WHITE RIVER NATIONAL FOREST

5-Year Monitoring and Evaluation Report
October 2002 – September 2007

United States Forest Service
Rocky Mountain Region

Photo courtesy of Peech Carpenter

Forest Service Motto: CARING FOR THE LAND AND SERVING PEOPLE
Forest Service Mission: To sustain the health, diversity, and productivity of the Nation's forests and grasslands to meet the needs of present and future generations.

Forest Supervisor's Certification

The White River National Forest (WRNF) Land and Resource Management Plan (Forest Plan) was approved in April 2002. The Forest Plan was developed to meet the requirements of the Forest and Rangeland Renewable Resources Planning Act of 1974 (RPA), as amended by the National Forest Management Act of 1976, and the National Environmental Policy Act of 1969 (NEPA).

The following is the White River National Forest 2008 5-Year Monitoring and Evaluation Report. The report is the 5-year report as required in the Land & Resource Management Plan (Forest Plan), Chapter 4. Monitoring is required under NFMA regulation for plans signed under the 1984 Planning Rule as specified in **36 CFR 219.7 (f):** *A program of monitoring and evaluation will be conducted that includes consideration of the effects of National Forest management on the land, resources, and communities adjacent to or near the national forest as well as the effects to national forest management from activities on nearby lands managed by other federal, state, local, or tribal government agencies or under the jurisdiction of local governments.*

Planning regulations **36 CFR 219.10 (g) state**: *Forest Plans shall ordinarily be revised on a 10 year cycle or at least every 15 years. It may also be revised whenever the Forest Supervisor determines that conditions or demands in the area have changed significantly.* For the White River NF, implementation of the Forest Plan will be evaluated through this report, as will determinations of the need to initiate change.

36 CFR 219.11 (d) states: Monitoring and evaluation requirements provide a basis for a periodic determination and evaluation of the effects of management practices. The 2008 5-Year Monitoring Report is part of an on going effort to document observations, changes, and trends in resources and the environment on the National Forest. This effort helps the forest to evaluate any need for management changes, decisions, or actions.

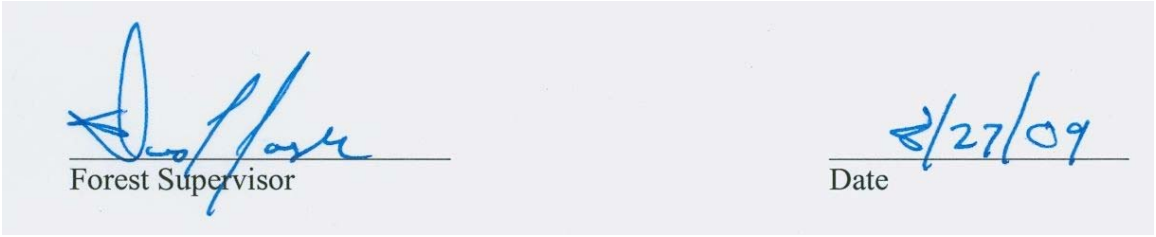
Findings

Overall, the 2002-2007 5-year monitoring and evaluation results indicate that the management of the forest is meeting goals, desired conditions, standards and guidelines, and prescriptive allocations. Recommendations for future amendments or assessments are as follows:

- Roadless updated regulation may be forthcoming. The Forest Plan will adhere to any direction that incorporates amending Forest Plans. The Forest Plan currently contains guidelines for Roadless, which will remain in place if no other direction is given.
- An Oil and Gas Leasing Analysis and EIS will be initiated to update the availability and conditions for leasing lands for oil/gas exploration and production. The analysis will include a Forest Plan amendment to incorporate the decisions from this effort.

- The forest continues to suffer from the effects of epidemic-level insect infestations. The forest may have to re-evaluate the timber program which may lead to a forest plan amendment.
- Due to changed conditions and to align the forest monitoring program to evaluate current and anticipated needs, the forest may evaluate the monitoring questions and propose an amendment to modify, add, or remove Forest Plan monitoring questions.
- During the implementation of the Forest Plan for the past five years some statements are found to conflict, not reflect what was intended, or are impossible to implement. Amendment(s) may be proposed to modify some goals, objectives, standards, guidelines, or statements in the desired conditions.

I have reviewed the 2002-2007 5-Year Monitoring and Evaluation Report and believe that the results, as documented in this report, meet the intent of both Chapter 4 of the Forest Plan and applicable regulations. This is not an appealable decision, according to 36 CFR 215.7, 217.3, Decisions Subject to Appeal.



Introduction

The White River National Forest is located in the central-western portion of Colorado from Eisenhower tunnel to the Town of Rifle, south of Aspen to north of Meeker. The forest is home to eleven ski areas, eight designated Wilderness areas, prime elk herds, variety of other plant and animal species, mountain waters, and is one of the most visited forests in the nation.

The forest sits in a high desert, dry forest climate zone. The ecosystems vary from alpine, subapine, montane, mesa, to semi-desert. Elevations range from over 14,000 feet to under 6,000 feet. Major vegetation types are spruce/fir, Douglas fir, lodgepole pine, pinyon juniper, oak and other shrubs and small amounts of ponderosa pine, sage brush, riparian vegetation, alpine vegetation, and cottonwoods.

The 2002 White River National Forest (WRNF) Land and Resource Management Plan (Forest Plan) contains goals and objectives to meet future desired conditions across the forest for the next 15-years. To help meet these goals the plan contains standards and guidelines for forest management, and a monitoring component for managers to measure whether the forest is moving toward the goals, objectives and desired condition outlined in the Forest Plan.

Effective monitoring and evaluation fosters improved management and more informed planning decisions. It helps identify the need to adjust desired conditions, goals, objectives, standards, and guidelines as conditions change. Monitoring and evaluation help the agency and the public determine how a forest plan is being implemented, whether plan implementation is achieving desired outcomes, and whether assumptions made in the planning process are valid.

This monitoring and evaluation report is based on the WRNF Monitoring Strategy, as described in Chapter 4 of the Forest Plan. This report is not a list of outputs; rather, it describes conditions of the various resources on the forest. This report is based on implementation of the Forest Plan for the past 5 years (2002-2007). This five year report is more comprehensive than the previous annual reports. It contains not only inventory and monitoring accomplishments, but also reflects on trends for the past five years, summarizes overall accomplishments, illustrates forest management effectiveness, demonstrates success or failures for reaching goals and objectives, and recommends any potential changes necessary to the Forest Plan.

The annual monitoring and evaluation report is a requirement under 36 CFR 219.6 for national forests and grasslands. The report and associated activities, data, and subsequent reports help evaluate the effectiveness of forest goals and objectives set forth in forest plans. These reports serve several purposes including:

- Documenting monitoring and evaluation accomplishments
- Providing an assessment of the current state of the forest or grassland
- Providing a mechanism for gathering all the monitoring activity occurring across forest lands

- Providing adaptive management feedback to responsible officials of any needed changes to Land and Resource Management Plans or adjustments to management actions
- Providing an accountability tool for monitoring and evaluation expenditures
- Describing to the public how their public lands are being managed.

Though it has only been five years, changes in conditions and emphasis on the Forest have occurred. For example the beetle epidemic and the current amount of natural gas production were not on the horizon during Forest Plan development. During this time we have progressed in monitoring species and habitat. We have learned more about what to focus on and what was not effective. As we look at the Forest Plan we will also look at the monitoring strategy and update it if necessary to reflect effective monitoring practices. Keeping the Forest Plan current gives the Forest a document that is useful as a guide for management of Forest lands.

There have been several amendments and corrections made to the Forest Plan over the last five years or more.

- Amendment 1 was signed in March of 2005 – Lynx and Water standard and guideline updates
- Amendment 2 was signed in January of 2006 – Alpine and Inventoried Roadless standard and guideline updates
- Amendment 3 was signed in March of 2006 – MIS List Revision
- 3 Errata documents have been issued for minor corrections and updates
- Southern Rockies Lynx Amendment was signed in October 2008 (Regional) – Lynx standard and guideline updates

All of these documents are available on the White River National Forest internet website http://www.fs.fed.us/r2/whiteriver/projects/forest_plan/index.shtml

Monitoring Strategy

Chapter 4 of the Forest Plan for the White River National Forest outlines the purpose of monitoring, the techniques used, and the actual monitoring strategy including items to be monitored. The National Forest Management Act (NFMA) requires national forests to do specific monitoring tasks. The level and intensity of any additional monitoring is dependent on available staffing, funding and forest priorities. Therefore criteria have been developed to guide the monitoring strategy. The criteria used for the monitoring strategy include monitoring drivers, monitoring questions, priorities, types of information collected or monitoring items, degree of precision and reliability, scale, and frequency of reporting.

Monitoring drivers are the reasons for including items in the monitoring plan, such as legal and regulatory requirements, Forest Service manual direction, or tracking Forest Plan goals and objectives or standards and guidelines.

Monitoring questions are specific questions that have been developed to ensure that monitoring and evaluation address information essential to measuring forest plan accomplishment and effectiveness. These questions help identify issues of concern and reveal how they are changing. The evaluation process determines whether the observed changes are consistent with forest plan desired future conditions, goals, objectives and what adjustments may be needed.

Monitoring priority is a screening process that sorts the more significant questions from the less significant to ensure efficient use of limited resources—time, money and personnel. The priority of a question may affect the intensity or extent of associated monitoring activities.

Monitoring items, or data elements, are quantitative or qualitative parameters that can be measured or estimated. One or more monitoring items are selected for the purpose of answering a monitoring question. A particular monitoring item may be used to answer more than one monitoring question. Examples of monitoring items with their associated unit of measure include acres and location of soils improved or number of water bodies restored on the White River National Forest.

The *precision and reliability* with which each forest program or activity is monitored depends on the particular program or activity to be monitored. Two classes of precision and reliability are recognized: Class A methods are generally well accepted for modeling or measuring the resource or condition. They produce repeatable results and are often statistically valid. Class B methods are often qualitative in nature, but still provide valuable information on the status of resource conditions.

Scale describes the level of analysis with respect to land size. This measure is important in describing effects dealing with habitat heterogeneity and viability issues as well as describing cumulative effects of management actions. Examples include: sixth order hydrologic unit code, geographic area, administrative unit, or landscape (forest-wide).

Frequency of reporting describes the timing of monitoring and evaluation efforts over time. Examples include: annually, every five years, or every ten years.

Monitoring History

Status of Monitoring Reports

Annual Plans

None for FY2003
Annual Report for FY2004
Annual Report for FY2005
Annual Report for FY2006

Three Types of Monitoring

Monitoring results are reported under three headings: Implementation Monitoring, Effectiveness Monitoring, and Validation Monitoring. These categories and the questions asked and answered

are taken directly from the WRNF Monitoring chapter of the Forest Plan (pages 4-2, 4-12 through 4-25). Three types of monitoring are described for forest management:

- **Implementation Monitoring.** This includes periodic monitoring of project activities to determine if they have been designed and carried out in compliance with Forest Plan direction and management requirements.
- **Effectiveness Monitoring.** This level of monitoring is used to determine if management activities are effective in achieving the desired future condition described for each of the various management areas.
- **Validation Monitoring.** This level of monitoring is used to determine whether the initial data, assumptions, and coefficients used in the development of the Forest Plan are correct, or if there is a better way to meet goals and objectives and desired future conditions.

These questions are answered annually or every five years. This report answers to the questions with a five year frequency of reporting.

The actual preparation of this report consisted of the compilation of respective staff observations for their areas of responsibility in answering the following monitoring questions from the Forest Plan Chapter 4.

FY 2002-2007 Five-year Monitoring and Evaluation By Type of Monitoring and Resource

Effectiveness Monitoring

Hydrology

Watershed 1: ***To what extent has water quality condition on watersheds containing National Forest System lands been restored, maintained or improved?***

Primary water quality effects on National Forest lands are sedimentation from ground disturbing activities, temperature increases from riparian disturbances, and heavy metals concentrations related to historic mining activities. Each will be discussed separately below.

In order to target limited funding for water quality restoration, all fifth field watersheds on the forest were prioritized in 2004. This prioritization numerically ranked all the watersheds on the forest based on physical factors such as parent geology, erosion potential, etc., and on anthropogenic disturbance factors such as road densities, presence of cattle grazing, historic disturbances, etc. The completed prioritization is available on

the file at the Forest Supervisor's Office. The prioritized list of watersheds was also used to schedule annual assessments of an individual fifth-field watershed. These assessments describe the existing conditions of aquatic resources in the watersheds, factors influencing the health of the watershed, and potential restoration projects to improve watershed health. To date the following assessments have been completed: North Fork White River (2003), Upper Eagle River (2004),.

Water Quality – Sedimentation

Sedimentation to streams can occur naturally through landslides and gully formation or from ground disturbing activities such as road and construction, ski area development, highway traction sand application, etc. Currently there are two streams on the forest that EPA and the State of Colorado consider impaired by sedimentation based on criteria in Section 303(d) of the Clean Water Act. These listed streams are Straight Creek and Black Gore Creek, both of which are primarily affected by traction sand applied on Interstate 70 at the Eisenhower tunnel and Vail Pass, respectively.

For both of these watersheds Total Maximum Daily Loads (TMDL) have been calculated in order to set a recovery standard for the stream. As part of the TMDL, Colorado Department of Transportation built and annually maintains a series of sedimentation ponds along the interstate designed to intercept highway sand before it reaches the stream. In each case physical measurements in the stream such as percent fine sediment from pebble counts, cross section shape, pool volume filled by sediment, and residual pool depth are annually measured to track improvements in stream conditions. These annual measurements are summarized in reports for each stream and are used to evaluate the efficacy of sediment trapping efforts by CDOT. Reports for Straight Creek and Black Gore Creek are on file at the Forest Supervisor's Office. Sample data of fine sediment concentrations for each watershed are shown below in Table 1 and Figures 1 and 2.

Table 1. Percent fine sediment (<8mm) and aquatic life use categories in Straight Creek, CO. Values in bold are non-supporting for aquatic life use, and underlined italics are supporting with impacts observed.

Year	9326	9602	9830	9952	10040	10196	10340	10582	10802	10980	11360 reference
1992	**38**	*23*	20	**84**	**57**	**46**	**50**	**67**	**49**	18	-
1993	*34*	**66**	*27*	**59**	**37**	*24*	*33*	**40**	20	**76**	-
1994	*32*	**79**	**39**	**42**	*35*	*36*	**37**	**45**	**52**	**55**	-
1995	*29*	**40**	*22*	**43**	*25*	*32*	*28*	31	*36*	**66**	-
1996	**37**	*36*	*34*	-	*26*	**39**	16	-	**51**	**57**	-
1998	**37**	**62**	-	**55**	**38**	**58**	**45**	**50**	**68**	**69**	-
1999	*36*	**47**	*26*	*32*	-	*32*	19	-	**52**	*31*	-
2000	**38**	**43**	*23*	*33*	-	*31*	19	-	*25*	21	-
2001	**63**	16	*25*	18	-	**41**	*33*	*26*	11	7	-
2002	**55**	*27*	*25*	*24*	-	*36*	21	**60**	18	*25*	-
2003	*32*	18	*25*	**54**	**41**	*29*	*27*	19	*31*	-	10
2004	**52**	7	14	*28*	-	*26*	*25*	*23*	*26*	**72**	13
2005	*30*	*31*	*26*	**82**	**53**	20	14	*29*	*26*	7	12

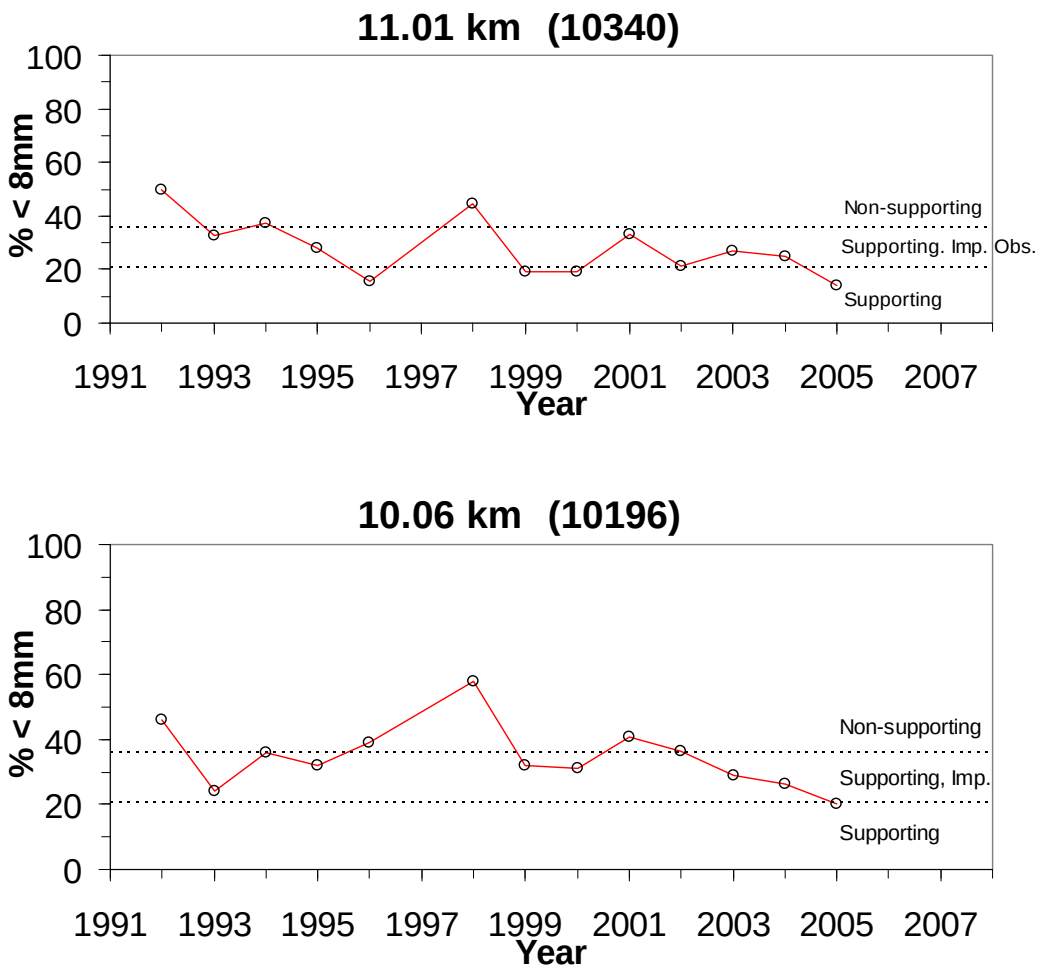
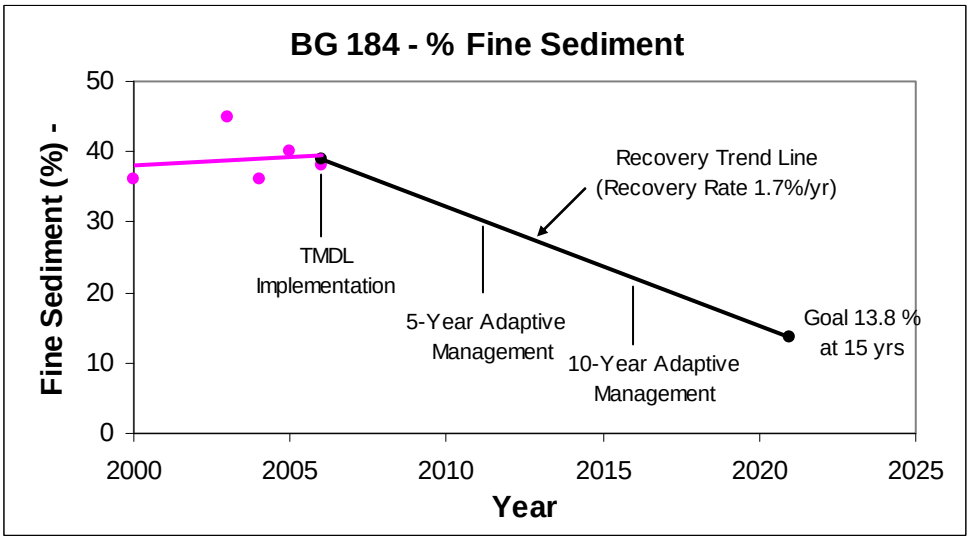


Figure 1. Representative plots fine sediment concentrations (percent of pebble count sample less than 8-mm in size) at Straight Creek, Colorado at sites 10340 and 10196.



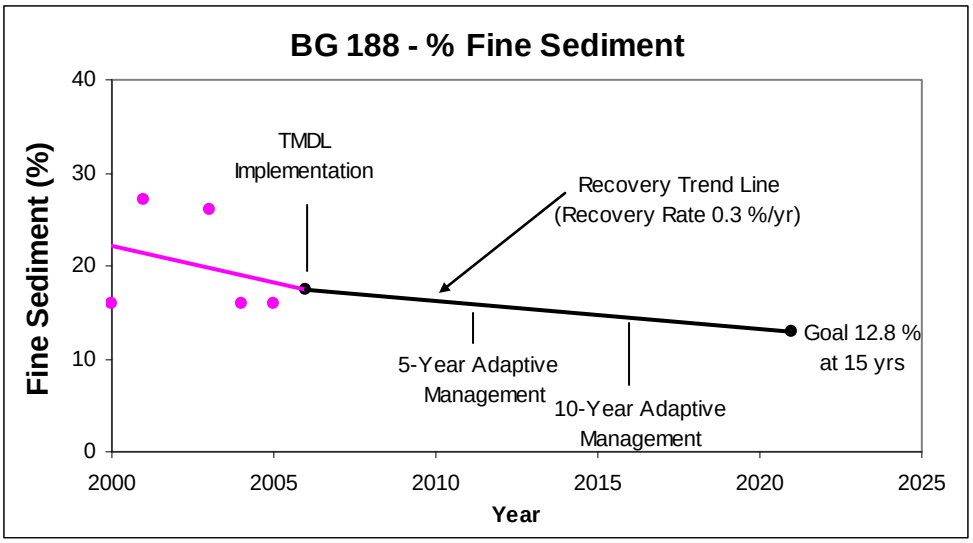


Figure 2. Representative plots of fine sediment concentrations (percent of pebble count sample less than 8-mm in size) at Black Gore Creek, Colorado at Mileposts 184 and 188, along with projected recovery goals to meet the TMDL.

Treatments by CDOT are designed to produce a decreasing trend in fine sediment concentrations, which is mandated under Section 303(d) of the Clean Water Act. For both sites, a statistical trend is not discernable, which is not surprising since the recovery and monitoring period might be as long as two decades. The TMDL for both Straight Creek and Black Gore Creek have very specific monitoring and reporting requirements that must be implemented each year. Measurements typically occur in the early fall with a coalition of volunteers, local and state agencies, and the Forest Service.

Most other watersheds on the forest have little or no data on which to evaluate water quality trends related to sedimentation. Streams representing 124 sixth-field watersheds have been evaluated using the WRNF Stream Health protocol. Part of this protocol includes measurements of fine sediment on the streambed using Wolman pebble counts. In streams where management activities are occurring or proposed, stream health metrics are measured and compared to 'reference' values measured in relatively undisturbed watersheds. On the basis of this comparison, streams are rated as Robust (within 74% of the reference value), At-Risk (59 to 74% of the reference value) or Diminished (less than 59% of the reference value). The Forest Plan and the Watershed Conservation Handbook emphasize that all activities maintain or improve stream health toward the Robust health class.

Based on Stream Health surveys since 2002, the following table summarizes stream health relative to fine sediment for a number of watersheds.

Table 2. Water quality rating for the stream health metric of fine sediment deposition on the streambed. See preceding paragraphs for definitions of stream health classes.

