

SECTION 319 NONPOINT SOURCE POLLUTION CONTROL PROGRAM
INFORMATION / EDUCATION / TRAINING / DEMONSTRATION PROJECT
FINAL REPORT

FY09 USU Extension Statewide NPS Pollution Education Program

Submitted by

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	TOTAL SECTION 319 MATCH ACCRUED	\$22,333
	TOTAL EXPENDITURES	\$55,833

SUMMARY OF ACCOMPLISHMENTS

This grant allowed us to do the following:

- We produced 5 watershed factsheets that highlight water quality projects and progress in the following watersheds: Mill Creek (Salt Lake County), Middle and Lower Sevier River, Middle Bear River, Price River, and San Rafael River. Five hundred copies of each factsheet were distributed to our state partners and electronic copies were also made available online at <https://extension.usu.edu/waterquality/htm/watershedinformation>.
- We trained the state's water quality coordinators on how to develop effective water quality monitoring plans, designed to measure impacts of best management practices.
- We provided assistance to watershed coordinators through the distribution of mini-grant funds used for website updates and local watershed events.
- We developed a simple new online dichotomous key for aquatic macroinvertebrate identification.
- We trained and provided oversight to citizen monitors who collected water transparency on 13 lakes and reservoirs throughout the state. We provided the data to Utah's lake management program, and developed online tools for looking at the data collected.
- In partnership with UDWQ, we assisted in the planning, collection, and processing of *E.coli* data at 9 sites.
- We provided hands-on water quality related activities to over 7,000 youth statewide. All our activities are reviewed for scientific accuracy and have been evaluated for effectiveness at increasing youth knowledge and interest in their local waters.
- A total of 160 educators attended 10 workshops and trainings. These educators learned about basic water quality and watershed concepts and were trained on the use of curricula that integrate water quality science into their classrooms.
- We developed new lesson plans and improved our existing water quality based curricula so they can be used more effectively by educators.
- We provided the water quality station activities (training, materials and testing) for the Utah Envirothon, conducted each year by the Utah Association of Conservation Districts.
- We presented 11 individuals and 1 organization with Utah Water Quality Awards at the 2011 Utah NPS conference, highlighting their commitment to water quality protection and improvement in our state.

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1.0 INTRODUCTION

This final report documents the I&E activities and impacts funded by a Fiscal Year 2009 EPA 319 grant to USU Water Quality Extension. The activities funded by this grant occurred between 2009 and 2011.

USU's Water Quality Extension program has been fully involved in Utah's 319 nonpoint source program since its beginning in 1991. USU Water Quality Extension leverages the relatively modest 319 funding it receives each year with other resources to provide as effective an I&E program as possible. Each year we conduct a needs assessment with our partners, we evaluate the high quality programs, materials and approaches used by other states, and we develop a work plan that we feel will be responsive to the ongoing and emerging needs of Utah.

We frame our activities and programs around a central mission: In all our programming, we attempt to help Utah citizens understand how their activities on land may impact the quality of local waters and the benefits that these waters provide. Our programs target different ages and sectors of the population, tailoring messages, materials and activities to be as effective as possible. The state's watershed coordinators are our primary audience. Although we focus on 303(d) listed water bodies or those with on-going TMDL efforts, we include all of Utah's watersheds and watershed coordinators in our programming. Educators and Utah's youth comprise another significant part of our total outreach effort. We feel strongly that programs that provide citizens with increased understanding coupled with opportunities to take action will be most effective at producing long term stewardship and desired changes. Toward this end, this grant helped us with our ongoing expansion of a citizen monitoring program.

Through this grant, we continued several of our successful programs to effectively reach a broad audience. Working with partners throughout the state we completed a set of 5 watershed factsheets. These factsheets are used to highlight successful water quality projects and encourage future projects within the watershed. They provide useful information to both landowners and the general public regarding what is being done in their watershed to improve water quality and why that is so important.

We continue to focus on youth education. In addition to providing activities to over 7000 youth throughout the state, this grant allowed us to conduct workshops to train over 300 educators on how to better implement water quality lessons into their classrooms. By providing these workshops we can effectively reach more students and the message of water quality can be implemented into classrooms for years to come. These workshops provide the necessary knowledge and skills to motivate and empower educators to teach important water quality concepts in their classrooms. We also planned and conducted the aquatic ecology station training, activities and testing at the Utah Envirothon.

We maintained our Utah Lake Watch activities and developed new approaches to volunteer water quality monitoring. We are developing online tools to observe

monitoring results. Throughout the monitoring season, Water Quality Extension provided contacts to UDWQ for new volunteers, trained volunteers, and assisted in the collection of bacteriological sampling throughout the state. Through the efforts of one of these volunteers, high levels of E. coli were discovered at a popular fishing and swimming pond and proper action was taken to warn the public of possible dangers from the contaminated water.

We continue to work with partners throughout the state to help them with their outreach activities. This broad partnership allows us to target the specific needs of our various partners statewide. We collect input from our partners and conduct rigorous assessments of our programs. These data allow us to continue creating new programs that meet current needs, and eliminate programs and practices that are no longer effective or no longer meet our statewide I&E goals.

2.0 PROJECT GOALS, OBJECTIVES AND ACTIVITIES

Our project goal was to protect the beneficial uses of Utah's waters through the long term reduction in NPS pollution. Specifically, we attempt to increase citizen understanding of the impacts of NPS pollution. We help citizens understand the role their actions or land uses may play in either increasing NPS pollution or in mitigating the impacts of pollutants. Finally, we empower citizens with different means of protecting and improving the quality of water bodies and groundwater throughout the state.

The four project objectives and associated tasks are listed below.

Objective 1. Provide educational and outreach support for watershed groups throughout Utah.

Task 1. Provide continued support for the Utah Watershed Coordinating Council.

Task 2. Provide mini-grants to watershed groups that will be used for NPS educational and outreach programs.

Task 4. Develop educational materials about aquatic macroinvertebrates.

Task 5. Support citizen monitoring as an effective way to educate citizens about water quality and watershed concepts.

Objective 2. Raise the awareness of Utah's school aged children and educators about watershed functions and nonpoint source water quality issues.

Task 6. Develop and provide water quality related experiences for youth.

Task 7. Develop and provide water quality and watershed science training for educators

Task 8. Provide support for Utah's Envirothon competition

Objective 3. Provide recognition for activities in Utah that protect our water quality.

Task 9. Provide funding and support for Utah's NPS Water Quality Awards.

Objective 4. Provide timely and accurate reporting to EPA concerning progress and completion of this grant.

Task 10. Produce timely interim and final reports on the project.

2.1 PLANNED AND ACTUAL MILESTONES, PRODUCTS, AND COMPLETION DATES

Task 1. Continued support for the Utah Watershed Coordinating Council.

Watershed fact sheets are a tool for watershed coordinators to use at their outreach events, highlighting watershed projects and increasing water quality awareness at a local level. This grant provided the funding for the following factsheets: Middle Bear River, Middle and Lower Sevier River, Price River, San Rafael River, and Mill Creek (Salt Lake County). The UDWQ, UACD, and the watershed coordinating council provided input on which watersheds to highlight with our factsheets.

With these 5 new watershed fact sheets, we have produced a total of 17 fact sheets for watersheds throughout the state. Each has a common format of an attractive, double sided glossy flier, with basic watershed information, a map, descriptions of projects and water quality improvements within the watershed, contacts, and other relevant information. All factsheets were reviewed by the relevant watershed coordinators, UDWQ TMDL coordinators, and other relevant partners to assure that the material is correct.

500 copies of each factsheet were printed and distributed to the watershed coordinators, extension offices, conservation districts, the UDWQ and other partners. All fact sheets are also posted on the Water Quality Extension Web site, (<http://extension.usu.edu/waterquality/html/watershedinformation>), and we make sure that electronic copies are provided for other partner websites.

The factsheets are all available on the UACD's website (<http://www.uacd.org/fact-sheets.html>) and the UDWQ website (<http://www.waterquality.utah.gov/NPS/index.htm>) See Section 2.3 for images of each fact sheet.

Other activities for the watershed coordinators include ongoing assistance in developing monitoring plans (this work primarily funded under a USDA grant), responses to specific concerns about BMP effectiveness, and support for the watershed coordinating council. We also provided well and septic protection and maintenance materials for use in efforts throughout the state (primarily funded by a USDA grant).

