

***WATERSHED RESTORATION ACTION STRATEGY  
(WRAS)***

***UPPER RIO HONDO***



Prepared by:  
The Upper Hondo Watershed Coalition  
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## ***ACKNOWLEDGEMENTS***

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# **UPPER HONDO WATERSHED RESTORATION ACTION STRATEGY**

## Table of Contents

<b>PREFACE.....</b>	<b>4</b>
<b>INTRODUCTION.....</b>	<b>10</b>
<b>PUBLIC OUTREACH.....</b>	<b>11</b>
<b>WATERSHED INVENTORY/ASSESSMENT.....</b>	<b>13</b>
<b>MONITORING/EVALUATION.....</b>	<b>18</b>
<b>WATER QUALITY PROBLEMS.....</b>	<b>22</b>
<b>WATER QUALITY GOALS AND RECOMMENDED ACTIONS.....</b>	<b>26</b>
<b>PAST, CURRENT, AND FUTURE PROJECTS.....</b>	<b>29</b>
<b>FUNDING.....</b>	<b>32</b>
<b>REFERENCES.....</b>	<b>33</b>
<b>APPENDIX A (WAG Members).....</b>	<b>35</b>
<b>APPENDIX B (Projects).....</b>	<b>38</b>
<b>APPENDIX C (Examples of BMPs).....</b>	<b>47</b>
<b>MAPS.....</b>	<b>54</b>
<b>A. Rio Hondo Watershed</b>	
<b>B. Vegetation Map</b>	
<b>C. Soils Map</b>	
<b>D. Land Ownership Map</b>	
<b>E. Ruidoso WUI Map</b>	
<b>F. Potential Non-Point-Source Nutrient Loading sources</b>	

## ***PREFACE***

The Upper Rio Hondo watershed, backdrop of the infamous Lincoln County Wars and Billy the Kid in late 1870s, is once again under siege.

- The Smokey Bear District of the Lincoln National Forest (LNF), which blankets the western edge at the top of the watershed, is in a serious state of degradation. Extensive livestock grazing in the early 1900s and fire suppression over the past 85 years have created a forest that is not only extremely vulnerable to catastrophic wildfire, but also one that is contributing to a severe loss of soil water. According to M3 Research in a report dated September, 2001, “Early pre-settlement forest and woodland landscape in the Lincoln National Forest carried 20-70 trees per acre, had significant openings, and extensive grass dominated understories.



View of Parsons Mine, circa 1915. (Johnson Stearns Collection)

- Today the Lincoln National Forest is dominated by dense forests and woodlands with average densities of 200-250 trees per acre. The combined effects of loss of openings, closed overstory, soil moisture depletion and increased litter, have all but replaced the grass understories. Small fuel ladders are prominent throughout the forest. Seeps, springs, and wetlands have been diminished by soil moisture deficits. Aquifer recharge and/or contribution to stream flow have been reduced 5-15%. Losses in water, grasses, and openings have reduced biological diversity. Insect and disease impact has increased. As a result, **over 65% of the forest landscapes in the watershed are at moderate to high risk of loss to catastrophic wildfire.**



Same view of Parsons Mine, 1996 (E. Hollis Fuchs)

- Given this milieu, considerable progress has been already been made in carving out a fire buffer zone around the Village of Ruidoso and other threatened areas (see

ongoing projects and WUI map), but the vast area outside of those buffers remains severely overgrown and vulnerable, with the possible exception of the forestland on Mescalero Apache Reservation, which has historically had a great forest health program and which also, as a sovereign nation, been able to address environmental issues with minimal delays caused by public controversy.

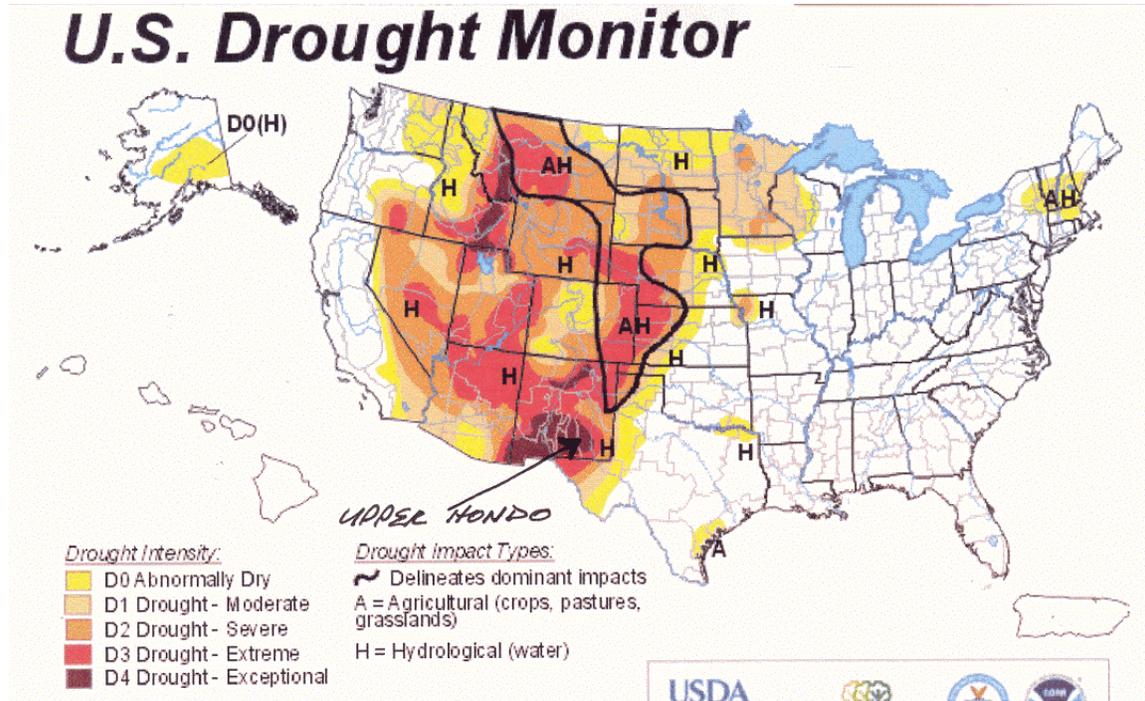
- And indeed, the fires have already started. Over past three years, the upper watershed has suffered no less than four catastrophic wildfires (see WUI map) and literally hundreds of smaller fires, as a result of the above conditions. The Cree Fire in May of 2000 not only burned 6,500 acres, but also came dangerously close to the Village of Ruidoso from the East. The Trap & Skeet Fire on the Mescalero Apache Reservation in June of 2001 burned 400 acres and came dangerously close to Ruidoso from the West. The Homestead Fire on the same weekend burned 200 acres and again threatened the Ruidoso from the east side. The Kokepelli Fire in late March of 2002 burned 1,092 acres and destroyed 29 high-dollar homes in Alto. High-intensity burns in these densely overgrown forests are now moonscapes of ash and sediment which threaten the water quality in the watershed. Indeed, as of this writing, according to the New Mexico State Forestry Division, Ruidoso remains the number one community in New Mexico potentially at risk to catastrophic wildfire. At the same time, as discussed herein, the Ruidoso Wildland Urban Interface Group is way out in front among communities dealing with catastrophic wildfire threats and has received numerous awards to that effect.
- The 2000 Census notes that population in the Upper Hondo Watershed (Lincoln County) has grown by 59% since 1990! Almost two-thirds of this growth has occurred in the mountainous western portion of the watershed (in the Villages of Ruidoso, Capitan, and Ruidoso Downs), which are interspersed with the Lincoln National Forest in a canyon setting. This growth has not only taxed the infrastructure, but has also contributed noticeable water quality impairments.
- A persistent drought, combined with “mining” of water during this growth period has drawn many of the watershed’s aquifers down to critical levels. (Indeed, in the summer of 2002, the water table in the Eagle Creek Basin, which provides 65% of Ruidoso’s municipal water supply, was drawn down below the well screens of 3 of the 4 major wells). The result of this collision course is, of course, an acute shortage of water in the Upper Hondo Watershed.



Eagle Creek, October 2, 2003. (Eagle Creek Conserv. Asso.)

Unfortunately, it only looks to get worse, as growth in the recreational upland area of the watershed is forecast to continue, while at the same time the New Mexico Bureau of Geology and Mineral Resources at New Mexico Institute of Mining and Technology warns that “river flow and reservoir storage during the 1980s and 1990s have been significantly higher than in previous decades and that most climate experts believe we are returning to a period of much drier conditions” (*New Mexico’s Water: Perceptions, Reality, and Imperatives*, 2002).

March 19, 2004



The search to find new sources of water in the Upper Hondo Watershed is, in a word, intense. So far, every attempt to bring all of the disparate users in the watershed to the table to form some kind of regional water planning authority has failed due to self-interest. The latest is just forming---The Lincoln County Commission has just appointed the South Central Mountain RC&D to conduct meetings “for the exchange of ideas on water conservation and development.”

Regional water planning is ever trickier in the URHW because some of the watershed’s most reliable “wet” water (see Bonito Lake) is currently owned by interests outside of the watershed (the City of Alamogordo and Holloman AFB) and is piped away into an adjoining watershed, the Tularosa Basin. A few years ago it seemed impossible that the rights to the Lake Bonito reservoir would ever be returned to Upper Hondo users, but the search for water to satisfy the State’s Pecos Water Compact with Texas and the possibility of a demineralization plant in the Tularosa Basin have suddenly made a swap far more possible. Indeed, in this direction, the

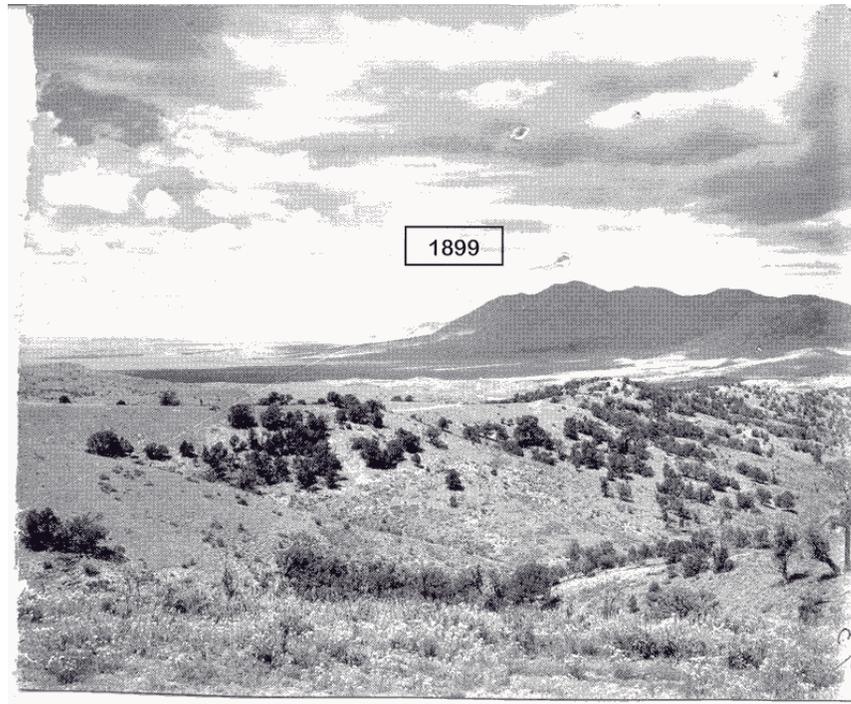
NM Senate recently passed *Senate Memorial 19*, resolving to investigate this very possibility.

- Just as the original Lincoln County War in 1878 was a complex battle for economic and political control of the county thorough the ownership of cattle, **the current war in Lincoln County is a complex battle over control through the ownership of “water rights.”** This battle was epitomized by a protracted legal struggle between Ruidoso Downs racetrack owner R. D. Hubbard, who wanted to build a golf course near the upland stretch of the Rio Bonito using water rights to be transferred from the Hondo area downstream, and downstream stakeholders who feared that such a transfer would impair their downstream rights (the OSE subsequently denied the transfer). Retired accounting professor and downstream stakeholder Hershel Anderson perhaps framed it best when he said, “You can’t keep diverting water up there and expect it to get back down here.” As discussed above, this battle is compounded by the fact that the Upper Hondo watershed contributes to the Lower Pecos, which is subject to the Pecos Water Compact with the State of Texas. It is therefore subject to a “priority call” should New Mexico’s annual delivery to Texas ever result in a shortfall. Indeed, the OSE announced in January of 2004 that it was ready to start purchasing and leasing 18,000 acres of water rights in the Lower Pecos.
- But downstream stakeholders in the watershed are not only concerned about quantity of water. They are also increasingly concerned about its quality. Over the past several years nuisance algae has begun to show up along the Rio Ruidoso and some of its tributaries, both above and downstream of the wastewater treatment at Biscuit Hill. This problem is now impairing the stream’s designated use as a high quality coldwater fishery upstream and also as an irrigation source downstream (see picture at right). This appearance has triggered the USEPA to impose a stringent phosphorus limitation on the WWTP that may require a \$7 million upgrade. The villages of Ruidoso and Ruidoso Downs, co-owners of the plant, in turn, contend that the nuisance algae is a watershed-wide problem and that it would make much more sense to fix the watershed above the WWTP. As of this writing, the villages have submitted a proposal (Appendix B) to do just that, which is under study at the EPA. It is hoped that some sort of solution involving “nutrient trading” could be worked out.

