Integrated Water Quality Monitoring and Assessment Report

State of Colorado

Prepared Pursuant to Section 303(d) and Section 305(b) of the Clean Water Act

2010 Update to the 2008 305(b) Report

Prepared by: Water Quality Control Division, Colorado Department of Public Health and Environment

Executive Summary

The Colorado 2010 Integrated Water Quality Monitoring and Assessment Report summarizes water quality conditions in the State of Colorado. This report fulfills Clean Water Act (CWA) Section 305(b) which requires all states to assess and report on the quality of waters within their State. This report fulfills Colorado's obligation under the Clean Water Act, and covers the 2008-2009 two-year period.

This report provides the State's assessments of water quality that were conducted during the past five years. Specifically, it compares the classified uses of all surface waters within the State to the corresponding standards in order to assess the degree to which waters are in attainment of those standards. The Integrated report (IR) provides the attainment status of all surface waters according to the 5 reporting categories, defined in detail within. This report also includes a summary of ground water quality assessments that were conducted during the 2008 and 2009 time frame.

The last full comprehensive report for Colorado was written in 2002. Biennial updates were provided for 2004, 2006, and 2008. A newly designed report was written for this 2010 submittal to provide a more useful, informative tool for the public and other state and federal agencies.

2010 Report Highlights

- Newly designed report and format
- Report covers use attainment by all uses, removing the antiquated "fishable" and "swimmable" categories
- New delisting table
- More in-depth coverage of Colorado's Water Quality Agencies
- More in-depth coverage of Water Quality Control Division's (WQCD) programs
- Events shaping the biennial report

From the highest sand dunes in North America to 54 mountain peaks over 14,000 feet, Colorado has one of the most unique and varied natural landscapes in the entire nation. Throughout the state, there exist lush green forests, fields of vibrant wildflowers, picturesque mountain lakes, abundant grasslands and rich red rock formations. There are many places to enjoy Colorado's vast natural beauty, with four national parks, five national monuments and 41 state parks waiting to be explored. Colorado is also home to 25 scenic and historic byways, noted for their distinct qualities. They include ghost towns, ancient ruins, alpine tundra, some of the oldest trains in the West and much more.

Oh Be Joyful Creek

What's Changed from the 2008 305(b) Report Update?

New Report and Format	• The 305(b) report was redesigned and reformatted. A full report is being submitted to EPA, rather than a report update.
Delistings Table	• A delistings table was added to the report for ease in 303(d) tracking and review.
Use attainment reporting	• Classified use attainment is reported out in all 5 categories separately, instead of the older, less-useful "swimmable and fishable" categories.
Safe Drinking Water Program	• An inclusion of a discussion of the State's Safe Drinking Water programs is new to the 305(b) report.
Greater Accuracy in Waterbody Sizes	• Great improvements in National Hydrography Dataset (NHD)/Geographical Information System (GIS) layers have improved the accuracy of waterbody sizes for Colorado.

Fun Fact: Antero is derived from the Spanish word "first", as it was the first dam on the South Platte River near the river's origin and first in storage capacity at the time of its construction. Built in 1909, the Antero Dam is an earth-filled dam. Green Lake lies submerged within the Antero Reservoir.

Events shaping Colorado's Water Quality for 2010 Integrated Reporting Cycle

Alamosa Salmonella Outbreak

An outbreak of waterborne disease associated with *Salmonella* in drinking water struck Alamosa, Colorado during March and April 2008. The city of Alamosa's public water system that supplies drinking water to the community became contaminated with *Salmonella* bacteria. Alamosa's drinking water comes from deep artesian wells in an aquifer considered to be a protected groundwater source. Prior to the outbreak, the city's drinking water was not chlorinated for disinfection. On March 19, 2008, the Colorado Department of Public Health and Environment (CDPHE) issued a bottled water advisory for residents of Alamosa. Governor Bill Ritter declared a state of emergency in Alamosa and funds from the Disaster Emergency Fund were activated for response efforts and activation of the National Guard. A statewide response to the outbreak lasting about one month involving numerous responders was coordinated using the National Incident Management System (NIMS) and Incident Command System (ICS).

During the outbreak residents were advised to drink bottled water, and then the entire water system was flushed and disinfected with chlorine to kill the *Salmonella* bacteria. A boil water order followed the bottled water order, and it remained in place until tests confirmed that the city's water was safe to drink again. Because of the quick operational response and the changes made to the physical infrastructure of the Alamosa public water system, the water in Alamosa has been safe to drink since April 2008. The city has since installed advanced treatment processes and improved system operations.

An investigation included a detailed review of the water system, historical records, and interviews with city of Alamosa personnel, local health officials and responders to the outbreak. Extensive monitoring was conducted for a number of water quality parameters throughout the distribution system, including *Salmonella*, total coliform, Giardia, cryptosporidium, arsenic, lead and copper, and chlorine residuals. Although there were several possible causes of the outbreak, the conclusion is that an animal source of fecal contamination entered the Weber Reservoir, and then spread throughout the entire system. The Weber Reservoir is a ground-level water storage reservoir near the Weber Well, which was the primary water well in use by the city, prior to the outbreak. The Weber Reservoir had several small cracks and holes that likely allowed the contamination to enter.

American Recovery and Reinvestment Act (ARRA)

ARRA is an economic stimulus package enacted by the 111th United States Congress and includes funding for core investments such as infrastructures. A $6 billion grant for wastewater and drinking water infrastructures was delegated nationally; Colorado received $32,290,880 million for Drinking Water State Revolving Funds (DWSRF) and $30,093,792 million for Water Pollution Control State Revolving Funds (WPCSRF).

Climate and Water Supply Issues

Climate and drought issues continue to impact Colorado. The Governor's Colorado Climate Action Plan identifies the following observations: shorter and warmer winters with a thinner snowpack and earlier spring runoff, less precipitation overall with more falling as rain rather than snow, more wildfires and longer periods of drought. Research conducted for the Action Plan projects the following changes to Colorado's water systems:

- Much lower flows in rivers during the summer months and greater vulnerability to drought
- Hydropower production may decline which will cause water quality problems as flows are depleted
- Water shortages and heat stress for irrigated agriculture
- Slower recharge in groundwater aquifers, including a projected 20% decline in water recharge for the Ogallala aquifer

Drought issues in combination with ever increasing water rights issues on the Front Range have brought about a trend in large-scale water supply projects. The Division has seen a rise in requests for 401 Water Quality Certifications (WQC) for these projects. A few to mention are the Southern Delivery System (SDS), the Northern Integrated Supply Project (NISP), the Windy Gap Firming Project, and the Moffat Collection System Project. The Division, along with the Environmental Protection Agency (EPA) and the United States Army Corps of Engineers (USACOE) will be taking a much closer look at cumulative impacts from these projects as this trend continues.

Montrose Arroyo, Colorado

Assessment Efforts during 2008 and 2009

Surface water quality assessments over the past two years have focused on basin rulemaking hearings for the Upper Colorado Basin (Regulation No. 33) and the Lower Colorado Basin (regulation No. 37) which were held in June of 2008, and the South Platte Basin (Regulation No. 38) which was held in June of 2009. Other water quality assessments were also conducted during the preparation of the 2010 303(d) List as well as those associated with Colorado Discharge Permit System (CDPS) permits.

Colorado continues to make improvements to the Assessment Database (ADB) through a long term effort to migrate all their water quality standards, and associated information, to a computerized Geographic Information System (GIS). Throughout this refinement process, a number of issues were discovered regarding the segmentation and segment sizes, and therefore the number of river miles and lake acres reported in this document will differ from previously reported values. A vastly improved National Hydrography Dataset (NHD) GIS layer provided the Division with greater accuracy in waterbody sizes for the State of Colorado and has therefore provided percents attaining/non-attaining with a level of confidence.

For the current cycle, over 94,455 river miles and over 255,567 lake acres were assessed. For Colorado streams and rivers, over 32,681 miles were supporting all classified uses. Approximately, 16,086 miles were supporting at least one classified use, but approximately 10,673 miles were found to be impaired and require a Total Maximum Daily Load analysis (TMDL) to be developed.

For Colorado lakes, approximately 39,278 acres were found to fully support all classified uses. An additional 37,728 acres were supporting at least one classified use. A total of approximately 78,997 lake acres were found to be impaired and require a TMDL. For both rivers and lakes, the majority of the waterbodies are in Category 3, insufficient information.

Surface Water Quality and Use Support

Surface water quality standards have been established to be protective of all uses. Waterbodies may be assigned any of five following categories of classified use classifications: aquatic life, recreation, water supply, wetlands or agriculture. One goal of the Clean Water Act (CWA) is that all waters of the state are classified and fully supporting "fishable" and "swimmable" use classifications. Past reports have combined these four classified use classifications into the older “fishable” and “swimmable” bigger categories. Beginning with the 2010 report, the IR will report all classified use attainment and all reporting categories.

Fun Fact: *the Colorado-Big Thompson and Fryingpan-Arkansas projects divert water from the Western Slope, which contains two-thirds of the state’s surface water, to the Eastern Slope. The Eastern Slope contains most of the state’s population and farmland.*

The five classified use reporting categories are as follows. Each assigned classified use will fit into one of these five categories. A more detailed description of the five categories, including subcategories is included within the report.

Category 1	• Attaining Water Quality Standards.
Category 2	• Attaining some classified uses.
Category 3	• Insufficient data to determine whether or not the classified uses are being attained. (Those Not Assessed and M&E category.)
Category 4	• Not supporting a standard for 1 or more classified uses, but a TMDL is not needed. (Subcategories further explained.)
Category 5	• Not meeting applicable water quality standards for one of more designated uses by one or more pollutants. (303(d) waterbodies.)

Miles/Acres Impaired - 303(d) List

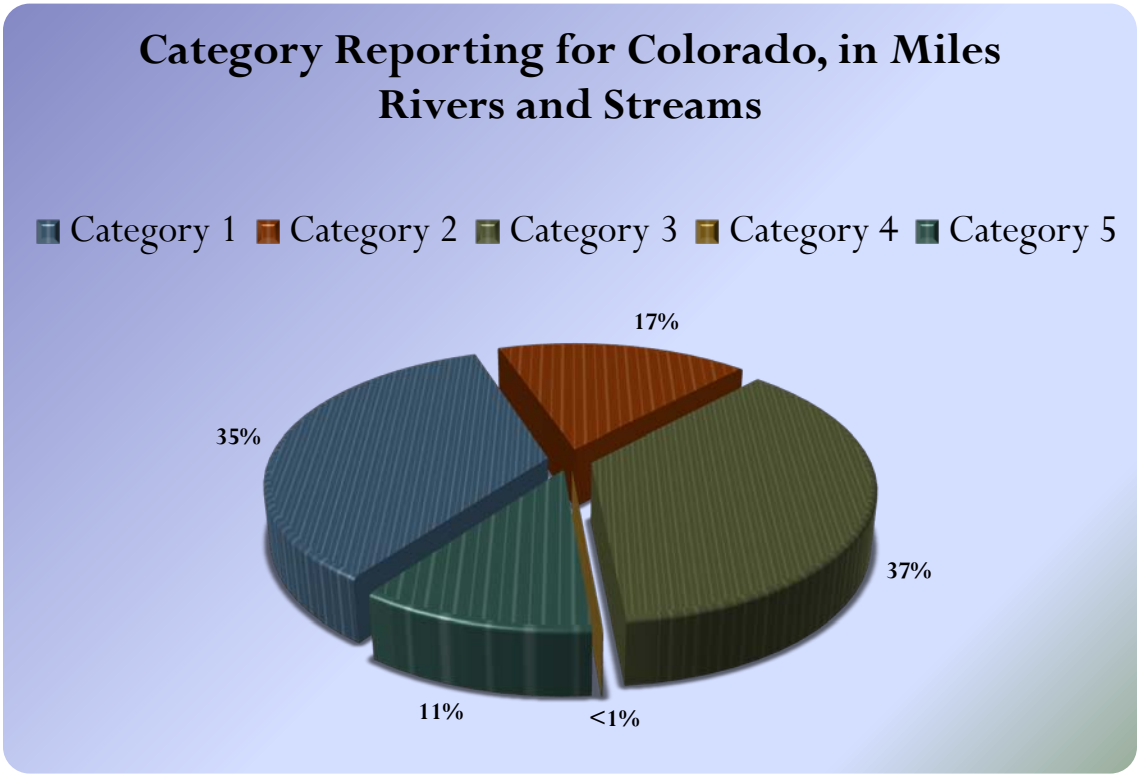
Stream segments that are not fully supporting their classified uses are defined as impaired and placed on the state 303(d) List of Impaired Waters. The 2010 Section 303(d) List identified over 174 impaired waterbodies, with approximately 265 individual pollutants on those segments requiring the development of TMDLs. This was an increase in the number of listed segments on the 2008 list, due mainly to changes in the 303(d) Listing Methodology, changes to table value standards in the Basic Standards, Regulation No. 31, and increased monitoring. The

Monitoring and Evaluation List also grew in 2010 with over 151 segments, with approximately 251 individual pollutants.

The 2010 303(d) List is submitted to EPA in April, 2010, as part of the submittal of the Integrated Report, which includes the 303(d) list and the 305(b) report. The suspected causes and sources of the impairment, if known, have also been identified. For impaired waters, the leading cause of impairment is metals and more specifically, selenium in rivers and mercury in lakes. A natural source of selenium in Colorado is marine shales, while mercury airborne deposition is from diverse sources. The major source or contributor of these pollutants in Colorado is still unknown in most cases. Where the source of metals has been identified, it is mostly resource extraction.

Support Summaries for Rivers and Streams

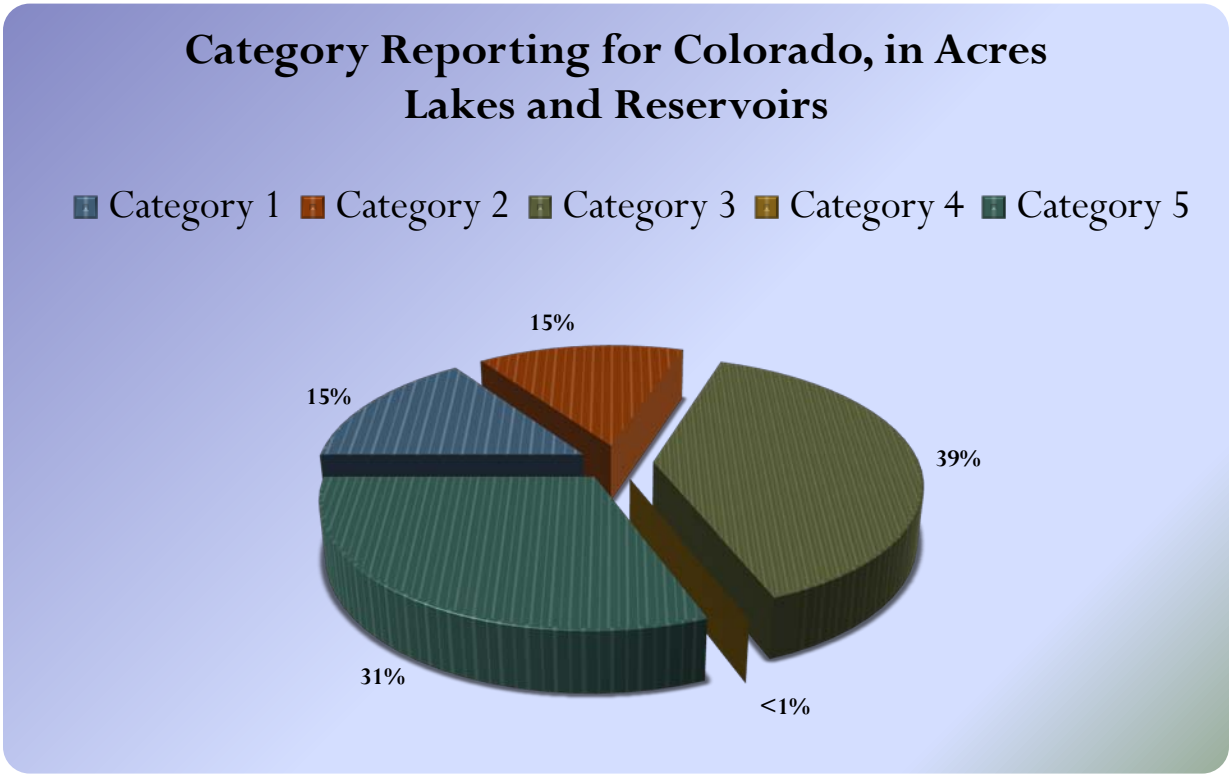
For the 2010 reporting cycle, the general category summaries are as follows. More detailed attainment graphs follow in the report.



River and Stream Category Summary *See page 5 for category explanations*		
Category	*Size (Miles)*	*Number of Assessment Units*
Category 1	32,681.81	295
Category 2	16,086.44	143
Category 3	34,341.07	218
Category 4a	623.34	43
Category 4b	49.9	0
Category 4c	0	0
Category 5	10,673.30	188

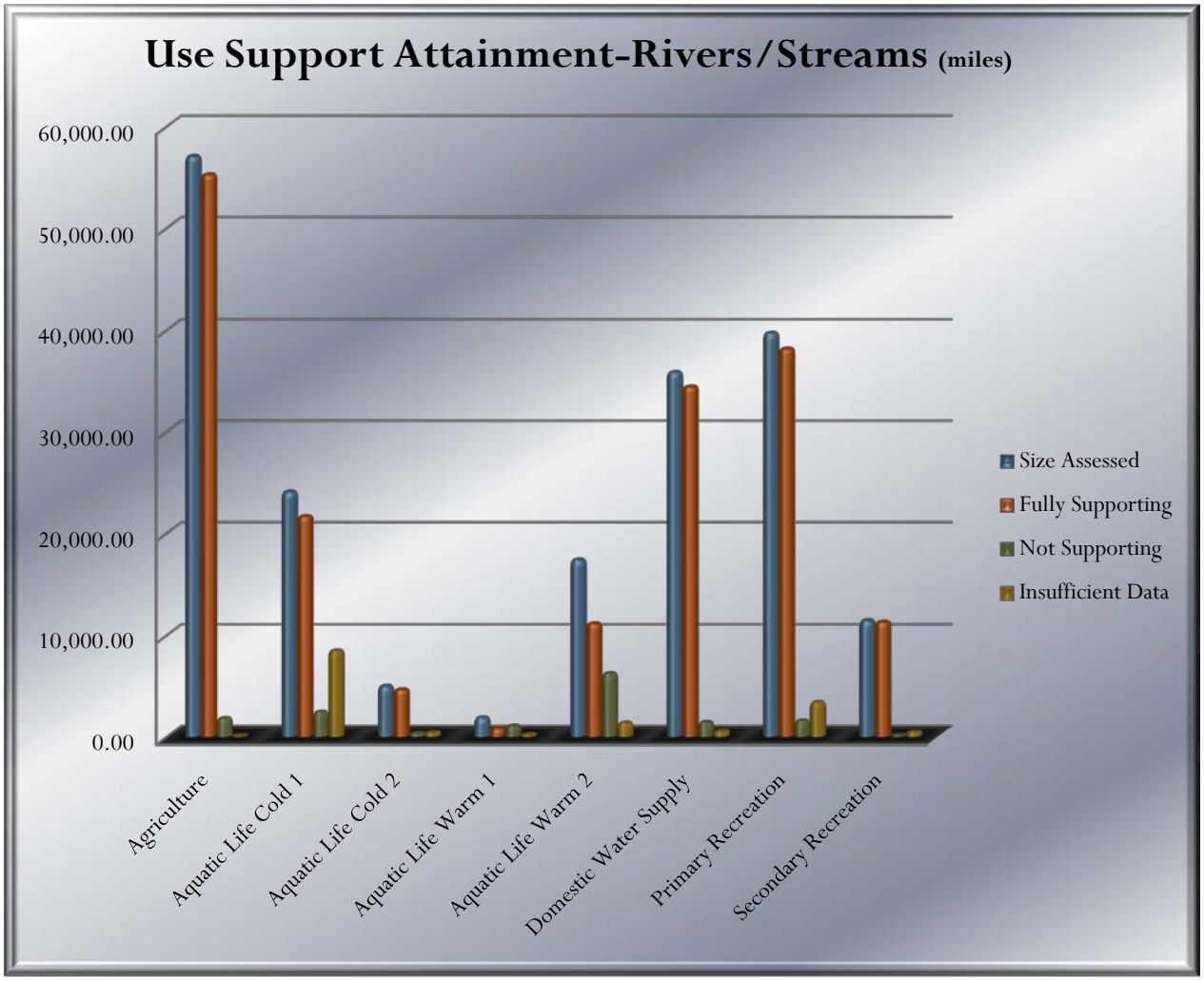
Support Summaries for Lakes and Reservoirs

For the 2010 reporting cycle, the general category summaries are as follows. More detailed attainment graphs follow in the report.



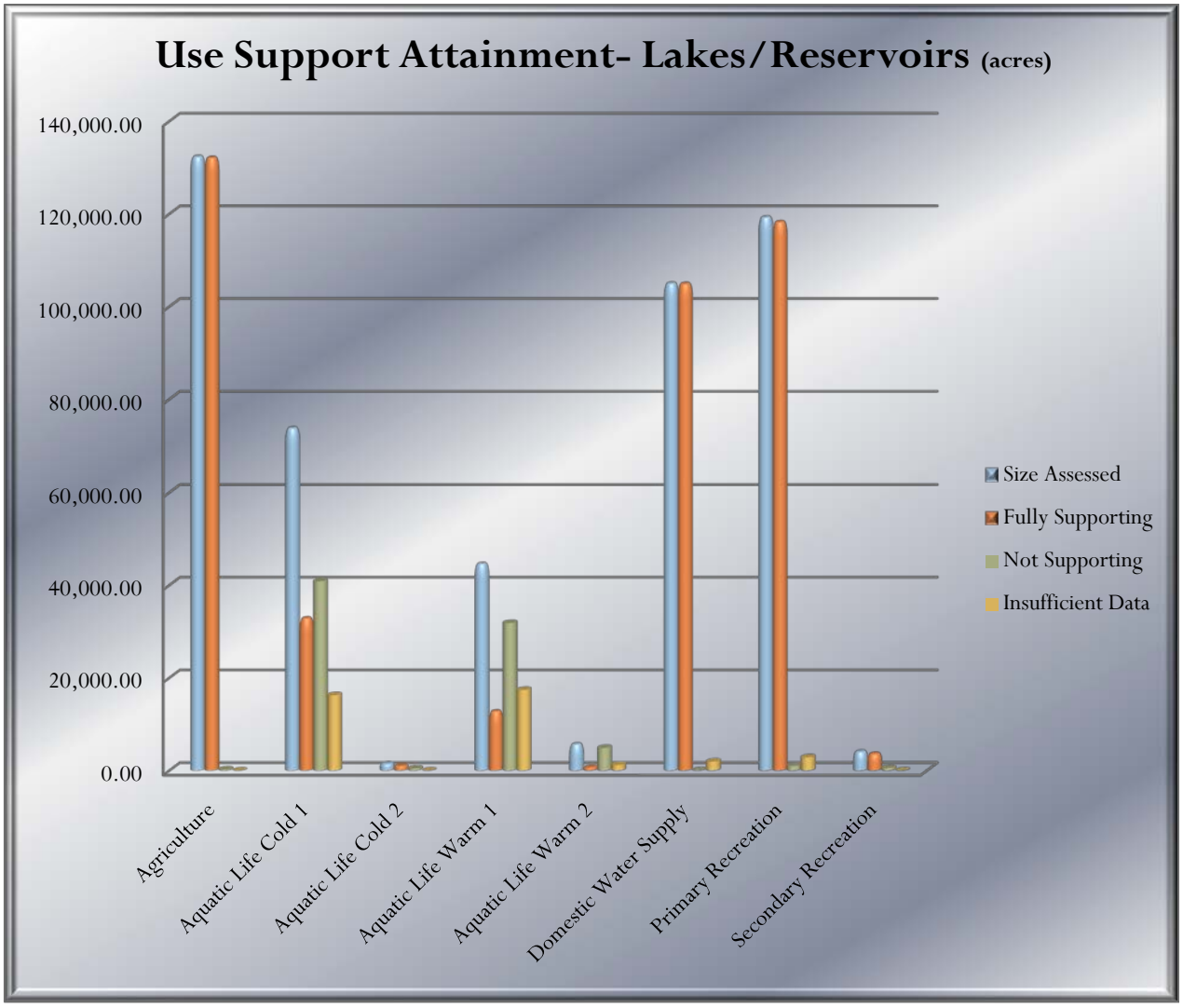
Lakes and Reservoirs Category Summary *See page 5 for category explanations*		
Category	*Size (Acres)*	*Number of Assessment Units*
Category 1	39,277.92	32
Category 2	37,728.06	47
Category 3	99,564.70	128
Category 4a	0	0
Category 4b	0	0
Category 4c	0	0
Category 5	78,996.78	56

Use support attainment, per assigned classified use for Rivers and Streams.



Classified Use	Size Assessed	Fully Supporting	Not Supporting	Insufficient Data
Agriculture	57,050.29	55,242.76	1,807.53	63.71
Aquatic Life Cold 1	24,057.13	21,629.40	2,427.72	8,469.88
Aquatic Life Cold 2	4,982.54	4,633.15	349.39	427.54
Aquatic Life Warm 1	1,869.01	814.72	1,054.29	201.8
Aquatic Life Warm 2	17,369.29	11,131.97	6,237.32	1,349.86
Domestic Water Supply	35,834.22	34,410.35	1,423.87	544.32
Primary Recreation	39,695.40	38,137.91	1,557.49	3,380.13
Secondary Recreation	11,442.38	11,293.43	148.94	473.10

Use support attainment, per assigned classified use for Lakes and Reservoirs.



Classified Use	Size Assessed	Fully Supporting	Not Supporting	Insufficient Data
Agriculture	132,224.50	132,008.50	216.00	0
Aquatic Life Cold 1	73,633.10	32,771.22	40,861.88	16,263.70
Aquatic Life Cold 2	1,475.80	1,027.50	448.30	0
Aquatic Life Warm 1	44,508.00	12,682.41	31,825.59	17,408.52
Aquatic Life Warm 2	5,573.35	710.34	4,863.01	1,221.70
Domestic Water Supply	104,873.65	104,820.80	52.80	1,935.70
Primary Recreation	119,151.40	118,146.10	1005.30	2,859.20
Secondary Recreation	4,009.80	3,541.70	558.10	0

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List of figures and maps

List of Acronyms

AAH – Administrative Action Hearing

ADB – Assessment Database

ARRA – American Recovery and Reinvestment Act

ASIWPCA - Association of State and Interstate Water Pollution Control Administrators

AWT - Advanced Wastewater Treatment

BAT - Best Available Technology

BMP - Best Management Practice

BPJ - Best Professional Judgment

BPT - Best Practicable Technology

CAFO - Confined Animal Feeding Operation

CCR - Colorado Code of Regulations

CDPHE - Colorado Department of Public Health and Environment

CDPS - Colorado Discharge Permit System

CDNR – Colorado Division of Natural Resources

CERCLA - Comprehensive Environmental Response, Compensation and Liability Act

CFR – Code of Federal Regulations

CLRMA – Colorado Lake Management Association

CMA - Colorado Mining Association

COGCC – Colorado Oil and Gas Conservation Commission

CWA - Clean Water Act

CWC - Colorado Water Congress

CWCB - Colorado Water Conservation Board

DCEED – Disease Control and Environmental Epidemiology Division

DLG - Division of Local Government

DOLA - Department of Local Affairs

DOW - Division of Wildlife

DRCOG - Denver Regional Council of Governments

DRMS – Division of Reclamation, Mining and Safety

DWSRF - Drinking Water State Revolving Fund

EPA - Environmental Protection Agency

FCA – Fish Consumption Advisory

FERC – Federal Energy Regulatory Commission

GC/MS - Gas Chromatography/Mass Spectrometry

GIS – Geographic Information System

IR – Integrated Report

HMWMD - Hazardous Materials and Waste Management Division

HCSFO - Housed Commercial Swine Feeding Operation

ICS – Incident Command System

ISDS - Individual Sewage Disposal System

IRIS - Integrated Risk Information System

LA - Load Allocation

M&E – Monitoring and Evaluation List

MCL - Maximum Contaminant Level

MCLG - Maximum Contaminant Level Goal

MDL - Method Detection Limit

MGD – million gallons per day

mg/l - milligrams per liter

MS4 – Municipal separate storm sewer system

NFRWQPA - North Front Range Water Quality Planning Association

NHD – National Hydrography Dataset

NIMS – National Incident Management System

NPDES - National Pollutant Discharge Elimination System

NPS – Nonpoint Source

PQL - Practical Quantization Limit

RCRA - Resource Conservation and Recovery Act

SARA - Superfund Amendments and Reauthorization Act

SEO - State Engineer's Office

SDWA - Safe Drinking Water Act

SDWRF – State Drinking Water Revolving Fund

SIC - Standard Industrial Classification

SWAP - Source Water Assessment and Protection Program

TDS - Total Dissolved Solids

TMDL - Total Maximum Daily Load

TVS - Table Value Standards

TSI – Trophic State Index

µg/l - micrograms per liter

UIC - Underground Injection Control

UMTRA - Uranium Mill Tailings Remedial Action

USACE – United States Army Corps of Engineers

USGS – United States Geological Survey

UST - Underground Storage Tanks

VOC – Volatile Organic Compound

WBID – Water Body Identification

WET - Whole Effluent Toxicity

WHPA - Wellhead Protection Area

WLA - Wasteload Allocation

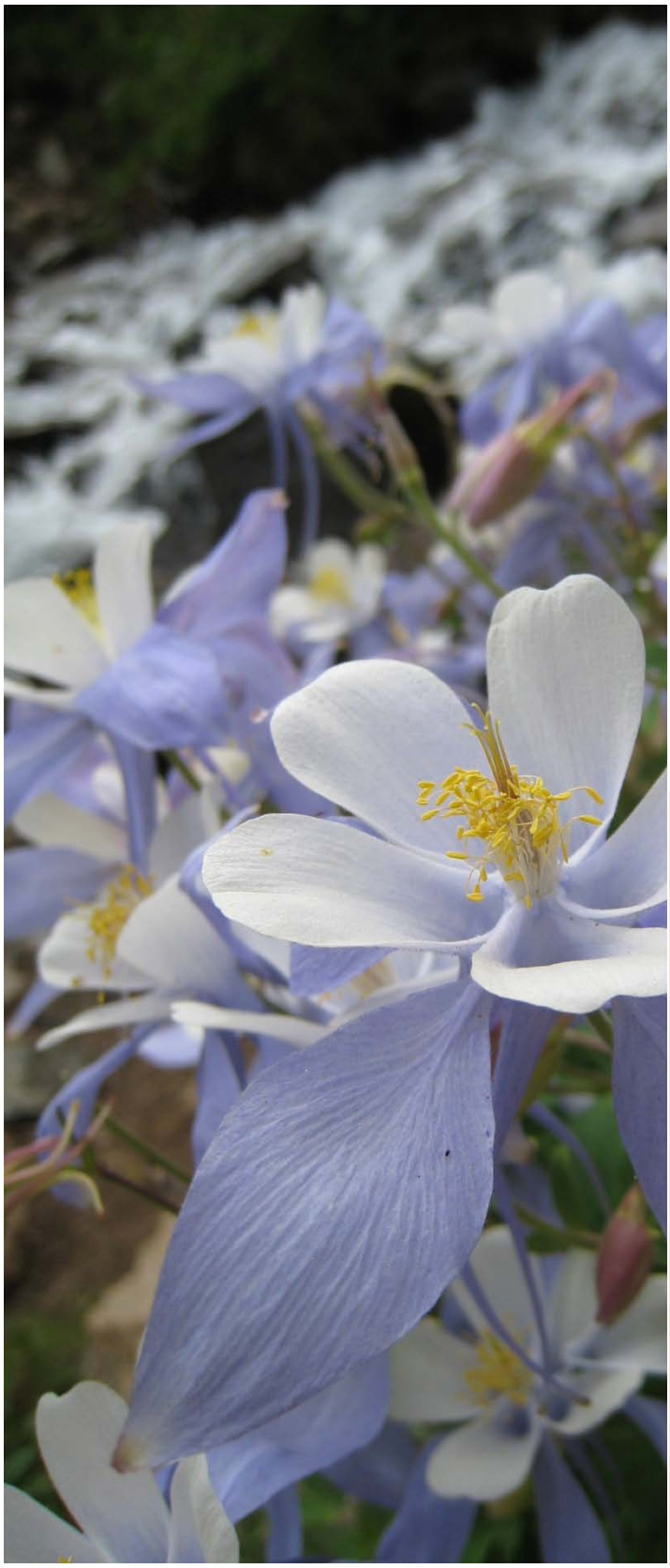
WPCSRF – Water Pollution Control State Revolving Funds

WQC – Water Quality Certifications

WQCC - Water Quality Control Commission

WQCD - Water Quality Control Division

WQS – Water Quality Standards



Acknowledgements:

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INTRODUCTION

Boulder Creek

A. Introduction

Colorado's 305(b) Component of the Integrated Report (IR)

This 305(b) report is intended to comprehensively summarize the quality of State waters during 2008 and 2009. This characterization of water quality is the result of the ongoing assessment of all readily available and existing data collected from governmental, municipal, and private entities working throughout Colorado.

The last complete 305(b) report for Colorado was written in 2002. Beginning in 2004, the State of Colorado elected to fulfill the reporting requirement by submitting comprehensive updates to earlier 305(b) reports. This 2010 report is a complete report. The reporting requirements and explanation of Integrated Report is further described within this introduction.

Clean Water Act (CWA) Section 305(b) Reporting Requirements

The Federal Water Pollution Control Act (PL92-500, commonly known as the Clean Water Act (CWA)), as last reauthorized by the Water Quality Act of 1987 (PL100-4), establishes a process for States to use to develop information on the quality on the Nation's water resources. The requirements for this process are found in Sections 106(e), 204(a), 303(d), 305(b), and 314(a) of the CWA. Each State must develop a program to monitor the quality of its surface and ground waters and prepare a report describing the status of its water quality. The Environmental Protection Agency (EPA) then compiles the data from the state reports, summarizes them, and transmits the summaries to Congress along with an analysis of the status of water quality nationwide.
http://www.epa.gov/waters/ir/

Section 305(b) of the CWA requires that each state submit a biennial report to the EPA. This 305(b) process is the principle means by which EPA, Congress, and the public evaluate whether U.S. waters meet water quality standards, the progress made in maintaining and restoring water quality, and the extent of remaining problems. Each 305(b) report will contain at least the following:

- A description of the water quality of all waters in the state and the extent to which the quality of waters provides for the protection and propagation of a balanced population of shellfish, fish, and wildlife and allows recreational activities in and on the water.
- An estimate of the extent to which CWA control programs have improved water quality or will improve water quality, and recommendations for future actions necessary and identifications of waters needing action.
- An estimate of the environmental, economic and social costs and benefits needed to achieve the objectives of the CWA and an estimate of the date of such achievement.
- A description of the nature and extent of nonpoint source pollution and recommendations of programs needed to control each category of nonpoint sources, including an estimate of implementation costs.
- An assessment of the water quality of all publicly owned lakes, including the status and trends of such water quality as specified in section 314(a)(1) of the CWA.

Clean Water Act (CWA) Section 303(d) Reporting Requirements

The 1972 amendments to the CWA include Section 303(d). The regulations implementing Section 303(d) require states to develop lists of water bodies that do not meet water quality standards and to submit updated lists to the EPA every two years, along with the 305(b) report. Water Quality Standards (WQS), as defined in the Code of Federal Regulations (CFR), include classified uses, water quality objectives (narrative and numerical) and anti-degradation requirements. The EPA is required to review impaired water body lists submitted by each state and approve or disapprove all or part of the list.

For water bodies on the 303(d) list, the CWA requires that a pollutant load reduction assessment or Total Maximum Daily Load (TMDL) be developed to correct each impairment. TMDLs must document the nature of the water quality impairment, determine the maximum amount of a pollutant which can be discharged and still meet standards, and identify allowable loads from the contributing sources. The elements of a TMDL include a problem statement, description of the desired future condition (numerical target), pollution source analysis, load allocation, description of how allocations related to meeting targets, and margins of safety. http://www.epa.gov/owow/tmdl/

Each 303(d) list as incorporated into the Integrated Report (IR) contains the following information:

- A list of water quality-limited waters still requiring TMDLs, pollutants causing the impairment and priority ranking for TMDL development.
- A description of the methodology used to develop the list.
- A description of the data and information used to identify water, including a description of the existing and readily available data and information used.
- A rationale for any decision to not use any existing and readily available data and information.
- Any other reasonable information requested by EPA, such as demonstrating good cause for not including a water or waters on the list.

Clean Water Act (CWA) Section 314 Reporting Requirements

In each 305(b) report submittal, an assessment of status and trends of significant publicly owned lakes including extent of point source and nonpoint source impacts due to toxics, conventional pollutants, and acidification is required. States must submit the following information in their 305(b) reports:

- An identification and classification according to eutrophic condition of all publicly owned lakes.
- A description of procedures, processes, and methods (including land use requirements), to control sources of pollution of such lakes.
- A description of methods and procedures, in conjunction with

Paonia Reservoir, Lake Sampling Program

appropriate federal agencies, to restore the quality of such lakes.

- Methods and procedures to mitigate the harmful effects of high acidity, including innovative methods of neutralizing and restoring buffering capacity of lakes and methods of removing from lakes toxic metals and other toxic substances mobilized by high acidity.
- A list and description of those publicly owned lakes in such state for which uses are known to be impaired, including those lakes which are known not to meet applicable water quality standards or which require implementation of control programs
- Plans to maintain compliance with applicable standards and those lakes in which water quality has deteriorated as a result of high acidity that may reasonably be due to acid deposition.
- An assessment of the status and trends of water quality in lakes in such state, including but not limited to, the nature and extent of pollution loading from point and nonpoint sources and the extent to which the use of lakes is impaired as a result of such pollution, particularly with respect to toxic pollution.

