures. This type could be considered the transitional type. It represents what grows where it is to hash for trees and not suited for sagebrush. Curlleaf mountain mahogany is the only mahogany found in the assessment area it is a hardwood evergreen with tree like from. Rocky mountain juniper is the dominant juniper species found within the assessment area, it is a shrubby tree with scale-like evergreen leaves.
Mountain Brush (3%)	94% FS 6% Non FS	Areas that currently have one or more of the mountain brush species representing over 10 % of the canopy cover have been included in this type. The mountain brush type is found intermingled with sagebrush at mid elevations and conifer/aspen forests at higher elevations. Mountain brush species are: chokecherry, serviceberry, rose, mountain, snowberry, elderberry and ceanothus. These species may occur alone and form rather distinct types or may have mixed composition. These species generally sprout after fire and normally occupy slightly moister areas than sagebrush. However, sagebrush and bitterbrush are also often represented. This type generally has an associated herbaceous layer of perennial grasses and forbs in varying amounts. Grass and forb species composition is strongly influences by physical and chemical soil characteristics and by grazing pressure.
Riparian/ Water (1%)	23% FS 77% Non FS	Areas that currently are dominated by riparian species or water have been included in this type. This type includes a wide range of riparian types from marsh type wetlands along Bear River to patches of willow. Most of the riparian that is located on national forest land is associated with stream channels. The type off national forest is a mix of marsh, open water and stream channel riparian.

FS = Forest Service

The Caribou National Forest Sub Regional Properly Functioning Condition (PFC) Assessment states that at the sub-regional scale the riparian/wetland, mountain shrub and sagebrush types are at high to moderate risk and that mountain brush is at low risk. The PFC document looked at structure, composition and disturbance regime to develop the ratings.

1.4.4 Disturbance Agents

Fire

Fire has been a frequent visitor in the Soda/Montpelier front area, either as localized spot fires or as large, expansive conflagrations. Barrett (1994) documented several major fire years throughout the Caribou National Forest in 1745, 1781, 1844, and 1934. Since the 1960, over 33 fires have been suppressed within the analysis area (33 on the Montpelier Ranger District (R.D.), and an unknown amount on Soda Springs R.D.), which equates to less than 1 wildfire per year. The results of fire suppression and historical grazing practices have had an impact on forested and non-forested community types. The lack of fire has resulted in two primary changes. First, it has resulted in an increased incidence of large fuel accumulations. Secondly, it has caused modification of vegetation structure and composition.

Fire has been the dominant historic disturbance that has determined the age and mix of species within the watershed. A mix of non-lethal and lethal fires controlled vegetation distribution prior to European settlement. The absence of fire, except prescribed fire in sagebrush communities, over the last 150 years has altered the patterns and species mix within vegetation types. Succession toward late seral or climax species has resulted from the lack of natural fire.

Insect and disease

Insects and disease have also played a role in shaping vegetation composition and structure. Insects that have played a role include mountain pine beetle, Douglas-fir bark beetle, spruce budworm, and fir engraver. The effects of these insects can range from small pockets of mortality to large epidemics that cover large areas. The diseases that exist include mistletoe, various rusts and root diseases, and many forms of cankers. The effects of these diseases tend to be limited in scope, effecting growth more than causing mortality, but where likely important in shaping fire intensity and severity.

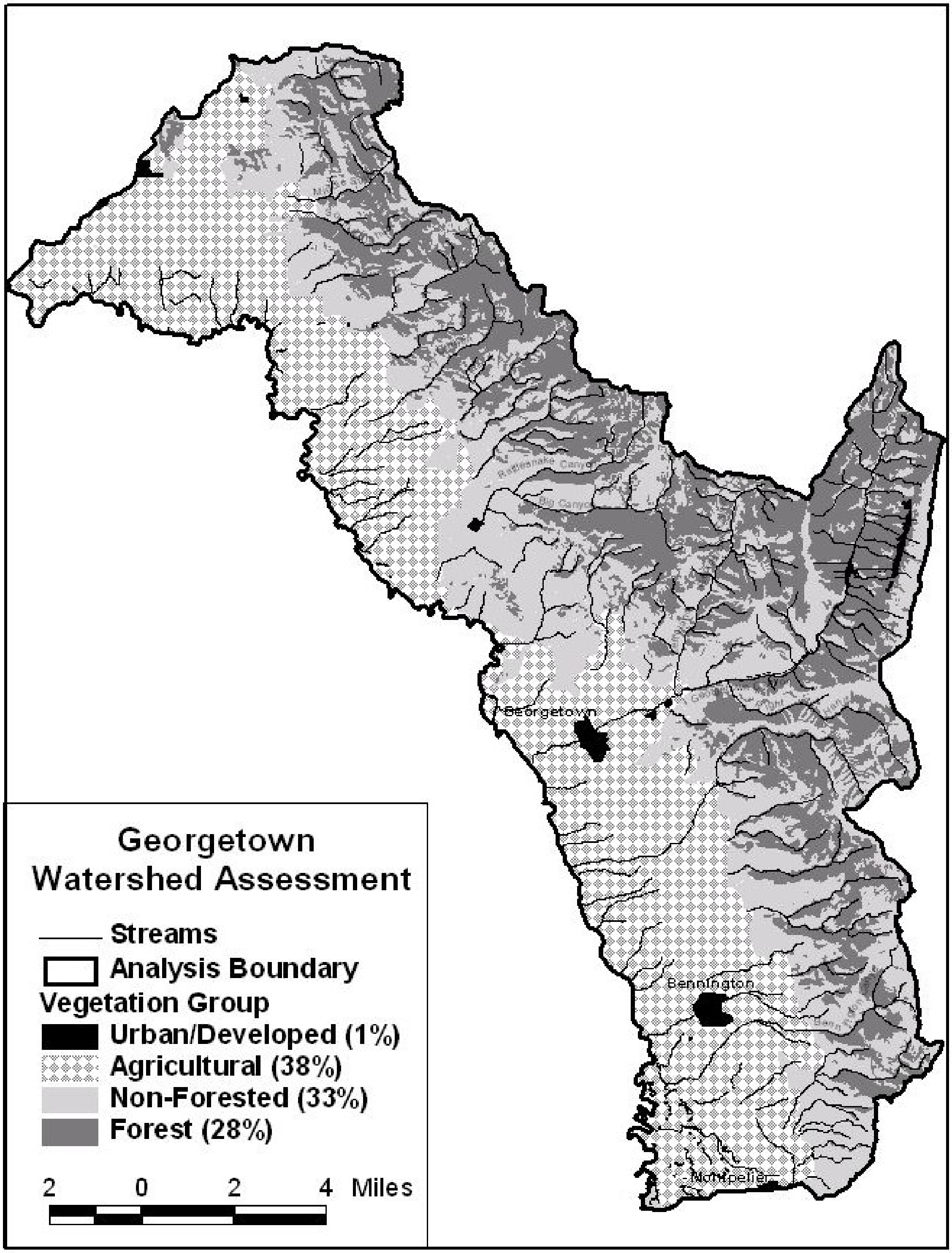


Figure 1.4-1 Aspect and elevation are the two variables that have the greatest impact on vegetative pattern across the landscape. Soil type and precipitation are also important variables that relate to vegetative pattern.

1.5 Species and Habitats

1.5.1 Fish

Prior to man the species present were determined by the geologic history of the area. Southeastern Idaho within the Bear River drainage is currently part of the Bonneville Basin, which comprises small parts of Wyoming, Idaho, Nevada, and the western half of Utah and is a closed basin. In the not too distant geologic past (34,000 years ago) the Bear River drained into the Portneuf River and into the Snake River. Only 10,000 years ago Lake Bonneville drained into the Snake River (Sigler and Sigler 1996).

Historically the Bear River connected directly to ancient Bear Lake but through fault blocking and volcanic activity it is not presently connected to Bear Lake naturally. Artificial channels connect it to Bear Lake through Dingle Swamp to provide irrigation and power storage for Utah and Idaho (Sigler and Sigler 1996).

The only trout native to the Bonneville Basin or Bear River drainage are Bonneville cutthroat (*Oncorhynchus clarki utah)*. The Bonneville cutthroat trout (BCT) have been further broken down into 5 geographic management units to facilitate BCT conservation. There are two management units in Southeast Idaho. One is the Bear Lake management unit and the other is the Bear River mangement unit. For a complete discussion of BCT systematics refer to the December 2000 publication of the Range Wide Conservation Agreement and Strategy for Bonneville Cutthroat Trout available at http://www.wildlife.utah.gov/pdf/cacs7.pdf. According to some experts the Bear River and Bear Lake BCT are more closely related to Yellowstone cutthroat than to the more southern populations of BCT. Geologically this seems to make sense as they were more recently connected to the Snake River which contains Yellowstone cutthroat.

In a pure sense Bear River Bonneville cutthroat are the cutthroats native to the Georgetown Watershed. To simplify writing we will simply refer to these fish as Bonneville cutthroat trout or BCT. Other fishes that are also likely native include mountain white fish (*Prosopium williamsoni*), mottled sculpin (*cottus bairdi*), Piute sculpin (*cottus beldingi*), speckled dace (*Rhinicthys osculus*), longnose dace (*Rhinicthys cataractae*), redside shiner (*Richardsonius balteatus*), Utah sucker (*Catostomus ardens*), Mountain sucker (C*atostomus platyrynchus*), and bluehead sucker (*Catostomus discobolus*). All of these native fish were probably common in the analysis area at one time except for the bluehead sucker which was likely rare.

Two life history patterns existed for BCT. One would have been resident fish that spent their whole life within the smaller tributaries to the Bear River. The other would have been a fluvial life history pattern where large cutthroat would have spent most of their time in the larger Bear River migrated into the smaller tributaries to spawn during spring runoff and then the adults would return to the river. The spawned eggs and resultant fish may not return to the river until the following spring during runoff and when the creek was connected to the river again. The Bear River and its tributaries would have been fully supportive of trout and other native species where sufficient flows occurred.

1.5.2 Wildlife

THREATENED, ENDANGERED, AND SENSITIVE SPECIES

Threatened and endangered species that may occur in the Georgetown Watershed include wolves, lynx, and bald eagle (USDI 2002).

Gray wolf (*Canis lupus*) (USDI 1994a, 1994b) – The Georgetown Watershed is within the Yellowstone nonessential experimental population area that currently has 12 breeding pairs (exceeding the 6 pair minimum). Thirty breeding pairs of wolves, with an equitable and uniform distribution throughout the three states for three successive years would constitute a viable and recovered wolf population. There are currently 43 and the three-year period has been met (USDI and others 2003). Wolf Management Plans for Idaho has been completed and approved by USFWS. The Montana and Wyoming Management Plans are being reviewed. (USDI et al. 2003)

Canada lynx (*Lynx canadensis*) - Primary vegetative types (lynx habitat), as described in the Lynx Conservation Assessment Strategy (LCAS) (Ruediger and others 2000) (USDI 2000) are patchy and disjunct on the Caribou National Forest and do not provide suitable lynx habitat. Caribou National Forest lands located in the Soda Springs and Montpelier Ranger Districts may provide linkage habitat for lynx.

Bald eagle (*Haliaeetus leucocephalus*)– The watershed is on the southwest corner of the Greater Yellowstone Ecosystem (GYBEWG 1996) and in Idaho bald eagle management zone 19 the southeast corner of Idaho (Beals and Melquist 2001, 5).

The Georgetown Watershed may provide habitat for several Forest Service sensitive species including Townsend's (Western) big-eared bat (*Corynorhinus townsendi*i), Wolverine (*Gulo gulo*), Boreal owl (*Aegolius funereus*), Flammulated owl (*Otus flammeolus*), Great gray owl (*Strix nebulosa*), Northern goshawk (*Accipiter gentilis*), Three-toed woodpecker (*Picoides tridactylus*), Columbian sharp-tailed grouse (*Tympanuchus phasianellus columbianus*), and Starveling milkvetch *(Astragalus jejunus var. jejunus)*. Sensitive species that do not exist because of lack of habitat include the spotted bat, harlequin duck, trumpeter swan, Cache beardtongue, slickspot peppergrass and Payson’s bladderpod (Groves and others 1997, Spahr and others 1991, and USDA 2003a, 3-271).

1.5.3 Other wildlife species

Riparian, Non-riverine wetlands, and sagebrush shrublands are the highest priority habitats for birds found in the Georgetown Watershed. Riparian habitat with dense grasses/shrubs (60-80% crown cover, 6’ tall, 20 acres with scattered openings), open tree canopy with balanced age classes (snags), and abundant flowers are important habitat features. A net increase of wetlands for will improve habitat features important for birds. Providing at least 25 percent of sagebrush communities (especially big sagebrush) in early, mid-, and late seral stages, and maintain adequate ground cover from May 1 to July 15 is the objective for sage grouse, which was chosen as the umbrella species for sagebrush shrublands.

The watershed provides summer and critical winter range for mule deer and elk. Georgetown Creek and tributaries also contain populations of beaver. Western boreal toad and Northern leopard frog may occur in the watershed.

1.6 Human Uses

Historic and existing human use patterns influence the appearance, condition, and management opportunities within the watershed.

1.6.1 The First Inhabitants

The entire Bear River Valley is thought to have been occupied by Shoshone bands. A group which has been labeled, "Cache Valley Shoshoni" is known to have ranged along the Bear River. After the tribes had acquired horses, they sometimes traveled to Bear Lake, which was a common meeting place for Shoshone from various regions. Along with collecting plant foods, and fishing in the area, the tribe utilized rabbit drives, hunted buffalo, mountain sheep, antelope, deer, and elk . Early trappers mention the Tribes in their journals, for instance, in his journal of August 1842, Fremont reported seeing a large village of horse Shoshoni near the head of the Bear River where "They had come to hunt antelope and to gather service berries and bitteroot" (1887, vol 1, p. 206).

Ethnographic sources indicated that at least one specific band is known to have wintered in the area somewhere along the Logan River above its junction with the Little Bear River and along Battle Creek. Although only a few specifics are known, there is no question that previous to the Bear River Massacre of Shoshone in 1863, the population had been more numerous and probably occupied more winter villages in the area.

The earliest inhabitants of European decent were mountain men and beaver trappers. Annual summer rendezvous were held around Bear Lake. The Oregon/California Trail passes through the lower part of the Watershed along what is now Highway 30.

1.6.2 Mining

Locatable Minerals

Locatable minerals include both metallic minerals (gold, silver, copper, etc.) and nonmetallic minerals (fluorspar, asbestos, mica, etc.). It is very difficult to prepare a complete list of locatable minerals because the history of the law has resulted in a definition of minerals that includes the economics of the minerals.

A careful search of the BLM's Land and Mineral Records LR2000 system turned up 357 closed and no active claims in the study area. This would seem to indicate that there is no new surface evidence for locatable mineral deposits. This does not preclude the existence of an economic deposit, only that there has been very little recent interest in locatable minerals within the area. Metalliferous prospecting has been done previously in this region, but no successful mines have been developed (Mansfield, 1927).

Leasable Minerals

The Mineral Leasing Act of 1920 defines a leasable mineral as "coal, phosphate, sodium, oil, oil shale, gas, and certain sulfur deposits." The area geology does not give any indication of oil shales, coal, or sodium deposits. However, there are leases for the known deposits of phosphate and sulfur.

Phosphate Mining

Phosphate is currently mined by an open pit method. This involves stripping off the layer of material overlying the phosphate ore and depositing it in either external waste rock piles, by backfilling behind the active mine as it progresses forward, or some combination of the two.

Historically, phosphate was mined via underground mining methods. This involved driving a tunnel along the ore seam and removing as much high-grade ore as was reasonable. This method of mining was replaced by open pit mining, which is a more economical and safer method of mining.

The mines within the Georgetown Watershed Analysis boundaries are:

- Conda and Trail Canyon Mine which have already been mined, and are contained within the T. 08 S., R. 42 and 43 E. townships. The mined area is mainly on private and BLM Land north of the study area. There are some patented lands that extend into the northern part of the study area. These lands have had some exploration done on them and will eventually be mined, but it is unknown when mining will start. (USGS, 2001)
- Diamond Gulch Mine (T. 09 S., R. 43 E.). Mining on this site started and was completed in 1960. Reclamation was conducted over the next two years. One 360-acre phosphate lease (I-07881) covers the mining that was done here. The lease was relinquished in 1993, and no more mining is expected. (USGS, 2001)
- Rattlesnake Canyon Mine (T. 10 S., R. 43 E.). This is another mine within the watershed boundaries that operated for less than one year and shut down. The operations occurred in 1920 and included an adit, which in 1996 was partially caved. (USGS, 2001)
- Georgetown Canyon Mine (T. 10 & 11 S., R. 44 & 45 E.). This mine is located on a series of 16 patented placer mining claims, that were patented in 1912, 1915 and 1916. Mining begin in 1909, which consisted of several tunnels, several shallow cuts and a tram located on several of the claims. There was a total of approximately 800 feet of underground workings in 9 tunnels and two shafts completed on the 16-placer claims. Not much happened until the early 1950's when an additional 4600 feet of underground workings were completed. In 1957, construction begin on the phosphoric acid plant and rail line, with open pit mining beginning in 1958. In 1964, production stopped and the mine has remained inactive since. Between then and 2001, pieces of the plant have been removed for use in the Conda plant, north of Soda Springs, Idaho. In 2001, Agrium, Inc. disassembled and removed the remaining structures from the plant site. (USGS, 2001)
- Bennington Canyon Mine (T. 12 S., R. 44 E.). This mine is located approximately ¼ mile west of the Forest boundary on private land (USFS, 2002). These claims were located between 1907 and 1912. There were three tunnels opened, but not much else was done until 1939. Several exploration trenches were constructed in 1940, and a small pit with a 150-foot exploration tunnel was completed in 1941. (USGS, 2001)

Selenium associated with phosphate mining.

Selenium was discovered in the early 1800's and by the mid-1900's it was identified as an important trace element for both livestock and people. It is critical for optimum health in livestock and people. Daily requirements have been established for both. Selenium helps prevent oxygen damage to living tissue, and is in nutritional supplements for both livestock and people. Salt blocks with selenium added, are given to livestock in areas that have low selenium values in the feed. Too much selenium in the diet can cause adverse reactions in animals as can too little selenium. (Bollard, 1999)

An incident occurred in 1996, which would indicate that a contaminant was being released into the environment from the phosphate mines in the SE Idaho region. This incident involved some horses pastured in an area near prior mining activity that became sick. It was subsequently determined that the cause was due to intake of elevated levels of selenium. It was determined that selenium had been leached from a nearby rock waste dump.

The results from samples collected at the mine sites indicated that the Meade Peak Member of the Phosphoria formation contains elevated levels of the element selenium. Mining of phosphate from the Meade Peak Member causes it to be exposed to air and water, promoting chemical oxidation. The results of this oxidation allow the previously insoluble selenium to become chemically mobile. It can then become incorporated into the soil, water and vegetation on and surrounding the mine sites. Grazing animals, both livestock and wildlife can become exposed to the selenium, where it can cause adverse reactions. Recent studies indicate there is no evidence that human health has been adversely affected in this region. To date, there have been no known selenium related illnesses or deaths to any animals grazing in this study area.

The selenium issue has been and continues to be studied by many agencies and graduate students, since the initial incident. Results from these may indicate how to best handle the release of selenium into the environment.

Sulphur

Sulphur was mined in the Sulphur Canyon area (T. 9 S., R. 42 E., Sec. 2, 12 and 14) around the 1900's. There was also some exploration done around the Rattlesnake Canyon area (T. 10 S., R. 43 E., Sec. 14). (Mansfield, 1927)

Energy Sources

Oil and gas exploration has occurred on the Forest in the study area as early as the late 1940's, but most occurred during the 1970's and 1980's. There is currently no oil and gas production in this area. There are no current oil and gas leases inside the study area (MT/OG Plat).

The potential for oil and gas does exist in southeastern Idaho. The same type of geology does exist in the study area as does in the oil fields of southwestern Wyoming. Any hope of oil and gas production could come from the sedimentary rocks deposited in shallow marine environment, which describe a lot of the rocks in this area (EIA, 2001).

There are no coal leases in the project area.

A potential for geothermal energy exists throughout the entire Southeast Idaho region, due to a relatively close proximity to Yellowstone National Park. Currently there are no geothermal leases and/or lease applications in the study area.

1.6.3 Livestock Grazing

Domestic livestock grazing has occurred on lands within the project area since the area was first settled in the 1860s. During the first decade, the rich bottomland of the valley and the low foothills provide adequate area for herds. Little use was made of the Forest.

After 1880s, local herds began to rapidly increase and transient sheep bands were moved through the area. Harsh winters seemed to control the early herds. It became the policy to follow the melting snow up the mountainside. Cattle and horse use came first, utilizing forage in the lower foothills and canyon bottoms. Later, the high meadows, basins and ridges were grazed by bands of sheep. The range never had a chance to recover before it was eaten off and trod under.

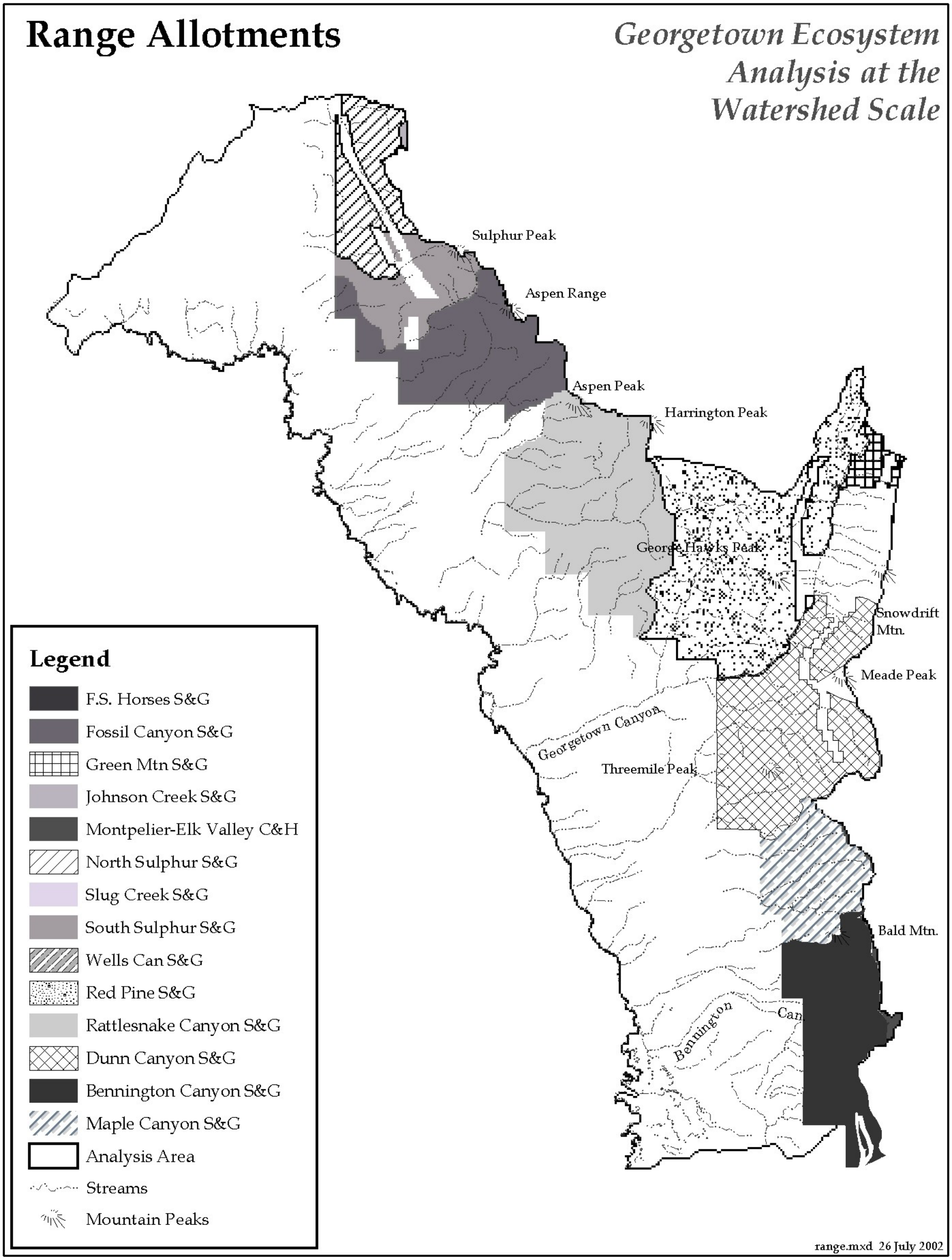
By 1893, transient herds of sheep worked their way through the mountains and valley from Washington and Oregon to feedlots in the Midwest. The sheep were also shipped in from Nevada, Colorado, and New Mexico. Utah herds used the Forestland more than local Idaho herds. By 1900, the sheep numbers reached a peak (500,000 sheep), which was a disaster to the rangeland. It was a "first come-first-served' basis.

By 1900, the "Two-mile law" was passed. It specified that a sheep herd could not graze within two-miles of inhabitant. After the Supreme Court of Idaho upheld the new law, there was a 50 percent reduction of sheep numbers. State administrated "permit system" was established. It had minimal success.

At the time the Forest was established in 1907, it was estimated that there were 387,295 sheep and 10,781 cattle on the Forest. The range needed improvement, numbers needed to be regulated, and season needed to be established. Generally, people approved of the system with the exception of fees being charged. By 1913, management directives were established. Allotments were designated as cattle and sheep range, permitted numbers were based on numbers of livestock the first owner had out on the range, and season of use was determined by the weather.

As the science evolved with livestock use, range analysis process was used to determine carrying capacity. Capable (physical attributes such as vegetation type, slope, access to water etc.) rangeland was mapped to support grazing on sustained basis. Season of use was determined by the average date the plants were capable of sustaining use without adversely affecting the plant's vigor. Reductions in permitted use were necessary to bring grazing use in line with productivity. Within the project area, these allotments were permitted three times the current permitted numbers and grazed during a longer season of use. See map below to display the nine sheep allotments and one cattle allotment in the project area.

Currently, Intermountain Region's policy is to graze livestock based on annual forage resource, not on permitted use. Annual monitoring is used to determine when livestock move to the next unit or off the Forest.


Range Allotments
Georgetown Ecosystem Analysis at the Watershed Scale
Sulphur Peak
Aspen Range
Aspen Peak
Harrington Peak
George Hawks Peak
Snowdrift Mtn.
Meade Peak
Georgetown Canyon
Threemile Peak
Bald Mtn.
Bennington
Can
Legend
F.S. Horses S&G
Fossil Canyon S&G
Green Mtn S&G
Johnson Creek S&G
Montpelier-Elk Valley C&H
North Sulphur S&G
Slug Creek S&G
South Sulphur S&G
Wells Can S&G
Red Pine S&G
Rattlesnake Canyon S&G
Dunn Canyon S&G
Bennington Canyon S&G
Maple Canyon S&G
Analysis Area
Streams
Mountain Peaks
range.mxd 26 July 2002

1.6.4 Timber Harvest and Personal Use Forest Products

Scattered stumps throughout the watershed indicate that timber removal has been a traditional use of the forest dating back the first settles. Early settlers would have needed lumber to construct homes, barns and other farming related structures and wood would have been the primary heat source. Since little forested ground exists outside what now is national forest and settlers would not have hauled wood any further than necessary it can be assumed that most of the early needs of Bennington, Georgetown and some of Montpelier's would have been harvested on national forest lands.

