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**Watershed Health Assessment Framework**

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# Watershed Health Assessment Framework



The Watershed Health Assessment Framework (WHAF) provides an organized approach for exploring the complexity of natural and human communities as they continuously exchange material, energy, organic information. The WHAF can reveal patterns of ecological health from multiple viewpoints, and encourage information sharing and collaboration; fostering innovative ideas that help the health and resilience of natural and human communities.



**What is it?**

The WHAF is an approach that uses a 5-component framework to consistently evaluate watersheds from different perspectives.

- [What is the WHAF?](#)
- [The 5 Components](#)
- [Health Index Scores](#)
- [Key Concepts](#)



**Use it**

Explore, interact and learn about Minnesota's watersheds and their health. Use the Map to view health scores, find data and share observations.

- [Interactive Map](#)
  - [Map Help](#)
- [WHAF Use Cases](#)




**Supporting Resources**

Find quick access to reports for Minnesota's watersheds, cited literature and recommended readings about system science. Subscribe to the WHAF newsletter for updates.

- Major Watershed Reports
  - [Context Reports](#)
  - [Health Report Cards](#)
- [References and Resources](#)
- [Email WHAF User Support !\[\]\(693fcb3caaca16f960792dd4ef78f66d\_img.jpg\)](#)
- [Subscribe to the newsletter !\[\]\(9c6bb19b0f713ce4c978fc97945488c7\_img.jpg\)](#)

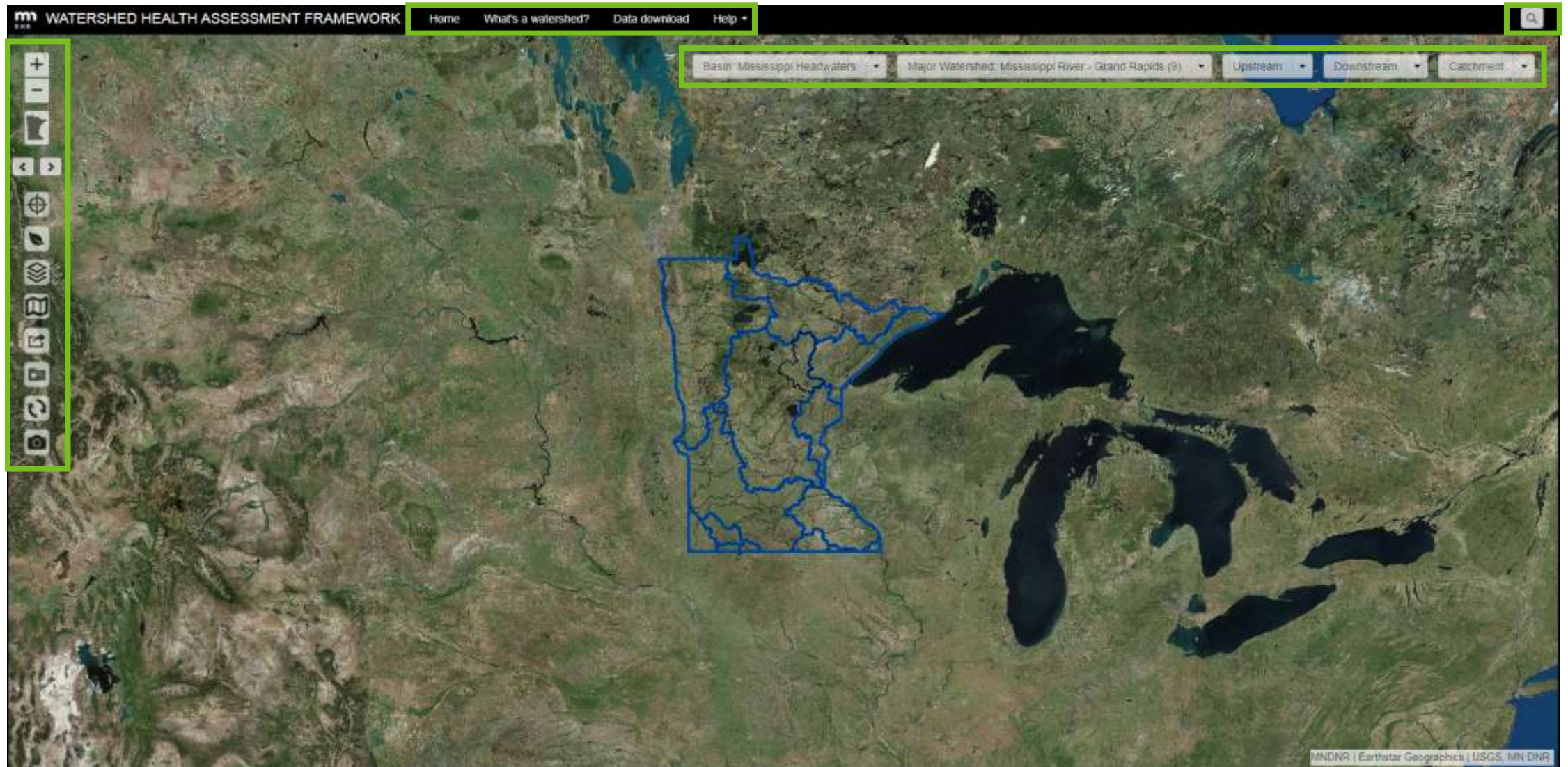
 Sign up for updates

Please email all feedback to: [WHAF.DNR@state.mn.us](mailto:WHAF.DNR@state.mn.us) 

Phone Contact: 651-345-3331 ext 228



# Version 1



Version 2

<http://arcgis.dnr.state.mn.us/ewr/whaf2/Explore/>

The screenshot displays the Watershed Health Assessment Framework web application. The main map area shows a watershed boundary in blue over a topographic map of Minnesota and surrounding regions. The interface includes a top navigation bar with the logo and title, a left sidebar with navigation controls, a right sidebar with tool options, and a bottom map style selector. Three orange arrows point to specific UI elements: the zoom controls on the left, the 'Click on a watershed' tooltip at the bottom left, and the map style selector at the bottom center.