Stream Name	Health Class	Stream Name	Health Class	Stream Name	Health Class

S Barton CSU	Robust	West Brush	Robust	E.F. Crystal	Robust
Barton MF	Robust	East Brush	Robust	Capitol	Robust
Barton NF of SF	Robust	Wheeler R2	At-Risk	Sunnyside	Diminished
Bighorn R2	Robust	Copper	Robust	N.F. Piney	At-Risk
Gore	Robust	Jones Gl R3	Robust	Milk*	Robust
Pitkin	Robust	Middle R3	Robust	N.F. Cedar*	Diminished
Piney	Robust	Stone R2	Robust	East Cottonwood*	Diminished
Keystone Gl.	Diminished	Wheeler R1	Robust	Slate*	Diminished
Outback	Diminished	Union	Robust	West Cottonwood*	Diminished
Sawmill	Robust	Northeast Bowl	Diminished	Bighole	Diminished
Jones G. Breck	Robust	Ptarmigan	Diminished	McPhee Gulch	Diminished
Lenawee CSU	Robust	Spraddle	Diminished	Three Licks	Robust
Meadow R2	Robust	Game R1-2	Diminished	Sundown Bowl	Robust
Cucumber R2	Robust	Mill R2-3	At-Risk	Mill Private	Robust
Jones. R1 Keyst	Robust	Nottingham	Diminished	No Name (GWS)	Robust
Camp R1	Robust	Red Sandst 2	Robust	Clark	Robust
Camp R2	Diminished	Red Sandst 3	Diminished	SF Grizzly	Robust
Mozart	Robust	Grouse	At-Risk	Lower Meadow	Robust
Lehman	Robust	Indian	Robust	Upper Meadow	Robust
Cucumber SF *	Diminished	Timber R2	Diminished	Deep	At-Risk
McKenzie	Robust	Cucumber R1	Robust	East No Name	Robust
Jacque CSU	Robust	Low N Barton	Robust	Hunter	Diminished
McCoy R3	Robust	Miners 1	Robust	Middle Thompson	Robust
Polk CSU	Diminished	Miners 2	Robust	North Thompson	At-Risk
Middle R4	Robust	Miners Trib	Diminished	East Divide	Diminished
Booth R2	Robust	Ophir	Diminished	N Thomp Trib A	Diminished
Timber R1	Robust	Peak One	Robust	Buck	Robust
Earl's Bowl	Diminished	East Grouse	Robust	No Name -HX	Diminished
Game R3	Diminished	Notch Mtn	Robust	Beaver Base	Diminished
Big Fish Creek*	Robust	Chapman Gl*	Robust	Fourmile Creek*	Diminished
Campbell Crk*	Diminished	Crystal Crk*	Robust	Bennett Gulch*	Robust
Ripple Creek*	Robust	Express Crk*	Robust	Miller Creek*	Robust
Avalanche Crk*	Robust	McCullough*	Robust	South Fork Swan*	Robust
East Maroon*	Robust	Buck Creek*	Robust	West Grouse*	Robust
Snowmass Ck*	Robust	Deep (Eagle)*	Robust	Deep Crk (Rifle)*	Robust
Meadow Crk*	Robust	EF Fawn*	Robust	East Canyon*	Robust
Piney River*	Robust	Morapos Crk*	Robust	Resolution Creek*	Robust
SF White *	Robust	Cattle Creek*	At-Risk	Turkey Creek*	Robust
Cache Creek*	Robust	Derby Creek*	Robust	Castle Creek*	Robust
East Brush*	Robust	East Elk Crk*	Robust	Two Elk Creek*	At-Risk
Gypsum*	At-Risk	East Miller*	Robust	West Tenmile Crk*	Robust
Snell Creek*	Robust				

*Denotes Management Indicator Species (MIS) sites sampled at five year intervals.

Based on Stream Health surveys since 2002, approximately 31 percent of the measured streams have sediment ratings below Robust. This is not surprising since the streams in Table 2 are not a representative random sample across the Forest. In fact, it could be considered biased toward degraded watersheds since the stream health surveys are often targeted at watersheds that experience ground disturbing activities such as developed ski areas or timber sale areas. Restoration is targeted at these watersheds to improve conditions to meet both the Forest Plan Standards and the Goal 1, Objective 1a of the Forest Plan: Improve and protect watershed conditions to provide the water quality and

quantity and soil productivity necessary to support ecological functions and intended beneficial uses.

Reported Forest accomplishments (targets) are used to assess, at the forest level, the extent that management actions are creating conditions favorable to water quality improvement relative to sedimentation. For example, long term sedimentation values could be increased by activities such as new road construction, which is reported annually under RD-CNSTR. Note that temporary disturbances such utility corridor construction, ski trail improvements, timber harvest areas, etc., are not included since revegetation is required shortly after disturbance. As such, they do not serve as a permanent source of sediment to streams. On the other hand, sedimentation is improved or reduced over current levels by specific watershed improvement activities (reported in acres under SW-RES_IMPR), miles of road decommissioned (RD-DECOM), miles of trail improved (TL-IMP-STD), and miles of road reconstructed (RD-RCNSTR).

Table 3. Summary of acres of activities (target accomplishments) either positively or negatively affecting water quality relative to sedimentation at the Forest level. Data summarized from annual monitoring reports.

Activity	Target Name	Unit *	Year of Implementation				
			2003	2004	2005	2006	2007
Watershed Restoration	SW-RES-IMPR	acres	42	9	23	22	29
Road Decommissioning	RD-DECOM	acres (miles)	48 (19.2)	33 (13)	11 (4.4)	23 (9)	27 (10.8)
Trail Improvement	TL-IMP-STD	acres (miles)		196 (196)	31 (31)	3 (3)	0.8 (0.8)
Permanent Road Construction	RD-CNSTR	acres (miles)			-6 (-2.5)	-6 (-2.5)	
Road Reconstructed	RD-RCNSTR	acres (miles)		18 (7)	80 (32)	73 (29)	
TOTAL		acres	90	256	139	115	57

*Miles converted to common unit of acres based on 2.5 acres/mile for roads and 1 acre/mile for trails. Road construction values shown as negative for comparison.

Table 3 suggests that activities permanently affecting water quality conditions on the Forest are generally producing a net benefit relative to sedimentation. However, temporary road construction is not reported as a target above, which could be a significant source of sedimentation. As stream health surveys are repeated (approximately on five year intervals or as new projects are proposed), trends may become apparent that could corroborate the Forest-wide summary.

The Management Indicator Species (MIS) reporting presents a framework for assessing trends in macroinvertebrates and trout abundance across a matrix of management activities. See questions MIS-1 through MIS-4. Sites represent a mixture of management activity intensities and are sampled at five year intervals to assess trends over time. Fine sediment is one of the metrics that is collected as part of the physical habitat survey. The sampling protocol was initiated in 2003 and few sites have had repeat sampling. In time, that information could also be used to corroborate the information above at a forest scale.

Water Quality – Stream Temperatures

The State of Colorado recently adopted stream temperature standards. For the mountain region of the White River National Forest, the maximum mean weekly average stream temperature is 17 to 18.2 degrees Celsius, depending on the stream size.

Stream temperature data is collected at a variety of streams across the Forest on an annual basis. Data are either collected to establish base-line conditions in major streams, or to determine if problems exist in areas subject to significant management activities. Data have been collected at approximately 65 locations beginning in 2001.

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Table 4. Stream temperature data sites on the White River National Forest from 2001 to 2006.

Stream Name	Logger Title	2001	2002	2003	2004	2005	2006
Blanco Ranger District							
Big Fish Creek	Big Fish Creek	x				x	
Fawn Creek	Fawn Creek	x	x			x	x
Lost Creek	Lost Creek (mouth)	x	x		x	x	x
Lost Creek @ trail	Lost Park Trail	x					
Marvine Creek	Below Lakes					x	
Miller Creek	Miller Creek	x				x	x
Ripple Creek	Ripple Creek	x	x			x	x
Snell Creek	Above Culvert	x	x			x	x
East Fork Snell Creek	E.F. Snell (upper)	x				x	
South Fork White River	Campground					x	
Trappers Lake	At Outlet	x	x			x	x
North Fork White River	Lost Creek	x	x			x	x
North Fork White River	Mouth	x	x				
North Fork White River	Big Fish Creek	x				**	
North Fork White River	Snell Creek	x	x				
South Fork White River	Mouth	x	x				
Main Marvine Creek	Main Marvine Creek	**					x
West Marvine Creek	West Marvine Creek	x					
East Marvine Creek	East Marvine Creek	x					x
Papoose Creek	Papoose Creek	x					
Skinny Fish Creek	Skinny Fish Creek	x				**	x
Hahn Creek	Trail Crossing	x					
Ute Creek	Ute Creek	x					
Sopris District							
Mormon Creek	Mormon Creek	x					
Lincoln Creek	Lincoln Creek	x					
Cunningham Creek	Cunningham Cr. #1	x					
Cunningham Creek	Cunningham Cr. #2	x					
Coal Creek	Coal Creek	x					
Rifle District							
Butler Creek	Butler Creek #1	x					
Butler Creek	Butler Creek #2	x					
Beaver Dam Creek	Beaver Dam Creek				x	x	
Camp Creek	Camp Creek				x	x	
East Divide Creek	FS Boundary				x	x	
East Willow Creek	East Willow Creek				x		
George Creek	George Creek					x	

Mosquito Creek	Mosquito Creek				x	x	
Little Rock Creek	Little Rock Creek					x	
West Divide Creek	FS Boundary					x	
West Divide Creek	Cayton Bridge					x	
West Divide Creek	Below Little Rock Cr.					x	
Eagle/Holy Cross District							
Snake River	Deer Snake River					x	
Frey Gulch	Frey Gulch					x	
Keystone Gulch	Lower Reach					x	
Keystone Gulch	Upper macro site					x	
Miners Creek	Miners Creek					x	
Meadow Creek	Meadow Creek 2					x	
Polk Creek	Polk 1b					x	x
Resolution Creek	Resolution Creek						x
E.F. Red Dirt Creek	E.F. Red Dirt Creek						x
Stafford Creek	Stafford Creek						x
East Fork Eagle River	E.F. Eagle Upper						x
Gore Creek	Gore 5						x
East Brush Creek	East Brush Creek						x
Hat Creek	Hat Creek						x
East Fork Eagle River	East Fork Eagle Rifle						x
Chihuahua Gulch	Chihuahua Gulch						x
North Fork Snake River	North Fork Snake						x
Piney River	Piney 3						x
Camp Creek	Camp Creek						x
Gore Creek	Gore 2						x
Thurman Gulch	Thurman Gulch						x
Meadow Creek	Meadow Creek MIS						x
Jones Gulch	Jones Gulch						x
Black Gore Creek	Black Gore 184						x

** Data logger missing. No data retrieved.

A subset of these data was used by the Colorado Water Quality Control Division to establish stream temperature standards for Colorado rivers and streams. The data were analyzed by the State to determine if the proposed standards were reasonable and attainable across a variety of stream types and elevations. Table 5 shows the White River NF temperature data used for these analyses, and how those sites compared to the new stream temperature standards.

Table 5. Selected stream temperature monitoring sites compared to the recently adopted Colorado stream temperature standards.

Stream Name	Year	Start	End	Elevation (feet)	MWAT* (deg C)	Standard (deg C)
Beaver Dam Creek	2005	16-Jun	29-Sep	8350	13.84	**17**
Camp Creek	2004	11-Jun	2-Sep	8366	16.33	**17**
George Creek	2005	7-Jul	25-Sep	7874	7.7	**17**
Big Fish Creek	2002	5-Jul	10-Oct	8858	9.79	**17**
Little Rock Creek	2005	16-Jun	29-Sep	8202	14.48	**17**
Papoose Creek	2001	14-Jun	10-Oct	7710	12.54	**17**
Ripple Creek	2001	14-Jun	10-Oct	8850	12.52	**17**
Butler Creek #1	2001	30-Jul	17-Oct	6726	10.11	**17**
East Marvine Creek	2001	13-Jun	10-Oct	8366	10.23	**17**
Fawn Creek	2002	12-Jun	8-Oct	7710	16.46	**17**

Lincoln Creek	2001	25-Jul	2-Oct	9678	11.83	**17**
Lost Creek	2004	3-Jun	17-Sep	7710	17.0	**17**
Miller Creek	2005	6-Jun	25-Sep	7382	9.96	**17**
Ute Creek	2001	14-Jun	10-Oct	7874	11.28	**17**
West Marvine Creek	2001	5-Jul	16-Oct	8366	11.54	**17**
Mainstem Marvine Creek	2005	9-Jun	2-Oct	8000	15.6	**17**
South Fork White River	2005	22-Jun	23-Sep	7000	12.5	**18.2**
North Fork White River Mouth	2002	12-Jun	7-Oct	7000	15.74	**18.2**

* Max MWAT = maximum mean weekly average temperature in degrees Celsius.

Table 5 shows that all of the stream temperature monitoring sites meet the new State standard. Forest-wide water and riparian standards minimize disturbance within the riparian zone (water influence zone [WIZ]), so current and future management activities should not have significant effects on stream temperatures related to removal of shade producing vegetation. On the other hand, the pine beetle epidemic is causing large-scale mortality across the east side of the forest and has already caused shade producing lodgepole pine to die. Continuing this temperature monitoring, or starting new sites in beetle-killed areas, will demonstrate effects to stream temperature from large scale vegetation mortality.

Water Quality – Acid Mine Drainage

Acidic drainage from historic mines causes heavy metals to leach from tailings and pollute local water bodies. The WRNF currently has many miles of stream with adverse water quality due to heavy metals such as zinc, manganese, and copper. Some of these streams, Peru Creek for example, are essentially biologically dead. The WRNF is actively working with the State of Colorado and local community groups such as the Snake River Task Force to remediate some of these mine sites. No data are currently collected to accurately track the miles of stream that are being affected by mine reclamation.

Snowmaking at Copper Mountain and Keystone Resort both produce artificial snow from water affected by historic mining in Tenmile Creek and the Snake River, respectively. Melting of this snow can cause dispersal of metals, particularly zinc, to enter on-mountain tributary streams and potentially affect water quality. Extensive water quality testing occurs on both mountains. Data for Keystone are summarized in the 2002 Keystone Ski Area Water Quality Study prepared by Hydrosphere Resource Consultants Inc., which is on file at the WRNF Supervisor's Office. The data for Copper Mountain is summarized in the 2006 Copper Mountain EIS, which is also on file at the Supervisor's Office. The affected streams meet current State water quality standards and compliance data are collected annually.

Watershed 2: ***To what extent have soils eroded or disturbed by Forest Service management or permitted activities been restored?***

The soil scientist position on the White River National Forest has been vacant since 2003. Consequently, no comprehensive data on soil quality have been collected in the past five years. However, some measure of soil erosion and disturbance was discussed previously under Watershed Question 1: Water Quality.

Soil conditions have been monitored at developed ski areas across the forest. Beginning in 2003 the impermeable nature of graded soils on ski slopes were identified as a causal factor for peak flow increases. Paired permeability and bulk density tests were conducted at Breckenridge, Copper Mountain, and Keystone ski resort to determine if drainage qualities of graded ski runs and adjacent soils in tree islands were different. These results are shown in the figures below.

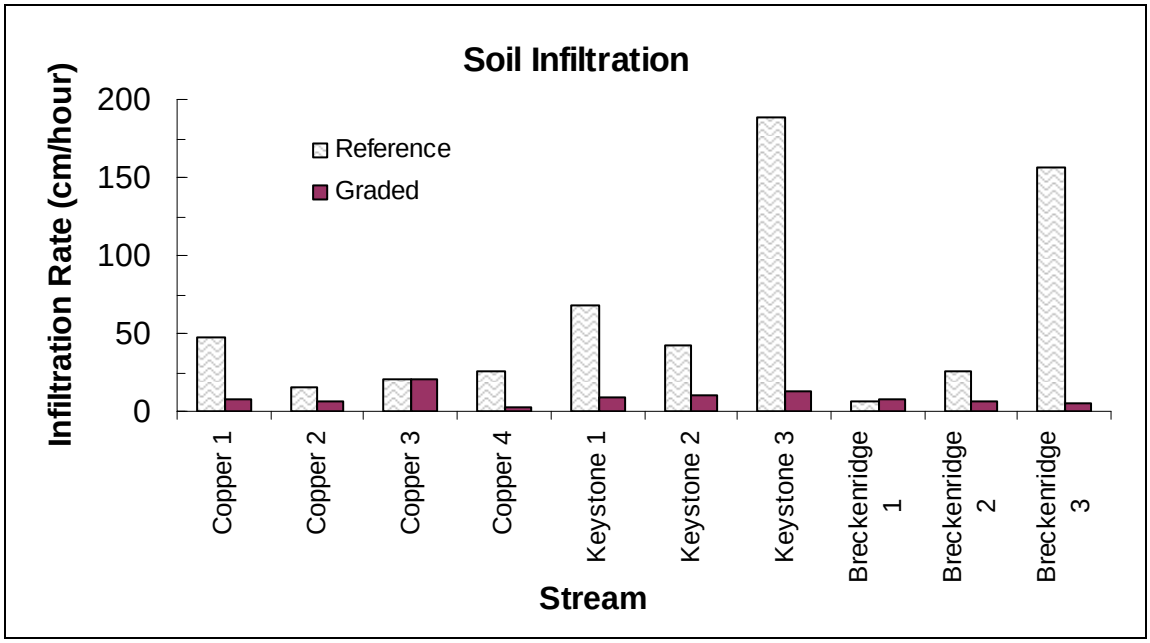

Figure 3. Paired infiltration tests of graded ski runs and adjacent undisturbed tree islands.

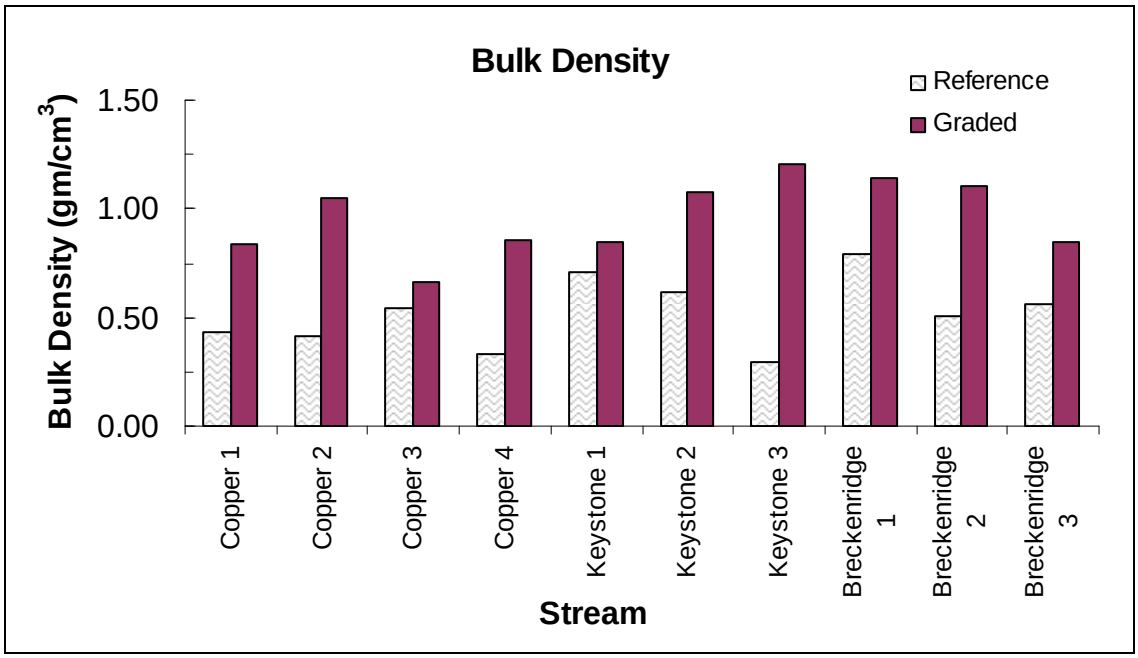

Figure 4. Paired bulk density tests of graded ski runs and adjacent undisturbed tree islands.

In light of the clear differences that graded terrain displays for bulk density and infiltration, ski area watersheds were surveyed to determine the amount of graded terrain. Measurements were conducted in 22 watersheds, data from which are located in the WRNF databases.

The values were used to predict changes in stream channel stability from changes in the timing and volume of stream flow associated with graded terrain.

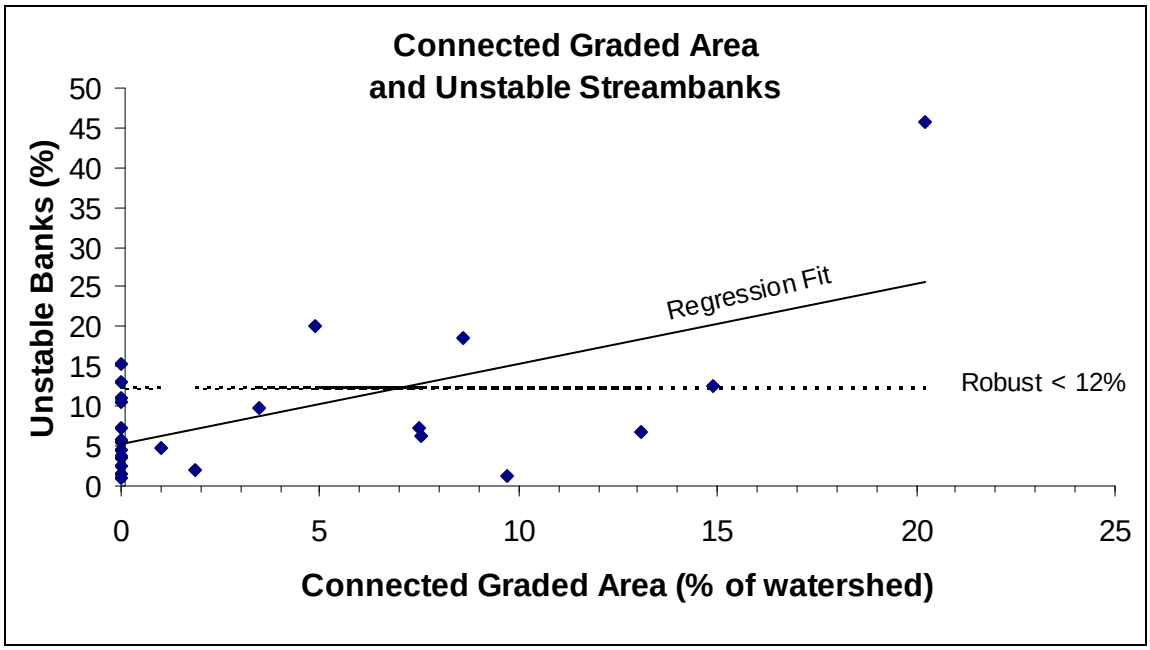

Figure 5. Potential relation of graded soils as a predictor for stream bank stability.

Watershed 3: ***To what extent have instream flows been assured to provide adequate water for fisheries and other riverine flora and fauna in streams and rivers with high resource values?***

The WRNF reviews monthly water rights resumes for State Water Divisions 5 and 6 to assess if any of the water rights applications occur on National Forest System lands and/or might impact USFS water rights and/or might impact streamflow-dependent resources managed by the Forest. An electronic database in maintained to allow timely access to past and current water uses across the Forest. Depending on the nature of the water rights application, the Forest either writes a formal letter to the applicant or files a statement of opposition with the water court in response to the application.

Table 6 identifies most of the Forest actions in response to water rights resumes since 2002. "FLPMA letters" consist of general statements advising applicants of USFS requirements for occupying NFS lands. The content of these letters have evolved over time and currently include USFS policy of denial of special use permits for private uses that can be reasonably accommodated off of NFS lands. All FLPMA letters reiterate USFS policy to protect scenic and aesthetic values, fish and wildlife habitat, and the overall environment. Directly or indirectly, USFS review and response to water rights applications helps protect streamflow-dependent resources on the Forest.

Table 6. Forest actions in response to water development proposals on the White River NF.