Task 1 short-term outcome:

- Factsheets complete for Middle Bear River, Middle and Lower Sevier River, Price River, San Rafael River, and Mill Creek (SLC)
- 500 printed copies of each factsheet to be used for outreach and marketing by the watershed coordinators, the UWCC, USU extension offices, and local health departments. They are made available at displays during fairs and other events all over the state.
- Fact sheets posted on USU Extension (<http://extension.usu.edu/waterquality/htm/watershedinformation>) and various partner's websites.

Task 1 long-term outcome:

- These factsheets highlight successes in local watersheds and demonstrate how the funds for these projects produce real results. This is an important tool in creating interest for future projects and funding through local landowner and community support. Watershed coordinators tell us that these fact sheets are useful handout when working with the public.
- The factsheets demonstrate successful partnerships encouraging individuals and other groups to get involved in watershed restoration, management, and protection.
- Additional projects will lead to greater reduction in NPS pollution and better water quality in Utah's streams, rivers, lakes and wetlands.

Task 2. NPS Outreach/Social Marketing Mini-Grant Program

Funds from this grant were used to assist in three projects in the state.

Justin Elsner, the Middle and Lower Bear River Watershed Coordinator, received \$500. A portion of these funds were used to assist with the Bear River Celebration and Free Fishing Day. Specifically, funding was used to help with displays, T shirts and other promotional materials used during the event. Goals of this activity are to increase understanding and stewardship for the Bear River by our local citizens. Individuals attending this event learned about their local watershed, including wildlife, native plants, fish resources, water quality, stream structure, and many fun related activities. See Section 2.3 for photographs from this event.

Remaining funds along with mini-grants provided by other EPA grants were used for planning and activities with a Prescription Drug Task Force in Northern Utah. The prescription drug task force is a partnership with the Bear River Health Department, the Cache County sheriff's office, Cache County Extension and USU Water Quality Extension. Appropriate disposal of drugs and personal care products will protect waters

downstream from treatment plants and will protect groundwater. Over 160 citizens took advantage of a community “Take Back Event” in August 2011, dropping off 277 pounds of prescription drugs (including containers). See project report in Section 2.3.

Tessa Groff, the Southeast Colorado River Watershed Coordinator, received \$1,750 for website assistance for the Moab Area Watershed Partnership (MAWP). The goal of this project was to increase public awareness of MAWP, local water quality issues, and community based watershed management planning efforts by developing an easily navigable website that is accessible to the entire community of Grand County in addition to the public at large. Funding from this contract was used for website design and development, including a useable content management system and hosting fee. Additional work on the website was funded by mini-grants from subsequent I&E contracts. A screen shot of the final website can be seen in Section 2.3. The website URL is: <http://www.moabwatersheds.org/>.

The third project funded by this task was a watershed field days for elementary students in Garfield County. Wally Dodds, the Upper Sevier River Watershed Coordinator, received \$750. During the field day, participating students learned about watershed protection and helped plant willow trees along the Upper Sevier River. Funds from this mini-grants were used for lunches for the students.

Task 2 short-term outcomes:

- Approximately 300 people participated in the Bear River Celebration and Free Fishing Day, learning about their local watershed and reasons for protection water quality, wildlife, plant communities and other watershed functions.
- The Northern Utah Prescription Task Force sponsored a drug take-back event, which educated citizens on the risks of inappropriate drug disposal, and also collected over 275 pounds of prescription drugs which were disposed of properly.
- In the first two months the Moab Area Watershed Partnership website was active it received over 1,400 page views from over 300 unique visits.
- Approximately 100 elementary students in the Upper Sevier watershed learned about watershed protection through activities and a service project.

Task 2 long-term outcomes:

- The Bear River Celebration and Free Fishing day has become an event that many families plan for each year. It gives them the opportunity to learn about the Bear River Watershed and how to protect it. Participation in the event results in increased stewardship and protection of water quality throughout the Middle Bear watershed.
- Citizens in the area are more aware of the dangers of inappropriate disposal of prescription drugs and pharmaceuticals. This will result in long-term protection of our rivers and groundwater from this suite of emerging contaminants.
- The Moab Area Watershed Partnership website will allow the group to effectively distribute information about the planning process they are initiating, as well as,

- create a venue for watershed education. It is a tool that will assist in community outreach on local water quality issues and keep all stakeholders updated in the planning process.
- Youth at the Upper Sevier watershed field days learn about the importance of functioning riparian corridors for protecting water quality. Service activities such as these result in long term commitment to stewardship of local rivers.

Task 3 – Provide assistance in water quality educational and outreach programs, through trainings and workshops

We used funding from this grant to provide a workshop to our watershed coordinators on effective monitoring to demonstrate BMP impacts. This activity benefited enormously from USDA's Conservation Effectiveness Assessment Program, which funded 3 to 4 year projects in multiple watersheds around the country. A common finding of many of these projects was that poorly conceived monitoring plans in many watersheds severely limit our ability to quantify the impacts of best management practices. Nancy Mesner and Ginger Paige (University of Wyoming Extension) were PIs on two of these projects and collaborated on a manual that provides guidance on developing monitoring plans for BMP implementations. This manual is intended to help watershed coordinators, managers, and others design monitoring plans that will demonstrate and quantify Best Management Practice impacts to water quality. The manual and additional information is available at <https://extension.usu.edu/waterquality/htm/bmps>.

Using this manual, and other findings, as a basis, in August 2010 Mesner and Paige conducted a workshop for the Utah Watershed Coordinators and UDWQ staff on improved monitoring plans and approaches. The training was organized around common mistakes made in developing monitoring:

1. Failure to establish clear project objectives and to design monitoring programs around those objectives;
2. Failure to understand and account for dynamics and transport process of specific pollutants of concern within a specific watershed; and
3. Reliance on traditional monitoring approaches (eg. monthly grab samples).

The workshop followed the specific steps in the BMP manual from establishing objectives to understanding variability in systems. Workshop participants also shared their specific projects and monitoring challenges and the group discussed approaches to take so that the impact of the project could be quantified. The BMP Monitoring Guidance manual was distributed to all workshop attendees.

Task 3 short-term outcomes:

- Watershed coordinators gained an improved understanding of how to develop and implement a monitoring plan to demonstrate the impact of a specific best management practices.

- Watershed coordinators began the process of developing monitoring plans for their projects in their own watershed.

Task 3 long-term outcomes:

- Better monitoring approaches will improve the ability of the Utah Watershed Coordinators and the UDWQ to identify and quantify the impacts of different types of BMPs implemented throughout Utah.
- Better monitoring will result in better estimates of pollutant reductions to be utilized in TMDLs and other watershed restoration efforts.
- The information gained from better monitoring efforts will result in more appropriate and well targeted implementation of future BMPs.
- Better targeting of BMPs will result in more efficient and effective use of resources, leading to improved water quality over time.

Task 4 – Development of aquatic macroinvertebrate educational materials

In our original proposal, this task was to develop and produce macroinvertebrate educational cards and posters, as well as other educational materials. After several discussions with partners and a more thorough needs assessment was completed, it was decided that current needs would be better met by developing an online and hard copy aquatic macroinvertebrate key and other products rather than the macroinvertebrate cards.

The following materials have been developed using these funds:

We worked in coordination with USU's BLM Macroinvertebrate Monitoring Lab to develop an online key for aquatic macroinvertebrates commonly found in Utah (<https://extension.usu.edu/waterquality/htm/macrokey>). The key includes color photographs as well as descriptions and other information such as water quality index ratings for each order and/or family of aquatic macroinvertebrates. This will assist educators and students in learning about the aquatic macroinvertebrates found in Utah and how to identify them. We have also put together a hard copy key for use in the field (<http://extension.usu.edu/waterquality/files/uploads/Educator%20Resources/macro%20key%20for%20Utah.pdf>).

Upon request by many of the teachers who use our materials, we revised our existing aquatic macroinvertebrate lessons and teacher training materials, repackaging them as a lesson manual called Bugs Don't Bug Me. The manual includes introductory information about aquatic macroinvertebrates, links to the Utah Core Curriculum for grades K-6, and each of the seven lessons/activities contain background information, visual aids, photographs, field trip suggestions, and discussion questions. This will allow teachers to conduct an entire unit on aquatic macroinvertebrates and water quality. It has been reviewed by educators and is now available on our website (<http://extension.usu.edu/waterquality/htm/educator-resources/lessonplans/macro/>).

Included in the manual is a new lesson entitled, “If Bugs Could Talk” that addresses the links between water quality and aquatic macroinvertebrates. This lesson targets upper grade school, was reviewed by educators and scientists, and was been presented to approximately 300 students in 10 different classrooms during the development phase of the lesson

(<http://extension.usu.edu/waterquality/files/uploads/Educator%20Resources/Bugs%20Don%27t%20Bug%20Me/If%20Bugs%20Could%20Talk.pdf>).

