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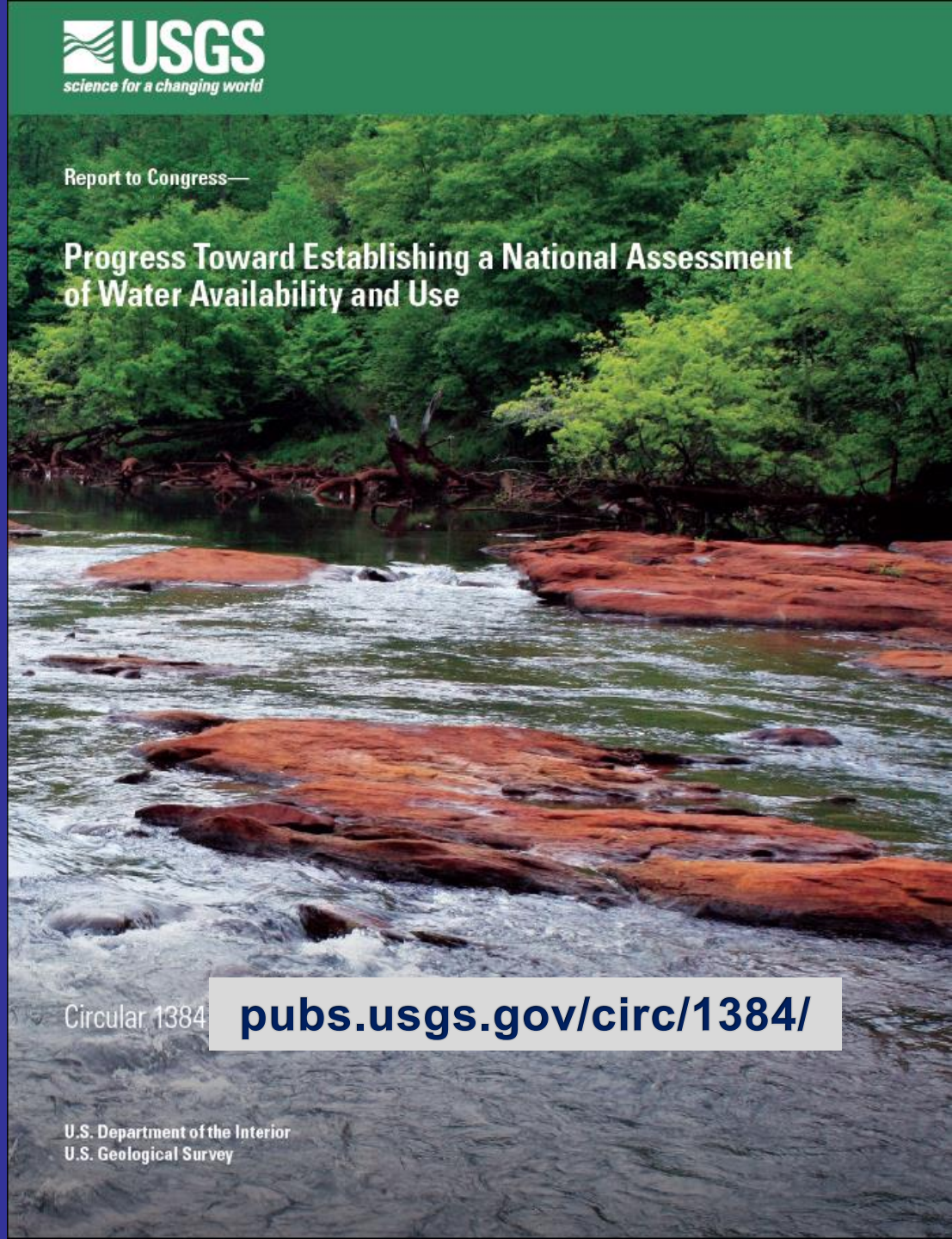
The National Water Census

* Part of the WaterSMART Initiative

Hydroclimate Monitoring Systems & Measurement Needs Workshop, San Diego CA, June 23-25, 2014



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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 (2009)
Public Law 111-11, § 9507 and 9508 – a National Assessment of Water Availability and Use

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

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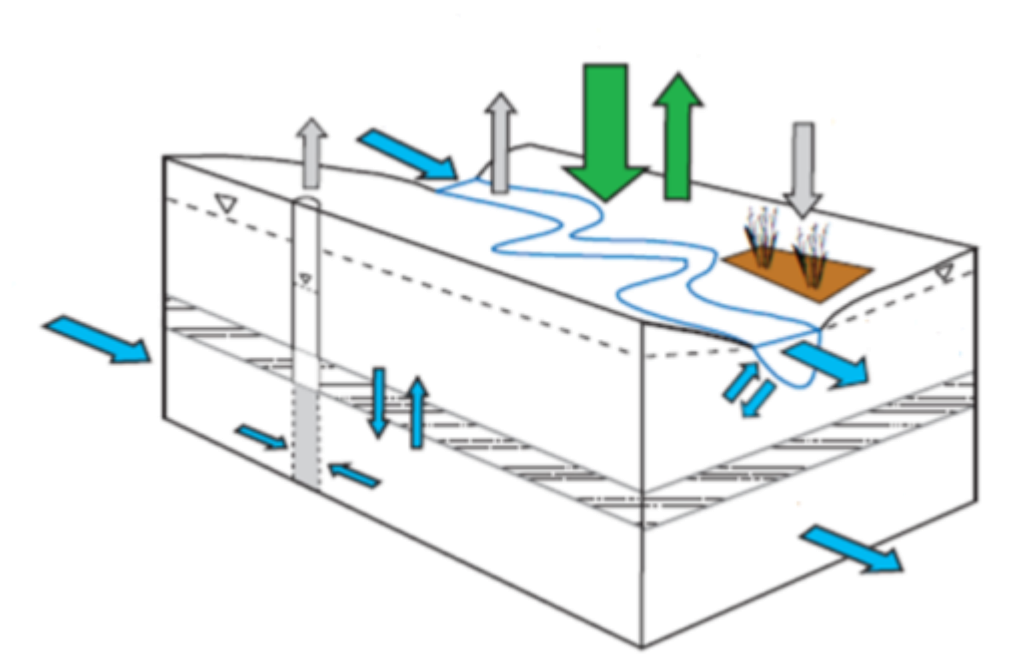
Account for water with a “budget”



Precipitation
+
Flow in
=
Evapotranspiration
+
Storage Change
+
Flow out

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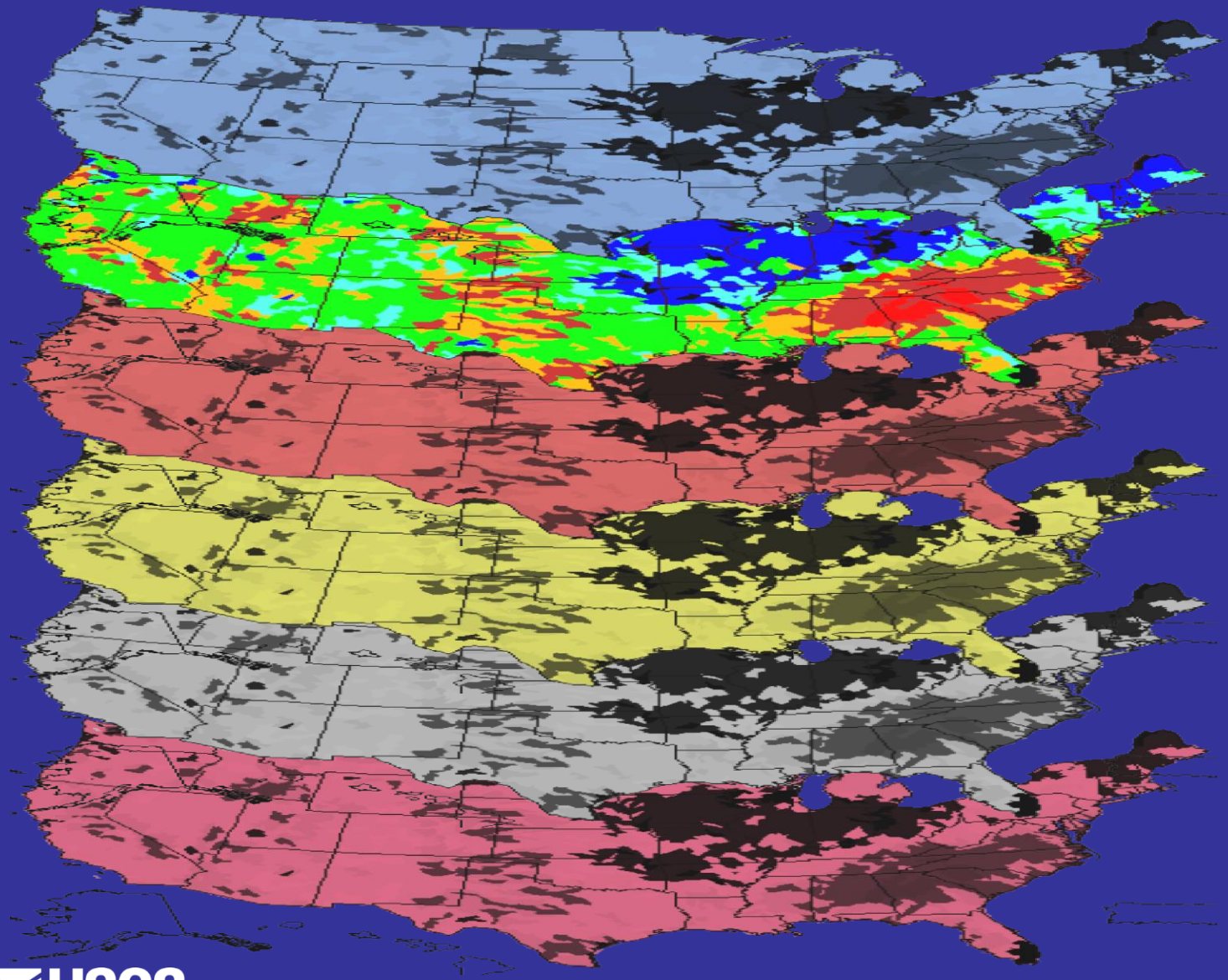
A Nationwide System to deliver water accounting information



