



The Penn State Approach to Watershed Conditional Assessment

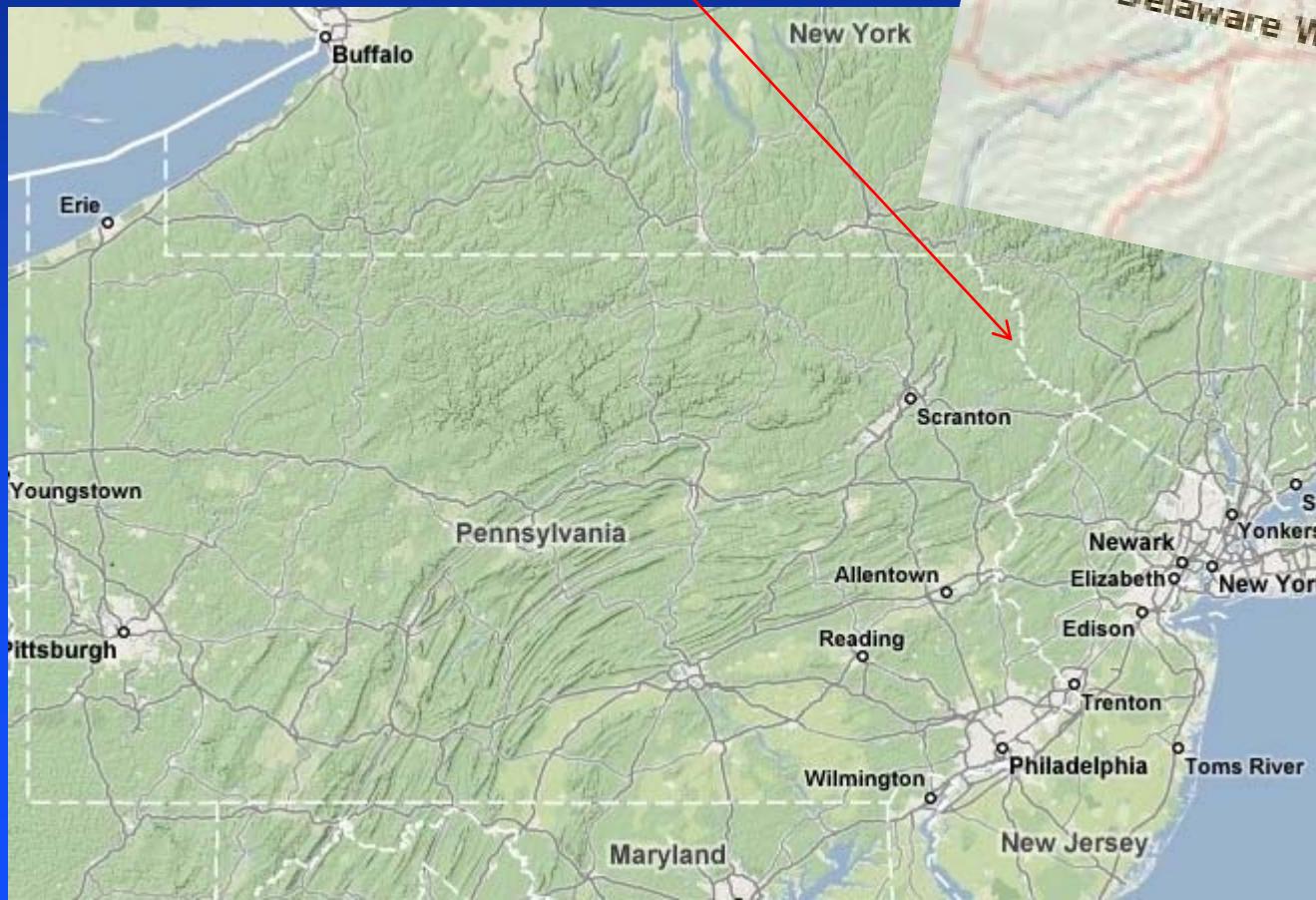
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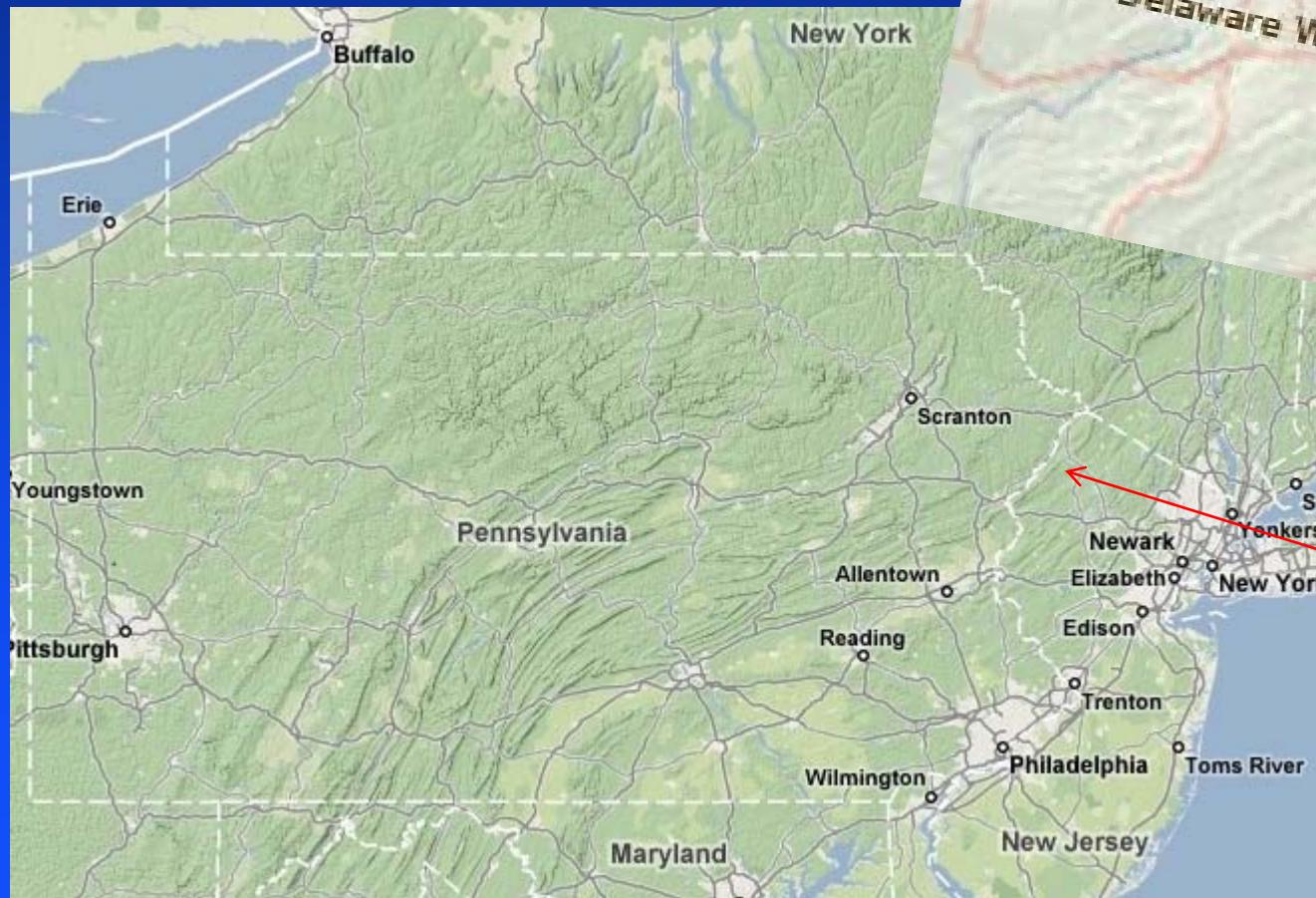
Upper Delaware Scenic and Recreational River
and
Delaware Water Gap National Recreational Area

Bruce J. Miller – Penn State University
Alan C. Ellsworth – National Park Service



UPDE





DEWA



Upper Delaware

Scenic and Recreational River
New York, Pennsylvania

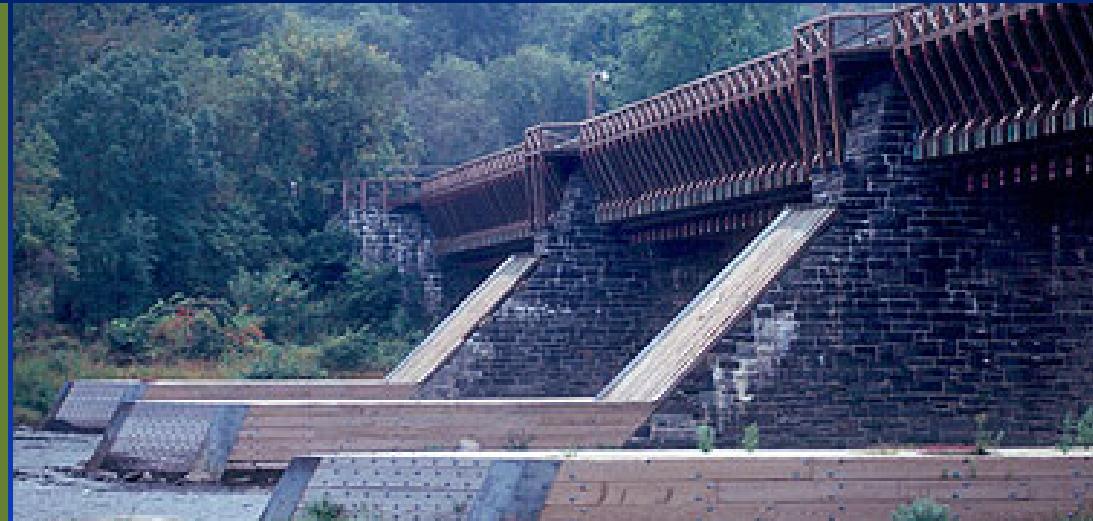


- Wild and Scenic River System
- 73 Miles of Mainstem Delaware River
- Bisects Southeast New York and Northeast Pennsylvania
- Supports boating, swimming, fishing, and hiking



Upper Delaware

Scenic and Recreational River
New York, Pennsylvania



- One of cleanest free-flowing rivers in eastern US
- World class trout fishery
- T&E species – Dwarf Wedge Mussel & Am Bald Eagle
- Very little land area – subject to land use decisions in surrounding watersheds



Delaware Water Gap
National Recreation Area
and
Middle Delaware
National Scenic River

Pennsylvania, New Jersey



- 40 Miles of Mainstem Delaware River
- Bounds New Jersey and Pennsylvania
- 67,000 acres of mountain ridge, forest, and floodplain
- Supports boating, swimming, fishing, and hiking



Delaware Water Gap
National Recreation Area
and
Middle Delaware
National Scenic River

Pennsylvania, New Jersey



- Black bear, timber rattlesnakes, bald eagles, nesting peregrine falcons
- Hemlock ravines, trout streams, lakes, ponds, some of highest waterfalls of either state
- Exceptional Water Quality



UPDEWA



- Share a common river with exceptional water quality
- Neither park has much land area
- Only a small percentage of watersheds within parks
- Water quality influenced by forces outside the parks
- Each spans two states, many counties and municipalities



Why WCA is important to UPDEWA?



- Centralized Data Repository
- Information Synthesis
- Access to current conditions and current data
- Informs water and other NR management planning



The Penn State Team



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- Carolyn Mahan, PhD – Penn State University



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- Mike Saunders, PhD – Penn State University



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- John Young, PhD – USGS, Leetown Science Center



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Penn State Approach

- “Living Document”
- Continuous Assessment VS Snapshot Assessment
- Infrastructure VS Report



Methodology

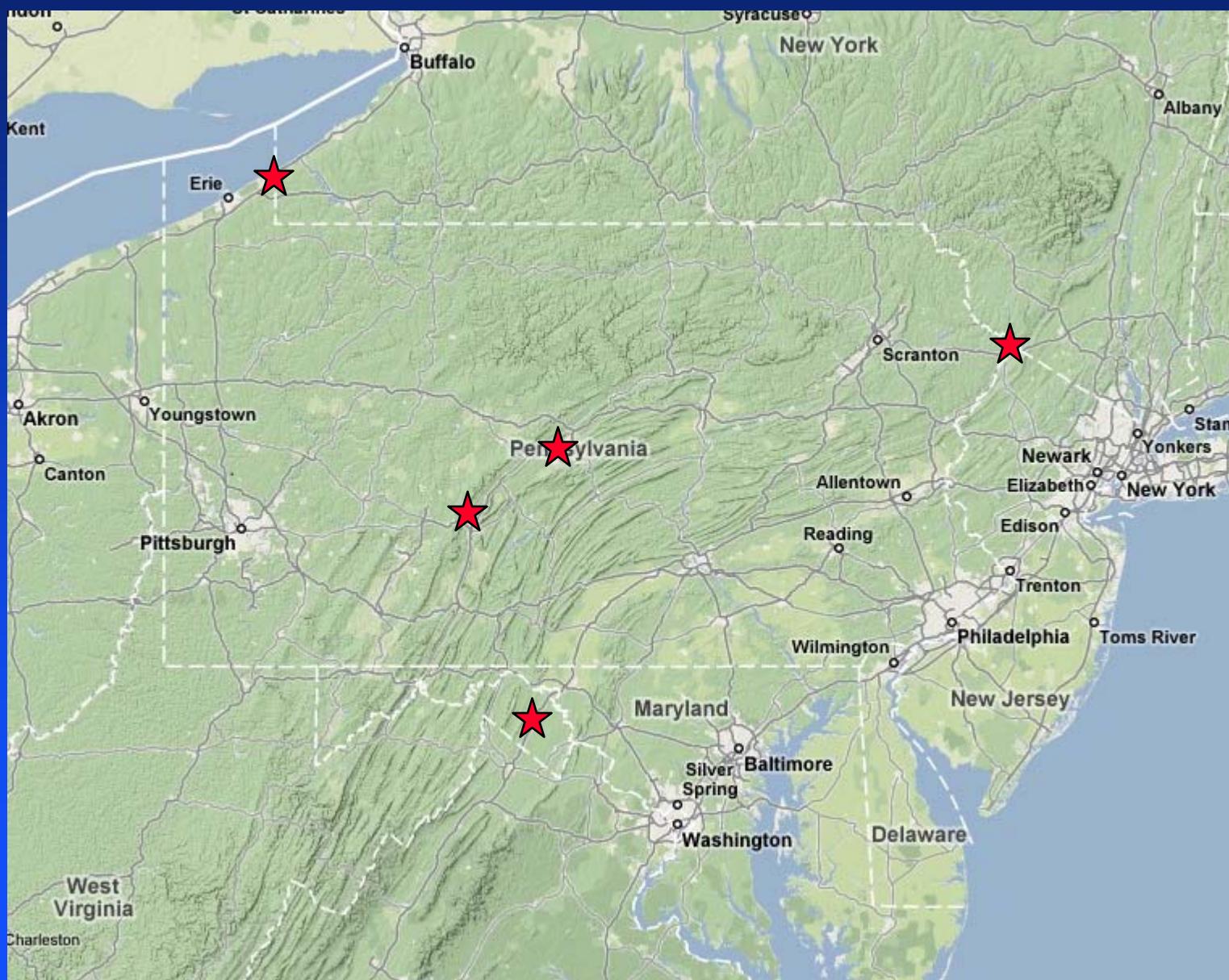
- Collaboration
- Data Collection/Entry
- Data Aggregation
- Data Assessment
- Results Synthesis
- Results Presentation



Collaboration



Collaboration





Delaware Water Gap - Wikipedia, the free encyclopedia - Mozilla Firefox

File Edit View History Bookmarks Tools Help

W http://en.wikipedia.org/wiki/Delaware_Water_Gap

Sign in / create account

article discussion edit this page history

Delaware Water Gap

From Wikipedia, the free encyclopedia

Coordinates: 40°58'11.58"N, 75°07'19.14"W

The Delaware Water Gap is on the border of New Jersey and Pennsylvania where the Delaware River traverses a large ridge of the Appalachian Mountains. A water gap is a geological formation where a river cuts through a mountain ridge.

The Delaware Water Gap is the site of the Delaware Water Gap National Recreation Area, which is used primarily for recreational purposes, such as rafting, canoeing, swimming, fishing, hiking and rock climbing. With a fishing license, one can fish in the Delaware for carp, shad and other fish.

Geography and boundaries

[edit]

The ridge of the Appalachians that the Delaware crosses is called the Blue Mountains in Pennsylvania and the Kittatinny Ridge in New Jersey. The New Jersey mountain is Mt. Tammany (located in Worthington State Forest); the Pennsylvania mountain is Mount Minsi. The summit of Tammany is 1200 ft (360 m) above the river. The Appalachian Trail threads the gap, and climbs the Kittatinneys alongside Dunnfield Creek.

