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## Hydrology, Geomorphology, and Sediment Transport of the San Miguel River, Southwest Colorado

**Type** Document  
**Author** Allred, Tyler M.  
**Author** E.D. Andrews  
**Publisher** U.S. Geological Survey  
**Extra** 00000  
**Date Added** 11/2/2019, 3:20:59 PM  
**Modified** 11/2/2019, 3:20:59 PM

### Tags:

flow regime, fluvial, sediment transport

### Notes:

Although the San Miguel River is one of the least regulated rivers on the Colorado Plateau, its channel geometry shows "poor agreement" with its sediment transport regime. The authors found that extensive placer mining and mine tailings, as well as attempts to stabilize mine tailings, are primarily responsible for the San Miguel's channel shape. Floods with recurrence intervals of 2.7 and 4.1 years are most effective at transporting sediment in the San Miguel River.

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## Relating Riparian Vegetation to Present and Future Streamflows

**Type** Journal Article  
**Author** Auble, Gregor T.  
**Author** Jonathan M. Friedman  
**Author** Michael L. Scott  
**Volume** 4  
**Issue** 3  
**Pages** 544-554  
**Publication** Ecological Applications  
**Date** 1994  
**Extra** 00000  
**DOI** 10/frw425  
**Date Added** 11/2/2019, 3:21:00 PM  
**Modified** 11/2/2019, 3:21:02 PM

**Tags:**

flow regime, riparian

**Notes:**

This paper developed a direct gradient method to predict riparian vegetation change from a hypothetical proposed upstream water development project. Using the Black Canyon of the Gunnison National Monument (now Park), the authors developed a model that shows the duration of inundation within the riparian zone. The inundation duration helps predict which species of riparian plants will exist at what elevation in the riparian zone. The paper found that changes to the minimum and peak flows had the greatest impact on riparian communities.

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## Pre-impoundment Water Quality Study for the San Miguel Project

**Type** Report

**Author** Larry Baker

**Author** V Dean Adams

**Author** Leslie G Terry

**Author** Jerald S Fifield

**Author** Darwin L Sorensen

**Date** June 1979

**Extra** 00000

**Series Title** Utah Water Research Laboratory

**Institution** Utah State University

**Library Catalog** Zotero

**Language** en

**Date Added** 11/2/2019, 3:20:54 PM

**Modified** 11/2/2019, 3:20:55 PM

**Tags:**

aquatic biota, quality, ag, drinking water

**Notes:**

The Bureau of Reclamation commissioned this study to capture water quality data in the San Miguel and Leopard Creek before the construction of the proposed Saltado Reservoir 20 miles below Telluride, Colorado. Water samples were collected from three sites on a monthly basis during 1977 and 1978. In 1977, metal mining was ongoing and the mainstem above Telluride and Howards Fork were nearly devoid of fish life. Water quality exceeded proposed Colorado Water Quality Standards, but no constituents exceeded the standards for Class II water supply or agricultural use more than half the time. Concentrations of cadmium, aluminum, and mercury exceeded proposed standards for aquatic biota more than 50 percent of the time at all three locations. Other metals such as copper, iron, lead, and zinc also exceeded aquatic biota standards. Manganese, barium, mercury, selenium, cadmium, lead, and sulfate exceeded proposed raw water supply standards. Cadmium and manganese exceeded proposed agricultural use standards at least once at each site.

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## Prediction of Flow Depth and Sediment Discharge in Open Channels

**Type** Report

**Author** William R Brownlie

**Pages** 246

**Date** November 1981

**Extra** 00419

**Institution** W.M. Keck Laboratory of Hydraulics and Water Resources, Division of Engineering and Applied Science, California Institute of Technology

**Library Catalog** Zotero

**Language** en

**Date Added** 11/2/2019, 3:20:51 PM

**Modified** 11/2/2019, 3:20:52 PM

### Tags:

flow regime, fluvial, sediment transport

### Notes:

This study analyzed the relationship between hydraulic variables (slope, depth, and velocity) and sediment concentration. With unsteady flows, modeling transport becomes more difficult. The HEC-6 program is the most widely used sedimentation model, but does not perform well when flows change rapidly. The study proposes the groundwork for a new model to better predict sediment transport in variable systems.

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## Ecohydrological and Socioeconomic Integration for the Operational Management of Environmental Flows

**Type** Journal Article  
**Author** B. A. Bryan  
**Author** A Higgins  
**Author** I. C. Overton  
**Author** K Holland  
**Author** R. E. Lester  
**Author** D King  
**Author** M Nolan  
**Author** D. Hatton MacDonald  
**Author** J. D. Connor  
**Author** T Bjornsson  
**Author** M Kirby  
**URL** <http://doi.wiley.com/10.1890/12-2104.1>  
**Volume** 23  
**Issue** 5  
**Pages** 999-1016  
**Publication** Ecological Applications  
**ISSN** 1051-0761  
**Date** 07/2013  
**Extra** 00018  
**DOI** 10/f44q93  
**Accessed** 4/20/2019, 12:08:35 PM  
**Library Catalog** Crossref  
**Language** en  
**Abstract** Investment in and operation of flow control infrastructure such as dams, weirs, and regulators can help increase both the health of regulated river ecosystems and the social values derived from them. This requires high-quality and high-resolution spatiotemporal ecohydrological and socioeconomic information. We developed such an information base for integrated environmental flow management in the River Murray in South Australia (SA). A hydrological model was used to identify spatiotemporal inundation dynamics. River ecosystems were classified and mapped as ecohydrological units. Ecological response models were developed to link three aspects of environmental flows (flood duration, timing, and interflood period) to the health responses of 16 ecological components at various life stages. Potential infrastructure investments (flow control regulators and irrigation pump relocation) were located by interpreting LiDAR elevation data, digital orthophotography, and wetland mapping information; and infrastructure costs were quantified using engineering cost models. Social values were quantified at a coarse scale as total economic value based on a national survey of willingness-to-pay for four key ecological assets; and at a local scale using mapped ecosystem service values. This information was integrated using a constrained, nonlinear, mixed-integer, compromise programming optimization model and solved using a stochastic Tabu search algorithm. We tested the model uncertainty and sensitivity using 390 Monte



Carlo model runs at varying weights of ecological health vs. social values. Integrating ecohydrological and socioeconomic information identified environmental flow management regimes that efficiently achieved both ecological and social objectives. Using an ecologically weighted efficient and socially weighted efficient scenario, we illustrated model outputs including a suite of cost-effective infrastructure investments and an operational plan for new and existing flow control structures including dam releases, weir height manipulation, and regulator operation on a monthly time step. Both the investments and management regimes differed substantially between the two scenarios, suggesting that the choice of weightings on ecological and social objectives is important. This demonstrates the benefit of integrating high-quality and high-resolution spatiotemporal ecohydrological and socioeconomic information for guiding the investment in and operational management of environmental flows.

**Date Added** 11/2/2019, 3:20:54 PM

**Modified** 11/2/2019, 3:20:54 PM

### Tags:

economic impact, aquatic biota, flow regime, riparian, modeling, ecosystem services

### Notes:

This article integrates high-resolution hydrological, ecological, economic, and social data in a model to support river management decisions. The model was developed to help guide a \$60 million investment into an environmental flow program on the River Murray in Australia. The study combined month mean and peak flow rates of the River Murray with response functions for 16 ecological components (eight vegetation types, two bird, and six fishes), and integrated the total economic value of floodplain vegetation, waterbirds, and native fish. The authors ran a Monte Carlo statistical model to develop optimal environmental flow management and investment.

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## San Miguel River Instream Flow Assessment

**Type** Document

**Author** Bureau of Reclamation

**Date** 1996

**Date Added** 11/2/2019, 3:21:02 PM

**Modified** 11/2/2019, 3:21:02 PM

### Tags:

recreation, fishing, aquatic biota, flow regime, quality, symbolic

### Notes:

After the BLM's amendment of the San Juan/San Miguel Resource Management Plan to designate the San Miguel River corridor as a Special Recreation Management Area and portions of that as an Area of Critical Environmental Concern, the BLM undertook this Instream Flow Assessment to determine flow characteristics important to riverine systems, for public education and water development interests, for management purposes, and for recreational uses.

Riparian and fish flows were studied but this draft does not include recommendations pertaining to those attributes. Acceptable recreational flows from Deep Creek to Fall Creek ranged from 350 to 1,400 cfs; from Specie creek to Beaver Creek ranged from 550 to 1,600 cfs; and from Beaver Creek to Pinon ranged from 750 to 1,600 cfs.

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## Ecoregions of Colorado

**Type** Map

**Cartographer** Shannen S. Chapman

**Cartographer** Glenn E. Griffith

**Cartographer** James M. Omernik

**Cartographer** Alan B. Price

**Cartographer** Jerry Freeouf

**Cartographer** Donald L. Schrupp

**Publisher** Environmental Protection Agency, U.S. Geological Survey, Colorado Division of Wildlife, Colorado Department of Public Health, U.S. Department of the Interior, Natural Resources Conservation Service, U.S. Forest Service

**Extra** 00000

**Date Added** 11/2/2019, 3:20:59 PM

**Modified** 11/2/2019, 3:20:59 PM

### Tags:

riparian, land use, geology

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## Southwest Basin Nonconsumptive Needs Assessment: Environmental and Recreational

**Type** Map

**Cartographer** Colorado Water Conservation Board

**Date** 2010

**Extra** 00000

**Date Added** 11/2/2019, 3:21:02 PM

**Modified** 11/2/2019, 3:21:02 PM

**Tags:**

boating, recreation, fishing, flow regime, riparian, symbolic, land use

**Notes:**

The 2010 Statewide Water Supply Initiative sought to capture water demands through 2050, including environmental demands. This map portrays the results of outreach to southwest basin stakeholders to determine key recreational and environmental water demands.