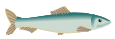
Integrated Reporting Guidance

The EPA has issued guidance for the development of an Integrated Water Quality Monitoring and Assessment Report (Integrated Report (IR)) by the States. This guidance requires that States integrate their Water Quality Inventory Report (305(b) report) and their Impaired Waterbodies List (303(d) list), along with an electronic copy of the 305(b) database, the Assessment Database (ADB) and a copy of the State's National Hydrography Dataset (NHD). These four components make up the IR. The IR is intended to provide an effective tool for maintaining high quality waters and improving the quality of waters that do not attain water quality standards. The integrated report will also provide water resources managers and citizens with detailed information regarding the following:

- Progress towards achieving comprehensive assessment of all waters.
- Water quality standards attainment status.
- Methods used to assess water quality standards attainment status.
- Additional monitoring needs and schedules.
- Pollutants and waterbodies requiring TMDLs
- Pollutants and waterbodies requiring alternative pollution control measures.
- Management strategies (including TMDLs) under development to attain water quality standards.
- TMDL development schedules.

This IR will streamline water quality reporting since data sources and assessment methods will be described in detail in Colorado's Section 303(d) Listing Methodology (LM), which provides a sound technical and scientific basis for assessment and listing decisions. Public participation events provide opportunities for data submittal and discussion of water quality assessments methods and results. The LM is reviewed and updated on a biennial basis in anticipation of the IR development. The LM is revisited and revised with the intent of clarifying the Division's procedures for assessing attainment of those uses and standards assigned by the Commission to Colorado waters. The current LM can be found here at http://www.cdphe.state.co.us/op/wqcc/SpecialTopics/303(d)/303dLM2010.pdf

***Fun Fact**: Only 371 square miles of Colorado are covered by water in the form of lakes and reservoirs.*



Integrated Reporting Categories

Waterbodies are assessed and divided into one of 5 reporting categories. Detailed descriptions are included below.

Category 1	• Attaining Water Quality Standards.
Category 2	• Attaining some classified uses.
Category 3	• Insufficient data to determine whether or not the classified uses are being attained. (M&E category.)
Category 4	• Not supporting a standard for 1 or more classified uses, but a TMDL is not needed. (Subcategories further explained.)
Category 5	• Not meeting applicable water quality standards for one of more designated uses by one or more pollutants. (303(d) waterbodies.)

Category 1: All classified uses are supported; no use is threatened.

Waterbodies in this category are consistent with their water quality standards and their assessment methodologies, and sufficient data and information exist to determine that all applicable water quality standards are being attained.

Category 2: Available data and/or information indicate that some but not all of the classified uses are supported.

Waterbodies in this category are characterized by data and information which meet the requirements to support a determination that some, but not all, uses are attained and none are threatened. Attainment status of the remaining uses is unknown because there is insufficient data or information available.

An example of a Category 2 would be a segment where the aquatic life and agriculture uses were both assessed and both attaining but *E. coli* data was lacking in order to assess the recreation use. In this case it is not known if the Recreation Use is being attained so it cannot be placed in Category 1.

Category 3: There is insufficient available data and/or information to make a use support determination.

Waterbodies in this category are listed as having insufficient data or information to support an attainment determination for any classified use. Assessment of the attainment status requires supplementary data and monitoring as needed and prioritized.

Colorado identifies water bodies where some data is available that indicates that there may be an impairment but there is not enough data to put it on the 303(d) List. This list is called the Monitoring and Evaluation List (M&E List). Segments are placed on this list until additional data can be collected to either add it to the 303(d) List (Category 5) or place it into Category 1. Colorado places segments on the M&E List into Category 3. Segments where no water quality data has been collected are also placed in Category 3.

Category 4: Available data and/or information indicate that at least one classified use is not being supported or is threatened, but a TMDL is not needed.

Segments are placed in category 4 if available data and/or information indicate that at least one classified use is not being supported or is threatened, but a TMDL is not needed. Category 4 is further broken out into 3 additional sub-categories:

4A – TMDL has been completed.

A state-developed TMDL has been approved by EPA or a TMDL has been established by EPA for any segment-pollutant combination. The waterbody is expected to result in full attainment of the standard once implementation of the TMDL is complete. Where more than one pollutant is associated with the impairment of a waterbody, the waterbody will remain in category 5 until all TMDLs for each pollutant have been completed and approved by EPA. Monitoring shall be scheduled for these waterbodies to verify that the water quality standard is met when the TMDL is implemented.

4B – Other pollution control requirements are reasonably expected to result in the attainment of the water quality standard in the near future.

Alternative pollution control requirements may obviate the need for a TMDL. Segments are not required to be included on the Section 303(d) list if technology-based effluent limitations required by the Act, more stringent effluent limitations required by state, local, or federal authority, or "other pollution control requirements (e.g., best management practices) required by local, State or Federal authority" are stringent enough to implement applicable water quality standards (see 40 CFR 130.7(b)(1)) within a reasonable period of time. The most effective method for achieving water quality standards for some water quality impaired segments may be through controls developed and implemented without TMDLs (referred to as a "4b alternative"). Monitoring shall be scheduled for these waterbodies to verify that the water quality standard is attained as expected.

4C – Impairment is not caused by a pollutant.

The non-attainment of any applicable water quality standard for the segment is the result of pollution and is not caused by a pollutant. These segments do not require the development of a TMDL. Pollution, as defined by the CWA is "the man-made or man-induced alteration of the chemical, physical, biological, and radiological integrity of water" (section 502(19)). In some cases, the pollution is caused by the presence of a pollutant and a TMDL is required. In other cases, pollution does not result from a pollutant and a TMDL is not required. States should schedule these segments for monitoring to confirm that there continues to be no pollutant associated with the failure to meet the water quality standard and to support water quality management actions necessary to address the cause(s)

of the impairment. Examples of circumstances where an impaired segment may be placed in Category 4c include segments impaired solely due to lack of adequate flow or to stream channelization.

Category 5: Available data and/or information indicate that at least one classified use is not being supported or is threatened, and a TMDL is needed.

Segments must be placed in Category 5 when, based on existing and readily available data and/or information, technology-based effluent limitations required by the Act, more stringent effluent limitations, and other pollution control requirements are not sufficient to implement an applicable water quality standard and a TMDL is needed. This category constitutes the Section 303(d) list of waters impaired by a pollutant. When more than one pollutant is associated with the impairment of a single waterbody, the waterbody will remain in category 5 until TMDLs for all pollutants have been completed and approved by EPA. Monitoring schedules shall be established for data collection to support TMDL establishment and to determine if the standard is attained. A schedule for the establishment of TMDLs for all waters in category 5 shall be submitted as well, and this schedule reflects the priority ranking of the listed waters.

Delisting Tables

In an effort to report progress of Clean Water Act programs, including progress in restoring waters, EPA strongly encourages States to document the status of segments that have been removed from Category 5 (303(d) listed streams). In order to provide a complete picture of restoration, States are also asked to capture the reasons for moving waters in Categories 4a, 4b, and 4c to other categories. This is now captured in a waterbody delisting table, which is now a permanent component of the 305(b) report. Below is the list of reasons for moving waterbodies off of the 303(d) list.

- State determines water quality standard is being met
- TMDL alternative (4b)
- Non-attainment not caused by a pollutant (4c)
- TMDL approved or established by EPA (4a)
- Waterbody not in State's jurisdiction
- Applicable water quality standard attained due to restoration activities
- Applicable water quality standard attained due to changes in standards
- Applicable water quality standard attained according to new assessment method
- Applicable water quality standard attained; the reason for recovery is unspecified
- Applicable water quality standard attained; the original basis for listing was incorrect
- Data and/or information is lacking to determine water quality status; original basis for listing was incorrect (Category 3)

The delisting table for 2010 is included in Appendix C.

Public Participation Process

Colorado has a unique public participation process for the 305(b) portion of the IR. In addition to the public participation process in place for the LM and the 303(d) list, a process is also in place for the report. The draft 305(b) report is posted on the Water Quality Control Commission (WQCC) website and public comments are encouraged. The WQCC will hold an Administrative Action Hearing (AAH) in March of every reporting year. Any public comments received will be considered and public participation is encouraged at the AAH. The WQCC will either approve or disapprove the report upon the conclusion of the AAH. The majority of the states do not have a public participation process for the 305(b) portion of the IR, thus making Colorado's process unique, informative and involved.

B1. Colorado Background

This section provides a statewide overview of Colorado's surface water and a summary of the status of water quality. Assessment information about individual basins is provided in Section D. The individual segment assessments are listed in Appendices A and B: Classified Use Support Summaries for Rivers and Lakes.

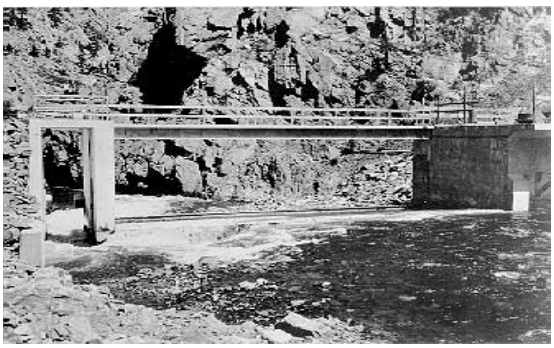
Within Colorado's borders can be found over 105,344 river miles and more than 249,787 lake acres. The majority of Colorado's rivers originate in the pristine high alpine environment of the Rocky Mountains and flow downstream through the high desert or high plains regions before leaving the state. Within the interior of the Rocky Mountains are several high broad basins. In the north, on the east side of the Continental Divide is North Park. North Park is drained by the North Platte River, which flows north into Wyoming. Just south and west of the Continental Divide is Middle Park, drained by the Colorado River. South Park is the headwaters of the South Platte River. To the south lies the San Luis Valley, the headwaters of the Rio Grande, which drains into New Mexico. Across the Sangre de Cristo Range to the east of the San Luis Valley lies the Wet Mountain Valley. The Western Slope is generally drained by the Colorado River and its tributaries.

Nearly half of the state is flat in contrast to Colorado's rugged Rocky Mountains. East of the Southern Rocky Mountains are the Colorado High Plains, the section of the Great Plains within Colorado. The plains are sparsely populated with most population existing along the South Platte and Arkansas Rivers.

Fun Fact: The world's largest natural hot springs pool is located in Glenwood Springs and was a favorite stop of President Teddy Roosevelt.

Numerous dams and reclamation projects on the rivers provide water for irrigation and municipal and industrial use, as well as supply hydroelectric power. The Colorado-Big Thompson and the Fryingpan-Arkansas projects are two of the largest, and divert water from the Western Slope, which has two-thirds of the state's surface water, to the Eastern Slope, where most of the population and farmland are concentrated.

There are seven major river basins in Colorado: the Arkansas, Rio Grande, San Juan, Colorado, Green, Platte and Republican. The largest of these basins on a national level is the Colorado River Basin, which has its headwaters in Rocky Mountain National Park, flows from Colorado through Utah and the Grand Canyon in Arizona, and ultimately completes its journey at the Gulf of California. Each of these river basins are covered in more detail in Section C of this report. Table 1 below summarizes statistics on Colorado's waters.



Big Thompson Dam, photo by USBR

Table 1: Colorado Atlas		
State Population[1]: 4,939,456 **State Surface Area: 104,100 Square Miles** **State Water Area: 371 Square Miles (as lakes and reservoirs)** **Number of Major River Basins: 7**		
River Basin	**Surface Area (sq. mi.)**	**Stream Length (mi.)**
Arkansas	28,258	22,095
Rio Grande	9,859	10,072
San Juan	7,540	5,773
Colorado	18,160	19,340
Green	10,499	13,448
Platte	20,897	18,959
Republican	8,829	5,846
Total Number of River Miles[2]: 105,344 Estimated Acreage of Lakes/Reservoirs/Ponds[2]: 249,787 Acreage of Freshwater Wetlands: unknown		
Notes: 1 U.S. Bureau of the Census, 2008 Population Estimates Program (PEP) 2 Estimated from NHD, 1:100,000 GIS coverage		

B1a. Colorado Use Support Summary

Summary of Classified Uses

The State of Colorado has adopted five different categories of classified waterbody uses: aquatic life, water supply, recreation, wetlands and agriculture. Table 2, Summary of Classified Uses, breaks down the number of stream miles and lake acres in the state that have been assigned each of these classified uses. Many segments support multiple uses.

Summary of Degree of Use Support

Colorado's water quality is assessed periodically in conjunction with the triennial review of water quality standards, the development of discharge permits, 303(d) Lists, and Total Maximum Daily Loads (TMDLs), and the completion

of special studies. The following tables summarize the number of assessed stream miles and lake acres that do or do not fully support "all" their assigned classified uses.

Table 2: Summary of Classified Uses

(estimates of river miles and lake acres)

Classified Use	River Miles	Lake Acres
Aquatic Life Cold 1	*38,055*	*115,322*
Aquatic Life Warm 1	*3,030*	*74,916*
Aquatic Life Cold 2	*8,801*	*7,846*
Aquatic Life Warm 2	*45,527*	*57,483*
Recreation Primary Contact (Recreation Class E and P)	*57,473*	*239,780*
Recreation Secondary Contact (Recreation Class U and N)	*36,942*	*15,787*
Water Supply	*43,440*	*203,568*
Agriculture	*94,386*	*255,568*

Table 3: Surface Water Quality Summary for Degree of Use Support[1]

Degree of Support	Percentage of Assessed River Miles	Percentage of Assessed Lake Acres
Supporting at Least One Use	*92.20%*	*83.56%*
Not Supporting at Least One Use	*7.80%*	*16.44%*
Total Miles or Acres Assessed[2]	*192,300*	*485,540*

Note: 1) Total assessed miles and acres include assessments conducted in the last five years.
2) Total miles or acres assessed includes multiple classified uses for the same segment, and therefore does not reflect the physical miles or acres present in Colorado.

Fun Fact: *The deepest natural lake in Colorado is Grand Lake at 265 feet deep.*

Summary of Waterbodies Meeting Classified Uses

The CWA at Section 101(a)(2) requires that all waters be suitable for the protection and propagation of fish, shellfish and wildlife and for recreation in and on the water unless it is demonstrated that the use is not attainable. Classified use classifications are assigned to waterbodies based upon the actual uses occurring in the waterbody. Water quality standards are in place to ensure that the waterbody is attaining the classified uses assigned. The following tables summarize the number of assessed stream miles and lake acres that have been assessed which do or do not support their assigned classified uses.

Table 4: Use support attainment, per assigned classified use for Rivers and Streams. (In miles)

Classified Use	Size Assessed	Fully Supporting	Not Supporting	Insufficient Data
Agriculture	57,050.29	55,242.76	1,807.53	63.71
Aquatic Life Cold 1	24,057.13	21,629.40	2,427.72	8,469.88
Aquatic Life Cold 2	4,982.54	4,633.15	349.39	427.54
Aquatic Life Warm 1	1,869.01	814.72	1,054.29	201.8
Aquatic Life Warm 2	17,369.29	11,131.97	6,237.32	1,349.86
Domestic Water Supply	35,834.22	34,410.35	1,423.87	544.32
Primary Recreation	39,695.40	38,137.91	1,557.49	3,380.13
Secondary Recreation	11,442.38	11,293.43	148.94	473.10

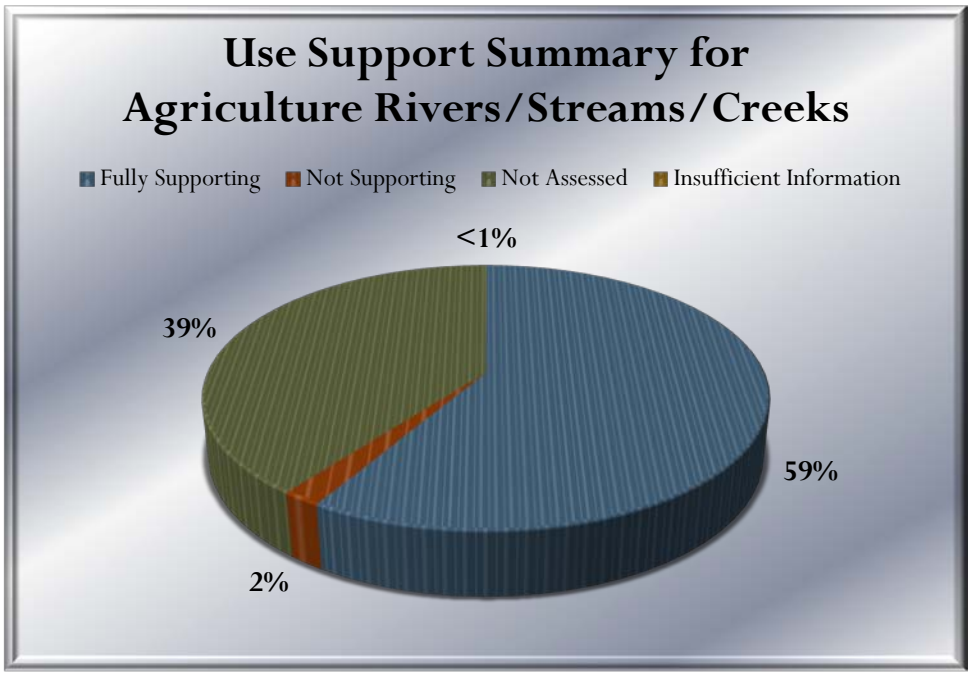
Table 5: Use support attainment, per assigned classified use for Lakes and Reservoirs. (In acres)

Classified Use	Size Assessed	Fully Supporting	Not Supporting	Insufficient Data
Agriculture	132,224.50	132,008.50	216.00	0
Aquatic Life Cold 1	73,633.10	32,771.22	40,861.88	16,263.70
Aquatic Life Cold 2	1,475.80	1,027.50	448.30	0
Aquatic Life Warm 1	44,508.00	12,682.41	31,825.59	17,408.52
Aquatic Life Warm 2	5,573.35	710.34	4,863.01	1,221.70
Domestic Water Supply	104,873.65	104,820.80	52.80	1,935.70
Primary Recreation	119,151.40	118,146.10	1005.30	2,859.20
Secondary Recreation	4,009.80	3,541.70	558.10	0

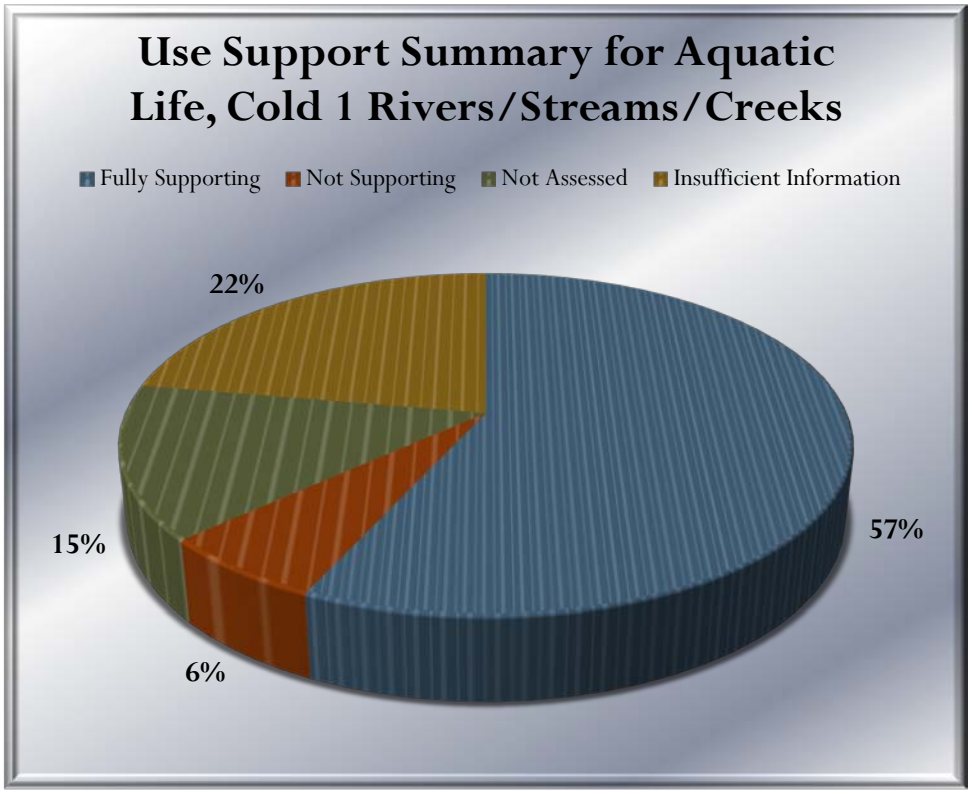
Detailed Summaries of Waterbodies Meeting Classified Uses

Beginning with the 2010 305(b) report, the use support summaries for the various classified uses are reported in graphic detail.

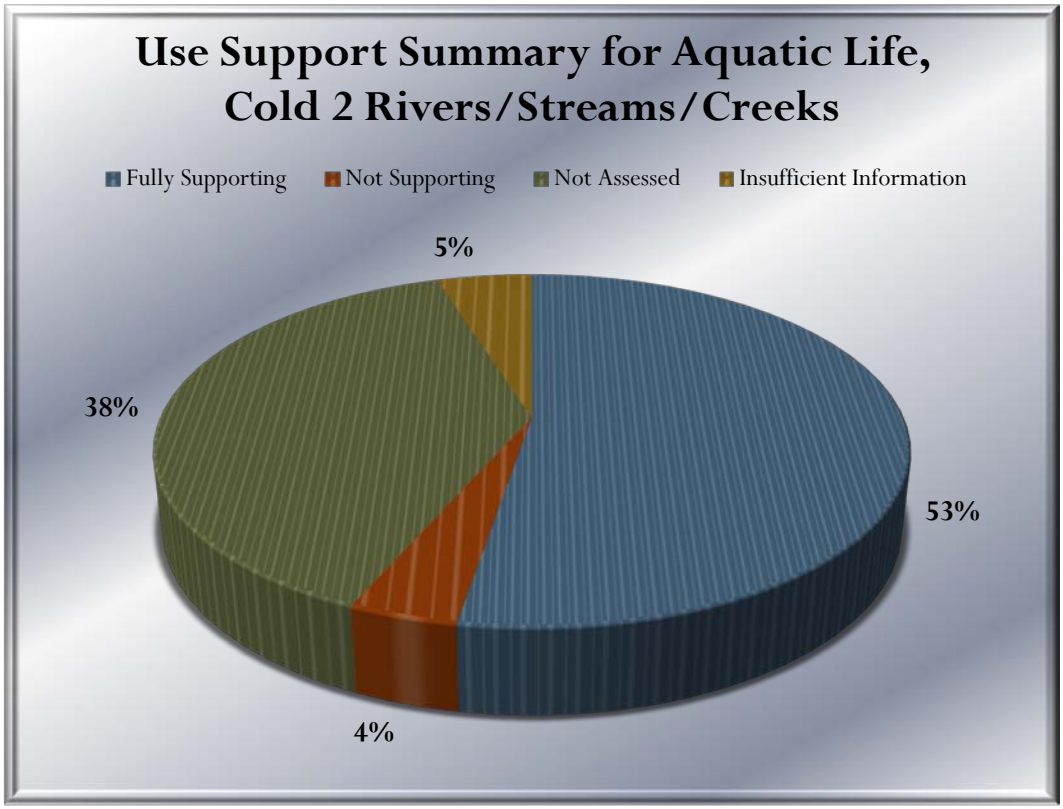
For Rivers and Streams:



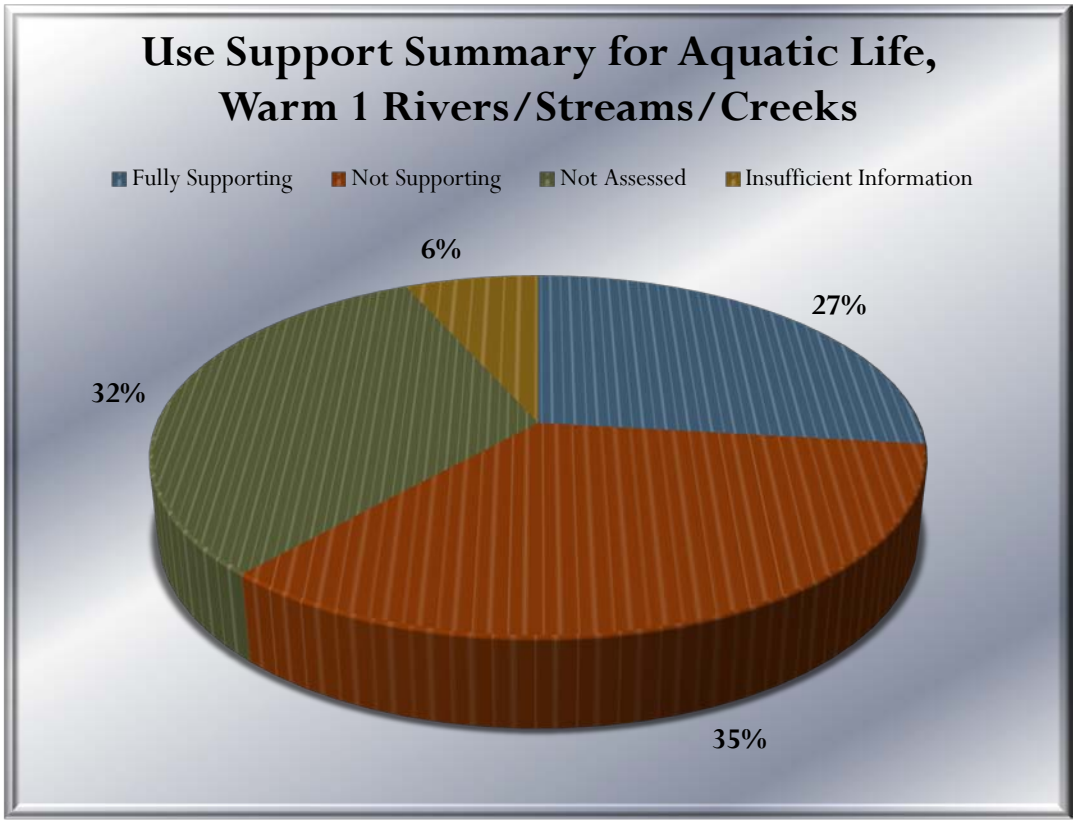
Degree of Use Support	Use Support Summary for Agriculture, in miles
	Rivers/Streams/Creeks
Fully Supporting	55,242.76
Not Supporting	1,807.53
Not Assessed	37,272.40
Insufficient Information, M&E List	63.71



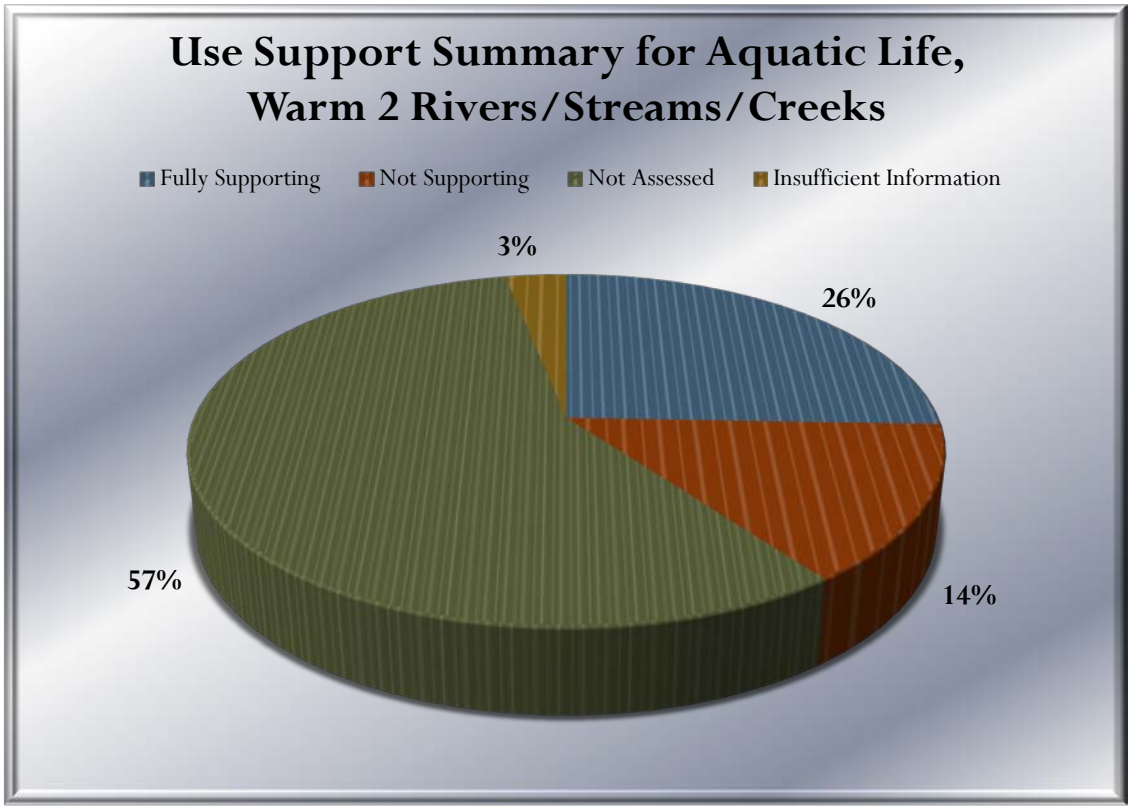
Degree of Use Support	Use Support Summary for Aquatic Life, Cold 1, in miles
	Rivers/Streams/Creeks
Fully Supporting	21,629.40
Not Supporting	2,427.73
Not Assessed	5,528.45
Insufficient Information, M&E List	8,469.88



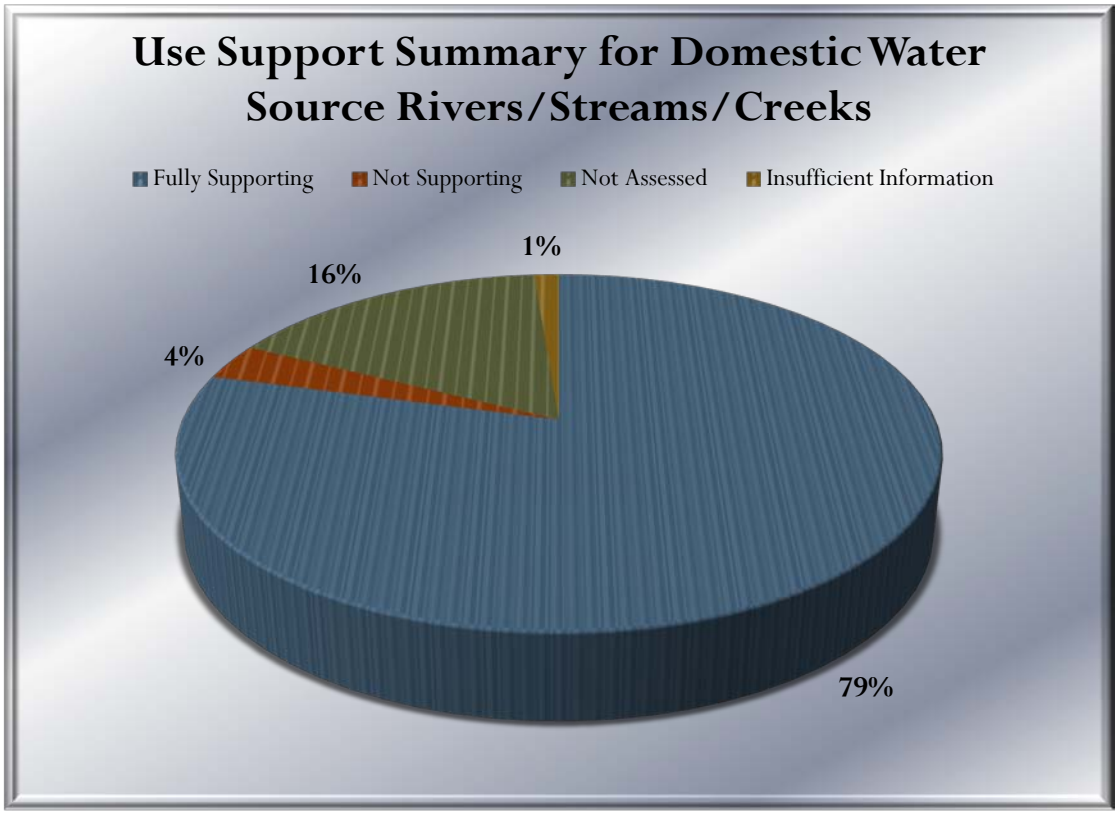
Degree of Use Support	Use Support Summary for Aquatic Life, Cold 2, in miles
	Rivers/Streams/Creeks
Fully Supporting	4,633.15
Not Supporting	349.39
Not Assessed	3,390.91
Insufficient Information, M&E List	427.54



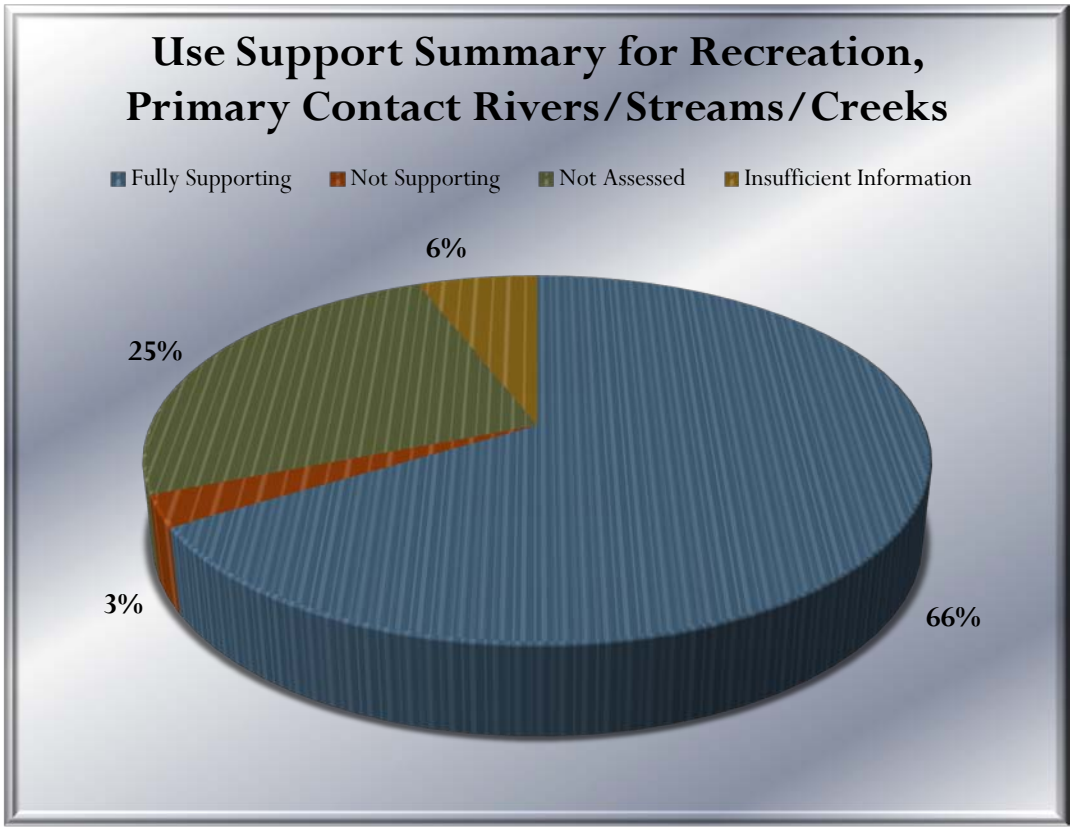
Degree of Use Support	Use Support Summary for Aquatic Life, Warm 1, in miles
	Rivers/Streams/Creeks
Fully Supporting	814.72
Not Supporting	1,054.29
Not Assessed	959.92
Insufficient Information, M&E List	201.80



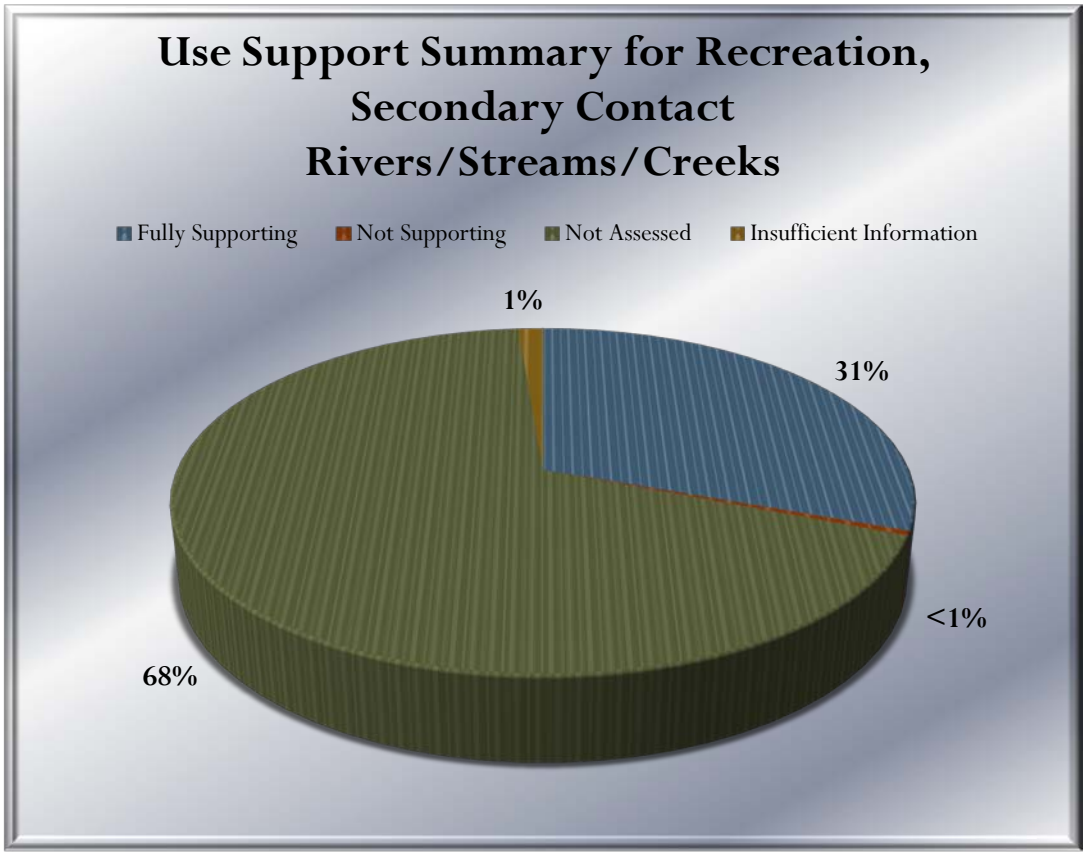
Degree of Use Support	Use Support Summary for Aquatic Life, Warm 2, in miles
	Rivers/Streams/Creeks
Fully Supporting	11,131.97
Not Supporting	6,237.32
Not Assessed	24,807.62
Insufficient Information, M&E List	1,349.86



