

**Bighorn National Forest Plan Revision
Existing Condition Assessment**

Tensleep Creek

Geographic Area Assessment



Picture of Tensleep Canyon

Tensleep Geographic Area Existing Condition Assessment for Forest Plan Revision

I.	Preface	4
II.	Forest Plan	5
	Comparison of existing condition to FP goals and objectives and standards and guidelines	6
	What is broken and needs to be fixed in the Forest Plan?	6
	What are the issues in this geographic area?	6
III.	Disturbance Factors	7
	Fire	7
	Insect and Disease	8
	Timber Harvest.....	9
	Exotic Species.....	12
IV.	Geology and Geomorphology.....	13
	Geologic Hazards.....	13
	Erodibility.....	14
	Mineral resources.....	14
	Hydrologic Disturbance factors	14
V.	Soils and Topography	15
	Erosional processes.....	15
	Range of variability in soil conditions	15
	Risk to soil resources including soil loss or compaction.....	15
VI.	Hydrology and Water Quality.....	16
	Irrigation and Diversions.....	16
	Human Impacts Upon Water Quality.....	16
	Wetlands/Riparian Areas.....	20
VII.	Aquatic Species and Their Habitat	21
	Sensitive Species	21
	Habitat Information.....	21
VIII.	Air Quality and Visibility	21
IX.	Climate	21
X.	Vegetation	22
	Composition, distribution, and abundance of the major vegetation types and successional stages of forest and grassland systems.....	22
	Estimate the Range of Variability in vegetative conditions.....	25
	Effects from air quality.....	25
	Risks to ecological sustainability.....	26
	Describe reference conditions (landscapes).....	26
XI.	Terrestrial Species and their Habitat	27
	General Theme/Vegetation	27
	Viability/Species At Risk.....	27
	WYNDD Biological Areas	27
	Wildlife Species Information/Recommendations	28
XII.	Cultural, Human Uses, Land Use Patterns.....	29
	Recreation and Travel Management.....	29
	Grazing.....	31
XIII.	Transportation System (Roads and Trails).....	33
	Roads	33
	Trails.....	37
XIV.	Bibliography.....	39

Appendix: Maps

Click on map name for full page view of map

Vicinity of Tensleep Geographic Area on Bighorn National Forest

Vegetation Cover Types

Forest Habitat Structural Stages

Landtype Associations

Riparian Areas

Road Locations relative to Riparian Areas

Management Areas relative to Riparian Areas

Roadless Areas

Road and Stream Crossing

Recreation Opportunity Spectrum

Suited Timber

I. Preface

This is one of nine geographic area existing condition assessments that will be used in the Bighorn Forest Plan Revision to describe resources at the geographic area scale and how they relate to the existing Forest Plan. A map of the Forest Plan revision geographic areas is in the appendix. A similar assessment will be done at the Forest-wide scale, and will include numerous resources/topics:

- that are not amenable to analysis at the geographic area scale. For example, most wildlife species are not bound by geographic area boundaries, and to avoid needless repetition in the assessments, such topics will only be discussed at the Forest scale.
- where data bases are not complete or where analysis is still on going at the time the geographic area scale assessments are completed. Examples in this category are fire condition classes and timber suitability, which are expected to be completed by early 2002.

This existing condition geographic area assessment includes the portion of the Tensleep Creek watershed that occurs on the Bighorn National Forest, unless noted otherwise.

There is very little information in this assessment concerning other than National Forest System land. This information will be gathered and analyzed, where appropriate, in the draft and final environmental impact statements' effects analyses.

These existing condition assessments focus on the physical and biological resources, and in some cases, human uses and resources, such as timber harvest, grazing and recreation. There will be a social and economic section in the Forest-wide existing condition assessment, and the draft and final environmental impact statements will also include the work of the social and economic analyses, which are currently being compiled by the University of Wyoming.

Despite the fact that these assessments primarily focus on the environmental effects of human uses, it must be remembered that National Forests are managed *to be used* by people. This is implicit in the laws governing National Forest management¹. Human use of the National Forests has been directed administratively since the earliest days of the Forest Service, "This force has two chief duties: to protect the reserves against fire, and to assist the people in their use."² That tradition continues to this day in the "Caring for the land and serving people" mission. While these assessments focus on the environmental effects that people are having on the resource, the point is to make sure that the uses we enjoy today are sustainable so that our children and grandchildren can continue to use and enjoy the Bighorn National Forest.

Disclaimer for GIS generated data: The Forest Service uses the most current and complete data available. GIS data and product accuracy may vary. They may be: developed from sources of differing accuracy, accurate only at certain scales, based on modeling or interpretation, incomplete while being created or revised, etc. Using GIS products for purposes other than those for which they were created, may yield inaccurate or misleading results. The Forest Service reserves the right to correct, update, modify or replace GIS products without notification. The GIS data in these documents were generated using ArcInfo 7.2.1, operating on a Unix platform, with analysis occurring between August of 2001 and January of 2002. For more information, contact the Bighorn National Forest.

¹ The Multiple Use Sustained Yield Act of 1960, the Renewable Resources Planning Act, and the National Forest Management Act, just to name a few.

² Forest Service "Use Book" of 1905.

II. Forest Plan

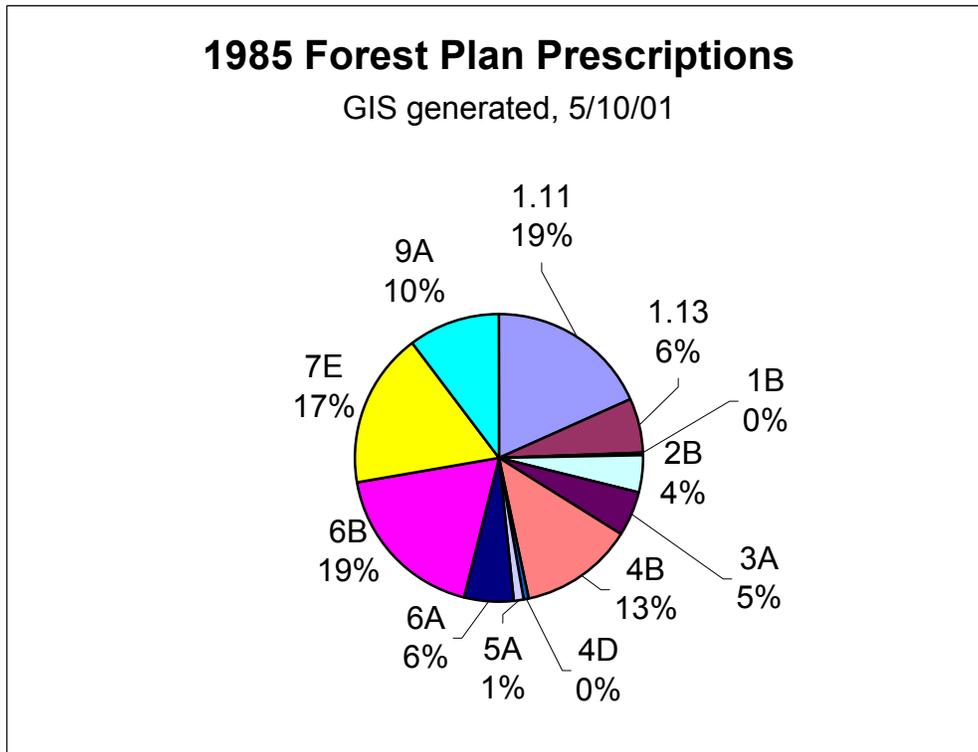
Table 1. Existing Forest Plan Management Area Allocations

Forest Plan Prescriptions	Prescription Description	GIS Acres with 9A Riparian Applied	
		Acres	%
1B	Existing and Potential Winter Sports Sites	190	0%
2B	Rural and Roaded Natural Recreation Opportunities	4221	4%
3A	Semi-Primitive Nonmotorized Recreation Opportunities	4923	5%
4B	Wildlife Habitat Management for Management Indicator Species	13,047	13%
4D	Aspen Stand Management	394	0%
5A	Wildlife Winter Range in Non-forested Areas	1030	1%
6A	Livestock Grazing, Improve Forage Condition	5778	6%
6B	Livestock Grazing, Maintain Forage Condition	18,456	19%
7E	Wood Fiber Production	17,530	18%
1.11	Pristine Wilderness (19,838 including the 9A)	18,503	18%
1.13	Semi-Primitive Wilderness (7389 including the 9A)	6051	6%
9A	Riparian and Aquatic Ecosystem Management	10,208	10%
Total		100,331	
Non-FS		799	

Some interpretations from Table 1 include:

- Commodity emphasis prescriptions of 6* and 7E account for 42% of the geographic area.
- Next high is 24% for Wilderness, and 4B at 13%.
- These four prescriptions account for 79% of this geographic area.

Figure 1. Existing Forest Plan Management Area Allocations



Comparison of existing condition to FP goals and objectives and standards and guidelines

What is broken and needs to be fixed in the Forest Plan?

- MIS species selection, modeling (elk habitat), and monitoring provisions.
- Riparian and Aspen communities forage utilization standards and guidelines.
- Road Density standards/guidelines need incorporated for elk security habitat.
- "C" Area provision for off road vehicle travel needs removed. Closure of big game winter ranges to motorized vehicles.
- Revise the standard/guideline regarding old growth.
- Vacant allotments need consideration for bighorn sheep reintroduction.
- Fences rebuilt/constructed need to have wildlife passage considered.

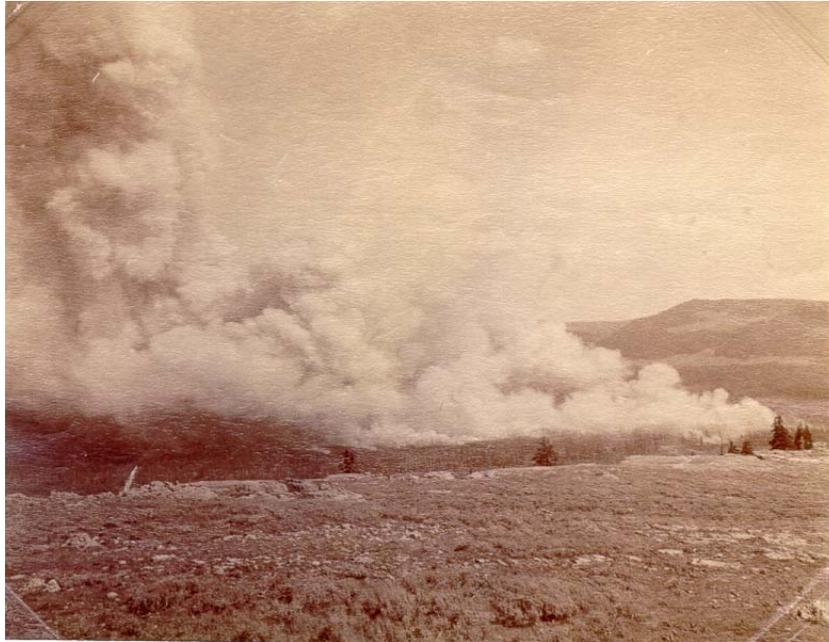
What are the issues in this geographic area?

