Big Wood River and Silver Creek Predictive Flow Model

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Issued by:
Wood River Water Collaborative

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1. Introduction & Background

The Wood River Collaborative (WRWC) is a grassroots effort to tackle water usage challenges among irrigators, municipalities, and protect minimum flows for fish and wildlife habitat. Its many, basin-wide participants include private citizens, representatives of water agencies, non-profit organizations, private interests and the public sector. The outcome of the collaboration is to bring all stakeholders together and develop strategies and tools for best use of water for consumptive use, while conserving water for groundwater and in-stream flows.

2. Project Description

One of the goals of the WRWC is to develop predictive tools for the lower reaches of the Big Wood River above Magic Reservoir and Silver Creek to improve management of surface and ground water resources for agriculture and conservation. Crop production decisions depend on predictions of snowpack, runoff timing and rate, reservoir carryover, and other environmental factors. Conservation transactions, such as split-season leases and reductions in ground and surface water use, will be enhanced with annual predictive tools. Currently, we use historic irrigation shut-off dates, NRCS surface-water supply indices (SWSI), and snow water equivalents (SWE) to inform these decisions.

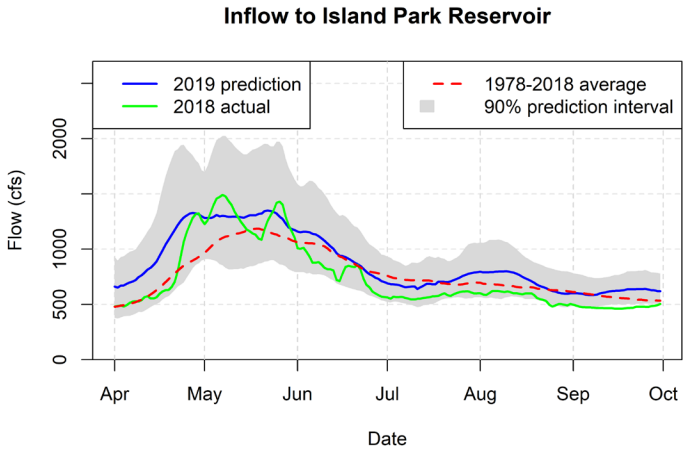
We would like to develop statistical models to predict water rights priorities and curtailment dates, as well as other dates related to water transactions, based on variables such as SWE and SWSI that are known in the spring, in advance of irrigation season.

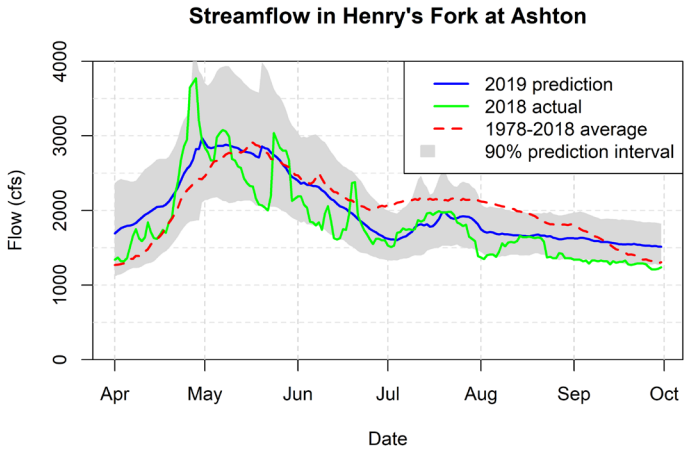
For the past two years, we have worked with the NRCS and District 37 watermaster to predict streamflow based on historic records (see attached March 2018 report and April 2019 update). The NRCS maintains nine SnoTel stations in the Big Wood River basin. Based on monthly SWE reports and historic SWSI records, we determined past years with similar SWEs. We then used curtailment dates and Big Wood River flow in those similar years for predictions of the current year.

In addition, the Big Wood Canal Company has used snow water equivalent data available from the National Operational Hydrologic Remote Sensing Center. Data for locations within the Camas Creek and Big Wood drainages were used in regression and power analyses to predict total acre-feet of water available in recent years. These analyses have provided information to the Company for hydropower and dam operations. Literature used to guide these analyses include *Bender, S. Miller, P., Bernard, B., and Lhotak, J. 2014. Use of snow data from remote sensing in operational streamflow prediction. Western Snow Conference Proceedings, Denver, CO.*

The WRWC is looking to improve this approach with statistical models that can provide statistically robust predictions, including measures of uncertainty, for flow at specified USGS gauges, water right priorities, and curtailment dates based on predictor variables that are known in the spring, prior to irrigation season. This approach has been successfully applied in the Henry's Fork basin to predict streamflow, irrigation diversion, return flows, and reservoir operations for the upcoming irrigation season, based on data known on April 1. We would like to have a similar predictive tool that can provide predictions by April of each year to support planning for crop selection and water conservation and efficiency projects.

For example, in the upper Henry's Fork watershed, streamflow has been predicted at several locations throughout the water year: https://henrysfork.org/water-supply-above-average-third-consecutive-year.