Degree of Use Support	Use Support Summary for Domestic Water Source, in miles
	Rivers/Streams/Creeks
Fully Supporting	34,410.35
Not Supporting	1,423.87
Not Assessed	7,061.07
Insufficient Information, M&E List	544.32

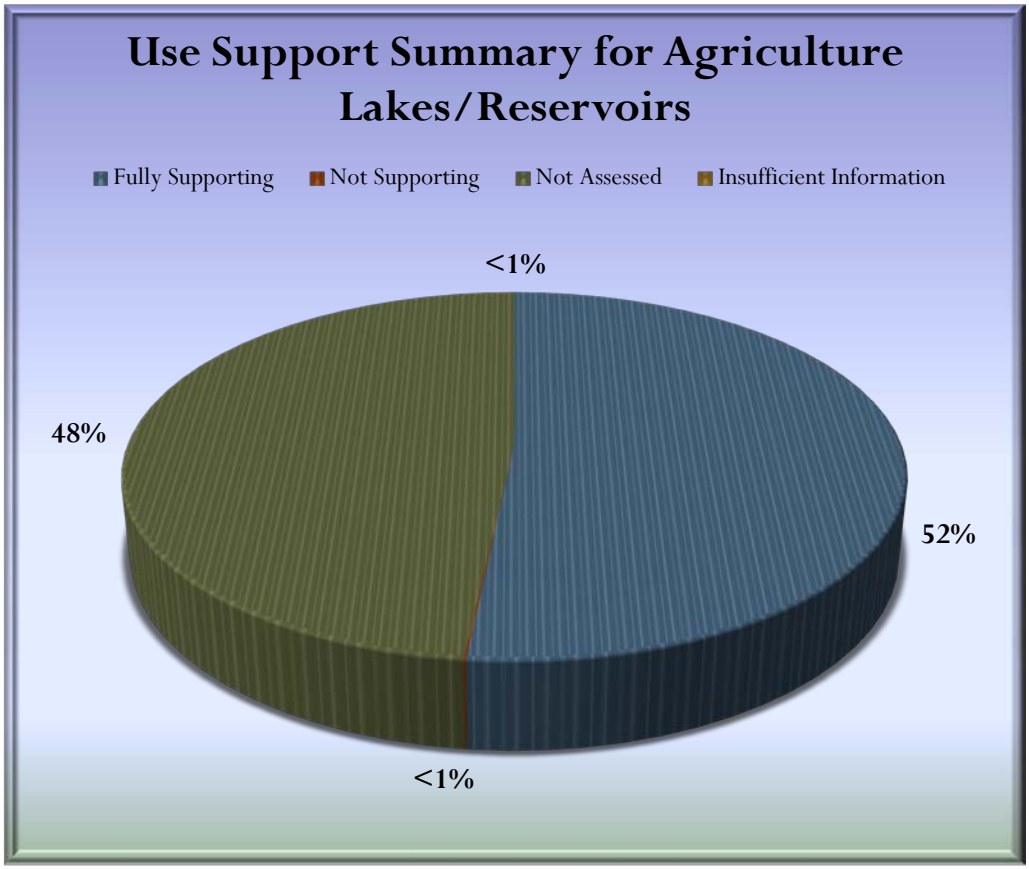


Degree of Use Support	Use Support Summary for Recreation, Primary Contact, in miles
	Rivers/Streams/Creeks
Fully Supporting	38,137.91
Not Supporting	1,557.49
Not Assessed	14,397.85
Insufficient Information, M&E List	3,380.13

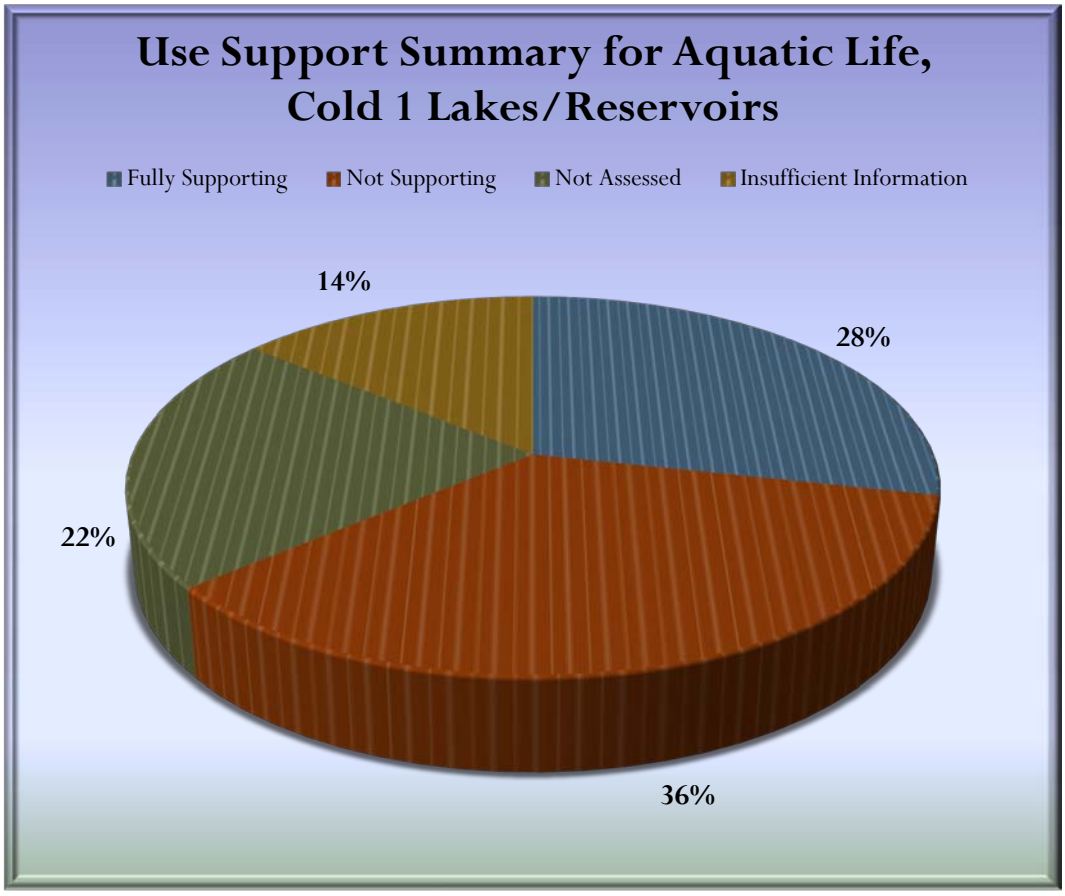


Degree of Use Support	Use Support Summary for Recreation, Secondary Contact, in miles
	Rivers/Streams/Creeks
Fully Supporting	11,293.43
Not Supporting	148.94
Not Assessed	25,026.11
Insufficient Information, M&E List	473.10

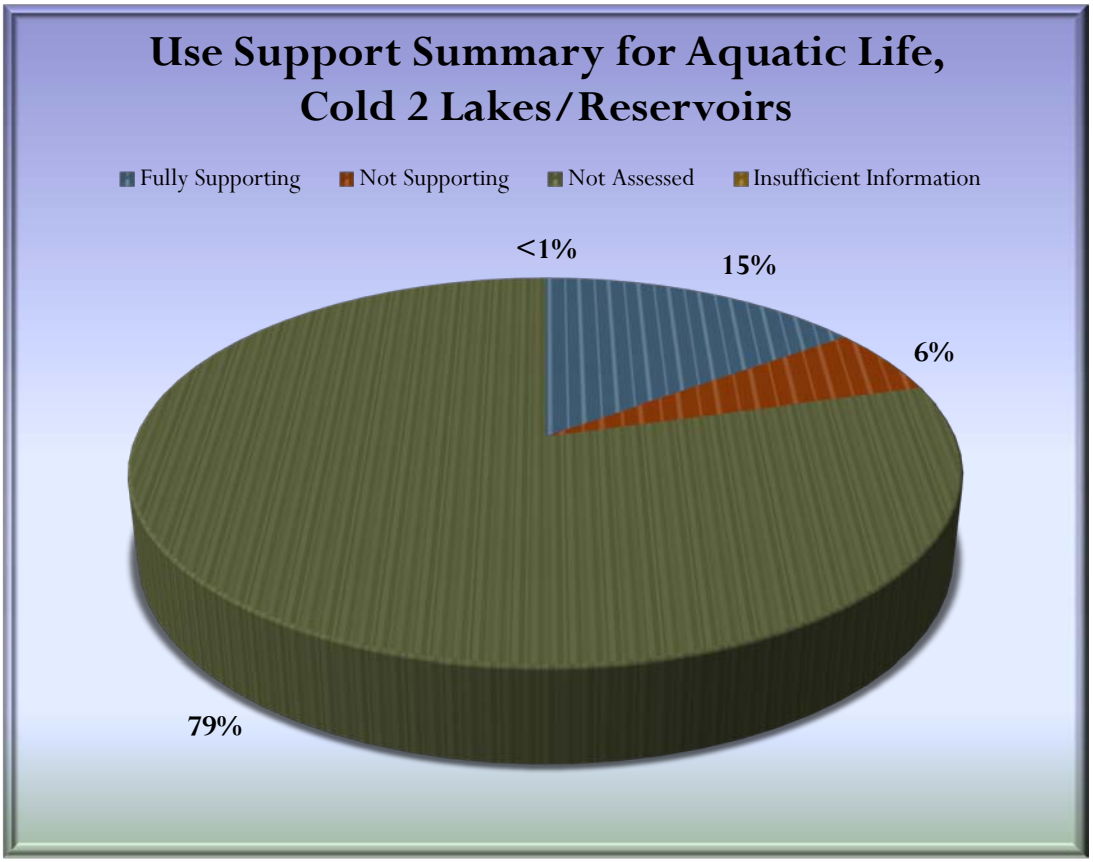
For Lakes and Reservoirs:



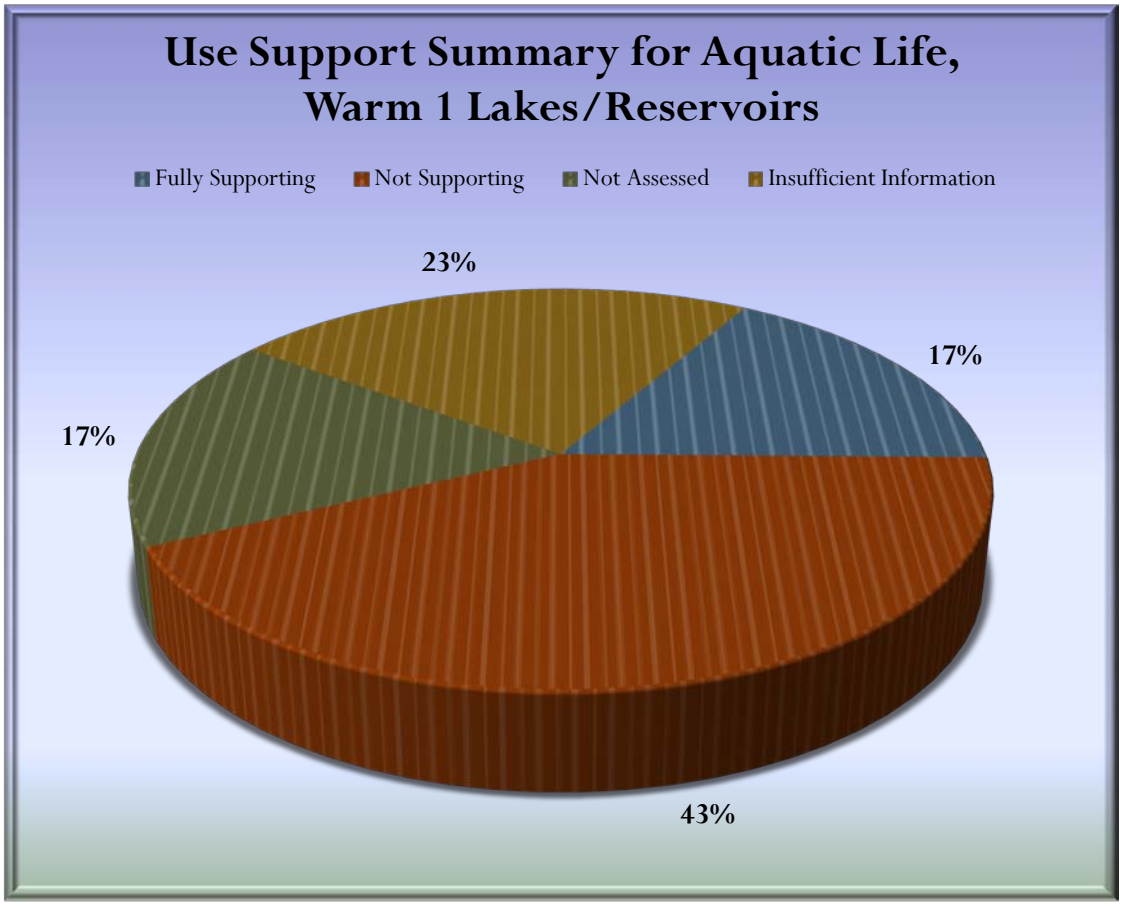
Degree of Use Support	Use Support Summary for Agriculture, in acres
	Lakes/Reservoirs
Fully Supporting	132,008.50
Not Supporting	216.00
Not Assessed	123,343.00
Insufficient Information, M&E List	0



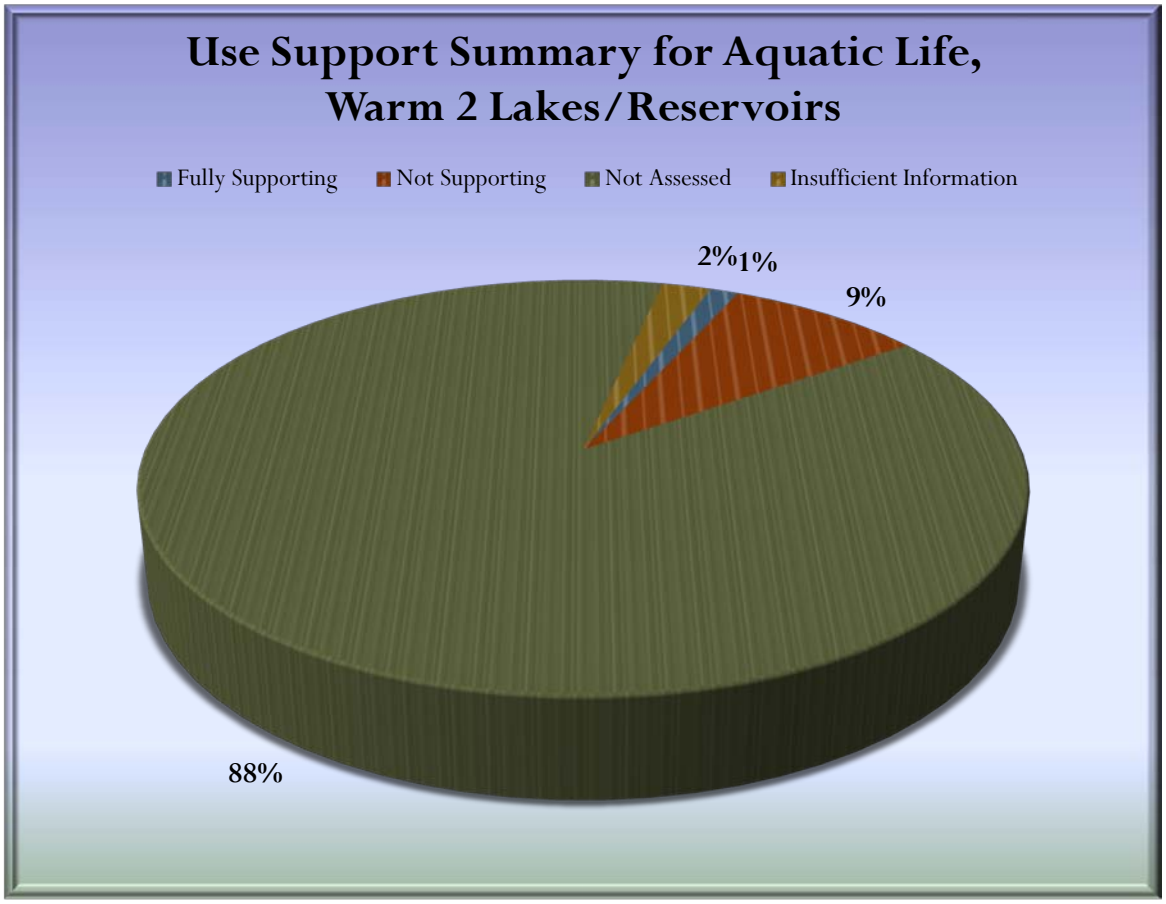
Degree of Use Support	Use Support Summary for Aquatic Life, Cold 1, in acres
	Lakes/Reservoirs
Fully Supporting	32,771.22
Not Supporting	40,861.88
Not Assessed	25,425.20
Insufficient Information, M&E List	16,263.70



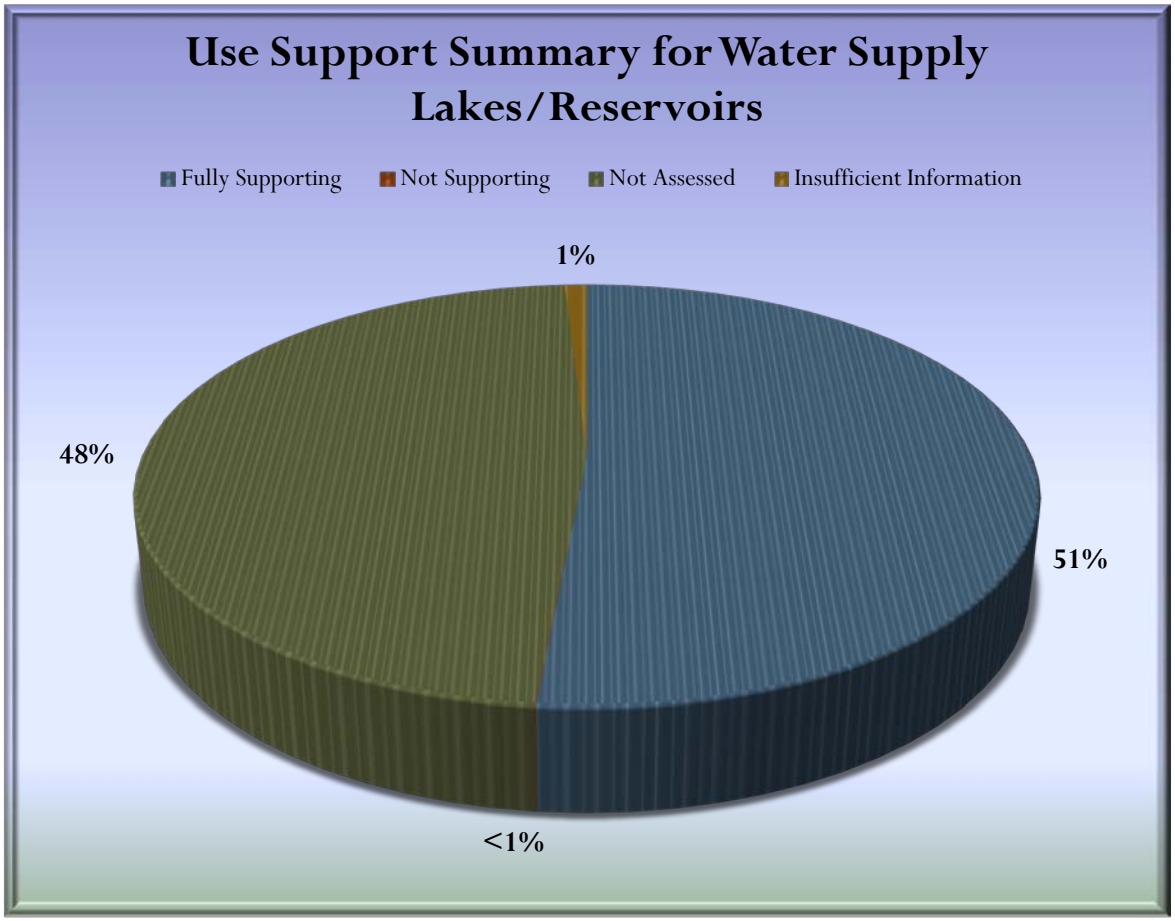
Degree of Use Support	Use Support Summary for Aquatic Life, Cold 2, in acres
	Lakes/Reservoirs
Fully Supporting	1,207.50
Not Supporting	448.30
Not Assessed	6,370.20
Insufficient Information, M&E List	0



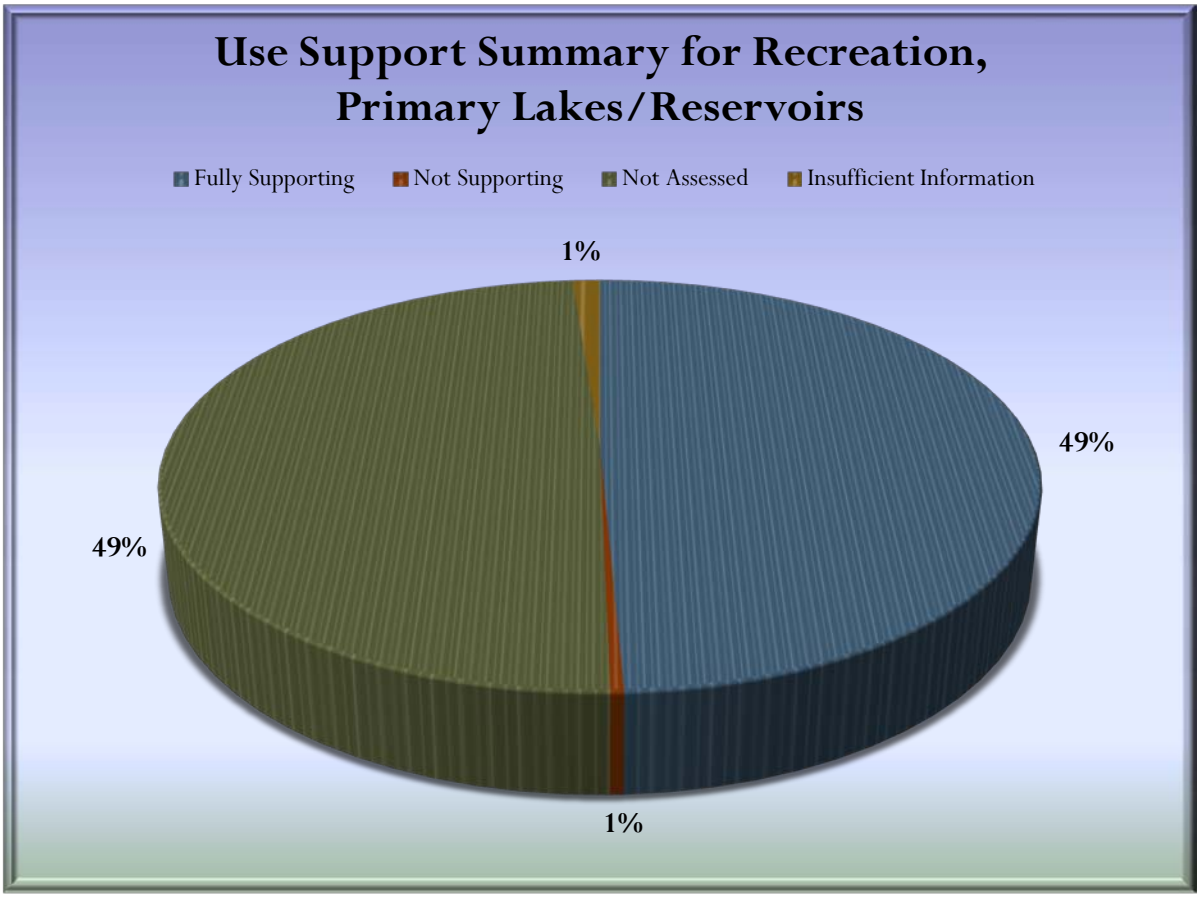
Degree of Use Support	Use Support Summary for Aquatic Life, Warm 1, in acres
	Lakes/Reservoirs
Fully Supporting	12,682.41
Not Supporting	31,825.59
Not Assessed	12,999.22
Insufficient Information, M&E List	17,408.52



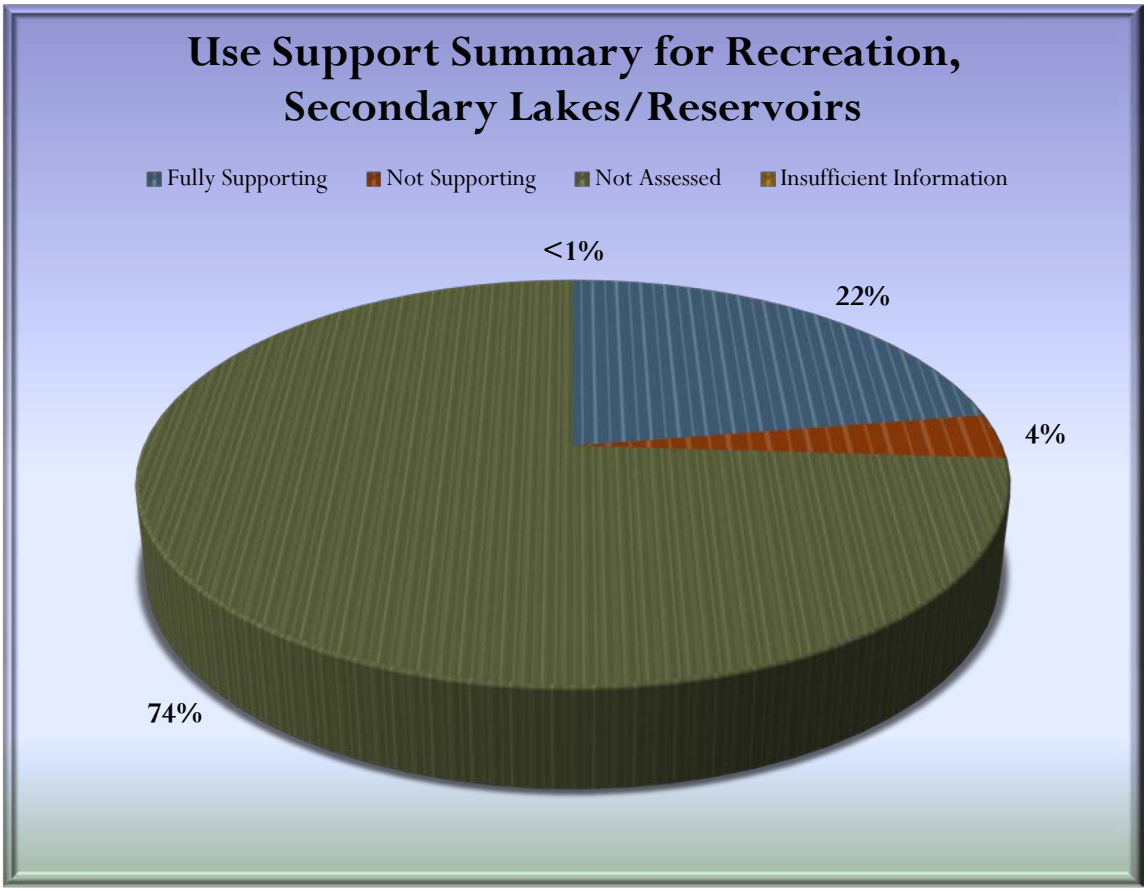
Degree of Use Support	Use Support Summary for Aquatic Life, Warm 2, in acres
	Lakes/Reservoirs
Fully Supporting	710.34
Not Supporting	4,863.01
Not Assessed	50,688.67
Insufficient Information, M&E List	1,221.70



Degree of Use Support	Use Support Summary for Water Supply, in acres
	Lakes/Reservoirs
Fully Supporting	104,820.80
Not Supporting	52.80
Not Assessed	96,737.35
Insufficient Information, M&E List	1,935.70



Degree of Use Support	Use Support Summary for Recreation, Primary, in acres
	Lakes/Reservoirs
Fully Supporting	118,146.10
Not Supporting	1,005.30
Not Assessed	117,769.80
Insufficient Information, M&E List	2,859.20



Degree of Use Support	Use Support Summary for Recreation, Secondary, in acres
	Lakes/Reservoirs
Fully Supporting	3,541.70
Not Supporting	558.10
Not Assessed	11,687.30
Insufficient Information, M&E List	0

Causes and Sources Affecting Use Attainability

In Colorado, when a narrative or numeric standard is exceeded, the associated use is determined to be in non-attainment and the cause and source affecting the water body is determined. The cause is the pollutant that contributes to the non-attainment. For example, if the aquatic life standard for zinc is exceeded, then the aquatic life use would be in non-attainment and the cause would be zinc. The source is the activity or facility that contributes the pollutant. An example of a source is resource extraction if metal exceedances are found in a historic mining district.

The following tables summarize the causes and sources contributing to non-attainment of uses for Colorado's assessed waters. Those causes and sources yet to be determined are identified as "unknown."

Table 5a: Summary of Causes Affecting Water Bodies Not Fully Supporting Classified Uses

Cause Category	*Colorado Rivers* Miles Affected	*Colorado Lakes* Acres Affected
Unknown Biological Stressor	**71.48**	**0**
Harmful Algal Blooms – Chlorophyll-a	**0**	**116.70**
Toxic organics - Tetracholoroethylene	**0**	**5.49**
Sulfates - Mineralization	**19.94**	**0**
Metals		
Aluminum	**83.32**	**0**
Arsenic	**64.03**	**30.40**
Cadmium	**772.10**	**0**
Copper	**1,015.86**	**2,582.10**
Iron (trec)	**954.98**	**671.60**
Lead	**187.45**	**0**
Manganese	**330.78**	**0**
Mercury	**9.6**	**39,981.97**
Selenium	**7,478.41**	**29,890.81**
Silver	**0**	**0**

Table 5a: Summary of Causes Affecting Water Bodies Not Fully Supporting Classified Uses

Cause Category	*Colorado Rivers* Miles Affected	*Colorado Lakes* Acres Affected
Uranium	**75.00**	**0**
Zinc	**899.75**	**0**
Nutrients	**0**	**116.70**
Nitrate	**45.80**	**4.931.22**
Unionized Ammonia	**94.79**	**530.00**
pH	**202.06**	**4,665.92**
Siltation	**136.94**	**0**
BOD, organic sediment load	**12.420**	**0**
Dissolved oxygen saturation	**111.50**	**7,938.32**
Thermal Impacts	**421.81**	**1,529.30**
Pathogens - e. coli	**1,666.02**	**1,563.40**

"Cause" means the pollutants and other stressors that contribute to the non-attainment of classified uses in a water body.

Sum of the acres or miles affected does not equal the total non-attained acres or miles since non-attainment may have more than one cause.

Fun Fact: Roughly forty percent of the state is plains with the remaining portion equally divided between the plateau and mountain zones..

Table 5b: Summary of Sources Affecting Water Bodies Not Fully Supporting Classified Uses

Source Category	*Colorado Rivers* (Miles Affected)	*Colorado Lakes* (Acres Affected)
Agriculture Related Sources	**1,835.30**	**216.00**
Contaminated Groundwater	**29.90**	**5.49**
Highway/Road/Bridge Runoff (Non-construction Related)	**16.30**	**0**
Mining Related Sources	**565.26**	**141.60**
Natural Sources	**19.08**	**141.60**
Sources Unknown	**7,884.11**	**48,327.58**
Upstream Sources	**47.17**	**0**

Notes:

"Source" means the activities, facilities, or conditions that contribute pollutants or stressors.

Sum of the acres or miles affected does not equal the total non-attained acres or miles since non-attainment may have more than one cause.

Support for Classified Use Tables

This section gives an explanation for the Classified Use Support Tables included in Appendix A and Appendix B of this Report. These assessments are individually listed in this table according to stream segments. The following table provides an explanation of the Water Body Identification (WBID) System used in Colorado. The basins are separated by Regulation Numbers. The Classified Use Table lists the assessments according to this system.

Table 5c: The Key to Colorado's WBIDs

Regulation Number	*Letters 1-2 = Colorado*	*Letters 3-4 = Major River Basin*	*Letters 5-6 = Minor River Basin*
#32	**CO**	AR Arkansas Basin	UA Upper Arkansas River Basin MA Middle Arkansas River Basin FO Fountain Creek Basin LA Lower Arkansas River Basin CI Cimarron River Basin
#33	**CO**	UC Upper Colorado and North Platte Basin	UC Upper Colorado River Basin BL Blue River Basin EA Eagle River Basin RF Roaring Fork River Basin NP North Platte River Basin YA Yampa River Basin
#34	**CO**	SJ San Juan River and Dolores River Basins	SJ San Juan River Basin PI Piedra River Basin PN Los Pinos River Basin AF Animas and Florida Rivers Basin LP La Plata River, Mancos River, McElmo Creek and San Juan DO (Upper) Dolores River Basin
#35	**CO**	GU Gunnison and Lower Dolores River Basins	UG Upper Gunnison River Basin NF North Fork of the Gunnison River Basin UN Uncompahgre River Basin LG Lower Gunnison River Basin SM San Miguel River Basin LD Lower Dolores River Basin
#36	**CO**	RG Rio Grande Basin	RG Rio Grande River Basin AL Alamosa River/La Jara Creek/ Conejos Creek Basin CB Closed Basin/San Luis Valley Basin
#37	**CO**	LC Lower Colorado Basin	LY Lower Yampa/Green River Basin WH White River Basin LC Lower Colorado river Basin
#38	**CO**	SP South Platte Basin	US Upper South Platte River Basin CC Cherry Creek BE Bear Creek Basin CL Clear Creek Basin BD Big Dry Creek Basin BO Boulder Creek Basin SV St Vrain Creek Basin MS Middle South Platte River Basin BT Big Thompson River Basin CP Cache La Poudre River Basin LA Laramie River Basin LS Lower South Platte River Basin RE Republican River Basin

Appendices A and B tabulate, for each segment, the classified uses as well the corresponding attainment status for each use, the date of the most current assessment, identified sources and impairments, and the corresponding segment size. The methodology used in Colorado for assigning these categories system is explained in the following table.

Table 5d: Comparison of EPA IR Categories to Colorado 303(d) Listings		
EPA IR Category	**EPA Description**	**Colorado Description**
1	All classified uses are supported, no use is threatened.	Fully Supporting for all uses. All uses have been assessed and all uses are fully supporting the classified uses.
2	Available data and/or information indicate that some, but not all of the classified uses are supported.	Some uses have been assessed and all uses assessed are fully supporting the classified uses. Other uses have not been assessed.
3	There is insufficient available data and/or information to make a use support determination.	Not Assessed for any uses. Placed on Colorado's Monitoring and Evaluation List (M&E) because impairment is suspected. Segments where no water quality data has been collected and assessed are also placed in Category 3.
4a	A TMDL to address a specific segment/pollutant combination has been approved or established by EPA.	TMDL completed. May be supporting or not assessed and waiting for future monitoring to determine use support.
4b	A use impairment caused by a pollutant is being addressed by the State through other pollution control requirements.	Water is impaired but a TMDL is not needed because other mechanisms are expected to result in the attainment of Water Quality Standards in a reasonable period of time. (e.g. CERCLA Sites)
4c	A use is impaired, but the impairment is not caused by a pollutant.	A use is impaired, but the impairment is not caused by a pollutant.
5	Available data and/or information indicate that at least one classified use is not being supported or is threatened, and a TMDL is needed.	Placed on Colorado's 303(d) List. No TMDL has been completed.

In Colorado, the majority of the assessed surface water bodies fall into IR Categories 1, 2, and 3. Colorado has elected to place segments where not all uses have been assessed in IR Category 2. In some cases, a complete assessment of all uses cannot be completed due to the lack of data, but the data that is available indicates that at least some of the uses that were assessed are fully supporting. An example would be instances where an aquatic life assessment has been completed, but analytical results to assess water supply uses were not available. Colorado places segments that lack topical and conclusive evidence regarding attainment of standards on the M&E list, which is equivalent to IR Category 3. Also included in IR category 3 are those water bodies that were not assessed during the current 305(b) assessment cycle. Segments for which an EPA approved TMDL has been completed are placed in IR Category 4a. In some cases, segments that previously were classified as IR Category 4a, have been re-assessed and

placed in Category 1, as they are now are in attainment of all classified uses. Colorado currently does not have any surface water bodies classified as IR Categories 4b or 4c. Regulation #93, Colorado's section 303(d) list of impaired waters tabulates all those segments that require a TMDL, (Appendix D) and tabulates all those water bodies that are classified as IR Category 5.

B2. Water Pollution Control Programs

This Section provides an overview of the Water Quality Control Division's (WQCD's or the Division's) water quality assessment and pollution control programs, and directs the reader to other documents where more information can be found.

The Water Quality Control Division

The WQCD is the primary agency responsible for maintaining, restoring and improving the quality of Colorado's waters, and for ensuring that safe drinking water is provided to the public from public water systems. The WQCD is organized into three programs: The Clean Water Facilities Program, the Drinking Water Program and the Watershed Program. The Watershed Program consists of three units: Environmental Data Unit, Standards Unit, and the Restoration and Protection Unit. The Clean Water Facilities Program consists of the Permits Section which includes a Industrial Permits Unit and a Domestic Permits Unit. The Safe Drinking Water Program consists of a Compliance Assurance and Data Management Section and an Engineering Section. In addition, the Business Services Unit and the Fiscal Services Unit operate under the WQCD Director's Office.

Water Quality Monitoring, Assessment and Reporting

A discussion of the Division's water quality monitoring assessment and reporting can be found in Chapter IV of *Colorado Water Quality Management and Drinking Water Protection Handbook* (*Handbook*). Division activities in the last two years are summarized in the Annual Reports to the Water Quality Control Commission (WQCC or Commision). http://www.cdphe.state.co.us/op/wqcc/PublicParticipation/98-2-2006.pdf

Monitoring Initiatives 2008/2009

PERIPHYTON SAMPLING

The Division conducts monitoring at a number of streams, reservoirs, and lakes around the state to determine their trophic status, develop TMDLs, and support changes to standards and classifications during triennial reviews. The Division's surface water monitoring activities for FY 2008/2009 were grouped into four general types: (1) routine sampling; (2) special studies; (3) lake and reservoir monitoring; and (4) aquatic life and habitat studies. The majority of the Division's sampling efforts were devoted to the collection of water chemistry samples from the

four major river basins across the state with an emphasis on the South Platte River Basin. River and stream sites in this basin are sampled for the purposes of reviewing and developing standards for triennial water quality standards reviews, water quality assessments, developing total maximum daily loads (TMDLs), Clean Water Act Section 303(d) listing determinations, and for reporting trends and water quality status in Colorado's Section 305(b) report.

