National Network of Reference Watersheds

National Water Quality Monitoring Council (NWQMC)

Advisory Committee for Water Information (ACWI)

NATIONAL WATER QUALITY MONITORING COUNCIL

Working Together for Clean Water

NWQMC

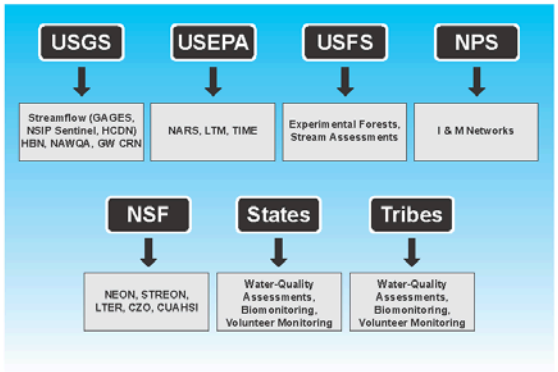
http://acwi.gov/monitoring/

Establishing a Collaborative and Multipurpose National Network of Reference Watersheds and Monitoring Sites for Freshwater Streams in the United States

A significant challenge faced by water-resource scientists in the public and private sectors is the need for reliable long-term data and information from watersheds minimally disturbed by human activities. Monitoring in areas with minimal human disturbance helps to provide (1) an understanding of natural patterns of variability that can be used to differentiate changes due to land and water use from changes associated with natural climatic cycles and (2) reference information that can be used to establish water-quality criteria or appropriate expectations for watershed restoration. Many agencies and organizations monitor streams in pristine and minimally disturbed watersheds or conduct research and other activities that would be useful to a reference watershed network (fig. 1). Much of the monitoring consists of one to several measurements at many sites, typically representing a particular hydrologic condition and a relatively short period of time. These synoptic measurements provide important information for understanding natural spatial patterns and variability. Unfortunately, there are relatively few sites among networks with long-term records for streamflow, water chemistry, and stream ecology necessary to distinguish changes associated with natural climatic cycles.

The National Water Quality Monitoring Council (NWQMC) is proposing the development of a collaborative and multipurpose national network of reference watersheds and monitoring sites that would provide quality-assured data and information for use in understanding the effects of land use change, water use, atmospheric deposition, and climate change on freshwater ecosystems. The scope of the collaborative effort will initially be limited to freshwater streams. Future collaborations would expand to freshwater lakes and wetlands. Membership in the network would be voluntary and open to individuals and institutions interested in participating in monitoring and (or) research in minimally disturbed and pristine watersheds. Funding support for the network would come from the participating agencies. The Council would provide the organizational structure and leadership to develop, enhance, and maintain collaborative, comparable, and cost-effective monitoring, research, and reporting among the Federal, State, tribal, interstate, academia, local and private sector organizations that choose to participate.

The collaborative effort would consist of three different types of activities in a tiered framework that are linked together by research and modeling. The three types of activities



USGS, U.S. Geological Survey
GAGES, Geospatial Attributes of Gages for Evaluating Streamflow
NSIP Sentinel, National Streamflow Information Program Sentinel streamgages
HCDN, Hydro-Climatic Data Network
HBN, Hydrologic Benchmark Network
NAWQA, National Water Quality Assessment Program
GW CRN, Groundwater Climate Response Network

USEPA, U.S. Environmental Protection Agency
NARS, National Aquatic Resource Surveys
LTM, Long Term Monitoring
TIME, Temporally Integrated Monitoring of Ecosystems

USFS, U.S. Forest Service

NPS, National Park Service
I & M, Inventory and Monitoring

NSF, National Science Foundation
NEON, National Ecological Observatory Network
STREON, Stream Experimental Observation Network
LTER, Long Term Ecological Research
CZO, Critical Zone Observatories
CUAHSI, Consortium of Universities for the Advancement of Hydrologic Science, Inc.

Figure 1. Monitoring networks and programs of Federal and State agencies and non-Governmental organizations that are candidates for inclusion in the design and operation of a collaborative reference watershed network.

