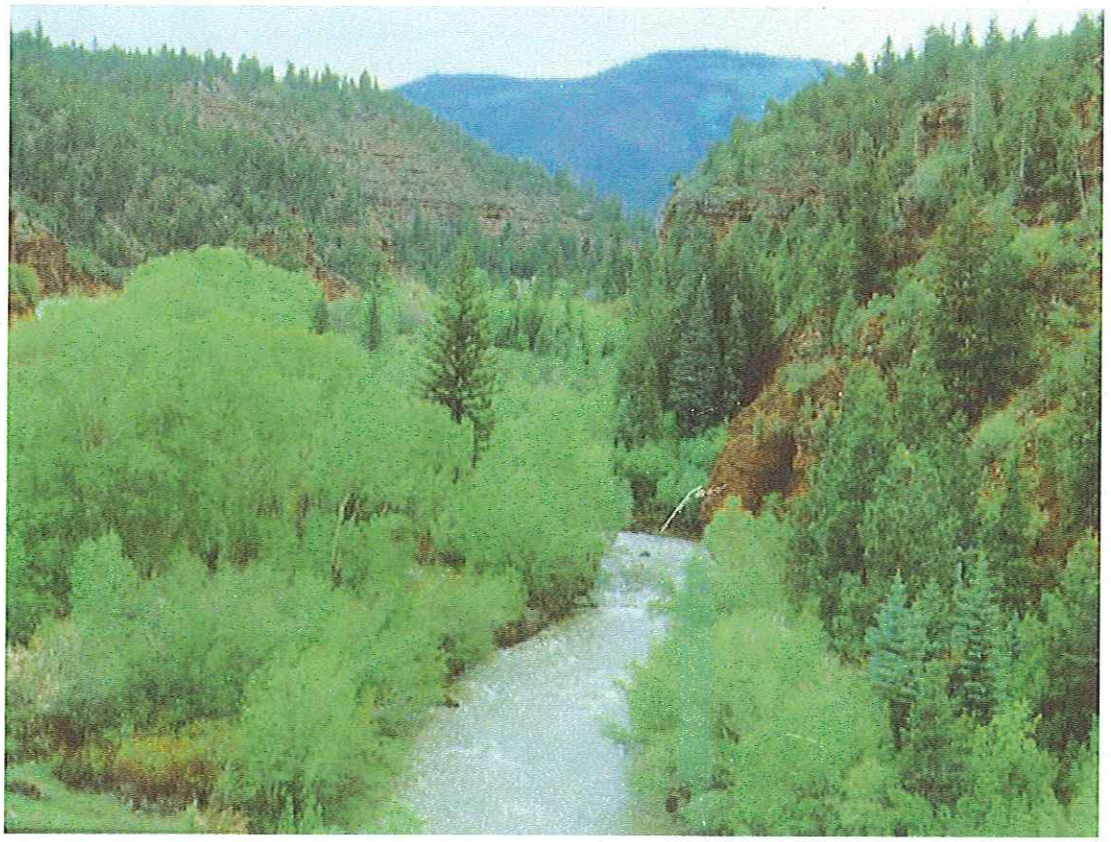
2005 Report Card

The Ecological Health of the San Miguel River Watershed



Produced by
The Nature Conservancy and the
San Miguel Watershed Coalition

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Thanks to Chris Pague, Senior Ecologist for The Nature Conservancy of Colorado, for inspiring us to undertake this project. Many thanks to the core team members Amanda Clements, Dennis Murphy, and Dave Schneck for setting the direction and methodology, gathering data, and providing regular input. Thanks to everyone who contributed data and expertise: John Almy, U.S. Forest Service; Mark Caddy, Colorado Division of Wildlife; Laurie Felix, Montrose County

Weed Manager; Sheila Grother, San Miguel County Weed Manager; and Peggy Lyon, Colorado Natural Heritage Program. Thanks to Deb Dion for producing the climate graphs and editing the report. Thanks to John Lifton of the Telluride Institute for supplying watershed maps. Thanks to Nikki Matous and Chris Brodabahm of The Nature Conservancy's Marketing Resource Center for designing and producing the executive summary and the full report.

Thank you to the following individuals who reviewed the executive summary and or the full report: Team Members (see above), Deb Dion, San Miguel County; David Gann, The Nature Conservancy; Tom Iseman, The Nature Conservancy; Linda Luther, San Miguel County; Linda Miller, Telluride Town Open Space member; Josh Sale, San Miguel County Open Space Commission; Pamela Zoline, Telluride Institute.

EXECUTIVE SUMMARY

This report presents the results of an ecological health assessment of the San Miguel Watershed, an area that covers approximately one million acres in Southwest Colorado. The overall objective of this assessment is to communicate the ecological health status of the watershed to interested citizens. It is the hope of The Nature Conservancy and the San Miguel Watershed Coalition that this report card will be replicated annually, to track the important attributes that represent the natural heritage of the San Miguel Watershed, and report on trends to its citizens. The report evaluates five themes that encapsulate the ecological health of the watershed: Water, Aquatic Life, Wildlife, Vegetation, and Soils. The assessment process involves compilation and analysis of the most up-to-date biological data available for the indicators for each attribute. The following chart shows the main attributes associated with each theme. Each attribute can have numerous indicators associated with it in order to get a comprehensive grade.

Watershed Health Report Card

A. Water	**GPA =**	**C**
a. Water Quality		B
b. Water Quantity		C
c. River Processes		C+
B. Aquatic Life	**GPA =**	**C**
a. Macro-Invertebrates		C
b. Native Fish		C
c. Non-Native Fish		C
B. Wildlife	**GPA =**	**C+**
a. Rare Species		C-
b. Landscape Species		C+
c. Migratory Birds		B
C. Vegetation	**GPA =**	**C+**
a. Vegetation Zones		C+

Grading System:
A = Excellent
B = Good
C = Fair
D = Poor
F = Failing

b. Rare Plant Species C
c. Rare Plant Communities B

D. Soils GPA = C+
a. Erosion C+
b. Surface Cover C+
c. Biological Crust C-

Overall Cumulative Watershed Health GPA = C

Grade Explanation:

Water: Quality is much improved from historic levels, but the upper basin is still affected by mining tailings. The planned clean-up of the Caribou mine in Ophir will further help the Howard's Fork. Quantity is OK, but need to make sure new water uses don't further degrade flows. River and Stream channel processes need the most work!

Aquatic Life: Native fish populations doing pretty well. Need to monitor the populations in the lower basins, and try to understand the effect of non-native fish on the native fish better.

Wildlife: Good work on recovery efforts for bald eagle, river otter, and Canada lynx. Gunnison Sage-grouse populations continue to be of grave concern. Rest of animals doing well.

Vegetation: Good work understanding and tracking rare plants and rare plant communities! Most of the higher elevation vegetation zones are in good shape, but the lower elevation zones could use some more attention. Weeds are a big concern at all levels.

Soils: Recreation and logging are having some impacts at higher elevations. Lower elevations have too much erosion and lack adequate soil cover.

Climate: Although this wasn't graded, this is an area that needs much attention in the coming years! This affects all of the other grades, and it seems that we are on a warming and drying trend locally. Need to better understand atmospheric deposition, and monitor for any increases in pollutants.

According to our ecological grading scale, the status of the San Miguel Watershed rates as fair or "outside range of acceptable variation; vulnerable to a serious degradation if left unchecked." Past activities in this watershed have dealt us this rank, but there is hope! There are successful on-going recovery efforts. The bald eagle has been removed from the Endangered Species List, the status of the river otter has gone from endangered to threatened, and there is a strong Canada Lynx recovery program in place. There are programs in place to clean stream stretches impacted by old mining practices, and methods to recover lands once overgrazed. The reversal of negative impacts takes decades, but we have already seen improvement. Through partnerships, and the help of engaged citizens, we can work to improve this watershed!

How Can You Help?

- *Contribute funds to the USGS to launch a comprehensive database for the San Miguel and Dolores watersheds.*
- *Become a member of the San Miguel Watershed Coalition. Go to www.sanmiguelwatershed.org and click Join Now!*
- *Contribute time, effort, and / or financial support to help advance the health of the San Miguel Watershed!*

INTRODUCTION

Background and Purpose

This report presents the results of an ecological health assessment of the San Miguel Watershed, an area that covers approximately one million acres in Southwest Colorado. The overall objective of this assessment was to communicate the ecological health status of the watershed to interested citizens. It is the hope of The Nature Conservancy and the San Miguel Watershed Coalition that this report card will be replicated annually, to track the important attributes that represent the natural heritage of the San Miguel Watershed, and report on trends to its citizens, and work together to identify significant ways to improve the health of the watershed. The report evaluates five themes that encapsulate the ecological health of the watershed: Water, Aquatic Life, Wildlife, Vegetation, and Soils. Establishing indicators, or benchmarks which measure the health of major environmental resources, is one of the most significant actions our community can take to facilitate practical steps towards genuine sustainability.

SAN MIGUEL WATERSHED ECOLOGICAL OVERVIEW

The San Miguel Watershed is like an enormous leaf, with streams and rivers the veins which drain the land in between, and the whole system a delicately tuned mechanism of amazing capability. Because it combines mountains with near desert terrain, the watershed is sparsely settled and still largely natural. Much of the wildlife originally found here still roams through vegetation which has been only slightly altered by man's activities. The watershed, approximately 1,550 square miles in size, provides habitat for 29 globally rare plant communities and 12 globally rare plants tracked by the Colorado Natural Heritage Program.

The San Miguel River, a tributary of the Dolores River in the upper Colorado River Basin, is one of the last free flowing rivers in the Colorado River watershed. Because it has never been dammed, the many of the river's natural processes are still substantially intact: mid-winter ice flows scour its banks, water volume rises dramatically as the high country snow melts and mid-summer monsoons swell its reach in the low country. This free-flowing river supports one of the longest and highest-quality stretches of deciduous and evergreen riparian forests and shrublands

(about 85 miles) in the Western United States. The river supports a dynamically functioning, rich mosaic of riparian and aquatic habitat types and associated species. In the arid West, riparian areas make up a tiny fraction of the landscape, yet these ribbons of life support up to 90 percent of our wildlife species and are "the most diverse, dynamic and complex biophysical habitats on the terrestrial portion of the Earth." (Naiman et al.1993).

Ecological Processes

Major ecologic processes such as watershed hydrology, climate, geomorphic and natural disturbance regimes influence the river system, aquatic life, vegetation, soils and wildlife. For the streams and rivers, these dynamic and variable processes are the principal driving forces behind river channel movement and the creation of bare soil sites that enable riparian plants to grow. For the land and vegetation, these processes create diversity, supporting over 1,000 plant species, numerous distinctive communities, and associated wildlife.

Some of these ecological processes are properties of climate, geology and physics, and as such are little affected by activities within the watershed. For example, snowmelt, ice flows and monsoonal moisture will continue to impact upper river reaches differently from lower ones no matter what manmade changes occur here.

Other ecological processes have been and are now being influenced by human actions. The impacts affect individual components of the watershed--like stream reaches or wildlife species--and, because of its inherent interconnectedness, the watershed as a whole. The natural systems in the San Miguel Watershed developed together over thousands of years. Such co-evolution leads to diversity, and a web of interlocking components and interdependencies. These systems are complex, and resilient to disturbance. However, when individual components, processes or relationships are affected or removed, the impacts can be far reaching and unpredictable.


Montrose
SAN MIGUEL
WATERSHED
San Miguel
Ouray
Dolores
San Juan

WATERSHED HEALTH ASSESSMENT PROCESS

Steps of the Watershed Health Assessment Process

The watershed health assessment process involves compilation and analysis of the most up-to-date biological data available for the assessment themes. It is an iterative process involving eight key steps:

1. Select broad focal themes for the ecological health of the watershed.
2. Select attributes for each theme that collectively represent the theme.
3. Assign indicators to each attribute in order to gauge health.
4. Grade each indicator based on most recent data and expert opinion.
5. Compute grades for a comprehensive grade for each attribute, theme, as well as an overall ecological health grade for the watershed.
6. Identify data gaps or additional research/inventory needs.
7. Team members and others review grades, supporting analysis, and data needs.
8. Produce and distribute final report.

Data Sources

Liz Hatzenbuehler of The Nature Conservancy led data collection for this assessment.

Dennis Murphy of the Bureau of Land Management provided his data and expertise on river processes, specifically ice flows and macro-invertebrates with input on channel morphology and water quality and quantity.

Mallory Dimmitt of TNC wrote the water quality and quantity descriptions by collecting and interpreting data from Riverwatch and the United States Geological Survey.

Amanda Clements, BLM, served as a liaison between the assessment team and other public land managers (Kelly Liston, Rangeland Management Specialist, USFS; Terry Hughes, Soil Scientist, USFS; Brad Banulis, Terrestrial Biologist, CDOW; Mark Caddy, District Wildlife Manager, CDOW, and Jim Garner, Conservation Biologist, CDOW).

Amanda provided BLM data on channel morphology, and gathered data from colleagues on wildlife, migratory birds, vegetation zones and soils.

Dan Kowalski of the Colorado Division of Wildlife provided data on the native and non-native fish species.

Jim Garner Wildlife Conservation Biologist, CDOW, Kathy Nickell of the BLM, and Jim Ferguson of the BLM provided information on rare and declining species, specifically Gunnison sage-grouse and Bald Eagles.

Peggy Lyon with the Colorado Natural Heritage Program provided input on the rare and imperiled plant species and communities.

Sheila Grother, San Miguel County Weed Manager, provided data and input on the invasive and noxious weed components within the vegetation zones.

Deb Dion, San Miguel County Environmental Health Specialist created graphs from data collected by the Western Regional Climate Center (WRCC) for temperature and precipitation within the watershed.

Dave Schneck, San Miguel County Environmental Health Director, provided data and a write-up for the Climate section, and also on instream flow protection within the watershed.

Grading System Explanation

A = **excellent**: functioning at ecologically desirable status; requires little human intervention.

B = **good**: functioning within range of acceptable variation; may require human intervention to maintain its status.

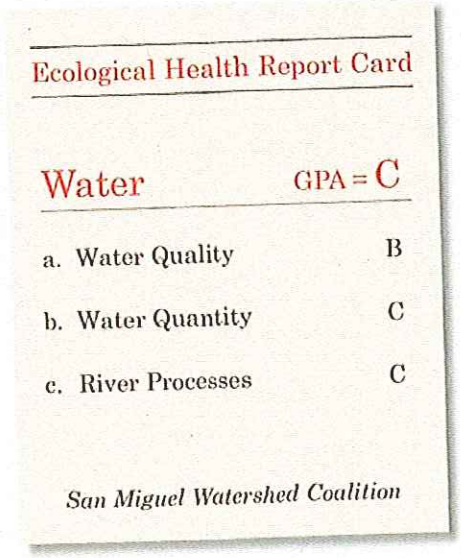
C = **fair**: outside range of acceptable variation; vulnerable to a serious degradation if left unchecked.

D = **poor**: if condition remains for extended period, restoration or prevention of extirpation will be practically impossible.

F = **failing**: irreversible, completely converted.

Numeric Values	**Grade Scale for Current vs. Historic Comparisons**
A = 4.0 or greater	**A = 100% or greater**
B = 3.0 to 3.99	**B = 75% to 99% of historic levels**
C = 2.0 to 2.99	**C = 50% to 74% of historic levels**
D = 1.0 to 1.99	**D = 25% to 49% of historic levels**
F = 0.0 to 0.99	**F = 0% to 24% of historic levels**

ASSESSMENT RESULTS


Ecological Health Report Card

Water GPA = C

a. Water Quality B

b. Water Quantity C

c. River Processes C

San Miguel Watershed Coalition

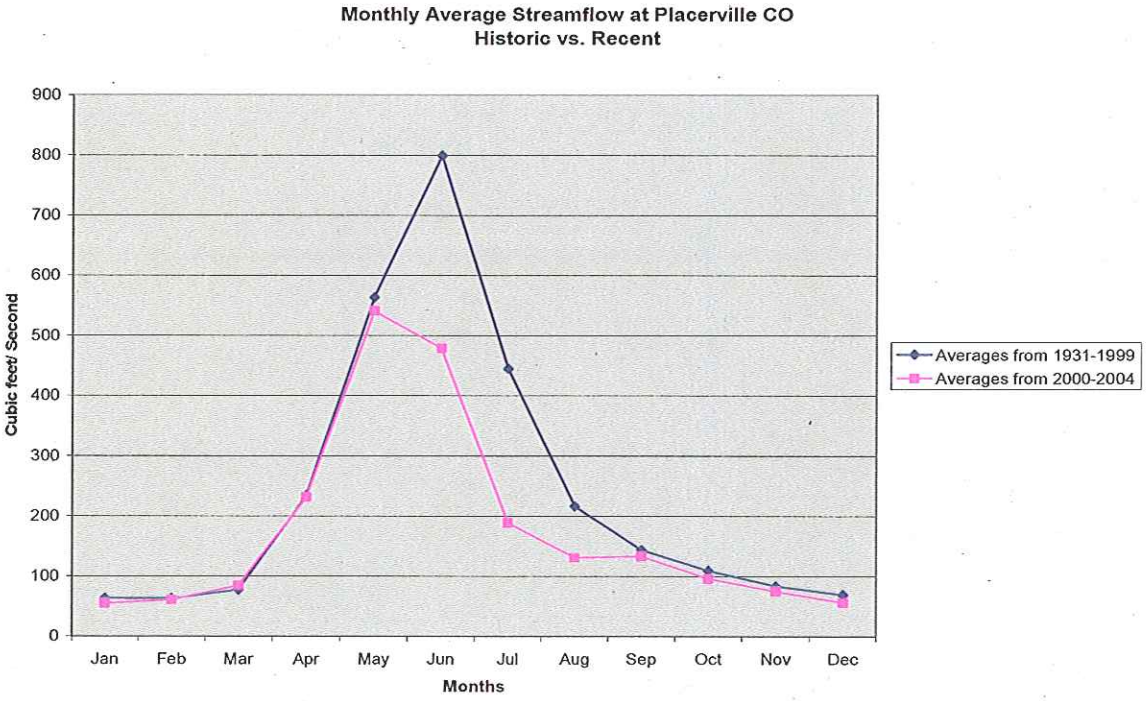
Water

The grade point average for water health in the San Miguel Watershed was calculated from the grades of three attributes: water quantity, water quality, and river processes. Each attribute and grade is described in more detail below.

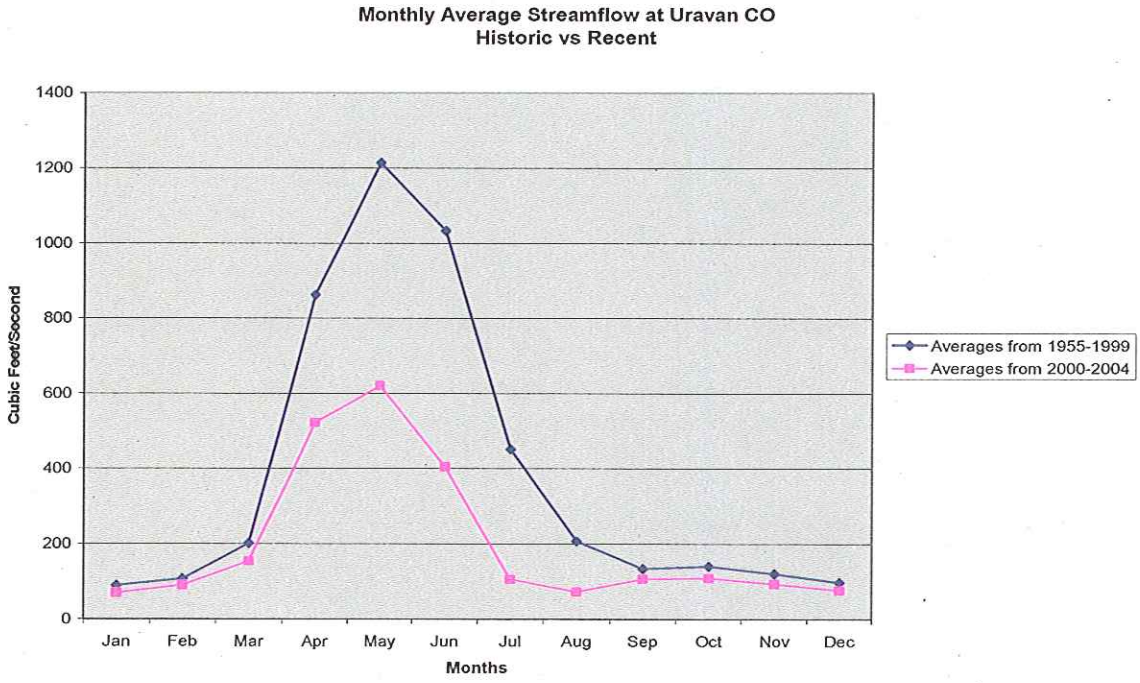
Water Quantity

The grade for water quantity is based on the volume of flow, or the amount of water, in the mainstem of the San Miguel River, measured in cubic feet per second. Data from both the Placerville gauge near the top of the watershed and the Uravan gauge near the bottom of the watershed were used. Both average monthly flows and annual peak flow were evaluated. Monthly flows are used to indicate the amount of water within a natural channel, while peak flows indicate the maximum surge of water within the river at a given location.

