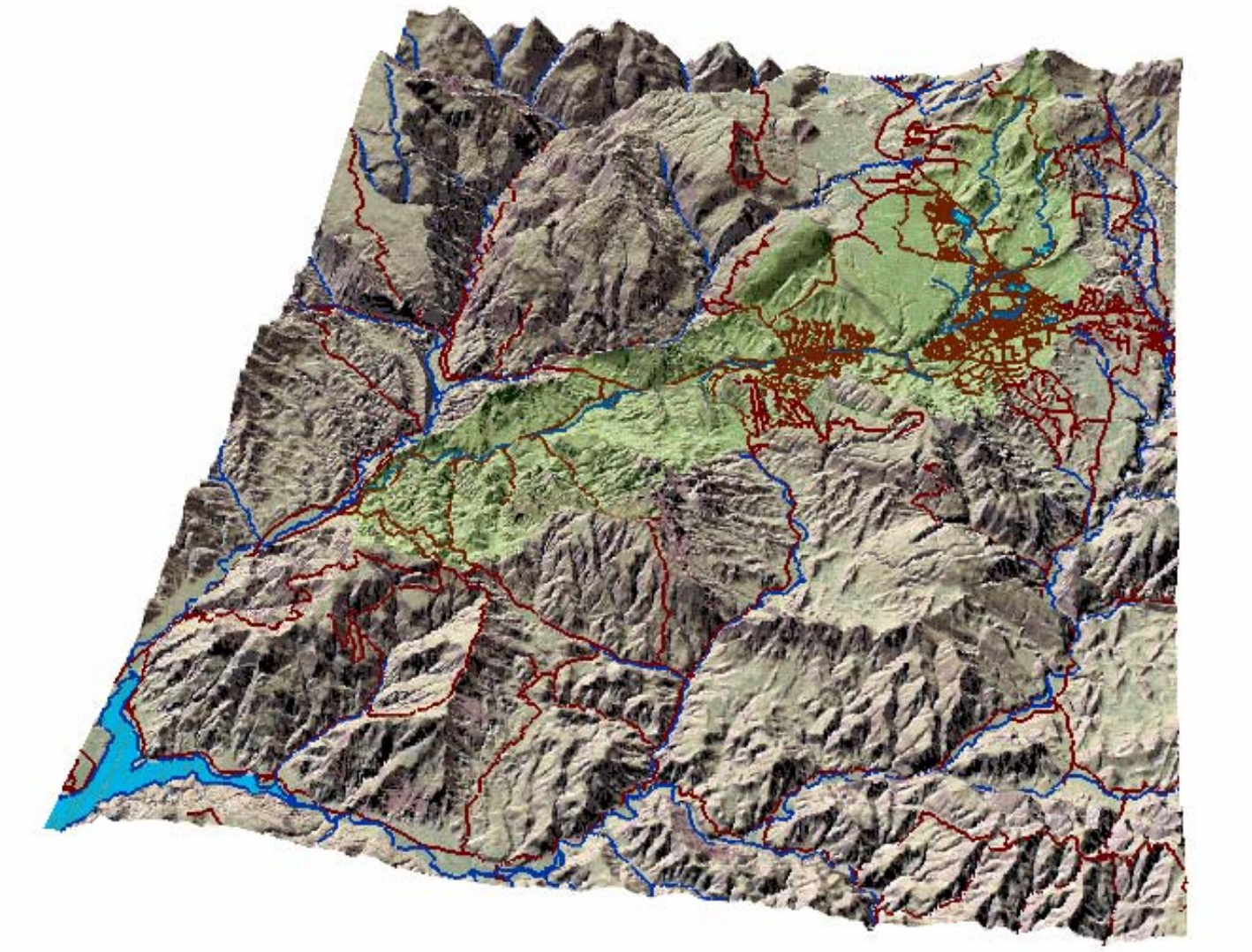
STOLLSTEIMER CREEK WATERSHED



MASTER PLAN

July, 2006

Stollsteimer Creek Watershed Master Plan
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Introduction

During the summer of 2004 the Natural Resource Conservation Service, San Juan Conservation District, Pagosa Lakes Property Owners Association and several other individuals became concerned about the overall watershed condition in both the upper and lower reaches of the Stollsteimer Creek Watershed. Of particular concern was the rapid growth and development occurring in the upper watershed and stream channel degradation in the lower watershed.

The upper watershed contains several important water storage reservoirs including two primary raw water storage reservoirs that supply the community's drinking water. In addition to the two drinking water storage reservoirs, there are four reservoirs that store water for irrigation purposes as well as providing important recreational opportunities for area residents. These four additional reservoirs could also be used to supply potable water for the area in the event of a severe drought such as the drought year of 2002.

Observations in the upper watershed regarding overall water quality were that several key lake inlet stream channels were exhibiting bank erosion as well as picking up sediments from other human caused activities. These sediments were then entering the reservoirs where large pronounced shallow deltas were forming. The concern was that over time and if unchecked these sediments could lead to substantial storage capacity reduction as well as significant nutrient loading and contaminants entering the reservoirs.

The upper watershed primarily lies within Archuleta County proper, concerns were that in 2004 the county had no drainage policies in the land use regulations and therefore no real or tangible means of controlling the ever increasing amounts of development related, untreated stormwater from entering the reservoirs. Commercial development in the watershed is at an all time high and current trends indicate that in 20 years this once rural community will be more of an urban and suburban type community. Addressing growth impacts to the overall water quality within the community has been the driving force behind this watershed study and planning effort.

The lower Stollsteimer Creek watershed is a mixed use region. The upper portion of the lower watershed includes a larger residential subdivided community where the main channel of Stollsteimer creek itself forms. Concerns in this reach include human caused impact to the stream channel and the potential for additional contaminants to enter the stream. Several commercial developments have located directly adjacent to the creek and little or no effort has been made for stream setback and protection in this stretch.

The lower two-thirds of the lower Stollsteimer Creek watershed are primarily agriculturally oriented and/or lie within Southern Ute Tribal boundaries. Concerns in this stretch are the negative effects of over grazing, the overuse of the stream by livestock and severe channel degradation. This stretch of the creek exhibits the worst of the stream channel problem. In some places 20 foot cut banks can be observed and during spring runoff the water quality becomes severely laden with heavy sediment loads. Stollsteimer Creek enters the main channel of the Piedra River at the bottom of the watershed.

Planning Action Items:

In 2004 several informal meetings were held between various stakeholders within the watershed and in cooperation with the NRCS and the San Juan Conservation District it was determined that a Master Watershed planning effort would be required to begin addressing concerns in the watershed now and into the future.

With the NRCS and San Juan Conservation District leading the way several discussions were held with the Archuleta County Commissioners, the Town of Pagosa Springs, The Pagosa Area Water and Sanitation District, the Pagosa Lakes Property Owners Association, the Southern Ute Tribe, State and Federal Forest Service, Colorado Division of Wildlife and the Colorado State Cooperative Extension Service. It was determined that the planning effort would require additional expertise and costs associated with planning efforts of this type and a fund raising effort began. Over the course of 2004 a cash fund of $24,750 was raised through contributions from various agencies. With this cash in hand the San Juan Conservation District applied successfully for an EPA 319 Fund in the form of the Colorado Non-Point Source Watershed Protection Fund grant in the awarded amount of $20,000. Additional in-kind contributions from the various parties totaled $16,125. The total project value, including the 319 funds totaled over $72,750.

With this funding source in place Riverbend Engineering was hired to facilitate many of the technical aspects of the project including the hydrologic modeling of the watershed, hydrographic surveys of the lakes, CAD based planning and mapping, assessing stormwater runoff and quantifying future infrastructure needs within the watershed and assisting with interagency planning efforts. Additionally, contributing partners such as PAWSD, Archuleta County, the Forest Service, CDOW, Southern Ute tribe and PLPOA agreed to contribute $16,125 in in-kind technical contributions to the project.

In 2004 a water quality monitoring plan was put in place. Twelve sampling sites were selected within the upper and lower watershed at key locations. Testing parameters include phosphate, nitrates, temperature, dissolved oxygen, conductivity, total suspended sediment, flow rates, CFS, a heavy metal series and a petroleum series. Samples were collected and analyzed in 2004, 2005 and 2006 (see sampling summary). Additionally, in October of 2004 several sediment cores were extracted from the lake bottoms in the upper watershed and analyzed. This water quality monitoring plan will establish an important baseline for the watershed as well as be used to determine where sediments and contaminants are originating and where to focus mitigation efforts.

An early key component of the watershed master planning effort was the formation of the Stollsteimer Creek Watershed Steering Committee. The committee is composed of several stakeholders within the watershed, key federal and state agency representatives and private at-large members. The steering committee has met eleven times over the past two years. During the second meeting a committee mission statement was adopted.

Steering Committee Mission Statement:

The Watershed Steering Committee will meet regularly as a group whenever the need arises and at least quarterly.
The Watershed Steering Committee is a committee that has three major responsibilities and missions in the watershed.

1. The collection point of information and findings in the watershed. The committee oversees data collection efforts (primarily water sampling data: Heavy metals, nutrients, suspended sediment, flow rates, total coliforms etc.), data storage and scientific studies and findings in the watershed. Additionally, the steering committee will collect engineering data in the watershed such as hydrologic models, lake survey/mapping and important documents such as the watershed master plan that we are working to develop and create. As the collection point of this information the committee then decides how best to distribute this information to those in the community that can

make a difference in the watershed such as State and local agencies, policy makers, landowners and developers.

2. Be a leading force in public education as to the importance of watershed protection and how public agencies, landowners and developers can take steps to protect and improve the watershed. Scheduling and facilitating meetings with commissioners, town council, planning departments, builders, landowners and developers to discuss watershed protection practices and regulations is an important mission of the committee.
3. Prioritize watershed improvement projects. The next several years will be very important years for the watershed with the rapid growth and development occurring in the watershed. Developing plans and improvement project details will be the responsibility of others such as consultants and engineers, but prioritizing these projects and developing funding plans for these projects will be a responsibility of the committee. Working closely with town and county officials in setting these priorities is a mission of the committee. Seeking State and Federal funding as well as local funding for larger projects will be an important tool in making these projects happen and will be within the committee's responsibilities to research these funding possibilities.

Objectives and Goals

A series of objectives and goals were established early on in the planning process based on steering committee recommendations as well as NRCS and Riverbend Engineering input. These objectives and goals formulate the action plan for the watershed planning effort. Six major objectives were created each with a series of action items:

OBJECTIVE 1: ASSESS STREAM HEALTH ON STOLLSTEIMER CREEK & TRIBS

#1 Conduct field investigation of stream courses using Stream Visual Assessment Protocol

OBJECTIVE 2: INVENTORY AND ASSESS PRIVATE AND PUBLIC LAND CONDITION

#2 Private land use inventory & condition assessment

#3 Public land use inventory & condition assessment, including forest health/wildfire mitigation assessment

OBJECTIVE 3: INVENTORY CURRENT IRRIGATION SYSTEMS

#4 Conduct field investigations with landowners using Field Irrigation Rating Index & Colorado Nitrogen and Phosphorus Index

OBJECTIVE 4: DEVELOP AN ASSESSMENT & MONITORING PROGRAM

#5 Integrate existing soils data, topography, vegetation, platting and land use/ownership into a CAD based planning document, generate various maps

#6 Purchase water quality sampling & monitoring equipment

#7 Collect water quality data on Stollsteimer Creek and major tributaries during spring runoff

#8 Perform hydrographic surveys of lakes (4) to determine current capacity and plan for eutrophication mitigation

#9 Collect flow, sediment and chemistry data at sampling areas and sediment samples from lake beds

#10 Establish a long term water quality monitoring plan, including locations, type of sampling, frequency, etc.

#11 Develop a hydrologic model for the upper watershed
#12 Assess stormwater runoff control & water quality mitigation measures for the upper watershed and quantify future infrastructure needs in the upper watershed
#13 Develop priority list of watershed improvement projects, including descriptions and estimated costs
#14 Prepare a watershed master plan document, incorporating all of the assessments, maps/GIS level data, hydrologic modeling, planning and project prioritization goals developed in this project
#15 Prepare semi-annual and annual reports

OBJECTIVE 5: IDENTIFY RESOURCE CONCERNS OF SHAREHOLDERS

#16 Conduct landowner surveys and hold public meetings
#17 Conduct watershed tours with land management experts for stakeholder education
#18 Develop a public education plan of key personnel on watershed issues

OBJECTIVE 6: DEVELOP WATERSHED POLICY

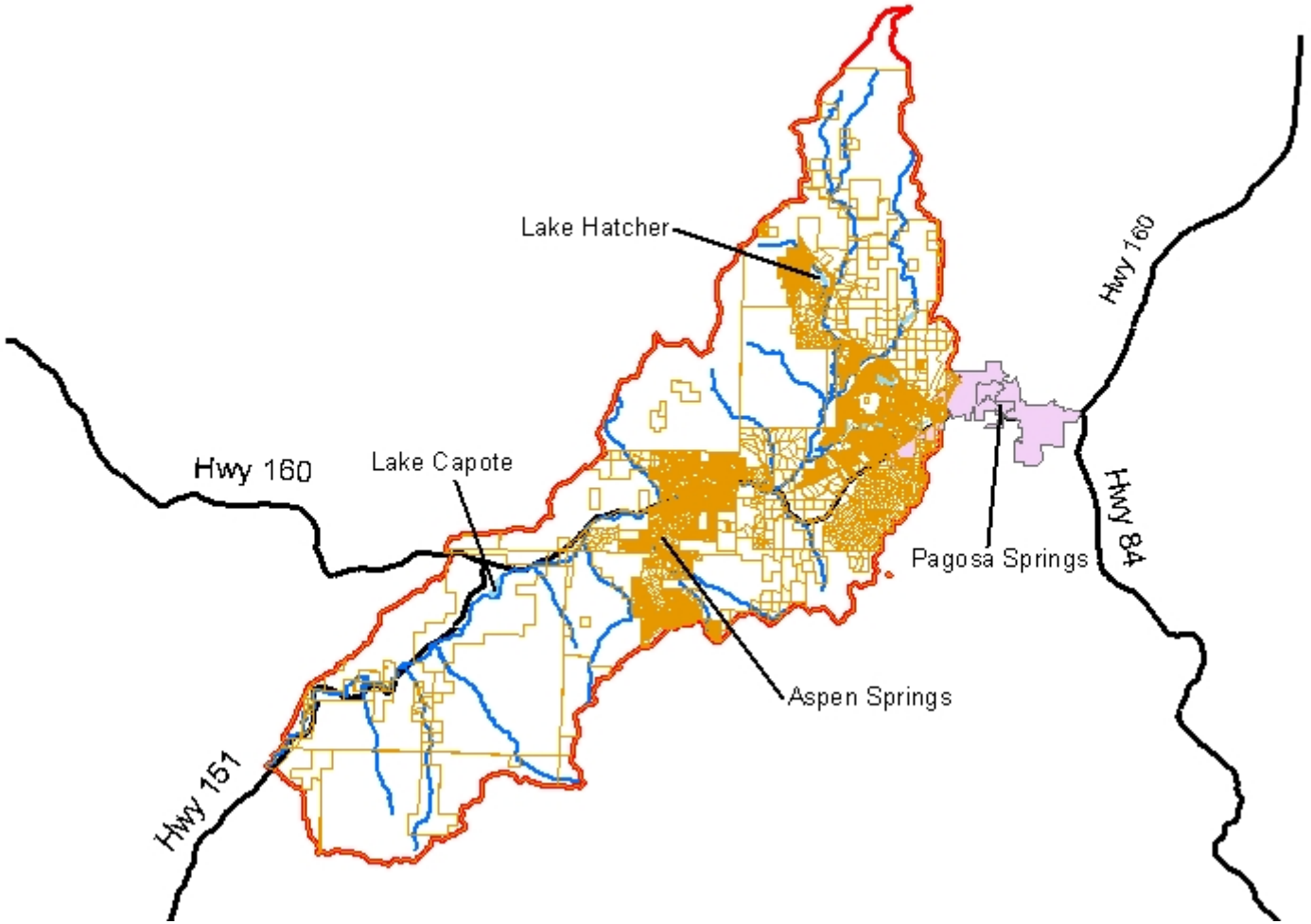
#19 Form a Watershed Steering Committee, hold regular, public meetings
#20 Quantify and prioritize water quality improvement goals for the lower watershed
#21 Work with Archuleta County as they update County Land Development regulations
#22 Develop cooperative agreements between various agencies for watershed protection

Section 1 - Watershed Overview

The Stollsteimer Creek watershed, located in Archuleta County, Colorado, is approximately 82,153 acres (128.3 sq. miles) and has a length of about 28 miles. Of the total acreage, 38,405 acres are private, 30,525 acres are US Forest Service or BLM and 13,204 acres are Southern Ute Tribal land. The upper watershed extends into Mineral County at elevations just over 11,000 ft. Watercourses in the upper watershed include Martinez Creek, Dutton Creek and Stevens Creek. Creeks from the upper watershed join together in the mid-section of the watershed to form Stollsteimer Creek. Stollsteimer Creek travels down to the confluence with the Piedra River at an elevation of 6,300 ft. Land use varies dramatically as you travel through the watershed. The higher elevations of the watershed are dominated by National Forest Lands. The middle section of the watershed is dominated by residential and commercial land use and several man-made storage lakes used to store domestic water supplies. Approximately 8,000 individuals live within the watershed. The lower watershed is dominated by large tracts of public and agricultural land. The watershed contains 24 miles of highways and 212 miles of secondary and residential roads. Surface water resources consist of 93 miles of streams and approximately 500 acres of lakes. The soils of the watershed are generally classified as soils having slow to very slow infiltration rates with a slow to very slow rate of water transmission through the soil. There are small isolated areas adjacent to stream beds that have been classified as having moderate infiltration rates. Vegetative cover and vegetative type vary throughout the watershed, as changes in elevation and land use occur.

Section 1a

Watershed Boundaries Map



Section 2 Assessment Data Summary –

a. Summary of Watershed Sampling Efforts

b. Long Range Water Quality Monitoring Plan

The watershed monitoring strategy encompasses water quality and upland conditions. Our primary goal is to improve water quality. We have been collecting water samples once a month at designated points throughout the year to get a good representation of the water quality through the annual high and low flow periods. We plan to continue water sampling in key areas in subsequent years and after major precipitation events to compare against baseline data gathered in the benchmark year. Careful testing will be conducted above and below any future detention or stream channel improvement projects resulting from this plan to evaluate the effectiveness of mitigation efforts. The Pagosa Area Water and Sanitation district and the Pagosa Lakes Property Owners Association have reliable historical water chemistry data for the lakes. Four different series of water quality monitoring tests were conducted in the watershed at designated locations. The first series is designated the Standard Stream Sampling Set. This includes temperature, dissolved oxygen, flow, cfs, nutrient series, pH, electro-conductivity and total suspended solids. This is a field test that has been conducted in various locations once a month as shown on the sampling location map. The second series is designated the Specialized Stream Sampling Set. This set has been conducted in important lake inlets, point source areas of concern above the reservoirs and below commercial zones, at the Martinez Creek/Upper Stollsteimer Creek confluence and at the bottom of the watershed on lower Stollsteimer Creek. This test set includes a nutrient series (nitrates, phosphorous, iron), a heavy metal series, *total coliform*, total suspended sediments, and a petroleum series. This sampling set was conducted once each year for three years during the spring runoff period in all five reservoir inlets. Total suspended sediment testing was conducted several times in the inlet streams of the lakes during the spring flow period. This set was also conducted at the Martinez Creek/Upper Stollsteimer Creek confluence and at the bottom of the watershed in lower Stollsteimer Creek during the spring. The third series is designated the Lake Sampling Set. This set analyzed water samples taken directly out of the reservoirs. This test set included a nutrient series, turbidity, temperature, dissolved oxygen, algae counts and iron. This allowed comparisons to be made to historical data in the reservoirs. The fourth series is designated the Sediment Sampling Set. This set included a nutrient series, particle size analysis (silt, sand and loam), total organic content, a heavy metal series and a petroleum series. This sampling series was conducted on sediment samples taken from the bottom of each of the reservoirs during the fall of 2004 as shown on the sampling location map. Several sediment samples from each reservoir were taken and analyzed. The watershed monitoring plan includes continuing these sampling series for a period of 5 years.

Results of the water quality monitoring plan in the upper watershed lake inlet sites indicate that heavy suspended sediment loads are entering the reservoirs with total suspended results as high as 365 mg/l at the Cloman inlet location in the spring of 2004. These high sediment loads are deposited into the reservoirs causing substantial loss of storage capacity. Additional contaminants entering the lakes are nitrates and phosphates which in turn cause or lead to increased vascular aquatic plants and algae growth in the lakes during the warm summer months.

Solutions to the problem of suspended sediments and nutrient loading into the reservoirs are addresses in the infrastructure assessment section of this master plan. Associated cost estimates are also provided.

Results of water quality testing on the lower portion of Stollsteimer Creek; Aspen Springs to the confluence with the Piedra River, indicate sediment being the main pollutant at this time. Sediment loads near the confluence with the Piedra River have reached as high as 592 mg/L. This is in comparison to sediment amounts peaking at approximately 25 mg/L at the point that Martinez Creek joins Stollsteimer Creek.

Other pollutants that showed occasionally high readings were nitrates and phosphates at the sampling point on Martinez Creek before it joins Stollsteimer. High nitrate and phosphate reading correspond with low flows during June and July. Readings of greater than 10 mg/L for nitrates were recorded during July of 2004 and June and July of 2005. A high phosphate reading of greater than 10mg/L was taken in June of 2005. The point and non-point sources of these high readings will require more in-depth sampling in the years to come.

Water temperatures, for the most part, were within the limits for cold water fish such as trout. During the summer months when flows were at their lowest, water temperatures did increase to the upper level of tolerance.

Water Quality Monitoring Cost: $2,000 per year for 5 years. Approximate Total Cost: $10,000

Section 2 - Assessment Data Summary

c. Private and Public Land Use Inventory and Condition Assessment

1. Forestry Component

The Stollsteimer Creek watershed extends from an elevation of 6,300 feet at the confluence with the Piedra River to an elevation of 11,000 feet at the headwaters of Martinez Creek. The predominant jurisdictional ownership of the lands within the watershed includes San Juan National Forest, Southern Ute tribal land, and private lands. In addition there is a small component of Bureau of Land Management, state, and local government lands. The private land portion of the watershed typically occurs between the elevations of 6,300 and 8,400 feet. The ownership pattern is typically inter-mixed with the private land concentrated adjacent to Pagosa Springs and along Highways 151 & 160 as well as the Piedra Road corridor.

The elevation range and variable topography of the watershed provides for a variety of forest vegetation that can be classified into the following types.

- Pinyon/Juniper
- Riparian
- Oak/shrub
- Ponderosa Pine
- Aspen
- Mixed-Conifer (Warm-Dry)
- Mixed-Conifer (Cool-Moist)

Pinyon & Juniper woodlands are associated with the lower elevations and on south-facing slopes. Rocky Mountain juniper is typically the dominant species in association with Pinyon pine. Utah juniper may be the dominant species mixed with pinyon pine on the drier sites at lower elevations.

Riparian corridors are found adjacent to Stollsteimer creek as well as lesser water courses. Narrowleaf cottonwood and willow species dominate the forest vegetation.

Oak/shrub vegetation is often dominated by Gambel oak. The Gambel oak often occurs in pure stands and is also a dominant species mixed with other shrubs including serviceberry, snowberry, chokecherry,

mountain mahogany and other shrubs. The Gambel oak is also a dominant understory vegetation often mixed with other shrubs associated with the ponderosa pine and warm-dry mixed-conifer type.

Ponderosa pine is the dominant forest vegetation in the Stollsteimer watershed and is significant on the other ownerships as well. The ponderosa pine forests typically have either a significant component of under-story shrub growth usually dominated by Gambel oak, or they are park-like stands with herbaceous species of grasses and forbs. The pine stands are typically even-aged and approximately 100 years old. Pine regeneration is often absent but there are exceptions of un-even aged stands with a component of regeneration with the watershed.

Aspen within the private land portion of the watershed typically occurs as small stands often associated with the ponderosa pine and the dry-warm mixed-conifer. The aspen is often in poor condition and deteriorating due to conifer dominance and lack of wildfire to provide regeneration opportunities. Aspen regeneration may also be heavily impacted by browsing wildlife.

The **warm-dry mixed-conifer** occurs at the lower elevation range of the mixed-conifer usually associated with north-facing slopes. It typically has a significant amount of ponderosa pine and Gambel oak associated with it. Douglas-fir is also a major species and can be dominant on the steeper north-facing slopes within the watershed.

The **cool-moist mixed-conifer** type is not common within the private land portion of the watershed. It may however be found in association with the higher north-facing elevations of the watershed and typically has a larger portion of aspen as well as fir and spruce species.

The private land portion of the watershed has recently experienced a "boom" of housing development and larger ranches being subdivided into smaller parcels. This trend is expected to continue and will place more demands on natural resources involving forests and water quality/quantity issues.

Effects of Euro-American Settlement

There has been dramatic alteration of the ponderosa pine forests in the Southwest during the last century. Native Americans cut trees and ignited fires during the indigenous settlement period, and some tribes grazed substantial amounts of livestock. The livestock grazing, logging, and fire exclusion introduced by Euro-American settlers in the late 1800s, however, were unprecedented in their intensity and extent. These human influences, combined with physical, biological, and climatic factors, shaped the ponderosa pine forests we see today.

Early Uses and Fire Suppression

Heavy grazing associated with Euro-American settlement began in the late 1800s and continued into the early 1900s, affecting much of the West. Because of the changes brought about by heavy grazing, it is difficult to reconstruct the structure, composition, and dynamics of herbaceous plant communities in Southwest Colorado. In many areas of Southwest Colorado, however, it is apparent that historic livestock grazing has caused shifts in species composition and reductions in overall herbaceous ground cover, while cover by woody vegetation (shrubs and tree saplings) has increased.

