Lessons learned and new challenges raised while turning public awareness into action
Ten Case studies regarding public involvement in water quality protection and improvement

Barb Horn
Tina Ludlow

Ms. Horn has worked on water quality issues Colorado Rivers since 1986. She started the Rivers of Colorado Water Watch Network as a mechanism to obtain water quality data for her work as well as for any other water quality decision-makers. This is a volunteer monitoring program in which the Division of Wildlife and a non profit Colorado Watershed Network supplies equipment and training to volunteers and in turn they collect samples on the river in their community. She has been an aquatic biologist for the Colorado Division of Wildlife for 15 years. A native of Colorado, she has a B.A. in Environmental Conservation, B.A. in Environmental Economics and a M.B.S. in Aquatic Ecology all from the University of Colorado. She likes Colorado.

Ms. Laidlaw started her water quality protection career in Costa Rica, as part of a Masters Project developing a River Watch program and manual. She moved to Alabama and was essential in the start up of their volunteer monitoring program. She migrated west to Colorado and is the current USEPA Region VIII Volunteer Monitoring Coordinator. To assist the Colorado Rivers of Colorado Water Watch Network, she started a non-profit called Water Watch Partners. Recently, Water Watch Partnership merged with another non-profit to form Colorado Watershed Network. This new organization will be more able to provide more services than monitoring to watershed groups. She has a B.A. in Biology from Davidson College, Davidson, North Carolina and M.S. in Conservation Ecology and Sustainable Development, from the University of Georgia.

In most areas it is known what waterways are meeting uses and those that are degraded or impaired, even if the knowledge is not quantifiable. In most cases, especially with impaired waters, the methods and technology exists to quantify or classify these waters, minimize further impairment and even improve quality. Often, what is missing is the right timing and combination of people, resources and the environment that allows collaboration and cooperation. Part of the solution to long term protection and improvement of water quality lies in the hands of the very people who depend on the water, citizens.

Regulations and legislation have a definite role but also have limitations and often halt on the ground work. The future quality of our Nation's waterways depends upon decision-makers adapting a paradigm that includes local communities and allocates resources to their effort.

In arid climates, water is in short supply, often during critical demand periods, making water quality a priority. We have 5 case studies in Colorado that employed citizens in 5 different scenarios to protect or improve their stream and water quality in their watershed. In all of these case studies, there are critical components in each project that would not have occurred if the citizens were not involved. In all of the cases regulation or legislation had a role but posed limitations. In most of the cases actual on the ground, moving dirt, would not have occurred and has not occurred for 100 years or more, if the citizens were not involved. In short, inspite of government pots of monies, programs, regulations and legislation, these water quality problems are to big, complex, and/or diverse enough in some regard that nothing is accomplished by anyone until local participation is engaged.

Case studies include scenarios regarding domestic wastewater treatment, acid mine waste, active and inactive mining, selenium and nutrients from agriculture/urban watersheds and hydrological modifications. Each case study briefly describes the water quality problem, level of public participation, highlights successes and failures regarding local participation, and discusses what would have happened without local participation. Included is a summary of common components in all these case studies for decision makers to consider in their paradigm regarding public involvement to improve managing water quality and a summary of new challenges this paradigm presents. It is the everyday decisions by individuals that will ultimately result in overall water quality protection and enhancement.

Case Study 1 – Waste Water Treatment (WWT)

1.0 Water quality problem

The year was 1990, in the city of Paonia and Hotchkiss, Colorado, on the western slope and in the North Fork of the Gunnison River basin. Both cities were exceeding their WWT effluent discharges and required, by the State to develop compliance schedules to rectify treatment. The cities are about 15 miles apart with populations of about 5,000 each. Mostly ranching, agriculture (orchard and wheat), coal mining and commutes to Aspen, Colorado support the economies of these two communities. In order to develop this WWT compliance schedule, the cities needed specific data, at specific locations and specific frequencies but didn't have the staff. The cities had contracted with an independent consultant to handle the whole situation including getting the sampling completed with a budget that was not feasible.