Routine Sampling

The Division uses a rotating basin approach for primary stream monitoring. The entire state is sampled on a five-year cycle that matches the Commission's schedule for triennial reviews of basin standards and classifications. For the purposes of conducting the triennial reviews, the state has been divided into four major river basins. Each of the four major river basins is sampled intensively once every five years. This allows the Division to concentrate its limited resources in one basin in order to provide a complete set of data in preparation for the triennial review scheduled for that basin. In every fifth year of the cycle, Regulation No. 31 (Basic Standards and Methodologies for Surface Water) is reviewed by the Commission and there is no need to intensively sample one of the major basins. For that year, sampling is more evenly allocated among the long-term trend sites in the four basins, special studies are conducted, specific data gaps may be filled, and other data needs met.

The number of sites and the number of times each site is sampled each year is controlled by the Division's fixed monitoring budget for laboratory analyses, which in FY 2008 was $410,000 and in FY 2009 was $460,657. The samples collected are analyzed by the CDPHE's Laboratory Services Division. Depending upon the amount of data sought for a particular site and the accessibility of the site, sites are visited on a regular schedule (i.e. monthly, bimonthly, or when weather and road conditions allow access). In FY08, routine water chemistry samples were collected from a network of 223 sampling sites located across the state. The Division concentrated 62 percent of the sampling in the South Platte River Basin. The remainder was allocated to the Colorado River Basin (16 percent), Arkansas and Rio Grande Basins (13 percent), and the San Juan and Gunnison River Basins (9 percent). This sampling resulted in the collection of 970 sample sets.

In State FY 2009, routine water chemistry samples were collected from a network of 178 sampling sites located across the state. There was not a specific river basin focus in FY 2009. The Division concentrated 32 percent of the sampling in the South Platte River Basin, 29 percent located to the Colorado River Basin, 22 percent located Arkansas and Rio Grande Basins, and 17 percent located in the San Juan and Gunnison River Basins. This sampling resulted in the collection of 809 sample sets. In both FY 2008 and 2009, samples were analyzed for a suite of constituents including metals, inorganics, nutrients and E. coli. Field parameters such as dissolved oxygen, pH, conductance, and temperature were also collected.

Special Studies

Special studies monitoring includes synoptic sampling events for Total Maximum Daily Load (TMDL) determinations, fish tissue sampling, and other water quality investigations. Six different synoptic sampling events were conducted in FY08 to obtain water quality data for upcoming TMDLs. Five of the six events were for streams listed for metals, such as Gamble Gulch in the Boulder Creek basin (Cu, Zn, pH), Illinois Gulch in the Blue River

basin (Zn), Sage, Grassy, and Dry Creeks in the Yampa River basin (Se), Oh-Be-Joyful and the Slate River near Crested Butte in the upper Gunnison basin (Cd, Cu, Pb, Zn), and Red Mountain Creek and the Uncompahgre River (Cd, Cu, Zn, Fe). The sixth sampling event was for *E. coli* on the Elk River in the Yampa River basin.

Fish tissue sampling to detect the presence of mercury was completed at 16 reservoirs across the state from July 1, 2007 through June 30, 2008. This effort resulted in 106 composite tissue samples for analysis by the Department's Laboratory Services Division. Of these 16 water bodies, one exceeded the action level for mercury (0.5 mg/kg dry weight) and was a candidate for a fish consumption advisory. As of July 1, 2008, there are 19 total fish consumption advisories for lakes and reservoirs in Colorado.

Synoptic sampling events were conducted in FY 2009 for Gamble Gulch in the Boulder Creek basin (Cu, Zn, pH), Illinois Gulch in the Blue River basin (Zn), and Red Mountain Creek and the Uncompahgre River (Cd, Cu, Zn, Fe).

Sampling was initiated in the Yampa River basin in FY 2009, and is continuing in FY 2010. This includes selenium sampling on Dry Creek near the town of Hayden in Routt County. Additional sampling may be required, however, to meet minimum data requirements. Sampling conducted to characterize *E. coli* sources on the Elk River is ongoing.

Sampling was initiated on selected tributaries to the lower Arkansas River below John Martin Reservoir in June 2009. This sampling is intended to characterize selenium contributions associated with smaller tributaries that, for the most part, have not previously been sampled. Two additional rounds of sampling are anticipated during FY 2010.

Finally, the Division has initiated *E. coli* sampling on Big Dry Creek in the South Platte basin in preparation of TMDL development.

Fish tissue sampling to detect the presence of mercury was completed at 26 reservoirs across the state from July 1, 2008 through June 30, 2009. Of these 26 water bodies, five exceeded the action level for mercury and were candidates for issuance of a fish consumption advisory. As of July 1, 2009, there are 24 fish consumption advisories for lakes and reservoirs in Colorado.

Arsenic and selenium were also analyzed in fish tissues from these reservoirs. The Division is currently working with the CDPHE Disease Control and Environmental Epidemiology Division to determine action levels for selenium concentration in fish tissue. A risk assessment for arsenic in fish tissue will be performed in FY 2010.

Lake and Reservoir Monitoring

The Division conducted lake and reservoir sampling in FY 2008. The Division visited 12 reservoirs/lakes during the algal growing season from June through August. Sites were located in the Upper and Lower Colorado River Basins, with the addition of Taylor Park Reservoir. All sites were visited three times. At each lake, depth profiles of dissolved oxygen, pH, conductivity, and temperature were collected at one-meter intervals. Water quality samples were taken from near the surface and near the bottom. Samples were analyzed for a suite of chemical parameters including nutrients, metals, and inorganics. In addition, the surface sample was analyzed for the chlorophyll-a content as a measure of trophic status and for the phytoplankton population to determine the algal species composition.

Fun Fact: *There are nearly 20 rivers whose headwaters begin in Colorado, with the Continental Divide directing each river's course.*

In cooperation with the WQCD, EPA collected and analyzed lakes information from ten lakes in the South Platte River Basin to assist the WQCD in their nutrient criteria development efforts. Sampling protocols were similar to the WQCD except that no bottom samples were collected.

The Division continued its lake and reservoir sampling in FY 2009. Since the sampling efforts were not focused on a particular basin, an entire list of candidate lakes was examined. A total of 18 lakes were sampled during the growing season between July and September. Of these, 16 had not been previously sampled by the Division. Two lakes, Sweitzer and Ridgway, were selected based on their existing water quality issues and their favorable locations for inclusion on extended sampling trips. At each lake, depth profiles of dissolved oxygen, pH, conductivity, and temperature were collected at one-meter intervals. Water quality samples were taken from near the surface and near the bottom. Samples were analyzed for a suite of chemical parameters including nutrients, metals, and inorganics. In addition, the surface sample was analyzed for the chlorophyll-a content as a measure of trophic status and for the phytoplankton population to determine the algal species composition.

In cooperation with the WQCD, EPA collected and analyzed lakes information from ten lakes in the South Platte and Arkansas River Basins to assist the WQCD in their nutrient criteria development efforts. Sampling protocols were similar to the WQCD except that no bottom samples were collected.

Aquatic Life and Habitat Studies

In 2008, macroinvertebrate and habitat samples were collected by the Division at 39 sites across the state. At each of the habitat sites, water quality samples were taken and analyzed for a specific suite of constituents. These data, plus substrate measurements, habitat scores and periphyton samples, will be used in the development of expected conditions and assessments of aquatic life.

2008's aquatic life and habitat studies included a one-day sampling event along Bear Creek, which involved 8 sites. Furthermore, the Grand County Water Information Network collected macroinvertebrate samples from 8 more sites around the Winter Park area.

In 2009, macroinvertebrate and habitat samples were collected by the Division at 49 sites across the state. At each of the habitat sites, water quality samples were taken and analyzed for a specific suite of constituents. These data, plus substrate measurements, habitat scores, and periphyton samples, will be used in the development of expected conditions and assessments of aquatic life.

The aquatic life and habitat studies included a special transition zone study along Elkhead Creek, Cherry Creek, and La Plata River, which involved approximately 22 sites. The Division worked collaboratively with the Eagle River Water and Sanitation District by collecting macroinvertebrate samples from 15 sites around the Vail/Minturn/Avon area. The Division also provided the necessary sampling equipment for the Bear Creek Watershed Association to continue sampling macroinvertebrates at eight sentinel monitoring stations along Bear Creek and two additional sites

Fish Shocking, Geneva Creek

further up in the watershed.

Nonpoint Source Monitoring Requirements

Grant requirements under the Clean Water Act Section 319 prescribe that nonpoint source projects for on-the-ground restoration and remediation activities report measurable results. EPA defines measurable results as "restoring waters to partial or full uses and standards, or as a minimum, reducing pollutant loads such as nutrients and sediment." To accomplish this, existing nonpoint source impacts must be better quantified in order to provide a water quality baseline from which to measure improvements. Surrogate measures, such as a record of the best management practices installed, can be used to evaluate the total project effort, but do not provide data that equate to water quality improvements. Few nonpoint source project sponsors have the expertise needed to prepare an adequate sampling and analysis plan that can be used to assess changes in water quality. As a result, the Division modified its approach to monitoring and evaluating nonpoint source projects. Starting with the 2004-2005 Nonpoint Source Section 319 project cycle, sponsors are required to provide more definitive water quality baseline data and subsequent post-project data to substantiate project outcomes. These additional monitoring requirements were continued during fiscal year 2007-08.

Nonpoint source management activities are implemented by using a focused watershed-based approach. This approach was initiated by synchronizing nonpoint source monitoring needs with the five-year, basin-monitoring schedule used to collect water quality data in support of the triennial review of basin classifications and standards. The Colorado and San Juan River basins were identified as the watershed funding priority in fiscal year 2007-08. In 2009, water quality data was collected at 39 sites to determine whether there was measurable water quality improvement from non-point source project construction.

Cooperative Monitoring Activities

To ensure that the maximum amount of relevant data is assessed each year, the Division issues a "call for data" to numerous cooperators, including federal and state entities, water quality management agencies, dischargers, and watershed groups, as well as River Watch and Nonpoint Source Management sponsors. Through this mechanism, the Division accumulates a considerable amount of data beyond what it can directly sample and analyze.

With the Division as a charter member of the Colorado Water Quality Monitoring Council (Council), the topic of cooperative monitoring efforts has been discussed with other stakeholders. To facilitate data sharing, the Council has initiated a Data Sharing Network. The Data Sharing Network is a statewide, web-based, water quality database and interactive map. Anyone who would like to share water quality data can upload their data through a template on the Internet. This data can be accessed (read only) by anyone. Anyone accessing the map can zoom into a particular watershed and click on a monitoring site (dots on the map) to find out who is monitoring at that site and what parameters exist. If the monitoring entity has uploaded data, the data can be viewed and downloaded. The data that is uploaded must comply with the STORET (EPA national database) requirements so that it is in a standard format that is usable by EPA and the WQCD.

A Clean Water Act Section 319 grant from the Division is funding this project and includes development of training materials, user training, and outreach to publicize the network and to seek out monitoring data to populate it. The Division is continually working on ways to build its capacity to gather water quality through partnerships with other agencies and citizen groups.

Augmented Monitoring Funds

In federal FY2007 and in order to upgrade state monitoring efforts and encourage implementation of the Monitoring and Assessment Strategies for States, EPA provided an additional $17 million in the Clean Water Act Section 106 state grants dedicated to monitoring purposes. Colorado received $441,900 of these "Monitoring Initiative" funds for a two-year period to facilitate the implementation of EPA's 10 Elements document and to conduct a statewide Lakes Probabilistic Survey of water quality as part of a national project. The Division has earmarked these funds for increased biological and habitat monitoring, biological data management, training, risk assessments for fish tissue analysis, additional monitoring of rivers and lakes, a Sweitzer Lake TMDL, ambient ground water monitoring, a USGS study of mercury methylation processes in lakes, additional monitoring equipment, increased data management capabilities, and ambient ground water monitoring. This program continues to fund Colorado's effort to expand its monitoring and assessment capabilities.

EAGLE RIVER BELOW MILK CREEK

Water Quality Standards

Water quality standards are dependent on the classified uses and are the regulatory basis for limits placed on discharges to waterbodies. A discussion of the water quality standards program can be found in Chapter IV of the *Colorado Water Quality Management and Drinking Water Protection Handbook* (*Handbook*). The surface water standards review schedule is presented in Table 6 below.

Table 6: Surface Water Standards Review Schedule

River Basins (and Regulation Number)	Issues Scoping Informational Hearing	Issues Formulation Informational Hearing	Rulemaking Hearing
Colorado Basin (#33 & #37)	October 2006	November 2007	June 2008
South Platte (#38)	October 2007	November 2008	June 2009
Basic Standards (#31)	October 2008	November 2009	June 2010
San Juan, Dolores & Gunnison (#34 & #35)	October 2010	November 2011	June 2012
Arkansas & Rio Grande (#32 & #36)	October 2011	November 2012	June 2013
Nutrient Criteria	October 2009	November 2010	June 2011

The Commission reviewed the Classifications and Standards for the Upper and Lower Colorado River Basins (Regulation #33 and #37) in June 2008. This was the first set of basins where temperature criteria were adopted for each segment. Establishing the appropriate temperature standards resulted in considerable resegmentation and adjustment of segment boundaries. In several cases, the assessment of the aquatic community and water temperature information resulted in changes to the aquatic life classification. Antidegradation designations were changed from "use protected" to undesignated for eight segments in the Upper Colorado River and 18 segments in the Lower Colorado River basins. Antidegradation designations of four segments were changed from undesignated to "outstanding waters". The Commission adopted narrative water clarity standards for Grand Lake with numeric clarity standards (in terms of Secchi depth) that will become effective in 2014. In addition, the Commission adopted site specific metals standards for the Eagle Mine site and portions of the Keystone Ski Area.

In July 2008, the Commission reviewed the antidegradation designation of five segments in the Arkansas River Basin (Regulation # 32). The results of this hearing were that four segments remained undesignated and one segment was changed to "use protected".

At the annual Temporary Modifications hearing in December 2008, the Commission reviewed the temporary modifications that were set to expire before February 28, 2011. This included temporary modifications on 22 segments in the Arkansas and South Platte River Basins (Regulations #32 and #38). Of these segments, temporary modifications were deleted for four segments, left unchanged for eight segments, extended for four segments, revised for four segments and replaced by new underlying standards for one segment.

In January 2009, the Commission revised the site-specific phosphorus standard and changed the chlorophyll goal to a standard for Chatfield Reservoir (Upper South Platte segment 6b, Regulation # 38) and revised the Chatfield Reservoir Control Regulation (Regulation # 73) to be consistent with these revised standards.

In January 2009, the WQCC also revised the site-specific standards for uranium, deleted the site-specific standard for gross alpha and gross beta radiation for segments 4a, 4b, and 5 of Big Dry Creek (Regulation #38) on the Rocky Flats site.

In March 2009, the Commission revised the site-specific chlorophyll standard for Cherry Creek Reservoir (Cherry Creek segment 5, Regulation # 38). The Commission also made extensive revisions to the Cherry Creek Reservoir Control Regulation (Regulation # 72) to be consistent with these revised standards and to accommodate a concentration-based approach to manage phosphorus levels in the reservoir.

SCULPIN

Similarly, in May 2009, the Commission established site-specific phosphorus and chlorophyll standards for Bear Creek Reservoir (Bear Creek segment 1c, Regulation # 38). No changes were made to the Bear Creek Reservoir Control Regulation (Regulation # 74).

The Commission conducted the basin-wide review of the Classifications and Standards for the South Platte River Basin (Regulation # 38) in June 2009. As with the Upper and Lower Colorado basins, the adoption of new temperature standards resulted in considerable resegmentation and adjustment of segment boundaries. Antidegradation designations were changed from "use protected" to undesignated for 39 segments. A recalculated zinc criterion was applied to five segments in the Clear Creek sub-basin and a numeric chlorophyll standard was adopted for Standley Lake (Big Dry Creek, segment 2).

The Standards Unit continued its preparation for the Basic Standards Rulemaking Hearing (Regulation #31) scheduled for June 2010. Efforts have been underway since 2000 to develop Colorado specific nutrient standards for lake and rivers. Efforts to recalibrate Colorado-specific bioassessment tools began in 2008. The current focus is to examine how the tools perform when used together and how the results can inform the policy decisions about nutrient impairment thresholds. Stakeholders have been involved through the work group process for both nutrient criteria and bioassessment tool development.

Point Source Control Programs

The Permits Section of the Water Quality Control Division protects public health and the environment through issuance of discharge permits and other control mechanisms, as provided by the Colorado Water Quality Control Act. The permits program is multifaceted and covers industrial, domestic and animal feeding operation wastewater discharges to surface waters and ground water, stormwater discharges, industrial pretreatment, biosolids, and treated wastewater reuse programs. Permits are designed to limit the amount of pollutants entering streams, lakes and groundwater so as to protect the classified uses of the receiving water, and to protect public health and the environment. The Division's permitting activities are summarized in the Annual Reports to the WQCC.

Fun Fact: *The town of Twin Lakes lies adjacent to two natural lakes at the foot of Colorado's highest Fourteener, Mt. Elbert.*

Stormwater Program

Stormwater runoff is rainfall and snowmelt that runs over land surfaces, and has the potential to mobilize and transport pollutants that could adversely affect water quality. The Colorado stormwater program issues CDPS permits that authorize stormwater discharges associated with sources defined in Regulation 61. The sources fall into three general categories: municipal separate storm sewer systems (MS4s), construction activities, and industrial activities. These stormwater discharge permits primarily include practice-based effluent limits that require the use of best management practices (BMPs) to control potential sources of stormwater pollution, and prevent additional unauthorized discharges from spills or other sources. Inspections and audits are conducted by the stormwater program to assess compliance with the permit conditions, and to identify unpermitted stormwater discharges that require permits. There are currently over 6000 active CDPS permits and general permit certifications for stormwater discharges.

Enforcement Program

The Water Quality Control Division's Enforcement Unit is responsible for assuring compliance with the requirements of the Colorado Water Quality Control Act (including its implementing regulations and the Colorado Discharge Permit System) and the Colorado Primary Drinking Water Regulations. These goals are accomplished through compliance assistance activities, and by reviewing self-reported or field-generated information, and by determining the appropriate response, which may include informal or formal inquiries, requesting additional field investigations, recommending and subsequently researching and developing administrative or judicial enforcement actions, and developing and negotiating civil or administrative penalties. Enforcement actions are issued on stormwater discharge permits actions, industrial discharge permit actions, domestic discharge permit actions, drinking water actions, housed commercial swine feeding operations actions, and confined animal feeding operations actions.

The work unit also assists in the maintenance of national databases as required under delegation agreements for the National Pollutant Discharge Elimination System (NPDES) and the Safe Drinking Water Act (SDWA). Additionally, the enforcement program quality assures self-reported data received from internal and external sources.

Discharge in compliance

Discharge out of compliance

Nonpoint Source Program

Nonpoint source pollution, unlike pollution from industrial activities and sewage treatment plants, comes from many diffuse sources. Nonpoint source pollution is caused by rainfall or snowmelt moving over and through the ground. As the runoff moves, it picks up and carries away natural and human-made pollutants, finally depositing them into lakes, rivers, wetlands, and underground sources of drinking water. These pollutants may be:

- Excess fertilizers and pesticides from agricultural lands and residential areas;
- Oil, grease, and toxic chemicals from urban runoff and energy production;
- Sediment from unprotected construction sites, crop and forest lands, and eroding stream banks;
- Salt from agricultural and urban irrigation practices and acid drainage and metals from abandoned mines;
- Bacteria and nutrients from livestock, pet wastes, and faulty septic systems.

The goal of the Nonpoint Source Program (NPS) is to restore water bodies impaired by nonpoint sources of pollution and to prevent future impairments. One means of accomplishing this goal is through the implementation of projects funded under the Clean Water Act Section 319 Grant Program. Federal guidelines direct grant money to Clean Water Act 303(d) listed segments that are significantly impacted by nonpoint sources and to specific action items identified in the "Colorado Nonpoint Source Management Program" document.

The Management Program was updated in 2005. The updated management program was approved by the Commission in August 2005, and a copy can be found at http://www.cdphe.state.co.us/wq/nps/2005MgtProg.html. Annual activities in the Nonpoint Source Program are described in the Division's Annual Reports. Table 7 lists the projects funded by Section 319 in 2008 and 2009.

Table 7: Nonpoint Source Projects funded by Section 319 in 2008 and 2009

Project Title	Project Sponsors	Year Funded	319 Funding Amount	General Project Type	Project Category
Rapid Restoration	WQCD and Several Entities	2008	$51,095.00	Several	Cross-cutting Categories
Outreach Mini-grants	WQCD and Several Entities	2008	$24,000.00	Information and Education	Cross-cutting Categories

Hecla Wash Restoration and Sediment Reduction	Arkansas Headwaters Recreation Area - AHRA	2008	$284,105.00	Restoration / BMPs	Recreation
Little Frying Pan Water Quality Improvement	CO Mountain College - Natural Resources Management	2008	$172,500.00	Restoration / BMP Implementation	Mining
Fountain Creek Water Quality Demonstration Projects	City of Pueblo	2008	$250,000.00	Restoration / BMP Implementation	Urban
Better Managing Irrigation Effluent Return Flows	Southeast Colorado Resource Conservation & Development	2008	$42,250.00	BMPs Implementation	Agriculture
Lower Willow Creek Restoration Project	San Luis Valley Resource Conservation & Development	2008	$398,770.00	Restoration / BMPs Implementation	Mining / Recreation
2008 Rio Grande Riparian Stabilization – Phase 3	Colorado Rio Grande Restoration Foundation	2008	$250,000.00	Restoration / BMP Implementation	Agriculture
Lefthand OHV Area Restoration: Phase 2	James Creek Watershed Initiative	2008	$150,000.00	Restoration / BMPs Implementation	Recreation
Nonpoint Source Newsletter (Continuation)	League of Women Voters of Colorado	2008	$32,000.00	Information and Education	Cross-cutting Categories
Uncompahgre Basin Watershed Plan	Shavano Conservation District	2008	$49,500.00	Watershed Plan Development	Cross-cutting Categories
DRMS - Technical Assistance	Division of Reclamation, Mining & Safety	2008	$75,000.00	BMP Implementation	Mining
Statewide I&E Coordinator	Colorado State University	2008	$65,895.00	Information and Education	Cross-cutting Categories

Kerber Creek Restoration Project	Trout Unlimited, Inc.	2008	$313,000.00	Restoration / BMPs Implementation	Mining
Data & Models for Planning NPS Selenium Management in LARB	Colorado State University	2008	$501,735.00	Watershed Characterization	Agriculture
Colorado Silviculture BMP Evaluation	Colorado State University – Colorado State Forest Service	2008	$33,605.00	BMP Evaluation / Outreach	Silviculture
Rapid Restoration	WQCD and Several Entities	2009	$157,748.00	Several	Cross-cutting Categories
Outreach Mini-grants	WQCD and Several Entities	2009	$25,000.00	Information and Education	Cross-cutting Categories
Edwards - Eagle River Restoration	Eagle County	2009	$600,000.00	Restoration / BMPs Implementation	Urban / Agriculture
Peru Creek Water Quality Improvement	Northwest Colorado Council of Governments	2009	$170,250.00	BMP Implementation	Mining
Sugarloaf Mountain Mining District BMP Performance Monitoring	CO Mountain College - Natural Resources Management	2009	$196,514.00	Watershed Characterization / Monitoring	Mining
Watershed Restoration Planning - Lake Fork Gunnison River	Hinsdale County	2009	$237,164.00	Watershed Characterization / Implementation Design	Mining / Urban
2009 Rio Grande Riparian Stabilization – Phase 4	Colorado Rio Grande Restoration Foundation	2009	$250,000.00	Restoration / BMP Implementation	Agriculture

Cost/Benefit Assessment

The citizens of Colorado expect a safe environment in which to live and thrive. It is easily taken for granted the availability of clean, safe drinking water, adequately maintained wastewater treatment facilities, and an aesthetically pleasing natural environment for recreation. The mechanisms for providing such a clean and safe environment are divided among the federal, state, and municipal governments. It is therefore difficult to obtain an accurate estimate of the cost of water pollution control efforts. A good estimate is possible by examining the funding received under the CWA. The following is the last five years annual costs for the WQCD to administer water pollution control activities. These amounts represent both federal and state expenditures and exclude all drinking water expenditures. NPS grant expenditures have also been excluded, as they are addressed in the NPS discussion earlier. All amounts have been rounded to the nearest hundred thousand.

- 2005 $8.4 million
- 2006 $9.0 million
- 2007 $9.8 million
- 2008 $11.0 million
- 2009 $12.1 million

Water Pollution Control Revolving Fund Financial Assistance

The State Revolving Fund is a funding mechanism managed by the Division's Financial Solutions Unit (FSU). In 2008-2009, the Water Quality Control Division assisted with the planning and financing of a total of 24 water quality improvement projects throughout the state. Funding was provided from the Colorado Water Pollution Control Revolving Loan Fund and the American Recovery and Reinvestment Act. The total amount of funding in the form of principal forgiveness, zero percent interest or low interest loans was $56,661,129.

In 2008-2009 the Water Quality Control Division's Financial Solutions Unit (the Outreach and Project Assistance Unit) assisted with the planning and financing of a total of 24 water quality improvement projects throughout the state. Funding from the Colorado Water Pollution Control Revolving Loan Fund was provided to 14 projects outlined below in Tables 8 and 8a. These projects have improved water quality and restored and protected classified uses by reducing pollutant loadings through wastewater treatment facility upgrades, aging infrastructure replacement and consolidation with larger wastewater treatment systems. The total amount of funding in the form of zero percent or low interest loans was $28,383,936.

***Fun Fact**: In 1859, John Gregory discovered the "Gregory Lode" in a gulch near Central City. Within two weeks, the gold rush was on and within two months the population grew to 10,000 people in search of their fortune. It was known as the "Richest Square Mile on Earth."*

Table 8: Colorado Water Pollution Control Revolving Loan Fund and the Small Community Domestic Wastewater Grant Fund

Assistance Recipient	WPCRF Loan Amount	Project Description
Elizabeth, Town of	$5,145,273	New lift station and approximately 5,000 feet of pipeline to transfer wastewater from the existing Wastewater Treatment Plant.
Fairplay Sanitation District	$2,000,000	Upgrades to the existing wastewater treatment facility. This action is necessary because the District's current three-cell lagoon facility is unable to meet effluent ammonia nitrogen limits.
Hudson, Town of	$1,636,000	Connection of existing collection system to the new wastewater treatment plant and abandonment and reclamation of the existing wastewater lagoon site. The project includes construction of a 0.25 MGD lift station, force mains and gravity mains.
Larimer County, Limited Improvement District	$443,662	Construction of a centralized Wastewater Treatment Facility to treat wastewater from septic systems and replace the existing septic system soil absorption field.
Las Animas, City of	$377,000	Replacement and relocation of the City's main lift station, repairs and upgrades to a second lift station, replacement of various deteriorated and leaking sections of the collection system, replacement of deteriorating brick and mortar manholes and installation of a composite sampler at the treatment plant.
Manzanola, Town of	$96,000	Replacement of segments of wastewater collection line, manhole replacement/ rehabilitation, and general wastewater treatment facility improvements.
Mountain View Water and Sanitation District	$1,500,000	Construction of a new .10 million gallon per day (MGD) new sequencing batch reactor (SBR) wastewater treatment plant.
New Castle, Town of	$8,247,172	Expansion of the existing municipal wastewater treatment facility to 0.6 MGD.
Pagosa Springs Sanitation General Improvement District	$2,000,000	Construction of a new 0.98 MGD, mechanical sequencing batch reactor and ultraviolet disinfection wastewater treatment facility and associated apparatuses.
Penrose Sanitation District	$128,000	Replacement of portions of vitrified clay pipe, and replacement of some manholes.
Sugar City, Town of	$65,000	Upgrades to the current wastewater treatment facility to include the installation of pond liners to prevent groundwater contamination and the installation of a new evaporation cell adjacent to the existing facility, eliminating all discharge points.
Triview Metropolitan District	$2,000,000	Upgrades and expansion of the existing wastewater treatment facility from 0.875 mgd to 1.75 mgd.

Additionally, with the funding provided to the State through the American Recovery and Reinvestment Act (ARRA), the Division was able to fund an additional 12 projects as identified in the table below. ARRA funding for these projects totaled $28,277,193 and was provided in the form of zero % interest loans and/or loans deemed principally forgiven. Two projects required supplemental funding from the Water Pollution Control Revolving Fund.

Table 8a: Colorado Water Pollution Control Revolving Loan Fund American Recovery and Reinvestment Act

Assistance Recipient	WPCRF Loan Amount	ARRA Loan Amount	ARRA Principal Forgiveness	Project Description
Bayfield, Town of			$193,956	Consolidation of two wastewater treatment facilities to include a new lift station, gravity sewer line and force main.
Erie, Town Of	$1,534,700	$2,000,000		Construction of a new reuse facility.
Fremont County Water and Sanitation District, North Canon			$2,000,000	Eliminate individual septic disposal systems.
Georgetown, Town of		$3,800,000	$2,000,000	Wastewater treatment facility upgrades.
Gunnison County			$474,019	Extension of a central sewer collection system into an area currently served by deficient sewer treatment system.
Manitou Springs, City of		$83,401	$2,000,000	Sewer collection system rehabilitation.
Monument Sanitation District		$418,000	$2,000,000	Extension of a centralized collection system and elimination of individual septic disposal systems.
Pagosa Area Water and Sanitation District	$3,211,129	$4,801,942	$1,309,282	Consolidation of two wastewater treatment facilities to include elimination of lagoons, new lift station, force main and gravity sewer lines.
Pueblo, City of		$1,500,000		Solar panels installed to existing treatment facility.
Red Cliff, Town of			$2,000,000	Construction of a new mechanical wastewater treatment facility.
Rye, Town of			$1,968,000	Sewer line extensions to connect to Colorado City.
Widefield Water and Sanitation District			$1,728,593	Wastewater treatment facility upgrades.

Based on the annual survey of local governments across the state, the identified wastewater, stormwater and nonpoint source needs over the next 3-5 years total approximately $2.4 billion (2010 WPCRF Intended Use Plan). Wastewater discharge permit requirements, aging infrastructure, and population growth are all factors in creating wastewater infrastructure needs.

Total Maximum Daily Load Development

The maximum pollutant load that a waterbody can assimilate and still attain standards is referred to as the "Total Maximum Daily Load". In instances where a waterbody does not attain its assigned water quality standards it is identified as "impaired", added to Colorado's 303(d) List of Impaired Waters Still requiring TMDLs, and a TMDL is developed to address the impairment. The TMDL workgroup is responsible for the development of the pollutant load allocations to address impaired waterbodies.

Uncompahgre River below Red Mountain

For an impaired waterbody that requires a TMDL, the Division must quantify the pollutant sources and allocate allowable loads to the contributing sources, both point and nonpoint, so that water quality standards can be attained for that segment. TMDL development is a regulatory method for weighing the competing pollution interests and initiating an integrated pollution reduction strategy for point and nonpoint sources. TMDL development includes these five basic steps: 1) identify the pollutant to consider, 2) estimate the water body assimilative capacity, 3) identify the contribution of that pollutant from all significant sources, 4) analyze information to determine the total allowable pollutant load, 5) allocate (with a margin of safety), the allowable pollution among the sources so that water quality standards can be achieved. The complexity of the TMDL development is determined by water body, the sources and the pollutant being considered. While not all segments and TMDLs require complex computer modeling; some do.

Implementation of the TMDL is the final step. It requires participation from all the stake holders as TMDLs are not self implementing. The Waste Load Allocation portion of the TMDL can be implemented through effluent limits in discharge permits. In the case of non-point sources, voluntary controls or locally enacted controls are necessary to implement the Load Allocations. The State must rely on authority already granted by the Clean Water Act to implement TMDL's.

The Colorado Water Quality Management and Drinking Water Protection Handbook describes the Division's process in Chapter V. Annual activities are described in the Division's Annual Reports. Colorado's 2010 Listing Methodology, Section 303(d) List (List of Impaired Waters Still Requiring TMDLs) and Monitoring and Evaluation (M&E) List are included as Appendix D.

Prior to 2008 the development of TMDLs by the Division was largely dictated by the provisions of a 1999 Settlement Agreement entered into by the State of Colorado, the Colorado Environmental Coalition and Biodiversity Legal Foundation, EPA, and other parties. The Settlement Agreement was terminated, with the agreement of all parties, in June of 2008. Since that time TMDL development has been dictated based upon the nature of the water quality

impairment, adequacy of existing water quality information, and synchronization with other programmatic mandates within the Division.

A list of TMDLs completed by the Division and approved by EPA during the previous two fiscal years is included as Table 9.

Table 9: Approved TMDLs as of September 2009

WBID	*Waterbody*	*Parameters*	*Approval date*
COARUA02a	Arkansas River, Birdseye Gulch to California Gulch	Zn	6/14/2009
COARUA02b	Arkansas River above Lake Fork	Cd, Zn	6/14/2009
COARUA02c	Arkansas River, Lake Fork to Lake Creek	Cd, Zn	6/14/2009
COARUA03	Arkansas River, Lake Creek to Pueblo Reservoir	Cd, Zn	6/14/2009
COARUA05	Halfmoon Creek	Cd, Pb	6/14/2009
COARUA07	Evans Gulch	Zn	6/14/2009
COARUA11	Sayres Gulch, & South Fork Lake Creek, Sayres Gulch to Lake Creek	Al, Cd, Cu, Zn, pH	6/14/2009
COARUA12a	Chalk Creek	Pb, Zn	6/14/2009
COGUSM03a	San Miguel River below Idarado	Zn	9/17/08
COGUSM03b	San Miguel River, Marshall Creek to South Fork San Miguel River	Cd, Zn	9/17/08
COGUSM06a	Ingram Creek	Zn	9/17/08
COGUSM06b	Marshall Creek	Zn	9/17/08
CORGCB09a	Kerber Creek above Brewery Creek	Ag, Cd, Pb	9/17/08
CORGCB09b	Kerber Creek, Brewery Creek to San Luis Creek	Cd, Cu, Zn	9/17/08
CORGRG04	Rio Grande River below Willow Creek	Cd, Zn	9/23/08
CORGRG30	Sanchez Reservoir	Hg	9/29/08
COSJDO09	Silver Creek from Rico's diversion to Dolores River	Cd, Zn	8/22/08
COSPBO04a	Gamble Gulch	Cu, Zn, pH	6/30/09
COSPCL02	Clear Creek, Silver Plume to Argo Tunnel	Cu, Pb, Zn	9/18/08
COSPCL03a	South Clear Creek	Zn	9/18/08

Table 9: Approved TMDLs as of September 2009			
WBID	***Waterbody***	***Parameters***	***Approval date***
COSPCL03b	Leavenworth Creek	Pb, Zn	9/18/08
COSPCL09a	Fall River	Cu	9/18/08
COSPCL09b	Trail Creek	Cd, Cu, Pb, Zn	9/18/08
COSPCL11	Clear Creek, Argo Tunnel to Farmers Highline Canal	Cd, Pb, Zn	9/18/08
COSPCL13	North Fork Clear Creek	Cd, Fe, Mn, Zn	9/18/08
COSPUS04	Hall Valley to Geneva Creek	Cu	9/17/08
COSPUS05b	Geneva Creek, Scott Gomer Creek to N. Fork S. Platte River	Cu, Zn	8/22/08
COSPUS14	S. Platte River, Bowles Ave. to Burlington Ditch	E. coli	10/30/07
COUCBL06	Snake River, source to Dillon Reservoir	Cd, Cu, Pb, Zn, pH	9/23/08
COUCBL07	Peru Creek	Cd, Cu, Pb, Mn, Zn, pH	9/23/08
COUCEA05(a,b,&c)	Eagle River, Belden to Gore Creek	Cu, Zn	8/31/09
COUCEA07b	Cross Creek, source to Eagle River	Cu, Zn	8/31/09

Colorado Source Water Assessment and Protection Effort Summary

Colorado Source Water Assessment and Protection (SWAP) is a relatively new effort designed to provide the public consumer with information about their untreated drinking water, as well as provide the community with a way to get involved in protecting the quality of their drinking water. The program encourages community-based protection and preventive management strategies to ensure that all public drinking water resources are kept safe from future contamination.

The Water Quality Control Division (Division) completed the initial source water assessment reports for over 1700 public water systems in November 2004. The results of the assessment reports can be reviewed at: http://www.cdphe.state.co.us/wq/sw/SWAP/swapreports.html.

The Division's Source Water Assessment and Protection (SWAP) effort is transitioning from the assessment phase to the protection planning phase. The long-term project goal is voluntary development and implementation of local

source water protection statewide. The success of the program will require a coordinated effort between the Division and local interests such as public water systems, interested stakeholders, and local governments.

The role of the Division is to assist local protection planning efforts by supplying the lead protection entity with the necessary consultation and tools to complete a protection plan. The Division has formulated a protection plan template that standardizes the format of protection plans. The template was developed to be user-friendly and accommodate the needs of a broad size range of public water systems. The protection plan template provides direction and guidance so systems can complete the document with an established Steering Committee to guide the process. The protection plan template is also available on the SWAP website at http://www.cdphe.state.co.us/wq/sw/protectionplanningtemplate.html.

Funding for protection planning is available from the State Drinking Water Revolving Fund (SDWRF) set-asides. The SDWRF set-asides enable the SWAP program to provide financial support for protection plan development. The set-asides allow the state to utilize a percentage of its capitalization grant to assist in the development of local drinking water protection initiatives and other State projects. The grant funds will be awarded for two types of projects: Pilot Planning Projects and Development and Implementation Projects.

