

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

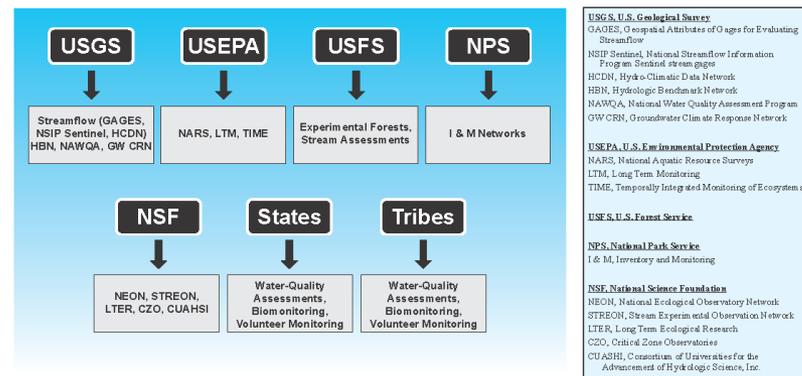


Figure 1. Monitoring networks and programs of Federal and State agencies and non-Governmental organizations that are candidates for inclusion in the design and operation of a collaborative reference watershed network.



Goals

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

FY 2013-14 Workplan Tasks

Task 1: Inventory of historic and current reference site monitoring

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

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





NATIONAL WATER QUALITY MONITORING COUNCIL



Working Together for Clean Water

- About NNRW
- Network Map
- Network Sites
- Data Access
- Reference QW
- About the Data
- Cooperators

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.

TODAY'S FEATURED WATERSHED

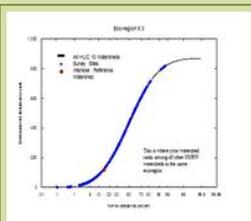
Kawishiwi River, MN



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.

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](#)

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)

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 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:

Longitude:

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 Water Quality

Aquatic Biota Watershed Soil Chemistry

Groundwater Elevation Groundwater Quality

Meteorological Data

Additional Information for Intensive Research Watersheds

Site Picture:

Site Description:

Site Web Link:

Number of Partnering Agencies/Institutions:

Agency/Institution Name: Agency/Institution Role:



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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)

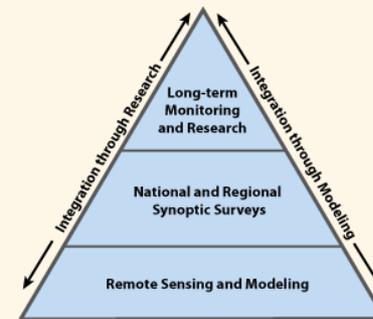
State(s):

