CONSERVATION PLAN

FOR

RIO GRANDE CUTTHROAT TROUT

(Oncorhynchus clarki virginalis)

IN COLORADO

August 23, 2004
Colorado Division of Wildlife
Aquatic Wildlife Section
Denver, CO

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ABOUT THIS SPECIES CONSERVATION PLAN

The original Rio Grande Cutthroat Conservation Plan was written by the Colorado Division of Wildlife in 1982 and has been periodically revised as information and conservation strategies changed. This plan supersedes the earlier versions.

The Colorado Division of Wildlife will use this conservation plan as a guide for the communication, planning, budgeting, and execution of management strategies targeted towards the long term stability and continued existence of the species in Colorado. It is based on the premise that State and Federal agencies, conservation groups, and interested individuals can collectively and cooperatively work towards the conservation and management of Rio Grande cutthroat trout.

This plan will also communicate the Colorado Division of Wildlife goals for the subspecies to the signatories and supporting entities of the recently completed Conservation Agreement for Rio Grande Cutthroat Trout (June 2003). That Agreement will result in enhanced and coordinated conservation efforts among and between resource agencies with the intent of improving overall status and distribution of the subspecies throughout its range.

This completed Rio Grande Cutthroat Trout Conservation Plan has been approved by the Colorado Division of Wildlife. This plan is subject to modification resulting from new findings and changes in subspecies status, and the completion of tasks assigned in the plan. Goals and objectives will be attained and funds expended contingent upon appropriations, priorities, and budgetary constraints of the agency.

Approved

Bruce L. McCloskey, Director — 8/30/04 Date

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ACKNOWLEDGEMENTS

This conservation plan was developed by personnel of the Colorado Division of Wildlife, and was distributed for internal and external review prior to approval. The CDOW wishes to acknowledge and thank those that contributed to its completion.

Bruce May – US Forest Service – Bozeman, MT
Marilyn Myers – US Fish & Wildlife Service – Albuquerque, NM
David Nickum – Colorado Trout Unlimited – Boulder, CO
Barry Wiley – US Forest Service – Monte Vista, CO
Peter Wilkinson – New Mexico Department of Game and Fish – Santa Fe, NM

INTRODUCTION

Rio Grande cutthroat trout, *Oncorhynchus clarki virginalis,* is the only native salmonid of the Rio Grande basin in Colorado. It is one of four subspecies of cutthroat trout that are native to Colorado's coldwater streams and lakes. The other three are Colorado River cutthroat (*Oncorhynchus clarki pleuriticus)*, greenback cutthroat trout (*Oncorhynchus clarki stomias)*, and now extinct yellowfin cutthroat trout (*Oncorhynchus clarki macdonaldi)*. Only in southern Colorado and New Mexico can anglers pursue this beautiful sport fish in its native waters. Currently, Rio Grande cutthroat trout occupies significantly less of its historic native range. Many of the populations are restricted to small headwater streams, and some are at risk of extirpation.

The Rio Grande cutthroat trout subspecies was not included in the original list of animal and plant species considered warranting protection under the Endangered Species Act of 1973 despite historic declines. In 1973, Colorado independently listed the Rio Grande cutthroat trout as a state threatened species. Recovery goals were established, and after an 11-year period of conservation activities, the subspecies was delisted in 1984 (Colorado Division of Wildlife 1992). Rio Grande cutthroat trout is presently designated a species of special concern in Colorado.

Policy of the State of Colorado is that the wildlife and their environment are to be protected, preserved, enhanced, and managed for the use, benefit, and enjoyment of the people of this state and its visitors (Colorado Division of Wildlife Statutes 33-1-101). This document was developed to provide a framework for the long-term conservation of Rio Grande cutthroat trout in Colorado, and represents an extension of previous management plans (Colorado Division of Wildlife 1982, 1992, 1996, 1999). The document will be used to develop management strategies, budgetary needs, and necessary regulations, as well as facilitate cooperative, interagency management of Rio Grande cutthroat trout to conserve and expand new populations. The conservation plan will be reviewed and updated on a 5 year cycle following final approval.

NATURAL HISTORY

Taxonomy

The cutthroat trout, *Oncorhynchus clarki*, is a prime example of a polytypic species. Cutthroat trout are found in both coastal and inland streams from Alaska to New Mexico, and

within this range the species has evolved into numerous subspecies or geographic races. Many subspecies undoubtedly are polyphyletic, having evolved directly from other subspecies rather than (monophyletically) from a centrally localized stem group. Rio Grande cutthroat trout are believed to have arisen from Colorado River cutthroat trout that entered the previously unoccupied Rio Grande drainage basin during the last glacial period (70,000 years ago) (Behnke 1992). Rio Grande cutthroat trout was first described from "Utah" [Ute] Creek, a tributary of the Rio Grande near Fort Garland, Colorado (Girard 1857).

Rio Grande cutthroat trout have red to orange slashes in the gular folds of the lower jaw. They develop colors similar to those of greenback and Colorado River cutthroat trout, but somewhat less intensely than the other two subspecies. Rio Grande cutthroat trout have olive colored backs, light rose to red-orange on the sides to pink or yellowish-orange bellies. Colors are more intense on breeding adults, especially males.

Taxonomic differences among cutthroat trout subspecies are based on variation in coloration, spotting pattern, and meristic characters including number of scales in the lateral series, number of gill rakers, number of pyloric caeca, and presence and number of basibranchial teeth. Rio Grande cutthroat trout differ from greenback and Colorado River cutthroat trout by having fewer scales in the lateral series and by the irregular shape of the spots on the caudal peduncle (Behnke 1992). Adult Rio Grande cutthroat trout are distinguished by large, club-shaped spots that are concentrated posterior to the dorsal fin on the caudal peduncle. Basibranchial teeth are weakly developed or absent in Rio Grande cutthroat trout. According to Behnke (1992, 2002), two forms of Rio Grande cutthroat trout exist based on meristic and morphological characteristics. One form associated with the Rio Grande proper of Colorado and New Mexico, and the other with the Upper Pecos River in New Mexico. Behnke determined that the Pecos form had larger spots, which are more typical of greenback cutthroat trout, and more scales in the lateral series.

Life History

Trout require four kinds of habitat during the various stages of their life history: spawning habitat, nursery or rearing habitat, adult habitat, and over-wintering habitat. Deficiencies in any one of the four will limit populations (Behnke 1992). Specific information on the habitat requirements for spawning, rearing, cover and feeding for Rio Grande cutthroat trout are not available (Rinne 1995). However, Rio Grande cutthroat trout habitat preference is probably consistent with typical cutthroat trout habitat. Cutthroat trout, in general, prefer clear, cold

streams and lakes. Population densities are regulated mostly by stream size and morphology, over-wintering habitat, stream productivity, and summer cover for predator avoidance (Sublette et. al 1990). Optimal cutthroat trout stream habitat is characterized by clear, cold water, a silt free rocky substrate in riffle-run areas; an approximately 1:1 pool-riffle ratio with areas of slow, deep water; well vegetated stream banks; abundant instream cover; and relatively stable water flow and temperature regimes (Raleigh and Duff 1981). Optimal lacustrine habitat is characterized by clear, cold, deep lakes that are typically oligotrophic, but may vary in size and chemical quality, particularly in reservoir habitats. Cutthroat trout are stream spawners and require tributary streams with gravel substrate in riffle areas for reproduction to occur (Hickman and Raleigh 1982).

Rio Grande cutthroat trout feed on aquatic invertebrates inhabiting riffle areas of streams, and terrestrial insects that fall into the water (Sublette et. al. 1990). Quality insect production requires rubble-dominated substrate in riffles, oxygenated water and less than 10 percent fines in those riffles.

Growth depends primarily on food availability, size of prey, competition, water temperatures, and the length of growing seasons (Behnke and Zarn 1976). Rio Grande cutthroat trout populations inhabiting small streams typically range in size from 2 inches at age 1 to 10 inches at age 7. However, cutthroat trout inhabiting productive lakes attain greater size. Rio Grande cutthroat trout brood fish at Haypress Lake grow to 20 inches and weigh 3.3 pounds (Alves 2002).

Spawning occurs in streams from March through July depending on water temperature (usually beginning at 42-48°F), runoff, elevation and latitude (Behnke and Zarn 1976). In Colorado, most spawning occurs from May through July, typically on the descending limb of spring snowmelt when water temperatures near 50 °F. Females mature at three years of age while males become sexually mature at age two. In cooler headwater streams, trout mature at a smaller size than they do at lower elevation habitats (Behnke and Zarn 1976). Typically 200-4500 eggs are produced, depending on the size of the female. Eggs are laid in a gravel nest, or redd, built by the female in flowing water where high dissolved oxygen levels exist, a requirement of developing embryos (Sublette et. al. 1990). Hatching time is dependent upon water temperature. For example, at the Colorado Division of Wildlife Fish Research Hatchery, Rio Grande cutthroat trout hatch in 26 days at 53°F (Phil Schler pers. comm. Colorado Division of Wildlife).

Rio Grande cutthroat trout evolved in Colorado and New Mexico as a member of a native fish assemblage that included longnose dace (*Rhinichthys cataractae*), flathead chub

(*Platygobio gracilis*), fathead minnow (*Pimephales promelas*), Rio Grande chub (*Gila pandora*) and Rio Grande sucker (*Catostomus plebeius*) (Hatch et.al. 1998, Rinne 1995, Sublette et. al. 1990).

Historic Range of Rio Grande Cutthroat Trout

The entire historic range of Rio Grande cutthroat trout cannot be known with certainty, due to the paucity of early distribution data. Presumably the subspecies occupied colder reaches of streams in the Rio Grande drainage of Colorado and New Mexico and Pecos River drainage of New Mexico (Stumpff and Cooper 1996). The occurrence of Rio Grande cutthroat trout in the Canadian River drainage of Colorado and New Mexico cannot be verified by historic museum specimens or from written accounts of early explorers (Behnke 1992).

Rio Grande cutthroat trout habitat in Colorado included many waters presently capable of supporting trout in the Rio Grande drainage above 7,200-feet elevation. Since some coldwater habitats were likely fishless as well, it would be erroneous to include all coldwater streams and lakes as historic habitat. Hydrologic modifications, subsequent water temperature changes (> 70°F), and increased deposition of sediment probably determined the lower terminus of Rio Grande cutthroat trout distribution in streams of the San Luis Valley. Cutthroat trout are usually not found in waters that exceed 70°F for extended periods. Natural barriers such as waterfalls that prevent fish movement probably defined the upstream limit of cutthroat trout distribution. Also water temperatures of headwater streams may be too cold to provide the temperatures needed to develop embryos. Water temperatures below a daily maximum of 39°F to 46°F can delay spawning and prolong egg incubation, lowering embryo survival and increasing time to hatching (Rinne 1980, Hubert et. al. 1994).

Subspecies of cutthroat trout (*Oncorhynchus clarki*) have been reduced to a small portion of their historical range, primarily due to habitat degradation and interactions with nonnative salmonids (Behnke 1992, Young 1995). Without doubt, the distribution of Rio Grande cutthroat trout has declined historically. The most significant period of decline, however, may have been associated with the late 1800s and early 1900s, when human population growth and exploitation of natural resources in the western states surpassed concerns for conservation of native fauna. Habitat degradation from anthropogenic activities including livestock grazing, logging, mining, irrigation, dewatering of streams and siltation contributed to a decline in distribution. Probably the greatest threat to Rio Grande cutthroat trout was the introduction of nonnative salmonids, principally rainbow trout, brook trout, brown trout and nonnative cutthroat

trout (Behnke 1992, Sublette et al. 1990). Rainbow trout and nonnative cutthroat trout are spring spawners and readily hybridize with Rio Grande cutthroat trout. Brook and brown trout compete with Rio Grande cutthroat trout for food and space (Rinne 1995).

Current Distribution

The range of the Rio Grande cutthroat (within Colorado) has been divided by sub-basins into eight geographic management units (GMUs) to bring a greater resolution to descriptions of population and habitat distribution and related maintenance and restoration work. These GMUs reflect the hydrologic divisions of the Rio Grande basin by river drainage. They do not necessarily reflect important differences in genetic variability in the subspecies based on geography or adaptation to specific environments. As knowledge of the genetic variability within Rio Grande cutthroat trout increases, planning and management should become increasingly sensitive to conservation differences that comprise the genome of the subspecies. Today, Rio Grande cutthroat trout populations exist in 162 waters of eight geographic management units in Colorado (Table 1) (Appendix II). These populations exist on public and private land.

Table 1. Distribution of Rio Grande cutthroat trout populations by GMU.

GMU	RGCT Populations			
	Public	**Private**	**Total**	**Percent**
Alamosa-Trinchera	17	26	43	26
Rio Grande Headwaters	34	1	35	22
San Luis Creek	27	0	27	17
Conejos River	24	0	25	15
Saguache Creek	16	3	19	12
Rio Chama	3	4	7	4
Canadian River Headwaters	0	3	3	2
Upper Rio Grande	0	3	3	2

TAXONOMIC AND GENETIC EVALUATION

The first method used for taxonomic evaluation of Rio Grande cutthroat trout was based on morphological and meristic characteristics. These characteristics were based predominately on phenotypic expressions such as number of scales along or above the lateral line, number of pyloric caeca, number of basiobranchial teeth, number of gill rakers on the first gill arch, spotting pattern, coloration, size and shape of parr marks, number of pelvic fin rays and the number of vertebrae (Behnke, 1992). Meristics were used to classify cutthroat trout from 43 populations in the Rio Grande basin (CDOW Blue Book 1979-1986) (Appendix I, Table 2). Populations analyzed by this technique were rated as "pure" (A), if all diagnostic criteria were within an expected range for that particular subspecies. A population was considered "essentially pure" (A-) if one or more of the diagnostic criteria was slightly outside the expected range. A rating of "good" (B) was used to describe a population where introgression with other subspecies of cutthroat or rainbow trout was detected. Utilizing this technique, it was difficult, in some cases to assess whether diagnostic criteria that fell outside the expected norm, were due to natural population variations or hybridization. Another drawback of this technique was that it required the sacrifice of specimens.

Horizontal starch gel electrophoretic analysis of allozymes was used to determine genetic characteristics of Rio Grande cutthroat trout populations based on different protein coding loci. These loci specifically coded for proteins that were present in muscle, liver and eye tissues. At some loci, Rio Grande cutthroat trout, rainbow trout and Yellowstone cutthroat trout rarely share alleles in common. Loci where fixed genetic differences exist are considered diagnostic, and theoretically can be used to determine whether a population is pure or hybridized. Currently, there are 9 diagnostic loci that are used to distinguish between Rio Grande cutthroat trout and rainbow trout (Leary, 2001). Also there are currently four diagnostic loci used to distinguish between Rio Grande cutthroat trout and Yellowstone cutthroat trout (Leary 2001). This procedure can also be used to estimate genetic variation within populations. Electrophoresis requires sacrificing specimens and can differentiate between Colorado River Cutthroat and Rio Grande Cutthroat trout. The Wild Trout and Salmon Genetics Lab at the University of Montana used electrophoresis to evaluate 21 cutthroat trout populations in the Rio Grande basin (Leary 1988, 2001, 2002, 2003, Leary et. al. 2000) (Appendix I, Table 2).

Currently, DNA is analyzed from two sources, the cell mitochondria and the cell nucleus. Mitochondrial DNA (mtDNA) is a maternally inherited DNA genome located within the mitochondria of the cell. Restriction site analysis of mtDNA can be used to evaluate the

presence and degree of hybridization (or introgression) between the Rio Grande subspecies and other western cutthroat subspecies (Yellowstone, Snake River) as well as rainbow trout. Due to the maternal inheritance of mtDNA, such analyses are more definitive for populations experiencing longer periods of hybridization with a greater exchange of genetic material between individuals. It is less useful for more slowly evolving hybridized populations (where there has been limited generational intercross between RGCT and other non-native trout), or in populations where the invasion of non-native individuals, particularly females, occurred over many years. Analysis of mtDNA was used to determine genetic introgression variation within RGCT populations. Don Proebstel at the World Salmonid Research Institute and Colorado State University used mtDNA technique to analyze hybridization in 15 cutthroat populations (Proebstel et.al.1996, Proebstel 1997, Proebstel 1998, Proebstel 1999) (See Appendix I, Table 2).

The presence and degree of hybridization or introgression between RGCT and other non-native salmonids can also be evaluated using nuclear DNA (nDNA). Such analysis has utilized a polymerase chain reaction (PCR) technique and paired interspersed nuclear DNA elements (PINEs). The PINEs technique can be used to amplify specific loci that are diagnostic for species and subspecies comparisons. Employing a nuclear DNA technique has the advantages of not requiring a lethal sample, and is not solely dependent on maternal inheritance as both male and female contribute to nuclear DNA. The Wild Trout and Salmon Genetics Lab at the University of Montana used the PINEs technique to analyze cutthroat trout specimens from 20 populations in the Rio Grande basin for genetic introgression with non-native salmonids (Leary report pending).

GENETIC MANAGEMENT

Results of genetic analysis will be used to guide management decisions for the conservation of Rio Grande cutthroat trout, and where possible, the species will be managed on the basis of each geographic unit. Genetic evaluation has been conducted, and will continue to be conducted, in order to make genetic distinctions between populations from the various geographical units. Based on results and interpretation of genetic information compiled thus far, unique haplotype fingerprints can not be recognized for the populations examined. In addition, there are an inadequate number of populations from each of the geographic units to serve as appropriate candidates for procurement of hatchery stock. Faced with the current limitations, we have produced composite broodstocks (captive and wild) composed of individuals and their

genetic components from several populations across geographical units. Essentially these broodstocks were constructed to mimic a mainstem Rio Grande population. This assumes that historic genetic exchange occurred as a large, functioning metapopulation, and that there were no discernable ecologically-specific limitations or uniqueness.