The Washington State Forest is to the immediate northeast on

Delaware Water Gap

Delaware Water Gap	
Elevation	
Location	New Jersey/Pennsylvania, United States
Range	Blue Mountains/Kittatinny Ridge
Traversed by	Interstate 80

Done

MediaWiki Software



Delaware Water Gap - Wikipedia, the free encyclopedia - Mozilla Firefox

File Edit View History Bookmarks Tools Help

W http://en.wikipedia.org/wiki/Delaware_Water_Gap Google

Sign in / create account

Delaware Water Gap

From Wikipedia, the free encyclopedia

Coordinates: 40°58'11.58"N, 75°07'19.14"W

Delaware Water Gap, Pennsylvania is also a town located near the gap.

The Delaware Water Gap is on the border of New Jersey and Pennsylvania where the Delaware River traverses a large ridge of the Appalachian Mountains. A water gap is a geological formation where a river cuts through a mountain ridge.

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The Washington State Forest is to the immediate northeast on





Notepad++ - C:_Web_\wamp\mediawiki\extensions\wca.php

wca.php

```

1 <?php
2 // add to LocalSettings.php: include("extensions/wca.php");
3
4 // form is: <wca_watershed_data>site_name watershed_name>wca_watershed_data
5
6 SwgExtensionFunctions[] = "wfWcaDataWatershedExtension";
7 SwgExtensionFunctions[] = "wfWcaDataIndicatorExtension";
8
9 function wfWcaDataWatershedExtension() {
10     global $wgParser;
11     $wgParser->setHook( "wca_watershed_data", "render_wca_watershed_data" );
12 }
13
14 function wfWcaDataIndicatorExtension() {
15     global $wgParser;
16     $wgParser->setHook( "wca_indicator_data", "render_wca_indicator_data" );
17 }
18
19 function render_wca_watershed_data( $input ) {
20     $dblink = new mysqli("mysql.beejspot.com", "*****", "*****", "WCA");
21
22     /* check connection */
23     if (mysqli_connect_errno()) {
24         return "Connect failed: " . mysqli_connect_error() . "\n";
25     }
26
27     $s = explode("|", $input);
28     $site = trim($s[0]);
29     $location = trim($s[1]);
30
31     // get the data row for the location
32     if ($data_result = $dblink->query("SELECT * FROM wca_data WHERE (site='$site')")) {
33         if ($data_row = $data_result->fetch_assoc()) {
34             $o .= "<table class='wca_data'>" ;

```

PHP Hypertext Preprocessor file | nb char : 4281 | ln : 20 | Col : 55 | Sel : 0 | UNIX | ANSI | INS

MediaWiki Software

Custom Data Display Extensions



WCA Wiki

Main Page - WcaWiki - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://wca.beajspot.com.local/wiki/Main_Page

Main Page - WcaWiki

Bjmiller my talk my preferences my watchlist my contributions log out

article discussion edit history protect delete move watch

Main Page

Welcome to the Watershed Condition Assessment private collaboration wiki.

New [edit]

- Info for new users

Access to this wiki by invitation only.
(Contact Bruce Miller for an account.)

Enter the Wiki

This page was last modified 15:00, 16 October 2006. This page has been accessed 103 times. Privacy policy About WcaWiki

Disclaimers

Powered By MediaWiki

Done

The screenshot shows a Mozilla Firefox browser window displaying the main page of a private MediaWiki instance titled "WcaWiki". The page features a large yellow sunflower image at the top left. A sidebar on the left contains sections for "navigation" (with links to Home, Indicators, Watersheds, Current events, Recent changes, and Help), "search" (with a search bar and "Go" button), and "toolbox" (with links to What links here, Related changes, Upload file, Special pages, Printable version, and Permanent link). The main content area includes a "Main Page" header, a welcome message, a "New" section with a link to "Info for new users", and a note about access being by invitation only. There is also a "Enter the Wiki" button. At the bottom, there are links for privacy policy and about the wiki, along with a "Powered By MediaWiki" logo. The browser's status bar shows the URL "http://wca.beajspot.com.local/wiki/Main_Page".



WCA Wiki

- Information
“Commons”
- Literature
Deconstruction
Repository
- Project
Documentation

The screenshot shows a Mozilla Firefox window displaying the WcaWiki homepage. The title bar reads "Home - WcaWiki - Mozilla Firefox". The menu bar includes File, Edit, View, History, Bookmarks, Tools, and Help. The main content area features a large yellow sunflower image. On the left, there is a sidebar with sections for "navigation", "search", and "toolbox". The "navigation" section contains links to Home, Indicators, Watersheds, Current events, Recent changes, and Help. The "search" section has a search bar with "Go" and "Search" buttons. The "toolbox" section includes links to What links here, Related changes, Upload file, Special pages, and Printable version. The main content area is titled "Home" and contains sections for "Contents [show]", "News", "Assessment", and "Tools". The "News" section lists several items: "Page caching has been turned off because data will not update on a cached page until the page has been edited. Unfortunately this causes pages to load more slowly.", "Individual indicators now have live data summaries across locations.", "Questions for Carolyn", "Questions for Mike", and "Questions for Bruce". The "Assessment" section lists "Indicators", "Watersheds", "Data Sources", and "Watersheds - not". The "Tools" section lists "Templates/Guidelines" and "PSU-WCA Database Manager". A "javascript:toggleToc()" button is at the bottom left, and a toolbar with various icons is at the bottom right.



WCA Wiki

- Hyper-linking
- Searchable
- Change History
- Page Watch
- RSS News Feed
- Help System

The screenshot shows a Mozilla Firefox window displaying the WcaWiki homepage. The title bar reads "Home - WcaWiki - Mozilla Firefox". The menu bar includes File, Edit, View, History, Bookmarks, Tools, and Help. The main content area features a large yellow sunflower image. On the left, there is a sidebar with sections for "navigation" (links to Home, Indicators, Watersheds, Current events, Recent changes, Help), "search" (with a search bar and Go/Search buttons), and "toolbox" (links to What links here, Related changes, Upload file, Special pages, Printable version). The main content area has several sections: "Home" (with a "Contents [show]" link), "News" (with a "[edit]" link), "Assessment" (with a "[edit]" link), and "Tools" (with a "[edit]" link). The "News" section contains a list of items: "Page caching has been turned off because data will not update on a cached page until the page has been edited. Unfortunately this causes pages to load more slowly.", "Individual indicators now have live data summaries across locations.", "Questions for Carolyn", "Questions for Mike", and "Questions for Bruce". The "Assessment" section lists "Indicators", "Watersheds", "Data Sources", and "Watersheds - not". The "Tools" section lists "Templates/Guidelines" and "PSU-WCA Database Manager". At the bottom of the page is a toolbar with icons for various functions, and a status bar at the very bottom.

WCA Wiki - Home

- News/Discussions
- Indicators
- Watersheds
- Data Sources
- Tools

Home - WcaWiki - Mozilla Firefox

File Edit View History Bookmarks Tools Help



navigation

- [Home](#)
- [Indicators](#)
- [Watersheds](#)
- [Current events](#)
- [Recent changes](#)
- [Help](#)

search

toolbox

- [What links here](#)
- [Related changes](#)
- [Upload file](#)
- [Special pages](#)
- [Printable version](#)

Home

Contents [show]

News [edit]

- Page caching has been turned off because data will not update on a cached page until the page has been edited. Unfortunately this causes pages to load more slowly.
- Individual indicators now have live data summaries across locations.
- [Questions for Carolyn](#)
- [Questions for Mike](#)
- [Questions for Bruce](#)

Assessment [edit]

- [Indicators](#)
- [Watersheds](#)
- [Data Sources](#)
- [Watersheds - not](#)

Tools [edit]

- [Templates/Guidelines](#)
- [PSU-WCA Database Manager](#)

 javascript:toggleToc()





News/Discussions

- Announcements
- Clarifications
- To-Do's
- Comments

Questions for Carolyn - WcaWiki - Mozilla Firefox

File Edit View History Bookmarks Tools Help

Bjmillier my talk my preferences my watchlist my contributions log out

article discussion edit history protect delete move unwatch

Questions for Carolyn

(add questions at the top of the list)

Contents [show]

Pending

[edit]

Answered

[edit]

Bushkill Creek

When given data for "Bushkill Creek" should I apply the data to:

- Little Bushkill
- Big Bushkill <-----
- Both
- Neither

EPT for watersheds.xls

[edit]

What is EPT?

EPT index an index of water quality based on the abundance of three pollution-sensitive orders of macroinvertebrates relative to the abundance of a hardy species of macroinvertebrate. It is calculated as the sum of the number of Ephemeroptera, Plecoptera, and Trichoptera divided by the total number of

Done



Indicators List

Indicators - WcaWiki - Mozilla Firefox

[edit]

File Edit View History Bookmarks Tools Help

■ Macroinvertebrate Model Affinity

Monroe County Water Quality Study 2003 [edit]

- Monroe County WQ Study Subcoregion
- Macroinvertebrate Score
- Habitat Score
- PA Stream Value
- CWF - Cold Water Fishes
- Warm Water Fishes
- Migratory Fishes
- Trout Stocking

Ersbak Bioassessment Study [edit]

Index of Biotic Integrity [edit]

- Index of Biotic Integrity - Ersbak
- Number of Intolerant Species
- Percent Individuals of Tolerant Species
- Percent Individuals of Carnivore Species
- Percent Individuals of Stenothermal Coolwater and Coldwater Species
- Percent Salmonid Individuals of Brook Trout
- Percent Individuals of Insectivores
- Percent Individuals of Pioneering Species

Done



Literature Deconstruction

- Metadata
- Discussion
- Data (potential indicators)

Monroe County Water Quality Study 2003 - WcaWiki - Mozilla Firefox

File Edit View History Bookmarks Tools Help

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article discussion edit history protect delete move unwatch

Monroe County Water Quality Study 2003

Title Page [edit]

Monroe County
Water Quality Study 2003
Monroe County Planning Commission
July 2004

Contents [edit]

- Monroe County WQ Study Subcoregion
- Macroinvertebrate Score
- Habitat Score
- PA Stream Value
- CWF - Cold Water Fishes
- Warm Water Fishes
- Migratory Fishes
- Trout Stocking

also includes some chem data and spp counts

navigation

- Home
- Indicators
- Watersheds
- Current events
- Recent changes
- Help

search

toolbox

- What links here
- Related changes
- Upload file
- Special pages

Done



Indicator Page

- Description / Definition
- Why Important
- Break points
- Discussion

DO - WcaWiki - Mozilla Firefox

File Edit View History Bookmarks Tools Help

Bjmillier my talk my preferences my watchlist my contributions log out

article discussion edit history protect delete move unwatch

DO

Contents [show]

Description [edit]

What makes this a good indicator? [edit]

Dissolved oxygen is affected by the physical, chemical, and biological characteristics of the stream, and adequate concentrations promote the health of aquatic ecosystems (USGS 2002). Excess nutrients in waterways and resulting eutrophication may result in lower dissolved oxygen concentrations due to a concurrent higher biological oxygen demand.

What are the important break points (w/ units) or classifications [edit]

The following specific dissolved oxygen criteria recognize the natural process of stratification in lakes, ponds and impoundments. These criteria apply to flowing waters and to the epilimnion of a naturally stratified lake, pond or impoundment. These thresholds are from the PA code.

DO1 For flowing waters, minimum daily average 6.0 mg/l; minimum 5.0 mg/l. (Cold water fisheries; high quality warm water fisheries; high quality trout stocking fisheries)

DO2 Minimum daily average 5.0 mg/l; minimum 4.0 mg/l. Warm water fisheries designation or

navigation

- Home
- Indicators
- Watersheds
- Current events
- Recent changes
- Help

search

toolbox

- What links here
- Related changes

Done



Indicator Page

- Metadata
- Data

DO - WcaWiki - Mozilla Firefox

File Edit View History Bookmarks Tools Help

Dissolved oxygen has been selected as a water chemistry core parameter vital sign by the Eastern Rivers and Mountain Network.

Metadata [edit]

Database Alias [edit]
DO

Source [edit]
Trib Chem 2000

Links [edit]

Data [edit]

DEWA

Adams Creek	8.1
Alicias Creek	
Big Bushkill	8.5
Brodhead Creek	8.6
Caledonia Creek	
Cherry Creek	
Csoncbaugh Creek	

< Done >

This screenshot shows a Mozilla Firefox browser window displaying a page from WcaWiki about Dissolved Oxygen (DO). The page content includes a general statement about DO being selected as a vital sign, followed by sections for Metadata, Database Alias, Source, Links, and Data. The Data section is titled 'DEWA' and lists DO levels for various streams: Adams Creek (8.1), Alicias Creek, Big Bushkill (8.5), Brodhead Creek (8.6), Caledonia Creek, Cherry Creek, and Csoncbaugh Creek. The browser interface at the top includes standard menu items like File, Edit, View, History, Bookmarks, Tools, and Help, along with window control buttons and a status bar at the bottom.

Watershed Page

- Discussion
- Data

Adams Creek - WcaWiki - Mozilla Firefox

File Edit View History Bookmarks Tools Help

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article discussion edit history protect delete move unwatch

Adams Creek

Narrative [edit]

Data [edit]

Invasive Exotics

Rusty Crayfish Presence

Fish Presence

Chain Pickerel Presence

Redbreasted Sunfish Presence

Common Shiner Presence

Darters Presence

Fish Species Count 16

American Eel Presence 1 T/F

Blacknose Dace Presence 1 T/F

Bluegill Presence 1 T/F

Brook Trout Presence 1 T/F

Brown Trout Presence 1 T/F

Brown Bullhead Presence 1 T/F

navigation

- Home
- Indicators
- Watersheds
- Current events
- Recent changes
- Help

search

toolbox

- What links here
- Related changes
- Upload file
- Special pages

Done

Watershed Page

- Data

Adams Creek - WcaWiki - Mozilla Firefox

	Parameter	Value
	Mean July Discharge	7 cfs
	Percent July Mainstem Discharge	0.2 %
	Water Temperature 2	24.3 C
	DO	8.1 mg/l
	Conductivity 2	71.5 microm
	pH 2	6.98
	NOx	0.21 mg/l
	NHx	0.03 mg/l
	Totkje_N	0.39 mg/l
	Orthophosphates	0.01 mg/l
	Total Phosphates	0.09 mg/l
	BOD 5 Day	0.74 mg/l
	Fecal Coliforms	18.5 per 100ml
	Turbidity	0.86 ntu
	WQI	81.58
	Drainage Area	42 sq km
	Forested	86
	Urban/Developed	9
	Agricultural/Farm	0
	Sewage Flow	0 kl/day



Data Entry



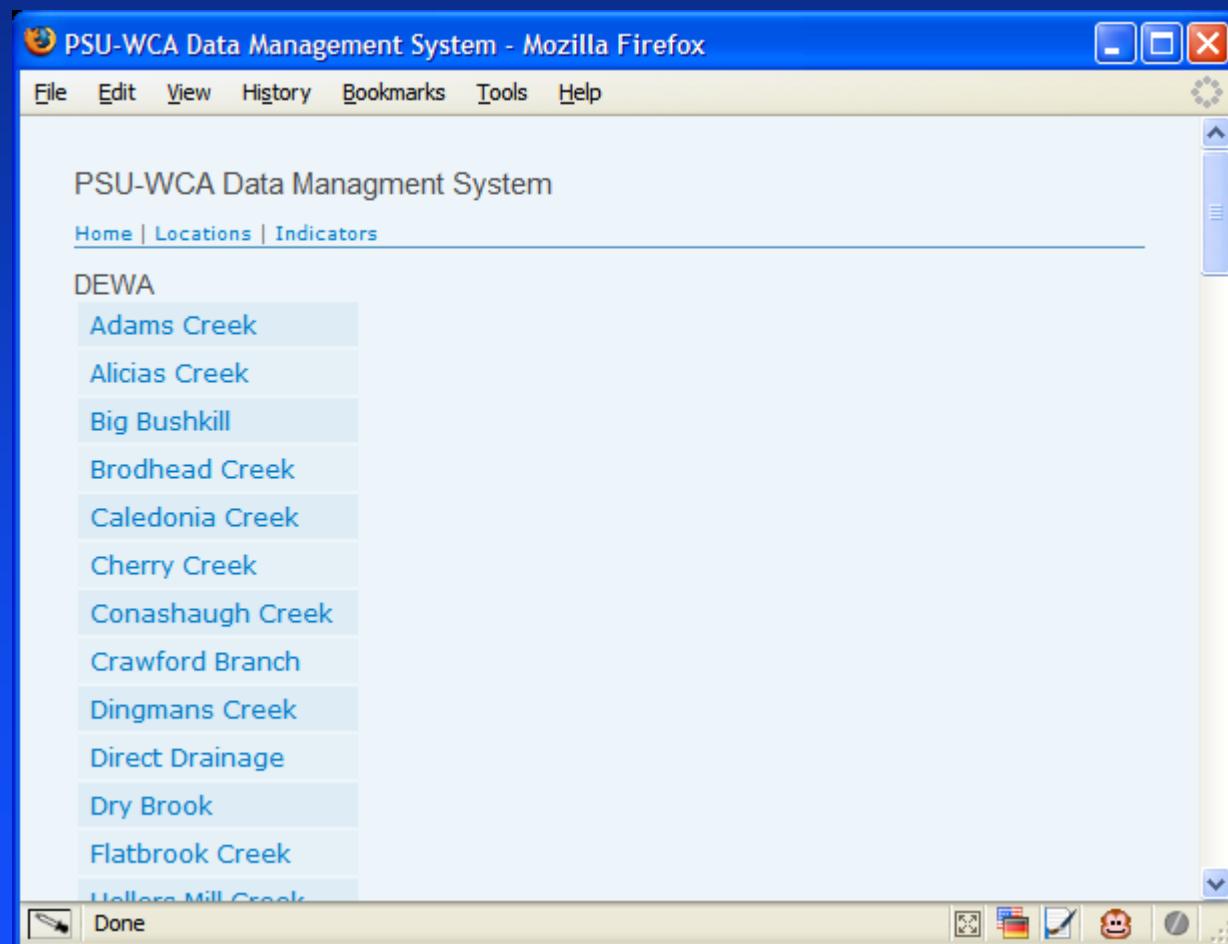
Data Entry – Home Page

- PHP script
- MySQL
- Data is integrated with the Wiki

A screenshot of a web browser window titled "PSU-WCA Data Management System - Mozilla Firefox". The window shows the URL "PSU-WCA Data Management System" and three navigation links: "Home", "Locations", and "Indicators". The browser interface includes standard menu items like File, Edit, View, History, Bookmarks, Tools, and Help, along with standard window controls (minimize, maximize, close) and a toolbar at the bottom.