**Watershed Health Assessment Framework**

**Left Sidebar:** +, -, <, >

**Right Sidebar:** Set Scale, Ecological Health Scores, Add Data, DSS, Legend, Charts & Reports, Search

**Map Style Selector:** Streets, Aerial, Aerial Hybrid, Gray, Dark Gray, MNDNR, Hillshade

**Bottom Left:** Click on a watershed

# Set Scale

The screenshot displays the Watershed Health Assessment Framework web application. The main map shows a large watershed area in the Upper Midwest, outlined in blue, covering parts of Minnesota, Wisconsin, and North Dakota. The map includes labels for cities like Winnipeg, Grand Forks, Fargo, and Minneapolis, as well as major water bodies like Lake Superior and Lake Itasca. A navigation toolbar on the left includes zoom in (+), zoom out (-), and pan arrows. A legend at the bottom of the map allows switching between map styles: Streets, Aerial, Aerial Hybrid, Gray, Dark Gray, MNDNR, and Hillshade. A tooltip at the bottom left reads "Click on a watershed".

On the right side, a "Set Scale" control panel is visible, featuring a search icon and the text "Set Scale". Below this, there are five sections, each with a title and a set of buttons:

- Basin**: Zoom, Mask, Fill, Outline
- Major Watershed**: Zoom, Mask, Fill, Outline
- Catchment**: Zoom, Fill, Outline
- Upstream**: Zoom, Mask, Fill, Outline
- Downstream**: Zoom, Mask, Fill, Outline

At the bottom of the "Set Scale" panel, there is an "All scales" section with "Select all" and "Clear" buttons. To the right of the "Set Scale" panel is a vertical sidebar with several icons and labels: a location pin icon labeled "Set Scale", a leaf icon labeled "Ecological Health Scores", a plus icon labeled "Add Data", a DSS icon labeled "DSS", a hamburger menu icon labeled "Legend", a bar chart icon labeled "Charts & Reports", and a search icon labeled "Search".

# Set Location

The image shows a screenshot of the Watershed Health Assessment Framework web application. The main map displays the Mississippi Headwaters Basin, with the Rum River Watershed highlighted in blue. A text box in the bottom left corner identifies the area as "Mississippi Headwaters Basin Rum River Watershed Catchment 2100200". The sidebar on the right, titled "Set Scale", contains several sections with buttons for "Zoom", "Mask", "Fill", and "Outline":

- Basin**: Zoom, Mask, Fill, Outline
- Major Watershed**: Zoom, Mask, Fill, Outline
- Catchment**: Zoom, Fill, Outline
- Upstream**: Zoom, Mask, Fill, Outline
- Downstream**: Zoom, Mask, Fill, Outline
- All scales**: Select all, Clear

At the bottom of the sidebar, there are navigation options: Streets, Aerial, Aerial Hybrid, Gray, Dark Gray, MNDNR, and Hillshade. A search bar is located at the bottom right of the sidebar. Two orange arrows point to the "Set Scale" button at the top of the sidebar and the "Select all" button in the "All scales" section.

# Select All Scales

The image shows a screenshot of the Watershed Health Assessment Framework web application. The main map displays the Mississippi Headwaters Basin, with the Rum River Watershed highlighted in yellow. The map includes a title bar at the top left with the logo and text "Watershed Health Assessment Framework". A bottom-left information box identifies the "Mississippi Headwaters Basin" and "Rum River Watershed" with "Catchment 2100200". A bottom navigation bar offers map styles: Streets, Aerial, Aerial Hybrid, Gray, Dark Gray, MNDNR, and Hillshade. On the right, a "Set Scale" control panel is visible, featuring a vertical sidebar with navigation icons and a main panel with buttons for "Zoom", "Mask", "Fill", and "Outline" for various scales: Basin, Major Watershed, Catchment, Upstream, and Downstream. The "Select all" button is highlighted in the "All scales" section.

