

# Upper Yampa River Watershed Plan



## *Protecting and Managing Long Term Health*

**A Collaboration of the Upper Yampa Technical Committee, Watershed Group  
and Constituents**

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# Upper Yampa River Watershed

## Plan -

### Protecting and Managing Long Term Health

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*Protecting and Managing Long Term Health*  
May 2016

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## Executive Summary



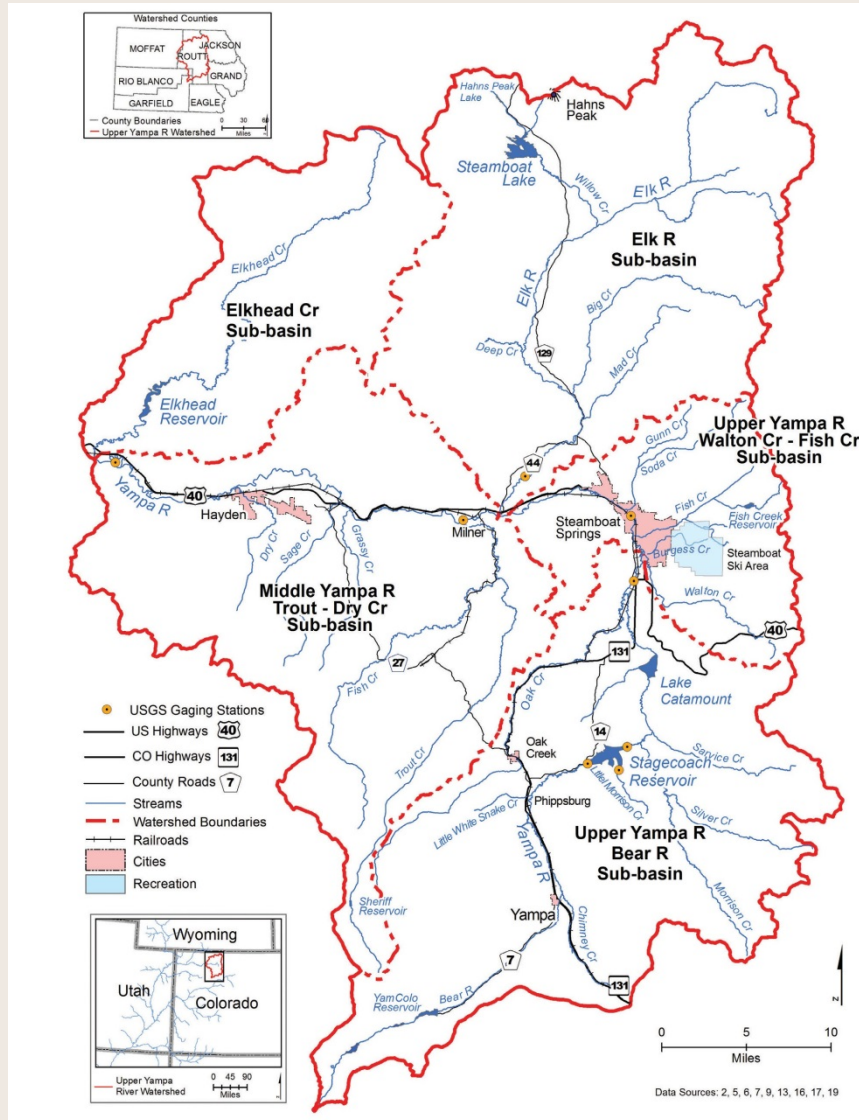
### What

The Upper Yampa River Watershed Plan (WP) is the culmination of decades of collaborative efforts to protect and enhance the health of the Upper Yampa River Watershed (UYRW). The Upper Yampa Watershed Group (UYRWG) initiated the development of the Plan in 2013 and is committed to maintaining and improving the physical, chemical, and biological health of the upper Yampa River and its tributaries. By creating a non-regulatory watershed plan, the UYRWG hopes to increase local partnerships and their capacity to protect and enhance water quality, promote water conservation, and sustain and improve the present health of the watershed.

A watershed is an area of land from which all water drains to a common point, a hydrologic system within which all living things are inextricably linked. Watershed health is influenced by both natural processes and human activities and is important for drinking water, agriculture, recreation, and ecological integrity. As water moves through a watershed the surface and sub-surface conditions affect the quality of water.

The UYRW planning area is approximately 1,800 square miles and extends from the headwaters of the Yampa River to the confluence of, and including, Elkhead Creek (figure below). The Yampa River is a snow-melt dominated river system which is typical of drainage basins located at high elevations where a majority of annual precipitation occurs as snow in winter months then melts and runs off over a relatively short time period in spring and early summer.





Accordingly, flows vary considerably across seasons. The river carries tons of sediment over its sand, gravel and cobble beds before its confluence with the Green River in Dinosaur National Monument. The system supports consumptive (municipal, agricultural, industrial) and non-consumptive (environmental, recreational) uses. The continued tradition of agricultural flood irrigation augments groundwater aquifers and creates wetlands which can assist with late season return flows to the river.

The primary focus of the WP is on preventing water quality degradation through the implementation of improved practices relative to non-point sources of contamination entering waterways through stormwater run-off. Riparian area protection and restoration; improving watershed connectivity; and maintaining the ecological balance of riparian, wetland, upland & aquatic biota are also priorities.

## Why

Although water quality in the UYRW is generally good, current water quality data indicate trends that warrant continuous monitoring. Thus, the WP identifies needs for watershed health protection going forward. These include encouraging the use of management practices that address ecosystem function, surrounding land use, and the ability of the river system to support the demand of the local communities. For community members and water users to fully comprehend the Yampa River system and the aquatic ecosystem, water quality and quantity must be considered holistically.

An approved WP opens the door for potential funding to implement well-thought-out projects in the future.

## How

Maps were created to aid in the understanding of features and influences on water quality both on a watershed scale and at the sub-basin level. Impaired stream segment information from the Colorado Department of Public Health and Environment (CDPHE) was further analyzed. Using both vetted water quality monitoring data and watershed health indicators, each of the five sub-basins was assessed resulting in the creation of “snapshots” of each. Results are outlined below.

Trends of concern watershed-wide include:

- increases in sediment loading;
- riparian area degradation; and
- non-native species encroachment.

### Bear River Sub-basin - Outstanding Waters / Anti-degradation designated streams

- Normal seasonal bedload alterations in main stem of Yampa below the Catamount dam causing sediment issues between Lake Catamount and Chuck Lewis State Wildlife Area
- Erosion from livestock grazing practices
- Forest fires having the potential to threaten water supplies and water quality
- Contaminated runoff from historic mining-related runoff

- Elevated zinc & dissolved iron in Little Morrison Creek (some natural some human-induced)
- Yampa River below Stagecoach Reservoir – elevated selenium & manganese (some natural some human-induced)
- Elevated temperature (M&E list - drought years)
- Mercury in fish tissue at Stagecoach and Catamount Reservoirs
- Elevated nutrient concentrations in Stagecoach Reservoir and Lake Catamount resulting in accelerated eutrophication
- Blue green algae blooms

Walton Creek/Fish Creek Sub-basin – smallest area with largest population center

- Elevated temperatures and low dissolved oxygen levels (drought years) (M&E List)
- Elevated Manganese
- Loss of wetlands which are necessary to filter stormwater as well as provide infiltration to groundwater
- Urban stormwater runoff carrying contaminants and potentially increasing temperature from impervious surface runoff

Elk River Sub-basin – largest tributary / some Outstanding Waters / Anti-degradation designated streams

- High readings of *E. Coli*
- Elevated Mercury - 303 (d) List
- Added bedload resulting from both several years of record spring runoff as well as poorly designed river channel restoration projects
- Willow Creek/Steamboat Lake outlet
- Damage from in-stream structures

Middle Yampa River - Trout Creek/Dry Creek Sub-basins

- Elevated Phosphorus
- Elevated suspended sediment potentially a result of degradation of riparian areas from unmanaged cattle grazing on leased lands
- One Dry Creek segment on 303 (d) List for exceedance of agricultural and aquatic life standards, Iron, and Selenium
- Sage Creek 303 (d) List for exceeding aquatic life standard for Iron
- Erosion caused by reduced ground cover (noxious weeds, overgrazing)
- Degraded stream banks and eroded channels (Morgan Bottom area)

Elkhead River Sub-basin – USFS Special Interest Area

- Fish tissue Mercury in Elkhead reservoir– (303 (d) List)
- Elevated temperatures due to erosion-caused wide shallow exposed channels and deep vertical mass wasting banks.

Following the identification of water quality trends and concerns, an analysis of potential sources or “stressors” was developed for the WP. These included both immediate and long term issues as they relate to the health of the watershed. As part of this analysis, impacts, impairments and possible solutions have been outlined.

Assessment of data gaps and further evaluation of each sub-basin followed, culminating in the development of a detailed Action Plan.

Finally, a list of potential projects was developed and prioritized.

## Potential Project List 2016

### Priority (in no particular order)

- Hire Watershed Coordinator
- Develop a BMP toolbox tailored to the UYRW and create related website
- Steamboat Lake / Willow Creek pollutant assessment & mitigation
- Elk River sub-basin comprehensive study/plan
- Headgate improvements education/mitigation
- Morgan Bottom Irrigation Delivery & Habitat Improvement
- Stagecoach nutrient management and algal study
- Steamboat Springs Stream Management and Target Flows Study
- CDOT Sediment Plan Implementation
- Native Plant Nursery
- Riparian restoration priorities:
  - Oak Creek
  - Need rapid assessment stream segment strategy in other areas
- Elkhead Riparian improvements and noxious weed management
- Trout Creek/Fish Creek, Foidel Creek Riparian Fencing and Noxious Weed Management
- Oak Creek Stormwater Management
- Outreach & Education

### Secondary

- Nutrient and sediment loading modeling
- Riparian health assessments – implementation plans including Adopt a Stream
- Critical wetlands identification & mapping – protection implementation
- 303(d) list segment sampling – Triennial review participation
- Butcherknife Creek Floodplain Reconnection and Mitigation
- Walton Creek habitat restoration/Pike removal/water temperature reduction
- Oak Creek Mine Drainage Project
- Sheriffs Reservoir wildfire preparedness
- Fish Creek Reservoir wildfire preparedness
- Scoria/Sand recovery and recycling facility
- Small Quantity Generator Hazardous Waste Disposal Education

### In Progress, may need additional support



- Northern Pike, Smallmouth Bass removal
- Mercury in fish tissue
- Thermographs
- Agriculture efficiencies/ return flow study
- Headgate/diversion structures - repairs and replacement
- Range management training
- Water conservation implementation
- Water quality monitoring
- River Watch

## Public Outreach

There are numerous agencies, non-profits, ad hoc groups, political bodies, businesses, recreational retailers and users, and other public and private interests that are active in the UYRW. A goal of the UYRWG is to help bring all willing stakeholders and potential partners together by establishing a network that will increase communication; maximize resources; emphasize collaboration and coordination; and preclude redundancy and duplication of efforts.

## Conclusion

Collaborative and comprehensive water resource management will be necessary as populations in the UYRW continue to grow and water shortages continue to rise throughout the Colorado River Basin. Stakeholder engagement will be critical to the success of holistic watershed planning and protection in the UYRW.



**SPECIAL THANKS IN THE DEVELOPMENT OF THIS PLAN  
TO:**

**UPPER YAMPA WATERSHED TECHNICAL ADVISORY COMMITTEE**

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Todd Hagenbuch, CSU Extension Agent

Bill Chace, River Keeper

Selina Heintz, RCCD Board Member

Christine Shook, NRCS.

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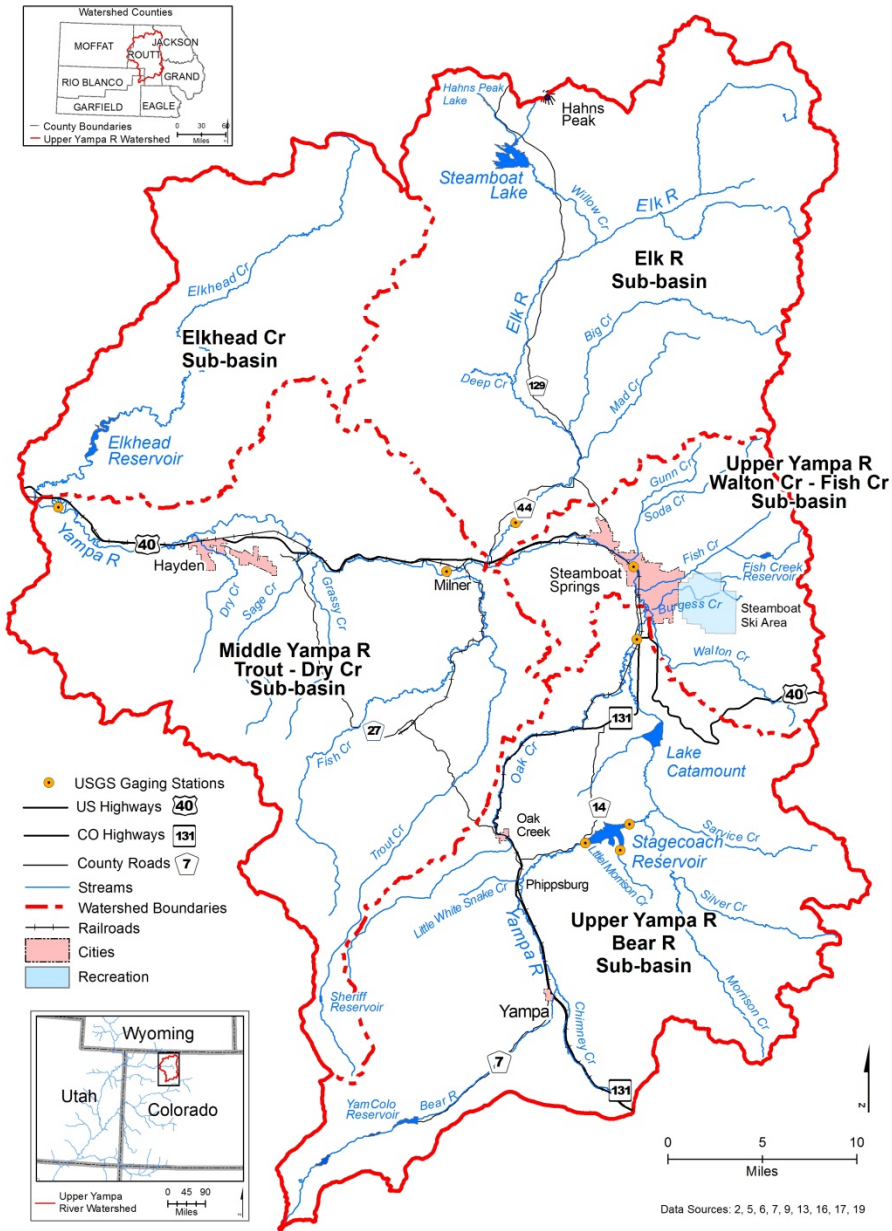
## **Mission Statement of the Upper Yampa River Watershed Group**

*The Upper Yampa River Watershed Group is committed to maintaining and improving the chemical, physical and biological health of the upper Yampa River and its tributaries through the creation of a non-regulatory Plan that informs decision-making and increases local capacity to protect and enhance water quality, promote water conservation, and sustain the present health of the watershed.*

## **Chapter 1. Overview**

The Upper Yampa Watershed Group (UYRWG) operating under the lead agency Routt County Conservation District (RCCD) was re-established in 2011 and represents a collaboration to protect and enhance the long term health of the Upper Yampa River Watershed (UYRW) extending from the headwaters of the Yampa River to the confluence with and including Elkhead Creek (Figure 1.0)

Figure 1.0 Upper Yampa River Watershed Planning Area



In 2014 the UYRWG published the *State of the Watershed Report* (SOTWR) with funding from the Colorado Department of Public Health and Environment, Colorado Water Conservation Board, Environmental Protection Agency, Upper Yampa Water Conservancy District, City of Steamboat Springs, The Nature Conservancy, Trout Unlimited, Routt County, The Town of Oak Creek, and the RCCD. The SOTWR built upon the work of many stakeholder efforts, studies and reports within the past two decades and provided updated information on the upper Yampa River system as a foundation for the development of implementation plans going forward.

This Watershed Plan (WP) is the next step in the process of achieving stated goals by developing implementation strategies using science and technology and spelling out methods for undertaking future implementation practices and projects.

An overarching goal of watershed planning is to be an inclusive, holistic, and collaborative approach that embodies the health and well-being of the environment and its inhabitants as well as supports a healthy economic climate.