Data Entry – Locations List

- Hyper-linked list of locations



The screenshot shows a Mozilla Firefox browser window displaying the PSU-WCA Data Management System. The title bar reads "PSU-WCA Data Management System - Mozilla Firefox". The menu bar includes File, Edit, View, History, Bookmarks, Tools, and Help. Below the menu is a header "PSU-WCA Data Management System" with links to Home, Locations, and Indicators. A sidebar on the left lists locations under "DEWA": Adams Creek, Alicias Creek, Big Bushkill, Brodhead Creek, Caledonia Creek, Cherry Creek, Conashaugh Creek, Crawford Branch, Dingmans Creek, Direct Drainage, Dry Brook, Flatbrook Creek, and Hollers Mill Creek. The "Locations" link in the header is underlined, indicating it is the active page. The bottom of the browser window shows standard toolbar icons.



Data Entry – Adding/Editing Data by Location

- Ordered by indicator group and indicator weight

PSU-WCA Data Management System - Mozilla Firefox

File Edit View History Bookmarks Tools Help

PSU-WCA Data Management System

[Home](#) | [Locations](#) | [Indicators](#)

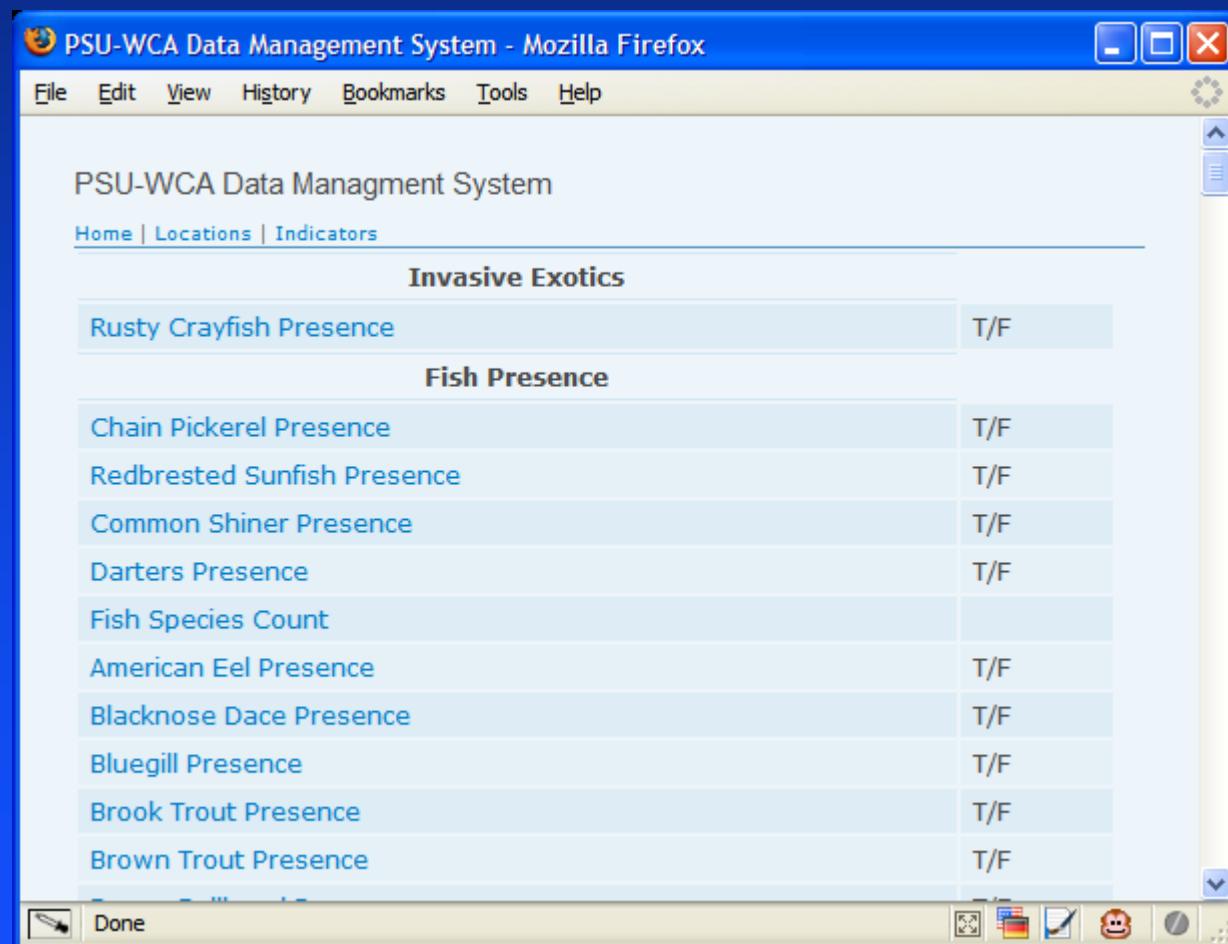
DEWA: Adams Creek

Invasive Exotics			
Rusty Crayfish Presence			T/F

Fish Presence			
Chain Pickerel Presence			T/F
Redbreasted Sunfish Presence			T/F
Common Shiner Presence			T/F
Darters Presence			T/F
Fish Species Count	16	16	
American Eel Presence	1	1	T/F
Blacknose Dace Presence	1	1	T/F
Bluegill Presence	1	1	T/F

Data Entry – Indicators List

- Hyper-linked list of indicators



The screenshot shows a Mozilla Firefox browser window displaying the PSU-WCA Data Management System. The title bar reads "PSU-WCA Data Management System - Mozilla Firefox". The menu bar includes File, Edit, View, History, Bookmarks, Tools, and Help. The main content area shows a list of indicators under the heading "Invasive Exotics". The indicators listed are Rusty Crayfish Presence, Fish Presence, Chain Pickerel Presence, Redbrested Sunfish Presence, Common Shiner Presence, Darters Presence, Fish Species Count, American Eel Presence, Blacknose Dace Presence, Bluegill Presence, Brook Trout Presence, and Brown Trout Presence. Each indicator has a "T/F" status column to its right. The bottom of the browser window shows standard navigation buttons (Back, Forward, Stop, Home) and a toolbar with various icons.

Indicator	Status
Rusty Crayfish Presence	T/F
Fish Presence	
Chain Pickerel Presence	T/F
Redbrested Sunfish Presence	T/F
Common Shiner Presence	T/F
Darters Presence	T/F
Fish Species Count	
American Eel Presence	T/F
Blacknose Dace Presence	T/F
Bluegill Presence	T/F
Brook Trout Presence	T/F
Brown Trout Presence	T/F



Data Entry – Adding/Editing Data by Indicator

- Ordered by park and watershed name

PSU-WCA Data Management System - Mozilla Firefox

File Edit View History Bookmarks Tools Help

PSU-WCA Data Management System

[Home](#) | [Locations](#) | [Indicators](#)

Rusty_Crayfish_Presence

DEWA

	<input type="button" value="submit"/>
Adams Creek	<input type="text"/>
Alicias Creek	<input type="text"/>
Big Bushkill	<input type="text"/>
Brodhead Creek	<input type="text"/>
Caledonia Creek	<input type="text"/>
Cherry Creek	<input type="text"/>
Conashaugh Creek	<input type="text"/>
Crawford Branch	<input type="text"/>
Dingmans Creek	<input type="text"/>
Direct Drainage	<input type="text"/>

Data Entry – Adding an Indicator

- Automated database restructuring
- Control over grouping and ordering

PSU-WCA Data Management System - Mozilla Firefox

Add a new indicator:

Indicator

Fullscreen

Data Type

Group

Weight

Description

Add a new indicator group:

Group

Weight

 Done





Data Aggregation



Water Quality Data Wizard

- Raw data from USGS – NWIS web site

nwis.waterdata.usgs.gov Water Quality Data Wizard

Input File:
C:_Downloads\qwdatal.txt

```
# File created on 2008-01-17 14:47:12 EST
#
# U.S. Geological Survey
#
# This file contains selected water-quality data for stations in the National Water Information System water-quality database. Explanation of codes found in this file are followed by the retrieved data.
#
# The data you have secured from the USGS NWISWeb database may include data that have not received Director's approval and as such are provisional and subject to revision.
# The data are released on the condition that neither the USGS nor the United States Government may be held liable for any damages resulting from its authorized or unauthorized use.
#
# To view additional data-quality attributes, output the results using these options:
# one result per row, expanded attributes. Additional precautions are at:
# http://waterdata.usgs.gov/nwis/qwdata?help#Data_retrievals_precautions.
#
# agency_cd      - Agency Code
# site_no        - Station number
# sample_dt      - Begin date
# sample_tm      - Begin time
# sample_end_dt  - End date
# sample_end_tm  - End time
# sample_start_time_datum_cd - Time datum
# tm_datum_rbtv_cd - Time datum reliability code
# coll_ent_cd    - Agency Collecting Sample Code
# medium_cd      - Medium code
# project_cd     - Project code
# aqfr_cd        - Geologic unit code
# tu_id          - Taxonomic unit code
# body_part_id   - Body part code
```

Back Next



Water Quality Data Wizard

- Configuration
- Auto-saved

7/ nwis.waterdata.usgs.gov Water Quality Data Wizard

Options <input checked="" type="checkbox"/> discard 2nd row <input checked="" type="checkbox"/> discard rows with no data 3 <input type="button" value="<"/> < <input type="button" value=">"/> > First data column	Fields to Save site_no= sample_dt= P00010=T_water_C P00020=T_air_C P00025=Barometer_mmHg P00300=D0_mgpl P00301=D0_percent_sat P00310=BOD P00400=pH_field P00403=pH_water P00618=Nitrate_N_mgpl_filtered P00620=Nitrate_N_mgpl_unfiltered P71851=Nitrate_mgpl P00650=Phosphate_mgpl_unfiltered P31615=Fecal_Coliform_EC_broth P31616=Fecal_Coliform_M_FC_GF P61028=Turbidity_nephelometric P63676=Turbidity_broad_band_light_source P63678=Attenuation_Turbidity_broad_band	Sites to Save Import Site List... Export Site List... 01367620=Wallkill R at outflow of Lk Mohawk at Sparta NJ 01367625=Wallkill River at Sparta NJ 01367700=Wallkill River at Franklin NJ 01367715=Wallkill R at Scott Road at Franklin NJ 01367729=Wallkill River at Route 94 at Hamburg NJ 01367750=Beaver Run near Hamburg NJ 01367770=Wallkill River near Sussex NJ 01367780=Papakating Creek near Wykertown NJ 01367800=Papakating Creek at Pelletown NJ 01367850=West Branch Papakating Creek at Mccoy's Corner 01367860=Papakating Creek near Sussex NJ 01367900=Clove Brook at Sussex NJ 01367910=Papakating Creek at Sussex NJ 01368720=Auxiliary out of Upper Greenwood Lk at Moe NJ 01368820=Double Kill at Wawayanda NJ 01368950=Black Creek near Vernon NJ 01379630=Russia Brook trib at Milton NJ 01379680=Rockaway R at Longwood Valley NJ 01379690=Rockaway River near Rt 15, at Berkshire Valley NJ 01379700=Rockaway River at Berkshire Valley NJ 01379740=Rockaway R at W Central Ave at Dover NJ 01379750=Rockaway R at Dover NJ 01379760=Green Pd Bk at 24th Ave at Picatinny Arsenal NJ 01379769=Burnt Meadow Bk at mouth at Picatinny Arsenal NJ 01379770=Green Pd Bk bl Burnt MW Bk at Picatinny Ars. NJ 01379773=Green Pond Brook at Picatinny Arsenal NJ 01379780=Green Pond Bk blw Picatinny Lk at Picatinny Ars N 01379781=Green Pd Br at 9th St at Picatinny Arsenal NJ 01379782=Green Pd Bk at Farley Rd at Picatinny Arsenal NJ 01379784=Bear Swamp Bk at 6th St at Picatinny Arsenal NJ 01379785=Bear Swamp Bk at 3rd St at Picatinny Arsenal NJ 01379786=Bear Swamp Bk at 2nd St at Picatinny Arsenal NJ 01379787=Bear Swamp Bk at Picatinny Arsenal NJ 01379788=Green Pd Bk bl STP at Picatinny Arsenal NJ
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Back



Water Quality Data Wizard

- Parsed data
- Meaningful field names
- Filtered by gauge
- Filtered by date
- Empty rows eliminated

nwis.waterdata.usgs.gov Water Quality Data Wizard

site_no	sample_dt	T_water_C	T_air_C	Barometer_in	DO_mgpl	DO_percent	BOD	pH_field	pH_water	Nitrate_N_mg	Nitr
01367620	2001-06-29	27.0	31.5		7.9			8.4			
01367620	2004-10-13	17.6	20.0		8.6	90		8.3	8.0		
01367620	2005-03-02								7.7	7.4	
01367620	2005-04-19	17.9		744	10.8	114		8.4	8.3		
01367620	2005-06-07	24.3	24.0	750	8.7	104		8.3	8.2		
01367620	2005-07-27	30.6	30.1	757	8.9	122		7.3	8.1		
01367625	1998-02-18	4.5		735	12.2	98	2.4	8.2	8.0	0.33	
01367625	1998-05-21	22.0		735	8.2	98	1.4	8.1	8.0	0.20	
01367625	1998-06-08										
01367625	1998-06-17										
01367625	1998-07-20										
01367625	1998-08-19	18.0		747	8.5	92	1.3	8.2	7.9	0.47	
01367625	1998-09-15										
01367625	1998-11-05	9.0		738	12.0	107	1.0	7.9	8.2	0.87	
01367625	1999-01-28	3.5		740	12.8	99	1.0	7.0	7.9	0.41	
01367625	1999-05-13	14.0		742	10.3	103	1.5	8.4	8.2	0.73	
01367625	1999-08-12	19.0		742	8.0	89	1.2	8.1	8.0	0.88	
01367625	1999-11-09	10.0		745	10.6	96	3.0	8.2	7.9	0.40	
01367625	2000-02-23	3.5		755	13.5	103	2.0	8.3	7.5	0.50	
01367625	2000-05-18	18.0		740	8.7	95	1.4	8.1	8.1	0.51	
01367625	2000-06-28										
01367625	2000-07-03										
01367625	2000-07-10										
01367625	2000-07-17										
01367625	2000-07-24										
01367625	2000-08-08	25.0		742	7.3	91	2.1	8.1	8.0	0.50	
01367625	2000-11-10	0.0	7.0	742	11.4	00	0.0	0.0	7.0	0.40	