**Watershed Health Assessment Framework**

**Mississippi Headwaters Basin**  
Rum River Watershed  
Catchment 2100200

Streets Aerial Aerial Hybrid Gray Dark Gray MNDNR Hillshade

**Set Scale**

Basin  
Zoom Mask Fill Outline

Major Watershed  
Zoom Mask Fill Outline

Catchment  
Zoom Fill Outline

Upstream  
Zoom Mask Fill Outline

Downstream  
Zoom Mask Fill Outline

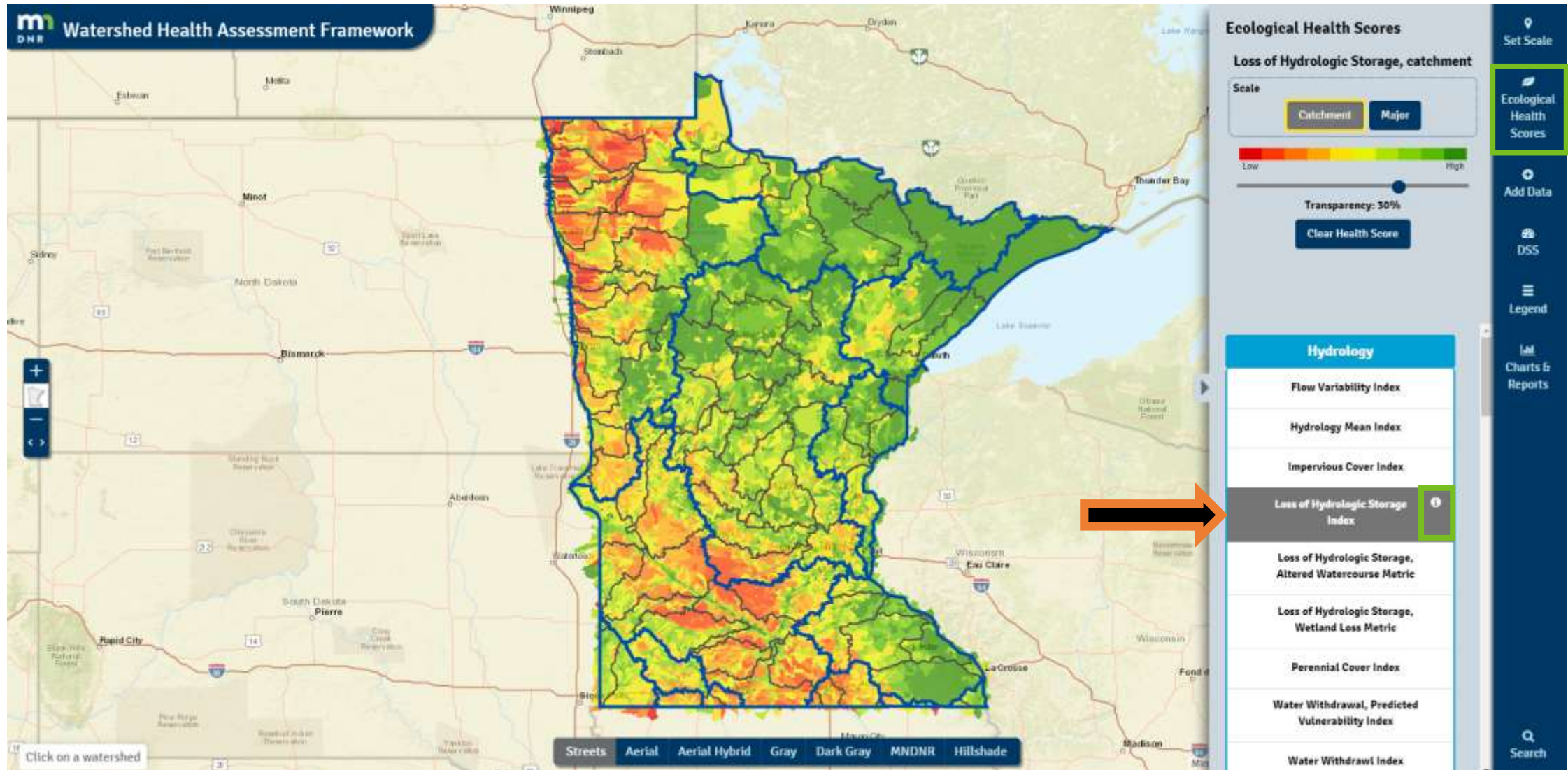
All scales  
Select all Clear

Set Scale  
Ecological Health Scores  
Add Data  
DSS  
Legend  
Charts & Reports  
Search