Precipitation

Runoff

Baseflow

ET

Recharge

Surface Storage

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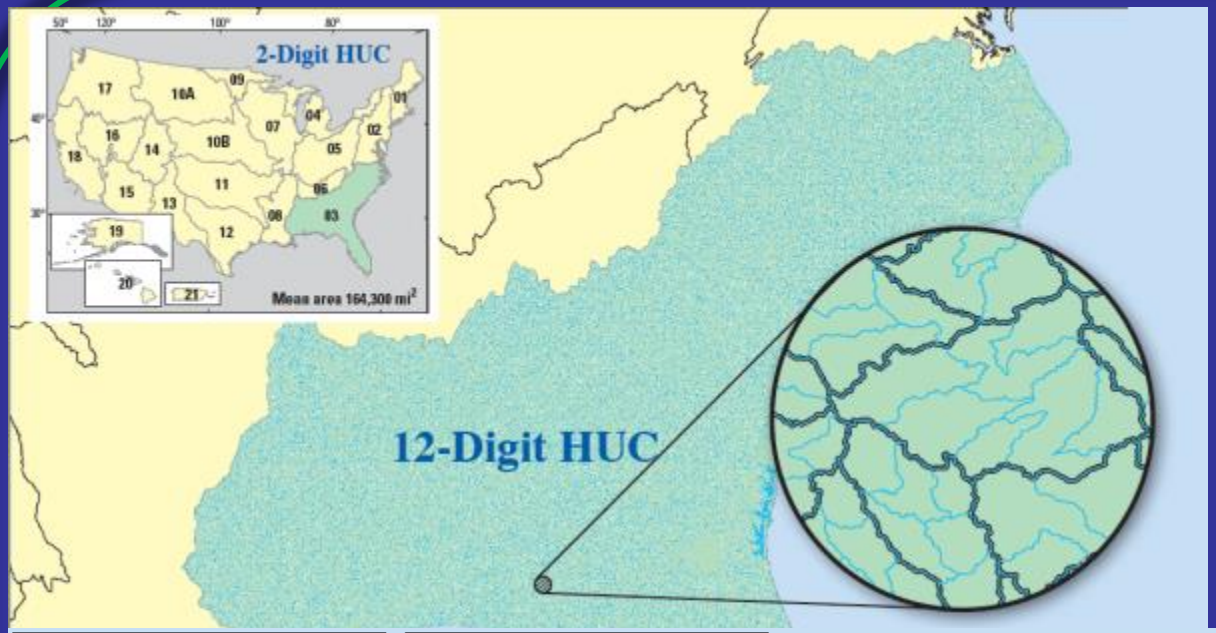
Information delivery

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

water.usgs.gov/watercensus/

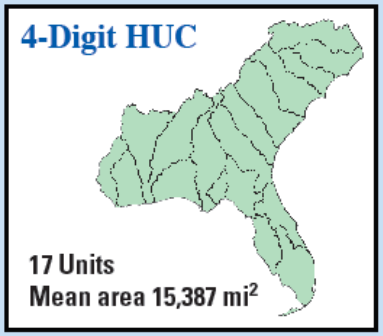
Scale Matters!

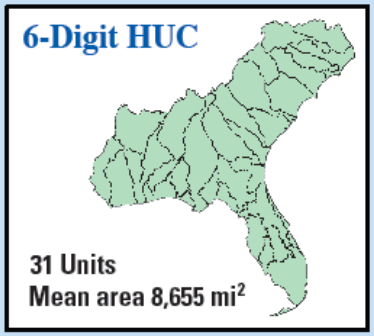


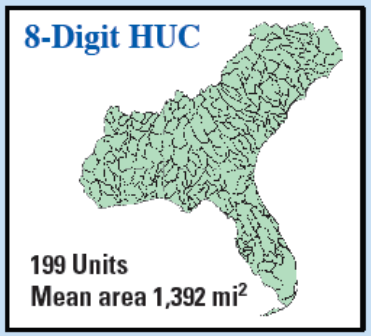
There are ~103,400 HUC-12s in the US.

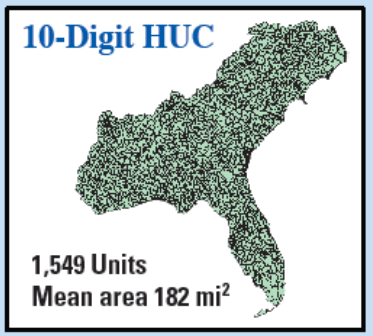
Daily-- Streamflow ET, Precip

Monthly – Water Budget









Density of hydrologic unit codes (HUCs) at different levels illustrated by using the 2-digit HUC Region 03

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Beta Testing the Water Census Data Portal

Scientists, Modelers, Managers...

User Interfaces and Scripts

Integration and Processing Services

Data Distribution Services

Canonical Persistant 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.

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Demo!

http://cida.usgs.gov/nwc/

Compatible with Chrome and Firefox browsers

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National Water Census - BETA

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.

≡ Menu

- Water Budget
- Streamflow Stats
- Aquatic Biology
- Data Discovery

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.

Home Page: Each tile represents a set of functionality

National Water Census - Data Portal - BETA

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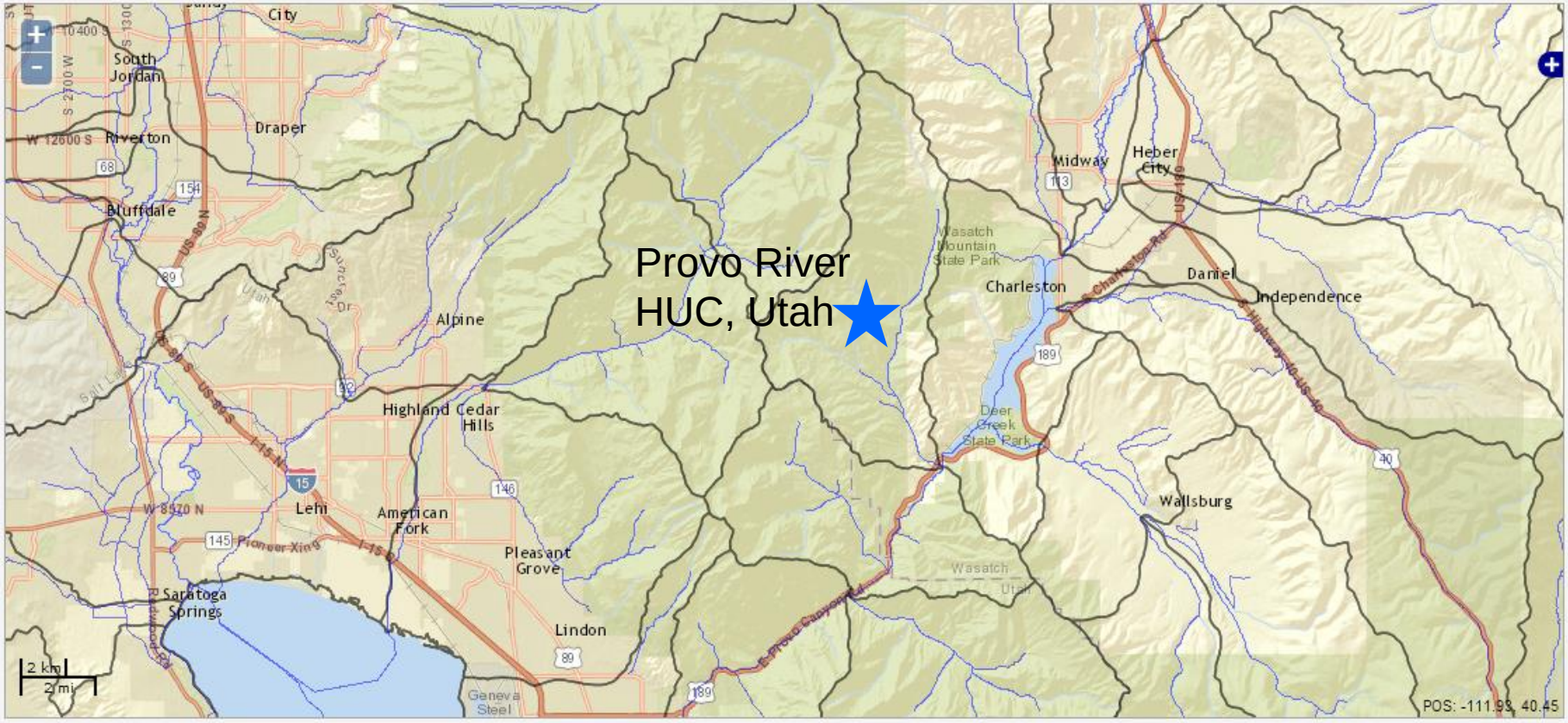
Available Water Budget Components

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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Available Water Budget Components