Average Flows

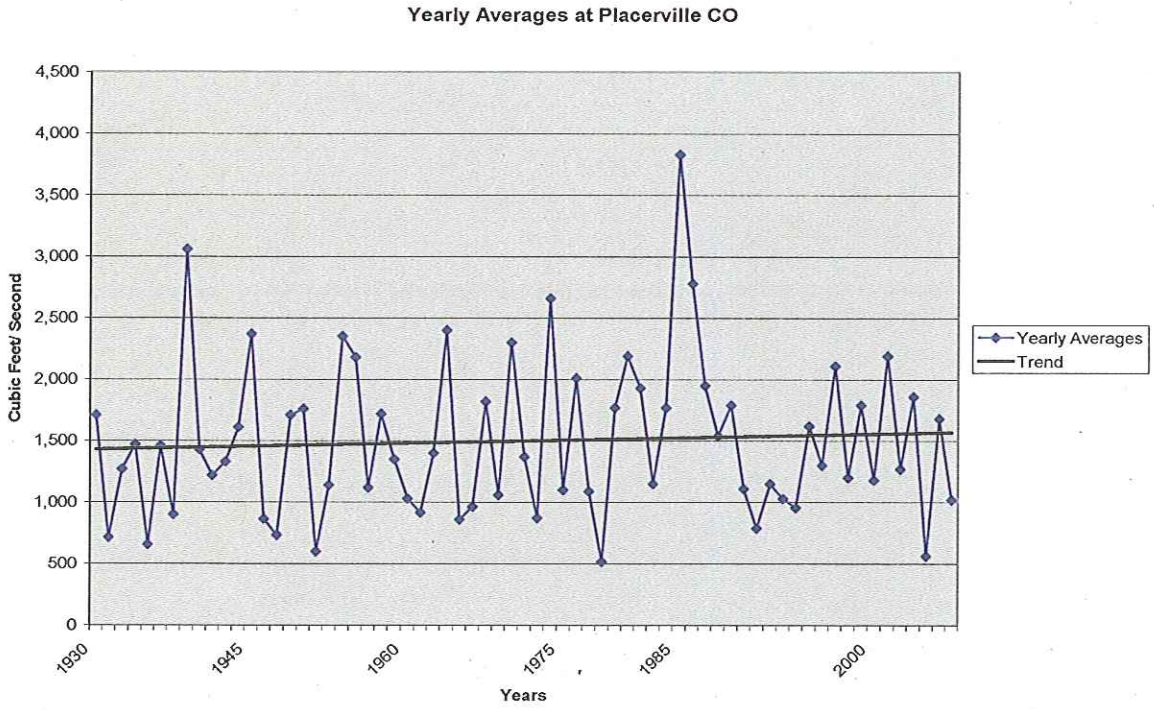


This graph shows a 40% reduction in recent flow volume for the month of June, a 58% reduction in July, and a 40% reduction in August, as compared to the long term averages at this site since data was collected consistently. Minimal reductions in volume are also shown for September through December. This reduced flow volume in the river can be mostly attributed to drought that occurred over the last five years, especially in 2002.

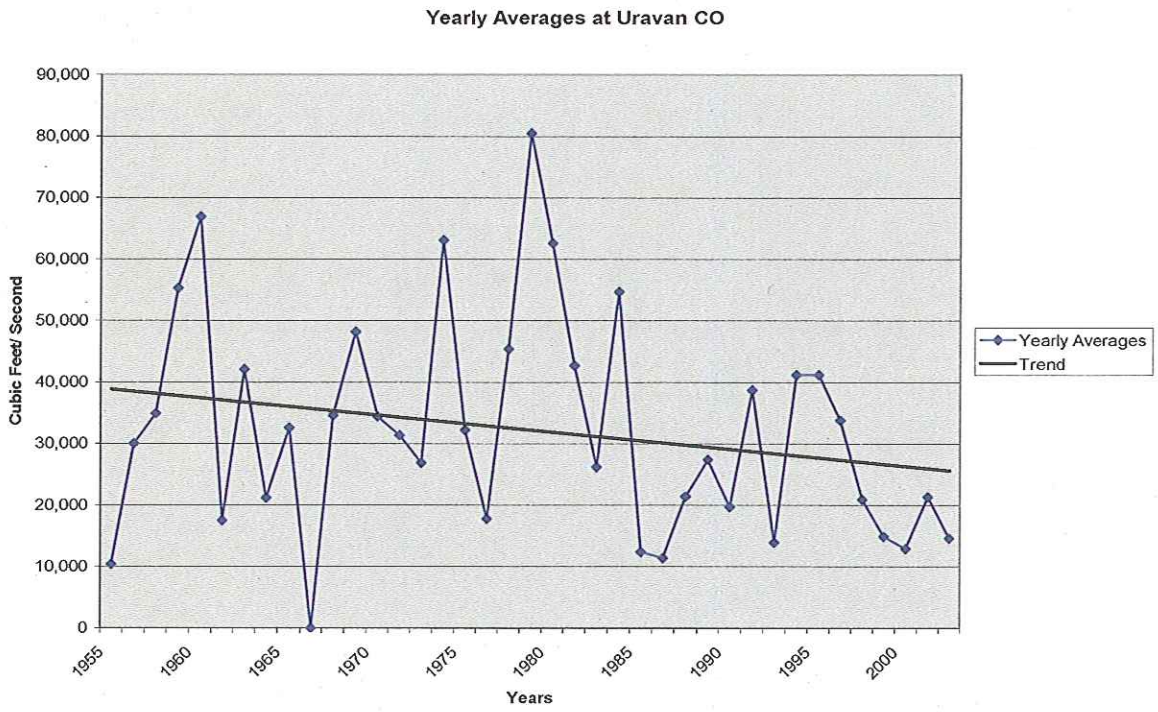


This graph shows reductions in recent flow volume for each month of the year, with the differences most pronounced in the months of April through August. The peak month, May, shows a 49% reduction as compared to the long term averages at this site since data was collected consistently. This reduced flow volume in the river can be mostly attributed to drought that occurred over the last five years, with 2002 as the most significant drought year.

Peak Flow (3.0/B)



This graph shows a slight increasing trend in the peak flow volume per year since data was first recorded at this station. However, the graph is heavily influenced by a massive peak flow of 3,3830 cfs in 1983, but the peak flows since that time have had lower water volume than average. This trend line may begin declining soon and needs to be watched.



Uravan is located at the extreme West End of the watershed, a few miles from the confluence with the Dolores River. Flow volumes are much higher here than Placerville because he majority of the watershed has drained into the San Miguel River at this point. In fact, the maximum peak flow recorded for the San Miguel River from Uravan in 1983 when the river topped out at 80,505 cfs! The trend line on this graph clearly shows declining peak flow volumes over time, which is mostly influenced by drought in the past few years. If peak flows continue to decline, then river bank flooding and scouring functions could also decline, resulting in poor natural processes for the San Miguel River

Instream Flow Protection

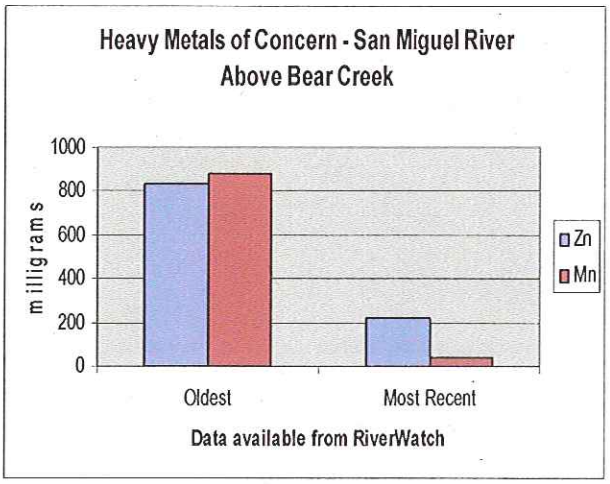
An instream flow is the amount of water needed to sustain one or more specified instream use of water. They are vital to sustaining the natural and community water supplies. Instream flow protection is a legal, contractual method used to ensure that water remains in streams, natural lake beds, or other areas where water naturally occurs. Approximately 33% or 194.5 miles of stream or river within the San Miguel River Watershed are protected by instream flow designations.

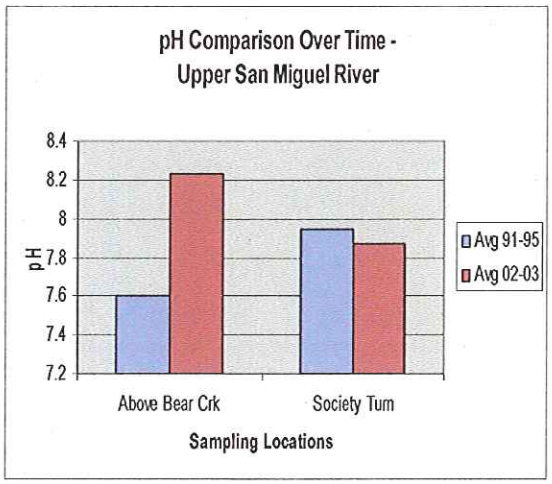
Lower San Miguel River © Betsy Neely

Water Quality

Although there are several different groups measuring water quality within the San Miguel Basin, there is not a comprehensive water quality database where this information can be easily accessed. It is the hope of the core committee leading this report that a comprehensive database, such as the one proposed by the US Geological Survey, can be developed in the near future, so that future report cards can more easily pull from multiple data sources. The 2005 Report Card uses only RiverWatch data and State of Colorado Water Quality Control Commission reports. Please see Appendix 1 for more information on RiverWatch and links to the WQCC documents.

The San Miguel Watershed has four segments of river or stream in the headwaters that are classified by the state as not supporting aquatic life. Ingram Creek and Marshall Creek both have elevated zinc levels. Ingram Creek also has a concern for elevated Cadmium and Manganese levels, and is therefore on the state's list of twenty-three "Water Bodies Identified for Monitoring and Evaluation." The San Miguel River from Bridal Veil to Marshall Creek, and the eight miles of the San Miguel River from Marshall Creek to the South Fork were also listed as not supporting aquatic life because of elevated zinc levels. The same four segments are also listed as medium priority on the state "Water Quality-Limited Segments Requiring TMDLs." The sources of these minerals are from natural resource extraction (hard rock mining) and natural sources. The following graph shows changes in zinc (Zn), cadmium (Cd), and Manganese (Mn) levels over time from RiverWatch data from the mainstem of the San Miguel River above Bear Creek.





Both zinc and manganese levels have significantly declined at this site over time, which is good for aquatic life. The pH level of the river water has decreased significantly, or become less acidic, over time as well. These are very positive results of the Idarado mining clean-up!

The state report also noted possible water quality problems in the Ophir Valley, although they were not assessed for supporting or not supporting aquatic life. Waterfall Creek is listed for Lead, and the Howard's Fork from Swamp Gulch to the South Fork of the San Miguel is listed for Iron. The South Fork will also likely be listed in the future. Monitoring efforts should make sure to address these reaches in the following years.

Water quality in the rest of the San Miguel River is generally good or very good.

River Processes

Two river processes were evaluated, river ice and channel morphology. Their combined grade is a **C+** or **2.83**.

River Ice

Cycles of excessive river ice accumulation and subsequent ice surges are an issue in the South Fork of the San Miguel and in the mainstem the San Miguel River from the South Fork confluence to approximately Specie Creek. Cycles of excessive surface and anchor ice accumulation and melt alter streamflow hydraulics and in-channel habitat conditions for fish and other aquatic organisms. Excessive channel ice and ice surges most commonly occur in December and January, and pose a threat to fish, microinvertebrates, riparian communities, and human safety; and also create sites potentially susceptible to the establishment of invasive weeds.

South Fork of San Miguel © Dennis Murphy

Managed flow and temperature regimes in the South Fork of the San Miguel River, and possibly the San Miguel above the South Fork, appear to be primarily

responsible for the excessive river ice formation and subsequent ice surges.

Cycles of excessive river ice accumulation and melt are more intense in the stretch of river from the South Fork to Specie Creek on the mainstem. Once waters enter the winter-shaded San Miguel Canyon, ice melt and refreeze is less common.

Table 1.River Ice Status

River Reach	River Ice
Upstream of South Fork	B
South Fork to Specie Ck	D
Specie Cr - Horsefly Cr	C
Horsefly Cr- Tuttle Draw	B
Tuttle Draw to Dolores R	A
TOTAL	**C**

Channel Morphology

The dimensions of stream or river channel indicate the allowable maximum amount of water and sediment within a given stream. Changes in the channel morphology can identify environmental changes that are naturally occurring or that are human induced. Channel morphology grades were assigned to seven streams within the watershed and five reaches of the mainstem of the San Miguel River. The health of each was representative gauged using BLM proper functioning condition (PFC) ratings.

PFC refers to the interaction between geology, soil, water, and vegetation. The PFC assessment is a way to determine how the river and riparian processes are functioning at a specific point in time. It also shows how well a river system can handle erosional forces of high stream flow events. The assessment is not used to determine a desired future condition, historic use, or management direction; rather it creates a baseline from which monitoring efforts can be focused (http://www.hccaonline.org/page.cfm?pageid=2068).

PFC assessments look at several factors to determine the condition of the channel or stream (See Appendix 1 for additional information), and then assign a rank of one of the following: Properly Functioning, Functioning at Risk, or Nonfunctioning. For the purposes of this assessment, we equated proper function as an A/B, functioning at risk as a C/D, and not functioning as an F.

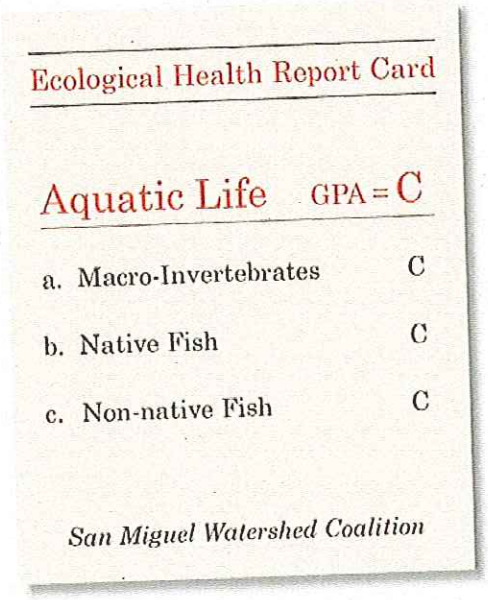
The following streams were selected as a representative sample of streams within the watershed: Fall Creek, Leopard Creek, Beaver Creek, Horsefly Creek, Dry Creek, Tabeguache Creek, and Atkinson Creek. The BLM PFC data indicated that six of the seven creeks are all functioning properly, although some sections could be improved upon. Atkinson Creek is functioning at risk.

Of the 63 sample locations from the mainstem of the San Miguel River, 42 were considered to be properly functioning while 21 were functioning at risk. When you combine the total grade for stream segments with the total grade for river segments, the final grade for channel morphology is a **B-**.

Table 2.Stream and River Channel Morphology Condition

Stream Name	Total # of Samples	# Functioning Properly	# Functioning at Risk	# Not Functioning	GRADE
Fall Creek	4	4 (100%)	0	0	**A/B**
Leopard Crk	6	6 (100%)	0	0	**A/B**
Beaver Crk	10	10 (100%)	0	0	**A/B**
Horsefly Crk	1	1 (100%)	0	0	**A/B**
Dry Creek	7	7 (100%)	0	0	**A/B**
Tabeguache	12	12 (100%)	0	0	**A/B**
Atkinson Crk	7	2 (28%)	4 (57%)	1(14 %)	**D+**
TOTAL	**47**	**42 (89%)**	**4 (8%)**	**1(2%)**	**B**

	Total # of Samples	# Functioning Properly (A/B)	# Functioning at Risk (C/D)	# Not Functioning (F)	GRADE
San Miguel River	63	42 (67%)	21 (33%)	0 (0%)	**C+**



Aquatic Life

The overall health of aquatic life in the San Miguel Watershed was tabulated by grading three attributes: macro-invertebrates, native fish populations, and non-native fish populations. The combined GPA of these attributes was a C or 2.39. Each attribute and its grade is described in further detail below.

Macro- invertebrates

Macro-invertebrates are stream-dwelling organisms without vertebrae that can be seen with the naked eye. Most are aquatic insects or the aquatic life stages of insects.

Table 3.Macro-invertebrate Status

San Miguel River Reach	MacroInvertebrates Grade
South Fork to Specie Creek	A-
Specie Creek to Horsefly Creek	B+
Horsefly to Tuttle Draw	D
Tuttle to the Mouth	C
AVERAGE	**C**

Macro-invertebrates are ideal indicators of stream health for several reasons, including: 1) there are usually many species that are relatively immobile, 2) many invertebrates are sensitive to pollution, 3) they are present year round in the stream environment and are capable of reacting to intermittent discharges, 4) samples are relatively easy and rapid to collect, 5) samples are relatively inexpensive to analyze. There are also several instream factors that control the composition and abundance stream invertebrates, including: river flow rate and water velocity, channel substrate size and concentration of aquatic and riparian vegetation, and the river water chemistry.

For this report, the macroinvertebrate samples were collected in 2000 over a 50-60 mile river reach. That reach was divided into four separate segments, as shown in the summary table above, to assign grades. Total number of invetebrates found, the EPT abundance (which is the sum total of caddisflies, mayflies, and stoneflies – all of which are *positive* indicators of stream health), and total disturbance tolerant and intolerant abundance were recorded for each sample, and were then averaged together for an overall grade of C or 2.5. More recent data collected by CDOW in the summer of 2005 was not analyzed in time to be included in this report, but should be included in the 2006 report card.

Native Fish

Three native warm water fish species, Flannelmouth Sucker (*Catostomus latipinnis*), Bluehead Sucker (*Catostomus discobolus*), and Roundtail Chub (*Gila robusta)*, occupy the mid to lower portion of the San Miguel watershed (see map 2 in Appendix C). While populations of native warm water fish within the San Miguel have decreased from historic levels, the current populations are deemed stable, and therefore earn the grade of C or 2.0. Predation of young by non-native species such as channel catfish, black bullhead, or green sunfish, water and habitat quality, and the hydrograph of the river (or water quantity) are factors limiting the population size of these native species. Hybridization of native sucker species with the non-native white sucker is a concern, but CDOW biologists are not finding nearly the level of hybridization on the lower San Miguel as is found on the Dolores River or other rivers on Colorado's West Slope.

Colorado River Cutthroat trout (*Oncorhynchus clarki pleuriticus)*, a native cold water species found in the San Miguel River, utilize the upper tributaries in the watershed. Recent counts of the Cutthroat indicate that the populations are lower than historic levels; however, the current populations are stable. Habitat quality, hybridization with non-native rainbow trout, and competition with non-native brook trout are factors that currently limit the CO River Cutthroat trout. This species also merits a grade of C or 2.0.

Table 4.Status of Native Fish Species in the San Miguel

Species	Habitat	Populations	Population Change	Grade
Flannelmouth Sucker	Warmwater/ Coolwater Unregulated Rivers	Decreased from Historic Levels	Stable, Decreasing	C
Bluehead Sucker	Warmwater/ Coolwater Unregulated Rivers	Decreased from Historic Levels	Stable, Decreasing	C
Rountail Chub	Warmwater/ Coolwater Unregulated Rivers	Decreased from Historic Levels	Stable, Decreasing	C
Colorado River Cutthroat Trout	Coldwater Streams, Rivers, and Lakes	Decreased from Historic Levels	Stable, Increasing	C

Non-Native Fish

Three non-native, cold water trout species, Rainbow trout (*Oncorhynchus mykiss*), Brown trout, (*Salmo trutta*), and Brook Trout (*Salvelinus fontinalis*), occupy the entire length of the San Miguel (see Map 1 in Appendix C). These species are included in this assessment because they are important sport fish, and can serve as a surrogate for the native salmonid fish species that they have replaced. They hold a similar ecological niche as the salmonids, and their widespread presence make them a keystone or landscape species for the aquatic system. Their numbers are increased from historic levels because these species were stocked by the Colorado Division of Wildlife, and current populations are stable or increasing. Current limitations to these species populations are habitat quality and the hydrograph of the river. Their combined grade equals a C or 2.33.

