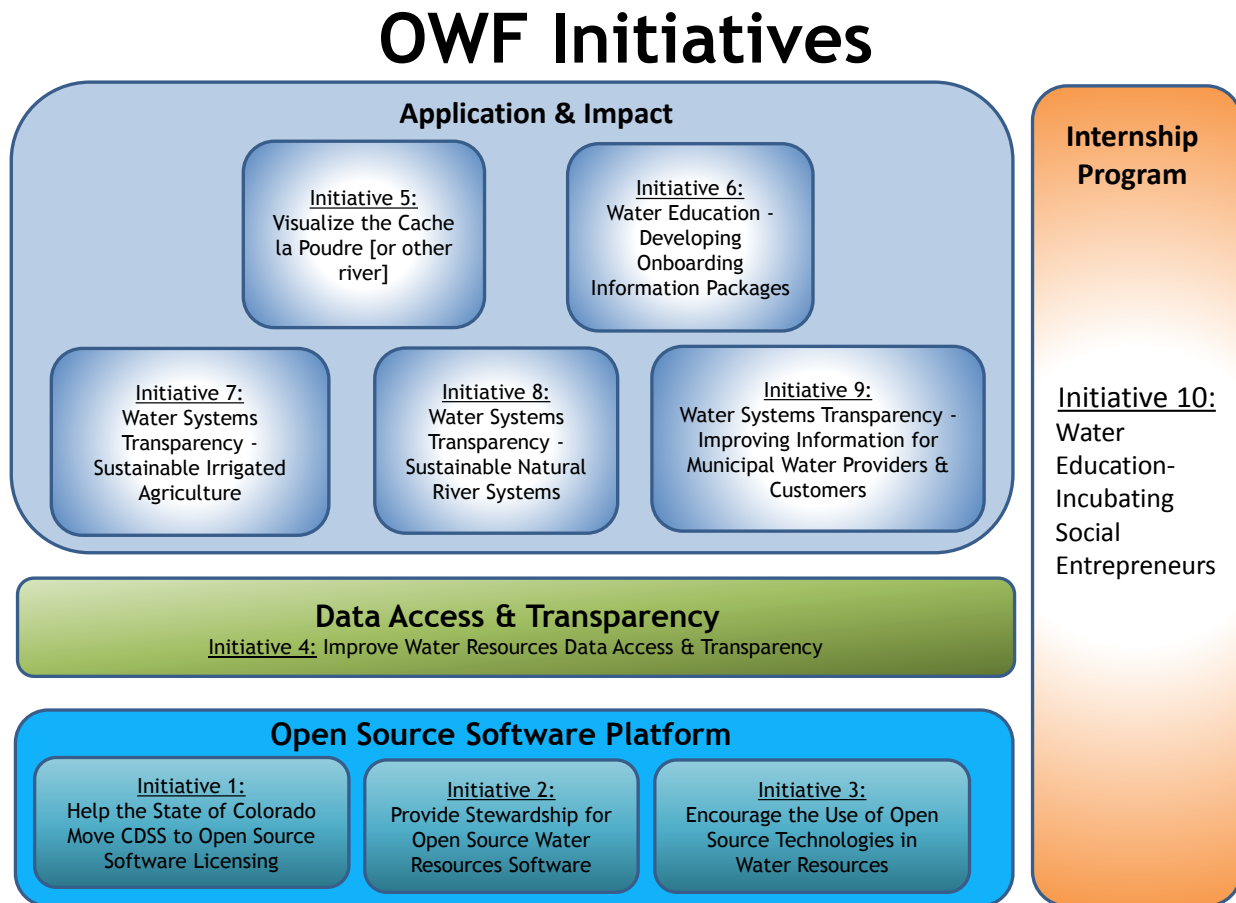


## Open Water Foundation Initiatives

Updated 2014-03-06

### Introduction

This document summarizes OWF initiatives, which are high-level focus areas for the work we do. We are seeking funding partners in order to make progress on these initiatives and support the goals of the funding organizations. A one-page synopsis of each initiative is included starting on page 4. The initiatives are grouped as shown in the following figure and are interrelated. Common threads are water, open source software, improved data access and transparency, and education.