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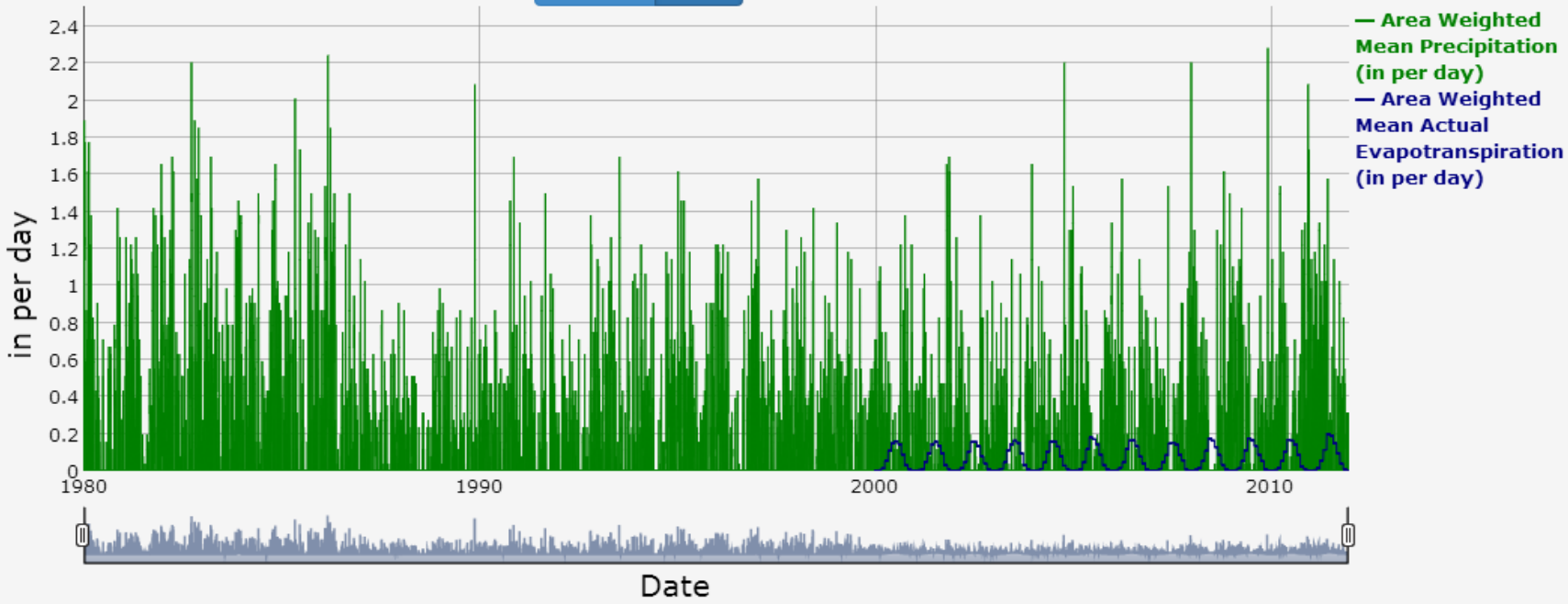
US Customary | Metric

Precipitation and Evapotranspiration for the Selected HUC

Hydrologic Unit Code
160202030501
HUC Name
Outlet Provo River

Monthly | Daily



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Available Water Budget Components

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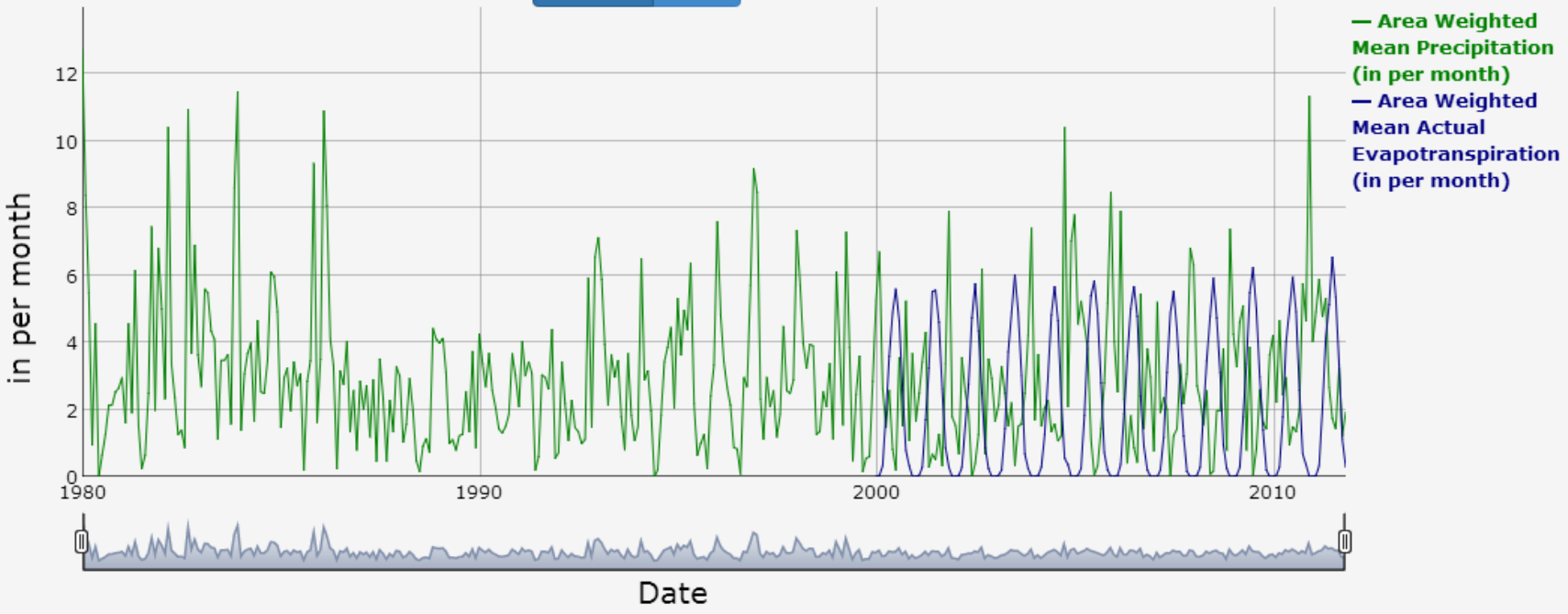

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Available Water Budget Components

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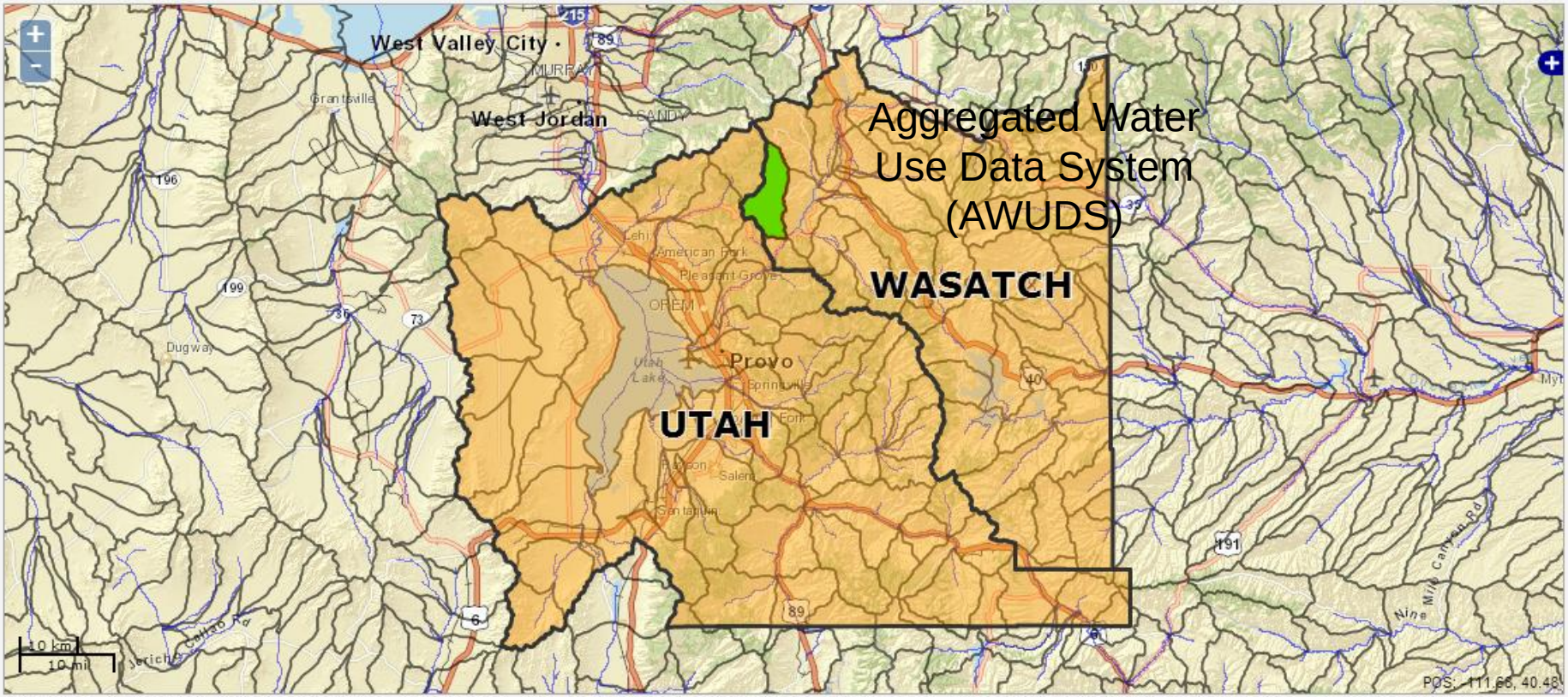

Siczewicz, Peter. U.S. Historical Counties (Generalized .001 deg). Dataset. Emily Kelley, digital comp. Atlas of Historical County Boundaries, ed. by John H. Long. Chicago: The Newberry Library, 2011. Available online from **http://publications.newberry.org/ahcbp**.