Available records indicate that less that 3% of the forested acres in the analysis area have been harvested in the last 40 years. Harvest in the last 40 years has been predominately clearcuts and seed-tree harvesting of lodgepole pine. Firewood, post and pole gathering has reduced snag and down woody debris within relatively narrow bands along roads.

1.6.5 Recreation

Motorized trail riding and hunting are probably the largest recreation uses within the watershed. Both have associated dispersed camping.

The analysis area lies within the State of Idaho Fish and Game Big Game Management Area #76. This management area provides deer and elk hunting opportunities through several different draw and general hunts. A mix of weapon and season choices extends the hunting season from September 1 through late November. Forest Grouse are also plentiful in the watershed.

Although the majority of the analysis area is motorized restricted (no motorized activity off designated trails or road) most of the trails and roads within the area are open to all types of trail use (foot and motorized).

Summit View is located in left hand fork of Georgetown canyon and is the only forest service developed campground in the analysis area. The campground has 23 single units and 2 group sites. It is typically accessible from late May to late October, fees are collected from June to labor day.

2.0 Issues and Key Questions

The purpose of this chapter is to focus on the key elements of the ecosystem relevant to future land management activities, and to identify data and analysis needed to provide broad direction for future projects. These issues and key questions were identified and developed by the interdisciplinary team. Major issues of immediate concern are identified and characterized. Key questions have been developed.

2.1 Vegetation Dynamics

The "Caribou Nation Forest and Surrounding Area Sub-Regional Properly Functioning Condition Assessment" and other similar broad scale assessments have indicated that existing vegetation distribution, structure, and composition are outside the historic range of variability across much of the Montpelier Ranger District. Therefore, the vegetation within the Georgetown watershed assessment area is likely also outside historic ranges, which has the potential to adversely affect ecosystem function.

Key Questions-

Non-Forested Vegetation

1) How has the structure of non-forested cover types changed? (Indicator - structure class reported by cover type)
2) How has the disturbance regimes of non-forested cover types changed? (Indicator - disturbance regimes reported by cover type)
3) How has the increased presence of noxious weed affected native vegetation?

Forest Vegetation

1) How has the structure of the forested cover types changed? (Indicator - structure class reported by cover type)
2) How has the density of the forested cover types changed? (Indicator - density reported by cover type)
3) How has the species composition of the forested cover types changed? (Indicator - species composition reported by cover type)
4) How has the disturbance regimes of the forested cover types changed? (Indicator - disturbance regimes reported by cover type)

2.2 Hydrologic Processes and Water Quality

Hydrologic processes and water quality within the watershed may be being impacted by past and present activities.

Key Questions-

1. How are hydrologic processes and water quality being impacted?

2.3 Soil Productivity

Is soil productivity being maintained now in the watershed?

Half of the soils in the Georgetown Watershed have inherent low productivity. In addition, almost 12% have unstable slopes. Resource management in this area includes 11 sheep allotments, one cattle allotment and several old phosphate mining areas In addition, ATV trails, pioneered campsites, and other human activities have the potential to increase the amount of detrimental soil disturbance and reduce soil productivity in the area.

Key Questions-

1. What are the major livestock grazing soil impacts in the watershed?
2. Is recreation use (camping and ATV use) causing a significant increase in soil disturbance, in the form of erosion, sediment delivery or compaction?
3. How susceptible to management activities are the land types found within the watershed?
4. How much of the watershed has been detrimentally disturbed by past activities?
5. At what point is an impact to soil no longer considered detrimental?

2.4 Native Fish Habitat

Bonneville Cutthroat Trout populations, distribution and available habitat has been altered by humans uses, which may have reduced species sustainability.

Key Questions-

1) How have fish populations, distribution and persistence been affected by past human use/management, within each local population watershed? (Indicator(s)- population, and presence reported by local population watershed)

2) How and to what extent have barriers affected native fish distribution and persistence within the watershed? (Indicators- barriers, reported by local population watershed)

3) How and to what extent have non-native fish affected native fish distribution and persistence within the watershed? (Indicators - presence/absence of non-native fish species reported by local population watershed)

4) How and to what extent have stream channels and habitat been altered? (Indicators - amount of altered channels)

2.5 Wildlife Habitat

The viability of some wildlife species may have been impacted by past and present activities.

Key Questions-

1) How and to what extent have human caused changes to habitat affected TES, MIS and other key wildlife species?
2) How and to what extent have natural changes in habitat affected wildlife species?

3.0 Reference, Current and Condition Trend

The purpose of this chapter is to present information on the indicators relevant to the issues and key questions developed in chapter 2. The IDT (interdisciplinary team) was instructed to develop a reference condition or desired future, current condition and trend for each indicator.

3.1 Vegetation Dynamics

In this section the indicators developed to track the Vegetation Dynamics issue will be displayed by vegetation type. The use of vegetation types allows for an operational way to reference other documents such as the Draft Revised Forest Plan and the Caribou National Forest Sub-Regional Assessment of Properly Functioning Condition (PFC).

Issue indicators:
- **Structure**
- **Species Composition**
- **Disturbance Regimes**
- **Presence of Noxious Weeds**

Due to a lack of issue indicator data on lands outside the National Forest boundary only National Forest lands will be included in this section.

Table 3.1-1 Acreage of National Forest land in each vegetation type and percent of national forest lands.

Vegetation Type	Acres	Percent
Aspen	11,602	20%
Douglas-fir	13,812	23%
Lodgepole	4,932	8%
Mixed Conifer	1,867	3%
Mountain Brush	1,057	2%
Mountain Shrub	3,881	7%
Riparian/Water	91	0%
Sagebrush/Grass	21,553	37%
Totals	**58,795**	

Figure 3.1-1 Mountain Brush and Mountain Shrub types. Both types tend to be complex mixtures of species, which are arranged in small stringers between the forested types and the sagebrush/grass type.

Figure 3.1-2 Aspen with Conifer Understory. This stand along the bottom of the Rattlesnake drainage is a good example of what many of the aspen stands within the assessment area look like, mature aspen overstory with Douglas-fir or subalpine fir or both understories.

Figure 3.1-3 Landscape Mosaic. Much of the landscape within the assessment area has very mosaic pattern of cover types.

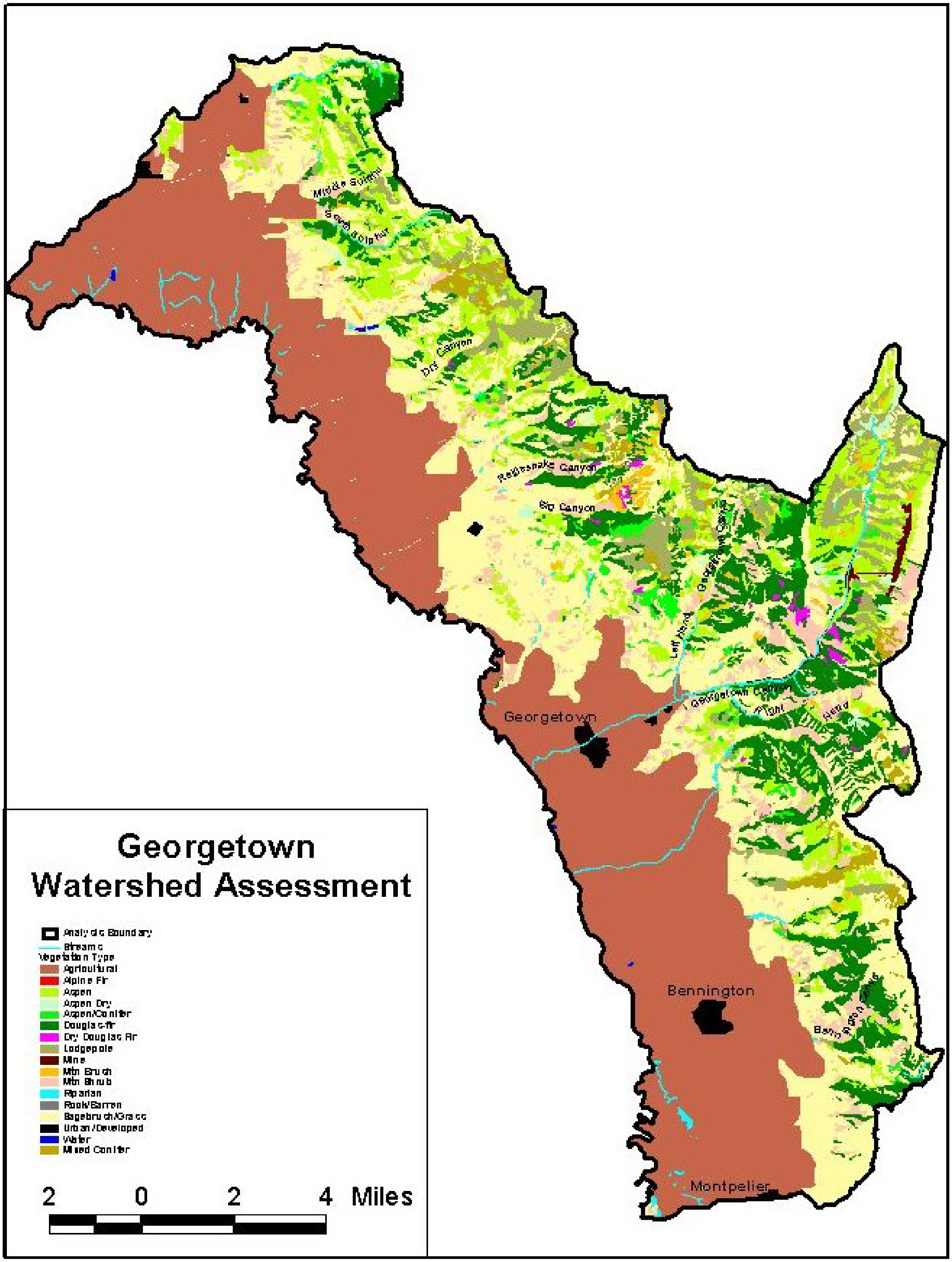


Figure 3.1-4 Cover Type Map

3.1.1 Structure

Vegetation Type	Landscape Scale Reference/Desired Condition		Current Condition*	Trend
Aspen	Grass/Seedling/Sap Young/Mid Mature/Old No Data Multiple Canopies	20-40% 20-40% 20-40% ND	0% 27% 68% 5% 75%	The distribution of structure classes across the **landscape is outside the reference/-desired condition**. Succession has moved the majority of the stands into the Mature/Old structure class.
Douglas-fir	Grass/Seedling/Sap Young/Mid Mature/Old No Data Multiple Canopies	10-30% 30-40% 30-40% <50%	0% 3% 95% 2% 62%	The distribution of structure classes across the **landscape is outside the reference/-desired condition**. Succession has moved the majority of the stands into the Mature/Old structure class
Lodgepole	Grass/Seedling/Sap Young/Mid Mature/Old No Data Multiple Canopies	10-30% 30-40% 30-40% <50%	10% 4% 86% 61%	The distribution of structure classes across the **landscape is outside the reference/-desired condition**. Succession has moved the majority of the stands into the Mature/Old structure class. The higher percentage in the seedling sap in this type can be contributed to timber harvest.
Mixed Conifer	Grass/Seedling/Sap Young/Mid Mature/Old No Data Multiple Canopies	0-10% 10-30% 30-40% 40%	0% 1% 96% 3% 86%	The distribution of structure classes across the **landscape is outside the reference/-desired condition**. Succession has moved the majority of the stands into the Mature/Old structure class.
Mountain Shrub	Grass/Seedling/Sap Young/Mid Mature/Old No Data/Other**	0-30% 30-40% 30-40%	0% 6% 79% 15%	The distribution of structure classes across the **landscape is outside the reference/-desired condition**. Succession has moved the majority of the stands into the Mature/Old structure class.
Mountain Brush	Multiple vegetation layers with alternating vertical dominance.		74% Multiple Layers 22% Single Layer 4% No data	The distribution of structure classes across the **landscape is close to the reference/-desired condition**.
Sagebrush/ Grass	0 - 5% Crown Cover 6 -15% Crown Cover 15% + Crown Cover Bare Ground	10% 50% 40% <20%	18% 60% 22% 0%?	The distribution of structure classes across the **landscape is close to the reference/-desired condition**.

* PFC did not include mixed conifer cover type and the forest plan revision DEIS did not set a desired future condition. For this cover type the range comes from PFC for subalpine fir. The range for the other species is based on the desired structure for this type in the FPR DEIS.
* Stands with multiple structure classes represented were included in the oldest structure class represented.
** On some of the Mountain Shrub areas canopy cover was recorded using the sagebrush codes rather than structure.

HUC	Structure	Aspen	Douglas-fir	Lodgepole	Mixed	Mtn. Shrub
Bennington	Grass/Seedling/Sap		0%	0%	0%	0%
	Young/Mid	76%	3%	0%	5%	4%
	Mature/Old	24%	95%	0%	95%	96%
	No Data	0%	2%	0%	0%	0%
	Acres	**255**	**1,205**	**0**	**34**	**563**
Big Rattlesnake	Grass/Seedling/Sap	0%	0%	20%	0%	0%
	Young/Mid	20%	1%	6%	0%	0%
	Mature/Old	69%	97%	74%	100%	55%
	No Data	11%	2%	0%	0%	45%
	Acres	**785**	**1,268**	**494**	**195**	**302**
Dry-Fossil	Grass/Seedling/Sap	0%	0%	19%	1%	0%
	Young/Mid	18%	8%	1%	0%	5%
	Mature/Old	80%	91%	79%	97%	83%
	No Data	2%	1%	0%	2%	12%
	Acres	**2,609**	**1,309**	**1,430**	**520**	**253**
Dunns	Grass/Seedling/Sap	0%	0%	0%	0%	0%
	Young/Mid	50%	0%	0%	0%	19%
	Mature/Old	49%	100%	0%	100%	81%
	No Data	1%	0%	0%	0%	0%
	Acres	**226**	**1250**	**0**	**23**	**203**
Georgetown Canyon	Grass/Seedling/Sap	0%	0%	0%	0%	0%
	Young/Mid	29%	2%	3%	2%	0%
	Mature/Old	68%	97%	97%	98%	75%
	No Data	3%	0%	0%	0%	25%
	Acres	**2,237**	**2,289**	**1,354**	**282**	**1,282**
Left Hand	Grass/Seedling/Sap	0%	0%	1%	0%	0%
	Young/Mid	28%	2%	13%	2%	0%
	Mature/Old	72%	96%	86%	98%	90%
	No Data	0%	2%	0%	0%	10%
	Acres	**1,139**	**1,946**	**444**	**81**	**369**
Pine-Maple	Grass/Seedling/Sap	0%	0%	0%	0%	0%
	Young/Mid	67%	9%	0%	3%	25%
	Mature/Old	28%	91%	100%	93%	75%
	No Data	5%	0%	0%	4%	0%
	Acres	**1,047**	**1,440**	**125**	**536**	**544**
Red Pine	Grass/Seedling/Sap	1%	0%	13%	0%	0%
	Young/Mid	4%	0%	0%	0%	0%
	Mature/Old	95%	95%	87%	100%	100%
	No Data	0%	5%	0%	0%	0%
	Acres	**452**	**225**	**315**	**67**	**114**
Sulphur	Grass/Seedling/Sap	0%	0%	0%	0%	0%
	Young/Mid	13%	1%	20%	0%	0%
	Mature/Old	85%	97%	80%	100%	100%
	No Data	2%	2%	0%	0%	0%
	Acres	**1,046**	**632**	**118**	**22**	**119**
Wood	Grass/Seedling/Sap	0%	0%	0%	0%	0%
	Young/Mid	2%	3%	0%	0%	0%
	Mature/Old	96%	97%	100%	100%	0%
	No Data	2%	0%	0%	0%	0%
	Acres	**219**	**484**	**4**	**6**	**0**
	Total	**10,016**	**12,047**	**4,283**	**1,767**	**3,751**

3.1.2 Species Composition

Vegetation Type	Landscape Scale Reference/Desired Condition	Current Condition	Trend
Aspen	Aspen 70–100% Ave 85% Conifer 0-30% Ave. <15% No Data/Other	61% 32% 7%	Aspen is being replaced by conifer. Conifer represents more than 30% **outside DFC**.
Douglas-fir	Douglas-fir 65-100% Ave >75% Subalpine fir 0-35% Ave. <25%	85% 15%	Subalpine fir represents a less than 35%, **within DFC**.
Lodgepole	Lodgepole 70 –100% Ave. >80% Other 0-30% Ave. <20%	51% 49%	Lodgepole pine represents less than 70%, **outside DFC**.
Mixed Conifer*	Subalpine fir 30-100% Ave. >40% Douglas-fir 0-50%* Lodgepole 0-50%* Aspen 0-50%*	44 to 50% ? ? ?	Subalpine fir is dominate on 44% of the acres and present on at least 50%, **within DFC**.
Mountain Shrub**	Balance of shrub and understory components.	Approx. 69% balanced	The data here was hard to interpret due to variations in data recording methods. In general it appears that a balance exists.
Mountain Brush	Mosaic of brush and herbaceous understory components.	74% of area reported as mosaic	The data indicated that a good mosaic exists across the landscape.
Sagebrush/Grass	Sagebrush dominant on 95 to 100% Sagebrush not dominant 0 to 5% No data/Other	71 % 18% 11%	The data indicated that sagebrush composition was **outside DFC.** However, this may be partially due to the way cover types were divided up.

The ranges displayed in this table represent a reasonable range around the PFC percentages, which are shown as the average.
** Mountain Shrub composition varies depending on the shrub type. Info needs to be examined on a site-by-site bases.

Vegetation Type	1913	Current
Aspen	20%	20%
Douglas-fir	12%	24%
Lodgepole	7%	8%
Mixed Conifer		3%
Mtn Brush	20%	2%
Mtn Shrub		7%
Sagebrush/Grass	41%	36%

Table 3.1-2 Percent of Cover Type 1913 and now. In 1913 the majority of what now is national forest land was mapped by vegetation type. That hard copy map was recently digitized. This table is a quick comparison of that information to the most recent vegetation typing. Although the definitions of vegetation type may not been directly comparable, it makes an interesting comparison. The cover types that have seen the most striking changes are Mountain Brush, which has been lost, and Douglas-fir which has increased. This is likely due to changes in disturbance regimes. More in chapter 4.

Figure 3.1-5 Species Composition. When aspen wears its fall colors it is easy to see the encroaching conifer pushing their crowns up through the aspen carpet. This photo was taken near the head of Georgetown canyon (fall 2002).

3.1.3 Disturbance Regimes

Vegetation Type	Landscape Scale Reference/Desired Condition		Current Condition	Trend
Aspen	Fire (G4)* Insects Disease	8–141 Ave 39 yrs Endemic Endemic	90 Years + . Endemic+ Endemic+ Timber Harvest 4%	Average post settlement fire interval in more than twice that of pre-settlement. Insect and disease both have increased slightly, but remain at endemic levels.
Douglas-fir	Fire (G3/4) Insects Disease	8 –154 Ave 78 yrs Endemic Endemic	102 Years + Endemic+ Endemic+ Timber Harvest 4%	Average post settlement fire interval is approaching the upper range of the historic fire interval. Insect and disease both have increased slightly, but remain at endemic levels
Lodgepole	Fire (G6/4) Insects Disease	11 –191 Ave 77 yrs Endemic Endemic	104 Years + Endemic+ Endemic+ Timber Harvest 27%	Average post settlement fire interval has been exceeded by 30 years and is approaching the upper range of the historic fire interval. Insect and disease both have increased slightly, but remain at endemic levels
Mixed Conifer	Fire (G6/4) Insects Disease	11 –191 Ave 77 yrs Endemic Endemic	104 Years + Endemic+ Endemic+ Timber Harvest 33%	
Mountain Shrub	Fire	50-100 years*	Approximately 80 yrs +	Average post settlement fire interval is approaching the upper range of the historic fire interval.
Mountain Brush	Fire	25-76 years	Approximately 40 yrs + Timber Harvest 3%	Average post settlement fire interval is approaching the upper range of the historic fire interval.
Sagebrush/ Grass	Fire	25-76 years	Approximately 60yrs +	Average post settlement fire interval is approaching the upper range of the historic fire interval.
Riparian		No Data	No Data	

* G4 See Appendix A for fire group definitions and data.

3.1.4 Noxious Weeds

Noxious weeds found within the project area are Morning glory (*Convolvulus arvensis*), whitetop (*Cardaria draba*), black henbane (*Hyoscyamus niger*), Russian knapweed (*Acroptilon repens*), spotted knapweed (*Centaurea maculosa)*, perennial sowthistle (*Sonchus arvensis*), leafy spurge (*Euphorbia esula*), Canada thistle (*Cirsium arvense*), musk thistle (*Carduus nutans*), yellow toadflax (*Linaria vulgaris*), and dyer's woad (*Isatis tinctoria*). The Caribou National Forest Noxious Weed Strategy (EA, 1996) includes strategies for these noxious weed and other noxious weeds that includes an integrated approach to control noxious weeds. In addition, the Caribou-Targhee Weed Strategy (2000) provides guidance in the prioritization treatment of each of the invasive species.

More recently, the expansion of noxious weeds is becoming more evident across this assessment area. Although the establishment of some exotic noxious weed species such as leafy spurge (*Euphorbia esula*) is not dependent upon disturbance, the frequency and intensity of disturbance can be related to the existence and expansion of others. The increase in motorized vehicle use within the assessment area as well as the dispersal of noxious weed seeds by wildlife and recreational stocks are all problematic contributors.

3.2 Hydrologic Processes and Water Quality

In this section the indicators developed to track the Hydrologic Processes and Water Quality issue will be displayed by 6th field Hydrologic Unit Code (HUC). The use of HUCs as a reporting unit allows for an operational way to understand the spatial context of the indicators and reduces the diluting effects of a largely unmanaged watershed.

3.2.1 WATERSHED CONDITIONS

Reference Condition

In its simplest form, a watershed's condition can be viewed as the status of its components as a result of natural and anthropogenic disturbances. To get a clear understanding of a watershed's condition, both the spatial and temporal variability must be considered. Eight sub-watersheds were identified to address the spatial variability: Bennington, Maple, Georgetown, Big, Red Pine, Rattlesnake, Sulphur, and Wood. The temporal variability was addressed by evaluating both historic and current conditions. This section deals with historic conditions.

Inland West Watershed Initiative Ratings (IWWI)

The IWWI was developed to evaluate all federally managed subwatersheds in the Great Basin and Rocky Mountain areas using common criteria. This analysis focused on three IWWI factors:

- Watershed vulnerability evaluates the inherent risk of instability based upon the presence of sensitive lands. Sensitive lands are defined as having highly-dissected slopes, highly erosive soils, landslide deposits, or landslide prone areas.
- Geomorphic integrity evaluates the function of the sub-watersheds, streams, and riparian areas within the basin.
- Water quality integrity evaluates whether water-related resource values (beneficial uses) are being protected.

Since watershed vulnerability reflects the inherent risk of instability, the historic and current conditions would be the same. This means that the watershed vulnerability of all eight five basins would have been moderate. The "Geomorphic Integrity" and "Water Quality" of all basins would have been high. This implies that most stream segments were properly functioning with only short-term or minor impairments. These ratings would have produced a high composite rating with no damaged segments.

Current Condition

In its simplest form, a watershed's condition can be viewed as the status of its components as a result of natural and anthropogenic disturbances. To get a clear understanding of a watershed's condition, both the spatial and temporal variability must be considered. Eight sub-watersheds were identified to address the spatial variability: Bennington, Maple, Georgetown, Big, Red Pine, Rattlesnake, Sulphur, and Wood. The temporal variability was addressed by evaluating both historic and current conditions. This section deals with current conditions.

Inland West Watershed Initiative Ratings (IWWI)

The IWWI was developed to evaluate all federally managed subwatersheds in the Great Basin and Rocky Mountain areas using common criteria. This analysis focused on three IWWI factors: watershed vulnerability, geomorphic integrity, and water quality integrity. These terms were defined under historic conditions.

	Bennington	Maple	Georgetown, LHF, & Dunn	Big	Red Pine
Watershed Vulnerability	Moderate 20-50% Sensitive	Moderate 20-50% Sensitive	Moderate 20-50% Sensitive	Moderate 20-50% Sensitive	Moderate 20-50% Sensitive
Geomorphic Integrity	Moderate <20% Not fully Functioning	Low >20% Not fully Functioning	Moderate <20% Not fully Functioning	Moderate <20% Not fully Functioning	Low >20% Not fully Functioning
Water Quality	Moderate <20% Impaired	Low >20% Impaired	Moderate <20% Impaired	Moderate <20% Impaired	Low >20% Impaired
Composite	Fair	Poor	Fair	Fair	Poor
Damaged Streams	None	None	None	None	None

	Rattlesnake	Sulphur	Wood
Watershed Vulnerability	Moderate 20-50% Sensitive	Moderate 20-50% Sensitive	Moderate 20-50% Sensitive
Geomorphic Integrity	Moderate <20% Not fully Functioning	Moderate <20% Not fully Functioning	Moderate <20% Not fully Functioning
Water Quality	Moderate <20% Impaired	Moderate <20% Impaired	Moderate <20% Impaired
Composite	Fair	Fair	Fair
Damaged Streams	None	None	None

3.2.2 RIPARIAN AND WETLAND CONDITIONS

Reference Condition

Riparian areas would have been in properly functioning condition meaning that they provided: (1) shade to regulate water temperatures, (2) strength to stream banks (3) large woody debris, (4) fine organic material and invertebrates as a food source, (5) sediment and water filtration, and (6) cover for fish. Specific areas assessed are "riparian conditions" and "floodplain and wetland conditions."

Riparian Conditions

Riparian areas were nearly continuous stringers along perennial stream and intermittent channels. The primary disturbances would have been large episodic disturbances such as avalanches, mass wasting, fire, and floods. Smaller chronic disturbances such as wildlife use would have also impacted riparian conditions.

Flood Plain and Wetland Conditions

These streams flowed through moderately wide to narrow valley bottoms. As a result most wetlands were narrow riverine (riparian) areas made up of willows and some sedges. The primary aquatic function of these areas was to filter sediments, maintain bank stability, and to provide shading and fine organic debris. The function and structure of these wetlands were maintained by periodic flooding. Wetlands were also likely common where streams entered the Bear Rivers floodplain.

Current Condition

Data Sources

- Personal Observations (Philbin, 2000)

<u>Roads:</u> Roads within riparian areas can have dramatic effects on riparian conditions. While effects like increasing the likelihood of sediment delivery, encroaching on the stream, reducing the supply of woody debris, and reducing shading are obvious; other like increased access for cattle, wildlife, and dispersed recreation are not. Riparian roads play a major role along four streams: Georgetown Creek, RHF Georgetown Creek, Sulphur Creek, and Woods Creek.

