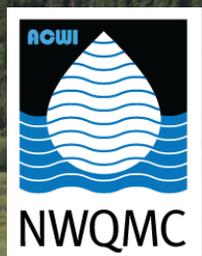


National Network of Reference Watersheds

National Water Quality Monitoring Council (NWQMC)

Advisory Committee for Water Information (ACWI)



NATIONAL WATER QUALITY MONITORING COUNCIL

Working Together for Clean Water

<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

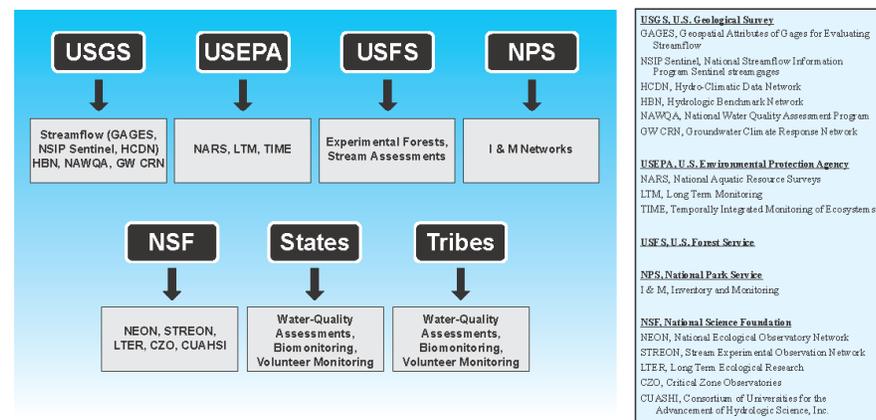
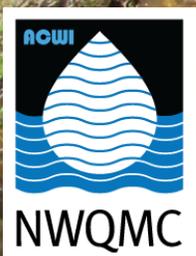


Figure 1. Monitoring networks and programs of Federal and State agencies and non-Governmental organizations that are candidates for inclusion in the design and operation of a collaborative reference watershed network.

National Network of Reference Watersheds

A collaborative network of watersheds 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.

Membership in the network is voluntary and open to individuals and institutions/organizations interested in participating in monitoring and (or) research in minimally disturbed and pristine watersheds.



Web Address:

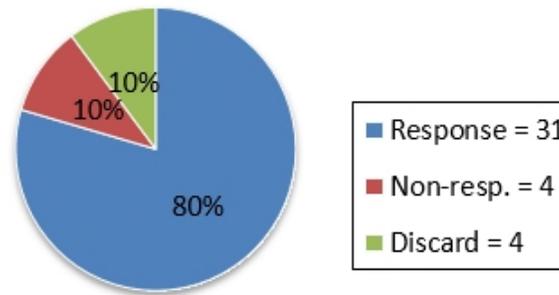
<https://my.usgs.gov/nnrw/>

The site launched in
May 2015

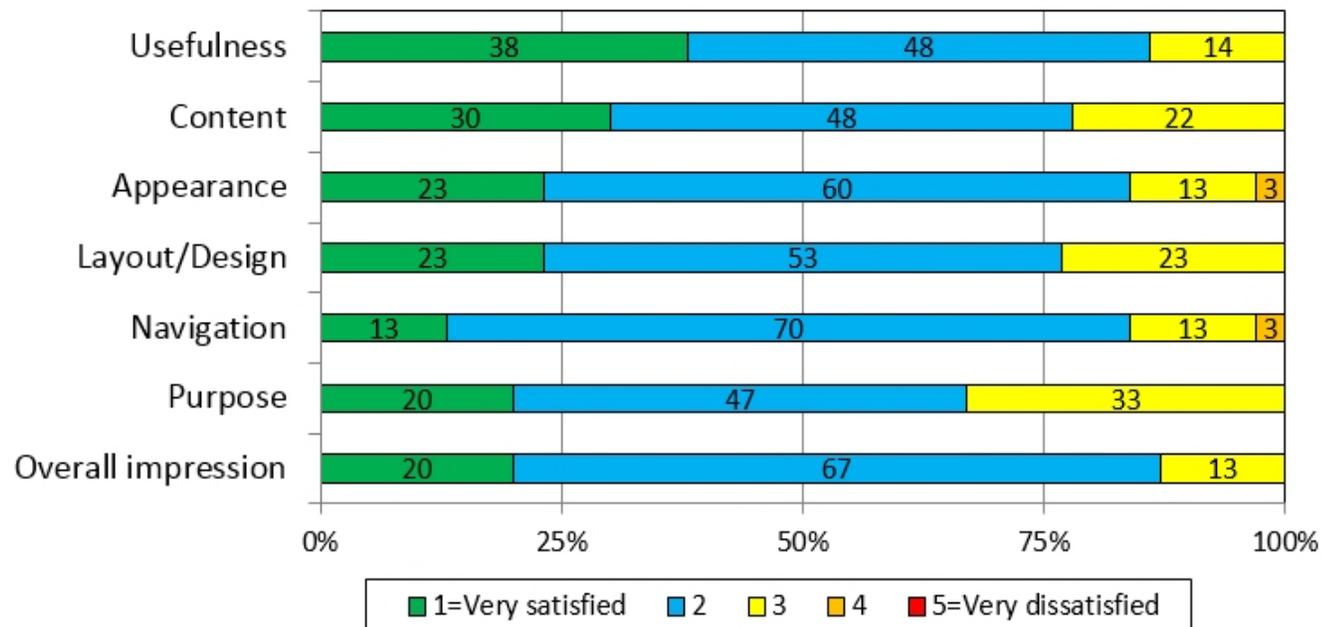
EVALUATION of NATIONAL NETWORK of REFERENCE WATERSHEDS