This heavy grazing had additional, unforeseen effects. The frequent, low-intensity ground fires common during the period of indigenous settlement (1500-1880) ended abruptly around 1880 in most ponderosa pine forests throughout the Southwest.

Timber harvest in the West also began with Euro-American settlement in the late 1800s. On the San Juan National Forest, the scale of timber harvest increased dramatically in the 1890s with the advent of railroad logging. Until 1915, most timber cutting in the Pagosa Springs area was confined to ponderosa pine. This early logging usually involved "highgrading," which selectively removed the highest-quality, largest trees, leaving smaller individuals or species of lesser value.

One of the main arguments in favor of creating a San Juan National Forest Reserve in 1905 was to "prevent and control the repeated forest fires". Apparently, early forest managers were very successful. In the 1930s, the aggressive and effective "10 A.M. policy," was instituted by the US Forest Service, which sought to control any wildfire by 10 A.M. the morning after it was discovered. The historic patterns of low-intensity fire in the inland West ponderosa pine forests have been essentially eliminated.

Current Ponderosa Pine Forest Conditions

The combined effects of fire suppression, timber harvesting, and livestock grazing have significantly altered stand density and canopy closure, compared with reference period (1500-1880) conditions. Research suggests that ponderosa pine seedling regeneration was greater in the early 1900s than in the indigenous settlement period (1500-1880) because there was less competition from grasses, due to grazing and reduced thinning effects from fire. Research shows how densities have increased since then. They found 19 trees per acre during the indigenous settlement period, compared with 851 trees per acre in 1990.

Not only has the number of trees per acre increased, but so has the percent of canopy closure. Comparing Southwest inventory data for 1962 and 1989, canopy coverage today varies from 40% to 70%. Comparing this with 1911 data verifies a loss of openness and closing of ponderosa pine canopies, with a range in 1911 of 7% to 12% closure.

During the last 75–100 years, with a greatly altered natural fire cycle, unprecedented and unnaturally large amounts of surface and ground fuels have accumulated. Research in Arizona indicates Southwest ponderosa pine forests' fuel loads have ranged from 1 ton per acre in 1867 to 30 tons per acre predicted in 2007. Researchers reported average loading of naturally fallen fuels at 22 tons per acre for 62 Southwestern ponderosa pine stands. They verified the heavy fuel loading with an average of 34 tons per acre in southeastern Arizona. Barring fire, these fuels persist for long periods, since decomposition rates are extremely slow.

Numerous studies show that the ponderosa pine forests of the Southwest are outside their historic range of variability for fire-return intervals.

Continuing Changes in Stand Structure and Composition

It is estimated that 4 million acres may be occupied by stands in which trees have too little space for optimum growth and are in need of thinning. Eighty percent of the stems are 12 inches or smaller in diameter, and 95% percent are 16 inches or less in diameter. Ninety percent of the trees sampled were 90 years old or less, with 95% being 110 years old or less.

While the density of ponderosa pine forests in the Southwest is much greater today than it was during the reference period (1500-1880), many stands are essentially a monoculture with a single story of trees, mostly void of understory pine regeneration. Less than 20% of the west-side pine zone stands on the SJNF have adequate regeneration (defined as 50+ trees/acre with a diameter at breast height of 2.0 inches or less). On the east side of the Forest, except the Turkey Springs area, most of the ponderosa pine forests are wholly lacking adequate pine regeneration. Should disturbance agents such as fire or insect and disease outbreaks continue outside historic ranges, as predicted by many scientists, forests lacking diverse age structures and younger understories likely would have little ability to regenerate themselves.

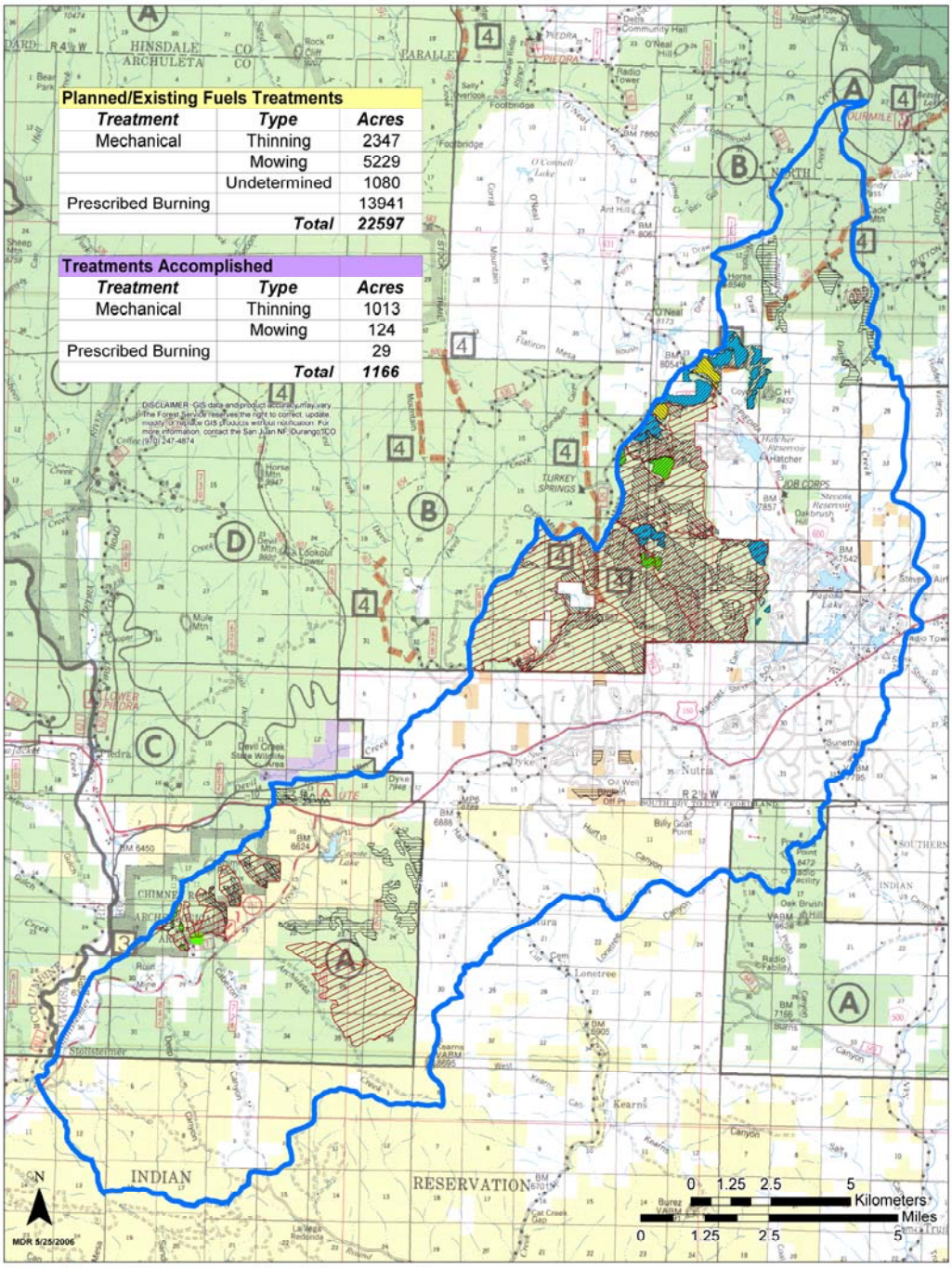
The structural characteristics associated with old-growth ponderosa pine also continue to change. Fire exclusion has led to the establishment of extensive conifer understories in unlogged areas which currently have an old-growth component. These developing understories are, in many cases contributing to the elimination of the old growth in two ways. Intense competition for limited resources results in physiological stress and fuel laddering allows wildfires to severely damage these large trees.

The combination of increasing mortality of the largest, oldest overstory pine, increased competition from firs, stagnating younger stands, and increasing risk of stand-replacement fires may have ramifications relative to the continued presence and/or recruitment of old growth in some areas.

Decades of fire exclusion have allowed thick litter layers to build up beneath forest canopies. This layer is probably suppressing seedling establishment.

Section 2c1a

USFS/BLM Fuels Reduction Treatments within the Stollsteimer Watershed (HUC5)



Section 2 – Assessment Data Summary

c. Private and Public land Use Inventory and Condition Assessment

2. Rangeland Condition

This overview addresses the importance of rangeland and describes the rangeland's current contribution to the hydrology of Stollsteimer Creek watershed. Rangelands are a type of land on which the natural vegetation is dominated by grasses, forbs, and shrubs. Rangelands are best managed as an ecosystem where the hydrologic condition of a site is determined through soil and vegetation factors.

Rangelands are divided into basic units for study, evaluation, and management. These units are called ecological sites. An ecological site is a distinctive kind of land with specific physical characteristics that differs from other kinds of land in its ability to produce a distinctive kind and amount of vegetation. Ecological sites have characteristic soils that have developed over time throughout the soil development process. Through the development of soil and evolution of an associated plant community, ecological sites have developed a characteristic hydrology influencing infiltration and runoff.

There are many interacting variables that influence the characteristic hydrology of an ecological site. Soil factors such as texture, bulk density, compaction, organic matter, and aggregate stability affect runoff. Important plant characteristics influencing hydrology include cover, density, biomass, plant life form (whether it is a grass, forb, shrub, or tree), rooting morphology and growth form. Always present, helping to define soils and vegetation are environmental variables with the most influential being geology, climate, aspect, and slope.

Within the Stollsteimer Creek watershed there is a mosaic of ecological sites with the dominant sites being Ponderosa-Gambel Oak, Mountain Clay Loam, Clayey Valley, Riverbottom, and Shallow Loam. Other minor sites include Mountain Clay, Pine Grasslands, and Mountain Swale.

The Ponderosa-Gambel Oak ecological site incorporates the largest percentage of upland within the watershed (approx. 35%). At 6400 feet elevation, this site occupies north facing slopes and ridges. At 8500 feet, the upper limit for this ecological site, it occurs on south facing slopes. It is characterized by large stands of ponderosa pine and scattered rocky mountain juniper. Gambel Oak is the primary understory shrub, often forming dense thickets. This site can occur on both shale and sandstone parent material, with shale being dominant within the watershed. The slope is highly variable.

Overall, the site is in fair condition with a similarity site index of 44. A healthy site would be comprised of ponderosa pine with various age classes, scattered rocky mountain juniper, gambel oak with around 15% species composition, and 35% grass. In some areas, due to fire suppression, the site has transitioned to shrubs and trees, with very little grass and forbs, which are important for wildlife food and escape cover. In other areas, where trees have been harvested and shrubs controlled, poor grazing practices have opened bare patches exposing soil to increased erosion and run-off.

An ecosystem based approach to management is important to maintain stable hydrologic function within the Ponderosa-Gambel Oak ecological site. Proper forestry management, brush management, and grazing management practices are critical to maximize infiltration, decrease sediment load into streams and rivers, and improve wildlife habitat.
To obtain proper grazing, the manager must know forage production to obtain stocking rates, and understand species composition to determine frequency and timing of grazing events. A multi-pasture-short duration, or herding rotation, would be best for the Ponderosa-Gambel Oak site.

The second most dominant site within the watershed is the Mountain Clay Loam (approx. 20%). This is a highly erosive upland site with clay soils mixed with outcrops of exposed shale. Slopes are moderate to steep with patches of ponderosa pine. This is a shrub dominated site with gambel oak having the largest composition. Other shrubs include mountain big sagebrush, snowberry, serviceberry, mountain mahogany, and antelope bitterbrush. Below the shrubs a large diversity of grasses holds the soil in place and provides food for many types of herbivores from herds of elk to rabbits.

Due to the extreme erosive nature of this site along with high evapo-transpiration and poor moisture retention, the mountain clay loam is extremely susceptible to poor grazing practices and reclamation is speculative. The current similarity index for this site is 29. Many problems have occurred from small acreage livestock activity grazing for long segments of time. Once the site has been grazed without plant recovery periods, vegetative cover and density decreases. This decrease leads to accelerated soil erosion destroying the thin layer of topsoil which is vital for plant growth. Runoff from the mountain clay loam has a direct affect on sedimentation of Martinez and Stollsteimer Creeks.

Prevention from degradation is most important for the Mountain Clay Loam. This includes brush and grazing management. Proper stocking rates along with extended plant recovery periods are critical when grazing this site. One to two week grazing periods coupled with 80 day rest periods is important to managing this fragile ecosystem. If degradation has occurred, reclamation would consist of range planting, mulching, erosion protection and grazing management.

The Clayey Valley Ecological Site lies between and below the Mountain Clay Loam and Ponderosa-Gambel Oak sites (approx. 15%). Located in a valley position it has moderately deep to deep clay soils. Permeability is slow and wilting point occurs quickly in dry summers. The similarity index for the watershed is 35 indicating a fair range condition. The similarity index is lowered due to large acreages of introduced and noxious plants, both from planting and invasion. The Clayey Valley site is important for livestock production, wildlife habitat and sediment control. The Clayey Valley is the primary upland buffer between the erosive Mountain Clay Loam and the riparian system.

Grazing management coupled with a multi-tiered pest management approach is critical for improving range health. The livestock grazing system should entail proper stocking rates, coupled with adequate rest and recovery periods. Often fences and livestock watering facilities are needed to control grazing. Pest management may include herbicide control, re-seeding, mulching, mowing, and grazing.

Section 2c2a

Rangeland Inventory Map

Section 2 – Assessment Data Summary

c. Private and Public Land Use Inventory and Condition Assessment

3. Riparian Condition

A riparian area is an ecosystem situated between aquatic and upland environments that is at least periodically influenced by flooding. Riparian zones have a rich diversity of plant and animal species and provide many important benefits including water quality protection, flood control, streamflow maintenance, water temperature regulation, wildlife habitat, recreation benefits and economic benefits.

The protection of water quality stems from the riparian vegetations ability to trap sediment and nutrients from surface runoff and prevent them from entering steams. In addition, the dense root system of riparian vegetation serves as an effective filter for shallow groundwater.

Riparian areas act as a sponge by absorbing floodwaters. The water is then slowly released over a period of time, which minimizes flood damage and sustains higher base flows during late summer. The elimination of woody riparian vegetation, such as willows, can result in the loss of summer streamflows because water storage capacity is greatly reduced. Riparian vegetation also plays an important role in controlling the water temperature in streams which is critical to the health of the riparian ecosystem. The shading of the water surface maintains a cooler water temperature which is required by many fish species in order to survive.

Riparian corridors are among the most productive wildlife habitats in this region. They provide a diversity of food and shelter. They also act as critical wildlife corridors allowing movement of wildlife between different habitat types. Due to the abundance of wildlife, presence of water, diverse vegetation and moderated climates, riparian areas are attractive locations for recreation, particularly trails.

Healthy streams and riparian areas are naturally resilient which allows for recovery from natural disturbances such as flooding. Human activities often produce disturbances that may exceed the recovery capability of a natural stream. When a stream and riparian system are degraded, excessive flooding, soil erosion, and sedimentation will often increase. Land use change in a watershed, for example, is one of many factors that can cause disturbances in the stream corridor. Degraded riparian areas are less effective in storing floodwaters and filtering pollutants. High levels of sediment in a stream can be lethal to fish and aquatic insects. In addition, excessive sediment deposited in streams may cause the streambed to build up and become shallower, forcing water to spread out and cause bank erosion. A shallower stream also has lower dissolved oxygen content and higher temperatures, which supports less aquatic life.

Riparian areas are shaped by the forces of water flowing across the landscape. Riparian health and streambank stability is a reflection of the conditions in the surrounding watershed. A watershed is simply the area of land that drains into a particular stream, such as Stollsteimer Creek. To understand the factors that are affecting a stream, you must look at the whole watershed to gain an understanding of the big picture.

Summary of Stollsteimer Stream and Riparian Condition.

Stollsteimer Creek is a 3rd order stream with a general classification of C3 in the Rosgen classification system. Streambed material is predominately cobble. The classification of the stream can change based on entrenchment ratio, sinuosity, slope and streambed material. Restoration plans developed for individual reaches of the stream during the implementation phase of the watershed master plan will break out stream classification more finely if required.

Vegetation:

Canopy cover and bare ground vary greatly along Stollsteimer Creek based on past and current management. Inventory points have been initiated to track cover which has a direct correlation to soil erosion.

Inventory points on well vegetated areas in the watershed show the riparian corridor to have vegetative cover of over 90% and bare ground below 10%. There is a high amount of diversity in plant species with a large amount of woody vegetation such as sandbar willow present. These sites also typically have very stable banks and well formed channels. On lower condition sites the percent of bare ground increases dramatically and species diversity, especially woody vegetation, decreases. There is a larger proportion of non-native species such as smooth brome which has an effect on streambank stability. Based on resource inventories it is estimated that 40 % of the riparian corridor along Stollsteimer Creek is in poor to very poor vegetative condition. Only approximately 35% of the riparian vegetation is considered in superior condition. Management activities that can be used to improve riparian condition include revegetation, control of livestock grazing to allow vegetation to recover, and reconstruction of the stream channel to provide a floodplain.

Channel Form and Streambank Stability:

The determination of proper stream channel form and streambank stability was made using information obtained from cross section surveys of the creek. Surveys were done in degraded areas of the Creek as well as areas considered stable. Well formed, stable sections of the Creek with desirable morphological and ecological conditions were surveyed in detail for use as a "Reference Reach". Reference Reaches can be used to develop design criteria for areas needing restoration (See attached cross section profile). In these alluvialy formed systems, it is important that the main channel of the creek be connected to the floodplain: that flows in excess of the "Bankfull" discharge can spread out on flat area next to the channel. This type of formation allows for the baseflow to be carried in small, deeper channels and for floodwaters to expand out of the main channel onto the surrounding floodplain. A stream channel functioning in this manner reduces streambank erosion and provides the proper conditions for riparian vegetation. Approximately 40% of Stollsteimer Creek is considered to have unstable banks and problems with channel formation that will require some restoration.

Demonstration Project:

A demonstration project showing how the proper installation and use of best management practices can restore a degraded riparian corridor and stream channel has been established on a section of Stollsteimer Creek approximately 1 mile upstream from the confluence with the Piedra River. This stretch of creek, currently owned by Larry Garcia, had been poorly managed by past owners. Riparian vegetation was severely overgrazed, contributing to the destabilization of streambanks and widening of the stream channel.

Streambanks in some portions of creek where completely vertical and reached a height of 12 ft. In order to correct the resource problems, rock structures were installed to protect the streambanks and proper channel form was constructed. The riparian corridor was fenced to control livestock grazing and some woody revegetation was implemented to help promote the establishment of riparian vegetation. Three years after the initial restoration efforts riparian vegetation has recovered on most of the riparian area and streambank stability and overall function of the ecosystem has improved. While additional work needs to be done in 2006, recent fish sampling efforts shows a more diverse fish population including rainbow and brown trout. The presence of these species indicates an improvement in water quality, especially cool water temperatures.

Section 2c3a

Sampling Locations
Riparian Transects

Site	UTM (Z13)		DESCRIPTION
	Easting	Northing	
1	291168	4130560	Old Gallegos Road
2	297631	4117455	Southern Ute, North of Cabezon Canyon Road
3	298400	4118073	Southern Ute, South of lake Capote
4	299074	4119217	Southern Ute, South of lake Capote
5	301361	4120547	1.5 miles upstream from Lake Capote
6	303254	4121972	West of West Cat Creek Bridge

Section 2c3b

Summary of 2005 Stollsteimer Riparian Cover

Canopy cover and bare ground vary greatly along Stollsteimer Creek based on past and current management. Inventory points have been initiated to track cover which has a direct correlation to soil erosion.

Site 1: Old Gallegos Road: Generally this site is thick with cover and vegetation wit the west side of the stream a little more abundant than the east side.

A. Across the riparian corridor: 96% canopy, 2% bare ground
B. East streambank: 90% canopy, 8% bare ground
C. West streambank: 98% canopy, 2% bare ground
D. Species frequency: sandbar willow 28%; redtop bent 26%; beaked sedge 20%; mint 16%; peachleaf willow 8%

Site 2: Southern Ute, north of Cabezon Canyon Road: This site is dominated by low seral plant species such as yellow sweet clover. The transect, run across the riparian corridor showed 88% canopy cover, 12% bare ground, 20% basal cover and 38% litter. Species frequency: clover 26%; smooth brome 16o%; cudweed sagewort 14%; horsetail 8%.

Site 3: Southern Ute, south of Capote: Much like Site 2, this transect contained an abundance of low seral plant species, with a large stand of quackgrass. The transect, run across the riparian corridor showed 80% canopy cover, 20% bare ground, 6% basal cover, and 44% litter.
Species frequency: smooth brome 18%; clover 14%; quackgrass 10%

Site 4: Southern Ute, south of Capote: This site is dominated by a large stand of smooth brome. 76% canopy cover, 22% bare ground, 18% basal cover, and 18% litter cover. Species frequency: smooth brome 20%; beaked sedge 10%; bulrush 8%

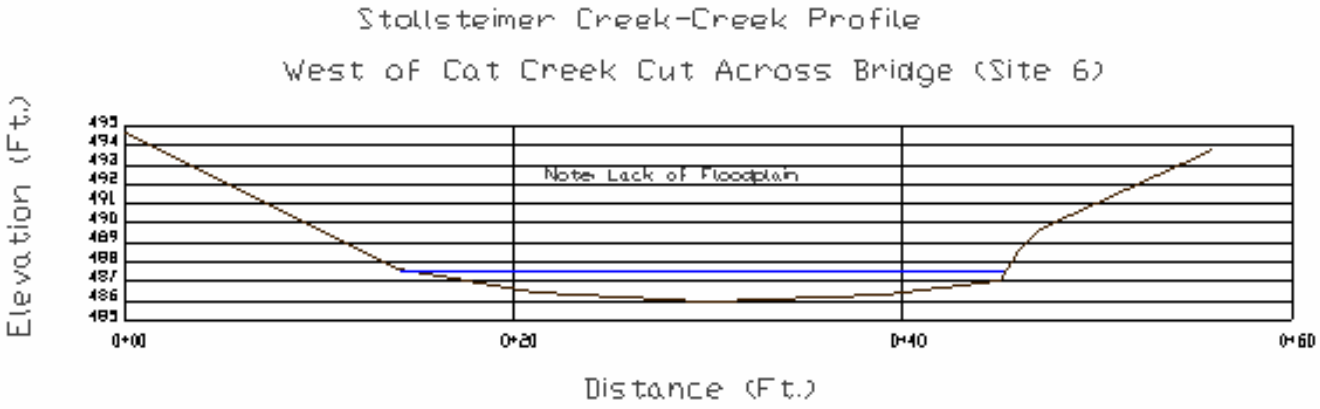
Site 5: 1.5 miles upstream from Lake Capote, along Highway 160: This site is heavily vegetated with grasses and grasslike plants.

A. North streambank: 100% canopy, 0 bare ground, 16% basal cover
B. South streambank: 100% canopy, 0 bare ground, 24% basal cover
C. Species frequency: beaked sedge 88%; mint 60%; redtop bent 14%

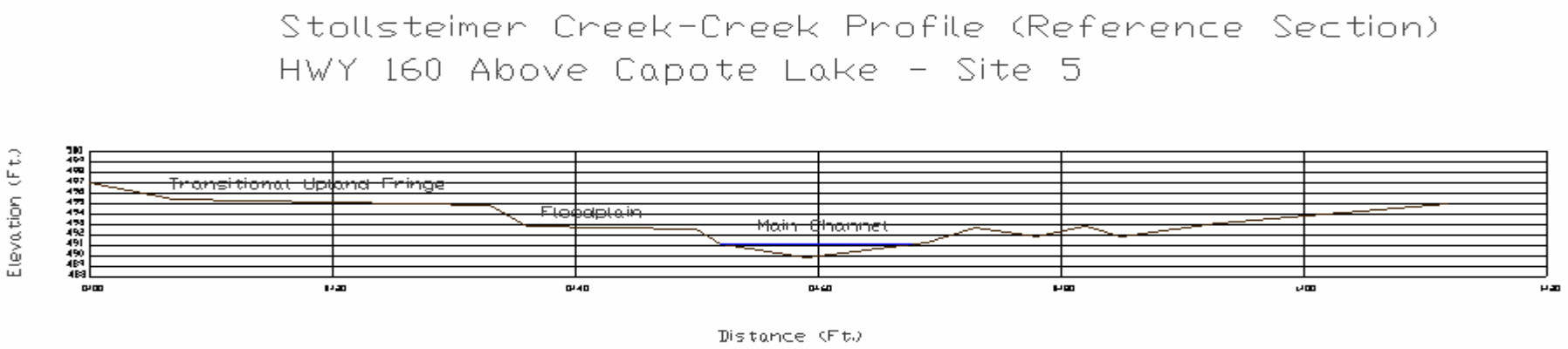
Site 6: West of Cat Creek, cut across bridge: This site had some regeneration of willows due to new sediment deposition. Bare ground was also higher.