> <u>Georgetown Creek</u>: Tim Burton (ex-Forest Fisheries Biologist/Hydrologist) identified nine culverts on the main "102 road" in a 1986 report. He found restricted passage at four of these culverts (two by Church Hollow, one below Dud Hollow, and one just into section 24). Besides these culverts the road has had a major effect on the stream up the mining site (all problems noted above plus channelization). From the mining site to the "197 road", the road runs through the riparian area affecting the abundance of riparian vegetation. However, with the exception of a few areas where the road actually encroaches on the creek, there is generally enough of a buffer to filter out most sediment. Above this point, the road is steep and within the bottom of the drainage. Here, runoff is difficult to control and sediment is being delivered to the head of the creek.

RHF Georgetown Creek: The "425 road" closely follows the RHF for most of its length. This is a stable stream, but high sediment loads produce fair and in some locations poor conditions. This high sediment load is especially a problem in the upper section above the diversion. Poor crossings (culverts and fords) are limiting channel and riparian conditions.

Sulphur Canyon The "177 road" runs right along the South Fork for 1.1 miles (from a ford located 1.4 miles above the property line to the stream crossing just inside section 16). This segment is both delivering large volumes of sediment and reducing the inputs of stable large woody debris. The first .6 miles, above the property line, is also reducing the stream's valley bottom width by fifty percent.

Wood Canyon: A small section of the "125 road" is having a major affect on the stability and sediment levels of this creek. At .2 miles above the property line, the stream enters a roadside ditch located immediately at the toe of the fill. Large quantities of sediment and road gravels enter the stream at this point. While in the ditch, the stream is channelized and bermed before being released. Beyond this point it cuts a deep and actively eroding gully (G4/5 stream type). This gully was initiated by the road.

Cattle: Cattle are impacting riparian conditions in isolated locations (reach scale) in RHF Georgetown Creek, Sulphur Creek, and Wood Canyon. While wildlife also grazes these areas, these animals spend less time browsing at any one location than domestic animals.

Mining: Mining has reduced the abundance, species composition, and vigor of riparian vegetation in Georgetown Creek's middle reach.

3.2.3 Flood Plain and Wetland Conditions

Reference Condition

Riparian areas would have been in properly functioning condition meaning that they provided: (1) shade to regulate water temperatures, (2) strength to stream banks (3) large woody debris, (4) fine organic material and invertebrates as a food source, (5) sediment and water filtration, and (6) cover for fish. Specific areas assessed are "riparian conditions" and "floodplain and wetland conditions."

Riparian Conditions

Riparian areas were nearly continuous stringers along perennial stream and intermittent channels. The primary disturbances would have been large episodic disturbances such as avalanches, mass wasting, fire, and floods. Smaller chronic disturbances such as wildlife use would have also impacted riparian conditions.

Flood Plain and Wetland Conditions

These streams flowed through moderately wide to narrow valley bottoms. As a result most wetlands were narrow riverine (riparian) areas made up of willows and some sedges. The primary aquatic function of these areas was to filter sediments, maintain bank stability, and to provide shading and fine organic debris. The function and structure of these wetlands were maintained by periodic flooding. Wetlands were also likely common where streams entered the Bear Rivers floodplain.

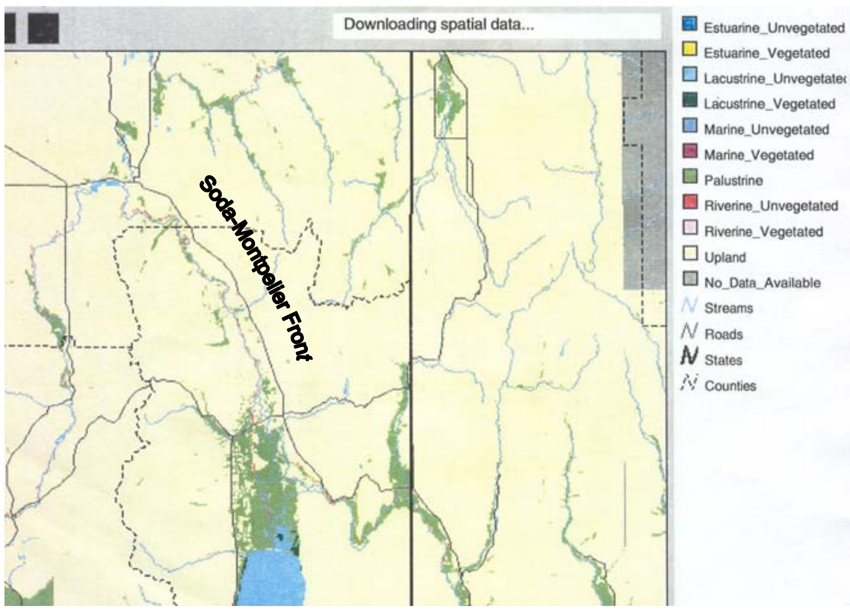
Current Condition

Data Source

- Data was obtained from the National Wetland Inventory (US Fish and Wildlife Service).

Data Gap

- Riverine wetlands are not fully shown.



With the exception of wetland lose in the Bear River flood plain; wetland abundance and function would be similar to historic conditions. At a local scale wetlands would have been lost due to mining in Georgetown Creek.

3.2.4 STREAM CONDITIONS

Reference Condition

Now that the drainage basin, climate, watershed conditions, and riparian conditions have been evaluated we can move on to stream condition/function. In all stream systems there exists a unique balance between many interrelated variables including: stream flow, sediment quantity and size, geomorphic controls, bank vegetation, and floodplain accessibility. A major shift in any of these variables could initiate a series of adjustments leading to a new channel form. This section begins with an assessment of the stream flow and sediment regimes and ends with a discussion of stream conditions.

Overall: Fire and floods are the primary natural disturbances in this area. These events, individually or together, produced large sediment and water yield increases that effected channel conditions. Following the disturbance, material accumulated in both headwater streams and localized areas of the primary channels. This material was then routed downstream delivering nutrients, sediment, and structure. While this pulse created a short-term impairment, it was important in maintaining the long term physical and biological functioning of the system. Following the disturbance was a period of recovery during which time the channel stabilized and provided the morphological features necessary for a variety of aquatic species. This recovery period continued until the next infrequent disturbance "reloaded" or "reset" the system.

Stream Flow Regime

The stream flow regime refers to the quantity and timing of runoff. Both of these variables are critical factors in determining the health of aquatic systems. Climate, watershed condition, and riparian condition all influence the streams runoff patterns.

In a typical snowmelt system, once snow begins to melt at the lower elevations the hydrograph begins to rise. As temperatures continue to increase, more of the basin melts out and flows rapidly rise. In its simplest form, this model produces a smooth hydrograph with the peak occurring when most of the basin is contributing water. In these drainages this peak likely occurred in late May or early June. By mid-June flows would have gradually decreased eventually reaching base flows in September.

Sediment Regime

The sediment regime refers to the size, quantity and timing of soil and rock movement through the watershed. All three of these variables are critical factors in determining the health of aquatic systems. Climate, drainage basin characteristics, watershed condition, and riparian condition all influence the stream’s sediment regime.

Sediment Sources

Most sediment would have entered the stream system through episodic mass wasting events or chronic bank erosion. The mass wasting would have been infrequent events triggered by extreme weather (in the “V” shaped valley bottoms). While less common than bank erosion, these pulses were much larger. Mass wasting also input large rocks and large woody debris, which were important in creating complex aquatic habitat. The bank erosion would have been associated with natural channel migration (in the flat or “U” shaped valley bottoms) as the streams moved across their valley bottoms. This erosion would have been most severe during large runoff events. Sediment from surface erosion would have been uncommon, occurring only after natural disturbances such as fire. However, the well vegetated and relatively flat valley bottoms would have minimized sediment delivery. A final and relatively minor sediment source would have been associated with wildlife impacts to stream banks and game trails.

Transport

During storms and catastrophic events, it's believed that sediment moved through the system in pulses as opposed to a continuous even flow. The steeper A channel types (upper Sulphur, Bennington, and upper RHF Georgetown creeks) would have been source and transport reaches characterized by a high rate of sediment delivery. Within these stream types, moderate duration woody debris storage was the primary storage component. The B channel types (Georgetown, lower LHF Georgetown, and LHF Georgetown) would have been have been transport reaches where fine sediment would be effectively routed through the reach while course sediment would be stored in short duration bed features such as point and side bars. Finally the C and E channel types (middle Sulphur, upper and lower Wood) would have been response/alluvial reaches where deposition would have occurred. These response reaches controlled sediment levels by storing fine sediments on the floodplain and coarse sediments in the streambed. Beaver dams would have also had a substantial affect on sediment transport in the “B” and “C” stream types.

Stream Channel Morphology/Stability

Historically Soda-Montpelier area streams would have been in a state of "dynamic equilibrium." This means that the channel would be in balance - not aggrading or degrading. Following the geomorphic theory that channels form to accommodate the watershed products (water, sediment, and woody debris) that they normally process, a stable stream would not show more than isolated channel erosion. Widespread erosion would imply that the current conditions are outside of the range that formed the existing channel. Stream types (based on geomorphic characteristics) play a major role in determining stability as the inherent stability of the different types varies considerably.

Determining historical conditions was accomplished by evaluating the drainage basin's characteristics and the forces acting upon them and then reconstructing the historic stream system from the existing conditions. The valley bottoms within this watershed would have supported "A", “B” and “E” stream types (Rosgen, 1994). The “A” channels were confined, steep streams with gravel to cobble beds. Woody debris would have been abundant in the timbered areas. The “B” channels were moderate gradient streams with some ability to access a 25 to 50 foot floodplain. These streams also had gravel to cobble beds and abundant large woody debris. The “E” reaches were inclusions found on benches between steeper reaches. These were meandering gravel and sand bed streams that could access their relatively wide floodplains. These were found in depositional areas with little woody debris. Based upon this analysis the average stream(s) would be similar to the following description:

- Floodplains were moist areas that filled the valley bottoms with deep-rooted vegetation. This slowed the rate of channel migration and bank erosion.
- Streams were connected to their floodplains. As such the energy of peak flows was dissipated on the floodplain and channel impacts were minimized.
- Banks were well vegetated and stable. Based upon an interpretation of the valley bottoms and stream types in the analysis area, the likely natural range of bank stability was from 80-90%.

- Beavers played an active role throughout the watershed. These complexes served as grade control structures keeping the channels relatively stable. These features also slowed water velocities, stored sediment, and added to stream structure. Good riparian and lower slope conditions supported a large enough population to maintain the facilities and prevent stream impacts when older dams failed.
- The substrate was dominated by cobble and large gravel. Silts dominated in beaver ponds and where the channel was cutting through old ponds.

Stream connectivity allowed the passage of fish, sediment, and woody debris.

Current Condition

Now that the drainage basin, climate, watershed conditions, and riparian conditions have been evaluated we can move on to stream condition/function. In all stream systems there exists a unique balance between many interrelated variables including: stream flow, sediment quantity and size, geomorphic controls, bank vegetation, and floodplain accessibility. A major shift in any of these variables could initiate a series of adjustments leading to a new channel form. This section begins with an assessment of the stream flow and sediment regimes and ends with a discussion of stream conditions.

Stream Flow Regime

The stream flow regime refers to the quantity and timing of runoff. Both of these variables are critical factors in determining the health of aquatic systems. Climate, watershed condition, and riparian condition all influence the streams runoff patterns.

Data Sources

- U.S. Geological Survey (USGS) stations used included:
  - **Georgetown Creek, Near Georgetown, ID (10069000)**
  - **Bear River @ Soda Springs, ID (10075000)**
  - **Bear River @ Pescadero, ID (10068500)**
  - **Bear River @ Harer, ID (10044000)**
  - **Bear River @ Border, Wyoming (10039500)**
  - **Thomas Fork (really Coal Creek) near Geneva (10040000)**
  - **Salt Creek near Geneva (10040500**
- **Beneficial Use Reconnaissance Project data for Georgetown Creek (1994)**

Assumptions

- The period of record for Georgetown Creek is adequate to determine bankfull flows.
- Although the Bear River @ Pescadero is controlled by Bear Lake and irrigation, the artificial "bankfull (1.5 year event)" still influences channel conditions.
- The basin hydrology for Georgetown Creek is representative of the entire area.

From 1940-51 there is an overlapping period of record between Georgetown Creek and the Bear River. During this time, 85% of Georgetown Creek's peaks came in May and June while 75% of the Bear River's peaks (below Bear Lake) occurred in June and July. This delay can be attributed to water storage in Bear Lake and irrigation diversions.

The importance of Georgetown Creek to the Bear River can be summarized as such:

- If all the flow reaching the mouth of Georgetown Canyon were actually delivered to the Bear River, it would account for 30% of the water gained between Pescadero and Soda Springs (table 4). However, the amount of flow that actually reaches the Bear River is unknown.

- Georgetown Creek makes up 5% of the Bear River's flow during May and June. This percentage is fairly high considering that the Georgetown subwatershed makes up only .6% percent of the Bear River drainage (at the confluence). To obtain this figure, bankfull flows were compared for the confluence area (table 4). This percentage was than adjusted since Georgetown Creek reaches its peak while the Bear River is still rising.

- Per unit area the Georgetown drainage produces 5.7 times more water than the Bear River basin up to this point (table 5). This reflects the magnitude of irrigation loses and water storage in Bear Lake.

- The Georgetown Creek watershed behaves like the other moderate sized drainages in this area. As shown in table 5, the Georgetown subwatershed produces 2.0 cfs/square mile. This is consistent with water production in Coal and Salt creeks. This implies that the same runoff drivers are operating in these drainages. However, base flow was found to be 4.2 cfs in 1994 (BURP) indicating a 10 fold increase between base and peak flows. This would make this basin less flashy than those in the Thomas Fork area.

Other findings related to the Bear River:

- The balance between water production and loss does not change between Pescadero and Soda Springs as shown by an equivalent unit discharge.

- The difference between tributary and Bear River water production (82%: Table 5) can be attributed to three factors: (1) storage in Bear lake, (2) irrigation losses, and (3) an increase in land area with no increase in water inputs. The third factor deals with the fact that there are vast valley bottoms that add considerable area yet produce almost no water. This is also true of the many small canyons that are tributary to the Bear River. Only the major canyons have elevations/precipitation high enough to support streams.

- Besides Georgetown, no other drainage contributes significant flow to the Bear River.

Table 4: Comparisons of Bankfull Flows at Different Locations Along the Bear River

Basin	Area	Bankfull
Bear River (Border)	2486	1884
Bear River (Harer)	2839	1810
Bear River (Pescadero)	3705	1300
Georgetown Creek	22	43
Bear River (Soda Springs)	3972	1448

Table 5: Comparisons of Bankfull Flows and Unit Discharge

Basin	Area	Bankfull	Ratio
Georgetown	22	43	2.0
Coal Creek	45	92	2.0
Salt Creek	38	111	2.9
Bear River (Border)	2486	1884	.76
Bear River (Harer)	2839	1810	.64
Bear River (Pescadero)	3705	1300	.35
Bear River (Soda Springs)	3972	1448	.36

Sediment Regime

The sediment regime refers to the size, quantity and timing of soil and rock movement through the watershed. All three of these variables are critical factors in determining the health of aquatic systems. Climate, drainage basin characteristics, watershed condition, and riparian condition all influence the stream's sediment regime.

Data Source

- Field Reviews of all perennial and intermittent streams (Philbin, 2000)

Sediment Sources

While upslope erosion displaces soil particles, this material must be delivered to a stream to effect water quality. This generally occurs where disturbances are either close to or cross a stream. Where disturbances are not close to streams, sediment is efficiently trapped on the hillslopes. However, this filtration is less likely to occur where motorized trails run straight up the slope or grazing reduces ground cover.

The primary sediment sources can be placed into three categories: (1) channel disturbances/ erosion; (2) mass wasting; and (3) surface erosion. Of these, channel erosion and mass wasting are the key sediment producers since they deliver large pulses of material in all size classes.

<u>Channel Disturbances/Erosion:</u> Channel erosion is important since it produces both suspended and bedload sized particles. The coarser material such as sands and fine gravels are transported as bedload, which can have negative effects on channel morphology. These sediments are also input directly to the stream system as opposed to sediment from surface erosion that must be delivered. In this watershed, the main causes for channel disturbances are road encroachment, livestock grazing, and altered riparian vegetation. This is primarily a problem in Woods Canyon.

<u>Mass Wasting:</u> Mass wasting also produces both coarse and fine sediments. This input is greatest in Bennington Creek where the natural instability of the streams inner gorge has added a lot of course sediment (and structure) to the stream.

Surface Erosion: The vast majority of surface erosion is generated from riparian roads. Overall, the Soda-Montpelier Front road network is contributing a moderate amount of sediment from those roads identified in the riparian disturbance section. This is primarily a problem in Georgetown (and its forks), Wood Canyon, and Sulphur Creek.

Transport

As with historical conditions, the ability of a stream to store or transport sediment is dependent upon channel morphology, particle size, flows, and large woody debris. Since large woody debris is currently lacking in most streams (due to road related impacts), the moderate duration storage component would be reduced and most storage is now occurring in short term bed features. This has resulted in larger sediment pulses than would have occurred naturally. Since most sediment storage is now in bed features, cobble embeddedness and surface fines are likely increased during low flow periods. Overall, since most storage sites are short-term locations sediment can move quickly through this system.

Stream Channel Morphology/Stability

Historically these streams would have been in a state of "dynamic equilibrium." This means that the channel would be in balance - not aggrading or degrading. Following the geomorphic theory that channels form to accommodate the watershed products (water, sediment, and woody debris) that they normally process, a stable stream would not show more than isolated channel erosion. Widespread erosion would imply that the current conditions are outside of the range that formed the existing channel. Stream types (based on geomorphic characteristics) play a large role in determining stability as the inherent stability of the different types varies considerably.

Data Sources

- Data for this section came from field reconnaissance (Philbin, 2000).

Bennington Canyon:

From the canyon forks to its mouth, Bennington Creek is a high-energy boulder controlled stream (Rosgen type “A2/3”). While this is a stable stream, its condition is only fair due to naturally occurring mass wasting. This upper bank unraveling is not expected to further impair channel conditions because the stream’s energy is capable of routing this material through the system. A potentially serious problem is that a newly constricted road will likely become a major sediment source to the lower reach. This is a very steep and poorly designed road (on private land) that runs through very erosive soils and dead-ends at the creek.

At the forks, the left fork is an intermittent “A2/3” stream type that is stable and in good condition. The right fork is a perennial “A4a” stream. This is a stable reach in fair condition. The only factors affecting this reach are naturally high sediment levels and a small knickpoint in its lower section. The upper section is in good condition as it flows through a “V” shaped valley bottom with abundant large woody debris (LWD).

Georgetown Canyon:

Georgetown Creek is the primary stream draining this subwatershed. The upper reach (197 road to Grant Canyon) is a stable "B4" stream type in fair condition. This stability is primarily a function of a well-vegetated riparian area. Impacts are limited to small openings in the riparian canopy (where a few headcuts are present) and sediment from the valley bottom road. Overall, the stream would be in good condition except for the headcuts and elevated levels of fine sediment. Fish were spotted below a headcut just above Lateral Canyon. The portion of Georgetown Creek below the mining site was not evaluated.

The Left Hand Fork begins at a large spring .5 miles above the property line (at the gravel pull off). This reach is a "spring/B4/E4b" complex with good overall stability. Channel conditions are fair, as the adjacent road has increased sediment levels (silt and gravels). This increased sediment load will likely persist for several years as this is a low energy system. Minor livestock and wildlife impacts were found below the culvert and at other small sites. However, these locations appear to be improving.

The Right Hand Fork is an E4b stream type with A4 sections near the upper end. A ½ mile long section of the stream has been de-watered by a domestic water diversion. This is a stable stream but high sediment loads generated from the adjacent road has produced fair and in some cases poor conditions. This is especially a problem in the upper section above the diversion. Poor crossings (culverts and fords) are also limiting channel conditions. In 2001 major work was completed at the diversion that likely affected short-term water quality.

Sulphur Canyon:

Two fork of Sulphur Canyon are located on National Forest System Lands. However, the Middle Fork does not have a defined channel from its headwaters to the Forest Boundary. This valley bottom has large rock and abundant down wood which would minimize the risk of scouring a channel in this area. The South Fork is perennial until it reaches the property line, and dewatered somewhere below that. Three distinct reaches were identified and are discussed below.

The highest reach is a stable "A4" stream in fair condition. The adjacent road has increased sediment production and decreased the amounts of woody debris storage resulting in large sediment pulses. This is having a substantial affect on downstream water quality and stream function. The reach begins 2.5 miles above the property line and ends 1.4 miles downstream (where a side road fords the creek).

For the next .6 miles the stream is a stable "E4/5b" stream in fair condition. Again road related sediment has degraded stream conditions. In low gradient sections, 2 – 4 inches of sediment was overlying the original gravel bed. This aggradation has reduced channel capacity and increased flooding. In steeper sections the channel is still affected by sediment but capacity remains.

The lowest reach is a stable "A3" channel type in good condition. This reach has rocky banks and a large gravel/cobble bed. There are also several areas where the stream flows subsurface through these cobbles. While the road reduces the valley bottom width in half, the channel is well armored which is preventing adverse channel impacts.

Wood Canyon:

Wood Canyon had three distinct stream reaches above the Forest Boundary.

The stream begins as an "E5" stream type that has good stability. While both the upper and lower banks are in good condition, elevated sediment levels have resulted in an overall rating of fair. The source of this sediment has not been determined.

The stream then enters a .7 mile long canyon where it becomes an "A4" stream type with abundant woody debris. Again the upper and lower banks are in good condition, but elevated sediment levels have resulted in an overall rating of fair. It appears that this sediment is originating from the upper reach and from wildlife use. Several wallows were noted and a cow and calf moose were observed during this survey.

The stream leaves the canyon .4 miles above the property line and becomes an E4 channel type. It flows freely for about .2 miles before entering a roadside ditch were large quantities of fine sediment and road gravels enter the stream. The stream then flows through a channelized and bermed ditch before leaving the roadside and cutting a deep and actively eroding gully ("G4/5" stream type). This is how the stream leaves the forest and continues onto State land. This reach is very unstable and is in poor condition.

3.2.5 WATER QUALITY

Reference Condition

Water Quality refers to the ability of a water body to support its beneficial uses. This can relate to changes in the physical channel or the water column. For this report, changes to the physical channel are discussed under "STREAM CONDITIONS" while water column impacts are emphasized here.

Water quality was likely excellent and capable of fully supporting all beneficial uses. The only sources of pollution would have been native wildlife and nutrient releases following large wildfires. Properly functioning riparian areas would have provided ample vegetation to filter animal waste and sediment. Water temperatures were fairly cool due to the mature vegetation in the riparian areas, topographical shading in these west aspect watersheds, and the relative high elevation of the basin.

Current Condition

Water Quality refers to the ability of a water body to support its beneficial uses. This can relate to changes in the physical channel or the water column. For this report changes to the physical channel were discussed under "STREAM CONDITIONS" while water column impacts are emphasized here.

Water Quality – Water Quality Limited Segments (303(d))

No streams are identified as being water quality limited.

3.3 Soil Productivity

3.3.1 Data Sources and Data Gaps

Reference Condition

Data Sources

- Soil Survey of the Caribou National Forest, Idaho (USDA Forest Service, 1990)
- A Hierarchical Stratification of Ecosystems of the Caribou National Forest, USDA Forest Service, 1997
- Soda/Montpelier Assessment, Watershed/Hydrology Report and Appendix A. Fire Regimes Soda/Georgetown Front, Caribou-Targhee National Forest USDA. 2002.
- Darrel VandeWeg, Geologist. Specialist Report on Historic Mining. 2003.
- John Lott, Soil Specialist Report for Fall Creek Watershed Analysis. 2000
- Heidi Heyrend, Range Specialist Report, Georgetown Watershed, Reference Conditions
- Ambrose, Stephen E., Undaunted Courage, Meriwether Lewis, Thomas Jefferson, and the Opening of the American West, First Touchstone Edition, 1997
- Haines, Aubrey L. editor, Journal of a Trapper, Russell Osborne, University of Nebraska Press. 1965
- USDA Forest Service Environmental Statement: Georgetown Creek, Watershed Project, Bear Lake County Idaho. 1973.
- Forest Service Historical 3510 Watershed Protection and Flood Prevention files

Data Gaps

- No real data on what conditions were actually like in prehistoric times.
- Assumptions will be liberally used

Current Condition

Data Sources

- Soda/Montpelier Front Ecological Assessment for Vegetation and Hydrology (Caribou Targhee National Forest, 2002)
- A Hierarchical Stratification of Ecosystems of the Caribou National Forest, USDA Forest Service, Caribou National Forest. 1997.
- Soil Survey of the Caribou National Forest, Idaho 1990 (USDA Forest Service)
- GIS layers in the Caribou-Targee National Forest GIS database
- Alma Winward, field notes from AMP review 2002
- Aerial photograph of the Caribou National Forest 2001
- Borst, H.L., A.G. McCall, F.G. Bell. 1945. Investigation in erosion control and the reclamation of eroded land at the northwest Appalachian Conservation Experiment Station, Zanesville, OH, 1934-42. USDA Technical Bulletin 888. USDA, Washington, D. C. pp. 1-95
- Olson, et al., "Preliminary Landslide Study of Eastern Caribou Forest" 1970

Data Gaps

- Accurate information on total pioneered (illegal) ATV trails and other unauthorized motor vehicle roads.
- Updated landslide inventory map
- Long term erosion studies covering key areas in forest (rangelands, forested lands, roaded and recreational areas)
- Major bedding areas for sheep and other localized grazing disturbances caused by sheep or cattle.

3.3.2 Properties

Reference Condition

Soils change very little over long periods of time. Geology changes over much longer time frames than even soils. The thrust-faulting, folding and block faulting processes would be unchanged. Likewise, there would be no difference in the parent material or soil properties from which the present day soils weathered. The erosion rates would be the same in the, Wells Dinwoody and Phosphoria Formations. The same fluvial, residual and gravitational transfer processes would still result in about the same areas of unstable slopes, and the same potentials for soil erosion, soil hydraulic conductivity and amount of inherently low productive soils. The soils susceptibility to compaction, displacement and puddling would be the same.

Weather conditions however, do vary. Historically, between 1880 and 1920, the western United States experience more arid conditions and more intense thunderstorms (John Lott, 2000). Vegetation patterns would also adjust to weather changes and could ultimately change the ph of the soil in local areas. Stream volumes could be expected to adapt to precipitation patterns by expanding or contracting, therefore changing the geomorphology of watersheds to varying degrees

Current Condition

Below is a table of the soil families and some of the most important properties for management considerations. The table includes only the soils within the Forest Service boundaries.