1.1 Description of local participation

The consultant had heard about a new program that involved students sampling rivers called the Rivers of Colorado River Watch Network (CRW), which at the time was in its first year and still developing. They sought this network that utilized teachers, students and citizens to achieve their sampling requirements because of their lack of budget to do so otherwise. In addition they liked the local personal relations it would develop, especially if the cities needed to build any infrastructure for further treatment.

1.2 Successes, Failures and Lessons Learned

This effort to use volunteers to obtain the necessary data needed overall failed. Some usable data was collected. The failure was not a function of an ill-prepared study design or methods. The failure was attributed to several factors. First of those was not enough quality training time for volunteers and contract coordinator on the CRW Network side. Traditionally CRW requires a four day minimum training and CRW has never certified a volunteer with a half-day training again. CRW staff was leery of this working with the amount of training time available by other participants but wanted to try and make this partnership work. This experience solidified the mandatory minimum training for CRW the next ten years. *Allocate proper amount of time to training, short cuts will not produce usable data, and potentially result in bad experiences that take time to erase from memories.*

The second factor credited to the failure was initial unexpressed or unclear expectations for all parties as well as too little communication between all parties during the sampling period. All parties being CRW sponsors, volunteers, the contractor and city personnel. Due to the unique and specific sampling schedule, extra communication was required and a partnership developed to make up for gaps that the samplers could not cover. The lack of clear roles and responsibilities up front resulted in a negative relationship and experience between the volunteers and the consultant, and thus between the volunteers and the cities. The cities were not involved or connected to their problem thinking the consultant would deal with it and it would go away. The lack of communication and clearer defined roles also resulted in negative personal relations for the CRW Network in that basin and delayed the cities' compliance schedule. *Before any sampling is conducted, all stakeholders need to be at table and expectations need to be clarified* up front and perhaps some sort of memorandum of understanding developed and signed to document roles and provide accountability. *All parties need to have a communicated contingency plan for their responsibilities.*

This effort did educate those involved about WWT and the need for it at various levels. Several of the student volunteers did receive the equivalent of a WWT entry-level technician's certificate.

1.3 What would have happened without participation

Each City would have had to pay fines for non-compliance and allocate the proper resources to collect the data. Even though the sampling partnership failed the city was given credit for trying. Data is now collected by the city and volunteers within each of their capabilities and is routinely shared.

Case Study 2 – Channel and Riparian Zone Restoration

2.0 Water quality problem.

The year was about 1981 when the watershed draining into the cities of Telluride and Ouray became a SUPERFUND site due to historic mining of precious metals. The headwaters of the Uncompahgre River drain into Ouray, the Swedish Alps of Colorado. The metals of zinc, copper, cadmium, lead, iron and manganese along

with low pH and hardness precluded life in the headwater tributaries before they reach the town. In addition, the tributaries flow through box canyons and steep slopes that can cause a channel blow out morphology and marginal aquatic instream habitat of the river through Ouray. By 1993, reclamation was 99% complete upstream and the city wanted to restore the stream channel and riparian zone through a two-mile stretch in town, even though reclamation had not restored the pH and level of metals in the Uncompaghre to a degree that trout could survive yet. The philosophy of the city was that they could not control or change on a large scale what was happening politically or technically upstream but could do something downstream.

2.1 Description of local participation

The city coordinated with multiple entities, agencies, and programs to pull together a plan to develop and implement the stream and riparian zone restoration project. The nucleus or common component in each of their grants was public participation. The community was involved in planning and design, boulder moving, tree planting, monitoring of bank and stream stabilization and vegetation growth. CRW Network provided the expertise; training and equipment for local volunteers to conduct project monitoring. Local contractors were employed whenever possible. The effort from vision to moving dirt took six years or more.

2.2 Successes, Failures and Lessons Learned

This project as a whole was a success. There were mini failures and rejections along the way. Matching and other funding necessary to complete the project was often turned down because there was a SUPERFUND site upstream that had completed its remediation and resulting water quality still did not support aquatic life, so why fix a dead stream. Countless agencies declared the project would not work, due to gradient, water quality, temperature, politics and the like. The citizens believed their project would result in better water quality and instream habitat that would support life at some point downstream. Their work would reduce sediment loads downstream at a minimum and provide quality instream habitat. In addition, the blow out section of river in town would be esthetically pleasing and usable as greenbelt and openspace.