We also continue to provide macroinvertebrate materials and other education materials including kick nets, macroinvertebrate posters, dichotomous keys, stream trailer access, and web resources.

Task 4 short-term outcomes:

- An online macroinvertebrate dichotomous key is now available on our website for educators and the general public at:
<https://extension.usu.edu/waterquality/htm/macrokey>
- The new print dichotomous key can be easily used in the field:
<http://extension.usu.edu/waterquality/files/uploads/Educator%20Resources/macro%20key%20for%20Utah.pdf>
- Restructuring and revising existing macroinvertebrate lesson plans will allow educators to make use aquatic macroinvertebrates more effectively when teaching about watershed science, aquatic biology, and water quality.

Task 4 long-term outcomes:

- New organization of the Bugs Don’t Bug Me lesson plans allows teachers to teach individual concepts or link several concepts of bugs and water quality together to help increase knowledge retention with students.
- Our evaluations of the effectiveness of these aquatic macroinvertebrate lesson plans indicate that students who are taught with these materials gain knowledge, and have measurable changes in their attitudes about streams and aquatic organisms. We also found that these changes were retained for at least 6 months.
- The online key and more easily accessed materials are located on our web site so teachers can access these materials during field trips, thus enhancing the learning experience.
- These materials are also being incorporated into other high quality educational activities and web sites. For example, these are being used in a touch screen display being developed for the Swaner EcoCenter in Park City, UT.

Task 5 - Support for citizen monitoring to educate citizens about water quality and watershed concepts

Because we did not receive an I&E grant for FY2008, funds for this grant covered 2010 and 2011 activities. Water Quality Extension continued coordinating the Utah Lakes Watch program and worked to incorporate new monitoring procedures into the program. We worked with multiple partners to identify and fill gaps in monitoring needs that were not met by professional water quality specialists. In addition, the citizen monitoring aimed to increase public participation in water quality monitoring and awareness about non-point source pollution. Overall our goal was to increase participation in citizen monitoring while advocating the role and value that citizen monitoring add to Utah.

At the end of the 2010 season 15 citizen monitors turned in Secchi Depth data (water clarity) for 19 sites on 13 different water bodies. Three additional monitoring locations were added in 2010. In total 117 monitoring events were reported across the state in 2010. This represents the largest amount of volunteer data collected during the ten year Utah Lakes Watch Program. These data, along with a final report, were given to the DWQ and shared with the volunteers.

2011 marked the tenth summer of the program and over 70 volunteers had participated through the years. In 2011, 17 citizen monitors measured water clarity using simple Secchi measurements at 15 sites on 13 lakes and reservoirs. Nine of the sites have at least 5 years worth of data. Two additional sites were added in 2011. In total 110 sampling events were reported. This year instead of creating a final report to send only to the volunteers, an interactive website that is publicly available was created. This website included maps, all data records from the past ten years, and graphs showing the changes in water clarity for each site. Volunteers were enthusiastic about this new and exciting way of accessing and displaying their data. The website is located on our extension page:

https://extension.usu.edu/waterquality/htm/citizen_monitoring/uww/maps/

In spring 2010, based on the results of the *E.coli* and total coliform citizen monitoring pilot study, DWQ decided to expand the *E.coli* monitoring program. We collaborated with DWQ, health departments, USFS, BLM, and citizens, to monitor *E.coli* on 33 lakes and reservoirs statewide. In 2010 five citizen monitors sampled *E.coli* at nine reservoirs. These monitors are sampling twice each month and taking samples to the Division of Water Quality, USU Water Quality Extension, or the Tri County Health Department for processing. Water Quality Extension staff worked with three additional citizen monitors to collect samples at six additional reservoirs. These three citizen monitors were not as confident taking samples without supervision leaving most of the sampling to Water Quality Extension staff. Lastly, Water Quality Extension staff is sampling at Willard Bay due to no response by park rangers or other potential citizen monitors. All data collected was reported to the DWQ.

E. coli was monitored by citizen monitors in 2011. In all, 7 citizen monitors were trained in collection and processing of samples, however, because of limitations with equipment,

only 5 of these volunteers collected *E. coli* samples in this season. Three of the volunteers worked with Water Quality Extension, and 2 worked directly with the Division of Water Quality. Citizen monitors collected samples at a total of 9 lakes and Water Quality Extension staff processed the samples at USU from 3 lakes.

DWQ has created an online database for *E. coli* data and site information. Water Quality Extension contributes to the *E. coli* database by submitting data after each reservoir or lake site is sampled.

A protocol was developed for chlorophyll *a* monitoring by volunteers, equipment was purchased, and 5 different volunteers were trained. Actual implementation of this part of the monitoring program was held up by unresolved issues about delivering final filtered samples to the state laboratory.

An online database developed for another project (A River Runs Through Us) was converted to a modern online database language and is ready for completion. This final step will be accomplished once a statewide coordinator is hired and following additional consultation with the UDWQ monitoring council.

The value of citizen monitoring was recognized by the DWQ and discussions to expand the program were initiated. Water Quality Extension met with DWQ staff to identify additional parameters that could be included in the new citizen monitoring program. The decision was made to expand citizen monitoring from a lakes only focus to include streams and add additional parameters. In order to facilitate this increased focus on citizen monitoring, the process to hire a full time coordinator began in 2011. These will result in a greatly expanded and enhanced citizen monitoring program called Utah Water Watch.

Task 5 short-term outcomes:

- 227 water clarity sampling events on 15 lakes and reservoirs
- Increased awareness by volunteers about the importance of water quality
- *E.coli* data was reported in a timely matter to manage water bodies

Task 5 long-term outcomes:

- Long term data records for the DWQ on water clarity from lakes and reservoirs
- Effective citizen monitoring protocols for *E. coli*
- Increased understanding of the need and role for citizen monitoring in Utah
- Started the process to enhance and expand citizen monitoring in Utah

Task 6 - Water Quality Experiences for Youth

Funding from this grant provided support for youth education activities in 2010. During that time, over 7,100 youth in 12 counties were taught water quality principles through hand on activities. An additional 2,100 people (youth and adults) participated in

activities provided by events open to the general public. These activities included 4-H camps, school events, Boy Scout activities, festivals, and water fairs. The hands-on youth activities we provide include the stream hydrology trailer, watershed and ground water models, water quality games and activities, activities focused on macroinvertebrates, water quality monitoring and testing, water cycle activities, water purification, water pollution activities, and watershed investigation activities. All activities are aligned to the Utah core curriculum and are posted on our extension web site.

We partnered with Utah Division of Wildlife Resources, Utah Association of Conservation Districts and Cache County Extension to organize and provide the annual Cache County Natural Resource Field Days. This event provides hands-on activities that teach about soil, wildlife, plants and water quality. Approximately 1600 youth participated in this event.

An assessment of changes in scientific knowledge and attitudes following involvement in Natural Resources Field Days was conducted as part of a graduate study (Kinder MS Thesis, 2012, USU Watershed Sciences Department). This project was funded by a USDA grant, allowing us to quantify the impacts of EPA funding on youth education. Results of this study are reported in Section 3.0

With funds from this grant we also organized and participated in the Bear River Celebration and Free Fishing Day in Logan, Utah. This event is held in June in conjunction with the Utah Division of Wildlife Resource's Free Fishing Day. Approximately 320 youth and over 200 adults attended the event, which included booths from many partners with hands on activities relating to watersheds, water conservation, water wise plants, wildlife within the Bear River watershed, and wetlands.

Task 6 short-term outcomes:

- Over 8,000 youth in 12 counties participated in hands on educational activities relating to watersheds and water quality in 2010.
- Many new and updated activities and lesson plans are available on our website at: <http://extension.usu.edu/waterquality/htm/educator-resources>.

Task 6 long-term outcomes:

- In the study done about Natural Resources Field Days, it was found that students who participate in these types of short term activities have a significant increase in knowledge for several months following the activity. All students who participated in the study retained knowledge gained on the field trip for a post test that was administered 8 months after the event.
- The study also showed evidence that students gain a more positive attitude towards watersheds and water quality following meaningful hands on activities, such as those that were paid for by this grant. The positive attitude and increase

in knowledge can lead kids to making better water quality decisions throughout their lives. For more information, visit:

- https://extension.usu.edu/waterquality/files/uploads/NRFD/ASLO%20poster_blue.pdf
- <https://extension.usu.edu/waterquality/files/uploads/NRFD/2012/NR%20Days%20summary.pdf>

Task 7 - NPS Water Quality Training for Educators

Funding from this grant supported our 2009 teacher training workshops. A total of 160 educators attended 10 workshops and trainings. These workshops and trainings include our Stream Side Science curriculum, watershed and GIS mapping, Mountain Wild to Wetland Wonders, and UT Envirothon workshop for team teachers.