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## Surface and Groundwater Interactions along the Middle and Lower San Miguel River, CO: Implications for Plant Water Sources, Plant Water Status, and the Susceptibility of Riparian Vegetation to Impacts from Changing River Base Flows

**Type** Report

**Author** David J Cooper

**Author** Peter A. Conovitz

**Pages** 41

**Date** June 2001

**Extra** 00000

**Institution** Bureau of Land Management

**Library Catalog** Zotero

**Language** en

**Date Added** 11/2/2019, 3:20:51 PM

**Modified** 11/2/2019, 3:20:51 PM

**Tags:**

flow regime, riparian, drought, groundwater

**Notes:**

This study investigates cottonwood use of groundwater during the drier late summer period. The study investigates the groundwater/surface water connection at three sites along the San Miguel River, and asks whether cottonwood trees are water-stressed during the summer of 2000 and how groundwater sources used by riparian plants are recharged. The authors took water level measurements from wells and river stage. They extracted water from cottonwood wigs and surrounding soils and performed an isotope analysis on the water to determine its source. The study found the San Miguel River is a losing stream in most reaches, and that groundwater levels were aligned to river stage, indicating a close relationship between surface and ground water. The isotope analysis showed plants higher above the river use water from soils recharged by rain. Lower elevation plants use water from shallow soil horizons recharged from rain or high spring river groundwater tables. Sufficient groundwater levels "are critical to trees on the floodplain." Minimum streamflows of 2-3 cubic meters per second around Placerville "likely are sufficient to maintain riparian vegetation in its current condition."

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## A New Measure of Longitudinal Connectivity for Stream Networks

**Type** Journal Article

**Author** David Cote

**Author** Dan G. Kehler

**Author** Christina Bourne

**Author** Yolanda F. Wiersma

**URL** <http://link.springer.com/10.1007/s10980-008-9283-y>

**Volume** 24

**Issue** 1

**Pages** 101-113

**Publication** Landscape Ecology

**ISSN** 0921-2973, 1572-9761

**Date** 1/2009

**Extra** 00246

**DOI** 10.1007/s10980-008-9283-y

**Accessed** 4/20/2019, 12:08:13 PM

**Library Catalog** Crossref

**Language** en

**Date Added** 11/2/2019, 3:20:52 PM

**Modified** 11/2/2019, 3:20:52 PM

### Tags:

aquatic biota, connectivity

### Notes:

This paper develops an index for quantifying longitudinal connectivity of a river. Barriers such as dams and culverts alter velocities and depths of rivers, or can otherwise physically impede movement of aquatic species. Such barriers can result in declines or extirpations of fish. The method, called the Dendritic Connectivity Index (DCI), can be applied to potadromous (freshwater migrating fish) and diadromous (fish migrating between marine and freshwater environments) fish. The probability of passing one barrier is independent of the probability of passing another. The model can also take into account natural barriers such as waterfalls. Upon development of the model, the authors tested it on two stream systems in Canada. As expected, connectivity index declined as the number of barriers increased. The first barriers make the largest impacts on connectivity, with subsequent barriers' impacts lessening with each barrier added. Notably, "a greater increase in connectivity is achieved by small improvements to barriers with moderate to good passability than with the same improvements to barriers with poor to moderate passability." Locations of barriers were also significant. Barriers located at headwaters minimized loss of connectivity.

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## San Miguel Watershed Water Resource Data Review

**Type** Report

**Author** Rory Cowie

**Author** Estella Moore

**Author** Marcie Bidwell

**Date** 2013

**Institution** Mountain Studies Institute

**Library Catalog** Zotero

**Language** en

**Date Added** 11/2/2019, 3:20:54 PM

**Modified** 11/2/2019, 3:20:54 PM

### Tags:

monitoring, quality

### Notes:

This report was commissioned by the San Miguel Watershed Coalition ("SMWC") to "provide a scientific analysis of the historic water quality data, trends and sampling plan." Since 1998, the SMWC has collected water quality data in accordance with its San Miguel Watershed Plan (although data in its database dates back to 1975), with 388 past or present sampling sites on 35 streams. In 2006, only 0.7 percent of stream miles in the San Miguel did not meet Colorado's water quality standards. Data shows Idarado Mining Company's remediation efforts upstream of the Town of Telluride have reduced zinc concentrations. The report urges SMWC to consider developing its own monitoring for this reach independent of Idarado's efforts. The Howards Fork continues to have iron contamination. Temperatures farther downstream remain a concern below the CCC Ditch adjacent to the Nucla Power Station, and the report recommends installing a data logger in that reach. Other recommendations for monitoring and data sharing and storage are available in the report.

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## Common Trout Species and Conservation Assessment for the Grand Mesa, Uncompahgre, and Gunnison National Forests

**Type** Report

**Author** Matthew Dare

**Author** Michael Carrillo

**Author** Clay Speas

**Date** March 2013

**Extra** 00000

**Institution** Grand Mesa, Uncompahgre, and Gunnison National Forests

**Library Catalog** Zotero

**Language** en

**Date Added** 11/2/2019, 3:20:56 PM

**Modified** 11/2/2019, 3:20:57 PM

### Tags:

aquatic biota, monitoring, objectives, quality, riparian, symbolic

### Notes:

This report provides an overview of the natural history, distribution, and status of common trout in the Grand Mesa, Uncompahgre, and Gunnison National Forests ("GMUG"): the brook, brown, and rainbow. These trout species are Management Indicator Species, "which are monitored during forest plan implementation in order to assess the effects of management activities on their populations." The common trout and the Colorado River cutthroat trout represent aquatic habitats on the GMUG. All three species of common trout are common throughout the GMUG and are stable or increasing in population. However, climate change, habitat fragmentation, and disease are trouts' biggest threats. Brown trout have a self-sustaining population in the San Miguel, near Telluride. Brook, brown, and rainbow trout have been observed by management survey crews in the South Fork San Miguel River in 2004 and 2006. Rainbows were found in Horsefly Creek in 2001 and 2009, Naturita Creek in 2005, and North Fork Tabeguache Creek in 2004 and 2008.

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## San Miguel River Recreation Study

**Type** Report

**Author** EDAW, Inc.

**Date** May 15, 1997

**Extra** 00000

**Institution** Bureau of Land Management

**Date Added** 11/2/2019, 3:21:03 PM

**Modified** 11/2/2019, 3:21:03 PM

### Tags:

boating, recreation, fishing, flow regime

### Notes:

This document provides an overview of the study design of recreation surveys for the BLM's San Miguel Instream Flow Assessment. The survey has two parts, a general user survey to gather baseline information on users and their interests in the region, and a flow evaluation survey to learn about the relationship between flows and boating and fishing.

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## San Miguel River Instream Flow Assessment Recreation Study

**Type** Report

**Author** EDAW, Inc.

**Date** August 1998

**Extra** 00000

**Institution** Bureau of Land Management

**Date Added** 11/2/2019, 3:21:03 PM

**Modified** 11/2/2019, 3:21:03 PM

**Tags:**

boating, recreation, fishing, flow regime

**Notes:**

This report provides the results of the San Miguel River Instream Flow Assessment Recreation Study - a survey of recreationalists using the river. Optimum conditions for angling occur at flows less than 200 cfs. Flow preferences for whitewater boating ranged between 300 and 600 cfs as marginally acceptable, flows greater than 600 cfs as acceptable, and 1,400 cfs as optimal.

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## Hydrologic and Geomorphic Aspects of Riparian Forest Ecology on the Lower San Miguel River, Colorado

**Type** Thesis

**Author** Gary Brandon Fleener

**Date** 1997

**Extra** 00000

**University** University of Colorado

**Date Added** 11/2/2019, 3:20:59 PM

**Modified** 11/2/2019, 3:21:00 PM

**Tags:**

flow regime, fluvial, riparian, geology, sediment transport

**Notes:**

This paper uses hydrologic and geomorphic processes to describe riparian forest dynamics on the lower San Miguel River. The paper found that snowmelt flooding's duration is the principal force of "floodplain reworking and the creation of bare alluvium establishment sites."

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## Transverse and Longitudinal Variation in Woody Riparian Vegetation along a Montane River

**Type** Journal Article

**Author** Jonathan M. Friedman



**Author** Gregor T. Auble

**Author** Edmund D. Andrews

**Author** Gwen Kittel

**Author** Richard F. Madole

**Author** Eleanor R. Griffin

**Author** Tyler M. Allred

**URL** <http://www.bioone.org/doi/abs/10.3398/1527-0904%282006%2966%5B78%3A%28LVIW%5D2.0.CO%3B2>

**Volume** 66

**Issue** 1

**Pages** 78-91

**Publication** Western North American Naturalist

**ISSN** 1527-0904

**Date** 01/2006

**Extra** 00051

**DOI** 10/dsn3z4

**Accessed** 4/20/2019, 12:08:31 PM

**Library Catalog** Crossref

**Language** en

**Abstract** This study explores how the relationship between flow and riparian vegetation varies along a montane river. We mapped occurrence of woody riparian plant communities along 58 km of the San Miguel River in southwestern Colorado. We determined the recurrence interval of inundation for each plant community by combining step-backwater hydraulic modeling at 4 representative reaches with Log-Pearson analysis of 4 stream gaging stations. Finally, we mapped bottomland surficial geology and used a Geographic Information System to overlay the coverages of geology and vegetation. Plant communities were distinctly arrayed along the hydrologic gradient. The *Salix exigua* Nuttall (sandbar willow) community occurred mostly on surfaces with a recurrence interval of inundation shorter than 2.2 years; the *Betula occidentalis* Hooker (river birch) community peaked on sites with recurrence intervals of inundation between 2.2 and 4.6 years. The hydrologic position occupied by communities dominated by *Populus angustifolia* James (narrowleaf cottonwood) was strongly related to age of trees and species composition of understory shrubs. The fraction of riparian vegetation on surfaces historically inundated by the river decreased in the upstream direction from almost 100% near Uravan to <50% along the South Fork of the San Miguel River. In upstream reaches much of the physical disturbance necessary to maintain riparian vegetation is provided by valley-side processes including debris flows, floods from minor tributaries, landslides, and beaver activity. Where valley-side processes are important, prediction of riparian vegetation change based on alterations of river flow will be incomplete.