The composite broodstocks have been utilized for establishment of new populations within various geographical units. However, the integrity of existing historic genetically-pure populations will be maintained, as progeny from the developed broodstocks will not be stocked "over" those individual populations.

The Rio Grande cutthroat trout conservation program in Colorado will strive to complete sufficient and adequate genetic testing which will allow the identification of unique and distinct characteristics for each geographical unit. If these efforts are successful, then the intent would be to establish broodstocks for those unique units. Progeny from those could then be utilized to establish new populations within those units. Until, or if, such unit-specific broodstocks can be developed, establishment of new populations using a "nearest neighbor" strategy remains an option. The selection of the nearest neighbor would depend upon identification of an appropriate population that exhibited similar ecological characteristics, provided adequate numbers of individuals to use for either spawning or transfer, and showed no or limited evidence of inbreeding.

Genetic purity (or conversely - the degree of genetic introgression) is used to assign each RGCT population into the most appropriate management classification (explained further in the following section). The management classifications are linked to the genetic management. For example, a lake or stream supports a Rio Grande cutthroat trout core conservation and conservation population if it is reproducing and recruiting as a geographically distinct group. These populations would not receive genetic material from other populations unless there is evidence of inbreeding depression. Unique population attributes, if present, would be influential in selecting a donor source to remedy inbreeding depression and maintain these attributes. Slightly hybridized populations would not be used to develop broodstock for new restoration populations, but may be considered as sources for introductions or reintroductions when the objective is to duplicate unique ecological, genetic or behavioral attributes. Naturally reproducing conservation populations within a larger drainage equate to subpopulations within a metapopulation.

MANAGEMENT CLASSIFICATIONS FOR RIO GRANDE CUTTHROAT TROUT POPULATIONS

Management of cutthroat trout must include consideration of the genetic conditions and characteristics that contribute to the maintenance of the attributes that make cutthroat trout a unique fish and a valued component of the fish community (UDWR 2000). There are three components associated with conservation of cutthroat trout, core conservation populations, conservation populations and recreation populations. A core population is a conservation population that is >99% pure, phenotypically true, and representative of the historic genome of the native cutthroat trout (Appendix I, Table 3; Appendix III, Map 1:3). Core populations contain cutthroat trout that have not been impacted by genetic alteration linked to human intervention. These populations serve as the primary source of gametes for introductions and re-introductions through transplants, and for broodstock development. These populations should not receive genetic material from other population sources unless there is evidence that inbreeding depression, random genetic drift or other factors have put the population in jeopardy (UDWR 2000).

A conservation population is a self-sustaining population of Rio Grande cutthroat trout that is managed to preserve the historical genome and/or unique genetic, ecological, and/or behavioral characteristics within specific populations and within geographic units (Appendix I, Table 3; Appendix III Map 1:3). Populations are further classified by quantifying introgression. A conservation population is at least 90% Rio Grande cutthroat trout (≤10% introgression). These populations retain all of the phenotypic attributes associated with the subspecies. Conservation of introgressed populations will be consistent with the guidance in the position paper (UDWR 2000). The conservation of slightly introgressed populations is meant to conserve as much of the taxon's genetic character without compromising phenotypic, behavioral, and ecological characteristics of the taxon. This genetic conservation approach is seen as consistent with direction under the Endangered Species Act of 1973 (as amended) and subsequent Federal policies. The identification of taxonomic levels below "species" as qualifying for protection under the Endangered Species Act (1973 as amended; Section 3.15) including distinct population segments (DPS). In the definition and application of DPS designations (61 FR 4722-4725), the biological and ecological significance of such populations would be considered under Congressional guidance to use of DPS designations sparingly while encouraging the conservation of genetic diversity (Senate Report 151, 96th Congress, 1st Session). In a proposed rule regarding treatment of introgression or hybridization in recovery of

listed species, The U.S. Fish and Wildlife Service suggested that progeny of intercross mating that retained the phenotypic, behavioral and ecological traits that characterize the listed species also be included in protections under ESA (61 FR 4710-4713). This draft rule has never been formally adopted, but as quoted in the background information, "the issue of hybrids is more properly a biological issue than a legal one." It is within this biological context that slightly-introgressed populations are included as important components of Rio Grande cutthroat trout conservation. The goal is to preserve as much Rio Grande cutthroat trout genetic diversity as possible; it may be appropriate to accept some hybrid influence in order to preserve a larger amount of Rio Grande cutthroat trout genetic diversity. The USFWS recently remanded a petition to list westslope cutthroat trout (*Oncorhynchus clarki lewisi*) as threatened based upon their decision to include hybrid populations and populations of unknown genetic characteristics in the taxonomic group considered for listing (USFWS 2003).

Recreation populations are established through stocking of genetically pure Rio Grande cutthroat trout from wild or captive brood stocks. Recreation populations inhabit high lakes and streams where restoration is unlikely due to physical, sociological, and political factors. Recreation populations are managed in high lakes through periodic stocking since these waters generally do not provide spawning habitat. The primary management focus of a Rio Grande cutthroat trout recreation population is on the sport fish benefits to the public. These populations will serve the dual purposes of maintaining genetic refugia for pure historic populations and providing sportfish recreation (Appendix I, Table 4; Appendix III, Map 2:3). Supplemental stocking of these genetic refugia populations is an interim management tool while working toward conservation population objectives.

Earlier categorizations of Rio Grande cutthroat trout populations based on genetic purity relied on an A, B, C or D purity rating. During the transition between this previous approach and the one outlined above, populations that were rated B or better will be considered conservation populations, and those that were rated A+, A, and A- will be considered core conservation populations. The overriding intent of this genetic management classification is to preserve, protect and enhance the purity and diversity of the genome of Rio Grande cutthroat trout across its range. The genetic purity of most core conservation populations has been confirmed by accepted and recognized analytical genetic techniques (allozymes and mitochondrial or nuclear DNA), however a few populations have been designated as such based only on meristic and morphological characteristics (in combination with stocking records and lack of phenotypic expression of other non-native salmonids). The intent is to complete diagnostic genetic testing on these latter populations to verify their purity and their valid inclusion as core conservation

populations. Genetic assessments of core and conservation populations will continue to be updated over time. In this manner, the influence of hybridization and the presence of unique genetic characteristics of the populations can be determined across and within the designated GMUs. It follows that populations that contain varying degrees of hybridization may need to be conserved throughout the range. Past experience with the continuing development of molecular genetic research technologies has demonstrated that interpretations of inland cutthroat trout phylogeny and genetic conservation will also continue to change. New information may compel changes in present genetic conservation strategies, which in turn, may influence the management classification of RGCT populations.

POPULATION VIABILITY AND STABILITY

Viability refers to the probability that a population or a group of subpopulations will persist within some given area over some period of time. The application of viability concepts and risk of extirpation or extinction in inland native cutthroat trout subspecies has been previously reviewed in McIntyre and Rieman 1995 and Young 1995. Viability has been evaluated through modeling using select population parameters to evaluate and quantify risk of extinction over a specific period of time (e.g. 100-year period), and to determine if a population can maintain a minimum threshold of population size over that time given those population characteristics (McIntyre and Rieman 1995). A range of population variables are used in a randomized, iterative process to simulate environmental and demographic stochasticity, resulting in population abundance fluctuations and providing estimates of persistence. From these models, thresholds for population abundance criteria that provide a 95% probability that a population will meet or exceed those thresholds and persist for 100 years have been proposed (Young and Harig 2001, Hilderbrand and Kershner 2000, McIntyre and Rieman 1995). In turn, this abundance criterion has been used to estimate habitat patch size to support that population size (Harig and Fausch 2002, Harig et al. 2000, Harig 2000, Hilderbrand and Kershner 2000).

These modeling processes are useful for providing guidance on how to enhance native trout populations and their habitat. However, the results have also been the focus of debate over thresholds for conservation criteria, below which populations are labeled as “nonviable” and a basis for exclusion from recovery or conservation goals. These criteria tend to discount small, isolated populations that have persisted for many years regardless of size or habitat occupied (Young 1995). Viability is viewed as relative and potential for persistence (or

extirpation) as a range from low to high probability. Under present circumstances, Rio Grande cutthroat trout populations exist in numbers and in a range of habitat conditions that also equates to a range of probability of being more or less likely to persist. Small, isolated populations are at higher risk of extirpation due to limited population size, catastrophic events and potential for genetic isolation than larger, connected populations. However, the remoteness of the isolated populations also infers a lower risk of disease and genetic introgression, than larger metapopulations. As such, these small populations may be targeted for management actions to simulate connectedness in a metapopulation as well as habitat enhancement to support larger populations and greater distribution. Replication and re-founding these populations in suitable habitats will be considered an appropriate conservation strategy for the species. In Colorado, all Rio Grande cutthroat trout core conservation and conservation populations are of value to the conservation objectives of the subspecies, regardless of size or habitat occupied.

Similar to conservation or recovery programs for most other inland cutthroat subspecies, Colorado has not adopted standards of population viability necessary for long term persistence (USFWS 1998, CRCT Task Force 2001). In the interim, we use a suite of population parameters to describe the status of our inland cutthroat trout populations. There is no quantitative threshold in our assessments which compels a decision of viable or not for a single population. Stable, self-sustaining populations are defined as those that maintain a minimum biomass of 20 lb/ac through natural reproduction; and contain a minimum of 500 adults (adults defined as fish > 4.7 inches in length). The population should be represented by a minimum of two-year classes within a five-year period established through natural reproduction. Stability is further defined by the presence of a physical, chemical or biological barrier separating the cutthroat population from other salmonids (USFWS 1998).

The survey data that may be associated with viability include abundance and biomass estimates, and length frequency distributions as they pertain to evidence of successful reproduction, survival and recruitment resulting in multiple year classes. The number of surveys and time interval bounded by these surveys demonstrates success over time. A population that approximates or exceeds the abundance and biomass criteria (500 adults, 20 lb/ac) and is represented by multiple age groups demonstrates both stability and viability since successful reproduction, recruitment, growth and survival are implied by these parameters. When these parameters are available from two or more surveys and indicate little or no change or an increasing trend, the population is generally regarded as persistent and stable or increasing/expanding. With the data available from additional surveys and/or greater time

intervals between surveys with little or no change or an increasing trend, these populations would be considered more viable due to persistence and stability or growth in population attributes. Other attributes, including allopatry, occupation of more complex drainage systems, and connection with one or more Rio Grande cutthroat trout subpopulations increase the sense of stability and viability when present.

Considering the various population parameters discussed above, Rio Grande cutthroat trout populations are assigned a status. The status categories include “At Risk and Declining”, “At Risk and Stable”, “Secure and Stable”, “Secure and Expanding”, and “Unknown” (Appendix I, Table 5; Appendix II; Appendix III, Map 3:3) (Alves 1998, Stumpff and Cooper 1996). These status rankings are intended to describe the status of Rio Grande cutthroat trout in Colorado, summarize the progress of the conservation plan, and assist managers in establishing priorities for population restoration.

MANAGEMENT OF RIO GRANDE CUTTHROAT TROUT WITH REGARD TO THREATS

This section of the conservation plan describes threats to population persistence. We chose to use the Endangered Species Act threat categories as a convenient way of addressing important conservation considerations.

A. Present or threatened destruction, modification or curtailment of the species' habitat or range:

Introduction of nonnative fishes and habitat alteration are primarily responsible for reduction in Rio Grande cutthroat trout distribution and abundance (Behnke 1992, Rinne 1995, Sublette et al. 1990). Stocking of non-native salmonids was widespread since before 1900, and has been considered a primary threat to inland native cutthroat subspecies. Brook trout are known to replace most subspecies of inland cutthroat trout when in sympatry (Behnke and Zarn 1976). Rainbow trout and other nonnative cutthroat trout subspecies hybridize with Rio Grande cutthroat and produce fertile offspring (Behnke and Zarn 1976, Rinne 1995). Introductions of non-native salmonids into existing populations of Rio Grande cutthroat trout populations in Colorado by State or Federal fish and wildlife agencies ceased with the state listing of the subspecies in 1973, and do not represent an ongoing practice or threat. Private organizations and individuals may, on occasion, illegally stock waters with nonnative salmonids which may potentially hybridize or compete with native cutthroats, but the stocking of private waters is now

regulated by a stocking permit program supported by policy, administrative directive, and regulation within the Colorado Division of Wildlife. Unauthorized stocking in public waters is illegal and punishable under Colorado state law. In pursuit of coldwater recreational fishery management objectives, the Division will give preference to the use of native cutthroat trout subspecies for management purposes. Stocked fish will not compromise the health of Colorado's aquatic resources, nor will the use of stocked fish threaten the status of any population of native fishes. Rio Grande cutthroat trout stocking will comply with guidance for genetic criteria, documented need, broodstock development, restoration stocking, and monitoring as approved within the conservation plan.

A wide variety of land management practices have been suggested to threaten the continued existence of populations of Rio Grande cutthroat trout, including overgrazing, heavy metal pollution, and water depletion and diversion (Behnke and Zarn 1976, Behnke 1992; Sublette et al. 1990, Stumpff and Cooper 1996). Some of these practices have served to isolate upstream populations of Rio Grande cutthroat trout and protected them from invasion by non-native salmonids, but they also serve to fragment streams, restricting movement between formerly connected populations and creating small, isolated populations that may be more likely to become extirpated. Based on the requirement of existing forest and range management plans to minimize negative impacts to listed "sensitive species" and the inclusion of native cutthroat trout subspecies as sensitive species, protection of native cutthroat trout populations and their habitat on federal lands seems more certain. The Rio Grande National Forest has developed forest-wide management goals and strategies intended to protect Rio Grande cutthroat trout habitat (USDA Forest Service 1996, 2003). Land use management considerations as part of this plan include; riparian buffer maintenance and protection, sedimentation abatement, mining and logging restrictions, proper placement of recreational trails, minimal impact grazing strategies, quantitative habitat monitoring, and development of instream/riparian habitat restoration projects. Coordination between the U.S. Forest Service and Bureau of Land Management and state wildlife agencies with regard to mutual habitat concerns for state-listed, special concern, and sensitive wildlife species like the Rio Grande cutthroat trout is an ongoing practice. This coordination will be formalized with final approval of the draft conservation agreement for the subspecies. Habitat problems are viewed as site specific and not an overall threat throughout the range. The summarized population data and assessments of individual waters provided here serve to confirm where site-specific habitat problems do exist, not that these individual populations are certainly headed toward extirpation, or that a range-wide threat from habitat mismanagement or degradation is present.

B. Overutilization of the species for commercial, recreational, scientific or educational purposes:

Overharvest is not considered a threat to this subspecies at this time. Special regulations requiring catch-and-release, very limited harvest, and terminal tackle restrictions have demonstrated effectiveness in maintaining trout populations in the face of a wide range of fishing pressure, and have been applied to native cutthroat waters throughout Colorado. Catch and release regulations with fly and lure only terminal tackle restrictions protect Rio Grande cutthroat trout populations in 22 streams (148.8 stream miles) and three reservoirs (82 acres) (CDOW Regulations, Chapter 1, Article 11, Special Regulation waters). These 25 populations have been judged potentially vulnerable to depletion with angler harvest and therefore protected with special regulations. Not all populations require special regulations. Location of Rio Grande cutthroat trout populations in remote headwater drainages and small streams with difficult access has provided an isolating, protective effect from fishing pressure. The tendency for these populations to be in smaller creeks and composed largely of small-sized fish ($\leq$ 10 in) has also served to protect these populations from angler harvest.

Scientific collection of wildlife is regulated through a permit system (CDOW Regulations, Chapter 13) requiring a formal application stating project objectives, sampling methodologies, sampling sites, and need for collecting. This application is subsequently reviewed by Division managers and biologists responsible for management of the species/sites designated in the application. Approval may be granted or denied; stipulations and restrictions may be attached to an approved permit.

C. Disease or predation:

Rio Grande cutthroat trout are susceptible to common salmonid diseases, including whirling disease (WD), which is caused by the myxosporean *Myxobolus cerebralis* (MC) (Markiw 1992). Native cutthroat trout, including Rio Grande cutthroat trout, exposed to MC in sentinel fish experiments suffered greater mortality from the infection than other non-native salmonid species like brown trout (Nehring 1998).

Transmission of diseases to wild cutthroat populations through hatchery-based fish stocking is recognized as a significant potential disease threat. Whirling disease became a specific concern when population-level impacts to wild rainbow trout were identified. In Colorado, Wildlife Commission policy D-9 on MC clearly prohibits stocking of MC positive salmonid fish in protected habitats, which include native cutthroat trout waters and most salmonid habitats as defined by regulation. For stocking of native cutthroat trout into existing or

restored habitats by the Division of Wildlife, only fish that have tested negative for MC using polymerase chain reaction (PCR) protocol are eligible for release, and the PCR test must be performed within 60 days of the desired stocking date. By policy and regulation (CDOW Regulations, Chapter 0, #008.H; #009.G), the Division of Wildlife has been directed to eliminate the stocking of WD positive fish in habitats that are capable of supporting self-reproducing salmonid populations, including standing waters above such habitat by 2003. These salmonid habitats and native cutthroat trout habitats are identified in regulation (CDOW Regulations, Chapter 0, Appendices D, E, and F), and include most coldwater stream drainages in the state. Colorado also has regulations for disease-free certification for seven salmonid pathogens for imported fish and a policy requiring use of isolation/quarantine units while propagating native cutthroat trout stocks to decrease risk of transmitting salmonid pathogens.