### Initiative 1 - Help the State of Colorado Move Colorado’s Decision Support Systems (CDSS) Software to Open Source Software Licensing

The State of Colorado has invested in software tools to help understand complex water resource issues in Colorado. However, budget cycles, limited human resources, and the State not being in the software business has resulted in a sustainability gap for software tools. The OWF is attempting to fill this gap with a nonprofit open source model that will ensure that the State’s investment in tools has maximum impact for Colorado. CDSS tools are a de facto standard sanctioned by the State of Colorado and can be leveraged and enhanced to support other OWF initiatives.

**Initiative 2 - Provide Stewardship for Open Source Water Resources Software**

Many organizations invest in software to study and manage water resources, ranging from complex Excel workbooks to custom software tools written in various languages. Often these tools are developed by individuals for a specific purpose and there is no plan for maintenance. In other cases, a useful tool may have been maintained for some time within an organization but the organization is no longer able to continue supporting the tool. The OWF provides services to maintain, enhance, and integrate such tools into the overall platform of technologies offered by OWF. The OWF will work with organizations to move tools to open source licensing to ensure accessibility.

**Initiative 3 - Encourage the Use of Open Source Software Technologies in Water Resources**

Analyzing water resources issues is complex and requires the use of extensive data and powerful software tools, including geographic information systems (GIS), models, and visualization tools. The financial investment needed to purchase software and the time commitment to learn how to use software can be prohibitive for many organizations, in particular for small businesses and nonprofits. The OWF seeks to leverage open source software for application to water resources. In addition to our own offerings, we will utilize “best of class” open source tools to increase access and decrease cost, which will allow more organizations to analyze water resources problems, leading to a more nimble and educated community of problem-solvers.

**Initiative 4 - Improve Water Resources Data Access and Transparency**

Water resources data can be difficult to access and understand. Federal, state, and local organizations provide varying levels of data access in a variety of formats. Data users often are expected to understand data details based on limited explanation from data providers. The OWF is attempting to synthesize data from multiple sources, while providing context so that data users can understand and apply data for their questions. To do this, we will improve technologies to access and visualize data, and provide context for data within the larger system. The OWF will collaborate to define and use open data standards to promote transparent data sharing. The results of this initiative are leveraged in other initiatives.

**Initiative 5 - Visualize the Cache la Poudre River [or insert your river name here]**

The Cache la Poudre River (the Poudre) in Northern Colorado is unique in its transition from high mountains to agricultural plains. Its history as a working river in addition to a portion being the only Wild and Scenic river in Colorado speaks to the complex challenges on the river. The OWF is applying technologies from other initiatives to develop a system-wide visualization of the Poudre, including online maps and graphs of historical and real-time data. The technologies and approach will support ongoing discussions about the Poudre and can be applied to other river basins.

**Initiative 6 - Water Education - Developing Onboarding Information Packages**

Many water organizations are challenged in that the complexity of water issues make it difficult for new board members, city council, staff, and the public to understand an organization’s relationship with its water resources. The OWF seeks to implement information packages and websites that educate an organization’s people about water issues. Examples of organizations that can benefit include ditch companies, water boards, utilities, conservation organizations, etc. Onboarding materials will utilize OWF’s open technologies and can be leveraged for multiple organizations and be updated over time.

**Initiative 7 - Water Systems Transparency - Sustainable Irrigated Agriculture**

Irrigated agriculture has had a profound impact on river systems in the arid west. Agricultural reservoirs dot the landscape and the peak flows of rivers have been smoothed out to ensure water supply for agriculture throughout the growing season. Agriculture uses over 80% of water supplies and in addition to food and other commodities provides wetlands and open space, replenishes groundwater, and provides economic benefits to communities. Dry-up of irrigated agriculture is the first source of supply for growing cities. OWF seeks to provide innovative data products and analysis tools to illuminate the discussion around irrigated agriculture - how can we preserve the values of agriculture while serving other needs?

**Initiative 8 - Water Systems Transparency - Sustainable Natural River Systems**

There is no doubt that one of the attractions of Colorado and other areas in the western USA is the beauty and bounty of natural river systems. Natural ecosystems provide recreational opportunities and a diverse ecosystem. However, due to pressures of increasing population, climate change, natural disasters, and other issues, environment often is often the first victim of water shortages. OWF will leverage its capabilities to provide access to data and analysis tools in order to provide a system-wide representation of river systems at spatial and temporal scale necessary to monitor and enhance environmental values, and support the activities of organizations interested in conserving and enhancing natural river systems.