A. Across the riparian corridor: 64% canopy, 20% bare ground, 16% basal cover, 54% litter
B. North streambank: 70% canopy, 20% bare ground, 10% basal cover
C. South streambank: 60% canopy, 22% bare ground, 6% basal cover
D. Species frequency: foxtail barley 20%; redtop bent 12%; sandbar willow 12%; bigelow's mountain aster 12%; beaked sedge 8%

Section 2c3c



Section 2c3d



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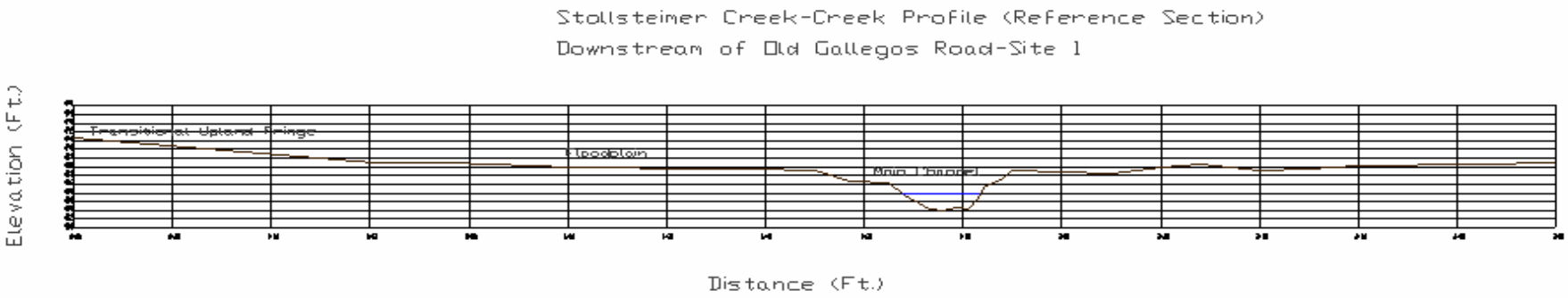


Section 2 – Assessment Data Summary

c. Private and Public Land Use Inventory and Condition Assessment

4. Wildlife

Archuleta County Wildlife Resources

The attached list (Amphibians, Reptiles, Fish, Birds and Mammals of Archuleta County, CO) identify the various species of aquatic and terrestrial wildlife that might be expected to be found in Archuleta County. These lists include species that: are expected to occur in the area but are currently undocumented, are known to be here now, and were found here historically.

Of the nearly 350 species listed for Archuleta County, 15 are identified by the U.S. Fish and Wildlife Service and/or the State of Colorado as threatened or endangered. An additional 13 are identified by the State of Colorado as Species of Special Concern and 15 by the United States Forest Service as Forest Service Sensitive.

Of the 9 species of fish native to Archuleta County, 3 are listed as Federal and State Endangered and are no longer found in the County; 2 are State Special Concern, and 2 are Forest Service Sensitive. Land use that dewaters rivers and streams, alters natural flow regimes or reduces water quality may negatively impact native fish species. Likewise water impoundments that block fish movement affect populations because they restrict fish movements between feeding, wintering and spawning habitats.

Every species of fish and wildlife has specific habitat requirements. Those habitat requirements and the degree to which the habitat is changed determine how species will be affected by development or changing land use patterns. It is important to realize that land use changes that benefit one or more species of wildlife may be detrimental to another.

Archuleta County provides habitat for hundreds of terrestrial or land-based wildlife species. The following species occur in the county and are economically important or have a special designated status.

<u>Bald Eagle (Federal Threatened, State Threatened)</u>
The Bald Eagle is usually associated with lakes, reservoirs, rivers, and adjacent conifer forests and cottonwood riparian areas. Bald Eagles nest in Archuleta County and adjacent counties. The San Juan and Piedra River basins, including the lower Stollsteimer Creek watershed are important wintering areas for Bald Eagles, as well as other raptors. Conifers and cottonwood trees provide perch and roost sites, while prairie dog downs, winter-killed and road-killed big game animals provide good forage for the birds when the lakes and rivers are frozen. Development and disturbances in cottonwood riparian areas can have a negative effect on Bald Eagles. The CDOW has mapped known nest trees and may recommend time and special buffers to reduce development impacts to these magnificent birds.

<u>Peregrine Falcon (Species of Special Concern)</u>
At one time the Peregrine Falcon was listed as Federally Endangered and in 1977 Colorado had only four known breeding pairs. The Chimney Rock area was home to one of those pairs and was very important to Colorado's efforts in the recovery of this recently delisted species, as it provides both nesting cliffs and good foraging areas. The CDOW has mapped known eyries and may recommend time and special buffers to reduce development impacts to Peregrine Falcons.

Mexican Spotted Owl (Federal Threatened, State Threatened)
This species occupies two distinct habitat types:

1. Large, steep canyons with exposed cliffs
2. Dense old growth mixed forest of Douglas-fir, white fir and ponderosa pine, and canyons in pinyon/juniper areas with small and widely scattered patches of old Douglas-fir.

Low numbers, coupled with exacting habitat requirements and low nesting productivity leave Colorado's Spotted Owls susceptible to extirpation. Logging, development and/or disturbance in this rare habitat type could have significant impacts to this species.

Southwestern Willow Flycatcher (Federal Endangered, State Endangered)
Historically, the Southwestern Willow Flycatcher was associated with wetlands, particularly the cottonwood-willow riparian habitats in the southwestern United States – California, Nevada, Utah, Arizona, New Mexico, Texas and possibly Mexico. The species is thought to occur in the extreme southwestern part of Colorado. However, breeding has never been documented. As much as 90 percent of their preferred habitat has been lost or degraded. The federal listing rule stated that the primary causes for the decline in Southwestern Willow Flycatchers are urban and agricultural development, water diversion and impoundment, stream channelization, livestock grazing, invasion of exotic tamarisk or salt-cedar, off-road vehicle use, other recreational uses and the hydrological changes resulting from these and other land uses.

Western Yellow-billed Cuckoo (Species of Special Concern)
The range of the western subspecies of this bird has contracted, and populations have declined dramatically within the remaining range, due to loss of mature closed-canopy riparian cottonwoods, its primary habitat. Western Colorado is part of the range of this subspecies, but it appears it was never common in Colorado.

Lewis' Woodpecker (Forest Service Sensitive)
Locally common, the Lewis' Woodpecker in this area prefers open ponderosa pine forests, riparian and rural cottonwoods, and pinyon/juniper woodlands. The comparatively weak skull and bill dictate these woodpeckers' choice of wood for nesting sites. They often use previously excavated holes of other woodpeckers, but drill their own holes when they find suitably soft wood. Excessive logging and removal of dead snag trees with suitable nest cavities could have negative impacts on this species.

Northern River Otter (State Threatened)
Once extirpated from Archuleta County, probably by trapping, the fish-eating river otter was reintroduced into the Piedra River canyon in 1978. Since that time, the river otter has spread its range locally to include the Piedra and San Juan Rivers and their tributaries, including sightings in the Stollsteimer Creek drainage. Land use that dewaters rivers and streams, alters natural flow regimes or reduces water quality may reduce the ability of the river otter to continue its comeback.

Black-Footed Ferret (FE, SE) Gray Wolf (FE, SE) and Grizzly Bear (FT, SE)
The most recent confirmed sighting of any of these three species was the 1979 killing of a female grizzly bear in the South San Juan Mountains. The black-footed ferret is associated with large prairie-dog colonies while the gray wolf and grizzly bear require large tracts of relatively undisturbed land. Habitat loss, conflicts with man and encroaching civilization have probably led to the loss of these species in Archuleta County.

Mule Deer and Elk

According to a recent 2004 survey, these economically important species bring in over $9 million per year to Archuleta County in the form of hunting-related expenditures. We are fortunate to have huge amounts of public land to provide summer range for deer and elk. However, much of the winter range for these species in Archuleta County is lower elevation lands where development has blocked migration corridors or has so changed the habitat that its value as winter range has been severely compromised.

2c4a

Archuleta County

Known or Likely Species Occurrence

Group	Common Name	Scientific Name	Occurence	Abundance
Amphibians	**Boreal Toad**	**Bufo boreas**	**Known to occur**	**Unknown**
Amphibians	**Bullfrog**	**Rana catesbeiana**	**Likely to occur**	**Unknown**
Amphibians	**Canyon Treefrog**	**Hyla arenicolor**	**Likely to occur**	**Unknown**
Amphibians	**New Mexico Spadefoot**	**Spea multiplicata**	**Likely to occur**	**Unknown**
Amphibians	**Northern Leopard Frog**	**Rana pipiens**	**Known to occur**	**Unknown**
Amphibians	**Tiger Salamander**	**Ambystoma tigrinum**	**Known to occur**	**Uncommon**
Amphibians	**Western Chorus Frog**	**Pseudacris triseriata**	**Known to occur**	**Common**
Amphibians	**Woodhouse's Toad**	**Bufo woodhousii**	**Known to occur**	**Fairly Common**
Birds	**American Coot**	**Fulica americana**	**Known to occur**	**Fairly Common**
Birds	**American Crow**	**Corvus brachyrhynchos**	**Known to occur**	**Fairly Common**
Birds	**American Dipper**	**Cinclus mexicanus**	**Known to occur**	**Uncommon**
Birds	**American Goldfinch**	**Carduelis tristis**	**Known to occur**	**Uncommon**
Birds	**American Kestrel**	**Falco sparverius**	**Known to occur**	**Fairly Common**
Birds	**American Peregrine Falcon**	**Falco peregrinus anatum**	**Known to occur**	**Unknown**
Birds	**American Pipit**	**Anthus rubescens**	**Known to occur**	**Uncommon**
Birds	**American Robin**	**Turdus migratorius**	**Known to occur**	**Common**
Birds	**American Tree Sparrow**	**Spizella arborea**	**Known to occur**	**Unknown**
Birds	**American White Pelican**	**Pelecanus erythrorhynchos**	**Known to occur**	**Unknown**
Birds	**American Wigeon**	**Anas americana**	**Known to occur**	**Unknown**
Birds	**Ash-throated Flycatcher**	**Myiarchus cinerascens**	**Known to occur**	**Uncommon**
Birds	**Baird's Sandpiper**	**Calidris bairdii**	**Known to occur**	**Unknown**

Birds	Bald Eagle	Haliaeetus leucocephalus	Known to occur	Unknown
Birds	Band-tailed Pigeon	Columba fasciata	Known to occur	Uncommon
Birds	Bank Swallow	Riparia riparia	Known to occur	Unknown
Birds	Barn Owl	Tyto alba	Known to occur	Unknown
Birds	Barn Swallow	Hirundo rustica	Known to occur	Common
Birds	Belted Kingfisher	Ceryle alcyon	Known to occur	Fairly Common
Birds	Bewick's Wren	Thryomanes bewickii	Known to occur	Uncommon
Birds	Black Rosy Finch	Leucosticte atrata	Known to occur	Unknown
Birds	Black Swift	Cypseloides niger	Known to occur	Uncommon
Birds	Black-billed Magpie	Pica pica	Known to occur	Common
Birds	Black-capped Chickadee	Poecile atricapillus	Known to occur	Fairly Common
Birds	Black-chinned Hummingbird	Archilochus alexandri	Known to occur	Fairly Common
Birds	Black-crowned Night-Heron	Nycticorax nycticorax	Known to occur	Unknown
Birds	Black-headed Grosbeak	Pheucticus melanocephalus	Known to occur	Fairly Common
Birds	Black-throated Gray Warbler	Dendroica nigrescens	Known to occur	Fairly Common
Birds	Black-throated Sparrow	Amphispiza bilineata	Known to occur	Casual/Accidental
Birds	Blue Grosbeak	Guiraca caerulea	Known to occur	Uncommon
Birds	Blue Grouse	Dendragapus obscurus	Known to occur	Uncommon
Birds	Blue-gray Gnatcatcher	Polioptila caerulea	Known to occur	Fairly Common
Birds	Blue-winged Teal	Anas discors	Known to occur	Unknown
Birds	Bonaparte's Gull	Larus philadelphia	Likely to occur	No Occurrence
Birds	Boreal Owl	Aegolius funereus	Known to occur	Rare
Birds	Brewer's Blackbird	Euphagus cyanocephalus	Known to occur	Common

Birds	Brewer's Sparrow	Spizella breweri	Known to occur	Unknown
Birds	Broad-tailed Hummingbird	Selasphorus platycercus	Known to occur	Common
Birds	Brown Creeper	Certhia americana	Known to occur	Uncommon
Birds	Brown-capped Rosy Finch	Leucosticte australis	Known to occur	Uncommon
Birds	Brown-headed Cowbird	Molothrus ater	Known to occur	Common
Birds	Bullock's Oriole	Icterus bullockii	Known to occur	Fairly Common
Birds	Bushtit	Psaltriparus minimus	Known to occur	Fairly Common
Birds	California Gull	Larus californicus	Known to occur	Unknown
Birds	Calliope Hummingbird	Stellula calliope	Likely to occur	No Occurrence
Birds	Canada Goose	Branta canadensis	Known to occur	Fairly Common
Birds	Canyon Wren	Catherpes mexicanus	Known to occur	Unknown
Birds	Cassin's Finch	Carpodacus cassinii	Known to occur	Uncommon
Birds	Cassin's Kingbird	Tyrannus vociferans	Known to occur	Uncommon
Birds	Chihuahuan Raven	Corvus cryptoleucus	Known to occur	Casual/Accidental
Birds	Chipping Sparrow	Spizella passerina	Known to occur	Common
Birds	Cinnamon Teal	Anas cyanoptera	Known to occur	Rare
Birds	Clark's Grebe	Aechmophorus clarkii	Known to occur	Rare
Birds	Clark's Nutcracker	Nucifraga columbiana	Known to occur	Fairly Common
Birds	Clay-colored Sparrow	Spizella pallida	Likely to occur	No Occurrence
Birds	Cliff Swallow	Petrochelidon pyrrhonota	Known to occur	Abundant
Birds	Common Goldeneye	Bucephala clangula	Known to occur	Unknown
Birds	Common Grackle	Quiscalus quiscula	Known to occur	Uncommon
Birds	Common Loon	Gavia immer	Known to occur	Unknown

Birds	Common Merganser	Mergus merganser	Known to occur	Uncommon
Birds	Common Nighthawk	Chordeiles minor	Known to occur	Common
Birds	Common Poorwill	Phalaenoptilus nuttallii	Known to occur	Uncommon
Birds	Common Raven	Corvus corax	Known to occur	Fairly Common
Birds	Common Snipe	Gallinago gallinago	Known to occur	Uncommon
Birds	Common Yellowthroat	Geothlypis trichas	Known to occur	Fairly Common
Birds	Cooper's Hawk	Accipiter cooperii	Known to occur	Uncommon
Birds	Cordilleran Flycatcher	Empidonax occidentalis	Known to occur	Fairly Common
Birds	Dark-eyed Junco	Junco hyemalis	Known to occur	Common
Birds	Downy Woodpecker	Picoides pubescens	Known to occur	Uncommon
Birds	Dusky Flycatcher	Empidonax oberholseri	Known to occur	Fairly Common
Birds	Eastern Kingbird	Tyrannus tyrannus	Known to occur	Rare
Birds	European Starling	Sturnus vulgaris	Known to occur	Common
Birds	Evening Grosbeak	Coccothraustes vespertinus	Known to occur	Fairly Common
Birds	Ferruginous Hawk	Buteo regalis	Known to occur	Unknown
Birds	Flammulated Owl	Otus flammeolus	Known to occur	Uncommon
Birds	Fox Sparrow	Passerella iliaca	Known to occur	Uncommon
Birds	Franklin's Gull	Larus pipixcan	Likely to occur	No Occurrence
Birds	Gadwall	Anas strepera	Known to occur	Rare
Birds	Golden Eagle	Aquila chrysaetos	Known to occur	Uncommon
Birds	Golden-crowned Kinglet	Regulus satrapa	Known to occur	Uncommon
Birds	Grace's Warbler	Dendroica graciae	Known to occur	Uncommon
Birds	Gray Catbird	Dumetella carolinensis	Known to occur	Rare

Birds	Gray Flycatcher	Empidonax wrightii	Known to occur	Rare
Birds	Gray Jay	Perisoreus canadensis	Known to occur	Uncommon
Birds	Gray-crowned Rosy Finch	Leucosticte tephrocotis	Known to occur	Unknown
Birds	Great Blue Heron	Ardea herodias	Known to occur	Unknown
Birds	Great Horned Owl	Bubo virginianus	Known to occur	Uncommon
Birds	Great-tailed Grackle	Quiscalus mexicanus	Known to occur	Unknown
Birds	Green-tailed Towhee	Pipilo chlorurus	Known to occur	Common
Birds	Green-winged Teal	Anas crecca	Known to occur	Fairly Common
Birds	Gunnison Sage Grouse	Centrocercus minimus	Known to occur	Casual/Accidental
Birds	Hairy Woodpecker	Picoides villosus	Known to occur	Uncommon
Birds	Hammond's Flycatcher	Empidonax hammondii	Known to occur	Uncommon
Birds	Harris' Sparrow	Zonotrichia querula	Likely to occur	No Occurrence
Birds	Hermit Thrush	Catharus guttatus	Known to occur	Common
Birds	Hooded Merganser	Lophodytes cucullatus	Known to occur	Unknown
Birds	Horned Grebe	Podiceps auritus	Likely to occur	No Occurrence
Birds	Horned Lark	Eremophila alpestris	Known to occur	Uncommon
Birds	House Finch	Carpodacus mexicanus	Known to occur	Common
Birds	House Sparrow	Passer domesticus	Known to occur	Common
Birds	House Wren	Troglodytes aedon	Known to occur	Common
Birds	Indigo Bunting	Passerina cyanea	Known to occur	Rare
Birds	Juniper Titmouse	Baeolophus griseus	Known to occur	Fairly Common
Birds	Killdeer	Charadrius vociferus	Known to occur	Fairly Common
Birds	Lapland Longspur	Calcarius lapponicus	Likely to occur	No Occurrence

Birds	**Lark Sparrow**	**Chondestes grammacus**	**Known to occur**	**Fairly Common**
Birds	**Lazuli Bunting**	**Passerina amoena**	**Known to occur**	**Fairly Common**
Birds	**Least Bittern**	**Ixobrychus exilis**	**Known to occur**	**Unknown**
Birds	**Least Sandpiper**	**Calidris minutilla**	**Likely to occur**	**No Occurrence**
Birds	**Lesser Goldfinch**	**Carduelis psaltria**	**Known to occur**	**Fairly Common**
Birds	**Lesser Scaup**	**Aythya affinis**	**Known to occur**	**Unknown**
Birds	**Lewis' Woodpecker**	**Melanerpes lewis**	**Known to occur**	**Uncommon**
Birds	**Lincoln's Sparrow**	**Melospiza lincolnii**	**Known to occur**	**Fairly Common**
Birds	**Loggerhead Shrike**	**Lanius ludovicianus**	**Known to occur**	**Unknown**
Birds	**Long-eared Owl**	**Asio otus**	**Known to occur**	**Uncommon**
Birds	**MacGillivray's Warbler**	**Oporornis tolmiei**	**Known to occur**	**Uncommon**
Birds	**Mallard**	**Anas platyrhynchos**	**Known to occur**	**Common**
Birds	**Marbled Godwit**	**Limosa fedoa**	**Likely to occur**	**No Occurrence**
Birds	**Mexican Spotted Owl**	**Strix occidentalis lucida**	**Known to occur**	**Unknown**
Birds	**Mountain Bluebird**	**Sialia currucoides**	**Known to occur**	**Fairly Common**
Birds	**Mountain Chickadee**	**Poecile gambeli**	**Known to occur**	**Common**
Birds	**Mourning Dove**	**Zenaida macroura**	**Known to occur**	**Common**
Birds	**Northern Flicker**	**Colaptes auratus**	**Known to occur**	**Fairly Common**
Birds	**Northern Goshawk**	**Accipiter gentilis**	**Known to occur**	**Rare**
Birds	**Northern Harrier**	**Circus cyaneus**	**Known to occur**	**Unknown**
Birds	**Northern Mockingbird**	**Mimus polyglottos**	**Known to occur**	**Rare**
Birds	**Northern Pintail**	**Anas acuta**	**Known to occur**	**Unknown**
Birds	**Northern Pygmy-Owl**	**Glaucidium gnoma**	**Known to occur**	**Unknown**

Birds	Northern Rough-winged Swallow	Stelgidopteryx serripennis	Known to occur	Fairly Common
Birds	Northern Saw-whet Owl	Aegolius acadicus	Known to occur	Uncommon
Birds	Northern Shoveler	Anas clypeata	Known to occur	Unknown
Birds	Olive-sided Flycatcher	Contopus cooperi	Known to occur	Uncommon
Birds	Orange-crowned Warbler	Vermivora celata	Known to occur	Fairly Common
Birds	Osprey	Pandion haliaetus	Known to occur	Rare
Birds	Pacific Loon	Gavia pacifica	Likely to occur	No Occurrence
Birds	Peregrine Falcon	Falco peregrinus	Known to occur	Unknown
Birds	Pied-billed Grebe	Podilymbus podiceps	Known to occur	Uncommon
Birds	Pine Grosbeak	Pinicola enucleator	Known to occur	Uncommon
Birds	Pine Siskin	Carduelis pinus	Known to occur	Common
Birds	Pinyon Jay	Gymnorhinus cyanocephalus	Known to occur	Fairly Common
Birds	Plains Sharp-tailed Grouse	Tympanuchus phasianellus jamesii	Known to occur	Unknown
Birds	Plumbeous Vireo	Vireo plumbeus	Known to occur	Fairly Common
Birds	Prairie Falcon	Falco mexicanus	Known to occur	Uncommon
Birds	Purple Martin	Progne subis	Known to occur	Rare
Birds	Pygmy Nuthatch	Sitta pygmaea	Known to occur	Fairly Common
Birds	Red Crossbill	Loxia curvirostra	Known to occur	Uncommon
Birds	Red-breasted Nuthatch	Sitta canadensis	Known to occur	Fairly Common
Birds	Redhead	Aythya americana	Known to occur	Unknown
Birds	Red-naped Sapsucker	Sphyrapicus nuchalis	Known to occur	Uncommon
Birds	Red-necked Phalarope	Phalaropus lobatus	Likely to occur	No Occurrence
Birds	Red-tailed Hawk	Buteo jamaicensis	Known to occur	Fairly Common

Birds	Red-winged Blackbird	Agelaius phoeniceus	Known to occur	Abundant
Birds	Ring-billed Gull	Larus delawarensis	Known to occur	Unknown
Birds	Ring-necked Duck	Aythya collaris	Known to occur	Uncommon
Birds	Ring-necked Pheasant	Phasianus colchicus	Known to occur	Unknown
Birds	Rock Dove	Columba livia	Known to occur	Fairly Common
Birds	Rock Wren	Salpinctes obsoletus	Known to occur	Fairly Common
Birds	Rough-legged Hawk	Buteo lagopus	Known to occur	Unknown
Birds	Ruby-crowned Kinglet	Regulus calendula	Known to occur	Common
Birds	Ruddy Duck	Oxyura jamaicensis	Known to occur	Uncommon
Birds	Rufous Hummingbird	Selasphorus rufus	Known to occur	Unknown
Birds	Sabine's Gull	Xema sabini	Likely to occur	No Occurrence
Birds	Sage Grouse	Centrocercus urophasianus	Known to occur	Unknown
Birds	Sage Thrasher	Oreoscoptes montanus	Known to occur	Unknown
Birds	Savannah Sparrow	Passerculus sandwichensis	Known to occur	Uncommon
Birds	Say's Phoebe	Sayornis saya	Known to occur	Fairly Common
Birds	Semipalmated Sandpiper	Calidris pusilla	Likely to occur	No Occurrence
Birds	Sharp-shinned Hawk	Accipiter striatus	Known to occur	Uncommon
Birds	Sharp-tailed Grouse	Tympanuchus phasianellus	Known to occur	Unknown
Birds	Solitary Sandpiper	Tringa solitaria	Known to occur	Unknown
Birds	Song Sparrow	Melospiza melodia	Known to occur	Fairly Common
Birds	Sora	Porzana carolina	Known to occur	Uncommon
Birds	Southwestern Willow Flycatcher	Empidonax traillii extimus	Known to occur	Rare
Birds	Spotted Owl	Strix occidentalis	Known to occur	Unknown

Birds	**Spotted Sandpiper**	**Actitis macularia**	**Known to occur**	**Fairly Common**
Birds	**Spotted Towhee**	**Pipilo maculatus**	**Known to occur**	**Common**
Birds	**Steller's Jay**	**Cyanocitta stelleri**	**Known to occur**	**Fairly Common**
Birds	**Summer Tanager**	**Piranga rubra**	**Likely to occur**	**No Occurrence**
Birds	**Swainson's Hawk**	**Buteo swainsoni**	**Known to occur**	**Rare**
Birds	**Swainson's Thrush**	**Catharus ustulatus**	**Known to occur**	**Rare**
Birds	**Three-toed Woodpecker**	**Picoides tridactylus**	**Known to occur**	**Uncommon**
Birds	**Townsend's Solitaire**	**Myadestes townsendi**	**Known to occur**	**Uncommon**
Birds	**Townsend's Warbler**	**Dendroica townsendi**	**Likely to occur**	**No Occurrence**
Birds	**Tree Swallow**	**Tachycineta bicolor**	**Known to occur**	**Common**
Birds	**Tundra Swan**	**Cygnus columbianus**	**Likely to occur**	**No Occurrence**
Birds	**Turkey Vulture**	**Cathartes aura**	**Known to occur**	**Common**
Birds	**Varied Thrush**	**Ixoreus naevius**	**Likely to occur**	**No Occurrence**
Birds	**Vesper Sparrow**	**Pooecetes gramineus**	**Known to occur**	**Common**
Birds	**Violet-green Swallow**	**Tachycineta thalassina**	**Known to occur**	**Common**
Birds	**Virginia Rail**	**Rallus limicola**	**Known to occur**	**Uncommon**
Birds	**Virginia's Warbler**	**Vermivora virginiae**	**Known to occur**	**Fairly Common**
Birds	**Warbling Vireo**	**Vireo gilvus**	**Known to occur**	**Common**
Birds	**Western Bluebird**	**Sialia mexicana**	**Known to occur**	**Fairly Common**
Birds	**Western Grebe**	**Aechmophorus occidentalis**	**Known to occur**	**Uncommon**
Birds	**Western Kingbird**	**Tyrannus verticalis**	**Known to occur**	**Fairly Common**
Birds	**Western Meadowlark**	**Sturnella neglecta**	**Known to occur**	**Common**
Birds	**Western Sandpiper**	**Calidris mauri**	**Likely to occur**	**No Occurrence**

