



# Water News

## UPPER GREEN RIVER BASIN STORAGE

Beginning around 1930 and over the decades since, the federal government and the State of Wyoming have financed studies that identified potential dam and reservoir sites in the upper Green River basin. Interest in constructing new reservoirs was and currently is fueled by water shortages that occur in the area.

Currently, the Wyoming Water Development Office's (WWDO) Dam and Reservoir Program is focusing on storage opportunities in the Green River tributaries west of the mainstem from Warren Bridge to Big Piney, Wyoming. Several Level II studies in this area have been approved since 2005 as part of the Planning Omnibus Water Bill. This focus has evolved from river basin planning that pointed to the need for supplemental irrigation water in the subbasins. These potential reservoirs would also likely have secondary benefits such as environmental and recreational values. A large part of the studies has been

aimed at hydrologic analysis, quantifying shortages and identifying potential on-channel and off-channel storage sites. Understanding the basin hydrology is critical for identifying water storage opportunities, and is dependent upon stream flow and diversion measurements, record keeping, and understanding consumptive use for various beneficial uses. Hydrologic models are utilized to simplify the complex interplay between demand, water availability and the environment. However, models are only as good as the quantity and quality of data input and one problem with current efforts is the limited data available. This requires additional data collection and modeling to evaluate potential reservoir sites. Both the State Engineer's Office (SEO) and the WWDO are undertaking efforts to gather more data. The SEO is working to gain a better understanding of actual consumptive use in

the Green River basin and the WWDO will establish stream gage locations in subbasins that appear to have the potential for storage projects.

Additionally, with reservoir projects, comes extensive alternatives analysis

and screening criteria, which will be required during any permitting process. Economic analyses are also being conducted to determine the benefits to the state and the project sponsor, as well as the sponsor's ability to pay. Historically, cost and ability to pay have proven to be a major project detractor. Due to elevation and climate, crops grown in the Green River basin are limited to forage crops and the revenue is not sufficient to cover a sponsor's debt and operation and maintenance obligations for a dam and reservoir project. In response, the Wyoming Water Development Commission (WWDC) has provided specific criteria for the Dam and Reservoir Program to aid in making storage projects more affordable to sponsors. The complete Wyoming Water Development Program operating criteria is located on WWDC's website in PDF format at [http://wwdc.state.wy.us/opcrit/final\\_opcrit.pdf](http://wwdc.state.wy.us/opcrit/final_opcrit.pdf). Furthermore, open houses for the Upper Green River Basin Storage Projects will be held this fall in several locations as outlined in the special points of interest section on this page. The open houses will provide the opportunity, for those interested, to learn more about the new operating criteria and potential projects that have been identified in the basin.



Green River near Warren Bridge

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### Special points of interest:

- **Open Houses for the Upper Green River Basin Storage Projects will be November 12 in Rock Springs; November 13 in Kemmerer, and November 14 in Pinedale.**



# Weather Modification Pilot Program Readies for Season

Program managers, scientists and field technicians conducting the 5-year Weather Modification Pilot Program for the Medicine Bow/Sierra Madre and Wind River Ranges are busy preparing for this year's operations which commence on November 15, 2008. The winter cloud seeding program, which was approved by the 2005 Wyoming Legislature, aims to increase snowpack and runoff within Wyoming's Green River, Platte River and Wind River basins and utilizes the latest technology for operations and independent evaluation procedures.

Responsibility for deployment, operations and maintenance of the program rests with Weather Modification, Incorporated (WMI), Fargo, ND, while evaluation of the program is the responsibility of the National Center for Atmospheric Research (NCAR), Boulder, CO. The

coming operational season builds on a successful 2007-08 campaign which included 26 ground-based seeding events in the Medicine Bow/Sierra Madre Ranges for a total of 258 generator hours seeded (note: 4 generators running simultaneously for 4 hours equals 16 total generator hours), and 26 seeding events in the Wind River Range for a total of 786 generator hours seeded.

NCAR has developed a strict experimental design for the Medicine Bow/Sierra Madre Ranges target area. This design was peer reviewed by experts across the country, with significant input being provided by faculty at the University of Wyoming (UW) Department of Atmospheric Science. Included in the randomized crossover design are 16

ground-based generators (8 per mountain range), a network of high resolution precipitation gages (target and controls), 2 radiometers (devices for identification of liquid water above the peaks), weather balloons,



numerous weather stations, and snow chemistry sampling around seeding events as conducted by the Desert Research Institute, Reno, NV.