Date/WD/RD	Case Number	Action
Jan, 2003/ WD5/Blanco	02CW296 – South Fork Reservoir (due diligence)	FLPMA letter sent to Shell Oil – Wilderness Act
5/20/08/ WD6/Blanco	07CW73 – Hay Ranch (due diligence)	Denial letter sent to Hay Ranch – no diversions on NFS due to wetlands
2/19/04/ WD5/Aspen	03CW288 – Blattberg Spring (due diligence)	FLPMA letter – wetlands protection identified
9/19/05/ WD5/Aspen	03CW324 – McFarlane PL (due diligence)	FLPMA letter
3/2/06/ WD5/Aspen	05CW251 – Katz pump and PL (conditional rights)	FLPMA letter
10/13/04/ WD5/Aspen	04CW122 – Queens Gulch (due diligence)	FLPMA letter
3/20/07/ WD5/Dillon	07CW13 – Dunham rights (due diligence)	FLPMA letter
2/6/07/ WD5/Aspen	06CW219 – Loushin PL (due diligence)	FLPMA letter/clearing up of SUP issues

2/20/07/ WD5/Hx	06CW264 – Bolts Ditch (condition rights)	Filed Statement of Opposition (SOP) – protection of Wilderness/Wild&Scenic. Concern over ISF
2/28/07 WD5/Aspen	06CW220 – Loushin PL (due diligence)	Letter sent to Aspen Ski Corp. re: USFS policy requiring water right to be placed in name of US if used for permitted purposes.
2006 WD5/Eagle	04CW246 - MidCities	Filed SOP – protection of USFS held water right (spring developed for domestic and used by wildlife)
3/21/06 WD5/Dillon	05CW20 – Tenmile PL (application to perfect)	Filed motion to intervene on numerous issues – Case unresolved to date. NEPA on structure requires bypass flow.
9/25/07 WD5/Dillon	04CW151 – CB2-Well (conditional right)	Entered into case as joint owner with Copper Mtn.
6/27/06 WD5/Eagle	06CW76 - King Spring & Ditch (application to perfect)	Filed SOP – protection of USFS held water right (spring developed for domestic and used by wildlife)
8/29/02 WD5/Hx	02CW20 – Eagle River Water and Sanitation (due diligence)	FLPMA letter
5/21/04 WD5/Rifle	04CW65 – Band J Spring (conditional application)	FLPMA letter
12/28/04 WD5/Eagle	04CW167/168 – Town of Gypsum (due diligence)	FLPMA letter – Wilderness issues
07CW151 WD5/Aspen	07CW151 – Aspen Ski CO (due diligence)	Working with Ski Corp to remove one structure from Wilderness and place another in name of US per policy

Prior to the 2002 Forest Plan Revision, the Forest required instream flow requirements in at least three special use permits. They include permits for the West Three Mile Ditch (aka Porter Ditch), the Homestake Project, and the Carbondale Water System (Nettle Creek). The purpose of these requirements was protection of wetlands, riparian systems and aquatic habitat.

Following the 2002 Forest Plan Revision, the Forest has worked with permit holders to protect instream flows on two special use permits. For the Grizzly Creek Diversion the Forest worked with City of Glenwood Springs to change timing of diversions to protect fish habitat. On the Brereton Ditch, Castile Ranch was required to keep a set volume of flow below the diversion to protect fish habitat.

Since 2002, about 10 to 15 letters have been sent to applicants informing them of USFS requirements pertaining to water rights development on NFS lands. Since 2002, the Forest has entered about 5 court cases to protect USFS water rights and/or instream flows for streamflow depending resources. To date, most of these cases remain in court.

The Forest has developed a water rights database that can be used to visually assess as well as calculate the magnitude of water diversions that may potentially impact instream flows.

Wildlife and Aquatics

MIS 1: *What is the potential habitat capability for each management indicator species?*

Wildlife

Total habitat capability is not the correct question to ask concerning MIS. Rather, the ability of the Forest to maintain or improve habitats and populations of MIS should be the goal. For example, the Forest has only minimal acreage of habitat (roughly 44,000 acres) for species such as the Brewer's sparrow that primarily nests in sagebrush. The WRNF will never have adequate expanses of sage to support large populations of some sage-obligate species such as sage-grouse, but the sage on the Forest does contribute to the overall maintenance of healthy sage dependent wildlife populations adjacent to the Forest. Management activities in sagebrush habitats should be focused to assure that we are maintaining this important species as well as the other sage related species to the levels possible given the small amount of habitat found on the WRNF. Biologists have been conducting surveys for sage-grouse presence and have contributed to habitat improvement plans. Surveys and habitat improvements are expected to continue to provide further documentation as to whether the Forest is providing and improving sage habitat type.

The WRNF supports the majority of the summer range for a large number of elk. Winter range has been identified as the primary limiting factor for elk in this portion of Colorado. For elk that summer on the WRNF, less than 20% of the winter range is located on the WRNF. As more of the winter range is lost to development on private lands, the ability of the winter range to support large populations of elk will be reduced. The Forest will continue to provide a surplus of summer range when compared to the amount of available winter range. The habitat capability of the summer range far exceeds the carrying capacity of the winter ranges both on and off Forest. Therefore, potential habitat capability of NFS lands is not the limiting factor. Providing quality, secure summer range for elk to assure that they move to winter range in high physical condition is the primary goal for elk habitat management. This includes managing motorized and non-motorized recreation at the levels that provide adequate security for calving and rearing young. Population monitoring is conducted by the CDOW. Elk habitat and population conditions were measured and modeled for the Forest Plan using a program that takes into account population, vegetation, and other physical conditions to render a percentage of what part of a unit qualifies for quality elk habitat. This programmatic

study allowed the Forest Service to apply appropriate prescriptions and measures for areas on the forest where priorities are placed on elk habitat. (Forest Plan FEIS, Chapter 3, Part 3, Chapter 1, Wildlife).

Transects have been established in known and potential habitats for American pipit and Virginia's warbler. The American pipit was chosen to measure alpine habitat including alpine grasslands. These lands are identified as those above treeline as depicted in the alpine map derived from elevation, soils, and vegetation criteria. Virginia's warbler depend almost exclusively on Gambel oak, mixed mountain shrub habitats, and pinyon-juniper communities. These communities are identified through soil and vegetation mapping and ground verification. (Forest Plan, Amendment 3-MIS, EA)

Caves with known and potential bat occupancy were identified for study based on geological features and food sources for bats.

Aquatics

The reason communities were selected for aquatic MIS was to be able to apply the aquatic MIS to all flowing waters across the Forest. As such, they cover everything from fishless perennial and ephemeral streams to large rivers. The habitat capability for each stream or river is unique based on many natural factors, such as stream size, parent geology in the watershed, elevation, topography or gradient, presence of barriers, etc.

MIS 2: *What is the current habitat suitability for each management indicator species?*

Wildlife

As a portion of the monitoring protocol for the MIS on the Forest, habitat conditions are assessed for each species, where appropriate. Habitat conditions are recorded at the transect locations for the three species of bird MIS including sage, alpine, and mountain shrub communities. These conditions will continue to be monitored as a portion of the MIS monitoring protocols across the Forest to determine habitat trends. Monitoring of habitats and populations of the 3 avian MIS indicates that habitats are in good to excellent condition across the Forest.

The Forest works closely with the CDOW and the State of CO Abandoned Mine Land programs to monitor interior habitat conditions. The entrances to one important cave are

being rehabilitated in conjunction with this monitoring effort. Recreation use of important caves is being monitored by the Forest and in association with local caving groups to assure that use does not reduce the opportunities for cave bat use. Bat surveys have been conducted from 2005-2006 and plan to continue to establish a baseline. The protection of habitat conditions surrounding caves on the Forest are considered in all project level proposals. Recently the white-nosed syndrome is of concern. Though not found in the area yet, monitoring along with trying to education the public on the disease are being conducted to prevent the spread of this disease.

Non-forested range conditions are monitored regularly on domestic livestock allotments and stocking rates and seasons of use are modified to assure that range conditions meet Forest Plan direction. This monitoring is adequate to assure that summer range conditions supply forage capabilities for elk and other wildlife species. As discussed under question number 1 above, summer range is not the limiting factor for elk on the WRNF. The quality of the elk habitat on the Forest is high and more than adequate to meet the needs of the elk population within the Data Analysis Units (DAU) included on the Forest.

Surveys are conducted in on Gambel oak, mixed mountain shrub habitats, pinyon-juniper, and sage communities prior to management activities including prescribed fire. By measuring habitat conditions and populations of the Virginia's warbler and Brewer's sparrow biologist are able to understand effects from activities and in cases where the focus is on habitat improvement, measure success.

Aquatics

To address this question, it is necessary to understand the current impacts to aquatic systems. Because aquatic MIS cover all flowing waters across the Forest, the answer to this question is necessarily broad. The best answer lies in the forest-wide anthropogenic effects analysis conducted by the Regional Office as part of the forest-wide aquatic assessment. Site specific information is available through Stream Health assessments, which determine if the stream health condition is robust or has been degraded. In general, how these assessments link to population levels and habitat suitability have not been assessed.

MIS 3: ***What are the long-term population trends for each management indicator species and the relationships between long-term population trends and the effects of management activities on habitats on NFS lands?***

Wildlife

Results of transects monitored by the WRNF coupled with additional transects monitored by the Rocky Mountain Bird Observatory, under the Monitoring Colorado Birds program, indicate that American pipit populations are stable on the WRNF while Brewer's sparrow and Virginia's warblers populations are increasing. These results should be considered preliminary at this time due to the type and power of the surveys being conducted, but do indicate stable to increasing populations for all three of the avian MIS. There have been no significant management activities occurring in alpine (American pipit) or sage (Brewer's sparrow) habitats over the past 5 years that would significantly change habitats for these species at the forest wide scale, therefore no significant population changes were expected. The Forest has continued its prescribed fire program within the mixed mountain shrub communities. This fuels/winter range enhancement program has not reduced the trends of Virginia's warblers within the shrub communities over the scale of the Forest.

Cave bat populations have not been monitored with adequate frequency to document trends with statistical accuracy, but initial baseline surveys indicate caves on the WRNF are providing adequate habitat to maintain current populations. No significant decreases in any bat populations have been detected using the current inventories. The Forest continues to monitor recreation use in and around caves on the Forest to assure that bat populations are protected, and is continuing a bat cave inventory under contract.

Elk population trends are generally down across the entire WRNF over the past 5 years due to a dedicated management program of increasing the harvest of antlerless elk. Populations of elk across the state have been over population objectives established by the DOW for 10-15 years. Recent liberal hunting seasons have begun to control population numbers and move them towards the population objectives in the DAU plans. These population decreases are considered to beneficial to the overall health of the herds of elk on the WRNF. The Travel Management Plan being developed on the Forest is considering the important seasonal habitats of elk to assure that motorized and non-motorized recreation is being managed to provide adequate security habitats on the Forest for elk.

Aquatics

Long-term population trends are not available yet since for most sites only the baseline information is available and repeat sampling will begin in 2008. At each site, a detailed physical survey is conducted as well as complete fish and macroinvertebrate data. A

limited presentation of some of the key information collected is presented in Table 1 in Appendix C.

Additional data collected at each site, but not presented here includes:
A complete physical stream survey with each habitat feature quantified and summary data including:

- The types of habitat units present (plunge pools, lateral scour pools, riffles, cascades, etc)
- A size distribution of the particles of the stream bed
- The condition of the banks (whether undercut or unstable)
- The wetted and bankfull widths
- Maximum, tail crest, and residual pool depths
- Average depth (across all habitat types)
- Shade
- Size and quantity of large wood in the channel
- Limited water temperature data

In addition to the density of each taxon present, macroinvertebrate metrics were calculated and can be found in Table 1 below.

Table 1 – Macroinvertebrate metrics

Total Density (N/m^2)	No. Plecoptera taxa	% Tolerant Organisms	% Scrapers	No. Diptera taxa
Diversity (d)	No. Trichoptera taxa	% Dominant Taxon	% Predators	No. Chironomidae taxa
Total Number of Taxa	% EPT	HBI	% Shredders	% Diptera
No. EPT taxa	% Ephemeroptera	BCI	No. Clinger taxa	% Chironomidae
No. Ephemeroptera taxa	No. Intolerant taxa	% Filterers	% Clingers	% Tribe Tanytarsini

Fish information collected includes the species and length of each individual captured, population estimates of each species encountered of fish at least one year old, and a combined population estimate for all trout species at the site. Information is also presented visually in a histogram. Vegetative conditions are noted and photographed.

The table below displays two key macroinvertebrate metrics from the eight sites which were sampled more than once. These sites were not randomly selected for repeat sampling (therefore they are not representative) and were usually chosen to provide "reference" site data for analysis for various projects across the Forest. Although there is not sufficient data to determine trends, in general sites seemed to support a more diverse community in later sampling.

Table 2 – Macroinvertebrate metrics by site

Site (management code)	**metric**	**2003**	**2004**	**2005**	**2006**	**2007**
Avalanche Creek	# EPT	18		21		
(MA1 – no grazing)	sed.sens.	8		9		
Big Fish Creek	# EPT	23			26	18

(MA1 – cattle grazing)	sed.sens.	9			9	5
East Maroon Creek	# EPT				16	17
(MA1 – no grazing)	sed.sens.				6	7
McCullough Gulch	# EPT	11				13
(MA3 – no grazing)	sed.sens.	2				3
Piney River	# EPT		21	17		
(MA1 – sheep grazing)	sed.sens.		7	6		
Ripple Creek	# EPT		21		26	21
(MA1 – cattle grazing)	sed.sens.		7		10	9
Snowmass Creek	# EPT		17			23
(MA1 – no grazing)	sed.sens.		6			7
Two Elk Creek	# EPT		17	23		
(MA7)	sed.sens.		6	9		

Viability 1: ***To what extent are National Forest System Lands and their management contributing to the viability of sensitive plant and animal species and species of viability concern?***

Wildlife & Plants

The 2002 Forest Plan included a viability assessment for all plant and vertebrate species known or thought to occur on the Forest. This assessment identified 12 plants, 4 birds, 4 mammals where there were viability concerns.

The Alpine fen mustard and Canada lynx are federally listed as threatened species and the Forest actively manages activities in potential habitat for those species to assure viability is maintained.

Pygmy nuthatches are found in the ponderosa pine stands on the Eagle District. Occasional nuthatches are also found scattered in other portions of the Forest, but those habitats are not thought to be critical to the maintenance of a viable population on the WRNF. Surveys have been conducted within the ponderosa pine habitats from 2002-2006 to track breeding nuthatches. These surveys will continue. Nuthatch populations within this area appear to be low but stable based on those surveys. The pine across the forest is currently experiencing a mountain pine beetle epidemic with expectations that most mature pine will be killed within the next 5 years. This epidemic is expected to benefit nuthatches for a few years with the increase in prey and nesting snags. The Forest will continue to monitor this species in this area.

All of the other species identified as “viability concern” are included on the R2 Sensitive Species list and are closely assessed during project level activities by biological

evaluations. These evaluations have not identified downward trends for any of these species due to Forest management activities.

Aquatics

Colorado River cutthroat trout (CRCT) is a sensitive species as well as a species of viability concern on the White River National Forest. A recent range-wide status assessment determined that this subspecies has been extirpated from over 80% of its historical range. Many remaining populations are hybridized with rainbow trout and other subspecies of cutthroat trout.

Genetic information on populations on the WRNF was largely lacking. It is critical to understand the genetic composition of our populations. If a population is greater than 90% pure, it is considered a "Conservation Population" according to the Colorado River Cutthroat Trout Conservation Team. Populations with no apparent hybridization would be appropriate for reintroduction into new waters. Over the past 5 years, the WRNF and the Colorado Division of Wildlife have made significant progress on determining the genetic status of unknown populations, tripling the number of populations tested (or awaiting results). Genetic testing is quite expensive and costs about $2000 for each population, therefore funding limits the amount of genetic testing we can accomplish. Funding for genetic testing has come from WRNF appropriated program dollars, the CDOW, and from a grant obtained through Trout Unlimited.

There are approximately 99 waters on the WRNF with CRCT. Forty-six of those populations were classified by the CDOW as "conservation populations" although most had not been tested genetically. Before 2003, only 11 of these populations had been tested. Since that time, nine more populations have been tested and samples have been collected from 3 additional populations and we are awaiting the results. Twenty-three conservation populations still have no genetic testing.

Of the 53 populations not considered conservation populations, only two had been tested in the past. The reason is that conservation populations were considered a higher priority for the limited funding available for genetic testing. In the past 5 years, fifteen additional populations have been tested and another 4 have had samples collected and we are awaiting the results. Of the 15 populations tested, seven qualify as "conservation populations" and will be added to that list. In addition, one previously unknown population was discovered during random MIS sampling and that population was determined to be completely pure, with no signs of introgression making this population an appropriate source for reintroduction efforts in the watershed.

Information on genetic testing as well as additional survey information collected on CRCT populations is maintained in a GIS based database maintained by the Colorado

River cutthroat trout conservation team, a tri-state multi-agency team to which the Forest Service is a signatory member. Additional information in the database includes: population density estimates, location and significance of barriers, population distribution, etc. Specific genetic results are maintained electronically and in paper form in the WRNF Supervisor's office by the Forest Fisheries Biologist.

Boreal toad is another aquatic species with focused monitoring. This monitoring is conducted in partnership with the Colorado Division of Wildlife and the Colorado Natural Heritage Program. Eighteen sites have been or are currently monitored on or near the WRNF in Eagle, Pitkin, and Summit counties. Fourteen of the 18 sites have been tested for chytrid fungus and four have tested positive (East Vail, Conundrum Creek, Campground Lift ponds, and Peru Creek). Inactive beaver ponds are an important habitat type for boreal toads. Therefore, boreal toad breeding in beaver complexes can be difficult to monitor as the toads move their breeding sites to accommodate the changing conditions in the complex. The boreal toad recovery team defines a "population" as "one or more breeding localities which are located within a common second or third order drainage, and separated by no more than five miles." A summary of the monitoring by county is presented below.

There are three populations (four sites) being monitored in Eagle County. All sites have been tested for chytrid fungus and the East Vail site has tested positive. One of the sites appears to be declining. No breeding has been detected at the Holy Cross City site during the last four years. Recreation use (hiking and jeeping) was noted as very high adjacent to the breeding pond. It is unknown if this use has contributed to the apparent decline. East Lake Creek site appears to be stable, however monitoring is limited due to the remote location. Despite testing positive for chytrid fungus, the East Vail site appears to be staying strong with abundant one year old and juvenile toads recorded at the site. It is possible that because the East Vail site is at a lower elevation, the habitat is less harsh and the toads are better able to survive with chytrid present. Limited data has been collected at Strawberry Lakes due to difficult access and there may be more reproduction than recorded. There is no apparent trend at the Strawberry Lakes site. (All site condition information from Tina Jackson, CDOW, personal communication). Table 2 in Appendix C summarizes some of the information available for boreal toad monitoring for sites on or near the White River National Forest in Eagle County.

There are four populations (six sites) being monitored in Pitkin County. Four of the sites have been tested for chytrid fungus and the Conundrum Creek and Campground Lift ponds sites have tested positive. Of the two sites with long term monitoring, the Conundrum Creek site appears to be lost. Comments from past surveys have noted declining conditions and at least one year in which one of the breeding ponds was dry. It is not known if this site succumbed to chytrid fungus or moved to more suitable habitat. The East Maroon Creek site is staying strong with yearlings and subadults observed every year. The other four sites were recently discovered and no trend information is available. Of these, Lincoln Creek and Homestake Reservoir sites appear to be strong and Grizzly Reservoir and Campground Lift ponds have not had limited successful reproduction during the limited period monitored with metamorphs observed during the

first year. (All site condition information from Tina Jackson, CDOW, personal communication). Table 2 in Appendix C summarizes some of the information available for boreal toad monitoring for sites on or near the White River National Forest in Pitkin County.

There are three populations (eight sites) being monitored in Summit County. Six sites have been tested for chytrid fungus and Peru Creek has tested positive. At least three of the Summit County sites appear to have a negative trend. Cucumber Gulch appears to be declining and may be gone. This site is difficult to survey due to limited access and the large size of the wetland. The Peru Creek site also appears to be in decline. The Montezuma site has not been monitored since 2002 due to access limitations. Upper North Tenmile appears to be remaining strong, although tadpoles were apparently lost in 2007. This site is somewhat difficult to monitor. Lower North Tenmile has had a couple bad years in 2006 and 2007. Not enough information is available to know whether this is a trend. Surveyors reported higher than normal water levels. It is possible this population relocated. No inferences can be made about the Upper North Fork Snake River site. Breeding has not been recorded since 2002. In 2006, there was a large chemical spill which impacted this breeding site. The Lower North Fork Snake River site is experiencing a negative trend and this site appears to be lost. In addition, the 2006 chemical spill also affected this site. Straight Creek has been monitored since 2003 when breeding was recorded. No toads have been sighted since then. It is possible that this site was only used in 2003 when the population's usual breeding site was less suitable and that they returned to it. (All site condition information from Tina Jackson, CDOW, personal communication). Table 4 in Appendix C summarizes some of the information available for boreal toad monitoring for sites on or near the White River National Forest in Summit County.

Wildlife 1: ***Is habitat effectiveness on the forest being maintained or enhanced?***

The BAs, BEs, MIS, and wildlife specialist reports completed for each project level activity assure that a wide range of terrestrial wildlife species are considered and analyzed to maintain suitable wildlife effectiveness across the Forest. Additionally, the Forest has an active wildlife enhancement program designed to increase habitat effectiveness for a variety of wildlife species. This program includes big game winter range enhancement projects, nest boxes for avian species, wetland enhancement, road closures, fencing of important habitats, and other activities. Between 2,000-5,000 acres per year are actively managed to enhance habitat values.

Special Areas 1: ***To what extent have the unique features of the Special Areas been conserved or enhanced? This includes Special Interest Areas, Wild, Scenic, and Recreational Rivers.***

As of 2007 a management plan the Camp Hale area was drafted. It considers recreation, transportation, and hydrology improvements and management direction for protection and enhancement of the Camp Hale Special Interest Area.

A Wild, Scenic, Recreational River Suitability Study is being launched in FY09 to study Deep Creek and segments of the Colorado River in the Glenwood Canyon in conjunction with the Glenwood BLM Resource Management Plan Revision. The study is going to be conducted on segments that are on both BLM and Forest Service lands. A determination of suitability and whether to recommend designation will be the outcome of this study.

Research Natural Areas 1: ***To what extent have the unique ecological features of the Research Natural Areas been conserved or enhanced?***

The Forest Plan management area prescription is one of the filters through which projects are run during the early stages of any project level NEPA. This should assure that these areas are protected from human-related management activities that jeopardize the values for which the areas were designated.

However, the Lower Battlement RNA was leased in 2003 for natural gas exploration and development. There was no blanket stipulation "No Surface Occupancy" for the RNA. A large portion of these leases were leased with "No Surface Occupancy Stipulations" for bighorn sheep habitat or steep slopes. Much of the lower elevation, flatter country on the west side of the RNA was leased with no surface protection stipulations. This would allow the lessee to develop well pads, roads and associated developments with little restriction. This type of development is not compatible with RNA management goals. No activity has been planned at this time, and no Request for Permit to Drill applications for these areas have been received by the Forest at the time of this writing.

Studies for flora have and continue to be conducted on the Hoosier Pass RNA. Studies were initiated to initiate potential project proposals for habitat protection in the Battlement RNA

Ecosystem Health 1: ***To what extent are destructive insect and disease outbreaks prevented following management activities?***

Silviculture

Simply put, forest management strategies have been ineffective at preventing insect and disease outbreaks, given the broadscale mountain pine beetle infestation that currently includes some 2.5 million acres of forested lands in Colorado and Wyoming; dramatically increased acres of aspen decline; and, emerging bark beetle infestations in Douglas-fir and Engelmann spruce. ***A better question for the next five year interval*** would be, "What forest management strategies are being developed to augment forest recovery and resilience to future infestations?"

While the WRNF treats individual trees of value, namely in campgrounds and other sites, for insects and disease, the ability to prevent an epidemic lies with the fundamental ability to effect age and species class diversity at scales appropriate to the potential hazard. Over the last 40 years, public tolerance for extensive forest management has declined precipitously, to be replaced by a "let natural processes prevail" ethic. During this period of time, less than 50,000 acres of regeneration harvest have occurred on the WRNF and the majority of those harvests occurred prior to 1997.

With over 50% of the White River National Forest's land base in wilderness or inventoried roadless areas, management activities to increase age class diversity at a meaningful scale are largely foregone. In fact, our Forest Plan maintains silvicultural standards to ***increase*** the distribution of mature stands on suited lands by extending the biological rotation age of lodgepole pine and Engelmann spruce well beyond their economic rotation age! Currently, of the 1.3 million acres of forested land base: less than 90,000 acres are in early structural stages; over 670,000 acres are in late successional structural stages; and, another 315,000 acres are late-pole structural stages.