Birds	Western Screech-Owl	Otus kennicottii	Known to occur	Unknown
Birds	Western Scrub Jay	Aphelocoma californica	Known to occur	Fairly Common
Birds	Western Tanager	Piranga ludoviciana	Known to occur	Fairly Common
Birds	Western Wood-Pewee	Contopus sordidulus	Known to occur	Fairly Common
Birds	White-breasted Nuthatch	Sitta carolinensis	Known to occur	Fairly Common
Birds	White-crowned Sparrow	Zonotrichia leucophrys	Known to occur	Common
Birds	White-rumped Sandpiper	Calidris fuscicollis	Likely to occur	No Occurrence
Birds	White-tailed Ptarmigan	Lagopus leucurus	Known to occur	Rare
Birds	White-throated Sparrow	Zonotrichia albicollis	Likely to occur	No Occurrence
Birds	White-throated Swift	Aeronautes saxatalis	Known to occur	Common
Birds	White-winged Scoter	Melanitta fusca	Likely to occur	No Occurrence
Birds	Whooping Crane	Grus americana	Likely to occur	No Occurrence
Birds	Wild Turkey	Meleagris gallopavo	Known to occur	Uncommon
Birds	Williamson's Sapsucker	Sphyrapicus thyroideus	Known to occur	Uncommon
Birds	Willow Flycatcher	Empidonax traillii	Known to occur	Rare
Birds	Wilson's Warbler	Wilsonia pusilla	Known to occur	Fairly Common
Birds	Wood Duck	Aix sponsa	Known to occur	Unknown
Birds	Wood Thrush	Hylocichla mustelina	Likely to occur	No Occurrence
Birds	Yellow Warbler	Dendroica petechia	Known to occur	Fairly Common
Birds	Yellow-breasted Chat	Icteria virens	Known to occur	Uncommon
Birds	Yellow-rumped Warbler	Dendroica coronata	Known to occur	Common
Mammals	Abert's Squirrel	Sciurus aberti	Known to occur	Fairly Common
Mammals	American Badger	Taxidea taxus	Known to occur	Uncommon

Mammals	**American Beaver**	**Castor canadensis**	**Known to occur**	**Fairly Common**
Mammals	**American Elk**	**Cervus elaphus**	**Known to occur**	**Abundant**
Mammals	**American Marten**	**Martes americana**	**Known to occur**	**Uncommon**
Mammals	**American Pika**	**Ochotona princeps**	**Known to occur**	**Fairly Common**
Mammals	**Big Brown Bat**	**Eptesicus fuscus**	**Known to occur**	**Abundant**
Mammals	**Bighorn Sheep**	**Ovis canadensis**	**Known to occur**	**Fairly Common**
Mammals	**Black Bear**	**Ursus americanus**	**Known to occur**	**Common**
Mammals	**Black-footed Ferret**	**Mustela nigripes**	**Likely to occur**	**Extirpated**
Mammals	**Black-tailed Jackrabbit**	**Lepus californicus**	**Known to occur**	**Uncommon**
Mammals	**Bobcat**	**Lynx rufus**	**Known to occur**	**Uncommon**
Mammals	**Botta's Pocket Gopher**	**Thomomys bottae**	**Known to occur**	**Fairly Common**
Mammals	**Brush Mouse**	**Peromyscus boylii**	**Known to occur**	**Fairly Common**
Mammals	**Bushy-tailed Woodrat**	**Neotoma cinerea**	**Known to occur**	**Fairly Common**
Mammals	**California Myotis**	**Myotis californicus**	**Likely to occur**	**Unknown**
Mammals	**Colorado Chipmunk**	**Tamias quadrivittatus**	**Known to occur**	**Fairly Common**
Mammals	**Common Muskrat**	**Ondatra zibethicus**	**Known to occur**	**Common**
Mammals	**Common Porcupine**	**Erethizon dorsatum**	**Known to occur**	**Uncommon**
Mammals	**Coyote**	**Canis latrans**	**Known to occur**	**Common**
Mammals	**Deer Mouse**	**Peromyscus maniculatus**	**Known to occur**	**Abundant**
Mammals	**Desert Cottontail**	**Sylvilagus audubonii**	**Known to occur**	**Fairly Common**
Mammals	**Ermine**	**Mustela erminea**	**Known to occur**	**Uncommon**
Mammals	**Fringed Myotis**	**Myotis thysanodes**	**Known to occur**	**Rare**
Mammals	**Golden-mantled Ground Squirrel**	**Spermophilus lateralis**	**Known to occur**	**Fairly Common**

Mammals	Gray Fox	Urocyon cinereoargenteus	Known to occur	Rare
Mammals	Gunnison's Prairie Dog	Cynomys gunnisoni	Known to occur	Fairly Common
Mammals	Hoary Bat	Lasiurus cinereus	Known to occur	Common
Mammals	House Mouse	Mus musculus	Known to occur	Abundant
Mammals	Least Chipmunk	Tamias minimus	Known to occur	Common
Mammals	Little Brown Myotis	Myotis lucifugus	Likely to occur	Unknown
Mammals	Long-eared Myotis	Myotis evotis	Likely to occur	Unknown
Mammals	Long-legged Myotis	Myotis volans	Known to occur	Common
Mammals	Long-tailed Vole	Microtus longicaudus	Known to occur	Fairly Common
Mammals	Long-tailed Weasel	Mustela frenata	Known to occur	Uncommon
Mammals	Lynx	Lynx canadensis	Known to occur	Very Rare
Mammals	Masked Shrew	Sorex cinereus	Likely to occur	Unknown
Mammals	Mexican Woodrat	Neotoma mexicana	Known to occur	Fairly Common
Mammals	Mink	Mustela vison	Known to occur	Uncommon
Mammals	Montane Shrew	Sorex monticolus	Known to occur	Common
Mammals	Montane Vole	Microtus montanus	Known to occur	Common
Mammals	Moose	Alces alces	Known to occur	Rare
Mammals	Mountain Cottontail	Sylvilagus nuttallii	Known to occur	Fairly Common
Mammals	Mountain Lion	Felis concolor	Known to occur	Uncommon
Mammals	Mule Deer	Odocoileus hemionus	Known to occur	Abundant
Mammals	Northern Pocket Gopher	Thomomys talpoides	Known to occur	Common
Mammals	Northern River Otter	Lutra canadensis	Known to occur	Rare
Mammals	Pallid Bat	Antrozous pallidus	Known to occur	Fairly Common

Mammals	**Pine Squirrel**	**Tamiasciurus hudsonicus**	**Known to occur**	**Fairly Common**
Mammals	**Pinyon Mouse**	**Peromyscus truei**	**Known to occur**	**Common**
Mammals	**Raccoon**	**Procyon lotor**	**Known to occur**	**Fairly Common**
Mammals	**Red Fox**	**Vulpes vulpes**	**Known to occur**	**Uncommon**
Mammals	**Ringtail**	**Bassariscus astutus**	**Likely to occur**	**Unknown**
Mammals	**Rock Squirrel**	**Spermophilus variegatus**	**Known to occur**	**Fairly Common**
Mammals	**Silver-haired Bat**	**Lasionycteris noctivagans**	**Likely to occur**	**Unknown**
Mammals	**Snowshoe Hare**	**Lepus americanus**	**Known to occur**	**Fairly Common**
Mammals	**Southern Red-backed Vole**	**Clethrionomys gapperi**	**Likely to occur**	**Unknown**
Mammals	**Striped Skunk**	**Mephitis mephitis**	**Known to occur**	**Common**
Mammals	**Water Shrew**	**Sorex palustris**	**Known to occur**	**Uncommon**
Mammals	**Western Harvest Mouse**	**Reithrodontomys megalotis**	**Known to occur**	**Fairly Common**
Mammals	**Western Jumping Mouse**	**Zapus princeps**	**Known to occur**	**Fairly Common**
Mammals	**Western Small-footed Myotis**	**Myotis ciliolabrum**	**Likely to occur**	**Unknown**
Mammals	**Western Spotted Skunk**	**Spilogale gracilis**	**Known to occur**	**Rare**
Mammals	**White-tailed Jackrabbit**	**Lepus townsendii**	**Known to occur**	**Uncommon**
Mammals	**White-throated Woodrat**	**Neotoma albigula**	**Known to occur**	**Fairly Common**
Mammals	**Wolverine**	**Gulo gulo**	**Known to occur**	**Extirpated**
Mammals	**Yellow-bellied Marmot**	**Marmota flaviventris**	**Known to occur**	**Common**
Mammals	**Yuma Myotis**	**Myotis yumanensis**	**Likely to occur**	**Unknown**
Reptiles	**Blackneck Garter Snake**	**Thamnophis cyrtopsis**	**Known to occur**	**Rare**
Reptiles	**Collared Lizard**	**Crotaphytus collaris**	**Known to occur**	**Unknown**
Reptiles	**Fence Lizard**	**Sceloporus undulatus**	**Known to occur**	**Common**

Reptiles	**Gopher Snake**	**Pituophis catenifer**	**Known to occur**	**Uncommon**
Reptiles	**Many-lined Skink**	**Eumeces multivirgatus**	**Known to occur**	**Unknown**
Reptiles	**Midget Faded Rattlesnake**	**Crotalus viridis concolor**	**Known to occur**	**Uncommon**
Reptiles	**Milk Snake**	**Lampropeltis triangulum**	**Known to occur**	**Rare**
Reptiles	**Painted Turtle**	**Chrysemys picta**	**Known to occur**	**Rare**
Reptiles	**Plateau Striped Whiptail**	**Cnemidophorus velox**	**Known to occur**	**Common**
Reptiles	**Racer**	**Coluber constrictor**	**Likely to occur**	**Unknown**
Reptiles	**Sagebrush Lizard**	**Sceloporus graciosus**	**Likely to occur**	**Unknown**
Reptiles	**Short-horned Lizard**	**Phrynosoma hernandesi**	**Known to occur**	**Fairly Common**
Reptiles	**Smooth Green Snake**	**Liochlorophis vernalis**	**Known to occur**	**Uncommon**
Reptiles	**Tree Lizard**	**Urosaurus ornatus**	**Known to occur**	**Unknown**
Reptiles	**Variable Skink**	**Eumeces gaigeae**	**Known to occur**	**Unknown**
Reptiles	**Western Rattlesnake**	**Crotalus viridis**	**Known to occur**	**Uncommon**
Reptiles	**Western Terrestrial Garter Snake**	**Thamnophis elegans**	**Known to occur**	**Fairly Common**

Taken from the Colorado Division of Wildlife Website:
http://ndis.nrel.colostate.edu/aspresponse/spxbycnty_res.asp

2c4b

Threatened & Endangered Species - Colorado

COMMON NAME	SCIENTIFIC NAME	STATUS*
AMPHIBIANS		
Boreal Toad	Bufo boreas boreas	SE
Northern Cricket Frog	Acris crepitans	SC
Great Plains Narrowmouth Toad	Gastrophryne olivacea	SC
Northern Leopard Frog	Rana pipiens	SC
Wood Frog	Rana sylvatica	SC
Plains Leopard Frog	Rana blairi	SC
Couch's Spadefoot	Scaphiopus couchii	SC
BIRDS		
Whooping Crane	Grus americana	FE, SE
Least Tern	Sterna antillarum	FE, SE
Southwestern Willow Flycatcher	Empidonax traillii extimus	FE, SE
Plains Sharp-Tailed Grouse	Tympanuchus phasianellus jamesii	SE
Piping Plover	Charadrius melodus circumcinctus	FT, ST
Bald Eagle	Haliaeetus leucocephalus	FT, ST
Mexican Spotted Owl	Strix occidentalis lucida	FT, ST
Burrowing Owl	Athene cunicularia	ST
Lesser Prairie-Chicken	Tympanuchus pallidicinctus	ST
Western Yellow-Billed Cuckoo	Coccyzus americanus	SC
Greater Sandhill Crane	Grus canadensis tabida	SC
Ferruginous Hawk	Buteo regalis	SC
Gunnison Sage-Grouse	Centrocercus minimus	SC
American Peregrine Falcon	Falco peregrinus anatum	SC
Greater Sage Grouse	Centrocercus urophasianus	SC
Western Snowy Plover	Charadrius alexandrinus	SC
Mountain Plover	Charadrius montanus	SC
Long-Billed Curlew	Numenius americanus	SC
Columbian Sharp-Tailed Grouse	Tympanuchus phasianellus columbianus	SC
FISH		
Bonytail	Gila elegans	FE, SE
Razorback Sucker	Xyrauchen texanus	FE, SE
Humpback Chub	Gila cypha	FE, ST
Colorado Pikeminnow	Ptychocheilus lucius	FE, ST
Greenback Cutthroat Trout	Oncorhynchus clarki stomias	FT, ST
Rio Grande Sucker	Catostomus plebeius	SE
Lake Chub	Couesius plumbeus	SE
Plains Minnow	Hybognathus placitus	SE
Suckermouth Minnow	Phenacobius mirabilis	SE
Northern Redbelly Dace	Phoxinus eos	SE
Southern Redbelly Dace	Phoxinus erythrogaster	SE
Brassy Minnow	Hybognathus hankinsoni	ST
Common Shiner	Luxilus cornutus	ST

Arkansas Darter	Etheostoma cragini	ST
Mountain Sucker	Catostomus playtrhynchus	SC
Plains Orangethroat Darter	Etheostoma spectabile	SC
Iowa Darter	Etheostoma exile	SC
Rio Grande Chub	Gila pandora	SC
Colorado Roundtail Chub	Gila robusta	SC
Stonecat	Noturus flavus	SC
Colorado River Cutthroat Trout	Oncorhynchus clarki pleuriticus	SC
Rio Grande Cutthroat Trout	Oncorhynchus clarki virginalis	SC
Flathead Chub	Platygobio gracilus	SC
	MAMMALS	
Gray Wolf	Canis lupus	FE, SE
Black-Footed Ferret	Mustela nigripes	FE, SE
Grizzly Bear	Ursus arctos	FT, SE
Preble's Meadow Jumping Mouse	Zapus hudsonius preblei	FT, ST
Lynx	Lynx canadensis	FT, SE
Wolverine	Gulo gulo	SE
River Otter	Lontra canadensis	ST
Kit Fox	Vulpes macrotis	SE
Townsend's Big-Eared Bat	Corynorhinus townsendii pallescens	SC
Black-Tailed Prairie Dog	Cynomys ludovicianus	SC
Botta's Pocket Gopher	Thomomy bottae rubidus	SC
Northern Pocket Gopher	Thomomys talpoides macrotis	SC
Swift fox	Vulpes velox	
	REPTILES	
Triploid Checkered Whiptail	Cnemidophorus neotesselatus	SC
Midget Faded Rattlesnake	Crotalus viridis concolor	SC
Longnose Leopard Lizard	Gambelia wislizenii	SC
Yellow Mud Turtle	Kinosternon flavescens	SC
Common King Snake	Lampropeltis getula	SC
Texas Blind Snake	Leptotyphlops dulcis	SC
Texas Horned Lizard	Phrynosoma cornutum	SC
Roundtail Horned Lizard	Phrynosoma modestum	SC
Massasauga	Sistrurus catenatus	SC
Common Garter Snake	Thamnophis sirtalis	SC
	MOLLUSKS	
Rocky Mountain Capshell	Acroloxus coloradensis	SC
Cylindrical Papershell	Anodontoides ferussacianus	SC

Status Code:

FE = Federally Endangered
FT = Federally Threatened
SE = State Endangered
ST = State Threatened
SC = State Special Concern (not a statutory category)

Section 2 – Assessment Data Summary

c. Private and Public land Use Inventory and Condition Assessment

5. Aspen Springs Subdivision

The Aspen Springs subdivision lies in the middle portion of the Stollsteimer Creek Watershed. It is a multi-unit, mostly residential type subdivision with some commercial development mostly along the highway and creek corridor. Stollsteimer Creek forms at the upper end of Aspen Springs, running parallel to U.S. Highway 160 for approximately 5 miles through the subdivision.

Through Aspen Springs the creek channel and riparian corridor exhibit mixed conditions. Many sections are in good condition and other sections show signs of stream bank erosion and negative human impacts. Improvement and development buffers are non-existent in many areas and human impacts are evident right next to the creek.

Most of the stream channel is privately owned making improvements challenging. One goal of this master plan is to work with owners in this stretch through educational outreach programs; offering stream channel improvement options to owners and possible funding assistance through the watershed partners and possible grant programs. Additionally, anytime land uses change in this area, the Steering committee would work closely with the Archuleta County Planning Department to see that stream and water body buffers and setbacks are implemented and enforced through the newly adopted County Land Use Regulations. In the years to come and as ownership changes in this area, it may be possible to actually develop a common stream channel corridor restoration and open space plan designed to protect this important water resource as well as offering recreational opportunities.

Absence of a central sewer system in Aspen Springs has great potential to affect water quality within the watershed. Recent water quality sampling efforts show a moderate increase of pollutants such as nitrates and phosphates during low stream flow but nothing outside of acceptable ranges. However, as the population of this area grows, the possibility of pollutants finding their way in to surface and groundwater from residential and commercial septic systems also increases. This impact will be even greater if a domestic water supply system is installed, increasing the water use of current and future residents. It will be critical to improve waste management infrastructure in concert with improvements to a domestic water supply system. It is also very important to continue water quality monitoring of pollutants, including E. Coli, so that any water quality problems can be detected as soon as possible. In this way residents of this area can maintain a healthy natural environment.

Section 2 – Assessment Data Summary

d. Hydrographic Surveys of the Lakes

There are six lakes in the upper Stollsteimer Creek Watershed, including Hatcher Lake, Stevens Lake, Lake Pagosa, Village Lake, Lake Forest and Pinõn Lake. Hatcher Lake and Stevens Lake are actively used to store water for the municipal drinking water system, each equipped with water treatment plants. Lake Forest, Village Lake, Pinõn Lake and Lake Pagosa store water for irrigation and recreation purposes and could also be used for a municipal water supply in the event of a severe drought. These six lakes were built for a variety of purposes, including agricultural water storage, recreation, golf course water storage & aesthetics, and domestic water supply. Upgrades in capacity and embankment integrity were accomplished over the years, although there was little accompanying documentation of capacity. The geographic

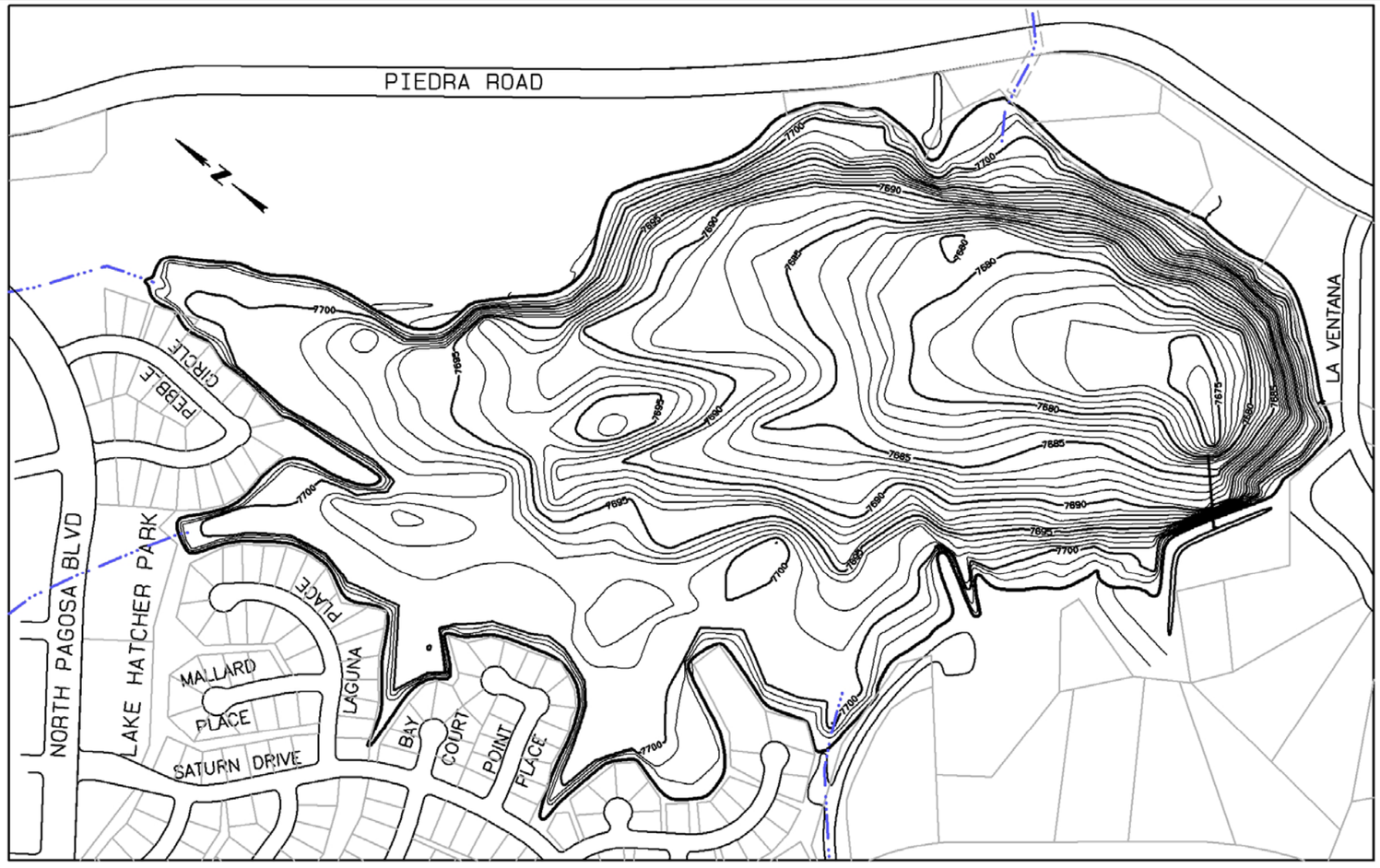
locations of these lakes make them central features of the upper Stollsteimer watershed, and make it imperative that water quality in the lakes be protected/enhanced to the greatest extent possible.

At this time, Stevens Lake is partway through a major expansion project, and construction surveys have thoroughly documented the present and future capacity of this water supply reservoir. From a watershed and water supply protection perspective, Stevens Lake's position in the watershed is quite good. Its natural watershed area is lightly developed, and the primary inlet area includes a meandering channel and broad wetland feature. Pinõn Lake is owned by the private golf course company, and they use the lake for temporary storage of irrigation water as well as aesthetics. This lake is shallow (<6 ft depth) and flat bottomed, and produces significant algal blooms in the summer months. Pinõn Lake serves as an unintended detention basin for areas of the golf course, as well as other upland areas currently experiencing land development. Because of these factors, Pinion Lake's capacity characteristics are not particularly important for watershed protection & water quality enhancement planning.

The other four lakes, Forest, Pagosa, Village and Hatcher all have poorly documented capacity information. The Watershed Steering Committee felt that it was important to complete hydrographic surveys of these four lakes as part of the watershed master plan effort. Hydrographic surveys would result in detailed stage/storage curves, as well as lake bottom contour mapping and assessments of opportunities to expand storage capacity and/or reduce bottom rooted vegetation problems. A local engineering firm was retained to accomplish hydrographic surveys for these four lakes. Ground survey equipment and depth sounding sonar equipment were used to build 3D surface models of the lake bottoms. Existing spillways were measured and stage/discharge rating curves were established for each of the lakes. Maps of the bottom contours for each of these four lakes are included in this report. A summary of lake capacity information is included below.

Lake Name	Surface Area (AC)	Maximum Storage Volume (AC-FT)
Hatcher Lake	130	1368
Lake Pagosa	106	1252
Village Lake	80	643
Lake Forest	42	272
Stevens Lake (above spillway)	N/A	921 @ 5 ft depth
Pinõn Lake	38	N/A

Section 2d1



Hatcher Lake

LAKE BOTTOM CONTOURS

Scale: 1" = 400 ft 1-5-2005

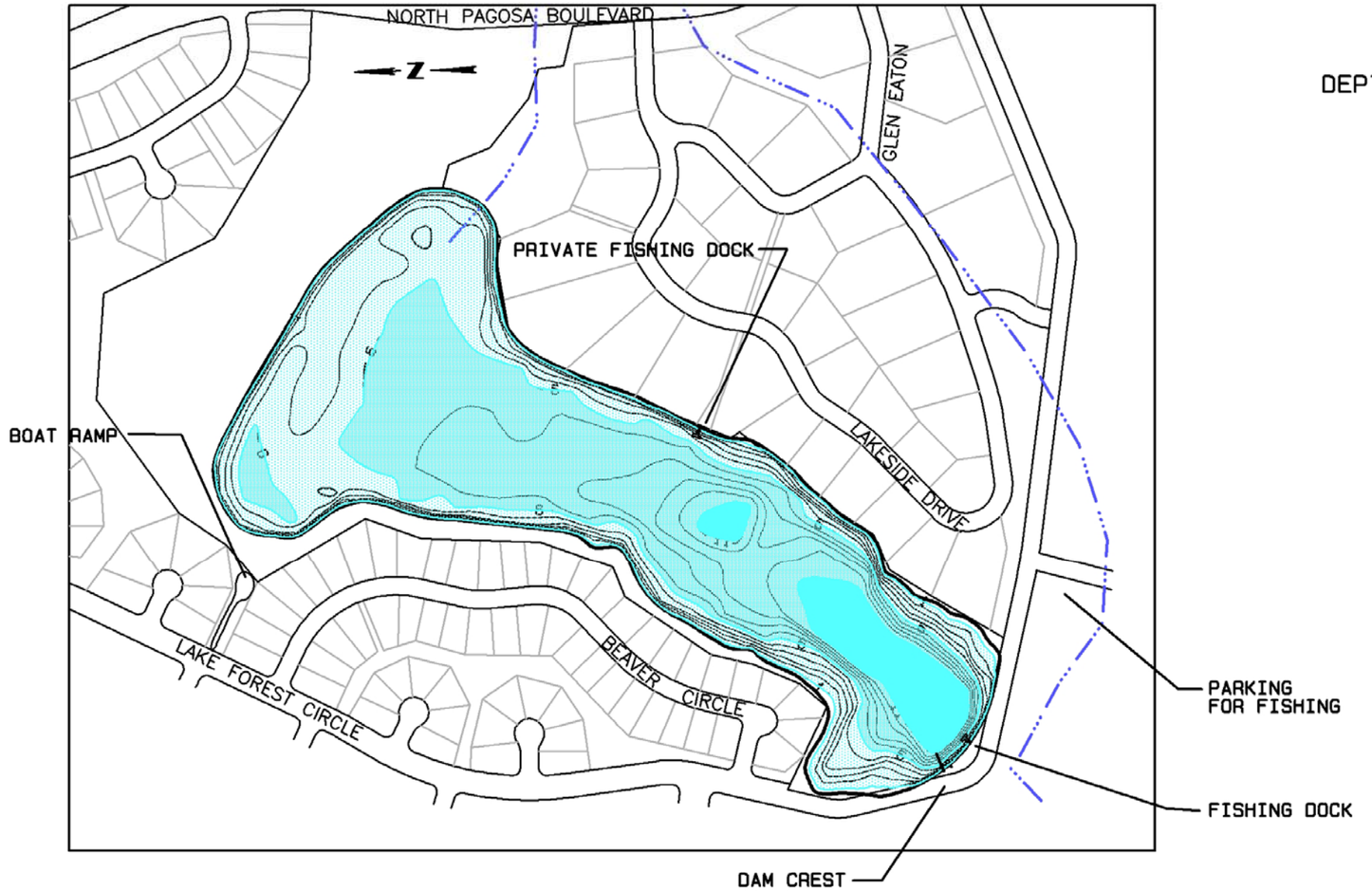
NOTE: PROPERTY BOUNDARY LOCATIONS ARE APPROXIMATE, AND ARE PROVIDED FOR GENERAL LOCATION REFERENCE ONLY.