They completed the channel morphology work and within a month, before it could take hold, the experienced a 50-70 year flood, dislodging the majority of the work. They regrouped and redid the necessary instream work and completed the revegetation on stream banks and riparian zone. The channel has held for two seasons to date.

Patience and persistence are the key components to this success. This project took six years to get to implementation, something no one would have predicted. The citizen's worked through each time they were told their project would fail. After the flood, most would be discouraged and give up, but the citizen's did not. They believed they could make a difference on a two-mile stretch of river. They incorporated what was happening upstream and downstream but stayed within the bounds of what they could influence.

2.3 What would have happened without participation

The project and thus the river in this stretch would look the same. The sediment load from the shifting channel would continue to enter the stream in this section during high flow events. No agency or entity would have taken this project on, due to the disbelief in the results, the level of coordination and local participation empowered to make it happen. This is an excellent example of the level and type of work local communities can achieve given the resources and support to do so. In this example, local participation filled niche that no other agency or entity would have.

Case Study 3 – Historic Mining

3.0 Water quality problem

The year was 1989 in the headwaters of the Animas River, tributary to the San Juan River, flowing through Silverton and Durango Colorado and Aztec and Farmington, New Mexico. The three headwater tributaries that comprise the Animas River first flow through Silverton at an elevation of 9,500 feet. Silverton has a permanent resident population of about 500. It is the only city in Colorado that lost population in 1998. The remnants of historic mining activity on Forest Service, BLM, and private land litter the mountainsides to such an extreme it was the only basin in the state of Colorado without stream standards. Precious metals mining had left most of the headwaters devoid of life and not meeting most uses. The majority of mine claim were owned by individuals who did not live in the state, inherited the mining claim and never reaped a dime from the boom and

bust era. Many have never been to their land. The State Health Department was going to tackle the basin and propose stream standards, which attracted the attention of SUPERFUND and other top down type programs.

3.1 Description of local participation

The State began their effort to designate use classifications and stream standards by building a local Stakeholder group and process. This Stakeholder process became the focal point for the basin for data collection, storage, and interpretation of mine dumps, adits, surface and ground water, background and historic, feasibility and prioritization work, geological, geochemical, physical, and biological. This group informally determined the mechanism to remediate this basin, determine and achieve appropriate classifications and standards were through voluntary participation and collaboration. They worked hard to keep top down tools from being used, such as SUPERFUND. Their ultimate product will be a use attainability analyses for the fall 2000 and final water quality hearing.

This stakeholder group has absolutely no regulatory authority, no local authority, and no formal organization like a non-profit status, although they are often targeted as if they do have authority. It operates with several subcommittees (monitoring, feasibility, prioritization, etc.) and a monthly community meeting. All meetings are open to anyone. They are composed of citizens, city and county officials, historical society, mining companies, water conservation districts, state (Health Department, Wildlife, Mineral and Geology) and federal agencies (EPA, USGS, BLM, BOR). Their strength is in numbers and pooling their resources to get the data and information to make the best informed decisions or standards as possible.

3.2 Successes, Failures, and Lessons Learned

There has been voluntary clean up, both on private and public land, in the basin as part of and separate from the Stakeholders group. Funds have come from private and government sources. *There will be more remediation projects in this basin* than if it became a SUPERFUND site. There would be more on the ground voluntary cleanup but the current liability associated with voluntary clean up deters action as opposed to encouraging action. This group has worked extensively to further the passing of the Good Samaritan legislation that enables voluntary clean up to occur and reasonably release associated liability.

