

Using the WATERSHED ASSESSMENT TOOL

How healthy, or unhealthy, is your watershed?

To start, let's test your current knowledge. Keep in mind these questions are intended to make you think about what you do and do not know and to spark your curiosity to use this tool to help you find the answers!

What do you know about the watershed you live in?

- What is a **watershed**?
- What **major river basin** do you live in? That is, where does the rain water and snow melt in your back yard or school parking lot ultimately go?
 - a) Red River of the North Basin then north through Canada to Hudson Bay
 - b) Rainy River Basin then north through Canada to Hudson Bay
 - c) Great Lakes Basin, where waters flow into Lake Superior
 - d) Mississippi River Basin then south to the Gulf of Mexico
 - e) Minnesota River Basin then to the Mississippi River and south to the Gulf of Mexico
- What is the name of the **major watershed** you live in?

{Examples: Sauk River, North Fork Crow River, Long Prairie River, Redeye River, Crow Wing River, Rum River}
- Are there lots of **lakes** and **wetlands** in your watershed?
- What are the predominant kinds of **land uses** in your watershed?

(For example: cropland, grassland/pastures, urban/rural development, roads & highways, industry, mining, forest harvest, parks & wilderness areas)
- How much has the landscape changed in the past 100+ years?
- Are there **rare animals & plants** or **biologically diverse sites** found in your watershed?
- How many **dams**, **superfund sites**, and **wastewater treatment plants** are in your watershed?
- Is the **water** pretty **clean** in your watershed for swimming, fishing and drinking?



- Have any lakes or stretches of river been declared impaired? What does **impaired** mean?
- If you were to compare the health of your watershed to other watersheds in Minnesota, do you think it is lower or higher than the average health of watersheds across the state? Lower or higher than other watersheds that flow to the same major river?

Now, let's explore the Watershed Assessment Tool to help you answer those questions you couldn't answer or were not sure how to answer.

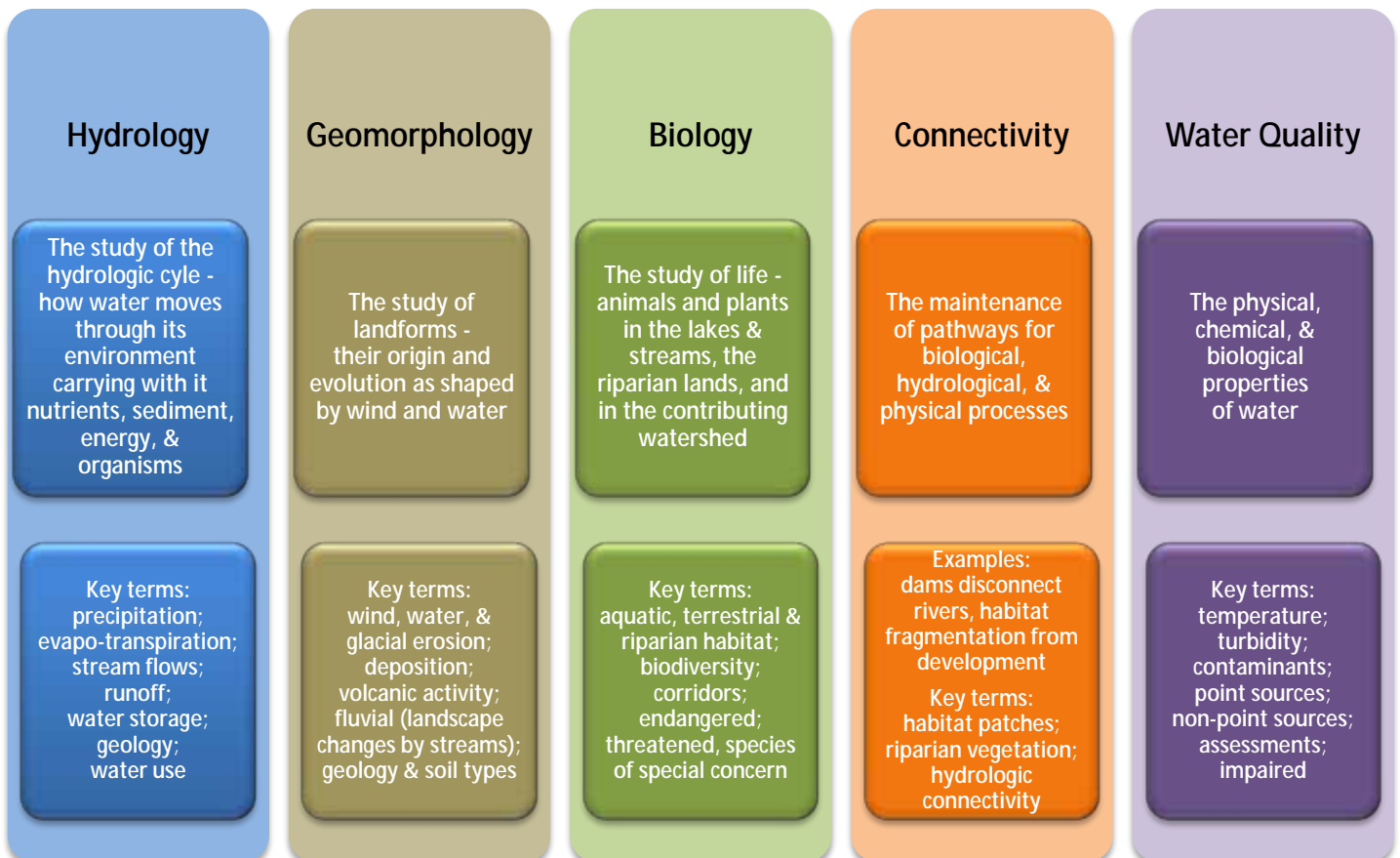
First, a few definitions you will need to be familiar with...