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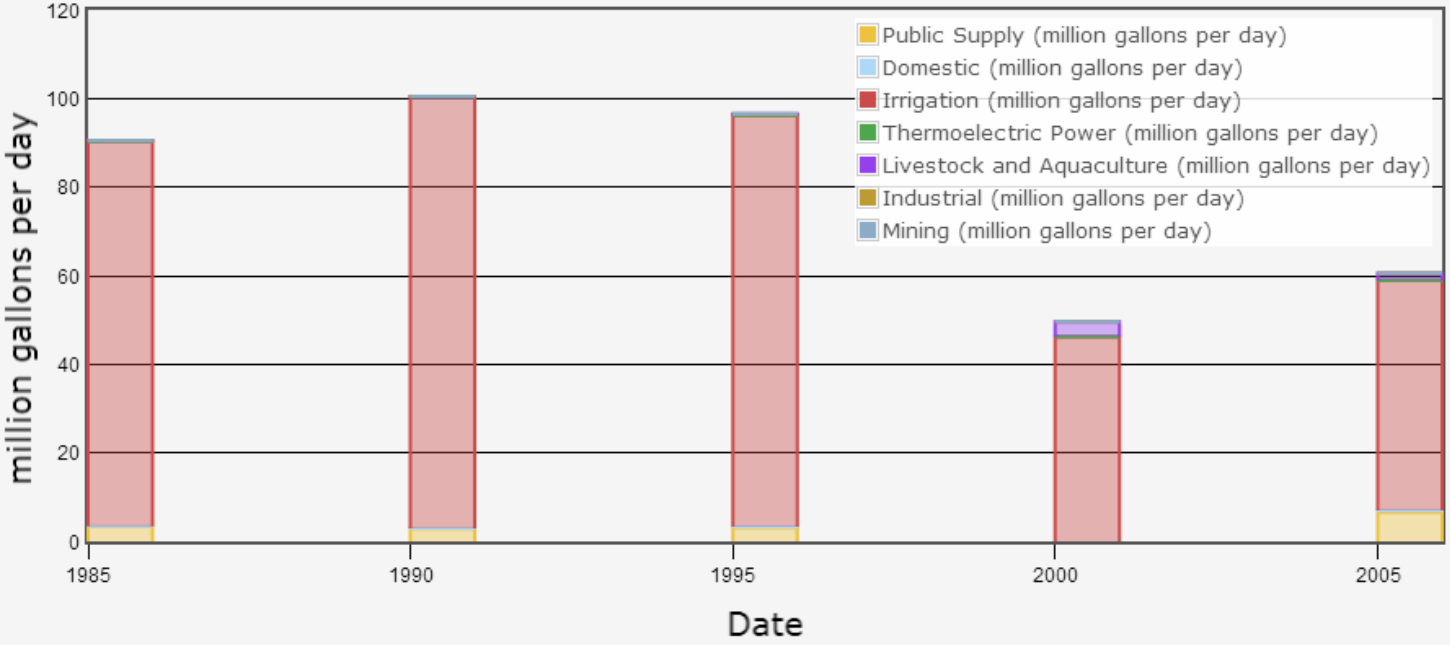
Available Water Budget Components

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.

US Customary | Metric

Total County Water Use | Area Normalized County Water Use

Water Use for Wasatch County



Water use estimates derived from the Aggregate Water Use Estimate dataset also available from **NWIS Web**.

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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: ***https://github.com/USGS-R/EflowStats*** .

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**

Date Range (Water Years)

From: 1929 **To:** 2013

Statistic Groups

Select	Statistic Group Name
☐	**Magnificent Seven**
☐	**Flow Magnitude**
☐	**Flow Frequency**
☐	**Flow Duration**
☐	**Flow Timing**
☐	**Rate of Change**

Streamflow Statistics Calculator

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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.

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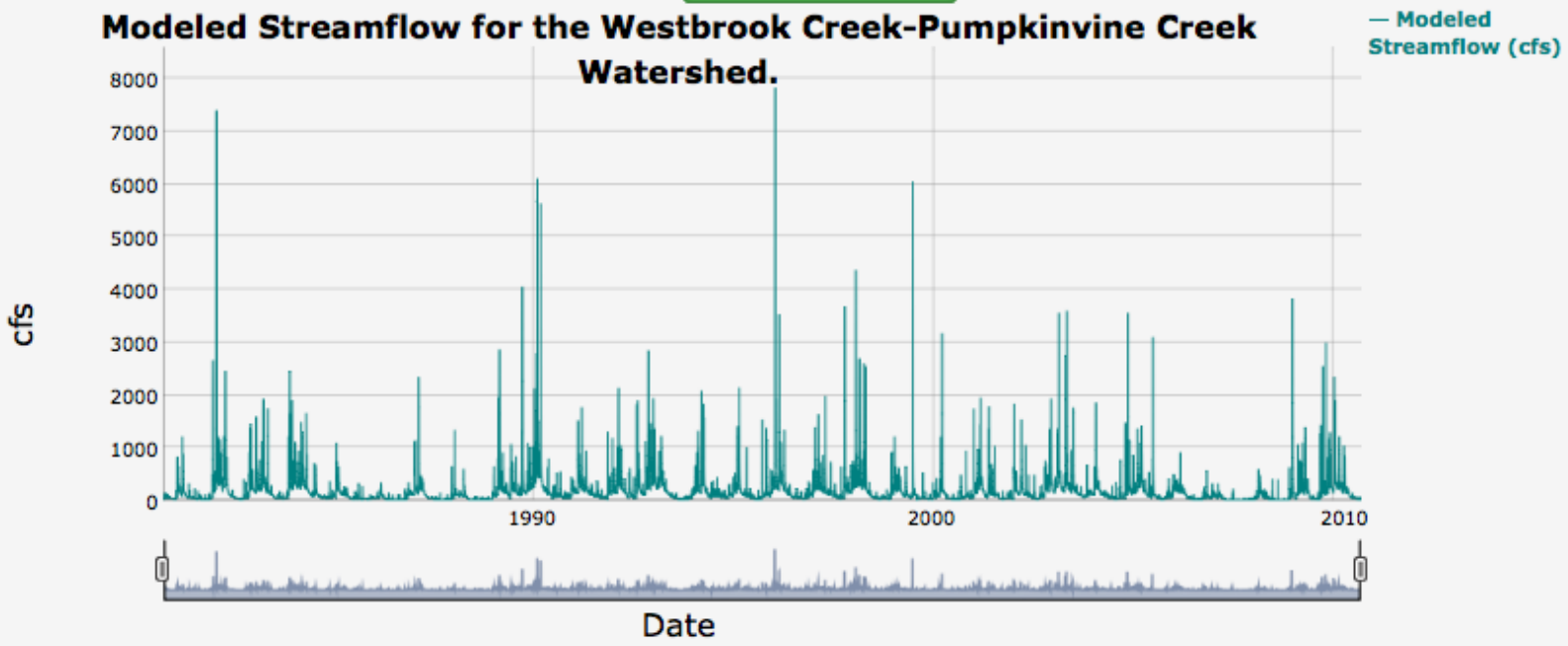
Hydrologic Unit Code
031501041105
HUC Name
Westbrook Creek-Pumpkinvine Creek
Drainage Area (km²)
364.00816808

Streamflow Data Plot



Download Modeled Streamflow

Download These Statistics

Name	Value	Description
site_no	031501041105	
min_date	1980-10-01	
max_date	2010-09-30	
lam1Obs	181.56	Mean of the daily streamflow for the period of record.
tau2Obs	0.56	Coefficient of L-variation (Hosking and Wallis, 1994, eqn. 2.61) of the daily streamflow for the period of record.
tau3Obs	0.51	L-skewness (Hosking and Wallis, 1994, eqn. 2.60 with r equal to 3) of the daily streamflow for the period of record.
tau4Obs	0.34	L-kurtosis (Hosking and Wallis, 1994, eqn. 2.60 with r equal to 4) of the daily streamflow for the period of record.

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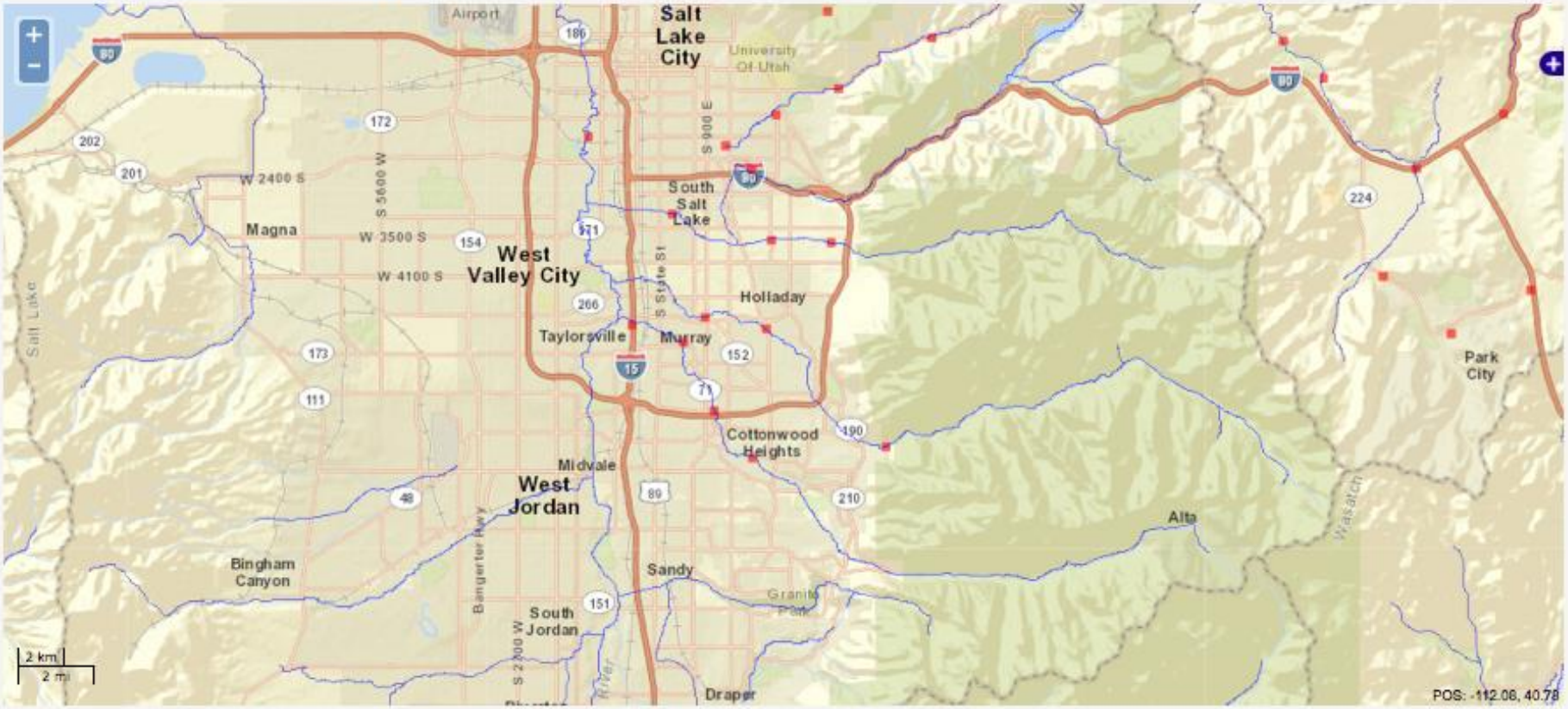
Aquatic Biology Data and Related Streamflow Statistics

*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.