At the same time, Science recognizes natural epidemics are part of the cycle of forest growth and decline, *but*, the current forest condition is the "trump card" in developing management strategies that **realistically** consider the long term effects of natural disturbance.

"The current mountain pine beetle infestations and their impact on lodgepole pine forests in northern Colorado and southern Wyoming have very likely been influenced by a number of factors: (**1) an abundance of older, dense, large diameter lodgepole pine stands**; (2) prolonged drought, where the onset of increasing mountain pine beetle infestation overlaps the onset of an extended and severe drought from 1998 – 2003; (3) earlier melting of the smaller, drought-influenced snowpacks, resulting in extended and more severe drought conditions that reduced the tree's defenses during the summer when bark beetle flight and attack of hosts occurs; (4) higher temperatures, allowing for an

expansion of the one-year mountain pine beetle lifecycle into areas of lodgepole pine forests at higher elevations (>9,500 feet elevation) where, traditionally, the two-year life cycle was the norm (Tishmack et al. 2005); and (5) greater survival of mountain pine beetle brood in these high elevation lodgepole pine forests due to their completion of development within a single year rather than the two-year life cycle typical at these elevations. Over the past eleven years (1996 – 2006) mountain pine beetle populations have increased to levels that have not been witnessed in northern Colorado or southern Wyoming in our recorded history of the area. Both the intensity of tree mortality and the extent of high levels of tree mortality are significant." *Status of Mountain Pine Beetle Populations in Lodgepole Pine Stands in Northern Colorado and Southern Wyoming, LSC-07-06.*

The LSC-07-06 report conducted annual aerial survey estimates of forested acreage containing lodgepole pine trees that died each given year as a result of mountain pine beetle infestation on portions of White River National Forests (Summit and Eagle Counties) within the Colorado Bark Beetle Cooperative Project Area, from 1996 through 2006.

Year	White River NF[2]
1996	532
1997	2,110
1998	5,760
1999	7,032
2000	9,510
2001	10,300
2002	11,600
2003	21,600
2004	57,200
2005	72,200
2006	86,800

This study (along with others) demonstrates the magnitude of the current epidemic. As a result plans for treatment are being implemented based on priority needs to mitigate fire threat and public safety. "Restoration" treatments are costly, and access can be an issue. Therefore at this time salvage priority areas include trying to capture the economic value of dead and infested trees where feasible, in areas where access is available without incurring extensive road construction or reconstruction costs.

The WRNF is conducting stand exams, where points are surveyed for forest conditions. This will help create a baseline whereby the WRNF can continue to measure forest conditions and vegetation response to these disturbances overtime.

Other infestations include a spruce beetle infestation that resulted from a blowdown event in the Four Mile area in 2003. A timely sanitation/salvage response was hampered by a protracted project planning and appeals process

Minor insect outbreaks are currently occurring in some pinyon-pine stand, Douglas fir stands, and Ponderosa Pine stands. The Ponderosa Pine stands are of concern due to the limited amount that occurs on the WRNF. Fire-use and extensive reforestation and stand improvement activities are being developed and implemented to provide for the "future forest" and preservation of at-risk, forested cover types.

Ecosystem Health 3: *To what extent are desired vegetation conditions in forested areas being met?*

Silviculture

Currently the WRNF is outside the range of desired conditions that were depicted in the Forest Plan. Due to the recent infestations, a re-evaluation of Forest Plan-desired conditions for the forested areas needs to be conducted, as well as a re-evaluation of timber suitability. As forest stewards, we need to do more than pay lip service to the concept that natural epidemics are part of the cycle of forest growth and decline. Again, the current forest condition is the "trump card" in developing management strategies that **realistically** consider the long term effects of natural disturbance.

The current Forest Plan, in fact, depicts a range of desired conditions that are neither achievable nor sustainable; nor does it provide meaningful direction in managing the natural disturbances it clearly portends.

> In all alternatives, the most change in structural stage is expected as forest stands continue to age naturally. Some aspen and lodgepole pine stands will slowly revert to spruce-fir through normal succession. Fire events, both prescribed and natural, will convert some areas to younger structural stages, but these events are not expected to convert major acreages over the planning period.[1]
>
> Because of the small acreage planned for active even-aged treatments (less than 0.08 percent of the forested acres harvested per year in all alternatives), forest-wide stands will continue to age, and acreages for structural stages 4 and 5 are expected to increase in all alternatives. Without large-scale natural disturbance events, structural stages 1 and 2 will continue to make up relatively low percentages for all cover types across the forest.[2]
>
> As the forests continue to age under all alternatives, forest insects and diseases will be increasingly evident in unmanaged areas. The lack of age class diversity in forest stands will result in higher levels of insect and disease caused mortality and growth loss.[3]

[1] ***Topic 1, Part 3, Section 3 3-307 Chapter 3, FEIS, WRNF Land Management Plan***
[2] ***Topic 1, Part 3, Section 3 3-313, 314 Chapter 3, FEIS, WRNF Land Management Plan***
[3] ***Timber Management 3-610 Chapter 3, FEIS, WRNF Land Management Plan***

Given the current situation the WRNF will have to re-evaluate what desired conditions both short-term and long-term we are trying to achieve for the forested landscape.

Recreation

Benefits to People 1: ***To what extent are trails managed to meet regional standards and to minimize conflicts among users?***

The forest annually monitors trail mileage for meeting standards as a part of the national trails monitoring program. Our travel management plan process has allowed for significant public comment on conflict. A primary goal of our soon to be released TMP is conflict reduction.

Benefits to People 2: ***Where does the demand for recreation opportunities warrant development of additional opportunities such as trails or campgrounds?***

For trails, several locations around the forest were identified for development and improvement of trail systems for various user groups. At this point, budget is not allowing for development of additional sustainable campgrounds, rather the forest has reduced the number of developed sites over the past five years following an intensive recreation facilities planning process.

Wilderness 1: ***To what extent has the natural condition of Wilderness been preserved?***

The forest annually is meeting standards on 4 wilderness areas. In addition, the forest is current on meeting the goals of the 10-year wilderness challenge.

Recommended for Wilderness 1: ***To what extent are the areas Recommended for Wilderness preserved in their natural condition?***

Any proposed new uses in proposed wilderness are evaluated as if the areas are already designated. Closures for motorized and mechanized access have been implemented in the short term and will likely be made permanent in the TMP. Road closures and some stabilization work have taken place in the Red Table proposed wilderness area.

Heritage

Benefits to People 4: ***To what extent are National Register sites and districts being protected and preserved?***

The **Independence and Ashcroft Townsites** are actively protected and preserved through partnership with Aspen Historical Society and Aspen Center for Environmental Studies. These partners provide resident caretakers and volunteers who provide on-site presence as well as maintenance with assistance from the Aspen-Sopris Ranger District. Historic research of Ashcroft, funded by a grant from the Colorado State Historic Fund in 2005, revealed evidence that supports a larger site boundary than currently identified on the National Register. The Colorado Office of Historic Preservation and Archaeology has submitted a proposal to amend the boundary to the National Register unit for review in 2007.

Through the efforts of the long-standing partnership with the 10th Mountain Division Foundation a Bailey bridge was placed at **Camp Hale**, a National Register site. Generous contributions from the Compton and Baker Foundations in the form of grants made this possible. A dedication was held on Memorial Day 2006. Dispersed camping and off-road activities have been prohibited by the Holy Cross Ranger District in 2007. An interdisciplinary management plan has been drafted and awaits finalization in 2008.

The **Cayton Guard Station** was placed on the National Register in 2005. In partnership with the Silt Historical Society, a Historic Structural Assessment was completed in 2004, funded by a grant from the Colorado State Historic Fund. This assessment identified critical maintenance issues and provides guidance on how to conduct repairs. The Forest has begun stabilization work in 2005 and continues this effort in partnership with the Cayton Ranger Station Foundation, established in 2007.

Benefits to People 3: ***To what extent are Forest visitors informed of the recreation opportunities available to them; are they adequately guided to those recreation opportunities; and do they receive adequate interpretive information on National Register of Historic Places and other heritage sites, geologic, paleontologic, wildlife, plant, and recreation resources or opportunities?***

The Forest Historic Preservation Program works closely with the Aspen-Sopris Ranger District to provide interpretive opportunities at the **Independence Townsite and Ashcroft Townsite**, both listed on the National Register of Historic Places. A partnership with the Aspen Historical Society and Aspen Center for Environmental Studies has been established to assist with the planning, preservation, interpretation, management and operation of these historic sites. The Aspen Historical Society has a special use permit to operate visitor information and interpretation programs seven days a week from June 16 to Labor Day and limited tours on weekends through September and October. This includes residential caretakers or "ghosts" who lead tours of the ghost towns and discuss the natural history of the area. Special events are also held for school districts and special occasions. Interpretive signs and materials have been developed for visitors. The partners also assist with the maintenance of the facilities and historic structures. In fiscal year 2007, AHS reported over 5,000 individual visitor contacts at Independence Townsite and over 6,000 individual visitor contacts at Ashcroft.

Camp Hale has interpretive signs along the Scenic Byway 10th Mountain Memorial Highway and at the site in 12 locations. A self-guided pamphlet has been made available to visitors but needs to be updated and reprinted. Audio tapes are available as well. These need to be updated since the installation of the Bailey bridge in 2006.

Cayton Guard Station built in 1909, is the oldest station in Region 2 and one of the oldest still standing in the Nation. It serves as an excellent example of early Forest Service architecture and displays the way of life of an early forest ranger, James Cayton. The building was placed on the National Register of Historic Places in April 2005. Key partners such as the Silt Historical Society, local businesses, the descendents of James Cayton, and other supporters of this historic structure brought the community together to celebrate our Forest Service Centennial in fall of 2005. The event featured "A Commitment to Conservation and the Community" and plans to stabilize and interpret the historic station were presented. In 2007, a new partnership was established with the Cayton Ranger Station Foundation, a non-profit organization. The purpose of this agreement is to work cooperatively to develop plans to restore the station, as well as develop a long-term strategy for managing this nationally significant site. This will be accomplished in a manner that provides Forest Service managers with management options, preserves and enhances the historic character of the Cayton Guard Station, and benefits and serves the public.

Between 2001 and 2003, the Heritage Resource Management Team of the White River National Forest worked in partnership to salvage a unique and important piece of history. The team, accompanied by members of the Aspen Historical Society, inventoried and recorded the historic mining site called Gold Hill, one of Pitkin County's few gold districts. The **Barr's Stamp Mill**, situated above Aspen, Colorado at 11,500 feet, was threatened by vandalism and the effects of a harsh environment. The cabin that sheltered the equipment was dilapidated, admitting destructive elements such as rain and snow. The Aspen Historical Society proposed to remove the old stamp mill and relocate it to the

Holden-Marolt Ranching and Mining Museum in Aspen. Working in partnership, the Aspen Historical Society and White River National Forest successfully saved this intact remnant of the historic gold mining era for scientific and public education and enjoyment.

American Indian Rights and Interests 1: *To what extent are traditional cultural properties being protected?*

Traditional cultural properties (TCPs) have been identified during the course of cultural resource inventories for proposed projects on the WRNF. When a potential TCP is identified, arrangements are made for tribal representatives to visit the site and make a determination. The information about the property is confidential and not available to the public. Known TCPs situated in or near project areas are protected through avoidance. Tribal representatives assist with determining the extent of an effective buffer zone for the site's protection. The site is monitored during project activity.

Known TCPs are also monitored periodically to assess changes in site condition. TCPs that are situated in areas of high use and accessible to the public are priority for monitoring. This includes TCPs situated along roads, near dispersed camping areas, within range allotments, etc. Certain TCPs have been impacted by Forest Service roads. We are in consultation with the Confederated Ute Tribes regarding the Forest Travel Management Plan on how to correct such road issues and yet allow access for traditional practices.

The White River National Forest Heritage Resources program has been conducting a series of investigations over the past 10 years to study the route that the historic Ute used to find their way across the Flat Tops Plateau. The objective was to systematically map the Ute Trail and identify the associated features with the assistance of volunteers, archeologists and the Ute Tribe, the Southern Ute, and the Ute Mountain Ute. The Ute Trail project was born in 1988 when Frank Olson, a local resident and ex-Forest Service employee, shared with Heritage Resource Manager Bill Kight, his concern about losing an important fragile and finite resource. The study also documented stories that tell of Ute interrelationships with the landscape. With the inclusion of the Ute people, our understandings and interpretations have grown to include Ute perspectives, ideas and knowledge of landscape use, rituals, cultural practices, and technology.

Additionally, this project was training for archaeologists and volunteers on the identification of sacred sites and ethnographic data gathering while remaining sensitive to Native American concerns. With this knowledge, we have been able to aggregate sensitive information about the Flat Tops. This information has been used to assess grazing impacts and to design timber sales and other projects to protect sacred sites.

It is hoped that, ultimately, the project helped to reconnect the Ute people with the Ute Trail. The more the Ute People experience the traditional, spiritual, and physical elements

of the White River National Forest the better their input will be. Their insight and knowledge will then guide us in this century to keeping this important landscape property un-fragmented, protected, and preserved. The ethnographic and archeological information about the Ute Trail gathered over the 10 years was pulled together in a report titled: "Mik Waas Taguven: Reconnecting the Ute Trail" by Alice Gustafson in 2006.

American Indian Rights and Interests 2: *To what extent has coordination with the three Confederated Ute improved?*

The White River National Forest is considered the ancestral homeland of the Ute people. The White River Plateau was a part of the Ute Reservation before 1881 until the Utes were forcibly removed to Utah. The 2002 White River Forest Plan requires consultation with the three confederated Ute tribes (the Ute Mountain Ute Tribe, the Ute Indian Tribe, and the Southern Ute Indian Tribe) for any project that might affect their treaty rights, sacred lands, or Traditional Cultural Properties. Representatives of the Ute Indian Tribe participated in a multi-year study of the Ute Trail on the White River Plateau (see above).

Consultation with the tribes is an ongoing process. It is conducted in several ways – correspondence, onsite visits, and tribal council meetings - depending on the scope of the project and types of cultural resources potentially affected. Every tribe is informed of proposed projects in government-to-government correspondence through the NEPA scoping process. Issues identified during analysis are provided to the tribes for their comment.

Onsite visits with tribal representatives are made available at their request. We have also requested field visits when known traditional cultural properties are involved or when confirmation of a potential traditional property is needed. Tribal representatives have been involved on the ground with such projects as forest health improvements, range management, timber salvage, prescribed fire and wildland fire management.

Face to face meetings with tribal councils are held at our request regarding forest-wide management issues, such as the Forest Travel Management Plan and interagency USFS/BLM fuel reduction programs.

Scenery

Benefits to People 5: *To what extent have scenery management objectives been met?*

The White River has a diverse range of management activities occurring across the forest which can change the character of natural landscapes. The effects of any activity or development may have on associated scenic resources must be considered for all activities which occur on the forest. In the last five years, there has been progress in achieving consistency in management activities occurring across the forest. The extent

that the Scenic Integrity Objectives (SIO's) have been met, are discussed below for the following management activities which occur on the forest. See Appendix D for more information on the Scenery Management System and the Forest Plan Goals and Objectives.

2002 to 2007 Effectiveness Monitoring:

This report is a review of the previous five years of implementation and the cumulative effects. Because of the diversity and quantity of activities across the Forest, this report reviews management activities in a general overview. During the past five years, the following management activities and their SIO's were reviewed:

Timber and Fuels: The Forest is experiencing several vegetation health problems including an extensive mountain pine beetle epidemic in the lodgepole pine and a spruce beetle infestation in some spruce stands. Additionally, there are other health related problems in the aspen, fir, Douglas fir, and ponderosa pine species occurring on the Forest. The mountain pine beetle epidemic is causing substantial changes to the landscape. On the east side of the forest, it is estimated that within 5 years, 90 percent of the mature lodgepole pine on the forest will be dead. It is necessary to take measures to move existing ecosystem conditions towards Desired Future Conditions.

The visual landscape across a large portion of the Forest will change due to an increase in tree mortality from the insect and disease infestations. If vegetation management and fuel treatments can be implemented through mechanical treatment, the scenic integrity of the landscape in the treated stands will be enhanced within 10 to 50 years. There has been varied public opinion about changes in the visual landscape due to the vegetation management activities, especially along the Forest scenic highways and trails.

Scenic Integrity is based on a landscape which is free from visible disturbances that detract from the natural or socially valued appearance of the landscape. Forest Health is a big factor in the Scenic Integrity Objective. The new scenery indicator, Scenic Stability, has been recommended for the Scenery Management System to help evaluate landscapes with visible disturbances such as insect infestations. Scenic Stability is based on the valued landscape character and its scenery attributes being sustained through time. If the forest is not healthy (full of diseased and dead trees), it is not meeting the desired landscape character. If the Scenic Integrity is currently being met in the short term, it may not meet long term if the forest health continues to decline. To meet the Scenic Integrity long term, something would need to happen to return the forest to a healthy condition. If the forest is returned to a healthy condition, the Scenic Stability would also be improved. Regenerating the forest by removing dead and dying trees will help to speed the process of returning the forest to a healthy condition.

Mining:

Mines: There is a history of mining activity across the forest with many historic mines still in existence. Some legacy (pre 2002 Forest Plan) projects still need to be brought into compliance through rehabilitation. When mine reclamation is implemented, the mines are reclaimed to meet the SIO's. This is being accomplished slowly as funds are available.

Gravel Pits: There are many gravel pits across the forest. In most situations, the gravel pits can be located so as not to be seen from travel corridors or other facilities. When the pits are no longer being used, they are reclaimed. The pits are designed to meet the SIO after reclamation has occurred.

Oil and Gas:

Present Development: Most of the existing development on the forest is located in areas of Low to Moderate SIO's. Design criteria are incorporated into the projects to achieve the SIO's.

Future Development: There is a substantial amount of oil and gas development occurring on the forest. The existing Oil and Gas EIS was completed in 1993. The Forest is in the beginning stages of revising the forest-wide Oil and Gas Leasing EIS. Recommended design criteria will be incorporated into the document to ensure achieving the SIO for all future projects.

Transportation:

Roads & Trails: The White River Travel Management Plan that is in progress includes recommendations for rehabilitating or bringing into compliance the roads and trails across the forest which are currently not meeting forest plan direction, laws, or regulations. The number of miles will not be determined until the Travel Management (TM) Plan is finalized. Upon completion of the TM Plan, a strategy and time frame will be developed to start the implementation process for the non-compliant travel routes. This will help to work toward meeting the SIO's for these legacy travel routes. Any projects in the last 5 years have been designed to meet the SIO's.

Recreation Sites:

Vegetation Management: There are many recreation sites across the forest which are being affected by the insect and disease infestation which is occurring on the forest. This has created a situation where many of the developed sites have required hazard tree removal. Many of the facilities were required to be closed until trees were removed for public safety. For the facilities on the east side of the forest, which have been greatly affected by the MPB epidemic, projects have been completed or plans are in the process of being implemented for large scale tree removal of the dead lodgepole pine. Vegetation management plans are being developed for revegetation of these sites. The forest has purchased a tree spade for relocating and transplanting trees within the recreation sites and from adjacent forest lands. Additionally, seed was collected from sites on the forest and there is a contract with the Bessey Nursery to grow plants for future transplanting. These revegetation projects will speed up the process of bringing the recreation sites back to meeting scenery objectives and for providing developed sites with healthy vegetation.

Facilities: Many of our restrooms on the forest are old and in poor condition. Additionally, many of the older buildings do not meet accessibility requirements. There have been many restrooms replaced in the last few years with new CXT toilets. New toilets are being installed this year and also planned for next year. All the new restrooms will meet the Built Environment Image Guide (BEIG) guidelines, the accessibility standards, and the scenery objectives for the forest plan. Direction in the BEIG is

followed to ensure that new buildings and other human-made features compliment the natural and cultural settings.

Utility Corridors:

Electrical Utility Lines 33 kilovolts or less and Telephone Lines – There are existing (pre-2002 forest plan) smaller electric lines and telephone lines across the forest that do not comply with SIO's. This is largely because these lines occur across many areas of the forest. Therefore these can occur in a variety management and SIO categories. In the 2002 Forest Plan, any new permit or reissuance of permit for electrical utility lines of 33 kilovolts or less and telephone lines require burial, with a few exceptions. There has been an effort to meet the SIO's through burial of lines when possible. When there is a permit reissuance of existing lines that have been determined not to be feasible to bury, recommendations are made for changes to meet the SIO.

Electric Utility Lines over 33 kilovolts: These larger capacity lines must be above ground. Due to the recently passed Energy Policy Act of 2005, there has been an emphasis to accelerate clearing of vegetation to reduce fuels and biomass on powerline corridors. There has been inconsistency of special use permits issued to the utility companies in the past. Some of the clearing practices have not always met the SIO's. In an effort to ensure consistency across the forest and meet the SIO's, "Vegetation Clearing Standards for Electric Power Lines for the White River National Forest" has been developed to ensure that all special use permits for powerlines larger than 33 kilovolt follow these standards for vegetation clearing.

Communication Sites: There are 25 communication sites on the forest. The existing facilities at many of the sites have been installed and constructed over several decades. There is a lack of consistency of color, materials, and reflectivity of facilities at many of the sites. Some of the facilities meet the scenery objectives and some do not. Another issue is that with the many changes in technology, the forest is receiving new applications every year for additional facilities. Most of the sites did not have communication site plans. In an effort to achieve consistency across the forest with the communication sites and consistency of facilities at each site, communication site plans are being developed for some of the sites. The goal is to have communication site plans for all the sites across the forest. The permittees will be given a time frame to bring the sites into compliance through their scheduled maintenance. As the facilities are painted or replaced, the facilities will work toward meeting the scenery objectives on the forest.

Ski Areas: There are 11 ski areas on the forest. Each year most of the ski areas have new or replacement projects which they are proposing and implementing. The structures and facilities are being designed to meet the Built Environment Image Guide (BEIG) guidelines, the accessibility standards, and the scenery objectives for the forest plan. Some of the older structures and facilities on the ski areas do not align with the BEIG. As upgrades and replacements are proposed, there will be a slow transition to alignment with the BEIG. Direction in the BEIG is followed to ensure that new buildings and other human-made features compliment the natural and cultural settings. The SIO's for the ski areas are either Very Low or Low although the goal should be to meet a higher SIO's where possible. As the older facilities and structures are upgraded or replaced, there will be an opportunity to work toward meeting higher SIO's where possible.

Scenic Byways and Scenic Areas: There are three designated Scenic Byways on the forest. The Top of the Rockies recently received confirmation of a grant which will be awarded in 2009 for byway planning. Any proposed activities along these scenic highway corridors will be required to meet the SIO for the corridors and meet the objectives of the Scenic Byway. Scenic Areas such as the Maroon Bells Corridor or Glenwood Canyon are continually monitored to ensure any activities continue to meet Scenery Objectives.

Transportation

Effective Public Service 1: *To what extent has the safety and economy of Forest Service roads, trails, facilities, and operations improved?*

In FY 2006, a program was initiated to install informational kiosks at critical locations on the forest to inform user/visitors of off-highway vehicle use regulations and to post general recreational information. The kiosk installation program continued in 2007.

The Forest has been in the process of preparing the Travel Management Plan since 2004. The plan will designate the authorized road and trail system and will identify which vehicle types will be authorized to use which roads and trails. The plan will also identify authorized roads and trails to be decommissioned and allowed to revegetate as well as unauthorized routes (user created roads and trails) to be rehabilitated and allowed to revegetate.

During FY 2006 and FY 2007, the Forest engineering staff conducted Motorized Mixed Use Analysis on 246 miles of Maintenance Level 3-4 roads to evaluate public safety factors in regards to mixing highway legal motor vehicles (licensed full size vehicles) and non-highway legal motor vehicles (unlicensed OHV's - ATV's, motorcycles, and UTV's – Utility Type vehicles). The results of the studies (compatibility of vehicle class(s) with road geometry & road surfacing) were evaluated and the decision to authorize the mixing of full sized licensed motor vehicles and unlicensed motor vehicles will be incorporated into the Travel Management Plan & the Motor Vehicle Use Map.