#### **What the Watershed Plan Will Address**

- Build on findings and recommendations of *2014 Upper Yampa River State of the Watershed Report* (SOTWR) (see Appendix);
- Focus on a collaborative and holistic non-regulatory management of non-point sources of potential pollution;
- Refine Upper Yampa River Watershed (UYRW) objectives as they relate to the WP;
- Develop specific strategies and action plans;
- Create components of ongoing outreach and education plan;
- Facilitate collaboration plan with related agencies, partners, programs, stakeholders;
- Develop milestones and measurements for progress and success;
- Plan for ongoing water quality monitoring and reporting;
- Prioritize, update and manage current and future project list;
- Meet USEPA Nine Elements for Approvable Watershed Plans;
- Explore and identify future funding sources.

It is also important to document progress toward attaining water quality goals which will be another key focus of the WP and subsequent updates. The planning horizon of this Plan is 5 – 10 years.

## **Chapter 2. Understanding Existing and Potential Water Quality Issues in the UYRW**

The 2014 SOTWR addressed water quality issues both on a watershed-wide scale and at the sub-basin level and generated GIS mapping to better understand and illustrate existing conditions.



The SOTWR is the precursor for and therefore included by reference as a part of this Watershed Plan. It can also be found at <http://routtcountycd.com/> (click on tab in upper right hand corner).

### **Watershed-wide Issues**

Newly created GIS mapping presented in the SOTWR aids in understanding water quality issues and includes watershed-wide drainage patterns; land cover; general geology; and water quality classifications (please see Appendix).

Although water quality in the UYRW is generally considered good, the following natural and human-induced water quality issues were identified on a watershed scale:

- Elevated nutrient contributions potentially leading to accelerated eutrophic characteristics and toxic algal blooms in certain lakes and ponds
- Higher than normal sediment loading in identified areas
- Normal seasonal bedload reduction (exhibited in both major river channels) which is characterized by dramatic increases in the size of point bars and erosion on the banks of outside channel meanders
- Elevated temperature and low dissolved oxygen that potentially stresses the aquatic ecosystem
- Riparian area and wetland degradation/loss
- Degraded stream banks and eroded channels
- Elevated metals and trace elements from historic mining, atmospheric contributions, and potentially other non-point runoff sources
- Impacts on native ecosystems from the proliferation of a variety of invasive species (both flora and fauna)
- Potential impacts from forest alterations.

### **Non-point Source Pollutant Loading and Load Reduction**

#### Regulatory Overview

Under Section 303 (d) of the 1972 Clean Water Act, States are required to list streams and water bodies that are impaired, i.e. do not meet water quality standards for designated uses. As part of this process, States are also required to develop Total Maximum Daily Loads (TMDLs) for impaired waters. A TMDL is the maximum amount of a given pollutant that a water body can receive and still meet water quality standards. TMDLs are expressed as pollutant loads. There are currently no TMDLs established for stream segments in the UYRW. Colorado's current 303(d) list for the UYRW appears in Chapter 6. Each stream segment that is currently listed is also discussed in that chapter.

Colorado also identifies water bodies with suspected water quality problems and lists them on their Monitoring and Evaluation List (M&E). The stream segments in the UYRW that are currently on the M&E list are also included and discussed in Chapter 6.

Nutrient standards have not yet been adopted by the State of Colorado, however in May of 2012 the Water Quality Control Commission adopted nutrient control management regulations (Regulations 85 and 31) which included interim total nitrogen, total phosphorus values and chlorophyll a. The Commission has adopted the interim value for total phosphorus as a numeric standard in waters upstream of domestic wastewater treatment facilities in the upstream waters of the Upper Colorado River Basin. Nutrients are common in stormwater runoff nationwide from both natural and human-related sources, and can be challenging to remove. Secondary impacts from excessive nutrient loading such as accelerated eutrophication, can lead to other costly problems. Dissolved oxygen standards were revised in Colorado in 2011.

#### General Load-reducing Methods

Non-point source management in the UYRW at the watershed scale will focus on the following overarching themes:

- Identifying and reducing non-point pollution sources
- Erosion prevention
- Reducing sediment loading
- Reducing nutrient loading
- Maintaining optimum temperatures
- Improving riparian conditions
- Addressing mining impacts
- Addressing oil & gas impacts.

Management measures will include:

- Floodplain protection
- Wetland protection – identify critical areas for focus (e.g. recharge areas and important habitats)
- Stormwater management (recharge/infiltration; pollutant removal; LID; rain gardens, reduce impervious surfaces, etc.)
- Roadway Management – de-icers, etc.
- Riparian habitat protection/restoration
- Native species protection/enhancements
- Lake eutrophication analysis to develop lake specific plans
- Silviculture management
- Agriculture management (grazing and waterways; crop rotation; minimize tilling, etc.)

- Land use planning and management strategies (setbacks, zoning, etc.)
- Septic system education
- Groundwater education
- Water conservation/efficiency
- Grey water reuse
- Climate change impact management.

**Water Quality Protection and Restoration Issues by Sub-basin (as identified in the SOTWR and USGS Study)**

GIS mapping was created as part of the SOTWR at the sub-basin level for land use; land ownership; point discharges and permitted oil and gas wells; instream flow segments; and known or suspected impaired segment information.

Using both vetted water quality monitoring data and watershed health indicators, each of the five sub-basins was assessed to identify existing and potential water quality issues as well as the factors that influence them. Some of these issues were based on observations by long term locals who reside in the area. Additionally, the SOTWR attempted to begin to compile existing projects and efforts underway to address some of these issues.

Below are summaries of water quality issues in the five sub-basins:

1. Bear River Sub-basin - some Outstanding Waters / Anti-degradation designated streams
  - a. Sediment loading (USFS decommissioned roads, Bushy Creek on 303 (d) list)
  - b. Normal seasonal bedload alterations in main stem of Yampa below the Catamount dam causing sediment issues between Lake Catamount and Chuck Lewis State Wildlife Area
  - c. Riparian area degradation
  - d. Erosion from livestock grazing practices
  - e. Forest fires having the potential to threaten water supplies and water quality
  - f. Contaminated runoff from historic mining-related runoff
  - g. Elevated zinc & dissolved iron in Little Morrison Creek (some natural some human-induced)
  - h. Yampa River below Stagecoach Reservoir – elevated temperature & manganese (some natural some human-induced)
  - i. Elevated temperature (M&E list - drought years)
  - j. Mercury in fish tissue at Stagecoach and Catamount Reservoirs
  - k. Elevated nutrient concentrations in Stagecoach Reservoir and Lake Catamount resulting in accelerated eutrophication
  - l. Blue green algae blooms
  - m. Non-native fish encroachment on native cutthroat trout populations.

2. Walton Creek/Fish Creek Sub-basin – smallest area with largest population center
  - a. Elevated temperatures and low dissolved oxygen levels (drought years) (M&E List)
  - b. Elevated Manganese
  - c. Sediment loading
  - d. Riparian area degradation
  - e. Loss of wetlands which are necessary to filter stormwater as well as provide infiltration to groundwater
  - f. Urban stormwater runoff carrying contaminants and potentially increasing temperature from impervious surface runoff
  - g. Non-native species encroachment
  
3. Elk River Sub-basin – largest tributary / some Outstanding Waters /Anti-degradation designated streams
  - a. High readings of *E. Coli*
  - b. Elevated Mercury - 303 (d) List
  - c. Sediment loading
  - d. Riparian area degradation
  - e. Added bedload resulting from both several years of record spring runoff as well as poorly designed river channel restoration projects
  - f. Willow Creek/Steamboat Lake outlet
  - g. Damage from construction of ditch diversions and push up dams
  - h. Non-native species encroachment
  
4. Middle Yampa River - Trout Creek/Dry Creek Sub-basins
  - a. Elevated Phosphorus
  - b. Elevated suspended sediment potentially a result of degradation of riparian areas from unmanaged cattle grazing on leased lands
  - c. One Dry Creek segment on 303 (d) List for exceedance of agricultural and aquatic life standards, Iron, and Selenium
  - d. Sage Creek 303 (d) List for exceeding aquatic life standard for Iron
  - e. Sediment loading
  - f. Erosion caused by reduced ground cover (noxious weeds, overgrazing)
  - g. Riparian area degradation
  - h. Degraded stream banks and eroded channels (Morgan Bottom area)
  - i. Non-native species encroachment
  
5. Elkhead River Sub-basin – USFS Special Interest Area
  - a. Fish tissue Mercury in Elkhead reservoir– (303 (d) List)

- b. Sediment loading
- c. Riparian area degradation
- d. Elevated temperatures due to erosion-caused wide shallow exposed channels and deep vertical mass wasting banks
- e. Non-native species encroachment.

## **Chapter 3: Overarching Goals, Objectives and Strategies of the UYRWG**

### Overarching Goals Identified by the UY Watershed Group in April 2015

1. Promote a watershed-scale approach to water quality protection and improvement, and
2. Improve and maintain the physical, chemical and biological conditions of the watershed that benefit the environment for present and future generations.

### Objectives

1. Protect and enhance water quality
2. Protect and restore riparian areas
3. Increase education, awareness and collaboration
4. Expand upon existing water quality monitoring
5. Serve as a resource for future projects and initiatives.

### Strategies Developed by the UYWG in April 2015

1. Advocate for an integrated approach to watershed restoration and monitoring.
  - Work with stakeholders to coordinate watershed-scale funding and implementation of projects that support uses defined in water quality classifications
  - Promote the importance of water quality monitoring
  - Seek to reduce nonpoint source pollution
  - Encourage watershed connectivity and ecological balance of riparian, wetland, upland and aquatic biota
  - Understand and address sediment and nutrient loading
  - Improve habitats negatively affected by invasive species.
2. Advocate for the region to maintain and improve water quality. Degraded areas and waters of the region not currently supporting classified uses will be prioritized for improvement.



- Promote water quality as an important consideration in making decisions on the location and extent of areas to be served by public facilities and services
  - Work with stakeholders to continue both citizen-based and professional water quality monitoring programs in the basin
  - Compile data from the upper Yampa River Basin
  - Develop a Sampling and Monitoring Plan
  - Provide an accessible and user-friendly database/geographic information system (GIS). Establish a mechanism to develop and update the database as new data are collected
  - Analyze and interpret data and assess information gathered from the Upper Yampa River Monitoring Plan on an ongoing basis. Include narrative discussions of changes in water quality
  - Coordinate monitoring to avoid duplication of efforts and ensure compatibility of data
  - Advocate that water development and transfer activities not have adverse effects on the region's water resources
  - Evaluate nutrient sources in the Upper Yampa and further characterize algae problems in the Yampa River system
  - Work with the State Water Quality Control Commission to ensure that sufficient water quality and stream flow data are provided for sites proposed for listing during the triennial review process
  - Encourage reclassification of water bodies if data indicate that streams have been misclassified based on historical beneficial uses
  - Advocate for water conservation and efficiency by all water users for the benefit of the people and natural resources in the Yampa River Basin
  - Continue local nonpoint source water quality improvement projects as identified through the Watershed Action Plan.
3. Act as a resource for stakeholder outreach and education to increase understanding of, and reduce and prevent, nonpoint source pollution.
- Increase education and awareness of the importance of a proper functioning Yampa River system
  - Assist local governments with Best Management Practices (BMPs) to minimize impacts to watershed health from development and growth including education for planning commissions,
  - Encourage private and public land management practices that result in minimized and/or controllable impacts to the overall health of the watershed by incorporating environmental stewardship with land-use activities,
  - Promote the importance of rehabilitation, replacement, maintenance, and operations of storm water discharge systems for improved watershed health,
  - Promote the proper management of riparian zones,
  - Encourage an approach that encompasses and BMPs that implement the appropriate volume, rate, scheduling, storage, transport, handling and disposal, of pesticide, fertilizer, and road deicing and friction applications are determined and

- applied to protect water quality while protecting public health and safety,
- Integrate Source Water Protection Planning (USDA program) when relevant,
  - Continue to improve agricultural BMPs,
  - Continue to promote urban and construction water quality BMPs through public education,
  - Encourage stream restoration be incorporated in land-use/construction projects,
  - Incorporate water quality protection features (BMPs) into new development/review process.

## **Chapter 4. Watershed-wide Known and Potential Stressors and Solutions to Water Quality Threats**

As part of creating a holistic watershed plan for the UYRW, the potential sources and causes of waterbody impairments and threats are identified to include both immediate and long term issues as they relate to the health of the watershed. Identification of these potential “stressors” and their sources, impacts, impairments and possible solutions are outlined in Table 4.1 below. It is acknowledged that many of the activities identified as potential sources of water quality contamination are vital to our economy, improved management techniques will result in less impact on the watershed and water quality.

**Table 4.1: Potential Source of Stressors\*, Impacts, Solutions in the Upper Yampa River Watershed**

Land Use Activity – Source of Stressor	Potential consequence(s)	Pollutant(s)	Effect(s) / Impacts	Potential outcome(s)	Possible Solutions	Resources
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">“Urban” Growth Areas</p> <ul style="list-style-type: none"> <li>-Roadways</li> <li>-Residential areas</li> <li>-Commercial areas</li> <li>-Road traction/snow removal</li> <li>-Construction</li> <li>-Unmanaged pesticide applications</li> <li>-Over-irrigation of lawns</li> <li>-Illicit discharges</li> </ul>	<ul style="list-style-type: none"> <li>-Increased impervious surfaces</li> <li>-Pollutants from stormwater runoff reaching water bodies such as from pet waste, fertilizers, pushing snow piles into waterbodies</li> <li>-Illicit discharges</li> <li>-Physical damage to floodplains and wetlands</li> <li>-Damage to riparian areas</li> <li>-Habitat fragmentation</li> </ul>	<ul style="list-style-type: none"> <li>-Above normal TSS/ sediment</li> <li>-Above normal nutrients</li> <li>-Trace elements/metals</li> <li>-Salts</li> <li>-Pesticides</li> <li>-Petroleum &amp; products</li> <li>-Fecal bacteria</li> <li>-Temperature</li> <li>-Litter</li> <li>-Paint &amp; chemicals</li> <li>-Solvents</li> <li>-Sewage</li> <li>-Food grease</li> </ul>	<ul style="list-style-type: none"> <li>-Reduced DO,</li> <li>-Altered pH,</li> <li>-Increased algae blooms</li> <li>-Sedimentation in water bodies</li> <li>-Negative effects on water quality, stream morphology, and habitat/ecosystem</li> <li>-Loss of native species to invasives</li> <li>-Reduced infiltration of surface water to groundwater</li> <li>-Loss of ability of riparian areas and wetlands to filter water</li> <li>-Loss of flood attenuation</li> </ul>	<ul style="list-style-type: none"> <li>-Impaired aquatic ecosystems</li> <li>-Sediment adhesion reduces water quality</li> <li>-Sediment loads affect ecosystem function and habitat</li> <li>-Loss of wetlands reduce groundwater infiltration and pollutant filtering</li> <li>-Nutrients and bacteria lead to algal blooms and recreational impairment</li> <li>-Water supply impairment</li> </ul>	<ul style="list-style-type: none"> <li>-Education on a watershed level regarding Best Mgmt. Practices (BMPs)</li> <li>-Sub-basin demonstration project</li> <li>-Acquire funding for the development of a basin-specific BMP Manual &amp; implementation programs</li> <li>-Rapid Stream Assessments to identify priority areas</li> <li>-Education to protect riparian areas</li> <li>-Develop and fund restoration Projects</li> <li>-LID</li> </ul>	<ul style="list-style-type: none"> <li>-Upper Yampa River Watershed Group (UYRWG)</li> <li>-City SS MS4</li> <li>-Routt County Road and Bridge</li> <li>-Planning Commissions</li> <li>-Construction regulations/ SWMPs</li> </ul>

Land Use Activity – Source of Stressor	Potential consequence(s)	Pollutant(s)	Effect(s) / Impacts	Potential outcome(s)	Possible Solutions	Resources	
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Structural Modifications</p>	<p>-----                      Structural changes in waterways:                      -Dams                      -Reservoirs                      -Stream fragmentation                      -Modified stream channels                      -Improperly designed diversions                      -Culverts                      -Inter-basin transfers of water                      -Poorly designed channel rehabilitation projects</p>	<p>-Alters hydraulic regime                      -Reduces energy dissipation causing stream enlargement or reduction                      -Flow alterations                      -Creates fish movement issues                      -Increased bank erosion</p>	<p>-Sediment,                      -Aquatic barriers/fish passage restrictions</p>	<p>-Streambank erosion                      -Avulsions                      -Channel instability &amp; in-stream flow alterations,                      -Alters normal baseflows and bedloads                      -Changes in nutrient loading                      -Changes in temperature                      -Variable level outlets reduce DO</p>	<p>-Increased or decreased sediment,                      -Impaired benthic habitat                      -Impaired aquatic ecosystem                      -Increased algal blooms                      -Accelerated eutrophication</p>	<p>-Encourage and fund planting of native species.                      -Coordinate private projects along same stream segment                      -Education and BMP development                      -Support programs and practices that minimize fragmentation                      -Acquire funding to address                      -Design conveyance structures that consider ecological issues</p>	<p>-UYRWG                      -CO Parks and Wildlife                      -Trout Unlimited (TU)                      -USFS                      -TNC                      -YWBRT                      -Literature</p>