Back Next



Water Quality Data Wizard

- Data aggregation
- Most recent data by gauge

nwis.waterdata.usgs.gov Water Quality Data Wizard

Summary											
site_no	sample_dt	T_water_C	T_air_C	Barometer_in	DO_mgpl	DO_percent	BOD	pH_field	pH_water	Nitrate_N_mg	Nitr
01367620	2005-07-27	30.6	30.1	757	8.9	122		7.3	8.1		
01367625	2007-05-07	16.5	21.0	761	10.6	108	1.0	8.4	8.4	0.82	
01367700	2006-05-17	13.0	19.0	741	8.4	82		7.8	8.0		
01367715	2006-05-17	13.4	16.5	742	8.8	87	2.1	8.2	7.9	0.16	
01367729	2006-05-17	13.8	19.9	740	9.8	97		8.3	8.4	1.99	
01367770	2007-05-07	13.1	14.0	761	10.3	98	1.0	7.8	8.1	5.05	
01367780	2002-08-07	17.0	23.0	745	8.2	87	1.1	8.0	8.0	0.13	
01367800	2007-06-06	15.8	18.0	748	8.0	81	1.0	8.0	7.6	0.55	
01367850	2000-08-09	22.5		751	9.1	107	1.2	7.9	8.0	0.61	
01367860	1998-09-15	21.0		753	8.9	101	1.0	8.1	7.9	1.03	
01368820	2007-05-14	16.5	19.5	741	8.8	93	1.3	7.4	7.6	0.04	
01379680	1999-09-14	19.5		747	7.0	78	1.0	7.8	7.8	0.04	
01379700	1998-09-22	21.0		740	6.7	78	1.0	7.4	7.5	0.08	
01379800	1998-09-16	20.0		742	5.5	62	1.0	7.8	7.8	0.10	
01379853	1998-09-22	20.0		742	6.5	74	1.0	7.8	7.9	0.32	
01379870	2004-08-11	19.7	30.5	746	7.7	86	1.0	7.3	7.6	1.60	
01380100	2007-05-16	19.8	4.0	739	7.5	85	1.0	6.8	7.5	0.15	
01380320	2007-05-10	20.1	24.5	748	7.8	86	2.1	7.2	7.8	0.30	
01380500	2003-10-08	10.9	18.0	759	11.0	100		7.6			
01381050	2000-08-23	16.0		755	9.0	92	1.0	7.7	7.4	0.07	
01382410	2002-09-03	22.0	29.0	740	13.2	156	1.0	8.0	8.1	0.22	
01382450	2000-08-10	21.0		755	8.6	97	1.0	7.5	7.5	0.31	
01382500	2007-06-06	17.8	15.5	743	8.8	93	1.0	7.5	7.8	0.14	
01382960	2004-09-08	18.1	21.6	748	8.7	93	1.0	8.2	7.4	0.07	
01438400	2004-12-15	1.0	-2.0	760	12.8	90		7.5	7.9	0.17	
01438500	2007-05-21	15.5	13.0	756	8.1	82	1.0	7.1	8.3	0.16	
01438500	2004-12-15	1.0	-2.0	750	12.0	94	2.2	7.1	8.1	0.00	

Back Next



Water Quality Data Wizard

- Exports tab-delimited text
- Imports into Excel, Access, ArcGIS, etc.

A screenshot of Microsoft Excel showing a spreadsheet titled "1998-2007_wq_data.txt - Microsoft Excel". The spreadsheet contains data for 31 rows, each representing a water quality sample. The columns include site_no, sample_dt, T_water, T_air_C, Baromete, DO_mgpl, DO_perce, BOD, pH_field, pH_water, Nitrate_N, Nitrate_N, Nitrate_m, Phosphate, Fecal_Coli, and Fecal_C. The data spans from row 1 to row 31, with the first row serving as the header. The Excel ribbon at the top shows tabs for Home, Insert, Page Layout, Formulas, Data, Review, View, and Add-Ins. The Font, Alignment, Number, Styles, and Cells tabs are visible in the ribbon.

site_no	sample_dt	T_water	T_air_C	Baromete	DO_mgpl	DO_perce	BOD	pH_field	pH_water	Nitrate_N	Nitrate_N	Nitrate_m	Phosphate	Fecal_Coli	Fecal_C
1367620	7/27/2005	30.6	30.1	757	8.9	122		7.3	8.1						
1367625	5/7/2007	16.5	21	761	10.6	108	1	8.4	8.4	0.82				3.64	500
1367700	5/17/2006	13	19	741	8.4	82		7.8	8						
1367715	5/17/2006	13.4	16.5	742	8.8	87	2.1	8.2	7.9	0.16			0.708		300
1367729	5/17/2006	13.8	19.9	740	9.8	97		8.3	8.4	1.99				8.8	
1367770	5/7/2007	13.1	14	761	10.3	98	1	7.8	8.1	5.05				22.3	500
1367780	8/7/2002	17	23	745	8.2	87	1.1	8	8	0.13			0.558		130
1367800	6/6/2007	15.8	18	748	8	81	1	8	7.6	0.55			2.43		3000
1367850	8/9/2000	22.5		751	9.1	107	1.2	7.9	8	0.61			2.7		3500
1367860	9/15/1998	21		753	8.9	101	1	8.1	7.9	1.03			4.55		3500
1368820	5/14/2007	16.5	19.5	741	8.8	93	1.3	7.4	7.6	0.04			0.173		170
1379680	9/14/1999	19.5		747	7	78	1	7.8	7.8	0.04			0.19		
1379700	9/22/1998	21		740	6.7	78	1	7.4	7.5	0.08			0.372		490
1379800	9/16/1998	20		742	5.5	62	1	7.8	7.8	0.1			0.452		330
1379853	9/22/1998	20		742	6.5	74	1	7.8	7.9	0.32			1.4		9200
1379870	8/11/2004	19.7	30.5	746	7.7	86	1	7.3	7.6	1.6			7.1		110
1380100	5/16/2007	19.8	4	739	7.5	85	1	6.8	7.5	0.15			0.677		130
1380320	5/10/2007	20.1	24.5	748	7.8	86	2.1	7.2	7.8	0.3			1.35		300
1380500	10/8/2003	10.9	18	759	11	100		7.6							
1381050	8/23/2000	16		755	9	92	1	7.7	7.4	0.07			0.332		20
1382410	9/3/2002	22	29	740	13.2	156	1	8	8.1	0.22			0.992		20
1382450	8/10/2000	21		755	8.6	97	1	7.5	7.5	0.31			1.39		790
1382500	6/6/2007	17.8	15.5	743	8.8	93	1	7.5	7.8	0.14			0.606		700
1382960	9/8/2004	18.1	21.6	748	8.7	93	1	8.2	7.4	0.07			0.297		20
1438400	12/15/2004	1	-2	760	12.8	90		7.5	7.9	0.17			0.753		
1438500	5/21/2007	15.5	13	756	8.1	82	1	7.1	8.3	0.16			0.691		20
1439830	12/15/2004	1	-2.5	758	13	94	2.2	7.1	8.1	0.08			0.367		20
1439920	12/15/2004	1	-2	760	13.2	93		7.5	8	0.46			2.06		
1440000	6/5/2007	17.1	30	740	8.2	85	1	7.8	7.6	0.09			0.385		9000
1440100	12/15/2004	2	0	763	12.4	90		6.7	7.6						

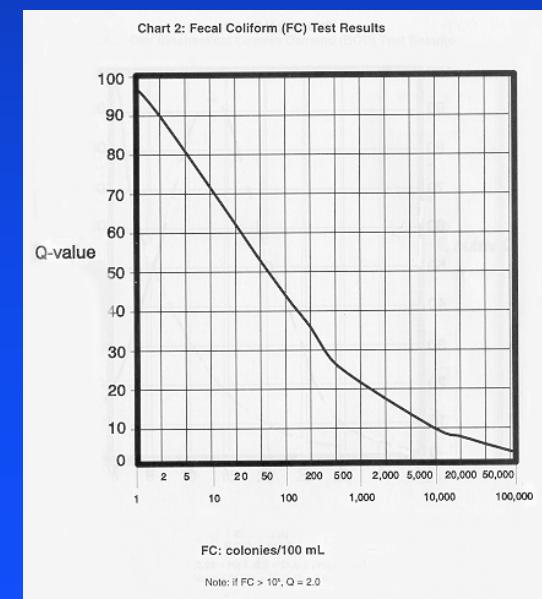
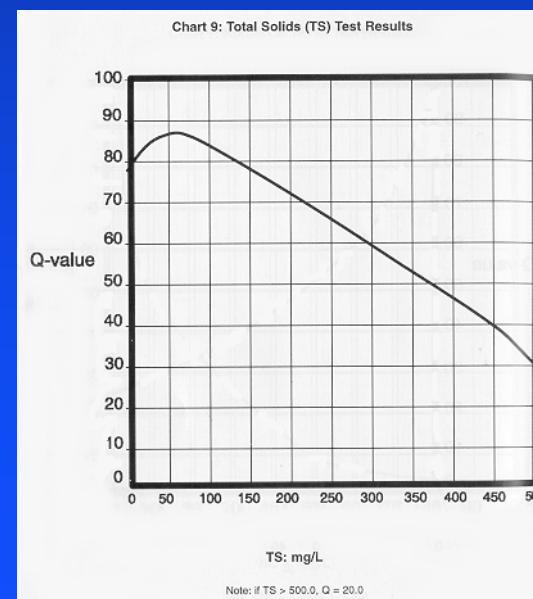
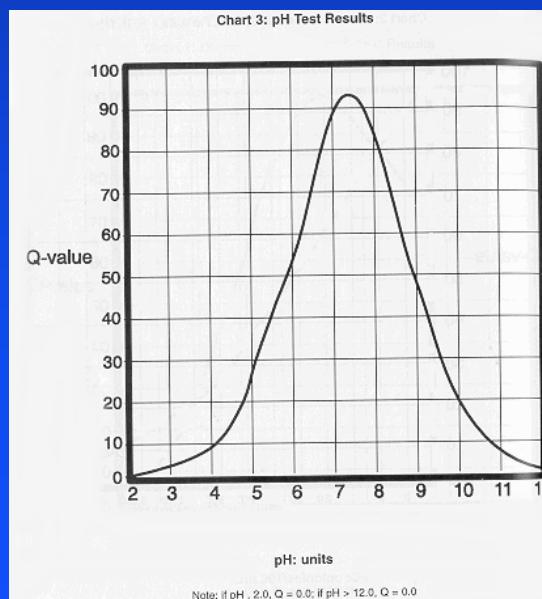


Data Assessment



Water Quality Index (WQI)

- Weighted sum of 9 indicator Q-values
- Variables are independent
- Each indicator has its own Q-value curve





WQI Components

- Biological Oxygen Demand (BOD)
- Dissolved Oxygen (DO)
- Fecal Coliforms
- Nitrate
- pH
- Temperature Change
- Total Dissolved Solids
- Total Phosphate
- Turbidity



WQI Model

- Represent Q-value curves with fuzzy curves



WQI Model

- Represent Q-value curves with fuzzy curves
- Evaluate each indicator against its fuzzy curve



WQI Model

- Represent Q-value curves with fuzzy curves
- Evaluate each indicator against its fuzzy curve
- Aggregate results of indicators with data using a special weighted average function



WQI Model

- Represent Q-value curves with fuzzy curves
- Evaluate each indicator against its fuzzy curve
- Aggregate results of indicators with data using a special weighted average function
- Classify the results aggregation with a fuzzy argument



WQI Model

- Represent Q-value curves with fuzzy curves
- Evaluate each indicator against its fuzzy curve
- Aggregate results of indicators with data using a special weighted average function
- Classify the results aggregation with a fuzzy argument
- Map the results of the individual indicators and the aggregation



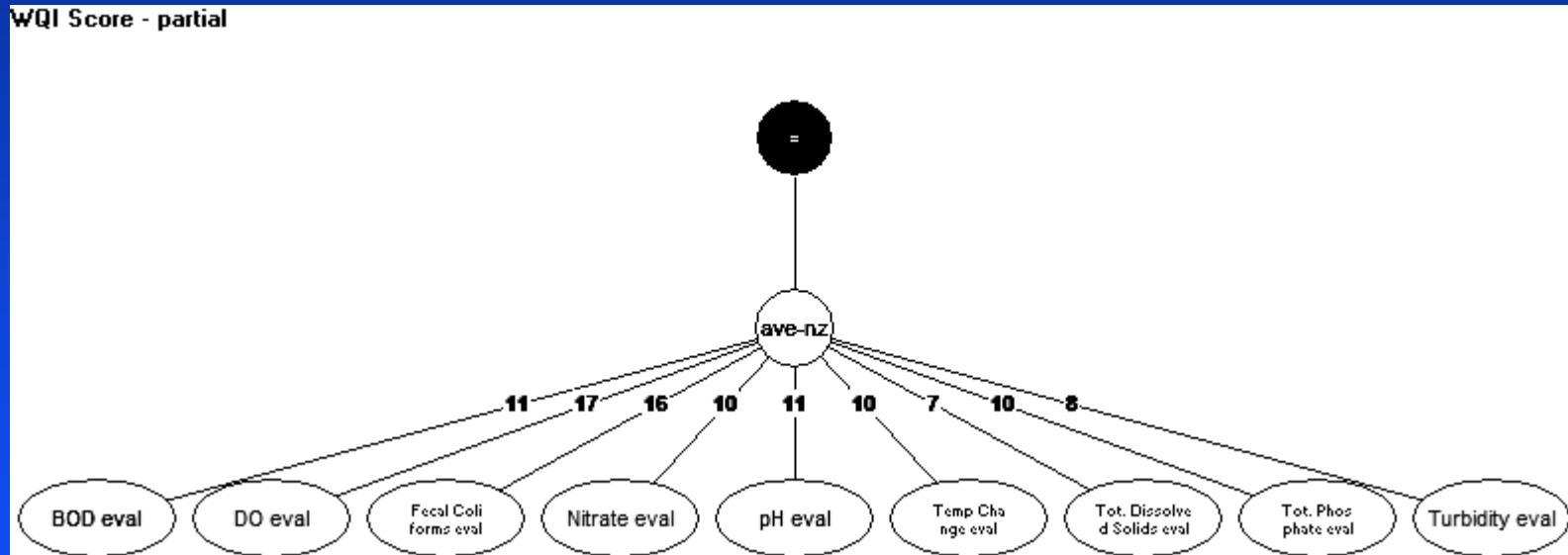
WQI Model

- Represent Q-value curves with fuzzy curves
- Evaluate each indicator against its fuzzy curve
- Aggregate results of indicators with data using a special weighted average function
- Classify the results aggregation with a fuzzy argument
- Map the results of the individual indicators and the aggregation
- Map the “holes” – missing data