Sample = 39 persons who had agreed to
evaluate the website
Response rate = 89%

Non-response bias is small
Survey conducted in February-March, 2015



Satisfaction with Website





The National Network of Reference Watersheds

[About NNRW](#)[Core Watersheds](#)[Watershed Search](#)[User Guide](#)[Cooperators](#)

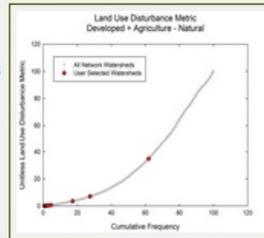
The **National Network of Reference Watersheds** is a collaborative and multipurpose network of minimally disturbed watersheds and monitoring sites. The purpose of this website is to allow users to search the NNRW database of reference watersheds, to identify watersheds of interest, and download watershed information and water quality data. The current scope of the network is limited to freshwater streams. Membership in the network is voluntary and open to individuals, agencies, and institutions interested in participating in monitoring and (or) research in minimally disturbed and pristine



WHAT IS A REFERENCE WATERSHED?

The NNRW defines reference watersheds as those minimally disturbed by human activity preferably in an area protected from human-induced changes. Reference watersheds can be used to measure changes in soil chemistry, vegetation, water quality, and biology through time as well as to compare to disturbed watersheds.

The network is currently composed mainly of U.S. Geological Survey and U.S. Environmental Protection Agency watersheds however, as the network expands watersheds will be added from other Federal, State, tribal, interstate, academic, local and private sector organizations that choose to participate.



The "Watershed Search" section of the website allows users to search the entire network database. The database includes many types of reference watersheds; some are considered reference based on low hydrologic disturbance, others based on land use disturbance, and others based on water quality, stream biology, or some combination of criteria. Results of users searches can placed into context with all watersheds in the database on cumulative frequency diagrams like the one to the right.

The "Core Watersheds" section of the website allows users to search a subset of the NNRW database that contains only the most pristine watersheds based on specific land use criteria. Core watersheds also have stream discharge data available.

Select the "Core Watersheds" tab to explore the most pristine watersheds in the network or select the "Watershed Search" tab to search the entire NNRW database of reference watersheds and access data available for those sites.

If you would like to submit a watershed or a group of watersheds to be included in the network please contact [Mike McHale](#)

TODAY'S FEATURED WATERSHED

Merced River



The Merced River Basin is located on the western slope of the central Sierra Nevada, in the Sierra-Cascade Mountains physiographic province in central...

WATERSHEDS WHERE I LIVE

Find a **Core Reference Watershed** near your location
Input either a 5 digit zipcode or latitude and longitude (in decimal degrees).

Zipcode: Latitude: Longitude:



The National Network of Reference Watersheds

- About NNRW
- Core Watersheds**
- Watershed Search
- User Guide
- Cooperators

NNRW Core Watersheds

The National Network of Reference Watersheds has defined a set of "Core" reference watersheds. NNRW Core watersheds meet the following criteria: Low hydrologic disturbance (dams, water withdrawal, pollutant discharge); 0% Row Crops; < 5% Pasture; 0% High Impact Development; 0% Medium Impact Development; < 10% Total Development (High + Medium + Low); Natural vegetation + Barren Land > 75%. Core reference watersheds also have stream discharge data available. The NNRW core reference watersheds are defined using land use characteristics calculated from the National Land Cover and Land Use dataset from 2006.