- Increasing fire danger, lack of escape routes, and a high use area in West Tensleep corridor
- Unique rock/cave features provide habitat for bats, etc. Potential MIS/Focal species.
- Riparian/Aspen conditions are of concern primarily due to ungulate browsing. Beaver at reduced levels and may be potential MIS/Focal.
- Unique amphibian potential habitat in Baby Wagon Creek.
- Lack of old growth inventories and past harvesting may indicate a lack of old growth conifer in the geographic area, with the exception of Douglas-fir. Mature conditions of conifer may implicate higher management responses around summer homes.
- Road densities may constitute concern for elk security habitat.
- Big game winter range occurs in the geographic area.
- Bighorn sheep potential habitat, currently unoccupied.

III. Disturbance Factors

Fire

- Fire is the most dominant disturbance factor in this landscape, from the perspective of total number of acres affected. A very small percentage of fires affect a majority of the acres burned.
- Known major fire events in the Tensleep geographic area:
 - circa 1900: There were large fires in Leigh Creek and the southern part of Canyon Creek. This is evidenced by the age class chart in this report, and by on the ground review of these areas, which are (or were, in the case of Canyon Creek after Gold Mine fire in 1988) 100 year old, pole-sized lodgepole pine.
 - August 7 to September 9, 1900: 13,000 acre fire in West Tensleep Creek. Professor Jack reported that it started from a hunter's fire, and burned to the northeast (Conner, 1940). See picture below.
 - 1967: Onion Gulch fire, just south of Forest boundary, 1100 acres.
 - 1975: Meadowlark fire, about 1900 acres.
 - 1988: Gold Mine fire, about 2000 acres, primarily in lodgepole stands regenerated after the ca. 1900 fire. This area was thinned by Forest Service crews between 1978 and 1982, which resulted in a 1-3' slash layer left on the ground.
 - 1988: Dorn Draw II, about 1500 acres, just west of Forest boundary along the Hyattville logging road.
- Fire's role is different among the major forest cover types of Douglas-fir, Lodgepole pine and Engelmann Spruce/Subalpine Fir. These are described in more detail in Meyer and Knight (2001), and will be summarized in the forest-wide assessment.
 - While little is known quantitatively about the role of fire in Bighorn Douglas-fir forests, the bark usually has at least 4-inch deep furrows, which is indicative of a frequent surface fire regime. It is also likely that Douglas-fir had infrequent catastrophic fire, so this fire regime can be described as mixed severity, moderately frequent.
 - The lodgepole and spruce/fir forests are typified by infrequent (100-300+ year), large scale, catastrophic fire, as evidenced by research from Yellowstone National Park and elsewhere in the Northern Rockies (Lotan, 1985).



**“Forest fire on Tensleep Creek looking E.S.E. Strong SW wind.
August 8, 1900” Professor John G. Jack**

Insect and Disease

- The biggest concerns for insect and disease in this geographic area would be: Douglas-fir beetle in Douglas-fir. There is an ongoing outbreak of Douglas-fir beetle in this cover type in this geographic area. The geographic area has a fairly significant amount of large Douglas-fir that is at risk, because of locally high insect populations. This could cause considerable changes in the landscape, as often, Douglas-fir is found in pure stands in this area. Also, although not extensive in land coverage, the limber pine in this geographic area is being affected by white pine blister rust, an exotic pathogen. Almost complete loss of limber pine could occur from this disease. The ecological consequences of such a loss are unknown. Thirdly, as in all geographic areas on the Bighorn NF, dwarf mistletoe and commandra blister rust on lodgepole pine must be considered. These diseases infect large amounts of the lodgepole throughout the forest causing considerable growth loss and, over time, tree mortality.
- For mountain pine beetle in lodgepole pine, roughly 9707 acres (37% of the cover type in this geographic area) would be considered as being at high hazard. 16,655 acres (63% of the cover type) is at low to moderate hazard.
- For mountain pine beetle in ponderosa pine, 234 acres 9% of the cover type in the geographic area) is considered to be high hazard to mountain pine beetle. 2508 acres (91% of cover type) is estimated to be moderate to low hazard.
- About 8557 acres (57% of the cover type) of the spruce-fir cover type would be considered to be at high hazard for spruce beetle. 6527 acres (43% of type) would be low hazard. Little is known about hazard rating for western balsam bark beetle in subalpine fir, but it will be assumed that the figures used for spruce would be roughly similar for fir.
- 3825 acres of Douglas-fir (38% of cover type) would be at high hazard to Douglas-fir beetle. 6289 acres (62% of cover type) would be at low hazard.
- Dwarf mistletoes are common on the lodgepole pine throughout the geographic area. Stands are generally not hazard rated for mistletoe, as any and all hosts trees are susceptible to the disease. Recent investigations forest-wide in the Bighorns indicate that

27% of the sawtimber sized (greater than 9 inch DBH) lodgepole pine are infected with dwarf mistletoe, 15% of pole sized (5-9 inch) lodgepole are infected with dwarf mistletoe, and about 2% of saplings (less than 5 inches) are infected with dwarf mistletoe. It is assumed that these figures would be consistent across stands of lodgepole pine in this geographic area, with locally higher or lower infestations likely.

- Comandra blister rust is the other common disease in this area. Recent work in the Bighorns has indicated that about 28% of lodgepole pine are infected with this disease. It is assumed that the infection rate in the Tensleep geographic area is similar to this number. Larger trees are the ones that are most obviously infected, since saplings and seedlings are frequently killed outright.
- White pine blister rust is present on limber pine in Tensleep Canyon.

Timber Harvest

Table 2 shows the amount of timber harvest and fire since the 1960s. This data is from the RIS database, unless otherwise noted, and is not considered accurate prior to 1960.

Table 2. Timber Harvest and Fires in the Tensleep Creek Analysis Area

Harvest Type	Pre-60's	1960's	1970's	1980's	1990's	2000
Clearcut	0	410	1285	217	135	0
Shelterwood: Prep Cut	0	173	789	1793	148	0
Shelterwood: Seed Cut	0	0	288	1178	0	0
Shelterwood: Overstory Removal	0	248	293	157	211	0
Seed Tree	531	0	0	0	45	0
Selection	0	0	140	761	0	0
Commercial Thin	0	0	854	506	0	0
Sanitation/Salvage	0	0	179	1059	0	0
Pre-commercial Thin	0	0	559	3653	43	0
Aspen Clearcut	0	0	0	0	0	0
Fire	0	0	1900 ³	1800 ¹	0	0
Blowdown	0	0	0	0	0	0
Acres CC+ SW+ST+S+S/S⁴	531	831	2795	4106	539	0

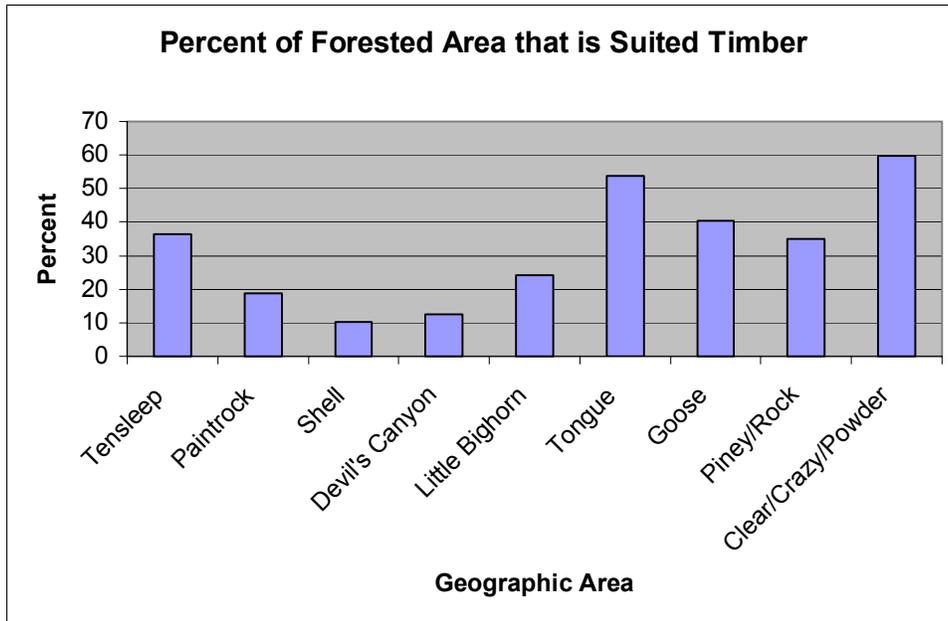
The primary insight from this table is that this geographic area has seen a dramatic decrease in timber harvesting in the decade from the 1980s to the 1990s. Part of the reason for the relatively high amount of harvest (see figures 3 and 4) for the acres of suited land was due to the fact that each district supported a timber program.

Tinker, et al (1998) quantifies fragmentation caused by timber harvest and roads on the Bighorn National Forest. That analysis and conclusions are presented in the forest-wide assessment, rather than in each geographic area assessment.

³ The fire acreages are not correctly identified in the RMACT activity region coverage, and these figures are the approximate acreages from the Meadowlark (1975) and Gold Mine (1988) fires.

⁴ CC = Clearcut, SW = Shelterwood, ST = Seed Tree, S = Selection, S/S = Sanitation/Salvage. These were summed to portray the amount of sawlog harvest that has occurred.

Figure 2. Amount of Forested Area Available that is Suited Timber, by Geographic Area



The table above shows the relative amounts of suited timber by geographic area. Tensleep is tied for fourth highest percentage of forested area that is currently classified as suitable for timber harvest, at approximately 34%. This table could be considered an indicator of the relative amount of forested area *available* for timber productions purposes.

The following table shows the percentage of the suited timber area that has received a final harvest (clearcut, shelterwood removal or seed cut, selection harvests) or stand-replacing fire or blowdown between 1960 and 2000. This is an indicator of the *intensity* of forest successional change, as it indicates how much of the suited land has actually had a stand-replacing event between 1960 and 2000. This data is from the RIS activity database, 3/2000, and includes the time period between January 1, 1960 and February 1, 2000.

Figure 3 shows the percentage of the suited timber area that has received a final harvest (clearcut, shelterwood removal or seed cut, selection harvests) or stand-replacing fire or blowdown between 1960 and 2000. This is an indicator of the *intensity* of forest successional change, as it indicates how much of the suited land has actually had a stand-replacing event between 1960 and 2000. This is from the RIS activity database and includes the time between January 1, 1960 and February 1, 2000. Each bar is divided into “fire and blowdown” and “timber harvest” to show the relative amounts of each type of disturbance.