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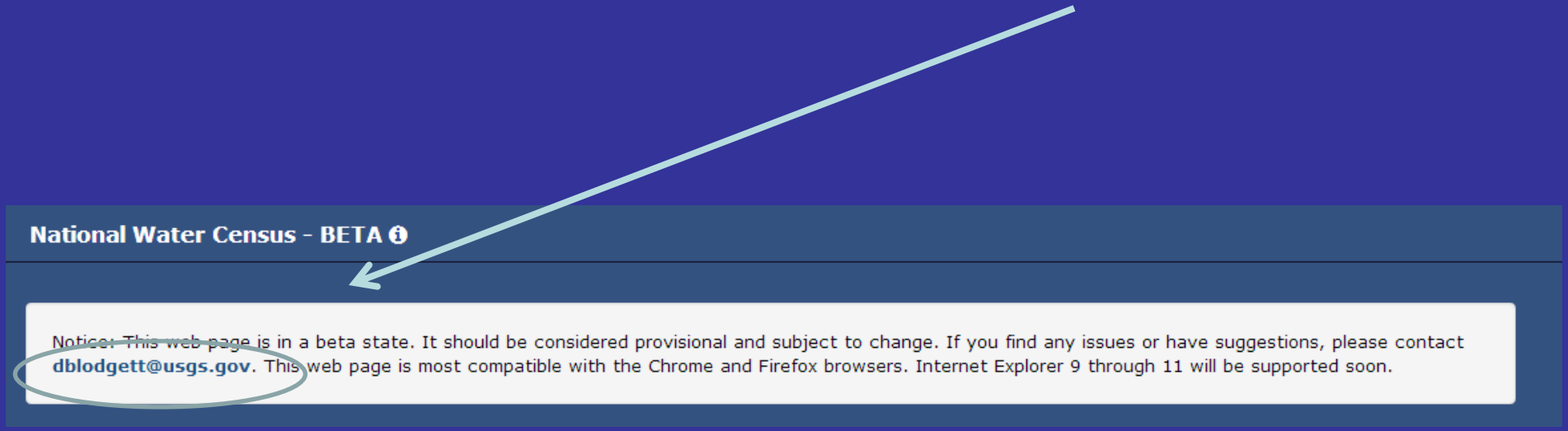
We need your feedback!



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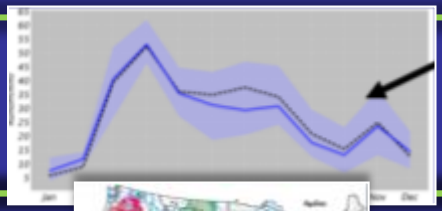
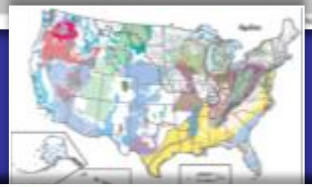
Five Areas of Nationwide Topical Work

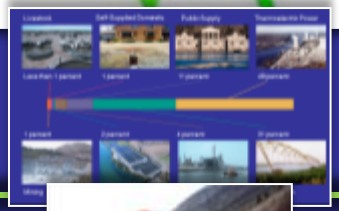


Estimation of Flow at Ungaged Locations



Groundwater Information

Estimation of Evapotranspiration



Water Use

Ecological Water Science

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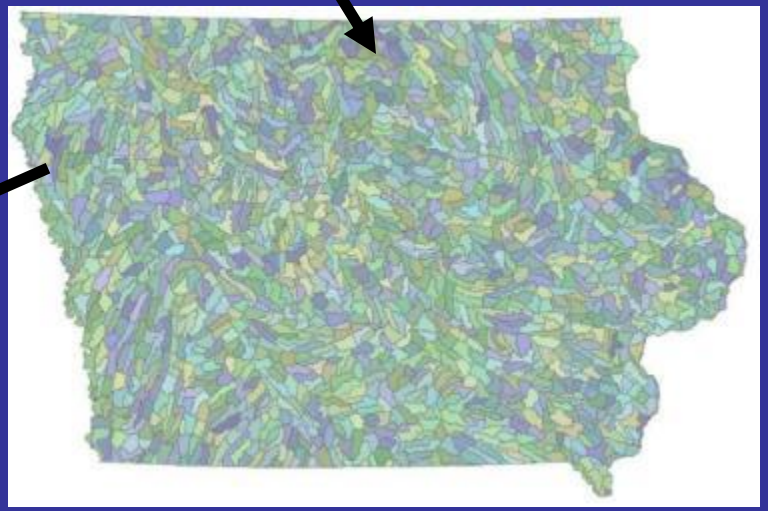
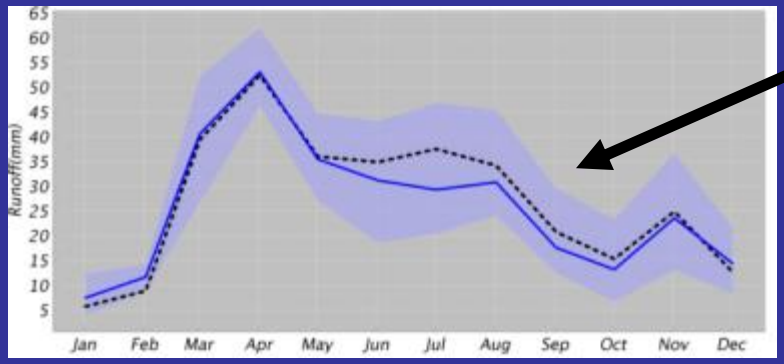
Surface Water Models
Estimating Flows at Ungaged Locations

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.





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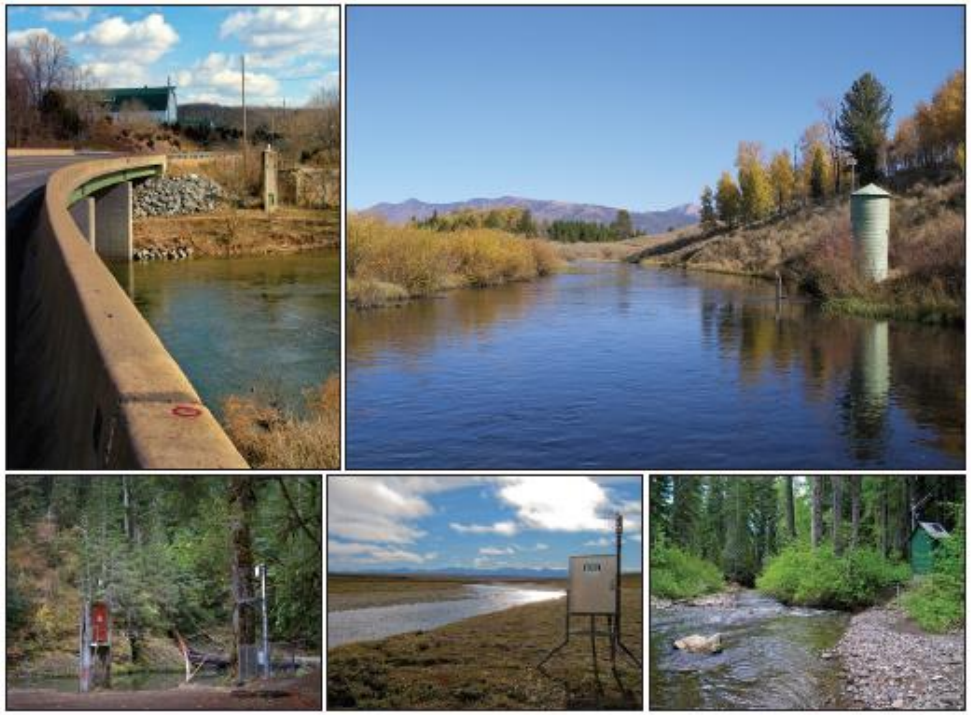
Prepared in cooperation with the U.S. Fish and Wildlife Service

A National Streamflow Network Gap Analysis



Scientific Investigations Report 2013–5013

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

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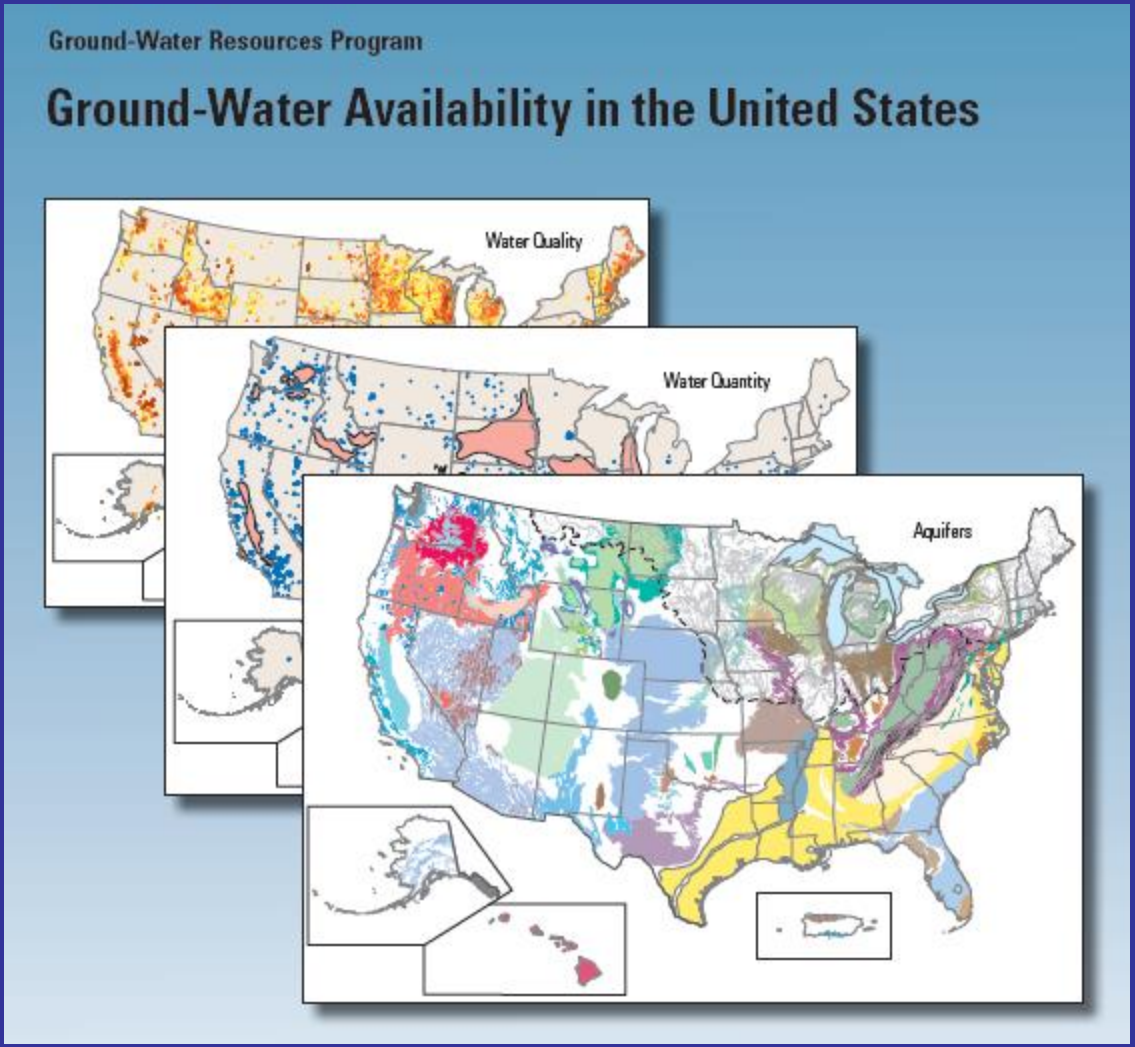
Assess Groundwater's role in Water Availability