NNRW Core watersheds can be used is to define reference or "background" conditions across the Nation and to measure changes in baseline conditions through time or to compare to disturbed areas. To search for Core Watersheds, first define the area(s) of interest and then choose the water quality parameters of interest.

Areas of Interest

State(s):

Counties will be loaded here according to states selected

Level II Ecoregions:

Water Resources Regions:

Select Sites by Group

Agency(s)/Partner(s):

Program(s)/Network(s):

Water Quality Data (optional)

Characteristic Group:

Time Period:

Start Date: / / End Date: / /

Proximity to NADP Station

Watersheds within km of an NADP station

Watershed Area and Elevation

Watershed Area (range) to square kilometersElevation at outlet (range) to meters

- NADP Sites
- Level II Ecoregions
- Water Resource Regions



NNRW “Core” Watersheds

- 0% Row Crops
 - < 5% Pasture
 - 0% High Impact Development
 - 0% Medium Impact Development
 - < 10% Low Impact Development
 - Low hydrologic disturbance (no Major Dams, low storage)
 - Based on the 2006 National Land Cover Dataset.
 - There are currently 504 NNRW Core watersheds
- 

Agency(s)/Partner(s):

Select Some Options

Program(s)/Network(s):

Select Some Options

Watershed Area and Elevation

Watershed Area (range) to square kilometers

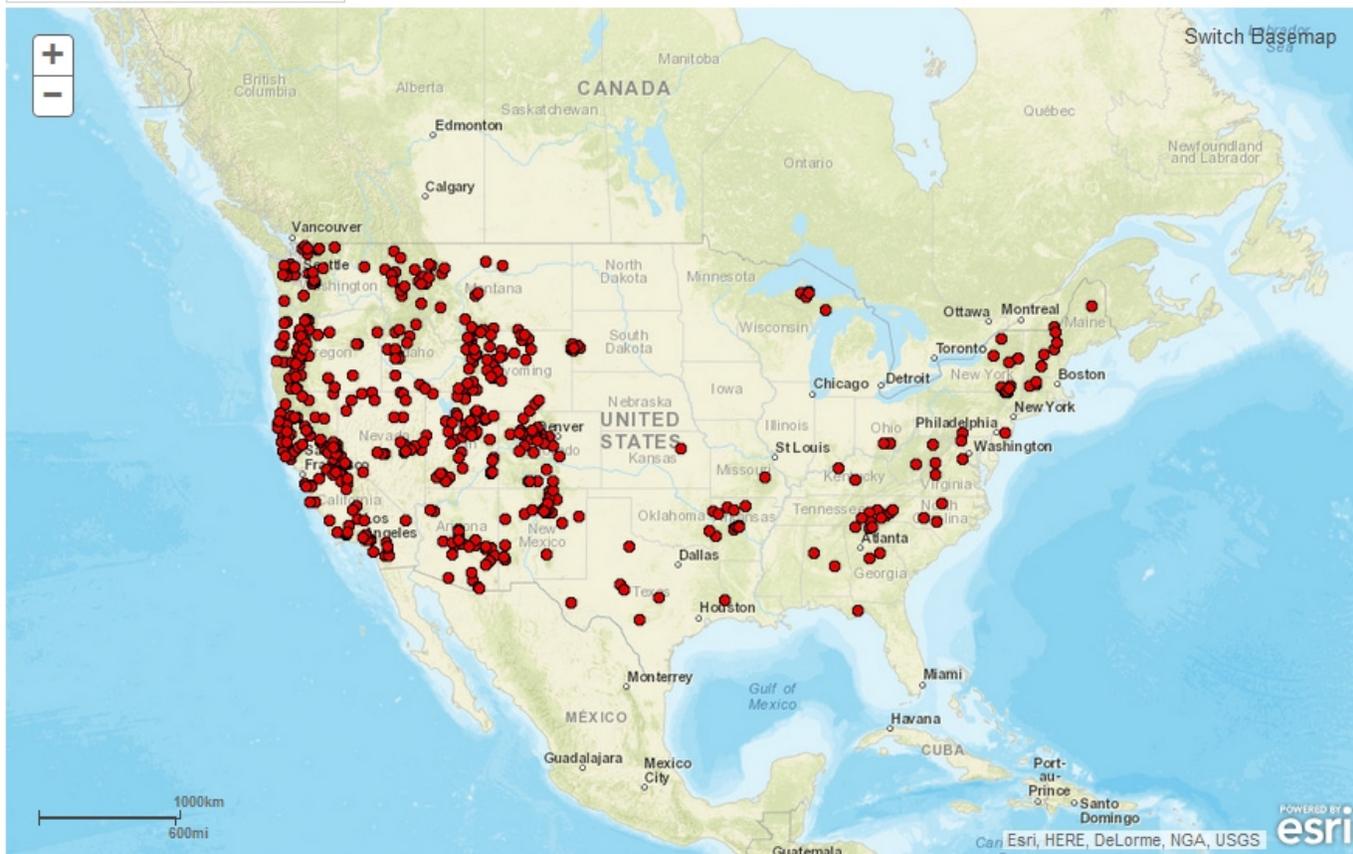
Elevation at outlet (range) to meters

Submit

Download Water Quality Data

Cumulative Frequency Chart

- NADP Sites
- Level II Ecoregions
- Water Resource Regions



504 Sites

▶ Expand Results Table



The National Network of Reference Watersheds

[About NNRW](#)

[Core Watersheds](#)

[Watershed Search](#)

[User Guide](#)

[Cooperators](#)

Watershed Search

The National Network of Reference Watersheds includes many types of reference watersheds; some are considered reference based on low hydrologic disturbance, others based on land use disturbance, and others based on water quality, stream biology, or some combination of criteria. This search allows users to search the NNRW database by specifying region, collecting agency and/or program, land use characteristics, and available water quality parameters. The network includes about 2500 watersheds, not all of which have water quality data available. You may select from any of the categories, but it is not necessary to select from all of the categories.