Figure 4 shows the percentage of all forested lands that has received a final harvest (clearcut, shelterwood removal or seed cut, selection harvests) or stand-replacing fire or blowdown between 1960 and 2000. This is an indicator of the *intensity* of forest successional change, as it indicates how much of the forested area has actually had a stand-replacing event between 1960 and 2000. This is from the RIS activity database and includes the time between January 1, 1960 and February 1, 2000. Each bar is divided into “fire and blowdown” and “timber harvest” to show the relative amounts of each type of disturbance.

Figure 3. Percent of Suited Timber that Received a Stand Replacing Event, 1960-2000

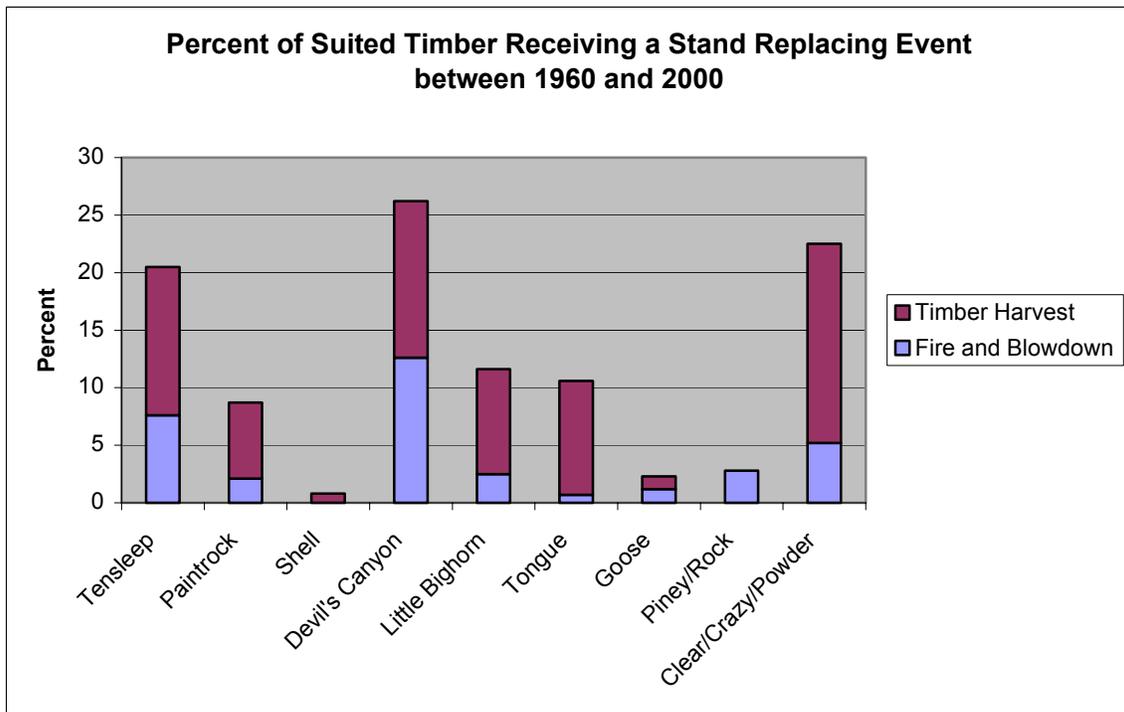
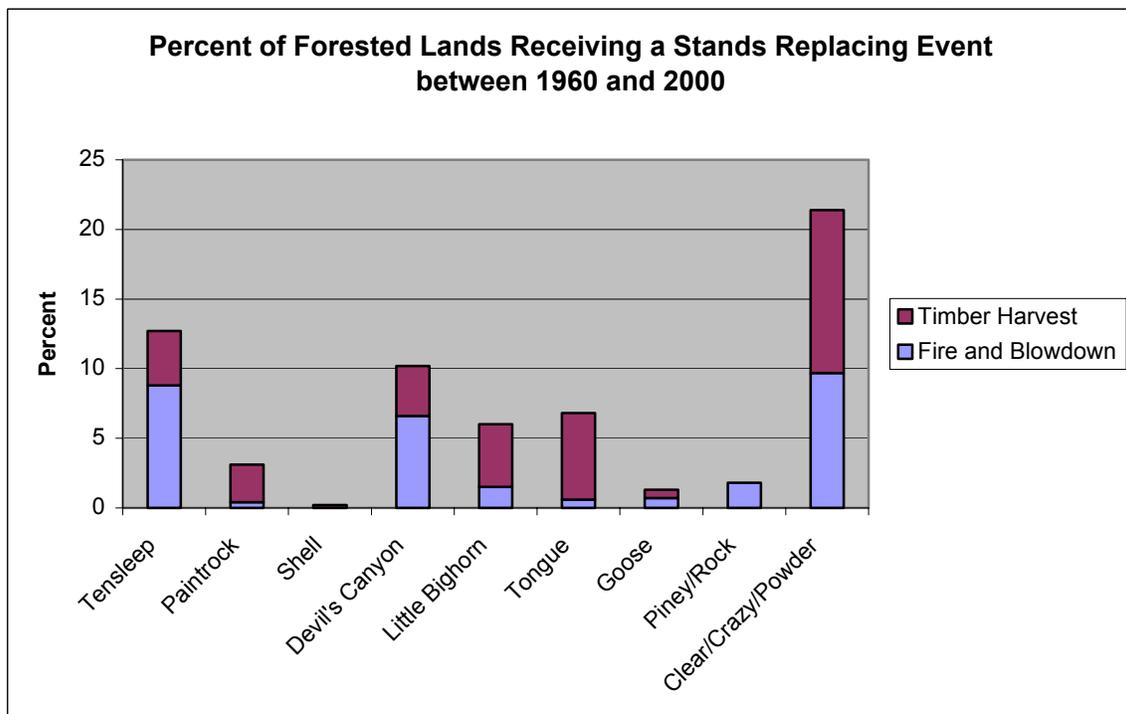


Figure 4. Percent of All Forested Lands that Received a Stand Replacing Event, 1960-2000



Exotic Species

The following exotic species are known to occur in the geographic area, and there may be additional species:

- Forest-wide issue of non-native grass/forb seed mix for revegetation and erosion control.
- Fish: Eastern Brook trout, brown trout, golden trout, and rainbow trout are popular fishing species, but are not native to the Bighorn NF.
- Canadian thistle, musk thistle and houndstongue are among the noxious weed species known to occur in this geographic area.

IV. Geology and Geomorphology

Table 3 shows the Landtype Associations (LTAs) within the assessment area. Landtype associations are general descriptions of local geology and topography⁵. A map of the LTAs is in the appendix.

Table 3. Acres of Landtypes within Tensleep Geographic Area

Landtype Description	Acres	% of total
Glacial cirquelands	15040	15
Alpine mountain slopes and ridges	17836	18
Glacial/tertiary terrace deposits	18596	18
Granitic mountain slopes, gentle	15669	15
Granitic mountain slopes, steep	874	1
Granitic breaklands	0	0
Sedimentary breaklands	6327	6
Sedimentary mountain slopes, limestone/dolomite	17843	18
Sedimentary mountain slopes, shale/sandstone	7274	7
Landslide colluvial deposits	1671	2
Totals:	101,130	100

From Buffalo to the eastern mountain front, Highway 16 traverses Eocene rocks of the Wasatch, at the base of the Bighorn range, is composed of cobbles of Paleozoic rocks that were deposited as gravels on alluvial fans along the front of the rising Bighorn Range around 55 million years ago. About 6 miles west of Buffalo, the road crosses the Piney Creek thrust fault, which shoved this portion of the central Bighorns over the western margin of the Powder River Basin. The road climbs through a narrow section of steeply inclined Paleozoic limestone and dolomite beds in the hanging wall of the Piney Creek thrust, then cuts into much older Precambrian “basement” rocks. The Precambrian is composed of extremely ancient metamorphic gneisses that over 3 billion years old. The earth is 4.7 billion years old, so these rocks are about 2/3 of the age of the planet. US 16 follows Precambrian rocks across the crest of the range to the west side where it again cuts through Paleozoic sedimentary layers along Tensleep Canyon.

The analysis area encompasses the Tensleep Creek fifth level watershed for a total of approximately 102,000 acres. The watersheds range in elevation from just over 7,000 feet at the Forest boundary to over 12,000 feet at the upper portion of the Tensleep Creek drainage.

Geologic Hazards

The landslide map used in this analysis were created from 1:24,000 scale maps obtained from the Wyoming State Geological Survey office in Laramie, WY. Within the Tensleep geographic area there are 3,278 acres of soils prone to landslides. The areas subject to slides are widely distributed in small units throughout the geographic area.

⁵ Landtype associations are groupings of landtypes or subdivisions of subsections based upon similarities in geomorphic process, geologic rock types, soil complexes, stream types, lakes, wetlands, and plant association vegetation communities. Names are often derived from geomorphic history and vegetation community. Avers, et al, 1993. See also Table 3, Chapter 1, for hierarchical location of landtype associations.

Table 4. Landslide Prone Acres

Geographic Area Name	Acres of Soils Prone to Landslides
Tensleep Creek Planning Area	3278

Erodibility

There are approximately 4951 acres of soils within the analysis area classified as having a severe risk for erosion.

Table 5. Acres of Erodible Geology

Geographic Area Name	Acres of Erodible Geology
Tensleep Creek Planning Area	4951

Mineral resources

A detailed minerals report for this area does not exist at this time. Minerals information for this area will be incorporated into the Forest-wide assessment.

Hydrologic Disturbance factors

This topic is relevant at the Forest-scale and is discussed in the Forest-wide assessment.

V. Soils and Topography

Table 6 displays the acres of each soil type within the geographic area. For each soil type, there is a range of production associated with that soil. The productivity estimate is used to quantify the range of variability in soil productivity within the geographic area.

Table 6. Acres of Soils within the Tensleep Geographic Area

Soil Identification Number	Acres	Productivity as Measured by Forage Production (#/acre)
10	11259	500-700
11	3037	500-700
13	2611	Na
14	4801	500-700
15	0	500-1,800
16	2193	3,000-3,500
18	554	1,500-1,800
19 A and B	15189	500-700
22	2872	1,200-1,700
24	1137	1,600-2,400
25	1198	1,500-1,800
26	3215	600-1700
27	5906	1,600-2,400
29	3504	1,600-2,400
31	0	500-700
32	2850	500-700
33	4228	600-800
36	0	500-800
37	0	Na
38	0	500-700
39	0	600-1,700
40	0	500-700
41 A and B	0	1,500-1,800
43	0	500-700
Water	715	Na

Erosional processes

This topic is relevant at the Forest-scale and is discussed in the Forest-wide assessment.