Pilot Planning Project Grants will support exemplary and comprehensive source water protection plans. It is anticipated that, once completed, these pilot projects will serve as examples to others interested in developing plans to protect their drinking water sources. The completion of a limited number, but broad spectrum, of protection plan pilot projects will provide planning results to other protection planning entities to assist and promote source water protection planning efforts. These grants can range up to $50,000 and will require a one to one financial match (cash or in-kind match). The Pilot Planning grants will also require the protection planning entity to evaluate the expenses related to replacing the current water source (ie: acquiring water rights, restructuring water supply system, economic impacts, etc.). The additional cost analysis will provide an estimated value of water resources to further understand the importance and significance of source water protection planning.

Development and Implementation Grants will be awarded to public water systems and representative stakeholders committed to developing a source water protection plan. Grants up to $5,000 will be awarded for plan development and for implementation. A one to one financial match (cash or in-kind) will also be required.

Grant proposals will be submitted electronically and reviewed by Division. Projects recommended for funding will receive an award notification and a purchase order for the protection planning effort. All grant funds are distributed on a cost-reimbursement basis and invoicing will occur on a monthly (pilot planning grants) or quarterly basis (development and implementation grants). Proposals are accepted throughout the year. Grant awards are subject to the availability of SDWRF set-aside funds.

For more details on grant requirements, guidance and access to the electronic grant application please visit the SWAP website at: http://www.cdphe.state.co.us/wq/sw/swaphom.html.

Colorado's CWA Section 401 Water Quality Certification Program

A CWA Section 401 Water Quality Certification (WQC) is a state certification of a federal license or permit to construct or operate facilities with may result in any discharge to waters of the United States. A WQC is required from the Water Quality Control Division (Division) for Section 404 permits issued by the U.S. Army Corps of

Engineers (Corps), Federal Energy Regulatory Commission (FERC) licenses for hydropower projects, and other federal permits which involve a discharge into waters of the state, including federal Clean Water Act Section 402 permits issued by the Environmental Protection Agency (EPA). The WQC applies to water quality impacts during both the construction and operation of the project for which the federal license or permit is required.

The WQCC adopted Regulation 82, Section 401 Certification Regulation in November 1985 to implement the requirement in the Colorado Water Quality Control Act which became law on June 4, 1985. The regulation authorizes the Division to certify, conditionally certify, or deny certification of federal permits and licenses. The certification program defines best management practices (BMPs) applicable to nearly all certifications and procedures for developing conditions to be included with the certification where necessary.

Wetlands protected from unstable soil during construction

The certification process requires the Division to perform a preliminary antidegradation review and draft certification determination of the project for public notice in the *Water Quality Information Bulletin*. Following the month long public comment period the project is reviewed and evaluated with respect to public comment, antidegradation rules, basic standards for surface water and groundwater, water quality classifications and standards, any applicable effluent limitations or control regulations, best management practices to protect water quality, stormwater discharge requirements, and any project specific special conditions. If it is determined that the project will comply with all applicable requirements, the Division will issue a Regular Certification for the federal permit or license. If the Division concludes the project will comply with applicable requirements only if special conditions are placed on the permit or license, the Division will issue a Conditional Certification. If the Division concludes that there is not a reasonable assurance that the project will comply with applicable requirements even with the addition of special conditions, the certification is denied.

The Division prepares around 50 WQCs per year, principally in response to Section 404 individual permit applications to the Corps. It is estimated that half of these Corps applications are in the South Platte River Basin and are primarily associated with urban growth. In most cases the Division issues a Regular Certification requiring utilization of BMPs during construction and operation of the project to protect and maintain water quality. In cases where it is determined that typical BMPs are not adequate to protect water quality or monitoring of water quality is needed to determine if BMPs are functioning as anticipated, the Division has developed special conditions in negotiation with the applicant. Many Conditional Certifications incorporate special conditions because the project is situated on an impaired waterbody. The Division has denied two projects since 2002. Both projects involved the applicant completing work prior to the issuance of the 404 permit. They did not use BMPs which later resulted in significant discharges to state waters, and therefore resulted in enforcement actions by the Division, the Corps and/or EPA.

There are currently several water supply development projects proposed in Colorado that will require a 401 WQC. These projects are associated with the diversion and storage of water in response to urban development. The potential impacts to water quality and streamflow have generated a fair degree of controversy. In addition, many FERC licenses are expiring and need renewal. Several current water storage facilities are also adding or increasing hydropower capacities, which require a 401 WQC. This situation presents a special challenge to the Division to protect the existing uses of these waterbodies, as required by the Colorado Water Quality Control Act.

Colorado's Clean Lakes Program, CWA Section 314

Colorado has approximately 1,533 publicly owned lakes of greater than ten surface acres. The total surface acreage of these lakes has been estimated at 249,787. Significant publicly owned lakes are defined as those natural lakes, reservoirs, or ponds where the public has access to recreational activities, such as fishing and swimming, or where the classified uses, such as water supply, affect the public.

Section 314(a)(2) of the Clean Water Act requires states to report on the status of lake water quality as part of the 305(b) report. Colorado conducted lake assessments under the Lake Water Quality Assessment assistance grant from EPA between 1989 to 1994. Since 1995, Colorado has not received separate funding for lake and reservoir monitoring.

During this biennium (7/2007 -7/2009), the Division monitored 50 lakes and reservoirs. The lake and reservoir monitoring efforts provide data to evaluate the trophic status of Colorado lakes and reservoirs. The data also are used to assess attainment of water quality standards.

Trophic state is a classification of lakes based on the level of biological productivity (especially algae) and nutrient status. Commonly used indicators of nutrient status and productivity include the amount of algae as measured by chlorophyll-*a*, water transparency as measured by Secchi disc depth, and in-lake epilimnetic total phosphorus concentration. The trophic state is broadly defined as follows:

- Oligotrophic: lakes with few available nutrients and a low level of biological productivity; characterized by clear water; often supports cold water fish species.
- Mesotrophic: lakes with moderate nutrient levels and biological productivity between oligotrophic and eutrophic; usually supports warmwater fish species.
- Eutrophic: lakes with high nutrient levels and a high level of productivity; typically supports exclusively warmwater fish species.
- Hypereutrophic: lakes in an advanced eutrophic state

Clear Lake Paradise Basin near Silverton

Trophic status is an index of water quality only to the extent that trophic condition limits the desired use of a lake (i.e., water supply or recreation). Generally, the effects of lake eutrophication are considered to be negative, especially if the eutrophication is accelerated by human activities. Negative effects include taste and odor problems for water supplies; reduction in water clarity, which is important for many recreational uses; and a reduction in the dissolved oxygen (DO) concentration in bottom waters to levels that are lethal to fish. Eutrophication often leads to increased fish production, but at the expense of desired species that inhabit cold deep areas, such as trout.

As part of the lake assessments, the Division also considers data collected by agencies other than the Division. Routine monitoring of publicly owned reservoirs is being, or has been performed, by the USGS, Army Corps of Engineers, Denver Water, and various other entities including cities, regional council of governments, and river basin associations.

The Division uses the Trophic State Index (TSI) equations developed by Carlson (1977) to estimate trophic state. Data for the epilimnion (upper-most layer in a stratified lake) collected during the summer were used to calculate the mean chlorophyll-a for each lake monitored by the Division during 2007 and 2008. The mean chlorophyll-a values were used to calculate the chlorophyll TSI for each lake. Each lake's TSI was compared to the categories presented below (Table 10) to determine an overall trophic state (http://dipin.kent.edu/tsi.htm). A summary of the lake assessments can be found in Table 11.

Table 10: Trophic State Index (TSI) vs. Trophic State

TSI	Trophic State
0-40	Oligotrophic
40-50	Mesotrophic
51-70	Eutrophic
>70	Hypereutrophic

Table 11: Trophic Status of Colorado Lakes Monitored by the WQCD During the Period 2007 - 2009.

Lake	WBID	Elevation (ft)	Surface Acres	Chl *a* µg/L	Chl - TSI	Secchi (m)	Estimated Trophic Status	Year(s) Monitored
11-Mile	COSPUS01a	8597	3405	4.72	46	6.27	Mesotrophic	2007
Adobe Creek	COARLA10	4128	5147	15.56	57	0.58	Eutrophic	2008
Antero	COSPUS01a	8940	5000	2.37	39	4.70	Oligotrophic	2007

Table 11: Trophic Status of Colorado Lakes Monitored by the WQCD During the Period 2007 - 2009.

Avery (Big Beaver)	COLCWH25	6989	300	2.08	38	3.40	Oligotrophic	2008
Boedecker	COSPBT14	5062	308	1.99	37	0.85	Oligotrophic	2008
Carter	COSPBT11	5760	1140	2.14	38	2.57	Oligotrophic	2007
Crawford	COGULG13	6558	394	1.99	37	4.15	Oligotrophic	2008
Douglas	COSPCP13a	5204	565	6.08	48	0.95	Mesotrophic	2008
Echo Canyon	COSJSJ06a	7237	118	1.59	35	5.65	Oligotrophic	2008
Eggleston	COGUNF04	10129	164	1.46	34	3.40	Oligotrophic	2008
Elkhead	COUCYA02	6306	400	1.56	35	1.60	Oligotrophic	2008
Groundhog	COSJDO05	8725	670	1.08	31	3.10	Oligotrophic	2008
Harvey Gap	COLCLC09b	6405	160	0.52	24	4.00	Oligotrophic	2008
Henry	COARLA12	4312	1350	10.14	53	0.37	Eutrophic	2008
Highline	COLCLC19	4700	174	4.17	45	1.07	Mesotrophic	2007
Holbrook	COARLA10	4164	537	11.20	54	0.90	Eutrophic	2008
Island	COGUNF04	10228	175	1.40	34	5.80	Oligotrophic	2008
Jackson	COSPLS03	4440	2600	26.67	63	0.70	Eutrophic	2007
John Martin	COARLA11	3783	11647	6.60	49	0.66	Mesotrophic	2008
Jumbo	COSPLS03	3704	1703	3.66	43	3.53	Mesotrophic	2007
Kenney	COLCWH12	5350	600	1.90	37	2.57	Oligotrophic	2007
Lake John	COUCNP04	8050	612	2.77	41	4.57	Mesotrophic	2007
Lon Hagler	COSPBT14	5125	100	4.30	45	1.68	Mesotrophic	2008
Lonetree	COSPBT14	5131	502	5.03	46	2.27	Mesotrophic	2007
Meredith	COARLA12	4100	3700	47.83	69	0.32	Eutrophic	2008
Miramonte	COGUSM11	7702	420	0.53	24	2.30	Oligotrophic	2008
North Delaney	COUCNP04	8050	565	1.17	32	4.37	Oligotrophic	2007
North	COUCNP04L	8893	130	1.84	37		Oligotrophic	2008

Table 11: Trophic Status of Colorado Lakes Monitored by the WQCD During the Period 2007 - 2009.

Michigan						3.15		
North Sterling	COSPLS03	4065	2880	77.80	73	0.52	Hypereutrophic	2007, 2008
Paonia	COGUNF07	6455	350	0.75	28	2.40	Oligotrophic	2008
Pearl	COUCYA02	8054	167	0.99	30	4.80	Oligotrophic	2008
Prewitt	COSPLS03	4088	900	14.50	57	0.40	Eutrophic	2008
Ridgway	COGUUN03	6851	1000	2.03	38	3.10	Oligotrophic	2008
Rifle Gap	COLCLC09b	5960	400	1.35	34	3.40	Oligotrophic	2007
Rio Blanco Lake	COLCWH11	5760	383	2.70	40	1.18	Mesotrophic	2007
Ruedi	COUCRF06	7766	997	1.63	35	2.32	Oligotrophic	2007
Spinney	COSPUS01a	8686	2520	1.81	36	5.47	Oligotrophic	2007
Stagecoach	COUCYA02	7210	780	6.00	48	3.50	Mesotrophic	2007, 2008
Steamboat Lake	COUCYA02	8031	1053	14.93	57	4.00	Eutrophic	2007
Sweitzer	COGUUN14	5126	137	2.47	39	1.50	Oligotrophic	2008
Tarryall	COSPUS02	8860	886	1.81	36	5.47	Oligotrophic	2007
Taylor Park	COGUUG04	9330	2000	5.83	48	6.07	Mesotrophic	2007
Union	COSPSV06	4956	743	5.37	47	1.27	Mesotrophic	2007
Vega	COLCLC15	7984	900	5.60	47	3.23	Mesotrophic	2007
Wellington #4	COSPUS04	5228	100	1.08	31	1.75	Oligotrophic	2008
Williams Creek	COSJPI05	8247	508	25.30	62	1.10	Eutrophic	2008
Williams Fork	COUCUC08	7811	1810	1.20	32	3.93	Oligotrophic	2007
Willow Creek	COUCUC05	8130	1530	0.84	29	3.30	Oligotrophic	2008

Fun Fact: *From 1820 to 1846, the boundary of the United States with Mexico was the Arkansas River*

The following figure (figure 1) shows both the chlorophyll a concentrations and Secchi disk depth for lakes in Colorado that were sampled by the State between July 1st, 2007 and July 1st, 2009. Lakes on the left side of the chart show measured chlorophyll levels indicative of an advanced trophic state whereas lakes on the right side of the chart showed low levels of biological productivity. While clarity tends to increase with decreasing levels of chlorophyll a, some lakes exhibit low clarity with low chlorophyll a. This is likely a result of dissolved organic matter and non-algal turbidity in the water column also contributing to reduced clarity in Colorado lakes.

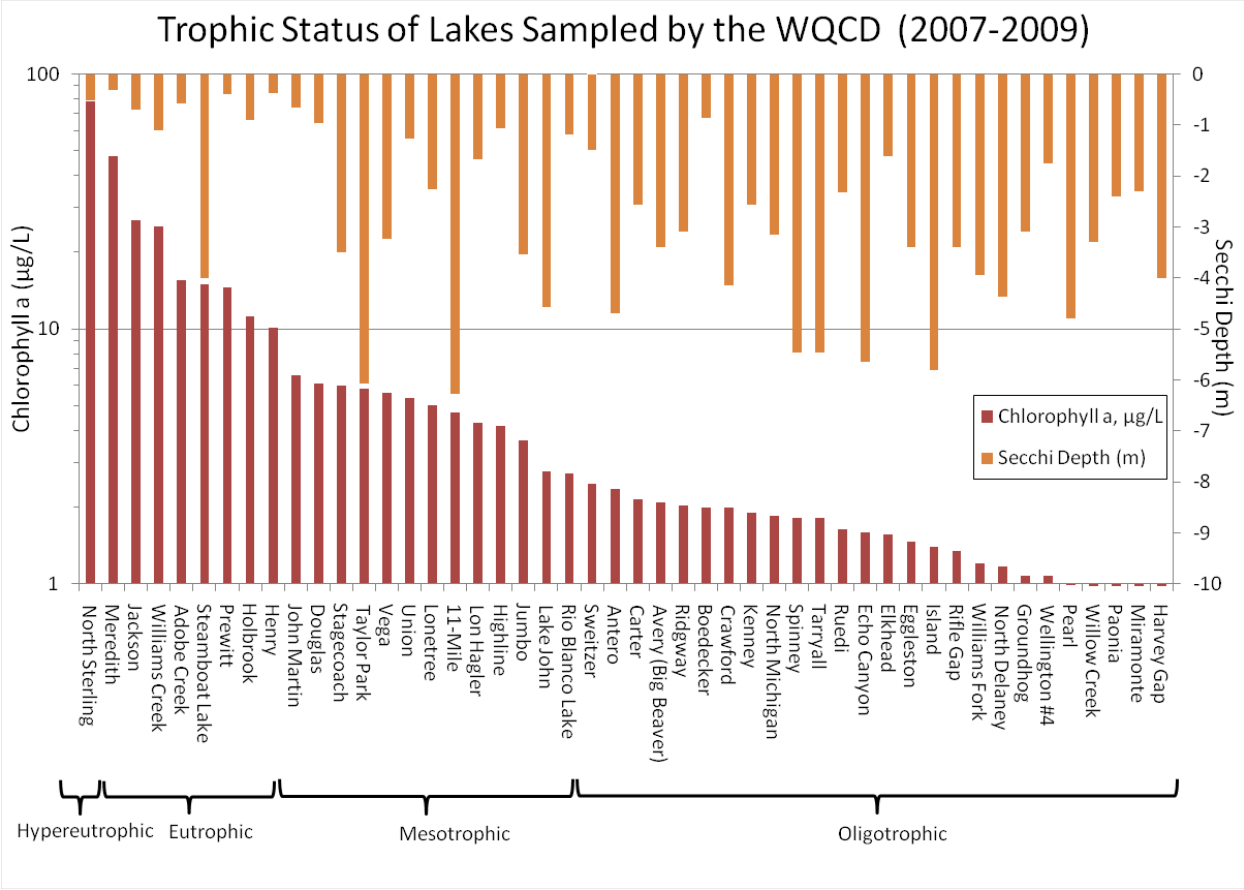


Figure 1: Chlorophyll a (µg/L), Secchi disk depth (m) and trophic status for lakes in Colorado sampled by the Water Quality Control Division between 7/2007 and 7/2009.

Lakes Probabilistic Survey

The WQCD received funding to participate in the EPA Survey of the Nation's Lakes. The purpose of the survey was to assess the condition of lakes across the nation by collecting a range of data from 1,000 randomly selected lakes in the lower 48 states. The indicators measured at each lake were used to assess the water quality, ecological and recreational integrity of lakes throughout the nation. Colorado was assigned 30 lakes to sample for the Survey. EPA provided the list of target lakes. The lakes were selected following a stratified random survey design. Thirty lakes were selected for primary sites; and an additional list of 29 lakes was provided for oversample sites.

Lakes from the lists were evaluated to determine if they were part of the target population for the Survey. The State conducted desk audits and field audits to determine which lakes were part of the target population and accessible to sample. The target population lake criteria were: surface area greater than 4 hectares, permanent waterbodies,

greater than 1 meter deep, and 1000 square meters unvegetated open water. Lakes that met the criteria were identified as target lakes. Lakes that did not meet the criteria were considered non-target, and were replaced with a lake from the oversample list. The final selection requirement was to acquire permission to sample, if the lake was a private lake. For public lakes, permission was not a factor.

The State contracted with the U.S. Geological Survey (USGS) to conduct the field sampling of the lakes. EPA provided training for the field sampling efforts in May of 2007. Staff from the USGS and the State participated in the training. The USGS sampled the 30 target population lakes during the period from June through September 2007, according to EPA's protocols for the Survey. The USGS also re-sampled 4 of these lakes during the same period. As part of an outreach education effort, the USGS also coordinated with the Colorado Lake and Reservoir Management Association (CLRMA) to take CLRMA-sponsored volunteer students on some of the sampling trips.

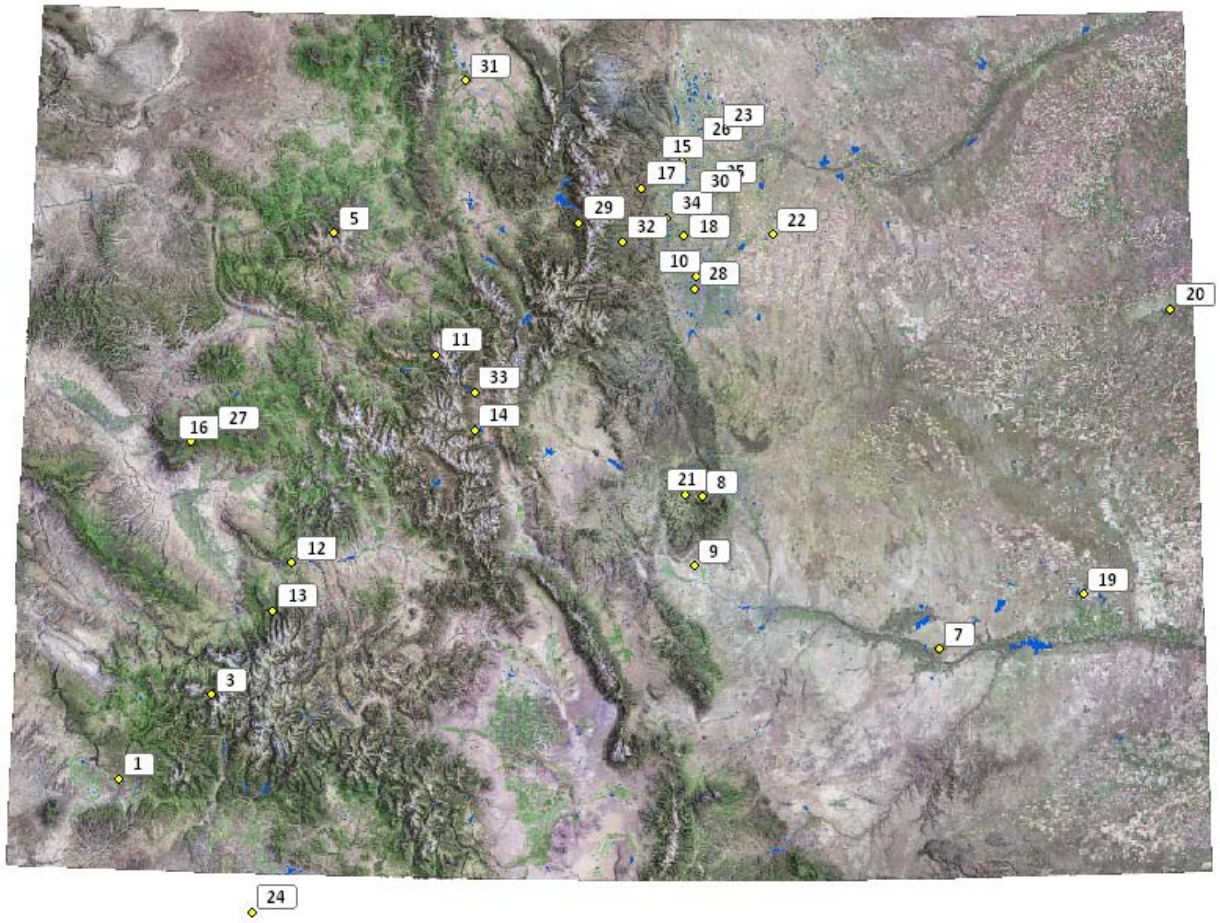


Figure 2: Lakes in Colorado randomly selected for the National Lake Survey.

Number	Lake	Number	Lake	Number	Lake
1	Puett Reservoir	15	Lonetree Reservoir	26	Boyd Lake
3	Trout Lake	16	Big Battlement Lake	27	Youngs Creek #3
5	Trappers Lake	17	Button Rock Reservoir	28	Sloans Lake

7	Holbrook Reservoir	18	Waneka Reservoir	29	Meadow Creek Reservoir
8	McReynolds Reservoir	19	Neegronda Reservoir	30	Union Reservoir
9	Brush Hollow Reservoir	20	Bonny Reservoir	31	East Delaney Reservoir
10	Jim Baker Reservoir	21	Cripple Creek #2	32	Barker Reservoir
11	Eagle Lake	22	Horse Creek Reservoir	33	Turquoise Lake
12	Morrow Point Reservoir	23	Windsor Lake	34	Boulder Reservoir
13	Silver Jack Reservoir	24	Navajo Reservoir		
14	West Twin Lake	25	Lake Thomas		

Preliminary chemistry results from the National Lake Survey were released October, 2008. Simple summary statistics were conducted on the Colorado data to evaluate how lakes in Colorado compare to lakes across the nation from a water quality perspective. Based on analysis of chlorophyll a data, the percentage of lakes in each trophic state in Colorado are very similar to that of national percentages (Figure 3). Colorado has a greater proportion of eutrophic lakes but a smaller proportion of mesotrophic and hypereutrophic lakes. Eutrophication is a natural process and that there is no ideal trophic state for lakes. Lakes can naturally fall into any category and will progress to different trophic states in a matter of centuries or millennia lakes age.

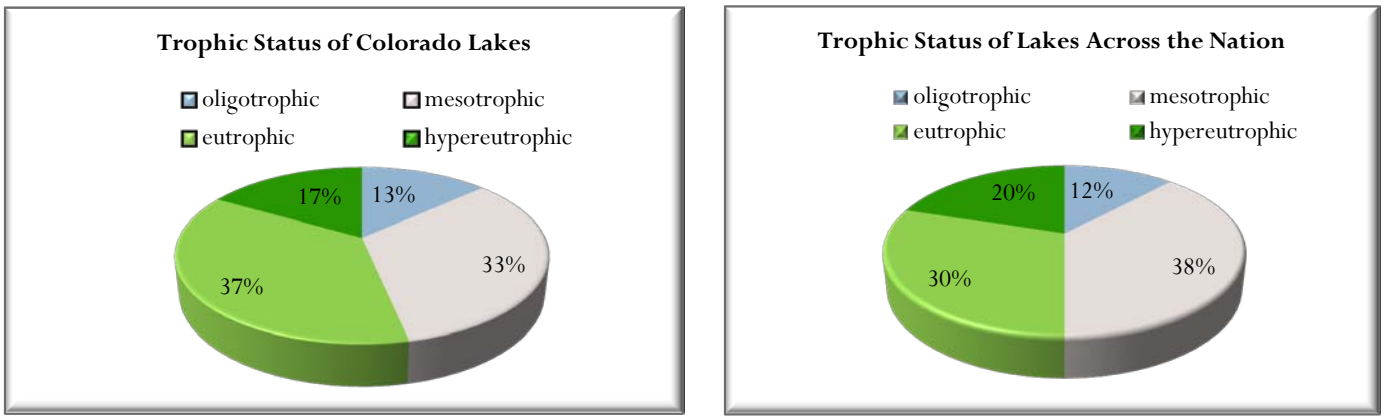


Figure 3: The trophic status of all lakes in the National Lake Survey compared to lakes in the Colorado state-wide lake survey.

Nutrients control the rate of algal productivity in lakes. While nutrients are naturally occurring in the environment and are necessary food for plants, when excess nutrients enter a lake as a result of human activities, eutrophication is accelerated. This can result in nuisance algal blooms and excessive plant growth. Compared to lakes across the country, lakes in Colorado have a lower median phosphorus and nitrogen concentration. As one would expect with lower nutrients, lakes in Colorado also have a lower median chlorophyll a concentration, and increased median clarity (Secchi disk depth) (Figure 4).

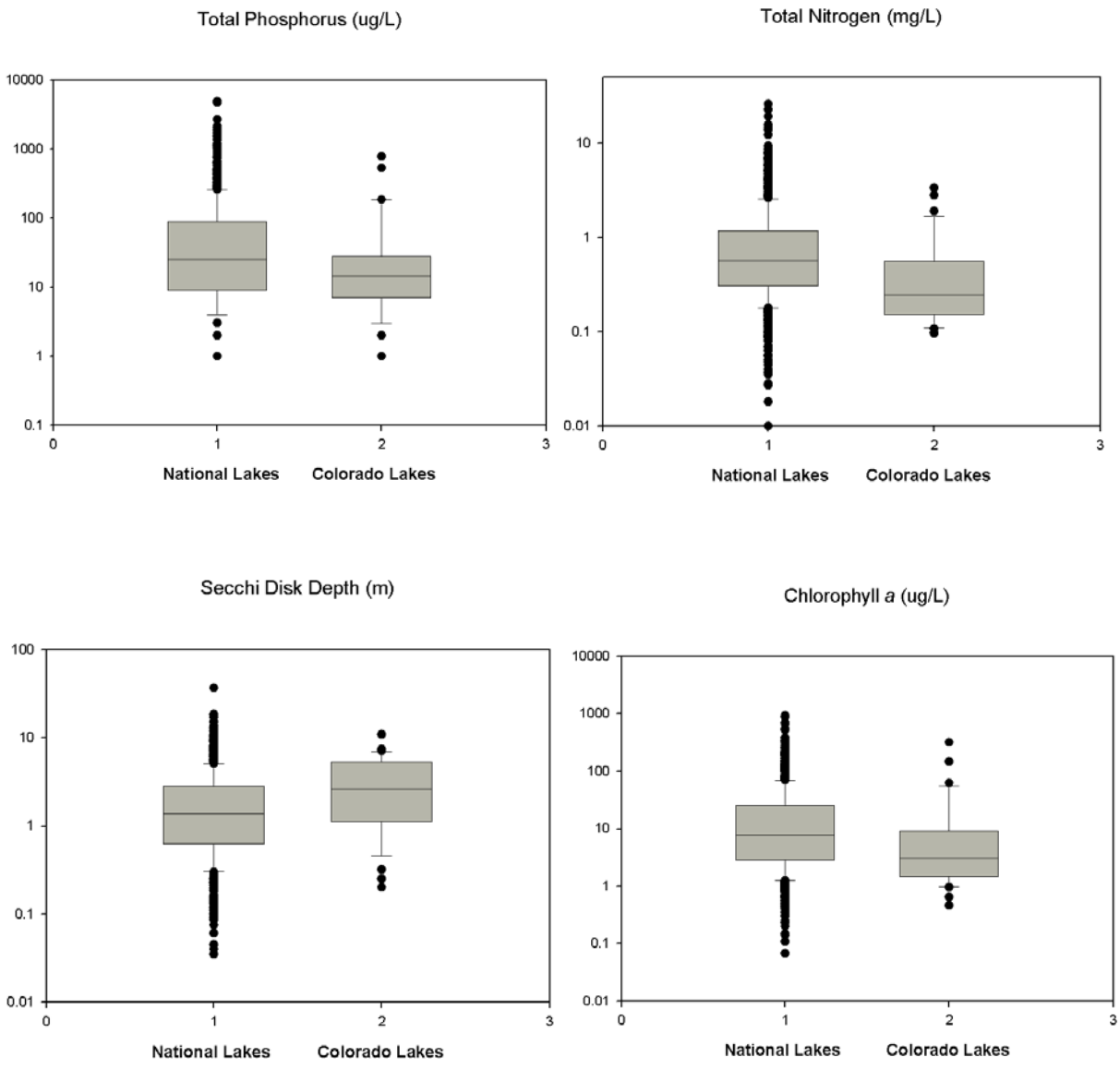


Figure 4: A comparison of water quality measurements between Colorado lakes and all lakes in the National Lake Survey. The bar in the middle of the box represents the median value for all measurements while the top and bottom of the box each represent a quartile (one fourth) of the data.

Fish Consumption Advisory Program

The WQCD conducts an on-going study aimed at investigating the presence of certain contaminants (such as mercury, arsenic and selenium) in fish that can potentially be consumed by the population. The results of this study are the basis for issuing fish consumption advisories (FCA) in the State of Colorado. FCAs are issued to protect public health and to address human health risk questions associated with consuming fish potentially contaminated with

certain chemicals of concern. The Colorado Department of Public Health and Environment (CDPHE) Water Quality Control Division (WQCD) works closely with Colorado Department of Natural Resources (CDNR) Division of Wildlife (DOW), and CDPHE Disease Control and Environmental Epidemiology Division (DCEED) in the collection of data, the analysis of the data and the determination of human health risks from consumption of locally caught fish.

The fish tissue testing is part of an ongoing sampling plan of approximately 120 water bodies in the state. Fish tissue samples are tested for mercury, selenium and arsenic. More than 112 water bodies now have had laboratory testing completed as part of the study. More than thirty of the 112 were assessed between July 1, 2007 through June 30, 2009. These are included in Table 12 below. Twenty-four waterbodies (approximately one in five) have required fish consumption advisories for mercury. These are listed on the state's Web site at http://www.cdphe.state.co.us/wq/FishCon/analyses/. Also listed are two other water bodies that are not part of the mercury study, but were posted for other parameters: Sweitzer for selenium, and Willow Springs Ponds for perchloroethylene.

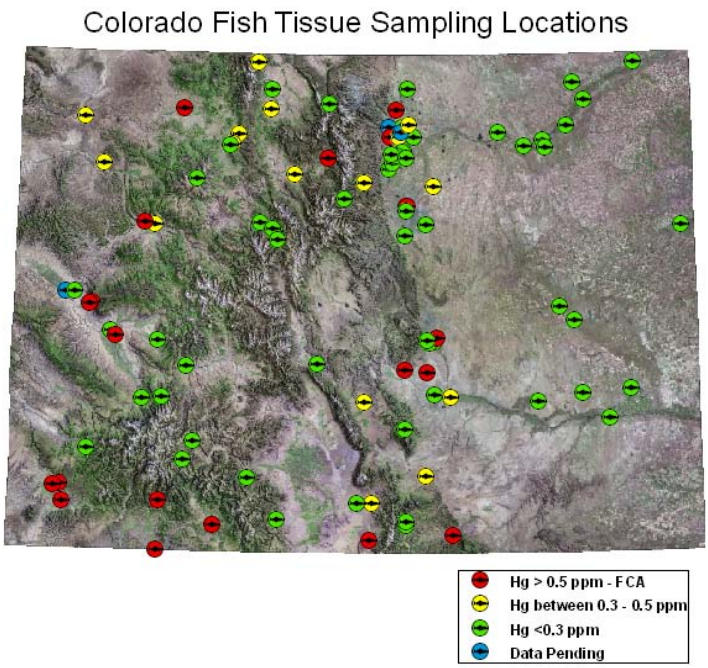


Table 12: Waterbodies in Colorado Assessed for mercury, selenium and arsenic

Waterbody	Species
Adobe Creek Reservoir	Black Crappie, Channel Catfish, Saugeye, Wiper, White Bass
Barker Reservoir	Brown Trout, Rainbow Trout
Boedecker Reservoir	Striped Bass, Walleye
Boulder Reservoir	Black Crappie, Channel Catfish, Smallmouth Bass, Walleye
Catamount Reservoir	Northern Pike
Cherry Creek Reservoir	Walleye
Crawford Reservoir	Northern Pike, Yellow Perch, White Crappie
DeWeese Reservoir	Smallmouth Bass

Table 12: Waterbodies in Colorado Assessed for mercury, selenium and arsenic	
Waterbody	**Species**
Douglas Reservoir	Wiper, Walleye
Echo Canyon Reservoir	Largemouth Bass, Yellow Perch, Black Crappie, Channel Catfish, White Sucker, Green Sunfish
Elkhead Reservoir	Largemouth Bass, Smallmouth Bass, Northern Pike, Black Crappie
Granby Lake	Lake Trout
Gross Reservoir	Tiger Muskie, Splake, Brown Trout
Harvey Gap Reservoir	Black Crappie, Yellow Perch, Smallmouth Bass, Bluegill, Largemouth Bass, Northern Pike
Ice Lake	White Sucker
Johnstown Reservoir	Walleye
Juniata Reservoir	Smallmouth Bass
Lagerman Reservoir	Largemouth Bass, Walleye
Lake Loveland	Smallmouth Bass, Yellow Perch, Walleye
Lon Hagler	Channel Catfish, Largemouth Bass, Northern Pike, Walleye, Striped Bass
McCalls Pond	Bluegill, Channel Catfish, Largemouth Bass
McIntosh Reservoir	Smallmouth Bass, Black
Meredith Reservoir	Channel Catfish, Largemouth Bass, Saugeye, Green Sunfish
Neenoshe Reservoir	Saugeye
Prewitt Reservoir	Wiper, Walleye
Rifle Gap Reservoir	Black Crappie, Smallmouth Bass, Northern Pike, Walleye, Yellow Perch
Rio Blanco Reservoir	Black Crappie, Yellow Perch, Bluegill, Largemouth Bass
Rio Grande Reservoir	Brook Trout, Brown Trout, Rainbow Trout, Splake
Smith Reservoir	Rainbow Trout

Table 12: Waterbodies in Colorado Assessed for mercury, selenium and arsenic	
Waterbody	**Species**
Stagecoach Reservoir	Northern Pike, Walleye
Townsend Reservoir	Channel Catfish, Rainbow Trout
Trappers Lake	Brook Trout
Trinidad Reservoir	Black Crappie, Channel Catfish, Walleye, Yellow Perch, Wiper
Wellington #4 Reservoir	Northern Pike, Walleye, Wiper
Williams Fork Reservoir	Northern Pike
Womack Reservoir	Channel Catfish

Each fish consumption advisory includes consumption recommendations in three categories: for the general population; children age 6 and younger; and women who are pregnant, nursing or who may become pregnant. Advisories also include information on recommended meal sizes and frequency of meals per fish species. The following table includes all waterbodies in Colorado where FCAs have been issued.

Table 13:Waterbodies in Colorado with Fish Consumption Advisories		
Waterbody	**Pollutant**	**Species**
Berkeley Lake	Mercury	Largemouth Bass
Boyd Lake	Mercury	Walleye
Brush Hollow	Mercury	Walleye
Carter Lake	Mercury	Walleye
Catamount Reservoir	Mercury	Northern Pike
Echo Canyon Reservoir	Mercury	Largemouth Bass, Yellow Perch. Black Crappie
Elkhead Reservoir	Mercury	Largemouth Bass, Smallmouth Bass, Northern Pike, Black

Table 13:Waterbodies in Colorado with Fish Consumption Advisories		
Waterbody	**Pollutant**	**Species**
		Crappie
Granby Lake	Mercury	Lake Trout
Horsetooth Reservoir	Mercury	White Bass, Wiper, Walleye
Horseshoe Lake	Mercury	Smallmouth Bass, Sauger
Juniata Reservoir	Mercury	Smallmouth Bass
McPhee Reservoir	Mercury	Smallmouth Bass, Largemouth Bass, Black Crappie
Narraguinnep Reservoir	Mercury	Northern Pike, Walleye, Smallmouth Bass
Navajo Reservoir	Mercury	Northern Pike, Smallmouth Bass
Purdy Mesa Lake*	Mercury	Largemouth Bass
Rifle Gap Reservoir	Mercury	Smallmouth Bass, Northern Pike, Walleye
Rocky Mountain Lake	Mercury	Largemouth Bass
Sanchez Reservoir	Mercury	Northern Pike, Walleye
Sweitzer Lake	Selenium	All Fish
Teller Reservoir **	Mercury	Northern Pike, Largemouth Bass, Bullhead, Crappie, Channel Catfish
Totten Lake	Mercury	Walleye
Trinidad Reservoir	Mercury	Walleye
Vallacito Reservoir	Mercury	Northern Pike, Walleye
Willow Springs Ponds	Tetrachloroethylene (PCE)	Largemouth bass, Western White Sucker, European Rudd
* Samples were run prior to the lake being drained in 2008. No current data exists after the reservoir was refilled. ** Samples were run prior to the reservoir being drained in 2002. The reservoir has not been refilled.		

Issuance of an FCA by CDPHE indicates impairment of an Aquatic Life Use classification for any waters so classified. These waterbodies are placed on the State's 303(d) List of Impaired Waters. Phase I TMDLs were completed in 2003 for two of the reservoirs listed based on FCAs: McPhee and Narraguinnep. A TMDL was completed more recently for Sanchez Reservoir in June 2008.