**Date Added** 11/2/2019, 3:20:53 PM

**Modified** 11/2/2019, 3:20:53 PM

**Tags:**

flow regime, fluvial, riparian, geology

**Notes:**

This paper investigated the cross-stream and upstream-to-downstream variation in riparian vegetation along the San Miguel River. The paper found that near Uravan, nearly 100 percent of surfaces historically inundated by the river was covered with riparian vegetation, dropping to below 50 percent upstream along the South Fork. The physical disturbances necessary to maintain riparian vegetation in the upper San Miguel come from valley-side processes like debris flows and beaver activity. The paper's conclusion is that riparian models that are based on flow regime may be inaccurate in predicting changes to riparian communities in these upper reaches.

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## Fish Traits: A Database of Ecological and Life-history Traits of Freshwater Fishes of the United States

**Type** Journal Article

**Author** Emmanuel A. Frimpong

**Author** Paul L. Angermeier

**URL** <http://doi.wiley.com/10.1577/1548-8446-34.10.487>

**Volume** 34

**Issue** 10

**Pages** 487-495

**Publication** Fisheries

**ISSN** 0363-2415, 1548-8446

**Date** 10/2009

**Extra** 00155

**DOI** 10/dsdzfv

**Accessed** 4/20/2019, 12:08:29 PM

**Library Catalog** Crossref

**Language** en

**Abstract** The need for integrated and widely accessible sources of species traits data to facilitate studies of ecology, conservation, and management has motivated development of traits databases for various taxa. In spite of the increasing number of traitsbased analyses of freshwater fishes in the United States, no consolidated database of traits of this group exists publicly, and much useful information on these species is documented only in obscure sources. The largely inaccessible and unconsolidated traits information makes large-scale analysis involving many fishes and/or traits particularly challenging. We have compiled a database of > 100 traits for 809 (731 native and 78 nonnative) fish species found in freshwaters of the conterminous United States, including 37 native families and 145 native genera.

The database, named FishTraits, contains information on four major categories of traits: (1) trophic ecology; (2) body size, reproductive ecology, and life history; (3) habitat preferences; and (4) salinity and temperature tolerances. Information on geographic distribution and conservation status was also compiled. The database enhances many opportunities for conducting research on fish species traits and constitutes the first step toward establishing a central repository for a continually expanding set of traits of North American fishes.

**Short Title** Fish Traits

**Date Added** 11/2/2019, 3:20:53 PM

**Modified** 11/2/2019, 3:20:53 PM

### Tags:

aquatic biota, flow regime, quality

### Notes:

This paper reports on the establishment of a publicly-available freshwater fish traits database. The database has searchable information on more than 100 traits for 809 freshwater fish species in the conterminous United States.

## Trait-Based Approaches in the Analysis of Stream Fish Communities

**Type** Journal Article

**Author** Emmanuel A Frimpong

**Author** Paul L Angermeier

**Volume** 73

**Pages** 109-136

**Publication** American Fisheries Society Symposium

**Date** 2010

**Library Catalog** Zotero

**Language** en


**Abstract** Species traits are used to study the functional organization of fish communities for a range of reasons, from simply reducing data dimensionality to providing mechanistic explanations for observed variation in communities. Ecological and life history traits have been used to understand the basic ecology of fishes and predict (1) species and community responses to habitat and climate alteration, and (2) species extinction, species invasion, and community homogenization. Many approaches in this arena have been developed during the past three decades, but they often have not been integrated with related ecological concepts or subdisciplines, which has led to confusion in terminology. We review 102 studies of species traits and then summarize patterns in traits being used and questions being addressed with trait-based approaches. Overall, studies of fish–habitat

relationships that apply habitat templates and hierarchical filters dominate our sample; the most frequently used traits are related to feeding. We define and show the relationships among key terms such as fundamental and realized niches; functional traits, performance, and fitness; tactic, trait-state, syndromes, and strategies; and guilds and functional groups. We propose accelerating research to (1) quantify trait plasticity, (2) identify traits useful for testing ecological hypotheses, (3) model habitat and biotic interactions in communities while explicitly accounting for phylogenetic relationships, (4) explore how traits control community assembly, and (5) document the importance of traits in fish–community responses to anthropogenic change and in delivering ecosystem services. Further synthesis of these topics is still needed to develop concepts, models, and principles that can unify the disparate approaches taken in trait-based analysis of fish communities, link fish community ecology to general community ecology, and inform sustainable management of ecosystems.

**Date Added** 11/2/2019, 3:20:56 PM

**Modified** 11/2/2019, 3:20:57 PM

### Tags:

 No DOI found, aquatic biota, climate change

### Notes:

This review paper looks at trends in research using traits in fish to predict species response to habitat and climate change. The paper proposes further research in five veins, including identifying traits useful for testing ecological hypotheses and how traits control community assembly .

## Multidecadal Responses of Native and Introduced Fishes to Natural and Altered Flow Regimes in the American Southwest

**Type** Journal Article

**Author** Keith B. Gido

**Author** David L. Propst

**Author** Julian D. Olden

**Author** Kevin R. Bestgen

**Editor** Jordan Rosenfeld

**URL** <http://www.nrcresearchpress.com/doi/10.1139/cjfas-2012-0441>

**Volume** 70

**Issue** 4

**Pages** 554-564

**Publication** Canadian Journal of Fisheries and Aquatic Sciences

**ISSN** 0706-652X, 1205-7533

**Date** 04/2013**Extra** 00053**DOI** 10/ggccdn**Accessed** 4/20/2019, 12:08:53 PM**Library Catalog** Crossref**Language** en

**Abstract** Both theory and empirical evidence identify flow regime as a primary factor driving the structure of riverine fish communities and spatial patterns of species invasions. We used long-term fish community monitoring data to evaluate hypothesized responses to interannual variability in flow attributes across seven rivers in the American Southwest. We asked the following three questions: (1) Can annual variation in species abundances be explained by attributes that represent flow seasonality, variability, and consistency? (2) Can species responses be predicted based on their origin (native versus nonnative) or life-history strategy? and (3) Are species responses to variation in specific flow attributes consistent across river systems with modified and natural flow regimes? We found that species responses to flow attributes were best predicted by origin, suggesting responses to flows are associated with adaptations to regional hydrologic variability. Additionally, most species responded negatively to increased flow variability, particularly in systems with an altered flow regime. Our findings demonstrate site- and taxa-specific responses to flows that can guide conservation of fishes in lotic systems of the American Southwest and elsewhere.

**Date Added** 11/2/2019, 3:20:55 PM**Modified** 11/2/2019, 3:20:55 PM**Tags:**

aquatic biota, flow regime

**Notes:**

This paper finds that fish species response to altered flow regimes are best predicted by the origin of the fish species. For example, maintenance of high spring discharge in naturally flowing and altered systems was beneficial to native fish that developed in that system. In addition, "some combination of high springs flows and pulsed flows timed to disrupt spawning of nonnative fishes in summer might benefit native and suppress nonnative fishes."

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## San Miguel Fisheries Inventory

**Type** Report**Author** Sherman Hebein**Date** December 1999**Extra** 00000

**Institution** Colorado Division of Wildlife  
**Date Added** 11/2/2019, 3:21:03 PM  
**Modified** 11/2/2019, 3:21:03 PM

**Tags:**

aquatic biota

**Notes:**

This report summarizes findings from electro- and boat-shocking runs on five sections of the San Miguel River. It also provides census data from anglers on catch data as well as stocking data.

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## Range-Wide Status of Colorado River Cutthroat Trout

**Type** Report  
**Author** Christine L Hirsch  
**Author** Matthew R Dare  
**Author** Shannon E Albeke  
**Place** Fort Collins  
**Date** July 2013  
**Series Title** Colorado River Cutthroat Trout Conservation Team Report  
**Institution** Colorado Parks and Wildlife  
**Library Catalog** Zotero  
**Language** en  
**Date Added** 11/2/2019, 3:20:52 PM  
**Modified** 11/2/2019, 3:20:52 PM

**Tags:**

aquatic biota, monitoring, objectives, symbolic

**Notes:**

This report summarizes the Colorado River cutthroat trout ("CRCT") Conservation Team's knowledge of the extent of the historical and present range and natural history of the Colorado River cutthroat trout, as well as the team's conservation efforts. Today, 361 conservation populations of CRCT live in 3,403 km of streams, 11 percent of its historical range. The Conservation Team performed genetic testing on 140 CRCT populations, which has helped clarify the genetic history of the CRCT from the greenback cutthroat trout. Historically, the CRCT occupied 473 km of the San Miguel. Today, it occupies 31.1 km.

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## Computational Methods for Determining Effective Discharge in the Yazoo River Basin, Mississippi

**Type** Thesis

**Author** Christopher Lee Holmquist-Johnson

**Date** Spring 2002

**University** Colorado State University

**Date Added** 11/2/2019, 3:20:59 PM

**Modified** 11/2/2019, 3:20:59 PM

### Tags:

flow regime, modeling

### Notes:

This paper provides an overview of methods of calculating effective discharge.

---

## A Preliminary Classification of the Riparian Vegetation of the Yampa and San Miguel/Dolores River Basins

**Type** Report

**Author** Gwen M. Kittel

**Author** Nancy D. Lederer

**Date** February 29, 1993

**Extra** 00000

**Institution** Colorado Department of Health, Environmental Protection Agency, The Nature Conservancy

**Date Added** 11/2/2019, 3:21:01 PM

**Modified** 11/2/2019, 3:21:01 PM

### Tags:

riparian

### Notes:

This paper reports on two years of field surveys of the Yampa and San Miguel/Dolores River basins. The authors classified riparian vegetation from intact reaches of those rivers. In the San Miguel, the authors used a stratified-random approach and classified the vegetation according to the UNESCO classification system. It is believed that the San Miguel's riparian communities rank as the best examples of riparian communities in Colorado.