Table 5.Status of Non-Native Fish Species in the San Miguel

Species	Habitat	Populations	Population Change	Grade
Rainbow Trout	Coldwater Streams, Rivers, and Lakes	Increased from Historic Levels, Non-Native	Stable, Increasing	C
Brown Trout	Coldwater Streams, Rivers, and Lakes	Increased from Historic Levels, Non-Native	Stable, Increasing	C
Brook trout	Coldwater Streams, Rivers, and Lakes	Increased from Historic Levels, Non-Native	Stable, Increasing	B

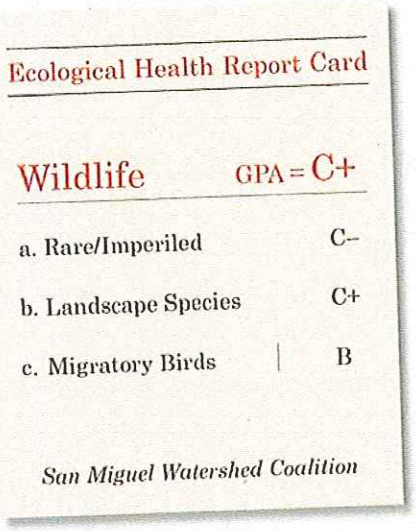
Table 6.Threats to the Fish Communities of the San Miguel River

Threats to the Fish Communities of the San Miguel

Species	Factors Limiting Populations
Colorado River Cutthroat Trout	Non-Native Species, Habitat Quality
Flannelmouth Sucker	Habitat Quality, Water Quality, Hydrograph, Non-Native Species
Bluehead Sucker	Habitat Quality, Water Quality, Hydrograph, Non-Native Species
Rountail Chub	Habitat Quality, Water Quality, Hydrograph, Non-Native Species
Rainbow Trout	Habitat Quality, Hydrograph
Brown Trout	Habitat Quality, Hydrograph
Brook trout	Habitat Quality, Hydrograph

Wildlife

The overall health of wildlife in the San Miguel Watershed was tabulated by grading three attributes: rare and declining species, landscape species, and migratory birds. The combined GPA of these attributes is a C or 2.4. Each attribute and grade is described in further detail below.



Rare and Declining species

The San Miguel Watershed is home to numerous wildlife species. A few of these species are either locally or globally rare, or locally or globally declining, and therefore merit increased attention to population trends. This report analyzes four of these species; Gunnison Sage-grouse, Bald eagles, Canada Lynx, and river otters. Each species and grade is described in further detail below.

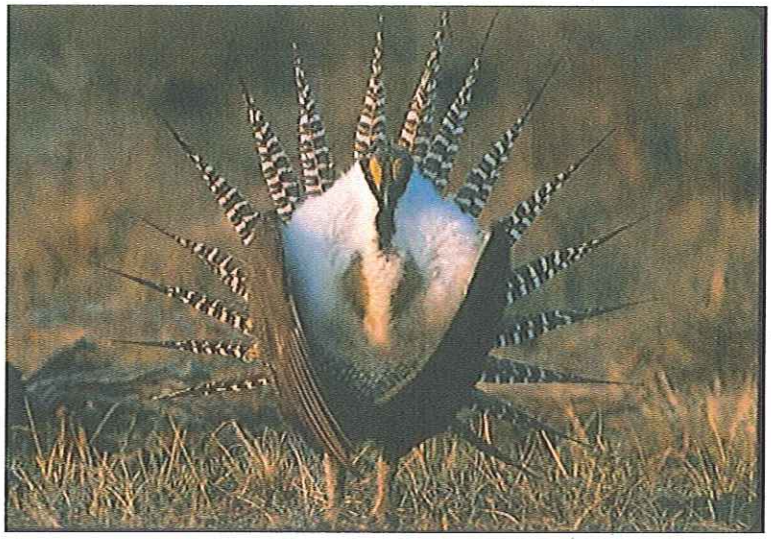
Table 7.Rare and Declining Species Status

Rare and Declining Species	Habitat Availability	% Occupied Habitat	Threats	Habitat Condition	Population	GPA
Gunnison Sage-grouse	C	C-	D	B	C	D+
Bald Eagle	B	C	C	C	C	**C**
Canada Lynx	B	D	C	B	C	**C**
River Otter	NA	NA	NA	NA	NA	**NA**
TOTALS	**C+**	**D+**	**D+**	**C+**	**C**	**C-**

Gunnison Sage-grouse

The Gunnison Sage-grouse (GSG) is a newly classified and distinct species of sage-grouse found south of the Colorado River in 7 small populations dotted across Western Colorado and Eastern Utah. The historic range of this species would have been more widespread across the four corners area. Gunnison Sage-grouse are globally rare and imperiled, with a G1 rank.

Gunnison Sage Grouse are currently candidate species under the Endangered Species Act, with a draft decision due March 31, 2006 concerning possible listing as threatened or endangered. They are also an indicator species in the shrub steppe ecosystem, meaning that their population numbers and productivity indicate the health of the various ecosystems they need to survive.



Gunnison Sage-grouse © Louis Swift

The current population in the San Miguel Basin is approximately 250 individuals. The 2005 count shows a continuing upward trend; however, despite the fairly constant overall count, there is concern regarding distribution. Recent increases in male attendance have been confirmed at sites above 7,500', with male attendance extremely low or non-existent at the lower elevations leks. The Colorado Division of Wildlife is highly concerned about the situation and is actively seeking ways to artificially augment those populations.

By definition, occupied habitat includes those areas that have recent documented sightings, along with all contiguous habitats that are suitable for GSG occupation. According to the Rangewide Conservation Plan, there are approximately 100,000 acres in the San Miguel Basin that fall under the definition of occupied habitat. The Colorado Division of Wildlife (CDOW) estimates that only 60% of the presently mapped occupied habitat is now being utilized on a regular basis. It should be noted that the rate of occupancy is much higher at elevations above 7,500'; low elevations that make up the bulk of available habitat are unutilized.

The general habitat conditions in the San Miguel basin have improved significantly since the 2002 drought. In 2003, a large-scale defoliation and die-off of sagebrush recorded in the Dry Creek Basin area severely impacted the habitat and the local population of GSG. More recent moisture conditions have aided in sagebrush recovery; however, sagebrush canopy levels are still way below pre-drought numbers.

A number of threats exist to the GSG population in the San Miguel Basin. Natural gas development, with associated roads, pipelines, and increased truck traffic, has intensified over the past year. Residential and commercial development within or adjacent to sagebrush systems continue to pose a threat to Gunnison Sage-grouse habitat.

Oil and Gas Development, San Miguel County © Dave Schnek

Bald Eagle

Bald eagles use the San Miguel watershed for roost sites during the winter. The San Miguel Canyon between Norwood Bridge and the powerplant, Wright's Mesa, and Dry Creek Basin are the most popular roost areas. Eagles use large cottonwood trees and ponderosa pines for roosting. It is very difficult to estimate the percent of available habitat occupied by Bald eagles because they use these areas on a seasonal basis and may change roost sites depending on weather conditions, regional weather patterns, or other factors.

There are seven known winter roosts sites between Dry Creek Basin and Disappointment Valley that are monitored by the BLM Dolores Public Lands Office on an annual basis. Two of the seven roosts are located within the San Miguel Watershed, both in Dry Creek Basin. The seven roosts were counted in January 2006, and all roosts were used except one, with a total of 5 eagles counted at the two sites in the San Miguel Watershed. Of the seven roosts, 6 are in cottonwood groves or small groups of trees. The Home Bench roost site in Dry Creek Basin is in ponderosa pines.

There are also numerous roost sites on BLM land in the San Miguel Canyon. BLM Uncompahgre Field Office staff used to do regular eagle counts until the mid 1980's, but they have not been repeated recently. Helicopter flights in the mornings would yield between 17-20 bald eagles, but an evening flight count was much higher, finding greater than forty Bald eagles. The Colorado Division of Wildlife counts the number of eagles that they spot on their annual big game surveys, but this data is not location specific, rather a total count per game management unit. In general, BLM and CDOW personnel believe that Bald eagle populations within the San Miguel Watershed are stable or increasing.

Threats to bald eagles include oil and gas development, as well as residential and agricultural development. Most of the roost sites are relatively isolated from disturbance. However, the Home Bench roost site is near significant gas field developments. Gas production facilities have been located within a ½ mile of this roost site. Roost trees are not removed as part of this development but the ensuing disturbance can result in abandonment by individuals, and discontinued use of the roost. Roost counts at this site are lower than they were in the mid and late 1990's. No habitat assessments have been done at any of the roost sites in the watershed.

Canada Lynx

Lynx typically occupy dense sub-alpine forests and riparian areas along mountain streams and avalanche chutes. Lynx habitat is limited to the higher portions of the San Miguel watershed in the Spruce/Fir forest; however, suitable habitat is not completely occupied. The most significant threat to the Lynx habitat is fragmentation due to development and subdivisions.

The Colorado Division of Wildlife (CDOW) is currently monitoring 118 lynx with active radio collars statewide. Tanya Shenk, CDOW field researcher, noted that "some females are having second and third annual litters in their established home ranges with the same mate" (http://dnr.state.co.us). Survival rates increased dramatically after the DOW changed release procedures. Lynx are now allowed to acclimate in pens in Colorado for at least a month. Lynx are released after April 1 when they are in peak condition and food sources, mostly small young mammals, are abundant. (http://wildlife.state.co). Despite the recent successes with lynx reintroduction program, which was begun in Colorado in 1999, the lynx is still considered federally threatened and state endangered.

River Otter

There is inadequate population data on river otters within the San Miguel Watershed, so they were not given a grade. Otters are included in the discussion because they are rare in Colorado, although they are making a comeback. Otters disappeared from the state in the early 1900s due to trapping, water pollution, and farming practices. (http://wildlife.state.co.us/NR/rdonlyres/DEC02DC7-487C-461A-A58B-D42639FD6120/0/RiverOtter.pdf) Between 1976 and 1991, approximately 120 otters were reintroduced into five locations in Colorado: Cheeseman Reservoir, Gunnison River, Piedra River, Upper Colorado River, and the Dolores River. Surveys and sightings indicate that the species is surviving and expanding into adjacent river drainages, such as the San Miguel. In 2003, the Colorado Wildlife Commission changed that status of the river otter in Colorado from endangered to threatened. Otters live in riparian habitat, usually in bank dens abandoned by beavers. In 2005, river otters were seen on the San Miguel River from the Tabegauche Creek area all the way up to the beaver pond in the Town of Telluride.

Migratory Birds

Migratory birds are particularly sensitive to habitat quality. This group of birds depends on connectivity across the landscape and on the quality of each habitat they use for successful nesting, brood rearing, migration and winter survival. Birds serve as a good indicator for habitat health because they are relatively easy to observe, they are the subject of long established monitoring studies, and many species are highly faithful to particular habitat types or vegetation zones. When habitat fails to provide adequate food or nesting resources, bird populations will decline. Four Breeding Bird Survey transects have been established and carried out over the last 30 years in or immediately adjacent to the San Miguel Watershed. Additional species which indicate condition of the other vegetation zones will be included in future report card efforts. (http://www.pwrc.usgs.gov/bbs/)

Table 8.Migratory Bird Status

Migratory Bird	Landscape / Vegetation Utilized	Long term use 1972-1999 (average # of indicator species per transect)	Recent Use 2000-2004 (average # of indicator species per transect)	GPA
Brewers Sparrow	Desert Valley	16.15	11.5	**C**
Loggerhead Shrike	Desert Valley	1.25	2.75	**A**
Virginias Warbler	Ponderosa / Shrublands	2.8	4.28	**A**
TOTALS				**3.33 / B**

Landscape Species

Landscape species are defined as species which "use large, ecologically diverse areas and often have significant impacts on structure and function of natural ecosystems" (Coppolillo et. al., 2002). The landscape species evaluated in this report include: mule deer, elk, bear, bighorn

sheep, beaver, and Gunnison prairie dogs. The grades for landscape species health in the San Miguel Watershed were calculated based on the grades of several habitat and population parameters: habitat availability, percentage of habitat occupied, threats to habitat, habitat condition, natality, mortality, age/sex structure, disease, and genetics. Each parameter and grade is described in more detail below.

Table 9.Landscape Species Status Summary

Species	Habitat Parameters	Population Parameters	GPA
Mule Deer	C	B	**C+**
Elk	B-	B	**B-**
Bear	C+	C+	**C+**
Bighorn Sheep	D	NA	**D**
Beaver	C	B	**C+**
Gunnison's Prairie Dog	C+	B	**C+**
TOTALS	**B-**	**B-**	**C+**

There is a high percentage of existing and potential habitat for elk, deer, and bear within the San Miguel River Watershed, but the winter range for deer and elk could be improved upon. The available habitat for bighorn sheep is good; however, there is a lack of permanent annual use. Habitat availability for beaver and Gunnison's Prairie dog is fair. There are extensive riparian communities along the San Miguel for beavers to utilize, but some streams and tributaries are too steep and narrow to allow for any significant beaver dams to be built or sustained. Available habitat for Gunnison's Prairie dog probably has not changed much in the last 50-75 years, but the recent moisture conditions have caused significant shifts. Habitat on public lands was very marginal during the recent droughts and a number of prairie dog colonies were wiped out. Conversely, large expanses of private lands that could not be irrigated during that time were fallowed out, creating excellent prairie dog habitat. Overall, the drought probably only caused a shift in population location from public to private, and not a significant loss or gain in the amount of available habitat.

Beaver © Ross Geredien

Although each of the landscape species noted in this report utilize different habitat types for their survival, they all face the same threats: habitat fragmentation, conversion of rangeland, home development, invasive weeds, oil and gas development, and the stresses related to human and domesticated animal contact.

Habitat condition is primarily a factor of weather. The habitat condition for both mule deer and elk is good in the San Miguel watershed; but the winter range has suffered

extensive stress from recent drought. Bear habitat condition is has been poor to fair within the last five years because late frosts have hindered berry and acorn production within the mountain shrub communities. Although there is an absence of bighorn sheep in the San Miguel watershed, the habitat condition is fair – the upper headwaters provide good summer range, but quality winter range free of disturbance is limited. The habitat conditions for beaver are overall good, but as with most riparian areas, could be improved upon through various methods, such as managed domestic grazing, site selection for development, or bank stabilization projects. Public rangeland condition has improved dramatically in the last two years due to increased moisture, making good habitat condition for the Gunnison's Prairie dog.

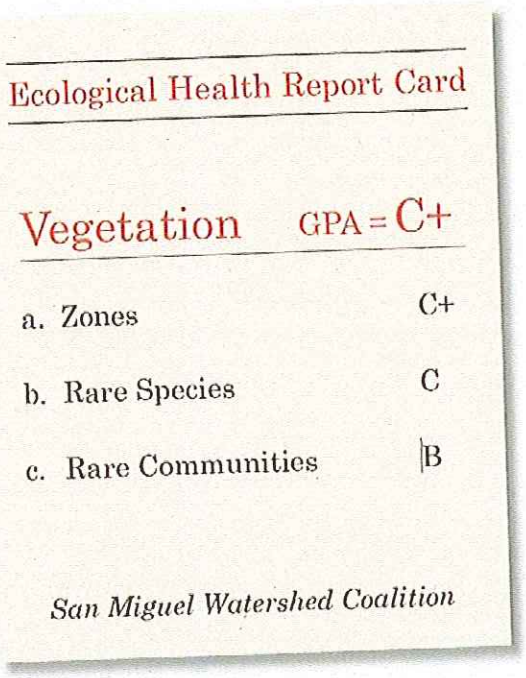
Bighorn Sheep, ewe © Janet Hess

There is little concrete data on population parameters for the landscape species. Most hard data has been collected on mule deer and elk by the CO Division of Wildlife (CDOW). CDOW conducted a research project from 2002-2004 (Bishop, 2004), which noted that the last three years have illustrated above average survival rates for fawns, probably associated with mild winter conditions and increasing quality of habitat. Also, according to Bishop's research, disease, malnutrition, and starvation are a mortality factor every year, but not significant. Currently, chronic wasting does not appear to be a factor within the San Miguel Watershed. There isn't specific data on elk birth rates across southwest CO, however, they are typically in excess of 90% and should be the same for elk within the San Miguel Watershed. While the overall population is increasing, there are declining cow/calf rations which could indicate that elk populations are reaching carrying capacity. Disease is not a significant mortality factor within the San Miguel Watershed; however, Chronic Wasting Disease (CWD) could become a concern if CWD rates increase in the Las Sal Mountains of Utah and migrating animals come into contact with deer and elk in the San Miguel, Dolores or Uncompahgre Watersheds.

Bear birth rates are probably below potential due to recent drought conditions and lack of berry and acorn production. Mortality is primarily associated with dispersing juveniles, hunter harvests, and nuisance bears in urban areas. There have been no reported births of Bighorn Sheep in the San Miguel watershed; the sheep that are observed are males that disperse widely in the summer and move back to winter range in the Ouray area. Disease can be a significant factor in the viability of a bighorn sheep population; pneumonia (*Pastuerella)* has been associated with extensive die-off of bighorns in the west. Beaver birth rates in the San Miguel watershed are unknown, but probably consistent with most populations. Most beaver mortality is probably associated with natural predators or areas of high human occupation where the beaver's construction ability is not appreciated! CDOW personnel noted a healthy crop of Gunnison's Prairie Dog's in spring of 2005; yet natural mortality is very high. "Undue" mortality (poison, shooting, gassing) is holding at historic levels and recreational shooting on public lands continues. No widespread outbreaks of the plague or other diseases have been reported.

Vegetation

To grade the health of the vegetation in the San Miguel Watershed, the team collected data on the health of three different attributes: vegetation or life zones, rare plants, and rare plant communities found within the watershed. The combined GPA for all of the attributes was a 2.78 or a C+. Each attribute and grade is described in more detail below.



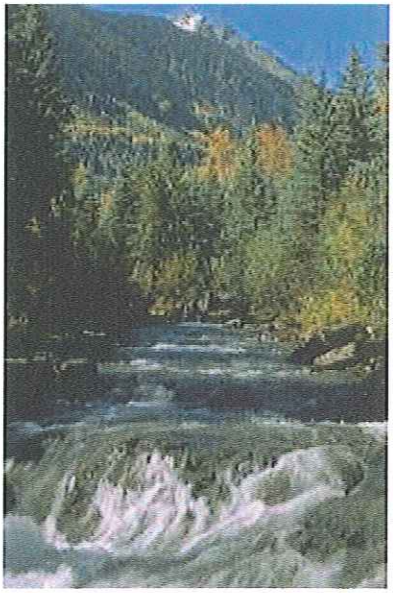
Vegetation Zones

Vegetation, which is such an important component of soil stability, ecosystem productivity, and habitat quality, has been broken down into six zones to distinguish between important species differences, climactic influences, and disturbance regimes. The vegetation zones are characterized by unique precipitation and temperature regimes. Within these broad parameters, natural disturbances like fire, grazing, drought, insects, and disease operate differently, as do the vegetation recovery processes known as plant succession. The zones and their elevation ranges are shown in the summary grading table below.

Table 10.Vegetation Zones Status

Vegetation Type	Condition	Threats	Natural Processes	Weeds	Mosaic	GPA
Riparian	B-	C-	B-	C+	B	**C+S**
Desert valleys <5,800'	C	D+	C+	C+	B-	**C**
Foothills 5,800'-7,500'	C	C-	B-	C-	B	**C+**
Ponderosa/shrub 7,500'-9,100'	C+	D+	C+	C	D-	**C-**
Montane 9,100'-11,000'	B-	C-	B-	B-	C+	**C+**
Alpine >11,000'	B-	B-	B+	A-	B+	**B**
TOTALS	**C+**	**C-**	**B-**	**C+**	**C+**	**C+**

Within each vegetation zone, a range of conditions is possible. A native plant community can be pristine, healthy, or badly degraded. In degraded communities, important species may be missing, or certain species may be overrepresented. This can happen as a result of poor livestock grazing, logging, or development practices, for example. Riparian area condition in the San Miguel Watershed was found to be in good condition in 90% of riparian areas, with the appropriate plant communities largely present and either intact or with only minor degradation (Colorado Natural Heritage Program, 1997). This evaluation was based on photographs from the 1980s and some ground-level inventory in 1997. Condition in the desert valley, foothill, and ponderosa/shrub zones is slightly better than fair, while montane and alpine vegetation condition is good. Condition in the lower elevation non-riparian zones is based on plant diversity, shrub vigor, and herbaceous cover data collected between 1999 and 2005 for BLM lands during their land health assessment process. Condition for the higher elevation zones is based on interviews with the USFS range and silvicultural staff familiar with the San Miguel Watershed.