	Land Use Activity – Source of Stressor	Potential consequence(s)	Pollutant(s)	Effect(s) / Impacts	Potential outcome(s)	Possible Solutions	Resources
						<ul style="list-style-type: none"> <li>-Stream Management Plans</li> <li>-Reservoir release plan to address ideal bedload &amp; flow/ operational changes</li> </ul>	
Structural Modifications	Improperly designed agricultural diversions, headgates, & pushup dams	<ul style="list-style-type: none"> <li>-Alters hydraulic regime</li> <li>-Increases sedimentation</li> </ul>	Sediment	<ul style="list-style-type: none"> <li>-Streambank erosion</li> <li>-Avulsions</li> <li>-Channel instability &amp; in-stream flow alterations</li> <li>-Alters normal baseflows and bedloads</li> </ul>	<ul style="list-style-type: none"> <li>-Impaired benthic habitat</li> <li>-Impaired aquatic ecosystem and fish passage</li> </ul>	<ul style="list-style-type: none"> <li>-Install fish friendly permanent diversion structures</li> <li>-Acquire funding to develop designs and BMPs</li> </ul>	<ul style="list-style-type: none"> <li>-NRCS</li> <li>-CSU Extension Office</li> <li>-UYWG</li> <li>-RCCD</li> <li>-Community Ag Alliance</li> <li>-UYWCD</li> <li>-District Engineer</li> <li>-CO Parks and Wildlife</li> <li>-TU</li> </ul>



Land Use Activity – Source of Stressor	Potential consequence(s)	Pollutant(s)	Effect(s) / Impacts	Potential outcome(s)	Possible Solutions	Resources	
Agricultural Activities**	<ul style="list-style-type: none"> <li>-Unmanaged or Mismanaged Grazing Activities</li> </ul>	<ul style="list-style-type: none"> <li>-Riparian degradation</li> <li>-Loss of canopy</li> <li>-Streambank erosion</li> <li>-Manure concentration in undesired areas</li> </ul>	<ul style="list-style-type: none"> <li>-TSS/</li> <li>-Sediment</li> <li>-Nutrients</li> <li>-Bacteria</li> </ul>	<ul style="list-style-type: none"> <li>-Sedimentation</li> <li>-Increased stream temperature</li> <li>-Wide and shallow channel</li> </ul>	<ul style="list-style-type: none"> <li>-Declining fish and macroinvertebrate populations</li> <li>-Declining water quality</li> <li>-Habitat damage resulting in potential invasives takeover</li> </ul>	<ul style="list-style-type: none"> <li>Development of BMPs to:                             <ul style="list-style-type: none"> <li>-create off-channel watering</li> <li>-ID critical areas &amp; manage/limit animal access points</li> <li>-Address timing issues &amp; winter issues</li> <li>-Provide proper rotation to support healthy soil structure and plant matter</li> <li>-Cost sharing to fence off riparian areas and wetlands</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>-NRCS</li> <li>-CSU Extension Office</li> <li>-UYRWG</li> <li>-RCCD</li> <li>-Community Ag Alliance</li> <li>-Upper Yampa Water Conservancy District (UYWCD)</li> <li>-YWBRT</li> </ul>
	<p>-----</p> <ul style="list-style-type: none"> <li>-Unmanaged or Mismanaged Irrigation Practices</li> </ul>	<ul style="list-style-type: none"> <li>Over-inundation of soil profiles results in leaching of and</li> </ul>	<ul style="list-style-type: none"> <li>-Manganese,</li> <li>-Selenium,</li> <li>-Arsenic,</li> <li>-Lead</li> </ul>	<ul style="list-style-type: none"> <li>Water quality standard exceedances</li> </ul>	<ul style="list-style-type: none"> <li>Water quality standard exceedances result in stream segments being regulated</li> </ul>	<ul style="list-style-type: none"> <li>-Develop and educate to BMPs that address proper</li> </ul>	<ul style="list-style-type: none"> <li>-NRCS</li> <li>-CSU Extension Office</li> <li>-UYRWG</li> <li>-RCCD</li> </ul>

Land Use Activity – Source of Stressor	Potential consequence(s)	Pollutant(s)	Effect(s) / Impacts	Potential outcome(s)	Possible Solutions	Resources
<p>-----</p> <p>Improper Pesticide Use</p> <p>-----</p> <p>Less than Ideal Crop Management</p>	<p>increased concentrations of major ions, trace elements, and salt being transported by water</p>				<p>timing, rates, methods, -Acquire funding for demonstration projects -Cooperate to preclude Call on river</p>	<p>-Community Ag Alliance -UYWCD</p>
	<p>Overuse, improper timing, use of incorrect product can result in water quality degradation</p>	<p>-Metals, -Chemicals</p>	<p>Negative affect on aquatic biota</p>	<p>-Fish kills, -Recreational impacts</p>	<p>-Integrated Pest Management, -Education on aquatic versions of pesticides -Education on “Label is the Law”</p>	<p>-CSU Extension -Routt County Weed Course</p>
	<p>Soil health can be compromised</p>	<p>-Sediment -Noxious weeds</p>	<p>-Increased erosion -Invasive weed establishment</p>	<p>Unhealthy watershed</p>	<p>BMPs for: -cover crops -no till farming -contour farming -Sediment – avoid, control, trap, Promote soil health</p>	<p>-CSU Extension Soil Health Tours -NRCS -RCCD</p>

Land Use Activity – Source of Stressor		Potential consequence(s)	Pollutant(s)	Effect(s) / Impacts	Potential outcome(s)	Possible Solutions	Resources
	----- Improper Manure and Fertilizer Activities	Stormwater runoff transports nutrients and other harmful constituents to waterways	-Nutrients -E. Coli	Degraded water quality, algae blooms,	-Impairment to aquatic ecosystem -Recreational impacts -Water supply impacts	-BMPs for proper management -Acquire funding for demonstration projects	-CSU Extension -NRCS -RCCD
Mining	Historic	-Runoff from tailings introduce contaminants to streams, -Un-reclaimed areas can result in non-native vegetation encroachment	-Metals -Non-native vegetation	-Degraded water quality -Loss of native habitat	Unhealthy watershed	Address problem areas – need further identification and analysis	May warrant further study in areas that display concern

Land Use Activity – Source of Stressor	Potential consequence(s)	Pollutant(s)	Effect(s) / Impacts	Potential outcome(s)	Possible Solutions	Resources	
Forestry	<ul style="list-style-type: none"> <li>-Road Construction and Timber Harvesting</li> <li>-Unmanaged off-road vehicle use, ATVs, bikes</li> </ul>	<ul style="list-style-type: none"> <li>-Increased erosion</li> </ul>	<ul style="list-style-type: none"> <li>-Sediment</li> <li>-Total Suspended Solids (TSS)</li> </ul>	<ul style="list-style-type: none"> <li>-Stream bottom inundated with fine sediment</li> <li>-TSS in water column</li> <li>-Lose pools</li> </ul>	<ul style="list-style-type: none"> <li>Declining fish and macroinvertebrate populations</li> </ul>	<ul style="list-style-type: none"> <li>Implement BMPs to improve design, stabilize disturbed areas, capture and remove sediment</li> </ul>	<ul style="list-style-type: none"> <li>US Forest Service</li> </ul>
	<ul style="list-style-type: none"> <li>-Excess Forest Fuel</li> </ul>	<ul style="list-style-type: none"> <li>Wildland fires increase erodibility</li> </ul>	<ul style="list-style-type: none"> <li>-Sediment</li> <li>-Chemicals</li> <li>-Ash</li> </ul>	<ul style="list-style-type: none"> <li>-Sediment loading</li> <li>-Chemical loading</li> </ul>	<ul style="list-style-type: none"> <li>Damage to water supplies and water quality</li> </ul>	<ul style="list-style-type: none"> <li>-Wildfire mitigation treatments that reduce burn severity within the watershed avoiding development of hydrophobic soils and related erosion</li> <li>-Defensible space projects</li> </ul>	<ul style="list-style-type: none"> <li>-USFS</li> <li>-CO Forest Service</li> </ul>

Land Use Activity – Source of Stressor		Potential consequence(s)	Pollutant(s)	Effect(s) / Impacts	Potential outcome(s)	Possible Solutions	Resources
Recreation	-Water sports -Fishing -Golf courses -Ski operations -Parks	Introduces contaminants that are transported by stormwater runoff to water bodies	-Chemicals -Nutrients -Invasives	-Negative effects on water quality -Eutrophication -Loss of native species to invasives	-Impaired aquatic ecosystems -Nutrients lead to algal blooms and recreational impairment -Water supply impairment	-Develop BMPs Education/ Outreach Programs	-UYRWG -TU -Friends of Yampa
Industrial Activity	-Oil & Gas Operations  ----- -Air Pollution	-Contaminants from hydraulic fracturing entering groundwater  Mercury deposition in water bodies	Chemicals  Mercury in fish tissue	Groundwater contamination  Impairment to food chain	Drinking water source concerns  Unhealthy watershed	Warrants further study  Warrants further study	



Land Use Activity – Source of Stressor	Potential consequence(s)	Pollutant(s)	Effect(s) / Impacts	Potential outcome(s)	Possible Solutions	Resources	
Other:	Drought or other causes of reduced stream flows	-Less dilution -Altered hydraulic regime	-Higher water temperatures -Low flows -Concentrated chemicals, salts, etc.	Impairment to aquatic ecosystem	-Damage to aquatic ecosystem -Fish populations stressed	-In-stream flow segments -Planned releases	-CWCB -BIP -Yampa/White Basin Roundtable (YWBRT) -UYWCD
	----- Introduction of non-native species	Non desirable species out-compete natives	-N. Pike -Non-native trout -Zebra Mussel -Didymo -Noxious Weeds, -Tamerisk	Impairment to aquatic ecosystem	Unhealthy / unbalanced watershed	-Fishery management projects -Noxious weed management -Education to reduce incidental transport (e.g. boating/fishing related -Native species nursery -Riparian restoration projects	-TU -CPW

*\*Note: only non-regulated potential stressors are addressed (e.g. activities already governed by existing legislation and permitting are not included)*

*\*\* Of the 1,664,179 acres in the UYRW, 7% is cropland; 48% rangeland and grassland; 38% forest; 2% riparian; 0.5% water; and 4.5% other. Of the 7% cropland identified above, 47% is dryland and 53% irrigated. (source NRCS 2010 Watershed Assessment Report). Since a variety of potential pollutants and related loading can come from these land uses, these percentages help to paint a picture of the level of management that may be needed.*

## Chapter 5. Assessing Watershed-wide Data Gaps

### Overview

Preventing problems is much less expensive and impactful than remediating them. By recognizing science-based indicators and trends, learning from the experience of others, and through proper education and implementation of BMPs, it is anticipated that a proactive approach to watershed health management in the UYRW will serve to mitigate at least some future problems and create a level of preparedness to deal with issues or concerns as they arise. It is advantageous that watershed monitoring, planning and management efforts are taking place in the UYRW *prior* to experiencing major water quality issues that so many other watersheds are already seeing.

### Data Gaps

The following data gaps have been identified as priorities:

- Nutrient and Sediment Loading Quantification

USEPA, as part of the nine required elements, requires the watershed plan to quantify pollutant loading from non-point sources such as nutrients and sediment as well as estimate reductions in loading that would occur as a result of watershed implementation projects. Although this method has benefits in measuring performance and successful outcomes, there is insufficient data in the UYRW to undertake this task at this stage. Many of the initiatives and projects outlined in the action plan presented herein, however, will incorporate the collection of loading data and will set targets for load reductions going forward. Further, options to measure success and improvements do exist and are discussed later in the WP. The WP implementation process is a dynamic one. Therefore updates are intended and information and data will need to be modified over time.

- Natural vs. Anthropogenic Data

Determining to a precise degree the sources of water quality contaminants currently being experienced, especially those that occur naturally from geologic sources, can be difficult and expensive. For example, data is not yet available to quantify the percentage of natural versus anthropogenic sources of Selenium in the UYRW. As limited funds exist for water quality monitoring on this magnitude, encouraging education and implementation of cost-effective

BMPs may serve as a better approach than spending significant resources on water quality monitoring. Nevertheless, these data gaps pose important questions to decision makers.

- Specific Stream Segment and Wetlands Data

Another data gap relates to identifying specific segments of streams that should be included on the priority list of needing BMPs or other restoration measures. It is proposed that a method such as the NRCS Rapid Stream Assessment be performed as part of the next steps in watershed planning to begin to address this data gap. Identifying and mapping critical wetlands will also be an important part of this effort.

- Small Sample Sets for Impairment Designations

A number of stream segments in the UYRW have been listed on the 303(d) and/or M&E lists with, in some cases, very small sample sets. This represents a data gap that will require additional sampling.

- Flow Data

Adequate flow data also represents a significant data gap in the UYRW. Extreme variations that exist in stream flows from season to season and year-over-year need to be correlated with water quality data for it to be meaningful and comparable.

- Nutrient Loading Data for Lakes

The Action Plan outlined in Chapter 12 of this WP further identifies the need for additional data and information as specific projects become ready for implementation. For example, before a Lake Management and Restoration Plan can be developed for Stagecoach Reservoir, a nutrient loading model will need to be developed to determine whether the lake is nitrogen or phosphorus limited.

- Biological Data

Biological indicators such as macroinvertebrates can be a reliable measurement of stream and ecological health. An Adopt a Stream Program is planned that will result in valuable information on the status and ongoing improvement or deterioration of stream segments in portions of the watershed. Additionally, a partnership with River Watch would augment this initiative.

## Chapter 6. Sub-basin Water Quality Classifications and Identified Water Quality Concerns

Categorizing and ranking areas for water quality protection and in some cases restoration has been performed using the following:

- Water quality sampling data
- Indicators and trends that were discovered as part of the SOTW process
- Identification of data gaps
- Anti-degradation waters designation
- State of Colorado 303(d) and M&E Lists.

The purpose of this Chapter is to:

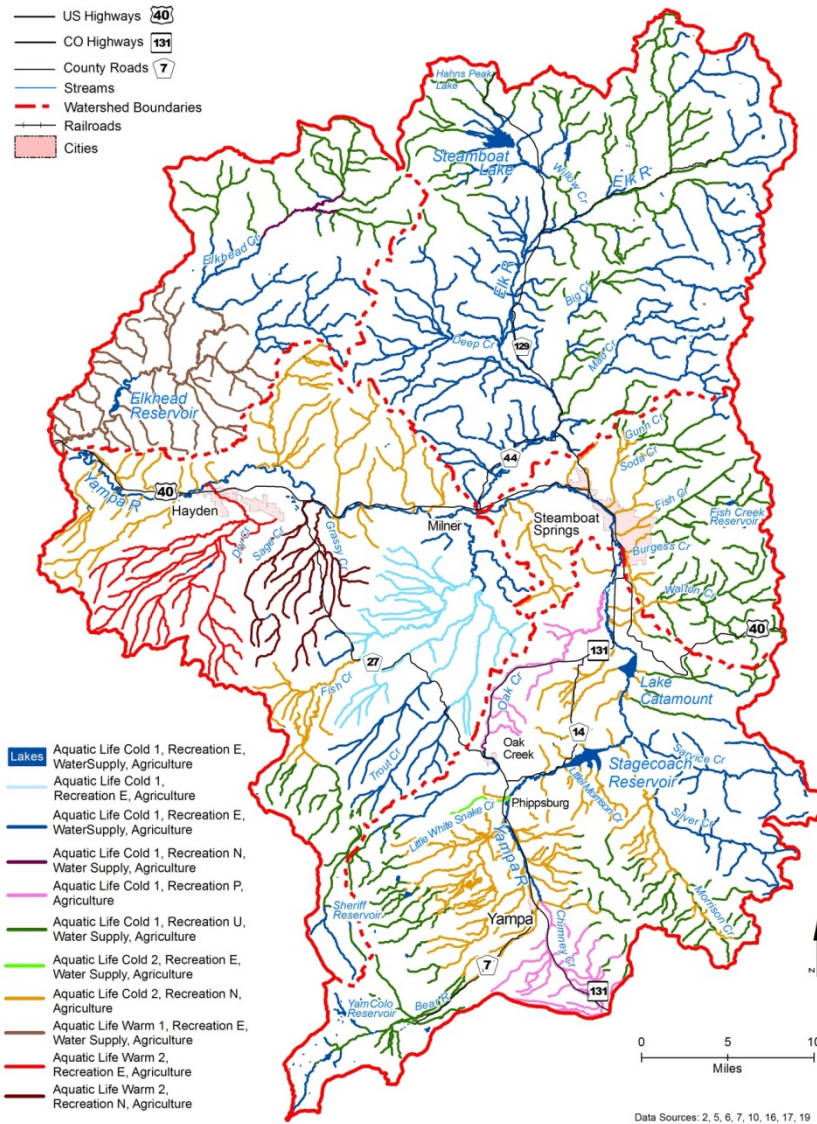
- 1) elaborate in greater detail current water quality classifications for each stream segment in the watershed. This is performed for each of the five sub-basins as defined in the SOTWR
- 2) correlate stream classifications by segment with identified potential water quality concerns
- 3) set priority areas for use in the Action Plan.

