The National Water Census

* Part of the Initiative

[Image link to pubs.usgs.gov/circ/1384/]

U.S. Department of the Interior
U.S. Geological Survey

ACF Stakeholders Update
May 12, 2014
Our objective for the Water Census

To place technical information and tools in the hands of stakeholders, allowing them to answer questions they face about water availability:

- Does the Nation have enough freshwater to meet both human and ecological needs?
- Will this water be present to meet future needs?

SECURE Water Act
Public Law 111-11, § 9507 and 9508
Water Availability Analysis

The process of determining the quantity and timing-characteristics of water, which is of sufficient quality, to meet both human and ecological needs.

Types of Information

- Technical
- Socio-economic
- Legal
- Regulatory
- Political
Account for water with a “budget”

\[
\text{Precipitation} + \text{Flow in} = \text{Evapotranspiration} + \text{Storage Change} + \text{Flow out}
\]
A Nationwide System to deliver water accounting information

- Precipitation
- Runoff
- Baseflow
- ET
- Recharge
- Surface Storage
Information delivery

A web application for delivering water availability information at scales that are relevant to the user

[Map image]  

[Link] water.usgs.gov/watercensus/
Scale Matters

Density of hydrologic unit codes (HUCs) at different levels illustrated by using the 2-digit HUC Region 03.
Beta Testing the Water Census Data Portal

- Scientists, Modelers, Managers...
- User Interfaces and Scripts
- Integration and Processing Services
- Data Distribution Services
- Canonical Persistent Archives

**Water Budget**
- Discover water budget data for watersheds and counties.

**Streamflow Stats**
- Access streamflow statistics for stream gages and model results.

**Aquatic Biology**
- Access aquatic biology data and streamflow statistics for related sites.

**Data Discovery**
- Search and browse datasets, publications, and project descriptions.
Demo!

http://cida.usgs.gov/nwc/
Notice: This web page is in a beta state. It should be considered provisional and subject to change. If you find any issues or have suggestions, please contact dblodgett@usgs.gov. This web page is most compatible with the Chrome and Firefox browsers. Internet Explorer 9 through 11 will be supported soon.

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Available Water Budget Components

Discover and access water budget data for watersheds and counties. Select a watershed of interest for precipitation and evapotranspiration data. County water use data for counties intersecting the watershed is also available.

Map Controls: Select Pan Zoom Single click selects sites or watersheds. Pan by click and drag. Zoom with double click, map buttons or scroll wheel.
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Precipitation and Evapotranspiration for the Selected HUC

Hydrologic Unit Code
1602040202

HUC Name
Big Cottonwood Creek-Jordan River

To access custom subsets of these and other data, visit the Geo Data Portal.

Download Evapotranspiration  Download Precipitation  Plot Nearby Water Use Data
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Water Use for Salt Lake County

- Public Supply (million gallons per day)
- Domestic (million gallons per day)
- Irrigation (million gallons per day)
- Thermoelectric Power (million gallons per day)
- Livestock and Aquaculture (million gallons per day)
- Industrial (million gallons per day)
- Mining (million gallons per day)

Date:
- 1985
- 1990
- 1995
- 2000
- 2005

million gallons per day: 0, 100, 200, 300, 400, 500
Streamflow Statistics Calculator

Access streamflow statistics for National Water Information System gages and modeled daily flow in some regions. Select a gage or watershed, provide a time period for which statistics are required, and choose statistics to receive. Software to calculate these statistics is also available as an open-source package on GitHub:

Streamflow Type:  
- Observed  
- Modeled

Observed streamflow from National Water Information System Gages.

Map Controls:  
- Select  
- Pan  
- Zoom

Single click selects sites or watersheds. Pan by click and drag. Zoom with double click, map buttons or scroll wheel.

Stream Gage Filters:  
- Gages for Evaluating Streamflow -

Options to filter displayed stream gages from the Gages II dataset.
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Access streamflow statistics for National Water Information System gages and modeled daily flow in some regions. Select a gage or watershed, provide a time period for which statistics are required, and choose statistics to receive. Software to calculate these statistics is also available as an open-source package on GitHub: https://github.com/USGS-R/EflowStats.

Preliminary Subject to Change

Modeled streamflow is preliminary and subject to change. Documentation in Review.

