

II. CLASS I & CLASS II AREAS

Most of the 2.3 million acres administered by the WRNF is designated under the CAA as Class II for air quality management. Of the eight Wilderness areas on the WRNF, three are designated as Class I and five as Class II. This chapter describes the Class I and Class II wilderness areas within the WRNF and provides a general discussion of the remaining portion of the Forest in terms of management activities that potentially impact air quality.

A. CLASS I AIR QUALITY AREAS

The WRNF manages three Class I Air Quality Areas:

1. Flat Tops Wilderness
2. Maroon Bells - Snowmass Wilderness
3. Eagles Nest Wilderness

The following sections describe the physical and biological components of each of these areas.

1. FLAT TOPS WILDERNESS

LOCATION

The Flat Tops Wilderness lies within the Routt National Forest and WRNF. The portion of the Flat Tops Wilderness on the WRNF lies within the northwest section of the forest (Exhibit 1). The Wilderness encompasses most of the White River Plateau in Garfield and Rio Blanco Counties and lies within the Blanco, Eagle and Rifle Ranger Districts. The gross acres, which include both National Forest System lands and private inholdings within the Wilderness, and net acres, which include only National Forest system lands designated as wilderness, are split between the Routt and WRNF as shown in Table 4.

Table 4 – Flat Tops Wilderness – Acreage by National Forest

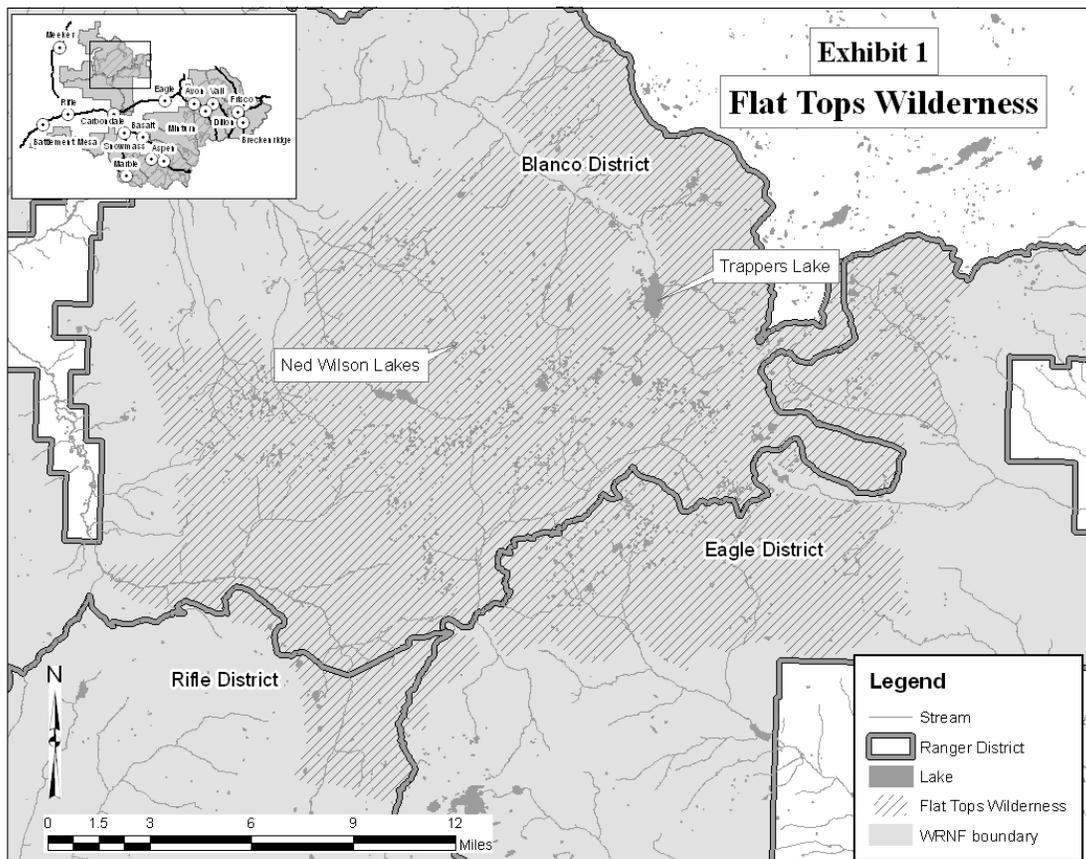
Forest	Gross Acres	Net Acres
Routt	38,870	38,870
White River	196,360	196,165
Total	235,230	235,035

Elevations range from 7,000 to 13,000 feet. Topography includes rolling, treeless alpine meadows on the Flat Tops plateau, sheer barren cliffs, and spruce covered mountainsides.

HISTORIC BACKGROUND

The Flat Tops Wilderness was established on the December 12, 1975, under Public Law 94-146. Trappers Lake, which some consider the heart of the Flat Tops Wilderness, was

the center of a development controversy in 1919. A proposed road and housing subdivision around Trappers Lake were hard fought by Arthur Carhart who felt there were alternatives that would preserve the beauty and wildness of this area. His plans to protect the area from development forever changed Trappers Lake's destiny and that of the Flat Tops Primitive Area surrounding it. His vision also impacted future management of national forest lands across the United States as his planning philosophies were directly tied to the Wilderness Act of 1964. Arthur Carhart eventually became known as the "Father of the Wilderness Concept". The Trappers Lake area is now referred to as the "Cradle of Wilderness."