Whirling disease infection was discovered in the Rio Grande between South Fork and Del Norte in1988, and in Beaver Creek and the Conejos River in 1994-1995. Since 1996, 75 fish samples have been collected for disease testing, research and monitoring on over 30 streams and lakes, including several segments of the Rio Grande, South Fork of the Rio Grande, and the Conejos Rivers. Whirling disease positive habitats are present in the Rio Grande from Rio Grande Reservoir to Monte Vista, in the South Fork Rio Grande from Big Meadows Reservoir downstream (including the Beaver Creek drainage), and in the Conejos River from Platoro Reservoir downstream. Trout populations in these stream and reservoirs are composed of rainbow, brook and brown trout. Fish samples collected from seven Rio Grande cutthroat waters since 1997 have all tested negative for whirling disease. It is important to note that these cutthroat trout waters contain Rio Grande cutthroat trout populations that are considered at risk and declining, but the declines are attributed to competition with brook and brown trout. Conversely, whirling disease positive trout stocked by a commercial fish hatchery at an isolated pond near Great Sand Dunes National Monument in April 1988 has not impacted a Rio Grande cutthroat trout population at nearby Medano Creek. Medano Creek was chemically reclaimed in 1988 to remove nonnative trout and was restocked with Rio Grande cutthroat trout. Although Medano Creek has not been tested for WD, the cutthroat trout population has demonstrated successful reproduction and recruitment annually for a decade, and is considered secure and expanding.

Competition between cutthroat trout and nonnative salmonids has been documented as a cause for declines in cutthroat trout populations (Griffith 1988, Peterson and Fausch 2002, Young 1995). Competition with and/or predation by introduced salmonid species can also be a contributing factor in the decline of some individual Rio Grande cutthroat populations and

putting their continued existence at risk. These adverse conditions can be resolved with appropriate chemical reclamation to remove the nonnative trout species' population and barrier re-construction as needed to isolate the reintroduced native cutthroat population from re-invasion. Due to potential illicit reintroduction on nonnative trout species into cutthroat waters, this threat must be dealt with on a case-by-case basis.

D. Absence of regulating mechanisms adequate to prevent decline of the species or degradation of its habitat:

Rio Grande cutthroat trout is not currently exhibiting a declining trend range-wide, and has been steadily improving in population distribution and abundance since the late 1980s. For example, the 1992 Rio Grande cutthroat trout management plan (CDOW 1992) listed 39 historic populations (i.e. conservation populations) in 184 stream miles, and 45 lake acres whereas the 2002 Rio Grande cutthroat trout status report (CDOW 2002) documented 77 conservation populations in 411 stream miles and 60 lake acres. In Colorado, the Division of Wildlife has placed the highest priority on protection of native cutthroat trout populations. The Division of Wildlife has implemented regulations consistent with its Statewide Fish Management Policy and Whirling Disease Policy. Native cutthroat trout populations are protected by state regulations concerning stocking restrictions, fishing closures, harvest and gear restrictions, stream barriers to fish passage, and disease control. These regulations prohibit the stocking of non-native salmonids in Rio Grande cutthroat trout populations, minimize their exposure to whirling disease infection and other diseases through stocking restrictions and rigorous disease testing of wild and hatchery salmonid populations. These approaches are considered to be effective in reducing the threats of hybridization with other salmonids, overharvest by angling, and disease. There is no evidence of a lack of adequate regulations contributing to a decline in any existing population in Colorado.

Threats to depletion of stream flow regimes are reduced through filing for minimum instream flow rights with the Colorado Water Conservation Board. As of December 2001, instream flows for 970 stream miles in 133 stream segments are protected by decree in the Rio Grande basin. Efforts are ongoing to identify all waters containing Rio Grande cutthroat populations that should have instream flow filings made to protect stream flows. Regulatory controls of water quality in Colorado are implemented by the Colorado Water Quality Control Division and Commission. Water quality standards are already in place to protect the maintenance of aquatic life in coldwater environments, and special resource restrictions are also available to provide further site-specific protection to water quality.

E. Other natural or manmade factors affecting continued existence of the species:

No other factors are recognized as actively contributing toward a documented decline in Rio Grande cutthroat trout across its range in Colorado.

DEFINITIONS

A. Geographic Management Unit:

The range of the Rio Grande cutthroat has been divided into 8 geographic management units (GMUs) to bring a finer level of resolution to descriptions of population and habitat distribution and related maintenance and restoration work. These GMUs reflect the common sense divisions of large areas based on river drainages (hydro-unit). They do not necessarily reflect important differences in genetic variability in the fish based in geography or other types of adaptation to specific environments.

B. Genetic Purity (CRCT Task Force 2001):

A+: A pure population with unique phenotypic, genetic or historical qualities that suggest special consideration and use for it in conservation planning.

A: A pure population with no evidence of hybridization with non-native salmonids.

A-: A population that is phenotypically representative but that has slight differences from the norm due to natural variation or human-caused movement of RGCT from other areas.

B+: A population where 5% of genetic markers or phenotypes indicate hybridization with non-native salmonids.

B: A population where 5% or more but less than 10% of genetic markers or phenotypes indicate hybridization with non-native salmonids.

C. Conservation Population:

A conservation population is a reproducing and recruiting population of RGCT that is managed to preserve the historical genome and/or unique genetic, ecological, and/or behavioral characteristics within specific populations and within geographic units. Populations are further defined by quantifying introgression. In general, a conservation population is at least 90% RGCT (≤10% introgression), but may be lower depending upon circumstances (UDWR 2000). These populations retain all of the phenotypic attributes associated with the subspecies. This definition includes situations where genetically pure individuals coexist with introgressed individuals or they occur as hybrid swarms.

Earlier categorizations of RGCT populations based on genetic purity relied on an A-D purity rating. During the transition between that system and the one outlined above,

populations that were rated B or better under the old system will be considered conservation populations.

D. Core Conservation Population:

A core conservation population is a conservation population that is >99% pure, phenotypically true, and representative of the historic genome of RGCT (UDWR 2000). Core populations contain RGCT that have not been impacted by genetic alteration linked to human intervention. These populations serve as the primary source of gametes for introductions and reintroductions through transplants, or for broodstock development. These populations should not receive genetic material from other population sources unless there is evidence that inbreeding depression, random genetic drift or other factors have put the population in jeopardy.

Earlier categorizations of RGCT populations based on genetic purity relied on an A-D purity rating. During the transition between that system and the one outlined above, populations that were rated A+, A, and A- under the old system will be considered core conservation populations.

E. Recreation Population:

A RGCT refugia population created through periodic stocking of genetically pure RGCT from wild or captive brood stocks (UDWR 2000). The primary management focus of a RGCT recreation population is on the sport fish benefits to the public.

F. "At Risk And Declining" Population:

A population which is impacted by limited habitat, habitat degradation or encroachment by non-native salmonids. Biomass is less than 20 lb/acre and population size is less than 500 individuals. Population statistics indicate a declining trend in biomass and density. Successful reproduction is inconsistent.

G. "At Risk And Stable" Population:

A self-sustaining population which is impacted by limited habitat, habitat degradation or encroachment by non-native salmonids. Population trends are not increasing or decreasing in biomass and density. Biomass estimate is greater than 20 lb/ac and population size is over 500 individuals. Successful reproduction observed in at least 2 years during a 5-year span.

H. "Secure and Stable" Population:

A self-sustaining population that is secure from impact of limited habitat, habitat degradation or encroachment by non-native salmonids. Population trends are not increasing or decreasing in biomass or density. Biomass estimate is greater than 20 lb/ac and population size is over 500 individuals. Successful reproduction is observed in at least 2 years during a 5-year period.

I. "Secure and Expanding" Population:

A self-sustaining population that is secure from impact of limited habitat, habitat degradation or encroachment by non-native trout. Population statistics indicate a trend of increasing biomass and density. Biomass estimate is greater than 20 lb/ac and population size is over 500 individuals. Successful reproduction is observed in at least 2 years during a 5-year period.

J. "Unknown" Population:

A population that we have limited knowledge of genetic classification, population status, and/or habitat condition.

K. Hybrid:

A hybrid is an individual fish, not a population, and is a fish that has cross-bred with other salmonids, commonly rainbow trout or other cutthroat trout subspecies. Populations containing hybrids offer genetic and ecological value to conservation efforts. The number of individuals and/or genes in a population that are hybrids can vary from population to population. The percentage of hybrid genes expressed in populations therefore, can be used as a relative measure of hybridization. This measure can be used as a component to assess the role of those populations in the conservation of the subspecies.

L. Introgression:

Introgression is reproduction between RGCT and other cutthroat trout subspecies (intraspecific) or other salmonid species (interspecific), and occurs in varying degrees among populations. Some introgressed populations may offer genetic, ecological, or behavioral attributes valuable to conservation efforts for RGCT. Measures of introgression are varied among research entities and governmental

management agencies. The following formula will be used to calculate percent introgression (UDWR 2000):

$$\%\text{introgression} = \frac{\text{(total number of nonnative alleles in sample)}}{\text{(total number of alleles per individual)} \times \text{(total number of individuals)}} \times 100$$

M. Metapopulation:

A collection of localized subpopulations that are geographically distinct yet are genetically interconnected through natural movement of individual fish between subpopulations.

N. Phenotype:

The physical manifestation of the interaction of an organism's genetic information with its environment which results in a unique physical, physiological or behavioral trait.

RGCT CONSERVATION STRATEGY

The primary goal of the Conservation Plan for Rio Grande cutthroat trout is

To assure the long term persistence of the RGCT subspecies throughout its historic range in Colorado by preserving its genetic integrity, reducing population fragmentation, and providing sufficient suitable habitat to support viable, self-sustaining populations.

The objective of the Conservation Plan for Rio Grande cutthroat trout is

To secure and maintain areas currently supporting RGCT conservation populations, and increase the distribution of RGCT where ecologically and economically feasible. Strive to restore and create 87 core and conservation populations in (375 miles) stream miles and 120 lake acres in 8 GMUs within the historic range. By 2015, restore 10 RGCT populations in occupied habitat and create 3 new populations in unoccupied habitat by chemical reclamation and reintroduction of genetically pure RGCT. Continue to manage 83 high lakes and streams by stocking genetically pure RGCT for angling recreation.

The RGCT conservation plan includes activities in four primary strategies:

Protect existing and restored ecosystems,
Population expansion,
Restore degraded ecosystems,
Planning and coordination.

Implementation of the action items associated with the strategies will be consistent with the stated goal and objective. Not all action items will be implemented for each population. Implementation of action items will be based on site specific conditions and are identified in the five year implementation schedule.

Strategy 1. Protect Existing and Restored Ecosystems

Action Item 1.1: Secure core conservation and conservation populations by constructing in channel barriers.

In channel barriers will be constructed downstream of existing populations which are at risk from invasion from non-native fish species or hybridized cutthroat populations.

Action Item 1.2: Prevent introduction of non-native fish species.

Enforce regulations that prohibit the stocking of hatchery reared fish and human movement of resident fish into RGCT habitat (CDOW regulations: Chapter 0, Article IX, #009.B) (Administrative directive W-6).

Action Item 1.3: Regulate angling and enforce regulations.

Populations of RGCT at risk from overharvest and excessive fishing mortality will be protected by appropriate fishing regulations. Fishing regulations will be enforced and monitored to ensure that their objectives are met.

Action Item 1.4: Prevent introduction of *Myxobolus cerebralis*.

Colorado Wildlife Commission policy D-9 prohibits stocking of Myxobolus cerebralis infected salmonid fish in protected habitats, which include RGCT waters and most salmonid habitats as defined by regulation (Chapter 0, #008.H; #009.G).

Action Item 1.5: Monitor RGCT populations to detect changes.

Monitor RGCT populations to measure cutthroat trout population statistics (biomass, density, and population size) to detect any changes in population trend.

Action Item 1.6: Monitor RGCT watershed conditions to detect changes.

Watersheds will be surveyed to detect changes in water quality, instream habitat, channel morphology, and riparian condition. Agency standardized procedures to monitor watershed conditions will be implemented.

Action Item 1.7: Implement interpretive and educational programs.

Develop an interpretation and education program addressing the values of conserving RGCT and the associated native community.

Action Item 1.8: Maintain and restore existing RGCT core and conservation populations.

Where feasible, at risk RGCT core and conservation populations will be secured by constructing a fish movement barrier, chemically reclaimed to remove nonnative salmonids, and restocked with genetically pure RGCT.

Strategy 2. Population Expansion

Action Item 2.1: Identify potential reintroduction sites within RGCT historic range.

Develop a list of potential reintroduction sites, and identify those sites that have the greatest potential for establishing metapopulations. Habitat suitability, complexity of fish removal, political and social implications will be considered when selecting potential reintroduction sites. The translocation model developed by Harig and Fausch (2002) will be used as a tool to help select and prioritize RGCT reintroduction sites. This information will be used to establish the long-term conservation goal in terms of populations and habitat area.

Action Item 2.2: Secure reintroduction sites.

Ecosystems selected for RGCT reintroduction will be secured from upstream movement of non-native fish and from instream, riparian and watershed degradation. Cooperative management agreements with public agencies and private organizations or individuals that have an interest in RGCT will be developed to ensure the long-term safety of the restored ecosystem.

Action Item 2.3: Remove non-native fish species.

In ecosystems selected for RGCT restoration, non-native fish will be removed using standard operating procedures for either rotenone or antimycin. Physical removal of nonnative fish species by electrofishing will be used in areas where chemical reclamation is not feasible.

Action Item 2.4: Re-establish connectivity between core populations in pursuit of a metapopulation status.

Where feasible, remove barriers to connect core conservation populations to create a metapopulation.

Action Item 2.5: Stock restoration sites with genetically pure Rio Grande cutthroat.

Restored ecosystems will be stocked with RGCT determined to be genetically pure using a complete suite of assessment techniques. Fish will be stocked either by transplant of juvenile and /or adult fish from a donor water, or stocked from hatchery source. Introduced populations will be considered restored when natural recruitment has sustained them for ten years.

Action Item 2.6: Consider reintroduction of other Rio Grande native fish species.

Where habitat is appropriate and suitable, recreate the native fish assemblage by stocking Rio Grande sucker (*Catostomus plebeius*) and Rio Grande chub (*Gila pandora*).

Action Item 2.7: Develop and maintain feral and captive RGCT brood stocks.

Maintain genetic diversity of Haypress Lake feral broodstock by periodically transplanting pure RGCT from designated wild populations. Annually collect eggs to augment captive broodstock at Pitkin Hatchery. Maintain disease certification by annual fish health inspection.

Action Item 2.8: Stock genetically pure RGCT in wilderness lakes and streams.

Continue to stock genetically pure RGCT fingerlings into wilderness lakes and streams to provide recreational fishing opportunity for the native cutthroat trout.

Strategy 3. Restore Degraded Habitat

Action Item 3.1: Improve RGCT watershed conditions.

Rio Grande cutthroat trout habitat requirements will be considered on watersheds inhabited by RGCT or designated for RGCT restoration. Coordinate with responsible land management agencies to implement existing standards and guidelines for watershed management in RGCT ecosystems (USDA Forest Service 1996, USDI Bureau of Land Management 1997). Work in cooperation with land management agencies and private land owners to develop plans to mitigate adverse impacts of watershed activities on water quality, instream habitat, channel morphology, and riparian areas.

Action Item 3.2: Improve RGCT lake and stream habitats.

Habitat improvement techniques will be used where appropriate to provide missing habitat components or improve existing ones. These techniques include constructing instream structures to improve pool riffle ratio, streambank stabilization, riparian management, instream cover, and spawning gravel enhancement.

Action Item 3.3: Acquire instream flow rights and conservation pools where needed.

Apply for minimum stream flow rights through Colorado Water Conservation Board. Negotiate conservation pool agreements to maintain static lake levels. Support the Rio Grande National Forest efforts to implement and enforce Forest Reserve Water Rights. Pursue where possible, purchase of water rights to secure adequate stream flows.

Strategy 4. Planning and Coordination

Action Item 4.1: Identify existing populations and suitable habitat.

Continue inventory of potential RGCT waters until all remnant populations and potential habitat have been identified. Collect population, genetic and habitat information on all RGCT populations within the historic range of RGCT.

Action Item 4.2: Complete genetic analyses on known or potential RGCT populations.

The genetic status of all known or potential RGCT populations will be assessed using the most effective genetic identification techniques.

Action Item 4.3: Identify Core Conservation, Conservation and Recreation populations.

Describe RGCT populations based on conservation status, level of introgression, population size and unique characteristics.

Action Item 4.4: Develop and maintain a RGCT database.

Develop and maintain a database that contains RGCT population data including, genetic, habitat, and inventory information.

Action Item 4.5: Provide an annual summary of conservation activities to RGCT Conservation Team.

At annual meetings of the RGCT Conservation Team, present a summary report of RGCT conservation activities.

Action Item 4.6: Develop a RGCT brood stock management plan.

Develop guidelines to manage feral and hatchery brood fish operations to optimize genetic diversity.

Action Item 4.7: Prepare interagency conservation plans.

Prepare conservation plans with USFS, NPS, and BLM that outline strategies for watershed management, population protection and enhancement. Roles, responsibilities and commitments from the responsible agencies will be outlined in the plans.

Action Item 4.8: Evaluate and monitor land management decisions.

Review and evaluate all land management decisions that could impact RGCT populations including timber management, livestock grazing management, road construction, and mineral development and water diversions.