**Initiative 9 - Water Systems Transparency - Improving Information for Municipal Water Providers and Customers**


Municipalities use less than 20% of the water in Colorado. However, utilities are experiencing increasing demand as population increases and are seeking new supplies from agriculture, groundwater, and other sources. At the same time that utilities ask their customers to conserve water they also ask for rate increases because much of the service cost is for fixed capital costs and commodities that are rising in price. Although drought has gripped the State, some utilities have not needed to implement drought restrictions because supplies have been sufficient. These complexities and others require transparent access to information so that water providers can make good decisions and the public understands why decisions are made. The OWF is interested in helping municipal water providers and their customers gain a better understanding of water use through improved data analysis, visualization, and open data.

**Initiative 10 - Water Education - Incubating Social Entrepreneurs**

The previous initiatives emphasize the unique mission and capabilities of the OWF, which focuses on technologies, data, and analysis. However, technologies have little meaning without application to important social issues. Additionally, the OWF recognizes the great challenges and opportunities for today's youth, who are searching for purpose and impact. Consequently, the OWF actively seeks out opportunities to engage students at every level to develop and apply data and analysis tools in order to tell the story of important water issues and make progress towards their solutions. We want to incubate social entrepreneurs that will have great impact in solving problems in water resources and areas that touch water.

**One Page Synopses of Each Initiative are Included on the Following Pages**

**Initiative 1 - Help the State of Colorado Move Colorado’s Decision Support Systems (CDSS) Software to Open Source Software Licensing**



Basins	Online Tools	Software Products	Modeling Data	GIS Data	Documents
Arkansas	Call Chronology	StateCU	Consumptive Use (StateCU)	Division 1 South Platte	Basin Reports
Colorado	Streamflow Stations	StateDGI		Division 2 Arkansas	Meeting Materials
Gunnison	Structures (Diversions)	StateDMI	Surface Water (StateMod)	Division 3 Rio Grande	Modeling Briefs
Rio Grande	Water Rights	StateMod		Division 4 Gunnison	Modeling Dataset Documentation
San Juan / Dolores	Map Viewer	StateView	Groundwater (MODFLOW)	Division 5 Colorado	Peer Review
South Platte	Ground Water (Water Levels)	StateWB	Water Budget (StateWB)	Division 6 Yampa / White	Publications
Yampa / White		TSTool		Division 7 San Juan / Dolores	Reports
	More ...	Third Party Software		More ...	More ...

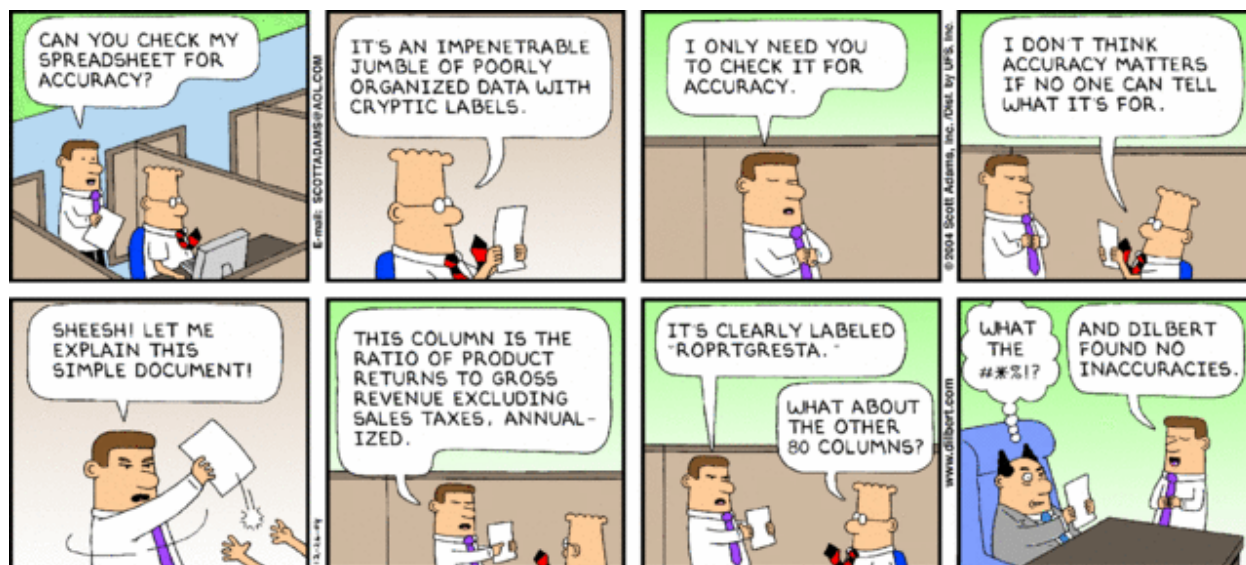
**Need:** The State of Colorado has invested in software tools for CDSS to help understand and make decisions about complex water resource issues in Colorado. However, budget cycles, limited human resources, and the State not being in the software business have resulted in a sustainability gap for software tools. Additionally, there traditionally has been a small number of CDSS software users, which minimizes opportunities for collaboration and cost-sharing. Enhancements to CDSS tools have been funded through a few State projects that primarily focus on water resources studies, NOT software development projects and there has not been funding for ongoing maintenance. All of these factors have increased the risk that an important set of tools will not be maintained at a level that best serves the State of Colorado.