CLIMATE AND HYDROLOGY

The climate is a mid-latitude, high elevational type with warm summers and cold winters. Temperatures rarely rise above 85 degrees Fahrenheit. Summers are short with an average growing season of 60 days, but frost can occur any time of the year. Winter temperatures may drop to extremes of 40 or more degrees Fahrenheit below zero. In northwestern Colorado, the precipitation can range from 10 to 47 inches. About 40 to 70 percent of the precipitation falls as snow from October to June. The summer rainfall is highly variable usually coming from large moist north and southwesterly air masses. These air masses are usually accompanied by high intensity thunderstorms of short

duration. The moisture distribution from these storms is greatly dependent on the topography.

Most of the Flat Tops Wilderness occupies the headwaters of the White River. Other major watersheds that the Wilderness lies in include the Colorado River to the east and the Yampa River to the north. Water yield from the drainages in the Flat Tops has high public value. Quality, quantity, and continuous flow of water are of major economic value to dependent downstream lands and users. The average annual precipitation of 30 to 40 inches yields between 10 and 20 inches of usable water annually. This averages to about 1.5 acre-feet of water per acre, annually.

SOILS & GEOLOGY

The Flat Tops area has been moderately dissected by stream erosion and glacial action. The plateau was formed from thick deposits of late Tertiary basalt that overlies the Leadville limestone (Mississippian age) and Dotsero Formation dolomite of Cambrian age. There are also a few areas where Precambrian granite is exposed. The stream valleys are covered with thick mantles of Quaternary glacial drift. Some of the valleys were formed from massive landslide deposits at the base of the vertical basalt walls.

Soils are variable. Generally, they are fairly stable and derive from granite, sandstone, limestone, and lava. The exception is the area to the northeast on the Routt National Forest. Soils here are of a shale origin and are a finely textured clay loam. They are fertile and productive, but subject to wind and water erosion with occasional "landflows".

VEGETATION

Broad cover types within the Flat Tops Wilderness include Engelmann spruce, Douglas-fir, aspen, brush, grassland, water, and other. Islands of timber surrounded by grassland comprise the typical vegetative pattern on the plateaus. Approximately 40 percent of the plateau is grassland. Hanging garden sullivania (*Sullivantia hapemanii* var. *purpusii*), which occurs in the Wilderness has been identified as "Sensitive" by the Forest Service, Region 2 (list accessed on May 16, 2008, see: <http://www.cnhp.colostate.edu/rareplants/whiteriver.html>). Rare plant species identified by the Colorado Natural Heritage Program on the above mentioned website also include: Wetherill milkvetch (*Astragalus wetherillii*), Harrington Beardtongue (*Penstemon harringtonii*), Pictureleaf wintergreen (*Pyrola picta*), and Northern twayblade (*Listera borealis*).

An epidemic of spruce bark beetle during 1939-1952 hit more than 68,000 acres of almost solid Engelmann spruce stands in the Wilderness. Today, as these stands of dead trees fall, they are progressively adding to fuel loading. Several relatively recent large fires have burned within the Flat Tops Wilderness:

- 1) Ute Creek Fire, 1994. Three thousand acres were burned, half of which were in the Flat Tops Wilderness.

- 2) Big Fish Fire, 2002. Seventeen thousand acres were burned, most within the Flat Tops Wilderness and the upper headwaters of the North Fork White River. All of the area around Trapper's Lake was burned in this fire.

WILDLIFE & FISH

A major part of the famous White River big game herds of several thousand deer and elk use the area during summer and fall. In addition, the area has black bear, mountain lion, bighorn sheep, and an occasional moose. Small game found in the area include blue grouse, white tailed Ptarmigan, snowshoe hares, pine squirrels, Nuttall's Cottontail, coyote, marmot, ground squirrels, and skunks. Other furbearers include bobcat, badger, fox, beaver, marten, mink, and weasel. Other native mammals include pika, chipmunks, gophers, and porcupines. Other birds are migratory waterfowl, eagles, hawks, crows, ravens, jays, Clark's nutcrackers, and numerous smaller birds that are found seasonally in the Montane and Alpine areas of the Central Rocky Mountains. The Barrow goldeye, Osprey and Black swift are sensitive bird species (Forest Service, Region 2 designation) found in the Flat Tops Wilderness.

Many lakes within the area are good to excellent fisheries. Several are periodically stocked by the Colorado Division of Wildlife. There are also a number of lakes which do not have fish. In addition to the lakes, over 50 miles of streams are rated as being good fisheries. Several of these contain "A+" strains of Colorado River cutthroat trout (*Oncorhynchus clarki pleuriticus*), which is a Forest Service, Region 2 sensitive species. Other sensitive aquatic species include the Northern Leopard frog (*Rana pipiens*) and the Boreal toad (*Bufo bufo boreas*).

2. MAROON BELLS-SNOWMASS WILDERNESS

LOCATION

The Maroon Bells-Snowmass Wilderness lies primarily within the WRNF with some acreage in Grand Mesa-Uncompahgre-Gunnison National Forest (GMUG). The Maroon Bells-Snowmass Wilderness is located on the south central portion of the WRNF and includes most of the Elk Mountains. It lies within both Gunnison and Pitkin Counties and within the Aspen and Sopris Ranger Districts.