Action Item 4.9: Cooperative interstate RGCT conservation effort.

Establish interstate, rangewide cooperative management strategies to conserve and restore RGCT populations (CDOW et.al. 2003).

RGCT CONSERVATION PLAN: FIVE-YEAR IMPLEMENTATION SCHEDULE

***Protection Activities*:**

Alamosa-Trinchera GMU:

1. Coordinate with landowners to secure RGCT populations by constructing fish movement barriers on Jaroso Creek, Torcido Creek, Alamosito Creek, and Vallejos Creek.
2. Monitor populations in 25 streams and 3 lakes.
3. Remove brook trout by electrofishing in West Indian Creek, and Placer Creek watersheds.

Canadian River Headwaters GMU:

1. Monitor RGCT population in Ricardo Creek.

Conejos River GMU:

1. Secure Lake Fork Conejos River by repairing fish movement barrier.
2. Monitor populations in Cascade Creek, Osier Creek and Rio De Los Pinos #2.

Rio Chama GMU:

1. Monitor population at Nabor Creek, Native Lake, and Wolf Creek.

Rio Grande Headwaters GMU:

1. Monitor RGCT populations in Pass Creek, West Bellows Creek, West Alder Creek and Haypress Lake.
2. Remove brook trout from Haypress Lake by trap net during fall spawn run.

Saguache Creek GMU:

1. Secure North Carnero Creek with a fish movement barrier.
2. Monitor populations in 15 streams.

San Luis Creek GMU:

1. Monitor populations in Medano Creek, Hudson Branch Medano Creek and Little Medano Creek.

Upper Rio Grande GMU:

1. Monitor populations in East Costilla Creek, West Costilla Creek and Glacier Lake.

***Population Expansion Activities**:*

Alamosa-Trinchera GMU:

1. Restore Trinchera Creek watershed (Trinchera Creek, North Trinchera Creek, South Trinchera Creek and Deep Canyon) by chemical reclamation.
2. Transplant from donor stream or stock genetically pure RGCT to Cat Creek.
3. Continue aerial plants and pack plants to high lakes and streams for fishing recreation.

Conejos River GMU:

1. Restore Lake Fork Conejos River watershed (Lake Fork Conejos River, Big Lake, Rock Lake) by chemical reclamation.
2. Continue aerial plants and pack plants to high lakes and streams for fishing recreation.

Rio Grande Headwaters GMU:

1. Continue annual spawntake and disease evaluation at Haypress Lake.
2. Continue aerial plants and pack plants to high lakes and streams for fishing recreation.

Saguache Creek GMU:

1. Restore Big Springs Creek by chemical reclamation.
2. Continue aerial plants and pack plants to high lakes and streams for fishing recreation.

San Luis Creek GMU:

1. Continue aerial plants to high lakes for fishing recreation.

Restore Degraded Habitat

Alamosa-Trinchera GMU:

1. Work with landowners to protect riparian habitat from adverse impacts of timber and livestock grazing activities.

Conejos River GMU:

1. Coordinate with USFS to protect and improve riparian habitat on RGCT streams.
2. Coordinate with Lake Fork Ranch owner to construct dam and spillway on Lake Fork Conejos River.

Rio Chama GMU:

1. Coordinate with USFS to protect Wolf Creek watershed from adverse impacts of timber harvest activity.

Rio Grande Headwaters GMU:

1. Install aeration system at Haypress Lake to prevent summer or winter kill.
2. Coordinate with landowners to install coanda screen and new diversion structure on Roaring Creek to eliminate movement of brook trout to Haypress Lake.
3. Maintain spawning channel at Haypress Lake.

Saguache Creek GMU:

1. Coordinate with landowners and land management agencies to protect riparian habitat on RGCT streams from impacts of livestock grazing activities.

San Luis Creek GMU:

1. Install new diversion structures on Medano Creek that are equipped with coanda wire screens to prevent emigration of RGCT via irrigation ditches.
2. Support efforts to purchase water rights to maintain suitable flows on Medano Creek.

Planning and Coordination Activities:

Alamosa-Trinchera GMU:

1. Evaluate potential to restore Ute Creek and Placer Creek watersheds.
2. Complete genetic evaluation for 20 populations (Alamosito Creek, Cuates Creek, North Fork Culebra Creek, Deep Canyon, Jaroso Creek, Jim Creek, Rhodes Gulch, Rough Canyon, San Francisco Creek, Middle Fork San Francisco Creek, Torcido Creek, North Fork Trinchera Creek, South Fork Trinchera Creek, Little Ute Creek, Vallejos Creek #2, North Fork Vallejos Creek, West Indian Creek, North Fork West Indian Creek, South Fork West Indian Creek, Willow Creek).
3. Inventory potential RGCT waters: San Francisco Creek, El Fragoso Creek, Bernardino Creek and El Perdido Creek.

Canadian River Headwaters GMU:

1. Evaluate potential to restore Ricardo Creek with NMGF and landowners.
2. Complete genetic evaluation for Ricardo Creek cutthroat.
3. Inventory potential RGCT waters: Fish Creek and Little Vermejo Creek.

Conejos River GMU:

1. Evaluate Elk Creek and Canon Verde watersheds for potential as a restoration sites.
2. Complete genetic evaluation for Cascade Creek, Osier Creek and Canon Verde.

Rio Chama GMU:

1. Inventory Rio Chamita and Sexto Creek.
2. Complete genetic evaluation for Rio Chamita and Sexto Creek, if necessary.
3. Evaluate potential to restore Rio Chamita watershed with NMGF and Diamond S Ranch.
4. Evaluate potential to restore and expand range of RGCT on Wolf Creek with NMGF and landowners.

Rio Grande Headwaters GMU:

1. Complete genetic evaluations for West Alder Creek, West Bellows Creek, and Pass Creek.
2. Evaluate potential to restore Ivy Creek, Little Squaw Creek, Miners Creek, Quartzite Creek and West Bellows Creek.

Saguache Creek GMU:

1. Complete genetic evaluations for Carnero Creek, Deep Creek, East Middle Creek, Miners Creek, Whale Creek, Wannamaker Creek, and Tuttle Creek.
2. Evaluate potential to restore La Garita Creek watershed.

San Luis Creek GMU:

1. Complete genetic evaluation for Medano Creek, Little Medano Creek and Hudson Branch of Medano Creek.
2. Evaluate potential to restore Sand Creek, Major Creek and Garner Creek watersheds.

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APPENDIX I

INFORMATION ABOUT RIO GRANDE CUTTHROAT TROUT POPULATIONS

KEY TO TABLES

Conservation Population:

A conservation population is a reproducing and recruiting population of RGCT that is managed to preserve the historical genome and/or unique genetic, ecological, and/or behavioral characteristics within specific populations and within geographic units. Populations are further defined by quantifying introgression. In general, a conservation population is at least 90% RGCT (≤10% introgression), but may be lower depending upon circumstances. These populations retain all of the phenotypic attributes associated with the subspecies. This definition includes situations where genetically pure individuals coexist with introgressed individuals or they occur as hybrid swarms.

Earlier categorizations of RGCT populations based on genetic purity relied on an A-D purity rating. During the transition between that system and the one outlined above, populations that were rated B or better under the old system will be considered conservation populations.

Core Conservation Population:

A core conservation population is a conservation population that is >99% pure, phenotypically true, and representative of the historic genome of RGCT. Core populations contain RGCT that have not been impacted by genetic alteration linked to human intervention. These populations serve as the primary source of gametes for introductions and reintroductions through transplants, or for broodstock development. These populations should not receive genetic material from other population sources unless there is evidence that inbreeding depression, random genetic drift or other factors have put the population in jeopardy.

Earlier categorizations of RGCT populations based on genetic purity relied on an A-D purity rating. During the transition between that system and the one outlined above, populations that were rated A+, A, and A- under the old system will be considered core conservation populations.

Recreation Population:

A RGCT refugia population created through periodic stocking of genetically pure RGCT from wild or captive brood stocks. The primary management focus of a RGCT recreation population is on the sport fish benefits to the public.

Unknown Population:

A cutthroat trout population that we have limited knowledge of genetic classification, population status, and/or habitat condition.

"At Risk And Declining" Population:

A population which is impacted by limited habitat, habitat degradation or encroachment by non-native salmonids. Biomass is less than 20 lb/acre and population size is less than 500 individuals. Population statistics indicate a declining trend in biomass and density. Successful reproduction is inconsistent.

"At Risk And Stable" Population:

A self-sustaining population which is impacted by limited habitat, habitat degradation or encroachment by non-native salmonids. Population trends are not increasing or decreasing in biomass and density. Biomass estimate is greater than 20 lb/ac and population size is over 500 individuals. Successful reproduction observed in at least 2 years during a 5-year span.

"Secure and Stable" Population:

A self-sustaining population that is secure from impact of limited habitat, habitat degradation or encroachment by non-native salmonids. Population trends are not increasing or decreasing in biomass or density. Biomass estimate is greater than 20 lb/ac and population size is over 500 individuals. Successful reproduction is observed in at least 2 years during a 5-year period.

"Secure and Expanding" Population:

A self-sustaining population that is secure from impact of limited habitat, habitat degradation or encroachment by non-native trout. Population statistics indicate a trend of increasing biomass and density. Biomass estimate is greater than 20 lb/ac and population size is over 500 individuals. Successful reproduction is observed in at least 2 years during a 5-year period.

Purity = Genetic Purity

A = Pure
A- = Pure, but slightly different from norm
B+ = Essentially pure (<5% of characters indicate hybridization)
B = Slight hybridization (5-10% of characters indicate hybridization)
C = Some hybridization (15-20% of characters indicate hybridization)
D = Distinct hybridization
U = Unknown Purity

Adult Population = Numbers of fish greater than 4.7 inches (120 mm) in length.

Barrier = Type of barrier to fish movement
0 = None Apparent
1 = Constructed Barrier, Road Culvert, Water Diversion
2 = Chemical/Temperature/Biological Barrier
3 = Gradient/Velocity Barrier to Fish Migration
4 = Natural, Single Point Barrier
5 = Natural, Multiple Site Barrier
6 = No Information

Other Salmonids = What other salmonids are present?
NONE = none present
NO INFO = no information provided
RBT = rainbow trout
BKT = brook trout
BNT = brown trout
YSC = Yellowstone cutthroat trout
SRC = Snake River cutthroat trout
CSC = Colorado River cutthroat trout
PPC = Greenback x Yellowstone cutthroat trout
SPL = Splake (Lake trout x Brook trout)

Table 2. Summary Report: Rio Grande Cutthroat Trout Genetic Analysis.

Sub-Basin	Water Name	Water Code	Sample Rating	Analysis Type	Geneticist	Year Sampled	Genetics Remarks	Mi	Ac
Alamosa-Trinchera	Alamosito Creek	38248	A	M	O	1979	CDOW Blue Book	6.4	
			A	M	O	1984	CDOW Blue Book	6.4	
Alamosa-Trinchera	Cat Creek	44242	A-	M	P	1998	Typical of RGCT, no evidence of PPC or YSC	6.2	
			A-	DM	P	1998	Most likely pure RGCT that has been isolated	6.2	
Alamosa-Trinchera	Cat Creek, North Fork	49418	A-				Purity rating based on Cat Creek rating	3.6	
Alamosa-Trinchera	Cat Creek, South Fork	49420	A-				Purity rating based on Cat Creek analysis	4.0	
Alamosa-Trinchera	Cuates Creek	38141	A	M	O	1979	CDOW Blue Book, typical RGCT	4.6	
Alamosa-Trinchera	Culebra Creek, North Fork	39493	A-	M	O	1979	CDOW blue book	11.0	
Alamosa-Trinchera	Deep Canyon	38350					Transplant from West Indian Creek (A)	3.3	
Alamosa-Trinchera	Grayback Creek	38459	A				Purity based on Placer Creek rating (JEA-61). Sample submitted to Leary 2001.	3.5	
Alamosa-Trinchera	Jaroso Creek	48066	A	M	P	1997		5.8	
			A	DM	P	1997		5.8	
Alamosa-Trinchera	Jim Creek	44254	A				Transplant from West Indian Creek, Jaroso Creek and Torcido Creek (A).	6.1	
Alamosa-Trinchera	Jim Creek, South Fork	43408	A				Purity based on Jim Creek rating.	2.0	
Alamosa-Trinchera	Placer Creek	44711	B	M	O	1978	Langlois and Zuckerman 1981	5.2	
			A	E	L	1987		5.2	
			A-	M	P	1994		5.2	
			A	DM	P	1994		5.2	
			A	E	L	2001	JEA-61 Pure RGCT	5.2	
Alamosa-Trinchera	Placer Creek, Middle Fork	49305	A	E	L	2001	JEA-58 Pure RGCT	4.8	
Alamosa-Trinchera	Placer Creek, South Fork	49292	A	E	L	2001	JEA-59 Pure RGCT	4.7	
Alamosa-Trinchera	Rhodes Gulch	43840	A				Transplant from Lake Fork Conejos (A)	3.4	
Alamosa-Trinchera	Rough Canyon	39691	A				Transplant from West Indian Creek, Placer Creek and Osier Creek (A)	1.0	
Alamosa-Trinchera	San Francisco Creek	42870	A				Transplant from West Indian Creek, Placer Creek, Torcido Creek, LF Conejos (A)	9.0	
Alamosa-Trinchera	San Francisco Creek, MF	44850	A				Transplant from LF Conejos, Torcido Creek, W Indian Creek	5.8	
Alamosa-Trinchera	San Francisco Lake, UW	93283	A				Stocked with RGCT broodstock progeny		4.2
Alamosa-Trinchera	Sangre De Cristo Creek	42882	A	M	O	1934	CDOW RGCT files	17.0	

Sub-Basin	Water Name	Water Code	Sample Rating	Analysis Type	Geneticist	Year Sampled	Genetics Remarks	Mi	Ac
Alamosa-Trinchera	Sangre De Cristo Creek	42882	B+	M	O	1984	Nankervis 1983, hybrid w/RBT	17.0	
			A	DM	P	1994		17.0	
			A	M	P	1994		17.0	
			A	E	L	2001	JEA-64 pure RGCT	17.0	
Alamosa-Trinchera	Torcido Creek	38137	A	M	O	1979	CDOW Blue Book	5.9	
			A	M	O	1984	CDOW Blue Book	5.9	
			A-	M	P	1996	Downgrade: lack of BT in 2 specimens	5.9	
			A	DM	P	1996		5.9	
Alamosa-Trinchera	Torsido Creek	43668	A				Transplant from W Indian Creek, Torcido Creek	4.1	
Alamosa-Trinchera	Trinchera Creek #2	43719	A-	M	O	1984	CDOW Blue Book, SP downgrade, transplant from W Indian Creek	6.3	
Alamosa-Trinchera	Trinchera Creek, NF	48670	A	M	O	1984	CDOW Blue Book, transplant from W Indian Creek (A)	7.7	
Alamosa-Trinchera	Trinchera Creek, SF	48682	A				Transplant from West Indian Creek (A)	9.3	
Alamosa-Trinchera	Ute Creek	37951	A	M	O	1853	Girard (1856) described RGCT from these specimens collected on Ute Creek.	12.6	
Alamosa-Trinchera	Ute Creek, Little	49379	A	DM			Transplant from Placer and W Indian Creeks (A)	2.6	
Alamosa-Trinchera	Ute Lake, Little, Lower	97659	A				Transplant from Placer Creek and W Indian Creek		3
Alamosa-Trinchera	Ute Lake, Little, Upper	97647	A				Transplant from Placer Creek and W Indian Creek		2
Alamosa-Trinchera	Vallejos Creek #2	38143	A	M	O	1984	CDOW Blue Book	3.0	
Alamosa-Trinchera	Vallejos Creek, NF	48078						7.0	
			A	M	O	1979	CDOW Blue Book	7.0	
Alamosa-Trinchera	Wagon Creek	44456	A	E	L	2001	JEA-54 pure RGCT	11.5	
Alamosa-Trinchera	West Indian Creek	44709	A	M	B	1958	Behnke 1967	6.4	
			A	E	L	1987		6.4	
			A	DM	P	1994	Proebstel and Ellis, baseline for pure RGCT	6.4	
			A	M	P	1994		6.4	
Alamosa-Trinchera	West Indian Creek, NF	39528	A				Purity based on West Indian Creek rating.	3.0	
Alamosa-Trinchera	West Indian Creek, SF	39530	A				Purity based on West Indian Creek rating.	6.0	
Alamosa-Trinchera	Willow Creek	39831	A				No taxonomic analysis available. Isolated and secure. No stocking records for this stream. Phenotype is characteristic of other pure RGCT in this drainage. At this time considered "A".	8.0	
Canadian River	Fish Creek	29785	U					3.5	
Canadian River	Little Vermejo River	38145	U					6.0	