Colorado is aggressively addressing mercury in the environment. In 2008, the Air Pollution Control Division at the CDPHE completed work with electric utilities, industry, environmental groups and local governments on a rule to

dramatically reduce mercury emissions from new and modified coal-fired power plants. The department helped develop a consensus agreement to monitor mercury emissions from power plants that will benefit lakes, streams, aquatic species and human health by reducing the amount of mercury that ends up in our natural ecosystems.

In addition, the department remains committed to a comprehensive mercury prevention and reduction campaign – the Mercury-free Colorado Campaign – to inform citizens, businesses and the medical industry about the health threat associated with exposures to mercury and to develop strategies to keep mercury out of our environment.

C1. Colorado's Groundwater Program

Ground water protection in Colorado is diverse, with a number of State agencies undertaking varying roles in providing water quality protection and assessment. A number of these agencies, referred to as "implementing agencies", are charged with protecting ground water under separate Federal or State legislation. The various implementing agencies have developed program specific regulations, under their respective authorities, to address ground water quality issues.

Ground Water Standards and Classifications

In 2007, the Water Quality Control Commission (WQCC) conducted a triennial review hearing to address Colorado's Basic Standards for Ground Water (Regulation 41). During the hearing the WQCC updated and revised the numeric ground water standards for toluene, ethylene dibromide (1,2-dibromoethane), and fecal coliform. The WQCC also adopted new standards for four pesticides; acetochlor, dicamba, metribuzin, and prometon. The WQCC also elected to implement the ground water narrative standards on a statewide basis.

During 2008 and 2009 there were no additional ground water classifications. Colorado currently has 53 site-specific ground water classifications. One ground water classification has been adopted as a surface water quality protection classification. Thirty-eight classifications were adopted as well head protection areas associated with municipal water supplies. An additional thirteen classifications have been adopted at existing oil fields, and are intended to work in conjunction with the Colorado Oil and Gas Conservation Commission (COGCC) regulation of Underground Injection Control (UIC) Class II wells. These oil field related ground water classifications are one example of Colorado's efforts to coordinate ground water quality protection efforts conducted by the various implementing agencies.

Groundwater Monitoring

The Groundwater Protection Program accomplished several tasks in its 18th year of monitoring responsibilities. The Weld County long-term monitoring, irrigation, and domestic well networks were all sampled and analyzed for the full suite of pesticides, nitrate- and nitrite-nitrogen. Sixteen monitoring wells were sampled as part of a sampling method study comparing the new low-flow minimum drawdown technology to the previously used conventional method of 3-5 casing volume evacuation with an electric submersible pump. Outside of comparable inorganic values for each well, very few wells had useful pesticide detections that could be statistically compared for difference between sampling methods.

Fun Fact: *The most acidic snow in the Rocky Mountains falls in northern Colorado in and near the Mount Zirkel Wilderness Area*

The Front Range Urban monitoring network, recently sampled partially in 2007, was re-sampled in its entirety in 2008 with the exception of three wells in Denver-metro, two in Pueblo, and one in Castle Rock. A total of 67 of the 73 monitoring wells in the network were sampled in 2008. Laboratory complications in 2007 prevented the samples from being analyzed for pesticides and therefore required a re-sampling in order to achieve an adequate baseline sampling for this network. Where appropriate, nitrate results for samples collected in both sampling years were compared. Results from sampling of the Front Range Urban network were presented at the 2008 South Platte Forum.

The Lower South Platte and Arkansas Valley monitoring well networks were sampled as according to the Program's long-term sampling plan initiated in 2007. Also on the schedule was the High Plains region which was last sampled in 1997-1998. The previous sampling event for this area utilized domestic and irrigation well types while this year's sampling utilized a newly installed network of 20 monitoring wells. The Program contracted the United States Geologic Survey to utilize their expertise and tools for determining appropriate locations for monitoring wells in the Ogallala formation of eastern Colorado and then contracted a drilling outfit from Fort Collins to install the well network.

Weld County Long-Term Networks

These three well networks have been sampled annually since 1995. The network of 20 monitoring wells had three problematic wells that were either consistently dry or damaged. As mentioned in the 2007 Annual Report, these three wells were re-drilled and additionally three new sites were added to the network including a site that has multi-depth wells for comparing results at different depths in the South Platte alluvial aquifer. Of the now 24 monitoring wells, at 23 sites, all were sampled with the exception of one that had too low a volume to be sampled.

As mentioned in the 2007 Annual Report, a change was made in sampling methodology from the previous conventional, electrical submersible pumping method to a new low-flow bladder pump method due to evidence that low-flow, minimal drawdown sampling of monitoring wells more accurately depicts what contaminants are actually in motion with the water in the aquifer. Furthermore, use of a bladder pump increases the likelihood that a low volume or slow yielding well can still be sampled when the conventional method is not feasible. Due to this change in methodology a sampling method comparative study was conducted on 16 of the long-standing wells in the monitoring well network to determine if any differences in analysis would result.

For the study each well was sampled first with the low-flow bladder pump method and then the conventional method promptly afterward. Each method utilized a flow-through cell and multi-parameter stabilization for determining when adequate purging had occurred which is standard protocol employed by the Program. All samples were analyzed for the full suite of pesticides, nitrate- and nitrite-nitrogen at CDA laboratory, and for basic inorganic nutrients and dissolved metals at CSU's Soil, Plant, and Water Testing Laboratory in Fort Collins, CO. In short, no statistically significant differences were observed in basic inorganic nutrients (including nitrate and nitrite) or dissolved metals when utilizing common non-parametric statistical tests. Unfortunately, very few wells came back with quantifiable amounts of pesticide compounds so a useful comparison between wells for several pesticide compounds was not possible.

Table 14: Weld County Monitoring Well Network, Nitrate Concentrations 2008			
Statistic	**Domestic**	**Irrigation**	**Monitoring**
Average	14.4	16.31	23.7
Median	8.1	14.87	21.5
Minimum	2.0	BDL	3.0
Q1	4.3	8.71	10.0
Q3	20.9	23.99	29.3
Maximum	48.0	37.04	64.6
# Samples	9	35	23
% Wells Above STD	44.4	68.6	73.9

Table 14. Nitrate-nitrogen concentrations for Weld County long-term well networks sampled in 2008. Units are in ppm or mg L-1. BDL is below detectable limit.

A follow-up study will be conducted in sampling year 2009 but will not be restrained to just Weld County monitoring wells. Wells from the Weld County long-term network were initially selected due to long-term history of pesticide detections and/or elevated nitrate levels. Even though these prospect wells did not turn up useful pesticide detections for the purpose of the study, several wells from various other networks contained detectable quantities of pesticide products in 2008, and from these various networks a selection of wells will be made and utilized for the follow-up study in 2009. Upon completion of the follow-up a detailed report will be completed discussing the results of the sampling method comparative study.

All of the following results are from water samples collected with the low-flow method.

Periphyton sampling

2008 Nitrate Results

As can be seen in Table 14, all three well network types had wells with nitrate-nitrogen over the EPA drinking water standard of 10.0 ppm in 2008. The monitoring well network has the highest percent of wells over the standard as has been the case historically. This is most likely due to the fact that these wells access the very top of the aquifer and therefore are sampling the most recently recharged water to the aquifer. The maximum nitrate concentrations in the various network types are comparable to historic values that have been reported in the past with the exception of the domestic network maximum of 48.0 ppm. The well containing this concentration of nitrate-nitrogen is a new well added to the domestic well network in 2007. The Weld County long-term study as a whole had a median nitrate-nitrogen concentration of 14.9 ppm with 67% of all wells sampled having 10.0 ppm or more.

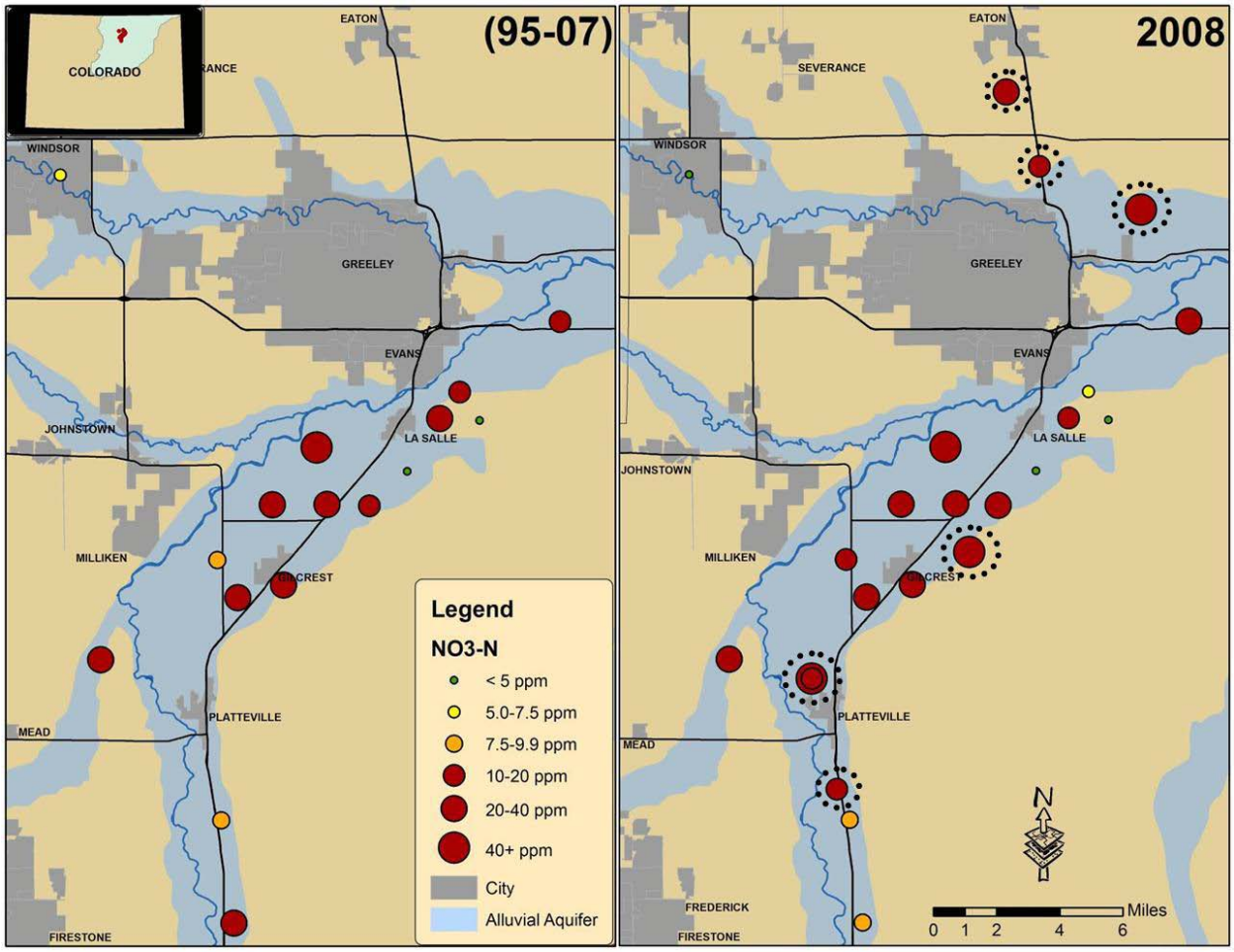
Table 15: Weld County Monitoring, Nitrate Concentrations 1995-2007

Statistic	Domestic	Irrigation	Monitoring
Average	13.45	16.9	22.8
Median	9.27	16.4	19.1
Minimum	0.25	BDL	1.7
Q1	4.37	9.5	8.21
Q3	19.75	25.4	30.4
Maximum	51.7	82	111.3
# Samples	76	554	239

Table 15. Nitrate-nitrogen concentrations for Weld County long-term well networks, sampled from 1995 to 2007. Units are in ppm or mg L-1. BDL is below detectable limit.

Results in 2008 for the various Weld County long-term well networks are in line with historical data (Table 15). All long-standing monitoring well (those not recently re-installed or newly installed) results for 2008 are very comparable to their historical results as seen in Figure 1. Wells with a dotted circle around them are the recently installed wells which all have nitrate-nitrogen present at greater than 10.0 ppm. Four of the seven wells have 40.0+ ppm of nitrate-nitrogen. The sample site just north of Platteville is the location with two monitoring wells installed at different depths. The shallow well is installed so the top two feet of a 10-ft screened interval is just above the top of the water table, while the deeper well is installed so the top of its 10-ft screened interval is about 5 ft below the bottom of the screened interval of the shallow well.

Figure 1. Historical and 2008 median nitrate results for Weld County monitoring wells. Graduated symbols represent relative amounts of nitrate. Red symbols signify locations with nitrate above EPA Drinking Water Standard. Wells with dotted spheres signify a newly installed or repaired well.



The reason for installing two wells in this fashion was to learn of any variation in nitrate concentration in the South Platte alluvial aquifer. It is known that in most cases nitrate concentrations will be higher in the shallower sections of the aquifer for multiple reasons including the lack of a dilution affect encountered deeper in the aquifer and the higher dissolved oxygen levels which do not facilitate the facultative anaerobic bacteria responsible for denitrification which tends to lower nitrate concentration through degradation to nitrogen gas. Other issues may affect nitrate concentrations with depth in an alluvial aquifer but the above mentioned factors are some of the main causes.

Fun Fact: *Anglers at the turn of the century used mice, birds, and small rabbits as bait for the now-endangered Colorado Pike Minnow.*

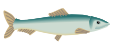
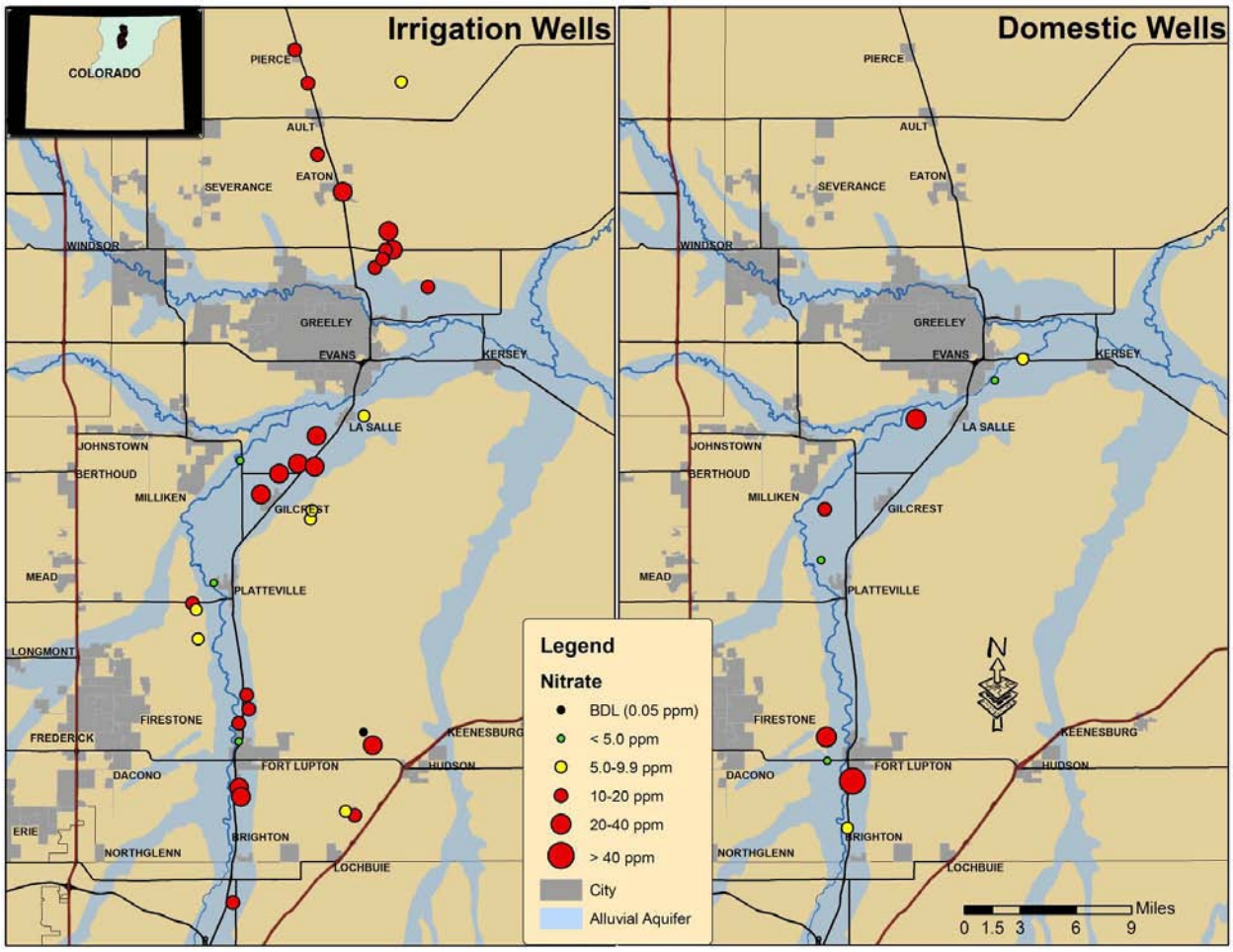


Figure2. Nitrate-nitrogen results for Weld County long-term irrigation and domestic wells sampled in 2008. Relative concentrations are shown with graduated symbols where red symbols signify nitrate concentrations at or above the EPA Drinking Water Standard. BDL is below detection limit.



In 2008, the shallow well contained 44.25 ppm of nitrate-nitrogen while the deeper well contained only 10.96 ppm. That constitutes a 75% difference in nitrate-nitrogen at this location with a difference in depth of 14 ft between the center point of each 10-ft screened interval. Static water levels were nearly identical at 4818 ft above mean sea level with the shallower well being 0.2 ft higher. Two other multi-depth well sites were installed in similar fashion as part of the Front Range Urban monitoring network in Colorado Springs. Both locations showed a similar response with a significant reduction in nitrate-nitrogen concentration in the deeper well.

Irrigation and domestic well nitrate-nitrogen results for 2008 are shown relatively with graduated symbols in Figure 2. Nearly 70% of sampled irrigation wells contained nitrate-nitrogen at or greater than 10.0 ppm. The area between Gilcrest and La Salle continues to show elevated nitrate levels in the groundwater in results from all three well networks, but where the monitoring well network is weak around Fort Lupton, the domestic and irrigation well

networks show several locations with elevated nitrate levels in the groundwater. The domestic well just south of Fort Lupton – containing the maximum nitrate value of 48.0 ppm – is an old domestic well down-gradient of several irrigated agricultural fields to the south and a former CAFO.

2008 Pesticide Results

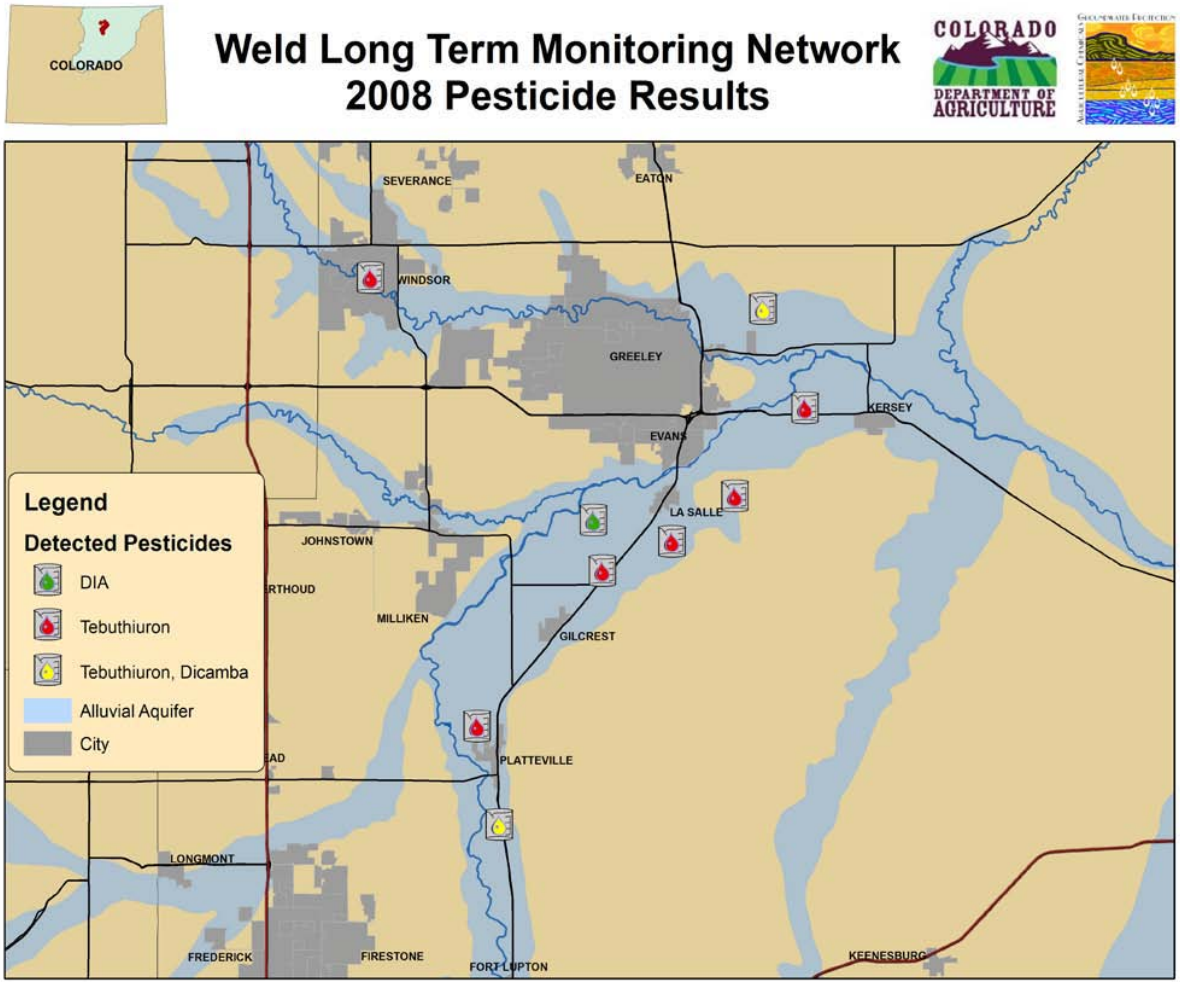
Sample results for the Weld County monitoring wells turned up several detections of tebuthiuron (Trade names Spike or Graslan). Concentrations ranged from 0.039 to 0.768 ppb with a 0.073 ppb from 9 wells with detections. The multi-depth site north of Platteville detected tebuthiuron in both wells. The deeper well had about 74% more tebuthiuron than did the shallow well which is an opposite response from the nitrate-nitrogen results for these wells. These are the first detections of tebuthiuron in the history of the Program; however, the Program only began monitoring for this active ingredient in 2007. Tebuthiuron is a systemic, lowly selective herbicide that inhibits photosynthesis. Products containing it as an active ingredient do have a groundwater advisory label which advises users of the dangers associated with using this product in areas of shallow groundwater and soils with high leaching potential.

Recent age-dating of groundwater in a portion of the South Platte alluvial aquifer by the USGS has unveiled the likelihood that water at or near the top of the water table could range from less than five years to thirty years in age with the older ages occurring closer to the river. Paschke et al. (2008) used Chlorofluorocarbon analysis and Tritium and Helium analysis to determine the approximate recharge date of groundwater at five locations in the South Platte alluvial aquifer. The locations of the flow-path wells used in their study are located between Gilcrest and La Salle and they state that water samples from these wells last came in contact with the atmosphere from 4 to 30 years ago. If these results can validly be extenuated to our wells in the South Platte alluvial aquifer then it is possible that tebuthiuron applications made upwards of 30 years earlier, with methods that could impact groundwater quality, are just now being detected. With the first registration of tebuthiuron occurring back in 1974 by Elanco Products Company, this scenario is plausible. However, without any use history for this product within the South Platte Basin it is not known when exactly tebuthiuron might have been applied. It will be interesting to see results from future monitoring of these wells.

Two other pesticides were detected in the monitoring well network – one detection of desisopropyl atrazine (an atrazine breakdown product) at 0.0966 ppb and two detections of dicamba at concentrations of 2.878 and 3.541 ppb. Quantities of all pesticides detected in 2008 are either below any established drinking water standard or no standards have been established.

Blue pool , telluride Colorado

Figure 3. Map showing locations of wells with pesticide detections in 2008



Front Range Urban Network

As mentioned in the 2007 Annual Report, installation of monitoring wells in Fort Collins and Colorado Springs was completed to add to the coverage of the Front Range Urban well network. The sampling in 2008 included these two new areas in addition to a re-sampling of wells in the Denver-metro and Greeley areas. A total of 67 monitoring wells were sampled between Fort Collins, Greeley, Denver-metro, and Colorado Springs in 2008. Three wells in SE Denver-metro and one well in Castle Rock were sampled in 2007 by USGS personnel but a re-sampling for 2008 was not possible. Two wells in Pueblo that were sampled in 2007 were not sampled in 2008. In all 39 wells in Denver-metro and Greeley were sampled in both 2007 and 2008. All samples collected in 2007 were analyzed for nitrate-

and nitrite-nitrogen concentration only due to laboratory complications that prevented pesticide analysis. Samples collected in 2008 were analyzed again for nitrate- and nitrite-nitrogen concentration, in addition to 100+ pesticide compounds and basic inorganic nutrients.

Nitrate-nitrogen results for samples collected in 2007 and 2008 are presented in Table 16. Even though there were 27 new wells sampled in Fort Collins, Denver-metro, and Colorado Springs, the statistics between 2007 and 2008 are similar for nitrate-nitrogen concentrations. The maximum nitrate-nitrogen concentration of 31.6 ppm for 2007 was in Denver-metro and actually decreased nearly 10.0 ppm by the spring sampling event. The maximum concentration for 2008 was from the shallow well of a multi-depth site in Colorado Springs. Five wells sampled in 2007 had nitrate-nitrogen concentrations above the EPA Drinking Water Standard, while this number increased to 13 in 2008. Of these 13 wells seven of them were in either Fort Collins or Colorado Springs which points to the fact that the baseline statistics for the Front Range Urban network should definitely be based on the 2008 sampling event. However, 39 wells were sampled in both 2007 and 2008 so the different sampling events can be compared.

Table 16: Front Range Urban Monitoring Well Results

	Nitrate-nitrogen		Dissolved Oxygen		Static Water Level	
Statistic	**2007**	**2008**	**2007**	**2008**	**2007**	**2008**
	---------- ppm or mg L-1 ----------				---------- ft ----------	
Mean	4.7	5.7	2.01	2.83	16.1	16.5
Median	3.2	3.7	0.98	2.08	12.7	12.9
STD	5.5	6.2	1.98	2.01	10.6	11.3
Minimum	BDL	BDL	0.26	0.51	2.4	3.2
Q 25%	1.0	1.0	0.62	0.98	1.0	9.6
Q 75%	6.3	8.4	3.05	4.46	6.3	19.7
Maximum	31.6	30.8	6.51	7.16	56.6	57.7

Table 16. Nitrate-nitrogen, dissolved oxygen, and static water level data for Front Range Urban monitoring wells sampled in 2007 and 2008.

Fun Fact: *Natural hot springs contribute 500,000 tons of dissolved solids (15% of total salinity) to streams in the Upper Colorado River Basin each year.*

Figure 4. Map showing distribution of monitoring wells in the Front Range Urban Network. Sampling events in 2007 and 2008 resulted in the sampling of all 73 wells at least once.

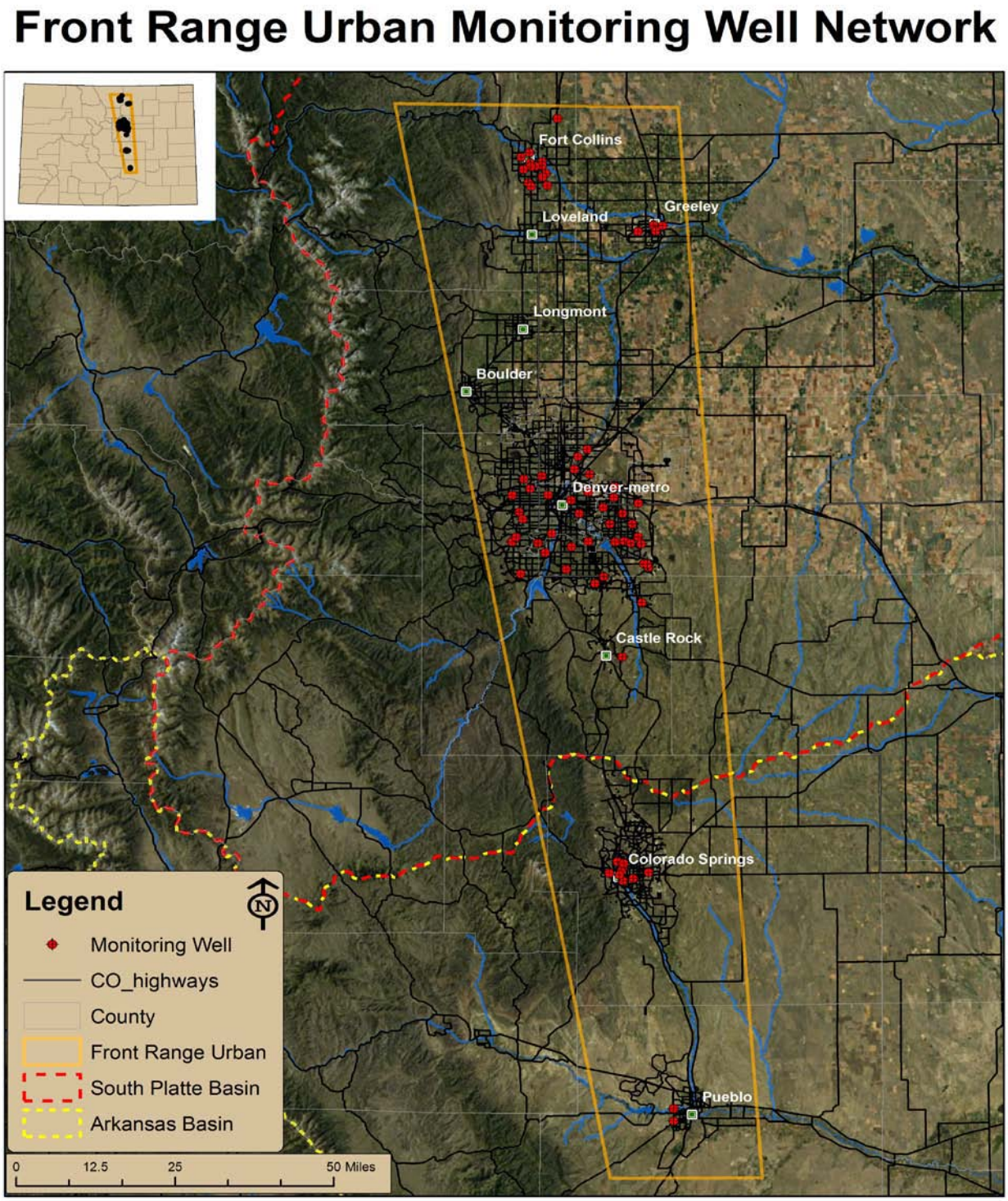


Table 17: Front Range Urban 2008 Nitrate

Statistic	Fort Collins	Greeley	Colo. Springs
Mean	4.33	5.64	9.78
Median	2.55	6.48	8.24
STD	5.94	3.77	10.04
Minimum	0.07	0.87	BDL
Q 25%	0.61	3.49	2.39
Q 75%	3.89	8.63	12.2
Maximum	19.48	8.73	30.76
Count	13	4	11

Table 17. Nitrate results for samples collected in three individual areas of the Front Range Urban network: Fort Collins, Greeley, and Colorado Springs. BDL is below detection limit. Units are in ppm or mg L-1.

In viewing statistics for these wells there is even less of a difference between sampling events in nitrate-nitrogen concentration, dissolved oxygen, and static water levels. Table 16 shows the differences in nitrate-nitrogen concentrations between 2007 and 2008 for the wells sampled in both years. The key difference was a monitoring well in Denver-metro that decreased in nitrate-nitrogen concentration from 31.6 to 21.8 ppm from October 3, 2007 to May 14, 2008. This large drop in concentration shows the potential variation that can occur between seasons even in urban environments. This monitoring well in NW Denver-metro is actually down-gradient from a community garden that was created in an old settling pond from the water treatment plant that used to occupy the space. It is possible that nitrate from fertilizer applied to various crops being grown in this garden could be contributing to the elevated nitrate concentrations. Quarterly monitoring of this site which coincides with the dormant *vs.* in-use status of the community gardens might help clarify whether this is likely or not.

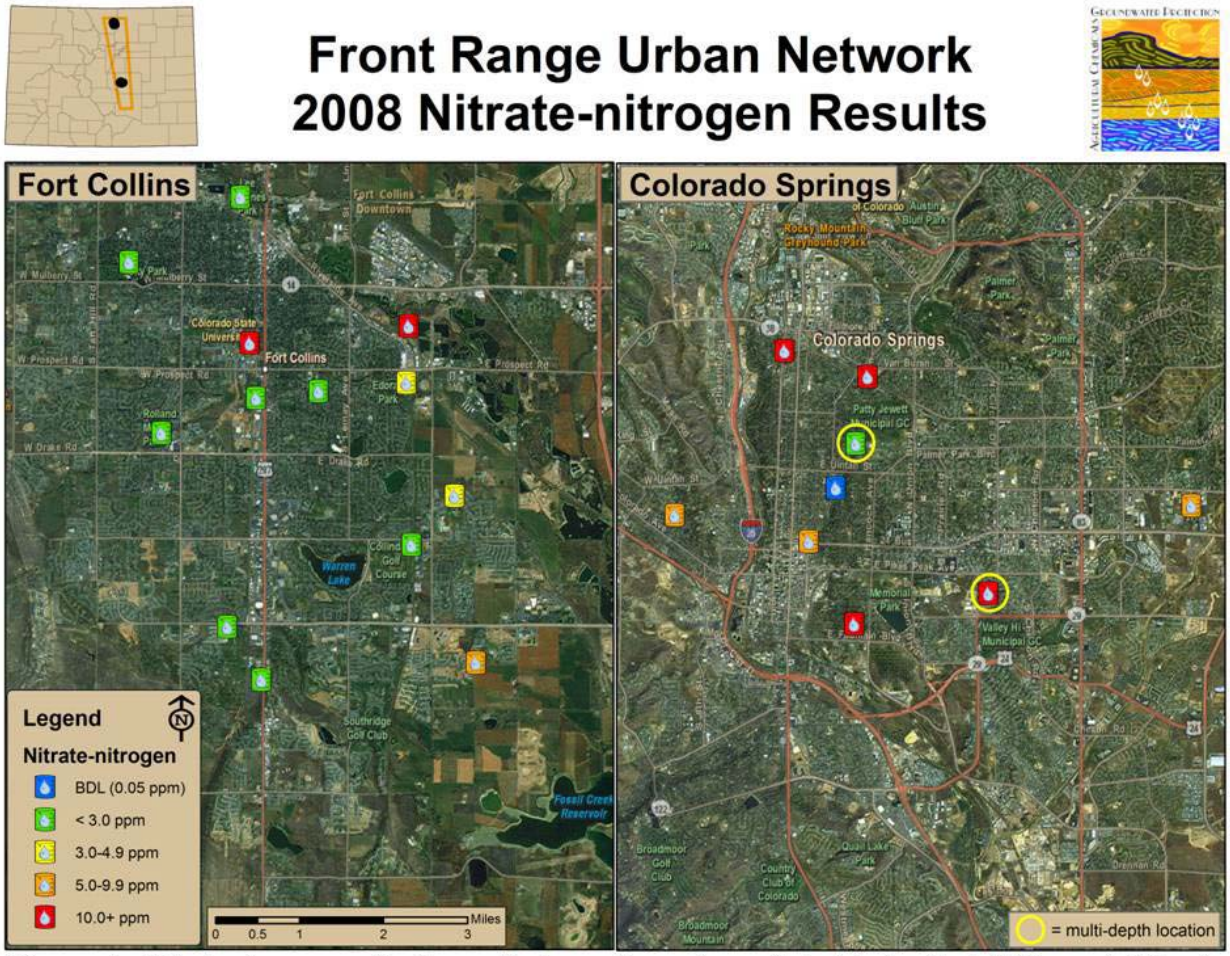


Figure 6. Nitrate-nitrogen results for monitoring well samples collected in the Fort Collins and Colorado Springs areas of the Front Range Urban Network. BDL is below detection limit in parentheses.

Nitrate results from various individual areas in the Front Range Urban network are shown in Table 17. The highest median nitrate concentration for all individual areas, including Denver-metro, was 8.24 ppm in Colorado Springs. This was a little more than 1.5 ppm higher than the median for the Greeley and over three times the median for Fort Collins. The maximum concentration for 2008 was also found in Colorado Springs; however, with two wells below the detection limit of 0.05 ppm, compared to no wells below detection in Fort Collins or Greeley, not all wells in the Colorado Springs area had elevated nitrate concentrations. Figure 6 shows the spatial variability of nitrate concentrations in Fort Collins and Colorado Springs. There are 8 of 13 locations in Fort Collins (61.5%) that have nitrate-nitrogen below 3.0 ppm which is believed to be the approximate upper level of the nitrate concentration that occurs naturally. While Colorado Springs may have two locations with wells testing below detection limit (one is the deeper well of a multi-depth location south of Patty Jewett Municipal Golf Course) more than 50% of the other wells had nitrate concentrations greater than 5.0 ppm, with four wells being greater than 10.0 ppm.