PAGOSA LAKES
PROPERTY OWNERS ASSOCIATION

230 Port Ave., Pagosa Springs, CO 81147

Tel: 970.731.5635 FAX: 970.731.5362 Email: larryl@plpoa.com

Section 2d2



DEPTH INTERVALS

0-6 FT

6-11 FT

11-16 FT

LAKE FOREST

LAKE BOTTOM CONTOURS

Scale: 1" = 400 ft 4-17-2005

NOTE: PROPERTY BOUNDARY LOCATIONS ARE APPROXIMATE, AND ARE PROVIDED FOR GENERAL LOCATION REFERENCE ONLY.

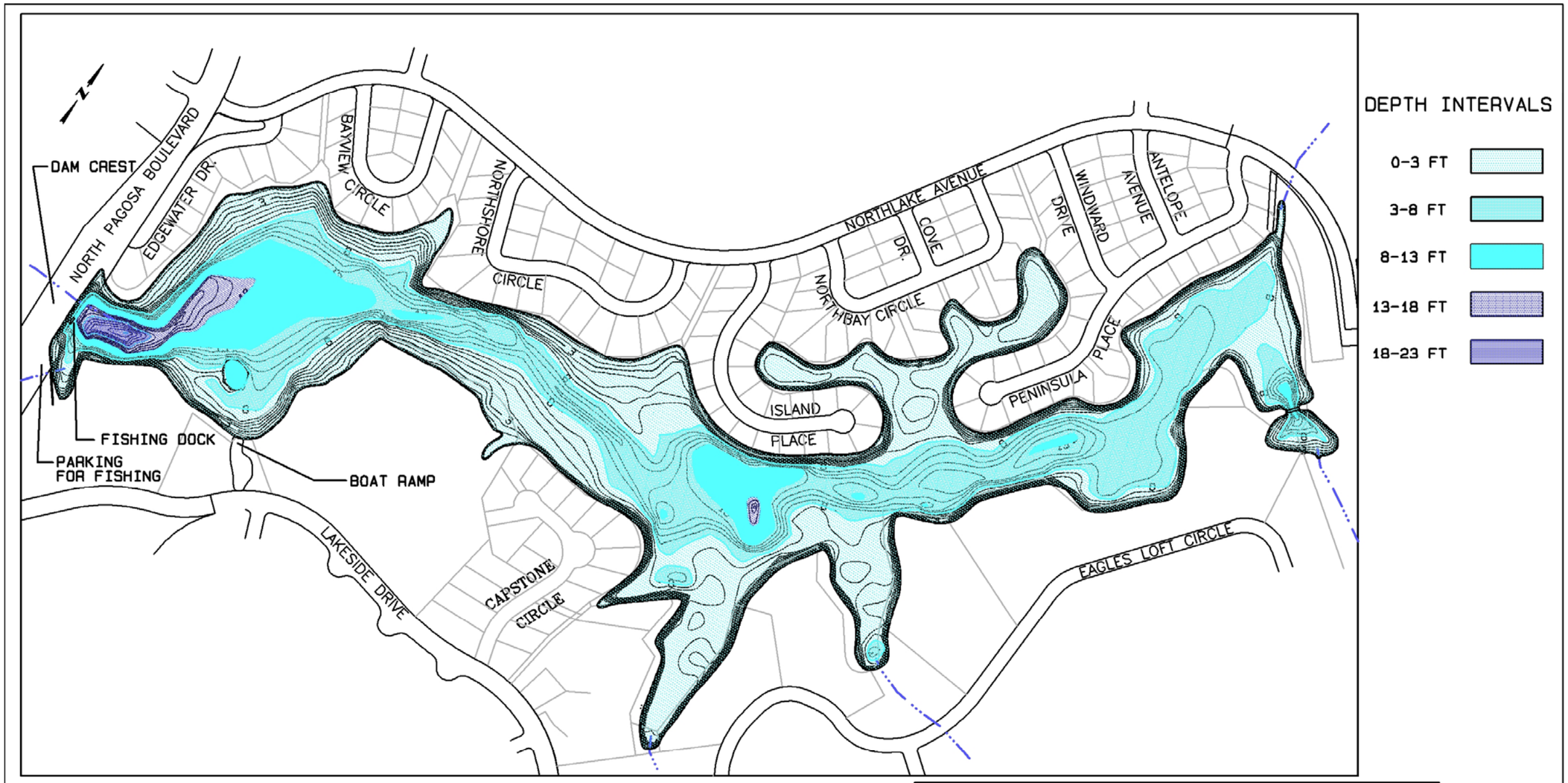
PAGOSA LAKES
PROPERTY OWNERS ASSOCIATION

Pagosa Lakes Property Owners Association

230 Port Ave., Pagosa Springs, CO 81147

Tel: 970.731.5635 FAX: 970.731.5362 Email: plpoa@plpoa.com

Section 2d3



VILLAGE LAKE

LAKE BOTTOM CONTOURS

Scale: 1" = 400 ft 4-17-2005

NOTE: PROPERTY BOUNDARY LOCATIONS ARE APPROXIMATE, AND ARE PROVIDED FOR GENERAL LOCATION REFERENCE ONLY.

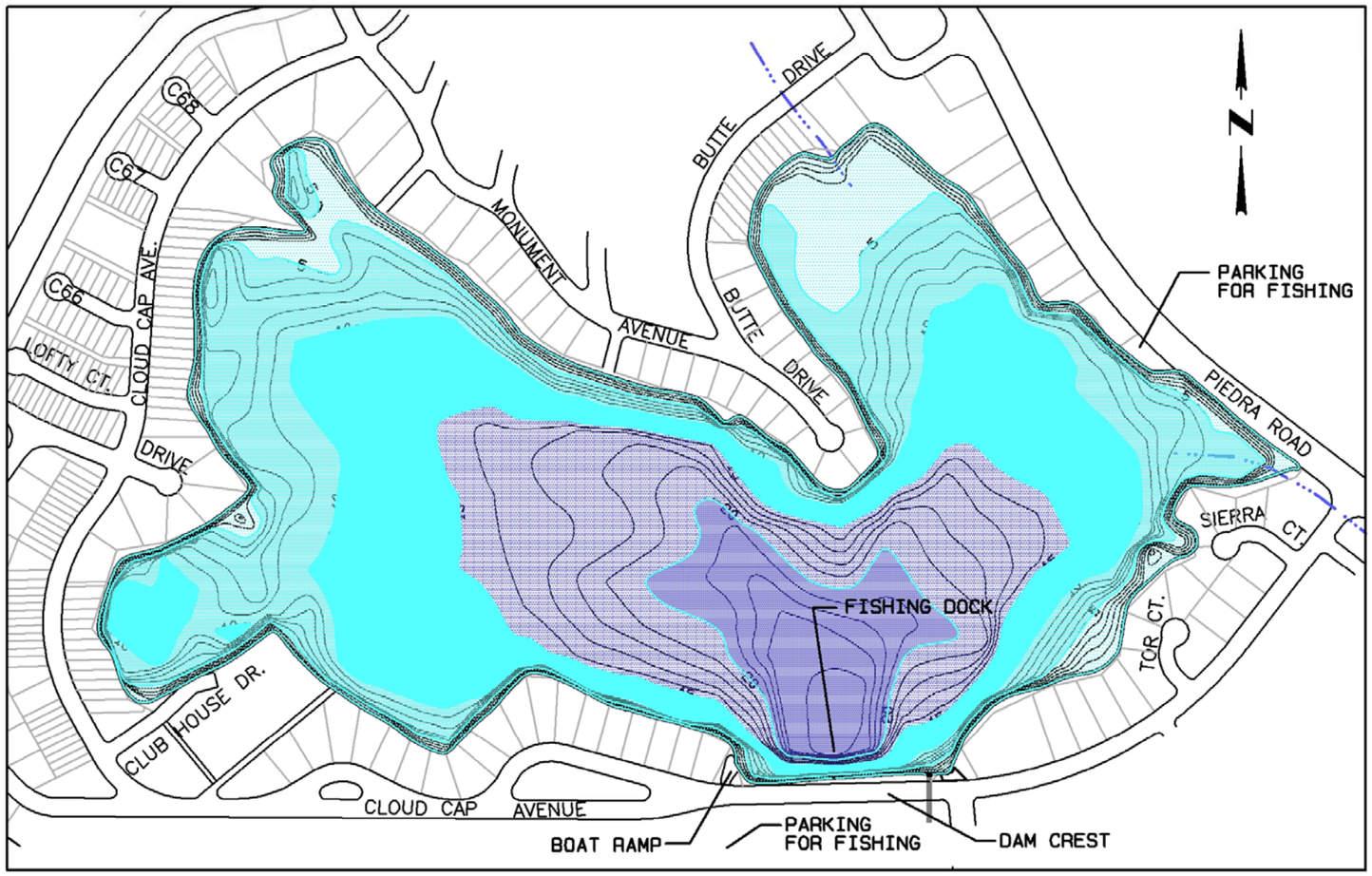
PAGOSA LAKES
PROPERTY OWNERS ASSOCIATION

Pagosa Lakes Property Owners Association

230 Port Ave., Pagosa Springs, CO 81147

Tel: 970.731.5635 FAX: 970.731.5362 Email: plpoa@plpoa.com

Section 2d4



DEPTH INTERVALS

- 0-5 FT
- 5-10 FT
- 10-15 FT
- 15-20 FT
- 20-25 FT

LAKE PAGOSA

LAKE BOTTOM CONTOURS

Scale: 1" = 400 ft 4-17-2005

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Section 3 - Hydrologic Modeling Upper and Lower Watershed

There are no formal stream gauges within the Stollsteimer Creek watershed, and therefore there are no historical records of rainfall & runoff to use for planning. This study effort included the development of a rainfall runoff model for the watershed, to assist in planning and modeling changes that may occur within the watershed as development occurs. Information about the watershed and channel behavior are critical in the decision making process for watershed regulators. A computer model developed by the U.S. Army Corp of Engineers titled HEC-HMS vs. 3.0.0 was utilized for this purpose. HEC-HMS includes numerous methods to simulate watershed, channel, and water-control structure behavior, assisting the user in predicting flow, stage, and timing. An explanation of the particular method used and a description of the various modeling components are presented below.

SCS Runoff Method

The Soil Conservation Service (SCS) now known as the Natural Resource Conservation Service (NRCS) has developed a widely used procedure for estimating runoff. The procedure was empirically developed from studies of agricultural watersheds. The SCS method was chosen for the Stollsteimer Creek Watershed Study because of its applicability, its widespread use, and its ease of reproduction. This method simplifies the runoff characteristics of a watershed (soil types, vegetative cover, etc.) into a single numeric value known as the Curve Number. The basic runoff algorithm includes drainage basin size, length, average slope and curve number. Rainfall amounts from different return frequency events are applied to the numeric model to determine rates of runoff and total runoff volumes.

Drainage Basins

The Stollsteimer Watershed is a highly diverse system. To accurately model the response of this system, the overall drainage basin was divided into 54 separate sub-basins based on geographic location, land use, and key infrastructure locations. Sub-basin boundaries and areas were determined using the United States Geological Survey (USGS) topographic maps at 1:24,000 scale. These maps were also used to define the major drainages within each sub-basin, and to estimate travel time and a time of concentration for the sub-basins. In each sub-basin the area was further divided by type of soil and land use as defined by the soil survey maps completed by the Soil Conservation Service, Forest Service, and subdivision maps provide by Pagosa Area Water and Sanitation District. From this data an “area weighted” average SCS curve number was determined for the sub-basins. The area, curve number, and time of concentration were then directly inputted into the HEC-HMS model. A copy of the input parameters for the lower and upper watershed sub-basins can be seen in Section 3c (Lower Watershed) and 3d (Upper Watershed).

Meteorological Model

Using the SCS method requires loading the model was loaded with various hypothetical storm events. Rainfall depths were obtained from the NOAA Atlas 2, Volume III maps for the 100, 50, 25, 10, 5 and 2 year 6-hr storm events. The temporal distribution of these rainfall events is defined by the hyetograph incorporated into the model; in this case an SCS Type II rainfall distribution was used.

Modeling Data Output

A summary of the resulting flows and volumes from various storm events for each of the sub-basins and for key analysis points is presented in Section 3b (Stollsteimer Watershed HEC-MS Summary Table).

Stormwater and Infrastructure Assessment

The capacity of existing culverts and drainage infrastructure was evaluated at key locations. Existing capacities were estimated from culvert nomographs, then compared with flow rates derived from the model. A comparison table of these results can be found in Section 3e (Stollsteimer Watershed Infrastructure Summary Table). This Summary Table presents key locations where infrastructure was evaluated for flow capacity. This table does not address every culvert in the Stollsteimer Watershed; however the model can be quickly modified to evaluate the flows at intermediate locations.

Prior to this study, several locations had been identified where stormwater quality improvement structures would have the most benefit. Peak rates of runoff and the corresponding runoff volumes were calculated for these locations. Key locations were identified where stormwater runoff enters lakes used for drinking water storage. These locations are believed to be of the utmost importance in mitigating pollutant loading from stormwater. Concept plans were developed for infrastructure improvements at these key locations, as were estimated costs. The results are presented below.

Location A: Northwest Inlet to Hatcher Lake:

Hatcher Lake is currently utilized for domestic water storage. Maintaining a high water quality is critical to the current and long term use of the lake for domestic water. A potential location for a water quality improvement structure was identified near the northwest corner of the lake. This potential location is identified as Water Quality Enhancement Location A on the Stollsteimer Watershed Sub-Basin Map in Section 3a. The general goal of the proposed improvements would be to extend the travel time and infiltration of small runoff events (<2yr) by creating a series of low check dams across the existing channel. Existing mature wetland plant materials would be retained. Larger runoff events (>2yr) would overflow these check dams, but medium size suspended sediments and larger would be deposited behind the check dams. The entire system would be utilized as public open space during dry weather periods.

Preliminary Probable Estimated Costs Water Quality Enhancement Location A:

Excavation	$1200
Berm Embankment	$3200
Rock Weir	$12000
Re-veg	$600
Engineering	$3000
Total	**$20,000**
Contingency Costs	$2000 to $5000

Location B: Lake Pagosa Inlet from Cloman Industrial Park

Water Quality Enhancement Location B shows a water detention basin that would trap sediments and contaminants before the runoff enters the lake. This drainage is a seasonal creek that drains the entire Cloman Industrial Park up to and including parts of the airport property. This is a water source of much concern and has been identified as the heaviest contributor of sediments into Lake Pagosa over the years. Catching sediments and contaminants before they enter the lake is the project goal. Stream channel work will include modifications to the channel including grade work and step-pool rock channel work. The basin itself would hold the water for a certain amount of time allowing for sediments and contaminant to settle before exiting the basin in the appropriately sized outlet pipe. For heavy flows there would be a concrete spillway that will allow for water to escape or overflow in a controlled manner. The basin would have to be cleaned out when conditions warrant. Available land for the project would determine the storage and related storm capacity of the detention basin. The land could potentially be utilized as open space or a neighborhood park during the summer months.

Preliminary Probable Estimated Costs Water Quality Enhancement Location B:

Excavation	800 CY	$2400
Embankment	400 CY	$1600
Excess Material	400 CY	$2400
Pipe Outlet Works		$3000
Concrete Spill		$5000
Rock channel		$2000
Re-veg		$500
Engineering		$3000
Total		**$19,900**
Contingency Costs		$2000 to $5000

Location C: East Inlet to Village Lake

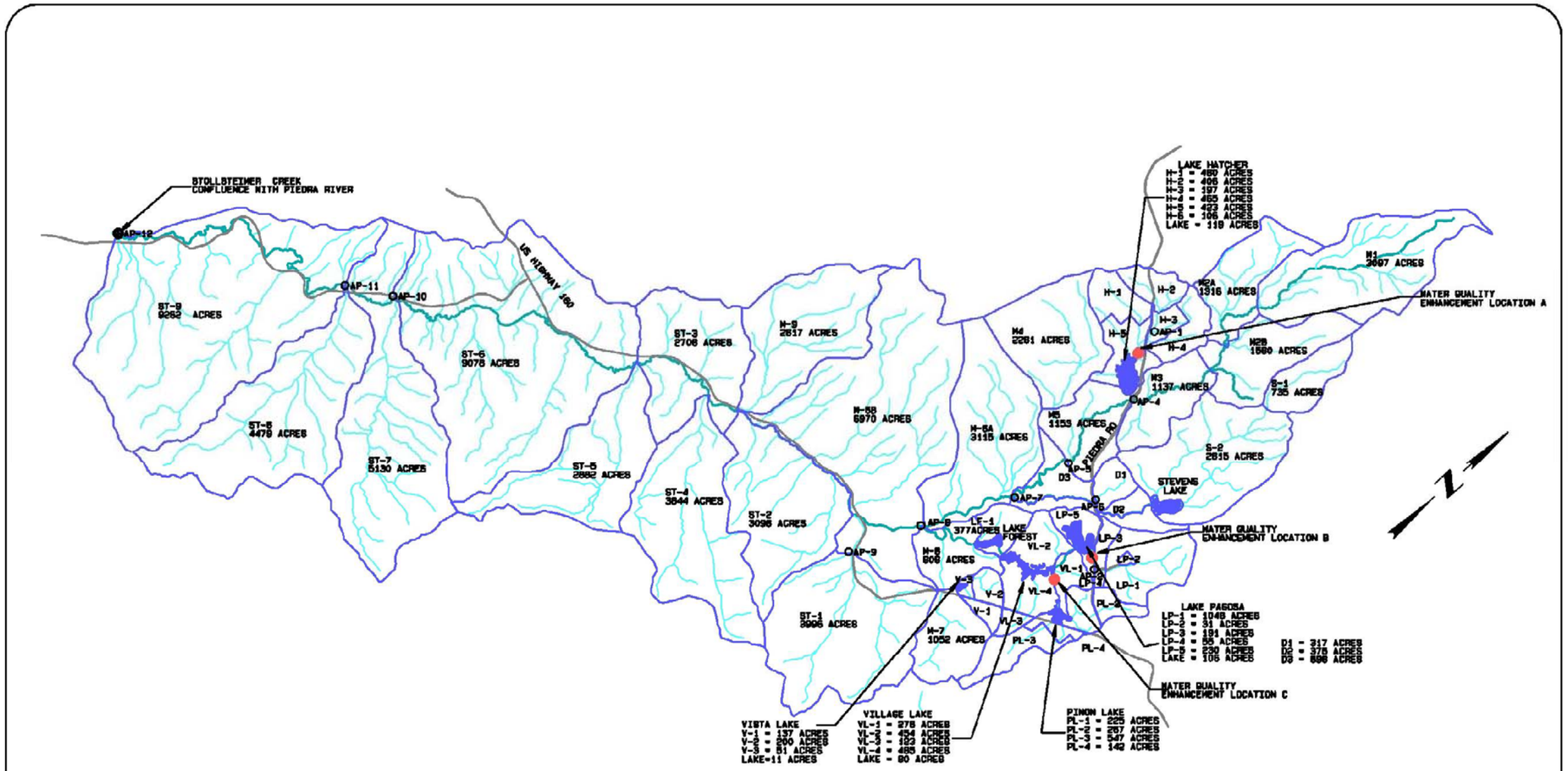
Village Lake is currently utilized for domestic water storage and recreation. Maintaining a high water quality and sufficient water storage is critical to the current and long term use of the lake. A potential location for a water quality improvement structure was identified near the northeast inlet of the lake adjacent to the meadows golf course. The potential location is identified as Water Quality Enhancement Location C on the Stollsteimer Watershed Sub-Basin Map (Section 3a). The general goal of the structure would be to extend the travel time and infiltration of small runoff events (<2yr) by creating a series of low check dams built with large boulders. Large runoff events (>2yr) would overflow the check dams but a significant portion of the suspended sediment load would be deposited behind the check dams. The large relatively flat detention areas could coexist with the meadows golf course.

Estimated Costs Water Quality Enhancement Location C:

Excavation	600 CY	$2000
Rock Weir		$16000
Re-veg		$1000
Engineering		$3000
Total		**$22,000**
Contingency Costs		$2000 to $5000

Additional Note: In October 2001, an important inlet to Lake Pagosa, the Linn and Clark Ditch, which enters from the northeast, was evaluated and a plan created to address severe stream bank erosion problems and heavy sediment loads. Dave Rosgen of Wildland Hydrology provided a restoration design of the stream channel using a series of step pools, cross vanes and j-kooks. The plan was implemented in 2002 through a cost sharing project between the Pagosa Lakes Property Owners Association and the Pagosa Area Water and Sanitation District. As a result this important stream channel will not need to be addressed in this stormwater and infrastructure section of the master plan.