GIS mapping developed for the SOTWR illustrates the information provided in the narrative below. The water quality criteria and classifications in Colorado are summarized on page 19 of the SOTWR.

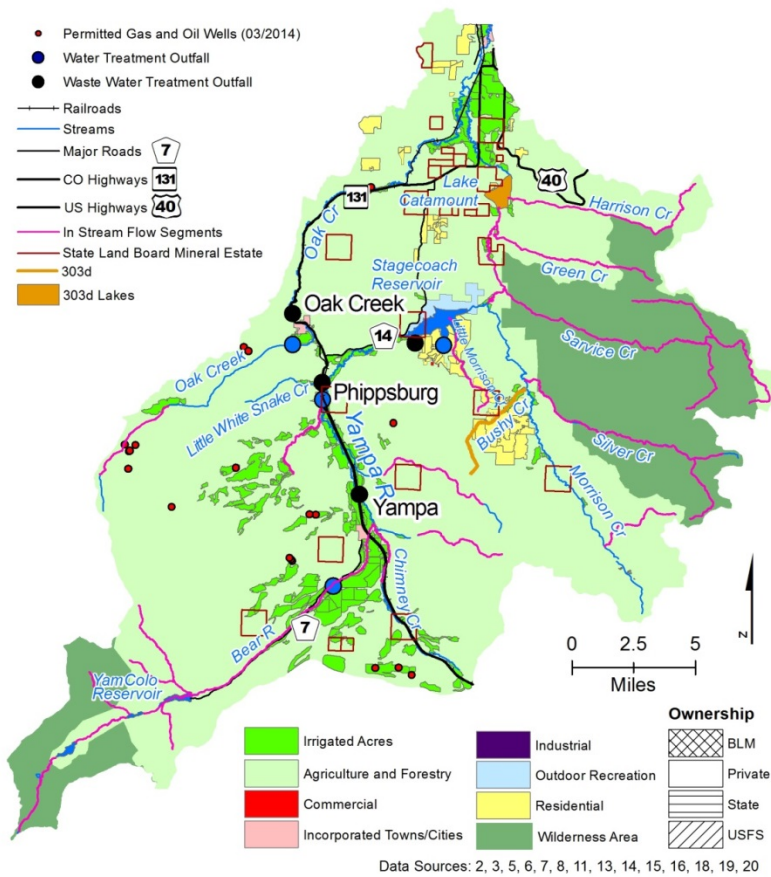
The CWCB holds multiple instream flow segment water rights in the headwater streams and tributaries of most sub-basins for the purpose of ensuring minimum flows. These rights are administered within the State's water right priority system to preserve or improve the natural environment to a reasonable degree.

Municipal wastewater treatment plant discharges in the watershed are currently regulated by the CDPHE Colorado Discharge Permitting System (CDPS) permit program.

Figure 6.0: Water Quality Classifications



Sub-basin 1: Bear River





<b>SUB BASIN 1: BEAR RIVER</b>	
<p>Stream segments within this sub-basin have the following designations and classifications. To view designations and classifications assigned to specific stream segments within the sub basin, refer to the maps contained in the SOTWR or <a href="https://www.colorado.gov/pacific/sites/default/files/33_2016%2803%29-Appendix33-1.pdf">https://www.colorado.gov/pacific/sites/default/files/33_2016%2803%29-Appendix33-1.pdf</a></p>	
<b>Anti-Degradation Designations</b>	
Outstanding Waters	X
Use-Protected Waters	?
Reviewable Waters	X
<b>Use Classifications</b>	
Recreation <sup>1</sup>	X-E,P,N,U
Aquatic Life	
Class 1 - Cold Water Aquatic Life	X
Class 1 - Warm Water Aquatic Life	
Class 2 - Cold Water Aquatic Life	X
Class 2 - Warm Water Aquatic Life	
Water Supply	X
Wetlands	?
<sup>1</sup> E = existing, P = primary, N = not primary, U = undetermined	

The Bear River sub-basin includes two areas classified as *Outstanding Waters*:

- 1) Service Creek and Silver Creek segments in the Sarvis Creek Wilderness area, and
- 2) Bear River and its' tributaries in the Flat Tops Wilderness area.

These Outstanding Waters stream segments are located in the pristine headwaters of the Yampa River system and support cold water species such as native trout. As Outstanding waters, these stream segments carry the highest *Anti-degradation* classification. As such, their existing high water quality must be preserved. The underlying geology of these drainages is predominantly igneous and metamorphic (Precambrian granite) along with volcanic sediments. These geologic types are resistant to weathering, create soft water, and cannot buffer acid well. The Wilderness areas are characterized by minimal threats to water quality from human activities. However livestock grazing is permitted in both the Flattops and Sarvis Creek Wilderness. Recent drought conditions further highlighted the importance of assuring minimum flows in small headwater tributaries to negate increased water temperature impacts due to flow conditions.

Silver Creek, Sarvis Creek, Upper Oak Creek, and the tributaries above the Yamcolo Reservoir are classified as *Aquatic Life Cold 1, Recreation E, Water Supply, Agriculture*: tributaries above Yamcolo Reservoir, Silver Creek, Sarvis Creek and Upper Oak Creek. The underlying geology of these stream segments includes sedimentary rocks that have the potential to leach out certain minerals and trace elements such as arsenic (As), zinc (Zn), dissolved iron (Fe), selenium (Se), and manganese (Mn). These formations are also more susceptible to erosion, create harder water, and can buffer acid well. Suspended solids during spring runoff are also often elevated in these stream segments.

Bear River (below Flattops Wilderness), Upper West Morrison Creek; Upper East Chimney Creek; Upper Little White Snake Creek and unnamed tributary above Phippsburg; unnamed tributary east of Lake Catamount; Little Morrison Creek; and Lower Bushy Creek are classified as *Aquatic Life Cold 2, Recreation U, Water Supply, Agriculture*: The underlying geology varies and the predominant land use is agriculture. There are a few historic mines as well as a number of permitted gas and oil wells in the contributing watershed areas to these stream segments. Identified concerns on these stream segments include:

- Bushy Creek COUCYA03 is on the water body impaired 303(d) List for excess sediment
- Little White Snake COUCYA04 is on the M&E list for Dissolved Oxygen and Mn
- Little Morrison Creek COUCYA03 is M&E listed for Mn and the 303(d) list for As and Fe.

Green Creek; Harrison Creek; tributaries NW of the Town of Yampa; Morrison Creek; Tributaries west of Lake Catamount; Little Morrison Creek; and Lower Bushy Creek are classified as *Aquatic Life Cold 2, Recreation N, Agriculture*.

Chimney Creek, and Oak Creek from the Town of Oak Creek to the confluence of the Yampa River are classified *Aquatic Life Cold 1, Recreation P, Agriculture* . Identified concerns include:

-The Yampa River below Stagecoach Reservoir COUCYA02a is on the M&E list Mn and on the 303(d) list for temperature. (It was previously listed for Se but delisted effective March 2016.)

-Lake Catamount COUCYA22 is listed for Mercury in fish tissue (and Fish Consumption Advisory).

**Sub basin 1: Bear River 303(d) and M&E Listings**

Waterbody ID (WBID)	Segment Description	Portion	Colorado’s Monitoring and Evaluation (M&E) Parameter(s)	Clean Water Act Section 303(d) Impairment
COUCYA02a	Main stem of the Yampa River from Wheeler Creek to Oak Creek	Yampa River below Stagecoach Reservoir	Mn	Temperature
COUCYA03	All tributaries to Yampa River except for specific listings, on USFS land	Bushy Creek	---	Sediment
COUCYA03	All tributaries to Yampa River except for specific listings, on USFS land	Little Morrison Creek	Mn	As, Fe (Trec)
COUCYA04	Little White Snake Creek, source to Yampa River	All	D.O., Mn	---
COUCYA22	All lakes and reservoirs tributary to the Yampa River, Elkhead Creek, and the Little Snake River, except Elkhead Reservoir	Lake Catamount	---	Aquatic Life Use (Hg Fish Tissue)

(also see Table 6.1 below)

Other water quality concerns in the Bear River sub-basin that were identified during the development of the SOTWR include:

-possible impacts from historic mining runoff;

- elevated nutrient loading causing lake eutrophication;
- toxic blue green algae blooms in Stagecoach Reservoir;
- increased sediment loading;
- deprivation of normal seasonal bedload in the Yampa River below the Catamount dam;
- riparian degradation;
- non-native fish (e.g. Northern Pike), crustacean (Rusty crayfish), and other nuisance or invasive species (e.g. zebra mussel, didymo, whirling disease) encroachment, and
- increased forest fuel loads and forestry-related impacts.

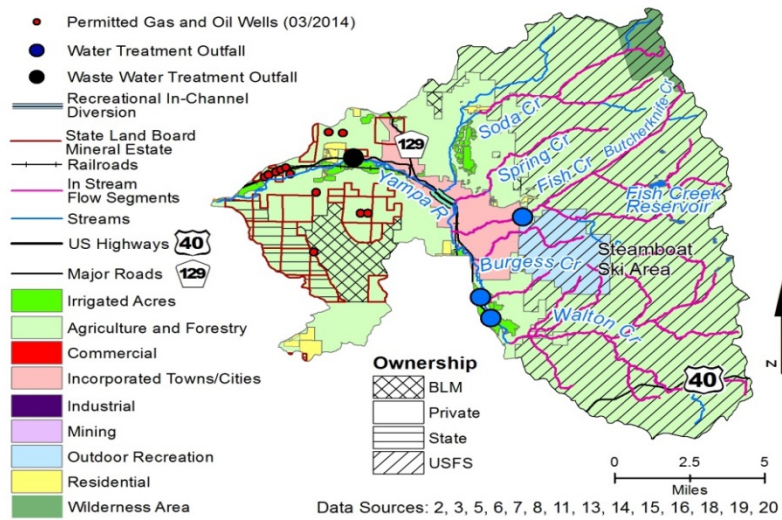
### Water Quality Prescriptions

The following water quality needs were identified by regulatory agencies and from public outreach feedback within the Bear River Sub-basin:

- based upon limited data utilized to support the CDPHE M&E and 303(d) impairment listings for Se, Mn, Fe, As, and temperature, it is recommended that additional water quality sampling be initiated to either support or delist these stream segments. Although expensive, it would be ideal to attempt to determine how much of the mineral and trace element loading is naturally occurring. It has been shown that Selenium loading from surrounding geologic conditions can be exacerbated by irrigation practices, which would also be of interest to study in this sub-basin as well as others.
- Mercury in fish tissue in Lake Catamount also warrants further study to determine the source and need for action.
- further assessment of riparian damage and development of priority areas and a mitigation plan;
- a nutrient study of Stagecoach Reservoir to further assess the concern, define sources of the problem and create a science-based management strategy (lake management and restoration plan);
- fine tune BMPs, educate and implement for agricultural uses including grazing and irrigation;
- further development of non-native fish species management strategies and projects;
- fine tune BMPs, educate and implement BMPs to address erosion and sediment control in the sub-basin;

- the growth centers of Yampa, Phippsburg, and Oak Creek do not yet have a population large enough to require an MS4 stormwater permit from CDPHE, however, BMPs developed by the UYRWG using examples of successful efforts of other communities such as the City of SS, may be useful for the Town to consider for implementation;
- evaluation of runoff from historic mining sites (especially Oak Creek Drain where USGS has done some preliminary work);
- determination of bedload needs and how to address; and
- further assessment and prescriptions related to managing forest fuels.

Sub-basin 2: Walton Creek, Fish Creek





<b>SUB BASIN 2: Walton Creek, Fish Creek</b>	
Stream segments within this sub-basin have the following designations and classifications. To view designations and classifications assigned to specific stream segments within the sub basin, refer to the maps contained in the SOTWR or <a href="https://www.colorado.gov/pacific/sites/default/files/33_2016%2803%29-Appendix33-1.pdf">https://www.colorado.gov/pacific/sites/default/files/33_2016%2803%29-Appendix33-1.pdf</a>	
<b>Anti-Degradation Designations</b>	
Outstanding Waters	?
Use-Protected Waters	?
Reviewable Waters	?
<b>Aquatic Life Classifications</b>	
Class 1 - Cold Water Aquatic Life	
Class 1 - Warm Water Aquatic Life	
Class 2 - Cold Water Aquatic Life	X
Class 2 - Warm Water Aquatic Life	
<b>Use Classifications</b>	
Recreation <sup>1</sup>	X N,U
Aquatic Life	X
Agriculture	X
Water Supply	X
Wetlands	?
<sup>1</sup> E = existing, P = primary, N = not primary, U = undetermined	

Water quality classifications in the Walton Creek/Fish Creek sub-basin are:

Burgess Creek, Fish Creek Fish Creek Reservoir, Butcherknife Creek, Soda Creek, Gunn Creek, and the upper stretches of Walton Creek, are classified as *Aquatic Life Cold 2, Recreation U, Water Supply, Agriculture*. The underlying geology of these stream segments is predominantly igneous and metamorphic (see discussion above). There are a few small areas of irrigated agriculture within the sub-basin, however, the majority of this sub-basin in USFS and BLM lands. The sub-basin also includes the Steamboat Ski Area.

The remaining segments of the above-listed streams are classified as *Aquatic Life Cold 2, Recreation N, Agriculture*. These streams are largely underlain by sedimentary rocks. The lower portion of the sub-basin also encompasses a densely populated area (City of Steamboat Springs) located immediately adjacent to the Yampa River. The sub-basin experiences significant summer and winter recreation. There are a number of permitted gas and oil wells in the southwest portion of this sub-basin. Identified concerns in the sub-basin include:

-The main stem of the Yampa River COUCYA02b from the confluence of Oak Creek to the confluence of Elkhead Creek is on the 303(d) list for temperature and As.

-The main stem of the Yampa River from Wheeler Creek to Oak Creek COUCYA02a confluence (above Stagecoach reservoir) is on the M&E list for Mn and 303(d) list for As (COUCYA02a)

-Gunn Creek COUCYA03 is on the 303(d) list for As and Zn.

-Walton Creek is on the M&E list for Mn. (delisted Jan. 2016 due to attainment).