The CWA, stream standard regulatory process brought this group together. However, they have achieved much more than a collaborative data collection and interpretation consensus processes. The State was looking for results in two-four years. It has been ten years and will be eleven before the final hearing. The State has had to adjust its expectations and time frames. *When you are working with people it takes time, relationships take time to build.*

Many of the agencies who desired to participate in this effort came with their agency agendas, funds and projects, which in most cases did not align with what the Stakeholders group had determined as their current needs. This is inspite of the fact most agencies where *part of* the Stakeholders group. This resulted in some studies being re-designed and achieving Stakeholders data objectives. It also resulted in some projects being conducted as originally planned and not assisting Stakeholder data objectives. This became a problem when citizens in the basin began to view every activity as Stakeholders and if they didn't like the project would hold the Stakeholders accountable. It also resulted in access problems and some relationship issues with the Stakeholders and agencies. Agencies could re-consider how they interact with communities. *Agencies need to allocate resources to communicating with locals (travel and time), adjust expectations and time frames to include perspectives and goals outside of the agency mission to create a synergistic result.*

The level of collaboration in collecting, storing, processing and interpreting the data is the most we have experienced in the state. They coordinated federal, state, city and private entities to accomplish this. The level of detail includes field and laboratory protocols, detection limits, frequency and location of samples, manipulation of information into a decision document. This effort demonstrates that this level of collaboration is possible. The Animas River will not further degrade and will improve due to their efforts, even if results are seen 50 river miles downstream.

The only active or permitted mine in the basin worked within their legal requirements and with the Stakeholders to pilot a "redesign" of their remediation effort to permanently close and release liability. Under current law they would never be able to fully be free from liability and that is a disincentive to remediate. A location was established and concentration requirements at that location where established for the future. If the concentrations are met at that location and time, the mine has achieved their reclamation goal and will be released

of their liability. The agreement is complex but innovative. In order to achieve this goal, the mine remediated sites they did not own, adding to the overall remediation of the basin.

Another success of this project was for CRW Network. Sampling collection and laboratory results were compared with the likes of the USGS, BOR, and mining companies. Results were excellent validating that citizens can collect usable valid data. In addition, CRW volunteers were collecting data at a higher frequency than agencies were able to. This extra data determined that the toxic time of year for aquatic life was in the winter pre snowmelt, not during runoff as the agencies data had determined. This is simply because there was more of the CRW data throughout the entire year. This changed the sampling frequency of the Stakeholders. In addition, CRW Network data provided 60% of the data used to calculate the remediation goal used in the State and mining companies' consent decree agreement.

. *A key component to the Stakeholders success is a supported, qualified coordinator*. This was essential to the process. Many pots of government funding support the upstart of watershed coordinators with the expectation they find local support for sustainability. This project demonstrated that local communities do not have the resources or infrastructure to support this type of coordinator. For one, the watershed is not a political jurisdiction, so a city, county or other local entity sees this as in their mission. Selling a coordinator to these entities as a partnership or collaboration for all of them to own a piece, takes coordinator to create the vision that they can support. *Potential funders for watershed coordinators, need to change their paradigm about long-term support for watershed coordinators until perhaps it is a more common concept and results, which take 10-20 years can be seen.*

3.3 What would have happened without participation.

Difficult to say, but all information leads to the presence of SUPERFUND in the basin. This alone would lead to little if no participation or voluntary reclamation by non-identified SUPERFUND locations. Reclamation would not begin for another 5 to 10 years. Each Stakeholder would be duplicating efforts, collecting their own data, not sharing, and proposing their recommendations independently. This no doubt, would lead to a very different water quality hearing, one of dissension not cooperation and consensus. This is how the hearing was before the Stakeholders process began. In addition the locals feel as historic preservation is considered and their property values will not decrease by being labeled SUPERFUND.

Case Study 4 – Historic Mining and Stream Restoration

4.0Water quality problem

The time is 1997 in Creede, Colorado in the headwaters of the mighty Rio Grande River. The citizen's of Creede wanted to reclaim the barren waste rock zone below town and create a greenway; golf course and esthetic open space. The degraded zone was created from historic dredging operations. Creede's population is about 1500 full time residence and at an elevation of 9,000 feet. The tributary flowing through their town, Willow Creek is impacted by historic and active mining and is channelized via a concrete channel through town. An active mine operation is located on the other tributary to the Rio Grande has an active mine operation. The Rio Grande currently supports a healthy fishery.