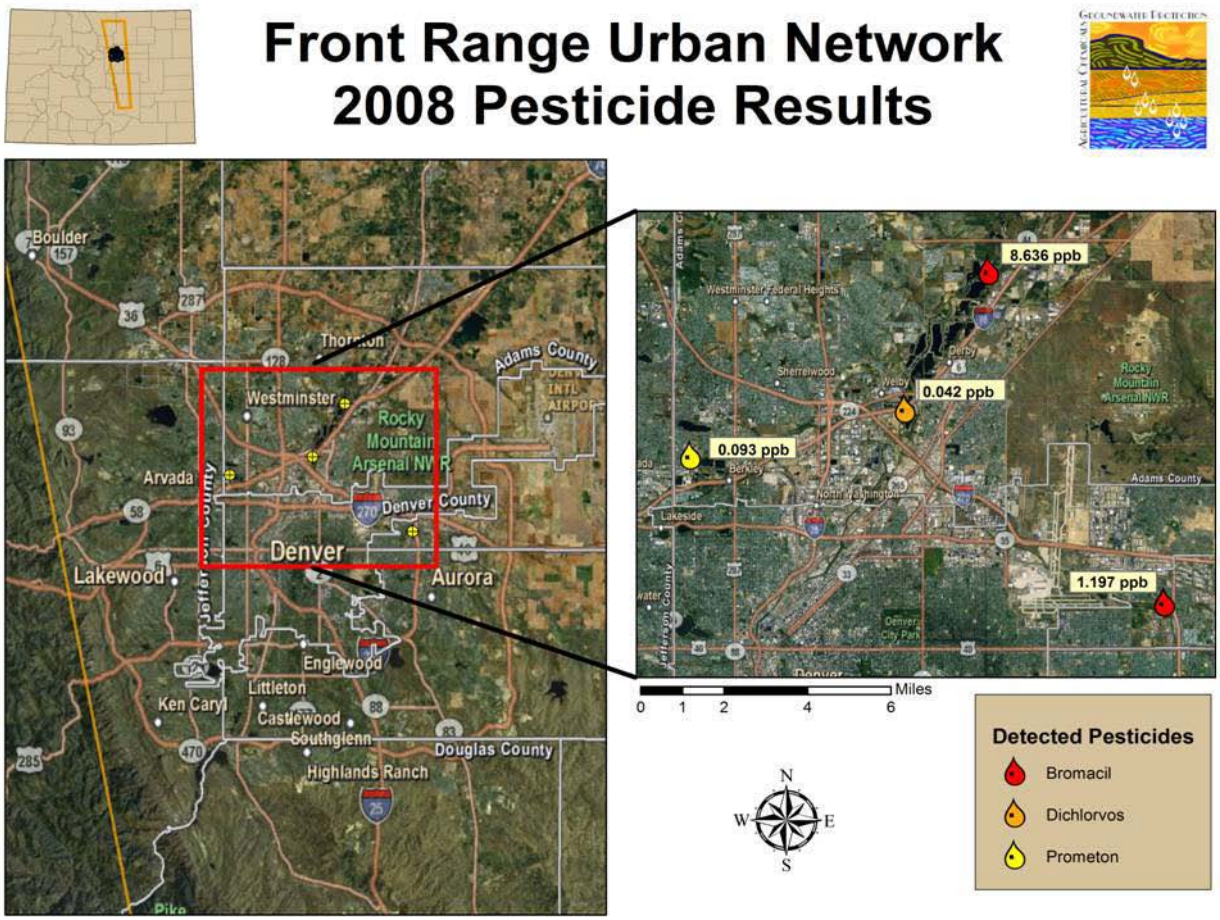


Figure 7. Pesticide detections in Denver-metropolitan monitoring wells sampled in 2008 as part of the Front Range Urban Network.

It is not entirely clear what might be causing the elevated nitrate levels in multiple locations of Colorado Springs. A variety of urban land use types are located up-gradient of wells with nitrate concentrations above the EPA Drinking Water Standard. These include commercial-residential areas, golf course-residential areas, residential areas, and open space-residential areas. In briefly looking at general land-use types around wells throughout the Front Range Urban network it is seen that those surrounded by residential or a mix of residential-commercial development had the highest median nitrate concentrations at 5.9 ppm. Areas of commercial-industrial development have a median of 4.9 ppm. Median concentrations for golf course-residential, open space-parkland and golf course are less than 2.0 ppm and third quartile (75% of sampled locations) concentrations for these areas are less than 5.0 ppm.

Bromacil, dichlorvos, and prometon were detected in the 2008 baseline sampling of the Front Range Urban network, and all four wells detecting one of these three pesticide active ingredients are located in the Denver-metropolitan area. As can be seen in Figure 7, all four wells with pesticide detection are in or near the more commercial-industrial areas of Denver-metropolitan. The rather high detection of bromacil at 8.636 ppb is still well below the health advisory level of 30 ppb.

The detection of dichlorvos is rather peculiar given that its chemical-physical properties do not lend it to be a typical groundwater contaminant concern. Dichlorvos is a degradate product of trichlorfon (Trade name Dipterex or Dylex) which is a groundwater contaminant concern due to its high leaching potential, high solubility, and low affinity for

adsorption to organic material in the soil. Products containing trichlorfon as the active ingredient are registered for use in Colorado but do not have a groundwater advisory label on them. Another active ingredient that dichlorvos is a degradate of is naled (Trade name Trumpet or DiBrom) which is a restricted use product (RUP). Colorado has several products currently registered for use. These product labels do not have a groundwater advisory on them as their characteristics do not suggest that naled is a leacher. It is highly toxic to bees and has a significant toxicity to humans as a known cholinesterase inhibitor and developmental or reproductive toxin.

The Program does not currently analyze for either naled or trichlorfon but recent creation of a pesticide properties database to assist with discerning which active ingredients should be monitored for, included trichlorfon in a list of 100 priority pesticides. Future analysis for trichlorfon at the CDA laboratory is desired but is dependant mostly on laboratory capabilities for analyzing for trichlorfon.

Lower South Platte Network

The Lower South Platte network is composed of 20 monitoring wells: 16 wells to which the Program has been granted access by the Lower South Platte Water Conservancy District, and four other wells owned permitted by CDPHE. The previous sampling effort for this network was in 2001. In 2008, 17 of the 20 wells were sampled. Of those wells not sampled, one CDPHE well was not sampled due to the land owner not allowing access, one LSPWCD was in the middle of a corn field and was not accessible with the low-flow bladder pump, and another LSPWCD well has been dry since 2001. Sampling was completed between 16 July 2008 and 23 July 2008. Samples were analyzed for 100+ pesticides, nitrate- and nitrite-nitrogen at CDA's laboratory.

In 2001 the mean nitrate-nitrogen was 12.3 ppm with a maximum of 73.98 ppm. The maximum concentration came from a well in Brush, CO. When this well's data is excluded from the statistics the mean drops to 8.9 ppm; however, the median concentration only goes from 9.6 to 9.3 ppm when the Brush well is excluded. Instances such as this are why median values are more commonly preferred when comparing environmental data, especially for non-point source data analysis. In 2008, this same well measured at 260.2 ppm for nitrate-nitrogen and nearly tripled the mean concentration for the network when included in the statistics. As can be seen in Table 18 the median nitrate-nitrogen concentration, as well as many of the other statistics for the Lower South Platte network, 2008 values compare favorably to 2001 values when the Brush well is omitted.

Table 18: Lower South Platte Network

Nitrate Results		
Statistic	**2001**	**2008**
Mean	8.9	8.9
Median	9.3	5
STD	4.5	7.9

Minimum	2.2	1.2
Q 25%	5.7	3.3
Q 75%	10.3	18.2
Maximum	17.7	22.5
Count	18	16

Table 18. Nitrate-nitrogen results for Lower South Platte monitoring wells sampled in 2001 and 2008. Units are ppm or mg L-1.

While the median nitrate increased to 9.3 ppm in 2008, up from 5.0 ppm in 2001, the concentration for 75% of all samples was less than 10.3 ppm in 2008. In 2001, the 3rd Quartile was 18.2 ppm. The standard deviation also dropped from 7.9 ppm in 2001 to 4.5 ppm in 2008. Besides the Brush well, five other wells contained nitrate-nitrogen at levels above the EPA Drinking Water Standard of 10.0 ppm. Four of these wells also had greater than 10.0 ppm in 2001 while one well increased 10 ppm from the 2001 sampling. All nitrate results for the sampled wells are shown in Figure 8. An area within the network that had the highest nitrate-nitrogen concentrations was that north of Wiggins, CO. The three wells with red symbols in Figure 8, north of Wiggins, had a median nitrate concentration of 20.4 ppm.

When the laboratory confirmed a rather high nitrate concentration in the sample collected from the well in Brush, CO, and Program personnel visited the site to try and determine what might be visibly contributing to the contamination. Upon visiting the location the Program decided to inform the Colorado Department of Public Health and Environment so they could follow up on investigating whether any point sources in the area could be contributing to the contamination of the shallow groundwater.

Only two samples from monitoring wells in the Lower South Platte network had detectable quantities of pesticide compounds in them. The well northeast of Sterling, with the red symbol in Figure 8, had a detection of desethyl atrazine at 0.8253 ppb. Desethyl atrazine is a commonly detected breakdown product of atrazine which has a EPA Drinking Water Standard of 3.0 ppb. The well in Brush was the other well detecting pesticide product and the following active ingredients were found: atrazine (1.641 ppb), clopyralid (3.865 ppb), metalaxyl (2.2712 ppb), and MCPA (0.055 ppb). Atrazine and metalaxyl were both found in the sample collected back in 2001 for this well. This was the first detection of clopyralid in the Lower South Platte network but it has been detected as recently as 2006 in the Weld County monitoring well network. MCPA had never been detected in Colorado prior to this detection. There is a 10.0 ppb Health Advisory Level in place for MCPA.

Fun Fact: *Leadville is the highest incorporated city in the United States at 10,430 feet elevation. Because there were lots of "silver" named towns at the time, the founding fathers suggested Leadville.*

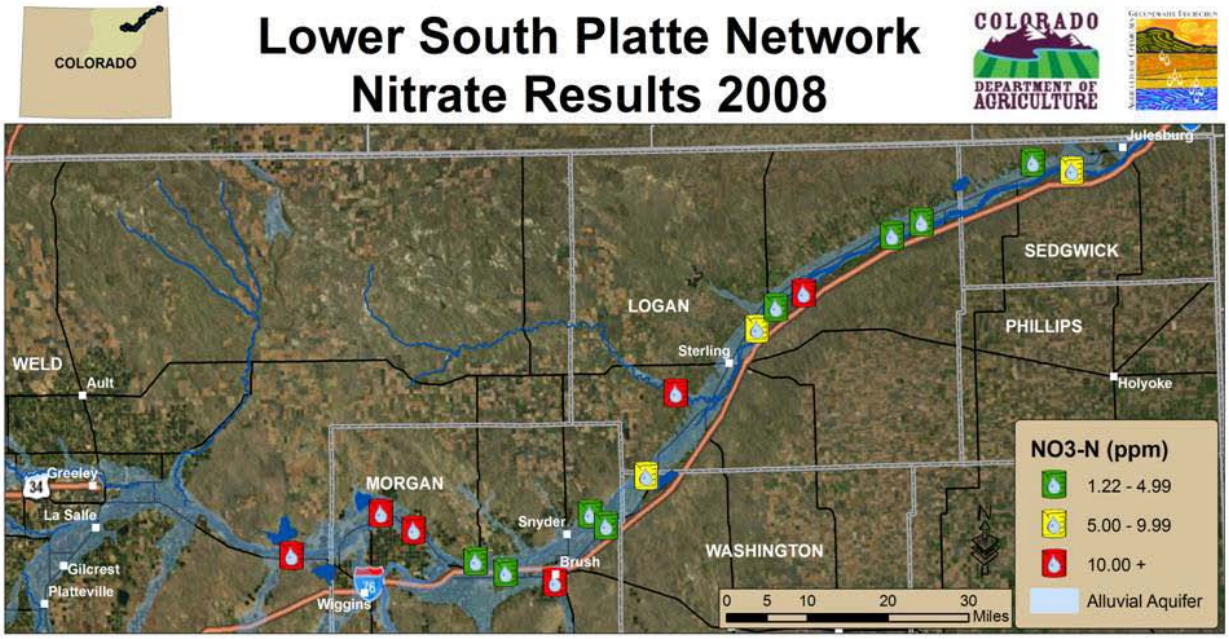


Figure 8. Map showing distribution of nitrate-nitrogen results for samples collected from monitoring wells in the Lower South Platte Network in 2008.

All four of the pesticides detected in the Brush monitoring well have groundwater advisories on their product labels and all have moderate to very high leaching potential. While it is surprising that all four of these active ingredients showed up in one well, their characteristics warrant the likelihood of their contamination. Without sufficient pesticide use information for the area it is not possible to know which entity's use may be contributing the pesticide product to the aquifer. It is known that the likely contributors of the nitrate contamination are not the same contributors of the pesticide contamination which points to this are of Morgan County as being highly vulnerable to groundwater contamination with agricultural chemicals.

Arkansas Valley Network

This network of 20 monitoring wells was installed by the Program in 2004 and was last sampled in 2005. The median nitrate-nitrogen concentration was 2.04 ppm with only one well having greater than 10.0 ppm. The third quartile was at 7.3 ppm which signifies that elevated nitrate levels in the Arkansas River alluvial aquifer were not of much concern given that this network spans from just east of Pueblo, CO all the way to Holly, CO. The three wells on the western extent of the network (just east of Pueblo) were all below detectable limits for nitrate.

In 2008, only 19 wells were sampled as one well had been completely wiped out by some large machinery. The current landowner at this site 5.5 miles west of Lamar, CO, does not wish for the Program to re-install a new well and would prefer for us to just properly abandon the damaged well. This will create a bit of a gap between John Martin Reservoir and Lamar, CO, but there is still pretty sufficient coverage of the Arkansas Valley. Samples collected in 2008 were analyzed for 100+ pesticides, nitrate- and nitrite-nitrogen, basic inorganic nutrients, and selenium. Split samples were also collected for CDPHE which analyzed their samples for dissolved metals

(unfiltered), basic inorganic nutrients, VOCs, some pesticide compounds, and arsenic speciation. Data from CDPHE is not included in this report, as many of their interests and analytes are outside of the Program's scope.

Results for various parameters of water quality are presented in Table 19 for samples collected in 2008. The median nitrate concentration was about two times higher than it was in 2005 while the third quartile was only slightly higher than it was in 2005. As can be seen in Figure 9 the key difference in the distribution of nitrate concentration in the alluvial aquifer, between 2005 and 2008, is the obvious increase in the number of wells with nitrate-nitrogen concentrations above the EPA Drinking Water Standard, east of Lamar, CO. The median nitrate for these five wells was 4.8, 7.3, and 12.3 in 2004, 2005, and 2008, respectively. The third quartile doubled in 2008, to 15 ppm, compared to values of 7.1 and 7.4 ppm in 2004 and 2005.

Table 19: Arkansas Valley Network 2008 Water Quality Results

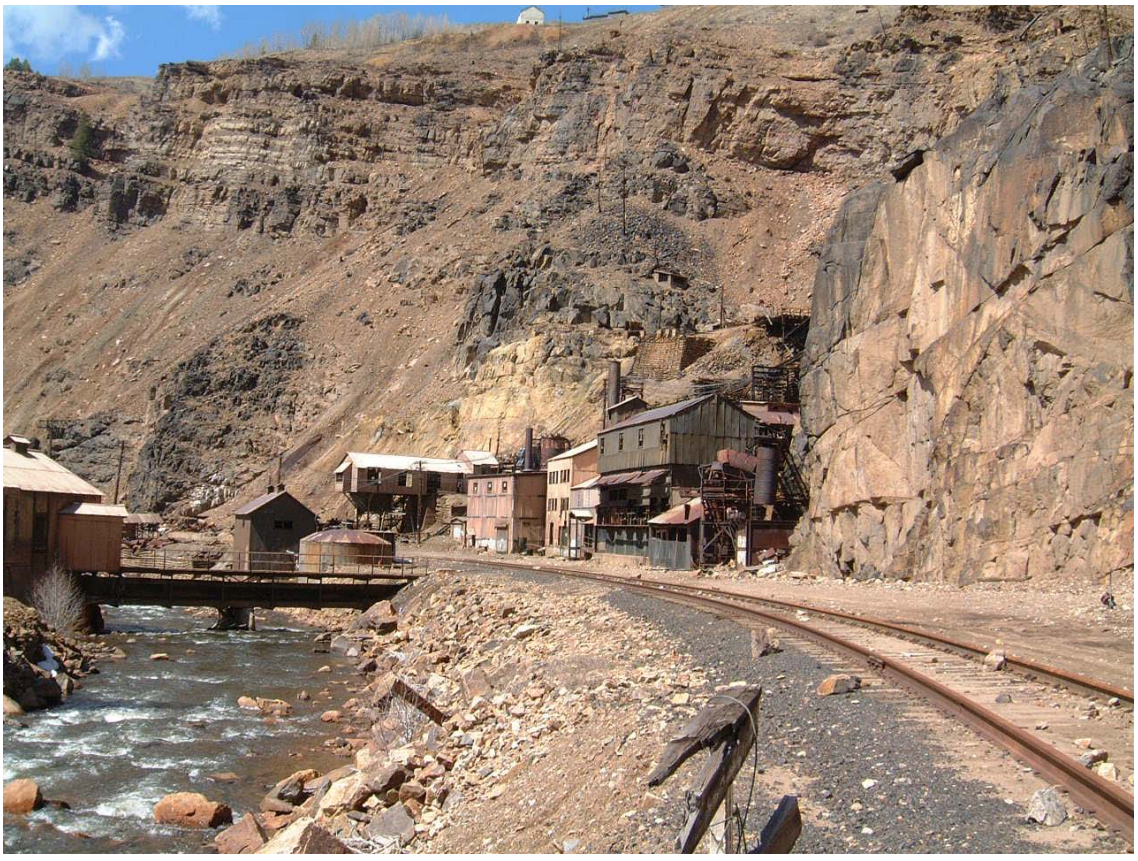
n=19	Nitrate-N	Sulfate	Sodium	Boron	Chloride	Selenium	TDS	SAR
---------- ppm or mg L-1 ----------								
Mean	5.7	946	253	0.5	85	0.022	2164	3.3
Median	4.1	827	165	0.35	56	0.019	1953	2.5
STD	5.6	475	188	0.41	72	0.015	1081	2
Minimum	BDL	94	21	0.06	8	BDL	386	0.6
Q 25%	1.0	605	134	0.22	45	0.012	1441	2
Q 75%	7.7	1362	411	0.64	102	0.031	3206	4.9
Maximum	20.5	1731	655	1.35	306	0.047	3957	7.7

Table 19. Results for various water quality parameters analyzed in samples collected from monitoring wells in the Arkansas Valley network in 2008. BDL is below detection limit. TDS is total dissolved solids (lab calculated). SAR is sodium absorption ratio.

This pattern of higher nutrient concentrations east of Lamar compared to wells lying west of Lamar does not end with nitrate. An obvious gradient is seen in Figures 10 and 11 for a few other select water quality constituents. With respect to these parameters, similar responses were seen in the 2005 data, but nitrate concentrations seem to have followed suit now in the 2008 sampling. It is possible that two factors could be at play in influencing this shift in water quality east of Lamar, CO. One thought could be that irrigation ditch returns are concentrating contaminants and another is that the dense coverage of phreatophytes like Tamarisk could be causing a evapo-concentration effect because of their high transpiration rates. No data is available to support these claims but they logically make sense and are possible.

Only samples from three monitoring wells had pesticide detected in 2008. Figure 12 below shows the three well locations with detections of either ethoprop, metalaxyl, or metolachlor. All detected concentrations are well below any established drinking water standards. Metalaxyl and ethoprop were detected for the first time while metolachlor

was detected in 2004 and 2005 at the same location as the 2008 detection. The concentrations for metolachlor were 0.580, 0.079, and 0.422 ppb for 2004, 2005, and 2008, respectively. Metolachlor is a commonly detected pesticide in major agricultural land-use areas of Colorado. It has been detected 86 times from samples collected between 1992 and 2007 in the Arkansas, South Platte, and Rio Grande basins. Never has a detected quantity exceeded the Health Advisory Level for metolachlor of 70.0 ppb.



Belden Mine, Eagle River

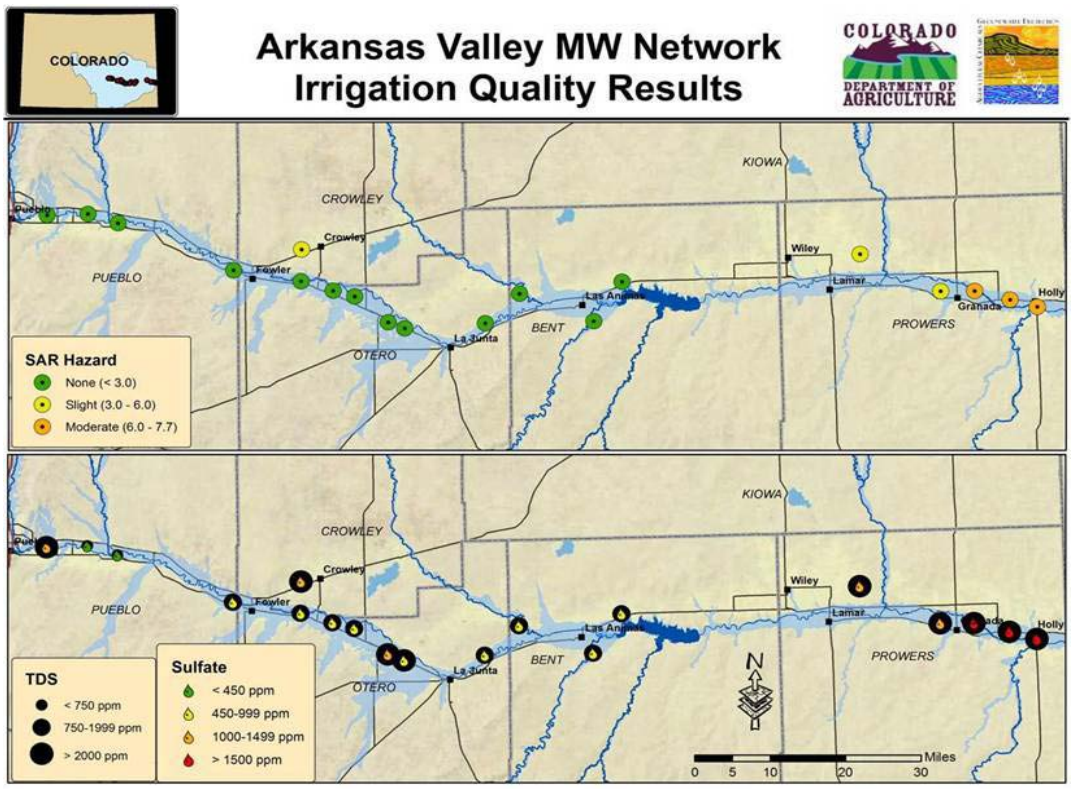


Figure 10. Map showing sodium adsorption ratio (SAR), total dissolved solids (TDS), and sulfate values in samples collected from monitoring wells in the Arkansas Valley Network in 2008.

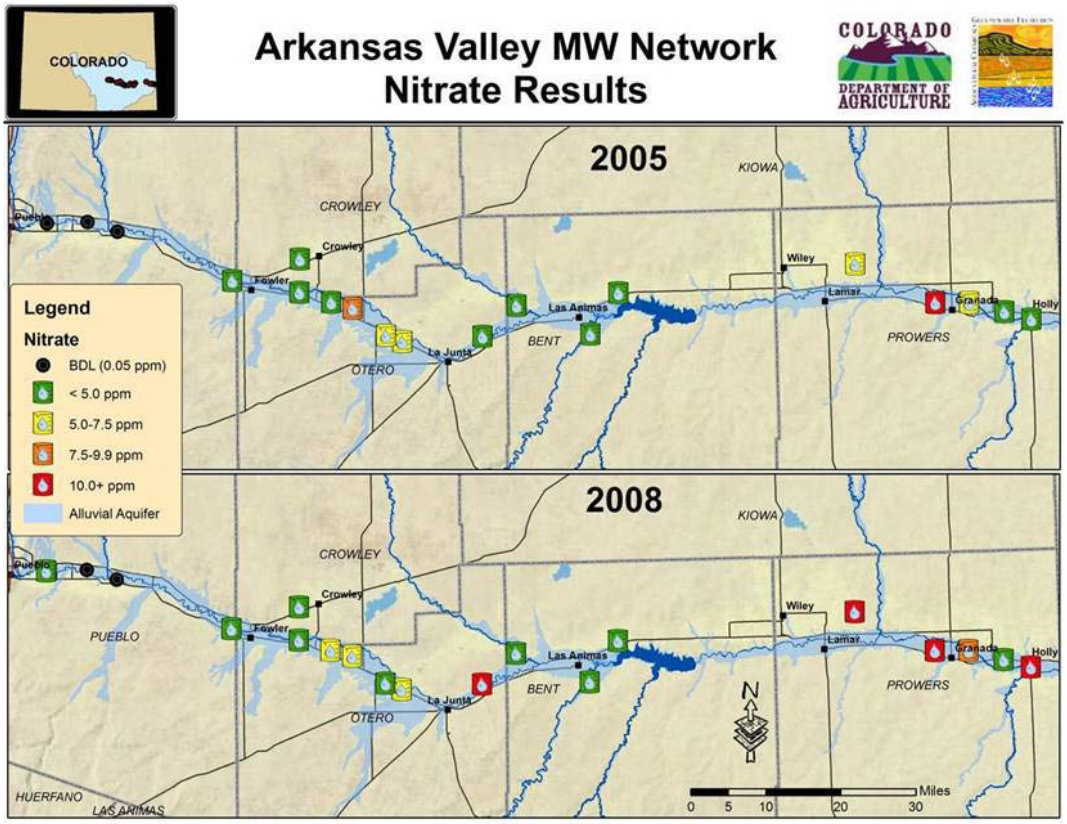


Figure 11. Maps showing distribution of nitrate-nitrogen concentrations in samples collected form monitoring wells in Arkansas Valley Network in 2005 and 2008. BDL is below detection limit in parentheses.

Fun Fact: *American Rivers once named the Animas River in southwestern Colorado one of the "most endangered rivers" in the United States and named La Poudre Pass Creek near Rocky Mountain National park one of the "most threatened rivers" in the United States.*

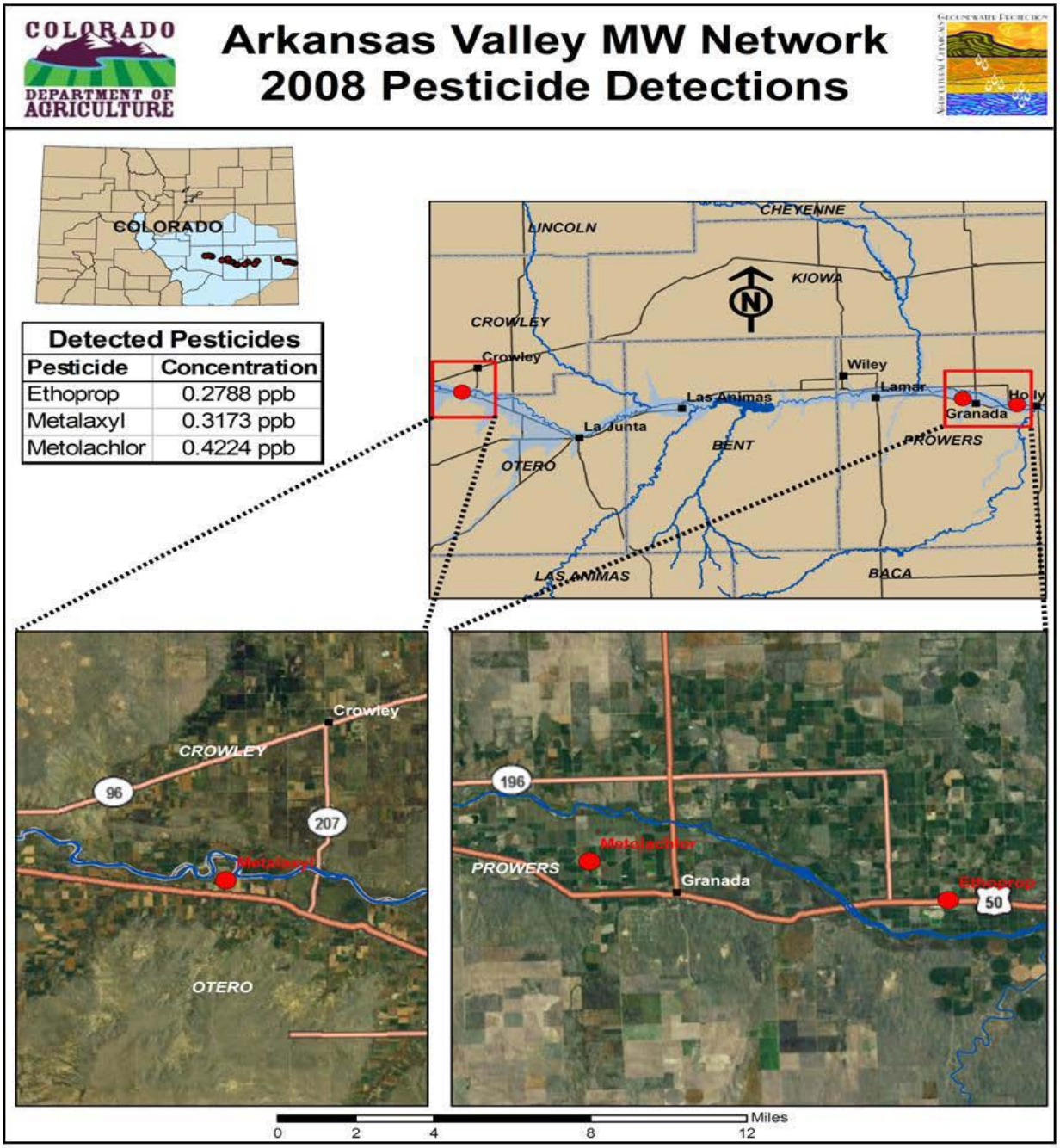


Figure 12. Map showing two areas of the Arkansas Valley network that contain monitoring wells with detected pesticide compounds from samples collected in 2008.

High Plains Monitoring Network

The Program contracted the services and expertise of the United States Geologic Survey (USGS) to assist with reasonable and appropriate placement for 30 monitoring wells within the center section of the Ogallala Formation underlying most of eastern Colorado's High Plains region. Furthermore, USGS personnel conducted geologic logging of boreholes, provided oversight for installation of 20 monitoring wells, and developed the wells to establish a hydraulic connection between the well and the aquifer material. Well drilling and installation services were bid out through the State's competitive bid process which awarded a drilling outfit from Fort Collins, CO with the job.

The High Plains region is unique to Colorado with respect to most other areas that the Program monitors for agricultural chemicals. While the Ogallala Aquifer is primarily an unconfined aquifer, like all alluvial aquifers, it varies greatly in depth to water and is usually greater than 80 ft below the land surface. In comparison, the deepest monitoring well from all other areas sampled by the Program is 80 ft with most of them being 20 to 40 ft below ground surface. Even though the depth to water in the High Plains is much greater – thereby lowering the potential for contamination with agricultural chemicals – the fact that there is key dependence on the aquifer for household and livestock use, and the fact that there is widespread irrigated agricultural land-use on a rather porous soil and vadose zone material, it is important that this area is monitored for agricultural chemicals.

The last sampling event which extended from 1997 to 1998 was conducted primarily with domestic, irrigation, and municipal wells. While these wells provide sufficient information with regards to contaminants in the aquifer, they are not the best wells for accurately determining the mobile fraction of contaminants in groundwater – that fraction which is dissolved in the water or adsorbed onto colloids or mobile sediment particles. Not only is it important to know where contamination with agricultural chemicals may be impacting human and/or animal health, it is also nice to be aware of where contamination may be headed so that forewarning can be provided to 'downstream' well users. Properly located, installed, and sampled monitoring wells help to facilitate this need.

The USGS has a vast knowledge of the geologic and hydrologic characteristics of the Ogallala Formation and was able to utilize various layers of data in a Geospatial Information System (GIS) for visualizing and querying. Several criteria needed to be established for properly locating suitable areas for installing monitoring wells. The Program's goal for the High Plains region is the same as for all other regions of study – to analyze water samples collected from near the top of the water table. It's also important that this monitoring takes place in areas where the land use practices are potentially impacting groundwater quality through the use of agricultural chemicals so only areas of irrigated agriculture were selected.

The Ogallala aquifer can vary greatly in saturated thickness and this can greatly affect both the long-term usability of a monitoring well and accuracy of the well in collecting a representative sample of the aquifer. A criteria was set at 50 ft or greater for saturated thickness. Lastly, a suggested well construction blueprint was decided on, and that in combination with the Program's available budget, resulted in capping the total well depth at 200 ft below ground surface. With long-term use in mind it was decided that the top of a 10-ft section of 2" screened Schedule 40 PVC would need to be set at least 5 ft below the top of the current water table.

Additionally, a 5 ft sump was installed at the bottom of the 10 ft screened section to capture sediment. Therefore, the preferred depth to water that would facilitate a total well installation without exceeding a maximum depth of 200 ft, was 180 ft below ground surface. All the above data layers were compiled in GIS and all area in the High Plains

that met the criteria was created. It was then possible to split the area into 30 equal area polygons. As can be seen in Figure 13 there are several contiguous equal area polygons but there are also some that have bits and pieces scattered across several square miles, like '14'. There appears to be two major areas of the Ogallala in Phillips and Yuma Counties which meet our requirements for suitable areas, while some other areas have scattered availability.

The next step was to generate a random grid of samples across the 30 equal area polygons so that each polygon had one well location. The program used by USGS for this purpose was ran a total of three times so that there were three options to pick from for each polygon. USGS personnel then visited the landowners in areas around the generated locations to obtain permission for installing a monitoring well.

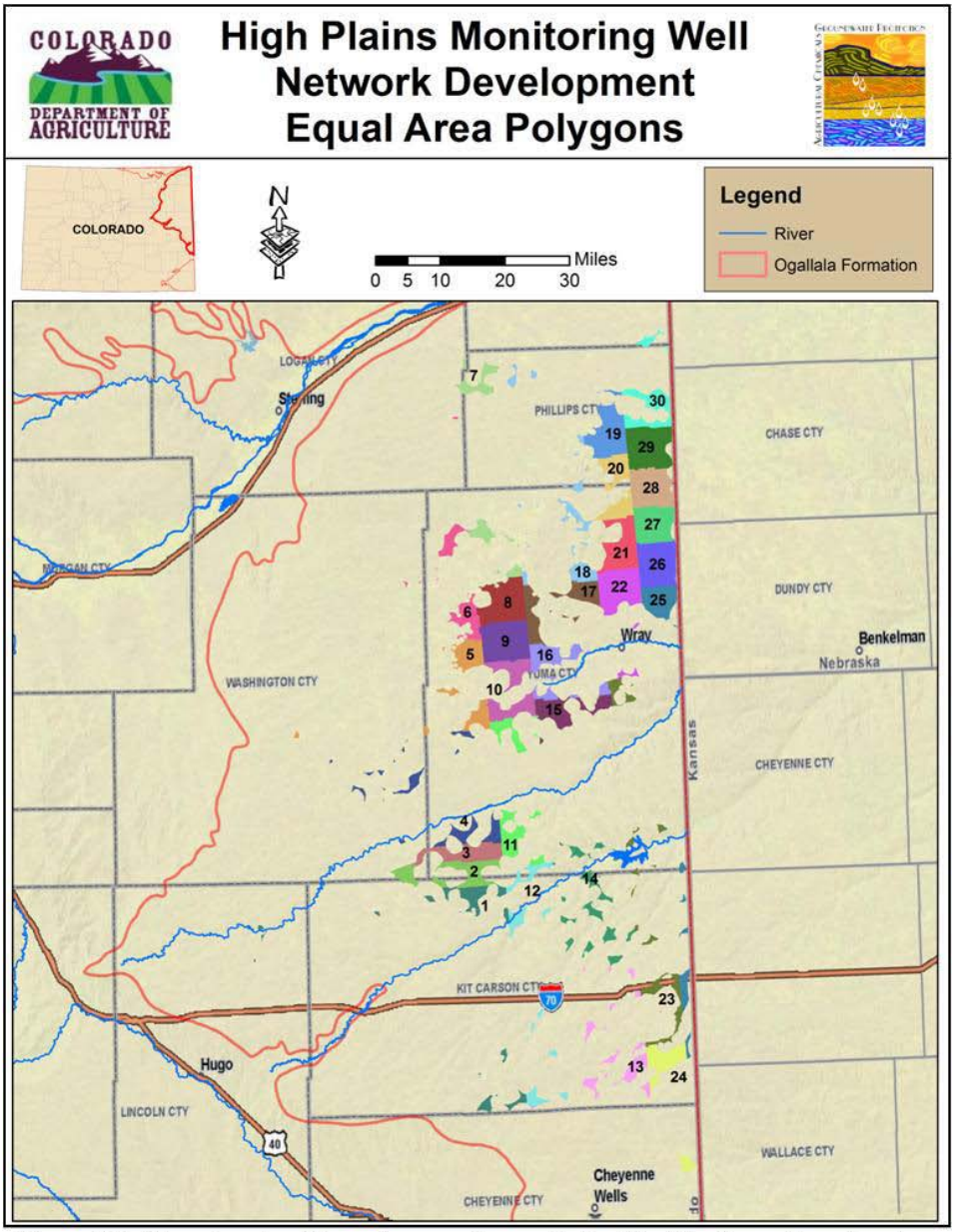


Figure 13. Map showing 30 equal area polygons in the Ogallala Formation of eastern Colorado that meet the following criteria: within area of irrigated agriculture, less than 180 ft to groundwater, and at least 50 ft of saturated thickness.

Due to budgetary constraints, only 20 of the 30 polygon areas were able to have a monitoring well installed in 2008. Figure 14 shows the spatial distribution of these 20 monitoring wells. USGS personnel were onsite for geologic logging and oversight of drilling operations. After the installation of monitoring wells, USGS was also responsible for thoroughly developing the wells to remove sediment from the screened portion and establish a hydraulic connection between the well and the water bearing material of the aquifer. A thorough report is being completed by USGS and documents all of the above information to greater detail and provides geologic logs and data acquired during well development activities. At the time of this writing the report had not yet been published.

The 20 well network was sampled in November 2008 and all samples were analyzed for 100+ pesticide active ingredients, nitrate- and nitrite-nitrogen, basic inorganic nutrients, and dissolved metals. Due to well depths, all wells had to be sampled with a Grundfos RediFlo2 pump using conventional sampling methods, and a flow-cell with multi-parameter stabilization, where possible. One well near Joes, CO was not able to be sampled because of inadequate well volume. Two other problematic wells had to be purged dry and allowed to recharge several times before sampling because their productivity was too low to keep up with the withdrawal rate of the Grundfos. With such a large head in these deeper wells, a sufficient column of water in and even above the screened interval is essential, especially if the well is slow to recharge.