Sub-Basin	Water Name	Water Code	Sample Rating	Analysis Type	Geneticist	Year Sampled	Genetics Remarks	Mi	Ac
Canadian River	Ricardo Creek	30635	B+	M	B	1975	11 lack BT, possible hybrid w/RBT	6.0	
			A	M	P	1996		6.0	
			A	DM	P	1996	Rare RGCT haplotypes	6.0	
Conejos River	Big Lake	88585	A				Transplant from W Indian Creek		11.9
Conejos River	Canyon Verde	38756	B	M	O	1982	CDOW Report 1982. Appear to be YSN. Considerable variation in spotting.	4.0	
Conejos River	Cascade Creek	40147	A	M	O	1980	Langlois and Zuckerman, 1981	2.5	
			A-	M	O	1982	Harrison, 1983, CDOW bluebook, PC	2.5	
Conejos River	Conejos River, Lake Fork	39289	A				Transplanted from West Indian Creek (A)	4.1	
								4.1	
Conejos River	Osier Creek	44444	A	M	O	1979	Zuckerman and Langlois, 1980	2.6	
			A	M	O	1982	Harrison, 1983	2.6	
			A	M	P	1994	Proebstel and Ellis, 1996	2.6	
			A	DM	P	1994	Proebstel and Ellis, 1996	2.6	
Conejos River	Rio De Los Pinos #2	42189	A				Transplant from West Indian Creek (A)	1.6	
Conejos River	Rock Lake	96417	A				Transplant from West Indian Creek		5
Rio Chama	Nabor Creek	43648	A				Transplant from W Indian Cr (A)	2.3	
			C	M	O	1981	Behnke, 1981, prior to chemical reclamation	2.3	
Rio Chama	Native Lake	97661	A				Transplant from Nabor Creek		5
Rio Chama	Rio Chamita	43864	B+	M	O	1985	CDOW Blue Book, BT downgrade, possible hybrid w/RBT	4.0	
Rio Chama	Sexto Creek	43965	B	M	O	1985	DOW Blue Book, CDOW 1986 Report	3.5	
Rio Chama	Wolf Creek	42343	B	M	O	1981	Wagner 1981	0.9	
			A	M	O	1982	Harrison 1983, CDOW Blue Book	0.9	
			A-	M	O	1986	CDOW Blue Book	0.9	
			A	E	L	2001	JEA-55 pure RGCT	0.9	
Rio Grande	Alder Creek, West	47755	B	M	O	1982	CDOW Blue Book	8.2	
Rio Grande	Bellows Creek, West Fork	38376	C	M	P	1998	Hybridization with Yellowstone cutthroat and rainbow trout	7.3	
			C	DM	P	1998	Hybridization with rainbow trout	7.3	
Rio Grande	Haypress Lake	90388	A	DN	L	2000	PINES Analysis		25.9
			A	E	L	2000			25.9
Rio Grande	Pass Creek	42010	B+	M	O	1982	Harrison, 1983. PC, SP downgrade, hybrid	9.1	
Rio Grande	Pass Creek, West Fork	47440	A	E	L	2000	Hatchery/Haypress Lk brood stock	1.0	

Sub-Basin	Water Name	Water Code	Sample Rating	Analysis Type	Geneticist	Year Sampled	Genetics Remarks	Mi	Ac
Saguache Creek	Carnero Creek	38770	B	NI			Purity based on values from South Fork Carnero Creek. Need genetic evaluation.	8.3	
Saguache Creek	Carnero Creek, MF	38782	B+	DM	P	1997		9.8	
			A-	M	P	1997	Judged to be "good" RGCT	9.8	
			A	E	L	2002	JEA-72 (9/12/02) Leary Report (9/24/03) :" Non-hybridized Rio Grande cutthroat	9.8	
Saguache Creek	Carnero Creek, NF	38794	B	M	O	1984	CDOW Blue Book	8.4	
			A	DM	P	1996	TYPICAL FOR RGCT IN CO	8.4	
			A-	M	P	1996	Judged to be essentially pure RGCT	8.4	
			A	E	L	2002	JEA-70 (8/26/02). Leary Report (9/24/03): "Non-hybridized Rio Grande cutthroat trout	8.4	
Saguache Creek	Carnero Creek, SF	38807	B	M	O	1978	Langlois and Zuckerman, 1981, hybrid w/RBT, phenotypically good	13.8	
			C	M	O	1981	Wagner, 1981, CDOW Blue Book, hybrid w/RBT, phenotypically good	13.8	
			C	M	O	1982	Harrison, 1983, CDOW Blue Book, hybrid w/RBT, phenotypically good	13.8	
			B	M	O	1984	CDOW Blue Book, hybrid w/RBT, phenotypically good	13.8	
			B+	M	P	1998	Meristics indicators depict this population as RGCT w/RBT influence	13.8	
			B+	DM	P	1998	Good RGCT, but only 90% pure	13.8	
			A	E	L	2002	JEA-71 (9/12/02). Leary Report (9/24/03) : "Non-hybridized Rio Grande cutthroat trout	13.8	
Saguache Creek	Cave Creek	38871	A-	M	O	1984	CDOW Blue Book, sample size too small, PC and SP downgrade.	6.1	
			A	E	L	2001	JEA-63 Pure RGCT	6.1	
Saguache Creek	Cross Creek	38581	A	DN	L	2000	PINE analysis	5.0	
			A	E	L	2000	Allozymes, pure RGCT	5.0	
Saguache Creek	Deep Creek	42432	U	NI				5.2	
Saguache Creek	East Pass Creek	42022	A	DM	P	1997	JEA-43 (11/7/97)	7.7	
			A	M	P	1997	JEA-43 (11/7/97)	7.7	
			A	E	L	2002	JEA-75 (10/7/02). Leary Report (9/24/03): "Non-hybridized Rio Grande cutthroat trout	7.7	
Saguache Creek	Jacks Creek	38579						8.9	
			A	E	L	2000	Allozymes	8.9	
Saguache Creek	Middle Creek, East	41587	A				Transplant from Osier Creek and Placer Creek (A)	3.2	
			D	M	O	1982	Harrison,1983	3.2	
Saguache Creek	Miners Creek	44432	A	M	P	1998		4.3	

Sub-Basin	Water Name	Water Code	Sample Rating	Analysis Type	Geneticist	Year Sampled	Genetics Remarks	Mi	Ac
Saguache Creek	Miners Creek	44432	A	DM	P	1998		4.3	
			A	DN	P	1998		4.3	
Saguache Creek	Prong Creek	38271	A	E	L	2001	JEA-65 Pure RGCT	3.6	
Saguache Creek	Tuttle Creek	45890	A	M	P			6.9	
			A	DM	P	1996		6.9	
Saguache Creek	Unknown Creek	48042	A				Transplant from Osier Creek (A)	3.1	
Saguache Creek	Wannamaker Creek	43935	B+	M	O	1981	Wagner 1981, BT & PC downgrade, RBT hybrids	6.8	
			B	M	O	1982	Harrison 1983, PC & SP downgrade, RBT	6.8	
			B+	M	O	1983	CDOW Blue Book, SP downgrade, RBT hybrids	6.8	
Saguache Creek	Whale Creek	42420	B-	M	O	1981	Wagner 1981, SP & PC downgrade, RBT hybrids	5.0	
San Luis Creek	Medano Creek	41501	A				Transplant from Osier Creek, Placer Creek, West Indian Creek (A)	13.0	
San Luis Creek	Medano Creek, Hudson Br	39590	A				Transplant from Osier Creek, Placer Creek, West Indian Creek (A)	3.0	
San Luis Creek	Medano Creek, Little	48143	A				Transplant from Placer Creek (A)	5.5	
San Luis Creek	Medano Lake	93512	A	E	L	2000	Stocked with RGCT brood stock progeny		2.7
Upper Rio Grande	Costilla Creek, East Fork	39390	A	E	O	1997	Keeler-Foster/NMSU	2.3	
			A	E	L	2000	Pure RGCT planted following chemical reclamation in 2002. RGCT from CDOW brood stock that Leary determined were pure.	2.3	
Upper Rio Grande	Costilla Creek, West Fork	33890	B+	E	O	1997	Keeler-Foster/NMSU. 2% introgression or about 98% pure.	1.4	
			A	E	L	2000	Stocked with pure RGCT from CDOW brood stock. Leary determined the brood stock was	1.4	
Upper Rio Grande	Glacier Lake	88291	A	E	L	2000	Stocked from hatchery/Haypress lake RGCT brood fish after chemical restoration in 2002. Leary determined brood stock was pure RGCT.		6.5

Purity Codes

A,Pure; A-,Pure but mixed w/other pure RGCT Pop.; B+,Essentially Pure; B,Slightly Hybridized; C,Some Hybridization; D,Distinct Hybridization; U,Unknown

Genetics Techniques Codes

DM,DNA Mitochondrial; DN,DNA Nuclear; E,Electrophoretic; M,Meristic; P,Phenotype; OT,Other

Genetics Analyst Codes

B,Behnke; S,Shizoawa; L,Leary; P,Proebstel; W,Williams; E,Evans; O,Other

Table 3. Summary Report: Rio Grande cutthroat trout Core Conservation and Conservation Populations.

Sub-Basin	Water Name	Purity	Miles/Acres	Adult Pop	Barrier	Other Salmonids
Alamosa-Trinchera						
Core						
	Alamosito Creek	A	6.4	627	0	NONE
	Cat Creek	A-	6.2	3224	1	NONE
	Cat Creek, North Fork	A-	3.6		1	NONE
	Cat Creek, South Fork	A-	4.0		1	NONE
	Cuates Creek	A	4.6	1168	1	NONE
	Culebra Creek, North Fork	A-	11.0	462	0	BNT, BKT, RBT
	Deep Canyon	A	3.3	429	1	BKT
	Grayback Creek	A	3.5	2475	1	BKT
	Jaroso Creek	A	5.8	4211	1	NONE
	Jim Creek	A	6.1	1500	1	BKT
	Jim Creek, South Fork	A	2.0		1	NO INFO
	Placer Creek	A	5.2	2226	1	BKT
	Placer Creek, Middle Fork	A	4.8	3379	1	BKT
	Placer Creek, South Fork	A	4.7	3412	1	BKT
	Rhodes Gulch	A	3.4	690	4	NONE
	Rough Canyon	A	1.0	219	2	NONE
	San Francisco Creek	A	9.0	4176	1	NONE
	San Francisco Creek, Middle Fork	A	5.8	592	1	NONE
	San Francisco Lake, Upper West	A	4.2		6	NONE
	Sangre De Cristo Creek	A	17.0	3621	1	BKT
	Torcido Creek	A-	5.9	6856	1	NONE
	Torsido Creek	A	4.1	33	1	BKT
	Trinchera Creek #2	A-	6.3	1827	1	BNT,BKT, RBT
	Trinchera Creek, North Fork	A	7.7	1324	1	BKT
	Trinchera Creek, South Fork	A	9.3	800	1	BKT
	Ute Creek	A	12.6	983	0	BKT, RBT
	Ute Creek, Little	A	2.6	304	5	NONE
	Ute Lake, Little, Lower	A	3		4	NONE
	Ute Lake, Little, Upper	A	2		4	NONE
	Vallejos Creek #2	A	3.0	960	0	BNT
	Vallejos Creek, North Fork	A	7.0	1645	0	BNT
	Wagon Creek	A	11.5	5796	1	BKT
	West Indian Creek	A	6.4	1299	1	BKT
	West Indian Creek, North Fork	A	3.0	1000	1	BKT
	West Indian Creek, South Fork	A	6.0	1000	1	BKT
	Willow Creek	A	8.0	208	1	NONE

Sub-Basin	Water Name	Purity	Miles/Acres	Adult Pop	Barrier	Other Salmonids
Canadian River Headwaters						
Core						
	Ricardo Creek	A	6.0	180	1	BKT
	Unknown					
	Fish Creek	U	3.5		6	NO INFO
	Little Vermejo River	U	6.0		6	NO INFO
Conejos River						
Conservation						
	Canyon Verde	B	4.0		5	RBT, YSC
Conejos River						
Core						
	Big Lake	A	11.9		1	BKT, BNT
	Cascade Creek	A-	2.5	2875	4	NONE
	Conejos River, Lake Fork	A	4.1	271	1	BNT, BKT
	Osier Creek	A	2.6	3838	1	NONE
	Rio De Los Pinos #2	A	1.6	242	5	NONE
	Rock Lake	A	5		0	BKT, BNT
Rio Chama						
Conservation						
	Rio Chamita	B+	4.0	424	0	BNT
	Sexto Creek	B	3.5		0	BNT, RBT, CRC
Rio Chama						
Core						
	Nabor Creek	A	2.3	2323	1	NONE
	Native Lake	A	5	100	6	NONE
	Wolf Creek	A	2.7	2381	1	NONE
Rio Grande Headwaters						
Conservation						
	Alder Creek, West	B	8.2	1246	0	BKT
	Bellows Creek, West Fork	C	7.3		0	BNT, BKT
	Pass Creek	B+	9.1	801	0	BKT, RBT
Rio Grande Headwaters						
Core						
	Haypress Lake	A	25.9	1000	0	BKT
	Pass Creek, West Fork	A	1.0	236	0	BKT

Sub-Basin	Water Name	Purity	Miles/Acres	Adult Pop	Barrier	Other Salmonids
Saguache Creek						
Conservation						
	Carnero Creek	B	8.3	465	1	BNT
	Carnero Creek, Middle Fork	B+	9.8	1215	1	NONE
	Carnero Creek, South Fork	B+	13.8	26123	1	BKT
	Wannamaker Creek	B+	6.8	75	0	BKT
	Whale Creek	B-	5.0	315	0	BKT
Saguache Creek						
Core						
	Carnero Creek, North Fork	A	8.4	2159	1	BNT
	Cave Creek	A	6.1	397	1	BKT, BNT
	Cross Creek	A	5.0	3310	1	NONE
	East Pass Creek	A	7.7	1656	1	NONE
	Jacks Creek	A	8.9	1104	1	BKT
	Middle Creek, East	A	3.2	646	5	NONE
	Miners Creek	A	4.3	933	5	BKT
	Prong Creek	A	3.6	475	1	BKT
	Tuttle Creek	A	6.9	1546	1	BKT
	Unknown Creek	A	3.1	47	3	NONE
Saguache Creek						
Unknown						
	Deep Creek	U	5.2	165	0	BKT
San Luis Creek						
Core						
	Medano Creek	A	13.0	24544	4	NONE
	Medano Creek, Hudson Branch	A	3.0	1626	1	NONE
	Medano Creek, Little	A	5.5	154	5	NONE
	Medano Lake	A	2.7		6	NONE
Upper Rio Grande						
Core						
	Costilla Creek, East Fork	A	2.3		1	NONE
	Costilla Creek, West Fork	A	1.4		1	NONE
	Glacier Lake	A	6.5		0	NONE

Table 4. Summary Report: Rio Grande cutthroat trout Recreation Populations.

Sub-Basin	Water Name	Purity	Miles	Acres	Barrier	Other Salmonids
Alamosa-Trinchera						
	Cliff Lake	A		8.4	6	BKT, PPC
	Hot Creek	A	13.7		0	BNT
	Kerr Lake	A		39.5	0	SRC, BKT
	La Jara Reservoir	A		1375	0	BKT, SPL
	Lost Lake	A		28.2	6	NONE
	Prospect Creek	A	3.5		0	SRC
	Treasure Creek	A	5.4		4	SRC
Conejos River						
	Ann Lake	A		15.6	6	SRC, PPC
	Bear Lake	A		18.3	6	RBT
	Beaver Lake	A		4.2	6	SRC, PPC
	Blue Lake	A		49.4	6	BKT, SRC, PPC
	Conejos River, Adams Fork	A	7.5		6	RBT
	Conejos River, Middle Fork	A	4.3		6	PPN
	Conejos River, North Fork	A	3.5		6	RBT
	Conejos River, South Fork	A	17.6		6	BKT, SRC, PPC
	Glacier Lake	A		21.2	6	RBT
	Green Lake	A		22.7	6	BKT, RBT
	Hanson Creek	A	5.8		6	SRC, PPC
	Red Lake	A		21.2	6	RBT
	Rock Lake	A		7.2	6	NONE
	Timber Lake	A		11.9	6	BKT
	Tobacco Lake	A		12.8	6	SRC, PPC
	Trail Lake	A		29.6	6	RBT
	Trujillo Meadows Reservoir	A		69.2	6	BKT, BNT, RBT
	Twin Lake, Upper (W)	A		2	6	RBT
Rio Chama						
	Archuleta Creek	A	5.9		6	BNT
	Rio Chama, West Fork	A	5.0		6	BNT
Rio Grande Headwaters						
	Alberta Park Reservoir	A		40	6	BKT
	Black Mountain Lake	A		5.9	6	BKT
	Brown Lake, Upper	A		109.9	4	BKT, RBT
	Crystal Lake	A		3	6	SRC, PPC

Sub-Basin	Water Name	Purity	Miles	Acres	Barrier	Other Salmonids
Rio Grande Headwaters						
	Goose Lake	A		26.7	6	SRC, PPC
	Heart Lake	A		16.8	6	BKT, BNT
	Lost Trail Creek	A	10.0		6	BKT
	Lost Trail Creek, West	A	5.7		0	BKT, SRC, CRC
	Poage Lake	A		28.9	6	YSC, SRC, BKT, RBT
	Pole Creek	A	6.3		6	CRC, PPC
	Rio Grande #5	A	14.8		6	BKT
	Rito Hondo Lake	A		40	6	BKT, RBT
	Ruby Lake, Big	A		29.6	6	BKT, RBT
	Ruby Lake, Little	A		17.8	6	BKT, RBT
	Shaw Lake	A		70	6	SRC, RBT, BKT
	Spruce Lake, Lower	A		19.8	0	BKT
	Spruce Lake, Upper	A		19.8	0	BKT
	Squaw Creek	A	10.9		6	CRC, RBT
	Trout Lake	A		23.7	6	SRC, PPC
	Ute Creek	A	5.9		6	CRC, PPC
	Ute Creek, East	A	3.0		6	NO INFO
	Ute Creek, Middle	A	4.5		6	NO INFO
	Ute Creek, West	A	4.5		6	NO INFO
	Ute Lake, Lower Twin (#2)	A		4.7	6	SRC, PPC
	Ute Lake, Main (E)	A		32.1	6	SRC
	Ute Lake, Middle	A		11.4	6	SRC
	Ute Lake, Upper Twin (#1)	A		15.8	6	SRC
	Ute Lake, Upper West	A		4.7	6	SRC
	Ute Lake, West	A		16.1	6	SRC, PPC
	Weminuche Creek	A	5.8		6	PPC
Saguache Creek						
	Machin Lake	A		11.4	6	SRC, RBT
	Saguache Creek, Middle	A	17.2		4	BKT, CRC
	Saguache Creek, South Fork	A	12.2		0	BKT
San Luis Creek						
	Blanca WA Ponds-Cold	A		41.8	2	RBT
	Blind Lake, Upper	A		7.9	6	SRC, PPC
	Blue Lake	A		4.9	6	SRC, PPC
	Cherry Lake	A		9.9	6	SRC, PPC
	Como Lake	A		6.9	6	NO INFO

Sub-Basin	Water Name	Purity	Miles	Acres	Barrier	Other Salmonids
San Luis Creek						
	Cotton Lake	A		9.9	6	SRC, PPC
	Cottonwood Lake	A		3	6	SRC, PPC
	Cottonwood Lake, South	A		2	6	SRC, PPC
	Crater Lake	A		9.9	6	SRC, PPC
	Crestone Lake, North	A		31.6	5	NONE
	Crestone Lake, South	A		8.9	0	SRC, PPC
	Deadman Lake, Lower (#1)	A		2.5	6	SRC, PPC
	Deadman Lake, Upper (#2)	A		13.8	6	SRC, PPC
	Deadman Lake, West	A		3	6	SRC, PPC
	Little Bear Lake	A		3	6	SRC, PPC
	Pioneer Lake	A		6.9	6	SRC, PPC
	Rito Alto Lake	A		4	6	SRC, PPC
	San Isabel Lake	A		5.9	6	SRC, RBT, PPC
	Sand Creek Lake, Little	A		12.6	6	PPC
	Sand Creek Lake, Lower	A		62.8	6	PPC
	Sand Creek Lake, Upper	A		42.8	6	PPC
	Teacup Lake	A		19.8	6	SRC, PPC
	Willow Creek Lake, Lower	A		19.8	6	SRC, PPC

Table 5. Summary Report: Status of Rio Grande Cutthroat Populations.