South Fork of San Miguel © Harold E. Malde

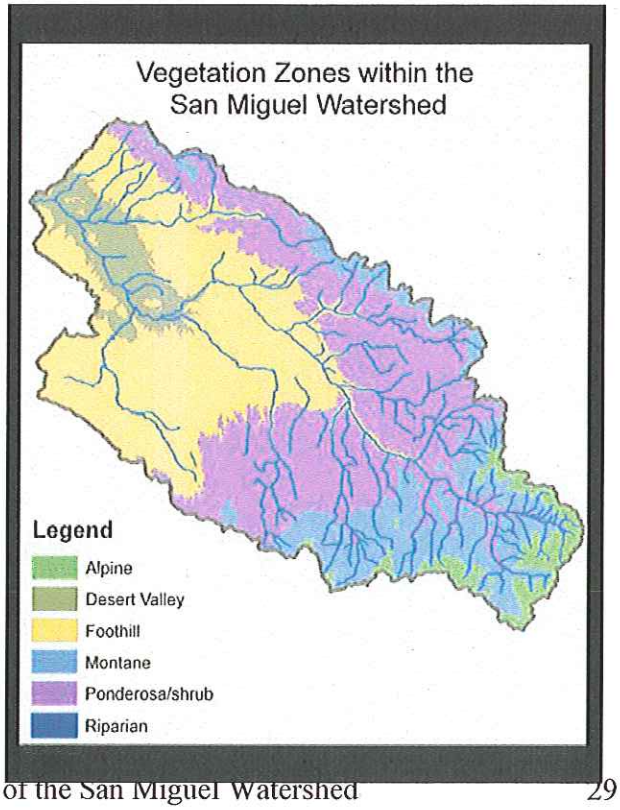
In the San Miguel Watershed, vegetation faces continual threats in the form of possible development, resource extraction, or resource use. Given the current and likely future development pressure in the watershed, these threats are only defrayed where development is legally restricted or the lands are designated as protected. A high grade in this category indicates high levels of protection from development or resource use impacts, while a low grade indicates little protection is in place. In the riparian, montane and foothill zones threats are rated as fair, while threats in the desert valley and ponderosa/shrub zone are slightly worse than fair. The threat level in the alpine zone is rated as good. These ratings are based on land ownership, special protective designations on public lands, and parcel size of private lands.

Natural processes which shape native vegetation can be altered, and thereby affect vegetation health. Important natural processes include fire, insects, disease, drought, herbivory, flooding and beaver activity. Fire suppression is a good example of man altering a natural process, which has in turn changed plant communities in the San Miguel Watershed to varying degrees by increasing woody plants and plant density. This effect has varied depending on the vegetation zone. Natural processes are rated as excellent in the alpine zone, good in the desert valley, foothill and montane zones, and slightly less than good in the riparian and ponderosa/shrub zones. These ratings are derived from interviews with BLM and USFS range and silviculture staff, in which each of the important processes affecting a given zone was discussed and compiled into a single rating.

Oxeye Daisy along river's edge © Sheila Grother

Invasive plant species are able to degrade native plant communities to varying degrees by displacing native plants and competing with them for resources. Each invasive plant species which threatens plant community health is typically a problem in only one or two zones. Yellow toadflax and oxeye daisy tend to occur at higher elevations, while cheatgrass threatens vegetation in the lower zones, and tamarisk afflicts the stream systems. A high grade in this category shows the absence of weeds, and a low grade indicates serious weed infestations. The alpine zone is rated in excellent condition with respect to weeds, and the montane zone is rated as good. Lower elevation zones show increased weed problems, with riparian, ponderosa/shrub and desert valley zones rated as slightly less than good, and the foothill zone rated as slightly better than fair. This grade also reflects the irrigated land in the foothill zone around Norwood, Nucla, and Redvale, some of which has extensive infestations of whitetop and Russian knapweed. This grade is based on weed inventory data, BLM land health assessment data on exotic plants, and interviews with USFS range staff and the San Miguel County Weed Coordinator.

The vegetation mosaic -- the arrangement and distribution of different plant communities -- within each zone is generally unique to the zone, as it arises from the natural disturbance regime. The mosaic is important for both plant and animal habitat, provides resilience to the larger system, and maintains diversity across a landscape. Some zones are highly fragmented by nature, while others have undergone extensive human-caused fragmentation and alteration. A high grade in this category means that the mosaic is similar to what would occur naturally. A low grade indicates the mosaic is highly altered from what natural disturbance and terrain would normally produce. The mosaic in the alpine zone was rated as slightly lower than excellent, while the riparian and foothill zones scored slightly better than



good. The desert valley zone rated as good, while the montane zone was slightly less than good, and the ponderosa/shrub zone scored a grade of poor because of extensive disruptions caused by logging, fire suppression, and widespread establishment of single age pine plantations. Data for this parameter was based on interviews with BLM and USFS fire ecology and silviculture staff.

Rare Plant Species

Within the San Miguel Watershed, there are twelve rare plant species ranked G1-G3. This report deals with the six species that are most rare or imperiled, with ranks of either G1 or G2. A G1 status means that the plant is critically imperiled either because of rarity (5 or fewer occurrences in the world/ state; or very few remaining individuals) or because of some factor of its biology making it especially vulnerable to extinction; a G2 indicates that the plant is imperiled globally because of rarity, with 6 to 20 occurrences, or because of other factors making it very vulnerable to extinction throughout its range.

Table 11.Rare Plant Status

Rare Plants	GPA
Pale Moonwort	NA
Parish's Alkali Grass	B-
Payson's Lupine	C-
Reflected Moonwort	NA
San Juan Whitlow Grass	B
Wetherhill Milkvetch	D
TOTAL	**C**

Rare Plant Communities

The San Miguel Watershed is home to twenty-nine rare plant communities. Analyzed in this report are the fifteen most rare plant communities, with either G1 or G2 status.

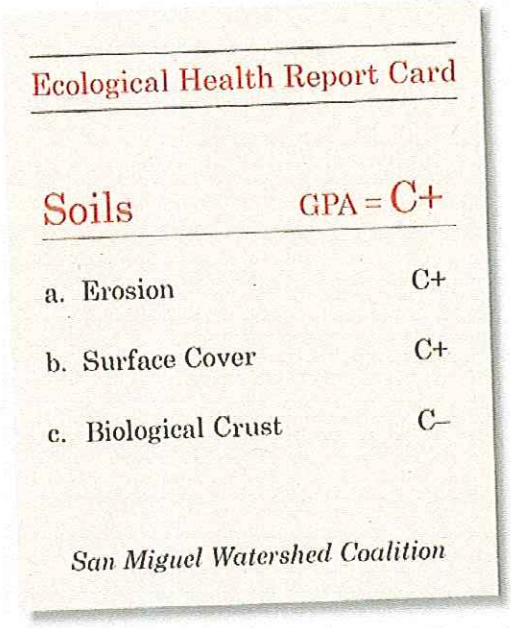
Table 12.Rare Plant Communities

Rare Plant Communities	GPA
New Mexican Privet Foothills Riparian Shrubland	B-
Blue Spruce / Thin-leaf Alder, Mt. Riparian Forest	A-
Geyer's Willow, Rky. Mt. Willow/ Mesic Forb	C
Narrow-leaf Cottonwood/ Skunkbrush (Riparian Forest)	B-
Needle and Thread (Great Basin Herbaceous Vegetation)	A-
River Birch / Mesic Gramminoid (Lower Montane Riparian Shrubland)	B-
Shadscale Cold Desert Shrubland	B-
Silver Buffaloberry (foothills Riparian shrubland)	C
Silver Sagebrush (W. Slope Sagebrush Shrubland)	C-
Skunkbrush / Colorado Williow Riparian Shrubland	B
Thinleaf alder / Mesic gramminiod (Montane Riparian Shrubland)	B+
Mesic W. Slope Pinion Juniper Woodland	C
Narrow-leaf cottonwood / Thinleaf alder (Montane Riparian Forest)	A-
West Slope Grasslands	NA
Great Plains Salt meadows	A-

TOTAL	B-

Soils

Soils are a crucial component of the ecosystem, playing an important role in many nutrient cycling processes, enabling plant growth, and contributing to overall biodiversity. Soils are complex webs of living and inorganic materials which take centuries to develop. They are characterized by their geological parent material, texture, depth, and slope. Climatic influences and vegetation growth modify these basic properties, as do the activities of soil organisms. As with vegetation, soil has been broken down for this report card into zones to distinguish between important climactic influences. The zones and their elevation ranges are shown in the summary grading table below.



The grade point average for soils health in the San Miguel Watershed was calculated from the grades of three attributes: erosion, soil cover, and biological crusts. The combined GPA for each of these attributes is 2.68/ C+. Each attribute and grade is described in more detail below.

Table 13.Soil Status

Zone	Erosion	Soil Cover	Biological Soil Crusts	GPA
Desert valleys <5,800'	C+	D+	D+	**C-**
Foothills 5,800'-7,500'	C+	C-	D+	**C-**
Ponderosa/shrub 7,500'-9,100'	B-	C	C	**C+**
Montane 9,100'-11,000'	C	A-	NA	**B-**
Alpine >11,000'	B-	B-	NA	**B-**
Totals	**C+**	**C+**	**C-**	**C+**

Erosion

Soil erosion is a concern because it reflects loss of site potential and productivity that usually cannot be regained for centuries or more. While some erosion is a natural phenomenon, increased erosion rates caused by poor land use practices, changes in vegetation, or altered hydrology across the landscape reflect the loss of an irreplaceable resource on which the

productivity of the ecosystem depends. Two indicators were used to assess active erosion: runoff drainages, (small channels formed on the soil surface when water fails to enter the soil and moves across the soil as overland flow, often carrying soil with it), and pedestal formation (the eroding away of surface soil leaving behind rocks, plants, or woody debris that are perched on little 'pedestals' of soil). In areas where soil evaluations have not been carried out, soil erosion ratings were based on interviews with USFS range and silvicultural specialists. Soil erosion in the desert valley and foothills zone rated a bit lower than "Good," with minor pedestal and runoff drainage problems. Erosion in the ponderosa/shrub zone was rated as slightly better than "Good." The montane zone was rated as less than "Good" with road and other disturbance-related problems cited, while the alpine zone rated as "Good" but with its fragile soils still recovering from historic grazing impacts and current recreation use.

Soil Cover

Soil cover refers to what lies on top of and protects the soil surface. Bare soil is that part of the ground surface which is not protected by rock, the basal portion of plants, biologic soil crust, or litter. Bare soil is vulnerable to the erosive forces of water and wind. It typically increases when plant basal, litter, and biological soil crust cover are reduced. These three types of cover are sensitive to poor land use practices or changes in vegetation. Soil cover in the desert valleys rated as slightly worse than "Fair" indicating these soils are more vulnerable to erosion than they would be under healthier conditions. Foothills soil cover was fair. Soil cover was better at the higher elevations, with cover in the ponderosa/shrub zone slightly lower than "Good," and ratings of "Good" for the alpine zone, and "Excellent" for the montane zone.

Biological Crusts

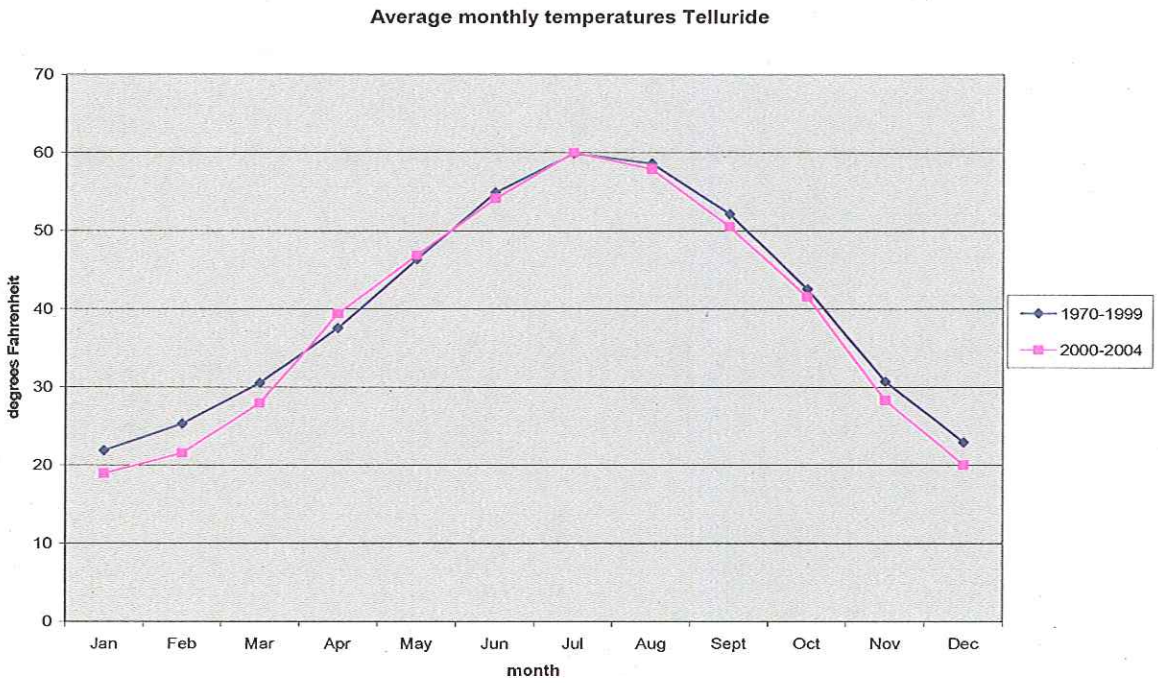
Biological soil crusts are made up of a community of cyanobacteria, lichens and mosses that live at the soil surface. In addition to protecting the soil surface from erosion, these crusts are an important component of soil flora which influences many soil processes and characteristics including water infiltration, nitrogen cycling, and soil organic matter. The crusts are easily disrupted by surface disturbance or the introduction of annual weeds. Crusts are considered to be an important contributor to the health of soils only in the lower elevation zones, since they do not occur at higher elevations. Biological soil crusts were rated as "Fair" in the desert valley and foothills zones, indicating they are either absent or not fully developed in many sites. Biological soil crusts are more intact in the ponderosa/shrub zone, with a score of "Good."

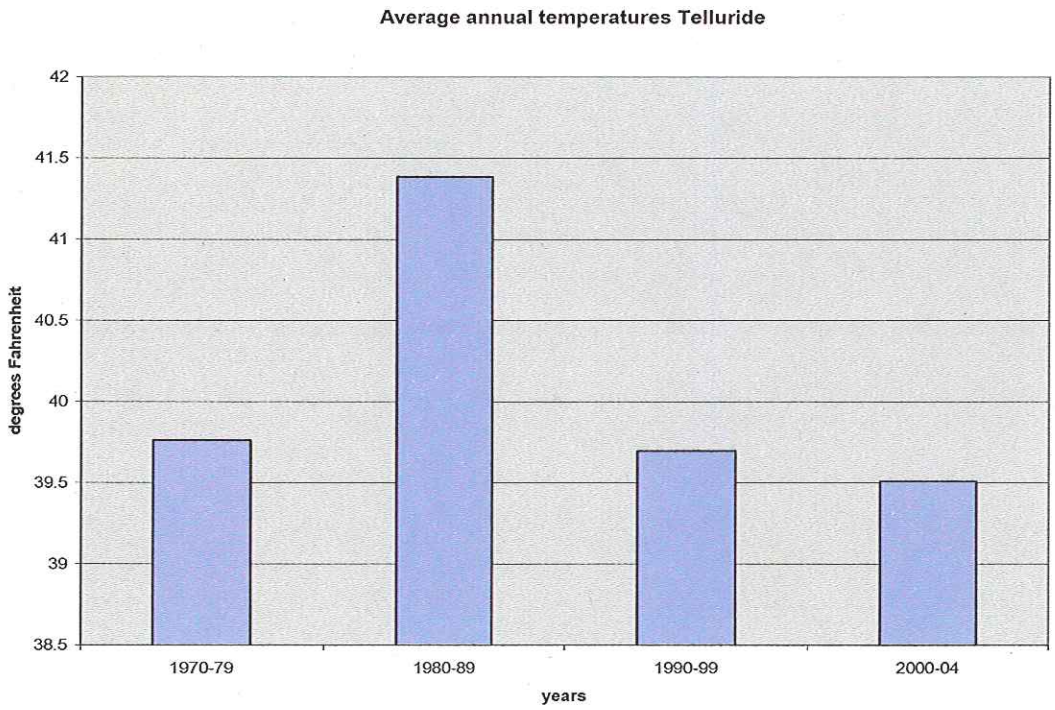
Climate

Climate is the average of weather patterns, temperature and precipitation, over a number of years from a specific place and season. It is an outside force which must be considered when discussing ecological health. Climate, along with elevation and soil structure and nutrients, create the niche where specific vegetation can grow. Climatic effects are often indirect and difficult to accurately measure. One cannot create a management plan to increase rainfall or cool temperatures; however, the Assessment team felt that Climate is a very important category to include so that citizens and managers alike can consider the data when making decisions. We charted average temperatures and average precipitation take from the upper, middle and lower watershed using the Telluride, Norwood, and Uravan station data.

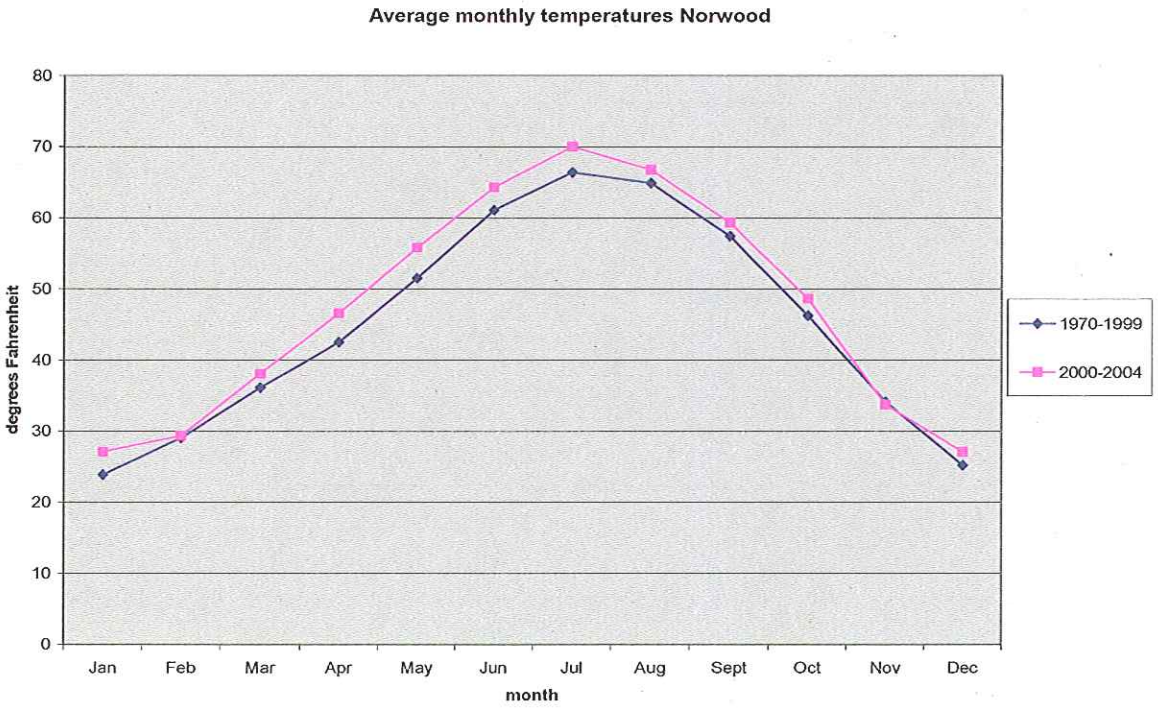
Temperature

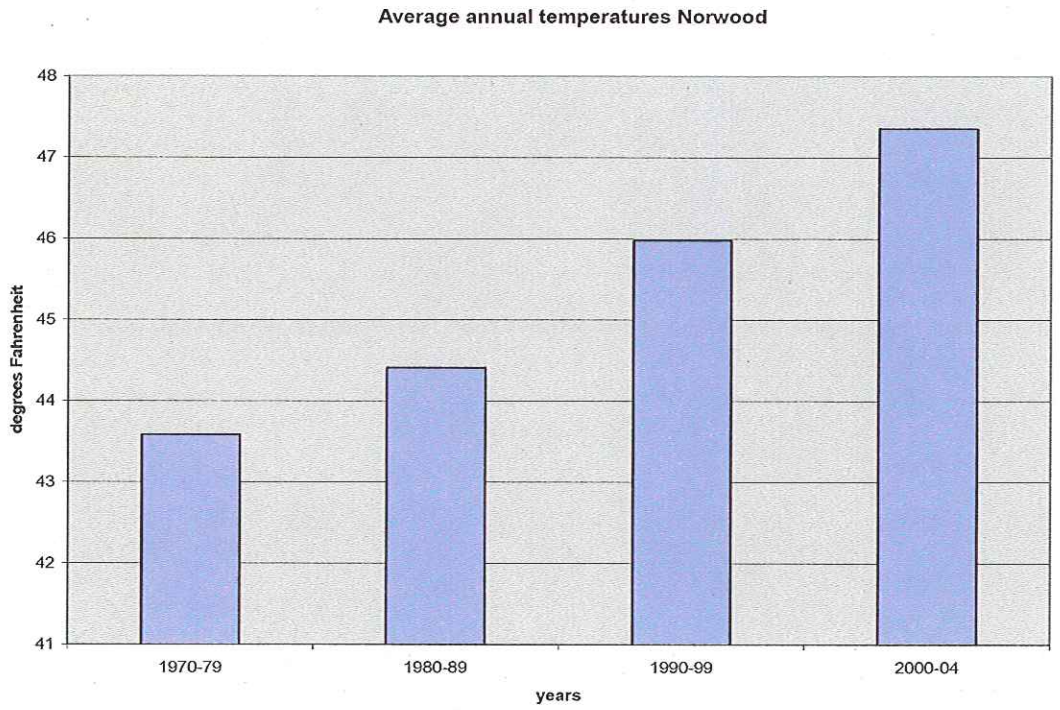
Temperature information was presented two ways: as average monthly temperature graphs comparing the four most recent years available with the oldest consistent data, and as bar graphs showing average annual temperature per decade since consistent data was recorded compared to the last four most recent years.