The 2002 Forest Plan lists a forest-wide objective to "conduct appropriate maintenance on 25 percent of the Forest Development Transportation System each year". The current road system consists of 2,209 miles and 25% of this mileage equates to 552 miles of road maintained per year. Overall, maintenance has been performed on 2,842 miles of road over the last 5 years, which equates to 568 miles maintained per year. All Maintenance Level 3-5 roads are maintained annually (379 miles). The remaining 1,829 miles of Maintenance Level 1-2 roads are maintained at a rate of 185 miles per year for a 10 year maintenance cycle, which equates to approximately 10% per year. Each year the Forest has accomplished the maintenance on 26% of the road system.

The 2002 Forest Plan lists a forest-wide objective to "decommission an average of 22 miles of Forest Development Transportation System roads each year", which would equal 110 miles over the last 5 years. The forest has accomplished 3% of that goal (3.2 miles = 0.6 miles per year). The forest has rehabilitated (decommissioned) 36.3 miles of user-

created roads during the past 5 years, which equates to 7.3 miles per year. When combined (system & user-created), the Forest has decommissioned/rehabilitated 39.5 miles over the last 5 years (7.9 miles per year), which equates to a 36% accomplishment.

Planning

Public Collaboration: *What are the effects of National Forest System Management on adjacent communities?*

Contributions to counties - Counties that contain National Forest System lands receive payments from the federal government to compensate the county for two costs: for serving visitors to the National Forests (compensated by the 25 Percent Fund); and for the loss of property tax revenues (compensated by Payment in Lieu of Taxes (PILT) payments).

The Secure Rural Schools and Community Self-Determination Act of 2000 provided counties with an additional payment option, which would provide a more stable flow of revenue from federal forest payments. The new law offered the counties a choice between the traditional 25% of forest income payment method or the fixed payment option. Counties had to choose between the two payment options. The Secure Rural Schools and Community Self-Determination act of 2000 (SRS) (PL 106-393) was enacted to provide transitional assistance to rural counties affected by the decline in revenue from timber harvests in federal lands. Traditionally, these counties relied on a share of receipts from timber harvests to supplement local funding for school systems and roads. By 2006 all the counties on the WRNF opted for SRS funds. Some of the counties have lands on other National Forests for which they received funds for in addition to the contributions based on WRNF revenue. Some counties such as Summit receive funding some years based on the WRNF revenue with some from the Arapahoe-Roosevelt, and others, and some years the WRNF is not part of the contribution.

The Secure Rural Schools and Community Self-Determination Act has to go before congress to be renewed. Legislative debate continues as to whether to not renew the act, or whether to extend the act with a time limit (year) or extend the act permanently.

Payments to counties under the SRS Act are shown below.

County Receipts

2002

County	Forest	Full payment base
Eagle	WHITE RIVER	521,069.00
Gunnison	WHITE RIVER	14,691.00
Rio Blanco	WHITE RIVER	196,608.00
Routt	WHITE RIVER	3,852.00

2003

County	Forest	Full payment base
Eagle	WHITE RIVER	527,322.00
Garfield	WHITE RIVER	413,935.00
Gunnison	WHITE RIVER	14,874.00
Rio Blanco	WHITE RIVER	98,967.00
Routt	WHITE RIVER	3,898.00

2004

County	Forest	Full payment base
Eagle	WHITE RIVER	534,177.00
Garfield	WHITE RIVER	419,316.00
Gunnison	WHITE RIVER	15,076.00
Pitkin	WHITE RIVER	438,605.00
Rio Blanco	WHITE RIVER	201,554.00
Routt	WHITE RIVER	3,949.00

2005

County	Forest	Full payment base
Eagle	WHITE RIVER	$546,463.47
Garfield	WHITE RIVER	$428,960.67
Gunnison	WHITE RIVER	$15,486.71
Mesa	WHITE RIVER	$35,494.66
Moffat	WHITE RIVER	$2,471.58
Pitkin	WHITE RIVER	$448,693.31
Rio Blanco	WHITE RIVER	$206,153.14
Routt	WHITE RIVER	$4,039.53
Summit	WHITE RIVER	$453,001.28

2006

County	Forest	Full payment base
Eagle	WHITE RIVER	551,928.11
Garfield	WHITE RIVER	$433,250.28
Gunnison	WHITE RIVER	$15,888.33
Mesa	WHITE RIVER	$35,849.61
Moffat	WHITE RIVER	$2,496.30
Pitkin	WHITE RIVER	$453,180.24
Rio Blanco	WHITE RIVER	208,214.67
Routt	WHITE RIVER	$4,081.29
Summit	WHITE RIVER	$457,531.29

2007

County	Forest	Full payment base
Eagle	WHITE RIVER	$550,795.40
Garfield	WHITE RIVER	$432,361.13
Gunnison	WHITE RIVER	$15,871.92
Mesa	WHITE RIVER	$35,776.04
Moffat	WHITE RIVER	$2,491.18
Pitkin	WHITE RIVER	$452,250.19
Rio Blanco	WHITE RIVER	$207,787.36
Routt	WHITE RIVER	$4,072.91

In the past five years

Timber – There are limited mills within a distance that provides an economical source for timber haul. These mills are set up to process timber products for 2x4 type products. To remain viable a steady source of timber must be provided. In the area this source is mainly National Forest System lands, with some State and private land contribution. The amount cut annually has varied and overall has not met the needed amount to keep mills viable. With the timber die-off this becomes even more problematic. One main timber company remains, who utilizes local and regional loggers for their operations. They are working on a margin however and this could make it difficult for the industry to remain viable in the area. A pellet mill was opened to process dead lodgepole pine. This mill is running at capacity and there is a lot more pine that needs to be treated. There were studies done to determine if the dead lodgepole could be a viable biomass source. To build or convert an energy system to biomass is expensive and requires commitment. To be valid, the source must be sustainable over time. This would mean the forest would have to be able to log timber in places where roads don't exist, and outside of urban interface zones, and the timber would have to keep some state of soundness. Even then it may not be enough to provide what is needed for a biomass system.

Range – Due to a housing boom in the valleys that make up the private lands of the White River, many one-time ranches have been sold and converted to housing developments. The industry still remains however, and because ranchers can use allotments on the WRNF they are able to remain a viable industry. The WRNF is undergoing range allotment renewals and numbers may have to be adjusted to protect resources. Permits continue to be issued to several ranchers and herders for grazing on the National Forest.

Natural gas exploration and development – There was a significant increase in natural gas exploration and development during this time period. This is occurring where the potential for gas is high, namely the Piceance Basin, which is south of Rifle and west of Meeker for the WRNF. The private and BLM lands within the basin have the highest amount of activity. Under the Energy Policy Act of 2005 the Forest Service and BLM have created an interagency office to process natural gas applications to drill. The boom created by the industry has created an influx of workers, service businesses, and community demands. The Forest Service's main involvement is to allow leases to be developed as required by law, but to require resource mitigations where and when possible. One of the main issues has been air quality. The air program on the WRNF in conjunction with other agencies and local community studies is providing data to help determine actual air quality levels, at different places, and what sources may or may not be impacting air quality.

Tourism, Ski areas / resorts – The main industry for the local communities is recreation based tourism. With eleven ski areas on the forest, including three of the major ski destination areas – Aspen, Vail, and Summit County, the ski industry is the

primary industry for the area. The WRNF works with the ski area managers to allow for quality ski experiences while protecting land resources and wildlife that occurs on and around the ski areas. Due to the number of resort areas the local population has grown to a year-round large community base. Tourists and local residences like to participate in many outdoor recreational sports. This demand has caused the Forest Service to continually evaluate, manage, and provide recreation facilities and opportunities across the forest. The WRNF continue to issue numerous outfitter and guide permits to allow local companies to cater to tourists (and some locals) in many recreation fields. Specialists are evaluating what is an appropriate number of permits that can be issued given the resources that are available (capacity). There is generally a greater demand for those who want permits than can be issued.

Travel Management - The WRNF began the travel management plan after the signing of the Forest Plan. The TMP will designate the legal system for summer and winter travel across the forest. In late 2002 scoping began so the public could provide input into the process. This included providing information to the inventory including roads and trails on and not on the system for consideration. The comments helped the specialists form the alternatives for consideration. In 2005 during the development of the DEIS the national travel rule was instituted. The DEIS incorporated components of the TR and was released for comment in 2006. The DEIS presented five alternatives, with three representing actions to address key issues. While the comments received provided good insight to public needs, potential solutions, some areas of conflict, and helped to lead the forest toward a final, it was decided that a SDEIS would be prudent. Producing a SDEIS would allow the forest to produce a focused preferred alternative based on input up to this point, better incorporate the TR (where direction was better defined), and allow the public to provide final input on a focused alternative that represented where the forest was going toward its final. Input into the TMP represents a solid cross section of public and other government agencies. Analysis from the comment periods show most input or concerns were locally based, with some from the Front range, and few from other states. Interest groups have been actively involved and provided input based on their local constituents and their overall missions. Agency input has mostly been local governments, BLM and CDOW. As required EPA and USFWS have been respondents as well. Along with the formal comment periods, the forest has also conducted several formal and informal meetings with groups, government officials, tribal representatives and councils, and individuals. Public input provided the forest with a better inventory and ideas to consider for the travel system. The final travel management plan will influence and dictate in many ways what activities people can participate in across the forest.

Insect and disease epidemic, Wildland Urban Interface, **Fire Protection –** The timber land, especially the lodgepole pine is undergoing high mortality due to mountain pine beetles whose populations are at epidemic proportions. Though considered a natural occurrence, the high level has caused concern as it is causing a complete loss of pine in a large part of Colorado. This level has raised awareness for the need to manage the dead or dying timber lands especially where the dead can cause an increased threat to wildfire. The Forest Service is working collaboratively with local governments, fire organizations, other agencies to focus on areas to treat high priority areas, especially WUI.

Collaboration groups have formed to consider actions that may need to be undertaken to deal with the epidemic.

Noxious weeds – The WRNF has been working with county officials to increase awareness about noxious weeds. Several campaigns, brochures, meetings, and talks have been given across the forest and in Colorado to ranchers, local businesses, local homeowners, and visitors to increase awareness. While still more can be done, in the past five years, most of the locals are at least aware that there is something called noxious weeds and that these can take over native plants. People are also aware now that collaboration is necessary in order to have an effective eradication program, one that has no boundaries. The next steps are to increase awareness of what these are and how they can be treated.

Land exchanges, special uses - The WRNF has been working to acquire in holdings that help unify National Forest System lands. In the realm of non-recreation special uses the WRNF issues numerous special use permits to private citizens so they can utilize NFS lands for certain uses in a responsible manner. These include spring boxes, pipelines, power lines, road access, cell sites, ditches, etc. An effort to reissue all the ditches across the forest was undertaken and many were completed. Some of the more complex ones are left to do. An effort in the future will be to meet Energy Policy Act safety regulations along utilities, especially power lines. In the future wind farms, solar farms may become new uses the forest has to consider. It may be beneficial to examine the forest, perhaps through the plan, to see if there are appropriate places on the forest for these uses, rather than wait for proposals to be presented.

Validation Monitoring

Wildlife and Aquatics

MIS 4: ***Are the selected management indicator species and their response to management activities in habitats on local National Forest System lands adequately representing management effects on other species in the associated response guilds and is the species membership identified for each response guild reasonably accurate and complete?***

The WRNF implemented monitoring for the initial 2002, from 2002-2006. In so doing the biologists found the following: there were some habitats that were being covered by two or more species, there were some species that were not very good representatives of management activities on a habitat, there were some species that did not represent a broad enough range of the habitat to be a good indicator. Biologists also found that the list was quite extensive and it was difficult given staff and funding, even with contractors, and other organizations such as RMBO and CNHP, to adequately monitor all the species.

Therefore the forest initiated Forest Plan Amendment 3-MIS. The amendment identified key species and habitats where management activities needed to be monitored. The species selected allows the forest to focus on the species, habitats, and potential effects to the habitats to demonstrate habitat effectiveness and species viability.

Noxious weeds

Noxious Weeds: *Are treatment and prevention measures effective in reducing infestations of noxious weeds?*

Treatment and prevention measures are reducing noxious weed infestations. Daily application records are filed each time there is any herbicide treatment. In areas treated 5 years ago verses the same areas visited in 2007, most infestations were reduced by 90 percent or more. The only problem species we deal with is yellow toadflax, however even with that specie we are seeing 70-80% reductions.

Preventative measures have also had a positive impact. Through education, awareness, and programs like the certified weed free hay/forage, we have continually seen the rate of new infestations decline at trail heads, campgrounds, and other areas of high human activity. The Forest is actively involved with County and State governments, as well as adjacent landowners, to cooperatively manage common weed infestations.

Other Monitoring

Air

Air Quality 1: *What are the trends in visibility, acid neutralizing capacity, deposition and other air quality indicators as they pertain to the health of air quality related values in Forest Class I and Class II Wilderness Areas?*

Indicators to air quality health in the Forest's Class I and Class II Wilderness areas include visibility, acid neutralizing capacity, acid deposition metrics and ozone concentrations. The following summarizes the Forest's air quality monitoring program in Wilderness Areas as well as general forest. Each will be discussed separately below.

Visibility

IMPROVE Monitor – AJAX site

Today, visibility is monitored at the top of Aspen Mountain (AJAX) under the Interagency Monitoring of Protected Visual Environments (IMPROVE) program. An IMPROVE monitor was established at AJAX in 1999. The IMPROVE monitoring

program was established in 1985 to aid in the protection of visibility in Class I areas. The objectives of IMPROVE are:

- to establish current visibility and aerosol conditions in mandatory class I areas;
- to identify chemical species and emission sources responsible for existing man-made visibility impairment;
- to document long-term trends for assessing progress towards the national visibility goal; and
- to provide regional haze monitoring as part of the enactment of the Regional Haze Rule.

See appendix E, Figures 1 and 2 for more detailed information.

Wilderness Workshop has partnered with the WRNF to operate and maintain the IMPROVE site at AJAX which hosts the highest IMPROVE monitor in the United States (11,200 feet elevation). It is well sited for monitoring regional visibility conditions at all three of the Class I Wilderness areas on the WRNF along with the West Elk Wilderness on the Gunnison National Forest.

IMPROVE-like Monitor – Ripple Creek Pass

Under a Special Use Permit with the WRNF, Shell Oil established an air quality monitoring site near Ripple Creek Pass in 2003. A large array of solar panels provides the primary electricity source to power certain instruments, including the IMPROVE-like visibility monitor at this site. While the instrumentation is identical to that used in the IMPROVE program, this site is not officially part of the national IMPROVE program in part because it has not met certain protocols. According to Scott Copeland (USFS Visibility Data Analyst) the visibility monitoring location near Ripple Creek Pass is well positioned to detect visibility impacts to the Flattops Wilderness from relatively local oil and gas development occurring in western Colorado and eastern Utah.

Data up through 2005 from this site has been shared with Scott Copeland, visibility analyst for the Forest Service.

In March, 2008 Shell Oil discontinued operation of the IMPROVE-like monitor. Efforts are currently under way to fund the operation and maintenance of this site

Monitoring Results

Visibility is measured by using a metric called a “deciview”, which is basically a change in visibility that the human eye can detect. One deciview represents a 10 percent change in the light extinction equation used to calculate visibility. The higher the deciview, the less a person can see into the distance.

In a visibility report prepared by the Colorado State Air Pollution Control Division (APCD – see CDPHE 2007) images are provided to depict natural visibility conditions

and actual visibility conditions during the AJAX IMPROVE monitoring period between 2001 and 2004. Using EPA Guidance the APCD estimated natural visibility for the Maroon Bells-Snowmass Wilderness at 0.52 deciviews for the 20% best days and 6.54 deciviews for the 20% worst days (CDPHE 2007). See figures 1-3 in Appendix X for an illustration of natural and measured visibility conditions.

These images can be found in the Colorado State Regional Haze State Implementation Plan (CDPHE 2007) which used IMPROVE data from the AJAX site to estimate the impacts of Regional Haze to the WRNF's three Class I areas. The report is a requirement under the Regional Haze Rule enacted in 1999 by the EPA to reduce regional haze and improve visibility in national parks and wilderness areas.

While the data at the AJAX site indicates the best visibility monitored at Colorado's six IMPROVE sites between 2000 and 2004, visibility degradation is indicated when compared to expected natural conditions. The APCD is currently working on establishing a "reasonable progress goal" to move visibility impacts during the worst 20 percent days towards natural conditions as well as prevent degradation of the cleanest 20 percent days. See figure 3 in Appendix E.

Data collected at the AJAX IMPROVE site indicate that the top three major constituents that impact visibility in these areas include organic mass carbon (sources include road dust, mobile sources, fires and industrial activity), ammonium sulfate (major source is coal fired power plants), and coarse mass (sources are the same as organic mass carbon). Figures 4 and 5 in Appendix E show the composition of visibility reducing particles measured at the AJAX IMPROVE site between 2001 and 2004. Additional charts (Figures 6-13) in Appendix E depict emission source contributions by region for the best and the worst 20 percent days.

National Acid Deposition Program

The National Atmospheric Deposition Program/National Trends Network (NADP/NTN) is a nationwide network of precipitation monitoring sites. The purpose of the network is to collect data on the chemistry of precipitation for monitoring geographical and temporal long-term trends.

The network is a cooperative effort between many different groups, including the State Agricultural Experiment Stations, U.S. Geological Survey, U.S. Department of Agriculture, and other governmental and private entities. The NADP/NTN has grown from 22 stations in 1978 to over 250 sites spanning the continental United States, Alaska, Puerto Rico, and the Virgin Islands.

The WRNF maintains and operates two NADP sites: Four Mile (located near the base of Sunlight Ski Resort at about 8,210 feet elevation) and Sunlight (located at the top of Sunlight Peak at about 10, 560 feet elevation). Both sites are located on the Sopris

Ranger District and were established in 1988. The Sopris District staff make weekly visits to the sites to collect the precipitation at each station, run preliminary tests and then send the samples to the NADP Central Analytical Laboratory where it is analyzed for hydrogen (acidity as pH), sulfate, nitrate, ammonium, chloride, and base cations (such as calcium, magnesium, potassium and sodium).

Severe weather conditions (especially drifting snow and blizzards) can hinder maintenance visits to the Sunlight Peak site resulting in a loss of data for that week. The few weeks of lost data has resulted in that site not meeting the NADP's strict protocol. However, the data is still important in providing information on acid deposition at higher elevations.

Monitoring Results

Trends in the data indicate that sulfate deposition (SO4) is decreasing at both stations. This trend is also being seen nationwide.

Generally in the West, the trends for ammonium and nitrate concentrations are increasing. An analysis of the Four Mile Park and Sunlight data (1988 through 2000) indicates statistically significant trends of increasing nitrogen deposition and ammonium concentrations at Four Mile Park (Burns 2003).

Figures 14 and 15 in Appendix E show trends in the deposition of ammonium respectively at the Four Mile (Site CO08) and Sunlight Mountain (Site CO92) NADP sites. Figures 16 and 17 are graphs of nitrate deposition at each respective site and Figures 18 and 19 show sulfate deposition values.

Wilderness Lake Monitoring

Acidic deposition from tainted snow and rain can lead to chemical changes within a sensitive ecosystem, adversely impacting vegetation, soils, and aquatic habitat. The purpose of the wilderness lake monitoring program on the WRNF is to establish baseline data from which to determine future trends in acidic deposition in the Class I and Class II Wilderness Areas on the Forest.

WRNF Wilderness Lake Sampling Program

Wilderness lake monitoring on the Forest began in the late 1980's on the Aspen Ranger District in response to pressure by the Aspen Wilderness Workshop to monitor sensitive wilderness lakes for acid deposition impacts. The program was formalized in 1991 when the USFS Region 2 air quality program published protocols for long term lake monitoring. These protocols establish quality assurance and quality control in data collection and handling from the time the water samples are collected to when they are delivered to the Rocky Mountain Research Station's (RMRS) Water Chemistry Laboratory.

Since 1991, the Forest has annually sampled from 10 established lake monitoring sites in the Holy Cross, Eagle's Nest, Collegiate Peaks, and the Maroon Bells/Snowmass

Wilderness Areas. Each lake is visited three times throughout the summer, usually between June and late August. Lake samples are sent to the RMRS lab for analysis for major anions and cations, pH, acid neutralizing capacity, and conductivity. Lab results are kept on the Forest in a database maintained by the Forest Air Resource Specialist.

Training in monitoring protocol is provided sporadically and usually when there is a change in personnel performing the work. The five lakes located within the Holy Cross Ranger District are monitored in-house by Wilderness Program personnel. The five lakes located within the Aspen Ranger District are monitored through an agreement with Wilderness Workshop by one of their employees who has provided high quality data collected for a number of years.

Monitoring Results

Data collected since the beginning of this program was statistically analyzed for trends in sulfate (SO4), nitrate (NO3), ammonium (NH4) and acid neutralizing capacity (ANC). The results are preliminary and, as such, no graphs will be provided at this time for this report. These results are contrary to what other deposition monitoring studies have found in this area which is that the concentrations of sulfate are decreasing and the concentration of ammonium and nitrate are increasing. Because of this discrepancy, the data is being reanalyzed at this time. The preliminary results indicate the following:

Statistical results (preliminary) of Seasonal Kendall Trend Test – Wilderness Lake Data

Wilderness	Lake Name	Statistical Trend Results			
		SO4	NO3	NH4	ANC
Maroon Bells-Snowmass	Avalanche	increase	No change	No change	No change
	Capitol	increase	increase	No change	increase
	Moon	increase	No change	No change	increase
Collegiate Peaks	Brooklyn	increase	No change	No change	increase
	Tabor	increase	decrease	decrease	increase
Eagle's Nest	Booth	No change	No change	No change	No change
	Willow	increase	No change	No change	increase
Holy Cross	Blodgett	increase	No change	No change	increase
	Up. Tennessee	increase	No change	No change	increase
	Up. Turquoise	increase	No change	No change	increase

Snow Chemistry Monitoring - USGS

Up to 70 percent of the precipitation that falls in the Rocky Mountains is snowfall. A snowpack that accumulates over the winter and early spring contains a record of chemicals deposited from the atmosphere during that time.

In 1993 the USGS began taking full depth snow samples each spring at a minimum of 50 sites along the spine of the Rocky Mountains. Two of the regularly visited sites are located on the WRNF: Sunlight Mountain near the NADP site and the Ned Wilson lakes

site. The WRNF is a partner with the USGS in this endeavor and assists in data collection at the Sunlight Mountain site.

Up through 2005, spring time access to the Ned Wilson site was done via helicopter. Recent direction from the Regional Office required the USGS to either find an alternate means of travel to the Ned Wilson site because of its location within a congressionally designated Wilderness or find a surrogate monitoring site outside the Wilderness. In response, the USGS decommissioned all of its monitoring equipment at the Ned Wilson site and is using a site near Ripple Creek Pass as an alternate.

Monitoring Results

For the past five years the USGS has published a findings report for each year's snowpack chemistry data. No trends analysis has been conducted on the data to date. However, data collected through the USGS snowpack study has supported various research publications including comparisons of the data to the NADP program data (Heuer, et al 2000) and an assessment of atmospheric deposition across the Rocky Mountains (Nanus, et al 2003).

The comparison to the NADP data (Heuer et al 2000) indicates that both sampling methods are comparable and that the snowpack surveys are a cost effective complement to the NADP network. This paper also states that precipitation chemistry at high elevation sites in Colorado varies seasonally due to weather patterns and emission source areas. Winter precipitation concentrations of nitrate and sulfate are greater at study sites west of the Rocky Mountain divide.

The study on atmospheric deposition indicates that within the Wilderness areas on the WRNF nitrate deposition is between 0.5 to 2.0 kilograms per hectare (kg/ha) and sulfate deposition is 2.0 to 6.0 kg/ha. These values represent moderate levels of deposition. Higher values occur along the Front Range of Colorado and in the Park Range of northwest Colorado where local sources including urban development and power plants are prevalent sources.

Ozone Monitoring

Western Colorado has recently seen a steady increase in population and associated vehicle traffic as well as a boom in the development of natural gas mining. Exhaust from cars, trucks, drilling rigs for gas wells and the wells, themselves, are all sources of nitrogen oxides (NOx) and volatile organic carbons (VOC), precursors to the formation of ozone.