Georgetown Watershed Soil Attributes

Data	Association	Slope	Low Productive	Unstable	Not Stockable	Timb_suit	Erosion Hazard	Bedrock	Hydrogrp	Compaction Hazard	Acres
1	Judkins-Ericson-Wallrock Families assoc.	2-10%	x		x	no		mix sed metamor	B to C	high	54.1
51			x		x	no		lacsed; alluv	A,B,C		131.6
82	Rosset-Beaverdam-Toone Families complex	10-20%	x	x	x	no		mix sed metamor	C	high	233.0
200	Blaine-Nisula-Swede Families complex	30-60%	x		x	no		sedimentary	B	moderate	2229.6
201	Farlow-Judkins-Starley Families assoc.	40-60%	x		x	no	mod-high	mix sed metamor	B to C	mod-high	2672.8
300	Ericson-Cloud Peak-Ketchum Families complex	15-40%				yes		sedimentary	B	mod-low	3404.8
301	Blaine-Dranyon Families assoc.	15-40%				yes		sedimentary	B	moderate	1709.7
302	Farlow-Thayne-Nisula Families assoc.	10-40%				yes		sedimentary	B	mod-high	329.0
380	Povey-Alpon-Ketchum Families complex	30-55%				yes		mix sed metamor	C	mod-low	1355.5
381	Parkay-Judkins-Farlow Families complex	30-35%				yes		sedimentary	B	moderate	3832.1
383	Farlow-Starley-Povey Families assoc.	35-55%	x		x	no		sedimentary	B	mod-high	757.4
400	Farlow-Starley-Cloud Peak Families assoc.	30-60%				yes	high	sedimentary	B to C	mod-high	11.2
404	Judkins-Farlow-Swede Families complex	40-65%				yes	high	sedimentary	B to C	mod-high	11073.3
405	Starley-Povey-Farlow Families assoc.	45-70%	x		x	no	mod-high	sedimentary	C to D	mod-high	11292.9
406	Blaine-Judkins-Richvale Families complex	35-60%				yes		sedimentary	B to C	mod-high	1609.9
407	Devoe-Blaine-Farlow Families complex	40-65%	x	x	x	no	mod-high	sedimentary	B	mod-high	6102.1
451	Beaverdam-Swede-Dranyon Families complex	25-35%		x	x	no		sedimentary	C	moderate	185.8
473	Dranyon-Judkins-Povey Families complex	30-50%	x		x	yes		sedimentary	C	moderate	3140.7
653	Judkins-Nisula-Farlow Families complex	40-60%				yes		sedimentary	B	mod-high	582.6
656	Cloud Peak-Jughandle-Swede Families complex	30-50%				yes		sedimentary	B	mod-high	440.2
755	Ketchum-Nisula-Farlow Families assoc.	25-45%				yes	mod-high	sedimentary	B	moderate	208.4
870	Blaine-Judkins-Swede Families complex	10-30%				yes		sedimentary	C to D	moderate	881.6
871	Cloud Peak-Alpon-Ketchum Families assoc.	10-30%				yes		sedimentary	B	mod-low	2440.3
912	Calcic Cryoborolls-Starley-Judkins Families complex	35-60%	x		x	no	high	sedimentary	C to D	mod-high	596.9

Soil Erosion Potential

Erosion is the detachment and transport of individual soil particles or aggregates of particles by wind, water or gravity. Much of the watershed area has been influenced by some form of erosion processes (USDA Forest Service, Caribou NF, 1997). The Wayan Twin Creeks and Preuss Formations have a high natural erosion potential. Erosion is also a factor of slope and soil type. Many of the soils in the Georgetown watershed have evolved from weathered shale, limestone, mudstone and siltstone. These soils tend to weather into clays and silts, which are easily eroded when the protective ground cover is removed.

Ground cover is an indicator for soil erosion potential. A vegetative ground cover of at least 75% can minimize or prevent erosion on grazed rangelands (Borst, McCall, and Bell 1945). Ground cover can also include rock fragments (larger than ¾ inch), and plant litter (leaf or duff). Canopy cover also helps shield the soil beneath from the forces of raindrop impact and reduces or eliminates erosion. High erosion potential soils cover 11681.4 ac. or 21.5% of the watershed.

Slope Instability or Mass Wasting Potential

Due to the thrust faulting, folding and other faulting of weak soft sedimentary parent materials, a moderate amount of the watershed (11681.4 ac. or 12 %) has unstable landforms that are subject to mass wasting and landslides. Formations that have been documented as being unstable include the, Twin Creeks Formation, Preuss Formation and the Wells Formation. (Olsen et al. 1970. and USDA. 1997). Indicators for slope instability are hummocky side slopes, with pistol-grip tree bases, and evidence of old landslides or debris flows. Soils in some areas have a high shrink-swell clay component. Through an aerial photo analysis, there appeared to be no recent large slide activity. Debris slides and avalanche slides on steep mountain slopes are supporting vegetation. Small slides were visible from over-steepened slopes near drainages. Water saturation is the probable factor in these failures. These areas have natural occurring slides and are not related to management activities.

Compaction and Soil Displacement Potential

Soil compaction is an increase in soil density (weight per unit volume) that occurs when the soil particles have been packed together more tightly as a result of some surface pressure. Compaction results in a decrease of soil porosity and an increase in soil strength (resistance to penetration). Compaction is detrimental when it limits aeration, root penetration, and water infiltration. Indicators can be soil structure changes (massive or platy structure) and increase in soil strength measured by resistance to a soil shovel. When compared to a sample taken in the undisturbed area, an accurate measure of the increase in soil density is available. Another indictor is a decrease in the cumulative annual increase in tree growth in forested areas or decrease in plant vigor in range vegetation. Soils with a high compaction potential are few in the Georgetown watershed, comprising only 287 ac (.5%). Soil potentials where taken from the Caribou National Forest Soil Survey, done in 1990.

Soil displacement is the movement of soil from one place to another by erosive or mechanical forces. It is considered detrimental when an area one meter by one meter or larger, has lost either 5 cm or ½ of the humus enriched top soil, whichever is less. Detrimental soil loss is considered to occur when top soil loss exceeds the soil loss tolerance value for the specific soil type. Indicators for loss of organic matter are the loss of the humus-rich surface soil (Task Team Edits, FHS 2509.18. 2002). Soil displacement potentials are not listed in the soil survey and no data exists to identify them. Displacement most typically occurs with heavy machine operations where the top soil is totally or partially removed.

3.3.3 Management Activities

Reference Condition

Farming/Ranching

The significant changes however, came from the influx or European settlers in the 1860's. Georgetown was first settled in 1870 by five pioneer families. They were soon joined by other families. The first sawmill was located on the right hand fork of Georgetown Canyon. The Georgetown Irrigation Company was organized in 1878, which secured agricultural as the main economy for the growing village (USDA Department of Agriculture, 1972). One of the biggest of the initial changes was clearing the land just outside the forest boundary in the Georgetown area for farming opportunities. Protective vegetation covers were plowed under and the newly exposed soil was exposed to erosion and displacement. All native vegetation, much of it brushy species associated with riparian area and sagebrush, was removed, and converted into dry cropland farming for grains,(wheat and barley) and forage crops. Such a change would alter soil microorganisms and therefore, effect nutrient cycling.

Some evidence of soil damage done in the past was gleaned from the Watershed Protection and Land Treatment files (3510) The 1973 Georgetown Watershed Environmental Statement reports that sheet, rill and some gully erosion existed on dry croplands. On the irrigated lands the existing surface irrigation system contributed to erosion problems. Because irrigation water was more abundance during the spring, and often scarce during the summer, there was a tendency to over-irrigate in the spring. This practice not only caused an increased erosion rate, but also contributed to loss of the soil structure and tilth when machinery was operated on wet soils. .

The livestock industry followed farming into the area. After 1880, local herds begin to rapidly increase, along with sheep bands moving through the area ((Heidi Heyrend - Range report 2002). Large numbers of livestock ushered in detrimental soil disturbance to the analysis area within the Georgetown watershed boundary. By 1913, an effort was made to bring management into the public range to protect the resource from becoming damaged to the point of long-term loss of productivity. Much of the rangelands are on steep slopes with shallow soils. The lack of good management in the past allowed the depletion of the native vegetation. Livestock used the area too early in the spring and stayed too long through the summer. Non-uniform location of livestock watering sources often resulted in uneven use of forage. Some areas had deteriorated to the point that restoration of the native plants was not effective. Seeding with non-native grasses such a smooth broom and bluegrass was necessary (Georgetown Watershed Environmental Statement, 1973).

Roads

Before the advent of the European's arrival, the native Indian's had developed routes of travel. While no information is available on the specifics of these travel routes, it can be reasonably assumed that they consisted of a system of pathways (Ambrose, Undaunted Courage, 1996). With the European farmers and ranchers came wagon roads, followed by more developed roads to accommodate the increase in population. Cattle drives probably paved the way for a more direct system to long distance markets as well.
The Union Pacific Rail Road came to this area in the late 1800's. Before motorized roads became established, erosion rates from travel routes were assumed to be relatively low.

Ground Cover

Prior to settlement, ground cover was assumed to have been adequate to protect the soils from erosion. Forest vegetation was assumed to be less dense and aspen more plentiful with a more frequent fire regime. This assumption is made from descriptions from the Lewis and Clark expedition (Ambrose 1997) and excerpts from a journal kept by a trapper that traveled through this area from 1834 to 1845 (Osborne, 1955).
Riparian areas and wetlands would most likely have had fewer impacts on vegetation and soils from the native ungulates alone than from the grazing pressures of domestic livestock and the wild native grazers combined.

Mining

Historically, mining was done by underground tunnels, causing minimal ground disturbance. Mining for phosphate started in 1907 at the Bennington Canyon Mine and ended in1912. In 1939, after several exploration trenches were constructed, a small pit with and exploration tunnel was completed in 1941. Georgetown Canyon Mine began in1909 and ended in 1916. In the early 1950's, mining activities resumed and construction began on a phosphoric acid plant and rail line. Open pit mining began in 1958. However, by 1964 all production stopped and the mine has been inactive since. The phosphoric acid plant was deconstructed and moved north of Soda Springs, Idaho. Rattlesnake Canyon Mine was a small tunnel mine that operated for less than a year and then shut down in 1920. Another small underground mine was the Diamond Gulch Mine which started and was completed in 1960. Reclamation was done over the next two years and the lease was relinquished in 1993. A Sulphur mine was operating out of Sulphur Canyon at the north end of the watershed around the early 1900's.

A large restoration project was conducted between 1972 – 1975 in Georgetown Canyon.. This project involved three debris basins, 106 gully plugs, six miles of erosion control on roads, 820 feet of stream bank stabilization and three miles of system road improvements on Forest Service land.

The primary factors that adversely affected the watershed was phosphate mine waste dumps, mining roads, and the residual phosphate ore dump in Phosphoria Gulch. Most of these activities were on private lands belonging to Becker Industries' Mining Gulch.
This resulted in an overland flow of chemical waste that reached the stream and eliminated all fish life and other aquatic biota for a 9 mile stretch in the main branch of Georgetown Creek,

below the mill site, between 1957 and 1962. After the watershed restoration project was completed, in 1973, 6 – 8 miles of stream had returned to a fishery support condition (Forest Service 3510 files.1967).

Current Condition

Most areas in the Georgetown watershed analysis area are being managed for sheep grazing, timber harvest and recreational uses such camping, hiking, horseback riding or off-road vehicle use (in selected areas). Fire and forest health issues also include thinning projects and removal of diseased and dying trees. Also, within the watershed analysis boundary but not within the forest boundary, private lands are being farmed for hay and other small grain crops grown for livestock consumption or for milling.

Livestock Grazing

Livestock grazing is the most active current management activity in the Georgetown watershed. All allotments are grazed by sheep with the exception of Maple Canyon and a very small portion of Montpelier Elk Valley. A data gap exists on the location and amount of detrimental soil disturbance that actually exists. Another data gap exists in range vegetation cover, condition and composition in the analysis area. Adequate vegetation cover is an important component to assess soil loss and productivity, because it not only protects the soil surface, but also incorporates organic matter into the soil, (both below ground root mass and above ground litter). Of special concern with sheep, is information on where and to what extent is the soil disturbance caused by their bedding grounds. These data gaps will have to be analyzed on a site specific basis for future in project work

Georgetown Watershed Allotments

Allotment Name	Count	Acres
Bennington Can S&G	2	4786.625
Crow Creek S&G	8	13.04
F.S. Horses S&G	1	73.621
Fossil Canyon S&G	15	5995.056
Georgetown Canyon S&G	2	4781.649
Green Mountain S&G	9	655.37
Johnson Creek S&G	3	80.732
Maple Canyon C&H	1	3848.116
Montpelier-Elk Valley C&H	16	217.431
North Sulphur S&G	4	3076.692
Rattlesnake Can S&G	3	6748.386
Red Pine S&G	7	6121.601
Slug Creek S&G	17	1.642
South Sulphur S&G	8	2661.841
Twin Creek S&G	4	5782.979
Wells Can S&G	5	8.038
Wells/Dunn Canyon S&G	1	6246.927
rna non	1	251.728
	3	3929.971

Colored area are allotments that have gone through NEPA Revision

Recreation Use

One Caribou National Forest administrated campground is located within the watershed. Summit View Campground is located just inside the watershed boundary. There is no stream nearby the campground and water is provided by a well. However, camping is dispersed throughout the flatter places of the watershed area. Only one of these areas is adversely impacted and it is located just to the south of Summit View campground in a flat area next to Georgetown Creek Sheep are causing some impacts as well as campers (See the map) to show known dispersed areas). No detailed information is known on the dispersed camping areas north of Big Canyon (Ken Klingenberg-personal conversation).

Another soil impact is the pioneering of ATV or off -road vehicles. Tracks some times go across creeks and up the fall line of steep a hillside. This activity can damage riparian soils by compaction and/or, soil puddling. The upland soils have the potential for the tire treads of the off road vehicle to channel water down hill with considerable velocity. The overland channeled flow can dislodge soil particles and lead to gully erosion. Increasing use off road travel is a growing problem in the Caribou National Forest and very hard to control (personal conversation with Ken Klingenberg and Maury Young. Caribou NF). An estimate of the non-system, unauthorized trails is around 28miles (Joe DeClark, map). Information is missing for the north portion of the watershed, past Fossil Canyon sheep and goat allotment.

Timber Sales

Data from 1965 to 1999 shows the timber sale units that have been harvested from the Georgetown watershed. An onsite inspection of these sales did not occur in the field inventory. An assumption is made that very little (to none) soil loss is occurring as erosion from harvest units logged after 1996. Vegetation would have had an opportunity to establish to protect the soil from most erosion processes. However, the amount of soil displacement and soil compaction is not known. Past logging units totaled 1104.5 acres.
If the assumption was made that all the acres where detrimentally disturbed soil, the total amount of disturbed soil would not exceed the 15% limit stated in the Caribou National Forest Standard and guidelines (see table summary by sub-watershed). However, for this analysis, the entire logging area was used as a disturbance, even though this is not accurate.

Mining

There are no active mining sites for phosphate at the present. However, past mining open pit operations are still considered detrimentally disturbed. The watershed area does have a number of phosphate leases that will, at some point be mined. Exploration at some of these leases indicates that they are economically feasible for development. Plans for mining development will be submitted in the future as the other leased on the forest are developed and exhausted.

Number	Owner	Leased	Location	Discription	Acres
IDI-01603	J.R. Simplot	yes	Trail Canyon	Exploration drill holes	40.233
IDI-01603	J.R. Simplot	yes	Trail Canyon	ExplorationComplete	98.732
IDI-01603	J.R. Simplot	yes	Trail Canyon	ExplorationComplete	530.044
IDI-01603	J.R. Simplot	yes	Trail Canyon	ExplorationComplete	43.047
IDI-014958	J.R. Simplot	yes	Sulfur Canyon	ExplorationComplete	312.516
IDI-016179	J.R. Simplot	yes	Swan Lake	ExplorationComplete	44.036
IDI-07240	NuWest Mining	yes	Husky #4	Exploration drill holes	365.053

Low Soil Productivity

Areas of inherently low soil productivity exist throughout the watershed. Certain soil properties are responsible for this, lack of vegetation regeneration such as low available water-holding capacity (AWC), shallow rocky soils, south and west facing aspects, and areas of high soluble salt concentrations Half the land base in the Georgetown watershed has low soil productivity. .

Summary Table of Georgetown Soil Properties

Soil Properties	Acres	% of Watershed (within FS Bnd)
High Compaction Potential	287	0.5
High Erosion Potential	1168.4	2.1
Soils Suitable for Timber	31019.1	57
Unstable Soils (MW)	6520.8	11.9
Inherently Low Productive	27211.0	50.0
Potential Soil Disturbing Activities		
Past Mining Disturbance	291.3	0.5
Logging (total area)*	1104.5	2.0
ATV	28.1 miles 13.6 ac.	0.02
Roads in Analysis Area	404 miles	Road Density 2.08 mi/mi^2.
Roads within Forest Bnd.	82.4	Road Density 0.95 mi/mi^2

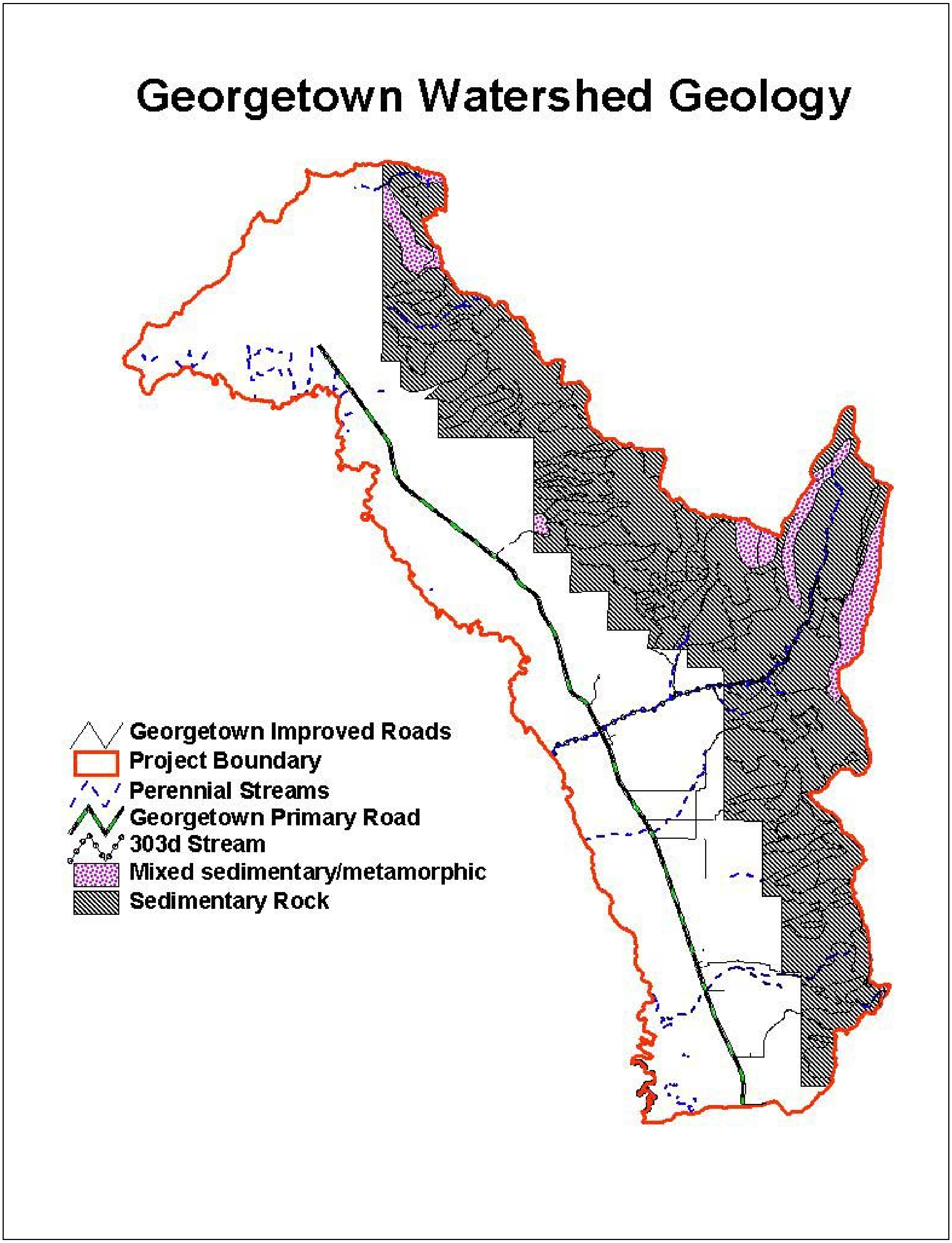
Roads

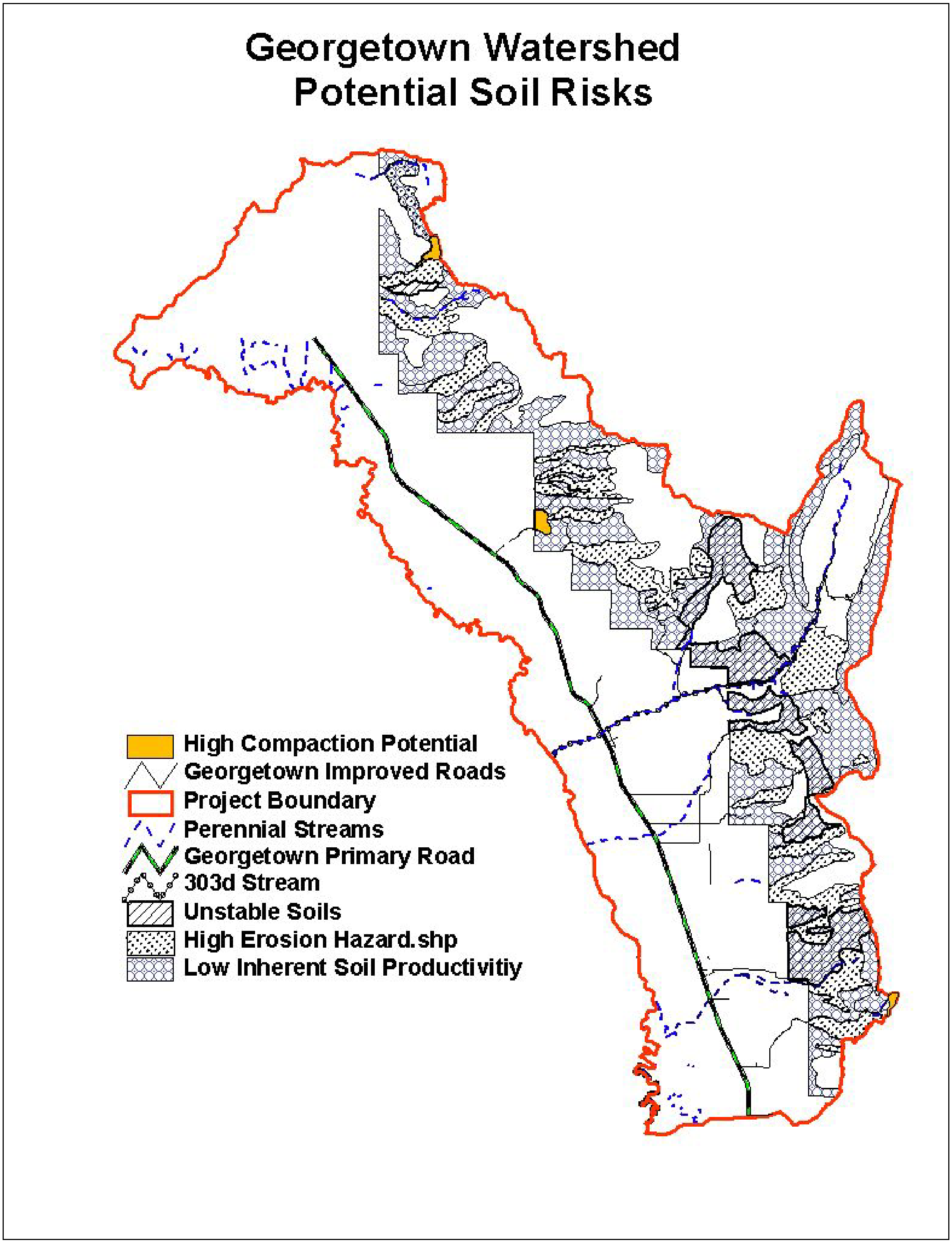
Un-surfaced roads are major source of soil erosion, both in the cut and fill portions and the road prism itself. Presently, the watershed analysis area has an approximate total of 404 miles of roads and trials, including motorized and non-motorized, open forest service system roads, closed road prisms from timber harvest and paved roads). Road density is 2.08mi./mi.^{2} for the entire watershed area (124,091.5 ac.) and .95 mi./mi.^{2} (82.4 miles) for the portion of the watershed within the Forest Service boundary. The rational for doing two road density analyses is to reflect the town of Georgetown, Bennington and Hwy. 30 as part of the reason for such a high road density. In addition, 140.7 miles of road are within 300 feet of a perennial stream or 150 ft. within intermittent stream or Riparian Habitat Conservation Area (RHCA). The potential for sediment delivery to streams is high in these areas.