April 2012

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Goals

- Provide access to documented quality data and information from minimally or least disturbed watersheds to assist with establishing “background” conditions for select water-quality variables.
- Increase the efficiency of monitoring with improved coordination and collaboration and increased opportunities to leverage existing reference sites, networks, and financial resources

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FY 2013 Workplan Tasks

Task 1: Inventory of historic and current reference site monitoring in the Northeast and Midwest

Task 2: Develop an approach for evaluating and incorporating existing reference sites

Task 3: Identify/design of a resource for data access

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Decisions to be made

- Should we establish basic reference criteria?
- What parameters should be included to let users define their own criteria?
- What is the difference between an intensive watershed and a synoptic sampling site?
- What is our data management approach?
- Should we institute data screening? How does this apply to data accessed through the QW portal?

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The Website

1. Main information page
2. Interactive network map
3. Network Site Search
4. Data Access
5. Reference Conditions
6. About the Data
7. Network Publications and Products

NWQMC

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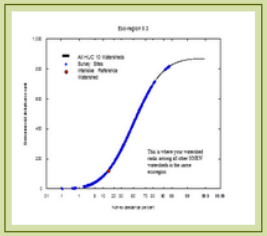
The National Network of Reference Watersheds

is a collaborative and multipurpose network of watersheds and monitoring sites that provides quality-assured data and information to understand the effects of land use change, water use, atmospheric deposition, and climate change on freshwater ecosystems. The current scope of the network is limited to freshwater streams. Future collaborations will expand to freshwater lakes and wetlands. Membership in the network is voluntary and open to individuals and institutions interested in participating in monitoring and (or) research in minimally disturbed and pristine watersheds.

What is a Reference Watershed?

A reference watershed is a watershed minimally influenced by human activity against which disturbed watersheds can be compared. Rather than set specific reference site criteria for the entire nation, the NNRW's approach is to give the user the tools to define their own criteria for their own purposes.



Nonetheless, default criteria have been define for all Level II Ecoregions to aid users who do not wish to define their own criteria. To see how these criteria are defined click on the diagram to the right.

Select the "Network Sites" tab to define reference criteria, identify sites, and access data available for the network.

Submit a Watershed to the Network

Today's Featured Watershed

Kawishiwi River, MN

Kawishiwi River is located in the Boundary Waters Canoe Area Wilderness, which is part of the Superior National Forest administered by the U.S. Forest Service.

Watersheds Where I Live

Find a reference watershed near your location

Input either a 5 digit zipcode or latitude and longitude.

Zipcode: Latitude: Longitude:

Please indicate the position format

Decimal Degrees (dd.ddddd)

Degrees, Minutes, Seconds (DD MM SS.S)

Submit

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Tools Help

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defined click on the diagram to the right.

Select the "Network Sites" tab to define reference criteria, identify sites, and access data available for the network.

Close the Form

Longitude:

Please indicate the position format

Decimal Degrees (dd.ddddd)

Degrees, Minutes, Seconds (DD MM SS.S)

Submit

Submit a Watershed

Fill out this form to add a site to the network
Adding a watershed to the network takes place in two steps

1. Input site information (this form)
2. Upload site data or provide access to site data (you will be contacted by network personnel)

Fill out the form below to upload individual site information, this will allow the site to be discoverable to network users. If you would like to batch upload many sites at once please contact network personnel and we will assist you.

Watershed Information

Site Type

Intensive Research Watershed

Synoptic Sampling Site

Site Identification

Site Name:

Site Number:

USGS Station Number:

QWDX Site Identifier:

Site Location

Latitude: dd.ddddd

Longitude: dd.ddddd

Agency/Institution Information

Agency/Institution Name:

Contact Position:

Contact email:

Why is the site considered a reference watershed?:

Data Availability

Please indicate which data types are available for this site.

Discharge

Aquatic Biota

Groundwater Elevation

Meteorological Data

Water Quality

Watershed Soil Chemistry

Groundwater Quality

Additional Information for Intensive Research Watersheds

Site Picture:

Site Description:

Site Web Link:

Number of Partnering Agencies/Institutions:

Agency/Institution Name:

Agency/Institution Role:

Submit

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Watershed Information

Site Type

Intensive Research Watershed

Intensively monitored watersheds have continuous flow measurements and water quality samples are collected seasonally or more frequently. Other data such as stream biota and meteorological data may also be available.