4.1 Description of local participation

The citizens soon discovered that they could not deal with channel modifications and water quality improvements below town without dealing with the stream and watershed upstream. They quickly formed a Stakeholders group, gathered existing data and obtained funding. Appearing just as quickly were the SUPERFUND, Health Department, Division of Minerals and Geology, and others with their toolbox, agendas and ideas. For a time period, the climate was ripe for mixed agendas and expectations, which could stall or delay progress for everyone. These Stakeholders, like the Animas Stakeholders, wanted to maintain control of the effort, stay focused on their goals, and decide what regulatory tools they would like to utilize.

4.2 Successes, Failures and Lessons Learned

The Creede Stakeholders, just as with the Animas group, formed focus groups to work on the various issues. They too worked politically very diligently to keep SUPERFUND and other heavy regulatory programs at bay because they felt these program tools do not align with their goals at this time. *This effort required frequent re-evaluation and re-grouping of state and federal personnel in order for the agency to remain a credible participant in the process.* This group has moved faster than the Animas Group have in all aspects, in part

learning from other groups and in part because the basin, issues and group are smaller and easier to characterize. Too date they have successfully implemented an assessment program, using volunteers, that will dictate their reclamation program. Their wastepile is still there but they know they will get to it.

The Stakeholders lesson was that they had to deal with the entire watershed, at least upstream, to achieve their goals. They listened and embarked on the level they feel is adequate upstream to continue to progress toward their downstream goal. *They also challenged various agencies to the letter about their goals and agendas in a constructive and productive manner*. This process is what made public everyone's expectations and goals for participating ultimately creating the operating set of individuals today.

The entire Stakeholders group are local citizens. Agency personnel participate in the meetings and subgroups but all decisions are made by the citizens. This is validation that state and federal agencies can evolve with a citizen driven effort and accomplish the same work versus the state or federal dictating to the citizens. They are a CRW volunteer group and conduct the monitoring themselves and/or coordinate with officials to get data they need that CRW Network cannot provide.

The entire town is together on this effort. This is attributed to the fact the Stakeholders are the citizens and the leaders have successfully communicated the project to them. Many of the summer and winter visitors and second homeowners reside in Texas or Oklahoma; thus the education is brought to other states indirectly.

4.3 What would have happened without participation

The abandoned mines in the headwaters might be remediated via existing programs and funds. The waste rock debris field below Creede would probably never be dealt with via existing programs. It is not a toxic pile, a structurally unsafe pile or any other real hazard. It is esthetically unpleasing too most. It will probably be there until the locals decide to do something with it. The educational outreach to Creede citizens would not have occurred to the same degree without the Stakeholders.

Case Study 5 – Selenium and Nutrients

5.0 Water quality problem

The time was 1997 on the lower Arkansas River from Pueblo, Colorado to the Kansas Border. The Arkansas flows out of Pueblo Reservoir through the city and on through predominately agricultural lands. Classic water quantity issues of the west plaque the Arkansas with a maze of ditches, irrigation return flows, and a few major reservoirs to hold water for when there is no precipitation. The parameter of concern here was selenium and nutrient concentrations (nitrogen, phosphorus, chloride and sulfate). Nutrients are entering the system via irrigation return flows, ground water and wastewater treatment plants. Sources and processes that release selenium into the system are very difficult to quantify. The combination is threatening native fish species and little if any historic data is available.

5.1 Description of local participation

The CRW Network was asked by the Division of Wildlife Biologists to add nutrients and selenium to its sample collection efforts. Nutrient analyses was to be completed at the Division of Wildlife laboratories. Selenium analyses was to be completed via a partnership with the City of Pueblo, who had an interest in the selenium concentration is must treat and or release into the Arkansas. The training was provided and sampling began.

5.2 Successes, Failures and Lessons Learned

The nutrient component of this project succeeded. Data was collected for a two-year period at a frequency and spatial scale that no other data existed. This data is being correlated with aquatic community and physical habitat data to determine the extent of species decline and continue to monitor future population decline or improvement.