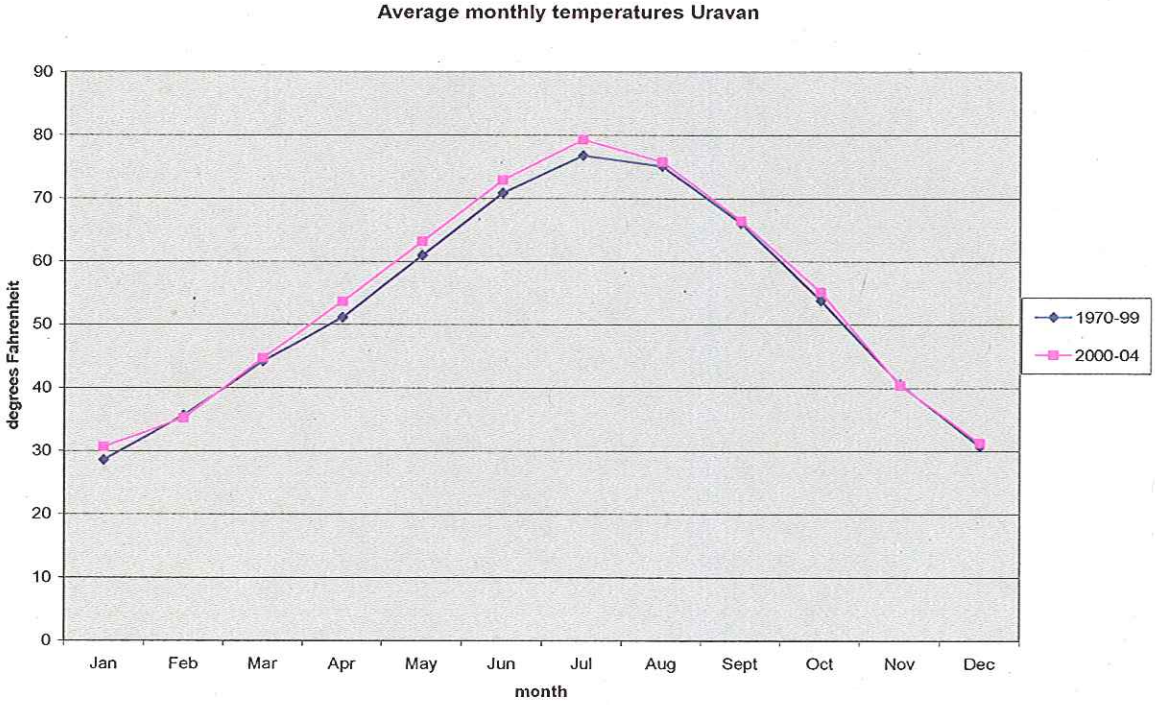


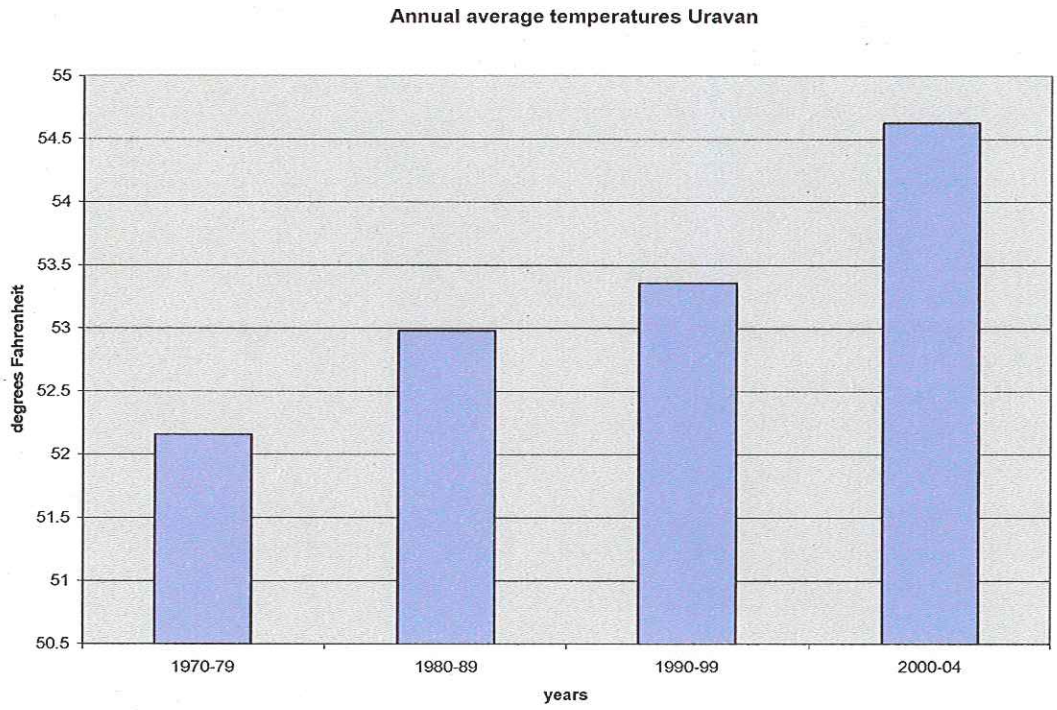
From this data, average temperatures in Telluride have actually decreased, with 1980-1989 the warmest decade on record. This should be re-evaluated as more data for this decade is available.





Temperatures in Norwood have increased decade per decade as data has been recorded at this station. This is evident in both the average annual temperature, but also in the average monthly temperature, where the hottest month, July, is close to 5 degrees warmer in recent years than the historic average!

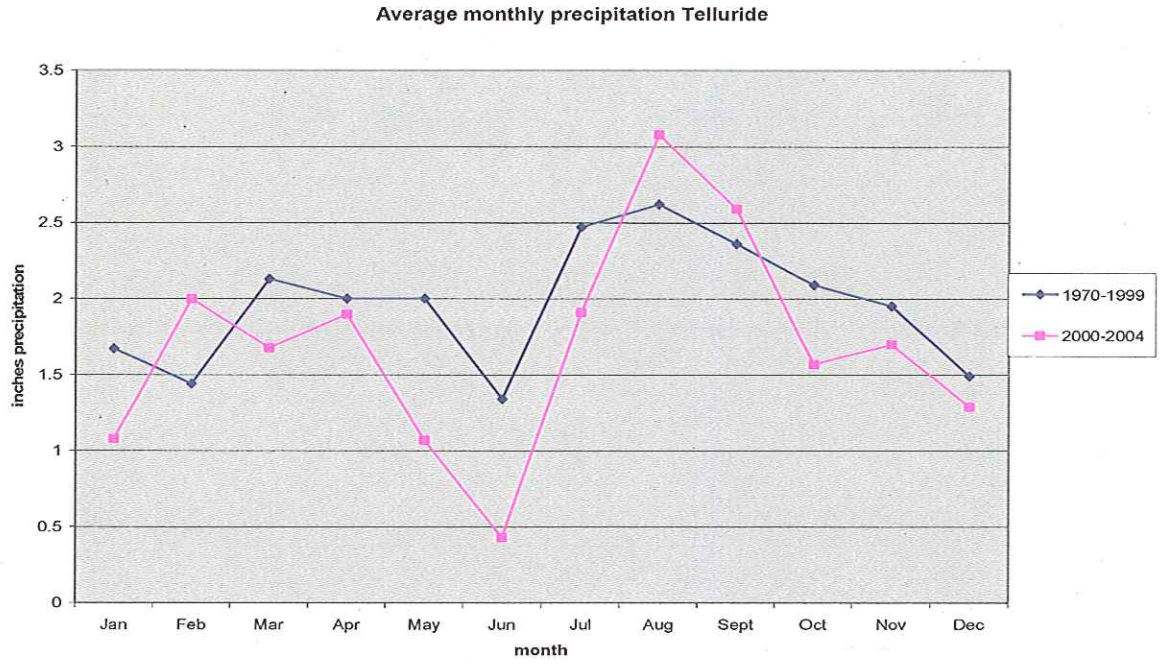


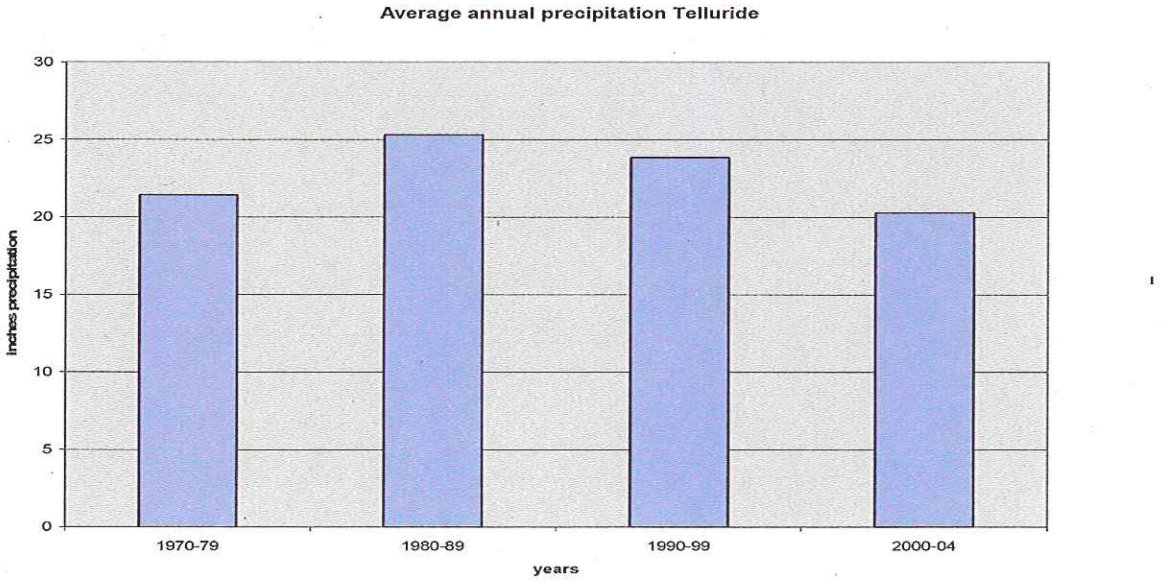


Uravan temperatures are also increasing recently. The warmest month, July, now has an average temperature close to eighty degrees. The average annual temperature has increased each decade since this data has been recorded. The most recent decade is not complete, so this will need to be updated annually to see if that trend holds true until 2009.

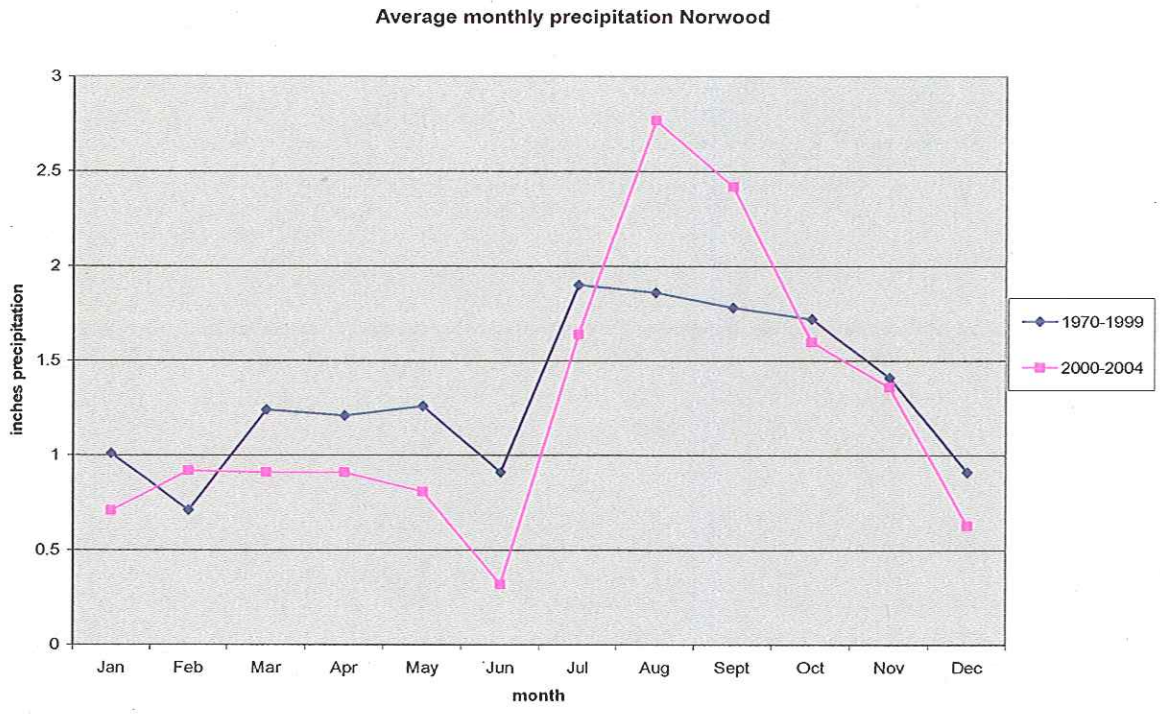
Precipitation

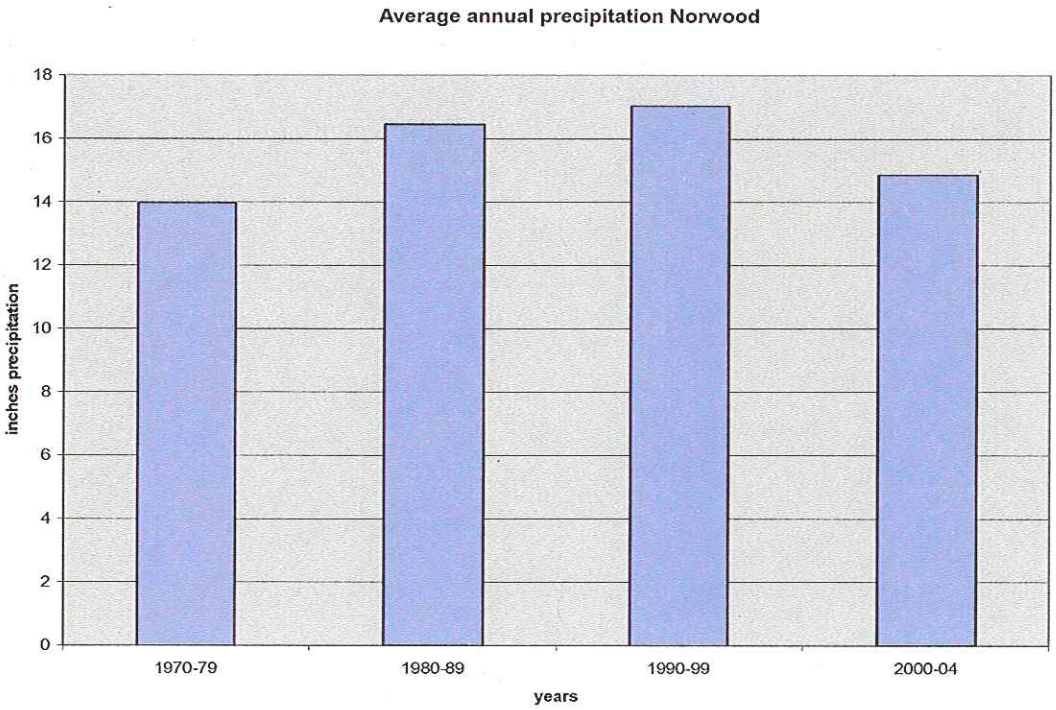
Precipitation was shown in the same manner as temperature, with line graphs for both monthly averages over time and bar graphs for annual precipitation averages each decade.

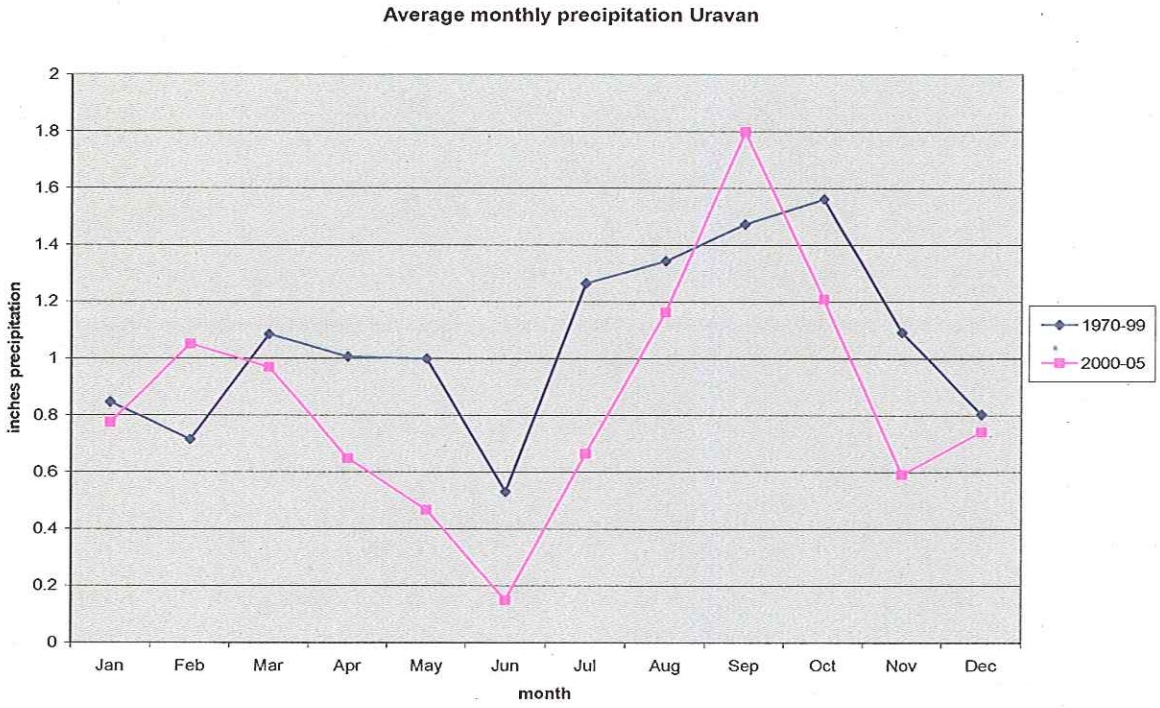


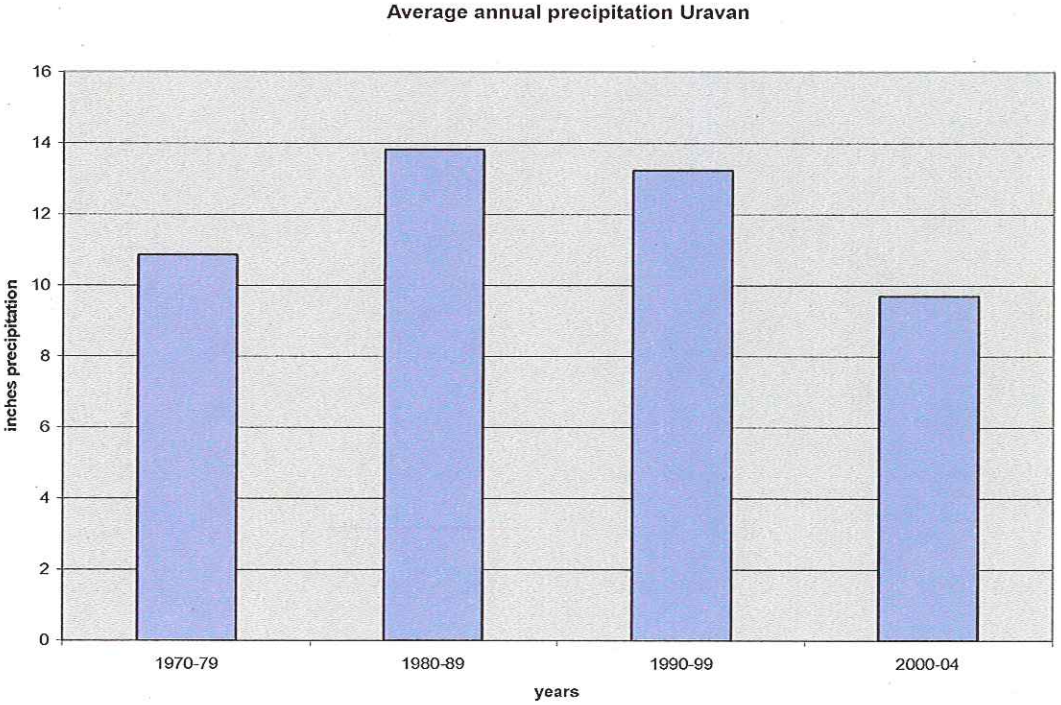


Average precipitation in Telluride is lower for the recent years than the previous three decades. This trend is of serious concern. The results available for this decade will be watched closely!