WQI Model

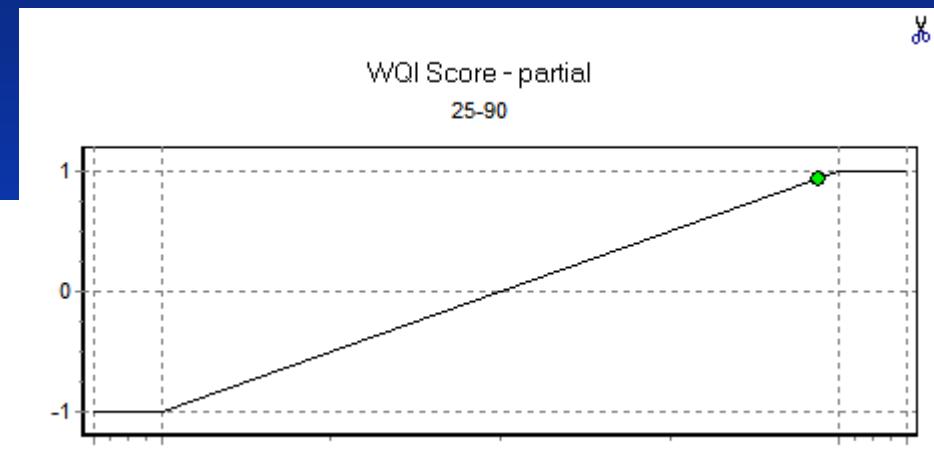
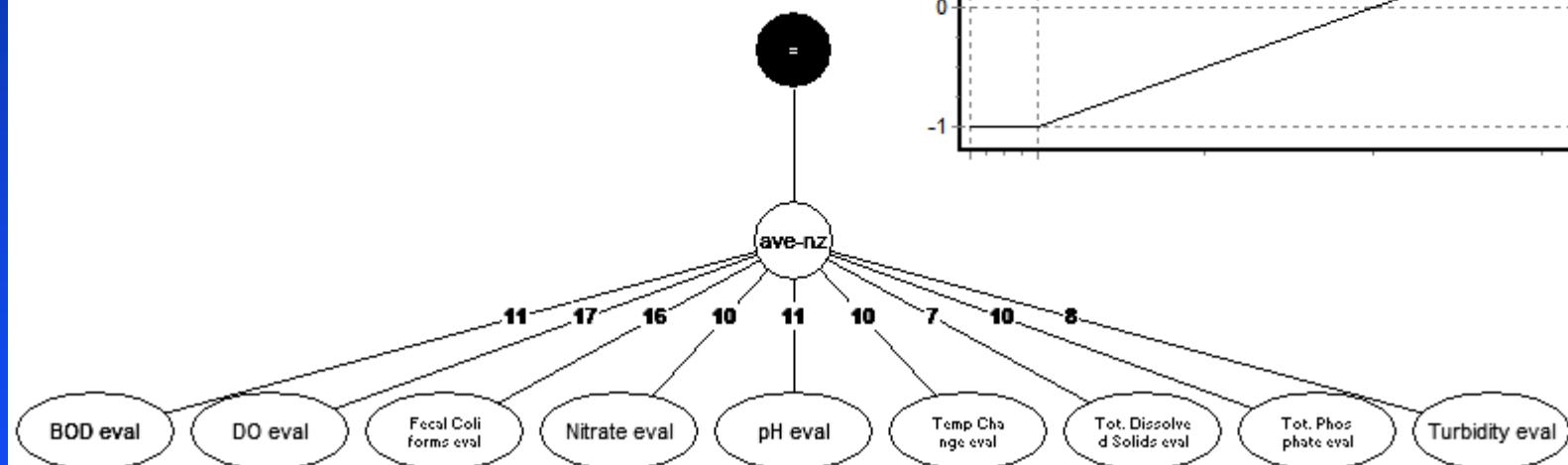
WQI Score - partial





WQI Model

WQI Score - partial



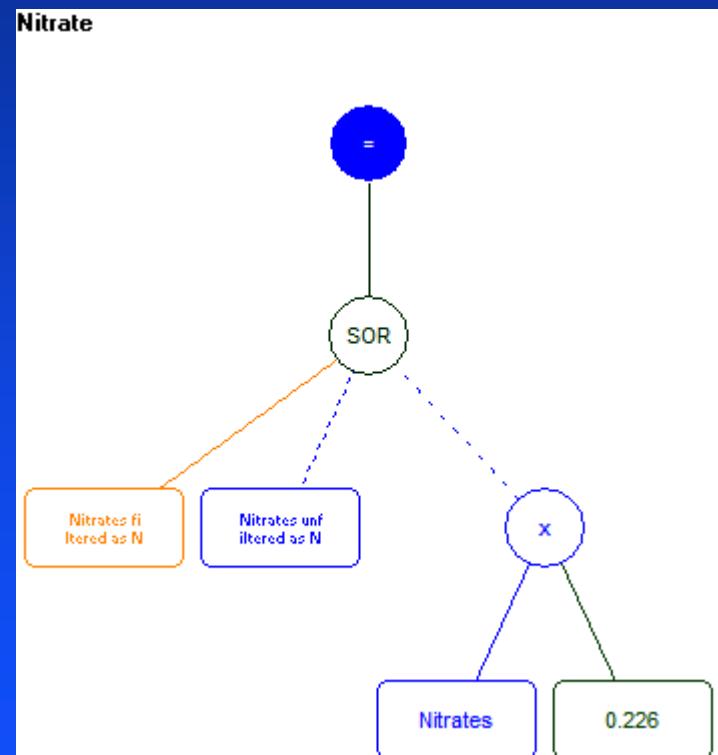


Results Synthesis



Selector of Multiple Inputs for Single Indicator

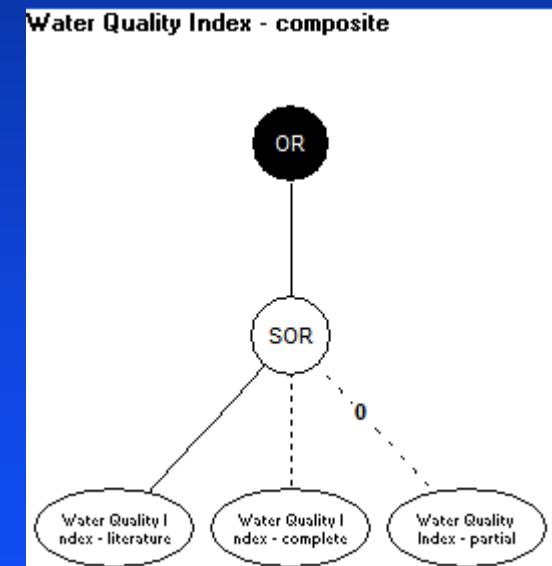
- Chooses first (left to right) route that has sufficient data
- Place methods in order of preference (best source/method first)





Selection from Multiple Evaluation Methods

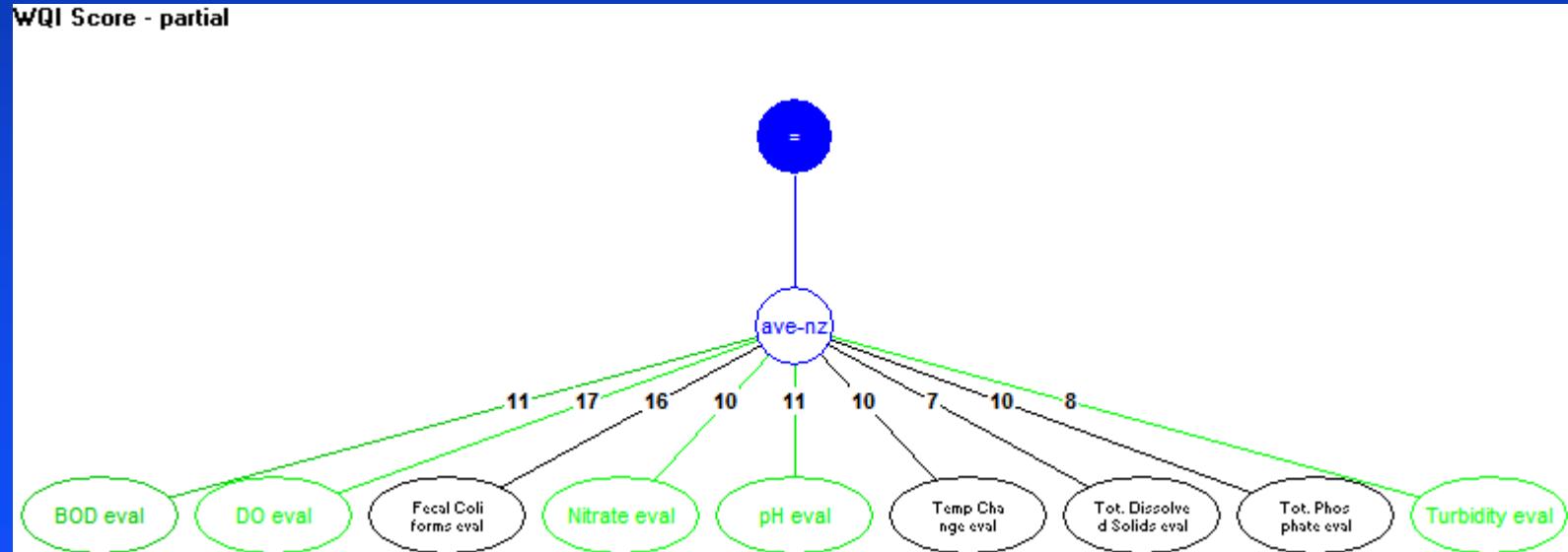
- Preferred method first
- Third method allows missing data





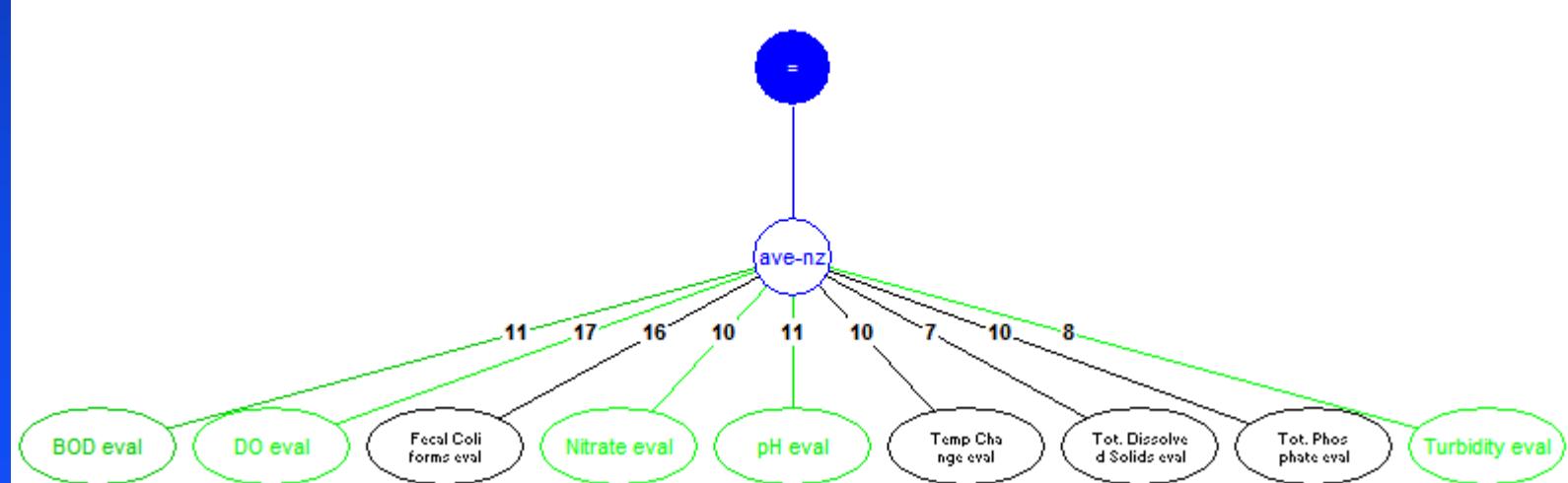
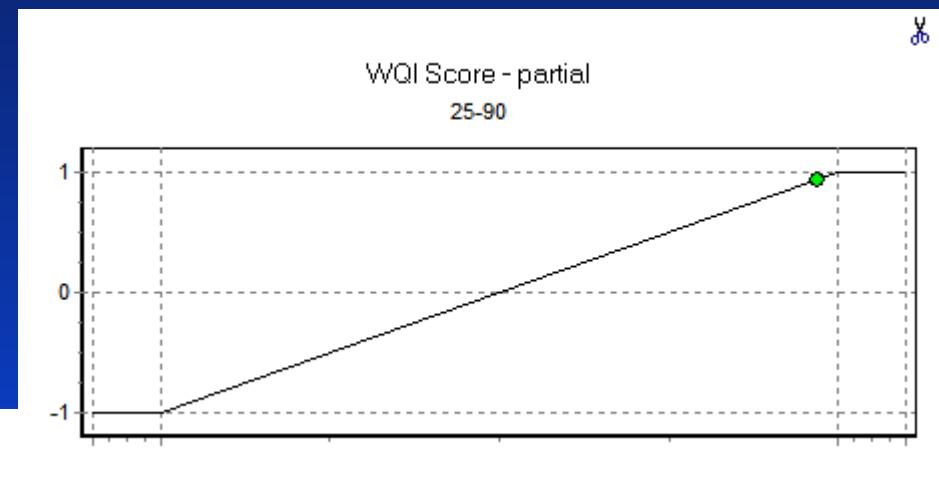
WQI Score – Partial Data