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

- Recharge
- GW yields
- Changes in storage.
- Trends in GW Indices
- GW/SW Interactions

In Principal aquifer systems



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Assess Groundwater's role in Water Availability

Study of the Glacial System

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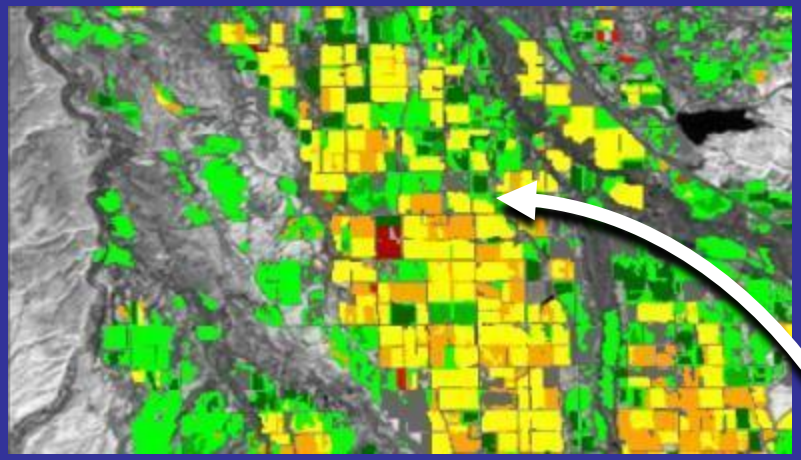
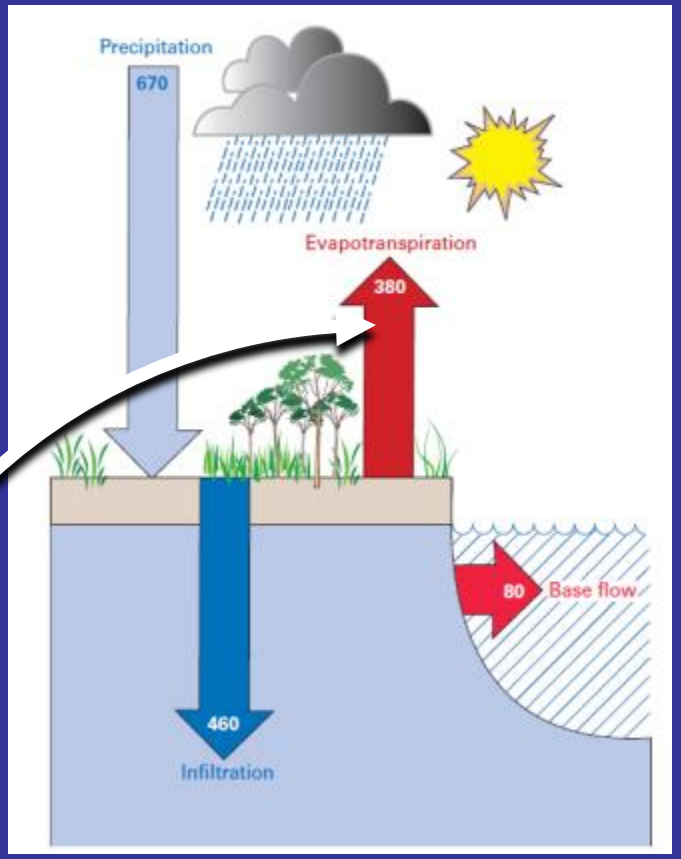
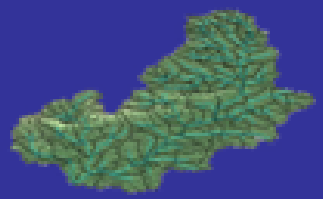


ET

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

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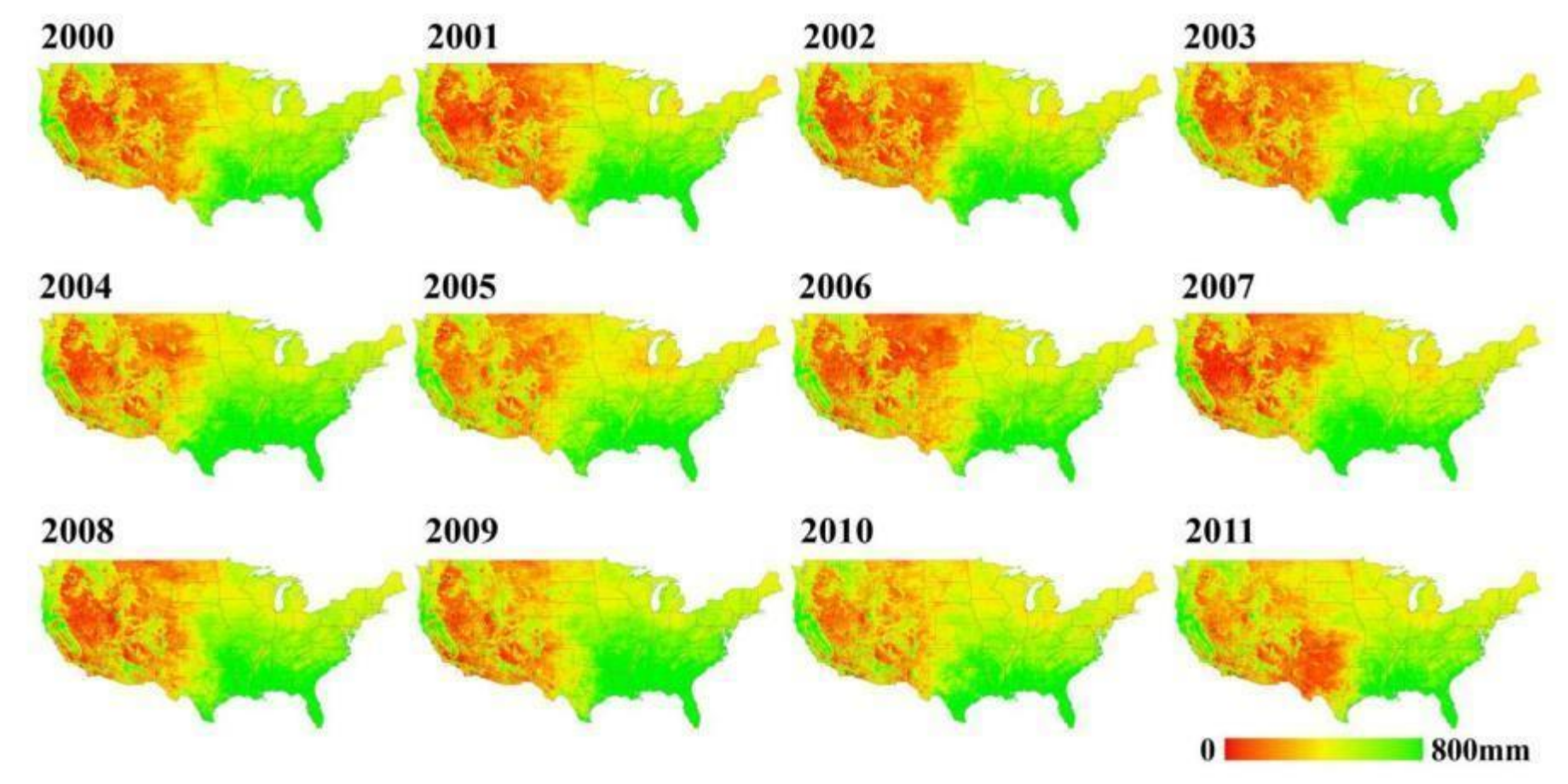
Annual and Monthly ET Totals from MODIS



Senay, Gabriel B., Stefanie Bohms, Ramesh K. Singh, Prasanna H. Gowda, Naga M. Velpuri, Henok Alemu, James P. Verdin. 2013. Operational Evapotranspiration Mapping Using Remote Sensing and Weather Datasets: A New Parameterization for the SSEB Approach. Journal of the American Water Resources Association (JAWRA). 49(3):577-591