**OWF Initiative:** The OWF is attempting to fill the CDSS maintenance gap with a nonprofit open source software approach that will ensure that the State’s investment in tools has maximum impact for Colorado. The OWF also actively markets CDSS tools as a solution and enhances the software to make tools useful to a wider audience, thereby increasing the user community and opportunities for collaboration and funding. CDSS tools are a de facto standard sanctioned by the State of Colorado and are leveraged to support other OWF initiatives.

**Impact:** By moving CDSS to open source licensing, the State of Colorado will see maximum return on its investment. The software will be enhanced for a larger community, thereby increasing users, encouraging scrutiny of software quality, and providing opportunities for more funding for OWF and others to maintain, enhance, and support CDSS tools.

**Potential Partners:** State of Colorado, any organization that is using CDSS tools and needs an enhancement, training, or support

## Initiative 2 - Provide Stewardship for Open Source Water Resources Software



**Need:** Many organizations invest in software to study and manage water resources, ranging from complex Excel workbooks to custom software tools written in various languages. Often these tools are developed by individuals for a specific purpose on a project and have no plan for maintenance. In other cases, a useful tool may have been maintained for some time within an organization but the organization is no longer able to continue supporting the tool. Yet another example is software developed at universities for research projects or to satisfy requirements of graduate degrees but which have no home after the initial work is completed. Although not all of these software programs may have value in their current form, there are often technological advancements embedded in the software and some tools are useful with minimal changes. In many cases, software needs to be updated to a newer technology (for example to run on newer versions of Windows) and can benefit from more rigorous testing and quality control.

**OWF Initiative:** The OWF provides services to maintain, enhance, and if appropriate integrate such tools into the overall platform of technologies offered by OWF. The OWF will collaborate with organizations to determine the best option to maintain and enhance functional software. As appropriate, legacy tools will be updated to new technologies.

**Impact:** This initiative will help ensure that investment in water resources tools is not lost. By using open source licensing, innovation by one organization can be shared with other organizations to the benefit of the water resources community.

**Potential Partners:** Any organization that has internally developed or outsourced the development of a software tool and is finding it difficult to maintain and enhance the tool.

## Initiative 3 - Encourage the Use of Open Source Software Technologies in Water Resources



**Need:** Analyzing water resources issues is complex and requires the use of extensive data and powerful software tools, including geographic information systems (GIS), models, and visualization tools. The financial investment needed to purchase proprietary software and the time commitment to learn how to use “black box” software can be prohibitive for many organizations, in particular for small businesses and nonprofits. Additionally, water resources involves very public issues including analysis and interpretation of science, policy, and law, which are all intended to be open. Consequently, in order to address important issues in water resources, the software tools and platforms that are used should be as open as possible and minimize barriers in data sharing and analysis.

**OWF Initiative:** The OWF seeks to leverage open source software for application in water resources. In addition to our own offerings, we will utilize “best of class” open source tools to increase access and decrease cost, which will allow more organizations to analyze water resources problems, leading to a more nimble and educated community of problem-solvers. The OWF will participate in open source software projects and will develop educational materials to help software users efficiently utilize open source software tools.