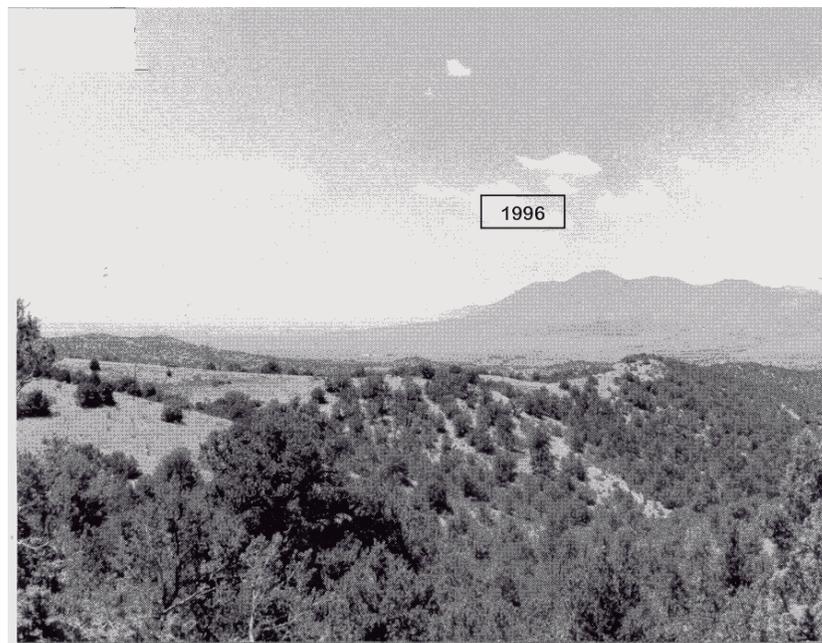


All of the above are currently combining to impair water quality in the Upper Hondo Watershed. It is the purpose of this Watershed Restoration Action Strategy to provide a blueprint for a long-term rescue plan.

An area east of Vera Cruz Mountain photographed in 1899, top, experienced an invasion of junipers in the last 100 years



Credit: R.T. Hill, U.S. Geologic Survey, 1899



Credit: E. Hollis Fuchs, 1996.



**45A.** Date: 1914. Credit: Rio Grande Historical Collections. Taken from Lookout Mountain, the highest point in Lincoln County, facing south, with White Mountain or Sierra Blanca (12,000 feet) in the background, on Mescalero Apache lands in Otero County. Trees appear to be covered with frost.

Lookout Mountain facing south to Sierra Blanca, 1914.



**45B.** Date: July, 1998. Credit: E. Hollis Fuchs, location found with help from Rick Hall and Roy Parker of Ski Apache. Compared to 1914, less area is covered with grass, while more area is covered by Mixed Conifers. Elevation of the photo point is about 11,800 feet.

Lookout Mountain facing south the Sierra Blanca, 1998. Less grass, more mixed conifers.

## **INTRODUCTION**

The Federal Clean Water Action Plan (CWAP) of 1998 was developed to help meet the goals of the Clean Water Act through the application of state-led cooperative efforts to identify and prioritize watersheds with water quality problems. In response to the actions mandated in the CWAP, a statewide task force conducted a New Mexico Unified Watershed Assessment in 1998 and therein identified 21 of New Mexico's 83 watersheds as Category I watersheds, or watersheds most "in need of restoration." The Upper Rio Hondo watershed was one of these.

The priority objective for the use of Section 319 grant funds is to implement the national policy, set forth in Section 101(a) of the CWA, that nonpoint source programs be implemented expeditiously to achieve the goals of the CWA, including the restoration and maintenance of the chemical, physical, and biological integrity of the Nation's waters. To achieve this objective, the CWA Section 319(h) program places top priority on implementing on-the-ground measures and practices that will reduce pollutant loads and contribute to the restoration of impaired waters, and to the development and implementation of watershed-based plans that are designed to restore waters that have been listed by States as impaired under Section 303(d) of the Clean Water Act. The watershed-based plan must be designed to achieve the load reductions called for in the NPS TMDL. However, where a NPS TMDL has not yet been developed and approved the plan must be designed to reduce NPS pollutant loadings that are contributing to non-attainment of water quality standards. However, once the TMDL is completed and approved, the plan must be modified as appropriate to be consistent with the load allocation portion contained within the TMDL.

The Watershed Restoration Action Strategy (WRAS) for the Upper Hondo Watershed contained herein is a comprehensive planning document for restoring the health of water bodies that are impaired within the Upper Hondo Watershed. This WRAS is not only a mandatory product for watershed restoration and non-point source pollution control project funding under Clean Water Act Section 319 (h), but is also meant to be the first edition of a living planning document for the continued restoration of the watershed into the foreseeable future. The UHWC will use the results of the New Mexico Environment Department's TMDL Assessment to modify this plan to reflect the nonpoint source load reduction needed to implement the TMDL for the Upper Hondo as soon as it is completed (it is currently ongoing).

## **SECTION 1. PUBLIC OUTREACH**

This section identifies the agencies and organizations that are responsible for the development of this WRAS, as well as the process by which it is being developed and will later be expanded.

The Upper Hondo Watershed Coalition (UHWC) is the lead organization for watershed plan development and will also play the major role in developing, coordinating and implementing public outreach activities within the watershed. The public outreach component will have two goals: 1) to make sure that every voice in the watershed is heard, and 2) to keep all interested parties fully informed of all of its activities and plans.

The UHWC was established in December of 1999 with a mission **“to protect, restore, and sustain the water resources of the Rio Hondo Watershed for the benefit of all through a collaborative effort to improve water quality, protect and enhance water and land resources, and to promote overall watershed health.”** From its first organizational meeting, the UHWC has included virtually all public and private entities with an interest in the watershed. Given the diversity of stakeholders in the Upper Rio Hondo watershed (Federal, Tribal, State, County, city, and private), this has been a significant accomplishment.

Planning and decision making in the UHWC is vested in an elected 10-member steering Committee, which also serves as the group’s Watershed Advisory Group (WAG). The WAG, with the help of public agencies as advisors and resource bases, has been responsible for the development of this initial WRAS, which has subsequently been reviewed and approved by the entire membership after incorporating changes approved by the WAG.

The driving force of the UHWC is the 1000+ member Ruidoso River Association, Inc. (RRA), which has been active in the watershed for the past 6 years and has already been enormously successful in drawing attention to the major tributary (Rio Ruidoso) in this Category I watershed. Indeed, the example of the RRA, and what it has been able to accomplish, has fostered a number of smaller watershed groups that are active in the watershed:

- Sacramento Mountains Watershed Restoration Corporation
- Eagle Creek Conservation Association
- The Water Network
- Rio Bonito Preserve
- Sonterra Watershed Management Area Committee

At the present time, there is no lack of interest in the Upper Rio Hondo Watershed. As mentioned above, the Upper Hondo Watershed provided the backdrop of the infamous Lincoln County Wars which spawned the Billy the Kid legend in the 1870s. Interest has been dramatically intensified during the past several years by widely publicized battles

over water rights, by significant wildfires, by a relentless drought which is seriously affecting the supply of water throughout the watershed, and even by a grassroots movement to determine if the person Sheriff Pat Garrett shot was really Billy the Kid.

Public outreach to assure support of this WRAS will come from the following activities:

- A Coalition Newsletter
- Wide distribution of a “State of the Rio Hondo Watershed” Video and Brochure
- Town Meetings, or “listening” sessions across the watershed.
- Regular Local Media coverage with an educational component.
- Public School Curriculum
- Classes at ENMU
- Annual County-wide River Cleanup Parties
- Retention of good, established working relationships with local governmental bodies.

Below: Volunteers take a break at the 2001 River Cleanup Party



## **SECTION 2. WATERSHED INVENTORY/ASSESSMENT**

**Location:** The Rio Hondo Watershed is a sub-basin of the Lower Pecos and is located in South-Central New Mexico, bordered by the Sacramento Mountains on the west, the Capitan Mountains on the North, and Pajarita Mountain on the south. As shown below, 55% of the watershed is in Lincoln County, 12% is in the highlands of Otero County, and the remaining 33% is in downstream Chavez County. Its Hydrological Unit Area is (HUA) is #13060008. The Rio Hondo Watershed drains its 1,076,480 acres (1,674 square miles) into the Pecos River near Roswell, New Mexico.



**Topography:** the following description of the topography of the Upper Hondo Watershed is excerpted from Water Resources and Geology of the Rio Hondo Drainage Basin, Walter Mourant, 1961:

“Relief in the Rio Hondo drainage basin ranges from an almost level alluvial plain in the east to deeply dissected mountains in the west. The altitude at the confluence of the Rio Hondo and the Pecos River is 3,445 feet; that of the Sierra Blanca peak in the western part of the basin is 12,003 feet.

Remnants of an ancient plain that probably extended through much of the region can still be traced on high mesas in parts of the Hondo basin. This plain was much higher and older than the alluvial terraces near the rivers.

The upland area west of the Pecos River alluvial plains is dissected deeply, especially at high altitudes in the western part of the Rio Hondo Basin. The valleys are U-shaped in the eastern and central part of the basin and are progressively V-shaped in westward in the upland area.

The mountainous areas consist of the Capitan Mountains, the Sacramento Mountains, and Pajarita Mountain. The Capitan Mountains, which rise about 4000 feet above the surrounding terrain, trend east-west about 20 miles and form the northern boundary of the Hondo basin. The altitude of the highest peak is 10,230 feet; the relief is sharp. Talus is common on the steep slopes and an alluvial fan of rounded boulders has been deposited around the flanks of the mountains. The Sacramento Mountains form a long north-south range, and a reach of about 15 miles of their crest forms the west boundary of the Hondo

basin. Sierra was glaciated during the Pleistocene Epoch, and has a glacial cirque on its northeast slope. Parajita Mountain forms the southern boundary and has an altitude of 8,014 feet.”

**Geohydrology:** The following description of the geology and structure of the Rio Hondo Watershed is taken from “Water Resources of the Ruidoso-Carrizozo-Tularosa Areas, Lincoln and Otero Counties, New Mexico” Shomaker (1991): “Rocks cropping out in the area range in age from Permian to Recent. The major structural features are the Ruidoso fault zone, Sierra Blanca Basin and Mescalero arch; the Ruidoso fault zone roughly separates the basin from the arch. In general, west of the Ruidoso fault line, Tertiary Sierra Blanca volcanics and Quaternary sediments overlie Tertiary and Cretaceous sedimentary rocks. East of the Ruidoso fault zone, rocks of Permian age are overlain by Quaternary sediments. The Three Rivers, Bonito Lake and Nogal stocks, large felsic intrusive bodies, are exposed west and northwest of the Ruidoso fault zone. These stocks, together with dikes and sills, intruded into the Sierra Blanca volcanics and older Tertiary and Cretaceous sedimentary rocks. In detail, the structure of the area is complex and rocks are locally faulted and highly fractured. East of the Ruidoso fault zone, the important aquifers are principally in Permian sedimentary rocks (Yeso Formation and San Andreas Limestone) and in Quaternary alluvium along major drainages.

**Climate and precipitation:** The climate of the Upper Hondo watershed varies with altitude, ranging from semi-desert in the eastern plains area, to the high, cool ranges of the Sacramento Mountains in the west and the Capitan Mountains in the North. Winters are approximately three months longer in the higher foothills and mountainous sections than they are in the east. The average precipitation ranges from 14 inches in the valleys to 30 inches in the mountains. At the higher elevations, one third to one-half of normal precipitation falls as snow from November through April. The lower elevations receive some snowfall, but it is usually less than one-third of the total annual precipitation. Temperatures in the watershed vary from a high of 90-100 degrees in the summer to below zero in the western section in the winter; however, prolonged periods of either extreme heat or cold are rare. During this rainy period in July, August, and September, localized, torrential rain storms, with very high intensity, but of short duration, are common.

**Drainage:** The principal streams in the Rio Hondo basin drain generally eastward toward the Pecos River from their points of origin high in the Sacramento Mountains. The principal streams are perennial only where their canyons are cut below the water table. Most of the tributary streams are intermittent.

### Surface Water:

The Rio Hondo: The Rio Hondo is formed by the confluence of the Rio Ruidoso and the Rio Bonito, at Hondo, 25 miles east of Ruidoso. The Rio Hondo is a perennial stream from Hondo to approximately Riverside where it flows underground into the Roswell Artesian Basin. The entire reach of the Rio Hondo below the confluence of the Rio Ruidoso and the Rio Bonito is 50 miles.

The Rio Bonito: The headwaters of the Rio Bonito are in the Sacramento Mountains. Until several years ago, the Rio Bonito was a perennial stream in the mountainous area down to about 10 miles northwest of Hondo, but recent drought conditions combined with increased diversions in the past several years have made it intermittent. Evidence suggests that the downstream reaches of the stream never sustained a perennial flow even prior to the initiation of the diversion in the early 1900s by pipeline of 3000 acre feet to the Tularosa Basin for municipal uses. To provide storage for this pipeline, in 1930-31 the Southern Pacific Railroad built a dam on the Rio Bonito, which created Bonito Lake (see below). The entire reach of the Rio Bonito is approximately 35 miles.

The Rio Ruidoso: The headwaters of the Rio Ruidoso are on the forested slopes of Sierra Blanca within the Ski Apache Resort Area. The Rio Ruidoso is perennial throughout its length of 34 miles, except that a few short reaches below Ruidoso Downs may not flow when water is temporarily being diverted for municipal or irrigation needs. A portion of the surface flow of the Rio Ruidoso is diverted to Grindstone Lake, a reservoir for one of Ruidoso's two water treatment plants.