Range of variability in soil conditions

This topic is relevant at the Forest-scale and is discussed in the Forest-wide assessment.

Risk to soil resources including soil loss or compaction

This topic is relevant at the Forest-scale and is discussed in the Forest-wide assessment.

VI. Hydrology and Water Quality

Table 7 displays the major sub-watersheds within the Tensleep planning area.

Table 7. 6th Field Watershed Data within the Tensleep Planning Area

6 th Field Watershed Name	6 th Field Watershed Number	Perennial Stream Miles	Intermittent Stream Miles	FS WS Acres	Other WS Acres	Total WS Acres
West Tensleep Creek near Meadowlark Lake	100800080201	32	91	33,022	0	33,022
East Tensleep Creek near Meadowlark Lake	100800080202	26	41	23,615	0	23,615
Leigh Creek near Tensleep	100800080203	13	37	13,818	231	14,049
Canyon Creek near Tensleep	100800080204	10	30	10,406	480	10,886
Canyon Creek near Tensleep	100800080205	0	2	349	0	349
Tensleep Creek near Tensleep	100800080206	17	56	15,912	52	15,964
Brokenback Creek near Tensleep	100800080401	0	20	4,007	127	4,134
Totals:		98	277	101,130	890	102,019

Irrigation and Diversions

Within the Tensleep Creek geographic area there is one Forest Service owned reservoir, Meadowlark Lake. This reservoir serves the recreational needs of users on the Forest while also helping augment flows in Tensleep Creek when necessary.

Human Impacts Upon Water Quality

The extent and intensity of land development and land-use activities within the area have increased during the past century. Environmental disturbances from non-mechanized, agriculturally based settlements have evolved into impacts associated with urban and suburban development. Non-point source pollution may be the most problematic cause of water quality deterioration because the origin of the impacts is often difficult to identify and control. Human activities and development around or near lakes, streams, reservoirs, and wetlands is directly associated with much of this non-point source pollution.

Analysis of lakes in the area shows that they have very low buffering capacities due to the granitic geology. The low buffering capacity of the lakes makes them susceptible to acidification due to atmospheric acid deposition.

Water quality criteria is established and monitored by the State of Wyoming. Surface water quality classes are a hierarchical categorization of waters according to existing and designated uses. There are four major classes of surface water in Wyoming with various subcategories within each class. Table 8 below gives a listing of water quality classes for streams within the analysis area.

Historically, the water quality within the Tensleep Creek geographic area has been good. Table 8 displays the water quality classification for the streams within the geographic area.

Table 8. Wyoming Surface Water Classification (2001) and Domestic Water Users

Watershed	Wyoming Surface Water Quality Class	Tributaries	Wyoming Surface Water Quality Class	Community Water System being Served
Tensleep Creek	2AB			
		Canyon Creek	2AB	
		Leigh Creek	2AB	
		Meadowlark Lk	2AB	
		Tensleep Lk	2AB	
		W Tensleep Creek	2AB	
		E Tensleep Creek	2AB	

All streams in the analysis area are classified as being Class 2AB. Class 2 waters are those that are known to support fish or drinking water supplies or where those uses are attainable. Class 2 waters may be perennial, intermittent or ephemeral and are protected for those uses indicated in each sub-category. There are four sub-categories of Class 2 streams. Class 2AB waters listed in Table 8 are known to support game fish populations or spawning and nursery areas at least seasonally and all their perennial tributaries and adjacent wetlands and where a game fishery and drinking water use is otherwise attainable.

In 2000, the State of Wyoming conducted a review of all watersheds within the State to determine whether or not they are meeting the designated beneficial uses (i.e., fisheries, recreational use, etc.). The results of that review can be found in the document titled, "Wyoming 2000 305(b) state water quality assessment report". Table 9 identifies which watersheds within the analysis area are included in the State 305(b) report.

Table 9. Water Quality Impaired Watersheds (2000)

Watershed	Listed on 2000 State 305(b) Report?	Type of Listing (Impaired or Threatened)	Reason for Listing and Location of Impairment
Tensleep Creek	No		

Influence of Timber Harvesting upon Water Quality

Table 10 gives the acres of timber treatments followed by the equivalent clearcut acres for that treatment. An equivalent clearcut acre is roughly equal to the basal area removed during timber harvest or fire. For example, a shelterwood prep-cut removes approximately 33% of the basal area in a treated stand. The ECA for that prescription is 0.33.

Table 10. Equivalent Clearcut Acres for the Tensleep Geographic Area

Harvest Type	Equivalent Clearcut Multiplier	1950's	1960's	1970's	1980's	1990's	2000	Totals
Clearcut (acres) (ECA)	1.00		410 410	1285 1285	217 217	135 135		2047
Shelterwood: Prep Cut (acres) (ECA)	0.33		173 57	789 260	1793 592	148 49		958
Shelterwood: Seed Cut (acres) (ECA)	0.33			288 95	1178 389			484
Shelterwood: Overstory Removal (acres) (ECA)	1.00		248 248	293 293	157 157	211 211		909
Seed Tree (acres) (ECA)	0.85	531 451				45 38		489
Selection (acres) (ECA)	0.35			140 49	761 266			315
Commercial Thin (acres) (ECA)	0.35			854 299	506 177			476
Sanitation/Salvage (acres) (ECA)	0.35			179 63	1059 371			434
Pre-commercial Thin (acres) (ECA)	0.20			559 112	3653 730	43 9		851
Aspen Clearcut (acres) (ECA)	1.00							
Fire (acres) (ECA)	1.00			1900 1900	1800 1800			3700
Blowdown (acres) (ECA)	1.00							
TOTAL ECA % of Area⁶								10,663 10%

As shown in Table 10, approximately 10% of the Tensleep geographic area is in an ECA condition. In reality, this number would be somewhat less than 10% due to vegetation recovery following timber harvest or fire. However, given this worst-case scenario, timber management combined with wildfire has probably not exceeded the range of variability in vegetation removal for this geographic area.

⁶ This number does not account for vegetation recovery over time. Following fire or timber harvest, trees will reestablish themselves on a site and the ECA for that activity will approach zero. Therefore, the ECA's for this watershed will probably be somewhat less than suggested by this table. Also, roads were not included in this table at this time. Roads add approximately 4 acres of ECA per mile.

Influence of Roads upon Water Quality

Table 11. Number of Stream Crossings in Tensleep Planning Area

Watershed	No. of Stream Crossings	No. of Stream Crossings/Square Mile
Tensleep	174	1.51

Roads contribute more sediment to streams than any other land management activity, but most land management activities such as mining, timber harvest, grazing, recreation, and water diversions are dependant on roads. The majority of sediment from timber harvest activities is related to roads and road construction and associated increased erosion rates. Serious degradation of fish habitat has been shown to result from poorly planned, designed, located, constructed, or maintained roads. Roads can also affect water quality through applied road chemicals and toxic spills.

Road/stream crossings can also be a major source of sediment to streams resulting from channel fill around culverts and subsequent road crossing failures. Plugged culverts and fill slope failures are frequent and often lead to catastrophic increases in stream channel sediment, especially on old abandoned or unmaintained roads. Unnatural channel widths, slope, and streambed form occur upstream and downstream of stream crossings, and these alterations in channel morphology may persist for long periods of time. Channelized stream sections resulting from riprapping of roads adjacent to stream channels are directly affected by sediment from side casting, snow removal, and road grading; such activities can trigger fill slope erosions and failure. Because improper culverts can reduce or eliminate fish passage, road crossings are a common migration barrier to fishes.

Field inventories have shown that the amount of watershed risk presented by roads in the analysis area is directly related to maintenance level. The lower maintenance level roads tend to be more susceptible to yearly input of sediment into nearby streams. Table 12 displays the existing miles of road by maintenance level in the analysis area.

Table 12. Miles of Forest Service Roads in the Tensleep Geographic Area

Maintenance Level	Miles of road within the Geographic Area	Overall Condition and Watershed Risk
Unclassified	31	In the watershed, roads in this category are generally either user-created or abandoned system roads (50/50). The level of watershed risk depends upon the treatments used to reclaim them. They tend to be used seasonally to access recreation areas. No maintenance occurs on these roads. Watershed impacts can occur when these roads are near water bodies. However, limited use reduces the risk to water quality.
Level 1	77	These roads are generally not open to the public. They are closed except for administrative purposes. Watershed impacts tend to vary with the amount of use and the effectiveness of erosion control measures.
Level 2	62	These roads tend to be native surface roads with poor drainage design. During wet seasons, rutting frequently occurs. Stream crossings are generally a source of sediment. These roads pose the highest risk to water quality due to their frequent use, number of stream crossings, and low standard design. However, road maintenance is beginning to catch up on the tremendous backlog of improvement needs in this area.
Level 3	24	These roads are generally designed with good road drainage and

		maintained on a regular basis. These roads tend to be in-sloped with a ditch and have a gravel surface. They usually do not pose a serious threat to water quality.
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Influence of General Recreational Activities upon Water Quality

This topic is relevant at the Forest-scale and is discussed in the Forest-wide assessment.

Wetlands/Riparian Areas

All wetlands are associated with streams in the upper reaches and those associated with springs at the intersection of the channels and groundwater. Generally, the conditions of wetlands are functioning at risk, and could be improved with the establishment of deep-rooted species.

Table 13. Acres of Riparian within Tensleep Geographic Area

6 th Field Watershed Name	6 th Field Watershed Number	Acres of Riparian	Miles of road within Riparian
West Tensleep Creek Watershed near Meadowlark Lake	100800080201	3,592	2.59
East Tensleep Creek Watershed near Meadowlark Lake	100800080202	3,461	3.39
Leigh Creek near Tensleep	100800080203	871	1.2
Canyon Creek near Tensleep	100800080204	1,126	2.06
Canyon Creek in Canyon Creek Canyon near Tensleep	100800080205	6	0.02
Tensleep Creek in Tensleep Canyon near Tensleep	100800080206	957	3.83
Brokenback Creek near Tensleep	100800080401	105	0.34
Totals:		10,118	13.43

Riparian vegetation has a moderate influence on water yield due to evapotranspiration rates associated with riparian species. Since evapotranspiration rates are highest during periods of highest runoff, the effect of riparian vegetation on the timing of water yield is only moderate. Riparian vegetation is extremely important for control of sediment from upslope sources during high runoff/surface erosion periods. Riparian vegetation is also critical for the stability of lower gradient stream reaches.

VII. Aquatic Species and Their Habitat

Streams in the analysis area support a diverse assemblage of fish species. Based on electro-fishing evaluations, conducted by the Wyoming Game and Fish Department (WGFD) and the Bighorn National Forest, brook trout (BKT), brown trout (BRN), rainbow trout (RBT), and cutthroat trout (CUT) are present in the analysis area. However, there is limited information on the distribution and concentration of these species in the Tensleep geographic area.