**Impact:** The OWF efforts will help ensure that software users have open tools that encourage efficiency and collaboration. Technology should be a benefit, not a barrier, and the OWF will respond to the needs of the water resources community to overcome technology barriers. These results will help organizations with interests in water resources, especially small organizations that do not have resources for high-cost proprietary software.

**Potential Partners:** The OWF will partner with like-minded organizations and individuals to encourage the use of open source software for water resources.

## Initiative 4 - Improve Water Resources Data Access and Transparency



<http://sunlightfoundation.com/opendataguidelines>

### What Data Should Be Public

#### 1 Set The Default To Open

#### How to Make Data Public

#### 8 Mandate Open Formats For Government Data

**Need:** There is a need to improve access to water resources data and increase transparency in water resources discussions. Although many organizations provide specific data, the data often are made available in esoteric data formats and cannot easily be used to answer various questions of interest to the public. Data also need to be provided with metadata that indicates source, quality, and age of the data. Data often are difficult to use in software and cannot be easily integrated into a derived product because the data are only made available in PDF or an image. The inability to access raw data behind data products limits users' ability to scrutinize, understand, and validate the data.

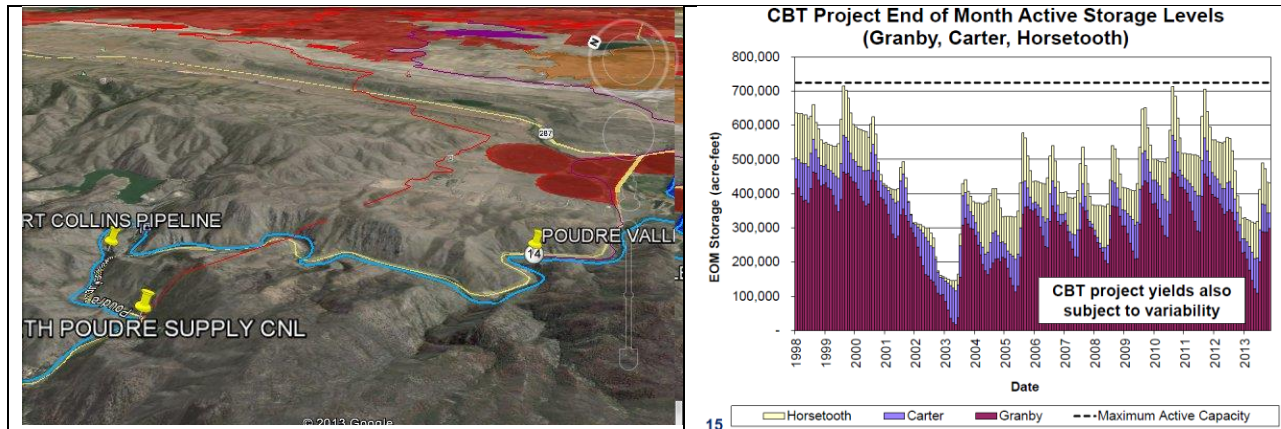
**OWF Initiative:** This initiative seeks to leverage existing and develop new open source software technologies to improve data access, transparency, and understanding. Examples of activities in this initiative include:

- Developing and implementing web technologies to access and visualize water data
- Simplifying web mapping tools
- Explaining data and information products in language that can be understood by a wide audience
- Providing context to explain data in terms of time and space
- Implementing large-scale websites to demonstrate the technologies and data access

**Impact:** By improving data access and increasing transparency, water resources data and analysis will be more collaborative. Organizations will spend less time dealing with data issues and more time on the substantive issues that need to be discussed. Organizations will be able to validate that common data are used in discussions, and data gaps can be collaboratively addressed. The public will benefit from data that are provided with context.

**Potential Partners:** OWF will collaborate with other organizations that provide data, in order to make the data more accessible and transparent. OWF will support organizations that are trying to "tell a story with data" by ensuring that the products allow drill-down to supporting data.

## Initiative 5 - Visualize the Cache la Poudre River [or insert your river name here]



**Need:** The Cache la Poudre River (the Poudre) in Northern Colorado is unique in its transition from high mountains to agricultural plains. Its history as a working river in addition to a portion being the only Wild and Scenic river in Colorado speaks to the complex challenges on the river. Many organizations have an interest in the Poudre River, including cities for municipal water supply and water quality, ditch companies for agricultural supply, nonprofits interested in the ecology of the river, rafting companies, etc. Some organizations collect data for the river but may not make the data publicly available. In general, each organization tends to only be responsible for and utilize a subset of data based on geographic region and organizational mission. This leads to an information gap for the river as a whole because the river basin is a connected system. There is a need for integrated data access and visualization for the entire river that includes historical and real-time data from multiple sources.