Small tributaries: Carrizo Creek, Cienegita Creek, Eagle Creek, Little Creek, Cedar Creek, and Gavilan Creek are smaller streams which feed the Rio Ruidoso. Of these, only one-Carrizo Creek-is perennial, and that for only in the short stretch from Lake Mescalero to its confluence with the Rio Ruidoso in downtown Ruidoso. Magado and Salado Creeks are major intermittent drainages which drain the area between the Sacramento and Capitan Mountains and empty into the Rio Bonito. Eagle Creek surface water is a source of drinking water for the Village of Ruidoso.

Lakes: There are 6 lakes in the Upper Hondo Watershed, all man-made.

Eagle Lakes #1 and #2: these two small lakes were constructed in the late 1950s along the South Fork of Eagle Creek on the Mescalero Apache Reservation. They are used for recreation only.

Mescalero Lake (3000 A/F) is located at the Inn of the Mountain Gods Resort on the Mescalero Apache Reservation. It was built in 1974 and is used primarily a recreational lake. Historically, it has historically been fed by the Cienegita and Carrizo Creeks, but recently those sources were subsidized by a newly drilled well. The lake is also used to irrigate the Golf Course at the Inn.

Bonito Lake (1,200 A/F) was created when a dam was built across the Rio Bonito in 1931 by the Southern Pacific Railroad to supply water for its steam engines. When the railroad switched to diesel engines in the early 1950s, the reservoir was sold to the City of Alamogordo for municipal use.

Grindstone Lake (1520 A/F) was created in 1987 when the Village of Ruidoso built a dam across Grindstone Canyon, filling it with surface water diverted from the Rio Ruidoso. Grindstone Lake is a reservoir for drinking water to the Village of Ruidoso. The lake is also has a secondary recreational use as a fishery and non-power boating.

Alto Lake (306 A/F) was created in 1965 when Eagle Creek was dammed up to create a reservoir for municipal water use, with secondary use for recreation (fishing).

Land Use: Although land use in the watershed as measured by acreage is primarily rangeland (65%) and forest land (25%), the lion's share of activity in the watershed comes from recreation and service industries. Urban land use in the watershed is estimated to be 10-15 %, but growing rapidly.

The major agricultural enterprise is cattle and sheep-raising on the native grasslands. Farming in the valleys of the Ruidoso, Bonito, and Hondo with water diverted from these streams for irrigation is the second most important enterprise, with crops consisting largely of fruit and forage crops. Woodland and timbering operations consist of cutting of such wood and posts that are used locally, and the cutting of pinon and juniper for sale as fireplace wood and cutting of Christmas trees. The major trend in land use, which began about 35 years ago and has continued at an accelerating pace, is the development of subdivisions for vacation homes and speculation on woodland and rangeland in the southwest part of the watershed near Ruidoso and northward toward Nogal and Capitan. This trend is likely to continue.

Land ownership in the watershed is broken down as follows: Private landowners 33%, USDA-FS 30%, Mescalero Apache Tribe 29%, BLM 4%, and the NM State Land Office 2%. The remaining 2% is owned and/or controlled by various entities. (see Map D).

Soils: A description of the soils of the Upper Hondo watershed can be found in the *Long Range Plan* of the Upper Hondo SWCD and can be divided into three large associations. "The first of these includes soils formed from limestone of the San Andreas formation in the central and eastern parts of the watershed. These soils are the very shallow Ector Deama and Tortugas cobbly and stony loams in association with limestone rock outcrop on hilltops and steep slopes, and Gabaldon and Asparas loam and clay loam soils along the narrow ranges. Hogadero, Pena and Plack gravelly loams are found on ridges and piedmonts, with Darvey, Asparas, Reventen and Sampson loams on side slopes and valley bottoms.

The second major association includes soils above 7,000 feet formed from granite and associated igneous, metamorphic, and sedimentary outwash. These soils are located in

the southwest and north central part of the watershed on the Sacramento and Capital Mountains, and include Monjeau, Docdee, and Nolten loams and cobbly loams.

The third major association of soils is found in the Ruidoso, Hondo, and Bonito drainages and in broad valleys between the Sacramento and Capitan Mountains. These are generally deep loamy and clay loam soils in the Reventen, Manzano, and Remunda series on the valleys and side slopes, and Nogal, Bernal, and Stroupe stony loams on ridges and hills.” Map C shows the location of these soil associations.

**Vegetation:** Also from the Upper Hondo SWCD’s *Long Range Plan*, “There are three main plant communities in the Upper Hondo watershed. Grasslands predominate in the eastern part and in the broad valleys between the Sacramento and Capitan Mountains. Pinon-juniper savannah and woodland predominates on the limestone hills in the middle of the watershed and on the lower slopes of the mountains. Finally, Ponderosa pine and mixed conifer (Douglas fir, White fir, Southwestern white pine, and aspen) are found on the higher slopes. A small area near Nogal Peak is dominated by broadleaf deciduous trees, primarily Gambol oak with a smaller amount of New Mexico locust and canyon maple.

Unfortunately, a significant portion of the upper watershed is made up of dense stands of pinon-juniper woodlands and ponderosa pine, which due to fire suppression policies over the past 50 years, have average densities now of 200-250 trees per acre above 5”dbh, versus pre-settlement densities of only 50-70 trees per acre. Suppression of wildfire has also resulted in excessive seedling regeneration and ingrowth success. This combination has not only engendered a significant degradation of forest health with its concomitant wildfire threat, but it has also caused a significant loss of infiltration into the watershed’s aquifers, increases rates of erosion, and significant downstream sedimentation.

In the grasslands, the vegetation consists largely of blue grama, galleta, black grama, sideoats grama, New Mexico feathergrass, threeawn, tobosa, cholla cactus, and broom snakeweed. This type merges gradually into the juniper-pinon area, which supports, in addition, mountain muhley, western wheatgrass, plains lovegrass, bottlebrush squirreltail and sagewort. The ponderosa pine and mixed conifer areas have an understory of mountain brome, mountain and spikey muhly, various fescues, junegrass, pine dropseed, and wavyleak oak. Numerous colorful forbs are found in all areas, especially following wet winters and during the summer rainy season.”

Like many watersheds in the southwestern states, the Upper Hondo watershed has also been invaded in the last 50 years by *Tamarix* (saltcedar), which has spread into nearly every perennial drainage in the watershed. This invasion has not only rapidly displaced native riparian forest and scrub communities by quickly creating saline soil conditions that native riparian species cannot tolerate, it has also drawn the water table significantly (*Tamarix* consumes water 35% more rapidly than native vegetation, lowering instream flows). *Tamarix* also fosters sedimentation and reduces the width and depth of river channels, reducing the water-holding capacity of waterways and increasing the frequency and severity of overbank flooding. Last, but not least, *Tamarix* provides poor habitat for

many species of native wildlife and drastically reduces the abundance and diversity of riparian taxa.

### **Human Resources:**

**Population:** According to the 2000 Census, approximately 19,000 people live in the Upper Hondo watershed. Of this number, roughly 2/3rds live in the communities throughout the watershed and 1/3<sup>rd</sup> live on farms and ranches. The largest village is Ruidoso with a permanent population of 7,700. Approximately 1,824 people reside in Ruidoso Downs, and 1,443 live in Capitan, the other two major communities in the watershed. Several small communities with populations of generally less than 100 residents are found along the Ruidoso, Bonito, and Hondo Valleys: Lincoln, Picacho, Tinnie, San Patricio, and Glencoe, as well as Arabela on the east end of the Capitan Mountains. In addition, thousands of tourists and part-time residents spend a few days or weeks year, in both summer and winter, in the recreational areas surrounding Ruidoso.

## **SECTION 3. MONITORING AND EVALUATION**

Every WRAS requires a monitoring plan so that its overall success, as well as the success of the individual projects undertaken under its aegis, can be continually evaluated, adjusted, and improved upon, so as assure that it will enjoy the greatest chance of long term success.

The goal of the monitoring plan of this WRAS is to develop a long-range monitoring program with clearly defined **milestones** that will oversee the restoration of the watershed, transcend the individual projects, and ultimately result in the delisting of all impaired stream reaches in the watershed..

The monitoring plan for the WRAS provides for the development of individual monitoring plans, or Proposal Quality Assessment Plans (PQAPs), specific to each underlying project. Technical assistance in setting up these plans will be provided in workshops held by the Upper Hondo Watershed Coalition in conjunction with the Surface Water Quality Bureau (SWQB) of the New Mexico Environment Department. Appropriate monitoring techniques will be chosen using that bureau's "Quality Assurance Project Plan for Water Quality Management Programs, 2000," or other methods approved by the Environmental Protection Agency.

The monitoring methodologies that will be developed for use in this WRAS will be methodologies that 1) use **measurables that will quickly reveal changes** in the parameters for which the project was implemented, 2) can be **readily understandable** so that they can be implemented by cooperators and volunteers whose levels of technical skills may vary widely, and 3) are **compatible and consistent throughout the watershed.**

At this time, it is anticipated that at least the following variables will be monitored in the Upper Hondo Watershed. As time goes by, this list will be expanded or contracted as conditions dictate.

- **Water quality**: sediment, turbidity, nutrients, stream bottom deposits, phosphorus, dissolved oxygen, metals, pH, temperature.
- **Water quantity**: in-stream flows, infiltration rates, aquifer recovery, ground water levels in water wells.
- **Riparian vegetation**: plant species, plant communities, cover, succession processes, proper functioning condition.
- **Fish habitat, reproduction**: population and fish health studies.
- **Outreach**: participation and behavioral changes in the affected communities
- **Conservation easements**: number of people attending workshops, feedback, number of people granting easements.

In each project, as well for the WRAS as a whole, baseline conditions will be established and monitored before implementation. A monitoring schedule will then be developed based on the type of project and the timing of its implementation. Monitoring results will be reported to NMED and EPA, by project, on a quarterly basis.

### **BASELINE DATA**

#### **Water quality:**

The UHWC will use the results of the New Mexico Environment Department's TMDL Assessment as baseline data for the Upper Hondo as soon as it is completed (it is currently ongoing). Until then, water quality in this WRAS will be guided by the following:

- "State of New Mexico CWA Section 303-D List for Assessed Streams and River Reaches, 2000-2002."
- Independent monitoring conducted by the Ruidoso River Association using with volunteer monitors certified by NMED.
- The results of professional monitoring currently contracted for and underway by the Village of Ruidoso to determine the cause and sources of nuisance algae.
- "Water Quality Survey of the Lower Ruidoso, Lincoln County, NM, July 29-31 and August 1, 1985," Smolka and Jacobi, NMED, Surveillance and Standards Section.
- "Intensive Survey of the Upper Ruidoso, Lincoln County, NM, September 7-9, 1983," Smolka and Jacobi, NMED, Surveillance and Standards Section.

- Lake Water Quality Assessment for Selected New Mexico Lakes” (Grindstone Canyon Reservoir, Alto Reservoir, and Bonito Lake), 1997, Seva J. Joseph and Danny R. Davis, Surveillance and Standards Section.

**Water Quantity**

- Historical stream flow records maintained by USGS (list location of all gauges)

**Upland and Riparian**

- M3 Research’s “Evaluating Forest Restoration Opportunities on the Lincoln National Forest,” September 25, 2001.
- BLM data
- USDA-FS data
- South Central Mountain NRCS data

**Fish Habitat, Reproduction:**

- New Mexico Game and Fish Studies

**DATA COLLECTION RESPONSIBILITIES**

Responsibility for the entering of data under the protocols defined above will reside with the project managers of the individual projects as spelled out their individual work plans. The collection, organization, and storage of data will be the responsibility of the Upper Hondo Watershed Coalition, which will also be responsible for the quarterly reporting of this data to the US-EPA and the SWQB of the NMED. Monitoring results for all projects will be available and accessible to UHWC members and made public through the posting of results and analysis on our website and also reported in the RRA newsletter, “Notes From the Noisy Water.”

In addition to those monitors to be identified in the workplans of the individual projects under this WRAS, the following entities will be involved in monitoring activities:

- As described above, the baseline monitoring for water quality will be done by the SWQB of the NMED in 2003-2004 in the TMDL Assessment of the Upper Hondo Watershed. Other data that may be used include compliance monitoring of industrial and municipal discharges, fixed station monitoring, and other intensive surveys including chemical, biological, and geomorphological assessments performed by NMED.

- Although it will have to be expanded and refitted, the Ruidoso River Association has a trained cadre of volunteers trained and certified by SWQB/NMED to monitor surface water quality.
- The Villages of Ruidoso and Ruidoso Downs as required under NPDES permits.
- The Mescalero Apache Tribe.
- The Bureau of Land Management
- The USDA-Forest Service
- The Office of the State Engineer
- The U.S. Geological Survey
- The Upper Hondo SWCD
- Watershed Watch –Ruidoso High School
- Additional volunteers among landowners throughout the watershed

**BENEFITS OF THE MONITORING PLAN**

- The implementation of this monitoring plan will enable the UHWC meet the goal of this WRAS, which is the restoration of the Rio Hondo Watershed so that it will be removed from the state’s 303-D list..
- The implementation of this plan will allow the UHWC to evaluate the ability of specific BMPs chosen to produce long-term benefits and to reach project goals.
- The UHWC will have reliable, hard data to document successes and failures.
- The compilation of this data will greatly improve our understanding of the processes at work in the degradation of the Rio Hondo Watershed.