# Ecological Health Scores

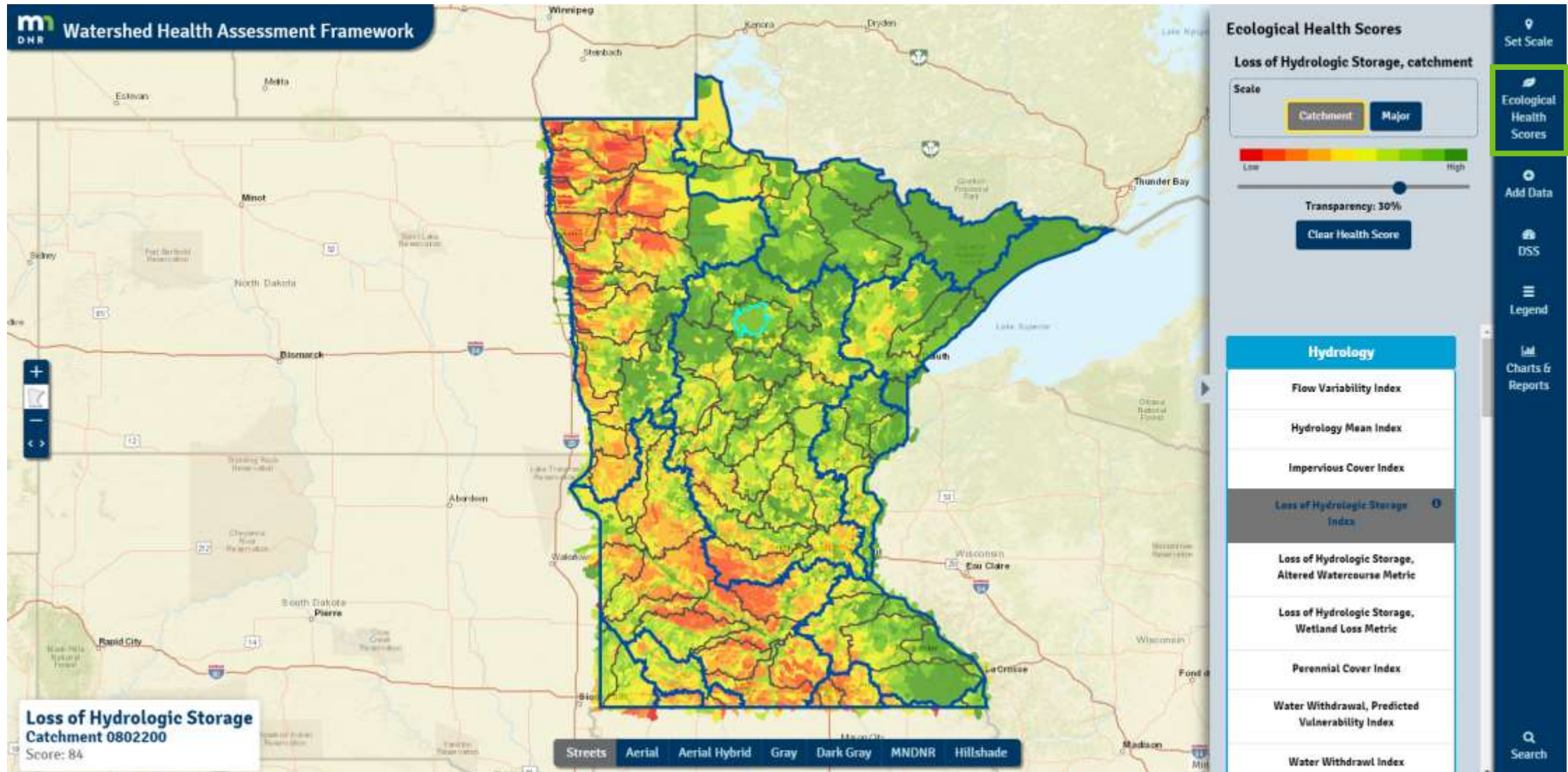


# Add an Ecological Health Scores





# Identify an Ecological Health Scores



# Add Data

**m DNR Watershed Health Assessment Framework**

**Mississippi Headwaters Basin  
Rum River Watershed  
Catchment 2100200**

**Add Data**

- Hillshade Topography
- Watershed Basins
- Major Watersheds
- Major Streams
- Catchments (HUC 12, subdivided)
- Impaired Waters 2018 (MPCA)
- Impaired Streams - Turbidity 2018 (MPCA)
- Altered Watercourses
- Public Ownership by Agency, GAP Stewardship 2008
- MN Wildlife Action Plan - Wildlife Action Network
- MN Wildlife Action Plan - SGCN Richness Grid
- Geomorphology of Minnesota - Sedimentary Association
- Population Density 2010 (Census Blocks)
- MN Biological Survey - Sites of Biodiversity Significance
- MN DNR Hydrography - Lakes of Biological Significance
- MDH Geologic Sensitivity at Walls
- HUC 10 Watersheds
- HUC 12 Watersheds

Streets Aerial Aerial Hybrid Gray Dark Gray MNDNR Hillshade

Set Scale  
Ecological Health Scores  
Add Data  
DSS  
Legend  
Charts & Reports  
Search

# Add Data to the Map

The screenshot displays the 'Watershed Health Assessment Framework' web application. The main map area shows Minnesota with various watershed basins outlined in blue and pink. A red 'X' is visible on the map. The interface includes a top navigation bar with the 'm DNR' logo and the title 'Watershed Health Assessment Framework'. On the right side, there is a 'Add Data' panel with a list of data layers. The 'Add Data' button is highlighted with a green box. Below the map, there is a map style selector with options: Streets, Aerial, Aerial Hybrid, Gray, Dark Gray, MNDNR, and Hillshade. At the bottom left, a tooltip says 'Click on a watershed'. At the bottom right, there is a search bar.

**Watershed Health Assessment Framework**

**Add Data**

- Hillshade Topography
- Watershed Basins
- Major Watersheds
- Major Streams
- Catchments (HUC 12, subdivided)
- Impaired Waters 2018 (MPCA)
- Impaired Streams - Turbidity 2018 (MPCA)
- Altered Watercourses
- Public Ownership by Agency, GAP Stewardship 2008
- MN Wildlife Action Plan - Wildlife Action Network
- MN Wildlife Action Plan - SGCN Richness Grid
- Geomorphology of Minnesota - Sedimentary Association
- Population Density 2010 (Census Blocks)
- MN Biological Survey - Sites of Biodiversity Significance
- MN DNR Hydrography - Lakes of Biological Significance
- MDH Geologic Sensitivity at Wells
- HUC 10 Watersheds
- HUC 12 Watersheds

Click on a watershed

Streets Aerial Aerial Hybrid Gray Dark Gray MNDNR Hillshade

Set Scale

Ecological Health Scores

Add Data

DSS

Legend

Charts & Reports

Search

# Identify Data

The screenshot displays the Watershed Health Assessment Framework web application. The main map shows Minnesota with various watershed basins outlined in pink and blue. A popup window titled "Impaired Lakes (2018) - All (labeled)" is open over a specific lake, displaying the following metadata:

- AUID = 48-0002-00
- LAKE NAME = Mile Lacs
- DESIGNATED USE CLASS = 2B, 3C
- AFFECTED USE = AQC
- IMPAIRMENT PARAMETERS = Hg-F
- LAKE LOCATION DESCRIPTION = AT GARRISON
- LAKE AREA (AC) = 128171.0625
- INTERSECTS TRIBAL RESERVATION = None
- OBJECTID = 1015
- SHAPE = Polygon

Below the popup, there is a "Zoom to" button. The application interface includes a top navigation bar with the "m DNR Watershed Health Assessment Framework" logo, a left sidebar with navigation controls, a bottom map style selector (Streets, Aerial, Aerial Hybrid, Gray, Dark Gray, MNDNR, Hillshade), and a right sidebar with an "Add Data" panel and a vertical navigation menu.

**Add Data Panel:**

- Hillshade Topography
- Watershed Basins
- Major Watersheds
- Major Streams
- Catchments (HUC 12, subdivided)
- Impaired Waters 2018 (MPCA)
- Impaired Streams - Turbidity 2018 (MPCA)
- Altered Watercourses
- Public Ownership by Agency, GAP Stewardship 2008
- MN Wildlife Action Plan - Wildlife Action Network
- MN Wildlife Action Plan - SGCN Richness Grid
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- Population Density 2010 (Census Blocks)
- MN Biological Survey - Sites of Biodiversity Significance
- MN DNR Hydrography - Lakes of Biological Significance
- MDH Geologic Sensitivity at Wells
- HUC 10 Watersheds
- HUC 12 Watersheds

**Vertical Navigation Menu:**

- Set Scale
- Ecological Health Scores
- Add Data
- DSS
- Legend
- Charts & Reports
- Search

# Health Score Matrix

**DSS**

Matrix Target Catchment Areas

Basin: Mississippi Headwaters (0701)  
 Watershed: Rum River (21)  
 Catchment: 2100200

[Collapse table](#) [Close table](#) [Download table](#)