**OWF Initiative:** OWF is applying open source technologies from other initiatives to develop a system-wide visualization of the Poudre, including online maps and graphs of historical and real-time data and links to related information such as descriptions of ditch systems. Currently this initiative is opportunistic based on related projects; however, funding is being sought to provide an integrated information platform through OWF efforts and collaboration with others.

**Impact:** The technologies and approach will support ongoing discussions about the Poudre and can be applied to other river basins. Easy access to data will support other initiatives such as education about the Poudre River.

**Potential Partners:** The OWF will collaborate with organizations that can benefit from a system-wide visualization of the Poudre River [or insert your river name here]. By utilizing well-maintained open source software, it will be possible to implement solutions that can be leveraged in other river basins. From the technology perspective, the OWF will collaborate with organizations like the GeoSpatial Centroid and Colorado Water Institute at Colorado State University, the State of Colorado Division of Water Resources and Colorado Water Conservation Board.



## Initiative 6 - Water Education - Developing Onboarding Information Packages



**Need:** Many water organizations have the challenge of “onboarding” boards, staff, city councils, and others to impart knowledge for policy and decision-making related to water. The onboarding process is often ad hoc and may require years of exposure to information before a person fully understands the impact of water decisions. Term limits and turnover can limit the effectiveness of organizations because water issues are so complex and projects span multiple years. There is a need to provide integrated information about water issues to ensure that informed decisions are being made. Examples of organizations that could benefit from onboarding packages include water utilities, ditch companies, and water conservation districts.

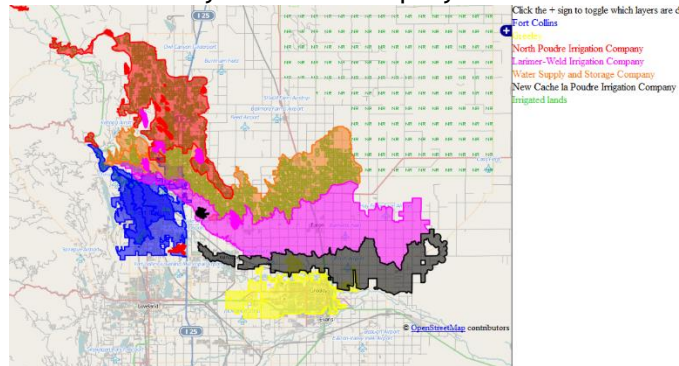
**OWF Initiative:** The OWF will develop templates to organize data products (maps, graphs, historical and real-time data) and documentation to help organizations with onboarding and training. The result is envisioned to be a website that can be integrated with an organization’s internal website, public website, and be saved in some form to a DVD or flash drive for off-line use. Open source tools and integrated data interfaces will be developed to allow application for many organizations, and allow for future updates. The resulting information packages can also be used as a reference after the initial onboarding.

**Impact:** By improving access to integrated information about their water resources, the OWF will help organizations efficiently train people who are defining policy and making decisions. Better-informed individuals will result in better-informed and functioning organizations and public.

**Potential Partners:** OWF will collaborate with other organizations that focus on education, such as the Colorado Foundation for Water Education (CFWE) and will seek to prototype onboarding packages for municipalities, ditch companies, and other water organizations.

## Initiative 7 - Water Systems Transparency - Sustainable Irrigated Agriculture

### Poudre Basin City and Ditch Company Service Areas



### Irrigated Agriculture near Fort Collins, CO



**Need:** Irrigated agriculture plays an important role in the fabric of society in the arid western United States. In addition to supporting the economies of rural areas, irrigated agriculture provides food security, sustains wetlands and recharges aquifers, and many other benefits. Agriculture often uses the largest share of water when compared to municipal uses; however, agricultural water supplies are being converted to municipal supply to meet growing municipal demand and consequently benefits of irrigated agriculture are being reduced. While agricultural dry-up is perhaps inevitable to a certain degree, haphazard agricultural dry-up will degrade agricultural systems to a tipping point beyond which sustainable irrigated agriculture is impossible and benefits from agriculture are lost. Agricultural water use efficiency must consider water laws and historical uses, which rely on return flows in upper reaches being the supply for lower reaches.