## ***SECTION 4: SPECIFIC WATER QUALITY PROBLEMS***

The New Mexico Environment Department-Surface Water Quality Bureau began the TMDL Assessment/Development Process for the Upper Rio Hondo in 2003. Upon completion, the resulting document will become the controlling document concerning water quality in the basin. Until then, the Upper Rio Hondo Watershed suffers from the following known or suspected non-point-source and point source water quality problems:

### **IMPAIRMENT**

Probable/potential sources

#### **Stream Bottom Deposits**

Removal of riparian vegetation  
Construction  
Range grazing  
Highway maintenance and runoff  
Flow regulation/modification  
Bank destabilization

#### **Plant Nutrients**

Ski Apache Resort  
Onsite wastewater systems (septic)  
Golf courses  
Catastrophic wildfire areas  
CAFO (RS racetrack and stables)  
Cattle and horse farms  
Agriculture  
Sludge, manure, and compost piles

Biscuit Hill WWTP

Mescalero Apache WWTP

#### **Turbidity**

Ski Apache Resort  
Land development  
Construction  
Municipal runoff  
Removal of riparian vegetation  
Range grazing  
Highway maintenance and runoff  
Bank destabilization  
Agriculture  
Recreation and tourism



Deep Freeze Ski Run blowout, 1996 (RRA photo)



Sediment pond below Ski Apache, 2000 (RRA photo)

### Temperature

- Sedimentation
- Excessive plant growth
- Invasive species
- Habitat modification
- Flow regulation/modification
- Bank destabilization
- Dewatering



Nuisance Algae in Carrizo Creek, 2000. Credit: NMED

### Dewatering

- Unbridled development
- Multi-year drought
- Dense forest overgrowth
- Invasive species
- Mining of water >sustainable yield



Invasive species attack Magado Creek, 1996 (E. Hollis Fuchs)

**IMPAIRMENT OF DESIGNATED USES.** As discussed above, the Rio Hondo Watershed is comprised of two primary perennial tributaries, the Rio Ruidoso and the Rio Bonito, which join to form the Rio Hondo approximately halfway down to where the Rio Hondo drains into the Lower Pecos. The New Mexico Water Quality Control Commission divides the watershed into two segments, separated basically by elevation and/or terrain. Segment #208 includes the perennial reaches of the Rio Bonito downstream of highway 48 (near Angus), the Rio Ruidoso downstream of the U.S. Highway 70 bridge near Seeping Springs, and the perennial reaches of the Rio Hondo. Segment #209 includes Eagle Creek above the Alto reservoir, the Rio Bonito upstream of state highway 48 (near Angus), and the Rio Ruidoso and its tributaries upstream of the U.S. Highway 70 bridge near Seeping Springs. The designated uses of segment 208 as listed in the *State of New Mexico Standards for Interstate and Intrastate Streams* (October, 2000) are fish culture, irrigation, livestock watering, wildlife habitat, coldwater fishery, aquatic life, and secondary contact. The designated uses for segment 2209 are domestic water supply, fish culture, high quality cold water fishery, aquatic life,

irrigation, livestock watering, wildlife habitat, municipal and industrial water supply, and secondary contact.

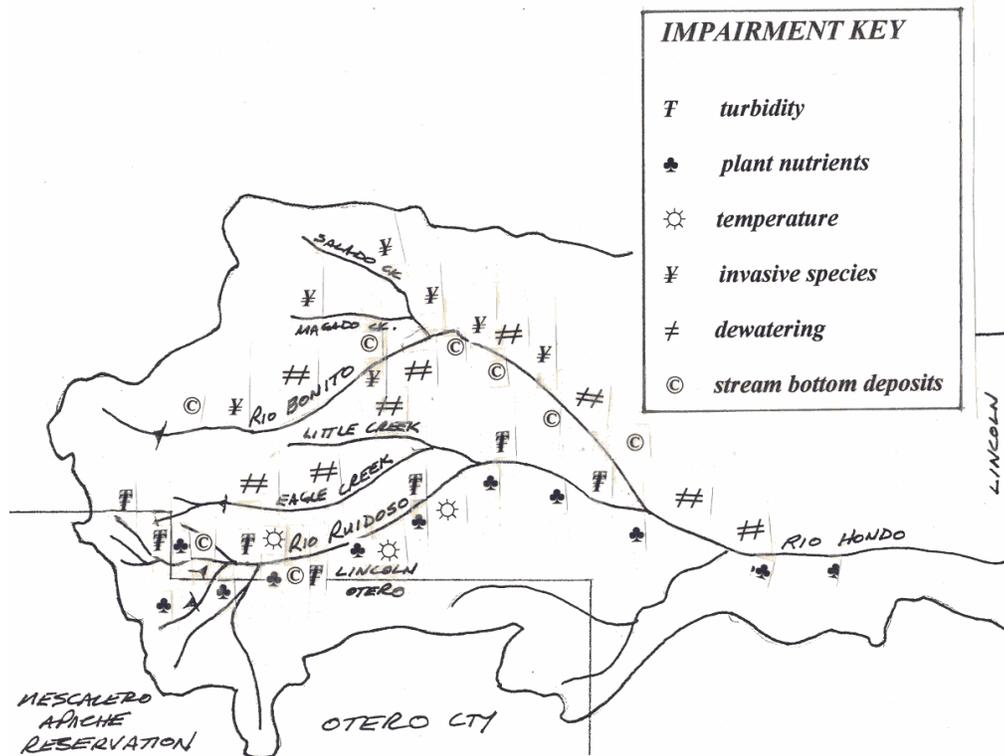
Four specific reaches of these stream segments are currently listed as impaired (failing to fully meet the stream's designated uses) in the 2000-2002 "State of New Mexico CWA Section 303-D List for Assessed Stream and River Reaches." Those reaches (with impaired designated uses, probable causes, and probable sources as listed on the 303-D list are:

- **The Rio Ruidoso upstream of the U.S. Highway 70 bridge at Seeping Springs to the Mescalero Reservation.** Impaired designated use: high quality cold water fishery. Probable causes: turbidity, temperature, and streambank deposits. Probable sources: removal of riparian vegetation, recreation and tourism, range grazing, septic tanks, land disposal, land development, construction, habitat modification, municipal point sources, bank destabilization, and agriculture. (To the probable causes we would add nuisance algae, and to the probable sources we would add ski slope runoff, forest management, urban runoff, and forest fire runoff.)
- **The Rio Ruidoso downstream from Seeping Springs to its confluence with the Rio Bonito.** Impaired designated uses: coldwater fishery. Probable causes: stream bottom deposits and plant nutrients. Probable sources: removal of riparian vegetation, range grazing, municipal point sources, hydro-modification, habitat modification, flow regulation, bank modification/destabilization, and agriculture). To the impaired uses we would add irrigation. To the probable sources we would add ski slope runoff, forest management, urban runoff, and animal holding/management-Ruidoso Downs Racetrack).
- **The Rio Bonito from the confluence with the Rio Ruidoso to Angus Canyon.** Impaired designated uses: cold water fishery and irrigation. Probable causes: stream bottom deposits. Probable sources: removal of riparian vegetation, range grazing, hydro-modification, highway maintenance and runoff, habitat modification, flow regulation, bank destabilization/modification, and agriculture. (To the probable sources we would add forest management).
- **The Rio Hondo downstream from the confluence of the Rio Bonito and Rio Ruidoso.** Impaired designated use: coldwater fishery. Probable cause: unknown; probable source unknown. To the impaired uses we would add irrigation. To the probable causes we would add ski slope runoff, forest management, urban runoff, forest fire runoff, and disposal .

The total reach of the Rio Ruidoso is 33 miles. The total reach of the Rio Bonito is also 33 miles. After they join to form the Rio Hondo, NM, the remaining length of the Rio Hondo to the Lower Pecos is 40 miles. The total reach of the CWA priority listing for streams in the watershed is 72 miles.

One of the watershed's man-made lakes, Alto Lake, is also on the state's 303-D list. Its impaired designated uses are fish culture and high quality cold water fishery. The probable cause is acute copper and the probable source is pesticide application (copper sulfate). Indeed, when the Village of Ruidoso went to draw on the reservoir in the spring of 2001, it smelled so bad that even after treatment that they were not able to use it. The reservoir was clean and refurbished in 2003 and is awaiting surface water flow from Eagle Creek to be refilled.

### LOCATION OF IMPAIRMENTS



## ***SECTION 5: WATER QUALITY GOALS-RECOMMENDED ACTIONS***

The implementation of this WRAS will restore the Upper Rio Hondo Watershed to a properly functioning condition and improve water quality to the degree that none of its rivers, lakes, and streams are on the State of New Mexico's 303-D list. The achievement of this goal will be a function of the success the UHWC achieves with respect to the following sub-goals:

**1. An effective, long-term public outreach/education program will continue to engender broad public participation, understanding, and support.**

**2. The danger of catastrophic wildfire has been reduced significantly, removing a major and ever-present threat to water quality.**

- Reintroduce fire and thinning to areas that have too many small diameter trees and/or where high levels of damaging insects and diseases are evident.
- Continue to thin out a buffer zone in the Ruidoso Wildland Urban Interface Area to protect structures and people.
- Remove invasive vegetation, such as salt cedar, and replace with native riparian species.
- Continue to support local efforts 1) to develop systems for the efficient removal of slash and small diameter trees resulting from forest thinning projects, and to 2) develop viable commercial products from the accumulated biomass.

**3. Instream flow and water retention are improved significantly.**

- Reduce tree density and open up the stand overstory in the watershed to engender the growth of grasses, shrubs, and forbs.
- Manage the pumping of groundwater on a "sustainable yield" basis.
- Remove invasive vegetation, such as salt cedar, and replace with native riparian species.
- Implement proven rangeland BMPs to control erosion.
- Encourage conservation.
- Meter irrigation and domestic wells.
- Ensure that land use decisions are consistent with available water supplies.

- Reintroduce beavers.

#### **4. Sediment loading is reduced by 40%.**

- Implement the *Ski Apache Watershed Restoration and Management Plan*.
- Encourage the Mescalero Apache Tribe to re-establish a wetland area just downstream of the Ski Apache Resort by re-introduce beavers or installing artificial terracing.
- Implement appropriate rangeland BMPs with respect to grazing management, gully erosion, and streambank degradation. (see Appendix C)
- Develop and implement a Storm Water Management Plan for Ruidoso and Ruidoso Downs.
- Through the use of monitoring, locate and identify all sources of significant sediment discharge and develop appropriate BMPs to mitigate the loading. (see Appendix C).
- Enforce current regulations or craft new ones that insure that runoff created from construction sites be retained on site.
- Insure that all highway and road construction in the watershed utilize proven BMPs to limit the negative effect of construction/maintenance on water quality. (see Appendix C ).
- Maintain all BAER projects.

#### **5. Nutrient loading is reduced by 40%.**

- Implement the *Ski Apache Watershed Restoration and Management Plan*.
- Evaluate all potential nutrient sources, such as septic systems, agricultural runoff, and golf courses and develop appropriate BMPs to mitigate nutrient loading. (see Map F).
- Upgrade WWTPs to meet state standards for effluent discharge.
- Launch an aggressive public information campaign with a “community spirit” motif to let citizens know what each can do to help reduce the input of phosphorus and nitrogen pollution in both the stream and wastewater system.
- Monitor the Ruidoso Downs Racetrack for strict compliance with EPA Region 6 guidelines on Concentrated Animal Feeding Operations.

**6. Eroding streambanks are stabilized and the riparian habitat is noticeably improved.**

- Remove and replace invasive foreign species, such as Tamarisk, Elm, and Russian Olive, with native species that are appropriate to the soil and climatic regime.
- Build structural BMPs (see Appendix C) wherever appropriate to reestablish the natural geomorphological characteristics that promote stability.
- Implement range improvements including reduction of woody species and improvement of grass cover, development of stock watering facilities off-river, active herding of livestock to minimize impacts in particular riparian and pasture areas, pasture rotation, and fencing to allow recovery of riparian vegetation.

**7. The floodplain is protected from development that degrades the watershed.**

- Land use planning.
- Conservation easements.

**8. The watershed's fisheries are improved.**

- See all of the above.
- Reduce “bag limits.”
- Encourage the practice of “catch and release” fishing.
- Set aside stream segments with the “special waters” designation.

## **SECTION 6: PAST, CURRENT, AND FUTURE PROJECTS**

As stated at the outset of this report, both water *quality* and water *quantity* in the Upper Rio Hondo Watershed are under siege. Thirsty forests at the top of the watershed are not only severely overgrown, but also diseased and thus stand at the mercy of catastrophic wildfire. Unbridled economic growth in the face of a multi-year drought has lowered water tables, dried up streams, and overloaded the remaining streams with too much sediment and too many nutrients. Invasive vegetation has seized the moment to gain a solid foothold.

The good news is that, as shown in Appendix B, the stakeholders in the watershed have responded admirably to meet this assault on all fronts. **An incredible amount of investigation and mitigative activity is already going on in the watershed and a great deal more is planned.** Indeed, many of these projects were underway well before the first draft of this document in late 2002. Many have, in fact, shaped its contents.

**CATASTROPHIC WILDFIRE:** As stated above, one of the biggest overall threats to water quality in the Upper Rio Hondo watershed is catastrophic wildfire. In response to this threat, led by the foresighted Ruidoso Wildland Urban Interface Group (RWUIG), approximately 20,000 acres have already undergone fuels reduction and/or forest health treatments of one sort or another (see map E), including an almost-completed defensive ring of space around the Village of Ruidoso. An additional 100,000+ acres are on various drawing boards for fuels reduction. The cost of these treatments already exceeds \$8,000,000. Thanks to the efforts of Sherry Barrow Strategies (SBS) and Sierra Contracting, Inc., (SCI) the watershed is also on the leading edge of biomass utilization. SBS was ranked #1 in a nation-wide demonstration project utilizing gasification of wood chips, co-sponsored by the U.S. Department of Energy (DOE) through the National Renewal Energy Lab (NREL), and the USDA-FS, Forest Products Laboratory (FPL) and SCI already has its composting product under specs for mulching at the NM Highway and Transportation Department. All past fires have had Burned Area Emergency Rehabs, (BAER) treatments at an additional cost of \$ 5,000,000. The Village of Ruidoso and the Mescalero Apache Tribe have received prestigious awards for being “Fire Wise.”