Section 3a



	The Stollsteimer Creek Watershed Steering Committee 505A County Rd 600 Pagosa Springs, CO 81147	**Stollsteimer Creek Watershed Study** Archuleta County, CO — Sheet
	Riverbend Engineering, LLC P.O. Box 2979 Pagosa Springs, CO 81147 Tel: 970.254.1195 FAX: 970.254.1195 Email: cphilips@Frontier.net	**Stollsteimer Watershed Sub-Basin Map** of 1 SCALE 1"=10000' — 5-22-06

Section 3b

Stollsteimer Watershed HEC-HMS Summary Table															
Description		Drainage Area		Peak Discharge (cfs)						Volume (Acre-Ft.)					
Element	Location	Mi^2	Acres	100yr	50yr	25yr	10yr	5yr	2yr	100yr	50yr	25yr	10yr	5yr	2yr
AP-1	Piedra Crossing @ Reserve	1.67	1068	350	283	166	96	43	9	69	58	38	25	14	5
AP-2	Cloman Drainage/Piedra Rd.	1.69	1079	419	353	230	148	81	25	87	74	51	35	22	9
AP-4	Martinez Cr./Piedra Rd	11.15	7136	564	478	318	213	124	48	518	442	299	204	123	50
AP-5	Martinez Cr./North Pagosa Blvd.	19.97	12782	858	727	484	325	191	76	888	756	512	351	213	90
AP-6	Dutton Drainage/Piedra Rd.	6.77	4330	601	507	335	223	129	49	342	293	202	141	87	38
AP-7	Dutton Drainage/Martinez Cr.	27.83	17810	1088	927	628	429	260	109	1285	1097	748	516	316	136
AP-8	Lakes/Martinez Cr.	43.58	27894	1545	1307	890	611	372	161	1949	1663	1135	784	483	213
AP-9	CR 139/Stollsteimer	6.24	3994	1170	1003	689	474	286	116	377	326	231	166	107	51
AP-10	Hurt Dr./Stollsteimer	69.95	44771	2788	2353	1564	1049	624	260	3029	2577	1745	1195	726	308
AP-11	Cat Creek #1/Stollsteimer	75.96	48617	3031	2550	1678	1115	653	265	3182	2702	1818	1236	744	309
AP-12	Piedra River/Stollsteimer Cr.	128.36	82153	3702	3128	2078	1392	813	312	2551	2136	1383	899	500	167
Hatcher Lake	Emergency Spillway	3.43	2196	185	159	110	78	51	26	180	156	111	81	54	29
Lake Forest	Emergency Spillway	7.36	4712	297	250	174	120	75	38	354	306	217	157	104	53
Lake Pagosa	Emergency Spillway	2.60	1661	74	63	44	31	20	10	107	92	65	47	30	15
Pinon Lake	Emergency Spillway	1.91	1219	233	154	105	73	45	20	110	95	67	48	31	15
Stevens Lake	Emergency Spillway	5.68	3633	538	453	296	195	111	40	283	242	166	116	72	32
Village Lake	Emergency Spillway	6.72	4298	350	290	204	146	95	47	345	299	213	155	103	53
Vista Lake	Emergency Spillway	0.62	399	47	36	20	13	8	3	32	28	19	14	9	4

Section 3c

Stollsteimer Creek Watershed Study

Lower Watershed and Drainage Basin Characteristics

Basin Name	Watershed Area Location/Description	Drainage Basins: Drainage Area (AC)	Drainage Area (sqmi)	Time of Concentration (min)	Composite Curve Number	Time of Concentration: Overland Flow Length (ft)	Overland Average Slope (%)	Overland Average Velocity (ft/sec)	Overland Travel Time (min)	Channel Flow Length (ft)	Channel Average Slope (%)	Channel Average Velocity (ft/sec)	Channel Travel Time (min)	Subarea #1 Land Use	Subarea #1 Area (AC)	Subarea #1 Soil Type	Range or Development Condition	Subarea #1 Curve Number
M-1	Upper Martinez Creek, in National Forest	3097	4.84	308.3	74	4,425	24.0%	1.5	49.2	23,320	8.4%	1.5	259.1	National Forest	1285	C	Good	70
															1812	D	Good	77
M-2A	Upper Martinez Creek, upper valley areas	1318	2.06	363.4	82	691	5.7%	1.1	10.5	15,880	2.3%	0.8	352.9	Private-Agricultural valley, upland forest A	567	C	Fair	79
M-2B	Upper Martinez Creek, upper valley areas	1580	2.47	138.4	82	4,115	11.7%	1.5	45.7	8,341	9.8%	1.5	92.7	A	751	D	Fair	84
														B	512	C	Fair	79
														B	1068	D	Fair	84
M-3	Upper Martinez Creek, upper valley areas	1137	1.78	139.4	81	2,538	16.9%	1.8	23.5	10,430	1.0%	1.6	115.9	Private Agricultural valley, brush & woods upland	780	C	Fair	79
															357	D	Fair	84
M-4	Martinez Watershed, National Forest on west side	2282	3.57	360.4	73	1,997	2.5%	0.8	41.6	15,300	2.6%	0.8	318.8	National Forest	1397	C	Good	70
															885	D	Good	77
M-5	Martinez Watershed, mixed use below Piedra Rd	1167	1.82	80.2	80	1,248	14.4%	1.0	20.8	8,910	2.8%	2.5	59.4	Private-Agricultural valley, brush & woods upland	906	C	Fair	79
															261	D	Fair	84
D-1	Dutton Creek, side drainage above Piedra Rd	317	0.50	77.2	80	2,450	11.0%	1.5	27.2	4,500	4.6%	1.5	50.0	Private- brush & woods upland	232	C	Fair	79
															85	D	Fair	84
D-2	Dutton Creek, drainage above Piedra Rd, below Stevens res.	375	0.59	80.4	82	1,812	4.4%	1.4	21.6	6,004	1.3%	1.7	58.9	Private- brush & woods upland	184	C	Fair	79
															191	D	Fair	84
D-3	Dutton Creek, Twin Creek Village, below Piedra Rd.	698	1.09	112.8	83	1,988	8.0%	0.7	47.3	8,246	2.2%	2.1	65.4	Residential - medium density	348	C	1/2 ac ave	80
															350	D	1/2 ac ave	85
M-6A	Lower Martinez Creek, west side National Forest	3115	4.87	347.8	71	4,472	2.9%	0.4	186.3	24,214	3.1%	2.5	161.4	National Forest	2803	C	Good	70
															312	D	Good	77
M-6B	Lower Martinez Creek, west side National Forest	6970	10.89	355.3	75	3,760	4.5%	0.6	113.9	37,657	3.3%	2.6	241.4	National Forest	1645	C	Good	70
															5325	D	Good	77
M-7	Lower Martinez Creek, east side, Meadows 3 area	1052	1.64	69.8	81	535	18.7%	1.1	8.1	9,250	2.6%	2.5	61.7	Low density residential valley, brush upland	614	C	Fair	79
															438	D	Fair	84
M-8	Lower Martinez Creek, east side, Vista subdivision area	808	1.26	118.0	82	1,814	1.6%	0.6	50.4	10,138	2.4%	2.5	67.6	Residential - low & high density	467	C	1/2 ac ave	80
															341	D	1/2 ac ave	85
M-9	Lower Martinez Creek, west side National Forest	2817	4.40	210.7	70	4,913	12.2%	0.8	102.4	20,800	6.8%	3.2	108.3	Industrial - partially developed	0	C	50% built	85
														National Forest	974	C	Good	70
														National Forest/Drainage bottom	530	B	Good	55
															1304	D	Good	77
ST-1	Upper Stollsteimer watershed, Parelli area, highway, Chris ranch	3996	6.24	99.5	83	1,777	31.5%	1.3	22.8	14,264	5.5%	3.1	76.7	Low density residential valley, brush upland	1079	C	Good	79
															2917	D	Good	84
ST-2	Upper Stollsteimer watershed, Broken off point	3098	4.84	142.8	82	2,800	29.0%	1.4	33.3	17,075	3.9%	2.6	109.5	Low density residential valley, brush upland	40	B	Good	69
															1100	C	Good	79
															1958	D	Good	84
ST-3	Keyah Grande Ranch Area	2708	4.23	120.1	82	1,746	20.9%	1.1	26.5	15,176	3.4%	2.7	93.7	Private-Agricultural valley, brush & woods upland	1141	C	Fair	79
															1567	D	Fair	84
ST-4	Hurt Canyon	3844	6.01	250.9	72	1,225	1.0%	0.3	81.7	32,079	3.6%	3.0	178.2	Private-Agricultural valley, brush & woods upland,	321	B	Good	55
														Southern Ute Indian Reservation	1789	C	Good	70
															1734	D	Good	77
ST-5	Cat Creek Area	2882	4.50	161.9	74	2,454	8.2%	0.7	58.4	18,005	2.6%	2.9	103.5	Private-Agricultural valley, brush & woods upland,	1142	C	Good	70
															1740	D	Good	77
ST-6	Capote Lake Area	9078	14.18	400.5	76	3,230	16.0%	1.0	53.8	41,600	1.9%	2.0	346.7	Private-Agricultural valley, brush & woods upland,	1282	C	Good	70
															7798	D	Good	77
ST-7	Archuleta Creek	5130	8.02	196.6	75	1,823	38.0%	1.5	20.3	31,741	3.9%	3.0	176.3	National Forest/ SUIT	84	B	Good	55
															1198	C	Good	70
															3848	D	Good	77
ST-8	Cabezon Canyon	4479	7.00	69.3	78	1,983	28.0%	1.4	23.6	10,964	7.6%	4.0	45.7	Low density residential valley, brush upland	204	B	Good	61
															667	C	Good	74
															3608	D	Good	80
ST-9	Lower Stollsteimer watershed at confluence with Piedra	9262	14.47	384.3	76	2,396	25.0%	1.2	33.3	52,655	2.8%	2.5	351.0	National Forest, Private-Agricultural valley, brush &	1788	C	Good	70
															7474	D	Good	77

Section 3d

Stollsteimer Creek Watershed Study

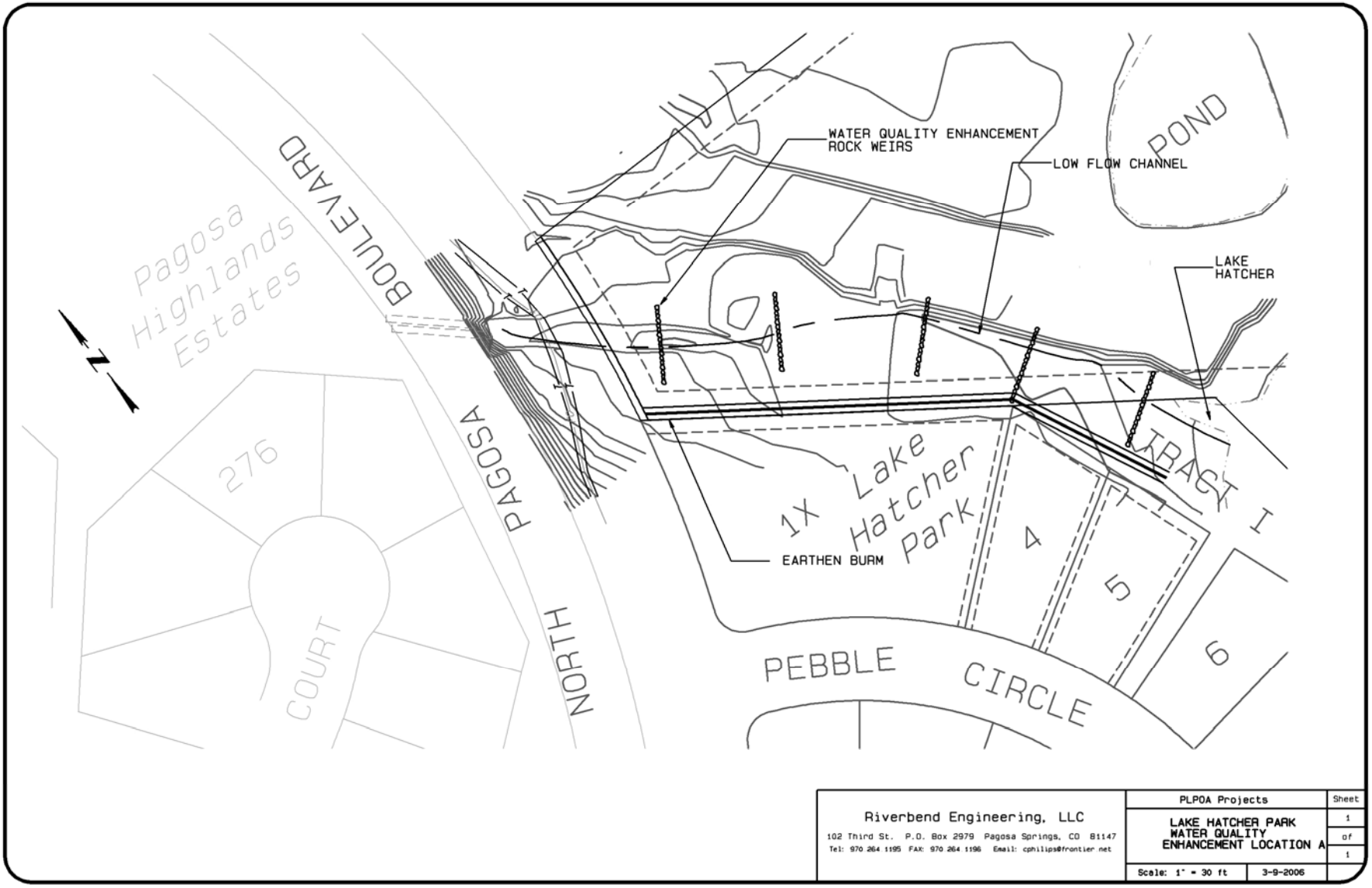
Upper Watershed and Drainage Basin Characteristics

Basin Name	Watershed Area Location/Description	Drainage Area (AC)	Time of Concentration (min)	Composite Curve Number	Overland Flow Length (ft)	Average Slope (%)	Average Velocity (ft/sec)	Travel Time (min)	Channel Flow Length (ft)	Average Slope (%)	Average Velocity (ft/sec)	Travel Time (min)	Land Use	Subarea #1 Area (AC)	Soil Type	Range or Development Condition	Curve Number
			Drainage Basins		Time of Concentration												
S-1	Upper Stevens Lake	735	89.6	71	2,590	0	1	43.2	10,040	0	4	46.5	National Forest	590	C	Good	70
														145	D	Good	77
S-2	Lower Stevens Lake	2815	126.9	80	830	12.0%	1.5	9.2	16,235	2.2%	2.3	117.6	Private - Agricultural	2131	C	Fair	79
														684	D	Fair	84
S-LAKE	Stevens Lake	83	N/A	100									Water Reservoir				
H-1	Hatcher Lake: S of Piedra Rd, in National Forest	480	49.4	75	1,090	10.1%	0.8	22.7	5,450	4.8%	3.4	26.7	National Forest	167	C	Good	70
														313	D	Good	77
H-2	Hatcher Lake: N of Piedra Rd, in National Forest	406	66.1	74	1,435	5.6%	0.6	39.9	4,720	3.8%	3.0	26.2	National Forest	160	C	Good	70
														246	D	Good	77
H-3	Hatcher Lake: E area the Reserve at Pagosa Peak	197	27.6	80	600	10.0%	0.5	0.0	4,145	1.9%	2.5	27.6	Residential - low density	140	C	1 ac ave.	79
														57	D	1 ac ave.	84
H-4	Hatcher Lake: E area, the west side of Coyote Hill	465	43.9	71	815	17.2%	1.1	12.3	5,495	3.6%	2.9	31.6	National Forest	407	C	Good	70
														58	D	Good	77
H-5	Hatcher Lake: Highlands Estates medium density residential	423	23.7	83	600	13.3%	3.5	2.9	4,130	2.7%	3.3	20.9	Residential - medium density	204	C	1/2 ac ave	80
														219	D	1/2 ac ave	85
H-6	Hatcher Lake: E area, open space & National Forest	106	4.9	70	1,855	15.1%	1.9	0.0	825	8.1%	2.8	4.9	Open space	106	C	Fair	70
H-LAKE	Hatcher Lake	119	N/A	100													
LP-1	Lake Pagosa: E of Piedra Rd, uplands surrounding Cloman	1048	86.7	80	1,375	9.3%	1.9	12.1	6,060	1.5%	1.8	74.6	Agricultural - active grazing	830	C	Fair	79
														218	D	Fair	84
LP-2	Lake Pagosa: E of Piedra Rd, Cloman industrial park	31	9.9	85	1,425	1.4%	2.4	9.9	0	0.0%	0.0	0.0	Industrial - partially developed	31	C	50% built	85
LP-3	Lake Pagosa: E of Piedra Rd, sidehill drainage	191	22.3	74	2,815	8.5%	2.1	22.3	0	0.0%	0.0	0.0	Open space	169	C	Fair	73
														22	D	Fair	79
LP-4	Lake Pagosa: W of Piedra Rd, south of Cloud Cap	55	23.9	83	1,585	5.6%	2.3	11.5	1,785	2.5%	2.4	12.4	Residential - medium/high density	26	C	1/2 ac ave	80
														29	D	1/2 ac ave	85
LP-5	Lake Pagosa: W of Piedra Rd, north of lake	230	8.7	80	2,085	6.7%	4.0	8.7	0	0.0%	0.0	0.0	Residential - medium/high density	230	C	1/2 ac ave	80
LP-LAKE	Lake Pagosa	106	N/A	100													
VL-1	Village Lake: NE area	276	31.7	83	1,310	3.8%	2.0	10.9	2,870	1.4%	2.3	20.8	Residential - medium/high density	133	C	1/2 ac ave	80
														143	D	1/2 ac ave	85
VL-2	Village Lake: NW area & Ranch Community	454	42.0	75	1,055	5.7%	1.7	10.3	4,750	1.5%	2.5	31.7	Residential & open space mix	454	C	50% open space	75
VL-3	Village Lake: S area above Hwy 160	123	39.9	78	1,825	2.7%	1.2	25.3	1,920	2.1%	2.2	14.5	Residential & open space mix	102	C	2 ac ave.	77
														21	D	Fair	84
VL-4	Village Lake: S area, core area in Pagosa Lakes	485	32.3	88	0	0.0%	0.0	0.0	3,875	1.0%	2.0	32.3	Commercial & residential, high density	397	C	75% built	88
														88	D	80% built	90
VL-LAKE	Village Lake	80	N/A	100													
PL-1	Pinon Lake: airport & above Piedra Rd	225	42.4	87	1,355	3.3%	1.8	12.5	3,580	1.1%	2.0	29.8	Airport, open space & low density residential	202	C	runway	87
														23	D	Fair	84
PL-2	Pinon Lake: golf course & below Piedra Rd	267	19.2	81	760	5.3%	2.3	5.5	3,280	3.7%	4.0	13.7	Residential (medium density) and golf course	137	C	90% built	81
														130	D	Good	80
PL-3	Pinon Lake: S of Hwy 160,upper areas	547	88.8	79	4,625	1.6%	1.9	40.6	5,500	0.8%	1.9	48.2	Residential, very low density	361	C	2 ac ave.	77
														186	D	2 ac ave.	82
PL-4	Pinon Lake: S of Hwy 160, along highway frontage	142	11.7	81	0	0.0%	0.0	0.0	1,965	2.0%	2.8	11.7	Commercial, high density & some open space	119	C	10% built	80
														23	D	10% built	85
PL-LAKE	Pinon Lake	38	N/A	100													
LF1	Lake Forest : mostly north area	377	44.0	82	840	1.2%	1.0	14.0	3,785	1.1%	2.1	30.0	Residential - medium density	366	C	1/2 ac ave	82
														11	D	50% built	78
LF-LAKE	Lake Forest	37	N/A	100													
V-1	Vista Lake: S area above Hwy 160	137	40.4	79	3,405	3.1%	1.7	33.4	1,355	2.5%	3.2	7.1	Residential, very low density	91	C	2 ac ave.	77
														46	D	2 ac ave.	82
V-2	Vista Lake: E area	200	28.8	80	385	2.6%	1.2	5.3	3,660	2.2%	2.6	23.5	Commercial & residential, medium density	124	C	1/2 ac ave	82
														76	D	50% built	78
V-3	Vista Lake: immediate area around the lake	51	8.9	83	350	2.5%	1.5	3.9	850	2.1%	2.8	5.1	Residential & open space mix	37	C	1/2 ac ave	82
														14	D	Fair	84
V-LAKE	Vista Lake: N of Hwy 160	11	N/A	100													

Section 3e

Stollsteimer Watershed Infrastructure Summary Table							
Description			Drainage Area		Capacity (cfs)		
Element	Location	Infrastructure	Mi^2	Acres	100 Year Event	Current Capacity	Estimated Current Return Frequency (year)
AP-1	Piedra Crossing @ Reserve	(1) 48" CMP w/ 3' cover	1.67	1068	350	130	20
AP-2	Cloman Drainage/Piedra Rd.	(1) 48" CMP w/ 4' cover	1.69	1079	419	150	10
NA	Piedra Rd./Cloud Cap Ave	(5) 30"-16" CMP	1.69	1079	419	63	4
AP-4	Martinez Cr./Piedra Rd	(1) 20' X 11' Plate Arch w/9' cover	11.15	7136	564	3800	100+
M4-AP5	North Pagosa Pre Martinez Cr.	(3) 3.5' X 6.0' CMP	3.57	2285	125	750	100+
AP-5	Martinez Cr./North Pagosa Blvd.	(2) 7' CMP w/ 4' cover	19.97	12782	733	1000	100+
AP-6	Dutton Drainage/Piedra Rd.	(1) 6' CMP w/ 4' cover	6.77	4330	601	350	30
NA	Dutton Drainage/North Pagosa	(2) 4' X 6' CMP w/ 3' cover	6.77	4330	601	280	20
PL-VL	Pinon Lk/Village Lk @ Park Ave.	(4) 18" CMP w/ 6" cover	1.91	1219	233	24	2
NA	North Pagosa /Village Spillway	(1) 20' x 60' Box Bridge	6.72	4298	350	2000+	100+
NA	Lake Forest Cir./Village Spillway	(4) 24" CMP w/ 1' cover	6.72	4298	350	60	3
AP-9	CR 139/Stollsteimer	(1) 7' CMP w/ 3' cover	6.24	3994	1170	425	8
AP-10	Hurt Dr./Stollsteimer	(2) 10' X 14' Plate Arch w/ 3' cover	69.95	44771	2788	2900	100+
AP-11	Cat Creek #1/Stollsteimer	(1) 10' X 24' Box Bridge w/ 18" cover	75.96	48617	3031	2640	50
NA	Cat Creek #2/Stollsteimer	(1) 15' X 30' Box Bridge w/ 3' cover	75.96	48617	3031	5700	100+
AP-12	Old Gallegos Rd.	(1) 9' X 20' Box Bridge w/18" cover	128.36	82153	3702	1800	20

Section 3f1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LOW FLOW CHANNEL
POND
LAKE
HATCHER
TRACT I
Pagosa
Highlands
Estates
BOULEVARD
PAGOSA
NORTH
276
COURT
1X Lake
Hatcher
Park
EARTHEN BURM
4
5
6
PEBBLE
CIRCLE
Riverbend Engineering, LLC
102 Third St. P.O. Box 2979 Pagosa Springs, CO 81147
Tel: 970 264 1195 FAX: 970 264 1196 Email: cphilips@frontier.net
PLPOA Projects
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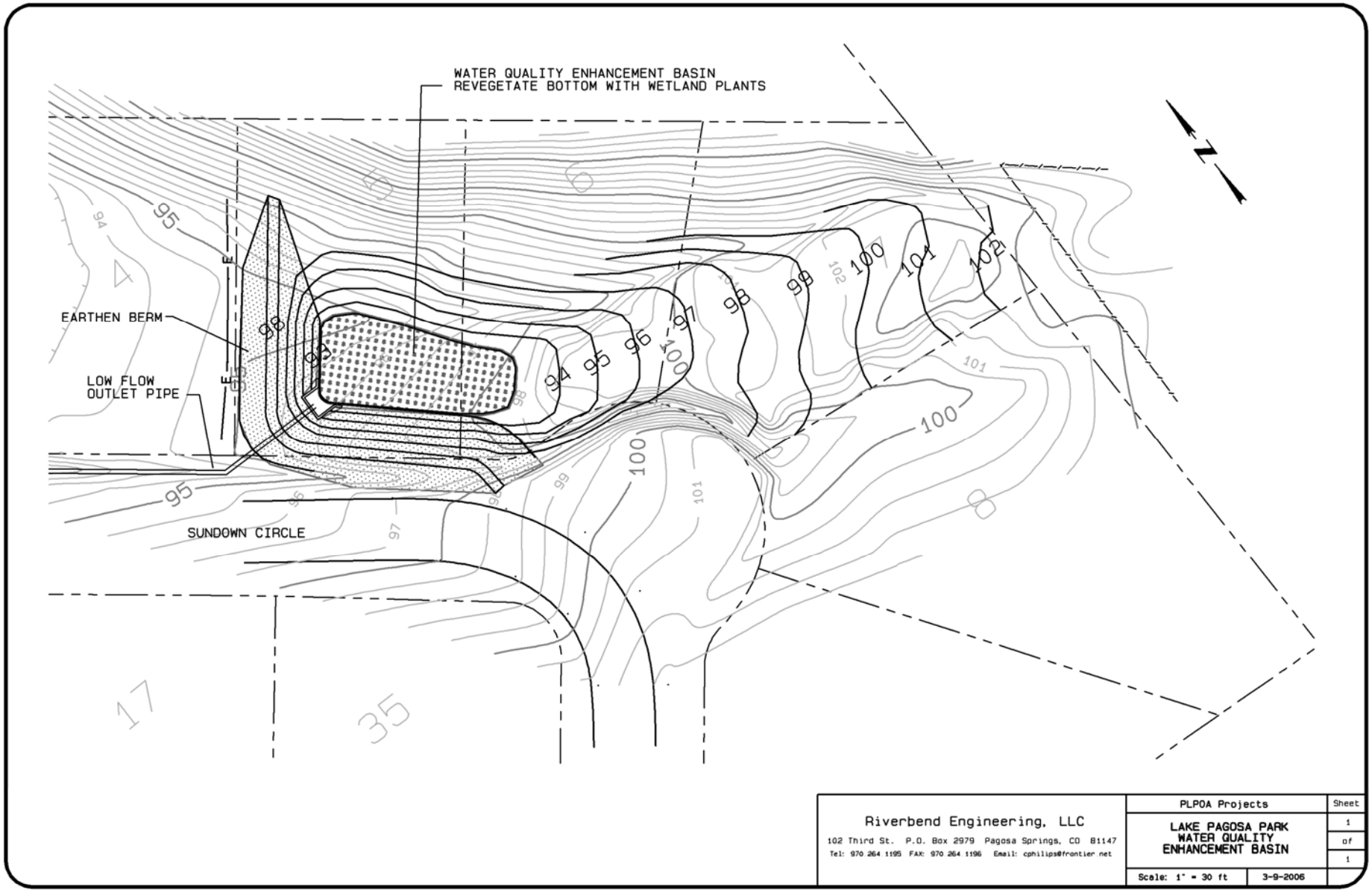
3-9-2006

Section 3f2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REVEGETATE BOTTOM WITH WETLAND PLANTS
EARTHEN BERM
LOW FLOW
OUTLET PIPE
SUNDOWN CIRCLE
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95
96
97
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100
101
102
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17
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Riverbend Engineering, LLC
102 Third St. P.O. Box 2979 Pagosa Springs, CO 81147
Tel: 970.264.1195 FAX: 970.264.1196 Email: cphilips@frontier.net
PLPOA Projects
LAKE PAGOSA PARK
WATER QUALITY
ENHANCEMENT BASIN
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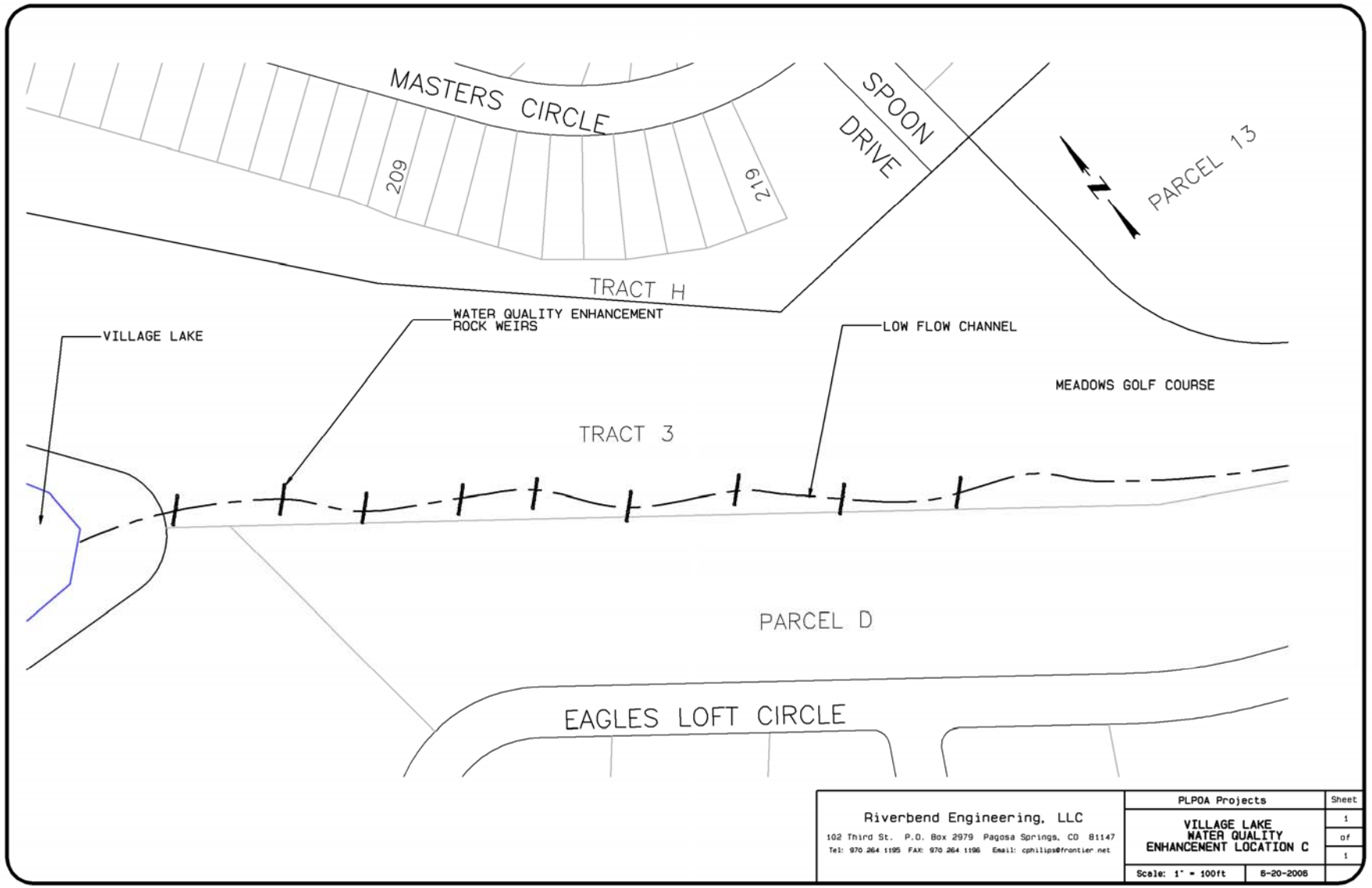
Section 3f3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219
SPOON DRIVE
PARCEL 13
TRACT H
VILLAGE LAKE
WATER QUALITY ENHANCEMENT ROCK WEIRS
LOW FLOW CHANNEL
MEADOWS GOLF COURSE
TRACT 3
PARCEL D
EAGLES LOFT CIRCLE
Riverbend Engineering, LLC
102 Third St. P.O. Box 2979 Pagosa Springs, CO 81147
Tel: 970 264 1195 FAX: 970 264 1196 Email: cphilips@frontier.net
PLPOA Projects
VILLAGE LAKE
WATER QUALITY
ENHANCEMENT LOCATION C
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Section 4 – Planning and Project Prioritization
a. Roadway Drainage Assessment

Infrastructure Drainage Assessment

The current capacity of key infrastructure locations were compared to modeled flows and a return frequency based on the current capacity was determined. The Stollsteimer Watershed Infrastructure Summary (Section 3f) presents key locations where infrastructure was evaluated for flow capacity. This table does not cover the entire road infrastructure in the Stollsteimer Watershed however the computer model can be quickly modified to evaluate the flows at any location in the watershed. The Infrastructure Summary (Section 3f) lists the present estimated capacities for 16 culvert or bridge locations within the watershed. These locations are considered infrastructure critical locations. Current calculated capacities range from 3-yr capacity to 100+ yr capacity. At present, the County has no specific plans for replacement of any of these culverts; however this capacity list will be helpful in planning future infrastructure improvements.