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## The Flushing Flow Problem: Defining and Evaluating Objectives

**Type** Journal Article

**Author** G. Mathias Kondolf

**Author** Peter R. Wilcock

**URL** <http://doi.wiley.com/10.1029/96WR00898>

**Volume** 32

**Issue** 8

**Pages** 2589-2599

**Publication** Water Resources Research

**ISSN** 00431397

**Date** January 1, 1996

**Extra** 00000

**DOI** 10/fhfj2k

**Accessed** 4/20/2019, 12:09:02 PM

**Library Catalog** Crossref

**Language** en

**Short Title** The Flushing Flow Problem

**Date Added** 11/2/2019, 3:20:56 PM

**Modified** 11/2/2019, 3:20:56 PM

### Tags:

flow regime, fluvial, riparian, sediment transport

### Notes:



Flushing flows remove accumulated sediments and scour river channels, and are often required in dam licenses. But flushing flows can be produced at different magnitudes for different objectives. The purpose of this paper is to better define flushing flows' ecological purpose, and then tailor flushing flows management to that purpose. For example, a river channel below an existing dam may already be adapted to the new regime, and so flushing flows designed for its pre-dam channel will not produce the desired response. Similarly, if a flushing flow objective is to move sand downstream, it must not be strong enough to also move gravel. Flushing objectives can include restoring or enhancing riffle habitat, removing fine sediment, maintaining gravel looseness, enhancing pool habitat, and maintaining channel width. Often, these objectives can have incompatible flow rates. A closer examination of flow rates needed for each objective will allow flow managers to weigh costs and benefits for a release.

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## Native and Sport Fish of the San Miguel and Dolores Rivers

**Type** Presentation

**Presenter** Dan Kowalski

**Date** December 15, 2010

**Extra** 00000

**Language** en

**Date Added** 11/2/2019, 3:20:55 PM

**Modified** 11/2/2019, 3:20:55 PM

### Tags:

recreation, fishing, aquatic biota, quality, symbolic

### Notes:

This presentation by a Colorado Parks and Wildlife Aquatic Biologist provides a short summary of native and nonnative fishes range and presence in the San Miguel River basin. Highlights include the recognized presence of a highly-valued sport fishery on the mainstem of the San Miguel, nonnative warm water fish habitat from the Dolores to Horsefly Creek, the extirpation of the Colorado Pikeminnow, the improvement overall of native fish populations, and that the Dolores River below the San Miguel "supports the healthiest native fish community of the entire Dolores river basin . . . chiefly due to the water quantity and natural hydrograph pattern of the San Miguel." Native fish in the San Miguel are healthier than in the Dolores, in part because diversions of water from the Dolores are used in the San Juan basin, with no return flows accruing back to the Dolores. Conversely, San Miguel water uses occur in the San Miguel basin, so the river benefits from return flows. Large senior water rights in the San Miguel basin protect both the sport fishery and the native fish habitat below Calamity Creek "under current operations." The presentation recommends more existing flow protection in the San Miguel basin, specifically on the mainstem and on Naturita Creek, La Sal Creek, Tabeguache Creek, Calamity Draw, Atkinson Creek, and Mesa Creek.

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## San Miguel Sampling 2003

**Type** Document  
**Author** Dan Kowalski  
**Publisher** Colorado Division of Wildlife  
**Date** December 12, 2003  
**Extra** 00000  
**Date Added** 11/2/2019, 3:20:58 PM  
**Modified** 11/2/2019, 3:20:59 PM

### Tags:

aquatic biota, monitoring

### Notes:

In late September of 2003, the Colorado Division of Wildlife sampled five sites on the San Miguel and South Fork. Brook, brown, and rainbow trout were found. Brook trout at Telluride exceeded Gold Medal standard for biomass but not quality fish; however, they did exceed Wild Trout standards. Native fish including the mottled sculpin were found at all sites as well as one speckled dace at Sanborn Park. Overall, fish populations were not strong: other than the brook population at Telluride, few fish were found and those found were in poor condition. The report offers several management recommendations, including maintaining stocks, investigating flow and quality to attempt to identify population-limiting factors, and continue to cooperate with local groups and agencies to improve the health of the watershed.

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## A Natural Heritage Assessment: San Miguel and Western Montrose Counties, Colorado

**Type** Document  
**Author** Peggy Lyon  
**Author** John Sovell  
**Publisher** Colorado Natural Heritage Program  
**Date** March 2000  
**Extra** 00000  
**Date Added** 11/2/2019, 3:21:00 PM  
**Modified** 11/2/2019, 3:21:00 PM

### Tags:

aquatic biota, objectives, riparian, symbolic

**Notes:**

National Heritage Methodology was designed in 1978 to address the absence of a methodical, science-based approach to preserving biodiversity. Colorado's Natural Heritage Program lives in the College of Natural Resources at Colorado State University. The methodology identifies potential conservation areas ("PCAs") and ranks them by viability. The project identified globally outstanding riparian areas along the San Miguel and Dolores River, and in total found 59 PCAs, containing 338 occurrences of rare or imperiled plants, animals, and natural communities. The assessment provides detail of the living things found in San Miguel and western Montrose Counties.

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## Hydrologic Filtering of Fish Life History Strategies across the United States: Implications for Stream Flow Alteration

**Type** Journal Article

**Author** Ryan A. McManamay

**Author** Emmanuel A. Frimpong

**URL** <http://doi.wiley.com/10.1890/14-0247.1>

**Volume** 25

**Issue** 1

**Pages** 243-263

**Publication** Ecological Applications

**ISSN** 1051-0761

**Date** 01/2015

**DOI** 10/f6zpm3

**Accessed** 4/20/2019, 12:08:33 PM

**Library Catalog** Crossref

**Language** en

**Abstract** Lotic fish have developed life history strategies adapted to the natural variation in stream flow regimes. The natural timing, duration, and magnitude of flow events has contributed to the diversity, production, and composition of fish assemblages over time. Studies evaluating the role of hydrology in structuring fish assemblages have been more common at the local or regional scale with very few studies conducted at the continental scale. Furthermore, quantitative linkages between natural hydrologic patterns and fish assemblages are rarely used to make predictions of ecological consequences of hydrologic alterations. We ask two questions: (1) what is the relative role of hydrology in structuring fish assemblages at large scales? and (2) can relationships between fish assemblages and natural hydrology be utilized to predict fish assemblage responses to hydrologic disturbance? We developed models to relate fish life histories and reproductive strategies to landscape and hydrologic variables separately and then combined. Models were then used to predict the ecological consequences of altered hydrology due to dam regulation. Although hydrology plays a considerable role in structuring

fish assemblages, the performance of models using only hydrologic variables was lower than that of models constructed using landscape variables. Isolating the relative importance of hydrology in structuring fish assemblages at the continental scale is difficult since hydrology is interrelated to many landscape factors. By applying models to damregulated hydrologic data, we observed some consistent predicted responses in fish life history strategies and modes of reproduction. In agreement with existing literature, equilibrium strategists are predicted to increase following dam regulation, whereas opportunistic and periodic species are predicted to decrease. In addition, dam regulation favors the selection of reproductive strategies with extended spawning seasons and preference for stable conditions. Key words: classification frameworks; dams; ecohydrology; environmental flows; fish reproductive strategies; fish traits; flow–ecology relationship; hydrologic alteration.

**Short Title** Hydrologic filtering of fish life history strategies across the United States

**Date Added** 11/2/2019, 3:20:53 PM

**Modified** 11/2/2019, 3:20:53 PM

### Tags:

aquatic biota, flow regime, quality

### Notes:

This paper explores the role of hydrology in structuring fish assemblages and whether effects to these assemblages can be predicted from hydrological disturbances. The authors found that models using landscape variables better predicted fish assemblage than models using only hydrological variables. To complement hydrological models, the authors recommend incorporating "geographic context and interacting abiotic and biotic confounding factors" as well as water quality information and confirming field studies into models.

## Assessing Streamflow Needs for Whitewater Recreation in the Gunnison River Basin

**Type** Journal Article

**Author** Chris Menges

**Author** Nathan Fey

**Author** Evan Stafford

**Publication** American Whitewater

**Library Catalog** Zotero

**Language** en

**Abstract** Streamflow, or the amount of water in a river, affects the quality, quantity, and timing of river-related recreation, such as whitewater boating. This report describes flows that provide whitewater boating opportunities for various crafttypes on

targeted river segments in the Gunnison River Basin in western Colorado. American Whitewater conducted the Gunnison Basin Flow Study during the summer of 2013, with the goals of 1) informing the deliberations and Basin Implementation Plan of the Gunnison Basin Roundtable and 2) adding to the dataset supplied to the Bureau of Reclamation (BOR) to inform the Colorado River Basin Supply and Demand Study. Two approaches were used in this assessment to collect information on the relationship between streamflows and recreation quality for each targeted river segment. An online survey collected information from 331 respondents who evaluated flows for whitewater boating on 17 river and stream segments in the Basin. Respondent data was organized to identify minimum, acceptable and optimal flows for whitewater boating, summarized by FlowEvaluation curves describing the quality of boating opportunities for each measured stream-flow. Respondents also reported specific flows that provide certain recreation experiences or “niches”, from technical low water to challenging high water trips. This report provides baseline information on streamflows and whitewater recreation in the Gunnison River Basin that can be applied to evaluating how future water management actions or risk management strategies may impact whitewater recreation.

**Date Added** 11/2/2019, 3:20:50 PM

**Modified** 11/2/2019, 3:20:51 PM

### Tags:

 No DOI found, recreation, flow regime

### Notes:

American Whitewater produced this report on boaters' streamflow preferences to inform the Gunnison Basin Roundtable and the Bureau of Reclamation's Colorado River Basin Supply and Demand Study. The preferences were developed using a survey and an analysis called the Flow Acceptability Agreement Index. The San Miguel River was not included in this study.