**PLANT NUTRIENTS:** Another significant threat to water quality in the watershed is excessive nutrient loading in the Rio Ruidoso and its tributaries. This loading has triggered a rash of excessive plant growth and other unsightly nuisance algae, which have severely taxed the stream’s designated uses as a high quality cold water fishery and irrigation source. Again, as shown in Appendix B, a major effort is already underway to locate and mitigate this impairment, at both point and non-point-source origins. In this direction, not only has the Village of Ruidoso and the City of Ruidoso Downs contracted for an outside firm to conduct nutrient monitoring on the subject Rio Ruidoso, but the watershed also underwent the NMED TMDL assessment process in 2004. Both Ruidoso and Ruidoso Downs are in the process of extending and updating sewer lines at a combined cost of over \$10,000,000. \$15,000,000 of plant upgrades are currently planned for the joint WWTP at Biscuit Hill. Another \$7,000,000 of WWTP improvements will be required to meet phosphorous standards if the cities are unable to

convince the EPA to “trade” NPS overall watershed improvements for the point source discharge at the WWTP. The Ruidoso Downs Racetrack and Casino is in the process of lining the river with revetments as it passes through the stable area. An outreach and education campaign is being written to get the whole watershed involved in the use of less phosphorus.

**SEDIMENT, TURBIDITY,& STREAM BOTTOM DEPOSITS:** As outlined in Section 4 above, another major non-point-source problem impairing water quality in the Upper Hondo Watershed is sediment/stream bottom deposits/turbidity. Again, as of this update, although a great deal remains to be done to mitigate this impairment, Appendix B shows that a great deal of diagnosis, ground-work, and planning have already taken place. Early monitoring by the Ruidoso River Association, Inc. followed the trail of sediment loading all the way up to the Ski Apache Resort at the top of the watershed. Although numerous other non-point sources have been identified downstream of the resort, such unpaved roads in the Upper Canyon, the need for a storm-water management plan in both the Village of Ruidoso and the City of Ruidoso, following the ancient Chinese proverb which advises that, “If you’re going to fix the river, you must fix the mountain first”---the ski resort is the logical place to start to mitigate the sediment loading before moving down-stream. In this direction, a comprehensive watershed improvement and management plan has been written for this area and has been approved by all parties. Implementation will begin later in the Spring (2004). The coalition working on this project includes the Mescalero Apache Tribe, the Smokey Bear District of Lincoln National Forest, and the Ruidoso River Association, Inc.

**INVASIVE PLANT SPECIES:** Invasive vegetative has so far only shown up in the lower elevations of Rio Bonito sub-watershed and downstream in the Rio Hondo Valley. Although Appendix B notes that a number of minor projects have already been completed in this area, this impairment is getting lots of attention. The Upper Hondo Soil and Water SWCD, for example, is in receipt of a \$350,000 grant from the New Mexico Water Trust Board “to thin/remove, control, and/or eradicate salt cedar, elm, Russian olive, pinion/juniper/pine overgrowth and/or phreatophytic vegetation” in the Upper Hondo Watershed. This project is currently under a feasibility study by the U.S. Army Corps of Engineers, which will contribute an additional \$ 750,000 if it is deemed feasible. In the meantime, federal representatives of the watershed are busy targeting this impairment: 1) under a bill sponsored by NM Representative Steve Pearce, the U.S. House recently passed a bill which would provide \$100 million to allow the Interior and Agriculture Departments to study the infestation and possible eradication of the salt cedar and Russian olive trees, and 2) a committee chaired by NM Senator Pete Domenici passed SB 1516, called the “Salt Cedar and Russian Olive Control Demonstration Act,” which aims to preserve in-stream water resources by establishing a research and demonstration program to accelerate the eradication of the non-species thriving along rivers in the western United States. This bill directs the Department of the Interior, working with other federal agencies, “to complete an assessment of the extent of salt cedar and Russian olive infestation in the western United States, to undertake a minimum of five eradication demonstration projects, and to analyze possible beneficial uses of the resulting material.” The bill authorizes \$20 million in fiscal year 2005 and \$15 million each year thereafter for demonstration projects that can use up to \$7 million in federal

funding on a cost share match on non-federal lands. Given the salt-cedar eradication efforts already underway in the Lower Pecos Watershed, of which the Upper Rio Hondo is a sub-watershed, the chances of some of this money going into the watershed appears to be very good. An equally strong effort is going on at the state level. New Mexico HB 2 calls for \$5 million for salt cedar removal and restoration on the Rio Grande, Pecos, and Canadian Rivers.

**DEWATERING:** The on-going drought in the Upper Hondo Watershed (see drought map in Preface) continues and is now being compared the “mother-of-all-droughts” back in the 1950s. At the same time, despite the frantic warning screams of science, the governing bodies in the watershed have yet to institute policies to restrain growth. Nevertheless, reality has set in and the process of acknowledgment has begun: 1) The 40-year water plan for the Lower Pecos Valley projects that increasing demand will cause a deficit of 25,400 acre feet/year by 2040, 2) The Village of Ruidoso has just submitted its 40-year water plan to the Office of the State Engineer which acknowledges that “Existing water supplies and water rights as developed do not meet (future water use projections),” 3) Lincoln County has commissioned a 40-year water plan which is due in June, 2004. 4) The intense fuels reduction efforts in the upper watershed in response to the fire threat will greatly enhance water retention, 5) The alarming draw-down of its Eagle Creek North Forks wells has painfully introduced the Village of Ruidoso to the concept of “sustainable yield,” 6) A memorial passed recently in the state Legislature which called for an investigation of returning the Lake Bonito reservoir (see above) owned by the City of Alamogordo to local hands in exchange for creating another water supply (a desalinization plant) for that city in the Tularosa Basin, 7) Most municipal entities in the watershed have enacted strict water conservation measures.

**SECTION 7: FUNDING NEEDS AND SOURCES**

<b><u>TASK</u></b>	<b><u>EST COST</u></b>	<b><u>SECURED</u></b>	<b><u>NEEDED</u></b>
Habitat Improvements	\$ 1,500,281	\$ 500,281	\$ 1,000,000
Watershed Improvements	2,000,000	200,000	1,800,000
Develop Wetlands	960,000	0	969,000
Remove/replace invasive species	1,100,000	1,100,000*	0
Eutrophication management			
WWTP-I	15,057,000	15,057,000	
WWTP-II	6,677,000		6,677,000
Ext sewer lines	10,420,395	10,420,395	
Rehab sewer line	701,008	701,008	
Other watershed mitigations	1,000,000	30,000	970,000
Fuels Reduction/WS Health	36,000,000	32,973,000	3,127,000
Outreach	1,000,000	171,800	828,200
Grand totals	\$ 75,415,000	\$ 52,953,800	\$ 22,461,200

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### Appendix A: Members of the Upper Hondo Watershed Coalition

<u>Organization</u>	<u>WAG</u>	<u>Name</u>	<u>Phone</u>	<u>E-mail</u>
Alto Lakes Water Corporation		John Whitehead	505 336-4333	jwhitehead@valornet.com
BIA		John Andrews	505- 464-4410	NA
BLM		Tim Kreager Ed Roberson Michael Mcgee	505 627-0272	tim_kreager@blm.gov ed_roberson@blm.gov mumcgee@blm.gov
City of Alamogordo	*	Keith Kessler	505 336-4157	KeithKessler@zianet.com
Devegetation Vegetation Management		Sally Canning	505- 653-4041	laughingsheep@pvtnetworks.net
Eastern New Mexico University		Jim Miller, PhD	505 257-2120	Jim.Miller@enmu.edu
Fly's Etc.		Charles Dixon	505 257-4968	flvs.etc@zianet.com
Ford Secure Trust	*	Royce Griggs	505 653-4617	NA
Lincoln County Commission	*	Tom Stewart	505- 648-2385	lincoln@tularosa.net
Mescalero Apache Tribe	*	Thora Walsh-Padilla	505 464-9222	thora@mescaleroapachetribe.org
Mesilla Flyfishers		Ron Smorynski	505 526-8086	ronaldvs@aol.com
NCRS		Bob Moorhead	505 648-4293	bob.moorhead@nm.usda.gov
New Mexico District 56		Rep. Dub Williams	505 378-4181	NA
New Mexico Environment Dept.-SWQB		Maryann McGraw	505 827-0160	maryann_mcgraw@nmenv.state.nm.us
New Mexico Dept of Game and Fish		Shawn Denny	505 624-6135	sdenny@state.nm.us

New Mexico Highway and Transportation Dept	Gary Shubert	505 637-7270	<a href="mailto:garyshubert@nmshhd.state.nm.us">garyshubert@nmshhd.state.nm.us</a>
New Mexico State Forestry Division	Bill Duemling Barbara Luna	505 354-2231	<a href="mailto:bduemling@state.nm.us">bduemling@state.nm.us</a> <a href="mailto:bluna@state.nm.us">bluna@state.nm.us</a>
NM State Land Office	Jim Norwick	505 827-5095	<a href="mailto:jnorwick@slo.state.nm.us">jnorwick@slo.state.nm.us</a>
Project WET-New Mexico	Bryan Swain	505 646-1378	<a href="mailto:bswain@nmsu.edu">bswain@nmsu.edu</a>
Rio Bonito Preserve	Reginald Richey	505 6534015	<a href="mailto:rwrm@pvtnetworks.net">rwrm@pvtnetworks.net</a>
Ruidoso Downs Racetrack & Casino	Bruce Rimbo	505 378-4431	<a href="mailto:brimbo@ruidosodownsracing.com">brimbo@ruidosodownsracing.com</a>
Ruidoso Independent School District	Paul Wirth	505 257-4051	<a href="mailto:pwirth@ruidoso.k12.nm.us">pwirth@ruidoso.k12.nm.us</a>
Ruidoso River Association, Inc.	Ben Mason Dick Wisner	505 257-9743 505 257-9494	<a href="mailto:ben315@charter.net">ben315@charter.net</a> <a href="mailto:noisywater@valonnet.com">noisywater@valonnet.com</a>
Ruidoso Valley Chamber of Commerce	Brad Treptow	505 257-7395	<a href="mailto:brad@ruidoso.net">brad@ruidoso.net</a>
Senator Jeff Bingaman	Lynn Ditto	505- 622-7113	<a href="mailto:lynn_ditto@bingaman.senate.gov">lynn_ditto@bingaman.senate.gov</a>
Sacramento Mountains Watershed Restoration Corp	Rick Warnock	505 434-9054	<a href="mailto:snwrc@yahoo.com">snwrc@yahoo.com</a>
Sherry Barrow Strategies	Sherry Barrow	505 257-5508	<a href="mailto:qualtrak@lookingglass.net">qualtrak@lookingglass.net</a>
Sonterra Watershed Management Area	Peggy Whitmore	505 336-1436	<a href="mailto:pegw@zianet.com">pegw@zianet.com</a>
Sierra Vista Estates	Jim Vender	505 336-4296	NA
Sierra Contracting Inc.	Van Patton	505 378-1091	<a href="mailto:vampatton492@yahoo.com">vampatton492@yahoo.com</a>
Southern Rockies Agricultural Land Trust	Sid Goodloe	505 354-2379	NA
South Central Mountain RC&D	Richard Shaw Greg Haussler	505 648-2941	<a href="mailto:richard.shaw@nm.usda.gov">richard.shaw@nm.usda.gov</a>

The Water Network	Bill Midkiff	505 336-2095	midkiff@zianet.com
Upper Hondo SWCD	Sue Stearns	505 653-4360	uhswcd@tralinnet.com
U.S. Army Corps of Engineers	Edward Paulsgrove	505 342-3279	ed.i.paulsgrove@usace.army.mil/reg1
U.S. Congressman Steve Pearce	Steve Pearce	505 622-0055	www.house.gov/pearce
USDA-Forest Service-Smokey Bear District	Buck Sanchez Larry Cordova Clark Taylor	505 257-4095	bsanchez@fs.fed.us lcordova@fs.fed.us clarktaylor@fs.fed.us
US Geological Survey	Louis Madrid Dan McElany	505 646-1335 505 885-5939	gdmcclha@usgs.gov
Village of Captain	Benny Coker	505 354-2691	
Village of Ruidoso	Rick Delaco	505 257-5544	vorpnz@tralinnet.com
Village of Ruidoso Downs	John Waters	505 378-4422	jwaters@zianet.com