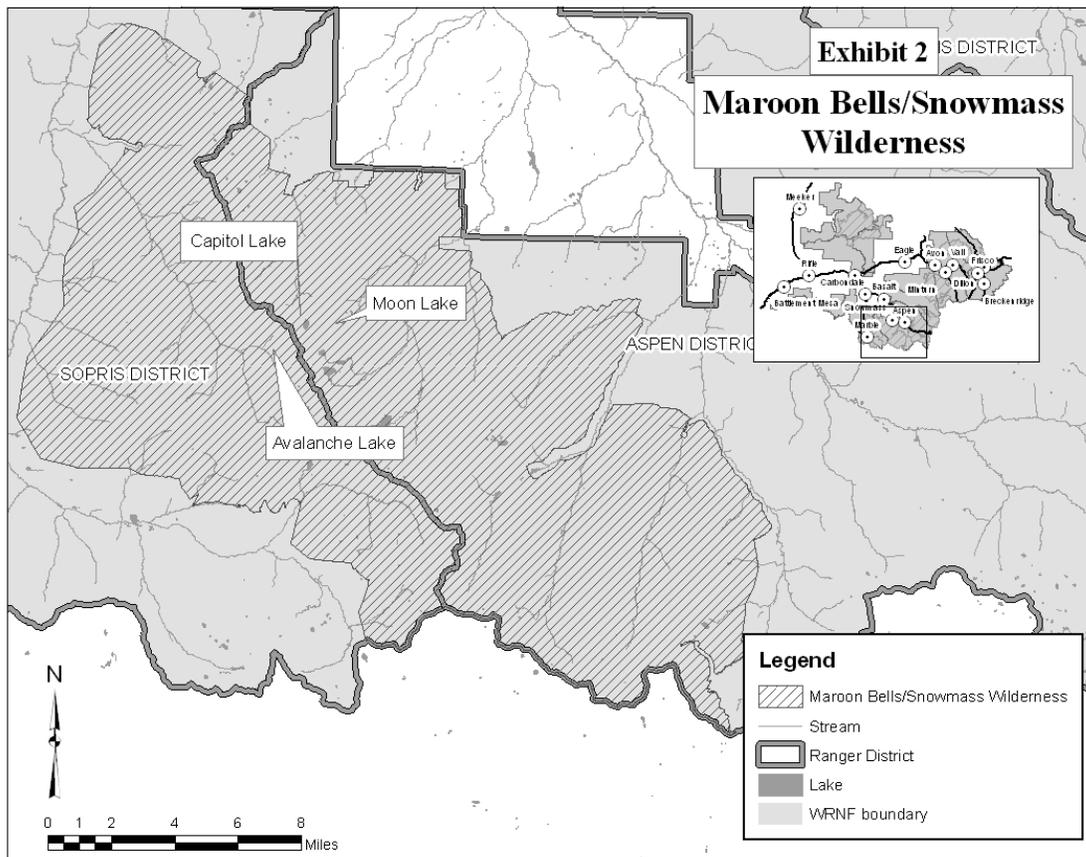
Table 5 – Maroon Bells-Snowmass Wilderness – Acreage by National Forest

Forest	Gross Acres	Net Acres
GMUG	20,364	19,194
White River	163,483	161,768
Total	183,847	180,962

Elevations range from about 7,500 to 14,300 feet.

HISTORIC BACKGROUND

The Maroon Bells-Snowmass Wilderness was first recognized for its wilderness attributes in 1933 when it was designated as a primitive area under Federal Regulation L-20. The name was changed from Primitive Area to Wild Area in 1956. With the passage of the Wilderness Act in 1964 the Maroon Bells-Snowmass Wilderness was established. At that time the Wilderness was 71,329 acres in size. It was enlarged by Public Law 96-560 adding 103,000 acres on December 22, 1980. The Wilderness is internationally known for the Maroon Peaks, which are the most photographed mountains in the United States.



CLIMATE & HYDROLOGY

Weather patterns in the Maroon Bells-Snowmass area can change rapidly. Summer is typically warm and dry but afternoon thunderstorms can occur on any given day. Temperatures range from highs between the 50's and 80's (Fahrenheit) and lows between the 20's and 40's depending on elevation. Average winter temperatures can range from highs between the 20's and 30's and lows that range between sub-zero and the teens. Average annual precipitation ranges between 18 and 46 inches depending on elevation. Snow can occur in any month of the year at the higher elevations. Most of the precipitation falls as snow between November and April.

The Maroon Bells-Snowmass Wilderness serves as headwaters to Maroon Creek, Snowmass Creek, and Avalanche Creek, which are all tributaries to the Roaring Fork River.

SOILS & GEOLOGY

The Maroon Bells-Snowmass Wilderness owes its scenic beauty to the unique geology of the Elk Range. It includes most of the Elk Mountain anticline, which is thrust-faulted in its southwestern part. The whitish gray rock of tertiary intrusives that include granodiorite are best evidenced in the sweeping narrow ridges of the Capitol Peak, Snowmass Peak, and Chair Mountain. The stratified purplish-red sedimentary rocks of the Permian age are evidenced in Pyramid Peak, the Maroon Bells, and Cathedral Peak. The area is crossed by the Colorado mineral belt, a narrow irregular strip of terrain that contains many of the mining districts in the State.