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

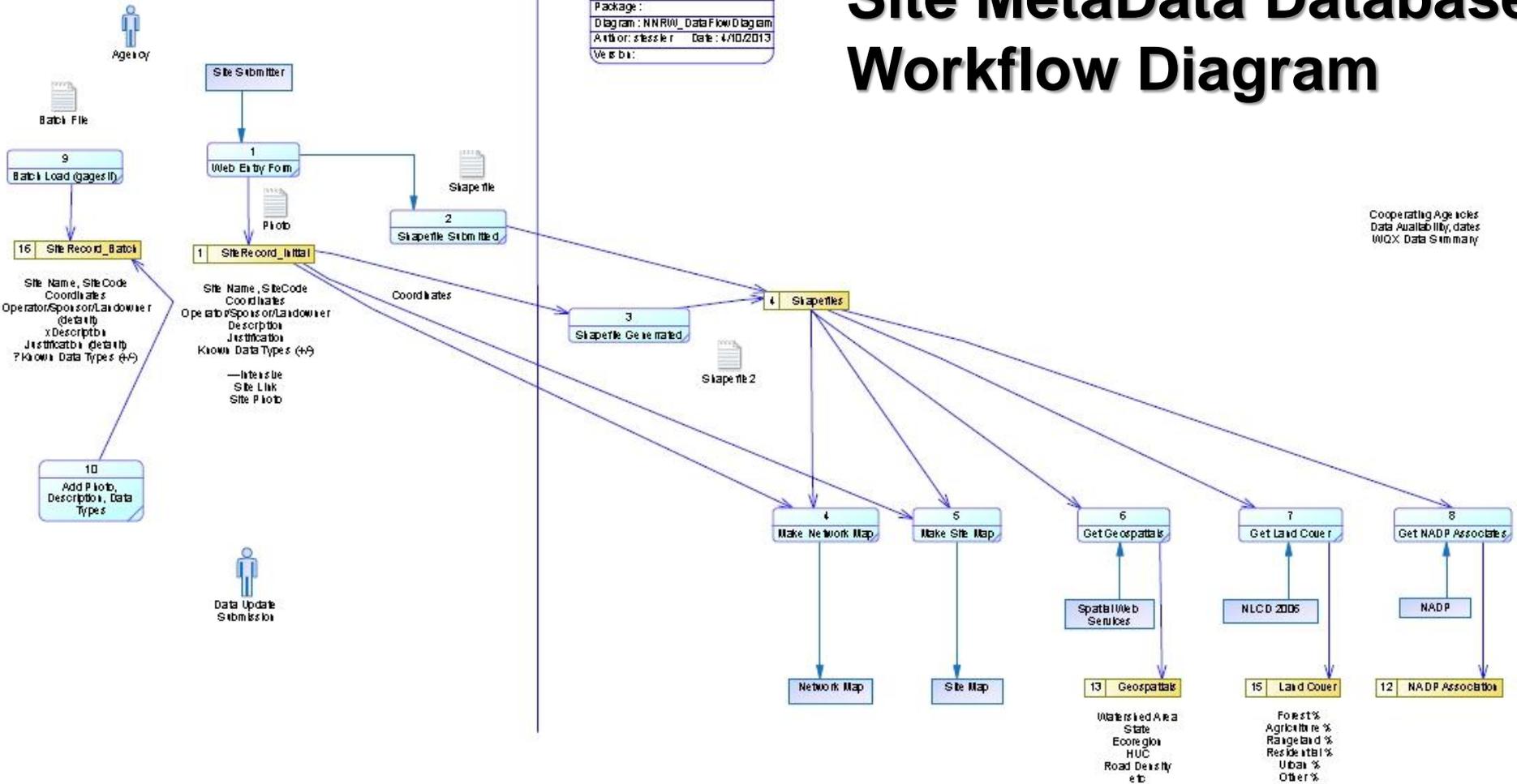
Data Availability

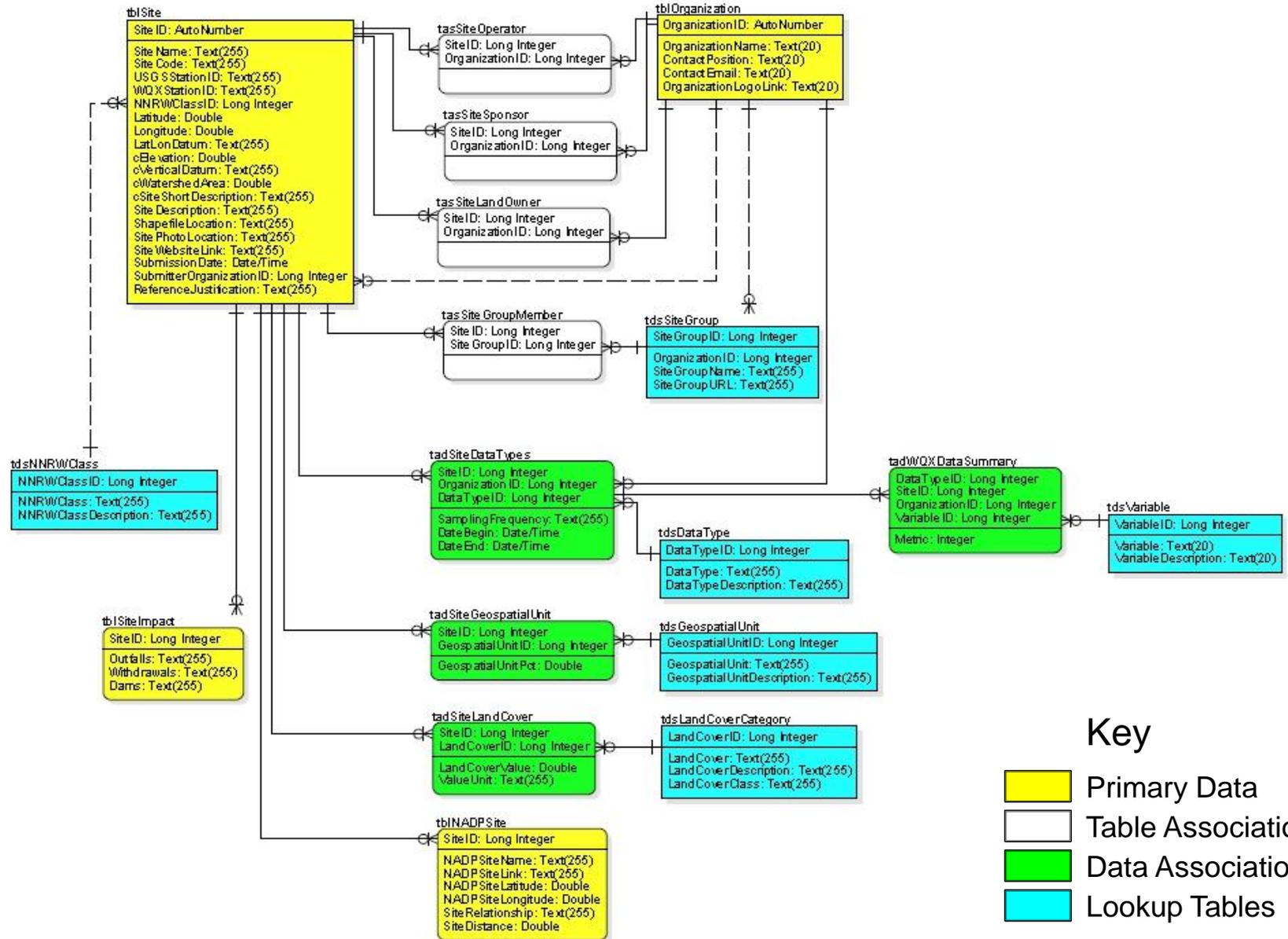
Date Range

Site MetaData Database Workflow Diagram

Business Process Model
 Model: NNRW Data Flow
 Package:
 Diagram: NNRW_DataFlowDiagram
 Author: slessler Date: 4/10/2013
 Version:

Cooperating Agencies
 Data Availability dates
 WQX Data Summary





Microsoft Access

File Home Create External Data Database Tools Acrobat Table Tools Fields Table

View Paste Copy Format Painter Filter Filter Ascending Descending Selection Advanced Remove Sort Toggle Filter Refresh All New Save Delete More Records Find Find Replace Go To Select Size to Fit Form Switch Windows Text Formatting

All Access Objects

Search...

Tables

- GagesRefSites
- tadSiteDataType
- tadSiteGeospatialUnit
- tadSiteLandCover
- tadWQXDataSummary
- tasSiteGroupMember
- tasSiteLandOwner
- tasSiteOperator
- tasSiteSponsor
- tblINADPSite
- tblOrganization
- tblSite
- tblSiteImpact
- tdsDataType
- tdsGeospatialUnit
- tdsLandCoverCategory
- tdsNNRWClass
- tdsSiteGroup
- tdsVariable
- Bas_Classif
- BasinID
- HydroMod_Dams
- HydroMod_Other
- Landscape_Pat
- LC06_Basin
- Pop_Infrastr
- Prot_Areas
- Regions
- Topo