Areas of Interest

You may choose multiple parameters in a regional group (States, EPA Ecoregion, or Water Resources Region)

State(s):

Counties will be loaded here according to states selected

Level II Ecoregions:

Water Resources Regions:

Select Sites by Group

Agency(s)/Partner(s):

Program(s)/Network(s):

Watershed Characteristics

Watershed Area (range) to square kilometers

Elevation at outlet (range) to meters

2011 National Land Cover

Dataset Land Use Classification

- % Water
- % Developed, Low Intensity
- % Developed, Med. Intensity
- % Developed, High Intensity
- % Barren
- % Forest
- % Shrubland

Search on Site Impact Data

- Disturbances Allowed
- Flow Alterations (Dams)
- Pollutant Discharge

Land Use Disturbance Metric to unitless metric

Proximity to NADP Station

Watershed Search

The National Network of Reference Watersheds includes many types of reference watersheds; some are considered reference based on low hydrologic disturbance, others based on land use disturbance, and others based on water quality, stream biology, or some combination of criteria. This search allows users to search the NNRW database by specifying region, collecting agency and/or program, land use characteristics, and available water quality parameters. The network includes about 2500 watersheds, not all of which have water quality data available. You may select from any of the categories, but it is not necessary to select from all of the categories.

Areas of Interest

You may choose multiple parameters in a regional group (States, EPA Ecoregion, or Water Resources Region)

State(s):

FL

County(s):

Select Some Options

Level II Ecoregions:

Select Some Options

Water Resources Regions:

Select Some Options

Select Sites by Group

Agency(s)/Partner(s):

Select Some Options

Program(s)/Network(s):

Select Some Options

Watershed Characteristics

Watershed Area (range) to square kilometers

Elevation at outlet (range) to meters

2011 National Land Cover

Dataset Land Use Classification

≤ ≥ % Water

≤ ≥ % Developed, Low Intensity

≤ ≥ % Developed, Med. Intensity

≤ ≥ % Developed, High Intensity

≤ ≥ % Barren

≤ 70 ≥ % Forest

≤ ≥ % Shrubland

≤ ≥ % Herbaceous

≤ ≥ % Pasture

≤ ≥ % Row Crops

≤ ≥ % Wetlands

≤ ≥ % Natural Land Cover

Search on Site Impact Data

Disturbances Allowed

Flow Alterations (Dams)