Sensitive Species

The Tensleep geographic area is not within the historic range of the pre-Columbian Yellowstone Cutthroat trout.

Habitat Information

The Forest has not completed an aquatic inventory on the Tensleep Creek geographic area. This information will be collected within the next few years.

VIII. Air Quality and Visibility

This topic is relevant at the Forest-scale and is discussed in the Forest-wide assessment.

IX. Climate

This topic is relevant at the Forest-scale and is discussed in the Forest-wide assessment.

X. Vegetation

Composition, distribution, and abundance of the major vegetation types and successional stages of forest and grassland systems

Figure 5 shows the major vegetation cover types that occur in the Tensleep geographic area area. Data from the Common Vegetation Unit.

Figure 5. Vegetation Cover Types in the Tensleep analysis area

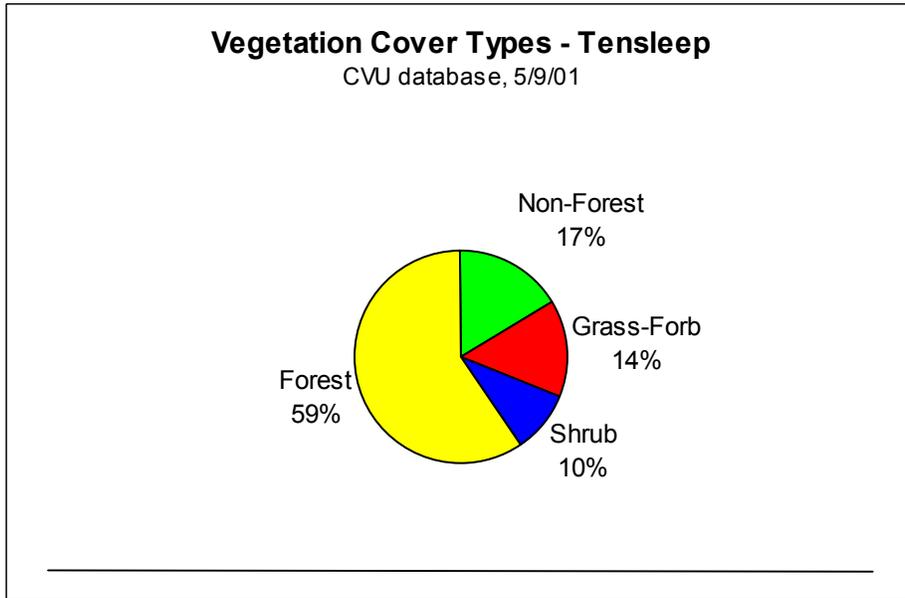
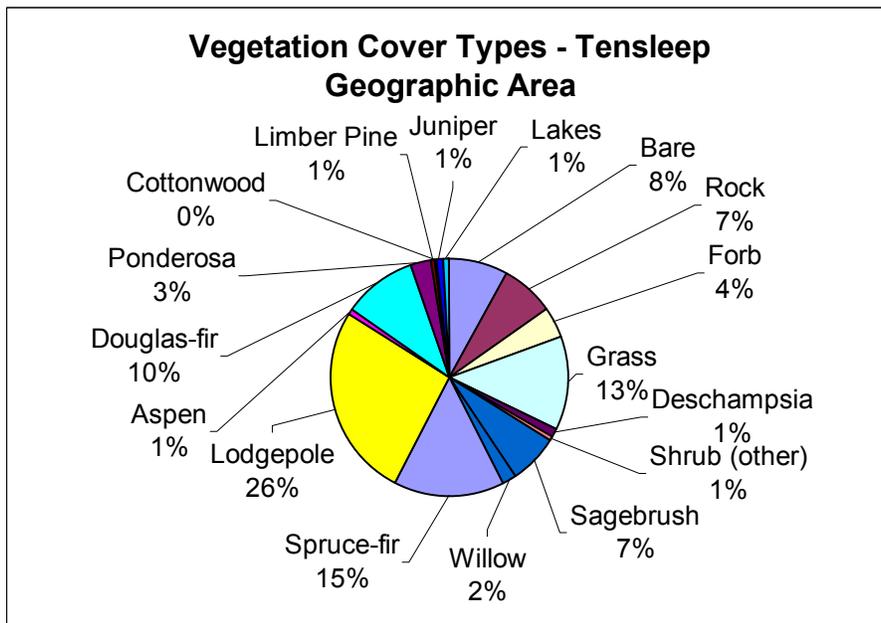


Figure 6 is from the CVU database, 5/23/01, and shows the relative amounts of the dominant cover types

Figure 6. Vegetation Cover Types in the Tensleep Analysis Area.



The origin dates chart, figure 7, shows the stand origin dates for the forested stands in the assessment area. This data is either from the Stage II point information, or origin years were assigned to stands that regenerated after harvests or fires. Some of the major disturbance events can be seen in this chart:

- The spike on the farthest right is timber harvest and fires in the 1970s and 1980s.
- The second highest spike is stands, primarily lodgepole, which originated in 1890-1905.

Figure 7. Forested Stand Origin Dates in the Tensleep Analysis area

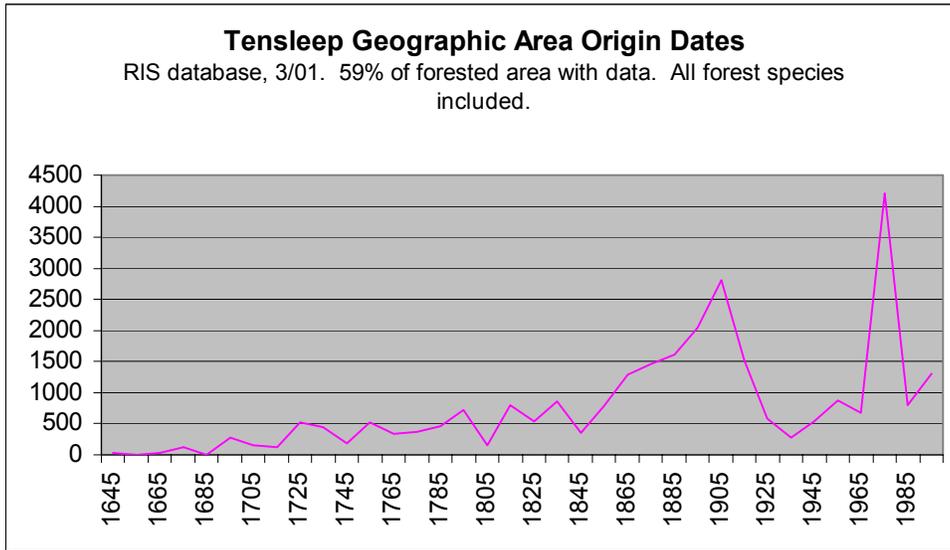


Figure 8 shows the habitat structural stages for the forests in the geographic area. The Structural Stage 1 are shown on the GIS maps as “transitory forests”. These areas do not have a forested cover type in the CVU database, but they are areas that were either recently burned or harvested and have a current cover type of grass, forb, bare, wood, etc. Table 14 defines the habitat structural stages.

Habitat structural stage provides a “coarse filter” look at habitats provided by forests in the geographic area. Interpretations from this table are:

- There is a relatively high amount of 3* classes. This is due to fires in the latter part of the 1800s, which have grown into pole size (5-9” diameter) stands.
- There is a relatively large amount of over 9” diameter stands, compared to other Bighorn geographic areas.

Figure 8. Habitat Structural Stages in the Tensleep Geographic Area

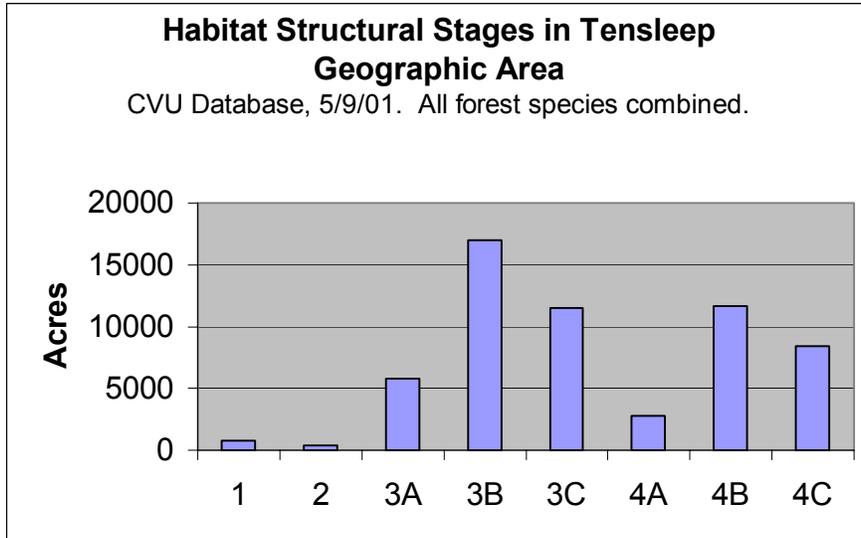


Table 14. Habitat Structural Stage Definitions, Hoover and Wills 1987

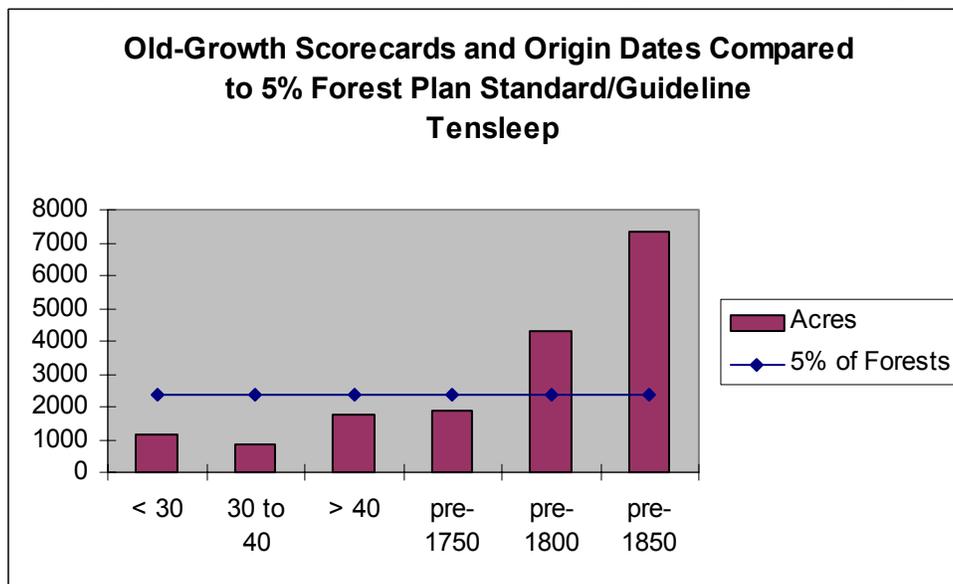
Habitat Structural Stage	Diameter	Crown Cover %	Habitat Structural Stage	Diameter	Crown Cover %
1	Not applicable	0-10%	3C	1 – 9 inches	70-100%
2	< 1 inch	10-100%	4A	9+ inches	10-40%
3A	1 – 9 inches	10-40%	4B	9+ inches	40-70%
3B	1 – 9 inches	40-70%	4C	9+ inches	70-100%

Concerning old growth, approximately 2370 acres of old growth are needed to represent 5% of the forested area in the Tensleep geographic area. Different measures of old growth are listed in table 15 and Figure 9.