Index Score	Basin	Major	Catchment	Upstream
Biology - Stream Species Quality, Fish IBI	46	53	N/A	N/A
Biology - Stream Species Quality, Invertebrate IBI	49	53	N/A	N/A
Biology - Stream Species Quality, Mussel Score	50	51	62	62
Biology - Terrestrial Habitat Quality	32	33	46	55
Connectivity - Aquatic Connectivity	90	91	53	96
Connectivity - Riparian Connectivity	78	79	73	88
Geomorphology - Pollution Sensitivity of Near-Surface Materials	46	41	52	51
Geomorphology - Soil Erosion Potential	74	79	83	68
Hydrology - Altered Watercourses	55	48	27	77
Hydrology - Impervious Cover, 2011	72	70	38	82
Hydrology - Loss of Hydrologic Storage	74	72	63	87
Hydrology - Perennial Cover, 2011	69	70	82	92
Hydrology - Water Withdrawal	97	99	100	100
Hydrology - Wetland Loss	87	90	99	96
Water Quality - Localized Pollution Sources	83	80	67	85
Water Quality - Localized Pollution Sources, Animal Units	90	97	98	99
Water Quality - Localized Pollution Sources, Open Pit Mines	99	100	100	100
Water Quality - Localized Pollution Sources, Potential Contaminants	89	91	84	97
Water Quality - Localized Pollution Sources, Septic Systems	70	53	28	58
Water Quality - Localized Pollution Sources, Superfund Sites	99	99	90	100
Water Quality - Localized Pollution Sources, Wastewater Treatment Plant	99	99	100	100
Water Quality - Non-Point Source, Phosphorus Risk	72	74	83	89
Water Quality - Water Quality Assessments, Aquatic Consumption	0	0	0	0
Water Quality - Water Quality Assessments, Aquatic Life	61	87	29	41
Water Quality - Water Quality Assessments, Aquatic Recreation	60	78	N/A	100

[Set Scale](#)  
[Ecological Health Scores](#)  
[Add Data](#)  
[DSS](#)  
[Legend](#)  
[Charts & Reports](#)  
[Search](#)

# Geomorphology Triage

DSS Collapse table Close table

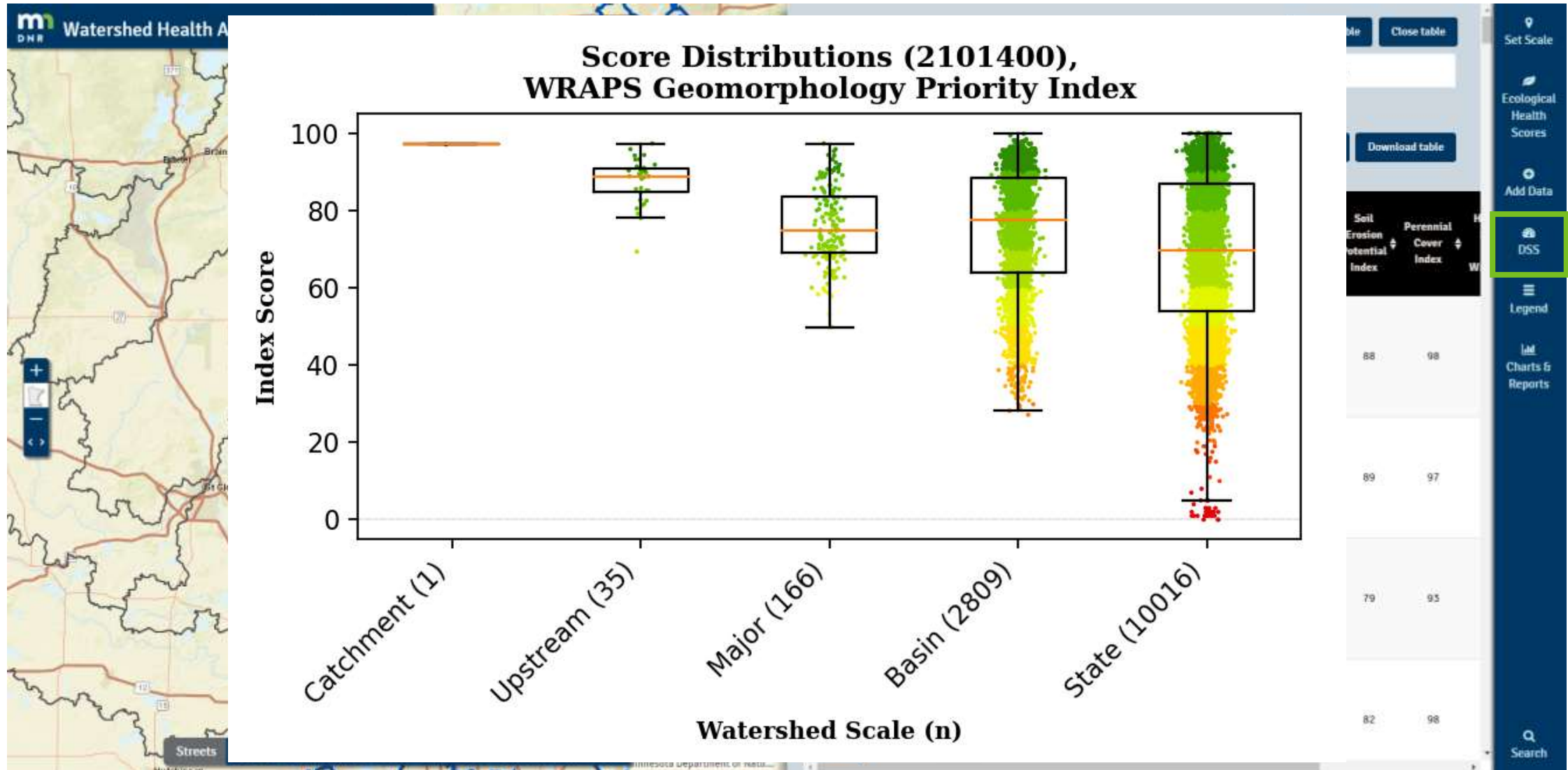
Matrix Target Catchment Areas

**Target Catchment Areas**  
Selected Watershed: Rum River (21)  
Selected Catchment: 2100200  
Catchments: 166 Zoom to Rum River (21) Download table