The Stream Side Science and CMAP workshops last a minimum of 6 hours and the Mountain Wild to Wetland Wonder and Envirothon workshops last about 3 hours. These workshops are designed to provide the participants with high quality resources and instruction to help them incorporate water quality education into their classrooms or educational programs.

Mountain Wild to Wetland Wonder is a unique Federal and State partnership linking agencies (Utah Division of Wildlife Resources, U.S. Fish and Wildlife Service) with schools to get kids in their watershed and relate water quality activities to the context of Utah's core curricular science standards. The teachers and their students (all of Box Elder County's fourth graders) participate in two field trips, one to Hardware Ranch Wildlife Management area and the other to the Bear River Migratory Bird Refuge which involve hands-on water quality activities and monitoring for the students. In 2009, Water Quality Extension assisted with the teacher training and several of the student field trips.

Task 7 short-term outcomes:

- 160 educators in 8 counties participated in training that included both classroom and field instruction.
- Educators receive the necessary instruction and materials to integrate water quality education into their classroom curricula. They also gain the necessary confidence to teach scientific concepts that they often times are not comfortable with beforehand.

Task 7 long-term outcomes:

- By training teachers in water quality education we can reach a much broader audience than by teaching the concepts to kids alone. These teachers can integrate the concepts they learn into their regular curricula and thereby expand water quality teaching in the state.

- From surveys we have found that over 65% of teachers who take our Stream Side Science course change the way they teach science. Over 30% of the teachers use the concepts throughout the school year, thereby helping students gain a lasting knowledge of water quality.

Task 8 – Support for Utah Envirothon

Funds from this grant helped offset costs and provided staff support for the Utah Envirothon during spring 2010. USU Water Quality Extension personnel helped write the aquatic ecology exams, provided material for the web site <http://www.utahenvirothon.org/> on water quality issues in Utah, and conducted the on-site testing and activities at the aquatic test station. The 2010 Utah Envirothon was held April 30th and May 1st in Heber City, Utah. 123 students, in teams of four to five, participated in the 2010 event.

The teams are judged on an oral presentation that analyzes a problem set forth by the Envirothon committee. The current issue in 2010 was “groundwater”. The students also compete through testing in a series of natural resource areas, including aquatic science. The winning team from Utah travels to the national competition where teams compete for over \$100,000 in Canon Envirothon scholarships and other prizes, but all teams increase their knowledge about natural resource issues and science. One of the Logan High School teams won the Utah Envirothon this year and placed 20th overall at the National Canon Envirothon. They place 3rd overall in the oral presentation about groundwater.

Task 8 short- term outcome:

- Educational material and training were provided for teachers, sponsors, and others involved in the Envirothon.
- We provided a thought provoking, real to life, activity that made the students better understand water management in a watershed.
- We provided a written aquatic ecology test that challenged the kids in understanding water quality and watershed concepts.

Task 8 long-term outcomes:

- Students and educators who participate in Envirothon gain knowledge for water quality and watershed principles. They use this knowledge to help encourage those around them to practice better water quality principles.
- Students that participate in Envirothon gain an appreciation for the natural resources around them. They become more interested in STEM (science, technology, engineering, and math) fields and are more likely to pursue long-term career goals that incorporate the principles they learn at Envirothon.

Task 9 – Statewide NPS awards

Funds from this grant helped pay for 11 water quality awards given out during the 2011 Water Quality Conference. The following received awards for their excellent work in water quality:

- Nathan Daugs (\$100) – Nathan has assisted hundreds of landowners in developing conservation plans to help conserve the natural resources of Cache Valley.
- Marni Lee (\$100) – Marni works with the Division of Wildlife Resources and works tirelessly to educate school groups about Wildlife and their dependence on water quality.
- Tony Ward (\$200) – Tony and his son Chris raise registered Angus cattle on their Cache Valley farm. Since 2000, they have been working to improve water quality of the Little Bear River.
- Mike Wangsgare (\$200) – Mike has an Organic Dairy in Young Ward Utah. Over the past 10 years Mike has worked to improve the water quality on his dairy through many projects including laser leveling of fields, and a waste management system to contain manure and runoff from the dairy.
- Clark Willis (\$200) – Clark has a lamb feeding operation along Big Creek, near Bear Lake. He has completed many projects to help improve water quality including restricting access to the waterway and installing conservation practices like off-site watering troughs. He has also worked to establish a conservation easement on his inherited ranch near Bear Lake.
- Kristina Brown (\$200) – Kristina is a 4th grade teacher who is very active in teaching her students about water quality.
- Carolyn Robertson (\$200) – Carolyn teaches 9th grade since 2004 has worked to teach her students about water quality and takes them on a field trip every year to the Ogden River to monitor the water.
- Northern Utah Conservation District (Fred Selman) – The Northern Utah Conservation District has completed a project to map the underground field drains in the Bear River Valley, and Cache Valley.
- Steve Bullock (\$100) – Steve has been very active in Utah's Citizen Monitoring Program since 2009. He has assisted in collecting water clarity measurements along with E. coli samples. He has allowed the use of facilities for trainings and assisted in the making of a video to promote citizen monitoring.
- Scott Tolentino (\$100) – Scott has participated in the Utah Lake Watch Program since 2002. He has provided valuable water clarity data at Bear Lake each year.
- Jay McAllister (\$100) – Jay has participated in sampling both water clarity and E. coli. Most notable are his efforts in collecting E. coli samples at Salem Pond through the summer of 2010, and continuing into the winter.

By recognizing individuals and organizations for their good work in water quality, we encourage continued efforts that help protect our water resources. These awards also help solidify partnerships that continue to help water quality causes throughout the state.

Task 10 - Reporting

Water Quality Extension strives to provide accurate, informative and timely reporting to fully document the expenditures and results of our grant allocation. This annual report includes all activities and accomplishments completed using funds from the fiscal year 2009.

2.2 EVALUATION OF GOAL ACHIEVEMENT AND REALTIONSHIP TO THE STATE NPS MANAGEMENT PLAN

All three of our objectives for this project were achieved through the completion of each associated task.

- Five factsheets were created for watersheds in the state. They are used by watershed coordinators and other professionals to demonstrate good water quality projects in their local watersheds and promote support for other projects.
- Mini-grants were provided to various watershed coordinators who were able to use the money for increased outreach and education efforts, website updates, and local watershed events.
- The creation of a new online dichotomous key for identifying aquatic macroinvertebrates makes it easier for students and educators to correctly identify species found in Utah.
- Through the efforts of several volunteers, secchi disk monitoring continued for several lakes, including two which have not had volunteers in several years. We also continued our partnership with UDWQ to enhance and expand the bacteriological monitoring in the state.
- Over 7,000 youth in 12 counties were able to participate in interactive water quality activities at various events.
- 160 educators in 8 counties participated in water quality workshops to learn how to implement water quality principles in their classrooms.
- We continued our support of Envirothon in 2010 by assisting in the planning and preparation for the event in Heber City. We also provided the necessary staff to run the aquatic ecology station.
- Eleven individuals and one organization were recognized for their work in promoting water quality at the 2011 Utah Non Point Source conference that was held in Logan Utah.

We continue to solicit feedback from partners, educators, and students to find ways to improve our program. We do this through evaluations at workshops and through contact we have with partners and other state officials. We make changes in any areas that need to help improve our presentations, lesson plans, workshops, and other activities. We are

Improving Utah's Water Quality Middle and Lower Sevier River Watershed

MAJOR WATERBODIES

- Sevier River
- Piute Reservoir
- Otter Creek Reservoir
- Yuba Reservoir

MAJOR CITIES

- Ridgfield
- Montrose
- Salina
- Delta
- Fillmore
- Sopio

MAJOR LAND USES

- Agriculture
- Public range & grazing
- Recreation

LOCAL WATER QUALITY ISSUES

- Salinity
- Sediment
- Phosphorus
- Poor aquatic habitat

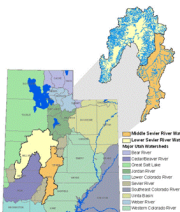
LOCAL CONTACT:
Lynn M. Koyle
Watershed Coordinator
(435) 895-4441 x104
lynn.koyle@ut.net

Watershed Description

The Middle and Lower Sevier watershed includes all of the basins of the Middle and Lower Sevier River, and is located in all or parts of Piute, Sevier, Sanpete, Juab, Millard, Tooele and Beaver counties. This watershed includes drainage to the Sevier River and the Piute Valley.