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## Theory, Methods and Tools for Determining Environmental Flows for Riparian Vegetation

**Type** Journal Article  
**Author** David M. Merritt  
**Author** Michael L. Scott  
**Author** N. LeRoy Poff  
**Author** Gregor T. Auble  
**Author** David A. Lytle  
**URL** <http://doi.wiley.com/10.1111/j.1365-2427.2009.02206.x>  
**Volume** 55

**Issue** 1  
**Pages** 206-225  
**Publication** Freshwater Biology  
**ISSN** 00465070, 13652427  
**Date** 2010  
**Extra** 00298  
**DOI** 10/bdkn2k  
**Accessed** 4/20/2019, 12:08:39 PM  
**Library Catalog** Crossref  
**Language** en  
**Short Title** Theory, methods and tools for determining environmental flows for riparian vegetation  
**Date Added** 11/2/2019, 3:20:54 PM  
**Modified** 11/2/2019, 3:20:54 PM

**Tags:**

aquatic biota, flow regime, fluvial, riparian

**Notes:**

When grouping plants together into guilds for the purposes of modeling riparian response to flow regime modification, this study advocates for those guilds to be developed by similar life histories, reproductive strategy, morphology, adaptations to fluvial disturbance and water availability rather than guilds based on genetic relatedness.

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## Life History Theory Predicts Fish Assemblage Response to Hydrologic Regimes

**Type** Journal Article  
**Author** Meryl C. Mims  
**Author** Julian D. Olden  
**URL** <http://doi.wiley.com/10.1890/11-0370.1>  
**Volume** 93  
**Issue** 1  
**Pages** 35-45  
**Publication** Ecology  
**ISSN** 0012-9658  
**Date** 01/2012  
**Extra** 00175

**DOI** 10/b9gfss**Accessed** 4/20/2019, 12:08:18 PM**Library Catalog** Crossref**Language** en

**Abstract** The hydrologic regime is regarded as the primary driver of freshwater ecosystems, structuring the physical habitat template, providing connectivity, framing biotic interactions, and ultimately selecting for specific life histories of aquatic organisms. In the present study, we tested ecological theory predicting directional relationships between major dimensions of the flow regime and life history composition of fish assemblages in perennial free-flowing rivers throughout the continental United States. Using long-term discharge records and fish trait and survey data for 109 stream locations, we found that 11 out of 18 relationships (61%) tested between the three life history strategies (opportunistic, periodic, and equilibrium) and six hydrologic metrics (two each describing flow variability, predictability, and seasonality) were statistically significant ( $P < 0.05$ ) according to quantile regression. Our results largely support a priori hypotheses of relationships between specific flow indices and relative prevalence of fish life history strategies, with 82% of all significant relationships observed supporting predictions from life history theory. Specifically, we found that (1) opportunistic strategists were positively related to measures of flow variability and negatively related to predictability and seasonality, (2) periodic strategists were positively related to high flow seasonality and negatively related to variability, and (3) the equilibrium strategists were negatively related to flow variability and positively related to predictability. Our study provides important empirical evidence illustrating the value of using life history theory to understand both the patterns and processes by which fish assemblage structure is shaped by adaptation to natural regimes of variability, predictability, and seasonality of critical flow events over broad biogeographic scales.

**Date Added** 11/2/2019, 3:20:52 PM**Modified** 11/2/2019, 3:20:53 PM**Tags:**

aquatic biota, flow regime

**Notes:**

This paper reports on the relationship between hydrologic variability and fish assemblage by looking at rivers throughout the United States. The paper suggests these results can help in the prediction of species response to flow regime alteration. For example, periodic strategists were positively related to high flow seasonality. Equilibrium strategists were positively related to predictability. In the Colorado River basin, native species were not equilibrium strategists, but now in the altered flow regime (from highly variable to less variable) the basin supports equilibrium strategists such as smallmouth bass.

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## Decision Record/FONSI: San Juan/San Miguel RMP Amendment, for the Proposed Area of Critical Environmental Concern and Special Recreation Management Area on the San Miguel River

**Type** Report

**Author** Bob Moore

**Date** February 23, 1993

**Extra** 00000

**Institution** Bureau of Land Management

**Date Added** 11/2/2019, 3:21:01 PM

**Modified** 11/2/2019, 3:21:01 PM

### Tags:

recreation, aquatic biota, quality, riparian, ag, land use

### Notes:

This Bureau of Land Management Finding of No Significant Impact allowed the BLM to amend its resource management plan for the Uncompahgre Basin Resource Area to create a Special Recreation Management Area of 32,641 acres (the San Miguel River from Placerville to Horsefly Creek). Of that land, 20,964 would be designated as an Area of Critical Environmental Concern. Such a designation allowed the BLM to close the riverbottom to sand and gravel sales and better protect riparian areas. The riparian community had begun to show damage from the rapid growth in the area. The report has a detailed description of aquatic biota and riparian communities existing at the time.

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## History, Geology, and Environmental Setting of Selected Mines near Ophir, Uncompahgre National Forest, San Miguel County, Colorado

**Type** Document

**Author** John Neubert

**Author** Robert H. Wood

**Publisher** Colorado Geological Survey

**Date** 2001

**Extra** 00000

**Date Added** 11/2/2019, 3:20:59 PM

**Modified** 11/2/2019, 3:20:59 PM

### Tags:

quality, land use



**Notes:**

Howards Fork basin's mining legacy dates back to the 1870s. This report describes the history, geology, and environmental setting of several mines near Ophir. For each mine, its history, development, production, and waste and hazard characteristics, including water quality concerns, are captured and described.

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## Intercontinental Comparison of Fish Life History Strategies along a Gradient of Hydrologic Variability

**Type** Journal Article

**Author** Julian D Olden

**Author** Mark J Kennard

**Volume** 73

**Pages** 83-107

**Publication** American Fisheries Society Symposium

**Date** 2010

**Extra** 00108

**Library Catalog** Zotero

**Language** en


**Abstract** The flow regime is considered the primary driver of physical processes in riverine ecosystems; thus we expect that the trait composition of fish assemblages might respond similarly to hydrologic variability, even at broad spatial scales. Here, we test the hypothesis that freshwater fish life history strategies on two continents (southern United States and eastern Australia) converge along gradients of hydrologic variability and primary productivity at the drainage scale. Our results show that the fishes of the United States and Australia conform to the three-dimensional adaptive space arising from the trade-offs among three basic demographic parameters of survival, fecundity, and onset and duration of reproductive life. Species from both continents represent the endpoints in adaptive space defining the periodic (19% versus 33% for the United States and Australia, respectively), opportunistic (69% versus 52%), and equilibrium life history strategies (12% versus 15%). We found evidence that fish life history composition of drainage basins in the two continents have converged across similar gradients of hydrologic variability and productivity despite phylogenetic and historical differences. Moreover, these relationships were largely consistent with predictions from life history theory. Increasing hydrologic variability has promoted the greater prevalence of opportunistic strategists (a strategy that should maximize fitness in environmental settings dominated by unpredictable environmental change) while concurrently minimizing the persistence of periodic-type species (a strategy typically inhabits seasonal, periodically suitable environments). Our study provides a conceptual framework of management options for species in regulated rivers because life history strategies are the underlying determinants for population

responses to environmental change and therefore can be used to classify typical population responses to flow alteration or mitigation via environmental flow prescriptions.

**Date Added** 11/2/2019, 3:20:52 PM

**Modified** 11/2/2019, 3:20:53 PM

### Tags:

 No DOI found, aquatic biota, flow regime

### Notes:

This comparative study between river basins in the southern U.S. and eastern Australia found that "patterns of life history composition of river basins responded similarly along a gradient of hydrologic variability." The river basins were chosen because of similar long-term climatic regimes. The authors found the two basins contained similar fractions of types of fish species: equilibrium, opportunistic, and periodic.

## Southwest Basin Implementation Plan

**Type** Document

**Author** Ann Oliver

**Author** Carrie Lile

**Publisher** Southwest Basin Roundtable

**Date** April 17, 2015

**Extra** 00000

**Library Catalog** Zotero

**Language** en

**Date Added** 11/2/2019, 3:20:56 PM

**Modified** 11/2/2019, 3:20:56 PM

### Tags:

recreation, aquatic biota, flow regime, objectives, quality, symbolic, ag, drinking water

### Notes:

Each basin in the state of Colorado produced a Basin Implementation Plan in 2015 to insert regional perspective into the Colorado Water Plan. The Southwest Basin Implementation Plan ("BIP") recognizes the need to better develop environmental and recreational supply needs based on attributes identified during the 2010 Statewide Water Supply Initiative. The BIP sets as goals the implementation of 10 projects that benefit recreation and 15 projects that "directly restore, recover, or sustain endangered, threatened, and sensitive aquatic and riparian dependent species and plant communities." Projects of note for the San Miguel River basin are: the Montrose County Firming Project, which may include the construction of one or two reservoirs, in addition to the Nucla Town Reservoir Enlargement; San Miguel potential recreational in-channel diversion; San Miguel Wild and Scenic Suitability; CCC-Ditch Fish Ladder Repair; Naturita Creek proposed instream flow; San Miguel instream flow; Valley Floor River Channel Restoration Project; Tabeguache Creek Native Fish Barrier Removal Project; and the Woods Lake Colorado river cutthroat trout habitat restoration.

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## San Miguel Watershed Plan: A Collaborative Management Framework for the San Miguel Basin

**Type** Report

**Author** San Miguel Watershed Coalition

**Date** 1998

**Extra** 00000

**Library Catalog** Zotero

**Language** en

**Date Added** 11/2/2019, 3:20:55 PM

**Modified** 11/2/2019, 3:20:55 PM

### Tags:

boating, recreation, fishing, flow regime, monitoring, objectives, quality, ag

### Notes:

The San Miguel Watershed Coalition's 1998 Watershed Plan was developed for a number of goals, including maintaining the good health of the landscape as the basin experienced rapid economic change. The plan is broad in scope, discussing issues ranging from affordable housing, preserving agricultural lands, reducing permitting times for logging, and maintaining healthy year round air quality. River-centric goals include supporting instream flows, evaluating future water projects in light of hydrological conditions, advocating for water conservation, minimizing non-point source pollution, achieving a sustainable riparian environment, and improving number and quality of access points to many streams in the area.