Pollutant Discharge

Land Use Disturbance Metric

to unitless metric

Proximity to NADP Station

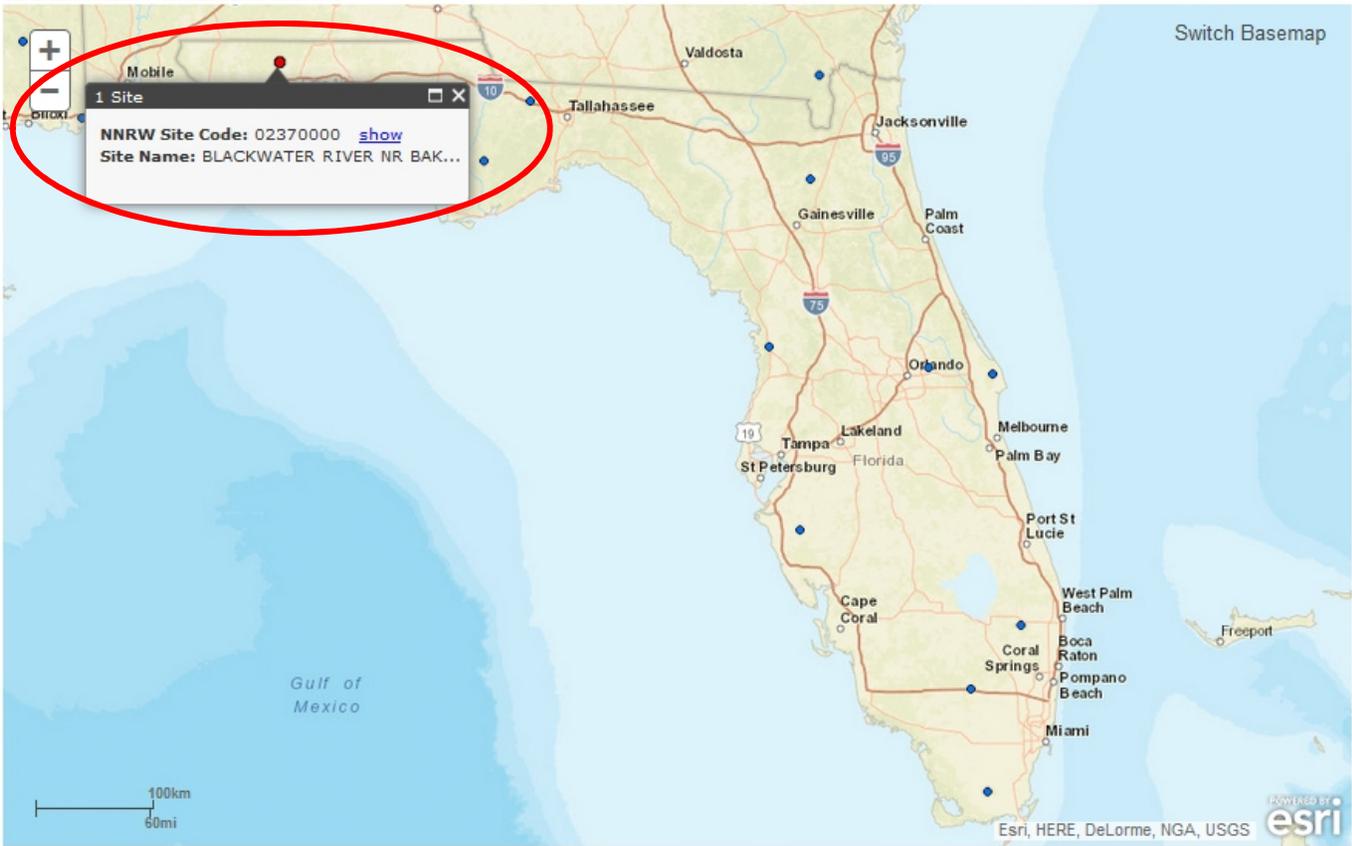
Watersheds within km of an NADP station

Water Quality Data

Search Results

[Download Water Quality Data](#) [Cumulative Frequency Chart](#)

- NADP Sites
- Level II Ecoregions
- Water Resource Regions



1 Sites

[▼ Hide Results Table](#)

[Download as Excel File](#)

Site Name	Site Code	Disturbance Metric	Dams	Outfalls	Withdrawals	State	HUC02
BLACKWATER RIVER NR BAKER, FLA.	02370000	11.8	5	0.0	16.649	FL	03

Navigation bar with left and right arrows and a vertical bar in the center.

The National Network of Reference Watersheds

About NNRW

Core Watersheds

Watershed Search

User Guide

Cooperators

BLACKWATER RIVER NR BAKER, FLA.