The State of Colorado periodically conducts emissions inventories to determine air pollution sources within each county. The 2004 inventory for Garfield County shows that 41 percent of NOx emissions come from highway vehicles and 47 percent come from stationary sources. Ninety-two percent of these stationary sources are related to oil and gas development. This inventory also shows that 75 percent of the VOC emissions come

from biogenic sources such as forests and agricultural lands. Overall these emissions are non-anthropomorphic. Of the remaining 25 percent of VOC emissions, 19 percent are from stationary sources. Ninety-six percent of these stationary emission sources are from oil and gas development.

The current National Ambient Air Quality Standard for ozone is 0.075 parts per million (ppm). Currently this value is the same for the primary standard (protection of public health) and secondary standard (protection of public welfare, which includes protection against damage to crops and vegetation). Research indicates that foliar injury can occur in sensitive plants exposed to ozone levels above 0.06 ppm. Ozone is a concern to the WRNF as it pertains both to adverse impacts to air quality related values (vegetation) in Wilderness areas as well as visitors to the Forest.

With funding from a grant by the Environment Foundation and support from Garfield County, the WRNF began a synoptic ozone monitoring program in 2006. Fourteen monitoring sites were initially established to cover a range of elevations as well as a wide geographic distribution east to west and north to south in and around the WRNF.

A passive ozone monitor was installed at each site. These inexpensive samplers react with the ambient ozone during the time they are exposed. At the end of a sampling period (usually between one and two weeks), the sampler is collected and sent to the RMRS lab in Fort Collins for analysis.

In addition to the passive monitors, continuous ozone monitors have been installed at two to four sites. These monitors provide hourly ozone concentration readings which are useful for determining daily ozone fluctuations.

See Figure 20 in Appendix E for a map of the ozone monitoring locations in 2008. The passive monitoring stations in 2007 are identical to those monitored in 2008. Three continuous monitors were operated during the 2007 ozone season: AJAX (on the top of Aspen Mountain), BELL (Bell Ranch located south of Silt), and RIPPLE (near Ripple Creek Pass). The data from this program is still preliminary and is presented here as such.

Monitoring Results

Passive monitors do not measure ozone directly. These samplers are coated with nitrite which reacts with ozone to form nitrate. Following exposure (usually between one and two weeks), the samplers are analyzed in the lab for nitrate. Nitrate values presented in Appendix E, Table 21 provide a surrogate for ozone concentrations measured at each monitoring site.

Typically ozone concentrations are greater at higher elevations. Figure 21 compares monitoring site elevation to relative ozone concentrations measured in 2006 and 2007. The DILLON and SPRADDLE sites are furthest east on the WRNF (see Figure 20, Appendix E). Although one of the lowest elevation sites monitored, the BELL site has

shown ozone concentrations closer to or higher than those seen at the high elevation sites. The BELL site is located within a heavily developed natural gas area.

Data taking in 2007 from the continuous monitors are presented in Figures 22 through 24. The data is compared to the National Ambient Air Quality standard for ozone (8-hour average concentration = 75 parts per billion). The graphs indicate that ozone concentrations at the AJAX site exceeded the NAAQS concentration value at least six times throughout the 2007 monitoring period. Ozone concentrations at the other two continuous monitoring sites were below the NAAQS.

Recommendations for Change in Forest Plan Monitoring Strategy

Water Quality

No changes are proposed to this monitoring question. Regarding erosion/sedimentation, data are currently collected to generally address the question, although the sampling and reporting should be adjusted. Target accomplishments reported for the Forest should be summarized by 4th or 5th field watershed to demonstrate that individual watersheds are improving. Also, temporary road construction miles/acres should be included in the summary in Table 3, Appendix A. Most stream surveys are five years old and should be re-surveyed to directly evaluate trends in sedimentation on Forest streams.

Regarding stream temperatures, a comprehensive multi-year plan should be developed to insure sampling of all major streams on the Forest. The goal would be to sample selected streams for a minimum of 2-3 years in order to determine compliance with the new State water quality standard for temperature. Sampling could be re-initiated in these sites if ground disturbing activities are proposed or large scale mortality form beetle infestations is occurring.

Regarding heavy metal impacts to water quality, many efforts are currently on-going to improve water quality conditions. These activities, and the miles of stream affected, should be summarized by 4th or 5th field watershed to demonstrate improvements at the appropriate scale.

Wildlife

MIS questions 1 and 2 are effectively answered through MIS 3. MIS 4 is a question that should be revisited regularly as the Forest Plan is implemented and as ecological and social changes occur on the Forest.. It is recommended that 1, 2 and 4 be rolled into question 3 and dropped as individual questions from Chapter 4 of the Forest Plan.

Transportation

The Travel Management Plan is scheduled for release in 2009. The purpose and need includes decommission system roads and rehabilitation unauthorized (user-created) routes (roads & trails). The current strategy (4a.2 - Decommission an average of 22 miles of Forest Development Transportation System roads each year) only addresses system roads and makes no mention as to the effectiveness of the decommissioning techniques/methods. While miles are still a relevant quantitative measure of accomplishment, both system roads and user-created roads should be measured.

Removal of user-created roads helps to eliminate unnecessary and environmentally damaging routes on the ground. With implementation of the Travel Management Plan in the near future, the effectiveness of decommissioning/rehabilitation techniques/methods utilized should be monitored so the Forest can be as effective as possible with limited budgets. The forest should consider modifying the above referenced strategy (Strategy 4a.2) to track and monitor the decommissioning/rehabilitation of both system and user created roads.

Silviculture

The current insect and disease epidemic causes the Forest Service to re-evaluate how it treats insect and disease. The question "*To what extent are destructive insect and disease outbreaks prevented following management activities"* should be amended to read *"What forest management strategies are being developed to augment forest recovery and resilience to future infestations?"*

Air

The WRNF is actively working with other agencies to monitor air conditions. To capture the monitoring efforts and meet Forest Plan goals for under the Clean Air Act, the regional goal for protection of air resources, and the WRNF goal for ecosystem health, the monitoring section in Chapter 4 should include an Air Resource monitoring question.

To better reflect the strategies for wilderness resource protection Forest Plan Strategy 2b.4 under Objective 2b, should be amended to read:
Monitor visibility, wilderness lake chemistries and other air quality indicators as needed to assure that over the life of the plan, air-quality-related values in all wilderness areas are protected and where necessary, improved.

APPENDICES

Appendix A - List of Preparers

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Mark Weinhold – Forest Hydrologist
Keith Giezentanner – Forest Wildlife Biologist
Christine Hirsch – Forest Fisheries Biologist
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Rich Doak – Forest Recreation Planner
Andrea Brogan – Archaeologist
Bruce Moss – Engineer
Donna Graham – Landscape Architect
Andrea Holland-Sears – Air Quality and Water Rights Specialist

Public Participation/ Disclosure

This report has been made available on the Forest Service Web at the following web address: http://www.fs.fed.us/r2/whiteriver/projects/forest_plan/index.shtml. It is also printed in hard copy, and may be obtained by request to Forest Planner, White River National Forest, 900 Grand Ave., Glenwood Springs, Colorado 81602.

Appendix B - Wildlife

The WRNF Land and Resource Management Plan (Plan) provides direction to enable the Forest to meet the goals of protecting and improving species populations and their habitats. Threatened, endangered, sensitive, and management indicator species are monitored at various levels for species populations and habitat trends. Table 1, below, lists the major terrestrial wildlife species monitored on the Forest and their respective classifications.

One change to the list of threatened and endangered species for the Forest since the Plan was signed has been the delisting of the bald eagle in 2007. The Region 2 Regional Forester Sensitive Species List has been amended 2 times since 2002. Through a Plan amendment the Forest revised its list of Management Indicator Species in 2006 in order to assure that the list adequately represented the important management issues on the Forest. All of these actions have affected the monitoring program for terrestrial wildlife species on the Forest by adding or dropping species of interest to specific lists.

Table 1 displays species evaluated in the document, their classification, their associated habitat types, and applicable monitoring accomplished since 2002. These lists are considered accurate at the time of this writing. Potential impacts to these species are included in Biological Assessments, Biological Evaluations and/or MIS evaluations completed as a portion of NEPA for all project level activities planned on the Forest.

Table 1. List of the terrestrial wildlife species with special designations on the White River National Forest, including the one federally-listed threatened plant on the Forest.

Species	Classification	Monitoring and trend information
Mammals		
Townsend's big-eared bat	Sensitive- MIS	This species is monitored as a portion of the cave bat monitoring across the Forest. Habitat and population trends appear to be stable at this time.
Spotted bat	Sensitive	Little is known of this species throughout its range; it has been documented on the Forest, but it is not currently being specifically monitored on the Forest. Glenwood Canyon and its tributaries are thought to comprise the most suitable habitat for this species on the WR. Little active management is currently occurring on this portion of the Forest that would potentially impact this species. It is not a cave roosting bat and is not included under the cave bat monitoring program.
Wolverine	Sensitive	Little is known of this species throughout its range, and it is not being specifically monitored on the Forest. If individuals or populations of this species occur on the Forest, they are of such low numbers as to be impossible to monitor using currently accepted techniques.
River otter	Sensitive	Little is known of this species and it is not currently being specifically monitored on the Forest. If individuals or populations of this species occur on the Forest, they are of such low numbers as to be impossible to monitor using currently accepted techniques.
American marten	Sensitive	No specific monitoring of this species occurs on the Forest. They are known to be fairly common inhabitants of suitable

		habitats across the Forest and are regularly documented during anecdotal surveys.
Fringed myotis	Sensitive	This species has been monitored as a portion of the cave bat monitoring across the Forest. No populations of this species have been identified on the Forest through these surveys at this time.
Pygmy shrew	Sensitive	Little is known of this species and it is not currently being specifically monitored on the Forest. A contract to initiate monitoring is planned for initiation in FY08.
North American lynx	Threatened	DOW monitors closely the reintroduced population of lynx across the state. The Forest monitors snowshoe hare populations (the principal prey for lynx) through pellet plots in specific locations across the Forest. Several lynx are known to have set up territories on the Forest, and snowshoe populations appear to be healthy, although recent DOW surveys may indicate a reduction in statewide hare populations.
Cave bats	Sensitive- MIS	This group of species has been monitored as MIS by the Forest as well as private individuals and other agencies such as DOW and CNHP. Trends for cave dwelling bats on the Forest appear to be stable at this time.
Elk	MIS	DOW closely monitors elk across the state. The 5 year assessment of elk on the WR indicates that total populations are down due to intentional, management harvest strategies by DOW. Bull to cow elk ratios are stable, calf:cow ratios are declining and of concern to both agencies.
Birds		
Northern goshawk	Sensitive	Project specific surveys are completed for this species when projects may affect potential habitat. Additionally, some known nest sites are monitored on a regular basis for occupancy. This species is also covered under Monitoring Colorado Birds (MCB) transects. Trends on the Forest appear to be stable.
Osprey	Sensitive	Anecdotal surveys for this species have documented several nest sites on and adjacent to the Forest. The MCB special species program has documented expanding range and populations for this species across the state.
Flammulated Owl	Sensitive	This range and population figures for this species have been expanded greatly over the past several years through survey efforts by individual biologists. This species has been documented to occur within suitable habitats across the WRNF. Population trend information is unknown at this time.
Boreal owl	Sensitive	The Forest has an active program of nest boxes for forest owls and these boxes are monitored annually. No use by boreal owls has been detected to date. Additionally, specific owl survey efforts are completed regularly by district biologists. These surveys have detected boreal owls widely scattered across the Forest in suitable habitat. No trend information is available for this species.
Sage sparrow	Sensitive	No specific surveys for this species are conducted. However, the species has been documented in the extreme southwestern portion of the Forest during anecdotal surveys. No population or trend date is available for the

		Forest. MCB has documented stable populations across the state over the past 10 years.
Ferruginous hawk	Sensitive	This species does not nest on the Forest but may use some of the high elevation grasslands during migration. No specific surveys have been conducted for this species on the Forest. MCB statewide surveys are insufficient to track trends for this species.
Greater sage grouse	Sensitive	This species is found only on the Dillon and possibly the Eagle Ranger Districts. It occurs in low numbers with the major population centers located immediately off Forest on BLM and private lands. CDOW conducts intensive annual lek surveys for this species. Only incidental lek surveys have been conducted on the Forest. No trend information is available from these surveys.
Northern harrier	Sensitive	This species has not been documented to nest on the Forest. MCB transects are insufficient to track trends for this species in the state.
Olive-sided flycatcher	Sensitive	Anecdotal surveys have documented this species across the Forest in suitable habitats. No specific surveys are conducted for this species on the Forest. MCB statewide surveys appear to indicate a stable population of this species.
Black swift	Sensitive	This species is annually tracked on the Forest through species specific surveys. Increased survey efforts over the past 10 years have documented several previously unknown nest sites. Populations appear to be stable at this time.
American peregrine falcon	Sensitive	This species is annually tracked on the Forest through species specific surveys by CDOW, Forest Service and private biologists. Increased survey efforts over the past 10 years have documented several previously unknown nest sites and the reestablishment of nests in some historic sites. Populations are stable or increasing at this time.
White-tailed ptarmigan	Sensitive	Only anecdotal records of occurrences are kept for this species. Few species specific surveys have been accomplished, but the species is known to inhabit suitable habitat across the Forest.
Loggerhead shrike	Sensitive	Only anecdotal records of occurrences are kept for this species. Few species specific surveys have been accomplished, but the species has been document on the western portion of the Forest. MCB transects appear to indicate a downward state wide trend for this species.
Lewis' woodpecker	Sensitive	This species has not been documented to occur on the Forest through species specific or anecdotal survey efforts. It has been documented in several of the major river drainages immediately adjacent to the Forest. MCB survey efforts across the state have not been successful in recording adequate numbers of this species to establish trend data.
American 3-toed woodpecker	Sensitive	Anecdotal surveys have documented this species across the Forest in suitable habitats. No specific surveys are conducted for this species on the Forest. MCB statewide surveys appear to indicate a stable to increasing population trend for this species.
Purple martin	Sensitive	This species has been documented to nest in several

		colonies on the WRNF. Recent increases in survey efforts have expanded the known population estimates across the state including the Forest. Populations appear to be stable at this time.
Brewer's sparrow	MIS	This species is monitored as an MIS within the sagebrush communities on the Forest. This information has been incorporated into the MCB transect information for analysis. MCB analysis indicates a possible increasing population trend for this species in the Ecological Section including the WRNF.
Columbian sharp-tailed grouse	Sensitive	This species has not been documented on the Forest through any transect or anecdotal surveys. It is known to occur north of the Forest and appears to be expanding its range. It will continue to be a "watch" species in those portions of the Forest where it may expand its range.
Mexican Spotted owl	Sensitive	Habitat and calling surveys for this species were initiated in 2005. Potentially suitable habitats have been narrowed through field inventories. Calling surveys in 2006-2008, following established protocols, have not documented any owls on the Forest.
Bald eagle	Sensitive	This species is monitored anecdotally across the Forest. The first nest on the Forest was documented in 2006 when a pair of eagles displaced a pair of osprey from a historic nest snag. The pair of eagles produced their first young in 2008 at this site. Eagles are known to use portions of the Forest for foraging throughout the year.
American pipit	MIS	This species is monitored as an MIS within the alpine communities on the Forest. This information has been incorporated into the MCB transect information for analysis. MCB analysis indicates a stable population trend for this species in the Ecological Sections including the WRNF.
Virginia's warbler	MIS	This species is monitored as an MIS within the mixed mountain shrub communities on the Forest. This information has been incorporated into the MCB transect information for analysis. MCB analysis indicates a possible increasing population trend for this species in the Ecological Sections including the WRNF.
Invertebrates		
Great Basin silverspot	Sensitive	Little is known of this species and it is not currently being specifically monitored on the Forest. At this time, no populations of this species have been identified on the Forest.
Uncompahgre fritillary butterfly	Threatened	Habitat surveys were initiated in 2006 in conjunction with alpine rare plant surveys. These survey efforts are continuing into at least 2008. No populations of this species have been found on the Forest at this time.

Appendix C – Fisheries

Table 1 - Aquatic MIS sampling partial results

Site	Mgmt area	date	grad.	alk.	elevation	width	% fines	res.pool depth	#EPT	sed. sens.	Trout	other sp
Big Fish Creek	MA1-C	08/29/03	2.5	92	8800	8.0	12	na	23	9	81	sculpin
*Campbell Creek	MA1-C	08/30/05	8.5	na	8799	1.8	31.6	0.14	14	4	none	none
Capitol Creek	MA1-C	08/18/06	1.6	150	9075	6.6	8.2	0.35	18	5	54	none
Ripple Creek	MA1-C	08/12/04	2.4	104	8920	3.4	9	0.32	21	7	45	none
*Ute Creek	MA1-C	08/22/07	2.4	--	8973	--	--	--	16	6	none	none
Avalanche Creek	MA1-no	09/03/03	3	102	8748	10.1	11.8	0.2	18	8	31	sculpin
*Black Creek	MA1-no	08/09/07	--	--	9062	--	--	--	13	6	na	na
East Maroon Creek	MA1-no	08/16/06	0.9	80	9399	7.2	3.9	0.48	16	6	79	none
Snowmass Creek	MA1-no	09/08/04	2	85	8874	6.7	6.3	0.66	17	6	79	none
Upper Fryingpan	MA1-no	08/18/05	2	44	10058				19	8	76	none
East Fork Crystal River	MA1-S	08/26/04	2.9	154	10511	4.4	6.1	0.19	18	6	1	none
Meadow Creek	MA1-S	09/26/05	7.6	76	8533	4	10.7	0.24	24	10	40	sculpin
North Fork Piney River	MA1-S	09/12/06	5	160	8030	3.6	10.6	0.26	24	11	45	sculpin
Piney River	MA1-S	09/11/03	4	32	9759	6.2	4	0.57	21	7	24	none
South Fork White River	MA1-S	8/14,15/07	0.9	76	9117	10.7	3.2	na	18	5	75	none
*Beaver Creek	MA3-C	08/04/04	2.5	130	9606	1.9	68.3	0.2	7	1	9	none
*Cache Creek	MA3-C	08/09/06	7	380	9869	2.5	10.8	0.34	14	4	none	none
Cottonwood Creek	MA3-C	09/02/03	4.7	200	7950	1.1	37	0.12	17	6	3	none
East Brush Creek	MA3-C	08/31/05	3.6	90	9423	4.1	6.4	0.27	20	8	52	none
Gypsum Creek	MA3-C	8/15,16/07	5.7	120	8602	3.7	25.5	0.22	16	8	31	none
Snell Creek	MA3-C	08/21/07	6.2	144	8386	4.3	3.4	0.31	22	8	14	sculpin
Chapman Gulch	MA3-no	08/27/07	0.8	60	8596	4.5	13.4	0.45	25	8	60	sculpin
Crystal Creek	MA3-no	09/08/03	8.4	na	10513	2.3	21.7	0.28	21	8	5	none
Express Creek	MA3-no	07/15/04	na	53	10773	1.5	19	0.45	9	1	4	none
McCullough Gulch	MA3-no	08/07/07	2.9	32	11329	4.2	8.7	0.42	13	3	none	none
South Fork Fryingpan	MA3-no	08/17/05	3	68	9488	8.0			11	5	128	none
Buck Creek	MA3-S	09/09/03	3	174	9960	2.5	4	0.24	16	6	77	none
Deep Creek (Eagle RD)	MA3-S	08/29/06	3	128	10597	3.6	4.8	0.25	20	6	136	sucker
East Fork Fawn Creek	MA3-S	08/20/07	7.4	320	7842	2.7	13.3	0.31	19	8	104	none
Milk Creek	MA3-S	08/15/05	3	164	8048	3.5	15.9	0.17	11	3	5	none
Morapos Creek	MA3-S	08/10/04	2.7	236	8150	2.5	15.3	0.28	20	3	36	sculpin dace
Cattle Creek	MA5-C	08/10/06	3	200	8562	3.7	25.9	0.35	19	8	75	sculpin

Derby Creek	MA5-C	09/29/05	2	156	7875	6.7	9.8	0.4	19	5	31	none
East Elk Creek	MA5-C	08/02/05	3.4	120	6450	7.5	6.7	0.21	19	6	28	sculpin
East Miller Creek	MA5-C	08/26/03	1	140	7198	4.7	22.5	0.29	10	5	14	sculpin
*Fourmile Creek	MA5-C	09/01/04	1.7	250	9040	2.4	45.7	0.2	na	na	none	sculpin
Middle Thompson Creek	MA5-C	08/29/07	na	168	7410	na	7.8	na	21	8	40	sculpin
Bennett Gulch	MA5-no	09/04/03	4.97	43	9908	1.5	22.2	0.14	20	7	26	none
*Miller Creek	MA5-no	08/03/06	4	80	8580	1.6	6.9	0.22	9	4	none	none
Miners Creek	MA5-no	08/06/07	3.7	20	9462	3.4	17.4	0.22	20	8	54	none
North Barton Gulch	MA5-no	07/22/04	5.1	44	10000	1.1	30.7	0.21	16	8	2	none
South Fork Swan	MA5-no	08/17/05	6.1	60	10020	2.4	6.1	0.17	21	8	23	none
West Grouse Creek	MA5-no	08/01/07	7.5	44	9397	3.2	10.4	0.22	17	7	47	none
Deep Creek (Rifle RD)	MA5-S	08/18/04	3.3	168	8905	2.2	22.5	0.17	12	4	45	none
East Canyon Creek	MA5-S	9/4, 10/2/03	2.4	174	9976	2.5	12.8	0.29	15	5	14	none
Resolution Creek	MA5-S	08/15/06	3.6	180	9595	2.8	20.3	0.24	21	9	42	none
Three Forks Creek	MA5-S	08/02/07	2	232	7581	3.9	na	0.48	7	1	29	none
Turkey Creek	MA5-S	09/01/05	5.8	200	9196	4.6	8.7	0.19	22	9	26	none
Castle Creek	MA7	08/28/07	1.5	188	8828	7.4	2.4	0.24	20	7	34	sculpin
Keystone Gulch	MA7	08/08/06	4.8	68	9992	3.0	7.8	0.27	18	8	40	none
Two Elk Creek	MA7	08/05/04	7.6	170	9220	3.2	26	0.32	17	6	28	none
West Tenmile Creek	MA7	08/23/05	2.5	112	9997	5.9	3.2	0.16	15	6	71	sculpin

*these sites have or will be replaced and will not be continued. In some cases, physical data was not collected at these sites.

Table column definitions:
Mgmt area: code for which management area this site represents MA is the level of activity, C = cattle grazing, “no” = no livestock grazing, and “S” = sheep grazing.
Date = date sampled
grad. = reach gradient
alk. = total alkalinity in ppm
elevation = elevation at bottom of the reach
width = average wetted width of sampled reach
% fines = % of particles less than 6mm from Wolman pebble count
res.pool depth = average residual pool depth
#EPT = the number of Ephemeroptera, Plecoptera, and Trichoptera taxa collected during macroinvertebrate sampling
sed.sens. = A WRNF specific metric of sediment sensitive macroinvertebrate taxa collected
Trout = population of trout captured in the sampled reach based on a multiple pass depletion estimate (excludes young-of-year)
Other sp. = other species of fish also present

The table below summarizes some of the information available for boreal toad monitoring for populations on or near the White River National Forest in Eagle County. The first column under each site is the number of males, females, and egg masses detected during surveys (yearlings and juveniles were also counted, but are not presented here). Testing for chytrid fungus ("BD") was conducted at each site at least once. The result is presented (negative = "neg" and positive = "pos" with the total number of samples tested in parentheses). (Data provided by Tina Jackson, Colorado Division of Wildlife.)