Section 4 – Planning and Project Prioritization
b. Stream Channel Improvement Projects

From Aspen Springs to confluence with Piedra River:

Existing Conditions/Problems:
Six miles of the total twelve miles of the lower portion of Stollsteimer Creek between the East entrance to Cat Creek road and the confluence of Stollsteimer with the Piedra River are considered in need of rehabilitation. This determination is based on resource inventories and stream channel cross sectional surveys conducted over the past 2 years. Within this section the riparian corridor is being or has been degraded due to improper grazing practices. This loss of riparian vegetation results in increased streambank erosion and loss of wildlife habitat. Another cause for the loss of stream stability is the increased urbanization of the watershed resulting in the change of drainage patterns and flow amounts.

Solutions to resource problems:
A diverse array of practices will be needed to address stream channel conditions in Stollsteimer Creek. The main objective is to develop a properly formed and functioning stream channel with a well vegetative riparian corridor. In order to do this, structural practices such as banking shaping or slope and rock structures would be installed. Once structural practices are installed, revegetation would be completed and if needed fencing and a grazing management system would be instituted to protect the rehabilitated areas.

Priority	Reach	Practice	Cost
1	East Cat Creek entrance To West Cat Creek entrance	Bank Sloping (3Ft.) Revegetation Fencing (Barbed Wire) Stockwater Watering Facilities Total:	$20,368 $45,600 $53,000 $4,000 $122,968
2	West Cat Creek entrance to Southern Ute Boundary	Bank Sloping (3 Ft.) Revegetation Fencing (Barbed Wire) Total:	$15,276 $34,200 $39,900 $89376
3	From Lake Capote Dam downstream 3 miles	Bank Sloping (3 Ft. – 5700 Ft.) (5 Ft. – 4600 Ft.) 10 Ft. – 5200 Ft.) Revegetation Rock Structures Total:	 $41,440 $34,040 $156,000 $183,600 $159,814 $571,894
4	From the confluence with the Piedra river upstream 3300 Ft.	Bank Shaping Rock Structures Revegetation Fencing (Barbed Wire) Total:	$8,844 $34,020 $79,200 $23,100 $85,764
		Total Projected Cost	$866,002

Section 4 – Planning and Project Prioritization

c. Lake Protection and Improvements

Key locations adjacent to lakes providing or having the potential to provide domestic water use for the area were identified and preliminary designs and associated cost were compiled and are presented below.

Northwest inlet to Hatcher Lake:

Hatcher Lake is currently utilized for domestic water treatment. Maintaining a high water quality and sufficient water storage is critical to the current and long term use of the lake for domestic water. A potential location for a water quality improvement structure was identified near the northwest corner of the lake. The potential location is identified as Water Quality Enhancement Location A on the Stollsteimer Sub-Basin Map (Section 4b). The general goal of the structure would be to extend the travel time and infiltration of small runoff events (<2yr) by creating an extremely sinuous small channel plan form. Larger runoff events (>2yr) would overflow the small channel and flow at shallow depths over large tiered areas, allowing for slower velocities and the deposition of a majority of the suspended sediment before the lake. The large relatively flat detention areas could be utilized as public space during dry weather periods.

Preliminary Probable Estimated Costs Water Quality Enhancement Location A:

Excavation	300 CY	$900
Weir Embankment	200 CY	$800
Excess Material	400 CY	$2400
Rock channel		$4000
Re-veg		$2000
Engineering		$3000
Total		**$13,100**

Contingency Costs $2000 to $5000

*Note: This cost estimate is preliminary based on a possible preliminary design

Lake Pagosa Inlet from Cloman Industrial Park

Water Quality Enhancement Location B is for the construction of a water detention basin that would enhance the water that enters Lake Pagosa on the southeast corner of the lake by allowing sediments and contaminants to fall out of suspension in the basin before entering the lake. The water is a seasonal creek that drains the entire Cloman Industrial Park up to and including parts of the airport property. This is a water source of much concern and has been identified as the heaviest contributor of sediments into Lake Pagosa over the years. Catching sediments and contaminants before they enter the lake is the project goal. Stream channel work will include modifications to the channel including grade work and step-pool rock channel work. The basin itself would hold the water for a certain amount of time allowing for sediments and contaminant to settle before exiting the basin in the appropriately sized outlet pipe. For heavy flows there would be a concrete spillway that will allow for water to escape or overflow in a controlled manner. The basin would have to be cleaned out when conditions warrant. Available land for the project would determine the storage and related storm capacity of the detention basin. The land could potentially be utilized as open space or a neighborhood park during the summer months.

Preliminary Probable Estimated Costs Water Quality Enhancement Location B:

Excavation	800 CY	$2400
Embankment	400 CY	$1600
Excess Material	400 CY	$2400
Pipe Outlet Works		$3000
Concrete Spill		$5000
Rock channel		$2000
Re-veg		$500
Engineering		$3000
Total		**$19,900**

Contingency Costs $2000 to $5000

*Note: This cost estimate is preliminary based on a possible preliminary design

East Inlet to Village Lake:

Village Lake is currently utilized for domestic water storage and recreation. Maintaining a high water quality and sufficient water storage is critical to the current and long term use of the lake. A potential location for a water quality improvement structure was identified near the northeast inlet of the lake adjacent to the meadows golf course. The potential location is identified as Water Quality Enhancement Location C on the Stollsteimer Sub-Basin Map (Section 4b). The general goal of the structure would be to extend the travel time and infiltration of small runoff events (<2yr) by creating an extremely sinuous small channel plan form. Larger runoff events (>2yr) would overflow the small channel and flow at shallow depths over large tiered areas, allowing for slower velocities and the deposition of a majority of the suspended sediment before the lake. The large relatively flat detention areas could coexist with the meadows golf course.

Preliminary Probable Estimated Costs Water Quality Enhancement Location A:

Excavation	600 CY	$1800
Weir Embankment	400 CY	$1600
Excess Material	400 CY	$2400
Rock channel		$5000
Re-veg		$2000
Engineering		$3000
Total		**$15,800**
Contingency Costs		$2000 to $5000

*Note: This cost estimate is preliminary based on a possible preliminary design

Section 4 – Planning and Project Prioritization

d. Drinking Water Supply Protection Measures

Overview

It is imperative in all stages of regulating, planning and developing that drinking water supply protection be addressed. A well protected drinking water supply will undoubtedly better serve all other purposes for which it may be used.

The quality of a water supply that is protected in its raw or natural state will be the most cost effective and justifiable way to approach drinking water supply protection. This can be accomplished in numerous ways with local planning departments, other governmental agencies, property owners associations, and numerous other routes. Protection of a drinking water supply should also mean quantity protection. In times of water rights issues where many needs are to be discussed and drought becoming more prevalent, quantity should be of high concern. Best Management Practices and construction and landscaping regulations should be implemented to maximize and conserve the finite resource. Public education regarding the use of pesticides and the potential for drinking water contamination should and is being addressed as well.

Prioritization

The town of Pagosa Springs and surrounding areas within the Stollsteimer Watershed are experiencing unprecedented growth. Since many of our new residents and tourists come from water-rich areas of our country, it is essential for the newcomers as well as the long-time residents to have an understanding of the limited water resources available in our watershed and how to protect and conserve their drinking water supply. As Archuleta County continues to grow, a prioritized list of drinking water assets and areas needing protection should be compiled. What needs to be protected, where, and why? Selection criteria should include but not be limited to:

Public Health/Benefit
Economic Benefit
Cost

There are many entities and groups such as the American Water Works Association, Colorado Department of Public Health and Environment, San Juan Basin Health Department, Colorado Division of Water Resources, and others who have resources and guidelines that could be helpful in determining where known problems exist and even provide technical assistance. Proactively addressing these issues now, knowing that previous laws and rules from decades ago may have been inadequate or new information or technology has become available will serve the public the best.

The new land use regulations adopted in May of 2006 for Archuleta County will address the watershed and drinking water protection. Specific protection measures put into place by Pagosa Area Water and Sanitation District (PAWSD) include: the piping of Dutton Ditch, expansion of water treatment facilities to include updated treatment methods for federal & state 2007 compliance requirements, and ways to address the blue-green algae bloom problems in the reservoirs. A successful toilet rebate program has been in effect for two years, and a Water Wise Landscape workshop was held for professionals and homeowners to understand how to protect against nutrient and pesticide runoff and the use of environmentally friendly landscaping products. A homebuilders' workshop was held concerning water-saving appliances and water-protection building methods and design.
Identifying the quality and quantity issues now and into the future with changing laws, technologies, and mindsets will be critical to sustaining the current and anticipated growth of this emerging county in the high mountain desert.

Costs:

The cost for each identified need and the required solution would be quite variable and very case specific.

Section 4 – Planning and Project Prioritization

e. Agricultural Best Management Practices

Grazing Land Existing Conditions/Problems:

Current grazing problems within the watershed fall into two categories 1) overgrazing by horses and exotic species on small acreages and 2) overgrazing by cattle on larger ranches. Of the 17,000 privately owned grazeable acres in the watershed 8,000 make up large ranches and 9000 are broken into small 35 to 160 acre

"ranchettes." The resulting loss of vegetation due to overgrazing, by all classes of livestock, decrease infiltration and increase runoff. When runoff increases, soil erosion is accelerated causing greater sediment load to enter watershed stream courses and noxious weeds to become vigorous.
As soil stability, hydrologic function and biotic integrity decline, water is polluted, wildlife habitat is lost, agriculture becomes non-sustainable, and scenic value suffers.

Solutions:

The solution for addressing poor grazing management for the watershed is to be directed to two audiences, the small "ranchettes" and the larger cattle ranchers.

The primary approach for preventing overgrazing on small acreage is education. Workshops and educational material that identify the problems associated with overgrazing and the connection between the health of an animal and the health of the land need to be made. Also, once a landowner understands the need and technique for grazing management, much of their property which has suffered severe degradation, will need to be reclaimed through reseeding, mulching, and pest control.

Cost: two workshops a year $500 each, educational material – $1,000 per year. Total per year $2,000 – 5 year initiative – $10,000. Cost of helping landowners re-establish adequate grass cover: Seeding cost $30 per acre - 50% cost share on seed = $15 per acre. Approximately 7,000 acres affected equals a total of $105,000.
Total cost: $10,000 + $105,000 = $115,000

On large acreages the primary approach is education with an emphasis on implementing a grazing system with proper stocking rates and adequate recovery periods for vegetation. This will often require the installation of cross fencing and improved livestock watering facilities to increase flexibility and adequately manage rest periods for pasture lands.

Average Cost of implementing a grazing system would be $20 per acre. There is approximately 8,000 acres of grazed land in larger ranches. Implementation cost would be $160,000.

Irrigation System Efficiency Improvements Existing Conditions/Problems:

Existing irrigation systems, covering 300 acres in the watershed, are predominately dirt ditch flood systems with efficiencies of 30% on average. This type of system results in large amounts of irrigation water being lost through seepage from delivery ditches as well as to deep percolation and excessive runoff once applied to fields. With the loss of large amounts of irrigation water there is the potential for the movement of nutrients into the stream course; although at this time water quality sampling has not shown this to be a problem.
Solutions:

The upgrading of existing dirt ditch irrigation systems to an underground pipeline and gated pipe system would provide much better control of irrigation water and reduce runoff, seepage and deep percolation. Irrigation efficiency would be improved to an average of 60%.

Cost: Based on a cost of $500 per acre for the installation of an improved irrigation system as described above, the total cost to treat 300 acres would be $150,000.

Section 4 – Planning and Project Prioritization
f. Wildlife Habitat Improvements and Protection

Wetland and Riparian areas

According to the US Fish and Wildlife Service wetlands provide important habitat for approximately one third of the plant and animal species federally listed as threatened or endangered. They also provide essential nesting, migratory, and wintering areas for more than 50% of the nations migratory bird species. Colorado has lost over 50% of it's wetlands since settlement. The Colorado Natural Heritage Program identifies 29 species of wetland-dependent birds and 11 species of amphibians as "rare and imperiled". According to the Colorado Division of Wildlife's Latilong Data Base, of the 33 habitat types identified in Colorado, the Riparian lowland (below 6000') and the Riparian transition (6000'-9000') are utilized by the most species at 302 and 222 respectively.

Prioritization

It is recommended that prioritization of projects be based on the Wildlife Habitat Overlay District Map developed by Archuleta County in consultation with the Colorado Division of Wildlife. Additional guidance can be found in the "Survey of Critical Wetlands and Riparian Areas in Archuleta County" created by the Colorado Natural Heritage Program April 2006.

Mitigation/BMP's

1. Wetland areas should be buffered a minimum of 20 meters from the designated outer edge and development, surface disturbance, domicile and out-building placement, and unregulated livestock access strongly discouraged. Additionally, hydrologic flows that support wetlands should remain undisturbed and not impeded. Wetlands are further regulated under the Clean Water Act by the Army Corps of Engineers.

2. When not specifically mapped, stream corridors should be buffered in accordance with the following standards to protect associated riparian habitat, and development, surface disturbance, placement of domicile and out-buildings, and unregulated livestock access within this zone is strongly discouraged. The intent of these proposed stream corridor buffers is to protect the riparian habitat corridor and these general guidelines attempt to accomplish that objective where site specific, detailed mapping is not available, however, local conditions may support either a larger or smaller riparian habitat corridor than those outlined below. Site specific information, where available, should be used and appropriate measures taken, as outlined in F.1 above, to ensure protection of these valuable wildlife habitats.

a) First Order Streams: 20 meter buffer either side of centerline.
b) Second Order Streams: 30 meter buffer either side of centerline.
c) Third Order Streams: 40 meter buffer either side of centerline.
d) Fourth Order Streams: 50 meter buffer either side of centerline.
e) Fifth Order Streams: 60 meter buffer either side of centerline.
f) Sixth Order Streams: 80 meter buffer either side of centerline.
g) Seventh Order Streams: 100 meter buffer either side of centerline.

To protect wetland functions, a number of best management practices (BMPs) are available for use on either a temporary or permanent basis. BMPs are generally considered to be economically feasible measures that

minimize adverse impacts to natural resources. BMPs are also employed to enhance degraded wetlands. Typical examples include:

• avoid existing wetlands;
• install temporary fencing during construction;
• control runoff/erosion from construction sites;
• use the smallest equipment feasible;
• work around species activities (*e.g.*, bald eagle nesting);
• control noxious weeds;
• establish management plans; and
• manage by burning, grazing, and/or mowing.

Cost

Cost varies from project to project depending on size and method.

Section 4 – Planning and Project Prioritization
g. Forest Health and Improvement Summary

Common Objectives of Private Forest Landowners include:

- Maintain a "healthy" forest condition that reduces risk associated by large scale disturbance events including wildfire and insect/disease epidemics.
- An uneven-aged forest condition with age and species diversity is typically desired.
- Maintain and enhance aesthetics and associated property values.
- Provide for various recreational pursuits.
- Enhance forage production for livestock.
- Enhance wildlife habitat for desirable species.
- Apply stewardship practices to enhance watershed values related to soil erosion, noxious weeds, and water quality/quantity.
- Production of forest products is often a primary or secondary objective as related to their forestry programs. Wood products are also viewed as a by-product of forest stewardship practices.

Forestry Issues, Concerns, and Solutions:

Issue: Natural disturbance events related to wildfire, insects, & disease of forestlands, and associated impacts to water quality/quantity and other values in the watershed
The potential of high intensity wildfire exists in the forestlands of the Stollsteimer watershed. Suppression of wildfires typically places priority in the order of protecting life, property, and resources. A large wildfire event could result in soil erosion and heavy sediment and ash loads carried into stream courses and lakes. The quality of municipal water supplies may be threatened and sedimentation can quickly overwhelm existing filtration systems.

Moisture availability or the lack of; drives many ecological processes associated with forestlands. Historic fire intervals and intensities are currently operating outside the natural range of variability in the ponderosa

pine type that dominates the watershed. Vegetative growth in the form of trees and shrubs often exceeds the productive capacity of the site resulting in severe competition for limited sunlight, soil nutrients, and water. Such competition and related stress often exposes forests to wildfire and insect epidemics thus jeopardizing a variety of values desired from forestlands.

Forest insects and pathogens are important regulators of forest density, composition, and structure. Forest conditions, in turn, affect the distribution and reproduction of forest insects and pathogens. Changes in stand structure and composition brought about by fire suppression, logging, and grazing appear to have changed the frequency, extent, and synchronicity of outbreaks of some of these disturbance agents. The potential for more severe outbreaks has also increased.

Mountain Pine and other Bark Beetles

Several factors that lower tree resistance to mountain pine beetle (MPB) attack are present in today's ponderosa pine forests. The most notable of these are overcrowding and increased disease (mostly mistletoe infection). Stand conditions could become more conducive for MPB epidemics if current fire suppression policies are continued and silvicultural activities are minimized in the pine type.

During epidemics, widespread tree mortality can be expected, especially in larger-diameter trees, which the MPB prefers. However, the MPB will also attack trees down to 8 inches in diameter during epidemics. Extensive and severe outbreaks of bark beetles can increase fire hazard.

Southwestern Dwarf Mistletoe

Dwarf mistletoe can weaken trees to the point that they become more susceptible to mountain pine beetle attack. The increased fine fuels and presence of brooms on dwarf-mistletoe-infected trees increase their flammability. If large stands are heavily infected by dwarf mistletoe, the likelihood of a low-intensity ground fire becoming a stand-replacing crown fire is increased.

Natural disturbance events resulting in vast areas of dead trees may also have significant impacts to aesthetics and view-sheds along primary travel corridors. Smoke and associated particulate matter is a concern in terms of air quality. Many other social, economic, and ecological impacts can result from large disturbance events in a local community.

Solutions:

Collaborative efforts among local, county, state, and federal entities to address risks from wildfires and other natural disasters are on-going in Archuleta County. These efforts are occurring in the form of planning and implementation. It is important these cooperative efforts continue to address the problem across all ownerships and jurisdictions.

Reducing hazardous fuel loads in critical parts of the watershed and developing breaks in continuous fuels will reduce the risk of large-scale high-intensity fires from occurring. Continuing private/public land tree & shrub thinning/mastication projects within the wildland/urban interface should continue to be the priority for treatments to protect life and property. Fuel treatments that involve small diameter tree removal and mastication or chipping of small trees, slash, and brush typically cost $200-$500 per acre. Treatment costs to reduce fuels and create defensible-space around structures can reach or exceed $1,000 per acre.

In order to modify the current fuel load and fuel profile to change fire intensity and rate of spread, as well as begin to restore the forest to pre-settlement conditions, vegetation treatments are being conducted. The objectives of these treatments are to:

1. Increase crown separation of trees and shrubs to reduce horizontal continuity and lessen the probability of large crown fires;
2. Reduce average crown base heights and remove ladder fuels under the trees to reduce vertical continuity and lessen the probability of crown fire initiation;
3. Move and/or modify fuels from the canopy to more compact surface fuels (chips);
4. Create conditions that allow for re-introduction of fire into the ecosystem in the form of prescribed fire and Wildland Fire Use;
5. Begin restoration within ponderosa pine forests by reducing stand densities, removing or reducing the amount of white fir, Douglas-fir, and juniper, increasing openings and clumpiness and reintroducing fire to fire dependant ecosystems.

Treatment types include mechanically mowing, shredding, or thinning understory vegetation including Gambel oak, juniper, white fir, Douglas-fir and ponderosa pine. Emphasis is on treating ladder fuels, enlarging existing openings and/or creating new openings in the canopy and thinning dense clumps of trees. Sixty to seventy percent of the understory Gambel oak, and associated shrubs, are mowed and shredded in a mosaic pattern emphasizing removal of ladder fuels and leaving clumps (or clones) of oak in openings. No oak over 6 inches diameter at root crown is mowed.

Nearly all live and dead white fir and Douglas-fir less than 12 inches diameter at breast height (DBH) in ponderosa pine stands are mowed or cut. Patches of post-settlement ponderosa pine are mechanically thinned and shredded to replicate the natural clumpy distribution pattern of ponderosa pine forests and begin to reduce the stocking levels to pre-settlement levels. Most of the trees to be removed are less than 12 inches DBH. Pre-settlement trees are not removed. All juniper trees that function as ladder fuels underneath the pine canopy are mowed and shredded while a few large juniper trees in openings are left. Units are prescribed burned following completion of the mechanical treatment where possible. Logs that are not mowed or shredded may be removed by timber sales, post and pole permits, or firewood permits. Slash is mowed and shredded, piled and burned, lopped and scattered, or broadcast burned.

Project Costs:

The Pagosa Ranger District/BLM Field Office of the San Juan Public Lands has completed 1,251 acres of thinning, 354 acres of mowing, and 29 acres of prescribed burning in recent years within the Stollsteimer Watershed. Currently 5,953 acres of thinning, 1,030 acres of mowing, and 12,303 acres of prescribed burning is planned within the watershed.

Completed projects:
Mechanical mowing - $175/acre
Hand thinning - $200/acre
Hand thinning with skidding of logs to road - $300/acre
Hand thinning, piling of slash, and burning piles - $500/acre

Cost estimates for future projects (increase in costs mostly due to increase in fuel costs):
Mechanical mowing - $230-250/acre
Prescribed burning - $100/acre
Hand thinning – costs same as above
Homes and other investments located in a forest setting at risk to wildfire should provide for a defensible-space. Reference Colorado State University Cooperative Extension publication no. 6.302 “Creating Wildfire-Defensible Zones”. Proper planning and the use of fire resistant building materials are also

recommended for public safety. Fire-safe communities may require fewer fire-fighting resources for protection and thus making them available for natural resource protection including watershed values.

Maintaining an “open” tree canopy that allows snow and rain to reach the ground rather than being intercepted by tree crowns and then evaporating, is desirable for watershed purposes. Precipitation that accumulates and permeates into the soil is then available for beneficial use by plants. An “open” tree canopy will still provide sufficient shade to retard moisture loss and also extend the period of melting snowpack. Ponderosa pine forests with an “open” canopy will promote full tree crowns and enhanced growth and health of individual trees. Full tree crowns will provide shade to conserve moisture and moderate soil temperatures while also reducing desiccation from direct solar radiation.

It is recommended that forestry and other operations that result in ground disturbance recognize a "streamside management zone" adjacent to any stream, lake, wetland area, or other water body including ephemeral or intermittent drainages. The function of a streamside management zone is to protect water quality by maintaining vegetation and the associated duff and humus layer of the soil profile to serve as a natural sediment filter. Streamside management zones are also important to filter undesirable pollutants from paved roads, parking lots, and other sources of contaminants. These protected zones also maintain shade, conserve aquatic and terrestrial riparian habitats, protect the stream channel and banks, and promotes flood plain stability. A 50 foot-wide strip on either side of a stream or wetland feature is the minimum recommended width for the zone.