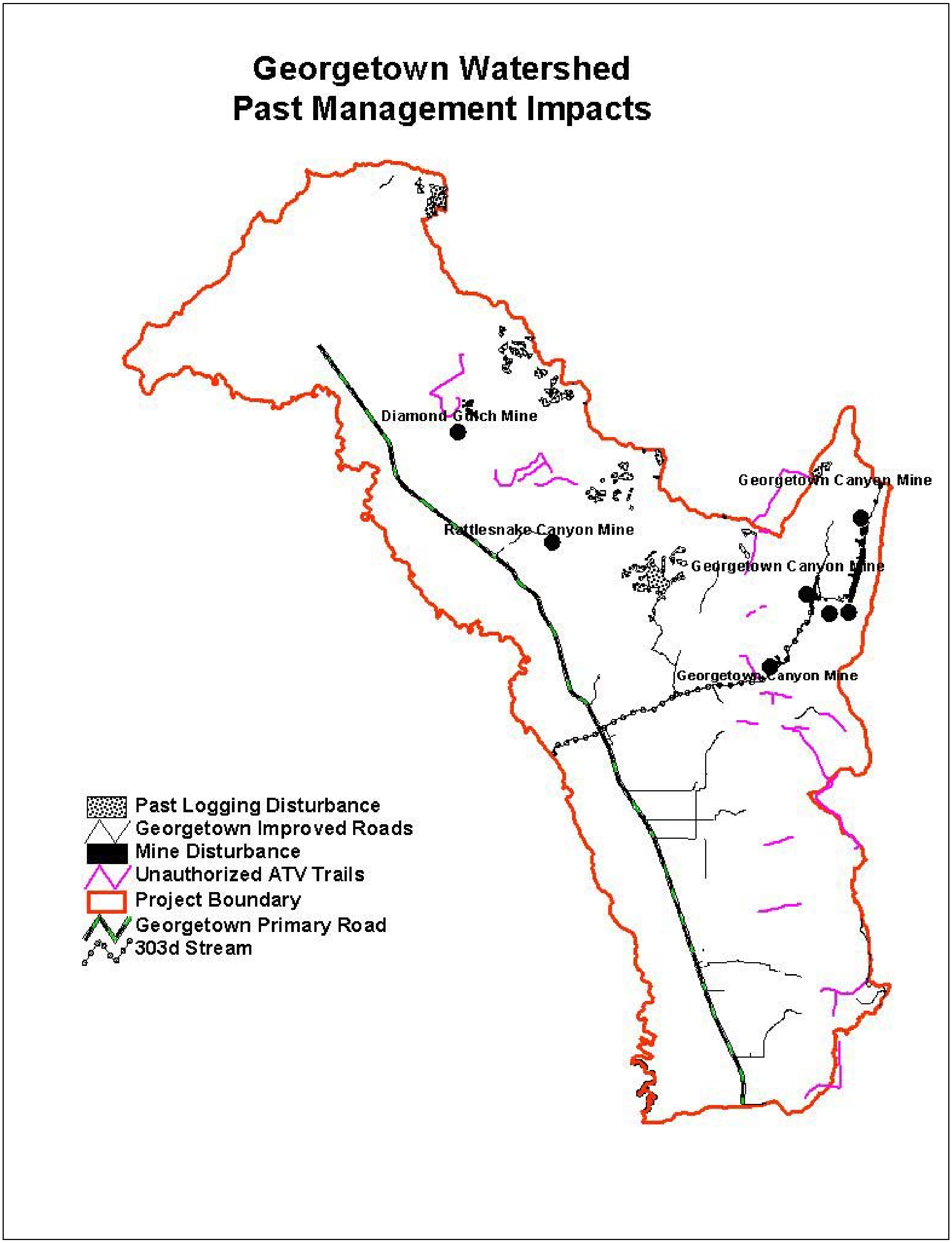
Georgetown Watershed Soil Properties and Disturbance Potentials

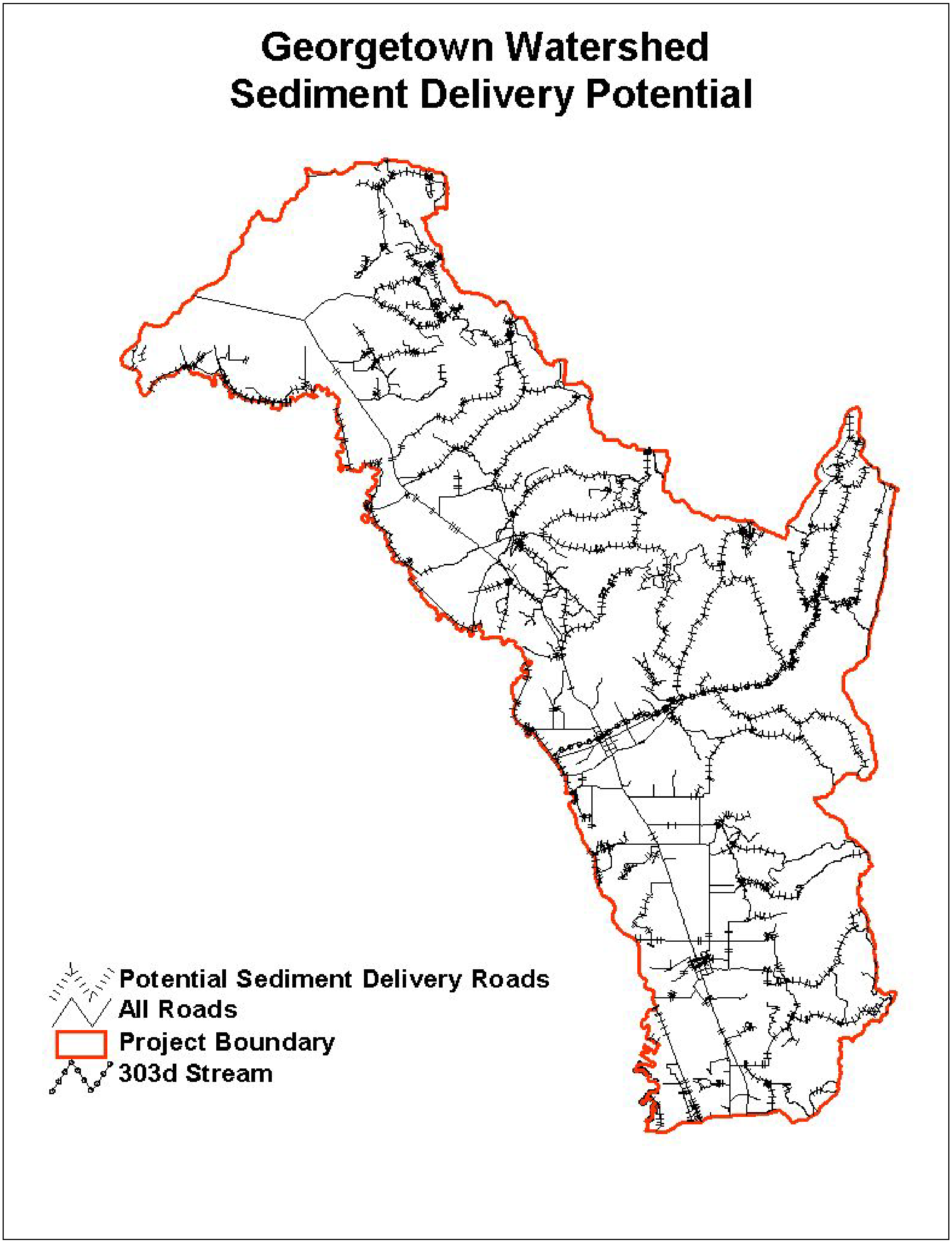
Properties																					
Low Soil Productivity	2613.6	19.5	2763.1	16.3	1601	22.8	7366.2	49.3	3003.2	48.8	1215.8	13.9	1927.4	23.7	44498	19	1667.1	25	556.5	4.2	
Unstable Soils	905.7	6.7	1209.7	7.1	716.9	10.2	1676.4	11.2	1593.4	25.9	0	0	123.8	1.6	0	0	294.9	4.4	0	0	
Erosion Potential	1193.6	8.9	1888.5	0.1	968.4	13.8	1413.9	9.5	945.4	15.4	592.7	6.8	1067.1	13.1	1978.7	8.4	1273.9	19.1	360.7	2.7	
Compaction Potential	54	0.4	0	0	0	0	0	0	0	0	0	0	123.8	1.5	0	0	109.2	1.6	0	0	
Disturbances																					
Mine	0	0	0	0	0	0	249.7						0.42	0.00005	32.5	0.001	0	0	0	0	
Logging	0	0	0	0	0	0	49.5	0.003	64	0.01	213.9	0.024	312.1	0.038	292.4	0.012	0	0	208.4	0.016	
Unauthorized	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
ATV Trails	2.18	0	3.37	0.0002	1.58	0.0002	1.38		0.9		0		0.13		3.9		?		?		
Disturbance Sum	2.18	0	3.37	0	1.58		300.58	0.003	64.9	0.01	213.9	0.024	312.65	0.038	328.8	0.014	0		208.4	0.016	
Sediment Delivery (miles)																					
Watershed Area	14.1		10.8		6.3		24.1		10.5		8.9		14.2		25		12.1		8.5		
Forest Service Bnd.	5.9		5.9		3		21.7		9.3		2.7		11		13		10.9		2.1		
																	? - no data available				

Sediment delivery by roads within 300 ft. of perennial streams and 150 ft. intermittent streams (flows water only part of the year)


Georgetown Watershed Geology
Georgetown Improved Roads
Project Boundary
Perennial Streams
Georgetown Primary Road
303d Stream
Mixed sedimentary/metamorphic
Sedimentary Rock


Georgetown Watershed
Potential Soil Risks
High Compaction Potential
Georgetown Improved Roads
Project Boundary
Perennial Streams
Georgetown Primary Road
303d Stream
Unstable Soils
High Erosion Hazard.shp
Low Inherent Soil Productivitiy


Georgetown Watershed
Past Management Impacts
Diamond Gulch Mine
Rattlesnake Canyon Mine
Georgetown Canyon Mine
Georgetown Canyon Mine
Georgetown Canyon Mine
Past Logging Disturbance
Georgetown Improved Roads
Mine Disturbance
Unauthorized ATV Trails
Project Boundary
Georgetown Primary Road
303d Stream


Georgetown Watershed
Sediment Delivery Potential
Potential Sediment Delivery Roads
All Roads
Project Boundary
303d Stream

3.4 Native Fish Habitat

General reference conditions were given in chapter one where the historical characterization was given. This chapter will focus on current conditions for specific streams and answer the four key questions for each stream.

The only drainages to be discussed are Bear River, Georgetown and Bennington Creeks as they are the only drainages where there is reason to believe they provided habitat for at least one life stage of fish. There will also be a short discussion of the role short spring creeks along the Bear River may have played. The trend towards replacement of the native BCT with brook trout on the Forest has likely been facilitated by habitat alteration and the many diversions present on these creeks

3.4.1 Population and Presence

Native fish populations have been affected by the introduction of non-native species, fragmentation of habitat by culverts and irrigation diversions, and habitat alteration due to roads and mining. The effects of each of these will be addressed more specifically under the other key questions.

Georgetown Creek

The latest electro-fishing data for Middle Georgetown Creek by the USFS (2000) indicates a population of 50% brook trout, 50% stocked rainbows and one cutthroat rainbow hybrid with a primary rainbow phenotype. This sampling occurred in 4 - 40 meter units and 1 - 100 meter unit between the forest boundary and Church Hollow. Paul Cowley (1994) of the USFS reported 35% cutthroat, 18% rainbow, 6% hybrids and 41% brook trout in a 100m reach below Church Hollow.

Stocking data from the Idaho Department of Fish and Game (IDFG) reports yearly stocking densities of 750 to over 3000 rainbow trout per year from 1967 to 1999. In 2000 IDFG began stocking triploid rainbows in an effort to reduce problems of hybridization. In 2000 and 2001 stocking was reduced to about 1000 triploid rainbows.

The trend in this drainage has been the total elimination of native BCT from the drainage. Before the placement of irrigation diversions, habitat degradation, and introduction of non-natives this stream would have been an important spawning tributary for BCT from the Bear River.

The Right Hand Fork currently does not support fish but may have historically before the spring was developed for culinary purposes.

The Left Hand Fork was sampled by the USFS (2000) reporting a low population of brook trout. No other sampling records are known but this stream would have been historically occupied by BCT. Again the trend has been replacement of the native species with the non-native brook trout.

Bennington Creek

This stream was sampled by Lee Mabey (2002) and was not found to contain any fish. Sufficient flows and habitat appear to be present to support fish. However, the stream bottom is cemented together through the precipitation of calcium carbonate or marl. There also are insufficient aquatic insects present to support fish. Historically in the valley floor this stream may have been an important spawning stream for BCT from the Bear River and may have contained a small population of resident BCT and other native fishes. These populations may have been present during wet-cycles and needed to be re-founded after drought cycles. These streams are now isolated by irrigation diversions. Current conditions are not expected to change unless connectivity to the Bear River is re-established and habitat conditions in the Bear River improve for BCT.

Spring Creeks

There are numerous springs with associated creeks that occur along the Bear River Valley that at one time may have provided valuable spawning and rearing habitat within a short distance of the Bear River. Changes to these systems due to agricultural practices and changes in ground water hydrology have likely had profound effects on these systems. The actual condition of these systems is unknown as they occur on private land.

Bear River

Bear River historically would have contained the full complement of native fish listed in the characterization. Currently the Bear River is home to an occasional BCT and mountain whitefish, which historically dominated the system and Utah suckers that are still common. Degradation of habitat, changes in flows, and the introduction of non-native species has caused the decline of the native species.

3.4.2 Barriers and Diversions

Connectivity of river systems one to another is critical to the long-term survival and persistence of the native fisheries. By having connected stream systems the long-term persistence of BCT as a whole is greater. Connected systems allows for the affects of localized disturbance to be buffered. When systems are connected and disturbances such as intense fire or drought occur in one area the sub-populations can be re-founded by a connected sub-population. Without this ability to re-found populations, resiliency and the populations are lost.

Diversions for irrigation frequently dewater the streams effectively stopping any fish migrations. If the streams are not dewatered the diversions can also be vertical barriers preventing up stream movement. The many barriers present have effectively eliminated the ability of the native cutthroat to fully express their fluvial life history and made them more prone to replacement by non-native fishes.

Georgetown Creek

Georgetown Creek is diverted between the Forest Boundary and the Right Hand Fork for irrigation and hydropower generation purposes. In the late seventies the point of diversion for the irrigation company was moved upstream to gain head for sprinkler irrigation and hydropower generation. Georgetown Irrigation Company has irrigation water right for 30 cfs from April 20 to Sept. 30. They also have a year round hydro power right of 30 cfs. Besides the main diversion for the sprinkling and hydropower system there are 6 other points of diversion that could also pose fish barriers. The hydropower facility is exempt from the Federal Energy Regulatory Commission and is managed under an easement by the BLM. As part of the easement Georgetown Irrigation Company agreed to a minimum bypass flow of 5 cfs. The irrigation company has rarely complied with this minimum flow. The BLM reports they are pursuing resolution of this long time infraction of the easement.

Culverts near Church Hollow pose migration barriers, the upper culvert is 200 feet in length, the lower crossing contains 2 culverts one is perched and the other is submerged with the inlet and outlet filled in with boulders and cobble functioning as a screen with the water bubbling out as if from a spring. There is also a section of stream .44 miles in length within a culvert in the mine area. These long culverts are likely migration barriers. Tim Burton (1986) also reports culverts just into section 24 and one below Dud Hollow as restricting fish movement.

The Right Hand Fork has a spring, which has been developed and captured for culinary use dewatering a large portion of the stream altering the habitat. The overflow from this culinary development enters into main Georgetown Creek below the confluence of the main and Right Hand Forks. The Left Hand Fork has also been diverted below the Forest Boundary.

Historically these streams would have been important spawning streams for BCT from the Bear River and would have contained populations of resident BCT and other native fishes. Current conditions are not expected to change unless connectivity to the Bear River is re-established and habitat conditions improve for BCT.

Bennington Creek

Bennington Creek is diverted below the Forest Boundary. By eliminating the connectivity to the Bear River both populations are affected. Historically this stream may have been an important spawning stream for BCT from the Bear River and may have contained a small population of resident BCT and other native fishes. Current conditions are not expected to change unless connectivity to the Bear River is re-established and habitat conditions in the Bear River improve for BCT.

Spring Creeks

Changes in land practices may have altered flows and access to these small systems by migrating fish.

Bear River

Dams and irrigation diversions along the Bear River have limited the migrational abilities of the native fishes. Alexander Reservoir south of Soda Springs forms the lower boundary for fish movement and the Bear Lake pumping station forms the upper boundary. There likely are irrigation diversions and barriers between these major upper and lower limits that restrict movement.

3.4.3 Non-Native Species

Non-native fish can impact BCT through at least three different mechanisms. One is hybridization by crossing with rainbow trout changing their genetic makeup. Two is competition and displacement by rainbow or brook trout for limited food or habitat. Three is by direct mortality as one fish preys upon another generally a brook trout preying upon a smaller cutthroat.

Bennington Creeks

It is unknown what role non-native fishes may have had in this stream, as it currently does not contain any fish. It is likely that this stream if it were used at all by fish was used primarily for spawning and rearing.

Georgetown Creeks

USFS surveys (2000) found that non-natives have had a profound influence on BCT within these streams. Brook trout have replaced cutthroat as the self-sustaining and naturally reproducing fish in the drainage. Brook trout have preyed directly upon the cutthroat and have been able to out compete the native cutthroat within this stream with its degraded habitat and lack of connectivity.

Stocking of rainbow trout has led to displacement and hybridizing of the native stocks of cutthroat to the point where rainbow characteristic dominate any cutthroat like fish. Stocking of predominately fertile rainbow into the system was stopped in 2000.

The impacts of these non-native fish on the other native fish species such as dace and sculpin are unknown though these species are known to coexist in other streams.

Spring Creeks

Changes to these creeks are likely similar to the changes on the Bear River.

Bear River

The native species that once dominated have been replaced by introduced species like carp (*Cyprinius carpio*), which now dominate the system. Utah suckers a native species are still common and other native non-game fish are still likely to occur. Other species present are brown trout (*Salmo trutta)*, rainbow trout (*Oncorhynchus mykiss)* and perhaps an occasional channel catfish (*Ictalurus punctatus)* or perch (*Perca flavescens*). Changes in habitat and streamflows have favored these introduced species.

3.4.4 Channel and Habitat Disturbance

The primary alteration to streams has been the re-alignment of the streams due to roads and mining. These changes have resulted in increased sedimentation and in the instance of the mine complete obliteration of the creek.

Georgetown Creeks

The Right Hand Fork is paralleled by the road through the BLM land and up through the Forest. The first .5 miles of road on private and BLM land are a major sediment source with the graded shoulder and streambanks being one and the same. Recently a spring was developed for culinary use that destroyed the natural channel. A nick point was created where the stream reconnects to the outlet from the spring development. This nick point threatens to move upstream down-cutting through the stream bottom. Excessive sediment is being created and delivered directly to the stream via the road system and its maintenance. Above the spring development the road surface is native material for about 2.5 miles.

Georgetown Creek has been heavily influenced by road building and mining. Massive road fills with aging culverts occur near Church Hollow. The longest of these culverts being angled through the fill and being 200 feet in length. These road fills have fragmented the habitat. A .44-mile long culvert through the mine has eliminated any habitat. This culvert ties into a .66-mile reach of stream that is entrenched between two roads. The collapse of these culverts could result in dams forming and or high releases of sediment. A graveled road parallels the creek for 5 miles providing a sediment source during rains and runoff.

USFS (2000) surveys also noted that fish were absent for .75 miles below the mine. The habitat and flows appeared to be adequate. Fish were found above the mine indicating there may be water quality issues associated with drainage from the mine tailings or mine drainage.

The Left Hand Fork only has water for about .5 miles above the Forest Boundary. Above the spring .5 miles up from the Forest boundary no intermittent or ephemeral drainages are present despite the size of the watershed.

Bennington Creek

Bennington Creek above the Forest Boundary is relatively undisturbed. There is a foot trail that parallels the creek but no roads. There has been some logging and roading on the south hillside above the creek on private ground.

Spring Creeks

These areas have been impacted by grazing and agricultural practices that have altered sediment input and hydrologic input.

Bear River

The Bear River has been altered hydrologically by high summer irrigation flows, removal of willows through grazing, cultivation, and perhaps spraying, resulting in unstable eroding banks lacking in habitat complexity. The turbidity has been increased. Low winter flows also result in the loss of habitat and over-wintering of fish.

3.5 Wildlife Habitat

Trend/Summary

Recovery Plans are in place to provide for the lynx and wolves. Existing habitat provides linkage between the Unita Mountains and the Greater Yellowstone Area. The LCAS provides standards and guidelines regarding lynx connectivity, movement, and dispersal (USDI Letter 9-13-01 and 2-5-02). Wolves could easily move into the watershed from the Gros Ventre Pack near Jackson, Wyoming. The delisting process can begin when the Montana and Wyoming State Management Plans are completed.

Disturbance from off-road motorized travel has increased as more people recreate on the Forest and the popularity of ATV's increases, but the motorized route density is relatively low in the area. The routes that are being used illegally by ATV's are primarily old jeep trails on ridges and an old dozer track left from the terracing work completed in the late 1960's. Suitable wolverine denning habitat is found in the watershed at higher elevations where access is limited to snowmobiles. The amount of snowmobile use in these upper elevations is unknown.

Succession to mature forest stands has created an abundance of habitat for old growth dependent wildlife. There is a lack of young- and middle-age stands to provide the diversity to maintain the composition and structure needed over the long term for wildlife. Many species require a variety of habitats to meet their full life histories. Conversion of aspen stands to conifer could reduce a prominent forest type used by wildlife.

Mortality from competition, insects, and disease in large trees of all species is expected to continue to provide a supply of suitable foraging habitat for three-toed woodpeckers.

Mountain brush is predominately in mature condition and meeting wildlife needs. Disturbance would provide early seral stands and improve the age and structure diversity of these stands. Early seral mountain brush is or would be created through ongoing or planned disturbance to forested or sagebrush habitats where mountain brush is a large component.

The trend in rangeland management is to reduce sagebrush densities through prescribed fire to maintain grass and forb production, re-introduce historic fire intervals, and restore watershed functioning. These treatments must comply with the latest sage grouse guidelines of no more than 20 percent of the acres within eleven miles of lek being in early seral condition at one time.

Riparian vegetation is providing suitable habitat for migratory birds. Riparian habitat is not at its potential vegetative condition. Any increase in wetland habitat would benefit waterfowl, amphibians, migratory birds and wildlife in general.

Elk and Deer. Populations meet or exceed State F&G goals. Elk populations continue to show an increase, while deer populations fluctuate greater and are perceived to generally be decreasing.

Brush species are available as winter forage but are declining in vigor due to over-utilization. Winter range acres are decreasing due to development. CRP lands are helping to maintain elk populations.

Beaver – Beaver dam complexes exist in willow dominated riparian habitat. A decline in nearby aspen stands due to encroachment of conifer or past over-utilization by beaver may limit the long-term sustainability of these beaver populations. Some beaver dams are not maintained and water is flowing through deposited sediment and through the dam structure.

Reference Condition

Pre-settlement population or even presence within the watershed is unknown for many TES species. A description of the required habitat for specific species is used as the desired habitat conditions.

The gray wolf occurred historically in the northern Rocky Mountains, including mountainous portions of Wyoming, Montana, and Idaho. The drastic reduction in the distribution and abundance of this species in North America was directly related to human activities, particularly extensive predator control efforts by private, State, and Federal agencies. The natural history of wolves and their ecological role was poorly understood during the period of their eradication in the conterminous United States. As with other large predators, wolves were considered a nuisance and threat to humans. (USDI 1994b).

Two lynx have been recorded as taken in Bear Lake County and there are additional anecdotal accounts of lynx in the valley. There are five verified records of lynx taken in Caribou County in 1947 and two from Bonneville County in 1955. Verified records of lynx in Wyoming after 1920 are rare. A lynx was collected in 1940 at Hoback Rim in northwestern Sublett County and another in 1949 near Afton, Lincoln County. A lynx was trapped in Cache County, Utah in 1991. (Ruggiero and others 1999, 226, 230-231). These five counties surround the Georgetown Watershed so it can be assumed that lynx would have been found here periodically and probably associated with cyclic population increases in their northern home ranges. Recent analysis of vegetation in the Southern Boreal Forests has concluded that this watershed and actually most of the Caribou National Forest probably only provided linkage habitat for lynx between the Greater Yellowstone area and the Uinta Mountains.

Bald eagles are found along large bodies of water and nest in large trees with strong branches to support the weight of their nests. Open water with perch sites and carrion (road kill and wild ungulates) is important winter habitat. The first major decline in the bald eagle population probably began in the mid to late 1800s due to shooting for feathers and trophies, carrion treated with poisons, loss of forests providing nesting habitat, and the use of dichloro-diphenyl-trichloroethane (DDT) and other organochlorine compounds. Pre-settlement populations are not known but populations are slowly increasing in the region.

Townsend's (Western) big-eared bat (*Corynorhinus townsendii*) – Maternity and hibernation colonies occur exclusively in caves and mine tunnels. (Groves and others 1997, Spahr and others 1991). There is no known naturally occurring habitat that meets these criteria within the watershed.

Wolverine (*Gulo gulo*) - Alpine cirque and talus slopes are important for den sites and is available in limited quantity within the watershed. Travel corridors are usually located in spruce/subalpine fir forested areas near natural openings with limited human activity and an adequate prey base (prefers carrion). The movements of dispersing or spatially unattached wolverine may include lowland vegetation communities generally considered nontypical in nature for wolverine (Copeland, per. Comm.). Pre-settlement presence is unknown. (Ruggiero and others 1994, Groves and others 1997, Spahr and others 1991)

Boreal owl (*Aegolius funereus*) - nest in tree cavities in mature subalpine fir or Engelmann spruce forests with a high density of large trees and forage on small mammals, birds and insects. (Hayward 1994, Groves and others 1997, Spahr and others 1991). Pre-settlement presence is unknown.

Flammulated owl (*Otus flammeolus*) - are obligate cavity nesters usually in mature Douglas-fir forests and aspen with open canopies (30-60%) and forage on insects in edge habitat. (Hayward 1994, Groves and others 1997, Spahr and others 1991). Pre-settlement presence is unknown.

Great gray owl (*Strix nebulosa*) - use nests abandoned by hawks or on the tops of snags in mature lodgepole pine or subalpine fir forests bordering small openings or meadows (Hayward 1994). They prey on voles, mice etc. along edges of clearings. (Groves and others 1997 & Spahr and others 1991). Pre-settlement presence is unknown.

Northern goshawk (*Accipiter gentilis*) nest in a mature & old-growth (aspen and conifer) forest stands with closed tree canopies, high density of large trees on slopes <30% & northerly exposures. They prey on birds & mammals within forest canopy. (Reynolds et al 1991, Groves and others 1997, and Spahr and others 1991). Pre-settlement population is unknown.

Three-toed woodpecker (*Picoides tridactylus*) - nests in snags. They feed on bark beetle larvae usually in subalpine fir habitat types (spruce-fir and lodgepole pine in a variety of successional stages). (Groves and others 1997 & Spahr and others 1991). Local population levels are reflective of conifer tree mortality. Pre-settlement presence is unknown.

Columbian sharp-tailed grouse (*Tympanuchus phasianellus columbianus*) - use undisturbed native shrub-grassland, with high structural diversity (Paige and Ritter 1999). Sharp-tailed grouse dancing grounds, nest sites, and brood sites are found in areas containing big sage, arrowleaf balsamroot, bluebunch wheat grass, mountain shrub, and riparian cover types. Grass and forbs are needed for cover. (Groves and others 1997 & Spahr and others 1991). CST grouse inhabit rangeland communities in the 12- to 20-inch precipitation zone. Pre-settlement population is unknown, but populations have declined in recent years.

Starveling milkvetch *(Astragalus jejunus var. jejunus)* - is found on barren, eroding shale substrata of the Twincreek Limestone formation. In general, astragalus plants have a low palatability. Pre-settlement extent is unknown.

Migratory bird populations that use riparian habitat, especially willow habitats may have been higher due to the greater expanses of willows that once occupied the valley bottoms. Wetlands have decreased due to spring developments and water diversions. Migratory bird populations that use sagebrush were higher since most of the basin big sagebrush has been converted to cropland/agricultural use. Region-wide, the sage grouse population has declined in the recent years.

Mule Deer - "Populations have declined since the 1950s and 1960s statewide. Because they are adapted to transitional, seral habitats, and because management activities (prescribed burning) are not occurring at historic levels, populations are not expected to rise to those levels. Generally, annual mortality is due to predation, winterkill, accidents, hunting, weather, and possible competition with elk and disease (Kuck and Compton, 1999). Additions to hunting regulations have included antlerless opportunities designed to stabilize or reduce populations. Recent population declines in part of southern Idaho are a result of severe winters when significant winter mortality occurred. Generally, for mule deer, the buck:doe ratio minimum objective is fifteen bucks per one hundred does (15:100)." (USDA 2003, 3-236)

Elk - "Elk are distributed across Idaho and are classified as habitat generalists. Elk populations can be influenced by human harvest. Because harvest is highly influenced by access on public lands, the most critical habitat factor facing managers is the use of roads (Kuck and Compton, 1999). Overall, elk populations statewide are near all time highs and objectives are generally being met statewide for total cows, bulls, and adult bulls; however, some zones are not meeting these objectives. The IDFG Plan objectives for elk include: Adult bull:100 cow and total bull:100 cow ratios. Areas on the Forest are generally meeting or exceeding objectives." (USDA 2003, 3-236)

Beaver – Early exploration of western North America was largely due to the search for beavers by trappers. Size estimates of the pre-European beaver population in North America were 60-400 million animals or the equivalent of 10-60 animals per mile of stream and river. Trapping nearly eliminated the beaver population and the subsequent quantity and quality of riparian habitat declined. Data specific to the watershed is not available.