Sub-Basin	Water Name	Purity	Mi/Ac	Adult Pop	Barrier	Other Salmonids
Alamosa-Trinchera						
At Risk and Declining						
	Alamosito Creek	A	6.4	627	0	NONE
	Jim Creek	A	6.1	1500	1	BKT
	Torsido Creek	A	4.1	33	1	BKT
	Trinchera Creek #2	A-	6.3	1827	1	BNT, BKT, RBT
	Trinchera Creek, South Fork	A	9.3	800	1	BKT
	Ute Creek	A	12.6	983	0	BKT, RBT
	West Indian Creek	A	6.4	1299	1	BKT
At Risk and Stable						
	Deep Canyon	A	3.3	429	1	BKT
	Grayback Creek	A	3.5	2475	1	BKT
	Placer Creek	A	5.2	2226	1	BKT
	Placer Creek, Middle Fork	A	4.8	3379	1	BKT
	Placer Creek, South Fork	A	4.7	3412	1	BKT
	Sangre De Cristo Creek	A	17.0	3621	1	BKT
	Trinchera Creek, North Fork	A	7.7	1324	1	BKT
	Vallejos Creek #2	A	3.0	960	0	BNT
	Vallejos Creek, North Fork	A	7.0	1645	0	BNT
	Wagon Creek	A	11.5	5796	1	BKT
Secure and Expanding						
	Jaroso Creek	A	5.8	4211	1	NONE
	Rough Canyon	A	1.0	219	2	NONE
	Torcido Creek	A-	5.9	6856	1	NONE
Secure and Stable						
	Cat Creek	A-	6.2	3224	1	NONE
	Cuates Creek	A	4.6	1168	1	NONE
	Rhodes Gulch	A	3.4	690	4	NONE
	San Francisco Creek	A	9.0	4176	1	NONE
	San Francisco Creek, Middle Fork	A	5.8	592	1	NONE
	Ute Creek, Little	A	2.6	304	5	NONE
	Willow Creek	A	8.0	208	1	NONE
Unknown						
	Cat Creek, North Fork	A-	3.6		1	NONE
	Cat Creek, South Fork	A-	4.0		1	NONE
	Culebra Creek, North Fork	A-	11.0	462	0	BNT, BKT, RBT

Sub-Basin	Water Name	Purity	Mi/Ac	Adult Pop	Barrier	Other Salmonids
	Jim Creek, South Fork	A	2.0		1	NO INFO
	San Francisco Lake, Upper West	A	4.2		6	NONE
	Ute Lake, Little, Lower	A	3		4	NONE
	Ute Lake, Little, Upper	A	2		4	NONE
	West Indian Creek, North Fork	A	3.0		1	BKT
	West Indian Creek, South Fork	A	6.0		1	BKT
Canadian River Headwaters						
At Risk and Declining						
	Ricardo Creek	A	6.0	180	1	BKT
Unknown						
	Fish Creek	U	3.5		6	NO INFO
	Little Vermejo River	U	6.0		6	NO INFO
Conejos River						
At Risk and Declining						
	Conejos River, Lake Fork	A	4.1	271	1	BNT, BTK
Secure and Expanding						
	Cascade Creek	A-	2.5	2875	4	NONE
	Osier Creek	A	2.6	3838	1	NONE
Secure and Stable						
	Rio De Los Pinos #2	A	1.6	242	5	NONE
Unknown						
	Big Lake	A	11.9		1	BKT, BNT
	Canyon Verde	B	4.0		5	RBT, YSC
	Rock Lake	A	5		0	BKT, BNT
Rio Chama						
Secure and Stable						
	Nabor Creek	A	2.3	2323	1	NONE
	Native Lake	A	5	100	6	NONE
	Wolf Creek	A	2.7	2381	1	NONE
Rio Chama						
Unknown						
	Rio Chamita	B+	4.0	424	0	BNT
	Sexto Creek	B	3.5		0	BNT, RBT,CRC

Sub-Basin	Water Name	Purity	Mi/Ac	Adult Pop	Barrier	Other Salmonids
Rio Grande Headwaters						
At Risk and Declining						
	Alder Creek, West	B	8.2	1246	0	BKT
	Pass Creek	B+	9.1	801	0	BKT, RBT
Rio Grande Headwaters						
At Risk and Stable						
	Haypress Lake	A	25.9	1000	0	BKT
Unknown						
	Bellows Creek, West Fork	C	7.3		0	BNT, BKT
	Pass Creek, West Fork	A	1.0	236	0	BKT
Saguache Creek						
At Risk and Declining						
	Carnero Creek	B	8.3	465	1	BNT
	Deep Creek	U	5.2	165	0	BKT
	Prong Creek	A	3.6	475	1	BKT
	Unknown Creek	A	3.1	47	3	NONE
	Wannamaker Creek	B+	6.8	75	0	BKT
	Whale Creek	B-	5.0	315	0	BKT
At Risk and Stable						
	Carnero Creek, North Fork	A	8.4	2159	1	BNT
	Carnero Creek, South Fork	B+	13.8	26123	1	BKT
	Cave Creek	A	6.1	397	1	BKT, BNT
	Jacks Creek	A	8.9	1104	1	BKT
	Miners Creek	A	4.3	933	5	BKT
	Tuttle Creek	A	6.9	1546	1	BKT
Secure and Stable						
	Carnero Creek, Middle Fork	B+	9.8	1215	1	NONE
	Cross Creek	A	5.0	3310	1	NONE
	East Pass Creek	A	7.7	1656	1	NONE
	Middle Creek, East	A	3.2	646	5	NONE
San Luis Creek						
At Risk and Declining						
	Medano Creek, Little	A	5.5	154	5	NONE
Secure and Expanding						
	Medano Creek	A	13.0	24544	4	NONE
Secure and Stable						
	Medano Creek, Hudson Branch	A	3.0	1626	1	NONE

Sub-Basin	Water Name	Purity	Mi/Ac	Adult Pop	Barrier	Other Salmonids
San Luis Creek						
Unknown						
	Medano Lake		A	2.7	6	NONE
Upper Rio Grande						
Unknown						
	Costilla Creek, East Fork		A	2.3	1	NONE
	Costilla Creek, West Fork		A	1.4	1	NONE
	Glacier Lake		A	6.5	0	NONE

APPENDIX II

STATUS OF RIO GRANDE CUTTHROAT TROUT POPULATIONS

Status of Rio Grande Cutthroat Trout Populations in 2002

Rio Grande cutthroat trout core conservation and conservation populations are present in all seven sub-basins in the Rio Grande basin and one in the Canadian River basin of Colorado. Within 162 RGCT waters, 76 are conservation or core conservation populations, three are of unknown status (Table 6). These populations provide the potential to maintain and enhance the genetic diversity of this subspecies. Recreation/genetic refugia populations are represented in 83 waters across six sub-basins (Table 6). These populations also provide recreational fishing opportunities for the public, and serve to increase the public awareness and appreciation of the value of this native trout.

Table 6. Summary of RGCT management classifications.

Sub-Basin	Management Classification											
	Core			Conservation			Recreation			Unknown		
	#	mi	ac	#	mi	ac	#	mi	ac	#	mi	ac
Alamosa-Trinchera	36	201	9				7	23	1451			
Canadian River Hdw	1	6								2	10	
Conejos River	6	11	17	1	4		18	39	285			
Rio Chama	3	5	5	2	8		2	11				
Rio Grande Hdw	2	1	26	3	25		30	71	537			
Saguache Creek	10	57		5	44		3	29	11	1	5	
San Luis Creek	4	22	3				23		317			
Upper Rio Grande	3	4	7									
Total	65	307	67	11	81	0	83	173	2621	3	15	0
Percent	40	53	2	7	14	0	51	30	98	2	3	0

Currently, there are 36 core conservation populations and 4 conservation populations with a biomass > 20 lb/ac (22 kg/ha); and 36 core conservation populations and 4 conservation populations with a population size > 500 adult fish. Within the core conservation and conservation populations, 39 are determined to be stable; 22 are considered to be both stable and secure or expanding and 17 are stable and at risk (Table 7). These risk factors are most often attributed to nonnative salmonid or habitat issues that are being addressed through specified conservation actions in the implementation plan. Another 18 populations are determined to be at risk and declining and are not in a desirable condition, but have demonstrated a previous capability to support more robust populations. Twenty-two additional populations are of unknown status due to insufficient data.

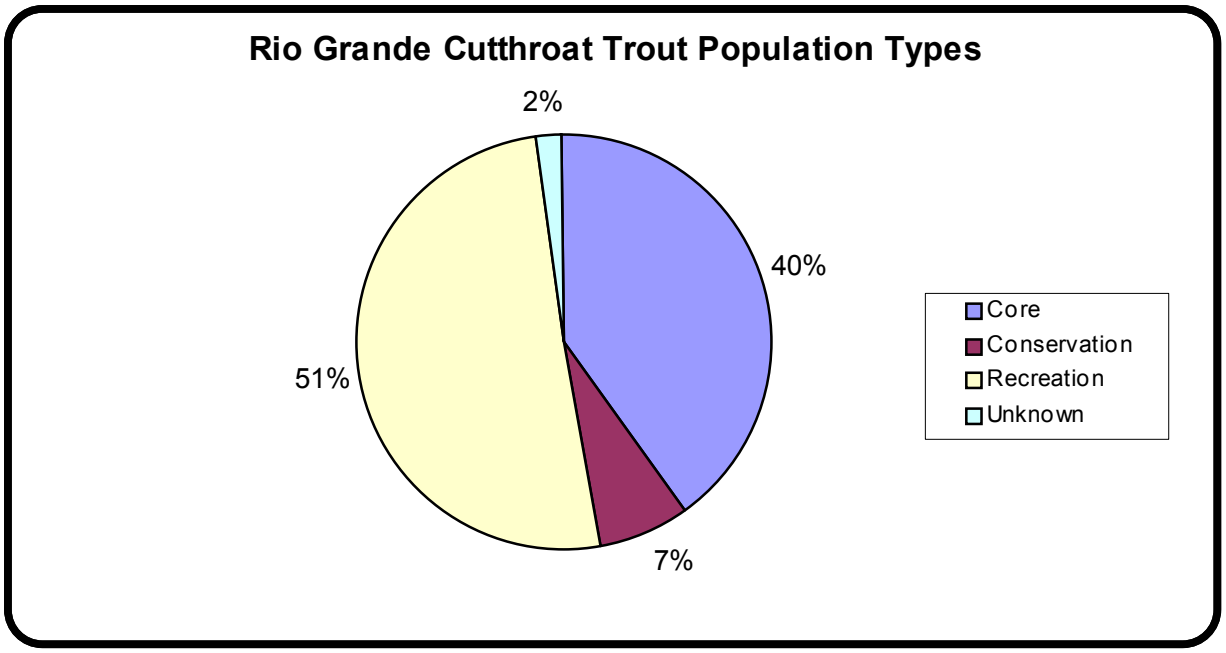
Table 7. Status summary for core conservation and conservation populations.

Sub-Basin	Population Status														
	ARD			ARS			SS			SE			Unknown		
	#	mi	ac	#	mi	ac	#	mi	ac	#	mi	ac	#	mi	ac
Alamosa-Trinchera	7	51		10	68		7	40		3	13		9	30	9
Canadian River Hdw	1	6											2	10	
Conejos River	1	4					1	2	0	2	5		3	4	17
Rio Chama							3	5	5				2	8	
Rio Grande Hdw	2	17		1		26							2	8	
Saguache Creek	6	32		6	48		4	26							
San Luis Creek	1	6					1	3		1	13		1		3
Upper Rio Grande													3	4	7
Total	18	116	0	17	116	26	16	76	5	6	31	0	22	64	36
Percent	23	28	0	22	29	39	20	19	7	8	8	0	28	16	54

ARD= At Risk and Declining; ARS= At Risk and Stable; SS= Secure and Stable; SE= Secure and Expanding

As the problems of nonnative fish, habitat degradation, and lack of data are addressed, populations can be added to the secure, stable and expanding categories from the pool of 57 “at risk” and “unknown” populations. Management techniques for restoring self-sustaining populations of native cutthroat have already been proven with the experience gained in their conservation since the 1970s.

Figure 1. Rio Grande cutthroat trout population types.



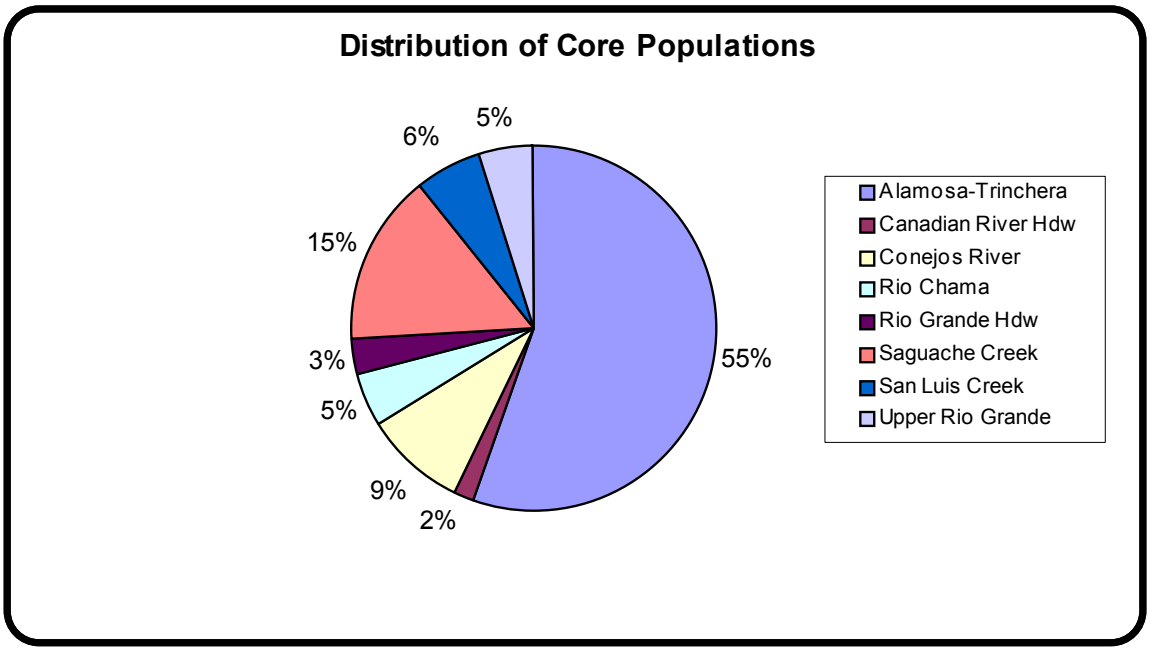


Figure 2. Distribution of Rio Grande cutthroat trout core populations.

Figure 3. Distribution of Rio Grande cutthroat trout conservation populations.