While operations in the Wind River Range are not randomized, similar seeding criteria must be met

before forecasters can call a case, which are not subject to the 4-hour limit. The program for this target area includes 10 ground-based generators, weather stations, a radiometer, snow chemistry sampling, and relies heavily on already deployed climatological monitoring devices for physical evaluation.

Finally, it should be noted that the unique opportunity presented by the state's weather modification pilot program has spurred "piggy-back" research as conducted by the UW Department of Atmospheric Science who are utilizing their King Air aircraft, Wyoming Cloud Radar, and lidar to detect the signature of glaciogenic cloud seeding above the Snowy Range in southeastern Wyoming. It is anticipated that these flights will resume February, 2009.

## News from Water Resources Data System

The Water Resources Data System (WRDS) is pleased to announce that the Wyoming Water Development Office (WWDO) website (<http://wwdc.state.wy.us/>) and State Water Plan Website (<http://waterplan.state.wy.us/>) have undergone major updates.

Upgrades to these extensive websites include improved ease of use, better navigation, and new features. From the WWDO website users can easily navigate through the different planning programs and access information regarding specific projects. Users can also obtain information on WWDO consultants and project application information. Furthermore,

access to different agency publications has been streamlined.

State Water Plan website users can now navigate through river basin plans and Basin Advisory Group (BAG) information with greater ease. Previously, the index pages for these were combined, causing some user confusion. Now, river basin plans are separate from BAG agendas, meeting records and reference material. Additionally, the new state water plan site incorporates river basin plans with Wyoming water facts and historical planning documents, along with GIS web mapping products. A new water search

engine, and frequently used online planning products, such as the Statewide Framework Water Plan and the Platte Water Atlas, are also included.



In the coming months, WRDS will also be releasing a new version of the State Climate Office website. This revamped website will host links to Wyoming climate, weather, climate change, drought information, data portals, and Wyoming climate news and events. The site will also feature precipitation data from CoCoRaHS (Community Collaborative Rain, Hail and Snow Net-

work) as well as climate monitoring maps, graphs and downloadable data compiled by the State Climate Office. The State Climate Office is updating related GIS web mapping tools that allow users to search and view maps and data related to wells, streamflow, precipitation, public water systems, and irrigated lands.

For more information about these products, please contact Steve Gray, WRDS Director ([sgray8@uwyo.edu](mailto:sgray8@uwyo.edu)) or Chris Nicholson, WRDS Outreach and Technology Coordinator ([cnichol5@uwyo.edu](mailto:cnichol5@uwyo.edu)).



## What's Up in the State Engineer's Office...

### Going High Tech for ET

Anyone involved in water resources management understands the importance of accurate evapotranspiration (ET) estimates over large landscapes. ET is one of the most important parameters for conducting water balance studies. In addition, as competition for water continues to increase across water users, the need for high quality ET estimates from irrigated lands increases. Yet, the quantification of ET is typically very imprecise. There are methods to acquire precise ET measurements, but they involve expensive equipment and significant know-how to turn complex data sets into meaningful ET related numbers.

As part of the State Engineer's Office (SEO) Colorado River Compact Administration Program, there is an ongoing coopera-

tive effort to develop high quality ET estimates in the Green River basin. In addition to the SEO, project co-operators include Dr. Fred Ogden (UW – Civil Engineering), Eli Rodemaker and Dr. Ken Driese (Wyoming Geographic Information Science Center, WyGIS), Dr. Steve Gray (State Climatologist) and Dr. Jan Hendrickx (New Mexico Tech).

The project includes three primary components. First, the WyGIS team and Dr. Hendrickx have been working to calibrate the METRIC™ evapotranspiration model (Allen et al. 2007) to conditions present in the Green River basin of Wyoming. METRIC™ calculates ET using a surface energy balance algorithm applied to satellite imagery containing both short wave and thermal information. METRIC™ is designed to produce high quality and accurate ET maps for regions up to a few

hundred kilometers in size.