<b>Appendix B: Completed, Ongoing, &amp; Future Projects</b>						
<b>PROJECT TYPE/PROJECT</b>	<b>LEAD</b>	<b>ACRES</b>	<b>DURATION</b>	<b>STATUS</b>	<b>COST(\$)</b>	<b>FUNDING SOURCE</b>
<b>PLANNING PROJECTS</b>						
<b>MONITORING PROJECTS</b>						
<i>TMDL ASSESSMENT</i>	NMED	1,076,480	2003-2006	Ongoing	?	NMED
<i>RIO RUIDOSO NUTRIENT/PHOSPHOROUS</i>	VOR		2003-2004	Ongoing	\$102,000	VOR
<i>WRAS DEVELOPMENT</i>	UHWC	1,076,480	2001-2004	Ongoing	18,182	NMED/RRR
<i>LINCOLN COUNTY WATER PLAN</i>	LC	3,108,760	2002-2004	Due 6-1-04	\$200,000	LC, USGS
<b>WATERSHED RESTORATION PROJECTS</b>						
Rio Ruidoso Watershed Restoration-Phase I	RRA	NA	1998-2003	Completed	\$438,481	NMED/RRR
Rio Ruidoso Watershed Restoration-Phase II	RRA	NA	2002-2005	Ongoing	\$400,000	NMED/RRR
Ski Apache Sediment Reduction Project	MAT	4	2000-2004	Ongoing	\$215,000	NMED/RRR
Bonito Lake Bank Restoration	UH SWCD	NA	1997	Completed	\$50,000	EQUIP
Ski Apache Watershed Improvement Project	MAT/RRR/FS	Apprx. 800	2003-2008	Underway	\$1,000,000	NMED/MAT/USDA
Bench 2 Juniper Removal	BLM	133	2003	Completed	66,500	FED
Bull Pasture Juniper Removal	BLM	470	2003	Completed	235,000	FED
Airport Mesa Juniper Removal	BLM	197	2003	Completed	98,500	FED
Rangeland Bush Removal	UH-SWCD	5,000	1998-2003	Completed	\$106,166	EQUIP



	SLO	120	2003	Completed	\$180,000	SLO
Hondo Valley Juniper Removal	SLO	120	2003	Completed	\$180,000	SLO
<b>FUELS REDUCTION PROJECTS</b>						
Hale Lake	USDA-FS	300	1997	completed	8,763	NFP
Eagle Creek	USDA-FS	275	1997	completed	4,063	NFP
South Divide	USDA-FS	700	1997	completed	?	NFP
Perry Canyon	USDA-FS	250	1998	completed	12,081	NFP
South Divide	USDA-FS	1000	1998	completed	?	NFP
Grindstone Water Development	USDA-FS	NA	1998	completed	7,350	NFP
Waterhole Canyon	USDA-FS	400	2000	completed	24,000	NFP
North Fork Salado	USDA-FS	280	2000	completed	18,000	NFP
Grindstone I	USDA-FS	162	2001	completed	20,354	NFP
Grindstone Habitat Improvement	UHWC	700	2001-2003	Completed	\$39,288	NMED/USDA
Tunstall Habitat Improvement	USDA-FS	280	2002	completed	\$27,725	NFP
White Mountain Habitat Improvement	USDA-FS	280	2002	completed	\$30,142	NFP
Devil's Canyon Watershed Improvement	UHWC	200	2002-2003	Completed	15,000	NMED/USDA
Silva Canyon Habitat Improvement	UHWC	260	2002-2003	90%	\$27,715	NMED/USDA
Philadelphia Canyon Habitat Improvement	UHWC	362	2001-2003	Completed	\$15,265	NMED/USDA
Lake Bonito Fuels Reduction Project	COA	50	2204-2005	Underway	\$50,000	COA
Mescalero Apache Reservation	MAT/BIA	1200		90%	\$1,500,000	MAT/BIA
Inn of the Mountain Gods		794		Completed	\$397,000	MAT/BIA
Travel Center		280		60%	\$300,000	MAT/BIA
Ruidoso Cabins		1068		Completed	\$534,000	MAT/BIA
Ciengita Lakes		1200		Completed	\$600,000	MAT/BIA
Palmer Pena						
<b>Wildland Urban Interface Projects</b>						
Perk Canyon	USDA-FS	3085		Completed	\$768,750	NFP
Eagle Creek	USDA-FS	2670		Ongoing	\$985,464	NFP

APPENDIX B

<i>Appendix B: Completed, Ongoing, &amp; Future Projects</i>							<i>FUNDING</i>	
<i>PROJECT TYPE/PROJECT</i>	<i>LEAD</i>	<i>ACRES</i>	<i>DURATION</i>	<i>STATUS</i>	<i>COST</i>	<i>SOURCE</i>		
<i>PLANNING PROJECTS</i>								
<i>MONITORING PROJECTS</i>								
<i>TMDL ASSESSMENT</i>	NMED	1,076,480	2003-2006	Ongoing	?	NMED		
<i>RIO RUIDOSO NITRENT/PHOSPHOROUS</i>	VOR		2003-2004	Ongoing	\$102,000	VOR		
<i>WRAS DEVELOPMENT</i>	UHWC	1,076,480	2001-2004	Ongoing	18,182	319MATCH		
<i>LINCOLN COUNTY WATER PLAN</i>	LC	3,109,760	2002-2004	Ongoing	\$200,000	LC, Uses		
<i>WATERSHED RESTORATION PROJECTS</i>								
<i>Rio Ruidoso Watershed Restoration-Phase I</i>	RRA	NA	1998-2003	Completed	\$438,481	319FRA		
<i>Rio Ruidoso Watershed Restoration-Phase II</i>	RRA	NA	2002-2005	Ongoing	\$400,000	319FRA		
<i>Ski Apache Sediment Reduction Project</i>	MAT		2000-2004	Ongoing	\$215,000	319FRA		
<i>Bonito Lake Bank Restoration</i>	UH SWCD		1997	Completed	\$50,000	ECIP		
<i>Ski Apache Watershed Improvement Project</i>	MAT/RR/AFS		2003-2008	Underway	\$1,000,000	319MAT/USDA		
<i>Bench 2 Juniper Removal</i>	BLM	133	2003	Completed		FED		
<i>Bull Pasture Juniper Removal</i>	BLM	470	2003	Completed		FED		
<i>Rangeland Bush Removal</i>	UH-SWCD	5,000	1998-2003	Completed	\$106,166	ECIP		
<i>Hondo Valley Juniper Removal</i>	SLO	120	2003	Completed	\$180,000	SLO		

<b>FUELS REDUCTION PROJECTS</b>									
Hale Lake	USDA-FS	300	1997	completed				8,763	NFP
Eagle Creek	USDA-FS	275	1997	completed				4,063	NFP
South Divide	USDA-FS	700	1997	completed			?		NFP
Perry Canyon	USDA-FS	250	1988	completed				12,081	NFP
South Divide	USDA-FS	1000	1988	completed			?		NFP
Grindstone Water Development	USDA-FS	NA	1988	completed				7,350	NFP
Waterhole Canyon	USDA-FS	400	2000	completed				24,000	NFP
North Fork Salado	USDA-FS	280	2000	completed				18,000	NFP
Grindstone I	USDA-FS	162	2001	completed				20,354	NFP
Grindstone Habitat Improvement	UHWC	700	2001-2003	Completed				\$39,288	318/USDA
Tunstall Habitat Improvement	USDA-FS	260	2002	completed				\$27,725	NFP
White Mountain Habitat Improvement	USDA-FS	280	2002	completed				\$30,142	NFP
Devil's Canyon Watershed Improvement	UHWC	200	2002-2003	Completed				6,776	318/USDA
Silva Canyon Habitat Improvement	UHWC	260	2002-2003	90%				\$27,715	318/USDA
Philadelphus Canyon Habitat Improvement	UHWC	362	2001-2003	Completed				\$15,285	318/USDA
Lake Bonito Fuels Reduction Project	COA	500-600	2004-2007	Underway				\$450,000	COA/CFRP+G79
Mescalero Apache Reservation	MAT/BIA								
Inn of the Mountain Gods		1200		90%				\$1,500,000	MAT/BIA
Travel Center		794		Completed				\$397,000	MAT/BIA
Ruidoso Cabins		260		60%				\$300,000	MAT/BIA
Ciengita Lakes		1068		Completed				\$534,000	MAT/BIA
Palmer Pena		1200		Completed				\$600,000	MAT/BIA
Wildland Urban Interface Projects									
Perk Canyon	USDA-FS	3085		Completed				\$768,750	NFP
Eagle Creek	USDA-FS	2670		Ongoing				\$985,464	NFP



Various Noxious Weeds Elimination	USDA-FS	2050	Ongoing	103,880	NFP
<b>NUTRIENT REDUCTION PROJECTS</b>					
Phosphorus Reduction Project	VOR, CORD	NA	2002-2006	Underway	24,798,403 ?
<b>BAER PROJECTS</b>					
CREE FIRE	USDA-FS	6519	2000	Ongoing	\$2,540,000 NFP
MUSKETBALL FIRE	SFDNM	250		Ongoing	562,000
KOKOPELLI FIRE	SFDNM	985	2002	Ongoing	690,000
TRAP AND SKEET FIRE	MAT/BIA	463	2001	Ongoing	\$2,000,000 NFP
HOMESTEAD FIRE	USDA-FS	201	2001	Ongoing	\$200,000 NFP
SKI RUN FIRE	USDA-FS	275	2003	Ongoing	\$2,500 NFP
MAINTENANCE OF ABOVE	NMED/RRRA/USDA			Ongoing	15,000 NMED/RRRA



<b>NUTRIENT REMOVAL PROJECTS</b>									
Biscuit Hill WWTP-Phase I	VOR/CORD	NA		2006	1	15,057,000	NM, EPA, VOR		
Biscuit Hill WWTP-Phase II	VOR/CORD	NA		2003-2009	1	6,677,000 ?			
Sewer Line Extensions									
VOR	VOR/CORD			2004-2008	1	6,663,395	VOR		
CORD	CORD			2003-2006	1	3,757,000	CORD		
Sewer Line Rehabilitation	VOR			2004	1	701,008	VOR, CORD		
Develop and Implement NPS BMPs	ALL			2004-2007	1	1,000,000	NMED, RRA		
<b>FUELS REDUCTION PROJECTS</b>									
Turkey-Gavilan	USDA-FS		63,000	2004-2009	1	31,500,000	NFP		
Bonito Lake	USDA-FS		2,500	Unknown	1	2,500,000	NFP		
Eagle Lakes	MAT/BIA		700	2005-2007	1	700,000	NFP		
SW Quadrant right-of way	VOR	250*25mile r-o-w		2004-2005	1	773,000	FEMA		
<b>COLLABORATIVE FOREST PROJECTS</b>									
Lake Bonito Fuels Reduction Project-Phase II	COA	500-600		2004-2007	1	\$400,000	CFRP APPLICANT		
Turkey-Spring Canyon	SCMRC&D		278	2004-2007	1	\$360,000	CFRP APPLICANT		
<b>OUTREACH PROJECTS</b>									
Annual River Cleanup Parties	RRA/VOR/NMED			Ongoing	1	21,000	NMED/RA		
Bi-monthly newsletter	RRANMED			Ongoing	1	9,000	NMED/RA		
Web page	RRANMED			Ongoing	1	1,800	NMED/RA		
River Trail Interpretive Center	RRA/VOR/NMED			Ongoing	3	100,000	NMED/RA		
River Ecology in Classrooms	RRA/ENMU/RPS			Ongoing	1	NA	ENMU/RPS		
Phosphorus Reduction Ad Campaign	CORD/VOR/RA			Fall, 2004	1	25,000	VOR/CORD/RA		
Series in Ruidoso News re: Ruidoso & Water	NMED/RA/RN			Spring, 2004	1	NA	NMED/RA		
Seminars on Conservation Easements	NMED/SRALT			Ongoing	3	NA	NMED/RA		



Examples of Best Management Practices (BMPs) for Control of Major NPS Pollution Categories and Subcategories Identified in the New Mexico NPS Pollution Water Quality Assessment.

**Agriculture**

Non-irrigated crop production

Crop and residue management practices to maintain soil cover:

- contour stripcropping
- stubble mulching
- conservation tillage

Practices to reduce runoff:

- terracing
- diversions
- contour farming
- grassed waterways
- vegetative filter strips

Practices to limit nutrient movement:

- nutrient management
- split fertilizer applications
- nutrient balancing using expected crop needs and soil sampling results
- rotate to deep rooted crops to deplete carryover nutrients
- limit pre-plant applications
- use of slow-release fertilizers when applicable

Practices to minimize pesticide impacts on surface and ground water:

- use least toxic compound which is effective on target species
- pesticide application strictly according to label directions and applicable legal requirements
- use certified applicators when possible
- use biological control mechanisms when possible
- clean and dispose of pesticide containers according to federal, State, and local laws
- do not apply when pesticide could drift off application site during spray application
- follow recommended IPM practices when possible
- calibrate spray equipment regularly
- know surface area of fields to be sprayed
- maintain adequate storage/mixing/loading facilities
- store or land apply tank rinsate at legal application rate
- use a nurse tank, back-flow prevention devices, siphon break or air gap when filling sprayer tanks
- retrofit sprayers with injection devices when upgrading equipment
- leave buffer zones adjacent to waterways, wells and wetlands when possible

- avoid applications when rainfall is imminent
- be prepared for spills and leaks at all stages of pesticide management
- utilize New Mexico Farm\*A\*Syst, Farmstead Assessment, section 2

#### Irrigated crop production

Management practices used to maintain crop and residue cover:

- no-till/conservation tillage
- utilize cover and green manure crops
- soil moisture monitoring devices
- irrigation scheduling when possible
- split fertilizer applications

Irrigation water delivery and drainage systems:

- irrigation water management
- irrigation water measurement
- irrigation pipeline
- tailwater recovery systems
- vegetation control
- concrete or synthetic ditch lining
- laser level fields
- low output sprinkler systems

Practices to reduce adverse pesticide effects:

- IPM when possible
- same practices as non-irrigated cropland (see above)

Animal waste management:

- maintain adequate solid and liquid management facilities
- utilize manure and effluent for crop fertilization; apply at agronomic rates
- compost solid wastes where applicable

Urban agriculture (landscaping, gardening, turf management):

- utilize urban IPM techniques
- reduce levels of pesticide usage
- use soil test results for turf, lawn and garden fertilization