The Sevier River originates in the mountains of Kane County in southern Utah. It follows a sinuous path of over 380 river miles ending in Sevier Lake, one of the major terminal lakes in the Great Basin. The Sevier River drains over 5,900 square miles, larger than the state of Vermont. The watershed ranges in elevation from almost 12,000 feet to less than 4,540 feet above sea level.

The Sevier River watershed was settled in the 1800s by pioneers who established an economic base built on agriculture. The communities have diversified since then, but the majority of the land is still used to agriculture. These land uses have sustained the community, however, combined with the naturally erodible and high saline characteristics of the soil they have inadvertently resulted in nonpoint source water pollution to the Sevier River. This has led to non-support of its designated beneficial uses.



UtahPCD is a partnership committed to providing conservation solutions.

Middle & Lower Sevier Water Quality Improvement

Project Description

The Sevier River Watershed project was launched in the fall of 2005 with the formation of a steering committee to help with the organization and development of the "Sevier River Watershed Water Quality Management Plan." The data was gathered and supplied to Currie Ecological Solutions, LC who organized and completed the Management Plan in the fall of 2010.

To date, one Annual Feeding Operation (AFO) and three river restoration projects have been completed totaling 3,500 feet of stream bank restoration. Another AFO and 4,700 feet of stream bank restoration are scheduled to be completed in the fall of 2010 and spring of 2011. The stream bank restoration projects include: bank shaping, rock apron, rock bays, planting riparian vegetation, and fencing. In addition, the land owners along the Sevier River have installed many other conservation projects that help control erosion and reduce sediment and nutrient runoff.

Partners



- Piute, Sevier, and Millard Conservation Districts
- Natural Resources Conservation Service
- Utah State University Extension
- Utah Association of Conservation Districts
- Fishlake National Forest
- U.S. Bureau of Land Management
- Utah Division of Wildlife Resources
- Utah Department of Environmental Quality
- USDA Farm Service
- Utah Department of Agriculture and Food

Related Projects

- Streambank Restoration
- Range and Pasture Planning
- Irrigation Systems
- Water Quality Monitoring
- Many other best management practices

Funding

- EPA
- Local landowners
- Utah Division of Water Quality

Produced by USU Water Quality Extension, Utah Watershed Coordinating Council, Utah Association of Conservation Districts, and Utah Division of Water Quality. UtahPCD is a partnership committed to providing conservation solutions. The data was gathered and supplied to Currie Ecological Solutions, LC who organized and completed the Management Plan in the fall of 2010. To date, one Annual Feeding Operation (AFO) and three river restoration projects have been completed totaling 3,500 feet of stream bank restoration. Another AFO and 4,700 feet of stream bank restoration are scheduled to be completed in the fall of 2010 and spring of 2011. The stream bank restoration projects include: bank shaping, rock apron, rock bays, planting riparian vegetation, and fencing. In addition, the land owners along the Sevier River have installed many other conservation projects that help control erosion and reduce sediment and nutrient runoff.

NR/WRQ/2010-4

Middle Bear River Watershed Factsheet

Improving Utah's Water Quality Middle Bear River Watershed

MAJOR WATERBODIES

- Bear River
- Cutter Reservoir
- Logan River
- Blacksmith Fork River
- Little Bear River

MAJOR CITIES

- Logan
- Hyman
- Providence
- Wellsville

MAJOR LAND USES

- Urban
- Agriculture
- Recreation

LOCAL WATER QUALITY ISSUES

- Phosphorus
- Sediment
- Bank Erosion
- Loss of Riparian Vegetation and Aquatic Habitat
- Animal Feeding Operations

LOCAL CONTACT:
Middle Bear River Watershed Coordinator
(435) 753-6029 ext. 21

Watershed Description

The Middle Bear River watershed includes all of the watersheds within the Cache Valley, starting from the Idaho-Utah border and extending to the south boundary of Cache County. The Middle Bear River watershed encompasses the drainage area of several major tributaries of the Bear River, which flow from the east into the shallow waters of Cutter Reservoir.

The Middle Bear River watershed has a drainage area of 888 square miles. The annual average flow into the Bear River increases from 1,519 cubic feet per second as it enters Cutter Reservoir. The Logan, Blacksmith Fork, and Little Bear rivers are primarily responsible for this increase as all three converge and enter the reservoir.

Cache County's population is approximately 100,000. Cache Valley is expected to see the highest rate of growth of all municipal areas in the Bear River Basin. With increased population, large emphasis has been placed on wastewater treatment and stormwater management.



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Middle Bear River Water Quality Improvement

Project Description

Water Quality implementation projects have been occurring in the Middle Bear River watershed since the early 1990s with great success. With the cooperation of local watershed groups, landowners, and various governmental agencies, several water quality projects have been implemented ranging from stream bank restoration to riparian revegetation systems. Several educational campaigns have also been initiated to help raise public awareness of water quality issues throughout the valley. These education campaigns include youth educational field days, storm water education, and pharmaceutical disposal programs.

The Middle Bear River watershed has a large number of dairy producers. Recently, efforts have helped many producers comply with state water quality standards. Various agencies have helped dairy producers implement best management practices to help contain water such as nutrients and organic matter on their property. Many producers have also developed nutrient management plans. These plans identify when and where to apply manure. Containment practices and nutrient management plans help prevent excess nutrients from entering local water bodies.

Partners

- North Cache Conservation District
- Blacksmith Fork Conservation District
- EPA
- Utah Division of Water Quality
- Utah Division of Wildlife Resources
- Natural Resources Conservation Service
- Utah Association of Conservation Districts
- Local Landowners
- Local Irrigation Companies
- Utah Watershed Coordinating Council
- Utah Beaver Advisory Committee
- Utah State University Extension

Related Projects

- Irrigation systems
- Range and pasture planning
- Soil testing and testing
- Bear River Celebration & Free Fishing Day
- 4th grade Natural Resources Field Days
- Stream restoration
- Animal feeding operation inventory
- Animal feeding operation improvements
- Wildlife habitat improvements
- Upland improvements
- Water quality outreach and education

Funding

- EPA 319 funding
- Utah State Nonpoint source funds
- NRCS Environmental Quality Incentives Program (EQIP)
- NRCS Wildlife Habitat Improvement Program (WHIP)
- Local Landowners




Produced by USU Water Quality Extension, Utah Watershed Coordinating Council, Utah Association of Conservation Districts, and Utah Division of Water Quality. UtahPCD is a partnership committed to providing conservation solutions. The data was gathered and supplied to Currie Ecological Solutions, LC who organized and completed the Management Plan in the fall of 2010. To date, one Annual Feeding Operation (AFO) and three river restoration projects have been completed totaling 3,500 feet of stream bank restoration. Another AFO and 4,700 feet of stream bank restoration are scheduled to be completed in the fall of 2010 and spring of 2011. The stream bank restoration projects include: bank shaping, rock apron, rock bays, planting riparian vegetation, and fencing. In addition, the land owners along the Sevier River have installed many other conservation projects that help control erosion and reduce sediment and nutrient runoff.

NR/WRQ/2011-2

Price River Watershed Factsheet

Improving Utah's Water Quality Price River Watershed

MAJOR WATERBODIES

- Price River
- Sootfield Reservoir

MAJOR CITIES

- Price
- Hooper
- Wellington

MAJOR LAND USES

- Coal Mining
- Rangeland
- Agriculture

LOCAL WATER QUALITY ISSUES

- Salinity
- Sediment
- Invasive Species

LOCAL CONTACT:
Daniel Gunnell
West Colorado River
Watershed Coordinator
(435) 381-2350 x117
daniel.gunnell@utahstate.edu

Watershed Description

The Price River watershed covers 1,830 square miles spanning Carbon, Emery, Utah, Wasatch, Sanpete, and Duchesne counties. The majority of the water in the Price River originates as snowmelt from the Wasatch Plateau to the west and the Book Cliffs to the east. The foothills of the Wasatch Plateau are also an important area for groundwater recharge. The tributaries in the Book Cliffs also contribute to the flows in the Price River during isolated stream events. Including the headwater tributaries at about 5,000 feet, the Price River flows for roughly 130 miles until it reaches the Green River at about 4,122 feet.