WQI Score - partial



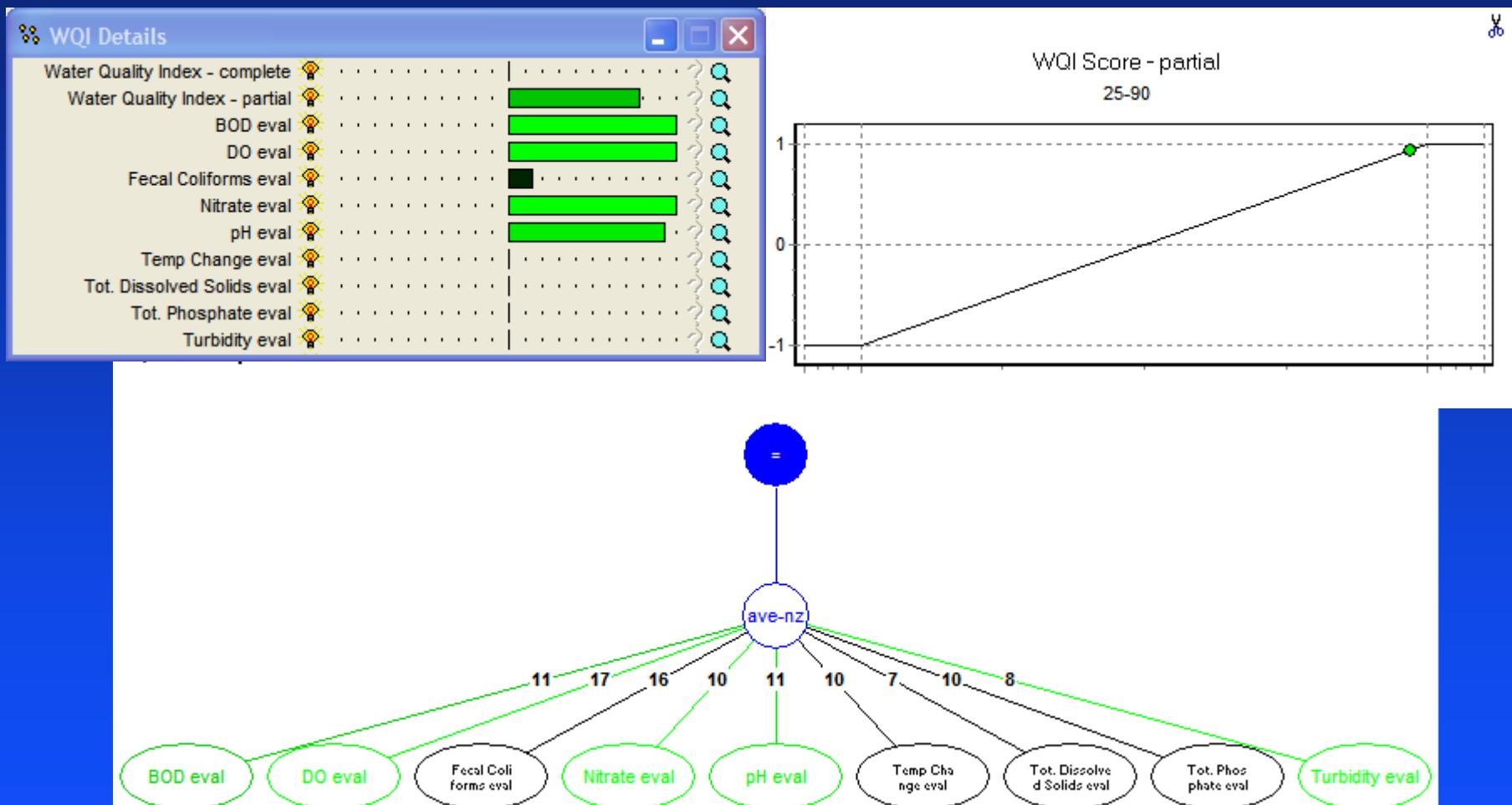
WQI Score

WQI Score - partial

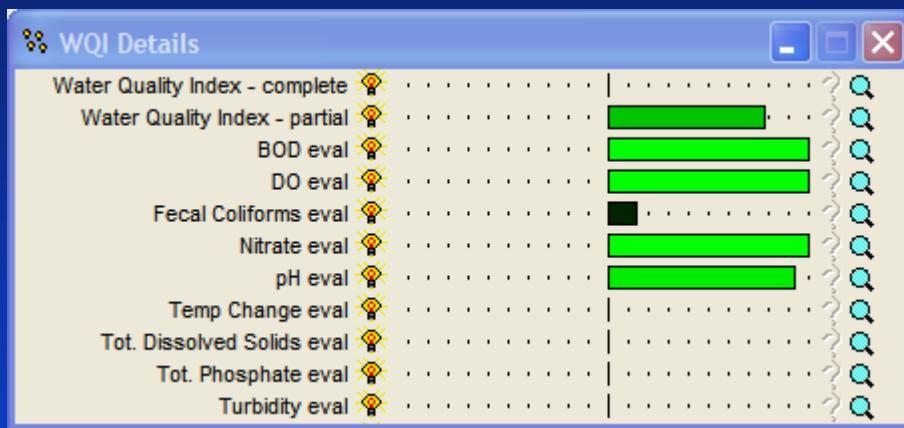




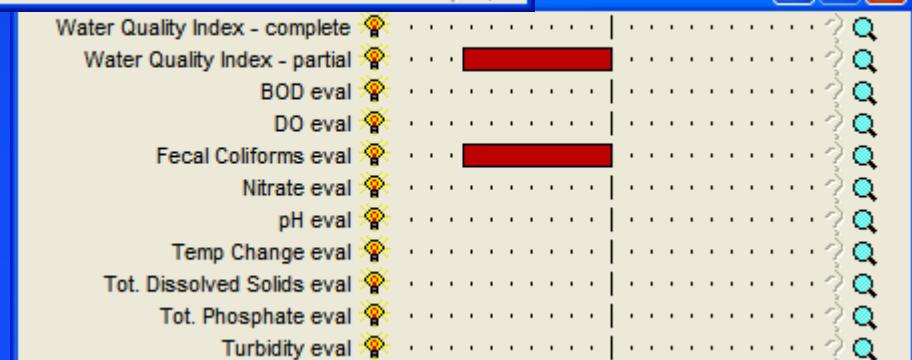
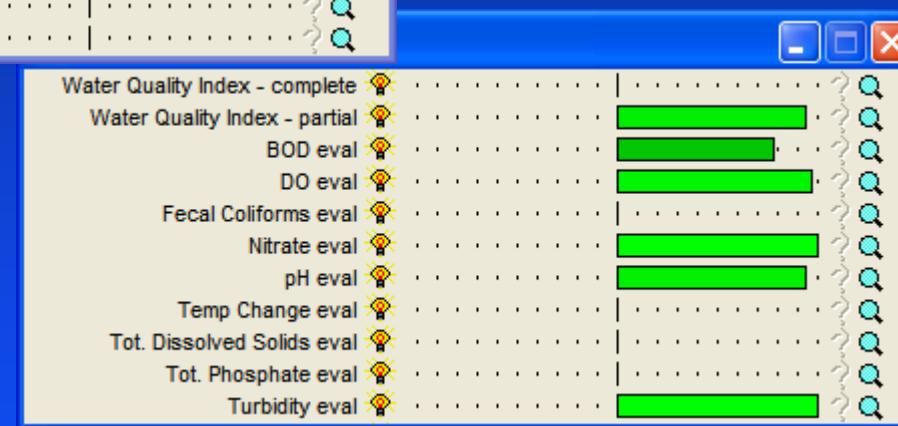
WQI Score



WQI Score



- Same gauge
- Different times

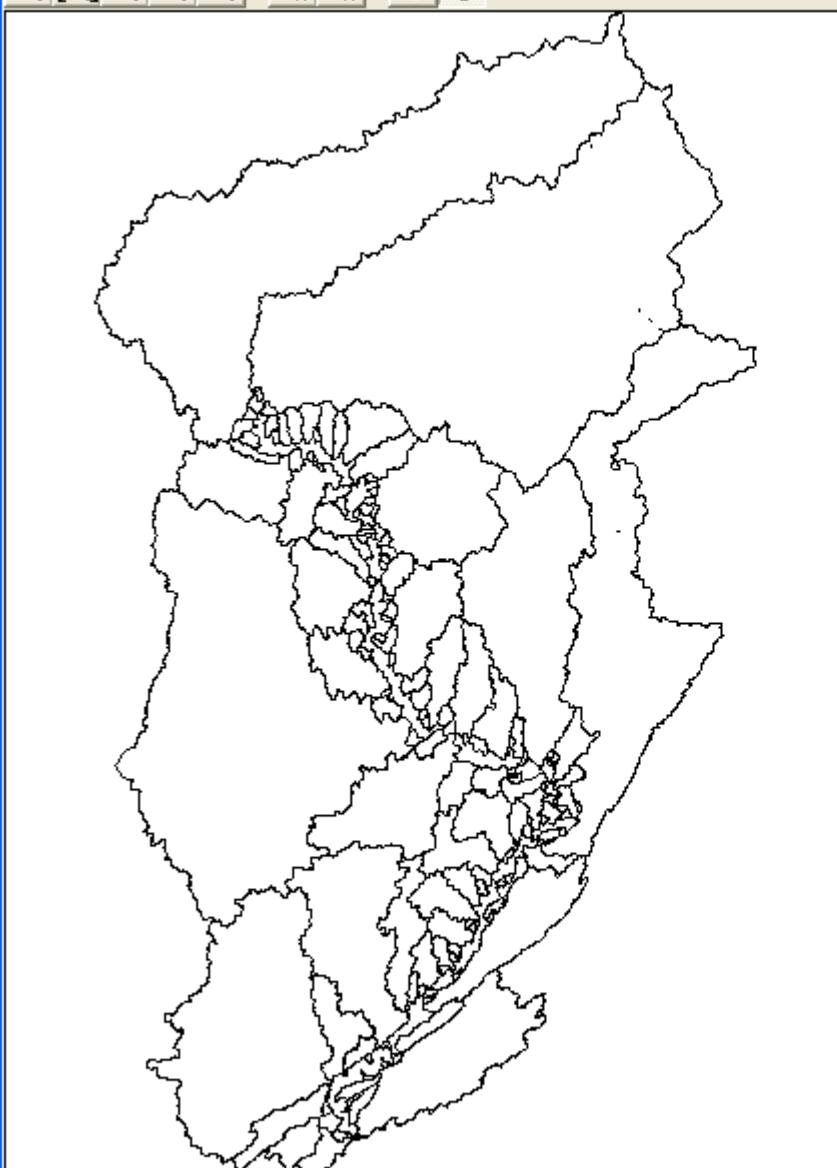
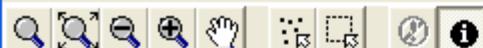




Results Display



GeoNetWeaver 2007.12.19 - beta

[File](#) [Setup](#) [Map](#) [Knowledge Base](#) [Results](#) [Help](#)

Results

Aggregation

none

Topic Displayed on Map

Antecedents

[Legend](#) [Stats](#) [Results](#) [Inputs](#) [Watershed_final](#)

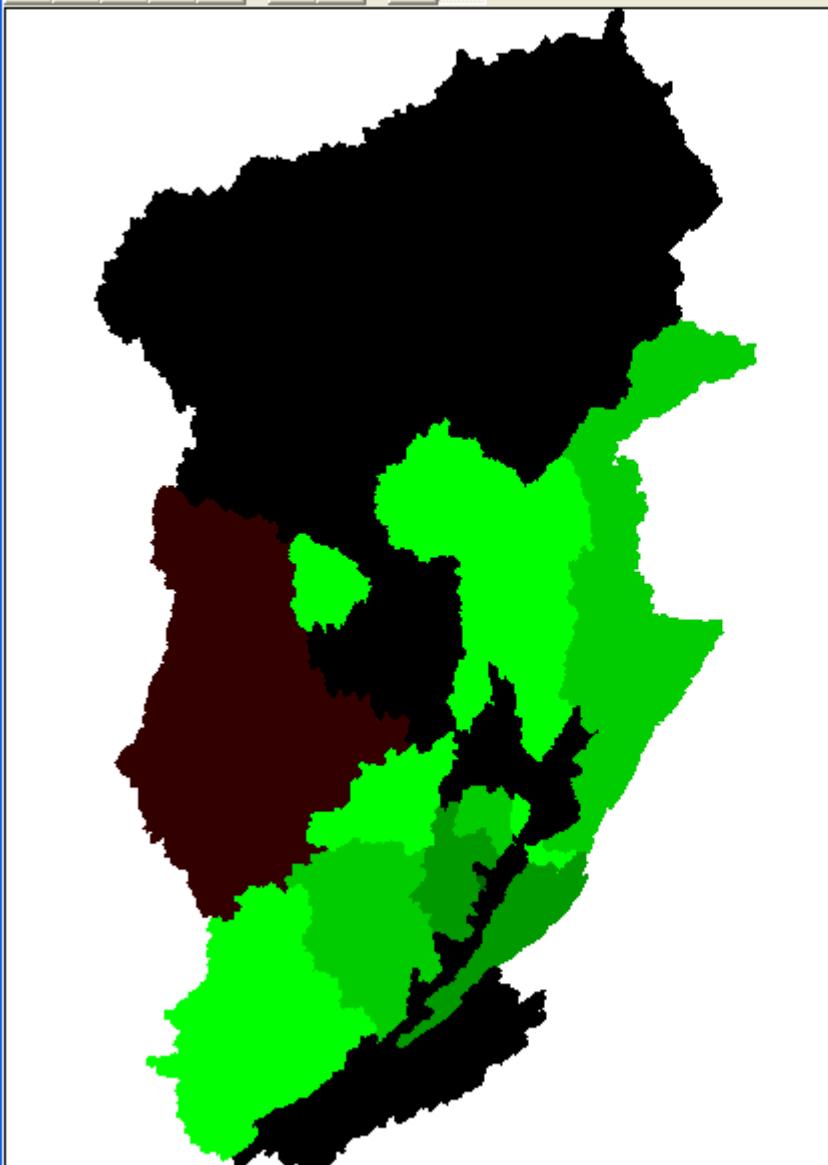
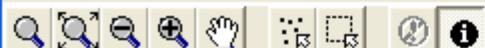
Name	Value	Data %
BOD eval		
Data Sufficiency		
DO eval		
Fecal Coliforms eval		
Nitrate eval		
pH eval		
Temp Change eval		
Tot. Dissolved Solids eval		
Tot. Phosphate eval		
Turbidity eval		
Water Quality Index - complete		
Water Quality Index - partial		



GeoNetWeaver 2007.12.19 - beta



File Setup Map Knowledge Base Results Help



Results

Aggregation

none

Topic Displayed on Map

Water Quality Index - partial

Antecedents

Legend Stats Results Inputs Watershed_final

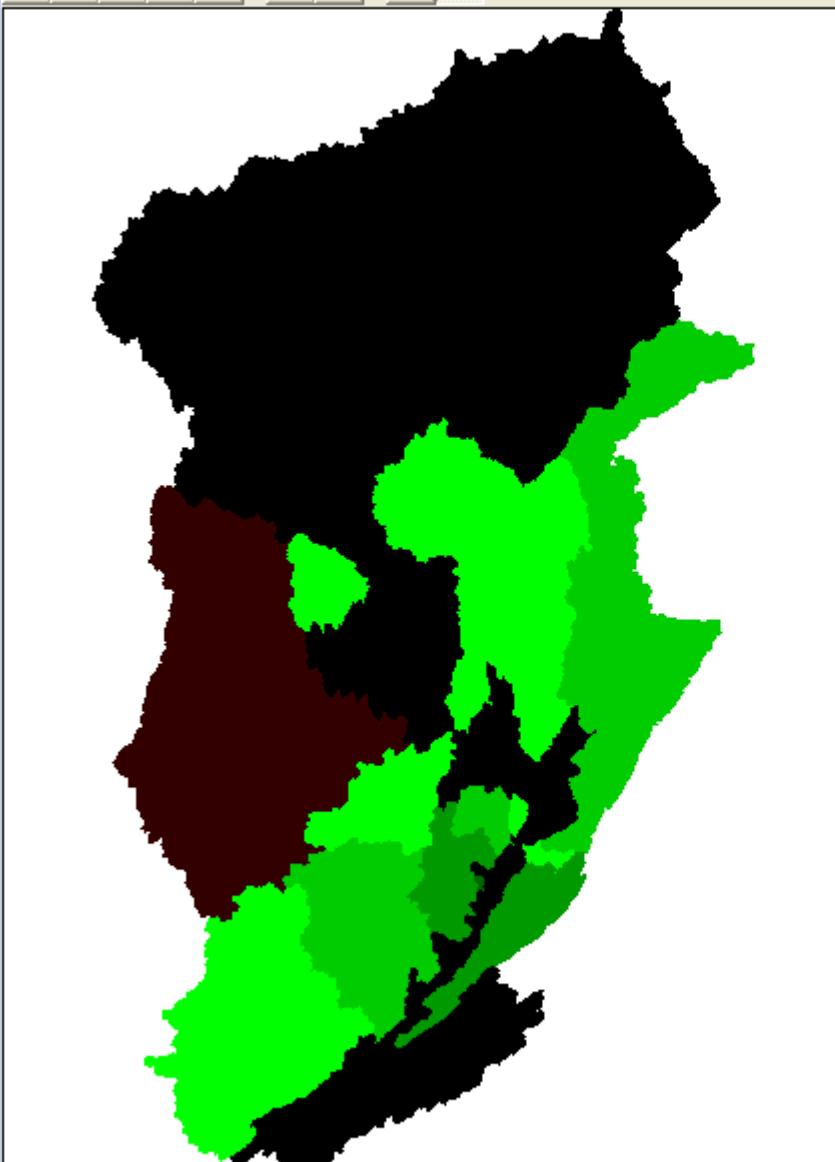
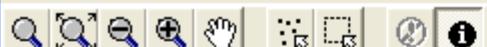
Name	Value	Data %
BOD eval		
Data Sufficiency		
DO eval		
Fecal Coliforms eval		
Nitrate eval		
pH eval		
Temp Change eval		
Tot. Dissolved Solids eval		
Tot. Phosphate eval		
Turbidity eval		
Water Quality Index - complete		
Water Quality Index - partial		



GeoNetWeaver 2007.12.19 - beta



File Setup Map Knowledge Base Results Help



geoProject: WQI
Result Set: 25 Sept 2007

Results

Aggregation

none

Topic Displayed on Map

Water Quality Index - partial

Antecedents

Legend

Stats

Results

Inputs

Watershed_final

Data Dissatisfaction

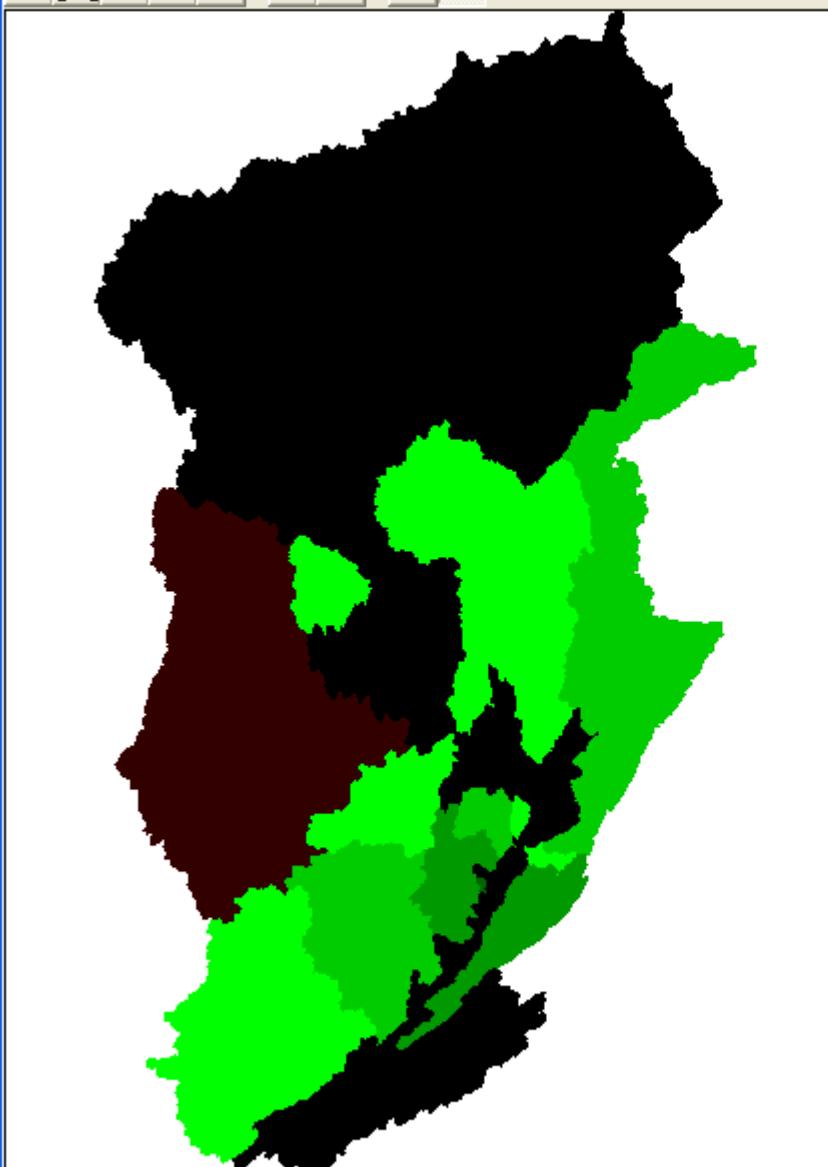
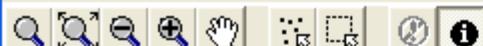
 Water Quality Index - partial