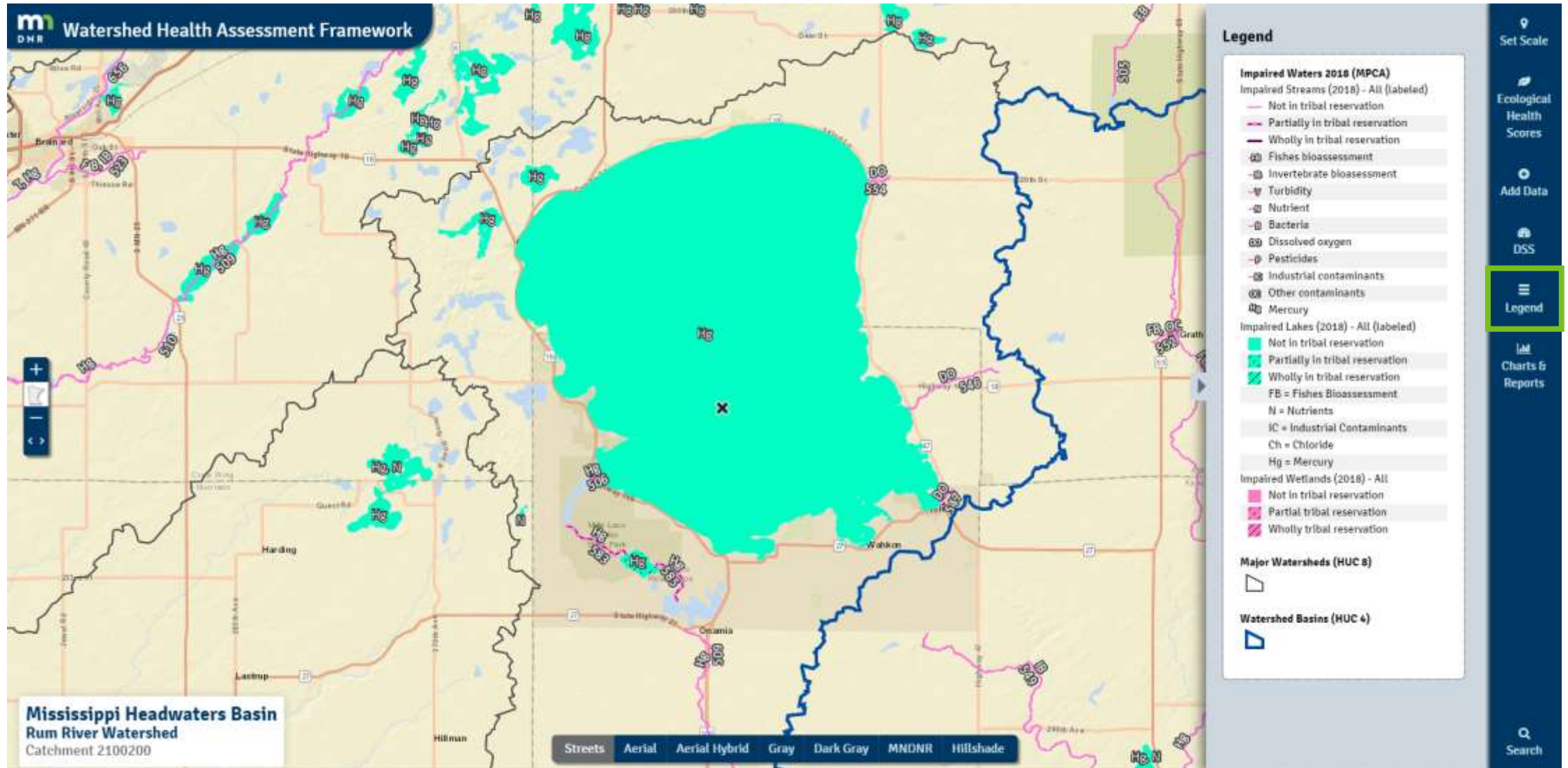
Tools	Catchment	Mean Score	Catchment Miles <sup>2</sup>	Upstream Miles <sup>2</sup>	Stream Species Quality, Fish IBI Metric	Aquatic Connectivity Index	Riparian Connectivity Index	Soil Erosion Potential Index	Perennial Cover Index	Loss of Hydrologic Storage, Altered Watercourse Index	Localized Pollution Sources, Animal Units Metric	Action
Map Zoom Chart	2101400	97	3.22	444.77		100	98	88	98	100	100	Protect
Map Zoom Chart	2100400	96	7.71	7.71		100	94	89	97	100	95	Protect
Map Zoom Chart	2102400	95	4.33	4.33		100	100	79	93	100	100	Protect
Map Zoom Chart	2101401	94	12.15	441.55		90	96	82	98	100	100	Protect
Map Zoom Chart	2101201	94	1.57	1.57		100	98	76	97		100	Protect
Map Zoom Chart	2105801	93	0.5	0.5		100	99	73	94		100	
Map Zoom Chart	2100300	93	9.95	17.65		100	96	86	96	83	98	

DSS Legend Charts & Reports Search

# Geomorphology Triage



# Legend





# Charts & Reports

The screenshot displays the Watershed Health Assessment Framework interface. The main map area shows the Mississippi Headwaters Basin, with the Rum River Watershed highlighted in blue. The map includes labels for various locations such as Garrison, Watikon, Onamia, and Lostrup. A legend in the bottom right corner of the map area lists map styles: Streets, Aerial, Aerial Hybrid, Gray, Dark Gray, and MNDNR. The 'Charts & Reports' sidebar on the right contains a 'Scale' dropdown menu with the following options: --Select from list --, --Select from list -- (highlighted), Basin, Major Watershed Catchment, and Upstream. The sidebar also features a vertical navigation menu with icons for Set Scale, Ecological Health Scores, Add Data, DSS, Legend, and Charts & Reports (highlighted in green). A search bar is located at the bottom right of the sidebar.