Invasive Tamarisk and Russian olive are widespread throughout the watershed. The impenetrable Tamarisk and Russian olive thickens narrow and channelize waterways reducing access to the floodplain. Without floodplains to absorb high flows, the potential for flooding events in the Price River watershed has increased. Also, the narrow, deep channels are devoid of fish habitat necessary to support native fish populations.

Water development for agriculture and livestock has further reduced stream flow causing fragmented streams and resulting in additional stream habitat loss. Also, introduced fish species in the Price River out-compete and prey on native fish species.

Biologists believe that the removal of invasive plants and non-native fish species will improve water quality throughout the watershed.




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Price River Water Quality Improvement

Project Description

The Price River Enhancement Committee was formed to address the growing concern of water quality degradation and noxious weed invasion along the Price River. Recently, Russian olive and Tamarisk was removed from nearly 5 miles of stream banks on both public and private land. Native vegetation restoration efforts have occurred along more than 3 miles. Additional vegetation efforts will continue to occur as funding becomes available. Currently, additional funding sources are being sought from the Natural Resources Conservation Service (NRCS), the Environmental Protection Agency (EPA), the State of Utah, and the Watershed Restoration Initiative (WRI) to assist in the enhancement of the Price River Watershed.



Partners

- Bureau of Land Management
- Colorado Resource Conservation and Development Council
- Carbon County
- Natural Resources Conservation Service
- Price City
- Price River Conservation District
- Price-Carbon-Mohave-Cash Conservation and Development Council
- Private Landowners
- Realty Cooperative Utah Management Area
- Utah Association of Conservation Districts
- Utah Department of Agriculture and Food
- Utah Department of Transportation
- Utah Division of Forestry, Fire, and Tree Lands
- Utah Division of Water Rights
- Utah Division of Water Quality
- Utah Division of Wildlife Resources
- Utah State University Extension

Related Projects

- Stream Restoration
- Irrigation Systems

Funding

- Price River vegetation efforts: \$280,500
- Irrigation systems for Carbon County salinity project: \$25.50 million

For funding opportunities in the Price River Watershed, contact the Price River Conservation District.

To learn how you can participate or lend your support to Utah community water quality projects, please contact your local conservation district or county agent.

Produced by USU Water Quality Extension, Utah Watershed Coordinating Council, Utah Association of Conservation Districts, and Utah Division of Water Quality

NR/WQ/2011-1

San Rafael River Watershed Factsheet

Improving Utah's Water Quality San Rafael River Watershed

MAJOR WATERBODIES

- San Rafael River
- Huntington Cask
- Cottonwood Cask
- Pease Cask
- Muddy Cask
- Huntington North Reservoir
- Middle Reservoir
- Elk-Hole Lake
- Joe Valley Reservoir

MAJOR CITIES

- Huntington
- Cattle Dale
- Chengsville
- Emery

MAJOR LAND USES

- Coal Mining
- Rangeland
- Agriculture


LOCAL WATER QUALITY ISSUES

- Salinity
- Detritus
- Invasive Species
- Flooding

LOCAL CONTACT:
Daniel Gunnell
West Colorado River
Watershed Coordinator
(435) 381-2350 x117
daniel.gunnell@utahstate.edu

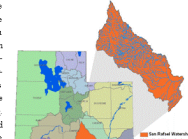
Watershed Description

The San Rafael River in southeastern Utah is formed by the confluence of Huntington, Cottonwood, and Pease Creeks. The San Rafael River is approximately 180 miles long and flows through some of the wildest landscapes in the state to its confluence with the Green River. The total watershed area is 2,432 square miles.



The San Rafael River is one of the most polluted creeks in the state and is currently on the 301D list of degraded waters due to high concentrations of total dissolved solids. Total dissolved solids result from both natural sources and irrigation return flow over salt irrigated soils. Another potential effect of irrigation is the devastating effect of erosion in the river in late summer. Most of the land along the San Rafael River is managed by the BLM. The primary uses for the property include recreation and rangeland for cattle grazing.

In addition to the water quality and quantity problems, the river has been severely impacted by invasive species including tamarisk and Russian olive. These species have replaced much of the native vegetation along the riparian zone. The presence of tamarisk on sand bars within the river traps additional sediments, eventually narrowing and deepening the channel. This reduces the ability to carry large flows, which increases flooding. Non-native fish are currently found throughout the lower reaches of the river. Abundance of these species are low throughout the river, however, it is reasonable to expect that these members would increase with improved habitat.



UtahPCD is a partnership committed to providing conservation solutions.


San Rafael River Water Quality Improvement

Project Description

A project is underway to remove nonnative tamarisk and Russian olive on 1,050 acres of state owned land on the lower San Rafael River. These areas will then be planted with native vegetation. Tamarisk and Russian olive seedlings will be treated with herbicide for 3 years following the removal to assure native vegetation becomes established. Riparian vegetation restoration will aid in the restoration of instream and riparian habitat. Currently 630 acres have been cleared of nonnative vegetation and planting on 322 acres was completed during winter 2010. Restoration continues will continue following the completion of this project.

Designs to restore connectivity between the upper and lower sections of river are being researched. Currently the flat diversion dam creates a barrier to upstream fish movement that is impassable at all flows. One potential solution to this is the removal of the diversion dam and replacement with a diversion that does not create a barrier. This design would also aid in the restoration of instream habitat.

Nonnative fish species in the San Rafael River pose a significant threat to native species. Techniques to control and eradicate nonnative fish species in the San Rafael River are being researched. One potential solution to the problem is the construction of a fish barrier that prevents the passage of nonnative fishes while allowing native species to pass near the confluence with the Green River.



Partners

- Bureau of Land Management
- Utah Division of Water Quality
- Utah Division of Wildlife Resources
- Natural Resources Conservation Service
- Emery County Mosquito and Weed Abatement
- Emery County Public Land Council
- Emery Water Conservancy District
- Natural Resources Conservation Service
- PacificCorp Energy
- The Tamarisk Coalition
- Utah Association of Conservation Districts
- Utah Department of Agriculture and Food
- Utah State University Extension

Related Projects

- Stream Restoration
- Irrigation Systems

Funding

- San Rafael River project: \$1,332,427
- Cost efforts: \$90 million
- Irrigation systems for Emery County salinity project: \$90 million

For funding opportunities in the San Rafael River Watershed, contact the San Rafael Conservation District.

To learn how you can participate or lend your support to Utah community water quality projects, please contact your local conservation district or county agent.

Produced by USU Water Quality Extension, Utah Watershed Coordinating Council, Utah Association of Conservation Districts, and Utah Division of Water Quality

NR/WQ/2011-3

Task 2. NPS Outreach/Social Marketing Mini Grant Program



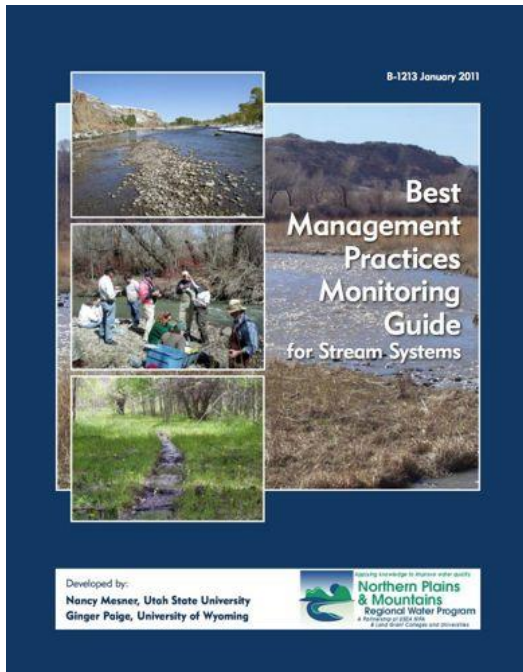
Youth and adults learn about fish and other aquatic life during the Bear River Celebration and Free Fishing Day.

Prescription Drug Disposal Day, August 20, 2011, collected 274 lbs of pharmaceutical waste, dropped off by over 160 individuals.