Western boreal toad (*Bufo boreas*) and – Northern leopard frog (*Rana pipiens*) are found in ponds, lakes, reservoirs, and slow-moving rivers and streams (Groves and others 1997, 6). Pre-settlement, this habitat would have been found in association with beaver ponds.

Current Condition

Habitat

Gray wolf (*Canis lupus*) – The goal for the breeding wolf pack in the Greater Yellowstone area was met for 2000, 2001 and 2002. The 3-year goal was met beginning the delisting process. Although there are 62 miles between the Georgetown Watershed and the Gros Ventre pack near Jackson, WY, the watershed is considered within the dispersal distance of wolves (Smith and others 2000). Wildlife Services took a wolf on private land 9 miles northwest of Soda Springs on November 21, 2000; removed a wolf from Utah in November, 2002, and two in Cokeville WY March 2003. Regulated and controlled wolf mortality is possible from wolf – human or livestock interaction but is outside the control of the USDA Forest Service. Illegal killing is also possible but the amount of total mortality has not prevented the expansion and increase of the wolf population as needed to meet recovery targets. Conflicts are expected if wolves were to attempt to become established in the watershed.

Canada lynx (*Lynx canadensis*) – The Wasatch-Cache NF and Caribou NF contain a variety of seral stages in forest and non-forest habitat, with a majority in the older age classes due to a lack of fire. Forest Plan (2003) standards and guidelines provide for early seral vegetation to reach maturity as outlined in the LCAS for lynx habitat. Vegetation in the watershed provides habitat to support linkage between the Greater Yellowstone area and the Unita Mountains (Ashley NF). However, existing and future conditions of the private lands between the pieces of National Forest lands may cause the biggest barrier to wildlife that attempt to migrate between these areas. Elk and deer mortality on US Highway 30 indicate that migration by large mammals is attempted but sometimes not successful. Highway 30 is currently being widened to three or four lanes to improve vehicle safety but no new measures will be in place to assist migration. Housing development is expected to increase on private land in the future. This may have the most impact to suitable linkage habitat.

Bald eagle (*Haliaeetus leucocephalus*) – Bald eagles winter along the Bear River and are seen foraging on road kill on US Highway 30. No active nests are documented in the area (Beals & Melquist 2001, 10). There is an inactive nest along the Bear River south of Soda Springs.

Townsend's (Western) big-eared bat (*Corynorhinus townsendii*) – There are no known caves in the watershed. Roosting sites may occur in the Georgetown Watershed. They may occasionally use buildings, bridges, and tree cavities for night roosts. They are extremely sensitive to human disturbance. Actual occurrence is unknown but mining and buildings have artificially created roosting habitat. A high percentage of forested vegetation in the mature and older age class with an increase in large diameter snags also represents a trend toward greater potential habitat.

Wolverine (G*ulo gulo*) – The Georgetown Watershed is within the home range of wolverines that may use suitable denning habitat found on Snowdrift Mountain and along the Salt River Range (Ruggiero et. al 1994). Occurrence has been documented on Caribou Mountain and the Bear River Range, and possible wolverine tracks were found on Hawks Peak on the edge of the Georgetown Watershed (USDA 2002). An increase in snowmobile use in suitable denning habitat may impact wolverine reproduction success if they exist in the watershed.

Boreal owl (*Aegolius funereus*) - Suitable nesting and foraging habitat (Groves and others 1997, 134) is found in forest stands in the Georgetown Watershed but actual occurrence is unknown. The watershed contains approximately 1,696 acres of mature stands of subalpine fir. This represents 96 percent of this forest type. The remainder is in early or young age classes. Actual occurrence is unknown.

Flammulated owl (*Otus flammeolus*) - Suitable nesting and foraging habitat (Groves and others 1997, 125) occurs in forested stands in the Georgetown Watershed. The watershed contains approximately 11,444 acres of mature stands of Douglas-fir and aspen forests containing soft snags with cavities. This represents 95 percent of this forest type. The remainder is in early seral or young age classes. Actual occurrence is unknown.

Great gray owl (*Strix nebulosa*) - Suitable nesting and foraging habitat (Groves and others 1997, 131) is found in the Georgetown Watershed. Owls have been observed but the actual population is unknown. The watershed contains approximately 3,683 acres of mature stands of lodgepole pine or subalpine fir forests bordering small openings or meadows. This represents over 86 percent of these forest types. The remainder is in early seral or young age classes.

Northern goshawk (*Accipiter gentilis*) - Suitable nesting and foraging habitat (Groves and others 1997, 80) is found in the Georgetown Watershed. A goshawk nest has been located outside the watershed, they have been observed within the watershed, but the actual population is unknown. The watershed contains approximately 23,634 acres of mature aspen or conifer forests. This represents 84 percent of the forested vegetation. The remainder is in early seral or young age classes.

Three-toed woodpecker (*Picoides tridactylus*) - Suitable nesting and foraging habitat (Groves and others 1997, 152) is located in the Georgetown Watershed but actual occurrence is not known.

Bark beetle mortality is currently at low or endemic levels, but is at high risk of epidemic levels. Approximately 84 percent of the forested vegetation is mature with varying amounts of large dead snags for foraging.

Columbian sharp-tailed grouse (*Tympanuchus phasianellus columbianus*) – Suitable habitat (Groves and others 1997) is found in the Georgetown Watershed but leks have not been identified near the project area (IDFG 2001a). Individual birds have been seen at Georgetown Summit and near Bennington (IDFG 2002). Good nesting and brood rearing habitat has been found on the valley bottoms and rolling foothills usually on private or BLM lands around agriculture lands. CRP lands provide approximately 2/3 of this nesting and brood rearing habitat. Very little of the existing aspen, chokecherry, and serviceberry acres are in early seral because prescribed fire treatments have not targeted these community types. The mature stands provide winter habitat.

Population estimates for beaver throughout the west are 6-12 million animals, a fraction of the original numbers. (Olson and Hubert 1994, 2). Beaver activity is relative to the amount of available food and construction materials. Beaver dams are evident in the watershed on perennial streams but recent activity is not evident. Some older dams that have filled in with sediment are now large willow stands (Dunns Canyon).

Starveling milkvetch *(Astragalus jejunus var. jejunus)* – Plants are found on the Twincreek limestone. This geologic formation is located in the Georgetown Watershed (IBMG 1979) and plants are expected to grow there. Plants are and can be impacted by ATV use on Twincreek limestone. However, ATV use on suitable habitat is limited to localized areas and plants are known to be growing adjacent to compacted trails.

Riparian with dense grasses/shrubs (60-80% crown cover, 6' tall, 20 acres with scattered openings), open tree canopy with balanced age classes (snags), and abundant flowers exist in the watershed. However mature aspen along live water is declining from conifer invasion and some use by beaver. Tall willows are providing bird habitat but willows are not occupying their potential habitat within the watershed. Riparian habitat for all bird species has been reduced by the Georgetown Mill site and road construction in riparian habitat. Riparian habitat has also been reduced through pasture development, settlement, livestock grazing, water diversions, and noxious weed introductions (Ritter 2001, 26). Wetlands have changed form and may actually have increased in extent because of livestock water developments.

Sage grouse are not known to be reproducing in the watershed. Surveys found five leks east of Geneva within 11 miles of the watershed (IDFG 2001b) but no sage grouse were found between Montpelier and Soda Springs during the 2002 survey (IDFG 2002). Recent and future prescribed burning is meeting the 20 percent early seral sagebrush limit needed for these sage grouse populations. This assessment is based on acres of sagebrush (as determined thru satellite imagery), within the Caribou/Targhee National Forest, and within an eleven-mile radius of the leks north of Geneva (closest known leks to the watershed). Ground cover of non-senescent grasses/forbs as cover/forage is available in rested or deferred grazing pastures. Large stands of mature sagebrush found on the northern end of the watershed may provide suitable nesting and foraging habitat.

Mule deer – population levels are meeting state objectives. Deer spend the winter along the foothills just north of Soda Springs south to Montpelier east of Highway 30. In the last 15 years the elk numbers have increased and deer numbers have decreased. Deer from the Montpelier area winter on the Bear Lake plateau, Banks Valley, and south-facing hills east of Montpelier. The population of this herd was 2,428 in 1994 and 4,334 in 2001. The population of deer in Southeast Idaho fluctuated from 3,600 to 7,400 in the past eight years. (C. Anderson per. com.).

Elk – population levels are meeting or exceeding state objectives. Elk winter on the lower elevations of the Georgetown Watershed. Critical winter range is located on the foothills north of Georgetown Canyon and (non-critical) Winter Range is located south of Georgetown Canyon. There was a large increase in elk numbers in the 1990s in southeast Idaho. The numbers have been stable in the last few years (C. Anderson per. com.). Depredation hunts have occurred north of Montpelier to reduce impacts to private property.

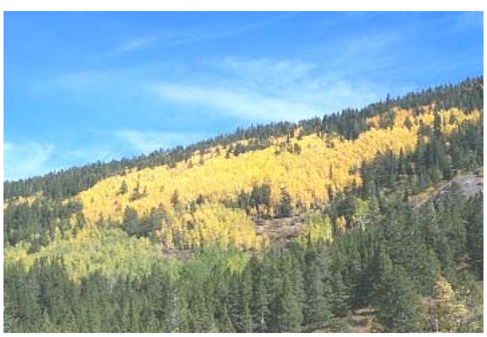
Western boreal toad (*Bufo boreas*) – Appear to be declining in Greater Yellowstone Ecosystem and in other parts of western United States (Groves and others 1997, 6). Surveys of sites with historical sightings, in adjacent watersheds, have not found boreal toads. Actual occurrence is unknown.

Northern leopard frog (*Rana pipiens*) – Anecdotal information exists for their decline in Idaho (Groves and others 1997, 11). Surveys of sites with historical sightings, in adjacent watersheds, have not found northern leopard frogs. Actual occurrence is unknown.

Human Disturbances

Human disturbances to wildlife come in many forms, including road building and use, trail use, camping, hunting, logging, grazing, spring development for livestock and consumptive use, stream diversions, firewood and other forest product removal, prescribed burning, etc. The disturbances of most concern are those that alter habitat or long-term use patterns. Disturbances during key life history phases can be important too.

Roads and trails open to motorized users can alter wildlife use within a corridor along either side and by fragmenting habitat. Big game tend to use the areas along motorized routes less, both for hiding cover and for foraging. The motorized route density (roads and trails) in the watershed has been relatively stable for 30 or more years (currently 1.2 miles/square mile, on Forest and 2.0 for project area as whole). Many miles of non-system/user defined trails exist in the watershed which would raise the density would not likely push it over 1.5 miles/square mile (estimate, exact locations and lengths of these trails are not known at this point). Left-hand Fork and Main Georgetown Canyon are the two main roads on NF within the watershed. Considerable road kill of deer occurs along Highway 30 off the NF and this problem will likely increase with the completion of the current widening. The secondary roads receive minimal use until hunting season when virtually any drivable road sees considerable use. The designated motorized trails (27.3 miles of open) are popular throughout the summer. .



Most forms of non-motorized recreation represent a short-term impact on wildlife habitat that is removed when the recreationalist leaves. Developed recreation sites and popular dispersed sites have the potential to have essentially a permanent impact on habitat. The primary impact is that very few wildlife species will use an area with concentrated human activity, thereby reducing acres of potential habitat. Another impact is the removal of habitat (ie; snags, down logs, forage). All forms of recreation are expected to increase in the future.

Timber harvest and prescribed burns alter vegetation structure, composition, and pattern for long periods of time. Species whose life histories include use of early seral habitats may benefit from increased forage (browsers) or increased prey base (predators). Following harvest, species dependant on cavity nesting and snags for feeding have less potential habitat when compared to that which would follow a natural disturbance (more snags remain following wildfire). Prescribed burns in this watershed have been limited to sagebrush and have provided a mosaic of age and structure.

4.0 Interpretation and Opportunities

The purpose of this chapter is to provide our interpretation of the information displayed in chapter 3 or to put it into a "So What?" context. We also attempted to identify what is broken or out of balance within the landscape/watershed and then to identify some possible opportunities to improve the condition of the landscape.

- Interpretation of Trend
  - Each resource specialist has interpreted the trend for the reporting unit i.e. cover type, HUC, or species, and will describe what caused the trend and what some of the results of the current trend may be. Reporting units should provide more clarity to discuss the cause, and results of, the indicator trends identified in Chapter 3.0. Indicators are all interrelated and a good interpretation cannot be done without discussing all the indicators at once.

The definition of synthesis in the *Federal Guide for Watershed Analysis is:*

"Synthesis – The integration of separate ecosystem elements to understand the whole system: a primary goal of watershed analysis."

- Opportunities/Recommendations
  - The management actions that may be taken to reverse or change the current trend.

4.1 Vegetation Dynamics

The indicators used to track the Vegetation Dynamics issue (structure, density, species composition, and disturbance regimes), are very interrelated, and the trend (or departure from reference conditions) often has common or closely related causes. Because of this close causal relationship, the interpretation of the trend and the assessment of risk and opportunities will be displayed/reported by cover type.

Interpretation of Trend

Fire was the disturbance agent that played the greatest role in shaping the structure, density, species composition and pattern of vegetation at the landscape scale, prior to the creation of the Forest Service. Insects, disease and weather also played a role but their affects tended to be at the stand scale.

The vegetation structure, density and species composition that we see today is the result of the fires that occurred prior to the area becoming National Forest and the management that has taken place since. Native American use of fire may have been very important in some types. Post Native American, fire suppression and grazing are the management activities that have had the greatest impacts; timber harvest has also played a role.

Early grazing levels directly impacted structure, density and species composition of mountain shrub, mountain brush and sagebrush/grass communities and potentially some early succession forest stands. Grazing also had an indirect impact on forest types; it severed as a means of fire control. During the early years of the Forest Service while permitted grazing limits were at the peak there was very little available fine fuel in the mountain shrub, mountain brush and sagebrush/grass communities, this kept the fires that did occur small.

As permitted animal numbers went down the range conditions began to improve. Fire suppression techniques also improved. The Forest Service became highly effective at suppressing fire post World War II. So fire that had been controlled indirectly by the lack of fine fuel could be controlled by the will of man.

During the summer of 2000, fire history sampling was conducted within the Georgetown Watershed Assessment area (see appendix A). This sampling provides a unique opportunity to compare onsite data with other broader based fire histories such as Barrett's 1994 work and others. It also provides a valuable link between how fire affected vegetation prior to settlement of the valley and how it shaped the vegetation that was here in 1913 when vegetation in the area was first mapped by the Forest Service and what we see today. While the available data does not paint nearly as clear of picture of fire history and regime as is available for ponderosa pine types. It is clear that the Caribou N.F. and the Georgetown watershed was/is a fire adapted system and that there has been a reduction in fire disturbances in recent decades (see Figure 4.1-1).

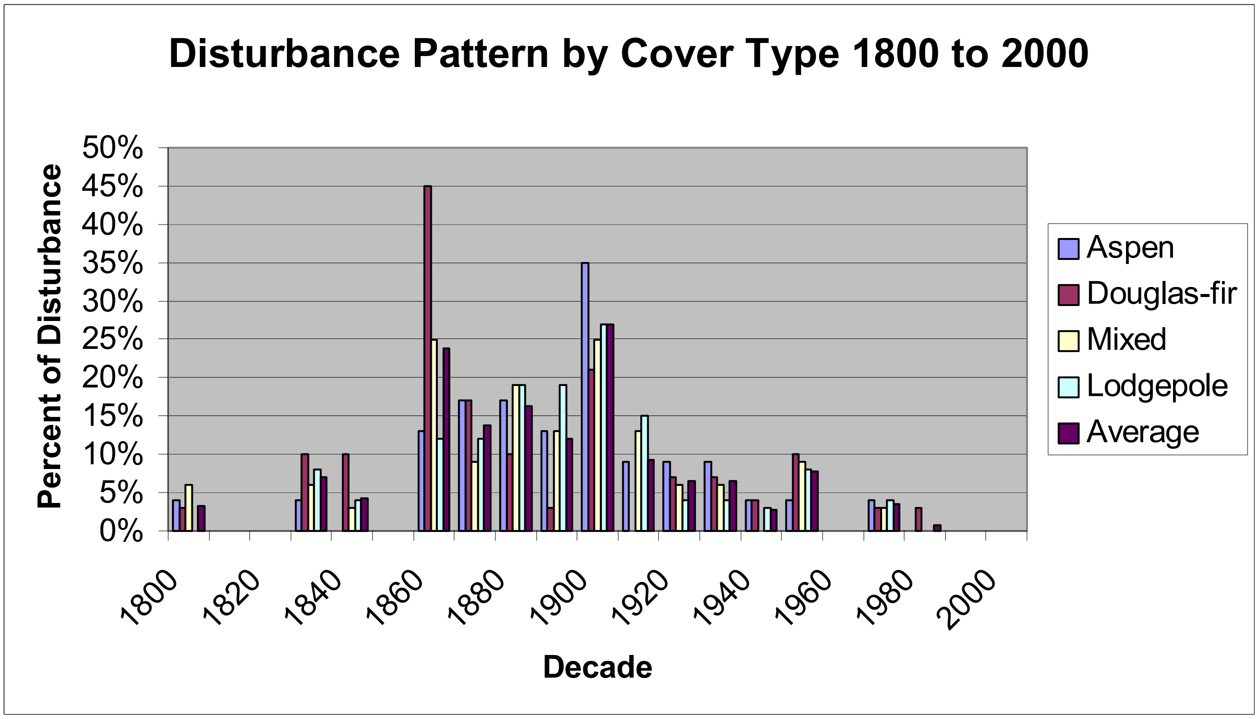


Figure 4.1-1 Fire History/Disturbance within the Assessment Area. This data shows a dramatic peak in fire disturbance frequency about 1860 the time of the first settlers to the valley. However, the trees that could be found and that originated prior to this had fire scars. The lack of fire history prior to 1860 is mostly a function of the relatively short lived tree species in the area and to some degree the mixed severity fire regime (odds of making it through more than a couple mixed severity fire are low).

Condition class was assessed for each cover type within the watershed as method to synthesis the information presented in chapter 3. Fire Regime and Condition class was assessed using a method described by Wendel Hann (2003) for mapping fire regime condition class at the watershed and project levels. The assessment determined that the project area historically had a natural fire regime of "*III – Infrequent Mixed and Surface*" and currently has a condition class of "*2 Moderate Departure form natural conditions.*" The table below shows the condition class for vegetation and fuels and frequency and severity for each cover type and for the project area as a whole. For Fire Regime and Condition Class Definitions refer to Figure 4.1-3**.**

Table 4.1-1 Cover Type Condition Class. **Condition class definitions can be found in the gray inset on the next page.**

Cover Type (% of project area)	Vegetation-Fuel Condition Class	Frequency-Severity Condition Class	Cover Type Condition Class
Aspen (32%)	2	2	2
Aspen/Conifer (18%)	2	2	2
Douglas-fir (3%)	3	2	3
Lodgepole (3%)	2	1	2
Mixed Conifer (18%)	2	1	2
Mountain Shrub (12%)	2	2	2
Mountain Brush (2%)	2	2	2
Sage/Grass (10%)	1	2	2
Project Area	**2**	**2**	**2**

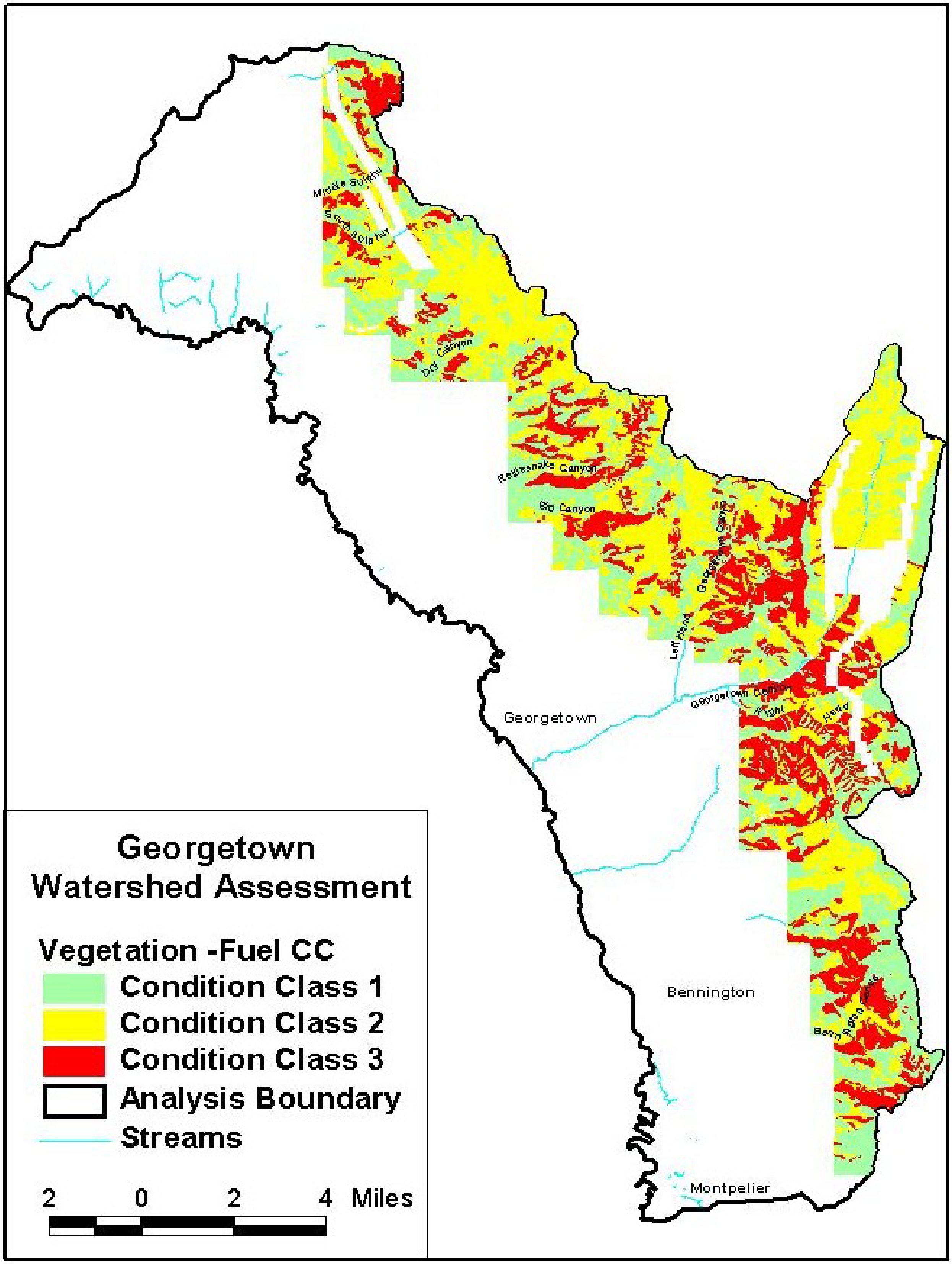


Figure 4.1-2 Vegetation-Fuel Condition Class Map. Colors on map represent the degree of departure form natural condition, where red is high and green is low.

Natural (historical) **fire regime classes** from Hardy et al. (2001) and Schmidt et al. (2002) as interpreted by Hann (2003) for modeling landscape dynamics at project and watershed scales.

Fire Regime Class	Frequency (Mean Fire Return Interval)	Severity	Modeling Assumptions
I	0 – 35+ Years, Frequent	Surface and Mixed	Open forest, woodland, shrub, and savannah structures maintained by frequent fire; also includes frequent mixed severity fires that create a mosaic of different age post-fire open forest, woodlands, shrub or herb patches that make a mosaic of structural stages, with patches generally < 40 hectares. Mean fire interval can be greater than 35 in systems with high temporal variation.
II	0 – 35+ Years, Frequent	Replacement	Shrub or grasslands maintained or cycled by frequent fire; fires kill non-sprouting shrubs which typically regenerate and become dominant within 10 -15 years; fires remove tops of sprouting shrubs which typically resprout and dominate within 5 years; fires typically remove most tree regeneration.
III	35 – 100+ years, Less Infrequent	Mixed and Surface	Mosaic of different age post-fire open forest, early to mid-seral forest structural stages, and shrub or herb dominated patches generally < 40 hectares; maintained or cycled by infrequent fire. Interval can range up to 200 years.
IV	35 – 100+ years, Less Infrequent	Replacement	Large patches generally > 40 hectares, of similar age post-fire shrub or herb dominated structures, or early to mid-seral forest cycled by infrequent fire. Interval can range up to 200 years.
V	200+ years	Replacement Mixed, and Surface	Variable size patches of shrub or herb dominated structures, or early to mid to late seral forest depending on the type of biophysical environment. Cycled by rare fire or other disturbance events. Often have complex structures influenced by small gap disturbances and understory regeneration.

Condition Classes from Hardy et al. (2001) and Schmidt et al. (2002) as interpreted by Hann for modeling landscape dynamics and departures from historical or natural range of variability at project and watershed scales.

Class	Departure	Description
Condition Class 1	Low	Vegetation composition, structure, and fuels are similar to those of the natural regime and do not predispose the system to risk of loss of key ecosystem components. Wildland fires are characteristic of the natural fire regime behavior, severity, and patterns. Disturbance agents, native species habitats, and hydrologic functions are within the natural range of variability.
Condition Class 2	Moderate	Vegetation composition, structure, and fuels have moderate departure from the natural regime and predispose the system to risk of loss of key ecosystem components. Wildland fires are moderately uncharacteristic compared to the natural fire regime behaviors, severity, and patterns. Disturbance agents, native species habitats, and hydrologic functions are substantially outside the natural range of variability.
Condition Class 3	High	Vegetation composition, structure and fuels have high departure from the natural regime and predispose the system to high risk of loss of key ecosystem components. Wildland fires are highly uncharacteristic compared to the natural fire regime behaviors, severity, and patterns. Disturbance agents, native species habitats, and hydrologic function are substantially outside the natural range of variability.

Figure 4.1-3 Fire Regime and Condition Class Definitions

Aspen

This cover type represents approximately 20% of the national forest acres within the analysis area and is mostly composed of the mature/old structure class (68%). This represents an imbalance in structural stages, which may represent a sustainability problem. Available data also shows species composition shifting to latter successional species such as subalpine-fir. A quick comparison of the 1913 data and current condition indicates it's overall percent in the landscape has not changed. However, when looking at the data spatially it is obvious that there has been a change, some areas that were in aspen are now in conifer cover types and some that were mountain brush or sagebrush are now in aspen. In general patch size has also gotten smaller. Aspen has encroached on the same number of acres as it has been replaced on. These changes are likely the result of an interruption in the natural disturbance regime.