**Watershed Health Assessment Framework**

**Charts & Reports**

**Scale**

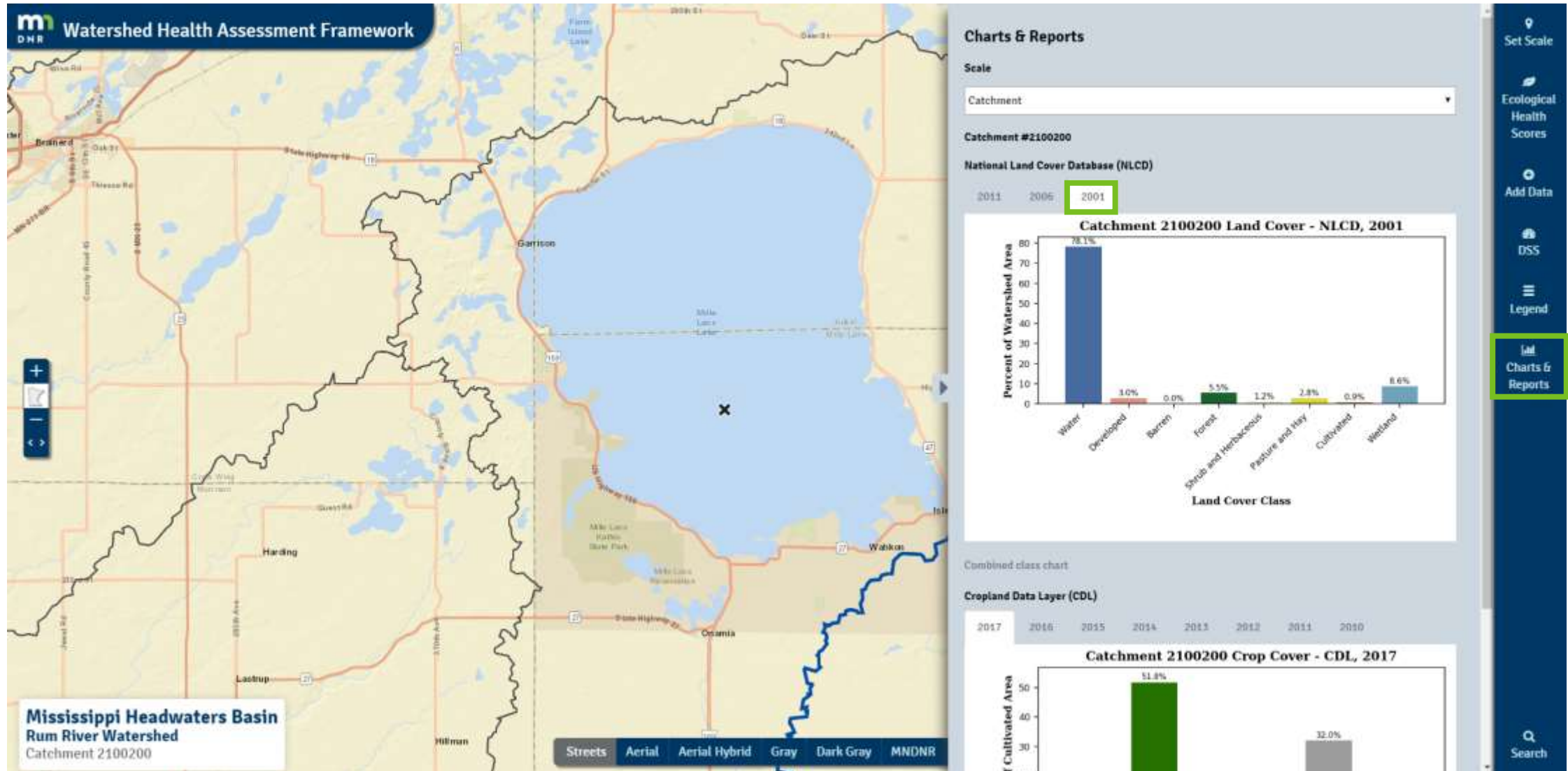
- Select from list --
- Select from list --
- Basin
- Major Watershed Catchment
- Upstream