**Sub basin 2: Walton Creek, Fish Creek 303(d) and M&E Listings**

Waterbody ID (WBID)	Segment Description	Portion	Colorado’s Monitoring and Evaluation (M&E) Parameter(s)	Clean Water Act Section 303(d) Impairment
COUCYA02a	Mainstem of the Yampa River from Wheeler Creek to Oak Creek	Yampa River above Stagecoach Reservoir	Mn	As
COUCYA02b	Yampa River from Oak Creek to Elkhead Creek	All	---	Temperature, As
COUCYA03	All tributaries to Yampa River except for specific listings, on USFS land	Gunn Creek	---	As, Zn

(also see Table 6.1 below)

Other water quality concerns identified during the development of the SOTWR include:

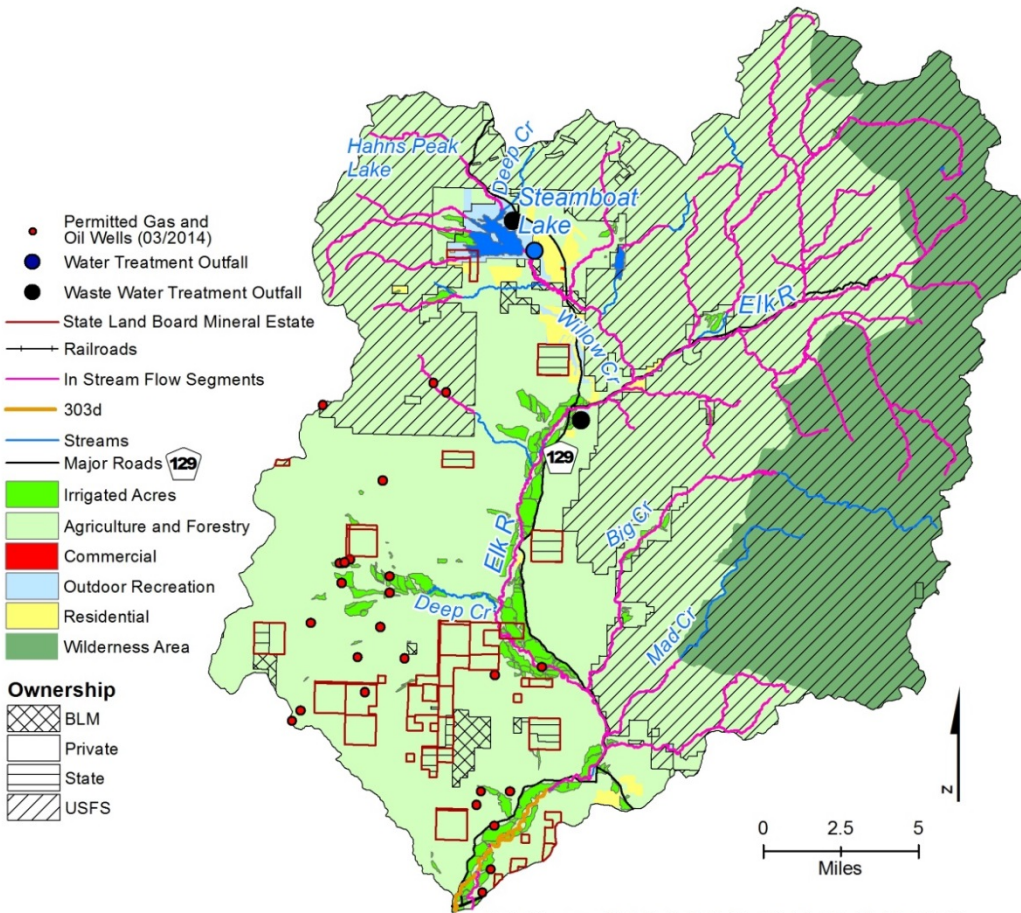
- excess sediment loading;
- contributions from road sanding and scoria;
- loss of riparian zones, floodplains, and wetlands resulting from streamside development, and
- groundwater contamination from leaking underground storage tanks.

Water Quality Prescriptions

The following water quality needs were identified by regulatory agencies and from public outreach feedback within the Walton Creek/Fish Creek sub-basin:

- Based upon limited data utilized to support the CDPHE M&E and 303(d) impairment listings for temperature and Mn, it is recommended that additional water quality sampling be initiated to either support or delist these stream segments. The City of Steamboat Springs has recently received a grant to review temperature and target flows
- In order to address sediment loading concerns, CDOT and USFS plan to finalize a sediment management plan to address sediment loading from road sanding operations.
- Additionally, the Steamboat Springs 2008 Yampa River Structures Master Plan is planned for implementation
- Fine tune BMPs, educate and implement regarding the interrelationship of riparian areas and watershed health and why protecting natural riparian areas, wetlands and floodplains, as well as mitigating structural changes in waterways that alter the hydraulic regime is important
- Restrictions have been placed by CDPHE on construction de-watering within a mile of identified leaking underground storage tank sites, which encompasses the majority of the City limits
- Fine tune BMPs and implement them. Educate the general public on proper management of lawn fertilizers, pet wastes, and water conservation including xeriscaping
- Further development of the City of Steamboat Springs' MS4 BMPs.

Sub-basin 3: Elk River



<b>SUB BASIN 2: Elk River</b>	
Stream segments within this sub-basin have the following designations and classifications. To view designations and classifications assigned to specific stream segments within the sub basin, refer to the maps contained in the SOTWR or <a href="https://www.colorado.gov/pacific/sites/default/files/33_2016%2803%29-Appendix33-1.pdf">https://www.colorado.gov/pacific/sites/default/files/33_2016%2803%29-Appendix33-1.pdf</a>	
<b>Anti-Degradation Designations</b>	
Outstanding Waters	?
Use-Protected Waters	?
Reviewable Waters	?
<b>Aquatic Life Classifications</b>	
Class 1 - Cold Water Aquatic Life	X
Class 1 - Warm Water Aquatic Life	
Class 2 - Cold Water Aquatic Life	X
Class 2 - Warm Water Aquatic Life	
<b>Use Classifications</b>	
Recreation <sup>1</sup>	N,U
Aquatic Life	X
Agriculture	X
Water Supply	X
Wetlands	?
<sup>1</sup> E = existing, P = primary, N = not primary, U = undetermined	

Water Quality Classifications

The northeast portion of the Elk River sub-basin encompasses the Mt. Zirkel Wilderness area. Stream segments in this wilderness area, Big Creek, Mad Creek, and the upper reaches of the Elk River, are classified as *Outstanding Waters*. These Outstanding Waters stream segments are located in the pristine headwaters of the Yampa River system and support cold water species such as native trout. As Outstanding waters, these stream segments carry the highest *Anti-degradation* classification. As such, their existing high water quality must be preserved. The underlying geology of these drainages is predominantly igneous and metamorphic (Precambrian granite). These geologic types are resistant to weathering, create soft water, and cannot buffer acid well. The Wilderness areas are characterized by minimal threats to water quality from human activities. However livestock grazing is permitted in these areas.

include The middle segment of the main stem of the Elk River; tributaries above Steamboat Lake from the north and northeast; Willow Creek; and the lower reaches of Big Creek and Mad Creek

are classified *Aquatic Life Cold 1, Recreation U, Water Supply, Agriculture*. This area is largely controlled by the USFS, with large ranches along the river. Geology is mixed.

From Steamboat Lake south including the main stem of the Elk River below Willow Creek confluence and related tributaries down to the Yampa River; and Deep Creek and its tributaries are classified *Aquatic Life Cold 1, Recreation E, Water Supply, Agriculture*. Geology is mostly sedimentary.

-The main stem of the Elk River COUCYA08 at its southern reaches is on the 303(d) impaired list for *E.Coli* (bacteria in human and animal excrement).

-Lost Dog Creek COUCYA08 is on the M&E list for exceeding the aquatic life standard for Mercury (Hg) and for As and Zn.

**Sub basin 3: Elk River 303(d) and M&E Listings**

Waterbody ID (WBID)	Segment Description	Portion	Colorado’s Monitoring and Evaluation (M&E) Parameter(s)	Clean Water Act Section 303(d) Impairment
COUCYA08	Elk River source to Yampa River	Elk River below Morin Ditch	---	E. Coli
COUCYA08	Elk River including tributaries and wetlands from the source to Yampa River	Lost Dog Creek	Hg, As, Zn	---

(also see Table 6.1 below)

Other water quality concerns in the Elk River sub-basin that were identified during the development of the SOTWR include:

- sediment loading from a landslide in Willow Creek canyon;
- foul odor and green color below Steamboat Lake dam during water releases;
- numerous avulsions on the Elk River between Clark and the Yampa River;
- construction of numerous gravel push-up dams to channel irrigation water into headgates;
- lack of coordination between land owners that are making river channel modifications to create fish habitat and to stabilize stream banks is potentially having a negative effect on the channel and resulting in added bedload in the system downstream;
- proliferation of non-native Reed Canary Grass.

There are a number of permitted gas and oil wells in the southern portion of this sub-basin.

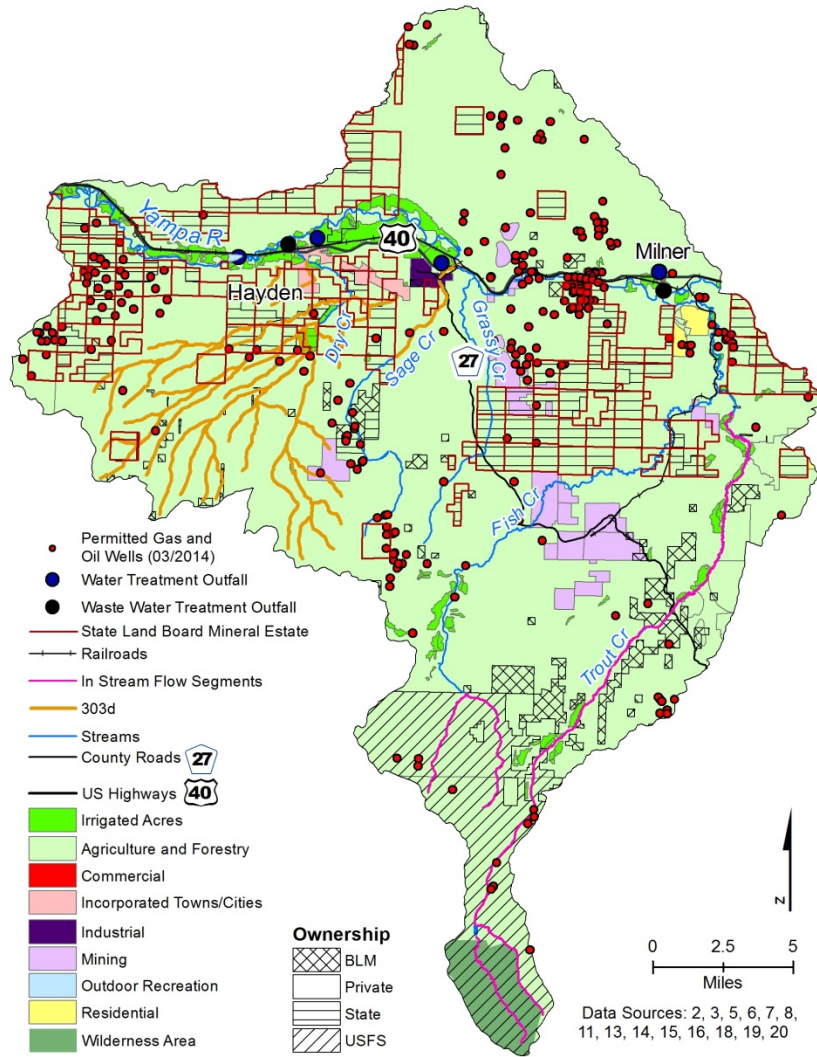
### Water Quality Prescriptions

The following water quality needs were identified by regulatory agencies and from public outreach feedback within the Elk River sub-basin:

- Based upon changes in land use in recent years, it is recommended that additional water quality sampling be initiated in an effort to delist the *E.Coli* listing in the lower Elk. Regarding Hg in Lost Dog Creek (near Farwell Mountain), the USFS contends this is from past wildfires in the area. Additional water quality sampling may be useful here as well.
- BMPs are needed to educate landowners of improved and effective irrigation diversions and head gate construction (and in some cases alternatives to push-up dams) to assist them in the design and implementation (including funding) of permanent structures;
- Further assessment of riparian damage and development of priority areas and a mitigation plan including the development of and education of BMPs for agricultural uses including grazing, manure management, integrated pest management, and irrigation;
- A collaborative and coordinated holistic approach to managing this sub-basin has been proposed by the UYRWG which would assess the entire area further, identify issues, bring together stakeholders, and develop a basin-wide approach to improvement of the health of the watershed. It is anticipated that this would serve as a model “demonstration” project for other basins.



Sub-basin 4: Middle Yampa River - Trout Creek & Dry Creek



<b>SUB BASIN 4: Middle Yampa River-Trout Creek, Dry Creek</b>	
Stream segments within this sub-basin have the following designations and classifications. To view designations and classifications assigned to specific stream segments within the sub basin, refer to the maps contained in the SOTWR or <a href="https://www.colorado.gov/pacific/sites/default/files/33_2016%2803%29-Appendix33-1.pdf">https://www.colorado.gov/pacific/sites/default/files/33_2016%2803%29-Appendix33-1.pdf</a>	
<b>Anti-Degradation Designations</b>	
Outstanding Waters	
Use-Protected Waters	?
Reviewable Waters	?
<b>Aquatic Life Classifications</b>	
Class 1 - Cold Water Aquatic Life	X
Class 1 - Warm Water Aquatic Life	
Class 2 - Cold Water Aquatic Life	X
Class 2 - Warm Water Aquatic Life	X
<b>Use Classifications</b>	
Recreation <sup>1</sup>	E,N,U
Aquatic Life	X
Agriculture	X
Water Supply	X
Wetlands	?
<sup>1</sup> E = existing, P = primary, N = not primary, U = undetermined	

Water Quality Classifications

*Aquatic Life Cold 1, Recreation E, Water Supply, Agriculture:* southern headwaters of Trout Creek; lower reaches of Fish Creek and Trout Creek near Milner. The Trout Creek headwaters are mostly in USFS lands.

*Aquatic Life Cold 1, Recreation E, Agriculture:* middle reaches of Fish Creek and tributaries; middle reaches of Trout Creek and tributaries

*Aquatic Life Cold 1, Recreation U, Water Supply, Agriculture:* southern headwaters of Fish Creek

*Aquatic Life Cold 2, Recreation N, Agriculture:* middle reaches of Fish Creek; northern unnamed tributaries to Yampa River; southwestern unnamed tributaries to Yampa River

*Aquatic Life Warm 2, Recreation E, Agriculture:* Dry Creek and tributaries

*Aquatic Life Warm 2, Recreation N, Agriculture:* Grassy Creek and tributaries; Sage Creek and tributaries

This sub-basin is underlain by erosive sedimentary rocks that commonly contain metals, minerals and other trace elements. The State Land Board owns large portions within this sub-basin.

-The main stem of the Yampa River COUCYA13e throughout this sub-basin is on the M&E list for temperature exceedances.

-Dry Creek COUCYA13 d & h and its tributaries are on the 303(d) list for exceeding aquatic life and agriculture use standards. Also segments of Dry Creek are listed for Se, Iron (Fe). (Dry Creek below CR 53 delisted for Pb Jan. 2016).

-Sage Creek below RCR 51D COUCYA13e is on the M&E list for Se.

-Fish Creek COUCYA13b is on the M&E list for *E.Coli*. (Dry Creek below CR 53 delisted for *E. Coli* Jan. 2016).

-Foidel, Fish, and Middle Creeks COUCYA13b are on the M&E list for sediment.

-Dry Creek to Temple Gulch COUCYA13h and Grassy Creek COUCYA13j are on the 303(d)/M&E list for Se.

**Sub basin 4: Middle Yampa River – Trout Creek , Dry Creek 303(d) and M&E Listings**

Waterbody ID (WBID)	Segment Description	Portion	Colorado’s Monitoring and Evaluation (M&E) Parameter(s)	Clean Water Act Section 303(d) Impairment
COUCYA13b	Mainstem of Foidel Creek, including all tributaries and wetlands. Mainstem of Fish Creek, including all tributaries from County Road 27 downstream to the confluence with Trout Creek, except for specific listings in Segment 13g. Middle Creek and all tributaries, from County Road 27 downstream to the confluence with Trout Creek	All	Sediment	---

COUCYA13b	Mainstem of Foidel Creek, including all tributaries and wetlands. Mainstem of Fish Creek, including all tributaries from County Road 27 downstream to the confluence with Trout Creek, except for specific listings in Segment 13g. Middle Creek and all tributaries, from County Road 27 downstream to the confluence with Trout Creek.	Fish Creek	E. coli	---
COUCYA13d	Mainstem of Dry Creek, including all tributaries and wetlands, from the source to just above the confluence with Temple Gulch	All	---	Fe (Trec) (during Snowmelt season)
COUCYA13e	Mainstem of Sage Creek, including all tributaries and wetlands, from its sources to the confluence with the Yampa River	Sage Creek below Routt County Road 51D	---	Se
COUCYA13e	Mainstem of Sage Creek, including all tributaries and wetlands, from its sources to the confluence with the Yampa River	All	Temperature	---
COUCYA13h	Dry Creek including all tributaries from Temple Gulch to the Yampa River	All	---	Se
COUCYA13j	Mainstem of Grassy Creek, including all tributaries and wetlands, from the confluence with Scotchmans Gulch to the Yampa River near Hayden.	All	Se	---

(also see Table 6.1 below)

Other water quality concerns in this sub-basin that were identified during the development of the SOTWR include:

- elevated Phosphorus has been detected by USGS water quality sampling.
- suspended sediment is high during spring run-off (USGS).
- excess sediment loading;
- spread of noxious weeds;
- overgrazing resulting in loss of ground cover and erosion/sedimentation;
- whirling disease;
- riparian damage and loss of aquatic habitat leading to elevated water temperatures;
- river channel impairments and stream bank damage at Morgan Bottom.