Historically fire was likely the dominant disturbance in this type. The absence of fire for 90+ years has allowed the aspen type to reach its current condition of predominantly mature old structure that is succumbing to invading conifer. Under natural conditions stands that reached this point became susceptible to fire and the fire cleared the way for the aspen to successfully sprout and rejuvenate the clone. In the absence of disturbance trees die of old age the clones are unable to sprout replacements due to the existing shade from the invading conifer. As time passes and the photosynthetic ability of the clone is reduced (i.e. trees die) the ability of the clone to respond to more favorable conditions (disturbance) decreases. Long periods with reduced aspen and increased conifer may also create site conditions that will make in difficult for aspen to recover (i.e. change is soil PH).

Aspen can function as a seral or climax cover type, so generalities can be dangerous. The generalities relate to the aspen where it functions as seral cover type, which is the majority of the acreage within this analysis. Where it acts a climax type conifer are not encroaching, it is encroaching on other types.

Douglas-fir

This cover type represents approximately 24% of the national forest acres within the analysis area and is mostly composed of the mature/old structure class (95%). This represents an imbalance in structural stages, which may represent a sustainability problem. A comparison of the 1913 data and current condition indicates the overall percent of the landscape in the Douglas-fir cover type has increased by nearly 12%. This increase of Douglas-fir has come at the cost of: mountain brush, aspen and sagebrush types. These changes are likely the result of an interruption in the natural disturbance regime.

Douglas fir can function as a seral or climax cover type. In general on dry sites Douglas-fir functions as a climax species/type and on moist sites it functions more as seral or intermediate species/type. Below an interpretation of the trend is made that tries to distinguish between these two roles for this cover type. This is an attempt to not over generalize.

Dry Sites

Most of the gain in overall area of the Douglas-fir type has been made on these types of sites, where the lack of disturbance has allowed the densities it increase. With a more natural fire regime many of these sites would have been classified as mountain brush because fire would have kept the trees thinned to the point that brush species would have dominated the site.

Moist Sites

The lack of natural disturbance (fire) has created a shortage of seedling-sapling and young/mid structure classes. The high percentage of acres with multiple canopies also indicates a lack of disturbance as subalpine fir is encroaching under these stands. Under a more natural disturbance regime these sites would have seen fire slightly less often then the dry sites so would have been dominated by Douglas-fir most of the time. However, due to the mixed severity of the fires when the occurred the sites structure would have been much more mosaic like. Alpine fir would have been rare located in isolated pockets that had been missed by fire for one or more fire cycles.

Lodgepole Pine

This cover type represents approximately 8% of the national forest acres within the analysis area and is mostly composed of the mature/old structure class (86%). This represents an imbalance in structural stages, which may represent a sustainability problem. Available data also shows species composition shifting to latter successional species such as subalpine-fir. These changes are likely the result of an interruption in the natural disturbance regime.

A mountain pine beetle epidemic and timber harvest during the last 30 years have played a role in shaping the current condition of this type. Mountain pine beetle killed a high percentage of the lodgepole pine in the 70's (exact % not known), which shifted structure and species composition away from lodgepole pine towards late succession or gap species like subalpine fir or aspen. Timber harvest has created structural diversity by moving mature/old stands to the seedling/sapling and young structure classes. Some the harvest units have decreased the average patch/stand size within the landscape.

The high percentage of the cover type in the mature/old structure class (86%) is especially a concern in this short-lived species. The 1913 data and available stand data suggest that most of the mature lodgepole in the assessment area are over 100 years old. This puts it at increase risk of mountain pine beetle epidemics, which could be far worse than those seen in the 70's due to its increased age and size. An epidemic attack could put lodgepole at extreme risk due to the low percentage of serotinous cones in the assessment area.

Serotinous Cones
The Dictionary of Forestry produced by the Society of American Foresters, defines serotinous as: *pertaining to fruit or cones that remain on a tree without opening for one or more years.*

Lodgepole pine can have serotinous cones. Serotinous lodgepole pine cones do not open at maturity due to resinous bonds between scales. This allows viable seed to be stored for decades. The resin scale bonds break when cone temperatures reach between 113 and 140 degrees Fahrenheit. The serotinous cone habit within lodgepole varies over geographic areas and locally. (Silvics of North America)

Mixed Conifer

This cover type represents approximately 3% of the national forest acres within the analysis area and is mostly composed of the mature/old structure class (96%). This represents an imbalance in structural stages, which may represent a sustainability problem. Available data also shows that a high percentage of the stands have multiple canopy layers. This type was not mapped in 1913.

This type is difficult to assess because most of the other cover types without large scale stand initiating disturbance will end up here (i.e. dominated by subalpine fir). However, some sites historically experienced very long periods without stand initiating disturbances and stayed in this type for long periods. This situation is rare within this assessment area but there are some stands within the area that are well within historical conditions. Most stands in this type however have experience a type conversion due to succession.

Mountain Shrub Types

This cover type represents approximately 7% of the national forest acres within the analysis area and is mostly composed of the mature/old structure class (79%). This represents an imbalance in structural stages, which may represent a sustainability problem.

Bigtooth maple (*Acer)* occurs in canyon bottoms and on portions of side slopes with deep developed soils. It is a native, deciduous tall shrub or small tree. Because of the absence of fire, it has expanded its range into adjacent sagebrush cover types. Most of the sites sampled concluded that there is a balance shrub/herbaceous understory.

Curlleaf mountain mahogany (*Cercocarpus ledifoius*) is a hardwood evergreen that has a tree like form. In the project area, it occurs in extensive pure stands, on moderately deep soils, and in small stringers on shallow soils of rocky ridges and cliffs. Mountain brush communities in which curlleaf mountain-mahogany is either dominant or co dominant are generally stable. Changes in relative abundance of co dominant species may occur; however, succession rates are extremely slow because vegetation changes depend on soil development which is also slow. On 20 sites sampled, herbaceous layers are well developed with groundcover greater than 75 percent.

Sagebrush Types

This cover type represents approximately 36% of the national forest acres within the analysis area and the majority is in a mid-ecological status (5-15 percent canopy cover) with a desirable mix of grasses and herbaceous forbs (Line intercept transects, Montpelier Ranger District).. This puts the type very close to desired/historical conditions. The sagebrush types on the project area are mountain big sagebrush *(Artemisia tridentata* var. *vaseyana)* habitat types. Mountain big sagebrush is usually dominant. Mountain snowberry *(Symphoricarpos orephilus)* is also well represented and sometimes codominant. Other shrubs include Wood's rose (*Rosa woodsii*),, green rabbitbrush (*Chrysothamnus viscidiflorus*), antelope bitterbrush (*Purshia tridentata*), and Rocky Mountain juniper. They form a medium shrub layer 2 to 3 feet tall. The understory consists of perennial grasses, along with a large number of perennial forbs. Associated grasses and forbs include Kentucky bluegrass (*Poa pratensis*), bluebunch wheatgrass (*Pseudoroegneria spicata*), Idaho fescue (*Festuca idahoensis*), prairie Junegrass (*Koeleria macrantha*)*)*, needle-and-thread grass (*Hesperostipa comata*), Sandberg bluegrass (*Poa secunda*), and bottlebrush squirreltail (*Elymus elymoides).* Most recent research indicates that big sagebrush is the climax species on its present-day range, and that invasion into other types is uncommon. Sagebrush species do not appear to have increased their range on a large scale, but reviewers agree that big sagebrush has increased in density in many places in response to historic grazing and altered fire regimes.

Minor sagebrush community types include Basin Bigbrush (*Artemisia tridentata* subsp. *tridentata)*, Threetip sagebrush (A*rtemisia tripartita*), Spiked sagebrush (A*rtemisia spiciformis).*

Mountain Brush Types

This cover type represents approximately 2% of the national forest acres within the analysis area and approximately 74 percent of this type has multiple vegetation layers with alternating vertical dominance and mosaic composition of shrub/herbaceous understory components. Several tree/shrub species such as chokecherry (Prunus virginiana), serviceberry (Amelanchier alnifolia), gooseberries (Ribes), mountain snowberry, elderberry (Sambucus), and snowbrush (Ceanothus) characterize the mountain brush cover type. These species may occur alone and form rather distinct types or they may have a mixed composition. These species re-sprout after fires and generally prefer slightly higher moisture regimes than sagebrush, with an annual precipitation of 15 to 25 inches. The mountain brush complex is found intermingled with sagebrush at mid elevations and conifer/aspen forests at higher elevations. This heterogeneous community is important because it provides diversity within a landscape. A variety of herbaceous understory species provides the needed ground cover to help maintain watershed values. The dense growth of snowbrush often inhibits establishment of very many associated undercover forbs and grasses, but its compact growth provides an excellent soil cover. ..

Riparian Types

Although riparian area types represent less than 1% of the National Forest lands within the assessment area, they represent a very important part of the ecosystem. Properly Functioning Condition Assessments (PFC) were conducted on all perennial waters within the assessment area (Districts files, 1999). These assessments give us an understanding of the condition of the riparian types.

PFC assessment on streams is a tool that evaluates variety of factors affecting a stream health including hydrologic, vegetative, and soils-erosion deposition. A team of interdisciplinary specialists and others who were familiar with the stream preformed these assessments. Three different rankings are possible including properly functioning condition, functional-at risk, and nonfunctional. The functional-at risk ranking is further divided into a high, medium, or low (high being close to properly functioning) with another category for apparent trend. Other factors contributing to the condition of the stream are also identified. The streams were broken into segments depending upon the type and condition of the stream. Assessments were not conducted on private land. Table 1 summaries the stream assessment rating for each perennial stream beginning at the north and going south:

Stream	Rating
Trail Creek Tributaries (3 tributaries)	Properly Functioning Condition
Johnson Creek (lower area)	Properly Functioning Condition
Johnson Creek (middle area)	Functional at Risk (Mid – road impacts)
Johnson Creek (upper area)	Functional at Risk (High – close to PFC)
Wood Canyon (lower area)	Nonfunctional -head cut/road impacts
Wood Canyon (middle area)	Properly Functioning Condition
Wood Canyon (upper area)	Functional at Risk (High – road and rec impacts)
South Sulphur	Functional at Risk (Mod – road impacts, aggradation)
Georgetown (Left- hand fork)	Functional at Risk (High).
Georgetown (above Mine)	Properly Functioning Condition
Georgetown (below Mine)	Functional-at-risk (Road, fords, and culvert problems).

Georgetown (Right-hand fork)	Functional-at-Risk (High- road impacts)
Dunn Canyon (lower)	Properly Functioning Condition
Dunn Canyon (middle)	Properly Functioning Condition
Dunn Canyon (upper)	Functional at Risk (High).
Maple Canyon (upper)	Properly Functioning Condition.
Maple Canyon (middle)	Functional at Risk (High – cattle grazing & ATV).
Maple Canyon (lower)	Nonfunctional (diversion, cattle grazing, rec., noxious weeds).
Bennington (11 segments)	Properly Functioning Condition
Bennington (7 segments)	Functional at Risk (Mid –4 segments) Mass Wasting and road impacts.

<u>Roads:</u> Area-wide, roads are having the greatest impact on riparian function/condition. This impact is highest in Right-Hand Fork Georgetown Creek, Sulphur Creek, and Wood Canyon. Roads are also having a lesser impact in Georgetown Creek. However when considered along with past mining impacts, Georgetown Creek would also have a highly impacted riparian area. The level of impact in all other areas is low.

<u>Livestock:</u> Livestock are impacting riparian conditions in isolated locations (reach scale) in RHF Georgetown Creek, Sulphur Canyon, and Wood Canyon.

<u>Mining:</u> Mining has reduced the abundance, species composition, and vigor of riparian vegetation in Georgetown Creek's middle reach.

Opportunities/Recommendations

- The "Condition Class Restoration Context Chart" output with the condition class runs suggests that restoration efforts need to focus on restoring fire effects, vegetation composition, structure and fuels. In other words treatments should be designed to address all the components of the system not just one, such as fuels or structure.
- Once a project area is picked a site-specific assessment should be made for every stand/site to determine the historical/reference type (e.g. was the site once aspen dominated). Stands or sites should be prioritized base on condition, giving priority to those that have the potential to lose an ecological component.
- Look for opportunities to move structure and species composition of forested cover types towards seral conditions with a combination of mechanical and prescribed fire treatments where mechanical treatment is operationally, economically and socially feasible. Where mechanical treatment is not operationally, economically or socially feasible assess options to use prescribed fire or other none traditional type treatments. In all cases the treatments should be designed to mimic the historical fire regime for the type.
- Develop a burning rotation plan for sagebrush/grass and mountain brush types to maintain the current balance of structure and species composition.
- For all treatments the risk to noxious weeds should be assessed and mitigated if possible.

Data gaps and additional information needs

- Much of the vegetation information used in this analysis is appropriate for use at the watershed scale and for development of an overall watershed existing condition, but should not be used for project planning without close review and on site visits.
- More fire history data is needed for some types.
- A potential natural vegetation classification system needs to be developed for the area so that a better analysis of departure from natural condition can be made. This system should use the existing fire history data plus new data collected for this purpose. A classification system like this would help to account for the acres that have already moved to a new type through succession.

4.2 Hydrologic Processes and Water Quality

CLIMATE - PRECIPITATION

- The entire watershed falls within the snowmelt-dominated zone. Therefore, activities that alter snow accumulation or melt rates could affect the magnitude of the basins runoff response.

- There is two-week time lag between the periods of maximum snowmelt and maximum stream flow. This lag is likely the result water storage in the soil until saturation is achieved. This is a key time since wet, silty soils are more susceptible to rutting and bank deformation than dry soils.

- Drought and wet seasons appear to be cyclical occurring on 7-9 year cycles. We have just left a wet cycle and are in the second year of a dry cycle.

WATERSHED CONDITIONS

Overall Watershed Ratings (IWWI)

Based upon field verification, two changes to the current ratings are warranted:

1. The Geomorphic integrity and water quality ratings for Bennington should be changed to high. All impacts are natural and the stream is in equilibrium. This would result in a composite rating of good.

2. The lower reach of Wood Canyon Creek is a damaged segment. However, this reach is primarily located below the forest boundary.

	Bennington	Maple	Georgetown, LHF, & Dunn	Big	Red Pine
Watershed Vulnerability	Moderate 20-50% Sensitive	Moderate 20-50% Sensitive	Moderate 20-50% Sensitive	Moderate 20-50% Sensitive	Moderate 20-50% Sensitive
Geomorphic Integrity	High All streams fully Functional	Low >20% Not fully Functioning	Moderate <20% Not fully Functioning	Moderate <20% Not fully Functioning	Low >20% Not fully Functioning
Water Quality	High Not impaired	Low >20% Impaired	Moderate <20% Impaired	Moderate <20% Impaired	Low >20% Impaired
Composite	Good	Poor	Fair	Fair	Poor
Damaged Streams	None	None	None	None	None

	Rattlesnake	Sulphur	Wood
Watershed Vulnerability	Moderate 20-50% Sensitive	Moderate 20-50% Sensitive	Moderate 20-50% Sensitive
Geomorphic Integrity	Moderate <20% Not fully Functioning	Moderate <20% Not fully Functioning	Moderate <20% Not fully Functioning
Water Quality	Moderate <20% Impaired	Moderate <20% Impaired	Moderate <20% Impaired
Composite	Fair	Fair	Fair
Damaged Streams	None	None	Lower Wood

Interpretations:

- "Georgetown", "Big", " Rattlesnake", "Sulphur", and "Wood" are moderately impaired with regard to their geomorphic integrity. The assumption behind this rating is that watersheds of moderate integrity can see short-term recovery either naturally or through revised management with minimal capital investment.

- "Maple" and "Red Pine" are severely impaired with regard to their geomorphic integrity and water quality. Capital investments may be necessary to recover these areas.

- "Georgetown", "Big", " Rattlesnake", "Sulphur", and "Wood" are moderately impaired with regard to water quality. Since this condition is primarily tied to sediment, the same premise that applies for geomorphic integrity also applies to water quality.

RIPARIAN AND WETLAND CONDITIONS

Flood Plain and Wetland Conditions

Agricultural activities have reduced the amount and function of wetlands in the lower reach of most drainages. This includes wetland conversion to crops and farmsteads, channalizing streams, and diverting water for irrigation. Some of these old wetlands still support seasonal wet areas.

Riparian Conditions

Riparian conditions are degraded along four streams: Wood Canyon, Georgetown, Sulphur, and RHF Georgetown creeks. Past mining and roads are the main causes along Georgetown Creek, while roads are the primary disturbance along the other three.

STREAM CONDITIONS

Stream Flow Regime

- Since there are no reservoirs on these streams the timing of runoff is likely close to historic conditions.

- When assessing future cumulative effects, the analysis area boundary should extend downstream either to the point of diversion or to the stream's mouth (for all streams). This is because Georgetown Creek, the watersheds largest drainage, contributes only 5% of the Bear Rivers flow at their confluence. Therefore, the Bear River would mask or dilute potential effects making them undetectable. Since the other drainages are much smaller than Georgetown Creek, this finding would hold true in these areas as well.

Sediment Regime

Sediment Sources

Channel Erosion:

- Channel erosion has been substantially increased in Wood Creek. This is the result of upstream channelization.

Mass Wasting:

- The frequency of mass wasting, in the Bennington drainage is occurring at natural rates. This is not a major factor in any other drainage.

Surface Erosion:

- Surface erosion is a concern in the "Georgetown" (mining, roads, and recreation), "Wood Canyon" (roads and gazing below the forest) and "Sulphur" (grazing and roads) areas.

Sediment Transport

- The current sediment pulses are somewhat larger than what was found historically. This is because the majority of the basin's sediment is now being stored in short-term bed features, as opposed to moderate duration woody debris storage. This has had a dramatic effect on depositional reaches, such as the middle reach on Sulphur Creek, which is filling and losing capacity due to sediment.

- Lower Wood Canyon Creek was historically a transport or depositional reach, however it is now a source reach. All other reaches are functioning as they should for their stream type and location along the channel.

  Source Reaches: Bennington, upper RHF Georgetown, lower Wood, and upper Sulphur.
  Transport Reaches: Georgetown, LHF Georgetown, lower Sulphur, and middle Wood.
  Depositional Reaches: lower RHF Georgetown, middle Sulphur, and upper Wood.

Stream Channel Morphology/Stability

This section is made up of three subsections; (1) an evaluation of the differences between the historic and current conditions, (2) an evaluation of how sensitive the various streams are to future disturbances, and (3) a prioritization of restoration opportunities.

Stream Evaluations

Stream stability is good in all drainages except Wood Canyon Creek. However, several streams have been impacted by fine sediment reducing their condition to fair. The relative condition of these basins can be rated from best to worst as Middle Sulphur, Bennington, LHF Georgetown, Georgetown, RHF Georgetown, SF Sulphur, and Wood Canyon.

Bennington Creek:

- While this stream is functioning as would be expected under natural conditions, the upper banks (the inner gorge) are very sensitive. Ground disturbing activities in these areas would result in a substantial increase in instability.

Georgetown Creek:

- Sediment levels are elevated in all three streams. These reaches cannot handle additional sediment inputs and existing sources should be addressed.
- Flows do not appear to be a limiting factor in this subwatershed.
- Upper Georgetown Creek has been affected by the adjacent road (sediment) and headcuts associated with small riparian openings. These headcuts threaten channel function. Overall these disturbances reduced channel condition to fair.
- Channel function was obliterated through the mining site. While pockets of stream exist, the stream is piped through the mine site and channelized between old roads and impact sites. This segment cannot regain its natural function without very costly restoration.
- Below the mining site, Georgetown Creek has been severely altered by roads. However, this reach is attempting to regain some characteristics of a natural channel before leaving the forest.
- While sediment levels are elevated in the LHF, this stream is still functioning.
- High sediment levels (from the road), a reduction in woody debris, poor stream crossings, and dewatering of the creek are the primary threats in the RHF drainage. This stream might be moving towards the non-functional category.

Middle Sulphur:

- This valley bottom is functioning as would be expected under natural conditions. There are no management limitations in this drainage.

South Fork Sulphur Canyon:

- The greatest threat to South Sulphur Canyon is the sediment produced in the upper reach. This sediment is already exceeding the capability of the middle reach to process this material and channel filling is occurring. This threatens channel function and beneficial use support and increases the threat of flooding.

Wood Canyon:

- This stream is dramatically different from historic conditions. The lower reach has changed from a depositional reach to a source reach, and habitat has been altered to the point it may already be lost. This is a serious problem that may lead to a loss of beneficial use support.

Sensitivity to Future Disturbances

Table 5-1 summarizes current stream stability, sensitivities to future disturbances, and the priority for restoration. These variables were developed based upon the inherent sensitivity of the stream and existing conditions. The extent of the change from historic conditions defines the magnitude of the streams sensitivity. The following bullets provide the interpretation for this table. Where sensitivities are different for sediment and flows, the interpretation applies to the variable being evaluated.

- Streams/reaches in good condition with low sensitivities are stable with little threat of instability. These streams are functioning as would be expected under minimally disturbed conditions. Resource management is not limited by stream conditions.

- Streams/reaches in good condition with moderate sensitivities are stable streams that may become slightly degraded if a large disturbance or alteration were to occur. These streams are functioning as would be expected under minimally disturbed conditions.

- Streams/reaches in fair condition with low sensitivities are streams that show impacts (likely natural) but are still functioning. While somewhat impacted, the inherent characteristics of these streams would protect them from further impacts to the variable being evaluated. Resource management is not limited by stream conditions.

- Streams/reaches in fair condition with moderate sensitivities are streams that show impacts but are still functioning. These streams would become impaired if a large disturbance or alteration were to occur. These are often referred to as functioning-at-risk.

- Streams/reaches in fair condition but with high sensitivities are streams that show impacts but are still functioning. These streams cannot handle any additional impacts. These are often referred to as functioning-at-risk.

- The lower reach of Wood Canyon limits management opportunities in this basin. This is an extremely unstable reach that cannot handle its current level of disturbance. Impacts should be reduced or stream conditions will continue declining.

Table 5-1 summarizes current stream information.

	Stream	Physical	Rating/	Sensitivity to Changes in		Restoration
	Types	Stability	Condition	Stream Flow	Sediment	Priority
Bennington	A2/3	Good	Fair (89)	Low	Low	Low
Georgetown	B4	Good	Fair (85)	Low	Mod-High	High

	Stream	Physical	Rating/	Sensitivity to Changes in		Restoration
	Types	Stability	Condition	Stream Flow	Sediment	Priority
LF Georgetown	B4/E4b	Good	Good (70)	Low	Mod	Low-Mod
RF Georgetown	E4b/A4	Good	Fair (87)	Low	High	Moderate
Middle Sulphur	Draw	Good	None	Low	Low	Low
SF Sulphur						
Upper	A4	Good	Fair (94)	Mod	Mod-High	High
Middle	E4/5b	Good	Fair (93)	Low-Mod	High	High
Lower	A3	Good	Good (65)	Low	Low	Low
Wood						
Upper	E5	Good	Fair (87)	Low	High	Moderate
Middle	A4	Good	Fair (85)	Mod	Mod	Low
Lower	E4/G5	Poor	Poor (120)	Very High	High	High

Opportunities/Recommendations

This analysis found that the primary threats to aquatic health are associated with riparian disturbances. Therefore, restoration should focus on reducing the level of impacts within the riparian zones (i.e., reducing sediment delivery from riparian roads) and improving riparian conditions. The priority for treatment can be summarized as:

- “Sulphur Canyon” has the highest priority because current sediment production is resulting in channel filling and a loss of function. This could eventually lead to a 303(d) listing. If treated early enough, this stream has a good recovery potential. The restoration should center on reducing sediment production from the road and reducing recreational impacts. Enhancing beaver habitat would be a benefit, but would likely conflict with other activities in this valley bottom.

- “Upper Georgetown” is the second priority because of its value as a fishery. The restoration should center on reducing sediment production from the road and stabilizing the headcuts. Enhancing beaver habitat would also be a benefit. With proper restoration this area has a good recovery potential.

- “RHF Georgetown” is the third priority because it has a high level of sediment impacts and it has a good recovery potential. The restoration should center on reducing sediment production from the road, improving/removing stream crossings, and reducing grazing impacts.

- “Lower Wood” is fourth, but only because of the magnitude of the problem. While this would be the most beneficial project, most of the impacts are on state lands (although the cause is on National Forest Lands). This could be a good cooperative project that could yield significant benefits to the system. Once this project is complete, addressing sediment in the upper reach would yield benefits.

- "Bennington Creek" is last because no improvement opportunities are known on National Forest Lands. However, the new private road poses a high risk of sediment delivery.

WATER QUALITY – WATER QUALITY LIMITED SEGMENTS (303(D))

- South Sulphur and Wood Canyon creeks may be moving towards listing if the sediment and loss of function problems aren't resolved.

These recommendations are evaluated in two ways. The first rating evaluates the risk of no action, while the second rates the potential benefit of implementing the recommendation. Items are listed in priority order.

Risk of no action: A rating is a best fit and does not need to meet all criteria.
High: Impacts would continue degrading conditions. The magnitude of the impact is such that it could lead to a 303(d) listing. Impacts are at the subwatershed scale.
Moderate: Impacts would continue but the stream is expected to continue functioning. The impact being addressed is not the primary factor affecting stream conditions. Impacts are at the reach scale.
Low: While impacts would continue, they are localized problems that are not expected to affect conditions at the reach or subwatershed scale.

Benefit to Resource:
High: The action would reduce impacts at the sub-watershed scale.
Moderate: The action would reduce impacts at the reach scale.
Low: The action would improve conditions at the local scale.

1. Reduce sediment production by improving road conditions in the South Fork Sulphur Creek subwatershed. This could include adding gravel, improving drainage, or restricting access.
   High. Existing conditions are resulting in channel filling and a loss of channel capacity. Maintaining existing trends would adversely affect stream conditions in this as well as downstream reaches and could threaten beneficial uses.
   High. Since this is the main sediment producer in the watershed, the entire drainage would benefit from reduced sediment inputs. This could prevent the stream from becoming 303(d) listed.

2. Repair the headcuts in the upper Georgetown reach preventing their upstream migration and eventually allowing fish passage. This can be accomplished by constructing a small boulder/cobble cascade immediately at the headcuts.
   High. The existing headcuts could continue moving up the valley producing a gully and generating large quantities of sediment. This could also disconnect the stream

from the floodplain. Finally, these sites would continue acting as upstream fish barriers.
Moderate. While fish passage can be a subwatershed issue, the mine site limits the benefit to the upper reach. However, this measure would still yield positive results by stabilizing the stream, eliminating a major sediment source, maintaining connectivity, and providing fish passage.

3. Reduce sediment production by improving road conditions in the RHF Georgetown Creek subwatershed. This could include adding gravel, improving drainage, removing or replacing culverts, and/or restricting access. Closing the road above the Right Forks diversion would substantially improve conditions down to this point.

   Moderate-High. Maintaining existing trends would adversely affect stream conditions in the reach above the domestic water diversion. This could threaten beneficial uses.
   Moderate. This could improve conditions from fair to good in the reach ending at the domestic water diversion.