3. Project Scope

The following are deliverables for this Request for Proposal (RFP) that will be completed by a set date negotiated between WRWC and awardee.

- Develop statistical models to predict streamflow for the upcoming season based on February 1, March 1, and April 1 data, respectively, at each of these USGS streamflow gauges:
    - Bullion Bridge gauge- Big Wood River USGS 1319510
    - Stanton Crossing gauge- Big Wood River USGS 13140800

    - Camas Creek near Blaine Idaho USGS 13141500
    - Sportsman Access- Silver Creek USGS 13150430

- Develop statistical models to predict curtailment dates for the upcoming season based on February 1, March 1, and April 1 data, respectively, for priority water right dates:
    - March 24, 1883
    - October 14, 1884
    - June 1, 1886
- Provide the model on a platform (R scripts greatly preferred) that can be easily used by WRWC members to run the models on the specific dates.
- Provide minimum training for several members of the WRWC to run the model
- Present results, in person to the WRWC in Hailey, Idaho
- Provide a technical report describing methods and results, including model selection criteria (e.g., AIC), relative measures of performance among candidate models (e.g., AIC scores, weights, etc.), measures of uncertainty, and measures of predictive skill of the final model(s) (e.g., R^2, MSE, residual variance).
- Provide code or software used to compile, analyze, and summarize data, and generate results. An open-source application such as R is highly preferred.
- Provide an efficient, preferably automated or semi-automated, method for adding new data to the model each year from publicly available data.
- Provide results with the lowest confidence interval possible, or multiple confidence intervals.

In the long run, WRWC would like to develop a user interface on its web site to allow users to view model results and access data. Although the web interface is not part of this RFP, proposals should briefly address compatibility of the products listed above with a future web interface

To maximize consultant time spent on the modeling itself, WRWC will provide reasonable assistance in compiling and entering data that are not readily available electronically from standard agency sources such as NRCS SnoTel, USGS water data, and USBR AgriMet. WRWC will work with the consultant to determine formats for provision of these data. WRWC data compilation and entry will be negotiated as part of the award process.

Potential available data and sources include:

- Water rights priority dates and curtailment dates; watermaster historic records (Microsoft Excel)
- Reservoir contents: watermaster historic records (Microsoft Excel)
- Irrigation diversion rates: watermaster historic records (Microsoft Excel)
- NRCS SnoTel sites:
    - Camas Creek Divide: range 1991-present
    - Chocolate Gulch: range 1993-present
    - Dollarhide Summit: range 1979-present
    - Galena: range 1979-present

    - Galena Summit: 1978-present
    - Hyndman: 1979-present
    - Lost-Wood Divide: 1979-present
    - Soldier R.S.: 1986-present
    - Vienna Mine: 1978-present
- USGS Streamflow gauges:
    - Big Wood River 13139510: range 1915-present
    - Big Wood River 13140800: range 1996-present
    - Big Wood River 13141500: range 1912-present
    - Silver Creek 13150430: range 1974-present
- NRCS Evapotranspiration Rates for Picabo (PICI) Agrimet Station: https://www.usbr.gov/pn/agrimet/etsummary.html
- Direct outputs of IDWR Groundwater Flow Model: https://idwr.idaho.gov/water-data/projects/wood-river-valley/model.html
- National Operational Hydrologic Remote Sensing Center data: www.nohrsc.noaa.gov/nsa
    - Maximum snow water equivalent data for up to seventeen individual locations within the Big Wood Basin (Microsoft Excel)

4. Submission Guidelines and Requirements

All guidelines and requirements must be completed to be considered for this proposal. Proposals need to be received by February 28, 2020.

- Consultant must provide a technical proposal that is no more than 8 pages which includes an overview of experience conducting similar projects, brief qualifications of staff that will be working on the project, a proposed schedule of completion of the Project Scope and estimated cost for each item included in the Project Scope.
- Consultants must provide project reports similar to this project, including references, as part of their technical proposal. These pages are not included in the page limit.
- Proposals must remain valid for 90 days after submittal.
- Proposals must be signed by a representative that is authorized to commit bidder's company.
- WRWC anticipates selecting at least two consultants to discuss the project in more detail before making a final decision.
- Proposals shall be emailed to Ryan Santo at Wood River Land Trust at rsanto@woodriverlandtrust.org by the date specified below.

5. RFP Timeline

RFP Process	Date
Deadline to submit proposal	February 28th, 2020 2019
Selection of top proposals to discuss details of project, unsuccessful applicants will be notified	March 16th, 2020
Finalize contract between WRWC and consultant	March 25th, 2020
Contract awarded, unsuccessful applicants notified	March 31st, 2020

6. Evaluation Factors

- Responsiveness to the requirements set forth in this RFP- 20 points
- Relevant past performance/experience- 30 points
- Samples of work- 35 points
- Technical experience of consultant and/or staff- 15 points

7. Budget

Funding for this project was awarded through a Bureau of Reclamation Cooperative Watershed Management Program grant. Our projected budget is $7,500 - $12,500.

WRWC reserves the right to award to the consultant that presents the best value to WRWC as determined solely by WRWC in its absolute discretion.