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Water Use

Livestock

Less than 1 percent

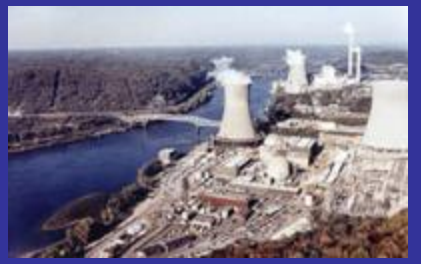
Self-Supplied Domestic

1 percent

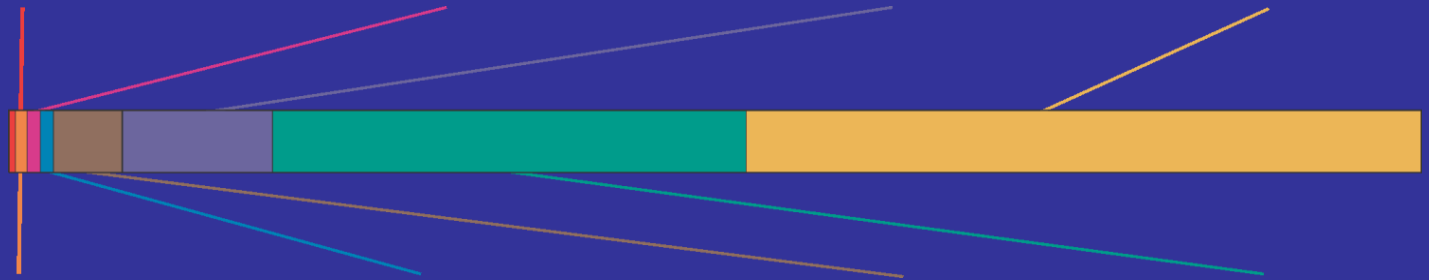
Public Supply

11 percent

Thermoelectric Power



49 percent



1 percent

Mining

2 percent

Aquaculture

4 percent

Self-Supplied Industrial

31 percent

Irrigation

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Circulars

1950

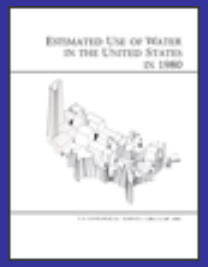
1955

1960

1965

1970

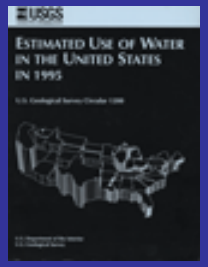
1975



1980

1985

1990



1995

2000

2005

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

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RIVER RESEARCH AND APPLICATIONS

River Res. Applic. (2013)

Published online in Wiley Online Library
(wileyonlinelibrary.com) DOI: 10.1002/rra.2710

AN OBJECTIVE AND PARSIMONIOUS APPROACH FOR CLASSIFYING NATURAL FLOW REGIMES AT A CONTINENTAL SCALE

S. A. ARCHFIELD[a]*, J. G. KENNEN[b], D. M. CARLISLE[c] AND D. M. WOLOCK[d]

[a] *Massachusetts-Rhode Island Water Science Center, US Geological Survey, Northborough, Massachusetts USA*
[b] *New Jersey Water Science Center, US Geological Survey, West Trenton, New Jersey USA*
[c] *National Center, US Geological Survey, Reston, Virginia USA*
[d] *Kansas Water Science Center, US Geological Survey, Lawrence, Kansas USA*

Article first published online: 30 Sept. 2013 | DOI: 10.1002/rra.2710

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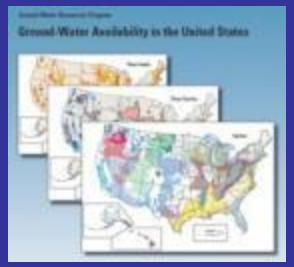
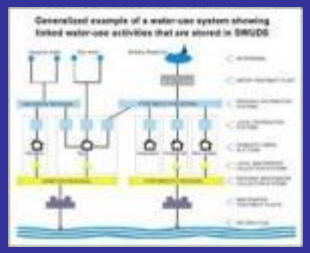
Finally, three studies focused on selected watersheds: the Colorado River, the Delaware River, and the ACF Rivers - where there is significant competition over water resources. Here, the USGS will work collaboratively with stakeholders to comprehensively assess the technical aspects of water availability.

Focused Water Availability Assessments

Water Quality



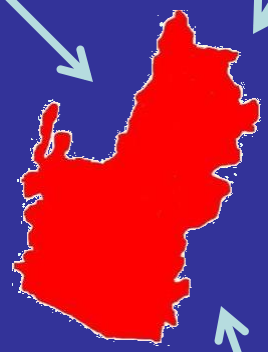
Groundwater Resources



Water Use

Surface Water Trends, Precipitation, etc

Eco Flows



Global Change

Defined Technical Questions to be Answered

State, Local, Regional Stakeholder Involvement

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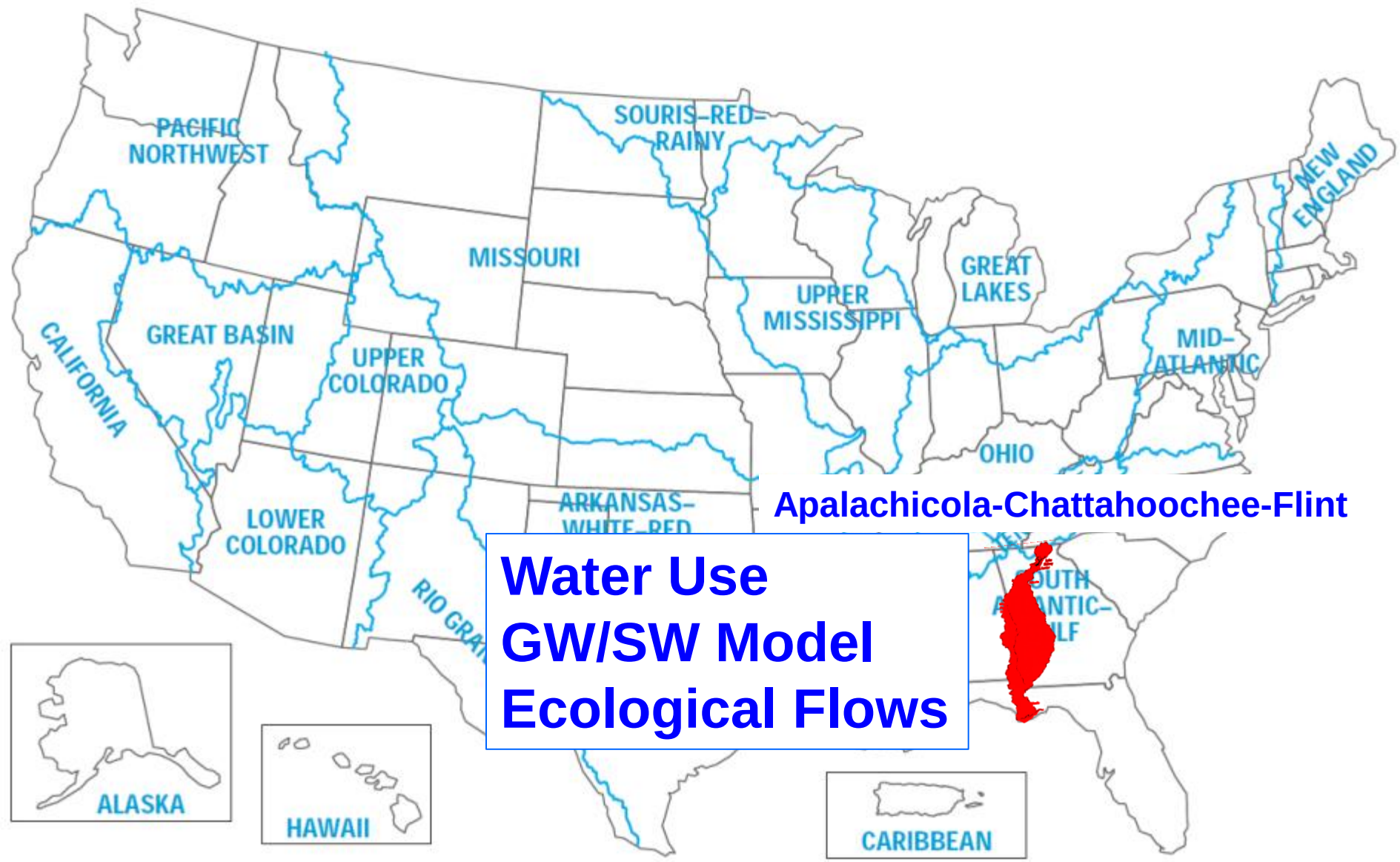
Focus Area Studies within Water Resource Regions