Site

Site

Site

USG

QWDX Site Identifier:

Site Location

Latitude: dd.ddddd

Longitude: dd.ddddd

Agency/Institution Information

Agency/Institution Name:

Contact Position:

Contact email:

Why is the site considered a reference watershed?:

Data Availability

Please indicate which data types are available for this site.

Discharge

Aquatic Biota

Groundwater Elevation

Meteorological Data

Water Quality

Watershed Soil Chemistry

Groundwater Quality

Additional Information for Intensive Research Watersheds

Site Picture:

Site Description:

Site Web Link:

Number of Partnering Agencies/Institutions:

Agency/Institution Name:

Agency/Institution Role:

Submit

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Site Search

1. Select the site type(s)

[for definitions mouse over the site type or the NNRW framework to the right]

Site Type(s)

- [ ] Intensively monitored watersheds
- [ ] National and regional synoptic surveys

2. Select the region of interest

[although you may choose multiple parameters in a given category, you may select from only one category at a time]

Region (leave blank to select all)

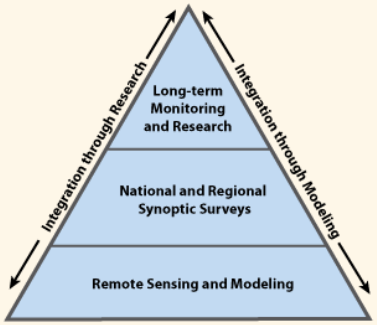
State(s):

EPA Level II Ecoregion(s):

USGS HUC Code(s):

Major Watershed(s):

Sites within the network are divided into two tiers and remote sensing and modeling can be used to infer conditions between sites. Integration across these scales can be accomplished through research and modeling.



3. Select Reference Site Criteria

Define Reference Conditions

Area (range in watershed size) to units

Land Use

% Forest

% Agricultural

% Residential

% Urban

Road Density (km/sq km)

Disturbances Allowed

Flow Alterations

Pollutant Discharge

Water Withdrawals

Choose the data of interest and the date range desired

pH
ANC
NO3
SO4
Cl
Ca
Mg
K
Na

Data Availability

Date Range mm/dd/yyyy mm/dd/yyyy

Submit

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Reference Conditions

One of the ways data from the network can be used is to define reference or "background" conditions across the Nation. These conditions can be used to measure changes in baseline conditions through time or to compare to disturbed areas.

To determine the reference conditions for a geographic area first define the area of interest and then identify which parameters for which reference conditions are desired. You can use default reference condition defined based on EPA Level II Ecoregions (the criteria will be summarized with the output) or you can define your own reference criteria. A summary of reference conditions will be provided for available parameters.

Area of Interest

Bounding Box (in decimal degrees)

north

west east

south

Region

State(s): AL

EPA Level II Ecoregion(s): 5

USGS Water Resource Regions: New England

Information Requested

Reference Criteria

- [ ] Use default reference criteria
- [ ] Define my own reference criteria

Parameters of Interest

Water Quality: Parameters units method

Aquatic Biota: Parameters units method

Time Period

start date: mm/dd/yyyy end date: mm/dd/yyyy

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The National Network of Reference Watersheds Site Map