## Quantifying Channel Maintenance Instream Flows: An Approach for Gravel-Bed Streams in the Western United States

**Type** Report

**Author** Larry J. Schmidt

**Author** John P. Potyondy

**URL** <https://www.fs.usda.gov/treearch/pubs/6434>

**Place** Ft. Collins, CO

**Date** 2004

**Extra** 00041 DOI: 10.2737/RMRS-GTR-128

**Accessed** 4/20/2019, 12:08:51 PM

**Institution** U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station

**Library Catalog** Crossref

**Language** en

**Abstract** This paper discusses one approach for quantifying channel maintenance instream flow necessary to achieve the Forest Service Organic Act purpose of securing favorable conditions of water flows. The approach is appropriate for quantifying channel maintenance flows on perennial, unregulated, snowmelt-dominated, gravel-bed streams with alluvial reaches. The approach identifies the minimum essential regime of streamflows necessary for the channel and its floodplain to remain fully functioning with respect to sediment and flow conveyance. The paper discusses the role of water, sediment, and vegetation in maintaining a channel and provides methodologies for estimating the upper and lower limits of the required sediment transporting flows. Conceptually, these flows range from intermediate flows associated with initial coarse sediment movement from the coarse surface layer of gravel-bed streams (Phase 2 transport) up to the 25-year flow event. The paper also provides suggestions for analyzing and displaying results, implementing studies at the watershed scale, determining data needs, and post-project management and evaluation. Best application of the approach occurs at sites having long-term bedload data and streamflow records.

**Short Title** Quantifying Channel Maintenance Instream Flows

**Date Added** 11/2/2019, 3:20:55 PM

**Modified** 11/2/2019, 3:20:55 PM

### Tags:

flow regime, riparian, sediment transport

### Notes:

The U.S. Forest Service is required to "improve and protect the forest . . . for the purpose of securing favorable conditions of water flows" under the Organic Administration Act. The agency has secured instream flow protections through western water adjudications under the interpretation of that phrase to mean "physical channel maintenance, excluding fisheries and aquatic ecosystem considerations." This report offers a methodology for quantifying channel maintenance instream flows, designed to maintain the physical characteristics of the stream channel. In places like Colorado, water required to maintain channels comes from and during runoff - a time of water surplus. And as such, the authors believe senior water users would not be affected by this methodology. The methodology combines two needed flows: bedload sediment transporting flows and streamside vegetation sustaining flows.

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## Putting the "Ecology" into Environmental Flows: Ecological Dynamics and Demographic Modeling

**Type** Journal Article

**Author** Will Shenton

**Author** Nicholas R. Bond

**Author** Jian D. L. Yen

**Author** Ralph Mac Nally

**URL** <http://link.springer.com/10.1007/s00267-012-9864-z>

**Volume** 50

**Issue** 1

**Pages** 1-10

**Publication** Environmental Management

**ISSN** 0364-152X, 1432-1009

**Date** April 28, 2012

**Extra** 00000

**DOI** 10.1007/s00267-012-9864-z

**Accessed** 4/20/2019, 12:09:06 PM

**Library Catalog** Crossref

**Language** en

**Short Title** Putting the "Ecology" into Environmental Flows

**Date Added** 11/2/2019, 3:20:57 PM

**Modified** 11/2/2019, 3:20:57 PM

### Tags:

aquatic biota, flow regime, riparian

### Notes:

This review identifies shortcomings in environmental flows methodologies and purposes improvements. Two assumptions the review focuses on are (1) a reliance on past flow data and (2) habitat suitability as a proxy for species population dynamics. The review argues reliance on past flow data undervalues the importance of extreme events and assumes the past is a good predictor of the future. Focusing on habitat suitability ignores issues like events or cues used by biota "to stimulate and govern life-history events." Demographic modeling can help strengthen these analyses, but they can be "data hungry". The review suggests the use of "guilds": a group of species that exploits the same class of environmental resources in a similar way. Through additional analyses, this information can help scientists estimate growth, survival, and mortality for an entire class of species as a shortcut.

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## Projected Changes in Plant Species Richness and Extent of Riparian Vegetation Belts as a Result of Climate-Driven Hydrological Change along the Vindel River in Sweden

**Type** Journal Article

**Author** Lotta Ström

**Author** Roland Jansson

**Author** Christer Nilsson

**URL** <http://doi.wiley.com/10.1111/j.1365-2427.2011.02694.x>

**Volume** 57

**Issue** 1

**Pages** 49-60

**Publication** Freshwater Biology

**ISSN** 00465070

**Date** 01/2012

**DOI** 10.1111/j.1365-2427.2011.02694.x

**Accessed** 4/20/2019, 12:08:56 PM

**Library Catalog** Crossref

**Language** en

**Short Title** Projected changes in plant species richness and extent of riparian vegetation belts as a result of climate-driven hydrological change along the Vindel River in Sweden

**Date Added** 11/2/2019, 3:20:55 PM

**Modified** 11/2/2019, 3:20:56 PM

### Tags:

flow regime, riparian, climate change

### Notes:

This paper presents the results of an attempt to predict changes in the extent and richness of riparian zones due to climate change. The study combines climate change models with a runoff model for a river in Sweden, and, finally, with riparian species accumulation curves. Their results showed changes and reductions in species composition due to climate change, tracking real world experiences on rivers in Sweden regulated by hydropower.

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## Save the Native: San Miguel Tamarisk Monitoring Update 2014

**Type** Document

**Author** The Nature Conservancy

**Date** May 2014

**Extra** 00000

**Date Added** 11/2/2019, 3:21:03 PM

**Modified** 11/2/2019, 3:21:04 PM

### Tags:

monitoring, objectives, riparian

### Notes:

In 2001 The Nature Conservancy, the Bureau of Land Management, San Miguel Weed Board, The San Miguel Basin Conservation District and private landowners began this project to establish the San Miguel as the only naturally functioning, tamarisk-free river in the Southwest; however, some areas were too remote or dense to be chemically treated. In 2013, TNC staff resampled treated areas. The survey confirmed that reduced tamarisk density persisted. Tamarisk beetles are now in the San Miguel watershed, but their impact is not yet being felt.

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## Save the Native: San Miguel Tamarisk Monitoring Update 2007

**Type** Document

**Author** The Nature Conservancy

**Date** December 2007

**Extra** 00000

**Date Added** 11/2/2019, 3:21:04 PM

**Modified** 11/2/2019, 3:21:04 PM

### Tags:

monitoring, objectives, riparian

**Notes:**

In 2001, The Nature Conservancy, the Bureau of Land Management, San Miguel Weed Board, San Miguel Basin Conservation District, and private landowners began a project to establish the San Miguel as the only naturally functioning, tamarisk-free river in the Southwest. Mapping tamarisk occurred during 2001-2002, and treatment during 2002-2008. The report gives detailed progress by segment.

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## San Miguel/Lower Dolores River Project: Measures of Conservation Success

**Type** Document

**Author** The Nature Conservancy

**Date** September 2008

**Date Added** 11/2/2019, 3:21:04 PM

**Modified** 11/2/2019, 3:21:04 PM

**Tags:**

flow regime, objectives, riparian

**Notes:**

The Nature Conservancy designated the San Miguel/Lower Dolores River as a conservation priority landscape for its work. TNC's goal is the conservation of river systems with healthy riparian and aquatic communities and with upland areas supporting sage-grouse and prairie dogs. This guide acts as a strategic plan for TNC's work in the area, identifying key attributes, threats, objectives, and strategies.

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## Telluride Valley Floor Open Space Management Plan

**Type** Document

**Author** Town of Telluride

**Author** ERO Resources Corporation

**Date** August 2009

**Extra** 00000

**Library Catalog** Zotero

**Date Added** 11/2/2019, 3:20:56 PM

**Modified** 11/2/2019, 3:20:56 PM

**Tags:**

recreation, aquatic biota, quality, riparian, land use



**Notes:**

The Town of Telluride condemned for open space 560 acres of San Miguel valley floor in 2008 after eight years of legislative and judicial wrangling. This Management Plan provides the overall guidelines for use of the property. It divides the property into three zones: recreational, conservation, and habitat protection, each with different levels of human use permitted. It also focuses on management of various species, including beaver and marmot; restoration of degraded sites; monitoring attributes; and recreational opportunities.

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**A Two-Fraction Model for the Transport of Sand/Gravel Mixtures****Type** Journal Article**Author** Peter R. Wilcock**Author** Stephen T. Kenworthy**URL** <http://doi.wiley.com/10.1029/2001WR000684>**Volume** 38**Issue** 10**Pages** 12-1-12-12**Publication** Water Resources Research**ISSN** 00431397**Date** 10/2002**Extra** 00000**DOI** 10/d3tfgz**Accessed** 4/20/2019, 12:09:08 PM**Library Catalog** Crossref**Language** en**Short Title** A two-fraction model for the transport of sand/gravel mixtures**Date Added** 11/2/2019, 3:20:57 PM**Modified** 11/2/2019, 3:20:58 PM**Tags:**

flow regime, sediment transport

**Notes:**

This paper develops a model for combining the behavior of different sized particles, sand and gravel, into a single transport function. The paper developed the model from observations in the field and using a flume.

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## Riparian Responses to Reduced Flood Flows: Comparing and Contrasting Narrowleaf and Broadleaf Cottonwoods

**Type** Journal Article

**Author** Thomas K. Wilding

**Author** John S. Sanderson

**Author** David M. Merritt

**Author** Stewart B. Rood

**Author** N. LeRoy Poff

**URL** <http://www.tandfonline.com/doi/abs/10.1080/02626667.2014.880786>

**Volume** 59

**Issue** 3-4

**Pages** 605-617

**Publication** Hydrological Sciences Journal

**ISSN** 0262-6667, 2150-3435

**Date** 2014-04-03

**Extra** 00000

**DOI** 10/ggccdp

**Accessed** 4/20/2019, 12:09:10 PM

**Library Catalog** Crossref

**Language** en

**Abstract** To enable assessment of risks of water management to riparian ecosystems at a regional scale, we developed a quantile-regression model of abundance of broadleaf cottonwoods (*Populus deltoides* and *P. fremontii*) as a function of flood flow attenuation. To test whether this model was transferrable to narrowleaf cottonwood (*Populus angustifolia*), we measured narrowleaf abundance along 39 river reaches in northwestern Colorado, USA. The model performed well for narrowleaf in all 32 reaches where reservoir storage was <75% of mean annual flow. Field data did not fit the model at four of seven reaches where reservoir storage was >90% of mean annual flow. In these four reaches, narrowleaf was abundant despite peak flow attenuation of 45–61%. Poor model performance in these four reaches may be explained in part by a pulse of narrowleaf cottonwood expansion as a response to channel narrowing and in part by differences between narrowleaf and broadleaf cottonwood response to floods and drought.