VEGETATION

Broad cover types within the Wilderness include Engelmann spruce, subalpine fir, aspen, lodgepole pine, Douglas-fir, mountain brush, and mountain grassland. Vegetation at the higher altitudes is fragile and slow to heal if damaged. There are three plant species found in the Maroon Bells-Snowmass Wilderness that have been identified as "Sensitive" by the Forest Service, Region 2 (see: <http://www.cnhp.colostate.edu/rareplants/whiteriver.html>). They are Woolly fleabane (*Erigeron lanatus*), Hanging garden sullivantia (*Sullivantia hapemansii* var. *purpusii*), and Leadville milkvetch (*Astragalus molybdenus*). Other "species of concern" per the Colorado Natural Heritage Program include Dwarf hawksbeard (*Crepis nana*) and Colorado wild buckwheat (*Eriogonum coloradense*).

WILDLIFE & FISH

The Maroon Bells-Snowmass Wilderness is populated with big game species such as elk, mule deer, mountain goats, bighorn sheep, and black bear. Important wildlife habitat for elk, deer, and bighorn sheep is located on the ridge between Conundrum and East Maroon Creek, and in the Willow, Haystack, Capitol, and Redstone Management Units. Small game species, furbearers, other mammals, and birds are similar to the listed species for the Flat Tops Wilderness. Lynx, a sensitive species, may inhabit the area; but there are no known threatened and endangered animal species.

Several of the lakes within the Maroon Bells-Snowmass Wilderness are periodically stocked by the Colorado Division of Wildlife.

Sensitive aquatic species identified by the USFS, Rocky Mountain Region, include the Boreal toad (*Bufo bufo boreas*) and Colorado River cutthroat (*Oncorhynchus clarki pleuriticus*).

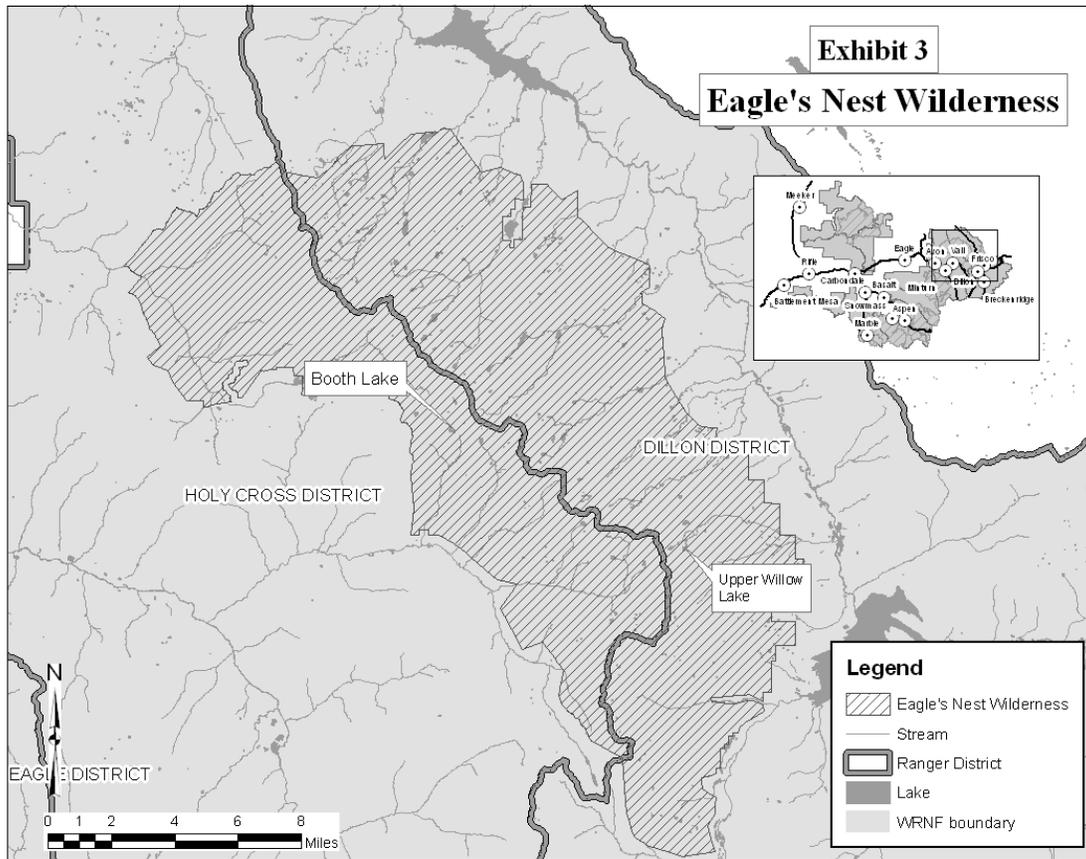
3. EAGLES NEST WILDERNESS

LOCATION

The Eagles Nest Wilderness is located on the northeast portion of the WRNF within the Holy Cross and Dillon Ranger Districts (Exhibit 3). Elevations range from 7,850 to 13,534 feet, with an average area over 10,500 feet. The Wilderness area's Gore Range provides a beautiful background from some of Colorado's ski area peaks. The entire Wilderness occurs within the WRNF as shown in Table 6.