## Range Land

### Grazing/wildlife management:

- determine grazing capability of lands
- monitor grazing/wildlife use
- planned grazing systems such as rest/rotation, seasonal or pasture rotation
- control livestock/wildlife use in sensitive areas including riparian/wetland areas
- livestock/wildlife water development to better distribute use
- relocate livestock trails to better distribute livestock use
- riding or herding to shift livestock locations
- using salt or supplemental feed as tools to gain proper distribution of livestock

### Gully erosion control:

- grade stabilization structure
- rock and brush dam
- debris basin
- diversion around eroding areas
- reestablishment of vegetation in riparian areas
- maintenance of erosion control structures

### Critical area treatment to restore vegetative cover:

- grazing land mechanical treatment
- critical area planting
- mulching

### Vegetative management practices to improve cover:

- brush management
- range seeding
- prescribed burning

## **Silviculture**

### Harvesting, reforestation, and residue management

- establish streamside management zones on all intermittent, interrupted or perennial watercourses for all activities
- design timber harvest units to minimize water quality impacts
- timber harvest limitations to protect steep slopes (>30%) or unstable areas
- clear delineation of protected areas in timber sale maps and special marking on the ground
- limiting the operating period of timber sale activities
- harvest when soils are frozen
- elimination of unstable stands from harvest units
- prescribing size, location and shape of clear cuts
- determining tractor loggable ground

- proper tractor skidding location and design
- suspended log yarding on sensitive areas (e.g., streamside management zones and steep slopes)
- proper log landing location
- special erosion prevention measures on disturbed lands
- site preparation for reforestation
- revegetation of areas disturbed by harvest activities
- log landing erosion prevention and control
- erosion control on skid trails
- meadow protection during timber harvesting
- proper location and method of stream crossings
- equipment kept out of streams
- erosion control structures and energy dissipaters
- maintenance of erosion control structures
- review and approval of timber sale erosion control measures before sale closure
- slash treatment in sensitive areas
- reforestation
- soil moisture and wetland limitations for equipment and vehicle use
- use of sale area maps for designating water protection needs
- directional felling of trees near streamside management zones
- modify timber sale contract if necessary as soon as water quality concerns are identified
- end-line logs out of streamside management zones

#### Fire suppression and fuels management

- fire and fuel management activities to reduce frequency, intensity and destructiveness of wildfires
- consideration of water quality in formulating fire prescriptions
- protection of water quality from prescribed burning effects
- minimizing watershed damage from fire suppression efforts
- repair or stabilization of fire suppression activities related to watershed damage
- emergency rehabilitation of watershed following fires

#### **Road Construction and Maintenance**

##### Road construction

- develop and implement erosion control plans
- timing of construction activities to avoid wet periods
- dispersion of subsurface drainage from cut and fill slopes
- provide for adequate road drainage
- timely erosion control on eroding cut-and-fill slopes
- properly orient, design and maintain stream crossings

- construction of stable embankments
- control of sidecast materials
- proper servicing and refueling of equipment to prevent surface or ground water pollution
- minimize in-channel excavation
- divert flows around construction sites
- spill prevention plans should be mandatory part of all construction projects
- proper bridge and culvert installation
- proper stream crossings on temporary roads
- regulation of streamside gravel borrow areas
- proper disposal of right-of-way and roadside debris
- specifying riprap composition
- water source development consistent with water quality protection
- timely erosion control measures on incomplete roads and stream crossing projects

#### Road maintenance

- regular maintenance and inspection
- road surface treatment to prevent erosion
- traffic control during wet periods
- snow removal controls to avoid resource damage
- obliteration of temporary roads
- restoration of borrow pits and quarries
- prevent side casting materials into streams or wetlands
- reduce use of salt for deicing roads in sensitive areas

#### Recreation

- surface erosion control of facility sites and recreation sites
- provide and maintain sanitation facilities
- control of refuse disposal
- sanitation at hydrants and water faucets within developed recreation sites
- proper location of pack and riding stock facilities
- management of off-road vehicle (ORV) use
- heavy use area protection
- public information on water quality protection at recreation areas
- recreation area closure or relocation

### **Resource Extraction/Exploration/Development**

#### Surface mining

- erosion control
- mined land reclamation including revegetation

- control of runoff into or through mine
- treatment of acid mine drainage

#### Mill Tailings and Mine Tailings

- tailings stabilization
- tailings relocation
- channeling runoff around tailings
- reclamation including revegetation

#### Oil and Gas Exploration and Production

- pit closures
- plug orphan wells
- provide secondary containment for above ground storage tanks where appropriate
- implement spill prevention control and countermeasure plans where appropriate

### **Land Disposal**

#### On-site Wastewater Systems

- inspection of construction
- maintenance of septic systems
- proper siting
- proper design
- proper disposal of septage
- land use management and zoning feasibility to protect ground water resources, floodplains and wetlands

### **Hydrologic Habitat Modification**

#### Flow regulation/modification

- flow management
- encourage floodplain protection

#### Streambank modification/stabilization

- stream channel stabilization
- streambank protection
- revegetation

#### Dam Construction

- erosion control

- coffer dams
- selection of proper materials for dam construction
- revegetation of construction areas

#### Urban Runoff

- use of stormwater pollution prevention plans as required
- settling ponds
- runoff collection and treatment
- land use planning

#### **Other**

##### Watershed Management

- watershed restoration to reduce potential for NPS pollution
- tree density reduction combined with increase in native herbaceous ground cover
- protection of wetlands and riparian areas
- control of activities under special use permit on USFS lands
- soil moisture and wetland limitations for equipment operation and vehicle use
- revegetation of surface disturbed areas
- contour disking, contour furrowing, contour terracing, harrowing, and ripping to minimize erosion
- evaluation of cumulative watershed condition effects on USFS lands

##### Wildlife and Fisheries Management

- control of channel disturbance from fish habitat improvement structures
- control of sedimentation from wildlife habitat improvements

D R A W I N G

USDA FOREST SERVICE  
GEOGRAPHIC INFORMATION SYSTEM

# Rio Hondo Watershed

Smokey Bear Ranger District  
Lincoln National Forest

-  Rio Hondo Watershed
-  Waterbody
-  Lake or Pond
-  City
-  Stream
-  Perennial Stream
-  Intermittent Stream
-  Main Road

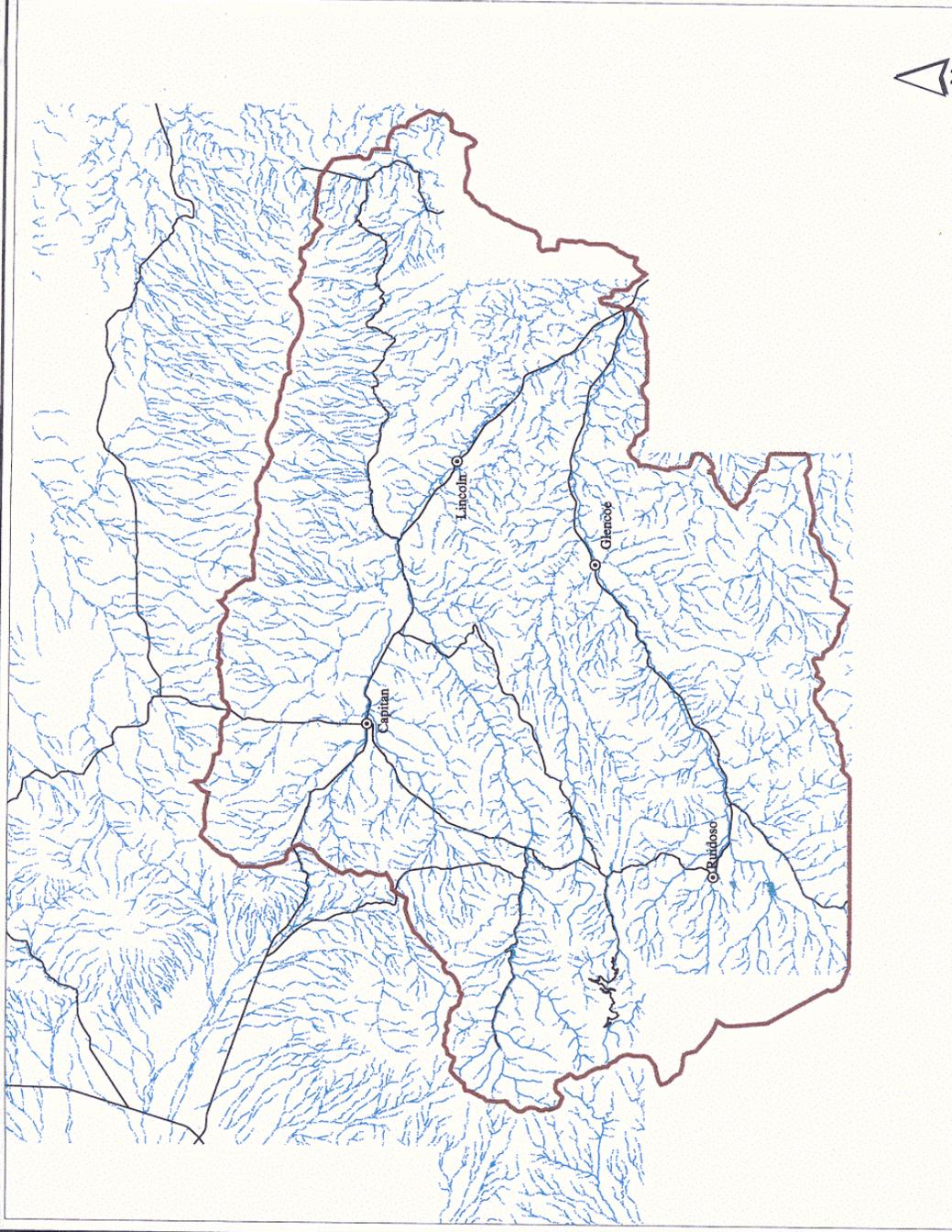
0 3.091 6.182 Miles

1" = 4.0 miles



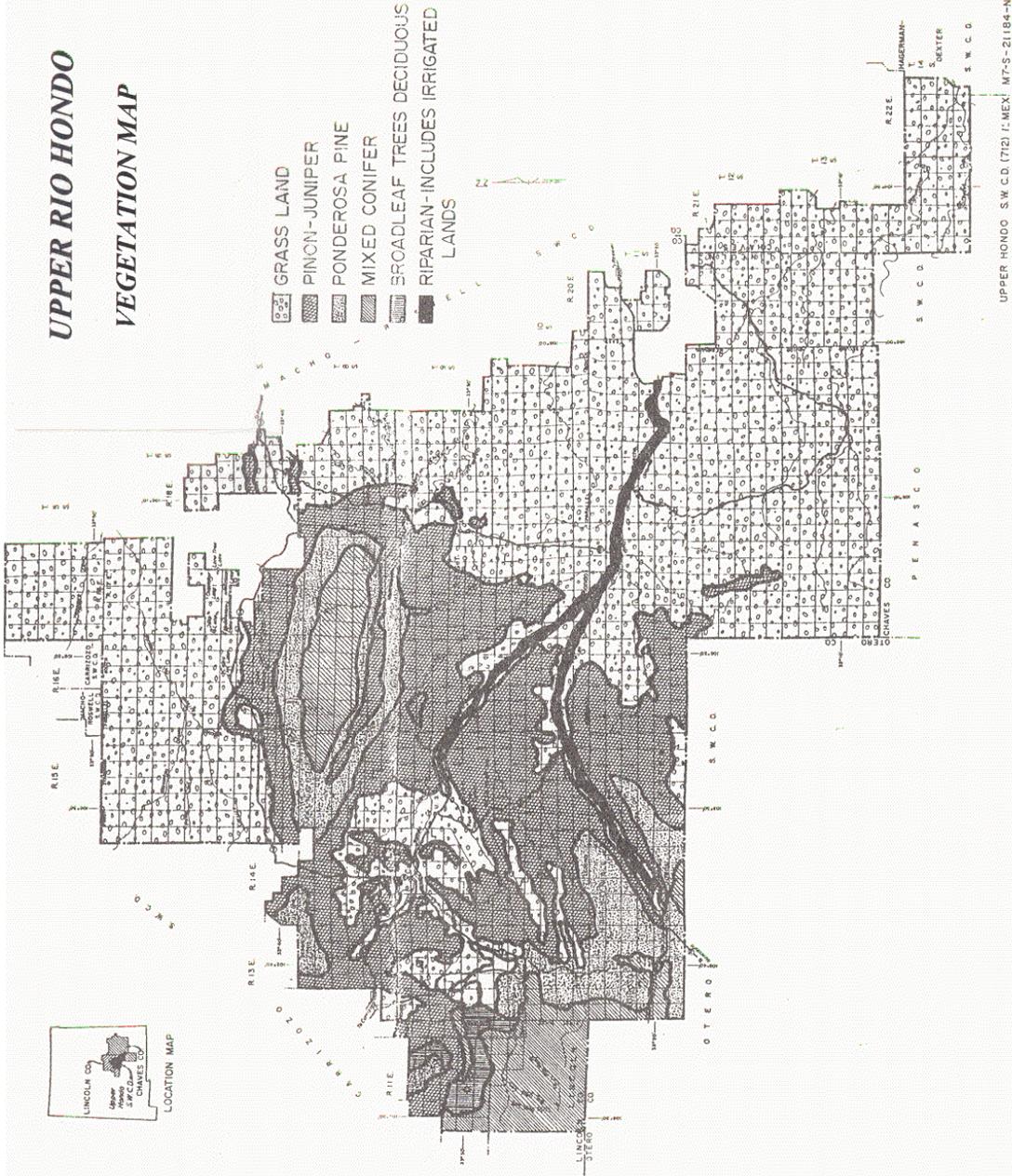
Original data was compiled from multiple source data and may not meet the U.S. National Mapping Accuracy Standard of the Office of Management and Budget. For purposes of this source data and for additional digital data, please contact the National Center for Geographic Information and Cartography, USDA FOREST SERVICE, Albuquerque, New Mexico.