The selenium project failed on several fronts, all due to unclear expectations and communication before any work was implemented. Samples were being collected faster than could be analyzed and at a larger volume than the laboratory expected. Tracking of sample numbers got mixed up due to a communications gap and City of Pueblo officials began to loose faith in the quality of samples from volunteers. Volunteer monitoring received bad personal relations from this effort when the communication gap was between the biologist and city not the data collection network. In addition, once communication did begin due to the encountered problems it was discovered that the City did not really want the data because they felt it would be used against them in a water

quality hearing. In otherwords it wasn't the perfect partnership it appeared to be, there wasn't a common ground. *Take the time and resources to have all participants at the table in the beginning, some may not be Stakeholders, and clarify the study design and data objectives before any work begins.*

The laboratory procedures and methods used by the city were within compliance with EPA and Health Department recommendations but not remotely close to the detection limit necessary to determine toxicity to aquatic. This caused further perturbation to the partnership. The Division wasn't satisfied with the results and sought analyses elsewhere and the City felt as if their effort was for wasted. The recommended protocol by EPA and the Health Department was valid in that it produced quality results, but it was out dated or not adequate to determine aquatic toxicity. *The recommended methods by authorities can and should be challenged to ensure the are always the most appropriate for their purpose as possible.* The samples that were collected were analyzed appropriately to determine aquatic toxicity and help change that recommendation in State protocols.

5.3 What would have happened without participation

The data would not have been collected or would cost more to collect than the volunteer network costs. There would not be better information on selenium and nutrients for the lower Arkansas Basin and to determine potentially toxic selenium amounts. Future partnerships to collect and analyze selenium have been built based on the success and failures of this partnership.

6.0 Common components of successful public participation

Local communities, in addition to assisting in traditional efforts, can fill a niche in water quality protection or improvement efforts. Citizens can complete and take on projects of relatively large size and succeed if resources are available to them. Often, projects that otherwise would probably not be completed by traditional agencies or programs. This should lend some insight to what might work to implementing TMDL's that might result in measurable water quality differences. There is no right or wrong way to involve the public in water quality or stream improvement projects. It is a process of discovering what will work. In all of the case studies present, as well as in other cases, all projects produced successful water quality data that was used to further the group or project. Whether you are an agency or citizen group, whether process or project oriented, the following are some components to consider when building relationships with communities for the purpose of watershed stewardship.

In the planning stage:

- ✓ Allocate resources to building relationships with people in local communities, this includes time and travel. Think of it as dating for awhile, before becoming engaged in a project.
- ✓ Create opportunities for local participation and communication, never assume they can't do it, and let them decide, you will be amazed.
- ✓ Identify and recognize the role of regulation and legislation, use them as tool, not a limitation or hurdle when possible.
- ✓ Identify and agree on all sampling and analytical methods, detection limits, data storage, retrieval, etc. All of these components would be covered in a sampling plan that should be developed by all stakeholders or participants.
- ✓ Have a mechanism for communicating objectives, motives, goals, and mechanisms to achieve data objectives before work begins, and it will only make the project better.
- ✓ Allocate time to just listen, then listen.
- ✓ Support a coordinator when appropriate or identify who is lead in various aspects of project.
- ✓ Allocate the proper resources to training. There are no successful short cuts, determine the minimum and do not conduct training under the minimum.
- ✓ Get all stakeholders to the table to develop the project and have welcome process for those who come to the table later for valid reasons.
- ✓ Formalize as many roles and responsibilities to some degree, take time to evaluate, check in and adjust roles or responsibilities.
- ✓ Develop contingency plans to the necessary degree.
- ✓ If possible, consider the entire watershed when planning. You may not be able to deal with the entire watershed but look outside of your river reach.

During the process:

- ✓ Check and challenge your and their existing paradigms of what an entity can or can't do. Think out of the box.
- ✓ Enter the process with more than your agenda, mission or goals, come with an open mind to develop what will work, to find the common ground
- ✓ Enter the process ready to partner and create synergy, have thought about opportunities and ideas to do so
- ✓ Evaluate, evaluate, evaluate, ask the hard questions often, it will keep communication open and expectations aligned
- ✓ Be flexible, be able to adjust expectations around goals, methods, processes, time frame, etc.
- ✓ Be patience and persistence, it takes time to genuinely involve people
- ✓ Capitalize on every opportunity to communicate to funders needs of this type of effort, such as support watershed coordinators longer than a start up year. That is how funding sources will change and evolve with needs.