**OWF Initiative:** This initiative focuses on presenting agricultural data in a transparent way in order to emphasize and evaluate the benefits of irrigated agriculture, issues such as water quality, threats such as urban growth, and opportunities for collaboration and multi-use projects. An example of an ongoing OWF project is the Poudre Basin Water Sharing Work Group, which seeks to establish water sharing agreements between municipalities and ditch companies in the Poudre Basin.

**Impact:** OWF will help evaluate the benefits of irrigated agriculture by analyzing and visualizing publicly available data. Software tools and procedures that are developed will be made available to others, such as agricultural economists. OWF will help organizations explore alternatives to permanent dry-up of agricultural lands.

**Potential Partners:** OWF will collaborate with agricultural organizations such as the Colorado Ag Water Alliance (CAWA), Ditch and Reservoir Company Alliance (DARCA), and Colorado Water Conservation Board (CWCB).

## Initiative 8 - Water Systems Transparency - Sustainable River Systems



**Need:** Rivers in Colorado and the arid west are under increasing pressure to supply water for multiple uses, with stress from drought, fires, and climate change. These pressures can result in rivers becoming unhealthy, and if conditions degrade too far, the river loses its resiliency. Projects to build new reservoirs, while providing water in times of reduced flows also reduce high flows that are ecologically desirable. Historical river operations are being evaluated to determine whether a more holistic handling of the river is possible that will help ensure that working rivers also are healthy. Efforts by concerned citizens and conservation groups to protect rivers challenge plans for new water projects. Rather than working together to address river health issues, groups can become polarized, in part due to regulatory processes and limited access to data.

**OWF Initiative:** The OWF is interested in developing access to system-wide data and analysis software for key rivers in order to provide a neutral and balanced set of information that can enhance discussions. The OWF can provide value because organizations typically provide only information that is under their control, and for only the region of interest. Instead, it often is necessary to provide data for a larger region that spans organizations and illustrates interactions and impacts. The OWF will seek to provide an information software platform based on open source software and open data that can be used by multiple organizations and facilitate their deliberations about river health. An example of an ongoing effort is OWF's involvement in the Poudre Runs Through It Study/Action Work Group, which is attempting to make the Poudre River in Colorado the world's best example of a healthy working river.

**Impact:** By providing software and data that enhance understanding system-wide river health, OWF will help organizations understand trends and impacts on a river. The information can facilitate consideration of options to balance the health of a river with its use as a water supply source.

**Potential Partners:** OWF will collaborate with organizations interested in river health, such as conservation organizations, recreation, brewing industry, and municipalities.

## Initiative 9 - Water Systems Transparency - Improving Information for Municipal Water Providers and Customers



**Need:** Municipalities use less than 20% of the water in Colorado. However, utilities are experiencing increasing demand as population increases and are seeking new supplies from agriculture, groundwater, and other sources. At the same time that utilities ask their customers to conserve water they also ask for rate increases because much of the service cost is for fixed capital costs and commodities that are rising in price. Although drought has gripped the State, some utilities have not needed to go on drought restrictions because supplies have been sufficient. Complexities related to water require transparent access to information so that water providers can make good decisions and the public understands why decisions are made.

**OWF Initiative:** OWF is interested in helping municipal water providers and their customers gain a better understanding of water use through improved data analysis, visualization, and open data. Specific activities may include developing open source software tools that implement open data standards and improving efficiency of data analysis so that timely information can be provided within organizations and to the public. Issues such as data privacy need to be balanced with the need for system-wide data to understand large-scale water issues. An example of an ongoing project is OWF's involvement in the South Platte/Metro Basin Implementation Plan, which will be used as input to the Colorado Water Plan requested by Governor Hickenlooper.

**Impact:** By improving public access to municipal water information, including water use, rates, and water supply planning decisions, water providers help their customers understand decisions. Improved access to data will increase innovation and allow system-wide and regional analysis of water issues. This initiative can be integrated with Initiative 6 (Developing Onboarding Information Packages) as appropriate to leverage information for education and making decisions.

**Potential Partners:** OWF will focus on the Colorado Water Innovation Cluster (CWIC), of which OWF is a member, Colorado Water Conservation Board (CWCB), and organizations like Colorado WaterWise.