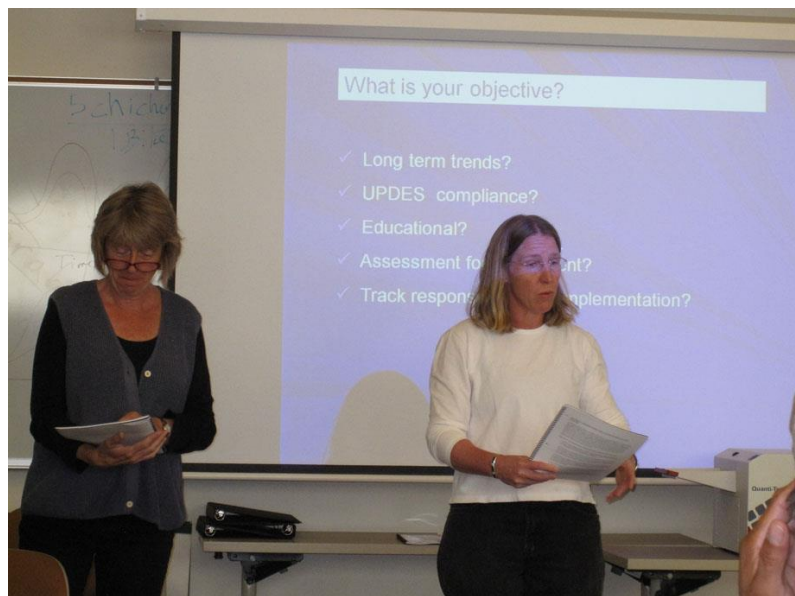
The Moab Area Watershed Partnership website is now online providing information about water quality and quantity in the Mill Creek and Castle Creek watersheds.

Task 3 – Provide assistance in water quality educational and outreach programs, through trainings and workshops



The Best Management Practices Monitoring Guide for Stream Systems was provided at a workshop to help participants understand how to integrate monitoring into their BMP implementation.

Nancy Mesner and Ginger Page conducting a monitoring workshop for Watershed Coordinators and UDWQ staff.



Task 4 – Development of aquatic macroinvertebrate educational materials

Water Quality Extension developed an online dichotomous key to guide students and educators through the process of identifying aquatic macroinvertebrates. It includes information about each insect and pictures to help in identification. It can be found at <https://extension.usu.edu/waterquality/htm/macrokey>. An updated print key was also produced.

Utah State University
COOPERATIVE EXTENSION

Utah Water Quality
water is life: quality matters

Extension Sites A-Z

Search

Key To Aquatic Macroinvertebrates In Utah

Home - Key To Aquatic Macroinvertebrates In Utah

Key to macroinvertebrate Life in Ponds and Rivers in Utah

Use the links on the pictures or text below to help identify your organism.

1. My organism has a shell

1a. [Single shell](#)



Photo courtesy of USDA NRCS National Aquatic Monitoring Center

1b. [Double shell](#)



Photo courtesy of the USGS National Aquatic Monitoring Center

2. [My organism does not have a shell](#)

[Send us your pictures to share & complete our Macroinvertebrate Keys](#)

Utah State University
COOPERATIVE EXTENSION

Utah Water Quality
water is life: quality matters

Extension Sites A-Z

Search




Key To Aquatic Macroinvertebrates In Utah - Plecoptera

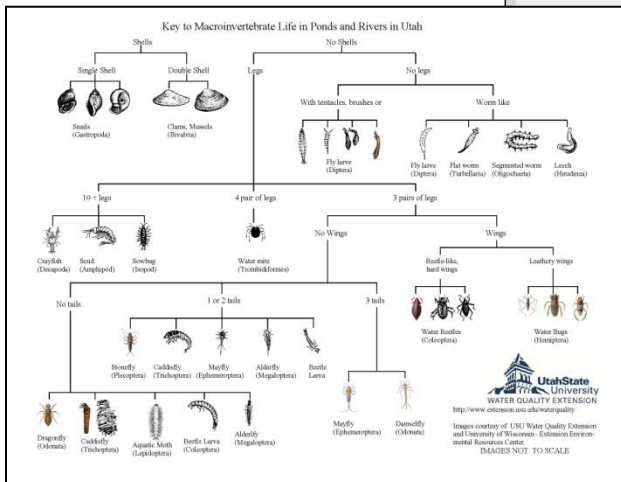
Home - Macroinvertebrate Key - No Shell - Macroinvertebrate Key - 3 pair of legs - Macroinvertebrate Key - 1 or 2 tails - Key to Aquatic Invertebrates - Plecoptera

Key to Macroinvertebrate Life in Ponds and Rivers in Utah

Stonefly

Plecoptera

Family	Common Name	Picture	Description	Habitat
Capniidae	Winter stoneflies		3-8 mm in size small, slender, cylindrical, black, brown or tan, without gills, long cerci, hind wings parallel	In rapid moving fresh water, a few found in deep cold lakes
Chloroperlidae	Salflies		5-12 mm in size without gills, no distinctive pigmentation, wings parallel to body, tails shorter than abdomen	In rapid moving fresh water
Isogenoides hansonii	Black stone, springflies		20-21 mm in size black with light green IV on head and thorax, pale patch on last tergite, banding pattern of abdomen	
			4-10 mm in size	

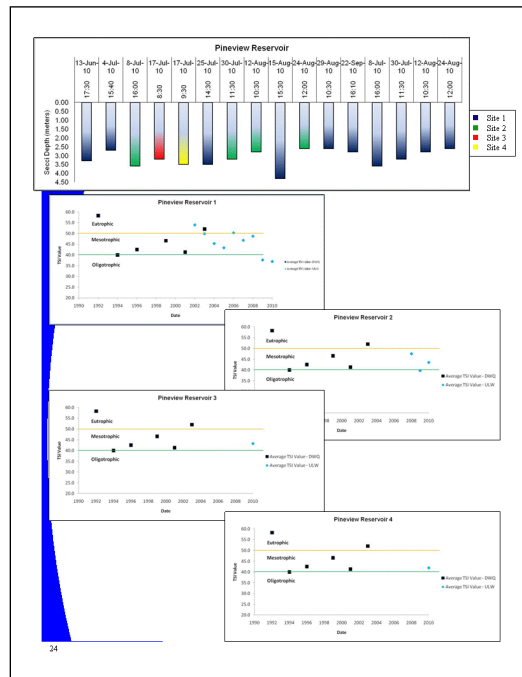
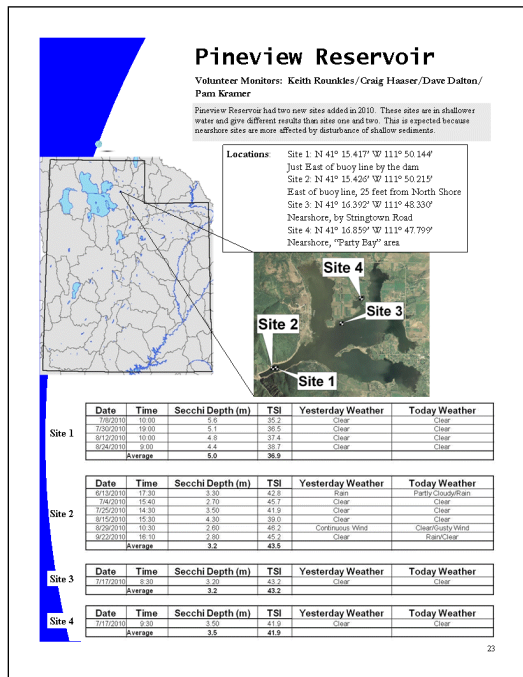


Task 5 - Support for citizen monitoring to educate citizens about water quality and watershed concepts

In its ninth year, the Utah Lake Watch program continued to provide water clarity data for lakes and reservoirs throughout the state. Three additional monitoring locations were added in 2010.

The bacteriological pilot study that began in 2009 was continued in 2010 with several water bodies being sampled for total coliforms and *E. coli*. These water bodies were identified by UDWQ and Water Quality Extension assisted in managing volunteers for the program and collecting water to be tested.

A report was written that included information for both the Utah Lake Watch program and the bacteriological program. This report included information about lakes that were monitored and was distributed to volunteers and the UDWQ. A portion of the report can be seen below.



Task 6 - Water Quality Experiences for Youth

Several hand-on activities were provided during many events to youth of all ages throughout the state.

Elementary students learn about aquatic macroinvertebrates and get a chance to catch them on the Logan River during Natural Resource Field Days.



High school students check dissolved oxygen levels at Thanksgiving point during the Fairchild Challenge.

Water Quality Extension staff teach youth about erosion and riparian vegetation during the Cache Stormwater Fair.



Youth learn about water pollution from Water Quality Extension during a Junior Master Gardeners event in Box Elder County.



Task 7 - NPS Water Quality Training for Educators

Hands-on and interactive trainings were provided for educators all over the state. These trainings include both classroom and field exercises.