4. Reduce sediment production by improving road conditions in the upper Georgetown Creek subwatershed. This could include added gravel, improving drainage, and/or restricting access. In steep sections, where the road is in the bottom of the drainage, a course base level topped with gravel would allow water to move through the road and minimize erosion of the road surface. This could include routing runoff to sediment basins.

   Moderate. Sediment from this section of road would continue affecting stream conditions. However, the reach would continue functioning.
   Moderate. Reach conditions would likely improve from fair to good. Improvements would not be detectable through and below the mine site.

5. Restoration should center on relocating and reconstructing Wood Canyon Creek from the road ditch to a stable point downstream.
   High. This reach would continue eroding producing large quantities of sediment. Habitat quality would also decline. This reach would likely be listed as water quality limited (303(d)).
   High. Since this is the main sediment producer in this subwatershed, the entire drainage would benefit from reduced sediment inputs. This could prevent the stream from becoming 303(d) listed. This project would be the top priority if it were located on National Forest System Lands. However, since this problem originated on the Forest, it may be appropriate to restore this site under authority of the Wyden Amendment (allowing us to spend federal dollars on non-federal lands).

6. Support beaver transplant into the Georgetown subwatershed. Restoring the role of beaver throughout this watershed would reestablish many processes affecting stream function/condition. As a result, this action item would improve sediment storage, vertical

stability (addresses the headcuts), and connectivity with the floodplain. It would also reduce channel erosion, and improve aquatic habitat.

Low-Moderate. Existing sensitivities would remain.

Low-Moderate. This measure would add stability at the local to reach scale.

7. Reduce sediment inputs to the upper Wood Canyon Reach.

   Low. Although sediment production would remain elevated, this source is producing a small percentage of the subwatersheds total sediment load.

   Low. This action would only improve conditions in the upper meadow area. Until the lower reach is restored there would be no detectable improvements at the subwatershed scale.

4.3 Soil Productivity and Soil Quality

Soil quality is defined as the capacity of a specific kind of soil to function. Vital soil functions include the following criteria:

- Sustain biological activity, diversity, and productivity
- Regulate water and nutrient solute flow
- Retain the ability to filter or buffer , immobilize and detoxify organic and inorganic materials
- To store and recycle nutrients and other elements

Soil quality assessment is based on certain chemical, physical and biologic functions that can change with introduced stress or management practices that reduce the productivity of the soil (Karlen et al. 1997).

Soil productivity is the inherent capacity of the soil to support the growth of specific plants, plant communities or a sequence of plant communities. Many soil properties affect soil productivity but to be useful as an indicator of changes in the soil, a soil property should meet certain conditions to be useful:

- Readily changed by management activities
- Easy to measure or observe, or directly related to a property that is
- Strongly correlated to with the growth of forest or range vegetation
- Sensitive to incremental changes that can cumulatively reduce soil productivity.

Loss of soil productivity is related to a reduction of soil porosity, the reduction of soil organic matter and soil loss by erosion or soil displacement (soil depth). All three of these characteristics strongly correlate with long-term loss of optimal vegetative growth. Soil productivity standards and guidelines serve several functions. They define minimum requirements for protecting the soil resource when management prescriptions are developed. They also provide a method to mitigate measures to restore the affected soil base back to a productive function. Lastly, they provide a basis for monitoring management practices to determine whether or not the soil productivity is actually being maintained or restored (Tahoe National Forest, internal working paper 1988).

Region 4's Soil Quality Guidelines state that at least 85% of an activity area should be in a non-detrimentally disturbed condition. These represent the limits of disturbance, or thresholds, beyond which research scientists have determined that there will be long-term losses in soil productivity or hydrologic function. If disturbances exceed the guidelines, detectable losses of soil productivity and soil hydrologic function will occur. These guidelines also represent the upper limit of allowable disturbances. The management goal should be to cause as little disturbance as possible (updated FSH 2509.18 2002). Detrimental soil disturbance would include compaction (loss of porosity), displacement (loss of organic matter and soil volume), puddling (loss of porosity), severely burned soil (loss of organic matter) and erosion (loss or organic matter and soil depth).

Interpretation of Trend

Soil properties usually change very slowly over long periods of time with out disturbance. Natural disturbances include fire, landslide or mass soil movement, and natural rates of erosion. Native American impact on this disturbance regime was basically the use of fire. This has changed dramatically with the influx of European emigration that settled around the Georgetown area. Their arrival marked the beginning of various land management activities. Most land management actives have a negative impact on soils. A comparison of current conditions with the starting the point of 1800, would conclude that trend would be downward for the soils. This would not reflect the improvements in management practices that have taken place since the Forest Service became the land manager of the area within the watershed analysis area in 1907. This marks the beginning of an organized attempt to manage resource values for future use (Heidi Heyrend-Range Specialist Report, 2002).

Before the Forest Service could put into place some management directives in 1913, soil damage had already reached some severe reduction of productivity (Al Winward-Regional Forest Ecologist – personal communication).

Slope Instability or Mass Wasting

While the inherent geomorphic instabilities of the geology, land type associations and soils still have the same properties as in the 1800's, human management activities have had impacts. In Georgetown Canyon sub-watershed, soil instability was accelerated by open pit mining. In the agricultural lands west of the Forest Service boundary, dry land farming and misuse of irrigation water had a similar effect on major drainages and their tributaries from 1906 to the mid 1960's. Since then, restoration projects improved vegetation cover, slowed or stabilized head cutting and gullying processes along streams. The increased use of ATV or other off road vehicles poses a threat to gains made in some of these areas. The trend is upward toward improvement.

Grazing

In livestock allotments, animals need to be moved from an area when established grazing protocols have been met so that over utilization of vegetation can be avoided. If the ground cover is denuding, the potential for erosion is increased. Compaction is most likely to happen in the early spring when soil moisture is high. Changing the timing of when livestock is permitted into the allotments and then required to be removed, has helped mitigate some of these soil risks. The decrease of livestock from their high in 1907 lessened the potential for soil damage by compaction and erosion. Soil displacement was also greatly reduced by this decrease. The trend is improving for the upland soils (Winward – personal communication – 2002).

Vegetation Cover

According to the Forest Plan, 65% to 70% ground cover is required to maintain soil productivity. As in previous years, the 2000 monitoring has recorded an average if 85% to 90% ground cover on sites (Caribou-Targhee National Forest 2001). Good vegetation cover is an indicator in range soil productivity. The trend is improving but in some areas, projects are still needed to restore areas with less ground cover, such as sheep bedding grounds, livestock driveways, and areas of decadent sagebrush on mountain sideslopes with erosion prone soils.

Timber Harvests

Timber harvests in the past have not covered a large area on the watershed. Forest wide, most timber sales (70%) have exceeded the guidelines of 15% detrimental soil compaction. However, 50% of the non-harvested samples also exceed soil compaction standards. The cause could be due to the extent of soil damage at the beginnings of the 1900's because of uncontrolled livestock populations. Post-harvest down woody debris standards are exceeded on 85% of the timber sales checked (Caribou -Targhee National Forest 2001). This represents an upward trend for soil productivity in the future. When balanced with compaction, the general soil trend is stable or slightly improved.

Mining

The Georgetown Canyon open pit mines have not been active since the mid 1960's but are still actively eroding due to the lack of vegetation and inadequate mine reclamation. However, the sediment delivery to the main stem of Georgetown Creek is considerably less than before an extensive restoration project completed in 1976. The soil condition trend is stable or slightly improving.

Roads

Roads are a major source of soil erosion. When a stream is in close proximity to a road, the risk of sediment delivery is higher. The analysis area has approximately 404 miles of roads and trails, much of it in a non- surfaced condition. The area within the Forest Service boundary has 82 miles of road, all of it unsurfaced. Erosion will continue, as well as sediment loading, when the roads are in close proximity to a stream. Many roads and trails are near streams and maintenance is not always optimal. The trend is downward for soil erosion from roads.

Opportunities/Recommendations

1. Close and obliterate pioneered, non system roads and trails. Re vegetate with appropriate grasses and native shrub (sagebrush, maple, willow or other desired species) to hold the soil in place, and create a physical deterrent to discourage further off road use.
2. Closely monitor new livestock grazing protocols to move sheep and cattle sooner where problem exist such as riparian and bedding areas
3. In severely damaged areas, identified by monitoring, remove or fence livestock out, and let the affected area rest.
4. For monitoring purposes, create plots in logged units for different prescriptions and logging intensities, spanning 20 to 30 years, to study the effects of soil disturbances overtime.

4.4 Native Fish Habitat

Interpretation of Trend

Native fish populations have been negatively affected by the introduction of non-native species, fragmentation of habitat by culverts and irrigation diversions, and habitat alteration due to roads and mining.

Non-native fish can impact BCT through at least three different mechanisms. One is hybridization by crossing with rainbow trout changing their genetic makeup. Two is competition and displacement by rainbow or brook trout for limited food or habitat. Three is by direct mortality as one fish preys upon another generally a brook trout preying upon a smaller cutthroat.

Connected systems allows for the affects of localized disturbance to be buffered. Diversions for irrigation frequently dewater the streams or are vertical barriers preventing up stream movement or connectivity. When systems are connected and disturbances such as intense fire or drought occur in one area the sub-populations can be re-founded by a connected sub-population. Without this ability to re-found populations, resiliency and the populations are lost. The many barriers present have also effectively eliminated the ability of the native cutthroat to fully express their fluvial life history and made them more prone to replacement by non-native fishes.

The primary alteration to streams has been the re-alignment of the streams due to roads and mining. These changes have resulted in increased sedimentation and in the instance of the mine complete obliteration of the creek.

Opportunities/Recommendations

- Conduct water tests below the mine to determine why no fish inhabit this area in Georgetown Creek.
- Restore connectivity of the streams to the Bear River for at least the spring run-off or cutthroat spawning period.
- Restore the over one mile of stream that has been channelized or put in a culvert by the ine in Georgetown Creek.
- Encourage measures in the Bear River to improve flows, bank stability, habitat improvement, and connectivity that would favor the native Bonneville cutthroat.
- Correct culverts that are fish migration barriers.
- Assess life expectancy of culverts under major road fills and determine plans to prevent catastrophic failure.
- Relocate or decommission roads that are encroaching upon the streams.
- Evaluate efforts to eradicate brook trout and restore native cutthroat once other habitat and connectivity issues have been resolved.
- Correct the nickpoint created by the culinary development on the Right Hand Fork of Georgetown Creek.
- Work to insure that the agreed to minimum flow of 5 cfs below the Georgetown hydro diversion is honored.

4.5 Wildlife Habitat

Interpretation of Trend

The lack of disturbance to most vegetation types has shifted habitat within the watershed towards late successional structure and composition. The consequences of this include a possible decline in some wildlife species and an increase in others, relative to pre-settlement levels. Another consequence is the potential over-use of the remaining early successional acres, especially rangeland types where livestock are part of the equation. However, no species are known to be threatened with extirpation because of these changes. Wolverine and sage grouse have been petitioned to be listed as threatened.

Prescribed fire and wildfire in sagebrush types within the watershed have not exceeded the 20 percent early seral threshold guideline recommended by Connelly.

Linkage habitat is provided for species moving between the Greater Yellowstone area and the Unita Mountains. This is primarily for large carnivores such as the wolf and lynx.

Total acres of riparian habitat have been lost since pre-settlement through diversions, mining, road building and reduction in beaver populations. Beaver populations are not at full potential due to these changes in stream condition and due to loss of food and dam construction materials. Amphibian and migratory bird populations are likely to be below potential due to this loss of riparian acres.

Although the number of open miles of motorized routes has remained relatively steady, use on those routes has increased and is expected to continue to increase as more people use the Forest for recreation and the popularity of ATV riding increases. The negative impacts to wildlife from this human activity aren't expected to go beyond its current spatial extent as long as open motorized route mileage does not increase and travel restrictions are enforced.

Elk populations are expected to remain stable but deer populations may decline due to changes in habitat, primarily winter range. Summer range will likely remain adequate despite succession of aspen to conifer and some very slow conversion of rangeland types to conifer. The increased elk population occupying higher elevation winter range has concentrated deer on lower elevation winter range which tends to be private land. Human development on these lands continues to reduce this critical habitat.

Opportunities

1. Protect mature sagebrush - The amount of mature sagebrush providing breeding habitat for the Geneva sage grouse leks should be monitored following each fire season to determine compliance with Connelly's recommendations. Controlled fire may be allowed until the 20 percent threshold is approached. New, better, and more extensive data on sagebrush conditions for the entire eleven-mile radius around the Geneva leks may allow for more treatments or may validate a need to exclude treatments for a longer period of time. (Note

the sagebrush within the analysis area and within eleven miles of the Geneva lek is high elevation sagebrush and most likely is not suitable sage grouse habaitat.)

2. Increase wetland habitat - Wildlife habitat would increase if the potential vegetative condition of riparian habitat were met. There is an opportunity to increase riparian vegetation for amphibians by fencing the north half of livestock ponds or natural seeps or springs heavily grazed by livestock. (The north half is warmer in the spring.) Any change in the Georgetown Road location or removal of the mine plant valley bottom fill allowing an increase in riparian vegetation would increase riparian vegetation. Maintaining a pool behind the road crossing is providing a unique wetland habitat.
3. Monitor ATV use on rare plants – Additional Off-road motorized travel restrictions are probably not needed at this time. Enforcement of existing regulations would help alleviate impacts of ATVs on rare plant habitat on the Twincreek formation.
4. Increase early seral aspen, chokecherry, and serviceberry. Good winter habitat has chokecherry, serviceberry, and aspen (D.Meints per. com.). In winter habitat, avoid treatments that will reduce the overall height, canopy cover, or density of key winter shrubs/tree. If treatment is needed to improve the quality of sharp tail winter habitat, limit treatments to no more than 20 percent of the area and allow adequate recovery time (7-10 years) before treating other portions of the winter habitat (Ulliman and others 1998, 15).
5. Monitor snowmobile use - Snowmobile use in wolverine habitat should be monitored to determine if there are undisturbed areas for wolverine denning.

6) Support CRP – Vegetation on CRP lands contributes to the success of sharp-tailed grouse and elk populations. A reduction would put additional foraging pressure on vegetation at higher elevations until elk populations are reduced. Sharp-tailed grouse would depend on the remaining foothills vegetation for nesting habitat if CRP lands are reduces.
7) Maintain the diversity of forest seral stages / Increase aspen stands – A diversity of seral stages of forest would increase aspen stands. An increase in aspen would support beaver dam construction. Bark beetle mortality is at levels to meet woodpeckers' needs.
8) Follow the Idaho Bird Conservation Plan guidelines: Recommends that each sage grouse area should be provided with at least 25 percent of each major sagebrush community (especially big sagebrush) in an early-seral stage, 25 percent in a mid-seral stage, and 25 percent in a late-seral stage. (For example use <15 %, 15-25%, & >25% canopy cover.) Connelly and others (2000) recommends that, within eleven miles from a lek area, a maximum of 20 percent mountain big sagebrush breeding habitat be treated in a 20-year period. The sagebrush understory should contain a healthy bunchgrass community (bluebunch wheatgrass, Idaho fescue, & *Stipa).* Adequate ground cover of non-senescent grasses/forbs as cover/forage should be maintained from May 1 to July 15 to provide cover and forage for nesting birds. More than 50 percent of the annual vegetative growth of perennial bunchgrasses should be allowed to persist through next nesting season. The proper use of rest-rotation or deferred-grazing systems will meet these conditions. Springs/seeps in suitable condition will provide for sage grouse water/insect use during chick rearing. Grass height and cover affect sage grouse nest site selection and success. (Connelly and others 2000, 974).

Data gaps and additional information needs

1. Sagebrush condition and extent for the entire eleven-mile radius around the Geneva leks.
2. Sage grouse use and extent within the watershed.
3. Presence of TES species and/or suitable habitat within the watershed.
4. Carrying capacity for big game on winter range.

5.0 Issues and Key Questions

The purpose of this chapter is to respond to the key elements of the ecosystem relevant to future land management activities developed in chapter 2. In this chapter the issues and key questions identified and developed by the interdisciplinary team have been answered with a short response to provide the reader with a quick summary of the results of the assessment.

5.1 Vegetation Dynamics

The "Caribou Nation Forest and Surrounding Area Sub-Regional Properly Functioning Condition Assessment" and other similar broad scale assessments have indicated that existing vegetation distribution, structure, and composition are outside the historic range of variability across much of the Montpelier Ranger District. Therefore, the vegetation within the Georgetown watershed assessment area is likely also outside historic ranges, which has the potential to adversely affect ecosystem function.

Key Questions-

Non-Forested Vegetation

1) How has the structure of non-forested cover types changed? (Indicator - structure class reported by cover type)

   Rangelands, primarily sagebrush communities, appear to have a structure very similar to the desired/ reference condition. Available data indicates that approximately 60% of the Forest Service sagebrush types have between 6 and 15% crown cover.

2) How has the disturbance regimes of non-forested cover types changed? (Indicator - disturbance regimes reported by cover type)

   The current fire disturbance is 60+ years the historic disturbance regimes was 25 to 76 years. Natural fire has been replaced with total suppression of wildfire. If the current disturbance regime trend continues, it will likely lead to a future imbalance in non-forest vegetation structure.

3) How has the increased presence of noxious weed affected native vegetation?

   Noxious weeds can be found across much of the lower portion of the watershed. Noxious weeds out compete and replace native species, they are often unpalatable to livestock and wildlife, and often reduce the watershed protection value of the vegetative cover. Noxious weed presence and abundance are increasing. Current funding levels will not control even existing populations. Noxious weeds are the main issue on non forested sites.

Forest Vegetation

1) How has the structure of the forested cover types changed? (Indicator - structure class reported by cover type)

   Natural stand development and succession and the lack of any major stand-initiating disturbance since the beginning of the last century has created a landscape with a dangerously high percentage of mature/old structure. Currently all cover types are outside the desired range of structure classes. This lack of balance in structure across the landscape is the driver behind all forest types having a condition class rating of moderate or high.

2) How has the density of the forested cover types changed? (Indicator - density reported by cover type)

   Densities have increased for all forest cover-types. Succession and stand development has continued without the natural fire disturbances that would have 'thinned' the stands kept the overall densities at a much lower level. This increase in density especially at such a large-scale could lead to an uncharacteristic fire when it does occur.

3) How has the species composition of the forested cover types changed? (Indicator - species composition reported by cover type)

   Species composition has changed in many of the covertypes due to succession to more shade tolerant species. Subalpine fir has developed in historically fire maintained Douglas-fir and mountain brush sites. Aspen has or is succeeding to conifer species on many acres. Lodgepole pine is succeeding to subalpine fir. Douglas fir is both gaining acres into sagebrush and mountain brush sites and loosing acres to subalpine fir.

4) How has the disturbance regimes of the forested cover types changed? (Indicator - disturbance regimes reported by cover type)

   Insect and disease disturbance continues to fluctuate with drought cycles but as the age of the forested vegetation increases susceptibility to more widespread will increase, especially with the high percentage of mature forest.

   The fire regime for all covertypes has been altered such that the relatively frequent, low-to mixed intensity fire opportunity has been lost. Although lethal fire events are natural for all of these covertypes, the loss of the intervening low intensity fires has resulted in an unnatural build-up of live and dead fuels. The result is a higher probability of an uncharacteristic fire event.

5.2 Hydrologic Processes and Water Quality

Hydrologic processes and water quality within the watershed may be being impacted by past and present activities.

Key Questions-

1. How are hydrologic processes and water quality being impacted?

   All forest activities from camping to grazing to timber harvest have an impact on both hydrologic process and water quality. A system that has not been overly degraded can handle most of these impacts. Roads that are in close proximity to streams and or that chronically contribute sediment to the system are the greatest impact to the over all health the system.

5.3 Soil Productivity

Is soil productivity being maintained now in the watershed?

Half of the soils in the Georgetown Watershed have inherent low productivity. In addition, almost 12% have unstable slopes. Resource management in this area includes 11 sheep allotments, one cattle allotment and several old phosphate mining areas In addition, ATV trails, pioneered campsites, and other human activities have the potential to increase the amount of detrimental soil disturbance and reduce soil productivity in the area.

Key Questions-

1. What are the major livestock grazing soil impacts in the watershed?

   The major livestock impacts to soils include; compaction in riparian areas and around water developments, and accelerating erosion by removal of ground cover through over utilization and concentrated use (sheep bedding and loafing areas, driveways), and stream bank hoof shear.

2. Is recreation use (camping and ATV use) causing a significant increase in soil disturbance, in the form of erosion, sediment delivery or compaction?

   Recreation pressure is increasing including more dispersed camping locations and more off-road vehicle use, mostly on designated trails but some unauthorized, cross-country use. Specific sites are being significantly impacted but the level of impact across the watershed is not significant. Camping with larger vehicles is compacting and denuding new areas and ATV use is causing increased erosion, loss of ground cover, and soil displacement where new routes are pioneered. The dispersed camping activities are occurring within riparian areas and in open meadows (just south of Summit View Campground, and along Georgetown Creek. Most of this ATV activity is occurring on ridges and upland sites in the watershed. Increasing legal ATV on designated trails is also causing detrimental effects when trail maintenance can not keep downfall cleared (side trails are developed) and drainage structures are not kept functional.

3. Is mining, both active and inactive, affecting the watershed soils?

   There is no active mining in the watershed. Old mines are contributing to erosion, sediment, and selenium discharges.

4. How susceptible to management activities are the land types found within the watershed?
5.

   See table in Chapter 3.

6. How much of the watershed has been detrimentally disturbed by past activities?

This value is hard to sample for. An estimate in chapter 3 is made evaluating past activities. See Summary Table, by sub-watersheds (HUC 6) for the analysis area

5.4 Native Fish Habitat

Bonneville Cutthroat Trout populations, distribution and available habitat has been altered by humans uses, which may have reduced species sustainability.

Key Questions-

1) How have fish populations, distribution and persistence been affected by past human use/management, within each local population watershed? (Indicator(s)- population, and presence reported by local population watershed)

   The only trout native to this watershed are Bonneville cutthroat. Strength and trend of the populations will be given.

2) How and to what extent have barriers affected native fish distribution and persistence within the watershed? (Indicators- barriers, reported by local population watershed)

   Irrigation diversions, dewatering, mining activity and culverts have created barriers. These barriers have had severe impacts by drying up stream habitat and more importantly eliminating connectivity of the tributaries to the Bear River disrupting or eliminating life history patterns that may have been vital to the long-term persistence of cutthroat in these drainages. Some tributaries may not have had resident populations of BCT but may have been useful for spawning and rearing of adults and age-0 fish. Connectivity to larger river system is vital especially in arid areas where droughts may occasionally be severe enough to extirpate fishes in a given stream that can in turn be re-founded by the fluvial river population.

3) How and to what extent have non-native fish affected native fish distribution and persistence within the watershed? (Indicators - presence/absence of non-native fish species reported by local population watershed)

   The two major non-native fishes that have affected the native fish populations are brook trout and rainbow trout. Brown trout may occur in the warmer and more polluted Bear River. Each of these fishes impacts the native fish differently and are maintained in the system differently.

   Brook trout were traditionally stocked only a few times in any given stream and from these initial stockings they survived to reproduce naturally in the system. Brook trout have a competitive advantage over cutthroat in degraded streams. One reason for this advantage is their life history traits. Brook trout are fall spawners giving brook trout fry a size advantage over the spring spawning cutthroat. Brook trout are also piscivorous being more likely to prey upon other fish verses the more highly insectivorous cutthroat. Brook trout over time will generally out compete and replace cutthroat populations especially in degraded habitat.

   Rainbow trout have been highly domesticated and are raised in great numbers in hatcheries from which they are stocked in streams and lakes to provide put and take fisheries. Their use has been justified under the guise that the native fish populations were not sufficient to provide fish to the public. These hatchery-raised fish are generally many generations removed from wild stock and are ill adapted for long-term survival in wild settings. The problem they create for native fisheries may be displacement by the shear numbers that are stocked. The greatest problem is the threat of hybridization with cutthroat. Though most catchables stocked into a stream will not survive a year in the wilds they can survive long enough to spawn with and hybridize with cutthroat. Also due to shear numbers of rainbows stocked it is likely that a few may be well enough adapted to thrive and establish a naturally reproducing population of rainbows that will continue to hybridize.

Brown trout and cutthroat do not usually coexist as brown trout prefer warmer water temperatures and can tolerate a more polluted environment. Brown trout may occur in areas once occupied by BCT due to changes in habitat conditions.

4) How and to what extent have stream channels and habitat been altered? (Indicators - amount of altered channels)

   As indicated above changes in habitat can make it easier for non-native fishes to replace the natives. Under this question an attempt will be made to quantify the type and amount of change to the channel and its habitat. Typically the more highly altered a system is by man the more degraded the habitat will be.

5.5 Wildlife Habitat

The viability of some wildlife species may have been impacted by past and present activities.

Key Questions-

1) How and to what extent have human caused changes to habitat affected TES, MIS and other key wildlife species?

   Motorized access density is approximately 1.2-miles/square mile. Domestic livestock grazing consumes forage otherwise available for big game and ground nesting and foraging birds. However, elk populations are high and meeting State population goals and deer populations are fluctuating within expected levels. Roads exist within the riparian areas of several streams reducing their potential as wildlife habitat. Beaver and migratory birds are probably below potential because of these lost acres.

   Conversion of large tracts of basin big sage and willow bottomlands to agricultural lands has reduced sage grouse habitat and winter range capacity. Highways, cities, and housing developments have had a similar impact in addition to altering migration patterns and linkage habitat.

   Logging has provided the only early-seral forested vegetation in the watershed, affecting less than 10% of forested acres.

Increasingly powerful and popular snowmachines have the potential to affect wolverine denning if the higher eleveations of the watershed are suitable and occupied.

2) How and to what extent have natural changes in habitat affected wildlife species?

Succession to late seral vegetation on most forested acres and some rangeland types favors late succession associated species like owls, woodpeckers, and goshawks. Early succession associated species, edge dwelling species, and opportunistic species have lost habitat. The lack of low-intensity thinning fires and stand replacing fires has changed the structural dynamics of forested and rangeland habitat. Fire caused mortality in forested vegetation has not occurred in the last 100 or more years, reducing this cyclic source of both standing snag and down woody habitat. However, insect mortality has occurred in older-aged forest, causing mortality (snags) and accumulated large down woody debris.

Aspen forests provide for the most diverse array of wildlife of all of the forested vegetation types. The diversity and quantity of forage (forbs, grasses, aspen shoots, bark, leaves, and buds) greatly exceeds conifer forests. As aspen forests succeed to conifer the forage production drops, affecting big game, birds, and small mammals, many of which are prey carnivores, raptors, and goshawks. Additionally, aspen are prone to various stem decay fungus that provide cavity nesting habitat as live or dead trees. Conifer are not as prone to heart rot as live trees, live longer, and as dead trees are often “hard snags” which fall over before providing cavity nest opportunities. Loss of aspen acres across the landscape represents a significant potential risk to wildlife in the watershed.

No Threatened, Endangered, Sensitive, or Management Indicator Species are known to be adversely affected by this tendency towards advanced successional stages.