Table 2 – Boreal Toad monitoring in Eagle County

	EA01 – Holy Cross City		EA02 – East Lake Creek		EA03 – East Vail		EA04 – Strawberry Lakes	
Year	M/F/egg	BD test	M/F/egg	BD test	M/F/egg	BD test	M/F/egg	BD test
1996	1/1/1		1/1/1					
1997	1/1/1		n/a					
1998	2/2/2		3/0/0					
1999	2/0/0		4/4/4		3/1/1			
2000	1/0/0		2/2/2		8/2/1			
2001	1/1/1		1/0/0		32/4/3			
2002	2/1/1		2/2/2		7/1/1			
2003	2/1/1	neg. (2)	2/2/2		4/1/1		1/1/1	
2004	1/0/0		2/2/2	neg (3)	5/1/1	neg (8)	1/1/1	
2005	1/0/0		16/1/1	neg (20)	8/2/2	**pos (9)**	0/2/0	
2006	0/0/0		5/0/1	neg (20)	6/1/1		no data	neg (14)
2007	1/0/0		8/1/1		2/2/2		3/2/2	

The table below summarizes some of the information available for boreal toad monitoring for populations on or near the White River National Forest in Pitkin County. The first column under each site is the number of males, females, and egg masses detected during surveys (yearlings and juveniles were also counted, but are not presented here). Testing for chytrid fungus ("BD") was conducted at three sites. The result is presented (negative = "neg" and positive = "pos" with the number of samples in parentheses). (Data provided by Tina Jackson, Colorado Division of Wildlife.)

Table 3 – Boreal Toad monitoring in Pitkin County

	PI01Conundrum Creek		PI02 East Maroon Creek		PI03 Lincoln Creek		PI04 Grizzly Reservoir		PI05 Campground Lift ponds		PI06 Homestake Reservoir	
Year	M/F/egg		M/F/egg	BD test	M/F/egg		M/F/egg		M/F/egg	BD test	M/F/egg	BD test
1995	3/1/1											
1996	1/1/1											
1997	2/2/2											
1998	2/2/0											
1999	0/0/0											
2000	2/2/2		3/3/3									
2001	3/9/3		3/3/3									
2002	1/1/1		3/3/3									
2003	0/0/0		3/3/3	neg (4)								
2004	0/0/0		7/1/1	neg (3)								
2005	0/0/0		2/2/2	neg (8)	0/0/0					neg (2)		
2006	0/0/0		2/2/2	neg (20)	0/0/1		0/0/0		0/1/0		found	neg (4)
2007	0/0/0	**pos***	5/5/5		2/2/2		0/0/0		0/0/0	**pos (14)**	4/2/2	

The table below summarizes some of the information available for boreal toad monitoring for populations on or near the White River National Forest in Summit County. The first column under each site is the number of males, females, and egg masses detected during surveys (yearlings and juveniles were also counted, but are not presented here). Testing for chytrid fungus ("BD") was conducted at 6 of the 8 sites at least once. The result is presented (negative = "neg" and positive = "pos" with the number of samples in parentheses). (Data provided by Tina Jackson, Colorado Division of Wildlife.)

Table 4 – Boreal Toad monitoring in Summit County

	SU01 Cucumber Gulch		SU02 Montezuma		SU03 Peru Creek		SU04 Upper North Tenmile	
Year	M/F/egg	BD test	M/F/egg	BD test	M/F/egg	BD test	M/F/egg	BD test
1995	1/1/1		7/1/1				6/6/6	
1996	?/?/0		9/?/0		1/1/1		17/6/6	
1997	2/1/1		1/1/1		6/2/2		13/3/3	
1998	1/0/0		0/0/0		3/1/1		18/3/1	
1999	1/1/1		3/1/1		14/1/1		2/3/3	
2000	0/1/0		0/0/0		19/1/1		7/4/4	
2001	0/0/0				29/1/1		8/2/2	
2002	0/0/0		0/0/0		2/1/1		8/8/8	
2003	0/0/0					**pos (2)**	1/1/1	neg (3)
2004	0/0/0				0/0/0		5/1/1	neg (4)
2005	1/1/0				0/0/0		2/2/2	neg (6)
2006					0/0/0		0/1/0	
2007					0/1/0		3/3/3	

	SU05 Lower North Tenmile		SU06 Upper North Fork Snake River		SU07 Lower North Fork Snake River		SU08 Straight Creek	
Year	M/F/egg	BD test	M/F/egg	BD test	M/F/egg	BD test	M/F/egg	BD test
1995								
1996	4/2/2							
1997	1/2/1							
1998	5/5/5		1/2/1		1/2/1			
1999	3/2/1		1/1/1		1/2/0			
2000	5/3/2		1/1/1		1/1/0			
2001	3/4/3		1/1/1		1/0/0			
2002	2/2/2		1/2/1		0/0/0			
2003	2/2/2			neg (3)			1/1/1	neg (7)
2004	1/1/1		16/0/0	neg (1)	1/0/0	neg (16)	0/0/0	
2005	4/4/4	neg (2)	20/0/0	neg (14)	0/0/0		0/0/0	
2006	2/0/0	neg (3)	20/0/0		0/0/0		0/0/0	
2007	0/0/0		0/0/0		0/0/0		0/0/0	

Appendix D - Scenery

Background

The *Scenery Management System (SMS)* is used by the Forest Service to determine the relative value and importance of scenery on NFS lands. The system is used in the context of ecosystem management to inventory and analyze scenery, assist in developing natural resource goals and objectives, monitor scenic resources, and ensure that attractive landscapes are sustained for the future. Providing a natural-appearing, scenic landscape is therefore an important element of forest management.

The Land and Resource Management Plan for the WRNF was completed in 2002, which included a *SMS* inventory. The "Plan" established acceptable limits of change for Scenery Resources. The acceptable limits are the Adopted Scenic Integrity Objectives. Scenic Integrity Objectives (SIO's) are defined by minimally acceptable levels with the direct intent to achieve the highest scenic integrity possible. Scenic Integrity is used to describe an existing situation, standard for management, or desired future condition. SIO's are expressed as forest plan objectives described in the Forest Plan standards and guidelines.

Forest Plan Direction

- *Page 1-1, bullet 4:* It is a **regional goal** to, "Provide for scenic quality and a range of recreational opportunities that respond to the needs of forest customers and local communities".
- *Page 1-10,* Forest **Goal 2 Objective 2a**: Improve the capability of the national forests and grasslands to provide diverse, high quality outdoor opportunities.
- *Page 1-11, 12,* Forest **Goal 2 Objective 2c**: Provide a variety of uses, products and services for present and future generations by managing within the capability of sustainable ecosystems.
- *Page 2-34,* **Scenery Management Forest-wide Guidelines**:
  1. Management activities should be designed and implemented to achieve, at minimum, the level of scenic integrity shown on the scenic integrity objective map.
  2. Rehabilitate all existing projects and areas that do not meet the scenic integrity objectives. Set priorities for rehabilitation considering the following:
     - •Relative importance of the area and the amount of deviation from the scenic integrity objectives;
     - •Foreground of high public use areas has highest priority;
     - •Length of time it will take natural processes to reduce the visual impacts so that they meet the scenic integrity objective(s);
     - •Length of time it will take rehabilitation measures to meet the scenic integrity objectives; and
     - •Benefits to other resource management objectives to accomplish rehabilitation.
  3. Plan, design, and locate vegetation manipulation on a scale that retains the color and texture of the landscape character, borrowing directional emphasis of form and line from natural features.

4. Choose facility and structure design, scale, color of materials, location, and orientation to meet the scenic integrity objective on the Scenic Integrity Objective Map.
5. Facilities, structures, and towers with exteriors consisting of galvanized metal or other reflective surfaces will be treated or painted dark non-reflective colors that blend with the forest background to meet an average neutral value of 4.5 or less as measured on the Munsell neutral scale.
6. Rehabilitate areas classified as "unacceptable alteration" in the existing scenic integrity inventory to the scenic integrity objective on the Scenic Integrity Objective Map.

Monitoring Driver: *Page 1-11, 12,* Forest **Goal 2 Objective 2c, Strategy 2c.9** states, "Within five years of plan approval, and each following 5 years, evaluate scenery management monitoring results and implement appropriate management adjustments".

Scenery Management – Scenic Integrity is a measure of the degree to which a landscape is visually perceived to be "complete." The highest scenic integrity ratings are given to those landscapes which have little or no deviation from the character valued by constituents for its aesthetic appeal. Scenic Integrity is used to describe an existing situation, standard for management, or desired future conditions. A Scenic Integrity Objective (SIO) is a goal to achieve a desired integrity level after completion of management activities. SIO definitions are as follows: (Landscape Aesthetics, pages 2-4)

- *VERY HIGH*: scenic integrity refers to landscapes where the valued landscape character "is intact" with only minute if any deviations. The existing landscape character and sense of place is expressed at the highest possible levels. (Note: This SIO usually only applies to wilderness areas.)
- *HIGH*: scenic integrity refers to landscapes where the valued landscape character "appears intact". Deviations may be present but must repeat the form, line, color, texture and pattern common to the landscape character so completely and at such scale that they are not evident.
- *MODERATE*: scenic integrity refers to landscapes where the valued landscape character "appears slightly altered". Noticeable deviations must remain visually subordinate to the landscape character being viewed.
- *LOW*: scenic integrity refers to landscapes where the valued landscape character "appears moderately altered". Deviations begin to dominate the valued landscape character being viewed but they borrow valued attributes such as size, shape, edge effect and pattern of natural openings, vegetative type changes or architectural styles within or outside the landscape being viewed. They should not only appear as valued character outside the landscape being viewed but compatible or complimentary to the character within.
- *VERY LOW*: scenic integrity refers to landscapes where the valued landscape character "appears heavily altered." Deviations may strongly dominate the valued landscape character. They may not borrow from valued attributes such as size, shape, edge effect and pattern of natural openings, vegetative type changes or architectural

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Appendix E – Air

Visibility Background

Section 169A of the Clean Air Act states, "Congress hereby declares as a national goal the prevention of any future, and the remedying of any existing, impairment of visibility in mandatory class I Federal areas which impairment results from manmade air pollution." Within the Clean Air Act, visibility is specifically mentioned as a Class I air quality related value that must be protected.

Photographic Images

Visibility monitoring began on the WRNF in the early 1990's. Cameras were set up at two sites to automatically capture daily images of specific wilderness scenes. The Eagle's Nest site was established in 1993 on Vail Mountain and discontinued in 2000. Camera operated visibility monitoring information on this site can be accessed at the following website: http://www.fsvisimages.com/gallery/EANE/start.htm

The Maroon Bells site was established in 1991 on the top of AJAX Mountain. Camera monitoring was discontinued at this site in 1999. Camera operated visibility monitoring information on this site can be accessed at the following website: http://www.fsvisimages.com/gallery/MABE/start.htm

The images below illustrate natural and measured visibility conditions.

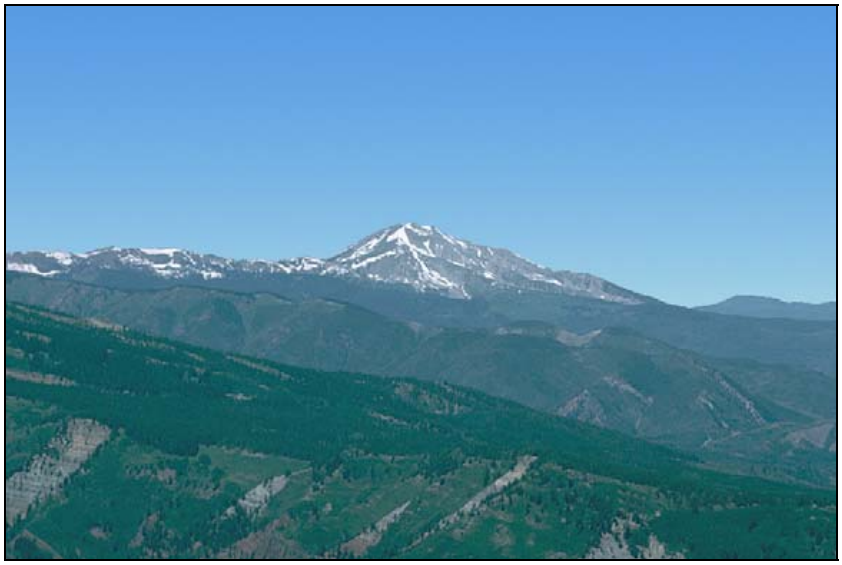

Figure 1: Maroon Bells-Snowmass Wilderness – Natural Best Days
Reference Vista of Maroon Bells-Snowmass Wilderness WinHaze Modeled Image
Haze Index (HI) = 0.52 deciviews; Bext = 10.5 $Mm^{-1;}$ Visual Range = 371 km/231 mi
(CDPHE 2007)

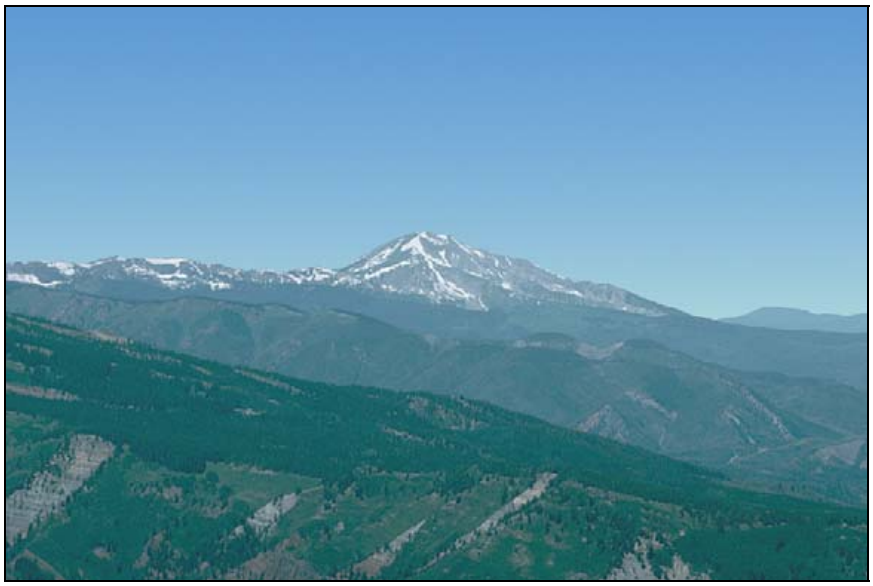

Figure 2: Maroon Bells-Snowmass Wilderness – Natural Worst Days
Reference Vista of Maroon Bells-Snowmass Wilderness WinHaze Modeled Image
Haze Index (HI) = 6.54 deciviews; Bext = 19.2 $Mn^{-1;}$ Visual Range = 203 km/126 mi
(CDPHE 2007)

Figure 3 visually compares the average condition of the 20 percent best days and 20 percent worst days during the 2001 to 2004 monitoring period.

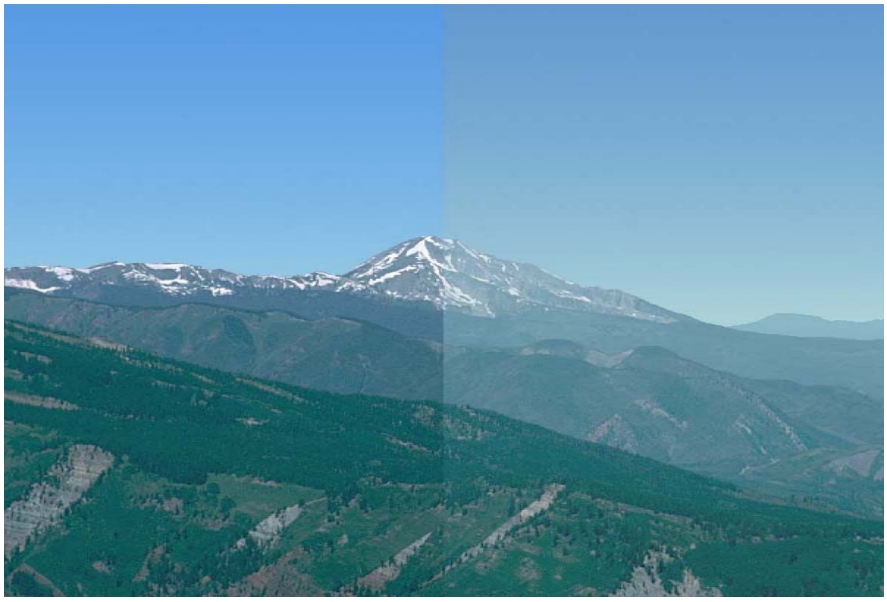

Figure 3: Maroon Bells-Snowmass Wilderness - Simulation of the Best and Worst Conditions: Monitored 2001-2004
Reference Vista of Maroon Bells-Snowmass Wilderness WinHaze Modeled Image

Haze Index (HI) =	Best: 0.7 deciviews	Worst: 9.6 deciviews
Visual Range =	Best: 365 km/227 mi	Worst: 150 km/93 mi

(CDPHE 2007)

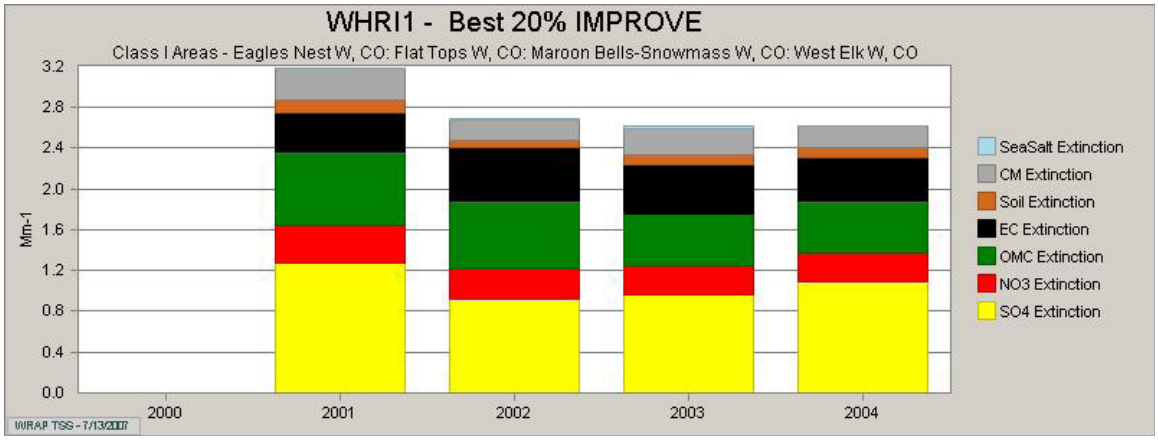

Figure 4: Reconstructed Extinction for 20% Best Days over Baseline Period

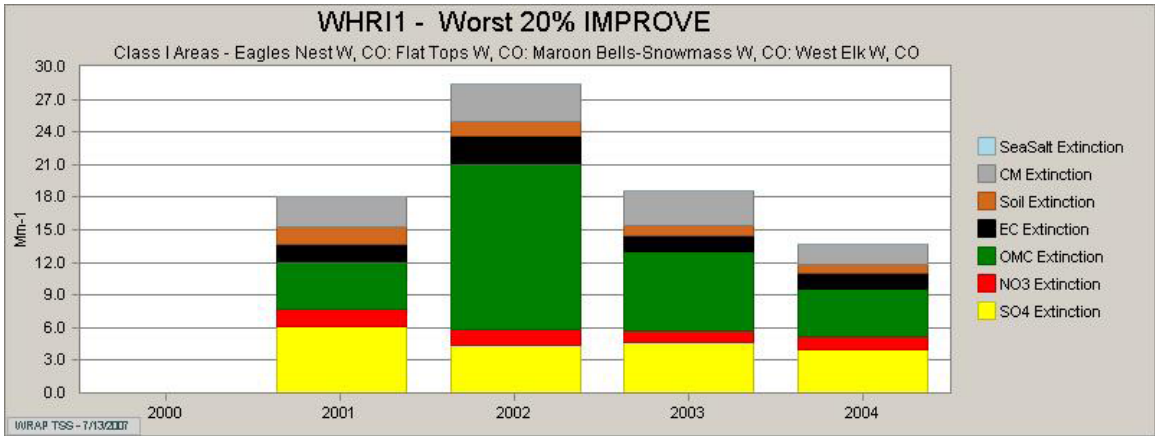

Figure 5: Reconstructed Extinction for 20% Worst Days over Baseline Period

An analysis of the sources of emissions reaching the AJAX IMPROVE site is available online at http://vista.cira.colostate.edu/tss/. The following pie graphs (Figures 6-13) pertain to 2002 data from this site and depict emission source contributions by region for the best and the worst 20 percent days. The bar graphs break down the source type (point, area, mobile, etc.) for each source contribution for the best and the worst 20 percent days.

The source titled "CENRAP" essentially represents states within the Midwestern United States. The source title "WRAP" represents Western States. "Outside Domain" is all other sources not specifically identified.