Task 8 – Support for Utah Envirothon

The 2010 Utah Envirothon was held in Heber City with the special topic of Protection of Groundwater through Urban, Agricultural, and Environmental Planning.



The winning team for 2010 was Logan High School from Logan, UT. They were sponsored by the North Cache Conservation District and their advisor was Andrew Semadeni. Team members were Gaurav Dhiman, Robin Pendery, Rachel Wooton, Katie Luecke, and Scott Aston.

Photo credit: http://utahenvirothon.org/?page_id=63

The team represented Utah at the Canon Envirothon held at California State University Fresno, in Fresno, California. They placed 20th overall and 3rd in the oral competition.

3.0 LONG TERM RESULTS IN TERMS OF BEHAVIOR MODIFICATION, STREAM/LAKE QUALITY, GROUND WATER, AND/OR WATERSHED PROTECTION CHANGES

Long term results in water quality are difficult to link directly to educational and outreach programs. We focus primarily on evaluating short term results from many of our programs in the belief that the short term knowledge gains lead to long term behavior changes in many cases. We do, however, see long term changes in Utah with respect to attitudes, personal choices and land use management, agency policies, and general awareness of watershed and water protection

Our work and support of the watershed coordinating council provides training opportunities and materials so that these coordinators can be as current and effective as possible in implementing watershed plans in their areas. This results in well trained and knowledgeable coordinators, which leads to effective management and improvement of water quality in their respective watersheds.

Our youth outreach and teacher education has resulted in amazing results over time. Our Stream Side Science curriculum is used in multiple states, as the textbook for a 3 credit online course offered by Montana State University, and is being used by hundreds of

teachers throughout Utah. We have been asked by the Utah Office of Education to add additional lesson plans and to expand the entire curriculum to meet teaching objectives for biological, chemistry and environmental science classes. We consistently receive strong reviews from participants in our teacher trainings. Our surveys indicate the majority of teachers who participate change the way they teach science and 30% use the concepts throughout the school year. Formal assessments indicate that the curriculum results in significant increases in student understanding of watershed and water quality science and policy. This curriculum is also the basis for aquatic ecology training for all Envirothon students in the state.

A graduate student study, funded by a USDA grant, formally assessed the increases in scientific knowledge and changes in attitudes following involvement in Natural Resources Field Days. Over 1500 youth participate each year in a full day of hands on activities. The study (Kinder MS Thesis, 2012, USU Watershed Sciences Department) allow us to quantify the impacts of EPA funding on youth education.

This study found that:

- * Students who participated in NR Days showed a significant increase in knowledge 2 weeks after the event.
- * Students were able to retain most information learned 8 months after participating in NR Days.
- * Enhancing NR Days with classroom lessons immediately before and after NR Days led to a significantly higher increase in student knowledge both 2 weeks and 8 months after the event.
- * Enhancing NR Days with a 2nd field experience in the spring led to complete knowledge retention 8 months after NR Days.
- * Students who participated in NR Days exhibited an increase in environmental awareness after the event.
- * Teachers consistently indicated the value of NR Days as a tool to introduce the science curriculum for the year and refer back to the experience throughout the year.
- * Teachers consistently indicated that NR Days aligns with the fourth grade science core curriculum.

We are encouraged that citizen monitoring is increasingly being accepted in Utah as a means of collecting credible data and as a powerful tool for citizen outreach. We believe that citizen monitoring is a cost effective way to supplement water quality data needs while simultaneously increasing the public's awareness about water quality. We have a solid foundation for citizen monitoring in the state and will build on this with our partners to create an effective and lasting citizen monitoring program in Utah.

Our 319 funds also help support work funded primarily from other sources, such as our USDA CEAP project, our EPA targeted watershed project, and our watershed monitoring guidance document and web site. The results from these projects have been presented to agencies and watershed coordinators throughout the state, have been highlighted at national meetings, and have resulted in improved approaches to targeting BMPs effectively and conducting monitoring programs that can actually identify impacts. See

some of these impacts at the Northern Plains and Mountains Regional Water Program website, hosted at <http://region8water.colostate.edu/>.

4.0 BEST MANAGEMENT PRACTICES (BMPS) DEVELOPED AND/OR REVISED (FOR DEMONSTRATION PROJECTS)

Not applicable (demonstration projects only)

5.0 MONITORING RESULTS FOR DEMONSTRATION PROJECTS

Not applicable (demonstration projects only)

6.0 PUBLIC INVOLVEMENT

We work closely with and gain support from many partners throughout the state. It is through these partnerships that we are able to maintain a successful program. Our partners include:

- NPS Task Force
- Utah Association of Conservation Districts
- Utah Department of Natural Resources – Division of Wildlife Resources
- Utah Department of Agriculture and Foods
- Utah Department of Environmental Quality – Division of Water Quality
- Utah Office of Education
- U.S. Fish and Wildlife Service
- Natural Resources Conservation Service
- BLM
- U.S. Forest Service
- Local jurisdictions
- Local schools and school districts
- Utah Watershed Coordinating Council
- Nonprofits including the Utah Society for Environmental Education.

7.0 ASPECTS OF THE PROJECT THAT DID NOT WORK WELL

In 2010 considerable resources were spent by Water Quality Extension in support of monitoring *E. coli* across the state. The travel and employee time costs resulted in a large portion of the budget being spent on sampling. This highlighted the benefit of creating a state-wide enhanced citizen monitoring program to reduce some of the costs associated with monitoring. We believe that an effective citizen monitoring program would be the

most cost effective way of collecting data across a large and environmentally diverse state like Utah.

The majority of tasks associated with this project exceeded expectations, but there were a few areas that could be improved. The Utah Lakes Watch program was successful and had the highest participation ever, but we feel that the program has plateaued and was not reached its fullest potential. Additionally the bacteriological monitoring pilot study demonstrated that citizen monitors could accurately collect credible *E.coli* and total coliform data, but logistical problems associated with equipment availability and Water Quality Extension staff travel made the program unsustainable in its current form. These temporary setbacks highlight the need for an effective citizen monitoring program that is fully supported. This includes the funds necessary to provide citizen monitors with proper equipment and a coordinator to oversee the program. Discussions with the UDWQ indicate that they agree with our assessment and are supportive of enhancing citizen monitoring in Utah.

8.0 FUTURE ACTIVITY

We aim to provide state-wide water quality education and engagement opportunities for citizens of all ages in Utah. While our programs are varied and diverse they all seek to increase awareness about the importance of water quality and how human actions influence water quality in lakes and streams. We envision our work as a comprehensive service of information and education outreach for the different agencies in Utah seeking to promote water quality.

We will continue working closely with watershed coordinators and the Utah Watershed Coordinating council to ensure appropriate education and outreach in all watersheds of the state. We will continue to improve and expand our youth activities and educator workshops to ensure that youth and educators are receiving high quality materials and education. We are currently working with the Utah State Office of Education and several other partners to expand our Stream Side Science curriculum to reach a broader audience.

By working with the UDWQ we plan to increase public interest and participation in citizen monitoring programs. We are working closely with the recently formed Utah Monitoring Council to develop a more inclusive citizen monitoring program that engages citizens in collection of credible, useful data on both streams and lakes.

We will continue to solicit feedback and input from partners and audiences (urban, suburban, and rural) throughout Utah and develop our outreach materials appropriately. With funding from other grants we will be surveying the program participants and partners and looking to expand into more meaningful areas.

9.0 INFORMATION AND EDUCATION OUTPUTS

- Five watershed factsheets were created for Mill Creek (Salt Lake County), Middle and Lower Sevier River, Middle Bear River, Price River, and San Rafael River watersheds.
- Funds were provided to assist in outreach and education efforts in 3 watersheds.
- A workshop was provided to teach watershed managers how to plan for and implement monitoring efforts when constructing BMPs.
- New online and print dichotomous keys were made available to the public to aid in the identification of aquatic macroinvertebrates and to educate on how their presence (or absence) relates to water quality.
- Thirteen lakes (19 sites) were monitored for transparency data in 2010. Fifteen lakes were also monitored by trained volunteers or staff for coliforms and E. coli.
- Over 7,000 youth participated in hands-on educational activities in 2010.
- 160 educators throughout the state participated in water quality workshops in 2010.
- We continued to provide support and expertise for the Utah Envirothon by running the aquatic ecology station in 2010.
- Eleven individuals and one organization were presented with Utah Water Quality Awards at the 2011 Utah NPS conference held in Logan.