REQUEST FOR PROPOSALS
University of Wyoming Office of Water Programs
Water Research Program
FY2015

The UW Office of Water Programs invites faculty members and affiliates of the University to submit FY15 research proposals under the Wyoming Water Research Program (WRP). Proposals responding to the research areas described in the accompanying RFP are sought.

Proposal submission due date: Thursday, Oct. 2, 2014, by 5:00 P.M., Room 203 WYO Hall.
Tentative project start date: March 1, 2015.

All researchers interested in submitting proposals must contact the Director of the UW Office of Water Programs for formatting requirements, mandatory Excel sheet for preparing budgets, submission guidelines, and other information.

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The Office of Water Programs/Water Research Program welcomes proposals covering a wide range of areas involved in Wyoming's water resources. Each proposal shall include a detailed explanation of how the study (i) will encourage the development of water facilities, (ii) will facilitate the planning, selection, financing, construction, acquisition, and operation of projects and facilities for the conservation, storage, distribution and use of water; (iii) could be used by any governmental agencies in the management of Wyoming's water resources, and (iv) will meet the research needs of State and Federal agencies regarding Wyoming's water resources.

Energy-Plan Strategy for Produced Water

Governor Matthew Mead has issued a document "Leading the Charge: Wyoming's Action Plan for Energy, Environment and Economy." In this document, 16 strategies are listed. Innovative Water Treatment and Management Incentives is listed as Strategy 9C. Oil and Gas development in Wyoming raises issues associated with the disposal and treatment of the water produced to facilitate production of oil and gas. To help fulfill the objectives of this strategy, and take a proactive approach to address the interdependence of water and energy development, research is needed in the following areas:

- Treatment and use of water produced by industrial and agricultural operations
- Improved regulatory standards for reuse
- Investment in reuse technology
- Incentives for third-party investment
- Development of industrial uses for produced water
- Development of advanced water treatment facilities for recovery and reuse

Establishing Temporal Distributions for Wyoming PMP

In June, 2011, a WWDO Level I study was initiated to determine probable maximum precipitation (PMP) estimates for Wyoming. PMP values are used in the computations of probable maximum floods (PMF) which are typically used to size spillways, and other similar structures. The study expected to be concluded December 2014, will provide PMP values for specific storm types and storm durations within Wyoming. However, in order to determine the PMF, these PMP values need to be temporally distributed over the total analysis duration in question. Temporal distributions can be thought of as the time order in which incremental PMP amounts are arranged within a PMP storm. At present, Wyoming does not possess any rules or regulations that specify such criteria to designers. In the past, Wyoming has been deferring to the Natural Resources Conservation Service (NRCS) and its guidelines. The NRCS design manual, TR-60, Earth Dams and Reservoirs, provides a cumulative temporal distribution curve that has been used by Wyoming in the past (NRCS, 2005). Given the updated PMP values that the State will soon possess, it is questionable whether this curve is still appropriate for use in Wyoming as design criteria.

Further study is required to fully analyze temporal distributions and determine applicability for use in Wyoming as design criteria. Storms that are found to be controlling PMP values must be analyzed in terms of their original temporal distributions and potential applicability for use in Wyoming as specified design criteria. Previously used curves must also be reexamined in terms of continual use and updated as needed. The project team would consist of a broad oversight committee including WWDO, NRCS, SEO, safety of dams officials, climatologists and meteorologist, and design engineers each having experience and

expertise in performing hydrologic studies in Wyoming. The goal of the project would be to appropriately capture reasonable temporal distributions based on controlling PMP storms, storm types, and storm durations that could be used by Wyoming as design criteria.

River and Stream Conveyance Losses

Proper accounting of stored and natural flows becomes an important component in the administration and enforcement of Wyoming water laws and is vital to any regulation that may occur. Both short term and long term conveyance losses are important quantities to measure. Conveyance losses along streams and diversions are of considerable interest to irrigators and water resource managers since they can significantly reduce the amount of water delivered to the point of use from the amount of water that was diverted from the source.

A specific area of interest is the Bridger Valley in Uinta County of southwest Wyoming which is an area of intense flood irrigation. Water used for irrigation consists of both natural stream flows and stored water released from upstream reservoirs. Water is diverted by a complex system of small and relatively large ditches. Water commissioners that work in the area recognize there are significant conveyance losses (as well as some conveyance gains) as water moves downstream through the system. However, to better perform their duties and manage the water they are responsible to administer, the commissioners desire to have a better understanding of the location, volumes, and timing of the system losses and gains. The specific area of focus would be the Blacks Fork River from Meeks Cabin Reservoir to the Deeben-Heinze diversion near Ft. Bridger, and Smiths Fork Creek from Stateline Reservoir to Hatch ditches. The study objective would be to evaluate conveyance losses and/or gains in the irrigated areas of the upper Blacks Fork River and Smiths Fork Creek drainages. The local water commissioners would be willing to discuss this issue in more detail at any time.