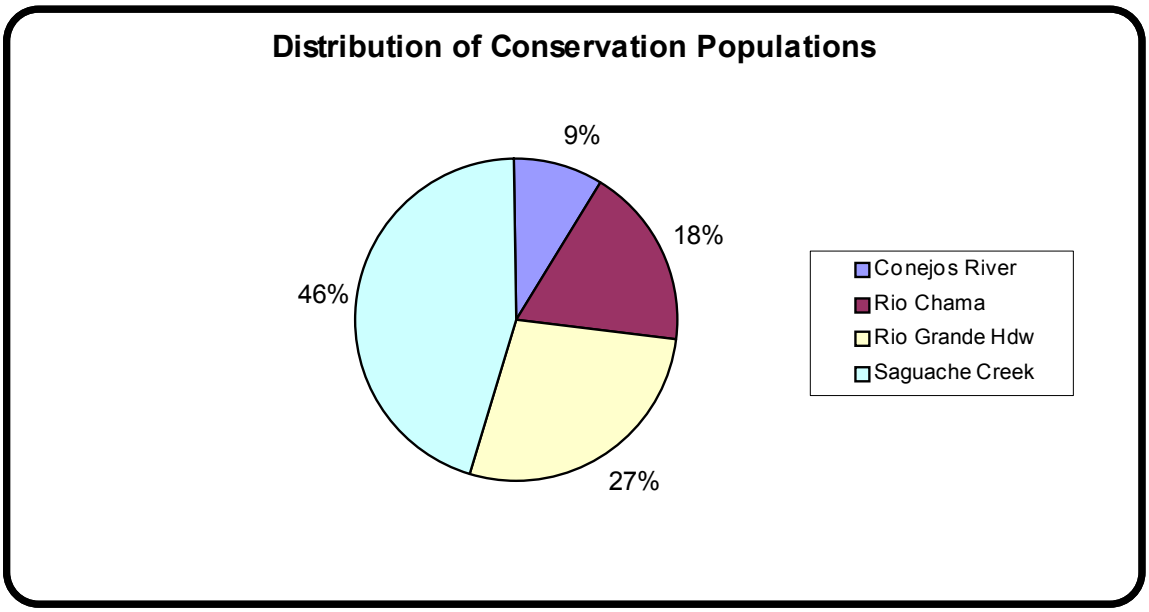


Figure 4. Distribution of Rio Grande cutthroat trout recreation populations.

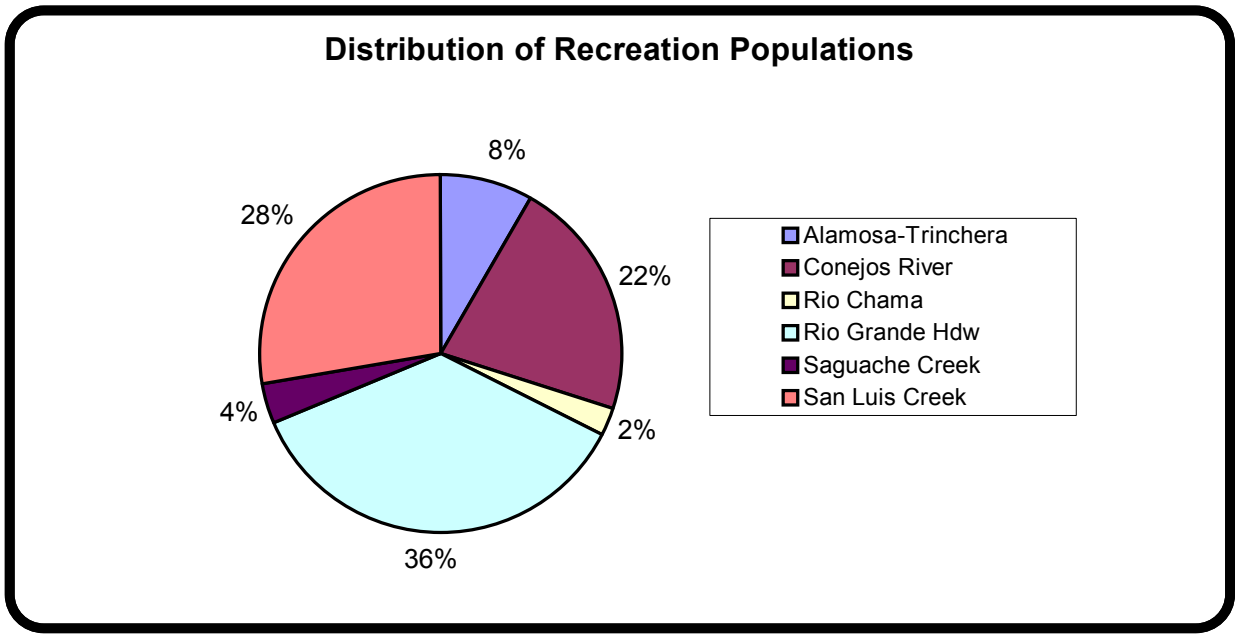
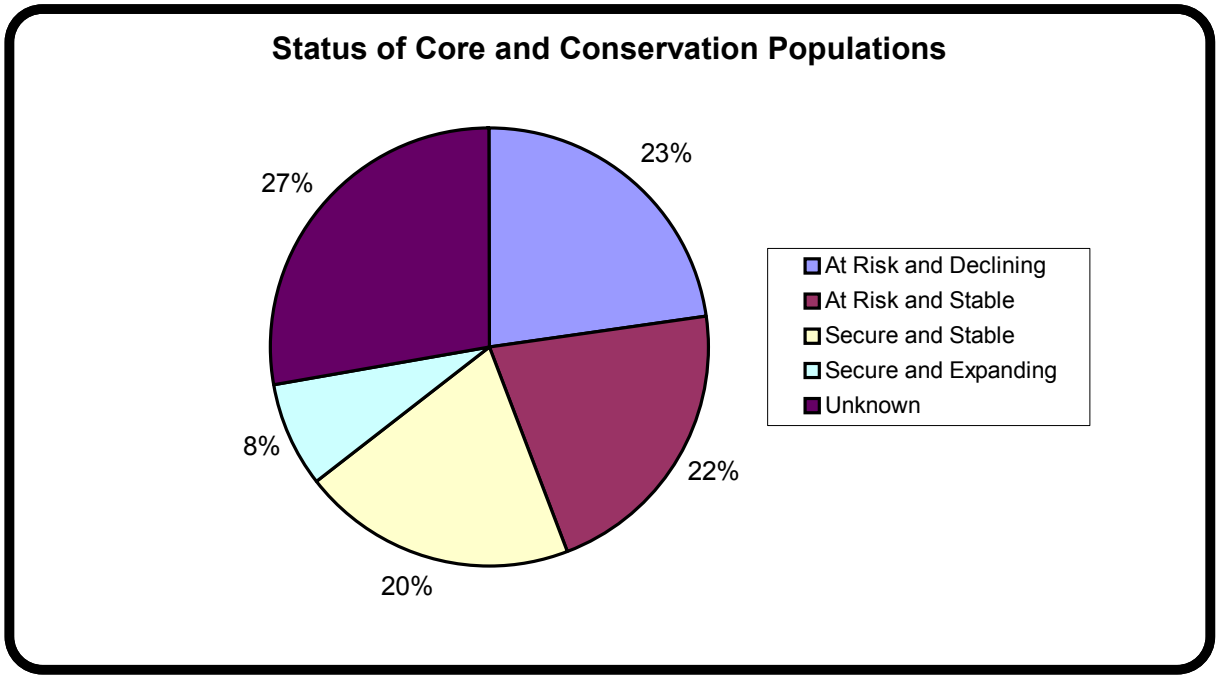
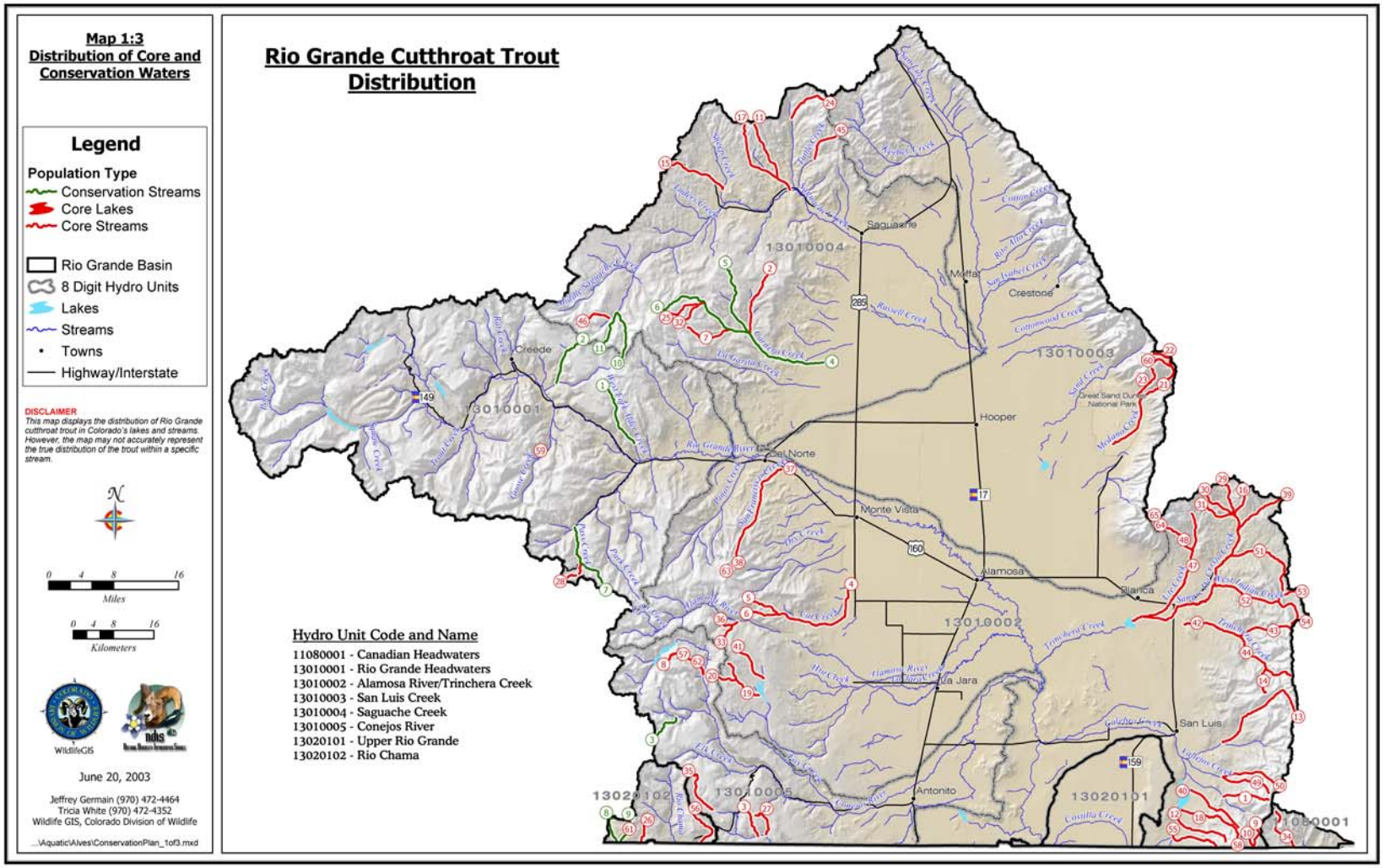


Figure 5. Status of core and conservation populations.



APPENDIX III

RIO GRANDE CUTTHROAT TROUT DISTRIBUTION MAPS


Map 1:3
Distribution of Core and Conservation Waters
Legend
Population Type
Conservation Streams
Core Lakes
Core Streams
Rio Grande Basin
8 Digit Hydro Units
Lakes
Streams
Towns
Highway/Interstate
DISCLAIMER
This map displays the distribution of Rio Grande cutthroat trout in Colorado's lakes and streams. However, the map may not accurately represent the true distribution of the trout within a specific stream.
0 4 8 16
Miles
0 4 8 16
Kilometers
WildlifeGIS
June 20, 2003
Jeffrey Germain (970) 472-4464
Tricia White (970) 472-4352
Wildlife GIS, Colorado Division of Wildlife
...\Aquatic\Alves\ConservationPlan_1of3.mxd
Rio Grande Cutthroat Trout Distribution
Hydro Unit Code and Name
11080001 - Canadian Headwaters
13010001 - Rio Grande Headwaters
13010002 - Alamosa River/Trinchera Creek
13010003 - San Luis Creek
13010004 - Saguache Creek
13010005 - Conejos River
13020101 - Upper Rio Grande
13020102 - Rio Chama
Saguache
Creede
Crestone
Hooper
Del Norte
Monte Vista
Alamosa
Blanca
San Luis
Antonito
13010001
13010002
13010003
13010004
13010005
13020101
13020102
11080001

Conservation Waters: Streams

Key- ID	Water Name	Water code
1	Alder Creek, West	47755
2	Bellows Creek, West Fork	38376
3	Canyon Verde	38756
4	Carnero Creek	38770
5	Carnero Creek, Middle Fork	38782
6	Carnero Creek, South Fork	38807
7	Pass Creek	42010
8	Rio Chamita	43864
9	Sexto Creek	43965
10	Wannamaker Creek	43935
11	Whale Creek	42420

Core Waters: Streams

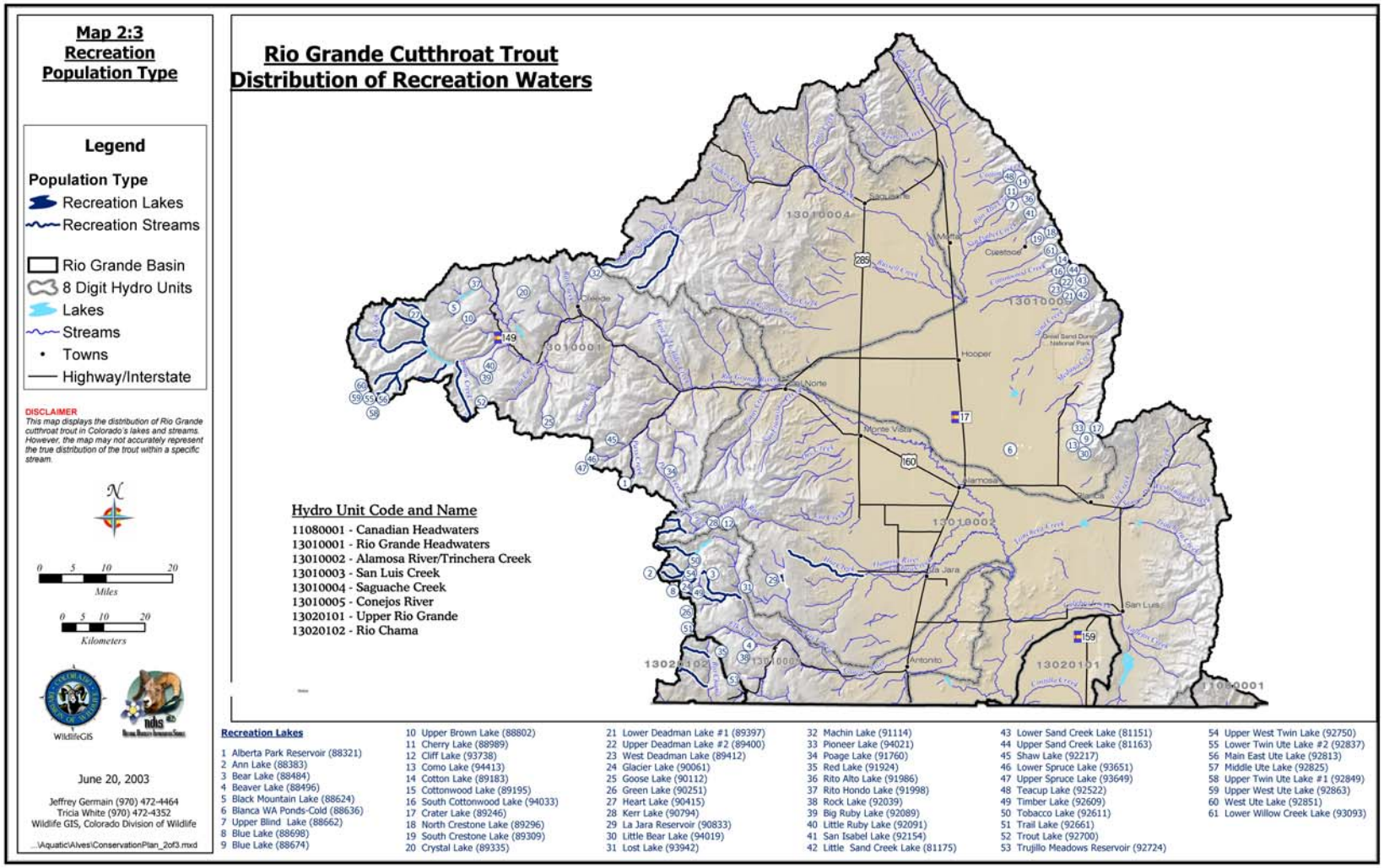
Key- ID	Water Name	Water Code
1	Alamosito Creek	38248
2	Carnero Creek, North Fork	38794
3	Cascade Creek	40147
4	Cat Creek	44242
5	Cat Creek, North Fork	49418
6	Cat Creek, South Fork	49420
7	Cave Creek	38871
8	Conejos River, Lake Fork	39289
9	Costilla Creek, East Fork	39390
10	Costilla Creek, West Fork	33890
11	Cross Creek	38581
12	Cuates Creek	38141
13	Culebra Creek, North Fork	39493
14	Deep Canyon	38350
15	East Pass Creek	42022
16	Grayback Creek	38459
17	Jacks Creek	38579
18	Jaroso Creek	48066
19	Jim Creek	44254
20	Jim Creek, South Fork	43408
21	Medano Creek	41501
22	Medano Creek, Hudson Branch	39590
23	Medano Creek, Little	48143
24	Middle Creek, East	41587
25	Miners Creek	44432
26	Nabor Creek	43648
27	Osier Creek	44444
28	Pass Creek, West Fork	47440
29	Placer Creek	44711
30	Placer Creek, Middle Fork	49305
31	Placer Creek, South Fork	49292
32	Prong Creek	38271
33	Rhodes Gulch	43840