This map has no warranty to its contents or accuracy.



# MAP B

## UPPER RIO HONDO VEGETATION MAP

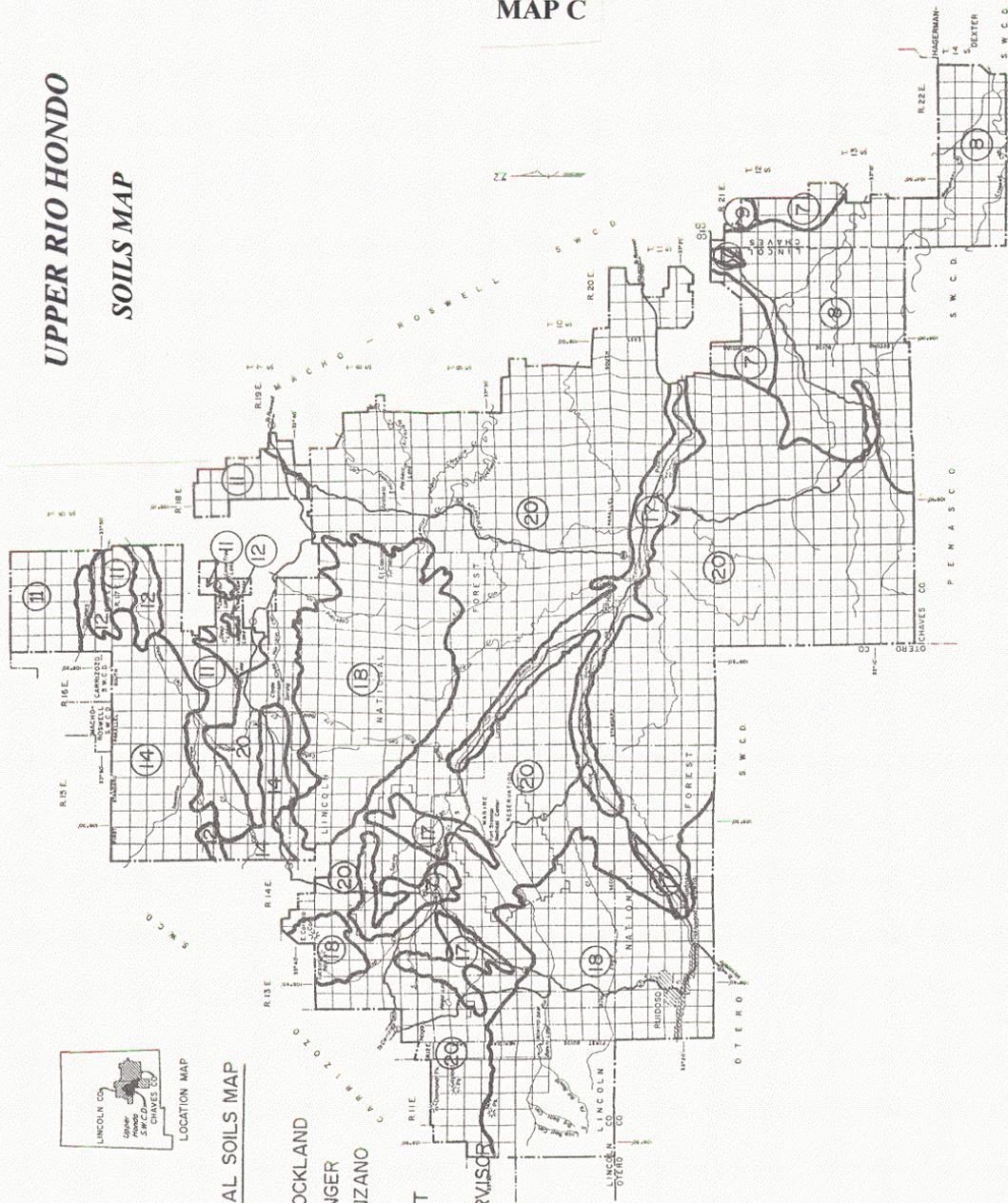


UPPER HONDO S.W. CD. (712) I. MEX. M7-5-21184-N



# UPPER RIO HONDO SOILS MAP

## MAP C



### LINCOLN COUNTY GENERAL SOILS MAP

- 7 ECTOR - CONGER
- 8 ECTOR - LIMESTONE ROCKLAND
- 9 REAGAN - EL FRIDA - CONGER
- 11 DEAMA - PASTURA - MANZANO
- 12 LIMESTONE OUTCROP
- 14 HARVEY - PASTURA - WITT
- 17 SAN MATEO
- 18 CABALLO - PESO - SUPERVISOR
- 20 DEAWA - LIMESTONE ROCK LAND

UPPER HONDO S.W.C.D. (712) N.MEX. M7-S-21189-N

D R A T T M A P  
USDA FOREST SERVICE  
COMPARATIVE INFORMATION SYSTEM

# Rio Hondo Watershed

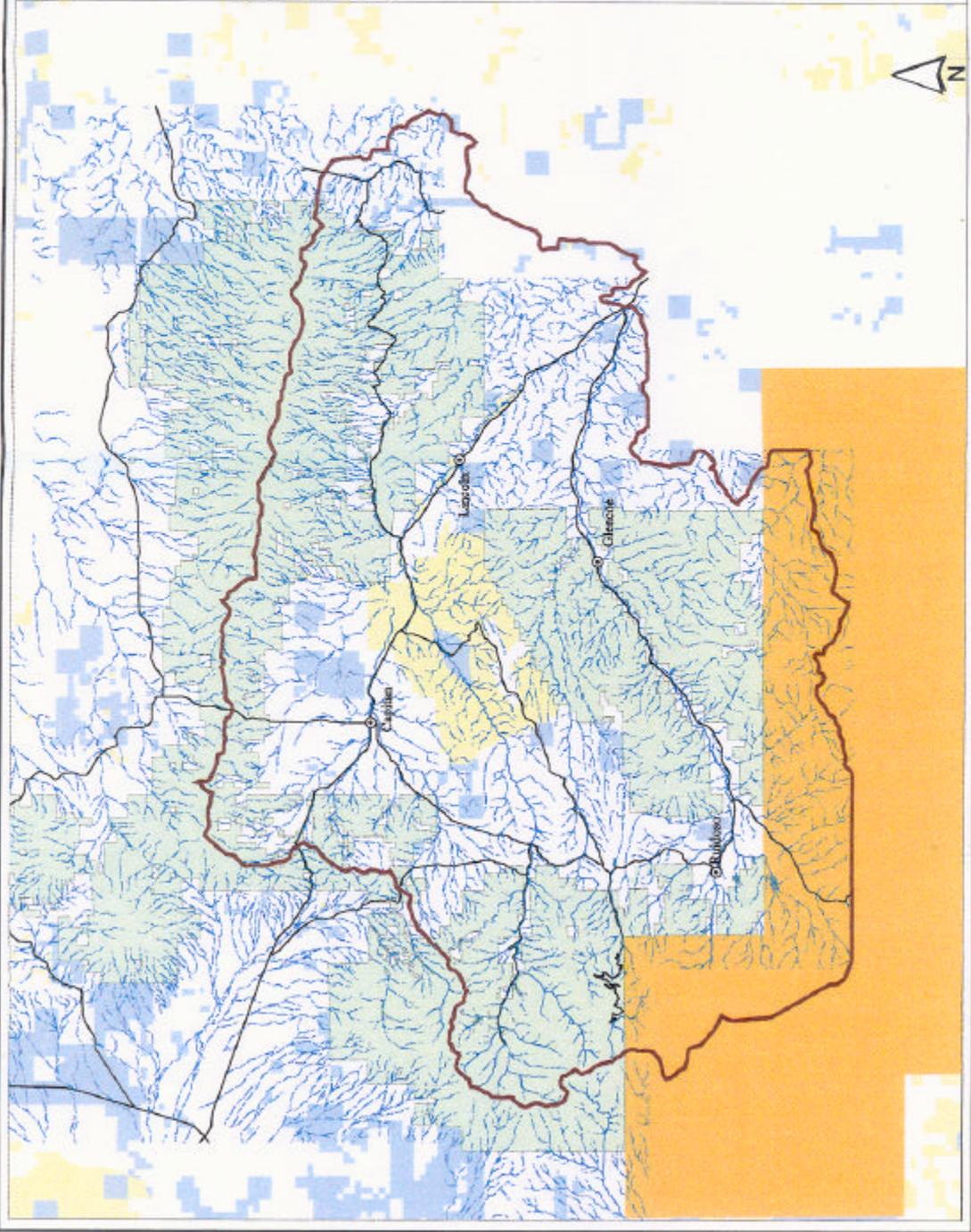
Smockey Bear Ranger District  
Lincoln National Forest  
**LAND OWNERSHIP**

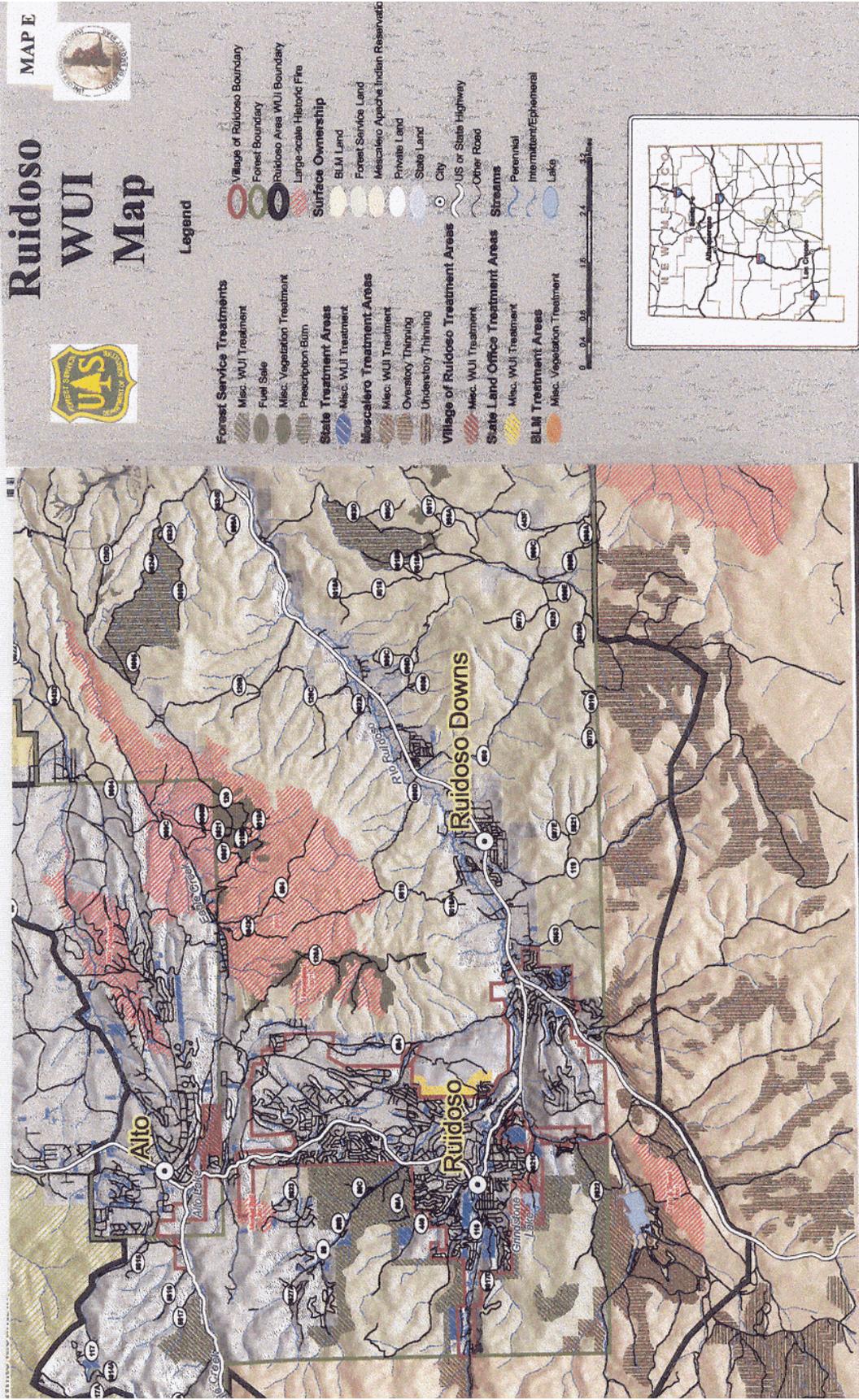
- Rio Hondo Watershed
- Craterstone Lake
- Watershed
- Lake or Pond
- City
- Stream
- Perennial Stream
- Intermittent Stream
- Main Road
- Owner
- USFS
- Bureau of Land Management
- Indian Reservations & Tribal Lands
- National Forest Service
- Private Land
- State of New Mexico

0 3.00 6.00 Miles  
1" = 4.0 miles



Original data was compiled from multiple sources into a single file for use in the US Forest Service's Comparative Information System. The accuracy of the data is not guaranteed. For specific data issues, please contact the US Forest Service, USDA FOREST SERVICE, Smockey Bear District.





**B. ILLUSTRATION**

**POTENTIAL NON-POINT SOURCES OF NUTRIENT LOADING IN THE RIO RUIDOSO ABOVE THE WWTP AT BISCUIT HILL**