Table 6 – Eagles Nest Wilderness – Acreage by National Forest

Forest	Gross Acres	Net Acres
White River	133,496	132,906



HISTORIC BACKGROUND

The area was first designated as the Gore Range Primitive Area in the early 1930's. It became the Eagles Nest Wilderness on July 12, 1976, under Public Law 94-352 after a 10 year battle by wilderness advocates to obtain Wilderness designation of this area. Much of the controversy stemmed around Denver's desire for the area's water and the timber industry's desire for wood products from the area's spruce forest.

CLIMATE & HYDROLOGY

Average annual precipitation is between 25 and 30 inches, and occurs mainly in the form of snow. Summer rain showers are usually of short duration and frequently produce hail and sleet. June and September are usually the dry months. Summer temperatures rarely exceed a maximum of 80 degrees and prevail from June through September. Winter minimums may reach 30 to 50 degrees below zero Fahrenheit. The growing season averages less than 60 days, and there are practically no extended frost free periods at the higher elevations.

The average water yield for the Wilderness is about 1.70 acre-feet per acre.

SOILS & GEOLOGY

The topography is dominated by the Gore Range, which is a chain of sharp peaks, rugged escarpments, and narrow mountain valleys. Bedrock in the area consists of several varieties of crystalline and metamorphic rocks of Precambrian age. Paleozoic and Mesozoic sediments were deposited over much of the area, but subsequent uplift of the Gore Range accompanied by erosive processes has stripped the sediments from the highlands.

Soils derived from granite, schist, and gneiss generally occur on steep slopes under a cover of trees. They are rocky, very acid, have varying depths, and are adapted to the rapid movement of water. There is very little erosion on these soils if the litter or vegetative protection is not destroyed.

Glaciers occupied most of the major valleys, and consequently, the valleys are blanketed by glacial and other surficial deposits. Terminal moraines can be found as well as areas of glacial till and outwash. Soil development on these glacial, colluvial, and residual soils differ because of the wide variation in elevation, climate, vegetation, and topography.

VEGETATION

Broad cover types within the Wilderness include: Lodgepole pine, Engelmann spruce, subalpine fir, Douglas-fir, aspen, grassland, brush, and water. Forest density varies from low on the steep, rocky hillsides and glacial moraines; to high in the narrow, moist valleys. Purple Lady's slipper (*Cypripedium fasciculatum*) is a Forest Service (Region 2) *sensitive species* found in Eagle's Nest Wilderness. Other *species of concern* per the Colorado Natural Heritage Program include: Low northern sedge (*Carex concinna*), and Northern twayblade (*Listeria borealis*).

WILDLIFE & FISH

Elk, deer, mountain goat, bighorn sheep, black bear, mountain lion, bobcat, lynx and coyote inhabit the area. The smaller mammals include snowshoe hare, pine squirrel,

beaver, badger, marten, weasel, mink, fox, skunk, porcupine, chipmunk, pika, marmot, and field mice. Ptarmigan, blue grouse, golden eagle, and many species of songbirds are present. There are reports of bald eagles in the vicinity of Eagles Nest Mountain. Lakes provide brook, native, and rainbow trout. Several streams contain "A+" strains of Colorado River cutthroat trout, which is a *species of concern* (Colorado Natural Heritage Program). Boreal toads (*Bufo bufo boreas*) have been found in the Wilderness and are also a *species of concern*.

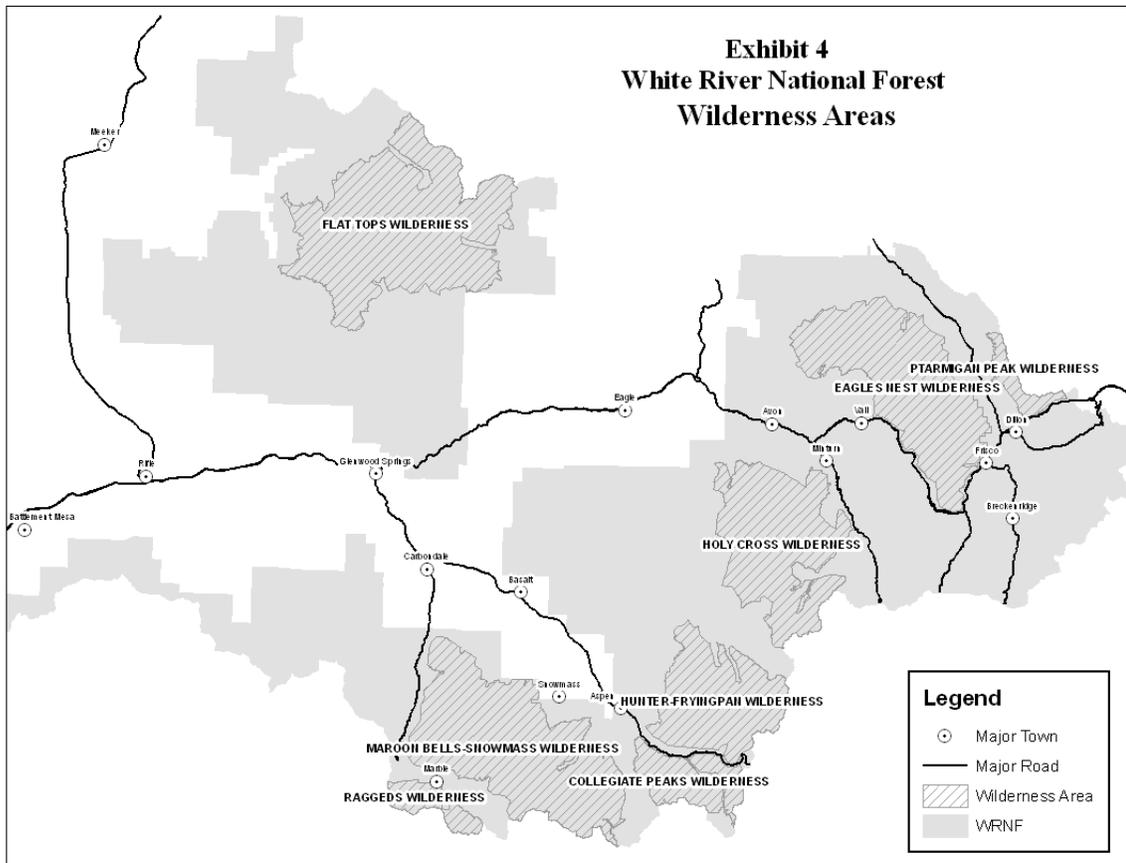
Several of the lakes within the Eagle's Nest Wilderness are periodically stocked by the Colorado Division of Wildlife.