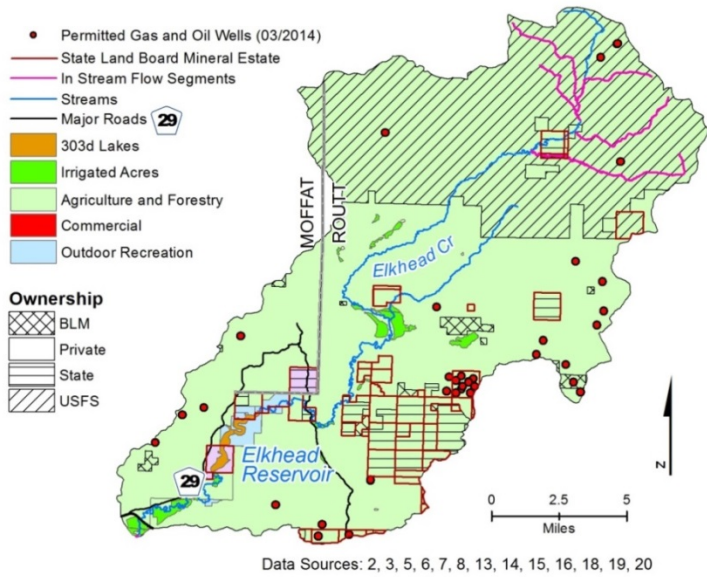
This area houses existing and historic coal mining operations. There are numerous gas and oil wells in this sub-basin.

#### Water Quality Prescriptions

The following water quality needs were identified by regulatory agencies and from public outreach feedback within this sub-basin:

- Additional water quality sampling has been undertaken by Peabody Energy (owner of the coal mines) to address CDPHE listings downstream of their operations;
- USGS recommends additional water quality sampling for phosphorus;
- The Nature Conservancy has received a grant for a large restoration project at Morgan Bottom;
- Fine tune BMPs, educate and implement to address erosion control measures; grazing and noxious weed management;
- the Town of Hayden does not yet have a population large enough to require an MS4 stormwater permit from CDPHE, however, BMPs developed by the UYRWG using examples of successful efforts of other communities such as the City of SS, may be useful for the Town to consider for implementation;
- Existing mining is governed by permitting programs, however, historic mining and related reclamation may need to be explored further.

Sub-basin 5: Elkhead Creek



<b>SUB BASIN 5: Elkhead Creek</b>	
Stream segments within this sub-basin have the following designations and classifications. To view designations and classifications assigned to specific stream segments within the sub basin, refer to the maps contained in the SOTWR or <a href="https://www.colorado.gov/pacific/sites/default/files/33_2016%2803%29-Appendix33-1.pdf">https://www.colorado.gov/pacific/sites/default/files/33_2016%2803%29-Appendix33-1.pdf</a>	
<b>Anti-Degradation Designations</b>	
Outstanding Waters	
Use-Protected Waters	?
Reviewable Waters	?
<b>Aquatic Life Classifications</b>	
Class 1 - Cold Water Aquatic Life	X
Class 1 - Warm Water Aquatic Life	X
Class 2 - Cold Water Aquatic Life	X
Class 2 - Warm Water Aquatic Life	
<b>Use Classifications</b>	
Recreation <sup>1</sup>	E,N,U
Aquatic Life	X
Agriculture	X
Water Supply	X
Wetlands	?
<sup>1</sup> E = existing, P = primary, N = not primary, U = undetermined	

Water Classifications

*Aquatic Life Cold 1, Recreation U, Water Supply, Agriculture:* Headwaters of Elkhead Creek

*Aquatic Life Cold 1, Recreation E, Water Supply, Agriculture:* Middle stretch of Elkhead Creek and tributaries; Headwaters of unnamed tributary southwest of the main stem

*Aquatic Life Cold 1, Recreation N, Water Supply, Agriculture:* short segment of the main stem of Elkhead Creek between the headwaters and the middle stretch

*Aquatic Life Warm 1, Recreation E, Water Supply, Agriculture:* Lower stretches of the Elkhead Creek and tributaries.

This sub-basin is underlain by sedimentary rocks. The northern third of the basin is USFS land. There are a number of permitted gas and oil wells. In-stream flow segments exist in the headwaters (northeast).



Water quality concerns identified by regulatory agencies:

-The Elkhead Reservoir COUCYA23 is on the 303(d) impaired list for Hg in fish tissue and Fish Consumption Advisory.

-Elkhead Creek mainstem and tributaries COUCYA15 are on the 303(d) list for As.

**Sub basin 5: Elkhead Creek 303(d) and M&E Listings**

Waterbody ID (WBID)	Segment Description	Portion	Colorado’s Monitoring and Evaluation (M&E) Parameter(s)	Clean Water Act Section 303(d) Impairment
COUCYA15	Mainstem of Elkhead Creek and tributaries Calf Creek and 80A Road on the Dry Fork of Elkhead Creek, to the confluence with the Yampa River.	Elkhead Creek	---	As
COUCYA23	Elkhead Reservoir	All	---	Aquatic life Use (Hg Fish Tissue)

(also see Table 6.1 below)

Other water quality concerns from public outreach and feedback include:

- high sediment loads in the upper basin;
- riparian degradation in headwaters;
- extensive noxious weeds and lack of ground cover contribute to erosion;
- wide, shallow exposed channels are result of erosion and sedimentation causing elevated temperatures
- encroachment of invasive fish species (northern pike, smallmouth bass).

Water Quality Prescriptions

- There is a restoration plan in place for the upper Elkhead Creek and tributaries. Project partners include USFS,CPW, TU, RCCD and others.
- BMPs and related education should be implemented including erosion and sediment, riparian protection, grazing, noxious weed management.

Table 6.1

**COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT  
WATER QUALITY CONTROL COMMISSION 5 CCR 1002-93  
REGULATION #93**

**COLORADO'S SECTION 303(D) LIST OF IMPAIRED WATERS AND MONITORING AND EVALUATION LIST**

WBID	Segment Description	Portion	Colorado's Monitoring & Evaluation Parameter(s)	Clean Water Act Section 303(d) Impairment	303(d) Priority
COUCYA02a	Mainstem of the Yampa River from Wheeler Creek to Oak Creek.	Yampa River above Stagecoach Reservoir	Mn	As	L
COUCYA02b	Yampa River from Oak Creek to Elkhead Creek	all		Temperature, As	H/L
COUCYA03	All tributaries to Yampa River except for specific listings, on USFS land	Bushy Creek		Sediment	L
COUCYA03	All tributaries to Yampa River except for specific listings, on USFS land	Little Morrison M Creek	n	As, Fe(Trec)	H/L
COUCYA03	All tributaries to Yampa River except for specific listings, on USFS land	Gunn Creek		As, Zn	H/L
COUCYA04	Little White Snake Creek, source to Yampa River	all	D.O., Mn		
COUCYA08	Elk River source to Yampa River	Elk River below Morin Ditch		<i>E. coli</i>	H
COUCYA08	Elk River including tributaries and wetlands From the source to Yampa River	Lost Dog Creek	Hg, As, Zn		

COUCYA12	All tributaries to the Yampa River, including all wetlands, from the confluence with the Elk River to the confluence with Elkhead Creek, which are not on National Forest lands.	Wolf Creek		Aquatic Life (provisional)	M
COUCYA13b	Mainstem of Foidel Creek, including all tributaries and wetlands. Mainstem of Fish Creek, including all tributaries from County Road 27 downstream to the confluence with Trout Creek, except for specific listings in Segment 13g. Middle Creek and all tributaries, from County Road 27 downstream to the confluence with Trout Creek.	all	Sediment		
COUCYA13b	Mainstem of Foidel Creek, including all tributaries and wetlands. Mainstem of Fish Creek, including all tributaries from County Road 27 downstream to the confluence with Trout Creek, except for specific listings in Segment 13g. Middle Creek and all tributaries, from County Road 27 downstream to the confluence with Trout Creek.	Fish Creek	<i>. coli</i>		
COUCYA13d	Mainstem of Dry Creek, including all tributaries and wetlands, from the source to just above the confluence with Temple Gulch	all		Fe(Trec) (Snowmelt season)	L

COUCYA13e	Mainstem of Sage Creek, including all tributaries and wetlands, from its sources to the confluence with the Yampa River	all	Temperature		
COUCYA13e	Mainstem of Sage Creek, including all tributaries and wetlands, from its sources to the confluence with the Yampa River	Sage Creek below Routt County Road 51D		Se	L
COUCYA13h	Dry Creek including all tributaries from Temple Gulch to the Yampa River	all		Se	M
COUCYA13j	Mainstem of Grassy Creek, including all tributaries and wetlands, from the confluence with Scotchmans Gulch to the Yampa River near Hayden.	all	Se		
COUCYA15	Mainstem of Elkhead Creek and tributaries Calf Creek and 80A Road on the Dry Fork of Elkhead Creek, to the confluence with the Yampa River.	Elkhead Creek		As	H
COUCYA18	Little Snake River including all tributaries and wetlands from forest boundary to Wyoming border	all	Cu		
COUCYA18	Little Snake River including all tributaries and wetlands from forest boundary to Wyoming border	South Fork Little Snake River	As, Fe(Dis)		

COUCYA22	All lakes and reservoirs tributary to the Yampa River, Elkhead Creek, and the Little Snake River, except Elkhead Reservoir.	Lake Catamount		Aquatic Life Use (Hg Fish Tissue)	H
COUCYA23	Elkhead Reservoir	all		Aquatic Life Use (Hg Fish Tissue)	H

## Chapter 7. Action Plan and Matrix by Objective

Based upon information provided in previous chapters, this chapter presents a proposed Action Plan and proposed projects for the next 5-10 years to work towards the following five objectives:

1. Protect and enhance water quality
2. Protect and restore riparian areas
3. Increase education, awareness and collaboration
4. Expand upon existing water quality monitoring
5. Serve as a resource for future projects and initiatives.

Included in the Action Plan by action item are:

- The preliminary identification of potential lead organizations;
- Watershed benefits
- Milestones
- Estimated costs
- Possible funding partners
- Preliminary schedule, and
- Products.

The Watershed Plan is a living document and intended to be updated frequently. Additional projects will be added as they evolve.

**Table 7.1: ACTION PLAN MATRIX****Objective 1: Protect and Enhance Water Quality**

Action Item	Potential Lead Organizations	Watershed Benefits	Milestones	Est. Cost	Potential Funding Partners	Est. Schedule	Products
Hire a Watershed Coordinator	UYRWG RCCD	Long term preservation of watershed health	-Resources for implementation -Project coordination	50,000/yr (part time)	-CDPHE -Yampa/White Basin Roundtable -CWCB	2016 & ongoing	-Coordination, collaboration, communication -Implementation of important watershed topics and projects
Analyze water quality issues identified in 303(d) and M&E lists	-UYRWG -CDPHE -WWTPs	Better understanding of the issue and how to address	-List of data gaps -Water quality Sampling	55,000	-CDPHE -WWTP -CWCB -City SS	2016	Either delist or address water quality concern* (see lists in Chpt. 6)
Further evaluate potential concerns and causes & seek appropriate <u>nutrient loads</u> starting with priority areas	-UYRWG -UYWCD -USGS -CPW -City SS -WWTP	Better understanding of current conditions and needs and how to make improvements	-Water quality data gathering -Lake Management Plan Development	50,000-100,000	-CDPHE -CPW -UYWCD -City SS -WWTP	2016 & ongoing	-Stagecoach Reservoir Nutrient Study* resulting in implementation plan to improve water quality -Demonstration project
-Further evaluate & seek appropriate <u>sediment loads</u> starting with identified problem areas -Implement shovel	-USGS -CPW -UYRWG -USFS -CDOT	Better understanding of current conditions and needs and how to make improvements	-Water quality data gathering -Implement sediment reduction projects	50,000-100,000	-CDPHE -CWCB -USFS -CPW -NRCS -TU	2017 & ongoing	-Data to support or negate concerns -Demonstration project: Elk River Pilot Study -Implement CDOT/USFS

Action Item	Potential Lead Organizations	Watershed Benefits	Milestones	Est. Cost	Potential Funding Partners	Est. Schedule	Products
ready projects		-Improve water quality & aquatic habitat					Sediment Reduction Plan
Develop Best Management Plan (BMP) Toolbox (website) for private and public land management practices relative to nonpoint source loading	-UYRWG -USFS -Routt County -City SS	Engagement of all stakeholders	-BMP Manual -Public outreach	20,000	-CWCB -Routt County	2016	Educational tools for widespread dissemination to work towards protecting and improving water quality
Further characterize <u>algae</u> problems in the Yampa River System starting with identified priority area	-CPW -UYWCD -UYRWG	-Improved water quality -Benefits to users & watershed health	Action Plan	50,000	-CDPHE -UYRWC -CPW	2017	-Stagecoach Reservoir Algal Study* -Identify other areas that need attention
Address possible <u>temperature</u> concerns starting with priority areas	-City SS	Aquatic habitat improvement	-Data gathering & analysis -Stakeholder engagement	108,000 (main stem)  1.5M (Walton Crk)	-City SS -CPW -CWCB -YWBRT	2016-18	-Steamboat Springs Stream Management and Target Flow Study* -Walton Creek habitat restoration/Pike removal/water temperature reduction project*
Evaluate & implement watershed connectivity and ecological balance of riparian, wetland,	-UYRWG -TU -USFS -City SS	-Improved water quality & riparian habitat -Benefits to users & watershed health	Stream Assessments, Data Gathering, Conservation Easements	1M +	-USFS -Yampa Valley Land Trust -CWCB	2018-2022	-Identification of priority areas for future implementation strategies -Butcherknife Creek Floodplain



Action Item	Potential Lead Organizations	Watershed Benefits	Milestones	Est. Cost	Potential Funding Partners	Est. Schedule	Products
upland & aquatic biota							Reconnection & Flood Risk Mitigation Project* -Riparian Corridor Conservation Easements
Respond to water quality concerns identified in SOTW not listed above	-UYRWG -Oak Creek -Water suppliers -City SS	-Improved water quality -Benefits to users & watershed health	-Mitigation Plans -Water supply Protection - Preparedness Plans	10,000	-CWCB -CDPHE	2017	-Steamboat Lake/Willow Creek pollutant assessment & mitigation*
				10,000	-Oak Creek	2017	-Town of Oak Creek stormwater management*
				5,000		2017	-Oak Creek Mine Drainage Project*
				1,000	-Water purveyors	2017	-Sheriffs Reservoir Wildfire Preparedness -Fish Creek Reservoir Wildfire Preparedness
				225,000	-City SS -Routt County -CDOT	2017-2020	-Scoria/Sand recovery and recycling facility
Implement 2003 Yampa River Management Plan & 2008 Yampa River Structural Master Plan	City SS	Improved recreational benefits		50,000 – 5M	-CWCB -City SS -Friends of Yampa	2017-2020	-Main stem improvements near SS -Recreational management -Stream health monitoring

**Objective 2: Protect and restore riparian areas**

A well-conceived riparian rehabilitation and protection program will go a long way to providing resolution for many of the water quality concerns previously identified in this WP including bank stability, shade, increased invertebrate populations, erosion control, reduced algae, lower water temperatures, etc. Focusing on improving riparian zones as integral parts of the Yampa River System will be cost effective, sustainable and can begin immediately. Education on the importance of retaining the integrity of riparian systems will be critical to the success of the WP.