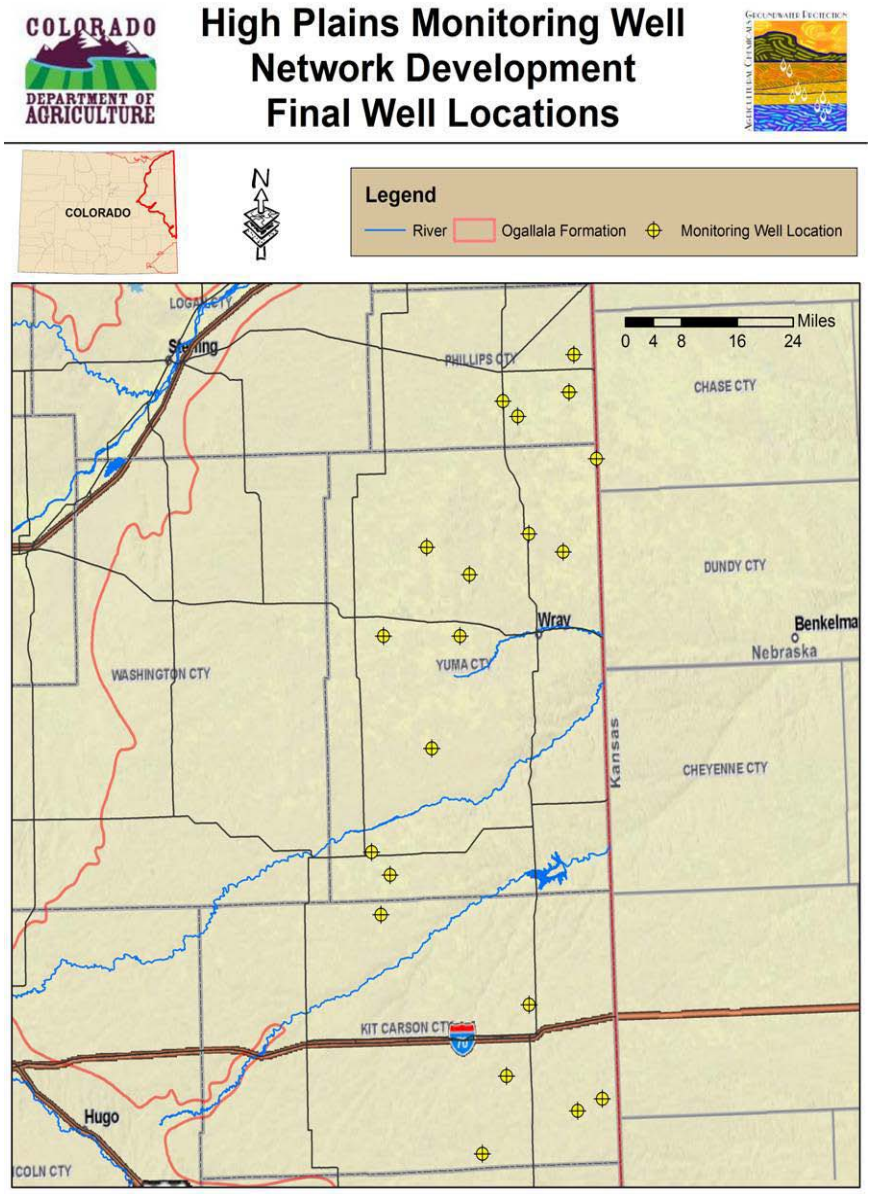


Figure 14. Map showing the distribution of 20 monitoring wells installed by the Colorado Department of Agriculture as part of the High Plains Network.

It is not clear if the well near Joes, CO will gain in volume by the next sampling event, but it is likely this well will have to be sampled with the low-flow bladder pump method.

Nitrate Results

Of the 19 wells sampled in 2008, five were over the EPA Drinking Water Standard for nitrate of 10.0 ppm. The median nitrate-nitrogen value for all wells is 5.84 ppm, the 75th percentile value is 10.31 ppm, and the maximum is

32.91 ppm. As can be seen in Figure 15, there does not seem to be a clear relationship between static water level and nitrate-nitrogen concentration; however, the highest concentration of 32.91 ppm, which is designated by the lone red nitrate symbol, was in a well with the shallowest water table at about 70 ft below ground surface. While depth to groundwater is important in determining vulnerability to nitrate contamination, it is known that other factors are at play in the mechanics of nitrate movement. Data from samples collected in 2008 further demonstrates this.

No groundwater quality concerns were raised due to analysis of the other inorganic nutrients and dissolved metals. All total dissolved solids were less than 800 ppm with a median less than 450 ppm, and all pH values were between 7.2 and 8.0. As baseline data for this newly installed monitoring well network, the results show that water in the Ogallala Aquifer, where we sampled it, is of good quality for both irrigation and drinking except for several locations that had elevated nitrate levels.

Pesticide data for the High Plains region resulted in two detections of dicamba at levels of 1.018 and 0.678 ppb. Both amounts are well below the Health Advisory Level of 200 ppb. These were the first ever detections of dicamba by our Program in the Ogallala Aquifer. They were both north of Wray.

MACROINVERTEBRATE SAMPLING

High Plains Network 2008 Results

Static Water Level and Nitrate-nitrogen Concentrations

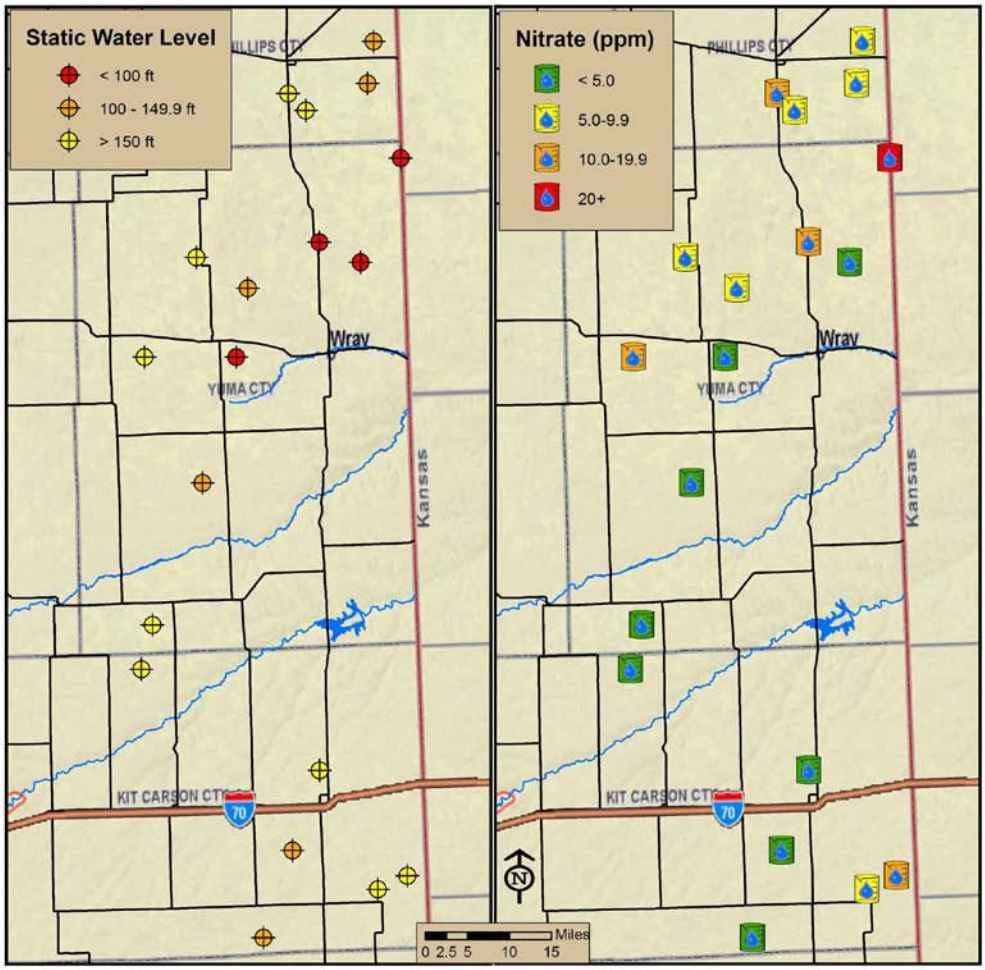


Figure 15. Map showing the static water level and nitrate-nitrogen concentration in monitoring wells sampled in 2008 as part of the High Plains Network.

C2. Safe Drinking Water Program

This Section provides an overview of the Water Quality Control Division's (WQCD's or the Division's) safe drinking water programs. This section is new to the 305(b) report and is intended to provide the reader with a an understanding of the State's water programs.

Colorado Safe Drinking Water Program

The Colorado Safe Drinking Water Program ensures that Public Water Systems always provide safe drinking water to their constituents. The program adopts and enforces regulations and provides assistance and incentives that further protect the quality of drinking water supplied by public water systems. The Safe Drinking Water Program of the Colorado Department of Public Health and Environment is housed within the Water Quality Control Division which administers two major federal statutes as authorized by Colorado law: the Clean Water Act (CWA) and the Safe Drinking Water Act (SDWA).

The sections/units that implement the overall Safe Drinking Water Program and the services provided to external entities by each unit are depicted below.

- Compliance Assurance and Data Management Section

Responsible for compliance assistance and assurance (enforcement) for all rules of the Colorado Primary Drinking Water Regulations, monitoring schedules, guidance document and reporting forms development, and inventory requests.

- Engineering Section

This section designs reviews, monitors waiver evaluations, performs sanitary surveys, and provides assistance responding to water treatment or distribution system failures, water quality/safety complaints/inquires, revolving loan fund eligibility determinations.

- Source Water Protection Program/State Revolving Funds

Responsible for the source water protection program, source water protection management plan development assistance, planning and design grants, and infrastructure improvement state revolving loan processing. (The SWAP Program and the SRF Program are discussed in depth in Section B2 of this report.

- Capacity Building Unit

This unit provides assistance in helping water systems achieve their full potential to provide the best drinking water for Colorado now and for future generations. The program also provides performance evaluations, performance improvement assistance, hosts an excellence program, training events, provides management tools, rate setting tools, and assists with operator certification reimbursement.

- Emergency Response and Security

Provides assistance responding to water treatment or distribution system tampering events, security and emergency response guidance documents, assists with vulnerability assessment and emergency response planning tools, and reporting information and forms.

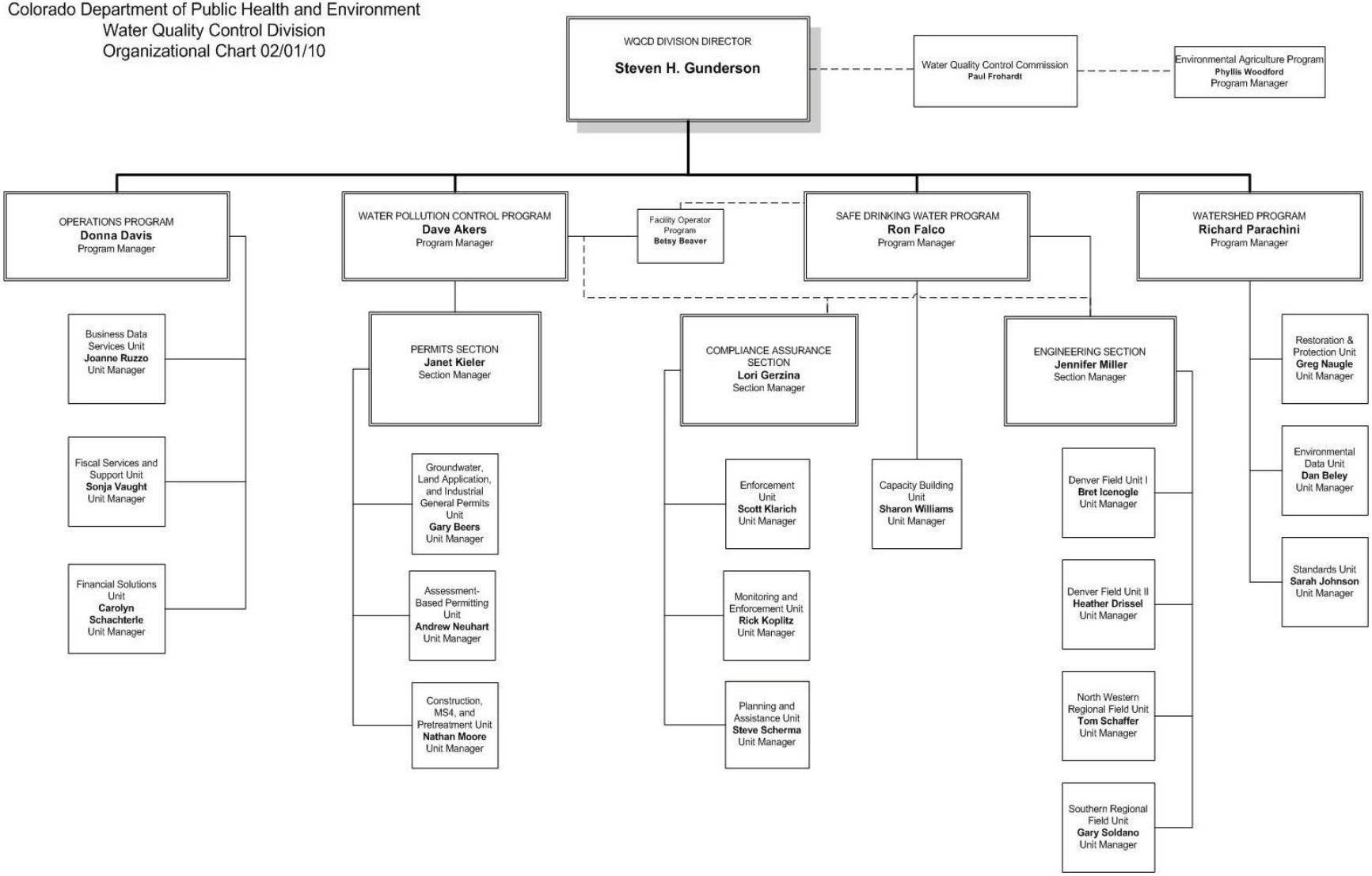
- Excellence Program

The Colorado Safe Drinking Water Excellence Program is an initiative being sponsored by the Colorado Safe Drinking Water Program within of the WQCD. The program's mission is to continuously improve public water system performance and public health protection in Colorado.

An organizational chart for the WQCD is included on page C2-2 for better clarity.

Fun Fact: *The Platte River, whose name means "flat" was named by early French trappers and explorers. The Native Americans in the region named it Nibraskier, a similar word for flat.*

Colorado Department of Public Health and Environment
Water Quality Control Division
Organizational Chart 02/01/10



Monitoring and Evaluation

Public water systems are required to monitor the quality of the water distributed to their consumers and ensure that water provided to consumers does not exceed promulgated health-based maximum contaminant level or treatment technique requirements. The required monitoring includes determination of the level of microbiological, chemical, physical, and radiological contaminants in their drinking water. The levels of detected contaminants are compared to an allowable maximum contaminant level. Detection of a contaminant in a finished water supply above the allowed maximum contaminant level may require public notification, and, in the case of a maximum contaminant level violation, the notification must include health effects information and explain any need for an alternate water source such as bottled water. Further, public water systems that exceed allowable levels of contaminants may be required to add or modify operational practices to reduce the contaminant level and achieve compliance.

The frequency of required monitoring is dependent on the type of water system, the water source, and the presence of contaminant generating activities in the area surrounding the water source. All public water systems must test for microbiological contaminants. Because of the short-term exposure of the population at transient non-community systems, the only chemical monitoring requirement is for nitrate, since this is generally the only common acute chemical contaminant. Non-transient non-community public water systems and community public water systems must monitor for many chemical contaminants because of the potential long-term exposure of the water users. Systems using surface water supplies have different monitoring requirements than ground waters due to the different paths of contamination that the water sources are exposed to.

BRIGHTON, CO PLANT

Certain monitoring requirements may be reduced through an assessment by the division of the vulnerability of the water supply. These vulnerability assessments are an evaluation of any existing sources of contamination that may affect the quality of the source water prior to treatment.

Enforcement Activities

The escalating enforcement process for drinking water is similar to that employed by the division for wastewater discharges:

- Identification of violation
- Informal notification of public water system
- Formal notification of public water system
- Formal enforcement action

This predictable escalation of response to violations is predicated on the assumption that regulated entities generally desire to be in full compliance and that violations are generally the result of accidents or ignorance of all requirements. Egregious violations resulting in environmental harm or disease outbreaks or willful violations (such as those associated with data falsifications) demand the immediate and full application of the division's formal enforcement and penalty authorities.

Consumer Confidence Report

Another mechanism to help assure long-term compliance by public water systems is the requirement to provide consumer confidence reports. The report must include:

- the telephone number and name of the system's local contact and information about public participation opportunities;
- all sources of drinking water used by the system including a summary of the Source Water Assessment Report (SWAP) if completed;
- the treatment techniques used;
- definitions of terms used in the report;
- a list of all contaminants tested for;
- table(s) that lists contaminants detected in the water the last time they were tested. This table must include the date of sample, the applicable standards, the level detected, most likely source of the contaminant and any required health effects information; and
- any violations for the reporting year including length of the violation, any pertinent health effects information, and steps the system is taking to correct the violation;
- other required information regarding drinking water and vulnerable populations as required by the US EPA;
- the telephone number of the EPA hotline.

The Colorado program provides extensive assistance to water systems to ensure their compliance with the Consumer Confidence Report requirements

Town of Eagle, CO Sanitary Survey

Engineering

The engineering section operates under the safe drinking water program as well as the water pollution control program. The section performs wastewater and drinking water design reviews, as well as technical assistance and inspections. There are two Denver Field Offices, a North Western Regional Field Unit located in Grand Junction, CO, and a Southern Regional Field Unit located in Pueblo, CO. District engineers and Drinking water engineers are assigned to all of Colorado's counties.

The engineering section also regulates grey

water reuse in Colorado. Grey Water refers to the reuse of water from baths, showers, washing machines, and sinks (household wastewater excluding toilet wastes) for irrigation and other water conservation applications. Practically speaking, the use of Grey Water systems is not viable for most homeowners in Colorado. Currently, the treatment, disposal, and potential use of Grey Water is regulated by the State of Colorado *Guidelines On Individual Sewage Disposal Systems* (http://www.cdphe.state.co.us/regulations/wqccregs/100306individualsewagedisposalsystems.pdf) and applicable county Individual Sewage Disposal System (ISDS) regulations. The Colorado Department of Public Health and Environment (CDPHE) does not currently separate Grey Water from blackwater in its regulations. Consequently, surface applications require permitting and monitoring. Application of Grey Water from systems discharging 2,000 gallons or more per day requires site location and design approval (http://www.cdphe.state.co.us/regulations/wqccregs/100222wqccdomesticwwtworks.pdf) prior to construction of the Grey Water System and a discharge permit from the CDPHE; smaller systems require permits from the local health department.

Capacity Building Unit

The purpose of the Capacity Building Unit of the Safe Drinking Water Program is to provide training, technical assistance, and management support services to public water systems so they can strengthen their ability to supply safe drinking water to the public. Unit activities include:

• **Coaching and Assistance** • **Drinking Water Excellence Program** • **Capacity Building Partners**	• **Training Events** • **Security and Emergency Response** • **Unit Reports and Publications**

The goal of the Colorado capacity development program is to assist public water systems to eliminate technical, managerial and financial capacity deficiencies and thereby ensure the consistent delivery of safe drinking water. The capacity development program identifies capacity deficiencies both in systems that are currently in compliance, and in systems that are not in full compliance. Once a system's capacity deficiencies are identified, resources are directed to assist systems to eliminate the deficiencies. The division intends for this capacity development program to better enable co's public water systems to consistently provide safe drinking water, thereby preventing waterborne diseases.

Technical capacity: is the physical and operational ability of a water system to consistently provide safe drinking water. Technical capacity refers to the physical infrastructure of the water system, including the adequacy of source water and the adequacy of treatment, storage, and distribution infrastructure. It also refers to the ability of system personnel to adequately operate and maintain the system and to appropriately apply technical knowledge to consistently provide safe drinking water.

Managerial capacity: is the ability of a water system to conduct its affairs in a manner that ensures that the system achieves and maintains compliance with the Colorado primary drinking water regulations.

Fun Fact: *The United States Federal Government owns more than one-third of the land in Colorado.*

Managerial capacity refers to the system's institutional and administrative capabilities and considers the structure, and constructive linkage to external entities including customers, regulators and assistance sources.

Financial Capacity: is a water system's ability to acquire and manage sufficient financial resources to allow the system to achieve and maintain compliance with the co primary drinking water regulations. Associated elements include having sufficient revenue to cover costs, access to credit through public or private sources, and use of standardized and accepted accounting, budgeting, and planning techniques.

Colorado Drinking Water Excellence program

The Colorado Drinking Water Excellence Program, hereafter referred to as the "Excellence Program," is an initiative sponsored by the Colorado Safe Drinking Water Program within the Water Quality Control Division (Division) of the Colorado Department of Public Health and Environment (CDPHE). The Colorado Safe Drinking Water Program originally introduced the concept of an Excellence Program in the Colorado Capacity Development Work Plan for SFY 2006-2008. The goal of the program is to help develop water system capacity and improve the performance of water treatment plants in Colorado.

The Colorado safe drinking water excellence program is a new state-wide initiative within the WQCD designed to continuously improve public water system performance and public health protection in Colorado through:

- Creating a definition of excellent performance for Colorado public water systems, and
- Providing advanced training in excellent performance, and
- Recognizing and awarding excellent performance from public water systems and individuals

FROM KNOWLEDGE, PERFORMANCE

Colorado Drinking Water Excellence Program

CoWARN

Another program in which the Division participates is the CoWARN Program. It is a formalized system of "utilities helping utilities" designed to facilitate mutual aid during emergency situations. Its infrastructure includes a secure web-based event tracking system and a practical mutual aid agreement designed to reduce bureaucratic red tape. Participation in any response is voluntary, and membership in CoWARN does not obligate members to offer aid. CoWARN's mission is to support and promote statewide emergency preparedness, disaster response, and mutual assistance matters for public and private water and wastewater utilities for natural and human-caused events.

CoWARN is *NOT* a for-profit organization or a government program. It is a partnership between utilities, the state primacy agency, and utility professional organizations. CoWARN's overhead is financed by the Colorado Dept. of

Public Health & Environment (CDPHE); however, operational and procedural decisions are made by the utilities themselves.

CoWARN works with its various partners, linking the Colorado Water community to provide these resources and services:

- Business Continuity Planning
- Preparedness Aids - *Tools and security protocols to aid in continual risk assessment and updating Emergency Response Plans.*
- Message Mapping - *A series of updated boiler-plate public information and press release templates tailored to provide immediate public response.*
- Communications -
    - *Annual statewide meetings to bring together both significant state authorities and national interests, providing the best and latest insights to power a utility's ongoing preparedness process. These meetings will include workshops in utilizing CoWARN to the best advantage.*
    - *Technologies to facilitate sharing of information between members.*
- Outreach - *Through cooperating entities, CoWARN will offer emergency preparedness and related regulatory liaison services to requesting members.*
- Exercises & Training

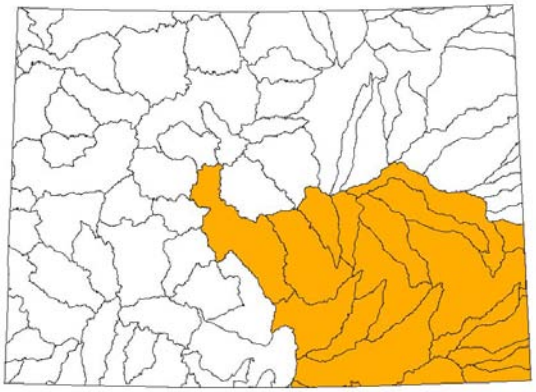
Through CoWARN, technical support was provided to Alamosa during the *Salmonella* outbreak mentioned in the executive summary of the 305(b) report. Because of CoWARN, assistance from so many disparate sources was mobilized very quickly.

Fun Fact: *A dry wash or ephemeral stream flows during and for a short time after rain or snowmelt. Other names for a dry wash include: draw, gully, swale, arroyo, and gulch.*

D. Use Support by Basin

This Section provides an overview of the beneficial use attainment by basin. There are 7 basin systems in Colorado : Arkansas, Rio Grande, San Juan, Colorado, Green, Platte, and Republican.

Arkansas River Basin



The Arkansas River Basin is the largest basin in Colorado (29,904 square miles), based on drainage area. Major tributaries within the basin include: Fountain Creek, Huerfano River, and the Purgatoire River. The headwaters originate near Leadville, and then run through the southeastern part of Colorado, where it leaves the State near the town of Holly. The major population centers in the Arkansas River Basin are Leadville, Colorado Springs, Pueblo, Las Animas and Lamar. The sub-basins include: Upper Arkansas River, Middle Arkansas River, Fountain Creek, Lower Arkansas River and the Cimarron River. Major reservoirs in the Arkansas Basin include Pueblo Reservoir, John Martin Reservoir, Great Plains Reservoir System, Twin Lakes Reservoir, and Turquoise Lake.

Assessment Results

For the Arkansas River Basin 28.9% of the river miles and 16.1% of the lake acres are fully supporting all classsified uses. For lakes another 5.45% of acres are supporting at least some of the classified uses. The individual use support for the Arkansas Basin waterbodies is summarized in the following table (Table 20).

Table 20: Impairment Summary for the Arkansas River Basin

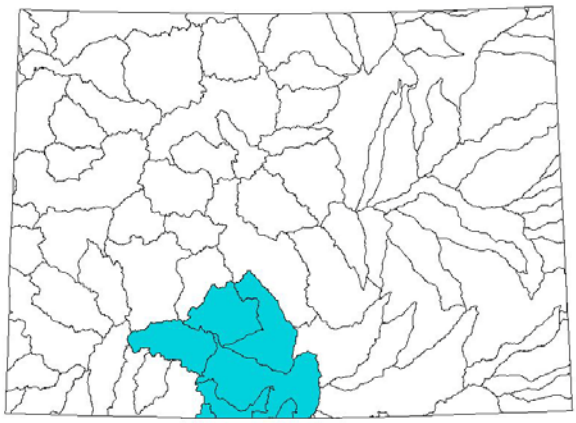
EPA IR Category	River Miles	Lake Acres
1 - Fully Supporting	6,356	9,698
2 - Some Uses Supporting	586	3,282

3 - Insufficient Data, including waters on the M&E list	11,943	12,570
4a - TMDL Completed and Approved	213	0
4b - Impaired no TMDL Necessary	0	0
4c - Impaired Naturally, Placed on the M&E list	0	0
5 - Impaired and TMDL Necessary	2,850	34,618

Pueblo Reservoir

Rio Grande Basin

The Rio Grande Basin is located in south-central Colorado, and covers 7,700 square miles. The basin ranges from above 14,000 feet above sea level in the Sangre de Cristo Mountains to 7,400 feet above sea level where the Rio Grande crosses the Colorado/New Mexico border. The principal tributaries of the Rio Grande are the Alamosa River and the Conejos River. Major reservoirs in the Rio Grande basin include Rio Grande Reservoir, La Jara Reservoir, Platoro Reservoir, Continental Reservoir, and the San Luis Lake.



Assessment Results

For the Rio Grande Basin 53.5% of the river miles are fully supporting all classified uses, with an additional 20% supporting at least one of the classified uses. For lakes within the Rio Grande Basin, 8.8% of the lake acres are fully supporting all classified uses, with an additional 20.5% supporting at least one of the classified uses. The individual use support for the Rio Grande Basin is summarized in the folowing table (Table 21).

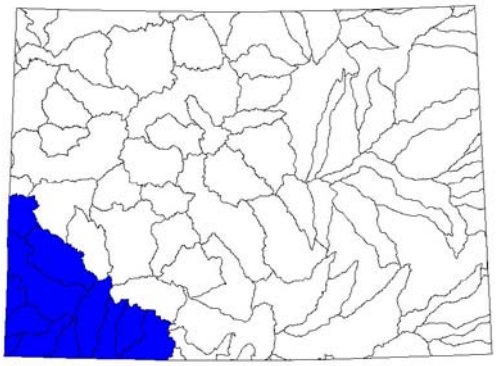
Table 21: Impairment Summary for the Rio Grande Basin.

EPA IR Category	River Miles	Lake Acres
1 - Fully Supporting	3,024	499
2 - Some Uses Supporting	1,139	1,153
3 - Insufficient Data, including waters on the M&E list	1,248	1,844
4a – TMDL Completed and Approved	142	0
4b – Impaired no TMDL Necessary	0	0
4c - Impaired Naturally, Placed on the M&E list	0	0
5 - Impaired and TMDL Necessary	90	2,127

Alamosa Canyon

San Juan River Basin

The San Juan and Dolores Rivers in southwestern Colorado are both tributary to the Colorado River. The principal tributaries of the San Juan River are the Animas, Florida, La Plata, Los Pinos, Mancos, and Piedra Rivers. The main tributary of the Dolores River is the San Miguel River. The San Juan River and tributaries pass through the Ute Mountain Indian Reservation and the Southern Ute Indian Reservation before exiting the state. The major population areas are Cortez, Durango, and Pagosa Springs. Major reservoirs in the San Juan basin include Ridgeway Reservoir, Mc Phee Reservoir, Vallecito Reservoir and Narraguinnep Reservoirj.



Assessment Results

For the San Juan River Basin, 42.2% of the river miles are fully supporting all classified uses. An additional 18.8% of the river miles are supporting at least one classified use. The individual use support for the San Juan Basin is summarized in the following table.

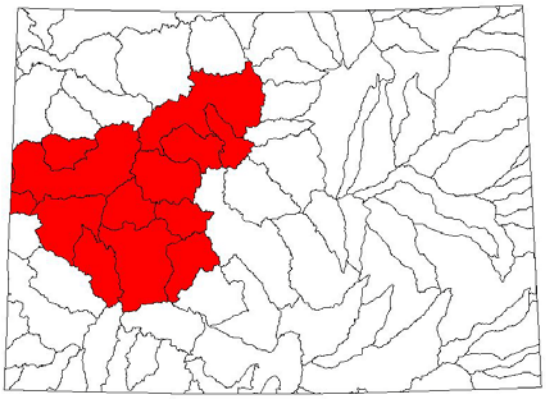
Table 22: Impairment Summary for the San Juan River Basin.

EPA IR Category	River Miles	Lake Acres
1 - Fully Supporting	2,780	1,654
2 - Some Uses Supporting	1,240	323
3 - Insufficient Data, including waters on the M&E list	2,264	5,227
4a – TMDL Completed and Approved	127	0
4b – Impaired no TMDL Necessary	0	0
4c - Impaired Naturally, Placed on the M&E list	0	0
5 - Impaired and TMDL Necessary	170	8,387

La Plata River

Colorado River Basin

The Colorado River Basin is the second largest basin in Colorado (22,200 square miles). The quantity of flows through the basin is greater than the combined flows of all the other basins in the state. Major tributaries to the Colorado River include: the Blue, Eagle, Roaring Fork, and Gunnison Rivers. The major population centers in this basin are: Grand Junction, Glenwood Springs, Gunnison, Montrose, Aspen, Delta, and Vail. Major reservoirs in the Colorado River basin include Blue Mesa Reservoir, Sweitzer Lake, and Ruedi Reservoir.



Assessment Results

For the Colorado River basin 48.8% of the river miles and 51.7% of the lake acres are fully supporting all uses. An additional 18.7% of the river miles, and 3.7% of the lake acres, are supporting some of the classified uses. The individual use support for the Colorado Basin is summarized in the following table (Table 23).

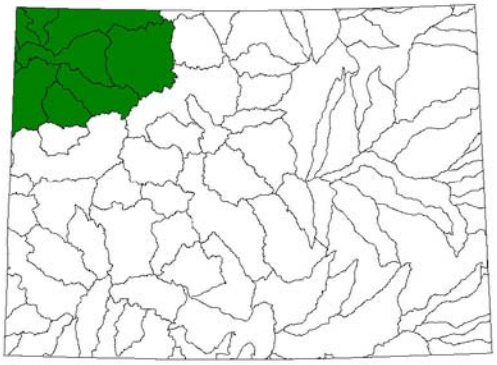
Table 23: Impairment Summary for the Colorado River Basin.

EPA IR Category	River Miles	Lake Acres
1 - Fully Supporting	10,840	25,570
2 - Some Uses Supporting	4,163	1,858
3 - Insufficient Data, including waters on the M&E list	3,817	12,613
4a – TMDL Completed and Approved	72	0
4b – Impaired no TMDL Necessary	4	0
4c - Impaired Naturally, Placed on the M&E list	0	0
5 - Impaired and TMDL Necessary	3,946	9,344

Eagle River above Squaw Creek

Green River Basin

The Green River Basin is comprised of the Yampa and the White River Basins, the principal Colorado tributaries to the Green River. The Yampa and the White Rivers are among the least developed rivers in Colorado. They originate in the high alpine forests of the Flat Tops Wilderness Area. This basin is sparsely populated and the largest city is Craig, Colorado. Major reservoirs in the Green River basin include Elkhead Reservoir, Kenney Reservoir, and Rio Blanco Lake.



Assessment Results

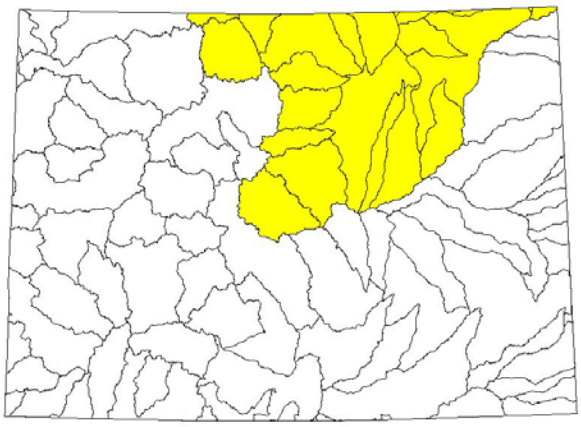
The Green River Basin has 26.7% of the river miles, and 6.0% of the lake acres fully supporting all designated uses. Additionally, 36.5% of the river miles, and 5.8% of the lake acres are supporting at some of the classified uses. The individual use support for the Green Basin is summarized in the following table (Table 24).

Table 24: Impairment Summary for the Green River Basin.

EPA IR Category	River Miles	Lake Acres
1 - Fully Supporting	4,243	1,629
2 - Some Uses Supporting	5,795	1,595
3 - Insufficient Data, including waters on the M&E list	5,294	9,574
4a – TMDL Completed and Approved	0	0
4b – Impaired no TMDL Necessary	0	0
4c - Impaired Naturally, Placed on the M&E list	0	0
5 - Impaired and TMDL Necessary	533	14,311

Pelicans in Kenney Reservoir, Photo by BLM

Platte River Basin



The Platte River Basin covers approximately 21,000 square miles in northeastern Colorado. The North and South Platte Rivers join in Nebraska to form the Platte River. The South Platte River has the largest population of any river basin in Colorado with almost 3 million people, or almost 70% of the state's population. The major tributaries of the South Platte are Bear Creek, Cherry Creek, Clear Creek, Boulder Creek, St. Vrain River, Big Thompson River and the Cache La Poudre River. Major reservoirs in the Platte River basin include Cherry Creek Reservoir, Chatfield Reservoir, Barr Lake, and Horse Creek Reservoir.

Assessment Results

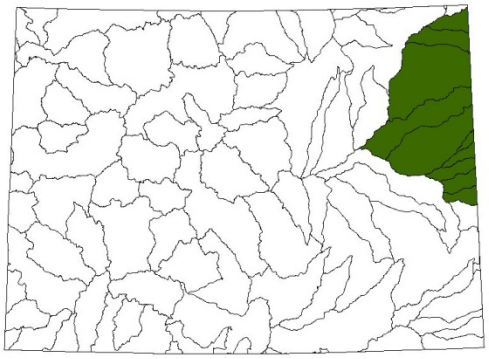
For the Platte River Basin 32.4% of the river miles are fully supporting, with an additional 18.9% supporting at least some of the uses. In terms of the precentage of river miles fully supporting, the South Platte River basin, with the largest population, is comparable to the Green River basin, one of the most sparsely populated basins in Colorado. For lakes within the Platte River Basin, 0.25% of the lake acres are fully supporting. Additionally, a further 32.7% of the lake acres are supporting at least some of the classified uses. The individual use support for the Platte Basin is summarized in the following table (Table 25).

Table 25: Individual Use Summary for the Platte River Basin.

EPA IR Category	River Miles	Lake Acres
1 - Fully Supporting	5,371	228
2 - Some Uses Supporting	3,413	29,517
3 - Insufficient Data, including waters on the M&E list	4,921	50,069
4a – TMDL Completed and Approved	78	0
4b – Impaired no TMDL Necessary	46	0
4c - Impaired Naturally, Placed on the M&E list	0	0
5 - Impaired and TMDL Necessary	2,997	10,211

South Platte River, North Denver Colorado

Republican River Basin



The Republican River Basin covers the northeast High Plains of Colorado. Yuma, Holyoke, and Burlington are the largest cities in this sparsely populated basin, where the population represents less than 1% of the State's population. The Republican is the only large river basin in the state that does not have headwaters in the mountains. The area depends primarily on groundwater from the Ogallala Aquifer for irrigating cropland and providing domestic water for farm communities. In 2004, the Republican River Water Conservation District was formed to respond to Colorado's requirements under the recently revised interstate compact.

Assessment Results

For the Republican River Basin, 1.1% of the river miles are fully supporting 55.4% of all designated uses. The individual use support for the Republican Basin is summarized in the following table (Table 26).

Table 26: Individual Use Summary for the Republican River Basin.

EPA IR Category	River Miles	Lake Acres
1 - Fully Supporting	66	0
2 - Some Uses Supporting	17	0
3 - Insufficient Data, including waters on the M&E list	5,484	7,668
4a – TMDL Completed and Approved	0	0
4b – Impaired no TMDL Necessary	0	0
4c - Impaired Naturally, Placed on the M&E list	0	0
5 - Impaired and TMDL Necessary	88	0

Republican River