True

False



GeoNetWeaver 2007.12.19 - beta

[File](#) [Setup](#) [Map](#) [Knowledge Base](#) [Results](#) [Help](#)

Results

Aggregation

none

Topic Displayed on Map

Water Quality Index - partial

Antecedents

[Legend](#) [Stats](#) [Results](#) [Inputs](#) [Watershed_final](#)

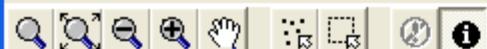
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BOD eval	- 0
Data Sufficiency	-0.778 17
DO eval	-0.231 100
Fecal Coliforms eval	- 0
Nitrate eval	1.000 100
pH eval	-1.000 100
Temp Change eval	- 0
Tot. Dissolved Solids eval	- 0
Tot. Phosphate eval	- 0
Turbidity eval	- 0
Water Quality Index - complete	- 67
Water Quality Index - partial	-0.130 38



GeoNetWeaver 2007.12.19 - beta

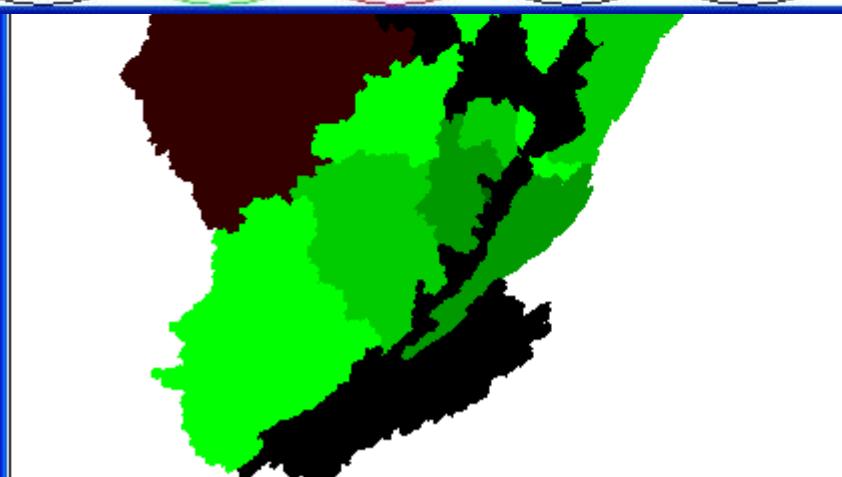
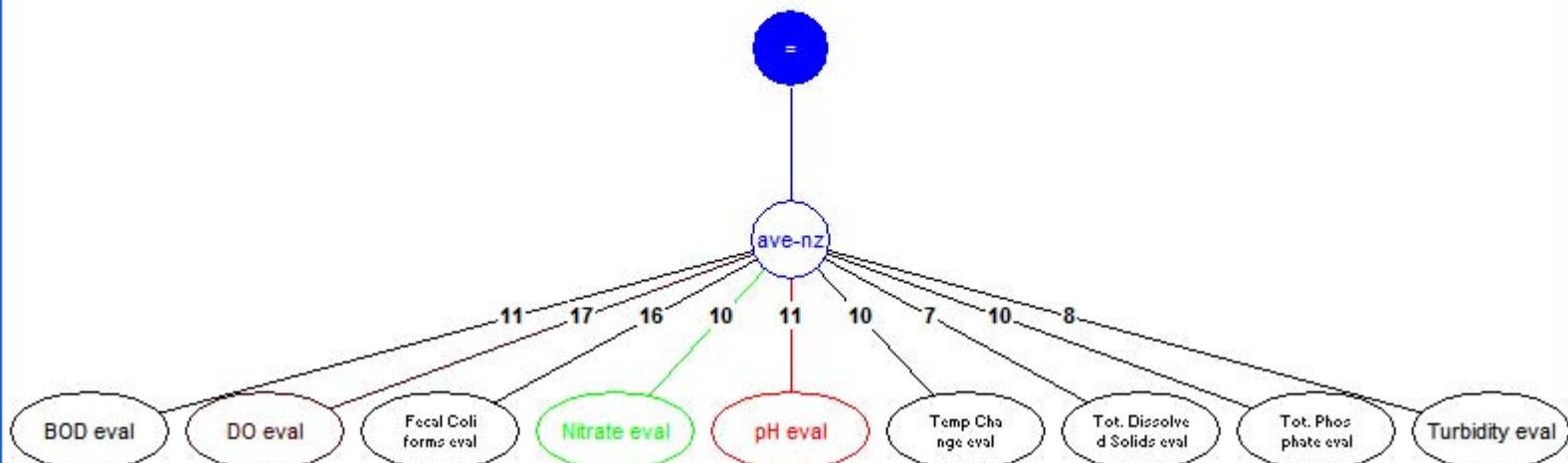


File Setup Map Knowledge Base Results Help

Results
Aggregation
none

WQI Score - permissive

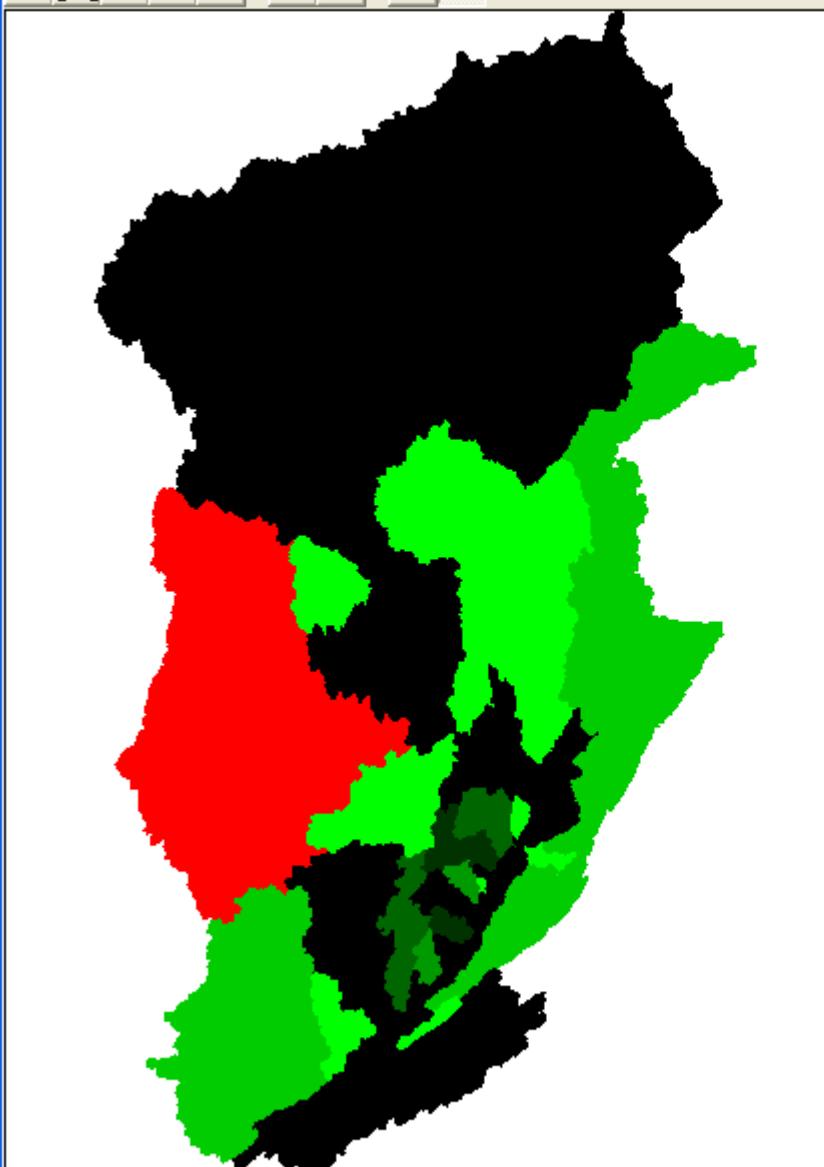
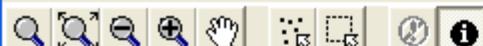
WQI Score - permissive



Water Quality Index - partial -0.130 38



GeoNetWeaver 2007.12.19 - beta

[File](#) [Setup](#) [Map](#) [Knowledge Base](#) [Results](#) [Help](#)geoProject: WQI
Result Set: 25 Sept 2007

Results

Aggregation

none

Topic Displayed on Map

pH eval

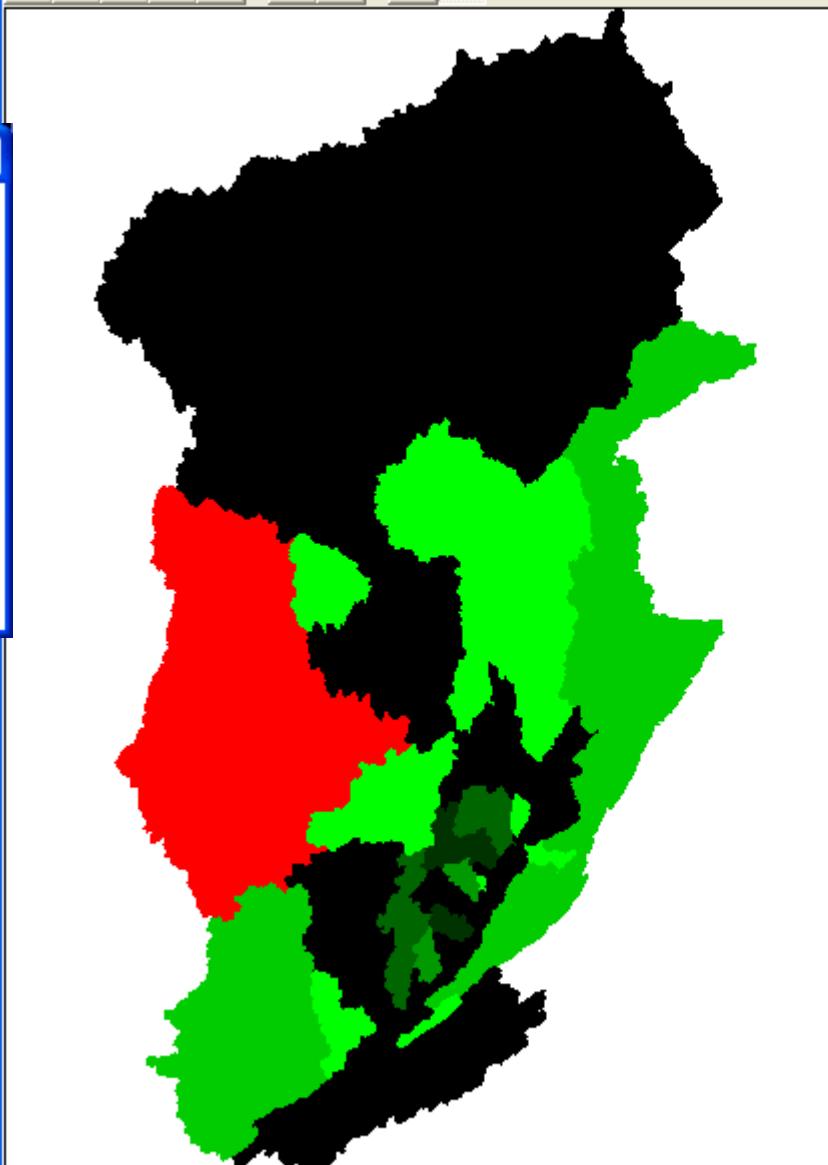
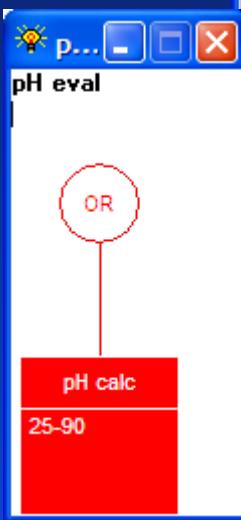
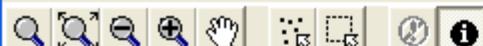
Antecedents

[Legend](#) [Stats](#) [Results](#) [Inputs](#) [Watershed_final](#) ▶

Name	Data %
BOD eval	0
Data Sufficiency	-0.778 17
DO eval	-0.231 100
Fecal Coliforms eval	0
Nitrate eval	1.000 100
pH eval	-1.000 100
Temp Change eval	0
Tot. Dissolved Solids eval	0
Tot. Phosphate eval	0
Turbidity eval	0
Water Quality Index - complete	67
Water Quality Index - partial	-0.130 38



GeoNetWeaver 2007.12.19 - beta

[File](#) [Setup](#) [Map](#) [Knowledge Base](#) [Results](#) [Help](#)

Results

Aggregation

none

Topic Displayed on Map

pH eval

Antecedents

[Legend](#) [Stats](#) [Results](#) [Inputs](#) [Watershed_final](#)

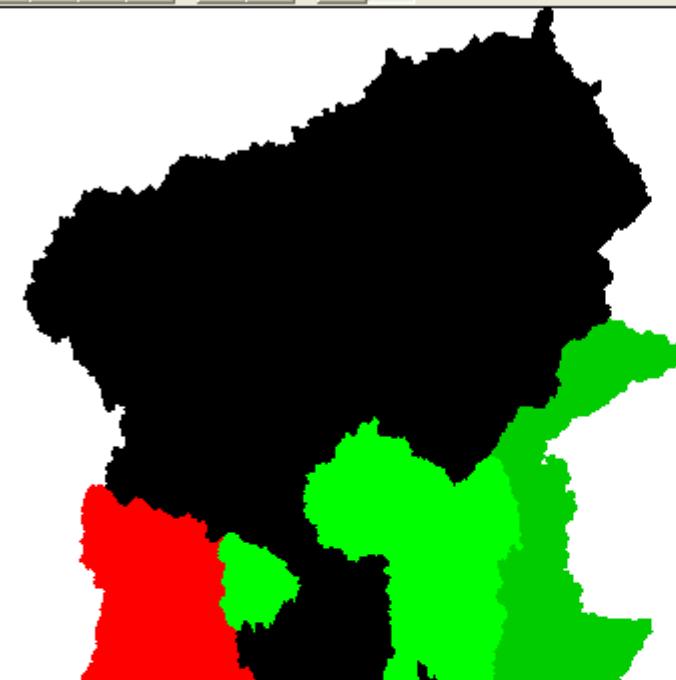
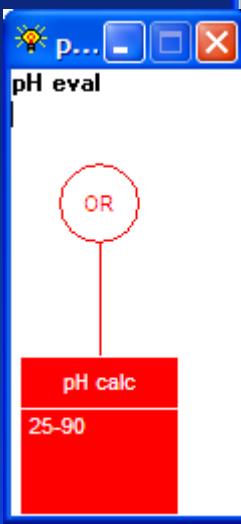
Name	Data %
BOD eval	0
Data Sufficiency	-0.778
DO eval	-0.231
Fecal Coliforms eval	100
Nitrate eval	1.000
pH eval	-1.000
Temp Change eval	0
Tot. Dissolved Solids eval	0
Tot. Phosphate eval	0
Turbidity eval	0
Water Quality Index - complete	67
Water Quality Index - partial	38