Action Item	Lead Organizations	Watershed Benefits	Milestones	Cost	Funding Partners	Schedule	Product
Further assess riparian areas that need attention & create action plans	-UYRWG -USFS -NRCS -Grazing Leasees -Oak Creek	Improved water quality	-Rapid stream assessment  -Create plan to address noxious weeds, erosion, water quality concerns	50,000	-NRCS -Oak Creek -USFS	2016-2017	-List of priority areas of concern -Oak Creek riparian restoration project* -Trout Creek/Fish Creek, Foidel Creek riparian fencing, noxious weed control & restoration*
Promote the proper management of riparian zones	-UYRWG -The Nature Conservancy -Public & Private Land Holders	Holistic improvements to sub-basins	-Meet with partners -Develop plan	2,5000 125,000	-CDPHE -CWCB	2017 2016	-Demonstration project in Elk River sub-basin* -Morgan Bottom Irrigation Delivery & Habitat Improvement Project*
Provide education on improved and effective irrigation diversions and head gate construction	-Community Ag Alliance (CAG) -CSU Extension -NRCS	-Sediment load reduction -Riparian area preservation	-Meet with partners -Develop plan, demo projects	15,000	-NRCS	2017	-Design standards -Demonstration Project
Work with partners to develop habitat	-UYRWG -TU	Watershed protection	-Meet with partners	0	All interested	2016 & ongoing	-List of Priorities -Action Plans

improvement education and projects	-Friends of Yampa		-Develop plan				
Improve habitats negatively affected by invasive species starting with identified priority projects	-USFS -CPW -TU	-Reduce erosion, improve habitat and water quality -Reduce negative ecological impacts that non-native species have on the native aquatic community	Plan to address issues	800,000	-CWCB -USFS	2018	-Elkhead Riparian Improvements* -Noxious Weed Management* -Ongoing non-native fish species control in Stagecoach Reservoir and Lake Catamount*
Wetlands Protection	-UYRWG	Identify critical areas for protection	Mapping	5,000	-CWCB -YWBRT		List and map of areas that need strategies to protect
Native Plant Nursery	-UYRWG -Riverkeeper	-Riparian restoration plant bank -Habitat improvements	-Acquire site -Plantings	20,000			Riparian restoration

**Objective 3: Increase education, awareness and collaboration**

Action Item	Lead Organizations	Watershed Benefits	Milestones	Cost	Funding Partners	Schedule	Product
Develop website	-UYRWG -RCCD	Education for watershed protection				2016	Website dedicated to watershed data sharing, protection
Expand watershed group to broader set of stakeholders	UYRWG	Coordinate efforts, improve communication	Invite stakeholders to a	0	n/a	2016	Improved outreach and participation

		of project and outcomes to increase success of efforts watershed wide	forum				
Provide opportunities for public education on the importance of a properly functioning Yampa River System	UYRWG	Increase participation, education	-Host events -Develop educational plan including website -Develop messaging	5,000			Improved outreach and participation
Reach out to key groups and provide tools to assist in understanding and participating in watershed improvements	-Municipalities -County Govt. -Recreational Orgs -Ag Community -Land managers -Planners			5,000			Improved outreach and participation
Advocate for water conservation and efficiency	UYRWG	Pro-active approach to water resources management	-Implement existing water conservation plans				
Advocate that water development & transfer activities not have adverse effects on the region's water resources	-UYRWG -Basin Roundtable	Maintain minimum in-stream flows for desired species & good water quality					
-Small quantity generator hazardous waste disposal	-UYRWG	Protect water quality	Public outreach	500	-CWCB -CDPHE -Routt Cty	2017	Outreach & educational materials

**Objective 4: Expand upon existing water quality monitoring**

Action Item	Lead Organizations	Watershed Benefits	Milestones	Cost	Funding Partners	Schedule	Product
Promote the importance of water quality monitoring	-UYRWG -Yampatika -YVSC -River Watch	Measure progress, track trends	Public outreach materials	5,000		ongoing	Better data for decision making
Provide a user friendly data base	-UYRWG -USGS -CO Data Share Network	Public engagement			Routt County	2016	-Public understanding of trends -Public participation
Provide ongoing interpretations of important data to the public and stakeholders	-UYRWG -USGS -CO Data Share Network	Collaboration using sound science				ongoing	-Public understanding of trends -Public participation
Identify data gaps and seek funding to address them	UYRWG	Better understand state of the watershed				2016	Better data for decision making
Work with CDPHE and CO Water Quality Control Commission to ensure that sufficient water quality and stream flow data are provided for sites proposed for listing during the triennial review process	UYRWG	Accurate information will drive sound decision making				2016 & ongoing	Better data for decision making

**Objective 5: Serve as a resource for future projects and initiatives**

Action Item	Lead Organizations	Watershed Benefits	Milestones	Cost	Funding Partners	Schedule	Product
Develop tools and strategies to assist other stakeholders in developing consistent and coordinated projects within and throughout the watershed	UYRWG						
Work with the Basin Roundtable on water quality issues	-UYRWG -YWBR						
Advocate for an integrated approach to watershed protection and monitoring	-UYRWG -NRCS						
Provide a forum to maximize communication among stakeholders and the public in general	-UYRWG						

\*Priority Projects

The action plan outlined above encompasses both watershed-wide management measures and sub-basin or stream-specific measures to protect or improve water quality as they relate to non-point source loading. They are intentionally non-regulatory, will be developed in collaboration with stakeholders, and include:

- demonstration projects that focus on best management practice (BMP) implementation with measurable outcomes (There exist numerous data bases detailing the intent, design and use of BMPs, many of which are applicable to the UYRW. These can often be used as a starting point, however, tailoring the BMPs to fit the UPYW will be necessary in many instances). BMPs will be more readily implemented if they are easily accessible and user-friendly. The UYRWG has listed this as a priority project and includes the creation of a website to house the UYRW BMP toolkit. Some examples of Tier 1 BMPs have been created as a start and are included in the Appendix

- natural/native riparian protection and restoration programs

- coordinated efforts along stream segments where multiple private property owners initiate projects

- nutrient and sediment loading reduction from

- agriculture

- roads and highways

- developed “urban” areas

- construction and earth disturbance

- household pollution reduction education and case studies for lawn fertilization and pet waste as well as xeriscape education

- stormwater runoff and storm sewer maintenance practices for populated areas

- low impact development strategies to be incorporated into new development

- wetlands – identify critical wetland systems, are they performing their function, do they need protection

- lakes and reservoirs – eutrophication potential, blue green algae concerns, non-native species/invasives

- collaboration and outreach/education strategies

- water quality monitoring:



- USGS
- River watch
- monitoring of biological indicators
- anti-degradation measures and strategies
  - examine possible alternatives to proposed or existing activities that have the potential to lower water quality.

The Action Plan Matrix begins to identify possible lead agencies and partners as well as potential resources that may be called upon to further develop actions to arrive at desired outcomes.

Similarly, potential funding sources have been identified on a preliminary basis. As future funding sources are discovered, they will also be pursued.

To maximize public participation and outreach, a Communication Plan will be developed by first appointing a Steering Committee to guide the effort. Outside consultants and/or non-profits will be enlisted to create related materials.

In addition to the priority projects listed in the Action Plan Table 7.1, a number of projects were identified during the development of the SOTWR as important. A full list appears below which is intended to be updated and amended on an ongoing basis.

### **UYRW POTENTIAL PROJECT LIST 2016 (in no particular order)**

#### Priority

1. Hire Watershed Coordinator
2. Develop a BMP toolbox tailored to the UYRW and create related website
3. Steamboat Lake / Willow Creek pollutant assessment & mitigation
4. Elk River sub-basin comprehensive study/plan
5. Headgate improvements education/mitigation
6. Morgan Bottom Irrigation Delivery & Habitat Improvement
7. Stagecoach nutrient management and algal study
8. Steamboat Springs Stream Management and Target Flows Study
9. CDOT Sediment Plan Implementation
10. Native Plant Nursery
11. Riparian restoration priorities:
  - a. Oak Creek
  - b. Need rapid assessment stream segment strategy in other areas
12. Elkhead Riparian improvements and noxious weed management
13. Trout Creek/Fish Creek, Foidel Creek Riparian Fencing and Noxious Weed Management

14. Oak Creek Stormwater Management
15. Outreach & Education

Secondary

1. Nutrient and sediment loading modeling
2. Riparian health assessments – implementation plans including Adopt a Stream
3. Critical wetlands identification & mapping – protection implementation
4. 303(d) list segment sampling – Triennial review participation
5. Butcherknife Creek Floodplain Reconnection and Mitigation
6. Walton Creek habitat restoration/Pike removal/water temperature reduction
7. Oak Creek Mine Drainage Project
8. Sheriffs Reservoir wildfire preparedness
9. Fish Creek Reservoir wildfire preparedness
10. Scoria/Sand recovery and recycling facility
11. Small Quantity Generator Hazardous Waste Disposal Education

In Progress, may need additional support

1. Northern Pike, Smallmouth Bass removal
2. Mercury in fish tissue
3. Thermographs
4. Agriculture efficiencies/ return flow study
5. Headgate/diversion structures - repairs and replacement
6. Range management training
7. Water conservation implementation
8. Water quality monitoring
9. River Watch

The UYRWG has already been approached by outside entities to support of a variety of water quality projects within the watershed. Below are some of the considerations the UYRWG would like to see addressed in such requests:

-Does the proposed project address a problem identified in the State of the Watershed Plan or Watershed Plan that is not already being addressed?	<u>   </u> Y <u>   </u> N
-Is desired outcome clear?	<u>   </u> Y <u>   </u> N
-Is implementation feasible, i.e. are technical and funding resources addressed?	<u>   </u> Y <u>   </u> N
-Are proposed practices or measures consistent with those recommended in the WP?	<u>   </u> Y <u>   </u> N
-Are short term, long term horizons identified?	<u>   </u> Y <u>   </u> N
-Have metrics to measure progress and success been defined?	<u>   </u> Y <u>   </u> N

-Is long term maintenance required? If so, has this been addressed?	<u>Y</u>	<u>N</u>
- Has the proposal addressed the availability of partners?	<u>Y</u>	<u>N</u>
-Is collaboration and coordination addressed?	<u>Y</u>	<u>N</u>
-Has an outreach and education component been included?	<u>Y</u>	<u>N</u>
-Are logistics adequately addressed?	<u>Y</u>	<u>N</u>

## Chapter 8. Outreach and Education

### Stakeholders and Partnerships

There are numerous agencies, non-profits, ad hoc groups, political bodies, businesses, recreational retailers and users, and other public and private interests that are active in the UYRW. A goal of the UYRWG is to help bring all willing stakeholders and potential partners together by establishing a network that will increase communication; maximize resources; emphasize collaboration and coordination; and preclude redundancy and duplication of efforts. A list of known agencies appears below.

#### Federal Government

US Geologic Survey

US Forest Service - Medicine Bow/Routt National Forest

US Fish and Game

Bureau of Land Management

#### State Government

CDPHE

Natural Resource Conservation Service

Colorado Division of Parks & Wildlife

Colorado State Parks

State Forest Service

Office of the State Engineer, Water Commissioners

Colorado Department of Transportation

#### Local Government

Routt County Conservation District

Routt County BCC

Office of Emergency Management

Routt County Planning Commission

City of Steamboat Springs Planning Department

City of Steamboat Springs Council

Municipalities – Yampa, Oak Creek, Hayden, Clark, Phippsburg, Milner

Non-government Organizations

Upper Yampa Watershed Group and Technical Committee

CSU Extension Office

Community Agricultural Alliance

Upper Yampa River Water Conservancy District

Colorado River Water Conservation District

Yampa White Basin Roundtable

Upper Yampa Nature Conservancy

Trout Unlimited

Ducks Unlimited

Yampatika

Friends of the Yampa

Yampa Valley Fly Fishers

River Watch

Water Purveyors

Wastewater Treatment Plants

Steamboat Ski & Resort Corp

Yampa Valley Sustainability Council

Routt County Cattlewomen

Yampa River Basin Partnership

Yampa Valley Land Trust

Tubing and Rafting Companies

Sporting Goods Retailers

Guides and Outfitters

Golf Course Operators

Landscape Contractors

Water and Sanitation Districts

Special Districts

Local Engineering Companies

Local Surveyors

Local Development Consultants

Local Excavating Contractors.

Maximizing understanding and buy-in from the general public, public officials, elected officials, and stakeholders on why watershed health is important and how they can participate will be critical to the overall success of any given strategy or set of implementation projects.

The Watershed Plan provides a platform to guide existing and future efforts in the same general direction.

The following are categories for preliminary outreach:

- General Public: Objective is to continue to expand awareness and participation
- Agricultural Community and Ditch Operators: Objective is to assist them in solving problems by providing tools and funding to achieve common goals
- Land Managers: provide tools and workshops as well as demonstration project results to improve stewardship of the watershed
- Non-profits involved in beneficial programs/projects in the watershed: objective is to collaborate and share data and information, maximize the use of resources, and avoid redundancy
- City and County Planners: objective is to create and maintain open channels of communication to enhance consistency with UYRWG goals and those of the planners
- Elected and public officials: objective is to educate, get support and possible funding
- Local businesses can play an active role in outreach efforts

-Recreational vendors, outfitters, users: objective would be to engage them in watershed efforts as well as educate on ways they can participate in effectuating desired outcomes.

Depending on the audience, a variety of different methods, messages, and communication tools will be needed. As mentioned previously, the UYRWG has prioritized a project that, if funded, would create a website that would house BMP tools and other valuable information that could be easily and frequently updated.

Meetings, workshops, development of fliers, press releases, news stories, local radio and TV spots, social media including crowd sourcing, events, will all be opportunities to increase education, collaboration and participation. Hiring a Watershed Coordinator will be essential toward achieving outreach goals.

**Identification of Measurable Water Quality Restoration and Protection Goals**

Evaluating and getting feedback will help to structure future outreach efforts.

Measurable progress can be evaluated in a variety of ways including the use of numeric criteria, narrative criteria, and bio-criteria. Although quantitative water quality monitoring in the watershed has been initiated, it is relatively sparse with many data gaps that need to be addressed with limited funding to do so.

Monitoring biological indicators may provide a reasonable measurement in certain stream segments and/or for certain desired conditions such as comparing progress against a prescribed healthy community of fish and associated aquatic organisms, or a desired riparian habitat. Certain initiatives are already ongoing, and gathering numeric and other results is a goal of the UYRWG so as to increase collaboration, communication and reporting watershed-wide.

Because the focus of the majority of implementation efforts in the UYRW will be on *protecting* waters whose water quality may be or become threatened by human activities, other metrics of success can be utilized. Some examples are annual quantification of volunteer participants in water quality related projects; setting up and monitoring a best management practice registration program where participants can get credits for load reduction efforts and are incentivized through rewards; soliciting funding for specifically targeted community workshops; soliciting funds for demonstration projects then using what was learned to encourage broader usage of best practices. Performance indicators will be developed for projects and tailored to specific desired outcomes outlined in each project Work Plan. Examples appear in Table 8.1.

**Table 8.1 Methods for Measuring Success**

<b>Objective</b>	<b>Measurement of Success</b>
Education and Outreach	# of attendees at meetings, workshops, events
BMP Implementation	# of BMPs implemented; # demonstration projects
Reduce nutrient loads	# BMPs implemented; water quality improvements

Reduce sediment loads	# BMPs implemented; water quality improvements
Restore damaged riparian areas	# miles restored; # BMPs implemented; water quality improvements
Protect native habitats	# acres identified and BMPs implemented
Wetland protection	# acres protected
Evaluate lake eutrophication issues	Completion of studies leading to restoration projects
Reduce accelerated algae blooms	Completion of studies leading to reduction strategies
Livestock grazing management	# BMPs implemented; water quality improvements
Address historic mining runoff	# BMPs implemented; water quality improvements
Improve stormwater management in developed areas	# municipal program enhancements
Reduce elevated temperature in areas identified	# miles of stream segments addressed for improvements
Restore normal seasonal bedload in identified areas	# of areas where improvements were made, # of collaborative agencies involved
Reduce wildland fire potential	# wildfire mitigation projects in critical areas; # defensible space BMPs implemented
Enhance water quality monitoring to address data gaps identified	-# Monitoring stations added -River Watch accomplishments -# of participants in Adopt a Stream program

## Chapter 9. Ongoing Water Quality Monitoring

The US Geologic Survey (USGS) was commissioned under a multi-partner funding arrangement to compile and analyze the vast amount of historic water quality data gathered between 1975 and 2009 and assess water quality conditions in the UYRW. The subsequent report released in 2012 was utilized to develop the SOTWR and the data is currently stored on the USGS website. Continued monitoring of five stations is being undertaken by the USGS. It is anticipated that the data can be transferred to a more user-friendly format on the Colorado Data Share Network. As water quality monitoring is expanded through implementation projects, it is important to ensure quality control and to store all newly acquired data in a central location along with frequent interpretations and communication to the public and stakeholders.

Monitoring of environmental indicators other than chemical parameter-specific is also important to retain in a central location and track over time. Examples of these might include biological (i.e. benthic, fish, algae), physical, (e.g. visual habitat assessments, riparian and geomorphic assessments), and hydrologic measurements. Even photos can be important in tracking trends. Because there are many agencies that collect data, developing a quality assurance and storage



plan will be a major undertaking. The UYRWG will spearhead this effort, however, other entities will need to collaborate to make it successful.

## **PLAN MILESTONES**

### **Short Term**

A number of short term milestones can be accomplished within the next 1-2 years without large amounts of funding. Expanding participation and stakeholder groups is one of those.

Additionally, outreach to the general public, to implementing partners, and to local schools can have a positive impact and be done in short term. The UYRWG feels strongly that hiring a full or part time Watershed Coordinator will be instrumental in moving action items forward in a timely manner. Certain projects such as the CDOT Sediment Plan, Elkhead Riparian Project, and Noxious Weed Management, are “shovel ready” and can be implemented upon acquisition of funding. Seeking out volunteers will also provide momentum to the program. Working with existing agencies can go a long way towards meaningful progress on a variety of fronts.

### **Mid-range**

The planning horizon of this watershed plan is 5-10 years. Many of the more comprehensive projects listed under the Action Plan will take a year or two to get off the ground, between grant writing, organization and preliminary planning. The UYRWG has supported in many meetings the benefit of implementing a few demonstration projects early on to show successful strategies that can be employed to meet water quality and watershed health goals. Also, developing a BMP toolbox tailored to the UYRW would fall in this timeline.