B. CLASS II AIR QUALITY AREAS - WILDERNESS

There are five Class II wilderness areas that are located in whole or in part on the WRNF. They are:

1. Collegiate Peaks Wilderness
2. Holy Cross Wilderness
3. Hunter-Fryingpan Wilderness
4. Ptarmigan Wilderness
5. Raggeds Wilderness

The location of each Class II Wilderness on the WRNF is presented in Exhibit 4 below. Class I Wilderness area locations are also shown.



1. COLLEGIATE PEAKS WILDERNESS

Collegiate Peaks is one of the ten largest wildernesses in the state. Within its boundaries are more peaks above 14,000 feet than any other wilderness area in Colorado or in the lower 48 states.

Established in 1980, this wilderness lies within the Pike-San Isabel, Gunnison, and White River National Forests. Elevations range between 8,500 and 14,420 feet. The WRNF portion of the wilderness is located on the west side of the continental divide at the headwaters of the Roaring Fork River. There are extensive areas of exposed rock and alpine tundra; less than 30% of the WRNF portion is forested. The Wilderness is characterized by wide U-shaped valleys and numerous alpine lakes formed in rocky cirques.

Table 7 - Collegiate Peaks Wilderness – Acreage by National Forest

Forest	NFS Acres	Other Acres	Total Acres
Gunnison	48,996	98	49,094
Pike-San Isabel	83,106	125	83,231
White River	35,482	189	35,671
Total	167,584	412	167,996

Climate and annual precipitation are typical of high elevations in the Rocky Mountains with average annual precipitation ranging, by elevation, between 25 and 40 inches.

Water from the area is an important resource for downstream communities in the Roaring Fork Valley, especially Aspen. Transbasin diversions send some of these water communities on the east side of the continental divide through the Twin Lakes Reservoir and Canal Company Tunnel Number 1.

Within the Collegiate Peaks Wilderness are eight peaks above 14,000 feet. They include the state's third and fifth highest summits: Mount Harvard and La Plata Peak. Both peaks lie within the Pike-San Isabel National Forest. An additional half-dozen peaks are above 13,800 feet.

2. HOLY CROSS WILDERNESS

This wilderness area was established in 1980 and lies within the WRNF and Pike-San Isabel National Forest. The area is located in the northern part of the Sawatch Mountain Range and is primarily drained by the Eagle River and its tributaries. The southern part of the wilderness drains into the Fryngpan River. The Pike-San Isabel portion of the wilderness drains towards the Arkansas River. Elevations range from 8,000 to over 14,000 feet, and much of the area is above timberline.

Table 8 – Holy Cross Wilderness – Acreage by National Forest

Forest	NFS Acres	Other Acres	Total Acres
Pike-San Isabel	9,518	50	9,568
White River	113,366	475	113,841
Total	122,884	525	123,409

The ridges and peaks that characterize the high county in the Holy Cross Wilderness are formed from 1.7 billion-year-old schist and gneiss. Its glacially carved U-shaped valleys support headwaters of lakes and streams rich with cutthroat trout.

The climate is typical of high elevations in the Rocky Mountains with average annual precipitation ranging from 30 to 50 inches with elevation. There are a number of small lakes located within the Wilderness. Some of the water produced by this area is diverted through the Missouri and Homestake tunnels for use by Colorado Front Range communities.

The central feature of the Holy Cross Wilderness is the Mount of the Holy Cross at 14,005 feet elevation. A white *Latin* cross can be seen on the northeast face of the peak. A deep crevice, 1,150 feet long, forms the upright of the cross. About 500 feet below the top of crevice a snow-covered bench, 25 to 50 feet wide and approximately 400 feet long, forms the cross arm. The *cross of snow* is usually partially melted by late July.

The first recorded ascent of the peak was in 1873 by members of the F.V. Hayden U.S. Geological Survey expedition. At the same time the cross was photographed by William H. Jackson. One year later an artist, Thomas Moran, visited the area. Moran's painting, "The Mount of the Holy Cross, Colorado" became one of his most famous works. In 1929, an area of 1,392 acres surrounding the mountain was established as a national monument. In 1951 the national monument was designated to national forest status.