Average monthly precipitation Norwood
inches precipitation
3
2.5
2
1.5
1
0.5
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sept
Oct
Nov
Dec
month
1970-1999
2000-2004


Average annual precipitation Norwood
inches precipitation
18
16
14
12
10
8
6
4
2
0
1970-79
1980-89
1990-99
2000-04
years





The precipitation data for Uravan is the most dramatic for percent reduction of average precipitation. For a region that barely averages 10 inches of rainfall a year, every drop truly counts! February and September storms in recent years have helped those monthly averages.

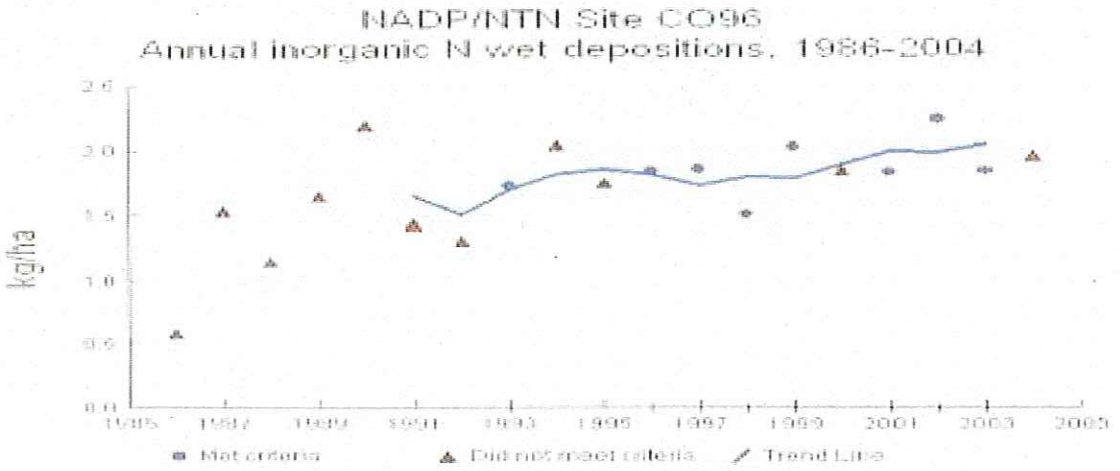
Atmospheric Deposition

Nitrogen deposition in alpine watersheds is a concern because high elevation ecosystems are sensitive to changes in the nitrogen levels. Nitrogen functions as a nutrient; however, excess levels can negatively alter water and soil chemistry as well as plants and animals.

Through a sensitivity analysis of the San Miguel's alpine basins, nitrogen levels were found to be comparable to those in Colorado's Front Range watersheds, and those are impacted by elevated levels of inorganic nitrogen in the form of wetfall. An atmospheric deposition monitoring station was set up in Waterfall Canyon south of Ophir, CO in 2000 to monitor the chemistry of summer wetfall deposition. Back trajectory analysis of air masses, which produced wetfall with elevated levels of nitrogen, suggest that the air masses had been affected by emissions from power plants in the Four Corners area. The nitrate chlorides and sulfates from power plant emissions can influence the pH of wetfall resulting in more acidic deposition. This negatively influences alpine ecosystems. Pollution causing the absorbed nitrogen deposition may also have the effect of contributing to a regional haze resulting in impaired visibility and air clarity. In addition, other pollutants of concern, such as mercury, may be elevated in our watershed when air masses are impacted by pollutant emissions.

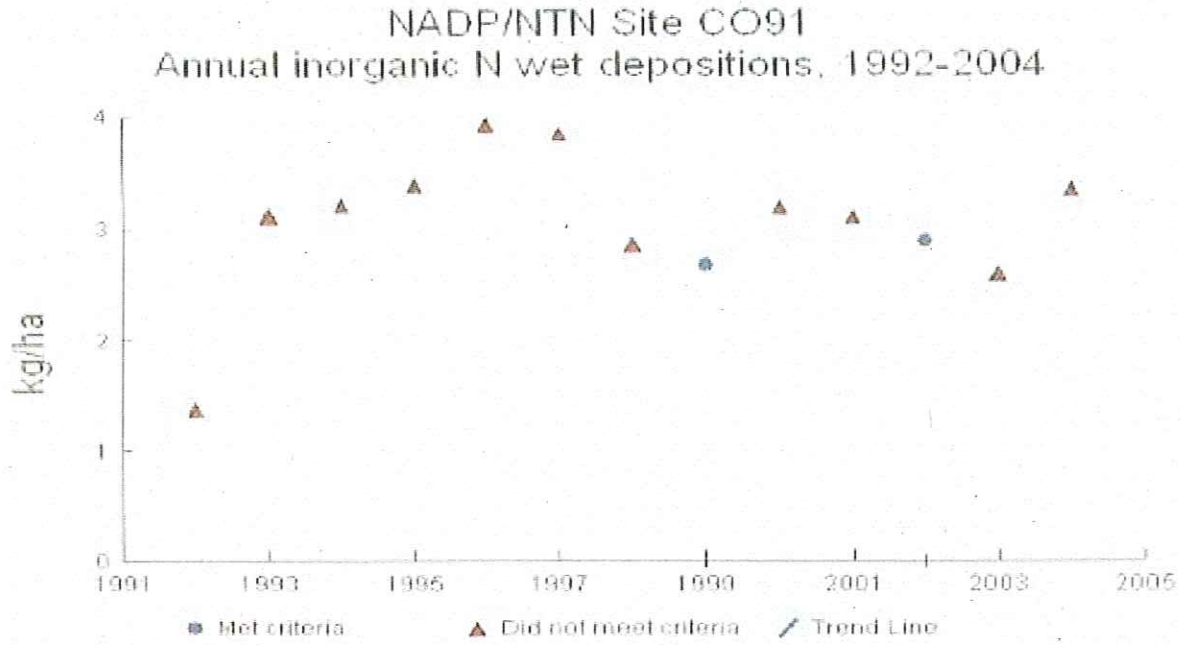
The San Juan Mountains act as an orographic barrier to air mass movement, causing precipitation to occur. Our studies suggest that the San Miguel watershed is experiencing ecological shifts due to nitrogen deposition from new power plants and additional oil and gas development that bring additional pollution. A regional air quality task force has recently been created to study and evaluate the impacts of present and future air pollution in the four corners. More studies to evaluate the impacts to our alpine watershed may be prudent. Our watershed may be ecologically impacted by influences outside of our control. This calls for active engagement to better understand impacts of air pollution and to ensure these impacts are minimized.

National Atmospheric Deposition Program, Molas Pass site



*There is no National Atmospheric Deposition Program site within the San Miguel River watershed, so the closest data available from the Molas Pass and Wolf Creek Pass sites is used to extrapolate trends that exist within this watershed. According to the National Park Service web site, pre-industrial or natural levels of nitrogen deposition are estimated to be about 20 times lower than current deposition, at around 0.2 kg/ha/yr.

National Atmospheric Deposition Program, Wolf Creek Pass site



* Triangle symbol indicates the data point did not meet criteria. This is due to the mountain setting of these sites and proportion of precipitation which is snowfall. Data value is considered to be valid.

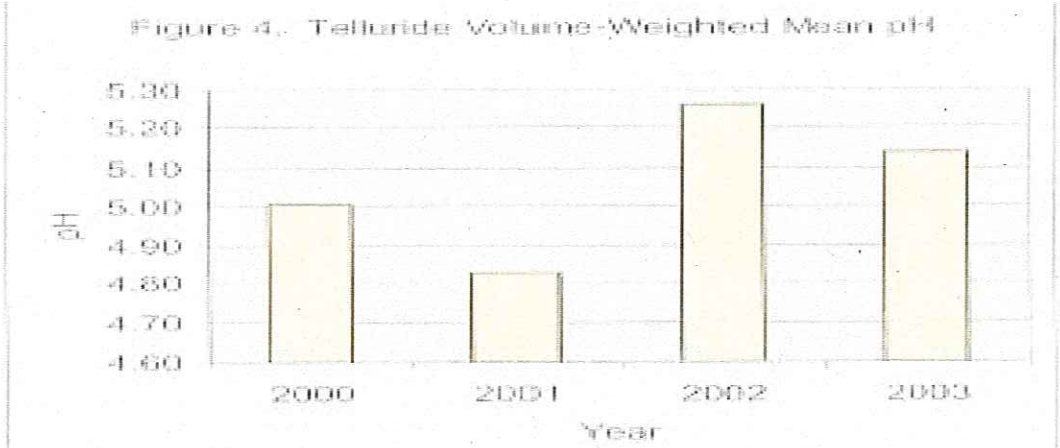


Figure 4. VWM pH values of wetfall to the Telluride AIRMoN-type site for the summers of 2000, 2001, 2002, and 2003.

*According to the Environmental Protection Agency web page on acid rain, the most acidic rain falling in the U.S. has a pH of about 4.3. Pure water has a pH of 7. Normal rain, because it has absorbed carbon dioxide, has a pH of about 5.5.

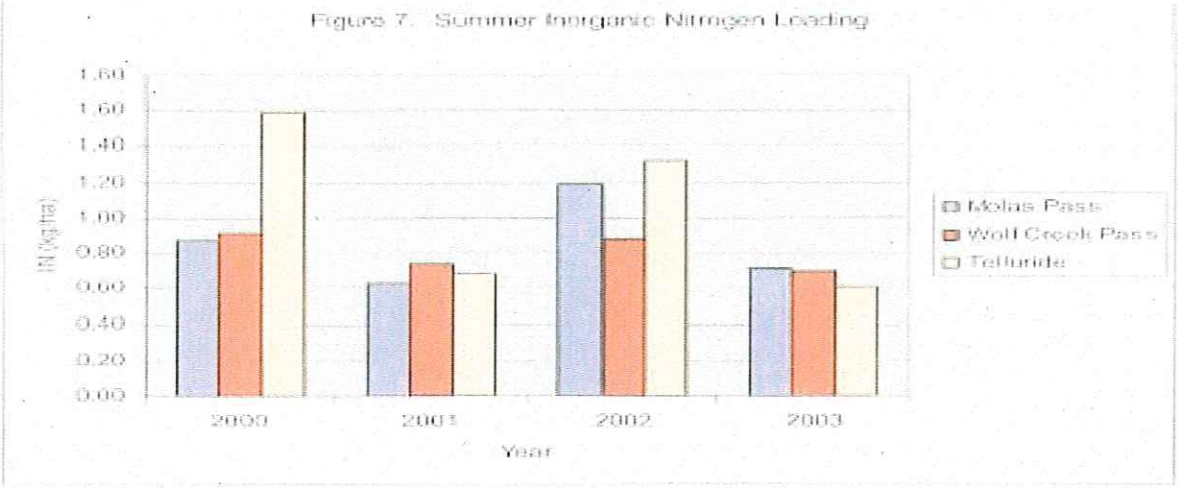


Figure 7. Inorganic nitrogen deposition in wetfall to the Telluride ARMoN-type site and comparison to nearby NADP sites at Molas Pass and Wolf Creek Pass for the period of study during the summers of 2000, 2001, 2002, and 2003.

* A different sampling protocol was used for the Telluride site in 2000 which may have contributed to the elevated nitrogen levels shown on the graph for the Telluride site relative to the Wolf Creek Pass and Molas Pass sites.

DATA GAPS / RESEARCH AND INVENTORY NEEDS

In the process of gathering information, it became obvious that there are large gaps in data collection, analysis, consistency, and a common data storage site for studies done specifically within the San Miguel River Watershed.

There is a strong need to establish a comprehensive database to house all data on water quality, quantity, stream biota data, and sampling sites within the San Miguel Watershed. Having all information in one maintained location will truly expedite the information collection process each year.

NEXT STEPS

The San Miguel Watershed Coalition (SMWC) and Telluride Institute will co-host a weekly watershed speaker series this summer which will go deeper into each of the themes of the report card. The intended goal of the series is not only to further educate citizens on the current status of the San Miguel Watershed Ecological Health but to increase involvement to better the status over time. The six week series will be offered for credit for those who attend the whole series and register for the course through the University of San Miguel, but each lecture will be free and open to the public.

In the fall of 2006, the SMWC will hold a Land Managers conference to discuss the report card with all of the agency and non-profit personnel who work in the watershed and are interested. This conference will help increase communication among entities, which may result

in some monitoring efficiencies, and will help make future report cards better by gathering feedback. Hopefully the list of team members who want to contribute to future reports will grow!

CONCLUSION

While seemingly extraordinary and pristine, the environment of our watershed has suffered much damage over the last century and a half. The residents of San Miguel Watershed have depended on extraction of its natural resources for the last five generations. While most citizens take the health of the watershed for granted, it cannot be assumed that the health will remain status quo into the future. That's why The Nature Conservancy and the San Miguel Watershed Coalition and have initiated an ecological report card, to establish a baseline or fact based assessment of where we are, to regularly measure the health of the watershed against. Its important that residents and visitors alike understand the current status and red flags, and what can be done to improve it. Armed with these facts, the Coalition, its partners, and the citizens, are much better prepared to solicit partners and funds for improvement efforts, and to get involved in the long term effort to raise the overall grade of the San Miguel Watershed from a C to a B.

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TNC: Southern Rocky Mountains: An Ecoregional Assessment and Conservation Blueprint. 2001

Web Sites

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Bureau of Land Management, http://www.blm.gov/riparian/tech.htm

CO Division of Wildlife:

- http://wildlife.state.co.us/WildlifeSpecies/SpeciesOfConcern/Mammals/Lynx/LynxOverview.htm

- "RIVER OTTER, *Lutra canadensis (Threatened Colorado)*", http://wildlife.state.co.us/NR/rdonlyres/DEC02DC7-487C-461A-A58B-D42639FD6120/0/RiverOtter.pdf.

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River Watch, http://wildlife.state.co.us/riverwatch/aboutus.aspx

Water Quality Control Commission, http://www.cdphe.state.co.us/wq/wqhom.asp

Western Regional Climate Center, www.wrcc.dri.edu

United States Geological Survey, http://nwis.waterdata.usgs.gov/co/nwis/monthly

APPENDICES

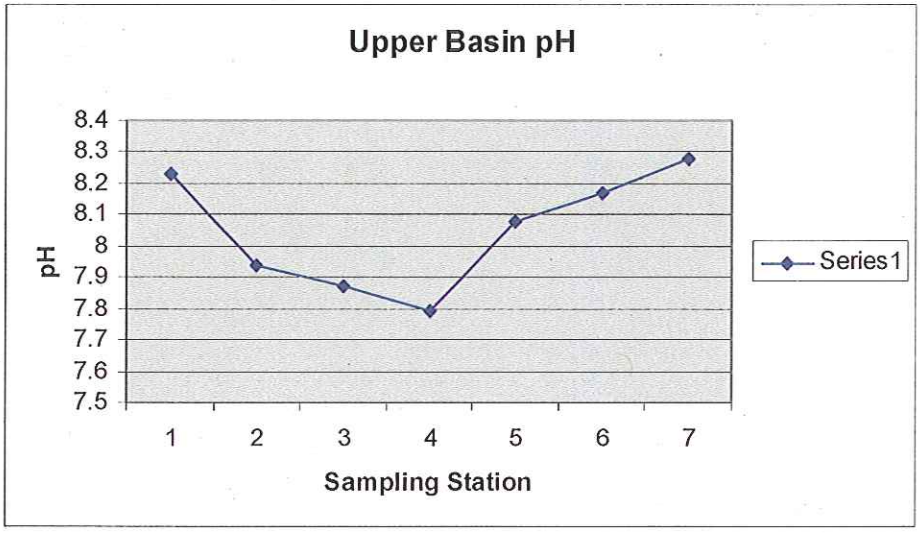
1. Water Data/ Supplemental Information

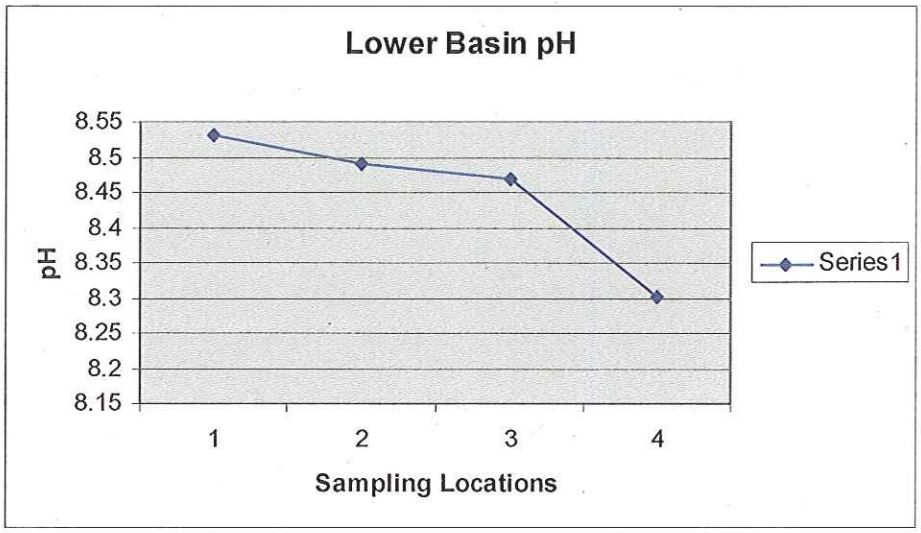
a. River Watch Information and WQCC

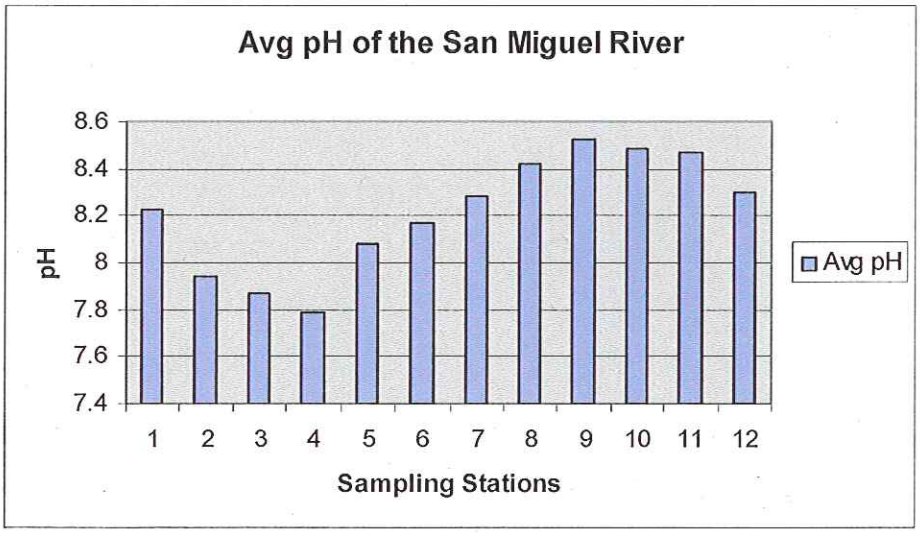
River Watch is a cooperative effort between the Colorado Watershed Network and the Colorado Division of Wildlife. This is a unique program in the state of Colorado, whose mission is to "work with voluntary stewards to monitor water quality and other indicators of watershed health, and utilize this high quality data to educate citizens and inform decision makers about the condition of Colorado's waters." The data used in this report was collected by the Telluride Middle and High Schools, Arlene Crawford, Norwood High School, Naturita Middle and Nucla High School. For more information and data, visit the River Watch website at http://wildlife.state.co.us/riverwatch/aboutus.aspx.