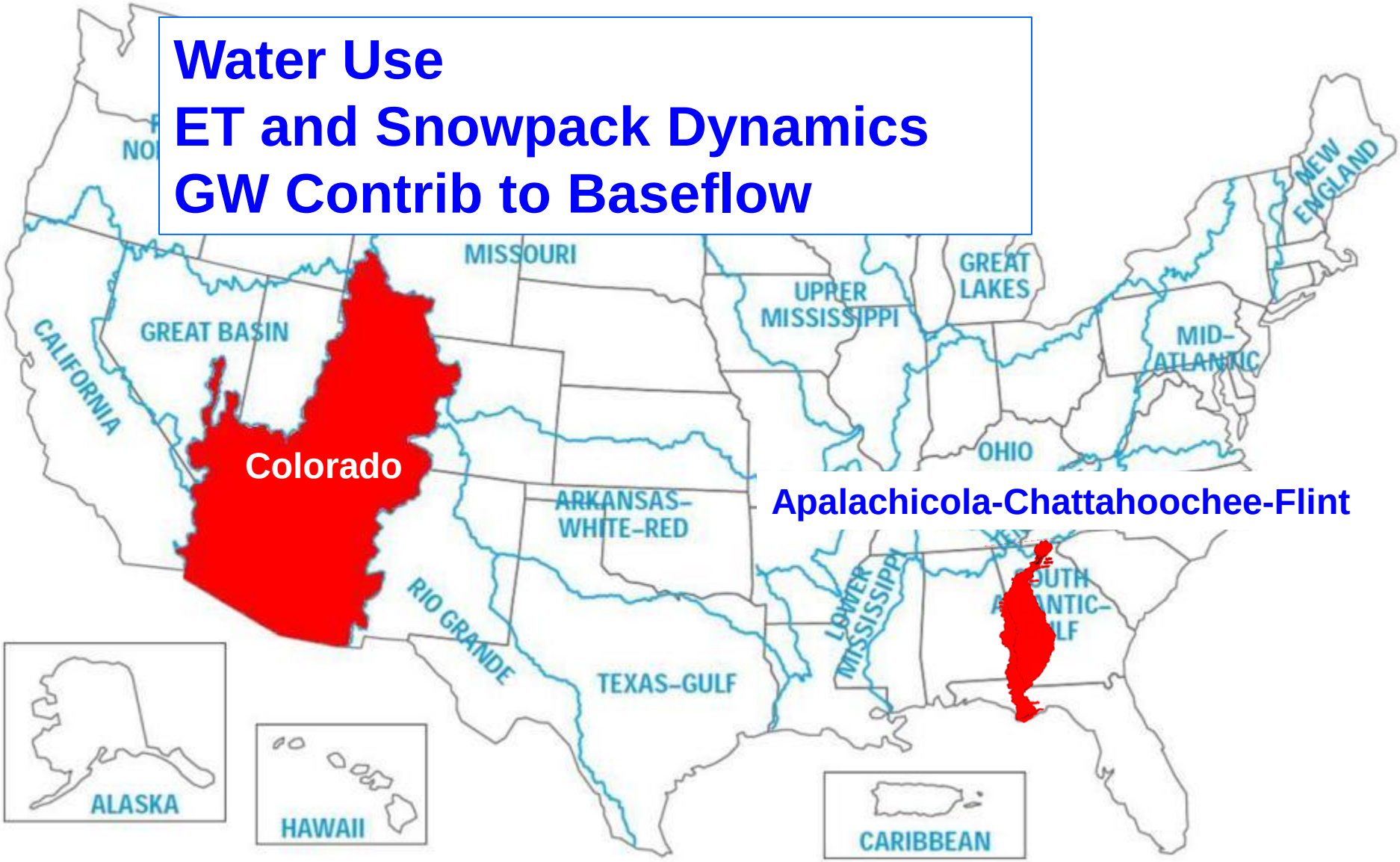


Apalachicola-Chattahoochee-Flint

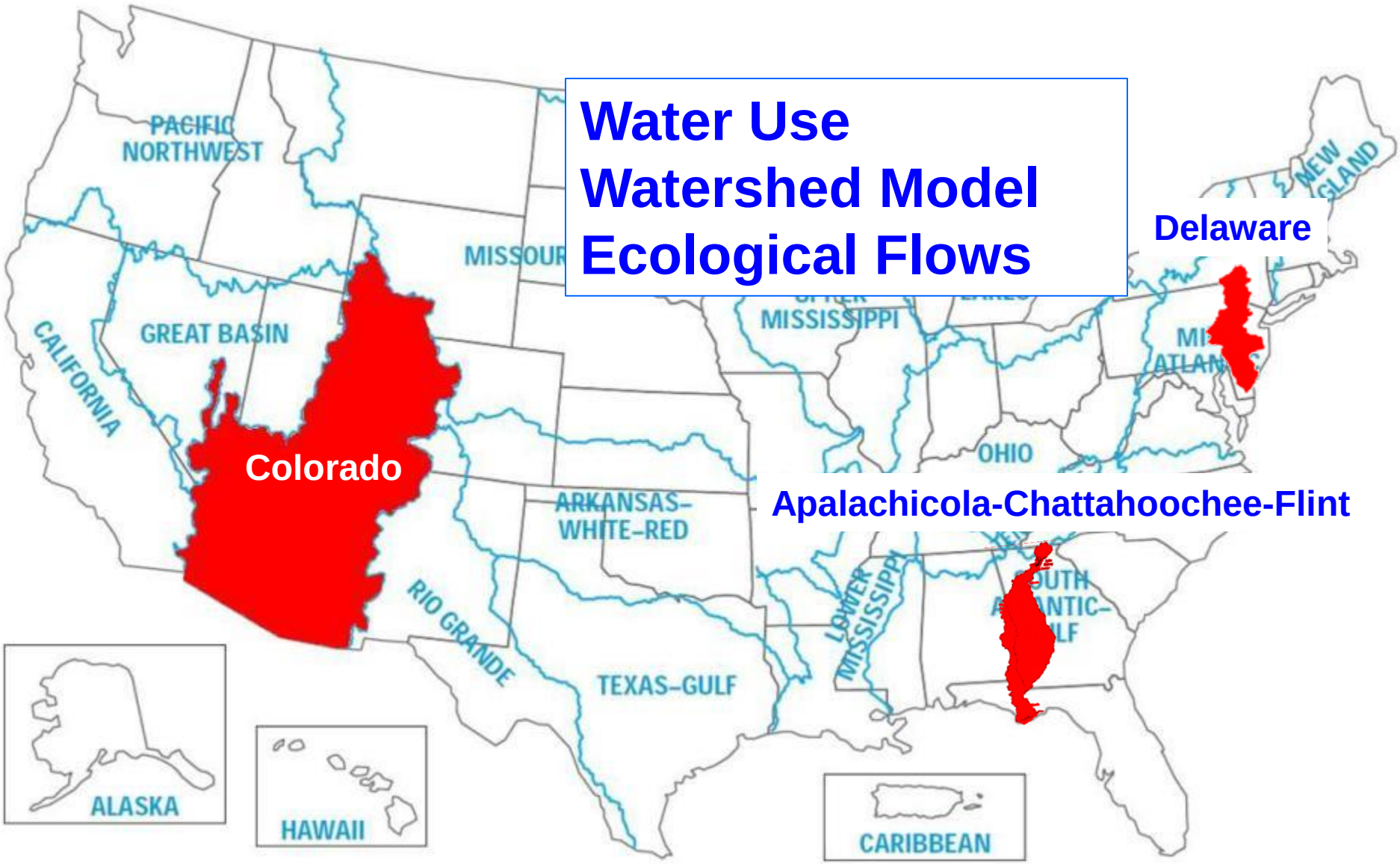
Water Use
GW/SW Model
Ecological Flows

Focus Area Studies within Water Resource Regions

Water Use
ET and Snowpack Dynamics
GW Contrib to Baseflow



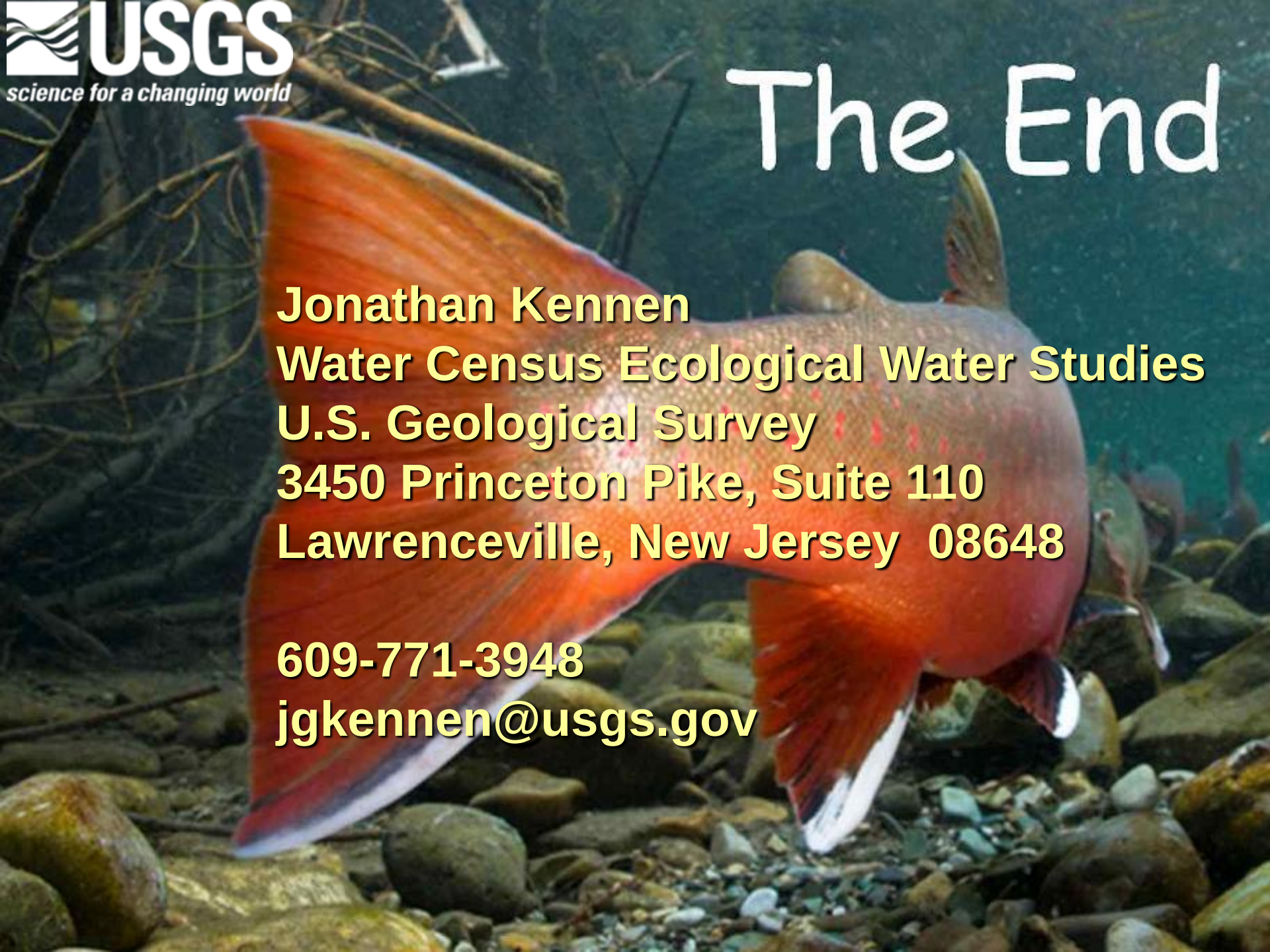
Focus Area Studies within Water Resource Regions



What are the Budget Plans for FY2015?

	Fiscal Years		
	2014	2015	
Programs			
Fisheries	$465,610	$465,610	
GWRP	$1,045,000	$3,445,000	$2.4M Increase for the National Groundwater Monitoring Network
HNA Water Census	$4,027,000	$6,027,000	$2M State Water Use Grant Program
Land Change Science	$514,000	$514,000	
Coop Water Program		$2,000,000	Expansion of Water Use efforts
Total - Water Census	$6,051,610	$12,451,610	$6.4M increase is proposed

USGS science for a changing world



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