Streamflow Type:  
- Observed
- Modeled

Map Controls:  
- Select
- Pan
- Zoom

Single click selects sites or watersheds. Pan by click and drag. Zoom with double click, map buttons or scroll wheel.
Hydrologic Unit Code
031501041105
HUC Name
Westbrook Creek-Pumpkinvine Creek
Drainage Area (km²)
364.00816808

---

**Modeled Streamflow for the Westbrook Creek-Pumpkinvine Creek Watershed.**

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### Download These Statistics

<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>site_no</td>
<td>031501041105</td>
<td></td>
</tr>
<tr>
<td>min_date</td>
<td>1980-10-01</td>
<td></td>
</tr>
<tr>
<td>max_date</td>
<td>2010-09-30</td>
<td></td>
</tr>
<tr>
<td>lam1Obs</td>
<td>181.56</td>
<td>Mean of the daily streamflow for the period of record.</td>
</tr>
<tr>
<td>tau2Obs</td>
<td>0.56</td>
<td>Coefficient of L-variation (Hosking and Wallis, 1994, eqn. 2.61) of the daily streamflow for the period of record.</td>
</tr>
<tr>
<td>tau3Obs</td>
<td>0.51</td>
<td>L-skewness (Hosking and Wallis, 1994, eqn. 2.60 with r equal to 3) of the daily streamflow for the period of record.</td>
</tr>
<tr>
<td>tau4Obs</td>
<td>0.34</td>
<td>L-kurtosis (Hosking and Wallis, 1994, eqn. 2.60 with r equal to 4) of the daily streamflow for the period of record.</td>
</tr>
</tbody>
</table>
Aquatic Biology Data and Related Streamflow Statistics

Access aquatic biology data from the BioData database and calculate streamflow statistics for near-by stream gages or model results. Select a collection of aquatic biology sites and access the data from the BioData system. Coming Soon: Select a collection of related stream-flow gages, specify a time range of interest, and choose statistics to receive. Software to calculate these statistics is also available as an open-source package on GitHub: https://github.com/USGS-R/EflowStats.

Map Controls: Select Pan Zoom Click and hold to drag a bounding box around sites.
We need your feedback!

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Five Areas of Nationwide Topical Work

- Estimation of Flow at Ungaged Locations
- Groundwater Information
- Estimation of Evapotranspiration
- Water Use
- Ecological Water Science
Surface Water Models
Estimating Flows at Ungaged Locations

Models provide us a means of estimating streamflow for time periods where we don’t have record or places where we don’t have monitoring capabilities.
Assess Groundwater’s role in Water Availability

Use the strength of and enhance the resources within this program to provide the information on:

- Recharge
- GW yields
- Changes in storage.
- Trends in GW Indices
- GW/SW Interactions
Assess Groundwater’s role in Water Availability

Study of the Glacial System
Water Use Effort: For irrigation water use to estimate consumptive use.

Water Budget Effort: Total ET as a component of the water budget.

Small Watershed Scale
Annual and Monthly ET Totals from MODIS

Water Use

Livestock: Less than 1 percent
Self-Supplied Domestic: 1 percent
Public Supply: 11 percent
Thermoelectric Power: 49 percent

Mining: 1 percent
Aquaculture: 2 percent
Self-Supplied Industrial: 4 percent
Irrigation: 31 percent

Irrigation Mining Self-Supplied Industrial
Thermoelectric Withdrawals
Methods for Estimating Water Consumption for Thermoelectric Power Plants in the United States

Scientific Investigations Report 2013–5188
FUEL HEAT 10400 Btu

HEAT REJECTED OUTSIDE COOLING SYSTEM

ELECTRICITY 1 kWh = 3413 Btu

HEAT CONDUCTED TO AIR IN COOLING TOWER

EVAPORATION IN COOLING TOWER
4600 Btu

0.53 gallon

MAKEUP

EVAPORATION IN COOLING TOWER

BLOWDOWN
Flows Needs for Wildlife and Habitat

- Classify streams - hydro-ecological type
- Tools to systematically assess ecological affects of hydrologic alteration
- Develop flow alteration – ecological response relationships by “h-e” type
AN OBJECTIVE AND PARSIMONIOUS APPROACH FOR CLASSIFYING NATURAL FLOW REGIMES AT A CONTINENTAL SCALE

S. A. ARCHFIELD\textsuperscript{a}\textsuperscript{,}x, J. G. KENNEN\textsuperscript{b}, D. M. CARLISLE\textsuperscript{c} AND D. M. WOLLOCK\textsuperscript{d}

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\textsuperscript{b}New Jersey Water Science Center, US Geological Survey, West Trenton, New Jersey USA
\textsuperscript{c}National Center, US Geological Survey, Reston, Virginia USA
\textsuperscript{d}Kansas Water Science Center, US Geological Survey, Lawrence, Kansas USA
Finally, three studies focused on selected watersheds: the Colorado River, the Delaware River, and the ACF Rivers - where there is significant competition over water resources. Here, the USGS will work collaboratively with stakeholders to comprehensively assess the technical aspects of water availability.
Focused Water Availability Assessments

- Water Quality
- Groundwater Resources
- Water Use
- Global Change
- Eco Flows
- Surface Water Trends, Precipitation, etc
- State, Local, Regional Stakeholder Involvement
- Defined Technical Questions to be Answered

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Focus Area Studies within Water Resource Regions

- Water Use
- ET and Snowpack Dynamics
- GW Contrib to Baseflow

Map showing focus areas in Colorado and Apalachicola-Chattahoochee-Flint.
Focus Area Studies within Water Resource Regions

- Colorado
- Apalachicola-Chattahoochee-Flint
- Delaware

Water Use
Watershed Model
Ecological Flows
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