USGS

SCIENCE THEMES

Nebraska Water Science Center

Hydrologic Monitoring

Continuous and discrete surface-water, groundwater, and water-quality data are collected to provide long-term hydrologic records critical to investigating hydrology, modeling climate-change, evaluating natural and anthropogenic changes in the hydrologic regime, and providing information on water availability to water managers.

Surface Water

Real-time streamgages: *~130*
Data: *Stage, discharge, precipitation*

Groundwater

Gages: *92*
Data: *Water levels, temperature, precipitation*

Water Quality

Real-time gages: *17 (5 GW/SW interaction)*
Data: *temperature, specific conductance, pH, dissolved oxygen, turbidity, nitrates*
New Sites: *5 (Platte, Elkhorn and South Loup Rivers)*

Environmental Health

Combined Sewer Overflow (CSO) Water-Quality Monitoring

Wastewater effluent and stormwater runoff have a suspected impact on Missouri River and Papillion Creek water quality in the Omaha metropolitan area. Combined sewer overflows contribute wastewater effluent to receiving water in the Omaha area during periods of high precipitation which result in large urban runoff.

Water quality is evaluated through a combination of continuous monitors and flow-weighted sampling techniques. Flow-weighted samples are collected monthly and during hydrologic events.

Drought and Water Availability

Regional High Plains Groundwater Availability

The High Plains aquifer is a nationally important water resource that underlies about 174,000 square miles in parts of eight states. The aquifer serves as a primary source of drinking water for approximately 2.3 million people and also sustains more than one quarter of the Nation's agricultural production. This study will estimate water budget components, build a refined groundwater model for the Northern High Plains aquifer, and use that model to better understand surface- and groundwater interaction.

Calibration of the model (one of the largest and most detailed groundwater availability models in the nation) was completed despite critical funding shortages in FY14 and early FY15.

The mean difference between simulated and measured water levels was less than 3 feet on ~335,000 groundwater level measurements spanning 1940-2009.

National Brackish Groundwater

The amount of fresh or potable groundwater in storage has declined for many areas in the United States and has led to concerns about the future availability of water for drinking, agricultural, industrial, and environmental needs. A better understanding of the location and character of brackish groundwater is needed to expand development of the resource and provide a scientific basis for making policy decisions.

Acquisition and compilation of regional and national-scale chemistry data was completed. This data set was merged with state data into a single comprehensive database.

Hydrogeologic characteristics associated with mineralized groundwater were characterized. Logistic regression to map probability of the occurrence of brackish groundwater resources is being performed.

Water quality and ancillary data were synthesized into a 3-dimensional grid. Preliminary maps to summarize national results were created. A 3-dimensional depiction of brackish groundwater is being created.

Hazards

Enbridge Oil Spill Science Support

In July 2011, EPA requested NEWSC science support for the Enbridge Oil pipeline release. NEWSC, as part of the science support team, has provided recommendations to accomplish these goals:

Provide an evaluation of viable analytical approaches, including benefits and draw backs for each, to quantify the amount of submerged oil in the Kalamazoo River sediments.

Identify and evaluate viable procedures for assessing the toxicity of remaining submerged oil.

Provide an evaluation of viable procedures, including benefits and draw backs for each, to assess whether remaining submerged oil will biodegrade over time.

Identify viable procedures to assess the potential for adverse ecological effects resulting from further oil recovery using sediment agitation toolbox techniques.

Flood-Inundation Mapping

A flood-inundation map (FIM) library is being created for the reach of Big Papillion Creek from several miles upstream of the USGS streamgage Big Papillion Creek at Fort Street at Omaha, Nebr. (station number 06610732) to the 72nd street bridge above the confluence of the Big Papillion and the Little Papillion Creeks. The FIM library will be linked to real-time water-level stage information from existing USGS stream-gaging locations, display estimated flood-inundation areas and flood depths, and be served to the public on the USGS FIM Web site:

http://water.usgs.gov/osw/flood_inundation/

A FIM library also will be created for the North Platte River in Scottsbluff. The maps will be created for the reach of the North Platte River from several miles upstream of the North Platte River at Mitchell, NE (station number 06679500) stream gage, to several miles downstream of the NDNR North Platte River near Minatare (station number 06682000) stream gage.

Lincoln/Omaha Metro Flood Warning Systems

Six gages across the Salt Creek Watershed and 22 gages across the Papillion Watershed of metro Omaha that measure discharge, gage height, and/or precipitation will provide near-real-time information for the FIM model, National Weather Service and Papio-Missouri River Natural Resource District to use in flood monitoring, assessment, and warning.

Ecosystem Understanding

National Water-Quality Assessment Program (NAWQA)

Decadal resampling of four NAWQA groundwater-monitoring networks in 2015 will provide an unprecedented number of water-quality determinations (i.e., results for a broad range of analytes in combination with large number of sites sampled) for a single-year, widely distributed survey of Nebraska groundwater.

Two networks were designed to measure effects of agricultural land use on shallow groundwater in eastern Nebraska, as well as temporal trends. Two networks include municipal-supply wells in the High Plains Aquifer and domestic-supply wells in south-central Nebraska for assessing vertical-flow process effects as well as temporal trends.

For surface water, a key objective is to determine trends in biological condition in relation to trends and changes in contaminants, nutrients, sediment, and streamflow alteration. Thus, National Trends Network monitoring continues for selected streams of the Platte River Basin, including large-river sites (Elkhorn and Platte Rivers) and sites intended to document the contrast between relatively undisturbed landscapes (Dismal River near Thedford) and agro-intensive watersheds (e.g., Maple Creek near Nickerson) or urban streams (Cherry Creek at Denver).

Stream chemistry samples are collected from 14 to 24 times annually at most of the trend-monitoring sites.

Special focus in 2015 is being placed on dissolved organic carbon in streams as a possible indicator of increased levels of greenhouse gases in the atmosphere.

Stream temperature also is being monitored at selected sites both as a habitat metric and to track possible effects of climate change.

Stormwater and Green Infrastructure Assessment

Stormwater Best Management Practices (BMPs) that focus on green infrastructure processes will be analyzed. Methodology for capturing, retaining, monitoring, and measuring stormwater flowing to a combined storm sewer overflow system will be implemented to evaluate the reduction of flow into the City of Omaha Wastewater Treatment plant or, in some cases, sewage released into the Missouri River and Papillion Creek watershed.

Water balance of stormwater flow at two Douglas County bioretention cells will be determined by measuring inflow, evapotranspiration, and infiltration.

USGS science has been communicated through informational kiosks and outreach events at public locations to raise public awareness of stormwater and USGS.