The second component involves the installation and operation of eddy covariance towers in the basin. Eddy covariance towers utilize a suite of instruments to measure water vapor moving away from the ground surface. Measurements are made at a sampling rate necessary to capture all variations in the data. This effort is being lead by Dr. Ogden. Two towers were installed this past summer. One tower was installed along Duck Creek just west of Pinedale. The site is a sub-irrigated, wet meadow. The second tower was installed north of Cora in a native sagebrush-steppe community. Data collected from the tower sites will be used for two general purposes. The two sites provide information needed to calibrate the METRIC™ evapotranspiration model. Also, the Duck Creek site

can be used to develop a highly accurate reference ET data set for use in other applications.



The third and final project component will involve the use of scintillometers. A scintillometer is a type of laser that is shot across an irrigated field just above the height of vegetation to a detector plate. The receiving detector allows measurement of the transfer

*(Continued on page 4)*

## WWDO - River Basin Planning

River basin planning is a continuing process and the Water Development Office (WWDO) and cooperating agencies are working on a number of studies and projects to gather additional data concerning the basins. Two new studies are being proposed for funding in 2009. A feasibility study for developing a simulation model and decision support system is proposed for the Green River basin and a groundwater study is being proposed for the Platte River basin. Additionally, a review and evaluation of the 2001 Bear River Basin Plan will be completed by an in-

house river basin planning team. Status of other river basin planning studies and projects are as follows:

The **Green River Basin Plan Update and Groundwater Study** is moving along. The WWDO is expecting a draft final groundwater report in October. The groundwater study is being headed by the Wyoming State Geological Service (WSGS). The WSGS is being supported by the U.S. Geological Survey (USGS) and Water Resources Data System, University of Wyoming (WRDS). A final product

presentation will be held October 23, 6 p.m., at the Western Wyoming Community College auditorium, in Rock Springs. The WSGS team will discuss the aquifers found within the basin, their properties, estimated recharge rates and recharge areas, and recommendations for furthering groundwater work in the basin. The public is encouraged to attend.

The **Wind/Bighorn River Basin Plan Update** was funded by the 2008 Legislature. This update will ensure that data from the 2003 plan is still current, and will advance the development of

several planning tools for the basin's surface and groundwater resource management. Short Elliott Hendrickson Inc. (SEH) was hired in May to complete the surface water portion of the update. The groundwater investigations for the update are being completed by the WSGS, the USGS, and WRDS. Project progress will be reported later this year or early in 2009 at a Basin Advisory Group meeting, so stay tuned to the water plan website for meeting dates and times.

Please visit the state water plan website (<http://waterplan.state.wy.us/>)



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of heat between vegetation and the air above (called the sensible heat flux), from which ET can be calculated. The scintillometer portion of the project will be lead by Dr. Hendrickx.

The ET measurement project will last from three to five years. The desired results will be very useful and

easily applied tools which can be used to provide precise ET estimates from specific land parcels. Such tools are necessary in day to day water resource management in the Green River basin. If these tools can be built around extremely high quality data sets, the confidence in their application

and outputs will be much greater and should allow for better water management decisions.

Funding for this project has been provided by the Wyoming Legislature to the Wyoming State Climate Office and the State Engineer's Office.

Any questions regarding this program should be directed to Steve Wolff, Colorado River Coordinator, Wyoming State Engineer's Office, [swolff@seo.wyo.gov](mailto:swolff@seo.wyo.gov) (307) 777-1942.



### Calendar of Water Events

October 14-17, 2008 - Western States Water Council , Oklahoma City, OK

October 17-18, 2008 - Bear River Commission meeting, Salt Lake City, UT

October 22-23, 2008 - Upper Missouri Water Association meeting, Spearfish, SD

October 23, 2008 - Green River Basin BAG meeting, Rock Springs, WY

October 27-31, 2008 - Interstate Council on Water Policy annual meeting, Sacramento, CA

November 3-7, 2008 - SEO Board of Control meeting, Cheyenne, WY

November 4, 2008 - SEO Water Forum, Cheyenne, WY

November 6-7, 2008 - WWDC meeting, Casper, WY

November 12-14, 2008 - Green River Basin Open Houses, Rock Springs, Kemmerer, Pinedale, WY

December 1-2, 2008 - Missouri River Association of States and Tribes meeting, Rapid City, SD

December 2, 2008 - SEO Water Forum, Cheyenne, WY

December 3-4, 2008 - Yellowstone River Compact Commission meeting, Chico Hot Springs, MT

December 15-17, 2008 - Colorado River Water Users Association meeting , Los Vegas, NV

December 16, 2008 - WWDC meeting, Cheyenne, WY