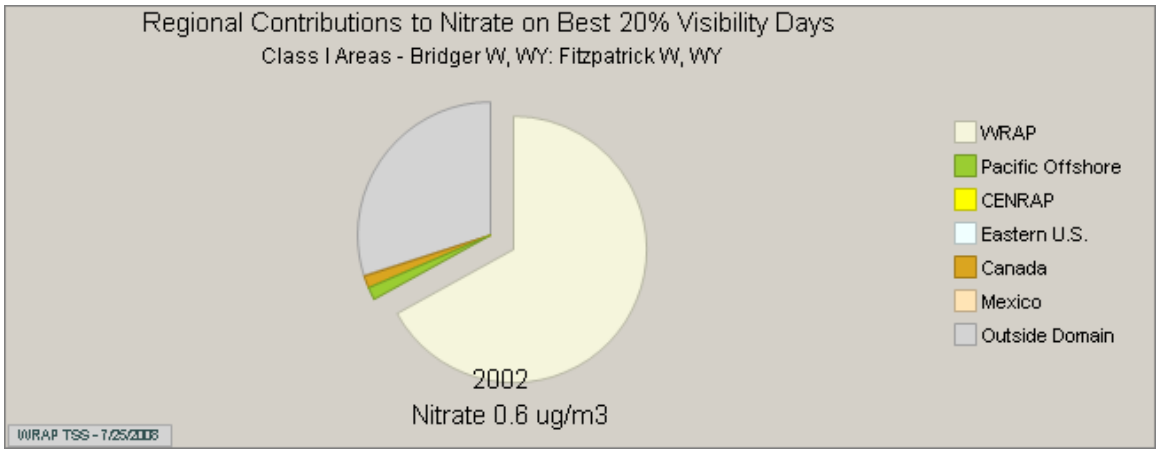

Figure 6

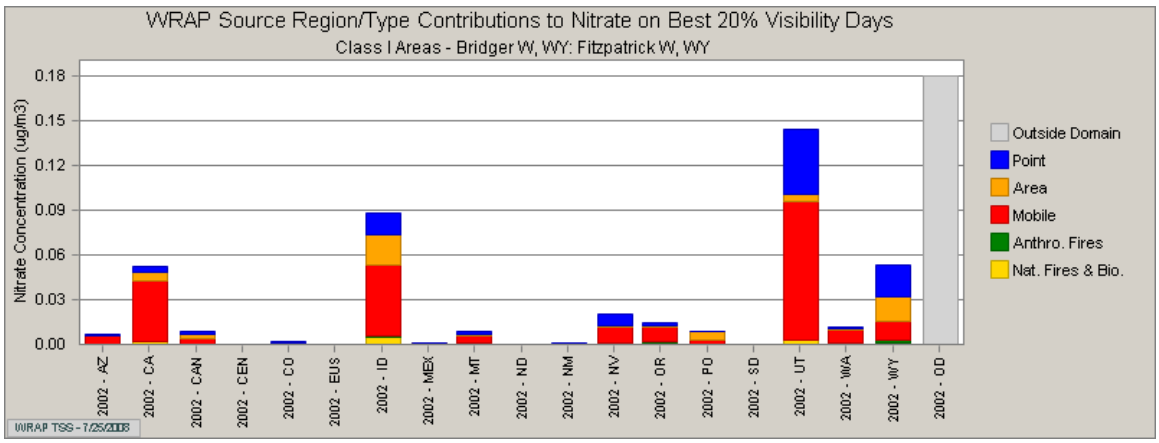

Figure 7

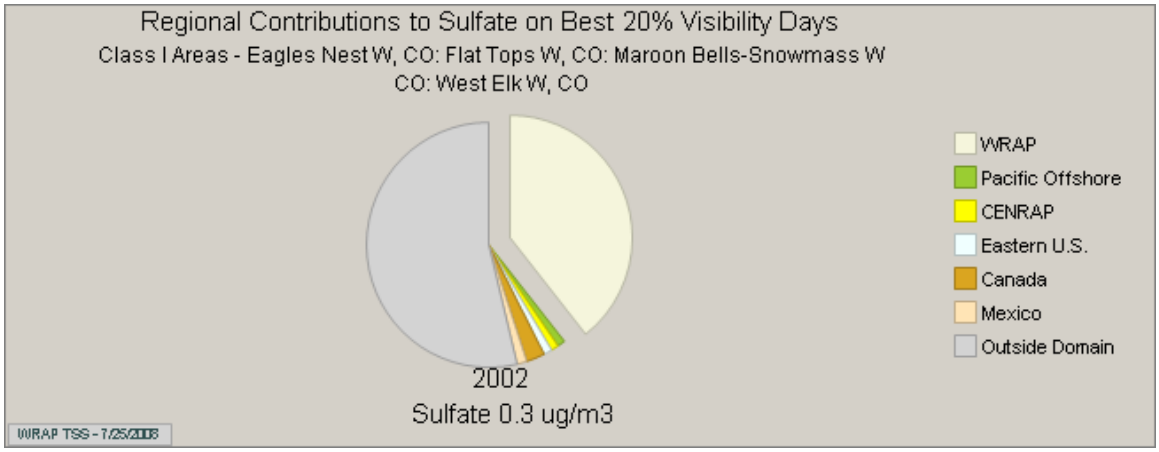

Figure 8

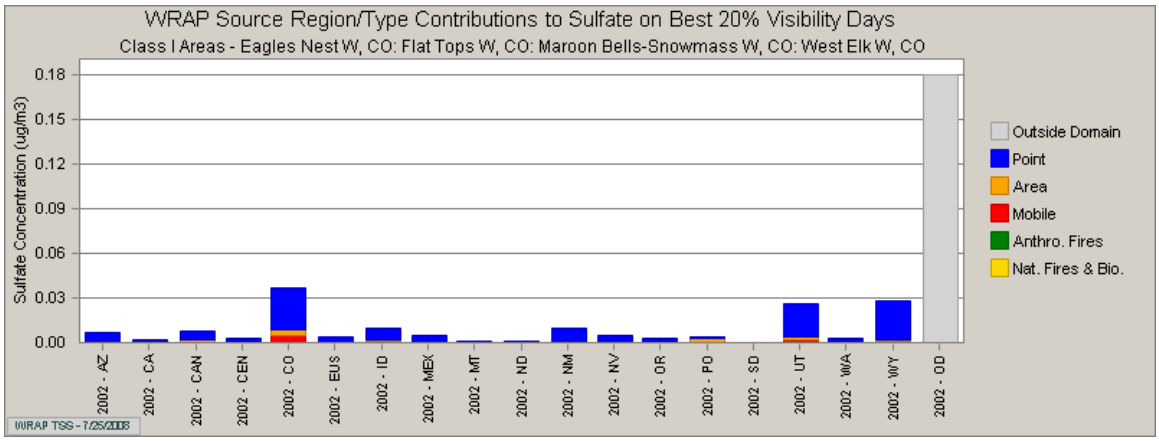

Figure 9

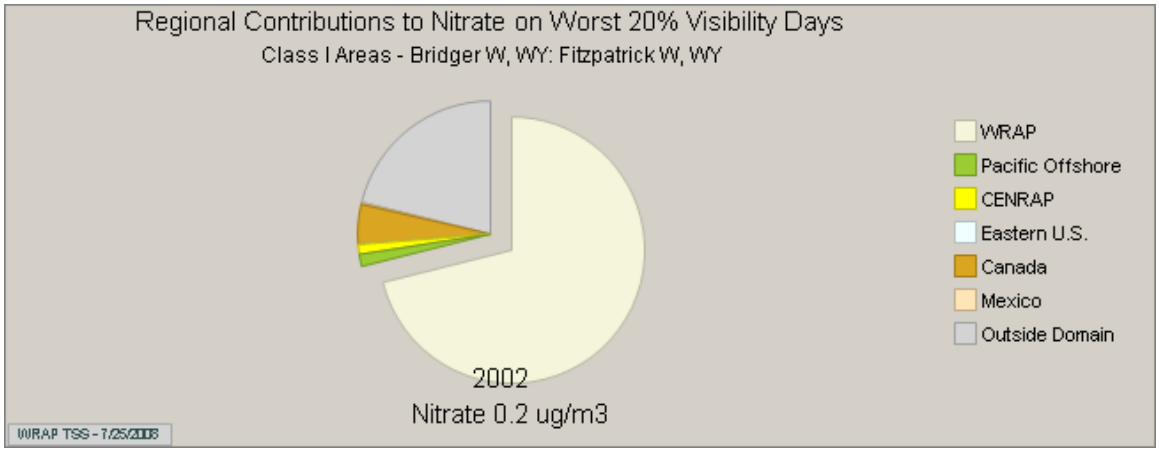

Figure 10

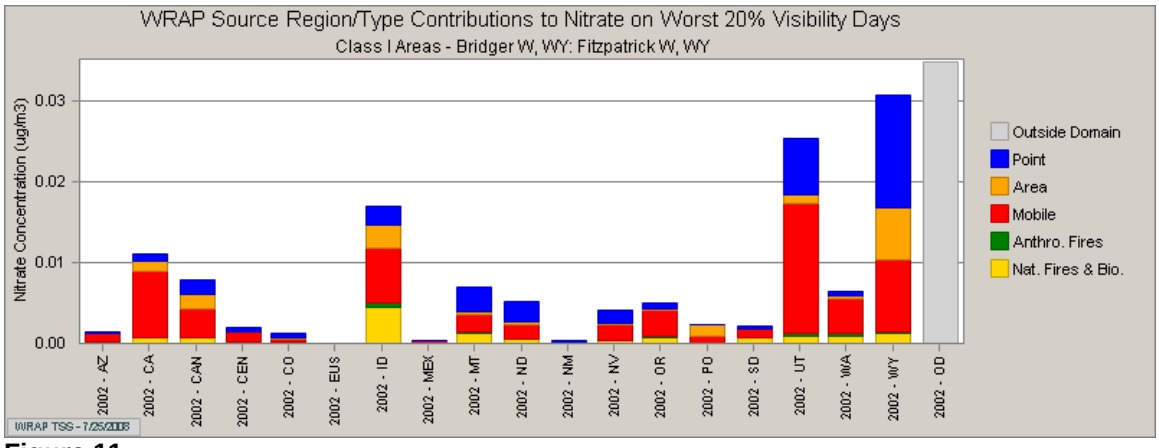

Figure 11

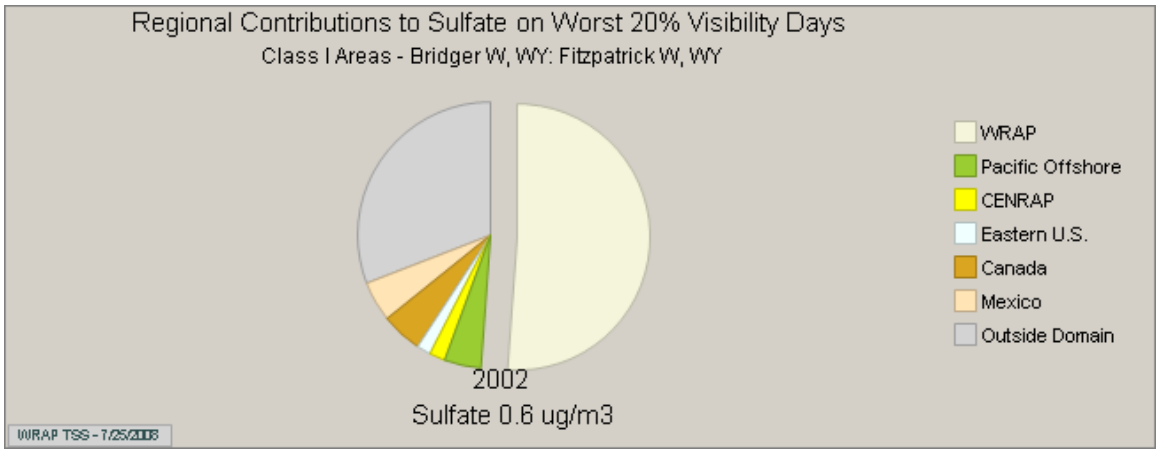

Figure 12

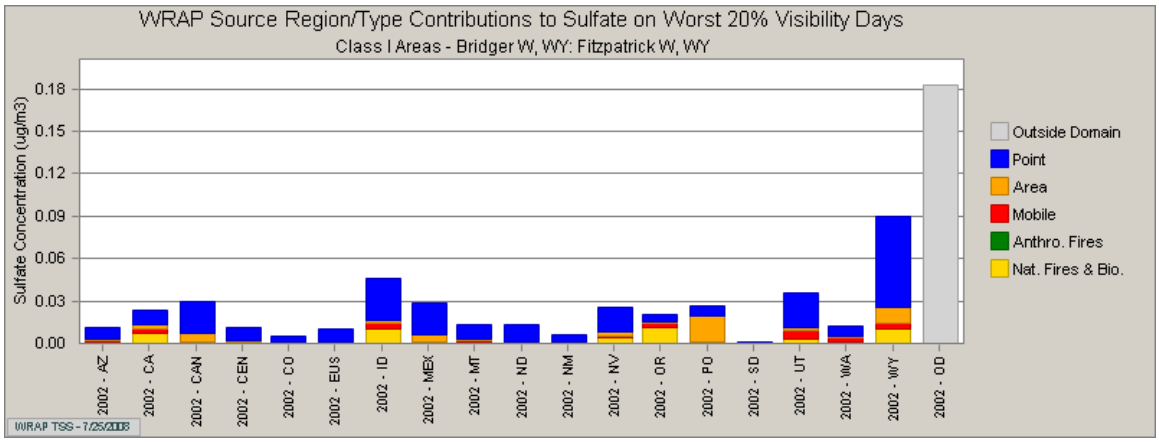

Figure 13

The following graphs of chemical constituents of interest are available through the NADP website (http://nadp.sws.uiuc.edu/). Figures 14 and 15 show trends in the deposition of ammonium respectively at the Four Mile (Site CO08) and Sunlight Mountain (Site CO92) NADP sites. Figures 16 and 17 are graphs of nitrate deposition at each respective site and Figures 18 and 19 show sulfate deposition values.

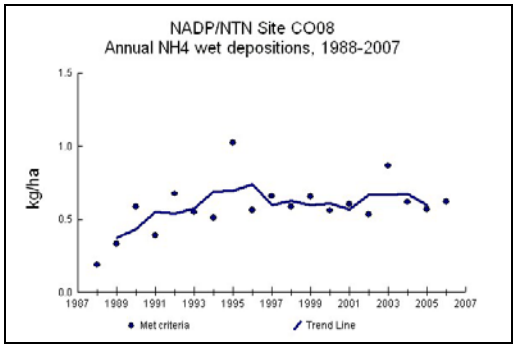

Figure 14

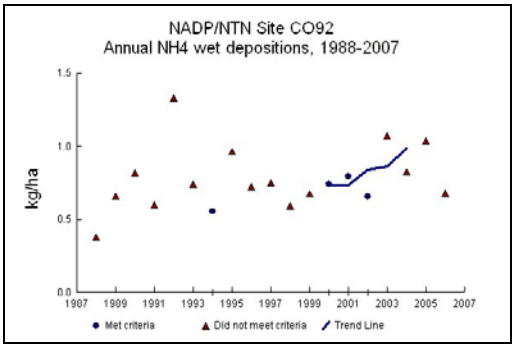

Figure 15

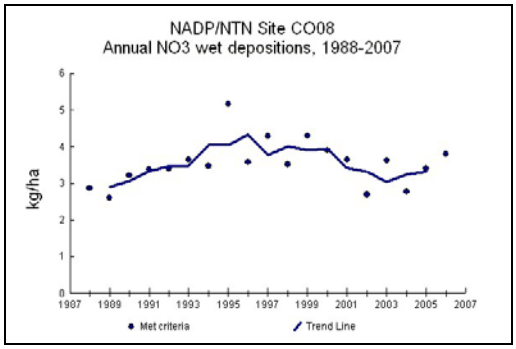

Figure 16

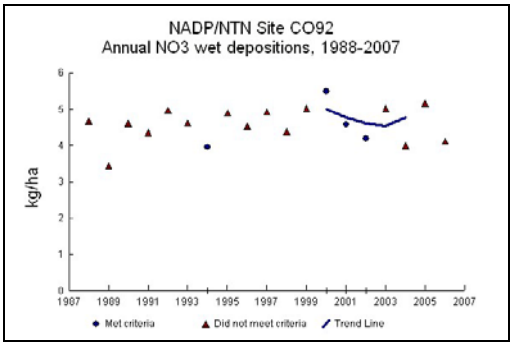

Figure 17

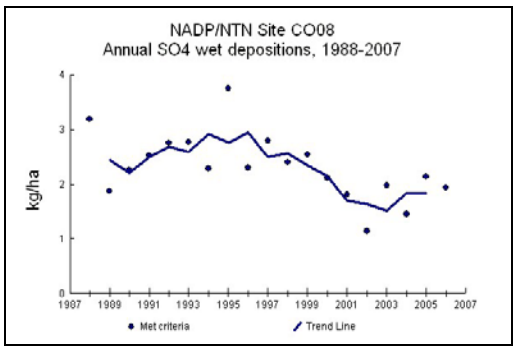

Figure 18

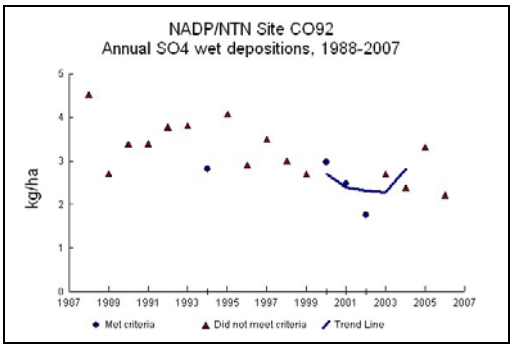

Figure 19

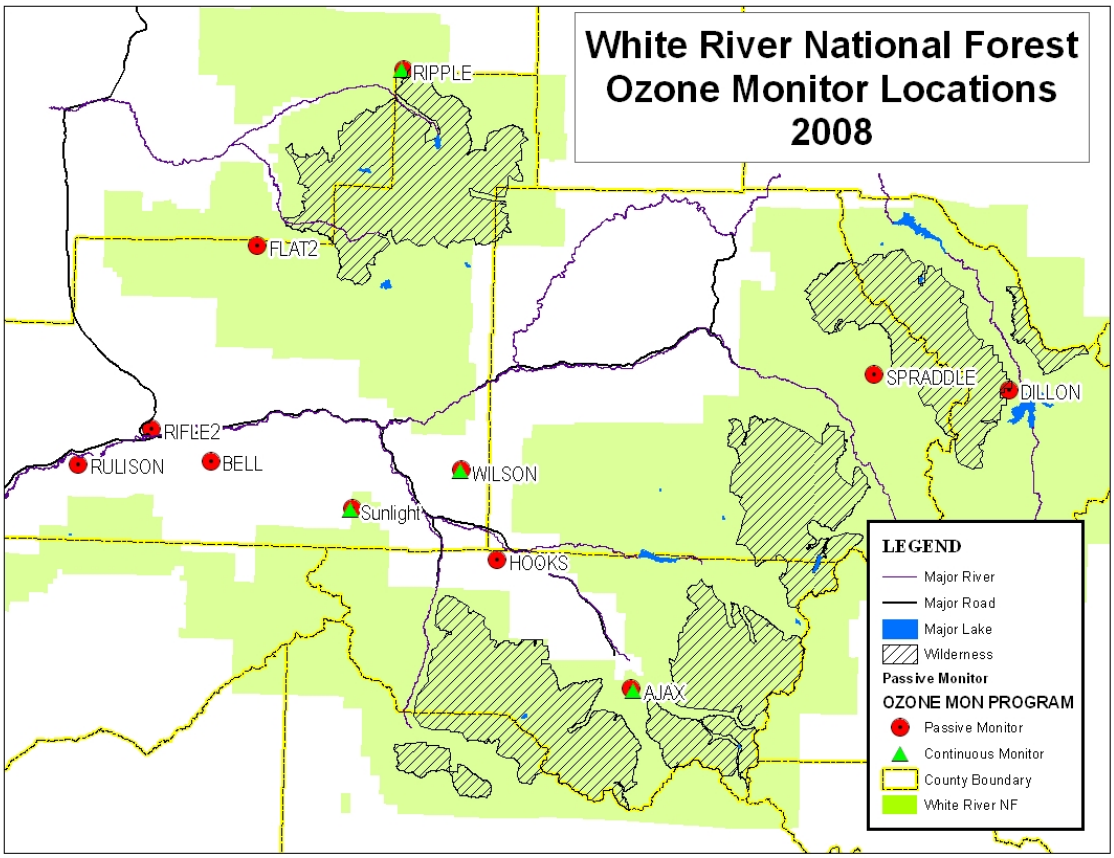

Figure 20 - WRNF Ozone monitor locations in 2008

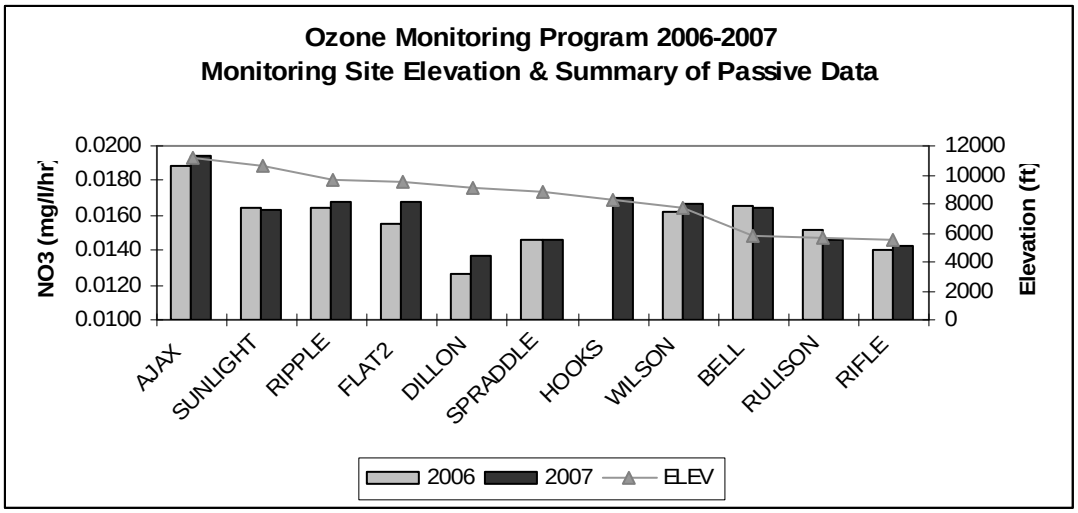

Figure 21 - Comparison of monitoring site elevation and mean ozone surrogate values

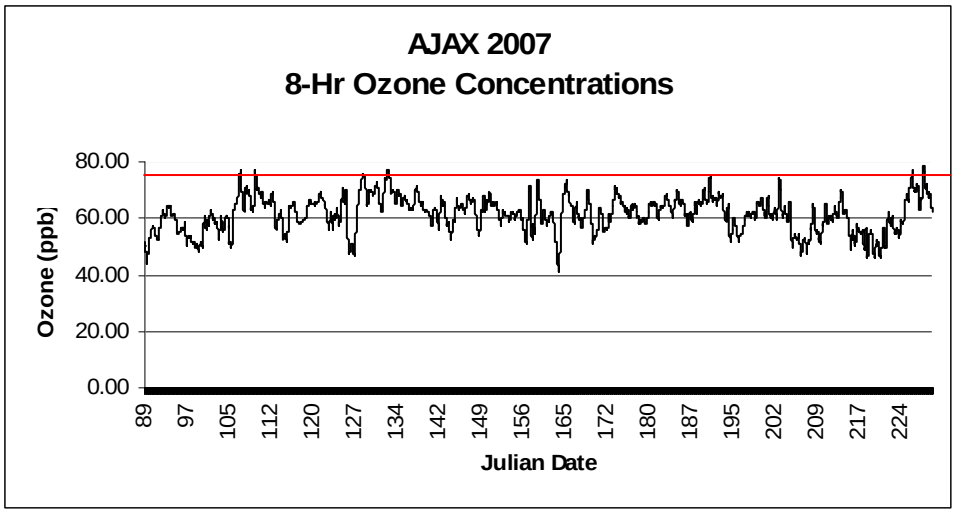

Figure 22 – 8-hour average ozone concentrations at AJAX continuous monitoring site

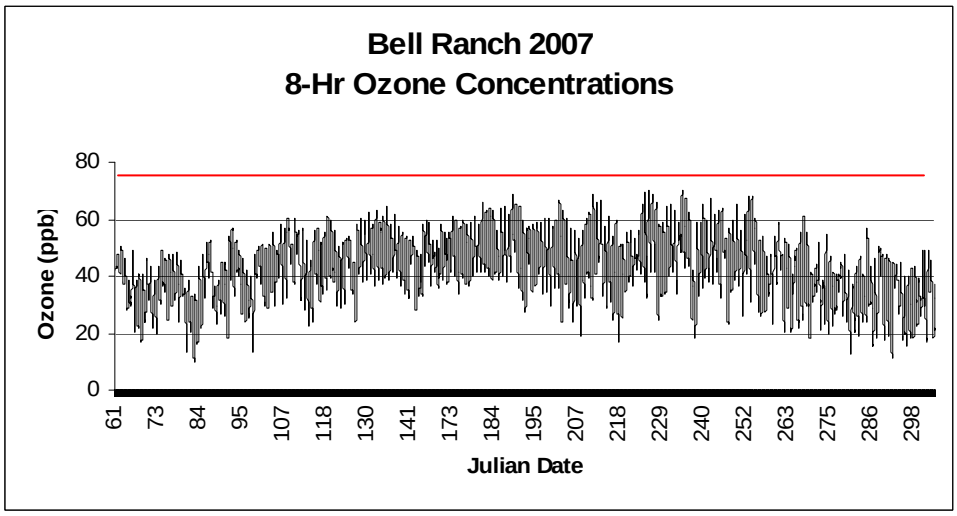

Figure 23 – 8-hour average ozone concentrations at Bell Ranch continuous monitoring site

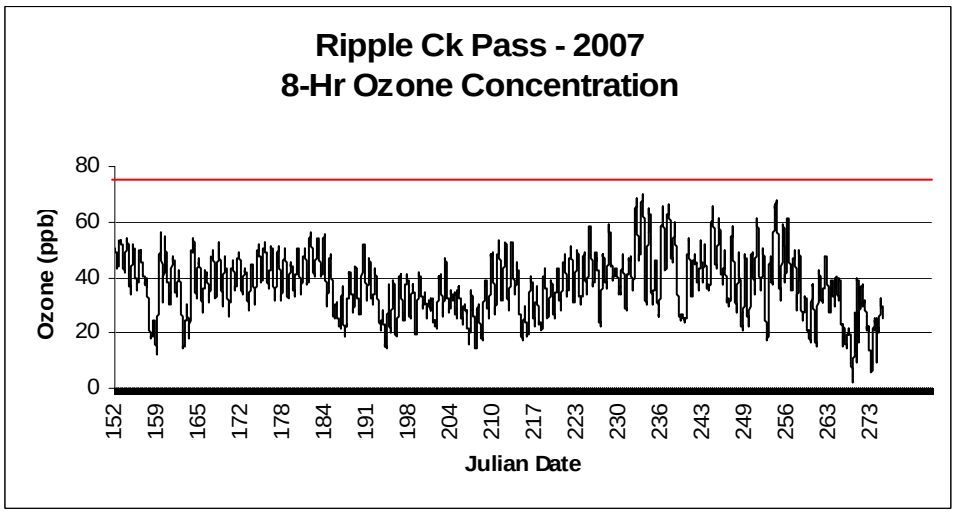

Figure 24 – 8-hour average ozone concentrations at Ripple Creek Pass continuous monitoring site

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