E. Coliform

There are over 70 waterbodies listed on the State's 303(d) list of impaired waters due to elevated E. Coli levels (http://deq.state.wy.us/wqd/watershed/Downloads/305b/2012/WY2012IR.pdf). As a result, millions of dollars are invested to attempt to reduce E. Coli loads to streams from a variety of sources. (http://www.conservewy.com/Attached%20Files/2011WatershedReport%20video%20files/2011WatershedReportIntroS.pdf). Further research to address the following would be beneficial in addressing the E. Coli issue:

- What are the natural background levels of E. Coli in non or minimally anthropogenic influenced watersheds, i.e. where minimal human activity is occurring? This question is posed frequently. The current E. Coli standard was developed by EPA based on surveys on the incidents of human illness in beach type high use recreation areas. There is a need to more accurately determine what background levels can be anticipated in order to determine what, if any, consideration can be given to those contributions in BMP implementation, TMDL development, etc.
- Fate and transport of coliform in Wyoming streams.

Reservoir Expansion – Wetland Issues/Opportunities

Governor Matthew Mead has placed developing water storage as a high priority for the State of Wyoming. Two traditional means of developing water storage are building new dams and expansion of existing reservoirs. Both require a significant investment of financial resources and time to acquire the necessary local, state, and federal permits and clearances to construct such storage projects.

Research, focused on reservoir expansion, which investigates developing or enhancing wetland community structure and function associated with periods of high inundation and subsequent draw-downs is desired.

Enlargement of reservoirs with fringe wetlands typically triggers NEPA (National Environmental Policy Act) and 404 permit requirements due to the potential degradation or loss of jurisdictional wetlands. For reservoir expansions to be feasible, existing wetlands either have to be maintained or mitigated, sometimes at ratios that make the project infeasible. However, it is known that wetland vegetation has varying tolerances to depth and duration of inundation. Therefore, it may be possible to enlarge reservoirs, perhaps only nominally, without significantly impacting existing wetlands through the use of water management, draw-down timing, and growing season. In some instances, there may be opportunity to expand, mitigate, and/or enhance functionality and value of wetlands.

Ground Water Modeling/Aquifer Potential Characterization
Research regarding the integration of recognized modeling techniques with existing hydrogeologic and geophysical measurements to understand aquifer reservoir properties and dynamics is needed. In portions of basins within Wyoming developed for ground water demands, uncertainty persists regarding the intrinsic nature of aquifers presently pumped and those with future supply availability opportunities. A wealth of information already exists such as extensive hydro-geologic mapping, surface/remote sensing surveys, geophysical logs of boreholes, pump test data & analysis, historic peizometric data, metered discharge reporting, etc. The priority is application of digital/numeric/statistical tools to explored localities or existing well fields to increase knowledge of key aquifer systems of the State.

Guernsey Reservoir Silt Run
During mid-summer of each year the U.S. Bureau of Reclamation conducts a rapid draw-down of Guernsey Reservoir on the North Platte River. This rapid draw-down results in large quantities of accumulated silt in the reservoir being sloughed into the river downstream. The purpose of this activity is to help seal irrigation canals in Wyoming and Nebraska and increase water delivery by reducing seepage of water from the canals. A special exemption in Wyoming's water quality standards allows for the silt run. The extent of water conveyance improvements has not been quantified and it is unknown if a different release scenario might provide more benefits. An independent socio-economic/environmental analysis of the silt run would benefit the State and water users by allowing decision makers to determine the relationship between silt run benefits and costs.

Oxbow Storage Properties/Opportunities
Information is desired on the potential benefits/costs of diverting high river flows for storage in old river channel and oxbow features. Potential benefits to examine could include, but not be limited to: augmenting return flows during low flow periods by diverting in high flow, supplemental water supply, fish and wildlife habitat, recreation, and flood control. Costs evaluated could include not simply the possible expense of the diversion and storage, but the impact of this new use on the functions the old channels and oxbow features already perform including flood control. Ideally, the investigation should look at the use of old river channel and oxbow features on Wyoming rivers that include at least one river with a major dam or dams and one that has not been significantly dammed.

In addition to the above priorities, the following areas are of interest:
Surface Water Hydrology: Studies related to the management of surface and connected shallow groundwater formations to better understand, manage, and enhance water availability and uses.

Groundwater Hydrology: Studies related to the management of groundwater resources that are hydrologically disconnected from surface waters to better understand, manage, protect, and enhance those resources.

Water Recycling, Reuse, Treatment and Conservation: Studies designed to better understand and manage the quality of surface or groundwater resources for the benefit of humans and other environmental purposes.

Biological Processes: Studies designed to better understand and manage water resources to maintain, restore, or enhance any plant or animal populations or communities that support the State's interests and authority over the management of those organisms.

Irrigation: Studies to identify methods to improve irrigation efficiencies and related water management to maximize the beneficial use of water.

Atmospheric/Hydrologic Processes: Studies to better understand ways to manage atmospheric conditions and processes to maintain or improve hydrologic yields in Wyoming.

Engineering: Studies that identify potential engineering solutions to water quantity and/or quality challenges.

Economics/Social Sciences: Strategies to improve the cost effectiveness of multi-use water development opportunities.

Multiple Resource Management: Studies designed to reveal opportunities to maximize multiple uses of water that enhance economic and non-economic benefits to the State.