3. HUNTER-FRYINGPAN WILDERNESS

Established in 1978 the Hunter-Fryingpan Wilderness lies entirely within the WRNF. The area includes the headwaters of the Fryingpan River and the Hunter Creek and Woody Creek tributaries of the Roaring Fork River. The continental divide forms its eastern boundary. Elevations range from 8,500 to more than 13,000 feet. The climate is typical of high elevations in the Rocky Mountains with short summers and long, cold winters. Average annual precipitation ranges by elevation from 30 to 40 inches with more than half of this falling as snow between November and April.

Table 9 – Hunter-Fryingpan Wilderness – Acreage by National Forest

Forest	NFS Acres	Other Acres	Total Acres
White River	82,026	40	82,066

The area is an important source of water, some of which is diverted through trans-mountain diversion tunnels (e.g. Hunter, Chapman, South Fork, and Charles H. Boustead Tunnels) to communities in the Arkansas River drainage on the east side of the continental divide. Although much of the area is above timberline, there are several extensive stands of coniferous forest. The vast majority of the exposed rocks are precambrian granites and metamorphic rocks.

4. PTARMIGAN PEAK WILDERNESS

This wilderness was established by the Colorado Wilderness Act of 1993. The area is located on the west side of the Williams Fork Mountains and lies entirely within the WRNF. While small in size, the top of its ridge offers vistas to the west of the Gore Range, Eagle's Nest Wilderness, and the Mount of the Holy Cross. Southern views include the Tenmile Range and Tenmile Canyon. To the south is the Continental Divide. There are no lakes in this Wilderness. Climate is typical of high elevations in the Rocky Mountains with average annual precipitation ranging between 30 and 40 inches with elevation.

Table 10 – Ptarmigan Wilderness – Acreage by National Forest

Forest	NFS Acres	Other Acres	Total Acres
White River	13,1754	0	13,175

5. RAGGEDS WILDERNESS

This wilderness was established in 1980 and lies within the Gunnison and White River National Forests. The WRNF portion of the wilderness comprises the northeast slopes of The Raggeds Mountains. These mountains are well named with extremely steep, rocky, and broken terrain and numerous ledges and cliffs. Elevations within the wilderness range from 7,000 to 13,462 feet. Average annual precipitation ranges between 25 to 50 inches with elevation. Within the WRNF the Wilderness is drained by tributaries of the Crystal River. Very little of the area on the WRNF is forested, since much of the surface is exposed rocks. The only lakes on the WRNF side are two small ponds in the Milton Creek drainage and Yule Lakes.

Table 11 – Raggeds Wilderness – Acreage by National Forest

Forest	NFS Acres	Other Acres	Total Acres
Gunnison	48,600	11	48,611
White River	16,793	39	16,832
Total	65,393	50	65,443

C. CLASS II NON-WILDERNESS AREAS

In addition to the responsibility of the WRNF to actively protect the AQRV's in Class I and Class II Wilderness areas, the forest is also responsible for conducting its management activities without adversely impacting air quality. The following activities are those most commonly analyzed for air quality impacts in NEPA documents.

1. WILDFIRE MANAGEMENT AND PRESCRIBED BURNING

WILDFIRE MANAGEMENT

In wilderness areas, the smoke from naturally occurring wildfires is considered to be a natural phenomenon. However, this same smoke can also become a nuisance and a problem if it impacts a residential area, high use recreation area, or other smoke sensitive locations.

Forest Service direction for the management of wildfires (FSM 5130) requires a Wildland Fire Situation Analysis (WFSA) to document wildland fire suppression strategy decisions for any incident that is expected to exceed, or has exceeded, the action planned in a Fire Management Plan. The purpose of this analysis is to facilitate decisions about how to organize and conduct suppression operations with the goal to minimize both suppression cost and resource loss consistent with the resource management objectives for the values to be protected.

Analysis of the potential wildfire impacts on air quality must include projections of the areas likely to be affected by smoke and the duration of the impacts. These estimations are based on fuel conditions, forecasted wind directions, forecasted smoke dispersal conditions, and the expected duration of the wildfire. The duration of the fire is dependent upon the suppression strategy employed. The analysis of air quality impacts must also identify any smoke sensitive areas, which are expected to be affected.

An example of how air quality considerations may influence management of a wildfire is a situation where natural barriers will be relied on to prevent the spread of a wildfire. In this example several days burning will be required for the fire to reach these barriers. In the interim heavy smoke is expected to drain downslope into a smoke sensitive valley each night until the fire is out. To reduce the duration of this impact, direct control suppression strategy may be employed or a burn-out operation may be conducted to shorten the time.

On the WRNF there is an increased awareness by fire managers of the potential impacts of smoke to downwind communities as well as knowledge of the methods available to mitigate those impacts.

PRESCRIBED BURNING

Smoke from prescribed burning has more potential to adversely affect air quality than any other national forest management activity on the WRNF. Several management requirements have been implemented to reduce and/or mitigate these adverse impacts. These requirements include:

- a. Open Burning Permits from the Colorado Department of Public Health and Environment are required for all prescribed burning projects on the WRNF. There are two types of permits: one is for planned ignitions and the other is for naturally ignited prescribed fires. Applications are normally submitted to the State annually during February. After completion of the prescribed burn project in any given year, an *Actual Fire Activity* report is submitted to the State by March 1 of the following year.
- b. Prescribed Burn Plans are required for all prescribed burning projects conducted on National Forest lands. Smoke management considerations are a required part of every prescribed burn plan (FSM 5142). This section of the plan must address potential impacts on Class I air quality areas, local residents, population centers, transportation corridors, airports, and other smoke sensitive areas. The smoke management section of the plan must also include the procedures to be followed to mitigate both expected and unexpected unfavorable effects. Approval of these plans may include a requirement to monitor for smoke impacts.
- c. The Forest Service has implemented a certification/qualification program for personnel involved in prescribed burning. Formal training in smoke management techniques is a qualification requirement for prescribed fire planning specialists, prescribed fire managers, and all three burn boss levels. This training provides personnel in these positions with both an awareness of the need for smoke management and technical training in the methods available for mitigating adverse effects.