Timber harvesting and forestry activities occurring on private lands should incorporate “best management practices”. Reference publication “Colorado Forest Stewardship Guidelines to Protect Water Quality – Best Management Practices (BMPs) for Colorado” available from the Colorado State Forest Service. Forestry practices that encourage a diversity of species and age classes throughout a landscape are encouraged.

Issue: Residential growth and development
As population in the region increases and growth from development occurs in the watershed, private forestlands will continue to experience stress resulting from construction activities. Building sites, roads, driveways, septic systems, and utility corridors will involve equipment capable of physical damage to individual trees and their root systems. Soil compaction from heavy equipment traffic, grade changes from removing or adding soil, and root severing as a result of utility and foundation excavation are a few problems which severely impact roots. The use of magnesium chloride and other solutions on roadways for dust abatement and ice removal can also be responsible for tree injury and decline.

Solution:
Root damage can be reduced by restricting construction traffic to a single lane (preferably the lane that will eventually be the driveway) and by keeping grade changes to a minimum within a distance of approximately the trees height. Removal of trees which have suffered severe root cutting is recommended to eliminate the risk of blowing over and becoming a hazard. Proper planning that acknowledges the needs of the trees and forest vegetation is the first step towards protecting the resource. Reforestation and landscaping should focus on native species adapted to the local environmental conditions.

Issue: “Forest Health”
The term “forest health” conjures up an extensive list of social, economic, and environmental concerns. Issues related to forest health must have scientific merit to sustain credibility.

Solution:
Collaborative decision making processes that identify concerns, acceptable compromises, and solutions are often needed to address complex natural resource issues. Solutions to forest health issues typically involve the desire for natural ecological processes to occur in a matter that is both economically and socially accepted. The promotion of native species and biological diversity is desirable to reach an acceptable "balance" among resource outputs. For instance in the ponderosa pine forest type, periodic low-intensity fire may be accepted within a window of opportunity that allows for air quality standards to be met. Likewise various tree densities may be desired so long as they are within an accepted level of risk associated with wildfire and insect epidemics. Wildlife needs must be recognized and provided for so that quality habitat exists. Habitat elements in the form of tree density, understory vegetation, standing dead snags, coarse woody debris, and a host of other specialized habitat needs must be provided to meet multiple-use objectives.

Issue: Forestry markets and infrastructure
Forest management objectives are difficult to obtain without an infrastructure in place that provides for technical assistance, forestry service providers, and marketing opportunities for wood products.
Solution:
Technical assistance can be provided through both public land management agencies and private natural resource consultants. A trained and skilled work force is also needed that is capable of providing both forestry related services as well as removal, utilization, and processing of various forest products. Commercial markets aimed at efficiently utilizing the renewable resource of wood fiber can provide economic incentives and related jobs in a "green industry". Small diameter tree and biomass wood product markets provide a value to material that otherwise is removed at an expense to accomplish a variety of land management stewardship objectives.

County land-use regulations should be developed or modified to encourage the practice of sustainable forestry and associated businesses.

Issue: Education

Solution:
Forest landowners as well as the general public should be informed on forestry as well as other issues related to the Stollsteimer watershed. A variety of educational formats should be used targeting school children, landowners, and the general public. Meetings, field tours, and a variety of publications and written documents are available or can be prepared that provides information on the various subjects. Articles for newspapers, newsletters, and other forms of print can be prepared. Presentations can be developed to deliver to civic and other groups of interested publics. Individual landowners and homeowner associations are encouraged to develop land management plans for their properties with the assistance of resource management professionals. Such plans should identify specific landowner objectives and issues of concern followed by an assessment or inventory of current natural resource conditions. Proposed solutions and specific treatment practices can then be developed, prioritized, and budgeted to facilitate moving forward to practice implementation.

Section 4 – Planning and Project Prioritization

h. Noxious Weeds

Noxious weeds within the Stollsteimer Creek watershed are of significant concern to the Steering Committee and land managers. Noxious weeds within the watershed include but are not limited to Canada thistle, musk thistle, leafy spurge, Russian knapweed, diffuse knapweed, yellow toadflax and white top. Limited mapping within the county exists of noxious weed infestations, which makes it difficult to assess exactly how many acres actually are impacted by these weeds. However, it is obvious to even the casual observer that many acres of noxious weed infestations occur within not only the county in general but within the Stollsteimer Creek Watershed.

Several entities within the county have weed control programs in place including Archuleta County Weed and Pest Dept., the Pagosa Lakes Property Owners Association and the San Juan National Forest Service. Within the jurisdictions of each entity strong weed control programs are in place and a good level of noxious weed control is attained. However, with all the growth and increased human activity within the watershed, noxious weeds are of high concern. Left unchecked noxious weeds can lead to severe range and property degradation, the reduction or elimination of native plant species in an area and can lead to erosion and soil loss.

Keeping noxious weeds under control in the watershed is of critical importance. The watershed steering committee recognizes this fact and will work hard to continue educating the public about noxious weeds and the importance of noxious weed control. Existing weed control programs within the county and within the watershed plan to continue aggressive noxious weed control efforts including herbicide applications, biological control (insect releases) and, whenever possible or feasible, mechanical control methods.

One additional positive aspect of the new County Land Use Regulations is that there is language in the document requiring developers in the county to consult with the Archuleta County Weed and Pest Department with regards to noxious weeds present on any proposed development and develop sound and responsible noxious weed control measures.

Noxious weeds will continue to be monitored and aggressively controlled within the watershed.

Section 5 – Summary of Watershed Protection Land Use Regulations

During the early stages of the Watershed Master Plan project, it was learned that Archuleta County had recently hired a consultant to begin the process of forming and adopting new and updated Land Use Regulations for the county. The Watershed Steering Committee felt that the timing was excellent and it would be important to become involved in the process, working closely with county planning staff and their consultant to see if new Land Use Regulations specifically targeted to watershed and water resource protection could be included in the new regulations where none had existed before.

By attending early public meetings in late 2005, submitting written recommendations and actually setting up a private meeting with the consultant and county planners in mid-January of 2006 this task was accomplished.

The new land use regulations, adopted in May of 2006 by the Archuleta County Commissioners contained several key regulations and special overlay districts designed to protect and actually enhance watershed and water resources within the county. In addition to this, a drainage policy was included in the Land Use Regulations that did not exist before, requiring developers (commercial and otherwise) to submit detailed engineered stormwater drainage plans designed to mitigate contaminated stormwater before leaving the project site. Additional regulations included in the document are water body setbacks, wetland protection and water quality sections.

The following section includes excerpts from the actual adopted County Land Use Regulations document, the Watershed Protection Overlay District, the Wildlife Protection Overlay District, water body setbacks, water quality control, wetland protection and the Drainage Policy section.

Section 3: Zoning

3.1.4 Overlay Districts:

An Overlay District is a supplemental district that may be superimposed over any Zoning District established in Section 3.1.2. The boundaries of each Overlay District shall be established by Resolution of the Board of County Commissioners and shall be shown on the Official Zoning Map, Section 3.3.1. On and after the date of adoption by the Board of such Resolution, all real property within the boundaries of each Overlay District, as described in said Resolution, shall become subject to the requirements of that Overlay District. Any use by right or conditional use permitted in the underlying Zoning District shall also be permitted in an Overlay District if the proposed use conforms with the purpose and any applicable standards for both the Zoning District and the Overlay District. The following Overlay Districts are established:

3.1.4.1 Watershed Overlay District (WO)

3.1.4.1.1 The purpose of the WO District is to:

3.1.4.1.1.1 Protect the watersheds and drinking water supplies from activities which could degrade drinking water quality in streams, rivers, lakes and reservoirs; including but not limited to toxins, poisons, and nutrient runoff.

3.1.4.1.1.2 Protect water supply reservoirs from sedimentation which would reduce their storage capacity, shorten their useful life, and reduce capacity to withstand drought.

3.1.4.1.1.3 Ensure that development is planned and designed to be harmonious with wildlife habitat.

3.1.4.1.1.4 Preserve the natural environment, historical and cultural resources, and aesthetics of the watershed to the greatest extent possible.

3.1.4.1.1.5 Ensure compatibility between a proposed land use activity and natural constraints by requiring well-engineered solutions to those constraints.

3.1.4.1.2 Development Standards

A site plan conforming to the following requirements shall be submitted to the Planning Department for approval before any land disturbance (other than the exempt activities provided in the next section) or building permit may be undertaken in a WO District.

3.1.4.1.2.1 A scale drawing showing location and dimensions off all existing and planned structures, roads, water courses, wastewater and stormwater systems, utility installations, as well as the locations, area and dimensions of any existing or proposed impervious surfaces;

3.1.4.1.2.2 Topographical map of the site and all adjacent land within two hundred (200) feet of any boundary of the property, with contour lines of five (5) feet or less;

3.1.4.1.2.3 A stormwater management plan, regardless or parcel size or zoning.

3.1.4.1.2.4 A detailed re-vegetation plan with a timeline for implementation, including a detailed management plan for control of nutrient runoff.

3.1.4.1.2.5 Location and detailed drawing and specifications of any spill and leak collection systems for containing accidentally released hazardous or toxic waste.

3.1.4.1.3 Additional Standards

Disturbance of the following types of land is prohibited in the WO District, except for perpendicular crossings of roadways, drainage ways, trails and paths and approved utility easements:

3.1.4.1.3.1 Riparian buffers fifty (50) feet.

3.1.4.1.3.2 Wetlands, as determined from field delineation, unless a permit has been obtained pursuant to Section 404 of the Clean Water Act.

3.1.4.1.3.3 Soils with severe limitations according to the applicable NRCS soil maps.

3.1.4.1.4 Hazardous Materials Mitigation

Certain land uses in the WO district will require a hazardous materials mitigation plan. The hazard mitigation plan shall detail specifically how hazardous materials will be handled and stored, and how spills will be contained on site. Those land uses include:

3.1.4.1.4.1 Distribution or storage of hazardous materials;

3.1.4.1.4.2 Sale of fuel for motor vehicles;

3.1.4.1.4.3 Confined animal feeding operations such as feedlots;

3.1.4.1.4.4 Landfills or waste water disposal facilities of any kind (except for septic tanks approved by San Juan Basin Health Department);

3.1.4.1.4.5 Underground or above ground fuel or chemical storage tanks;

3.1.4.1.4.6 Disposal of hazardous or toxic waste;

3.1.4.1.4.7 Industries or businesses classified as large quantity waste generators;

3.1.4.1.4.8 The manufacture of chemicals, dairy products, fats and oils, leather tanning; meat, fish and poultry packing; the manufacture of paper and allied products; petroleum industries; the manufacture of primary metal, rubber, plastic or concrete products;

3.1.4.1.4.9 Junkyard or auto wrecking facilities;

3.1.4.1.4.10 Truck terminals;

3.1.4.1.4.11 Auto and truck rental and repair shops;

3.1.4.1.4.12 Commercial auto and truck washes;

Within the WO District, the land uses described above shall be prohibited within two hundred and fifty (250) feet of any lake or water course described on the USGS 7.5 minute topographic map.

3.1.4.1.5 Exemptions

The following uses shall be exempt from the stream corridor buffer and setback requirements in the WO District provided they meet the following conditions.

3.1.4.1.5.1 Utilities, so long as they are located as far as practicable from the stream bank, so not impair the quality of the stream water and are installed and maintained so as to protect the integrity of the buffer and setback areas in which they are located.

3.1.4.1.5.2 Agricultural activities involved in the planting and harvesting of crops, cattle or livestock raising, or non-commercial forestry or timbering operations, if best management practices

developed by the either the Colorado Department of Agriculture or the Colorado State Forest Service are followed.

3.1.4.1.5.3 County or NRCS approved stream channel, drainage or water quality improvement projects.

Section 5: Subdivision Standards

5.2.1.1 Wildlife Habitat Protection:
For all development within the Wildlife Habitat Overlay District:

5.2.1.1.1 The applicant shall provide a list of all Wildlife Activity Areas and the Habitat Ranking for the proposed development site. A list of Wildlife Activity Areas may be obtained from CDOW. The list shall be developed using the Colorado Division of Wildlife's GIS species maps. Habitat Ranking may be determined by referring to the Wildlife Habitat Assessment Map, on file at the Planning Department.

5.2.1.1.2 If the proposed development lies in an area identified as "HIGH" on the Wildlife Habitat Assessment Map, the applicant shall provide a Wildlife Impact and Mitigation Plan. A Wildlife Impact and Mitigation Plan shall include conflicts of the proposed development with the guidelines included in the WDSG. Also required is a mitigation plan outlining steps to address identified conflicts.

5.2.1.1.3 Mitigation techniques for development within a Wildlife Habitat Overlay District may include:

5.2.1.1.3.1 Creating buffer zones between wildlife habitat and areas of development.

5.2.1.1.3.2 Constructing game-proof fencing, one-way gates and game underpasses or other structures to minimize hazards.

5.2.1.1.3.3 Developing additional or improved habitat to compensate for habitat losses.

5.2.1.1.3.4 Retaining existing vegetation.

5.2.1.1.3.5 Avoiding disturbance of stream beds, stream banks and streamside vegetation.

5.2.1.1.3.6 Placing catchment basins to avoid siltation of streams.

5.2.1.1.3.7 Using stream alteration techniques in accordance with the Colorado Division of Wildlife to enhance fish habitat.

5.2.1.1.3.8 Reclaiming disturbed areas for use by wildlife and waterfowl upon completion of development.

5.2.1.1.3.9 Using slopes flatter than three to one (3:1), and creating islands and irregular shorelines for reclamation of wet site excavations.

5.2.1.1.3.10 Avoiding new road construction through critical habitat areas.

5.2.1.1.3.11 Limiting recreational or other use of wildlife concentration areas during the seasons of wildlife concentration.

5.2.1.1.3.12 Limiting density of adjacent development.

5.2.1.1.3.13 Providing dog control in development areas.

5.2.1.1.4 For any additional mitigation techniques, applicants shall submit a wildlife impact report created by a qualified professional for review by the Colorado Division of Wildlife (CDOW).

5.2.1.1.4.1 Upon review of the wildlife impact report by CDOW, CDOW may provide additional mitigation techniques for alleviating any identified wildlife impacts.

5.2.1.1.4.2 The applicant shall be required to comply with CDOW recommended mitigation techniques, unless otherwise waived by the Board of County Commissioners.

5.2.1.1.5 Fencing within a Wildlife Habitat Overlay District shall be in accordance with the following standards:

5.2.1.1.5.1 Use of privacy fencing, chain link fencing, and other restrictive access fencing shall be restricted to the immediate area surrounding a dwelling unit or within the designated building envelope and shall not be used as a method to designate boundaries of lot sizes in excess of one (1) acre.

5.2.1.1.5.2 Fencing outside the immediate building envelope or area surrounding a dwelling unit shall have a recommended maximum top height of forty two inches (42"), not to exceed forty eight inches (48”), and the bottom section should be at least sixteen inches (16”) above the ground. If fence is of wire construction there shall be at least twelve inches (12”) between the top two wires. Construction of woven wire fences shall be prohibited unless a waiver is granted by CDOW.

5.2.1.1.5.3 Construction of wrought iron fencing with closely spaced vertical bars less than twelve inches (<12”) and speared tops shall be prohibited unless a waiver is granted by CDOW.

5.2.1.2 Wetlands Protection:

Mitigation techniques for development near wetland areas, as defined by the US Army Corps of Engineers, may include:

5.2.1.2.1 Avoiding development near wetland areas.

5.2.1.2.2 Preserving existing significant vegetation within and surrounding wetland areas.

5.2.1.2.3 Developing sediment ponds and drainage swales to prevent pollution of nearby wetlands.

5.2.1.2.4 Replacing disturbed wetland areas in-kind, and on-site.

5.2.1.3 Water Quality Control

State of Colorado regulations regarding storm water discharges from construction activities that disturb at least one (1) acre of land, or is part of a larger common plan of development or sale that will disturb at least the minimum land area, have been enacted since July 1, 2002, as part of the Federal Clean Water Act, National Pollutant Discharge Elimination System. The State of Colorado regulation requires persons responsible for the disturbance to obtain a storm water discharge permit associated with construction activities through the Colorado Discharge Permit System (CDPS) from the Colorado Department of Public Health and Environment (CDPHE), Water Quality Control Division (WQCD) before construction. The County shall require proof of such permit as a condition of final approval of any development one (1) acre of larger in land area.

5.2.1.4 Water Body Setbacks:

All roads and driveways and all structures and improvements which require a land use permit shall be located a minimum of fifty (50) feet from the ordinary high water line of all water bodies. In the event that construction within the water body setback is unavoidable, a showing of unavoidability may be made by showing at least one of the following to the satisfaction of the Director of County Development:

5.2.1.4.1 The structure is water-dependent (i.e., docks, piers, watercraft launches and ramps, flood control structures), and is a use by right or is permitted by administrative, conditional, or special use permit;

5.2.1.4.2 Because of the physical features, other restrictions, and conditions of the property, construction outside of the water body setback is not technically feasible (i.e., the entire property is within the water body setback), or would contribute to a hazardous condition on the property;

5.2.1.4.3 In the case of a road, the road is necessary to achieve access to the property or to a building site thereon and no other access route which would avoid the water body setback is technically feasible;

5.3.1 Drainage System:

Unless waived by the County Engineer, a professional engineer licensed in the State of Colorado will conduct a drainage study of the area to be developed and adjacent areas that affect the

development. The results of the study shall be used by the developer to implement the design and construction of drainage facilities necessary to the development.

5.3.1.1 Onsite detention or retention facilities will be provided and will store the difference between the one hundred (100) year historic and one hundred (100) year developed storm runoff, and shall limit the rate of runoff from the site to the one hundred (100) year historic flow rate.

5.3.1.2 The twenty five (25) year storm shall be the criteria for the design of the interior stormwater drainage system of the development and the criteria for the design of cross culverts and bridges of major drainage ways shall accommodate the one hundred (100) year storm frequency.

5.3.1.3 The design of cross culverts and bridges of major drainage ways shall accommodate the one hundred (100) year storm frequency.

5.3.1.4 The Rational Method shall be used for the design of site developments and drainage infrastructure where the total drainage area does not exceed one hundred (100) acres. Precipitation intensity, depth and duration values used in the rational method calculations shall be obtained from current NOAA published data, or from the County Road and Bridge design standards.

Section 6 – Overview of Public Education Efforts

Preserving the quantity and quality of our water supplies is vital to everyone. We are all a part of the problem and the solution when it comes to protection of one of the most important resources on earth. It will take a partnership of people in all sectors from public to private to ensure the future of water for all purposes is protected. Our goal through education, planning, design and conservation is to create a healthy water ethic, a way of becoming good stewards of all of our water resources.

Education Programs ensure effective, accurate and precise communication. They can be general in nature for all residents in the watershed or specific to meet the needs of such targeted audiences as: county and town government officials and their planning and engineering departments; landowners on water ways or lakes; the Chamber of Commerce; developers; real estate and time share/rental, builder's and homeowner's associations; ORV & ATV groups; outfitters; homeowners/ranchers with wells; plant & garden nurseries/stores, landscape businesses/golf courses; and of course, our youth through school programs.

Public Education Programs Conducted:

A landowner survey was sent out to landowners within the watershed in January, 2004. The survey collected information about environmental concerns the landowners have on their property and in the area, where they go to access information about environmental concerns, what they value most about living here, the most important water quality issues that need to be addressed, if they raise any livestock, the size of their property, if they would be willing to implement conservation practices on their property and how important

it is to receive financial help with this. Please see attached survey with results from both the upper and lower watershed.

A public meeting was held to get input from landowners about their priorities and concerns in the watershed in May, 2005.

A Steering Committee was formed to guide the efforts of the watershed planning

A public watershed tour was conducted in June, 2005. The tour began at the headwaters and ended at the lower portion of the watershed.

A brochure was designed to educate the public about the Stollsteimer Creek Watershed and the importance of protecting it. It was printed in May, 2006.

Numerous PowerPoint presentations were given to various community organizations and governmental agencies about the watershed project and progress made to date.

US Forest Service has conducted the following:

Wildflower information walks in Turkey Springs and at Chimney Rock

Bird information walks in Turkey Springs

Winter bird survey

Children's programs on trees and birds in Turkey Springs

Interpretative signs about the changing forest in Turkey Springs (discusses fire, grazing, and logging history and current fuels/forest restoration projects)
Photography walks in Martinez Canyon

Implemented different types of hazardous fuels treatments on several small units in Turkey Springs. We had several public tours to look at these treatments and discuss the differences between the treatment types and hazardous fuel reduction and ponderosa pine forest restoration.

We also have an extensive interpretative program at Chimney Rock where volunteers lead numerous tours of the archeological ruins throughout the summer. We also do special programs there like the full moon and Native American dancing programs.

Numerous free brochures are available to the public at the USFS office on hazardous fuels reduction, forest restoration, prescribed fire, wildland fire use, weeds, and wildlife. These are general in nature and not specific to the Stollsteimer watershed.

Public Education Programs to be conducted:

Plan and schedule additional public watershed stewardship meetings to continue public input for

improvement and recognition of the benefits to the community of a healthy watershed. 2 per year for 5 years: $100/meeting

Develop a Watershed Protection Program with a speaker's bureau (power point) to address groups on the hazards of certain pesticides, fertilizers, and the alternatives available; proper disposal of petroleum products and pet waste; erosion and noxious weed identification and control; Water Wise landscaping; and impacts of recreational activities.

Utilize local media sources for educational articles and informational campaigns on the Watershed Master Plan, and the importance of a healthy watershed and ways to protect it.

Distribute watershed protection brochures/materials to the public; such as government offices, libraries, Chamber of Commerce, banks, coffee shops, recreational vehicle/outdoor stores, and outfitters. Additional brochures may need to be printed: $3,000

Develop a website exclusively for the Stollsteimer Creek Watershed to help inform the public about the current status of the project and include links to maps, inventory resource guides, wildlife habitat, etc. within the watershed. Design: $5,000 and maintain website: $2,000 per year for 5 years.

A history tour of the Turkey Springs area and the role it plays in providing healthy drinking water.

Site specific interpretative signing for specific hazardous fuels/forest restoration treatment units.
Self guided tour of the Turkey Springs area.
Interpretative programs, particularly for kids, of the wetlands areas in the watershed: $500/year for 5 years

Education programs in the schools:

Existing water education programs used in the Pagosa Springs School District include:
Waterwise – PAWS water education program implemented in the Pagosa Springs Elementary School;
River Watch – 7th grade students continually monitor the water quality of the San Juan River under the supervision of 7th grade Life Science teacher, Cindy Nobles (cnobles@pagosa.k12.co.us);
8th Grade Earth Science – Topics such as erosion and deposition, watersheds, properties of water, water cycle and water quality are all addressed throughout the 8th grade science curriculum taught by JD Kurz (jkurz@pagosa.k12.co.us).

Future additions to existing educational programs used in the Pagosa Springs School District to include:

The Stollsteimer Creek Watershed brochure could be utilized by 8th grade students when learning about watersheds. Student activities could be designed using the brochure as a reference. This brochure could be transferred to a website with an interactive mapping program in which students could input their address. The computer would then plot the location within the watershed at different scales. Links could be provided to the sites listed below. Design: $5,000 and maintain website: $1,000 per year.

Create a watershed website with links to sites such as:
Know Your Watershed, www.ctic.purdue.edu/KYW/KYW
Science in Your Watershed, http://water.usgs.gov/wsc/index.html

Surf Your Watershed, http://water.usgs.gov/wsc/index.html
Piedra Watershed, http://water.usgs.gov/wsc/cat/14080102.html#.html
Map Your Watershed, http://map8.epa.gov/scripts/.esrimap
Education in Your Watershed, http://water.usgs.gov/wsc/wshed_education.html
Drinking Water & Ground Water Kids' Stuff, www.epa.gov/OGWDW/kids/
Online Training in Watershed Management, www.epa.gov/watertrain/
Water Information Program at www.waterinfo.org
Colorado Foundation for Water Education at www.co-water-edu.org
Colorado Water Protection Project at www.ourwater.org
AWARE Colorado at www.awarecolorado.org
Archuleta County Extension office at www.ext.colostate.edu
Pagosa Area Water and Sanitation District at www.pawsd.org

Total funds needed for Public Education Efforts: $34,000 + $1,000 incidental = $35,000

Section 7 - Watershed Planning Participants, Funding Sources, Credits

Steering Committee Members	Entity
Windsor Chacey	PAWSD
Larry Garcia	Arch. County
Becca Smith	USFS
Gene Tautges	PAWSD
Mike Reid	CDOW
Justin Krall	CDOW
Dan Wand	CSFS
Larry Lynch	PLPOA
Sue Walan	Arch. County
Ben Zimmerman	SU Tribe
Michiko Burns	SU Tribe
Tami Sheldon	SU Tribe
JD Kurz	J.H. Science Teacher
Jerry Archuleta	NRCS
Cynthia Purcell	SJCD
Chris Philips	Riverbend Engineering

Entity	Technical Assistance	Financial Assistance
San Juan Conservation District (SJCD)	$3630	$150
Pagosa Lakes Property Owners Association (PLPOA)	$2065	$8250
Pagosa Area Water and Sanitation District (PAWSD)	$2370	$8250
Archuleta County (Arch. County)	$726	$6750
Colorado State Forest Service (CSFS)	$3336	-
CSU Extension Service	$280	-
Colorado Division of Wildlife (CDOW)	$3100	$300
Southern Ute Tribe (SU Tribe)	$2000	
United States Forest Service (USFS)	$931	-
State of Colorado, 319 Grant	-	$20,000
Southwestern Water Conservation District	-	$3100
Aspen Springs Metro District	-	$350
San Juan Water Conservancy District	-	$1250
Town of Pagosa Springs	-	$2000