Site Code: 02370000
Agency(s)/Partner(s): USGS
Program(s)/Network(s): GAGES-II
Coordinates: 30.8335197/-86.7346786
Elevation: 24.0m
Watershed Area: 534.3345km²
Core Watershed?: Yes
Gaging Station Information: http://waterdata.usgs.gov/nwis/inventory/?site_no=02370000&agency_cd=USGS

Download QW Data



Site Geospatial Units:

State: FL
County: Okaloosa
Ecoregion Level II: 8.3
Ecoregion Level III: 65
Water Resources Region: South Atlantic-Gulf Region

Site Impact:

Dams: 5
Outfalls: 0.0
Withdrawals: 16.649
Disturbance Metric: 11.8

2011 Land Cover Data Year

2011 Site Land Cover Summary:

Barren Land (Rock/Sand/Clay): 0.01%
Developed, Open Space: 3.10%
Developed, High Intensity: 0.00%
Developed, Low Intensity: 0.11%
Developed, Medium Intensity: 0.01%
Total Developed: 3.22%
Deciduous Forest: 2.39%
Evergreen Forest: 62.28%
Mixed Forest: 7.79%
Total Forest: 72.46%
Grassland/Herbaceous: 3.10%
Pasture/Hay: 4.72%
Cultivated Crops: 3.52%
Planted/Cultivated Total: 8.24%
Shrub/Scrub: 8.69%
Open Water: 0.55%
Emergent Herbaceous Wetlands: 0.06%
Woody Wetlands: 3.66%
Total Wetlands: 3.73%
Natural Land Cover Total: 87.99%

Closest National Atmospheric Deposition Program Station:

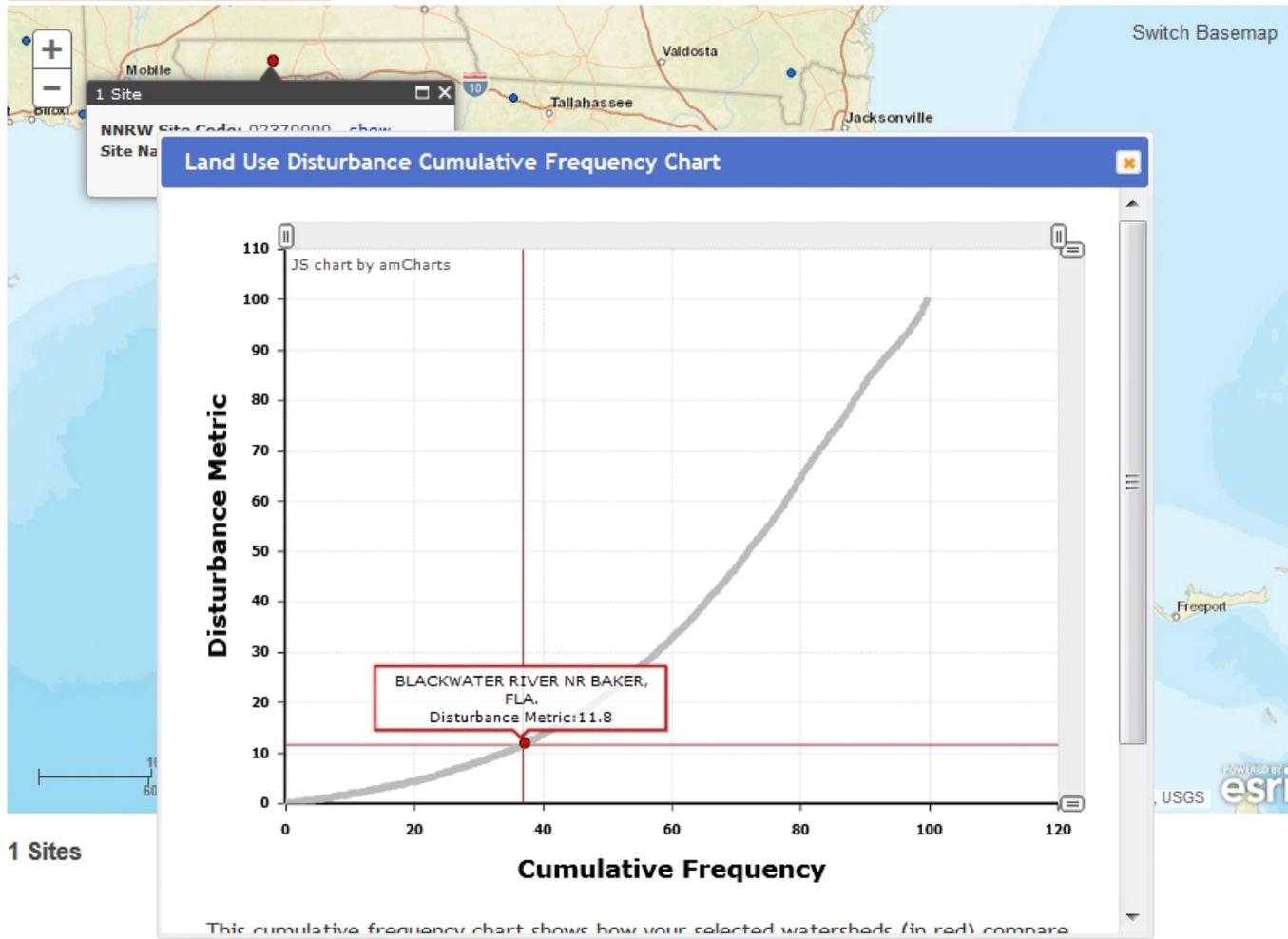
NADP Code: FL96
NADP Name: Pensacola
NADP Site Coordinates: 30.550/-87.376
NADP Hyperlink: <http://nadp.sws.uiuc.edu/data/sites/siteDetails.aspx?net=NTN&id=FL96>
Distance from this site to NADP Site: 67.185km