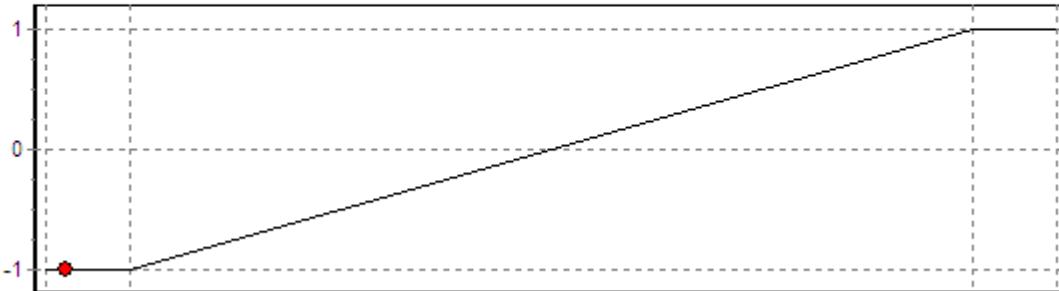
GeoNetWeaver 2007.12.19 - beta



File Setup Map Knowledge Base Results Help



? 25-90 in pH calc

pH calc
25-90

Results

Aggregation

none

Topic Displayed on Map

pH eval

Antecedents

Legend Stats Results Inputs Watershed_final

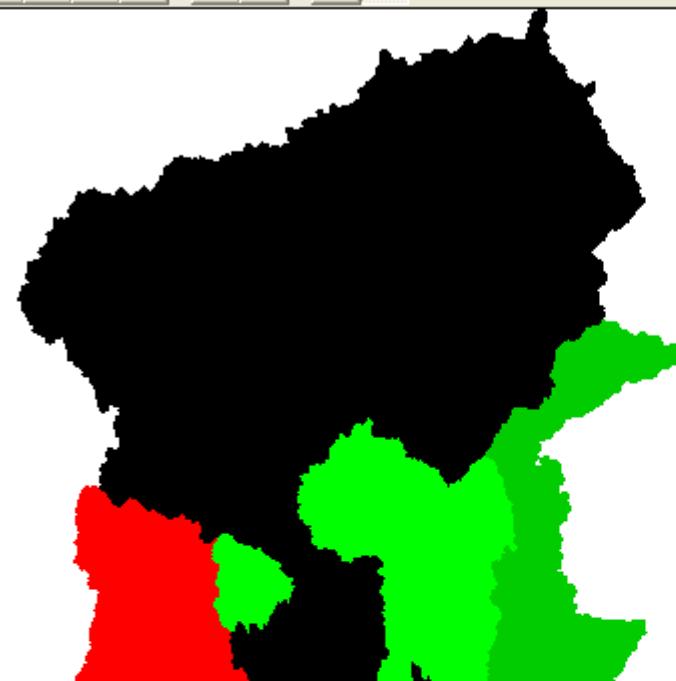
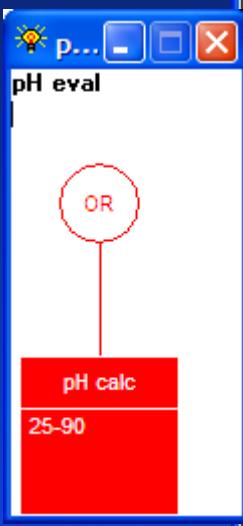
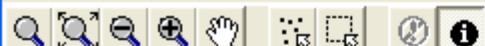
Name	Data %
BOD eval	0
Data Sufficiency	-0.778 17
DO eval	-0.231 100
Fecal Coliforms eval	- 0
Nitrate eval	1.000 100
pH eval	-1.000 100
Temp Change eval	- 0
Tot. Dissolved Solids eval	- 0
Tot. Phosphate eval	- 0
Turbidity eval	- 0
Water Quality Index - complete	- 67
Water Quality Index - partial	-0.130 38



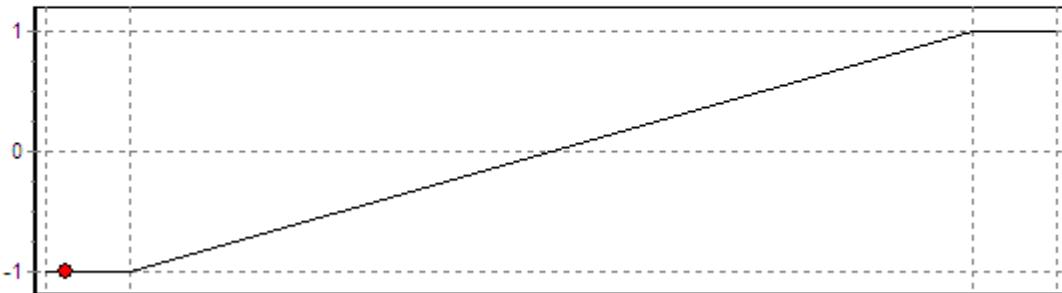
GeoNetWeaver 2007.12.19 - beta



File Setup Map Knowledge Base Results Help



? 25-90 in pH calc

pH calc
25-90

Results

Aggregation

none

Topic Displayed on Map

pH eval

Antecedents

Legend Stats Results Inputs Watershed_final

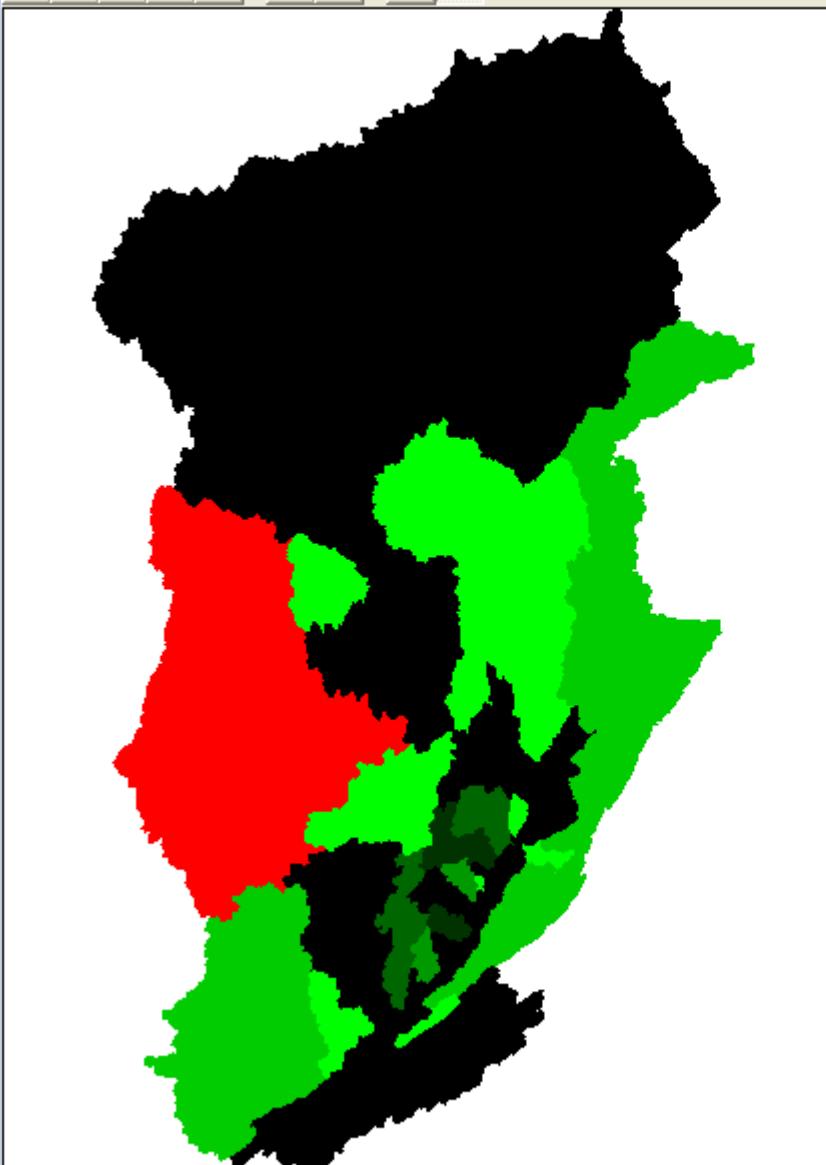
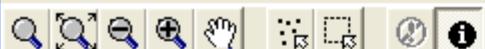
Name	Source
BOD	Watershed
DO	Watershed
Fecal Coliforms ECBroth	Watershed
Fecal Coliforms MFCMF	Watershed
Nitrates	0.699
Nitrates filtered as N	0.16
Nitrates unfiltered as N	0
pH_field	10
pH_lab	9.5
Temp Change	Watershed
Tot. Dissolved Solids	Watershed
Tot. Phosphate	0
Turbidity	0



GeoNetWeaver 2007.12.19 - beta



File Setup Map Knowledge Base Results Help



geoProject: WQI
Result Set: 25 Sept 2007

Results

Aggregation

none

Topic Displayed on Map

pH eval

Antecedents

Legend Stats Results Inputs Watershed_final

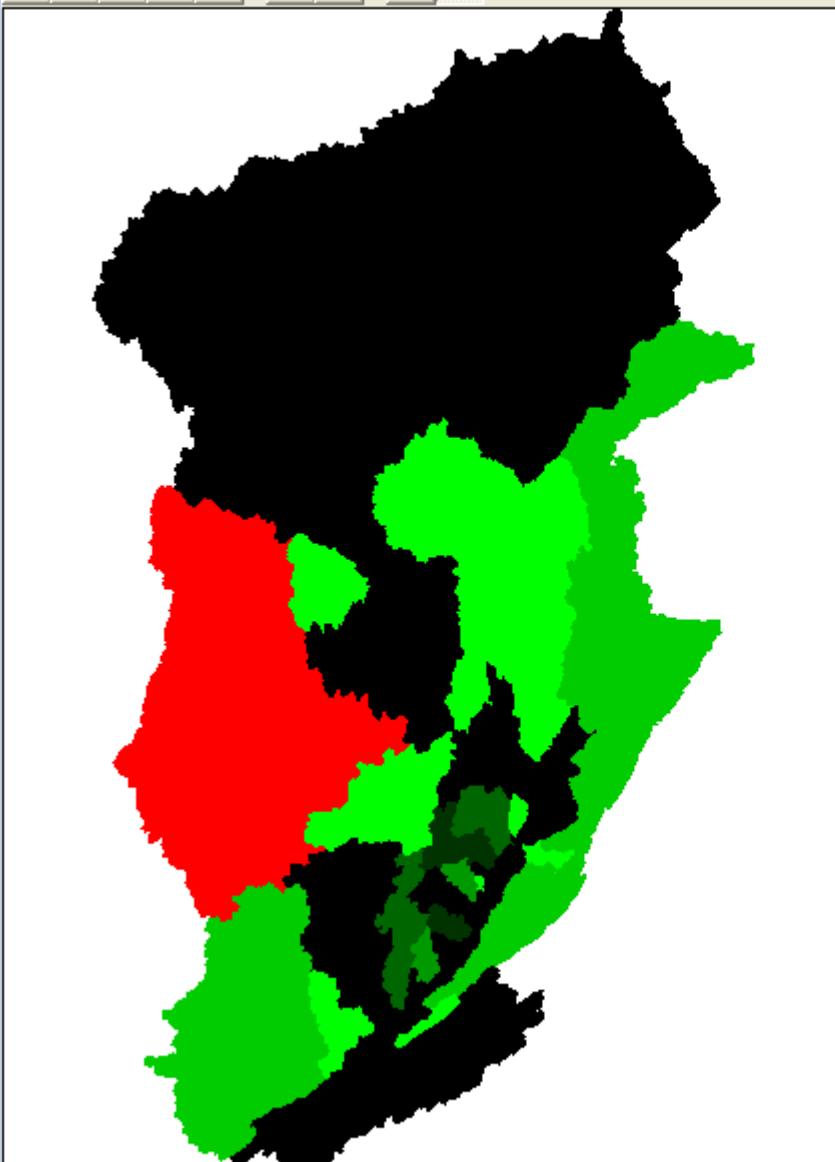
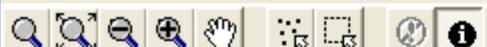
Name	Source
BOD	Watershed
DO	155
Fecal Coliforms ECBroth	Watershed
Fecal Coliforms MFCMF	Watershed
Nitrates	0.699
Nitrates filtered as N	0.16
Nitrates unfiltered as N	Watershed
pH_field	10
pH_lab	9.5
Temp Change	Watershed
Tot. Dissolved Solids	Watershed
Tot. Phosphate	0
Turbidity	Watershed



GeoNetWeaver 2007.12.19 - beta



File Setup Map Knowledge Base Results Help



Results

Aggregation

none

Topic Displayed on Map

pH eval

Antecedents

Legend

Stats

Results

Inputs

Watershed_final

Data Dissatisfaction

 pH eval

True

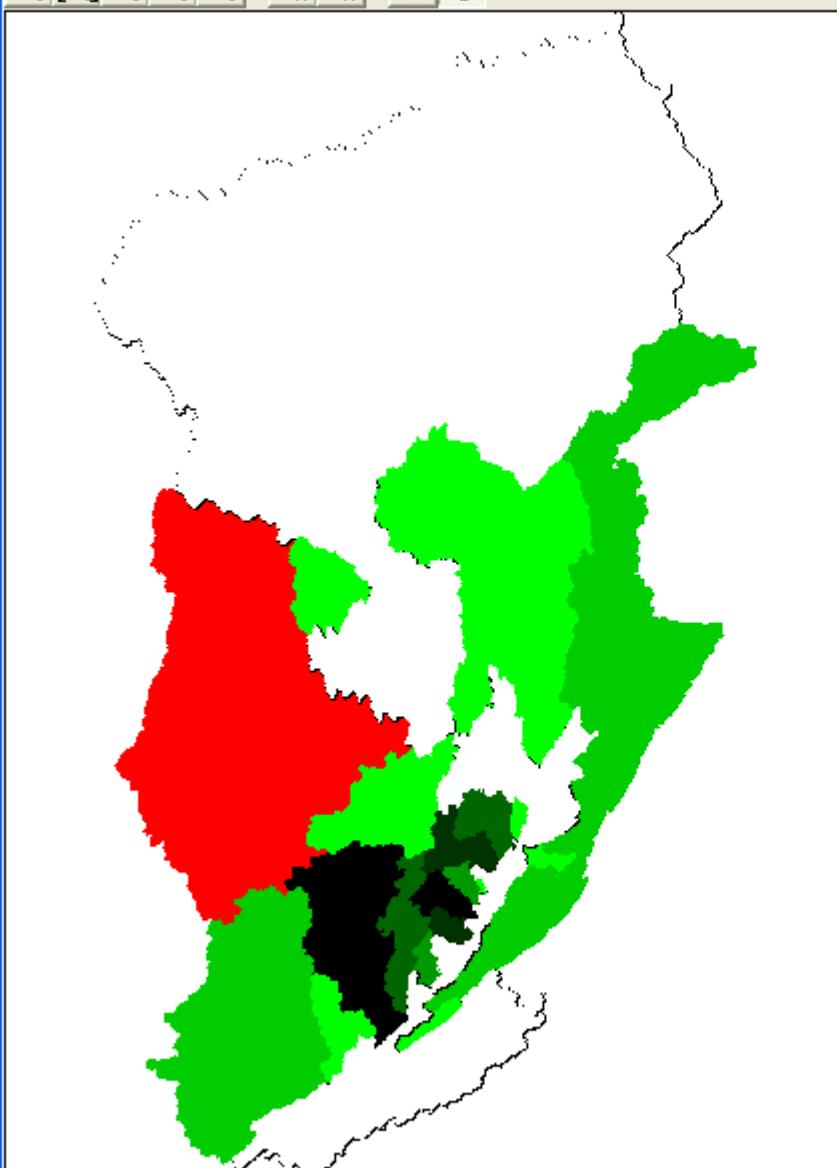
False



GeoNetWeaver 2007.12.19 - beta



File Setup Map Knowledge Base Results Help



geoProject: WQI
Result Set: 25 Sept 2007

Results

Aggregation

none

Topic Displayed on Map

pH eval

Antecedents

Legend

Stats

Results

Inputs

Watershed_final

 Data Dissatisfaction pH eval

True



False



WCA Models in Development



Water Quality (chemical/physical)

- Water Quality Index
- Watersheds Hydrologic Flow
- Mainstem Hydrologic Flow
- Impoundments



Water Quality (biologic)

- Fish Indices of Biotic Integrity
- Fish (native vs non-native & natural vs recreational goals)
- Macroinvertebrate Indices
- Periphyton
- Rare Aquatic Species



Terrestrial

- Change in Forest Cover
- % Watershed in Natural Condition
- Road Density
- Road Stream Crossings
- % Impervious Surface
- Riparian Forest Fragmentation
- % Core Forest
- % Edge
- % Perforated Forest
- Rare Communities/Species
- Invasive Species
- Human Stressors



Conclusion



Conclusion

- Makes the most of the available data
- Consistency across landscape
- Easily modify/extend models
- Reusable as new data is acquired
- Dynamic view of analysis and data requirements



Remember...



Remember...

*“... you go to assessment with the data
you have, not the data you might want or
wish to have ...”*

Paraphrase of D. Rumsfeld, 2006-04-07

PENNSTATE





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