**Short Title** Riparian responses to reduced flood flows

**Date Added** 11/2/2019, 3:20:57 PM

**Modified** 11/2/2019, 3:20:58 PM

### Tags:

flow regime, riparian

**Notes:**

A related previous paper had developed a relational model between streamflow and adult broadleaf cottonwood abundance on 13 perennial rivers. The purpose of this paper was to test the model's performance for narrowleaf cottonwoods on 21 streams. The paper found the narrowleaf cottonwood has "a more complicated relationship to streamflow alternation" than its cousin. The narrowleaf "may persist or even expand in particular instances where flood flows are strongly attenuated."

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**San Miguel River Restoration Assessment Summary****Type** Report**Author** Patrick Willits**Author** Linda Luther**Author** Robert Wigington**Author** Ned Andrews**Author** Leslie Pizzi**Date** March 5, 2001**Extra** 00000**Institution** San Miguel County**Library Catalog** Zotero**Language** en**Date Added** 11/2/2019, 3:21:03 PM**Modified** 11/2/2019, 3:21:03 PM**Tags:**

aquatic biota, flow regime, fluvial, objectives, quality, riparian, ag

**Notes:**

This document summarizes the extensive San Miguel River Restoration Assessment Final Report. The goals of the assessment were to identify elements of biodiversity, their condition, and the ecological and hydrological processes that sustain them; and to identify and prioritize restoration reaches and activities that will help restore and maintain those elements and processes. The assessment identified 17 restoration sites, with five selected as highest priority. In addition, the assessment supports further study of the ice flows that originate in the South Fork.

The top five restoration reaches are below, with select restoration recommendations:

Dry Creek to Tabeguache Creek - highly ranked biodiversity values: maintain seasonal high flows, re-connect river channel to floodplain, fence riparian areas, control weeds, assess minimum flows.

Horsefly Creek to Cottonwood Creek - highly ranked biodiversity values: same as above, and cooperate with water users to obtain a CCC Ditch efficiency study with goal of trading water efficiency improvements for a guaranteed low water minimum streamflow.

Deep Creek - Colorado River cutthroat trout: prevent re-introduce of nonnative species by construction of in-channel barrier, remove nonnative species, regulate angling, monitor water quality, maintain seasonal high flows, analyze USFS Road 639 impacts, secure water rights for cutthroat habitat.

Howard Fork - important information needed to determine value of restoration to biodiversity: gather stakeholders to analyze impacts of acid mine drainage, encourage remediation, look at in-channel tailings, study directing braided channels into single channel.

Telluride Valley Floor - important information needed to determine value of restoration to biodiversity: analyze metal loading, analyze flora, remove taillings, relocate sewer line and remove railroad grade, perform in-channel construction to restore sinuosity and meander.

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## Colorado River Cutthroat Trout: A Technical Conservation Assessment

**Type** Report

**Author** Michael K. Young

**URL** <https://www.fs.usda.gov/treesearch/pubs/29451>

**Place** Ft. Collins, CO

**Date** 2008

**Extra** 00022 DOI: 10.2737/RMRS-GTR-207

**Accessed** 4/20/2019, 12:08:16 PM

**Institution** U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station

**Library Catalog** Crossref

**Language** en

**Abstract** The Colorado River cutthroat trout (*Oncorhynchus clarkii pleuriticus*) was once distributed throughout the colder waters of the Colorado River basin above the Grand Canyon. About 8 percent of its historical range is occupied by unhybridized or ecologically significant populations. It has been petitioned for listing under the Endangered Species Act and is accorded special status by several state and federal agencies. Habitat alteration and nonnative trout invasions led to the extirpation of many populations and impede restoration. Habitat fragmentation exacerbated by climate change is an emerging threat. A strategic, systematic approach to future conservation is likely to be the most successful.

**Short Title** Colorado River cutthroat trout

**Date Added** 11/2/2019, 3:20:52 PM

**Modified** 11/2/2019, 3:20:52 PM

**Tags:**

aquatic biota, monitoring, objectives, symbolic, climate change

**Notes:**

This assessment provides an extremely detailed look at the Colorado River cutthroat trout across the USFS Rocky Mountain Region, its natural and management history, and ongoing conservation issues. Conservation issues include competition from and predation by nonnative fishes, habitat fragmentation, fire, and climate change. The assessment also provides a comprehensive overview of conservation management efforts for the trout within the National Forest System.

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## Range-Wide Conservation Agreement and Strategy for Roundtail Chub, Bluehead Sucker, and Flannelmouth Sucker

**Type** Document

**Publisher** Utah Department of Natural Resources

**Date** September 2006

**Extra** 00006

**Date Added** 11/2/2019, 3:20:49 PM

**Modified** 11/2/2019, 3:20:51 PM

**Tags:**

actions, aquatic biota, monitoring, objectives, symbolic, regulatory compliance

**Notes:**

This interstate agreement between Colorado River Basin state wildlife management agencies seeks to hasten the conservation of three fish species: roundtail chub, bluehead sucker, and flannelmouth sucker. Each state is required to develop conservation and management plans for the species that exist within each state, which should include: status assessments, databases, population demographics, and genetic characterization. Management actions include increasing populations and habitat and controlling non-native species. The Dolores basin is home to the flannelmouth sucker and bluehead sucker.

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## DRAFT Ice Accumulation Downstream of the Ames Powerhouse: Quality of the Sport Fishery Potentially Affected by the Project

**Type** Document

**Publisher** Ames Hydroelectric Project Water/Terrestrial Resource Work Group

**Library Catalog** Zotero

**Language** en

**Date Added** 11/2/2019, 3:20:50 PM

**Modified** 11/2/2019, 3:20:50 PM

### Tags:

aquatic biota, flow regime, hydropower, riparian

### Notes:

Channel ice and ice surges can pose a threat to riparian and aquatic river species. This report, written in partnership between the San Miguel Watershed Coalition, the Bureau of Land Management, and Public Service Company of Colorado attempts to establish to what extent managed temperature and flow regimes at the Ames Hydroelectric Project contribute to ice issues in the South Fork San Miguel and mainstem San Miguel Rivers. The report found that a combination of winter water temperatures, releases of warmer water from the Ames Plant, and drops in air temperature can create conditions favorable to the development of ice flows. These ice flows can travel as far as 30 miles downstream. The report proposes additional monitoring points and management experiments to further understand the problem and test out solutions.

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## BLM Uncompahgre RMP Planning Area: Special Management Areas

**Type** Map

**Publisher** Bureau of Land Management

**Date** January 2010

**Library Catalog** Zotero

**Language** en

**Date Added** 11/2/2019, 3:20:50 PM

**Modified** 11/2/2019, 3:20:50 PM

**Tags:**

monitoring, objectives

**Notes:**

This BLM planning map depicts the scope of the BLM's Uncompahgre Planning Area and Field Office Boundary, as well as Areas of Critical Environmental Concern, Special Recreation Management Area, Wilderness Study Areas, Wilderness Areas, and National Conservation Planning Areas, among others.

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## Application for License, Ames Hydroelectric Project - Exhibit E: Applicant-Prepared Environmental Assessment

**Type** Document

**Publisher** Public Service Company of Colorado

**Date** 2008

**Extra** 00000

**Date Added** 11/2/2019, 3:20:58 PM

**Modified** 11/2/2019, 3:20:58 PM

**Tags:**

aquatic biota, flow regime, hydropower, quality, riparian, symbolic

**Notes:**

This Environmental Assessment on the Federal Energy Regulatory Commission license for the Ames Hydropower Project provides a great deal of information on Howards Fork and Lake Fork of the South Fork San Miguel River. It includes hydrological information on operations of the plant and Trout Lake and Hope Lake, including depletion and accretion effects on stream reaches used by the project. In addition, the report captures information on aquatic resources in tributaries, the South Fork San Miguel, and the mainstem San Miguel River, including macroinvertebrate survey results, a synthesis of fish reports (including cutthroat numbers) and biomass numbers. Further, the report includes information on water quality, ice flows, and riparian areas.

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## Application for License, Ames Hydroelectrical Project - Exhibits A-D & F-H

**Type** Document

**Publisher** Public Service Company of Colorado

**Date** 2008

**Date Added** 11/2/2019, 3:20:58 PM

**Modified** 11/2/2019, 3:20:58 PM

**Tags:**

flow regime, hydropower

**Notes:**

Exhibits for the Ames Hydroelectric Project's Application for License include a project description, project operations and resource utilization, project history and proposed improvements, project economics and financing, public design drawings, and maps. The resource utilization section provides hydrological information about Lake Fork, Howards Fork, and the South Fork San Miguel.

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## Draft Evaluation of Proposed and Existing Areas of Critical Environmental Concern for the Uncompahgre Planning Area

**Type** Document

**Publisher** Bureau of Land Management

**Date** June 2010

**Extra** 00000

**Date Added** 11/2/2019, 3:20:58 PM

**Modified** 11/2/2019, 3:20:58 PM

**Tags:**

monitoring, objectives, riparian

**Notes:**

The BLM is required to consider for designation Areas of Critical Environmental Concern ("ACEC") as a part of its land use planning process under the Federal Land Policy and Management Act. Lands designated as ACEC are given special management attention and protection. This document includes a proposal to extend this designation upstream and downstream from an existing ACEC that encompasses the San Miguel River from Placerville to Horsefly Creek, preserving high quality riparian vegetation resources, bird habitats, and scenic value. The reach represents the finest protected Southwest Canyon Riparian Habitat outside of Arizona's San Pedro River, with more than 300 bird species observed. The BLM and Trout Unlimited have proposed the addition of 35,181 acres.