Search Results

Download Water Quality Data

Cumulative Frequency Chart

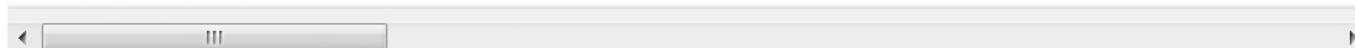
- NADP Sites
- Level II Ecoregions
- Water Resource Regions



1 Sites

Download as Excel File

Site Name	Site Code	Disturbance Metric	Dams	Outfalls	Withdrawals	State	HUC02
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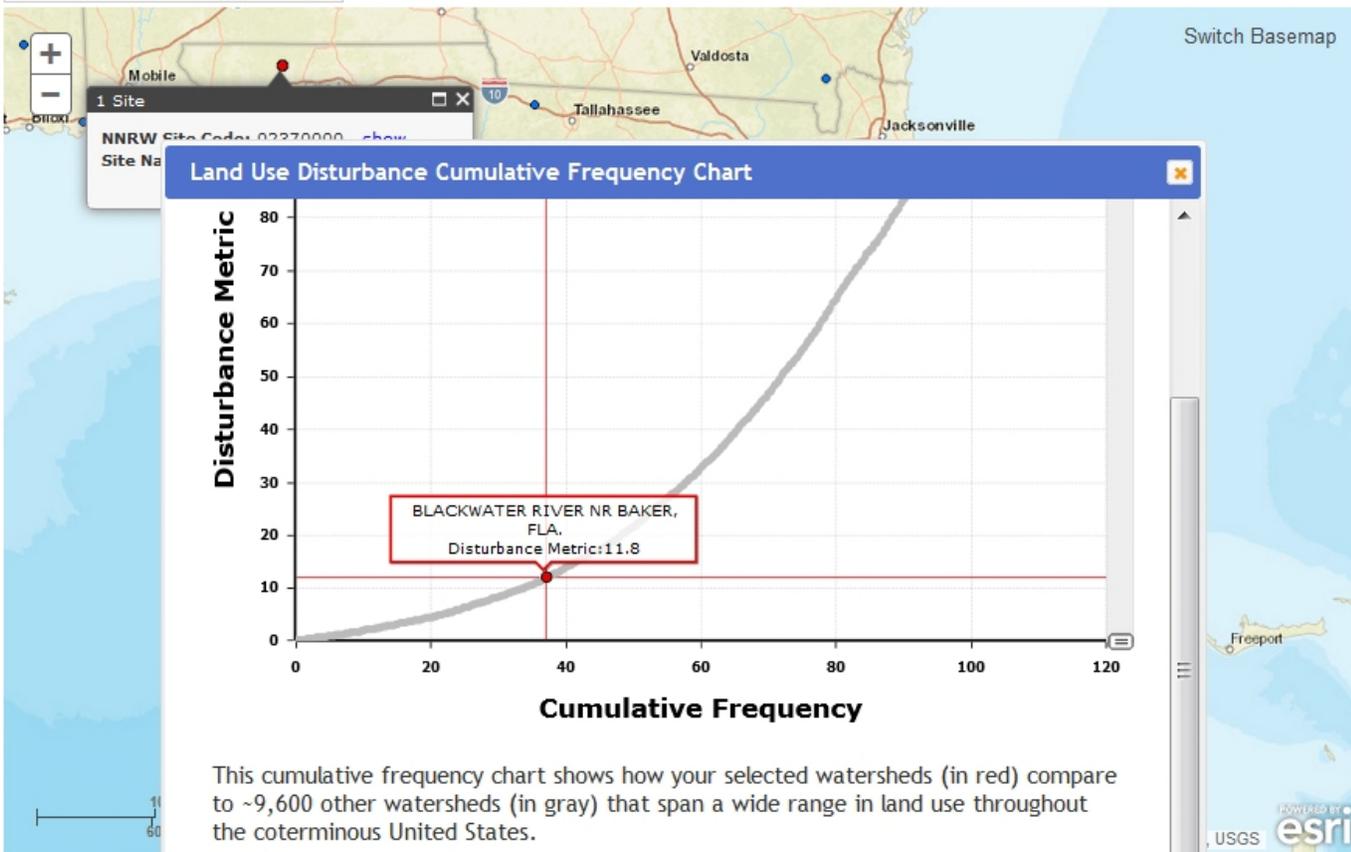