Table 15. Old-Growth Acres

Old Growth Scorecard			Acres by Cover Type over 250 years old				Acres by Cover Type over 200 years old			
Acres <30	Acres 30-40	Acres >40	Doug-fir	Lodgepole Pine	Spruce/fir	Limber Pine	Doug-fir	Lodgepole Pine	Spruce/fir	Limber Pine
1136	839	1765	408	511	921	41	740	2092	1411	41
			Total Acres over 250 years old: 1881				Total Acres over 200 years old: 4284			

Figure 9. Old-Growth Scorecard and Origin Dates - Tensleep



Some good examples of old trees in the Tensleep geographic area:

- The Douglas-fir in the Tepee Creek area is large (some stands over 22" diameter at breast height), and the trees are 350 to 400 years old. This area was logged in the mid-1980's.
- Large (15-20"+) lodgepole old-growth, in a spruce/fir habitat type, exist in the West Tensleep lake vicinity. Numerous large snags and multiple canopy stories characterize this area.

Estimate the Range of Variability in vegetative conditions

- The overall change in the relative amounts of forests to meadows in the subalpine habitat types changes very little, due to soil conditions. (Despain, 1973) Thus, the current mix, of 59% forest to about 14% meadow fluctuates by no more than 1-2%.
- Riparian areas may fluctuate as large, catastrophically burned areas return to a forested condition, and more water is lost to transpiration and sublimation off of the forested canopy in the winter. This would only occur in watersheds and subwatersheds that have a large percentage of the watershed burned in the same event.
- Aspen is declining for three factors:
 - Long term climatic warming since the little ice age about 10,000 years ago. There was also a relative drying of the climate since that time until the last 100 years, at which point, the climate became relatively wetter. (Knight, 1994)
 - Effects on seedling survival due to wildlife and domestic livestock grazing.
 - While the subalpine fire cycle has only marginally been affected (since this type has a fire frequency interval of 100-300 years, and European man has only been suppressing fires for about 100 years), continued fire suppression will decrease the amount of aspen in the geographic area, since stand replacing fire events are regeneration events for aspen.

Effects from air quality

There have been no studies to date on the Bighorn concerning air quality effects on plants. An applicable study from Yellowstone National Park concluded that ozone levels are suspected to be well below the level that would affect human health or vegetation.

Risks to ecological sustainability

- Vegetation in high use areas of the Cloud Peak Wilderness is threatened by overuse by people. This affects both trees (used for firewood) and long term soil productivity (soil compaction and removal of plant/litter layer in heavily used campsites.) This has been recently addressed by additional use restrictions, but monitoring will be needed to see if the restrictions are sufficient in light of increased rates of human visitation.
- The cumulative effects of human intervention in the ecosystem. This includes:
 - People as vectors of exotic species. This includes plant and animal species.
 - Roads
 - Livestock and wildlife grazing and browsing
 - Timber harvest
 - Fire suppression
 - Recreation use

Describe reference conditions (landscapes)

Two areas in this geographic area were considered as potential Research Natural Areas (pRNAs):

- McClain Lake: This area is the only pRNA on the Bighorn that represents high elevation forests and alpine areas. It is on granitic substrate, and the southwest corner is dominated by glacial potholes and lateral moraines. There are several rare plants. The level of human disturbance is quite low, and the ecological conditions and processes are considered to be relatively intact, especially for the Bighorn.
- Tensleep Canyon: This pRNA should be renamed Leigh Creek, as the Tensleep Canyon portion is extremely impacted by non-native vegetation due to the old and new highways and resulting heavy human impacts. The Leigh Canyon portion is considered by WYNDD to be a very good candidate for RNA inclusion, although it is so rugged and difficult to access it may present problems to research design and access.

In the Fine Filter Analysis (Welp, et al., 2000), three areas within the geographic area were considered areas "...that contain a high concentration of important taxa or representative vegetation communities." (For a complete discussion of ranking criteria, codes and descriptions, see pages 1192 to 1230 of Welp, et al., 2000):

- Cloud Peak, B2 rank (very high significance): Contains nine species tracked by Wyoming Natural Diversity Database (WYNDD); alpine, granite, habitats are unique in the Bighorn Mountains, and are relatively undisturbed.
- Virginia Creek, B2/B3 rank (very high significance/ high significance): Wide variety of relatively unimpacted alpine and subalpine habitats, unique geologic features, and populations of 5 rare plant species. Only known population on Bighorn NF of *Carex misandra*, an alpine perennial. At upper elevations, alpine meadows and granite talus fields support a variety of forbs and graminoids. Marshes, lakes, and glacial moraines in the riparian zone intergrade with wet graminoid and willow communities along the major creeks. Quaternary glacial deposits of sand, gravel moraines, and boulders are particularly well developed in the Baby Wagon Creek area.
- Leigh Creek, B2/B3 rank (very high significance/ high significance): Excellent populations of 5 rare plants and 1 animal. High quality of the populations derives in part from their inaccessibility and large degree of natural protection. Sedimentary geology, deep canyon topography.

XI. Terrestrial Species and their Habitat

Most of the wildlife existing condition information will be presented at the Forest wide scale, since terrestrial species are rarely bounded by geographic areas. Topics included in the forest wide scale assessment include population viability, species categories (species of local concern, species at risk, etc.), and species habitats.

General Theme/Vegetation

Wildlife species composition, distribution, and abundance are determined primarily by the distribution, structure, and composition of vegetative and non-vegetative habitat components. It is assumed that managing the vegetative components within the Historic Range of Variability (HRV) would be the most beneficial for the most wildlife species. Refer to the vegetation section description of current vegetation distribution and relevance to HRV. Of concern in this area were the riparian areas, aspen stands, and old growth conifer stands.

Old growth Douglas-fir likely exists on the ridges between Leigh and Tensleep canyons. Inventories for old growth have not been conducted for the most part. Loss of snags and down woody debris may be of concern in highly managed areas such as past logging in Tepee Creek and within the upper portion of Tensleep Creek. However, the predominantly mature conditions of conifer in the geographic area are also providing an opportunity for a bark beetle epidemic, which would cause a rise in snag availability and dead/down material.

Aspen are at risk from a lack of disturbance and from ungulate browsing levels. Riparian areas may be at risk from livestock grazing, dispersed recreation use, noxious weeds, and past road construction within these areas. It is noted that the Tensleep road is very close to the creek in many areas above the highway crossing. It is assumed that priority geographic areas will be identified through this process at the Forest level to prioritize any treatment or restoration activities needed relative to HRV.

Unique non-vegetative attributes of the geographic area may include abandoned mines or cave resources, and this geographic area may have a high potential for this. The presence of many cabins in the upper portion of this geographic area may cause a management priority of maintaining reduced densities of coniferous vegetation around these areas to reduce fire risk.

Viability/Species At Risk

All information relative to these species and viability concerns will be handled from a Forest wide compilation of species, recommended conservation measures, and viability assessments. Primary information for this analysis will be derived from the WYNDD database and existing literature reviews.

WYNDD Biological Areas

The areas within the geographic area identified by Wyoming Natural Diversity Database as having a high concentration of important taxa or representative vegetation communities are described within the Vegetation section. These include Leigh Canyon, noted for rare plant occurrences, Virginia Creek, also noted for rare plant occurrences, and the Cloud Peak site. In addition, the Nature Conservancy operates a preserve that adjoins the Forest in this area, providing a biological reserve area.

Wildlife Species Information/Recommendations

Historically, *beaver* were likely more present in the geographic area than presently occur. The species is important for shaping and maintaining riparian communities. The link to deteriorated quality and reduced presence of aspen was also noted as an important consideration for this area. Aspen habitats are frequently used by beaver for dam construction when they occur in riparian areas.

- Consider beaver as a potential focal species for this geographic area area due to the habitat potential and previous use. Willow conditions on the lower end of the Forest are not likely adequate to support them currently and need improved.

Elk habitat use in the geographic area would be similar to that described in the Clear/Crazy assessment.

Bighorn sheep are not currently present in the area, but were more abundant in the pre-European settlement era. Elements of extirpation included loss of open corridors for migration habitat use, disease from domestic livestock, and over hunting. There is likely more suitable habitat in this geographic area than in others on the Forest, and the Virginia Creek RNA may provide potential habitat as there is no longer sheep grazing permitted in this area.

Issues of wildlife winter range and motorized vehicle access persist in this area, as described in the Clear/Crazy assessment.

The Baby Wagon Creek area may provide unique habitat potential for *amphibian* species, however little inventory has occurred in this area.

From the Clear/Crazy and Powder River landscape assessments previously completed, habitat important for species was noted for the old growth conifer occurrence and the riparian communities.

XII. Cultural, Human Uses, Land Use Patterns

Recreation and Travel Management

Summary

- This geographic area is one of most heavily used recreation areas on the forest.
- West Tensleep trailhead is the highest use access to the wilderness on the forest.
- The Meadowlark Lake area is a concentrated developed recreation area, both summer and winter.
- There are several recreation residences located in the geographic area.
- Wilderness accounts for 24 percent of the geographic area.

Participation in outdoor recreation has grown in most activities on the Bighorn National Forest including camping, hiking, horseback riding, atvs, motorcycles, fishing, snowmobiling and cross country skiing. Access is associated with almost every activity that takes place on the forest.

Summer travel: Water based recreation is concentrated near Meadowlark Lake in the summer. Several developed campgrounds are within the geographic area including Leigh Creek, Tensleep Creek, Bull Creek, Sitting Bull, West Tensleep Lake and Deer Park campgrounds. Recreation emphasis off the main travelway of US Highway 16 is nonmotorized for most of the area, with the southeast part of the geographic area being motorized emphasis. The area is popular for access to the wilderness through the West Tensleep trailhead.

Winter travel: There are several miles of State groomed snowmobile trails in the Tensleep geographic area. This area is heavily used by snowmobiles during the winter with Meadowlark and Deer Haven being important destinations. The Forest Service maintains cross-country ski trails in the Willow Park Ski Area. A nonmotorized recreation area north of Highway 16 was identified on older Forest Service maps.

Bighorn Mountain Resort is a developed downhill skiing area located near Meadowlark Lake. The area offers other winter recreation opportunities including ice-skating and snowshoeing.