Queries

- GagesRefSites_Load
- GagesRefSites_PURGE

GagesRefSites

STAIID	CLASS	STANAME	DRAIN_SQKI	HUC02	LAT_GAGE	LNG_GAGE	STATE	COUNTYNAM	AGGECOREG	HYD
01085800	Ref	WEST BRANCH	14.7681 01		43.25924306	-72.0259169	NH	Merrimack	NorthEast	
01086000	Ref	WARNER RIVER	381.5766 01		43.25118944	-71.7322997	NH	Merrimack	NorthEast	
01091000	Ref	SOUTH BRANCH	266.7591 01		43.01480528	-71.64146139	NH	Hillsborough	NorthEast	
01093800	Ref	STONY BROOK	9.3897 01		42.8600847	-71.8328544	NH	Hillsborough	NorthEast	
01096503	Ref	NISSITISSIT RIV	155.7549 01		42.672034	-71.577013	MA	Middlesex	NorthEast	
01109090	Ref	RATTLESNAKE R	12.771 01		41.77677	-71.08921	MA	Bristol	NorthEast	
01115630	Ref	NOOSENECK RIV	21.7368 01		41.626767	-71.632565	RI	Kent	NorthEast	
01115670	Ref	CONGDON RIV	10.899 01		41.612322	-71.622842	RI	Kent	NorthEast	
01115770	Ref	CARR RIVER NE	18.9081 01		41.643156	-71.607842	RI	Kent	NorthEast	
01117370	Ref	QUEEN R AT LIE	50.4774 01		41.53899	-71.568673	RI	Washington	NorthEast	
01117468	Ref	BEAVER RIVER	25.3413 01		41.49260028	-71.6281194	RI	Washington	NorthEast	
01117800	Ref	WOOD RIVER N	90.76591 01		41.5739883	-71.720623	RI	Washington	NorthEast	
01118300	Ref	PENDLETON HI	10.3644 01		41.47482139	-71.8342372	CT	New London	NorthEast	
01120500	Ref	SAFFORD BK N	6.6564 01		41.9264861	-72.0570197	CT	Windham	NorthEast	
01121000	Ref	MOUNT HOPE R	70.25372 01		41.84370889	-72.1689661	CT	Windham	NorthEast	
01123000	Ref	LITTLE RIVER N	77.85271 01		41.671765	-72.052298	CT	Windham	NorthEast	
01127880	Ref	BIG BROOK NE	16.9623 01		45.13504639	-71.20590778	NH	Coos	NorthEast	
01130000	Ref	UPPER AMMON	597.9547 01		44.62505306	-71.46897222	NH	Coos	NorthEast	
01134500	Ref	MOOSE RIVER A	195.1299 01		44.51172311	-71.8373143	VT	Essex	NorthEast	
01135000	Ref	MOOSE RIVER A	334.305 01		44.42283589	-72.00009448	VT	Caledonia	NorthEast	
01135150	Ref	POPE BROOK (S	10.1016 01		44.476167	-72.124543	VT	Caledonia	NorthEast	
01135300	Ref	SLEEPERS RIVE	111.1173 01		44.435335	-72.038429	VT	Caledonia	NorthEast	
01137500	Ref	AMMONOOSU	228.5543 01		44.2686741	-71.63036172	NH	Grafton	NorthEast	
01138000	Ref	AMMONOOSU	1026.288 01		44.15395258	-71.98564544	NH	Grafton	NorthEast	
01139000	Ref	WELLS RIVER A	246.3333 01		44.15034134	-72.06509154	VT	Orange	NorthEast	
01139800	Ref	EAST ORANGE I	22.7997 01		44.09284191	-72.33565327	VT	Orange	NorthEast	
01141800	Ref	MINK BROOK N	12.2805 01		43.7022933	-72.187033	NH	Grafton	NorthEast	
01142500	Ref	AYERS BROOK A	82.16668 01		43.93450969	-72.65788214	VT	Orange	NorthEast	
01144000	Ref	WHITE RIVER A	1790.244 01		43.7142361	-72.41814889	VT	Windsor	NorthEast	
01145000	Ref	MASCOMA RIV	208.1349 01		43.65118308	-72.08480849	NH	Grafton	NorthEast	
01150900	Ref	OTTAUQUECHE	61.1667 01		43.62229069	-72.7589899	VT	Rutland	NorthEast	
01153500	Ref	WILLIAMS RIVE	263.3301 01		43.2086872	-72.5175894	VT	Windham	NorthEast	
01154000	Ref	SAXTOMS RIVE	187.3278 01		43.13757777	-72.4881444	VT	Windham	NorthEast	
01155000	Ref	COLD RIVER AT	215.4186 01		43.13174443	-72.39036554	NH	Cheshire	NorthEast	
01162500	Ref	PRIEST BROOK	49.70559 01		42.6825859	-72.1150812	MA	Worcester	NorthEast	

Record: 1 of 1947

Datasheet View

Num Lock

8:51 PM 6/3/2013

Intensive Site Definition

Current Definition: Continuous discharge is available and QW is available at a minimum of seasonally.

Problem: What if that creates too many intensive sites?

Other Possibilities

- ▶ We could limit specific site pages to those watersheds that contain and NADP deposition station creating deposition – stream water paired sites.
- ▶ We could define a subset of “least disturbed” NNRW sites. The sites could be identified using a disturbance metric, all sites in the lowest 5–10% of the disturbance metric would be flagged as least disturbed.

NNRW Disturbance Metric Idea

Develop a metric that can be calculated automatically by capturing watershed disturbance criteria using data clipped from web services enabled data layers.

- ▶ Road Density
- ▶ Land Use/Land Cover
- ▶ Fragmentation
- ▶ National Dam Database
- ▶ Census Data (housing and population density)

The metric would need to be developed by a team of experts.



National Network of Reference Watersheds

Development Tasks **Year 1**

- ✓ 1. Create the Network Website (**I am still working on it**)
- ✓ 2. Construct or adopt a network data model (Site Metadata)
- ✓ 3. Build the database and populate it with the existing reference sites
- ~~4. Define and Create **LINK the NNRW** Data Access Portal to the Water Quality Portal. **Fall 2014**~~
5. Present website to the Council (**December meeting**) and launch the site for the **2014 NWQMC Meeting**.

National Network of Reference Watersheds

Executive Committee
Rick Haeuber, USEPA
Neil Kamman, VTDEC
Doug McLaughlin, NCASI
Bill Wilber, USGS