The WRNF has an active prescribed burning program for wildlife habitat and range improvement. Depending upon funding and weather conditions, between 2,000 and 4,000 acres are burned annually for these purposes. Most of these burns are in brush and grass fuel types with light to moderate fuel loadings. The burns can usually be conducted during one burning period and during conditions which are conducive to good smoke dispersal. As a result, smoke management measures are usually limited to ensuring that smoke dispersal conditions are favorable during the actual burning period, wind directions carry the smoke away from smoke sensitive areas, and there is a minimal amount of hold-over burning during the night.

The WRNF also burns from 100 to 200 acres of logging slash each year. Most of this consists of burning scattered piles of landing slash, which have been machine-piled by timber purchasers. Fuel loadings are typically in excess of 200 tons per acre and include

a high percentage of large diameter fuels (3+ inches). To avoid fire control problems, this type of burning is usually conducted during the late fall and early winter after the first snowfall. Although burning under these conditions minimizes control problems, it makes management of the smoke much more difficult. Hold-over burning of slash piles during the night may result in smoke draining downslope into smoke sensitive valley areas during the night and early morning hours. A number of techniques are available to prevent adverse impacts including:

- Reducing the amount of slash through utilization methods such as fuel wood gathering, lop and scatter for wildlife habitat, etc.
- Timing of the burning so that heavy fuels are still dry
- Machine bunching to achieve more consumption of the heavy fuels during favorable smoke dispersal conditions
- Stage burning to reduce the volume of smoke being produced at one time, etc.

In addition to prescribed burning by the Forest Service, there is a significant amount of burning each year by permittees and others. Disposal of slash and debris from clearing operations on ski areas are the most common type of burning by national forest permittees. There is also a small amount of burning on national forest lands by timber purchasers, oil and gas leases, and others. Prescribed burn plans, approved by the Forest Service, are also required for burning by permittees and others. In the case of ski areas, the prescribed burning plan is usually incorporated into the ski area's summer operating plan, which is prepared and approved annually.

SMOKE SENSITIVE AREAS

The most smoke sensitive areas in the immediate vicinity of the WRNF are the primary river valleys. These include the following:

- Blue River valley from Breckenridge to Kremmling
- Vail Valley from East Vail to Dowd Junction
- Eagle River Valley from Redcliff to Dotsero including the lower portions of Lake Creek, Brush Creek, and Gypsum Creek
- White River Valley from Lost Creek to Meeker
- Crystal River Valley from Marble to Carbondale
- Roaring Fork valley from Aspen to Glenwood Springs
- Frying Pan River drainage from Ruedi Reservoir to Basalt
- Colorado River canyons and valleys from State Bridge to Parachute.

The above areas are sensitive because population centers are primarily located within these valley bottoms. These areas also include most of the major transportation corridors and all of the local airports. Night time inversions and the diurnal wind patterns tend to concentrate smoke in the valleys and canyons during the night and early morning hours.

Three other areas on the WRNF are considered to be smoke sensitive because of their nationally renowned scenic values and high recreation use. They are:

- Maroon Creek valley from Maroon Lake to Aspen
- Mount of the Holy Cross including the viewing area from Shrine Pass
- Trappers Lake area.

There are also several smoke sensitive areas, which are not located in the immediate vicinity of the WRNF but could be impacted by smoke from wildfires or prescribed fires on the WRNF. These areas include:

- Plateau Creek valley including the town of Colbran
- North Fork of the Gunnison River Valley from Paonia Reservoir to Hotchkiss
- Slate River Valley in the vicinity of Crested Butte
- Upper Arkansas River Valley from Leadville to Twin Lakes
- Clear Creek drainage from Loveland Ski Area to Idaho Springs
- Fraser River Valley from Winter Park to Granby
- Upper Colorado River Valley from Grand Lake to Kremmling
- Yampa River Valley from Toponas to Craig

Wildfires and prescribed fires, which produce large quantities of smoke and/or last for several days, could easily impact these "down-wind" areas. Recognition and consideration of potential impacts to off-forest smoke sensitive areas is essential to proper management of both wildfires and prescribed fires on the WRNF.

2. GRAVEL PITS AND ROADS

National Forest management activities occasionally produce other air pollutants in addition to smoke. The most common of these is dust from gravel crushing operations, road construction, and travel on unpaved roads.

Dust from these operations is generally a localized nuisance and is easily mitigated with the use of dust abatement measures such as surface wetting or the application of magnesium chloride.

3. OTHER PERMITTED NATIONAL FOREST USES

A number of activities are authorized on National Forest land, which have potential for degradation of air quality within and adjacent to the WRNF. These include oil and gas exploration/development authorized by minerals leasing, locatable mineral mining with required surface operating plans, and commercial recreation developments permitted by special use permits.

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