**Mississippi Headwaters Basin**  
**Rum River Watershed**  
Catchment 2100200

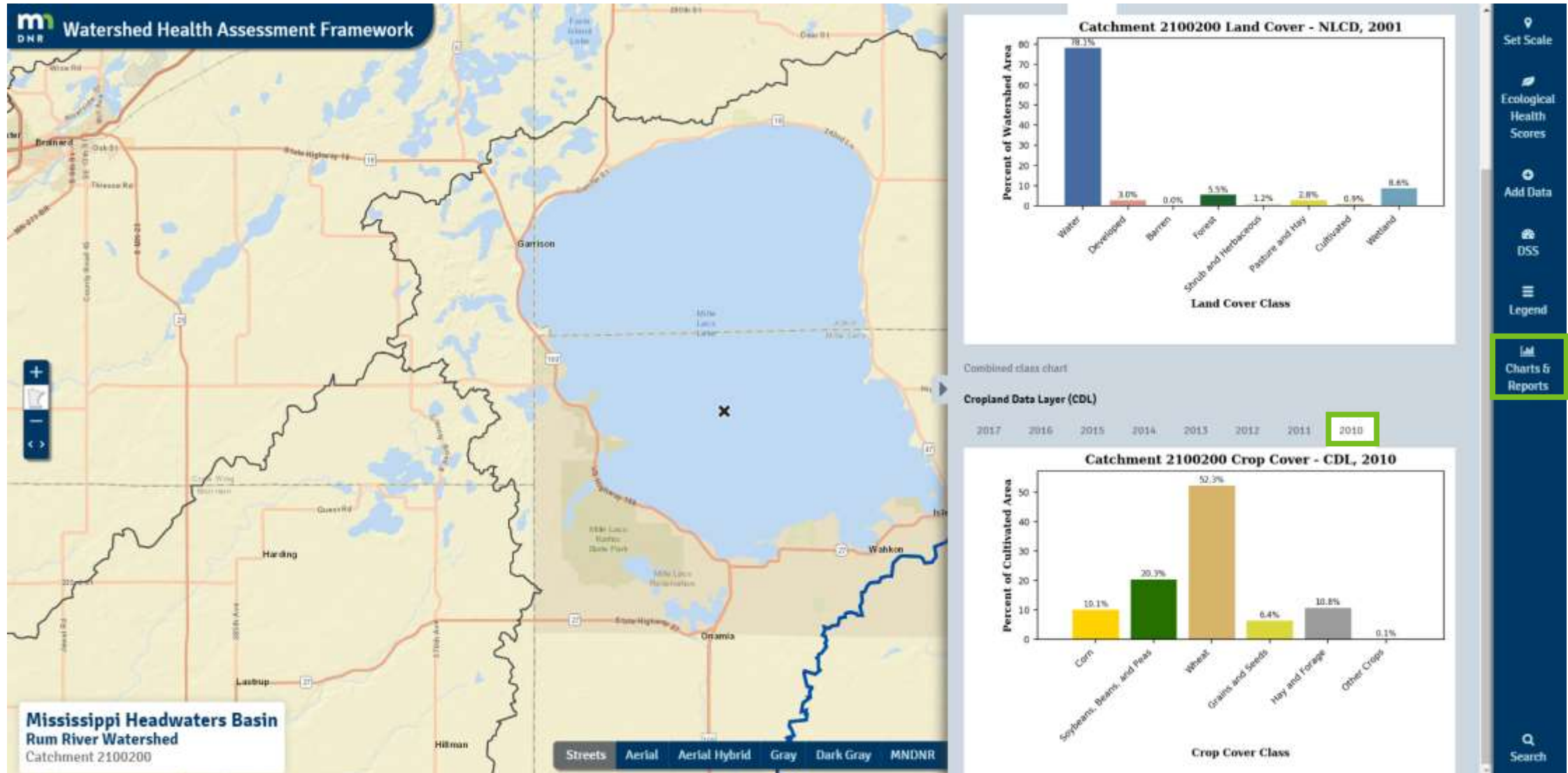
Streets Aerial Aerial Hybrid Gray Dark Gray MNDNR

Set Scale  
Ecological Health Scores  
Add Data  
DSS  
Legend  
Charts & Reports  
Search

# National Land Cover Database (NLCD) Charts



# Cropland Data Layer (CDL) Charts



# Reports

The screenshot displays the Watershed Health Assessment Framework interface. On the left is a map of the Rum River Watershed, showing the Mississippi Headwaters Basin and Catchment 2100200. The map includes labels for various locations like Garrison, Onamia, and Wahkon, and features like the Rum River and Lake Umbagog. A legend at the bottom of the map allows switching between different map styles: Streets, Aerial, Aerial Hybrid, Gray, Dark Gray, and MNDNR.

On the right side, the 'Charts & Reports' section is active. It includes dropdown menus for 'Major Watershed' (set to Rum River) and 'Major Watershed' (set to Rum River (21) Major Watershed). Below these are buttons for 'Watershed Report Card' and 'Watershed Context Report'. The 'National Land Cover Database (NLCD)' section shows a bar chart for the year 2011, titled 'Major 21 Land Cover - NLCD, 2011'. The chart displays the percentage of watershed area for various land cover classes.

Land Cover Class	Percent of Watershed Area
Water	14.9%
Developed	6.7%
Barns	0.0%
Forest	24.4%
Shrub and Herbaceous	3.9%
Pasture and Hay	16.1%
Cultivated	17.6%
Wetland	16.5%

At the bottom right, there are options for 'Cropland Data Layer (CDL)' and a search bar.

# Major Watershed Reports



Watershed Health Assessment Framework  
 "Managing for System Health"



## Watershed Report Card: Rum River



### People and Places:

**Watershed Population:**  
 2000 census - 121,686  
 2010 census - 143,863

**Largest Cities - Population:**  
 Ramsey - 23,668  
 Anoka - 17,142  
 Cambridge - 8,111  
 Oak Grove - 8,031  
 Saint Francis - 7,218

**Counties - % of watershed:**  
 Mille Lacs - 36 %  
 Isanti - 23 %  
 Aitkin - 13 %  
 Anoka - 11 %  
 Morrison - 6 %  
 Crow Wing - 3 %  
 Sherburne - 3 %  
 Benton - 2 %  
 Kanabec - 1 %  
 Chisago - 0 %

### Watershed Area:

**Watershed size:**  
 1,013,793 acres  
 1,584 square miles

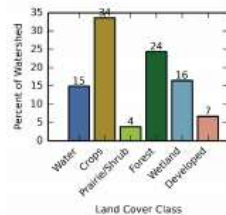
**Watershed Surface Area:**  
 Percent Land - 85 %  
 Percent Water - 15 %

**HUCS ID:**  
 07010207

**Basin Name:**  
 Mississippi Headwaters (0701)

### Land Use:

**Percent of watershed area  
 by land cover type:**



## Watershed Context Report

Rum River  
 September, 2017

# Search

**Watershed Health Assessment Framework**

**Location Name**

eagle

Name	County	Type
Bald Eagle	Ramsay	lake
Bald Eagle	Lake	lake
Bald Eagle Bluff SNA	Wabasha	sna
Bald Eagle Creek	Lake	stream
Eagle	Hennepin	lake
Eagle	Becker	lake
Eagle	Itasca	lake
Eagle	Hubbard	lake
Eagle	Carver	lake

**Address**

**Mississippi Headwaters Basin**  
**Rum River Watershed**  
Catchment 2100200

Streets Aerial Aerial Hybrid Gray Dark Gray MNDNR Hillshade

Search