## San Juan/San Miguel Resource Management Plan and Environmental Impact Statement

**Type** Document

**Publisher** Bureau of Land Management

**Date** December 1984

**Date Added** 11/2/2019, 3:20:58 PM

**Modified** 11/2/2019, 3:20:58 PM

### Tags:

aquatic biota, monitoring, objectives, quality, riparian, symbolic

### Notes:

This plan was developed to provide a "comprehensive framework for managing and allocating public land and resources." Part of the plan included BLM's decisions regarding how to manage riparian and aquatic resources, water quality, as well as watershed-level lands. The plan analyzed several alternative management scenarios. Specifics as to how fish and wildlife habitat would be protected or improved are provided through specific projects and identified under habitat management plans. The plan forbids activities that jeopardize the continued existence of threatened, endangered, or sensitive species habitat. Bridges and culverts must be designed to maintain passage.

Specific alternatives prioritize the restoration of the upper San Miguel riparian habitat and give a lower priority to the lower San Miguel.

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## San Miguel River: Legal and Institutional Analysis

**Type** Document

**Date** February 2000

**Extra** 00000

**Date Added** 11/2/2019, 3:20:59 PM

**Modified** 11/2/2019, 3:20:59 PM

### Tags:

water rights

### Notes:

This report provides a history of water development in the San Miguel basin, beginning with the discovery of gold in the basin and the agriculturalists who came after, through the development of the Telluride ski area and later protections of instream flows. It is likely this is part of the San Miguel Restoration Assessment, but it is uncredited.

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**Type** Case

**Extra** 00000

**Court** District Court, Water Division No. 4

**Case Name** Application for Conditional Water Storage Rights

**Docket Number** 10CW\_\_

**Date Added** 11/2/2019, 3:20:59 PM

**Modified** 11/2/2019, 3:21:00 PM

**Tags:**

water rights

**Notes:**

In 2010, Montrose County applied for conditional storage water rights totaling 15,000 acre-feet, with a 15,000 acre-foot refill. The conditional water rights were tied to three structures, Maverick Draw Reservoir Nos. 1 and 2, and the Marie Scott Reservoir, filled by the J. & M. Hughes Ditch and the Beaver Park Ditch. The requested decreed uses are domestic, industrial, and municipal uses, plus enhancement and/or maintenance of water quality, among others.

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## Norwood Land Health Assessment 2005-2006

**Type** Document

**Publisher** Bureau of Land Management

**Extra** 00000

**Date Added** 11/2/2019, 3:21:00 PM

**Modified** 11/2/2019, 3:21:00 PM

**Tags:**

aquatic biota, quality, riparian, ag, land use, sediment transport

**Notes:**

The BLM assessed 103,000 acres of public land (including rivers) in San Miguel and western Montrose Counties to determine which acres met Colorado BLM's Rangeland Health Standards. Around 90 percent of streams met healthy riparian vegetation standards, and a majority of streams met water quality standards. Areas with riparian problems were found on Dry Park Draw, Goat Creek, Hamilton Creek, Naturita Creek, and Specie Creek.

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## San Miguel Watershed Rapid Assessment

**Type** Document

**Publisher** U.S. Department of Agriculture

**Date** March 2010

**Extra** 00000

**Date Added** 11/2/2019, 3:21:00 PM

**Modified** 11/2/2019, 3:21:00 PM

### Tags:

economic impact, quality, riparian, symbolic, ag, land use, geology

### Notes:

Rapid watershed assessments by the Natural Resources Conservation Service are intended to "increase the speed and efficiency [of] generating information to guide conservation implementation." The San Miguel watershed rapid assessment provides map overlays of soils, elevations, land ownership, vegetation, precipitation, 303(d) listed streams, forest insects and disease, geology, state and federal special status species, social data, long range resource concerns, and conservation systems available. Conservation district concerns include inadequate irrigation supply, soil erosion, and water quality and quantity. Conservation practices undertaken from 2005 to 2009 included side roll installations.

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## 2005 Report Card: The Ecological Health of the San Miguel River Watershed

**Type** Report

**Institution** The Nature Conservancy; San Miguel Watershed Coalition

**Date Added** 11/2/2019, 3:21:00 PM

**Modified** 11/2/2019, 3:21:00 PM

### Tags:

aquatic biota, flow regime, monitoring, objectives, quality, riparian

### Notes:

The Nature Conservancy and San Miguel Watershed Coalition partnered to produce a watershed report card. The report thematically divided watershed attributes to investigate and evaluate: water, aquatic life, wildlife, vegetation, and soils. The report gave the San Miguel River watershed overall a 'fair' grade, or 'C'. Only two subcategories received a grade other than 'C': both water quality and migratory birds received at 'B'. Some outlying grades of the report include: problems with river ice from South Fork to Specie Creek; poor channel morphology on Atkinson Creek; poor macroinvertebrate status on the San Miguel from Horsefly to Tuttle Draw; good macroinvertebrate status from South Fork to Specie; and concerns about threats to riparian vegetation.

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## 2006 Report Card Update: San Miguel River Watershed

**Type** Report

**Date** 2006

**Extra** 00000

**Date Added** 11/2/2019, 3:21:00 PM

**Modified** 11/2/2019, 3:21:01 PM

### Tags:

hydropower, quality, riparian

### Notes:

This report provides an update to the 2005 San Miguel River Watershed Report Card. Of note was progress on the Ames Power Plant Relicensing effort, particularly on studying ice flow issues. Water quality concerns that emerged in this report include temperature issues below the CCC Ditch near the Nucla Power Station and zinc concentrations in Ingram Creek and the upper San Miguel.

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## Field Guide for Managing Russian Olive in the Southwest

**Type** Report

**Date** September 2014

**Institution** U.S. Department of Agriculture

**Date Added** 11/2/2019, 3:21:01 PM

**Modified** 11/2/2019, 3:21:01 PM

### Tags:

riparian

### Notes:

The U.S. Department of Agriculture produced this field guide to assist land managers in their fight with the invasive and fast-growing Russian olive. The Russian olive is a thirsty plant and is found in riparian areas, where it can crowd out native riparian trees. The best way to manage Russian olive is to prevent its establishment. Once established, the plant is difficult to remove, but the guide provides physical (backhoe), cultural (education), biological (goats), and chemical (herbicide) methods for removal.

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## San Miguel Project

**Type** Report

**Date** March 1975

**Extra** 00000

**Institution** Colorado Water Conservation Board

**Date Added** 11/2/2019, 3:21:01 PM

**Modified** 11/2/2019, 3:21:01 PM

### Tags:

flow regime, quality, ag, drinking water

### Notes:

This 1975 report by the Colorado Water Conservation Board summarizes the feasibility, statistics, environmental impact, status, and recommendations for the San Miguel Project. The San Miguel Project was authorized by U.S. Congress under the 1968 Colorado River Storage Project Act. Its components include Saltado Reservoir, to be constructed on the mainstem of the San Miguel River just downstream of Placerville. The project would provide flood control and water for municipal, industrial, irrigation, and fish and wildlife uses, ultimately depleting to the Colorado River by 85,000 acre-feet. The project's total cost was estimated to be \$106 million. The report found no major environmental problems associated with development of the project, but did note more study was needed on the possibility of increased salinity downstream of the project.

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## Field Guide for Managing Siberian Elm in the Southwest

**Type** Report

**Date** September 2014

**Institution** U.S. Department of Agriculture

**Date Added** 11/2/2019, 3:21:01 PM

**Modified** 11/2/2019, 3:21:01 PM

**Tags:**

riparian

**Notes:**

The U.S. Department of Agriculture produced this field guide to assist land managers in their fight with the invasive Siberian elm. The Siberian elm is a thirsty plant and is found in riparian areas, where it can decrease overall species diversity. The best way to manage Siberian elm is to prevent its establishment. Once established, the plant is difficult to remove, but the guide provides physical (backhoe), cultural (education and reporting), and chemical (herbicide) methods for removal.

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## State of the San Miguel Watershed 2014

**Type** Report**Date** 2014**Extra** 00000**Institution** San Miguel Watershed Coalition**Date Added** 11/2/2019, 3:21:01 PM**Modified** 11/2/2019, 3:21:02 PM**Tags:**

aquatic biota, flow regime, monitoring, objectives, quality, land use

**Notes:**

This State of the San Miguel Watershed report is a revised follow-up to its 2005 Report Card. The report has brief summary chapters on climate, aquatic ecosystem, terrestrial environment, and land use. Of note, the report graded water quantity with a 'D'. The report looked at two stream reaches that serve as proxies for the entire watershed and found streamflows fell at times below existing instream flow protections (up to 22 days in the 2013 drought). Fisheries received a grade of 'C', with positive marks for increasing populations of native warm-water fish but lower marks for biomass of cold-water fish. Macroinvertebrate counts range from good to poor along the mainstem of the San Miguel. Vegetation received a 'B' for strong native plant communities.

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## Southwest Basin Roundtable Identified Projects and Processes

**Type** Document**Publisher** Colorado Water Conservation Board**Date** March 2015

**Extra** 00000

**Date Added** 11/2/2019, 3:21:02 PM

**Modified** 11/2/2019, 3:21:02 PM

**Tags:**

recreation, fishing, aquatic biota, objectives, ag, drinking water

**Notes:**

As part of developing basin implementation plans, each Colorado basin collected information on existing or proposed water projects, also known as Identified Projects and Processes ("IPPs"). The Southwest Basin's IPP table is broken down by subbasin. In the San Miguel basin, the document lists 31 IPPs including the enlargement of Gurley Reservoir, Montrose County Firming Project, San Miguel Project, Wild and Scenic Suitability, and Wood Lake Colorado River Cutthroat Trout Refuge.

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## Appendix D-8 Southwest Basin Mapping Results: Environmental and Recreational Nonconsumptive Focus Mapping

**Type** Document

**Publisher** Colorado Water Conservation Board

**Date** 2010

**Extra** 00000

**Date Added** 11/2/2019, 3:21:02 PM

**Modified** 11/2/2019, 3:21:03 PM

**Tags:**

boating, fishing, aquatic biota, flow regime, riparian, symbolic

**Notes:**

The 2010 Statewide Water Supply Initiative sought to capture Colorado's water demands through 2050, including environmental demands. This report provides the background data for the Southwest Basin map.