Relationship between supply and demand of opportunities: Campgrounds located on US Highway 16 are typically full on weekends and busy during the week between June 15 and August 15. It is difficult to quantify whether supply meets demand due to the dispersed recreation activities that occur away from developed sites. It is assumed that recreation participation will continue to grow because of the popularity and marketing of the Bighorns and growth in population and participation rates in outdoor recreation.

During the winter there is limited parking for recreation users.

Recreation Opportunities: There are many recreation opportunities within the Tensleep geographic area. The Forest Service describes different recreation experiences using the setting, activities and the experience. These experiences are separated in recreation opportunity spectrum (ROS) classes. The following ROS classes and acres are found within the analysis area.

Table 16. Recreation Opportunity Spectrum (ROS) Classes within the Tensleep Creek Analysis Area

ROS class	Acres in analysis area	Percent
Primitive	23,089	23
Semi-primitive nonmotorized	14,643	15
Semi-primitive motorized	31,826	31
Roaded natural	13,436	13
Roaded modified	13,113	13
Rural	5,022	5

As displayed in table 16, the area has more opportunities towards the more developed classes of the spectrum.

Primitive – 23,089 acres

These areas are characterized by an unmodified environment and have a very high probability of experiencing solitude, freedom, closeness to nature, tranquility, self-reliance, challenge and risk. There is very low interaction between recreation users. Access and travel is nonmotorized on trails or cross-country.

Semi-primitive nonmotorized – 14,643 acres

Areas in a semi-primitive nonmotorized class are in a natural appearing environment with a high probability of experiencing solitude, closeness to nature, tranquility, self-reliance, challenge and risk. There is low interaction between users. Access and travel is nonmotorized on trails, some primitive roads or cross-country.

Semi-primitive motorized – 31,826 acres

There is a moderate probability of experiencing solitude, closeness to nature and tranquility. The setting is in a predominantly natural appearing environment. There is a low concentration of users, but often evidence of others on trails. Motorized vehicles are allowed for travel.

Roaded natural – 13,436 acres

Self-reliance on outdoor skill is of only moderate importance to the recreation user with little challenge and risk. The environment is mostly natural appearing. Access and travel is motorized including sedan and trailers.

Roaded modified – 13,113 acres

In a roaded modified setting, there is opportunity to get away from others, but with easy access. There is moderate evidence of other users on roads and little evidence of others or interaction at campsites. Conventional motorized access includes sedan, trailer, atv and motorcycle travel.

Rural – 5,022 acres

The opportunity to observe and affiliate with other users is important as is convenience of facilities and recreation opportunities. There is little challenge and risk. Interaction between users may be high as is evidence of other users.

Areas of conflict: Increasing participation rates in outdoor recreation bring increased complaints of user conflict. Some areas of conflict identified are:

- Conflicts in the winter between snowmobilers and telemarkers
- Conflicts between wildlife and winter motorized users – several violations in 2000
- Cross-country skiers and snowmobilers on the same trails or area
- Increasing numbers of recreation users accessing wilderness

Additional information needed

Need information to deal with the West Tensleep travel corridor. What is the proper maintenance level for FDR 27? Need to evaluate the section from Tyrell Ranger Station to West Tensleep Trailhead. This information could be part of the forestwide roads analysis

Grazing

In 1995 the Bighorn National Forest in conjunction with the University of Wyoming Department of Renewable Resources, University of Wyoming Extension Service, and Bighorn National Forest Grazing Permittees Association developed the ***Bighorn National Forest Vegetation Grazing Guidelines***. These guidelines were revised in 1996 and finalized on April 9, 1997.

The Guidelines outline vegetation-monitoring requirements for riparian areas on the Forest. This monitoring is mandatory for all allotments on the Forest with penalties established if the monitoring is not completed. The Forest rangeland management personnel spot check permittee monitoring and if discrepancies are found they are resolved on the ground or Forest Service data is used as the baseline for that season. Upland vegetative standards are outlined in the 1985 Bighorn National Forest Plan and still apply to all upland use.

Until the geographic area level AMPs are complete, existing AMPs will remain in affect and Annual Operating Instructions will be used to adjust the Plans to fit current resource objectives and assure management meets existing on the ground needs.

To assure objectives are being met annually the Forest Service, permittees or both complete riparian and upland monitoring. If problems occur adjustments in grazing use (changes in season of use, livestock numbers, rest periods, or deferment of on-dates) are made to allow the herbaceous vegetation to recover.

Table 17 shows selected information for the six grazing allotments in the Tensleep analysis area.

Table 17. Select Information for Grazing Allotments in the Tensleep Analysis Area

Allotment	Livestock Permitted	Number Permittees	Total Acres	Capable Acres	Current AMP	Scheduled AMP Update	Permitted Season
Dry Tensleep C&H	774 C/C	4	5466	3495		2008	7/10 – 9/15
Tensleep Canyon C&H	175 C/C		2671	1470		2008	6/23-10/8
South Canyon C&H	930 C/C	3	14097	6459		2008	
Monument C&H	250 C/C	1	3643	1495		2008	7/1-10/1
North Canyon C&H	800 C/C	1	13384	6644		2008	7/1-9/20
Leigh Creek S&G						2008	7/1-10/5
Garnet S&G	1250 S	*	5157	2965		2008	
Upper Meadows S&G		1	6996	2159		2008	
McLain S&G	0	Vacant				2008	
Willow S&G	0	Vacant	11421	2217		2008	
Baby Wagon S&G	520 S	Vacant	6737	1498		2008	
Hazelton S&G	1000 S	*	5954	1978		2008	

The geographic area is scheduled for analysis in 2007 based on the schedule developed after passage of the Rescission Act of 1995. This scheduled may be adjusted if current geographic areas being analyzed are delayed and target dates for completion are missed. Current delays are primarily based on the complexity of allotments in the Tongue geographic area, potential controversy of management decisions and cultural resource impacts.

Overall the herbaceous vegetation in the geographic area is in good condition with static to upward trends on most allotments. Isolated areas occur where vegetation use exceeds standards and guides but corrective action is normally taken the following year to allow these areas to recover. All allotments in the drainage are considered to be moving toward 1985 Forest Plan objectives. The rate of movement varies by allotment with the vegetation improving faster on some allotments than others.

Highway fences are also being built to reduce the livestock hazard on Highway 16.

XIII. Transportation System (Roads and Trails)

A Forest-wide roads analysis will be conducted during the effects analysis part of Forest Plan revision. It will be done under the 1985 Forest Plan direction. When the revised Forest Plan is implemented, the roads analysis will be reviewed and applicable revisions made.

Roads

There are currently approximately 266 miles of roads in the Tensleep Analysis Area. This system of roads accesses an area of approximately 158 square miles, including wilderness and private lands. The road system in this analysis area varies from high standard US Highways to primitive, abandoned wheel tracks. Table 18 gives a breakdown of roads within the analysis area.

Table 18. Miles of Road by Jurisdiction

Jurisdiction	Length (miles)
Forest Service	171
State	30.6
Private/Other	0.6
Unclassified	31.4
Total:	265.8

The roads within the analysis area under Forest Service jurisdiction are divided into categories called maintenance levels. Maintenance levels range from 1-5, with 5 being the highest standard, and 1 being the lowest standard. There may also be additional roads no longer required for management purposes, or which have been created by off road vehicle use, but there still exists a road 'footprint'. These roads are called unclassified, and the mileage of these unclassified roads is an approximation. A description of maintenance levels is shown in Table 19.

Table 19. Description of Road Maintenance Levels

Maintenance Level	Description
1	Closed to public travel – can be used intermittently for management purposes.
2	Maintained for use by high clearance vehicles.
3	Maintained for use by a prudent driver in a passenger car.
4	Maintained for use by passenger cars with a moderate degree of user comfort. Usually double lane, gravel roads.
5	Maintained for a high degree of user comfort, double lane, often paved.

Figure 10 shows a breakdown of Forest Service roads within the analysis area by maintenance level, as well as other roads within the analysis area by jurisdiction.

Figure 10. Roads by Forest Service Maintenance Level and Roads by Other Jurisdiction

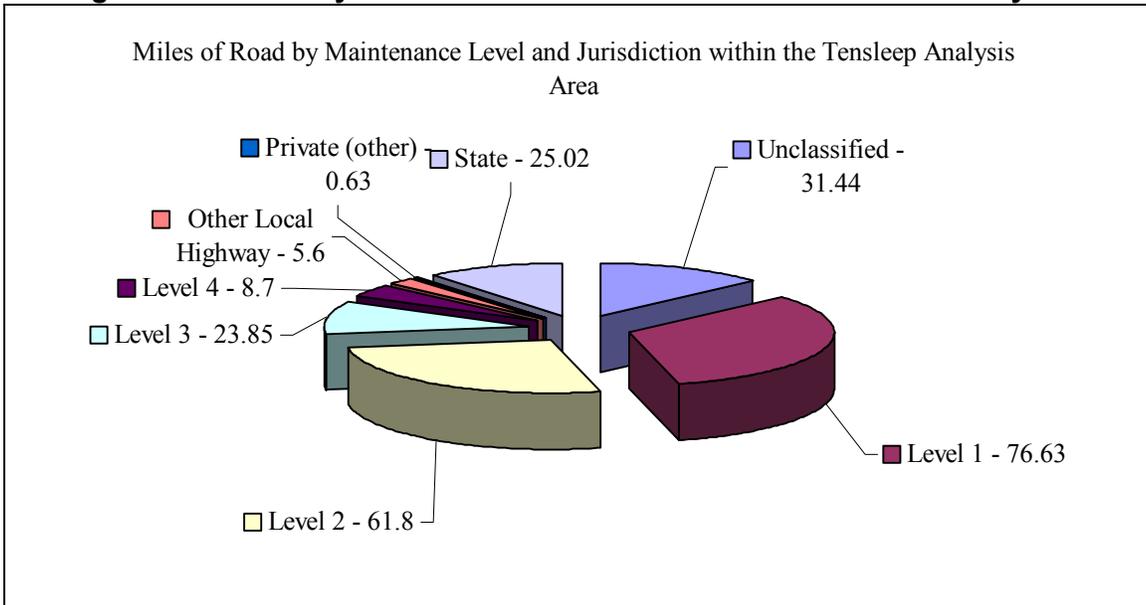


Table 20 lists the road density in the Tensleep analysis area. These figures do not include wilderness and private land. The open road density does not include unclassified roads.

Table 20. Road Density in Tensleep Analysis Area (National Forest System, Non-wilderness land only)

Total Road Density	1.67 miles per square mile
Open Road Density	1.28 miles per square mile

Various structures and components are needed to manage and operate those roads under Forest Service jurisdiction. These structures include bridges, culverts, cattleguards, waterbars, rolling dips, gates, and signs. These structures along with the roads themselves represent a great investment in the transportation system, as well as a great cost for annual maintenance and, over the years, a resulting backlog of maintenance needs. Table 21 shows the breakdown of annual and deferred maintenance needs by maintenance level⁷.