Search Results

Download Water Quality Data

Cumulative Frequency Chart

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- Water Resource Regions



1 Sites

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BLACKWATER RIVER NR BAKER, FLA.	02370000	11.8	5	0.0	16.649	FL	03

NNRW Land Use Disturbance Metric

- ▶ It must be able to be calculated with readily accessible data.
- ▶ It must be easily understood and have physical meaning.
- ▶ The metric should be related to water quality e.g., the higher the disturbance the worse the water quality.

$\% \text{ Developed Land Use} + \% \text{ Agricultural Land Use} - \text{Natural Land Use}$
The result is divided by 2 and 50 is added to scale it from 0 to 100

NNRW Direction

- ▶ We are currently working with Britta Bierwagon and Jen Stamp to incorporate Regional Monitoring Network watersheds into the database. We are also talking to the NPS and we have many watersheds from the Ca Dept. of Fish & Wildlife we are working through.
 - ▶ We are looking for other federal and state agencies to help fill-in the gaps in the “Core Watersheds”
 - ▶ Preferably these are sites that are currently active, collecting water quality data, and ideally have “long-term” QW data
- 

NNRW Direction cont.

- ▶ Watershed Shapefiles are critical in order to calculate watershed characteristics
- ▶ We will calculate the WS characteristics or show you how to do it.



National Water Quality Monitoring Council

Working together for clean water

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2016 Conference

Methods & Protocols

Monitoring Networks

Volunteer Monitoring

Water Quality Data

Newsletter

Webinar Series

Meeting Minutes

YouTube Channel

ACWI

EPA

USGS

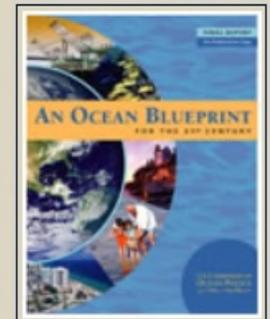
Monitoring Networks

[National Monitoring Network](#)

[National Network of Reference Watersheds](#)

National Monitoring Network

The [National Monitoring Network](#) was designed by the Council and more than 80 stakeholders in response to a recommendation by the U.S. Commission on Ocean Policy in 2004. The Network integrates biological, chemical, and physical features and links uplands to the coastal ocean. It is, in reality, comprised of a “network of networks” and represents an integrated, multidisciplinary, and multi-organizational approach that leverages diverse sources of data and information; augments existing monitoring programs; and links observational capabilities.



National Network of Reference Watersheds

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The National Network of Reference Watersheds

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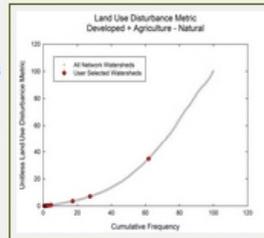
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TODAY'S FEATURED WATERSHED

Merced River



The Merced River Basin is located on the western slope of the central Sierra Nevada, in the Sierra-Cascade Mountains physiographic province in central...

WATERSHEDS WHERE I LIVE

Find a Core Reference Watershed near your location
Input either a 5 digit zipcode or latitude and longitude (in decimal degrees).

Zipcode:

Latitude:

Longitude:

Submit

<https://my.usgs.gov/nnrw/>

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