### **Long Term**

It is critical that the watershed plan not sit on the shelf. It is designed to be a living document and will need to be re-visited and updated periodically. The priority project list will certainly change and grow over time. Some of these projects span over a number of years and depend upon the acquisition of outside funding.

## **Commonly Used Abbreviations**

BIP Basin Implementation Plan

BMPs Best Management Practices

CAA Community Ag Alliance

CDPHE Colorado Department of Public Health and Environment

CPW Colorado Parks and Wildlife

CSU Extension Colorado State University Extension Office

CWCB Colorado Water Conservation Board

LID Low Impact Development

M&E Monitoring and Evaluation List (CDPHE)

NRCS Natural Resource Conservation District

RCCD Routt County Conservation District

SOTWR State of the Watershed Report

THN The Nature Conservancy

TMDL Total Maximum Daily Load

TU Trout Unlimited

USEPA United States Environmental Protection Agency

USFS United States Forest Service

USGS United States Geologic Survey

UYRW Upper Yampa River Watershed

UYWCD Upper Yampa Water Conservancy District

UYRWG Upper Yampa River Watershed Group

WP Watershed Plan

YWBRT Yampa / White Basin Roundtable

WWTP Wastewater Treatment Plants



# **APPENDIX**

## Best Management Practices for Fisheries

### Goals

Maintain or restore:

1. Appropriate stream form and function
2. Natural flow regimes
3. Existing aquatic communities
4. Stream connectivity

### Background and best management practices (BMPs)

*Natural stream form and function.*—In general, robust fisheries are found in healthy, intact streams. Healthy streams possess an appropriate shape (e.g., width-to-depth), pattern (pool versus riffle), and profile (e.g., slope) on the landscape. Healthy streams are also typically well connected to their floodplain and densely lined by riparian vegetation (e.g., willows, alders, cottonwoods). Widening and straightening a stream, for example, can alter stream form and function and ultimately compromise the health of a fishery.

A fundamental best management practice is to leave healthy streams and riparian areas intact. Degraded streams can be restored by first treating the root of the problem and then addressing the symptoms of the problem. In some cases, managing ungulate use and/or planting riparian vegetation will help to set a stream on the path to recovery (see Riparian BMPs). In other cases, engineering, heavy equipment, and materials (e.g., logs rock) are required to effectively restore a stream. Another BMP is post-project monitoring—restoration projects often require follow-up maintenance and stewardship. Finally, a simple and recommended BMP is to consult local experts when considering a stream restoration project—they may be able to provide both technical guidance and ideas regarding cost-share opportunities.

*Flow regimes.*—Stream discharge influences both the quantity and quality of fish habitat. In general, higher flows are associated with greater habitat area, lower stream temperatures, and higher dissolved oxygen concentrations. Warm, low-flow periods can be especially stressful on native fishes and popular sport fishes.

A BMP is to divert water from streams only at the time and in the amount necessary to meet beneficial uses. Stream flows can sometimes be restored by increasing irrigation efficiency, and less often by releasing storage water.

*Aquatic communities.*—The Upper Yampa River watershed is home to a number of native and nonnative fishes (see SOTWR). Introductions of new aquatic species, whether they be fishes or

otherwise (e.g., plants, crayfish), can have significant, negative effects on existing fish communities. For example, invasive fishes may prey upon, hybridize with, outcompete, and/or introduce diseases to, existing fishes. Foreign pathogens—for example, whirling disease—can decimate trout populations.

State law prohibits individuals from removing live fishes from water bodies and from stocking fish of any species into water bodies (unless explicitly permitted by Colorado Parks and Wildlife). A BMP is to disinfect fishing gear (e.g., waders, boots), boats, and equipment when moving between water bodies. Options for disinfecting fishing gear are to 1) submerge it in a quaternary ammonium-based cleaning solution for  $\geq 10$  minutes (6 oz. of cleaner for every 1 gallon of water), 2) soak it in hot ( $\geq 140^\circ\text{F}$ ) water for  $\geq 10$  minutes, or 3) freeze it overnight (see Colorado Parks and Wildlife Fishing Regulations).

*Stream connectivity.*—Stream-dwelling fishes will move considerable distances to find the habitats most suitable for meeting life requirements. For example, some fishes spend much of the year in a large river but use smaller tributaries to spawn. Because fish will move among habitats and streams, it is important to maintain stream connectivity. Culverts, diversions, and other instream obstacles (e.g., dry channel beds) can disrupt that connectivity.

A simple BMP is to be mindful of fish passage when installing instream structures. Existing barriers can be removed through structure modification or replacement. For example, under certain circumstances, a seasonally-constructed gravel dam might be replaced with a permanent, fish-friendly diversion. Likewise, a perched culvert might be replaced with an open-bottomed arch. Local resources are available to assist landowners with designing, funding, and implementing qualified fish passage projects.

### **Potential resources**

A number of agencies and entities are available to assist interested parties with evaluating and planning for fisheries resources. Following is a list of potential contacts:

- Colorado Parks and Wildlife
- Trout Unlimited
- U.S. Forest Service
- Natural Resources Conservation Service
- Riverkeeper Inc.
- CSU Extension
- U.S. Fish and Wildlife Service: Partners for Fish and Wildlife

*By Brian Hodge, Trout Unlimited*

**Best Management Practices for Riparian Areas:  
Introduction to Yearly Riparian Stewardship Activities**

Evolving a plan for yearly stewardship activities on properties that do not require rehabilitation can be easily facilitated by a “limiting factor” walk through with one or more of your agency or private sector contacts. The primary contact should be a professional with a riparian ecology background (NRCS). The riparian ecologist will help you identify your particular plant community, its current state of health and what plant species are missing or present in an overabundance. The ecologist will also help you make the connection that defines how your particular riparian species community fits into the puzzle that is the aquatic system.

Secondary contacts could include a fisheries biologist capable of guiding the landowner to the selection and placement of trees (alders for example) that will stabilize stream banks, provide overhead cover that will protect fish from aerial predators, and also provide a continuous supply of terrestrial insects to the stream channel that would benefit both fish and birds.

A private lands biologist from the Natural Resource Conservation Service, Colorado Parks and Wildlife and the Rocky Mountain Bird Observatory partnership could easily outline the appropriate plant species that would feed and provide nesting habitat for the 80 species of Neotropical birds that visit our riparian zones every summer. Inclusion of serviceberry, chokecherry, Hawthorn and red osier dogwoods would provide beautiful flowers and color in season as well as provide late summer, fall and some winter food sources for our game bird species, bears and some ungulates. All of the previously mentioned riparian species will contribute shade, leafy detritus and dissolved organic matter to the channel to bolster the riparian zones Allochthonous (terrestrial) energy contribution.

A final and maybe most significant contact would be the Routt County Weed supervisor Mr. Greg Brown. The county weed dept. can identify the noxious weeds of Colorado, particularly those that are on the “A” and “B” list covered by the Colorado Noxious Weed Act. The county offers an excellent weed control class most winters specifically designed for agriculture and small land owners (highly recommended).

Landowners that want to be directly involved in their own stewardship activities can participate in the yearly “Retree Steamboat” Program sponsored by the Yampa Valley Sustainability Council in conjunction with the Co, State Forest Service. Volunteers learn how to harvest species specific native riparian cuttings and seed sources. These cuttings are forwarded to the Co. State Forest Nursery seedling program in Fort Collins where they are rooted and either started in small pots or returned as bare root plants to the ordering customers in Steamboat. Volunteers then learn how to mix soils and pot these plants as well as watering and maintaining them until they are ready to be planted streamside.

Landowners that want to restore and maintain their riparian habitats but have absolutely no interest in doing any of the work themselves will find experienced and highly qualified

contractors in the Yampa and Elk River drainage area. Please refer to the UYRWG Riparian Rehabilitation Guide.

The following is a basic yearly riparian area stewardship schedule from Early February thru November, **Please note a high percentage of stewardship activities have distinct windows of opportunity for their discharge. These windows are controlled by weather, seasonal time slots, water levels and a host of other conditions. A good example is herbicide application to control Larkspur. In Routt County Larkspur emerges early in the spring and can easily be controlled by a number of broadleaf herbicides however the growth areas are generally wet with valley snowmelt ( some with running water) which precludes the use of broadleaf herbicides that do not have an aquatic rating. Some years it is dry enough to spray and some not this means that when you have the chance you better jump on it! The toxic alkaloids contained in Larkspur cause fatal poisoning in cattle.**

- 1) February- When you have decided what you want to plant and the numbers of each species the second step is to clear your potential order with the CSFS Nursery Manager. We try to order as far in advance as possible to assist the CSFS Nursery planning process and to assure getting our orders when we need them. Volunteers will probably collect these cutting in early February when we are sure that they are still dormant. You will be more than welcome to assist. We try to do these collections on a good weather day and normally we are done by mid-day. Plants that you order that are raised from seed sources will have to be ordered a year in advance as the seeds are collected in the preceding fall. Cost will surprise you as the bare root trees are usually less than two dollars apiece and those planted in pots are less than \$2.75. Plants must be purchased in 25 tree lots.
- 2) Ice out (late March through April) As the snow melts in the riparian zones some Stewardship tasks must be discharged rather quickly they are as follows:
  - Tree protection As soon as the snow cover is gone check the welded wire baskets protecting your cottonwood trees and any other species that the beavers seem to relish. Drifting snow and ice may have compromised their effectiveness.
  - There will always be some new trees in a riparian cottonwood stand. Protect them as quickly as you find them or they will be eaten .If you find trees that have been eaten by beaver cut the remaining stem as close to the ground as possible to allow a new leader to start from the root system. When you see that a new leader has developed, protect it immediately.
  - Beaver control – this is one of the peak times of year for beaver activity. Currently there is no shortage of beaver in Routt County. Be aware, you may have to remove beavers to protect your new riparian habitat. Due to historic land use practices there is a finite amount of healthy riparian habitat in Routt County. Healthy riparian habitat will draw many species of wildlife including every beaver in a 10 mile radius. Beaver



can be quickly and humanely controlled by commercial varmint control company like Valley Varmints of Hayden Co.

- Fencing- Many new landowners in the west do not realize that if you do not desire to have stock animals (horses, cattle or sheep) on your property you must **fence them out**. On smaller properties with no agricultural activity an outside boundary fence of four strand barbed wire will work fine for cattle and horses. On larger properties or those with agricultural activity you will probably have to protect your new riparian areas with four strand barb wire fencing ideally placed an average of thirty five feet from the top of the river bank. Fencing is most economical if it runs as straight as possible to minimize the high cost of corners, braces and gates this means that it is not cost effective to have fencing run parallel with the stream channel so the fence will be fifty feet away from the channel in some places and five feet in others. Please be aware! All fencing requires yearly maintenance in the spring. Many financial assistance grants are available for fencing construction on riparian areas. If you are going to lease your land for agriculture you really must use barbed wire.
- Harrow grass areas where possible to remove thatch and allow spring rains and over bank flows to penetrate .Over seed with native grasses or legumes where practical.
- Controlled burns can be accomplished while the ground is wet before new growth begins. Residential properties and some agriculture areas will need to observe county burning regulations and obtain burning permits .Make sure that you obtain someone with documented experience to help you with these endeavors check with the fire marshal first!
- Tune up and prepare your equipment before the season starts. It is not uncommon for our equipment repair facilities to be backed up 3 to 4 weeks in the busy season.
- Plant wild life food plots if applicable.
- Apply herbicide to early broadleaf weeds if ground moisture and rainfall allows.

### 3. May and June

- Continue tree protection activities and beaver control.
- Tour the property with agency representatives to update their input and to discuss potential grant funding and co-funding .Collect and print up the required data and get the grant applications in on time. Try to maintain a pre and post project photographic record of your riparian stewardship efforts from fixed sites. Placing wildlife cameras will add a marvelous perspective to your efforts and may help the CPW management efforts.
- Purchase a commercial grade weed sprayer of at least 25 gallons (\$450.00 to \$550.00) this sprayer will mount easily on any 4 wheeler and if properly cared for will last at least 15 years. This type of sprayer is generally powered by deep cycle 12 volt battery that runs a diaphragm pump. It will generally have 25 feet of spray hose attached to a light

weight spray gun and two nozzles at the back of the tank that will spray 6 to 8 feet on either side of the delivery vehicle. **Work with the County weed control department to accurately calibrate the sprayer and remember that the directions on the herbicide label are the law.** If you take the county weed class you will save money by learning the proper way to spray, what herbicides to use and when to use them. You will need a chemical respirator, mask and goggles. For more in depth information look up “weed Control spraying” on “You Tube”. Spray broadleaf weeds as required.

- Mature trees in riparian areas will die on your property every winter. Having a small limbing chainsaw “Stihl 180” and a medium size chain saw “Stihl Farm Boss” should take care of most problems. Fallen trees will get in the way of many of your activities and will attract collections of aerial borne weed seed. Ideally if trees can be chipped and spread they will recycle into the soil. Trees can also be cut up, dried and burned. Smaller hand tools such as lopping shears, pole saws and hand held clippers will help greatly with tree maintenance. When your river or stream banks are eroded and larger trees are ready fall into the channel they should be cut down so that the root wad of the tree is left in the bank to stabilize it. Failure to remove the tree would allow erosion to fall the tree and tear out the root wad out of the bank, which in turn damages the bank and partially block the channel this will cause many additional expensive problems.
- Meet on site with your state water commissioner ask any questions about your rights and responsibilities. He or she is well versed in water rights, use (Water delivery) requirements and any other water use issues.
- Utilize a rough grass mower to maintain riparian areas adjacent to your residence to lower wildfire danger. This will also promote vitality of the plants. A tour with the fire marshal or the NRCS Range Conservationist might generate opportunities for controlled burns in the late fall.
- Receive rooted riparian plants from the State Forest nursery. Mix soils, plant the rooted plants in 3 gallon pots. Store plants in a fenced area and water to develop a large healthy root system. The plants will be planted in your riparian zones in Sept/Oct.
- Stock fish, check water chemistry and oxygen. Work on collection and identification of your aquatic invertebrates. This activity can be accomplished a little at a time. The aquatic invertebrate inventory will give you a solid picture of the health of your river channel as well as warn of negative changes.

#### 4. July and August

- Repair, replace and replant areas in the riparian zone that have been damaged during the high snowmelt flows. Also utilize fixed photo points for pre and post high water records.
- Irrigation- irrigation is utilized in the development and maintenance of riparian areas primarily to allow the root systems of your riparian plantings to chase moisture down to the attendant river bank capillary zone. Once the plants root system reaches the capillary zone further irrigation is not required. However it will quite difficult to assure plant

survival and growth if there is no capillary zone. Riparian irrigation on streams and rivers in the Upper Yampa Basin begins as the runoff slows in late June and can continue through to when the fall rainy season begins or in mid-September when the growing season ends bringing dormancy to riparian trees and shrubs.

- Late season weed control- Biennial weeds like hounds tongue have flowered and died by mid-July but next year's florets are easy to see and selectively spray (broad leaf herbicides). The same applies to most species of thistle which are quite hardy and can actually be sprayed through the month of September. August is a good time to spray cattails when they begin to store nutrients for winter will readily accept herbicide (rodeo/accord). Once most of the native grasses have stopped growing for the year the time is right to spray hardy invasive species like Reed Canary grass.

#### 5. September and October

- Planting and seeding- After September 15<sup>th</sup> Install potted 3 gallon plants that you have been growing for the summer. Water in the root systems, cover disturbed soils with bark or woodchips and install wire beaver protection cages. Utilize a mini track hoe to transplant larger rooted trees and shrubs from areas adjacent to the riparian zone. Protect with wire baskets as required. Plant sod forming grass seed and clover or alfalfa for wildlife consumption in all disturbed areas. Harrow the seed in and mulch with wheat straw.
- Break down irrigation systems. Clean and close all irrigation gates and laterals. Drain old gas and water from water pumps, move to storage. Repeat this process with all gasoline powered equipment. Drain and rinse the herbicide sprayer tank, hoses and pumps. Clean the spray gun. Prep your equipment and materials for ready access and use for the next spring season.
- Beavers will be cutting their winter food supply and invariably they will place their cache exactly where it shouldn't be. Beavers can cause an extreme amount of damage in a new riparian area in an extremely short time. Beavers that threaten channel health and the development of new healthy riparian areas should be removed.
- Burn downed timber and brush after the first real snow. Make sure to obtain the appropriate permits from the Fire Marshall and follow the daily burn weather forecast. If you start an agricultural fire on a red flag day (too windy) and it gets away from you, you can be charged with arson!
- Open all fence gates to allow the safe passage of wildlife to their winter areas. They will break down the fence if you don't.
- Continue to photo document stewardship activities.

#### 6. November

- Put everything to sleep and start planning for next year, Good Job!

By Bill Chace

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**Best Management Practices – Land Management**

**TIER 1 Examples – Non-Point Source Runoff**