Core Waters: Streams

Key- ID	Water Name	Water Code
34	Ricardo Creek	30635
35	Rio De Los Pinos #2	42189
36	Rough Canyon	39691
37	San Francisco Creek	42870
38	San Francisco Creek, Middle Fork	44850
39	Sangre De Cristo Creek	42882
40	Torcido Creek	38137
41	Torsido Creek	43668
42	Trinchera Creek #2	43719
43	Trinchera Creek, North Fork	48670
44	Trinchera Creek, South Fork	48682
45	Tuttle Creek	45890
46	Unknown Creek	48042
47	Ute Creek	37951
48	Ute Creek, Little	49379
49	Vallejos Creek #2	38143
50	Vallejos Creek, North Fork	48078
51	Wagon Creek	44456
52	West Indian Creek	44709
53	West Indian Creek, North Fork	39528
54	West Indian Creek, South Fork	39530
55	Willow Creek	39831
56	Wolf Creek	42343

Core Waters: Lakes

Key- ID	Water Name	Water Code
57	Big Lake	88585
58	Glacier Lake	88291
59	Haypress Lake	90388
60	Medano Lake	93512
61	Native Lake	97661
62	Rock Lake	96417
63	San Francisco Lake, Upper West	93283
64	Ute Lake, Little Lower	97659
65	Ute Lake, Little Upper	97647



Recreation Lakes

1 Alberta Park Reservoir (88321)
2 Ann Lake (88383)
3 Bear Lake (88484)
4 Beaver Lake (88496)
5 Black Mountain Lake (88624)
6 Blanca WA Ponds-Cold (88636)
7 Upper Blind Lake (88662)
8 Blue Lake (88698)
9 Blue Lake (88674)
10 Upper Brown Lake (88802)
11 Cherry Lake (88989)
12 Cliff Lake (93738)
13 Como Lake (94413)
14 Cotton Lake (89183)
15 Cottonwood Lake (89195)
16 South Cottonwood Lake (94033)
17 Crater Lake (89246)
18 North Crestone Lake (89296)
19 South Crestone Lake (89309)
20 Crystal Lake (89335)
21 Lower Deadman Lake #1 (89397)
22 Upper Deadman Lake #2 (89400)
23 West Deadman Lake (89412)
24 Glacier Lake (90061)
25 Goose Lake (90112)
26 Green Lake (90251)
27 Heart Lake (90415)
28 Kerr Lake (90794)
29 La Jara Reservoir (90833)
30 Little Bear Lake (94019)
31 Lost Lake (93942)
32 Machin Lake (91114)
33 Pioneer Lake (94021)
34 Poage Lake (91760)
35 Red Lake (91924)
36 Rito Alto Lake (91986)
37 Rito Hondo Lake (91998)
38 Rock Lake (92039)
39 Big Ruby Lake (92089)
40 Little Ruby Lake (92091)
41 San Isabel Lake (92154)
42 Little Sand Creek Lake (81175)
43 Lower Sand Creek Lake (81151)
44 Upper Sand Creek Lake (81163)
45 Shaw Lake (92217)
46 Lower Spruce Lake (93651)
47 Upper Spruce Lake (93649)
48 Teacup Lake (92522)
49 Timber Lake (92609)
50 Tobacco Lake (92611)
51 Trail Lake (92661)
52 Trout Lake (92700)
53 Trujillo Meadows Reservoir (92724)
54 Upper West Twin Lake (92750)
55 Lower Twin Ute Lake #2 (92837)
56 Main East Ute Lake (92813)
57 Middle Ute Lake (92825)
58 Upper Twin Ute Lake #1 (92849)
59 Upper West Ute Lake (92863)
60 West Ute Lake (92851)
61 Lower Willow Creek Lake (93093)

Recreation Waters: Streams

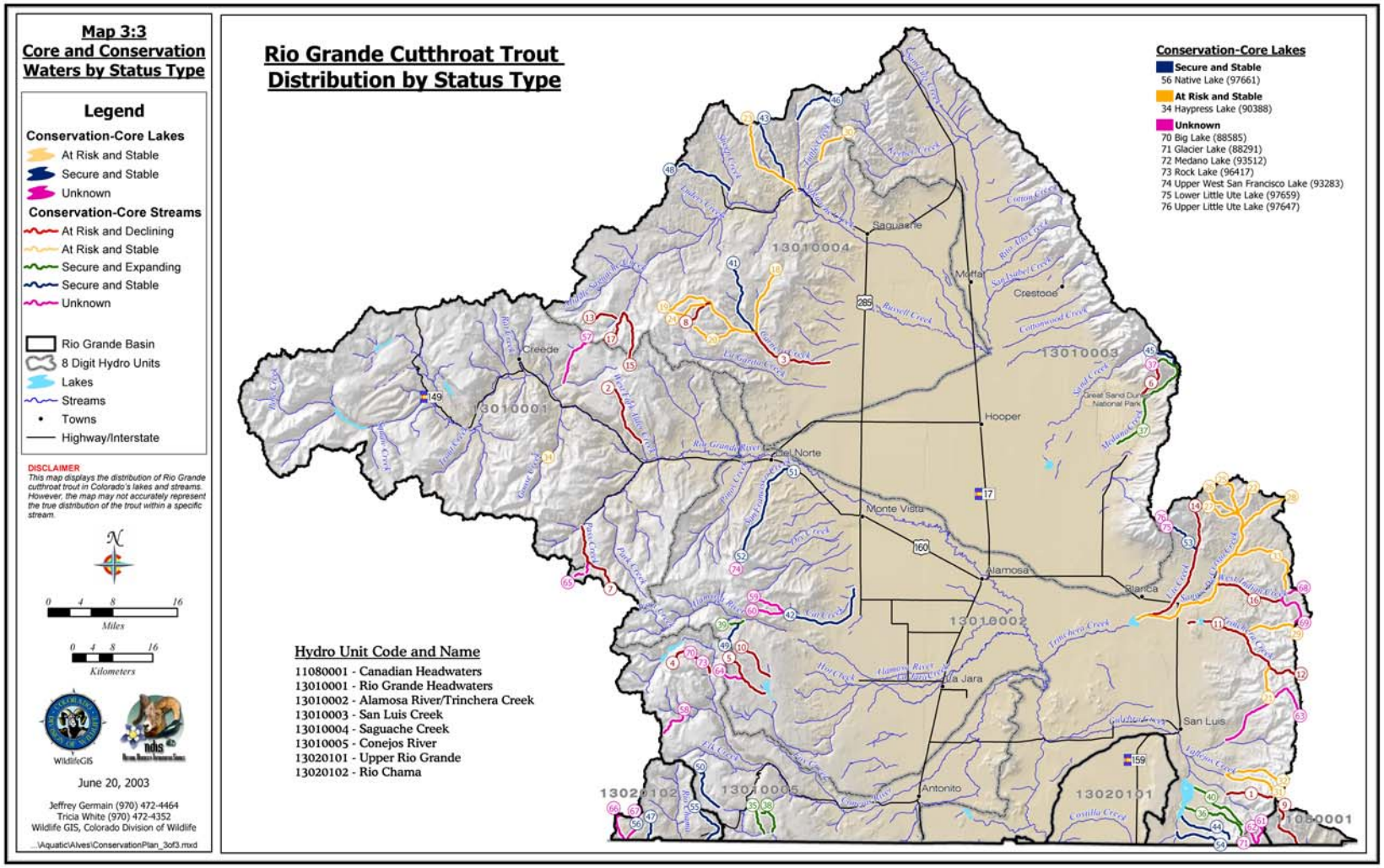
Key- ID	Water Name	Water Code
1	Archuleta Creek	38059
2	Adams Fork Conejos River	39277
3	Conejos River, Middle Fork	39291
4	Conejos River, North Fork	48416
5	Conejos River, South Fork	39304
6	Hanson Creek	40561
7	Hot Creek	40725
8	Lost Trail Creek	41309
9	Trail Creek, West Lost	41311
10	Pole Creek	42197
11	Prospect Creek	46967
12	Rio Chama, West Fork	38972
13	Rio Grande #5	42553
14	Middle Saguache Creek	42806
15	South Fork Saguache Creek	42818
16	Squaw Creek	43365
17	Treasure Creek	49127
18	Ute Creek	43834
19	Ute Creek, East	43846
20	Ute Creek, Middle	43858
21	Ute Creek, West	43860
22	Weminuche Creek	43985

Recreation Waters: Lakes

Key- ID	Water Name	Water Code
23	Alberta Park Reservoir	88321
24	Ann Lake	88383
25	Bear Lake	88484
26	Beaver Lake	88496
27	Black Mountain Lake	88624
28	Blanca WA Ponds-Cold	88636
29	Blind Lake, Upper	88662
30	Blue Lake	88674
31	Blue Lake	88698
32	Brown Lake, Upper	88802
33	Cherry Lake	88989
34	Cliff Lake	93738
35	Como Lake	94413
36	Cotton Lake	89183
37	Cottonwood Lake	89195
38	Cottonwood Lake, South	94033
39	Crater Lake	89246
40	Crestone Lake, North	89296
41	Crestone Lake, South	89309
42	Crystal Lake	89335
43	Deadman Lake, Lower (#1)	89397
44	Deadman Lake, Upper (#2)	89400

Recreation Waters: Lakes

Key- ID	Water Name	Water Code
45	Deadman Lake, West	89412
46	Glacier Lake	90061
47	Goose Lake	90112
48	Green Lake	90251
49	Heart Lake	90415
50	Kerr Lake	90794
51	La Jara Reservoir	90833
52	Little Bear Lake	94019
53	Lost Lake	93942
54	Machin Lake	91114
55	Pioneer Lake	94021
56	Poage Lake	91760
57	Red Lake	91924
58	Rito Alto Lake	91986
59	Rito Hondo Lake	91998
60	Rock Lake	92039
61	Ruby Lake, Big	92089
62	Ruby Lake, Little	92091
63	San Isabel Lake	92154
64	Sand Creek Lake, Little	81175
65	Sand Creek Lake, Lower	81151
66	Creek Lake, Upper Sand	81163
67	Shaw Lake	92217
68	Spruce Lake, Lower	93651
69	Spruce Lake, Upper	93649
70	Teacup Lake	92522
71	Timber Lake	92609
72	Tobacco Lake	92611
73	Trail Lake	92661
74	Trout Lake	92700
75	Trujillo Meadows Reservoir	92724
76	Twin Lake, Upper (W)	92750
77	Ute Lake, Lower Twin (#2)	92837
78	Ute Lake, Main (E)	92813
79	Ute Lake, Middle	92825
80	Ute Lake, Upper Twin (#1)	92849
81	Ute Lake, Upper West	92863
82	Ute Lake, West	92851
83	Lower Willow Creek Lake	93093


Map 3:3
Core and Conservation Waters by Status Type
Legend
Conservation-Core Lakes
At Risk and Stable
Secure and Stable
Unknown
Conservation-Core Streams
At Risk and Declining
At Risk and Stable
Secure and Expanding
Secure and Stable
Unknown
Rio Grande Basin
8 Digit Hydro Units
Lakes
Streams
Towns
Highway/Interstate
DISCLAIMER
This map displays the distribution of Rio Grande cutthroat trout in Colorado's lakes and streams. However, the map may not accurately represent the true distribution of the trout within a specific stream.
Miles
Kilometers
WildlifeGIS
June 20, 2003
Jeffrey Germain (970) 472-4464
Tricia White (970) 472-4352
Wildlife GIS, Colorado Division of Wildlife
...\Aquatic\Alves\ConservationPlan_3of3.mxd
Rio Grande Cutthroat Trout Distribution by Status Type
Conservation-Core Lakes
Secure and Stable
56 Native Lake (97661)
At Risk and Stable
34 Haypress Lake (90388)
Unknown
70 Big Lake (88585)
71 Glacier Lake (88291)
72 Medano Lake (93512)
73 Rock Lake (96417)
74 Upper West San Francisco Lake (93283)
75 Lower Little Ute Lake (97659)
76 Upper Little Ute Lake (97647)
Hydro Unit Code and Name
11080001 - Canadian Headwaters
13010001 - Rio Grande Headwaters
13010002 - Alamosa River/Trinchera Creek
13010003 - San Luis Creek
13010004 - Saguache Creek
13010005 - Conejos River
13020101 - Upper Rio Grande
13020102 - Rio Chama
Saguache
Crestone
Creede
Hooper
Del Norte
Monte Vista
Alamosa
Blanca
La Jara
San Luis
Antonito
13010004
13010003
13010001
13010002
13010005
13020102
13020101
110-0001

At Risk and Declining Waters

Key- ID	Water Name	Water Code	Status
1	Alamosito Creek	38248	At Risk and Declining
2	Alder Creek, West	47755	At Risk and Declining
3	Carnero Creek	38770	At Risk and Declining
4	Conejos River, Lake Fork	39289	At Risk and Declining
5	Jim Creek	44254	At Risk and Declining
6	Medano Creek, Little	48143	At Risk and Declining
7	Pass Creek	42010	At Risk and Declining
8	Prong Creek	38271	At Risk and Declining
9	Ricardo Creek	30635	At Risk and Declining
10	Torsido Creek	43668	At Risk and Declining
11	Trinchera Creek #2	43719	At Risk and Declining
12	Trinchera Creek, South Fork	48682	At Risk and Declining
13	Unknown Creek	48042	At Risk and Declining
14	Ute Creek	37951	At Risk and Declining
15	Wannamaker Creek	43935	At Risk and Declining
16	West Indian Creek	44709	At Risk and Declining
17	Whale Creek	42420	At Risk and Declining

At Risk and Stable Waters: Streams

Key- ID	Water Name	Water Code	Status
18	Carnero Creek, North Fork	38794	At Risk and Stable
19	Carnero Creek, South Fork	38807	At Risk and Stable
20	Cave Creek	38871	At Risk and Stable
21	Deep Canyon	38350	At Risk and Stable
22	Grayback Creek	38459	At Risk and Stable
23	Jacks Creek	38579	At Risk and Stable
24	Miners Creek	44432	At Risk and Stable
25	Placer Creek	44711	At Risk and Stable
26	Placer Creek, Middle Fork	49305	At Risk and Stable
27	Placer Creek, South Fork	49292	At Risk and Stable
28	Sangre De Cristo Creek	42882	At Risk and Stable
29	Trinchera Creek, North Fork	48670	At Risk and Stable
30	Tuttle Creek	45890	At Risk and Stable
31	Vallejos Creek #2	38143	At Risk and Stable
32	Vallejos Creek, North Fork	48078	At Risk and Stable
33	Wagon Creek	44456	At Risk and Stable

At Risk and Stable Waters: Lakes

Key- ID	Water Name	Water Code	Status
34	Haypress Lake	90388	At Risk and Stable

Secure and Expanding Waters

Key- ID	Water Name	Water Code	Status
35	Cascade Creek	40147	Secure and Expanding
36	Jaroso Creek	48066	Secure and Expanding
37	Medano Creek	41501	Secure and Expanding
38	Osier Creek	44444	Secure and Expanding
39	Rough Canyon	39691	Secure and Expanding
40	Torcido Creek	38137	Secure and Expanding

Secure and Stable Waters: Streams

Key- ID	Water Name	Water Code	Status
41	Carnero Creek, Middle Fork	38782	Secure and Stable
42	Cat Creek	44242	Secure and Stable
43	Cross Creek	38581	Secure and Stable
44	Cuates Creek	38141	Secure and Stable
45	Medano Creek, Hudson Branch	39590	Secure and Stable
46	Middle Creek, East	41587	Secure and Stable
47	Nabor Creek	43648	Secure and Stable
48	Pass Creek, East	42022	Secure and Stable
49	Rhodes Gulch	43840	Secure and Stable
50	Rio De Los Pinos #2	42189	Secure and Stable
51	San Francisco Creek	42870	Secure and Stable
52	San Francisco Creek, Middle Fork	44850	Secure and Stable
53	Ute Creek, Little	49379	Secure and Stable
54	Willow Creek	39831	Secure and Stable
55	Wolf Creek	42343	Secure and Stable

Secure and Stable Waters: Lakes

Key- ID	Water Name	Water Code	Status
56	Native Lake	97661	Secure and Stable

Unknown Waters: Streams

Key- ID	Water Name	Water Code	Status
57	Bellows Creek, West Fork	38376	Unknown
58	Canyon Verde	38756	Unknown
59	Cat Creek, North Fork	49418	Unknown
60	Cat Creek, South Fork	49420	Unknown
61	Costilla Creek, East Fork	39390	Unknown
62	Costilla Creek, West Fork	33890	Unknown
63	Culebra Creek, North Fork	39493	Unknown
64	Jim Creek, South Fork	43408	Unknown
65	Pass Creek, West Fork	47440	Unknown
66	Rio Chamita	43864	Unknown
67	Sexto Creek	43965	Unknown
68	West Indian Creek, North Fork	39528	Unknown
69	West Indian Creek, South Fork	39530	Unknown

Unknown Waters: Lakes

Key- ID	Water Name	Water Code	Status
70	Big Lake	88585	Unknown
71	Glacier Lake	88291	Unknown
72	Medano Lake	93512	Unknown
73	Rock Lake	96417	Unknown
74	San Francisco Lake, Upper West	93283	Unknown
75	Ute Lake, Little Lower	97659	Unknown
76	Ute Lake, Little Upper	97647	Unknown