Table 21. Annual and Deferred Maintenance Needs by Maintenance Level

Maintenance Level	Miles	Annual Cost/Mile	Deferred Cost/Mile
1	76.63	\$683	\$886
2	61.8	\$920	\$2,316
3	23.85	\$6,561	\$8,109
4	08.7	\$5,991	\$14,730
Total needs for annual maintenance in Tensleep =		\$317,795	
Total needs for deferred maintenance in Tensleep =		\$532,573	

Current funding levels for road maintenance over the past 3 years have remained fairly constant, with an approximate allocation of \$460,000. This amount is far below the level needed for full

⁷ Costs arrived from performing condition surveys on each level 3, 4, and 5 road on the Bighorn National Forest in 1999, and from a random sample of level 1 and 2 roads in 2000. Costs per mile were interpolated from these surveys. Also, these costs do not reflect annual and deferred costs for bridges. Those costs are not yet readily available.

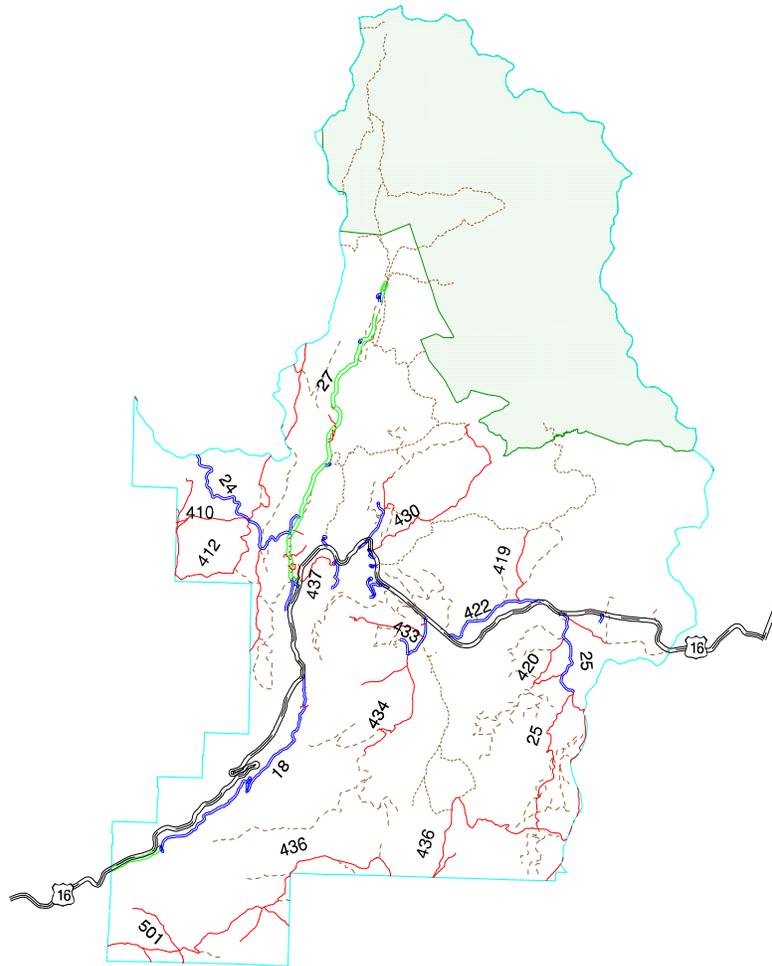
implementation of the current transportation system forest wide. Current forest plan standard for full maintenance is also not being met under current allocations. Currently, general plan direction states to keep roads open to public use unless financing is not available to maintain the facility, or use is causing unacceptable damage to soil and water resources. Based on current deferred maintenance and annual maintenance needs, plan direction is not being met.

Forest Plan Goals/Desired Conditions

Forest Plan direction for road management and operations are primarily based on resource needs rather than the road systems as a separate entity. In other words, the driving force behind road management decisions are primarily based on the management directions resource needs for an area. The Forest Plan does, however, give direction that roads may be closed if financing is not available to maintain the facility, if use is causing unacceptable resource damage, if they are unsafe, or if their use conflicts with the management objectives for an area. The Forest Plan also states that arterial and collector roads shall be maintained to a minimum maintenance level of 3, and all open local roads shall be maintained to a minimum maintenance level of 2. In contrast, forest plan goals to provide additional road and trail access to the National Forest boundary are being met.

The map on page 36 shows the current Forest Service Road system by maintenance level in the Tensleep analysis area.

ROAD DISPLAY BY MAINTENANCE LEVEL
FOR
TENSLEEP ANALYSIS AREA



-  US Highways
- Road Maintenance Levels
 -  1 - BASIC CUSTODIAL CARE (CLOSED)
 -  2 - HIGH CLEARANCE VEHICLES
 -  3 - SUITABLE FOR PASSENGER CARS
 -  4 - MODERATE DEGREE OF USER COMFORT
-  Trails
-  TENSLEEP ANALYSIS AREA
-  CLOUD PEAK WILDERNESS

Trails

There are currently approximately 64 miles of trail in the Tensleep Analysis Area. This trail system accesses an area of approximately 158 square miles, including 42.5 square miles of wilderness. The trail system in the analysis area varies from high standard ATV trails to primitive single-track trails. The majority of the trails within the analysis area are constructed and maintained by the forest service. However, there is also a small length of trails in the analysis that are user created, or are abandoned trails that still have an existing footprint. These trails are referred to as unclassified. Table 22 gives a breakdown of classified and unclassified trails within the analysis area:

Table 22. Miles of Trail by Status in Tensleep

Trail Status	Length (Miles)
Forest Service	58.8
Unclassified	5.4
Total:	64.2

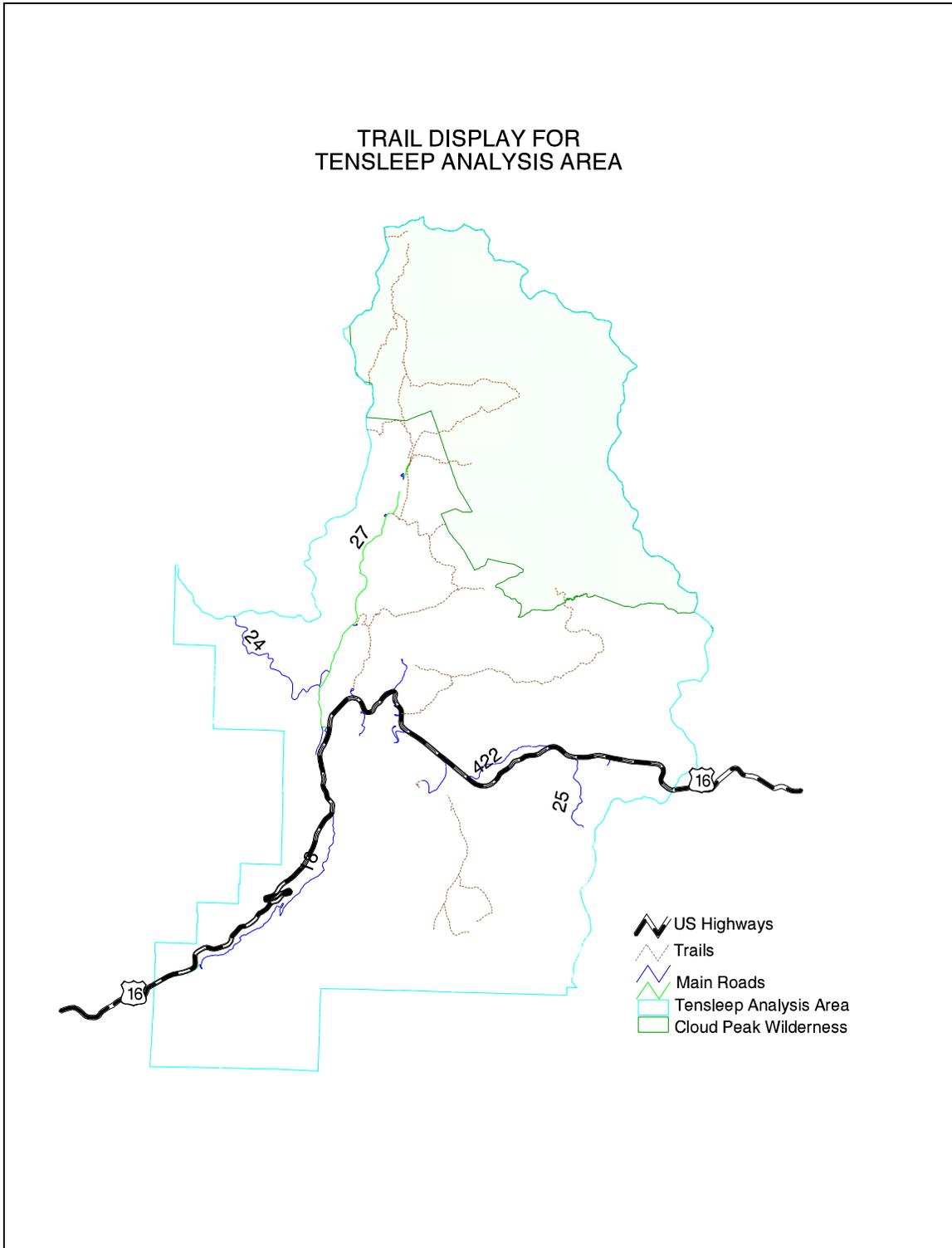
Forest Plan Goals/Desired Conditions

Forest Plan direction for transportation facilities are primarily based on resource needs rather than the road systems as a separate entity. In other words, the driving force behind road management decisions are primarily based on the management directions resource needs for an area. Currently, general plan direction states to maintain all trails to certain minimum requirements, including maintaining drainage structures to prevent unacceptable resource damage, and to remove all hazards from trails to allow safe passage for specified classes of users. For the most part, this direction of the plan is being met, however, deferred maintenance surveys have revealed that a lack of a steady budget in trail maintenance has caused some degradation of the trail system that is not consistent with current plan direction. In contrast, plan direction for providing a full range of trail opportunities in coordination with other state, federal and county municipal jurisdictions and private industries is generally being met.

The current annual trail maintenance need is estimated to be \$1,217 per mile and deferred maintenance costs are estimated to be \$13,125 per mile⁸. Total trial maintenance needs in the Tensleep analysis area are estimated to be \$71,560 annually maintenance, with a \$771,750 deferred maintenance backlog.

The map on page 38 shows the current trail system within the Tensleep analysis area.

⁸ These costs are interpolated from the forest wide condition survey assessments done in 2000 and 2001.



XIV. Bibliography

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