To find more information on the Water Quality Control Division of Colorado visit their website, http://www.cdphe.state.co.us/wq/wqhom.asp.

b. Additional Water Quality Graphs







c. PFC Definitions from http://www.blm.gov/riparian/tech.htm

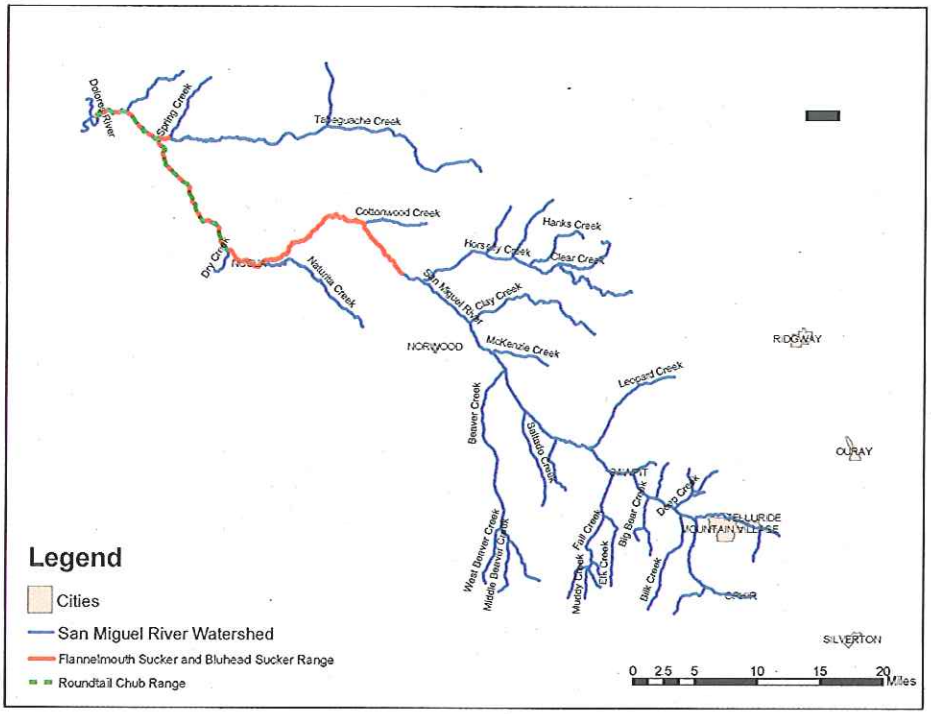
Proper Functioning Condition – Riparian-wetland areas are properly functioning when adequate vegetation, landform, or large woody debris is present to dissipate stream energy associated with high waterflows, thereby reducing erosion and improving water quality; filter sediment, capture bedload, and aid floodplain development; improve flood-water retention and ground-water recharge; develop root masses that stabilize streambanks against cutting action; develop diverse ponding and channel characteristics to provide the habitat and water depth, duration, and temperature necessary for fish production, waterfowl breeding, and other uses; and support greater biodiversity. **The functioning condition of riparian-wetland areas is a result of interaction among geology, soil, water, and vegetation.**

Functional – At Risk – Riparian-wetland areas that are in functional condition but an existing soil, water, or vegetation attribute makes them susceptible to degradation.

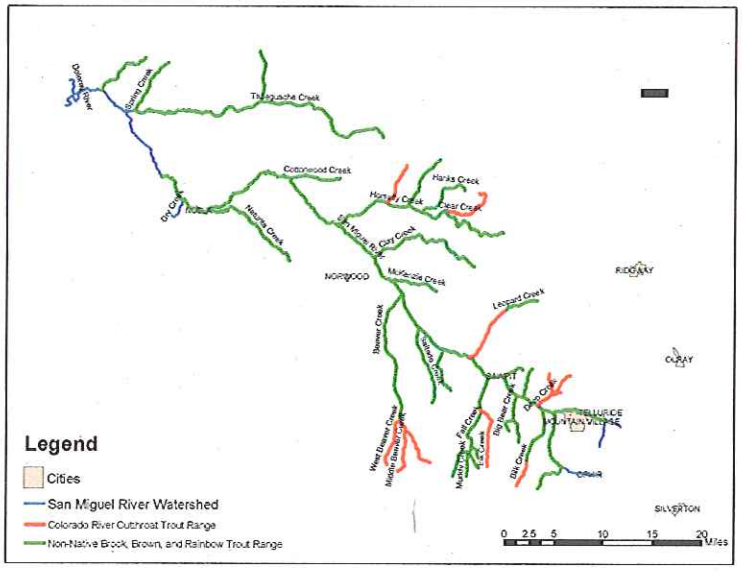
Nonfunctional – Riparian-wetland areas that are clearly not providing adequate vegetation, landform, or large woody debris to dissipate stream energy associated with high waterflows, and thus are not reducing erosion, improving water quality, etc., as listed above. The absence of certain physical attributes such as floodplain where one should be are indicators of nonfunctioning conditions

2. Aquatic Life Data / Supplemental Information

a. Map of Native Fish populations in the San Miguel Watershed



b. Map of Non-Native Fish populations in the San Miguel Watershed



3. Wildlife Data / Supplemental Information

a. Data on Landscape Species

This information was provided by Brad Banulis, Terrestrial Biologist, CDOW, Mark Caddy, District Wildlife Manager, CDOW, and Jim Garner, Conservation Biologist, CDOW.

Mule Deer

The San Miguel watershed has a high availability of existing and potential habitat for mule deer, with most suitable habitat being occupied. Habitat improvement practices could be undertaken to improve available winter range habitat through the removal of pinyon/juniper. Some available habitat is decreasing due to the development of houses and natural gas.

Fragmentation of habitat, which also injects obstacles such as fences and dogs, is occurring at a remarkable rate due to subdivision of agricultural lands. In particular, fragmentation of winter range habitat is the greatest threat to mule deer, as winter range is the most limiting factor for mule deer in the San Miguel watershed. Pinyon/juniper and noxious weed encroachment into sagebrush winter range is also a threat to winter range habitats.

Habitat condition is primarily a factor of weather and drought. The winter range is currently in the worst condition of all the mule deer habitats, due to extensive stress and partial mortality of sagebrush from recent drought. Most other mule deer habitat in the San Miguel watershed is in good condition; however, it could definitely be improved. Even with the large fires and mechanized habitat improvement projects that have taken place, there are still large expanses of mountain shrub and pinyon/juniper communities that are over-mature and could be thinned to allow growth of understory species like grasses and sagebrush. A recent research project conducted by the Colorado Division of Wildlife from 2002-2004 (Bishop, Effect of Nutrition and Habitat Enhancements on Mule Deer Recruitment and Survival Rates) documented adult doe pregnancy rates of .937, fetus rates of 1.84, and fetus survival to birth at .879 on the Uncompahgre Plateau. This specific data is not available for game management unit (GMU) 70, yet is believed to be similar to GMUs 61 and 62.

The above mentioned research project also estimated neonate survival to December at .456, over-winter survival at .655, and annual adult doe survival at .824 from 2002-2004. Primary sources of mortality consisted of predation, but also included disease/malnutrition, still born (fawns), vehicle collisions, and poaching. Bishop's research project illustrated similar mortality rates to a long-term monitoring project that is also taking place across the Uncompahgre Plateau. The last three years have illustrated above average survival rates for fawns; probably associated with mild winter conditions and increasing quality of habitat. This specific data is not available for GMU 70, yet is believed to be similar to GMUs 61 and 62.

Since 1999, when mule deer hunting was limited across the state, sex ratios have averaged 27 bucks/100 does and age ratios have average 50.9 fawns / 100 does on the Uncompahgre Plateau. The 2004 post-hunt observed ratios for GMUs 61/62 were 34.8 bucks/ 100 does, and 53 fawns/100 does. The 2004 post-hunt observed ratios for GMU 70 were 28.8 bucks/100 does and 47.7 fawns/100 does. The 2005 data has not been summarized. The sex ratio is well above the 20 year average and the age ratio is consistent with the 20 year average. The 2004 sex ratio falls in line with the newly accepted Data Analysis Unit management plan for the Uncompahgre Plateau, yet the 3 year average is still below.

Bishop's research project and the long-term monitoring study on the Uncompahgre Plateau have found disease/malnutrition/starvation to be a mortality factor every year, but not a significant factor. A variety of diseases have shown up on the Uncompahgre Plateau, yet no

epidemics have been noted. Currently, chronic wasting disease does not appear to be a factor within the San Miguel watershed.

No genetic analyses have been conducted within the San Miguel watershed. Genetic variability appears to be in good shape based on over-all quality of bucks being harvested within the watershed and increasing recruitment.

Elk

As with mule deer, there is a high availability of habitat for elk within the San Miguel watershed. Habitat types range from pinyon-juniper/sagebrush winter range to alpine in the upper headwaters of the San Miguel watershed. Winter range habitat is the most limiting factor, and typically the most troublesome for human-wildlife conflict including game-damage to private land, as well as increased stress to elk due to increasing development of houses and natural gas production. Most suitable habitat gets used by elk at some time of year. However, additional habitat could be improved to provide to provide quality winter-range, while trying to minimize elk conflict on private land.

The greatest threats to elk habitat within the San Miguel watershed include housing and natural gas development, as well as invasive weed infestations. The threats lead to direct habitat loss, physical disturbance, habitat fragmentation, decrease in habitat quality, and potentially will affect overall distribution and production of elk populations.

Overall elk habitat condition is good. The primary factor affecting habitat condition within the last 5 years has been weather and the associated drought. Winter range condition has been anywhere from poor to good depending summer moisture. Fall of 2005 was good for grass production and improved shrub condition.

We do not have specific data on elk birthrates across Southwest Colorado, however, birth rates for elk are typically in excess of 90% and should be the same for elk within the San Miguel watershed.

Post-hunt calf/cow ratios have been declining over the last 20 years, indicating declining summer/fall survival rates of calves. We do not have any data locally to define primary causes of death. Declining calf/cow ratios, while the overall population is increasing, could be associated with density-dependent factors indicating elk populations are reaching carrying capacity. There is no data to support or negate this hypothesis. Adult elk mortality is primarily caused by hunter harvest. The only other predators for elk locally are mountain lions, but they are not believed to play a significant role.

The twenty year average age ratio for the Uncompahgre Plateau is 43.3 calves/100 cows, while our 3 year average is 36.1/100, illustrating the declining summer/fall calf survival rates that may or may not be related to density-dependence. The twenty year average sex ratio for the Uncompahgre Plateau is 17.4 bulls/100 cows, while the 3 year average is 19.8 bulls/100 cows. The recent increase is probably related to higher proportions of female harvest affecting the sex ratio, as well as the managed limited harvest that occurs in GMU 61.

Disease is not believed to be a significant mortality factor within the San Miguel watershed. Chronic wasting disease (CWD) has not been found within Southwest Colorado, but could become a concern if CWD rates increase in the La Sal Mountains of Utah, and migrating animals come in contact with deer and elk within the San Miguel, Dolores, and Uncompahgre watersheds.

Genetic data is not readily available for elk within the San Miguel watershed. In general, genetics don't appear to be an issue based on overall animal health.

Bear

The San Miguel watershed has a large amount of available bear habitat associated with mountain shrub and aspen communities. However, some of the available areas have declined due to recent frost kill on mountain shrubs, as well as increased housing and natural gas development. The northern portion of the watershed has the greatest proportion of occupied habitat. The southern portion of the watershed has a lot of suitable habitat that is not occupied at very high densities.

The greatest threats to the habitat are similar to most other species. Development of residences and natural gas within the watershed pose great threats to loss of the mountain shrub and aspen communities, as well as the associated human activity causing shifts in distribution and production of bear populations.

Habitat condition has been poor to fair in the last five years with the exception of this last year (2005). Late frosts from 2000 to 2004 hindered berry and acorn production within the mountain shrub communities, as well as causing mortality in some shrubs. 2005 was the first year in 5 years that there was an extensive crop of berries and acorns on the shrubs.

Based on recent drought conditions and lack of berry and acorn production, birth rates are probably below potential.

Bear mortality is primarily associated with dispersing juveniles, hunter harvest, and nuisance bears in urban areas. Additional mortality may have occurred in recent years due to starvation.

Harvest data indicate males compose 60% of harvest across the bear Data Analysis Unit (composed of GMUs 40, 60, 61, 62, 64, 65, and 70). However, the percentage of female harvest within total harvest has been greater in GMUs 61 and 70 within the last 5 years (GMU 61= 36%, GMU 70= 48%). The increase in percentage of female harvest within the past few years has probably been related to increased vulnerability of bears in the fall due to lack of forage abundance and higher concentrations within areas of quality forage.

Disease data within local bear populations is not available.

No genetic analyses have been conducted for bears within the local area, but genetics are believed to be good.

Bighorn Sheep

(Rocky Mountain bighorn sheep are present within the San Miguel watershed above Sawpit, but are believed to be annual dispersers from the Ouray sheep herd. A transplant was conducted in the Sawpit area in the past that was not successful due to high mortality associated with domestic dogs.) There is extensive habitat available to bighorn sheep from the upper alpine habitat types in the San Miguel watershed to the lower canyon country of the watershed. The available habitat provides good forage availability, but in some areas of the lower watershed the escape cover is fair to good based on pinyon-juniper encroachment. Percent of habitat occupied is poor due to lack of any permanent annual use by Rocky Mountain or Desert bighorn sheep. There are random sightings each year of Rocky Mountain bighorn sheep usually in the upper reaches of the San Miguel watershed.

The greatest threats to bighorn sheep habitat within the watershed include development of houses as well as weed infestation. The development along with the associated human activity create a permanent loss of habitat as well as create additional stress on animals as seen with a previous transplant where the majority of sheep were killed by domestic dogs. Weed infestation is also a concern for the availability of quality forage.

Overall habitat condition is fair within the San Miguel watershed. The upper headwaters of the watershed provide good quality summer range, however, quality winter range free of

disturbance is limited.**Natality:** Not believed to occur within the San Miguel Watershed. **Mortality (undue)**: Unknown. **Age/Sex structure**: Most animals observed have been males. The males are probably dispersing during the summer and moving back to winter range in the Ouray area to winter. **Disease**: Locally unknown. Generally, disease can be a significant factor within the viability of a bighorn sheep population. *Pastuerella* (pneumonia) has been associated with extensive die-offs of bighorn sheep in the West. In most cases, *pastueralla* is believed to be introduced into a population by domestic sheep. **Genetics:** Unknown.

Beaver

There are extensive riparian communities throughout the San Miguel watershed, however, the river and most tributaries are fairly steep. The valley below Telluride provides typical high quality beaver habitat, but have a high threat of being developed. Below the valley down to the confluence with the Dolores River, the vegetation is good; but the San Miguel runs fast and is too narrow to allow for any significant beaver dams to be built or sustained. Within the smaller tributaries there are a lot of areas with suitable habitat, but many of these areas have been degraded enough that beavers do not occupy them. Suitable habitat occupied is fair to good. Most of the limitations are human induced and related to irrigation diversions.

Threats to beaver habitat include development of houses and natural gas, as well as poor grazing management and weed invasion. Riparian areas are typically selected as primary development areas for their scenic values. These areas can be affected by physical disturbance and type-change, as well as indirectly by human activity and pollutant introduction. The physical disturbance associated with development practices or over-grazing can create easy areas for non-native weeds and shrubs to invade and change the overall value of the riparian area.

Overall habitat condition is good, but as with most riparian areas, could be improved. Managed domestic grazing and wild grazers, site selection for development, managing water quality, controlling invasive non-native weeds and shrubs, and bank stabilization projects when ever needed can all be done to improve the overall habitat condition for beavers. **Natality:** Unknown, however, is probably consistent with most populations. **Mortality (undue)**: Unknown. Most mortality is probably associated with natural predators. Mortality also associated with areas of high human occupation where the beaver's construction ability and desire to change existing landscape is not appreciated. **Age/Sex structure**: Unknown, but probably consistent with other populations. **Disease**: Unknown, but probably not a big concern. **Genetics:** Unknown, but probably not a big concern.

Gunnison Prairie Dog

Historically, large expanses of Gunnison Prairie Dog (GuPD) habitat were converted to irrigated pasture. However, these losses were probably offset by increased GuPD densities in or adjacent to the same areas. Overall, available habitat in the San Miguel Basin has probably not changed significantly in the last 50-75 years. Recent fluctuations in moisture conditions have caused significant shifts. Habitat on public lands (unirrigated) was very marginal during the recent drought and a number of colonies in these areas were wiped out. Conversely, large expanses of private property that could not be irrigated due to a lack of water, were fallowed during this same time period. These fallowed pastures provided excellent GuPD habitat and populations in many of these areas expanded significantly. Overall, there was probably no significant loss or gain in the available habitat, just a shift in the location from public to private lands. Most of the suitable habitat in the San Miguel Basin is currently used. Densities shift in a fairly constant ebb and flow depending on localized control efforts or disease outbreaks. In

general, densities are low on the public (unirrigated) lands, and much higher on private (irrigated) lands.

Loss of habitat is not a significant threat to existing populations of GuPD in the San Miguel Basin. Conversion of rangelands to other uses (primarily residential home sites) is occurring in some areas, but the overall effect appears to be minimal. In some cases, a change in land use is actually beneficial if the new owner decides to cease population control efforts.

Habitat condition on public rangelands has improved dramatically during the last two years. Better moisture has greatly increased the base food supply for GuPD's. However, the ability to again farm or graze fields that were fallowed during the drought has led to increased control efforts in some areas. No local data exists in regards to population parameters for Gunnison prairie dogs. **Natality:** A healthy crop of pups were noted this spring by DOW personnel. **Mortality (undue)**: Natural mortality is generally high. "Undue" mortality (poison, shooting, gassing, etc.) is holding roughly at historic levels. Control efforts on private land generally result in little more than holding populations in check. Recreational shooting on public land continues. **Age/Sex structure**: No data is available on this aspect. **Disease**: No widespread outbreaks of plague or other disease have been reported. **Genetics:** No available data.

b. Status Summary of all Landscape Species

Species	Available Habitat	%Habitat Occupied	Threats	Habitat Condition	Mortality-undue	Natality
Mule Deer	B	B	C	C	B	A
Elk	B	A	B	C	B	A
Bear	B	B	B	C	C	B
Bighorn Sheep	B	F	C	D	NA	NA
Beaver	C	B	C	B	B	B
Gunnison's Prairie Dog	C	B	B	B	C	A
Totals:	**C+ (2.6)**	**C+ (2.8)**	**C (2.5)**	**C (2.5)**	**B (3.2)**	**B (3.6)**

Species	Age/Sex structure	Disease	GPA
Mule Deer	B	B	**B (3.0)**
Elk	B	B	**B (3.2)**
Bear	B	B	**C+ (2.7)**
Bighorn Sheep	NA	NA	**D (1.5)**
Beaver	B	B	**C+ (2.7)**
Gunnison's Prairie Dog	NA	**C+ (2.8)**	**C+ (2.8)**
Totals:	**B (3.0)**	**C+ (2.7)**	**C+ (2.7)**

4. Vegetation

a. Percentage of Vegetation with Protected Status

*** Threats were evaluated based on level of protection from development. Percentages of land within a vegetation zone were calculated for each category as shown in the following table. ***

Vegetation Type and total acreage	% Wilderness	% WSA, ACEC, RNA, % under other restrictive management (public land)	% unrestricted-ed public land or large private parcel (>100 acres)	% medium size private parcel (10-100 acres), developed public	% private, small parcels (<10 acres)
Riparian 6,021	11.5	16.1	52.6	13.5	4.7
Desert valleys 69,893	0.2	1.9	82.7	10.9	1.4
Foothills 362,457	5.2	17.7	65.3	6.7	0.5
Ponderosa/ shrub 357,232	2.4	8.9	73.3	11.1	0.9
Montane 155,972	12.9	11.4	60.3	10.1	2.6
Alpine 44,289	50.9	14.7	23.6	7.3	1.3

b. Data and other notes

This data was provided by Amanda Clements, Ecologist BLM, Kelly Liston, Rangeland Management Specialist, USFS, Terry Hughes Soil Scientist, USFS, and Sheila Grother, San Miguel County Weed Manager.