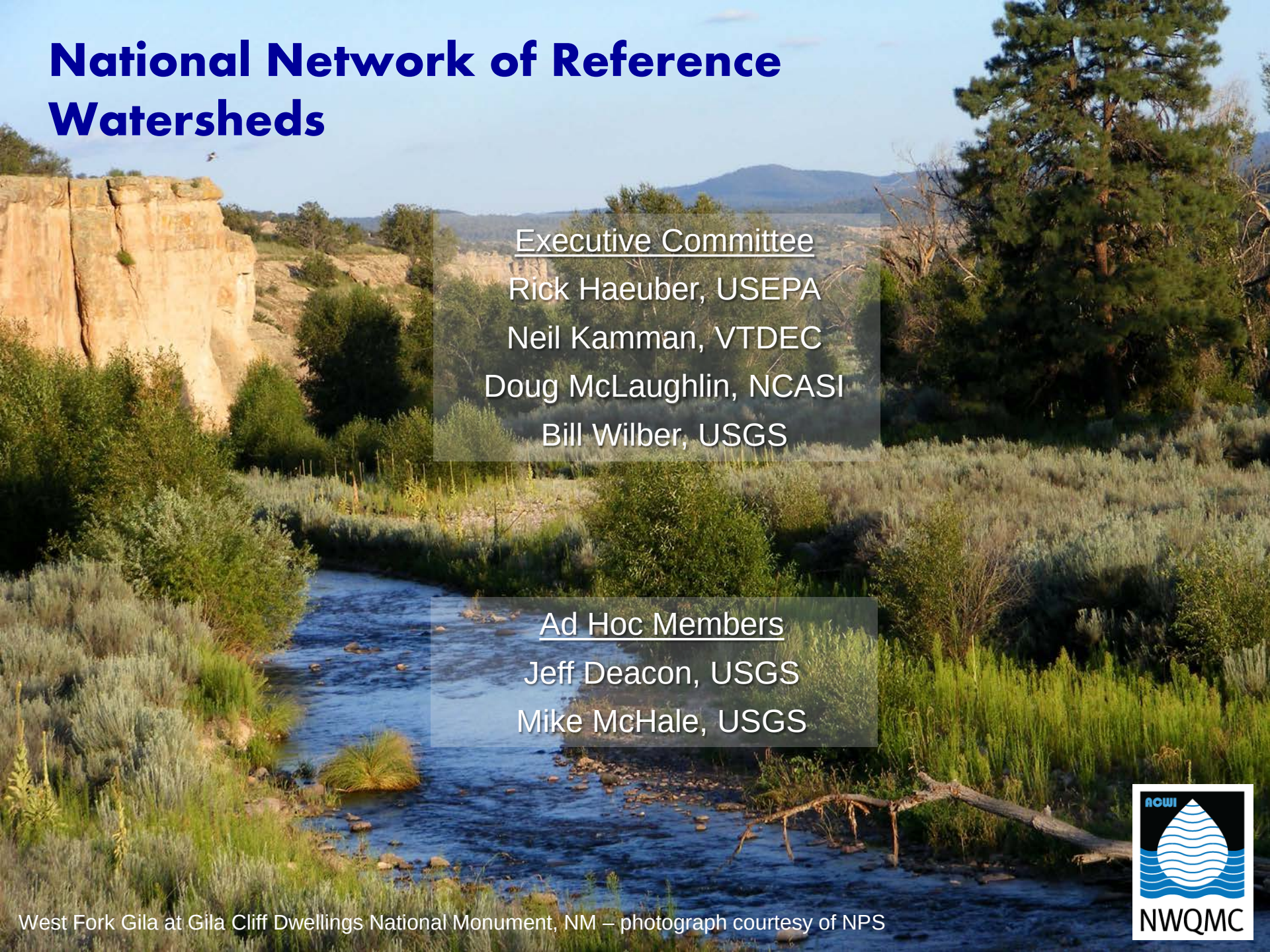
View Larger Map

National Network of Reference Watersheds

Development Tasks Year 1

1. **Create the Network Website**
2. **Construct or adopt a network data model (Site Metadata)**
3. **Build the database and populate it with the current NNRW sites (Funded by EPA Office of Air and Radiation).**
4. **Define and Create the Data Access Portal (Meeting with Nate Booth's group in May to determine what is feasible this year).**
5. **Present website to the Council at Fall Council meeting?**

National Network of Reference Watersheds



Executive Committee

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Doug McLaughlin, NCASI

Bill Wilber, USGS

Ad Hoc Members

Jeff Deacon, USGS

Mike McHale, USGS

West Fork Gila at Gila Cliff Dwellings National Monument, NM – photograph courtesy of NPS

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