Proposal for an Expansion of NOAA/NWS Support For Multi-agency Runoff Risk Forecasts

NOAA's National Weather Service (NWS) North Central River Forecast Center (NCRFC) has been exploring usability of NWS river forecast model soil moisture model output for applications beyond river flood forecasting. In meeting its hydrologic forecast responsibilities to protect life and property and to enhance the Nation's economy, the National Weather Service (NWS) River Forecast Centers (RFCs) continuously simulate, in time and space, moisture within the soil column using the Sacramento Soil Moisture Accounting model.

The NCRFC was approached by the Wisconsin Department of Agriculture, Trade and Consumer Protection (DATCP) to explore the usability of NWS hydrologic models to stratify the risk of significant forecast runoff from rain or snowmelt which could transport recently applied manure and fertilizers from agriculture fields. A project was initiated with the state of Wisconsin in 2011 (Phase 1- completed 2013). The target audiences are industry sectors and environmental or natural resource agencies looking for insight about temporal sensitivity of soil moisture levels and possible runoff so that they can optimize their short-term application planning. Providing a science-based management tool which can be incorporated into daily routines has incredible potential for benefits to the user communities and the Nation's lakes, streams and coastal waters. Increased awareness of runoff risk in nutrient application timing could also decrease nutrient transport from agricultural and developed lands which is known to be a significant factor in water quality in many streams, lakes, shallow wells, as well as fueling hypoxic zones and harmful algal blooms in the Great Lakes, Gulf of Mexico, and other regions around the country. Such a capability has the potential to enhance the utility of ongoing NOAA efforts to develop an ecological forecasting capability to address these and other nutrient affected issues as well as State and local level nutrient management efforts. To this end, the NCRFC efforts were recently presented to federal members of the Gulf of Mexico/ Mississippi River Watershed Nutrient Task Force ("Hypoxia Task Force") as a practical and effective tool for facilitating achievement of nutrient load reduction targets to meet their hypoxia mitigation goal.

The development and implementation of runoff risk forecasts has been a multi-agency collaborative effort consisting of many federal and state agencies and academia. The NWS has been providing historical and future modeling capabilities and analysis. Other agencies provide observed datasets while the universities and state partners provide website development and public ownership and outreach. The runoff risk forecast development consists of iterative analyses comparing combinations of simulated model states against observed edge-of-field (EOF) runoff datasets to arrive at simulated runoff risk indicators which can be applied spatially over a given region (or state). The analyses are conducted by the NWS and involve periodic reviews and discussions with the other agencies and partners involved. The current tool in Wisconsin relied on the creation of watershed basin specific event thresholds which stratified expected conditions into low, medium, and high risk for runoff. The NWS produces runoff risk forecast guidance multiple times daily as a by-product of current river forecasting operations.

The NWS product format for the current runoff risk forecast is a text file in a comma-delimited format and is available on the NCRFC webpage. The CSV file lists events by basin and includes the start and ending times of the event along with a runoff depth. Product spatial resolution is limited by watershed basin size, which averages approximately 300 square miles in Wisconsin. The University of Wisconsin ingests these files and compares them against the basin-specific thresholds to populate their database and website. The current Wisconsin Runoff Risk Advisory Forecast website is: http://www.manureadvisorysystem.wi.gov/app/runoffrisk.

Proposed Expansion

The successful implementation of the runoff risk forecasts in Wisconsin has generated attention from other states interested in a similar NOAA NWS partnership. Recent environmental events have enhanced public awareness regarding nutrient pollution, and have only increased the states' desire for this product partnership. The NCRFC has partnered with the Great Lakes Restoration Initiative (GLRL) to investigate developing runoff risk tools in new areas such as Minnesota, Ohio, and Michigan. Investigative coordination continues with the U.S. Geological Survey (USGS) to provide observed datasets, and has begun with the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS) and Agricultural Research Service (ARS). In addition, NOAA agencies such as the National Ocean Service (NOS) and Sea Grant are also joining the effort. (Completed)

Phase 2: The NWS is proposing expansion of NOAA NWS support for these multi-agency runoff risk tools in Wisconsin, Minnesota, Michigan, and Ohio through federal, state, and academic collaboration in 2016-2017. Expansion to the remaining Great Lake states and many other states has been requested following the round of states mentioned above. Activities will involve the Ohio River Forecast Center in FY16 and other RFCs across the country in subsequent years.

Included in the proposed expansion, the NWS will upgrade the modeling structure. The NWS will transition from a watershed basin basis to a 4kmx4km gridded model which will increase the spatial resolution of the tool as well as allow a more universal basis across a larger region. This new modeling approach will require new runoff risk analyses and development which will be conducted in collaboration with the agencies listed above. The NWS computing infrastructure will be used to evaluate soil moisture model output and determine runoff risk based on event thresholds developed by state agencies. Deliverables will no longer be a CSV file and instead will be a suite of ASCII grids. The grid package will include the calculated runoff risk and model forcings such as observed and forecast precipitation and temperature and may also include model states such as soil temperature, soil moisture, and ground snow water equivalent values.

Phase 3- The National Water Center will transition the output for Runoff Risk Forecasts to use the NWS Central Forecast System when it is available. (Runoff Risk Forecasts should be considered experimental until the Phase 3 transition is complete.)

NWS' proposed expansion of support for Runoff Risk Forecast is expected to further NOAA's collaboration on multi-agency efforts to ensure safe water quality and healthy ecosystems in the nation's streams, lakes, and coastal waters. Comments on this proposed effort by NWS may be provided by February 29, 2016 to wendy.pearson@noaa.gov

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