Condition grades from BLM Health Assessment Data are combinations of plant diversity, perennial herbaceous cover (combines grades for cover of total or cool season perennial grass cover and perennial forb cover), and amount of low vigor shrubs. Field data for 608 sites has been collected over the past 6 years. For this analysis, each site was given a grade for each of the four parameters listed above, based on the data values. The grades were then averaged across all of the points in a vegetation zone. For perennial herbaceous cover, canopy cover was converted to percent of average by ecological site type. The resulting percentages were graded as follows: F=none present, D=less than 50% of average present, C=50-100% of average, B=100-150% of average, and A=more than 150% of average. For shrub vigor, F=more than 37.5% cover of shrubs in low vigor, D=15% cover of shrubs in low vigor, C=2.5% cover of low vigor shrubs, B=0.1% low vigor shrub cover, and A= no shrubs in low vigor. Plant diversity data ranked the community on site against the potential diversity for that ecological site type. F=0-25% of

expected species, D=25-50%, C=about half of the expected species, B=50-75%, and A=75-100% of expected species present.

Weed species in the San Miguel Watershed: Includes land within a mile of the river or associated drainages (by most common to least) and may not capture some dry land species and does not include Dolores River drainage (West end of county).

Riparian

CNHP reviewed aerial photos (vintage 1982-1988) of all streams in watershed in 1997, found :Highly Disturbed Riparian= 110 acres or 1.5%, Somewhat Disturbed Riparian=688 acres or 9.2% Good Riparian, Disturbed Upland, 4245 acres or 56.8%; Pristine riparian 2430 acres or 32.5%. , for a combined grad or 3.2A subsequent field inventory and mapping effort (1997) of BLM riparian areas in the San Miguel Watershed found 13% in excellent condition with no sign of weeds or human impacts, and 87% in good condition, with few weeds and minor human impacts evident, for a combined grade of 3.13, supporting the grade above. Suggested overall grade of **3.2**

Condition grades from CNHP riparian survey as follows:

(1) Highly Disturbed- the riparian corridor is disturbed, vegetation is nonexistent or highly fragmented and the surrounding land is slightly to drastically altered (110 acres or 1.5%)=D

(2) Somewhat Disturbed- the riparian corridor is fragmented and/or the surrounding lands are disturbed (688 acres or 9.2%)=C

(3) Good Riparian, Disturbed Upland- riparian corridor exhibits excellent vegetative cover but the surrounding land is altered (4245 acres or 56.8%) =B

(4) Pristine- riparian corridor and the surrounding area appears natural with no major disturbances, no fragmentation in the riparian corridor and vegetation follows natural alluvial pattern (2430 acres or 32.5%)=A.

Threats: See table below for amount of riparian in various categories of protection **Natural Processes:** Flooding and a hydrograph altered by 354 recorded reservoirs retaining 64,110 acre feet, and 1401 diversions totaling 3631 cfs. Data comes from Colorado CWCB website Decision Support System. Also see water quantity section. Flooding altered--diminished but not eliminated by these. Weight this the heaviest? 50% of total? **C-?...discuss** Drought probably is not altered from Historic Range of Variability (HRV). **A** Succession probably is not altered from Historic Range of Variability. **A Beaver**: Refer to Wildlife section **Weeds:** Based on CNHP inventory of invasive weeds, they are present but not dominant on 87% of BLM riparian areas, this may be good estimator for entire watershed? Grade of B?; and based on map of known noxious weeds, they widely are distributed across riparian areas, especially from 10,000' elevation and downward. Oxeye daisy is rapidly spreading throughout the watershed, and purple loosestrife poised to invade lower San Miguel river, B-.?? Sheila's input: *Purple loosestrife plants (only a few) have been found in the river from Silverhawk Ranch to Uravan since 1995 when the PL was identified in the Nucla area. None have been found (as far as I know) above the powerplant for a couple of years. Since being listed as an A list species $$$ has come into Montrose County and the effort has been increased including at least two days a season of backpack spraying in otherwise inaccessible areas. It is very likely that there is PL seed is still entering the river but to date I do not know of any establishment. I consider this a serious threat that has not yet been realized. A grade of ! B might be overly optomistic in the lower watershed unless lots of $$$ becomes available for control efforts on more than just tamarisk, Russian olive and elm. Russian knapweed is dominent in some areas right to river's edge* **Mosaic:** An analysis of riparian plant communities mapped by CNHP in 1997 indicates that the patterns and communities are distributed as would be expected with the HRV, with minor modifications, dependent on flooding, amount of grazing and lingering impacts historic grazing, areas where the riparian community has been placer mined, and in areas below the CC Ditch

diversion where low flows appear to have diminished the amounts of certain riparian communities. Overall grade = **B+ (3.4)??**

Desert Valley

BLM land makes up 61% of the 70,682 acres of land in this zone. The BLM Land Health Assessment data for 155 different sites; the overall grade is based on the average of following three parameters: perennial herbaceous cover GPA=2.21, shrub vigor GPA =3.44, and vegetation diversity GPA= 2.21. Average together they equal a GPA of 2.62.Threats: See table below for amount of this habitat type in various categories of protection Natural Processes: Drought is probably not altered from the HRV= A. Grazing has been significantly altered, with domestic animals taking at least half of the forage. There are also impacts from prairie dog probably rabbit, and deer grazing levels, however, much lower than those of domestic animals within HRV=D. Succession probably is somewhat altered from HRV because of grazing influencing, regeneration of some shrubs, particularly winterfat and 4-wing saltbush, and because tendency of invasives to tie up site with early seral species=B-. Insect/disease probably have not been altered from HRV=A. Rockfall and similar effects have probably increased somewhat because of extensive uranium mining disturbance and land movement=B Weeds: Of the 154 BLM health assessment points in this zone, 37% had essentially no presence of invasives, 17% had limited presence, 36% had significant levels, 6% were mostly dominated by invasives, and 3% were completely dominated. Grade = 2.77 Estimate 50% of this vegetation zone has been inventoried, showing 136 small infestations of noxious weeds (estimate 136 acres), 104 miles of linear infestation (estimate 104 acres), 119 acres of larger infestations have been documented. These are spread throughout the inventoried area. Using CNHP/TNC rating scale, this overall falls between fair and good, closer to fair, because much of the Nucla area, that is known to be heavily infested with weeds, is contained in this zone. Grade= C+ Mosaic: Probably minor shift away from HRV, because most disturbances still in place, but some alteration of amount and location of these. Grade=B

Foothills

BLM land makes up 54% of the 364,269 acres of land in this zone (15% Forest, 26% private). BLM Land Health Assessment has data for 410 different sites. The overall grade is based on the average of the following three parameters: perennial herbaceous cover GPA=2.01, shrub vigor GPA =3.60, and vegetation diversity GPA= 2.18. Totaled together they average to 2.60. **Threats:** See table below for amount of this habitat type in various categories of protection **Natural Processes:** Drought in this zone probably not altered from HRV=**A.** Grazing has been significantly altered from the HRV, with domestic animals taking at least half of the forage. Grazing of prairie dogs, probably rabbit, and deer are within HRV, while elk grazing levels higher than HRV =**C.** Early to early mid transition succession has probably somewhat altered from HRV due to the impacts of grazing and invasive species, which delay the transitions and nature of seral stages.=**B.** Insects and disease may be somewhat altered from HRV by warmer temperatures, and fire suppression. **B+** Fire frequency has been reduced somewhat by fire suppression, but fire behavior is still similar to HRV (Eisenhart dissertation)=**B-** Little changed in the amount of rockfall from HRV=**A.Weeds: O**f the 408 BLM health assessment points in this zone, 36% had essentially no presence of invasive weeds, 26% had limited presence, 26% had significant levels, 10% were mostly dominated by invasives, and 1% were completely dominated. **GPA=2.8** Approximately 30% of this vegetation zone has been inventoried, showing 615 small infestations of noxious weeds, 541 miles of linear infestation, and 1070 (BLM) + 182 (USFS) acres of larger infestations have been documented. USFS staff estimates

that weed data through updated 2004 is 80-85% accurate. Much of the Redvale area, located within this vegetation zone, is known to be heavily infested with weeds. Using CNHP/TNC rating scale, this probably equates to fair. **Grade = C Mosaic:** This area is probably close to its HRV, as it has had numerous fires of significant size over the past 30 years, creating many early seral patches on the landscape. Dendrochronology work from the Eisenhart dissertation indicates that such patches are probable on this part of landscape, and there is probably minor modifications to mosaic from fire suppression and vegetation treatments =**B+**

Ponderosa/shrub

BLM lands makes up 8% of the 359,467 acres of land located within this zone (43% Forest, 47% private). BLM has Land Health Assessment data for 42 different sites, with the overall grade based on average of following three parameters: perennial herbaceous cover GPA=2.44, shrub vigor GPA =4.0, and vegetation diversity GPA=3.05. Totaled together these average to **3.16.** USFS staff communication, gives the zone a grade of **2.5** due to the fact that most range studies show stable or improving trend, and her overall impression of vegetation condition is based on canopy cover, basal cover and amount of desirable natives. **Threats:** See table below for amount of this habitat type in various categories of protection **Natural Processes:** Drought probably has not altered from the HRV=**A.** Most of this vegetation zone is accessible to livestock so the grazing is significantly altered from HRV. Domestic animals are probably taking perhaps 50-60% of the available forage, rabbit, and deer grazing at levels that are within HRV, and elk levels above the HRV (K Liston, USFS). Most of area accessible to livestock and probably grazed. **Grade=C-** In some areas, succession may be altered from HRV, with grazing suppressing aspen regeneration in aspen/pine sites. There are also possible grazing effects on pine regeneration **=B+.** Insects and disease may be somewhat altered from HRV due to warmer temperatures, and fire suppression = **B**. Fire frequency has been significantly reduced by fire suppression and grazing-caused changes in fine fuels, and the fire behavior is probably more intense than under HRV (UP ponderosa study), **grade = C- Weeds:** USFS staff determined this vegetation zone to have a large invasive weed infestation compared with higher elevations. Data collected from the BLM land health data, 50% of the points had no invasives, 31% had trace amounts, 7% had significant amounts, and 12% were dominated by invasives, GPA=3.2, possibly drop to **B** based on Kelly's feedback. Noxious weeds are not fully mapped, but the existing inventory shows large areas with houndstongue infestations, smaller Canada thistle and spotted knapweed infestations spread throughout vegetation zone. Using CNHP/TNC rating scale, this probably equates to fair. **Grade = C Mosaic:** USFS personal communication with Tim Garvey indicates that the existing mosaic poor. It has been altered by past logging, no old growth, few old trees, snag deficient, stands dense, dominated by 80-120 year old cohort, with some lack of regeneration. (W Sheppard ponderosa study on Uncompahgre Plateau) **Grade of D.**

Montane

Mosaic: Overall mosaic grade=B-, based on Tim Garvey, USFS. Aspen are reaching their pathological maximum, with many stands reaching an age where they are declining. Small scale disturbances, such as windthrow, in dark timber might be adequate to maintain aspen. By controlling fire we are influencing the mosaic, even if the spruce-fir-aspen is not ready for a stand replacement fire, we have altered the cooler fires. Encroachment into meadows by aspen/spruce is occurring: and the structure of spruce/fir has been severely altered, especially by timber harvest, which has taken out the surviving, remnant big spruce that survived the 1879 fire. (64% Forest, 35% private). USFS staff indicates that the following species constitute this vegetation zone: dry aspen, which is not in good condition, wet aspen, which is in very good

condition, spruce-fir which is stable, and some high elevation meadows which are in poor condition and don't seem resilient. Other meadows with Thurber fescue are in fair condition. **Overall grade of B/B-.Threats:** See table below for amount of this habitat type in various categories of Protection. **Natural Processes:** Drought probably has not altered from HRV =**A.** Grazing has significantly altered from HRV, with domestic animals taking perhaps 40% of the available forage, small mammals and deer grazing at levels within HRV, and elk at levels higher than HRV and grazing more heavily than livestock, affecting aspen regeneration.=**B-** Succession probably not altered from HRV, except for areas where aspen regeneration is being affected by elk grazing. Historically, some upland meadows were damaged and have been slow to recover.=**B** Insect and disease may be somewhat altered from HRV due to warmer temperatures and fire suppression. Tim Garvey: Some areas are experiencing aspen disease (root disease, bark beetles) and it is not known if these stands are regenerating = **C-** grade. 80-120 year old Subalpine fir is being widely affected by spruce budworm, and long term persistence coupled with drought may be alter this zone from HRV. Overall grade is a **C.** Fire frequency has been reduced significantly by fire suppression, but fire behavior is probably similar to that under HRV. Guess a **B** Rockfall and avalanche probably has little changed, but there could be some lingering increase over HRV from old hard rock mining=**A- Weeds:** There are few invasives in this area and the noxious weeds, oxeye daisy and toadflax, *Canada thistle, musk thistle, common burdock, serious threat of scentless chamomile starting as high as Ophir (an ornamental). If the Forest Service does not begin control efforts in this zone the problem will continue to increase and likely quite dramatically.*

Alpine

85% Forest, 15% private. The alpine zone has more fragile soils, which, while mostly no longer grazed, are still impacted by very heavy past sheep grazing and mining. The biggest current impact is recreation. These areas take a long time to recover, not pristine. Overall grade of **B. Threats:** See table below for amount of this habitat type in various categories of protection. **Natural Processes:** Drought is not altered from HRV =**A** There are no domestic sheep grazing anymore, but there are lingering effects in some areas due to heavy sheep use. Small mammal grazing is within HRV Probably a **B.** The effects of snow have probably varied little from HRV=**A** Avalanche and rockfall have strayed minimally from HRV, possibly around ski area. Grade=**A- Weeds:** Invasive weeds and noxious appear to be very few, possibly some like dandelion in are in disturbed areas Grade=**A-** Yellow toadflax and oxeye daisy are possible within this zone in very small amounts, and located in disturbed areas. Grade=**A- Mosaic:** Probably little altered from HRV, as most processes are still intact. Mining may have altered it a bit. **A-** *Again same comment as above regarding FS weed control efforts in this zone. Species present in this area include Canada thistle, musk thistle as well as toadflax and oxeye daisy. Without a concerted effort problems will get worse. Work is currently being done on the three passes- Ophir, Black Bear and Imogene to determine the presence of invaders and the quantity and elevations of each. Toadflax was found on Blackbear at over 11,000 feet and from other information in the state there is no elevational limitation.*

c. List of Invasive / Noxious Weed Species

** This is not an all inclusive list**

Upper Watershed- Includes extreme East end of San Miguel County from Lizard Head Pass to Placerville and Leopard Creek.

Common-

1. Canada thistle — B list (unless otherwise noted)
2. oxeye daisy
3. field bindweed — C list
4. musk thistle
5. common mullein — C list
6. common burdock — C list
7. yellow toadflax
8. Russian knapweed
9. bull thistle
10. houndstongue

Rare but known to be present at less than 1 acre in this section

1. spotted knapweed	Several locations	B list
2. scentless chamomile	Several locations	B list
3. absinth wormwood	Several locations	B list
4. Dalmatian toadflax	1 location 2005	B list
5. Cypress spurge	2 locations 2005	A list
6. black henbane	1 location 2005	B list
7. diffuse knapweed	1 location 2005	B list

Not known to be present but possible due to proximity of known infestations and suitable environment

1. yellow starthistle — A list
2. leafy spurge
3. purple loosestrife — A list
4. meadow knapweed — A list
5. Myrtle spurge — A list
6. Tamarisk (several plants removed over time) — B list

Middle Watershed- From Placerville to Horsefly Creek

1. Canada thistle — B list (except where noted)
2. oxeye daisy
3. field bindweed — C list
4. musk thistle
5. common burdock — C list
6. Russian knapweed
7. common mullein — C list
8. bull thistle
9. tamarisk

Rare but known to be present at less than 1 acre in this section

1. spotted knapweed — B list (except where noted)
2. diffuse knapweed
3. squarose knapweed (1 plant found in 2004) — A list
4. yellow toadflax

Not known to be present but possible due to proximity

1. purple loosestrife
2. yellow starthistle

Lower Watershed- Pinon to confluence with Dolores River

1. Russian knapweed
2. Tamarisk
3. field bindweed
4. common mullein
5. common burdock
6. Canada thistle
7. musk thistle
8. bull thistle

Rare but known to be present at less than 1 acre in this section

1. spotted knapweed
2. purple loosestrife A list

Not known to be present but possible due to proximity of known infestations and suitable environment

1. yellow starthistle A list
2. diffuse knapweed

5. **Soils**

a. Data

Erosion (3.12 / B)

Desert Valley: 154 BLM Health Assessment points, Runoff drainage GPA = 2.7, Pedestal GPA = 2.8, avg = 2.75

Foothills: 408 BLM Health Assessment points, Runoff drainage GPA = 2.65, Pedestal GPA = 2.76, avg = 2.71

Ponderosa/Shrub: There is some pedestalling in open ponderosa pine, but not much in shrub communities. In this area, roads and other soil disturbances are adding to soil. Grade=B. BLM 3.20 for runoff drainages, 3.37 for pedestals, ave=3.28

Montane: There is very little erosion in the natural setting, however, there is active erosion where in areas that have roads or have been otherwise disturbed. (B-)

Alpine: The alpine soils are more fragile, and still suffer from past grazing impacts and suffer significantly from current recreation impacts. (B)

Surface Cover (GPA= 2.40/ C)

Desert Valley: Based on bare soil. All grades are based on percentages of average values for a given ecological site. A=bare soil 50% less than average for the site, B=25-50% less than average, C= 25% more or less than average, D=25-75% more than average, F=>75% more than average

Foothills: Based on bare soil. All grades are based on percentages of average values for a given ecological site. A=bare soil 50% less than average for the site, B=25-50% less than average, C= 25% more or less than average, D=25-75% more than average, F=>75% more than average.

Ponderosa/Shrub: In the ponderosa community, there is some bare ground, but lots of grass/ forb growth. In this landscape, there is lots of protective cover, with little to no bare soil in shrub communities. These communities experience surface cover loss to roads and other disturbances=B, BLM GPA= 2.1

Montane: Bare soil not really a problem-A

Alpine: B

Biological crusts/ Cryptograms GPA = 2.07/ C

Desert Valley: Calculate GPA by removing the points with no cryptogams from analysis as a proxy to account for those soils and slopes which do not support cryptogams. GPA=1.88

Foothills: Calculate GPA by removing the points with no cryptogams from analysis as a proxy to account for those soils and slopes which do not support cryptogams. GPA=1.90

Ponderosa/Shrub: Biological crusts are more important feature in open ponderosa pine communities than in the shrub communities. Cyanobacteria seems to recolonize quickly after disturbance. B.

Montane: Not relevant to soil protection in this zone

Alpine: Not relevant to soil protection in this zone

6. Suggestions

1. Water

- Use USGS regional water quality database if it becomes available.
- Include Town of Telluride, and Telski and SMWC data in the water quality analysis.

2. Aquatic Life

- Include CDOW 2005 field season data in macro-invertebrate section and compare to BLM surveys from 2000-2004.

3. Wildlife

- Expand bird list, adding species utilizing riparian and wetland areas.
- Include a section on amphibians, as they are generally declining worldwide.
- Include a section on terrestrial invertebrates?

4. Vegetation

- Consider making non-native plants its' own category?

5. Soils

6. Climate

- Include SMWC data from Waterfall Canyon in atmospheric deposition analysis.
- Include Snow Pack data analysis in the Precipitation Section

7. Other

- Begin data collection in October with Thanksgiving deadline for submission.
- Aim for January completion and distribution to stakeholders.
- Private Land Protection Analysis Mapping Exercise to gauge all lands protect through either conservation easement or other measure