There are many different watershed scales, from very large (Mississippi River watershed which encompasses 40% of the US!) to very small (couple acre pothole wetland). For various reasons, this tool is organized into the **'major'** watershed scale. Major watersheds are also known as HUC 8 watersheds. Minnesota has 81 major watersheds, as shown in this map.

A five-component framework:

This framework was adopted to organize all the various information and data pertaining to watershed health into an easy to understand arrangement. Natural systems are very complicated, so it is necessary to organize into a framework.



WATERSHED ASSESSMENT TOOL:

How healthy is your watershed?

STEP 1 - BACKGROUND INFORMATION

- What is a major watershed?

Home > Assistance > Natural resource planning > Big picture tools >

Minnesota's Watershed Assessment Tool

"Connecting Our Resources"



How Healthy are Minnesota's Watersheds?

The Watershed Assessment Tool gives an overview of the ecological health of Minnesota's 81 major watersheds. Like your family physician gathering blood pressure, weight and body temperature during an annual physical, these rankings indicate areas of concern and areas functioning well.

By providing a snapshot of the condition of our natural systems today, this assessment also provides a baseline to discuss how to improve and maintain healthy systems for tomorrow.

Moving forward, this site will report the results from regular check-ups to keep a closer, more informed eye on emerging health trends.

Home Page | Health Index List | Map Your Watershed

Please email FEEDBACK on the Watershed Assessment Tool to: WATcomments@state.mn.us

YOUR WATERSHED HEALTH REPORT

Learn about health scores:
Creating a **health index**

Learn about natural systems:


- What is a **watershed**?
- What are the **five ecological components**?
- What natural resource features are in **my watershed**?

Start by going to the Watershed Assessment Tool (WAT for short) home page:
www.dnr.state.mn.us/watershed_tool/index.html

Click here

When done go back to Home page

- How do we define watershed health?



Watershed Health is a term used to describe how well ecological systems are functioning. The biggest challenge in defining the health of any given watershed is to decide what "well-functioning" means for each location.

A physician will decide if a human patient appears to be "healthy" based on measurements like:

- body temperature,
- blood pressure,
- heart rate;

while also considering the patient's age, their genetic background and their personal health history.

An ecologist will decide if a watershed appears to be "healthy" based on measurements like:

- habitat quality
- water quality and quantity,
- contaminants and risk factors,
- plant and animal biodiversity

while also considering the climate, geology, location and land use history of the watershed.

THE CHALLENGE OF MEASURING WATERSHED HEALTH

One major difference is that there are not target values for ecologists to use to guide their "diagnosis". Is this watershed running a fever or not? Does this watershed have high blood pressure or not?

In most cases, instead of having a threshold value (98.6 body temperature), watershed health is measured by comparing the current condition with an estimate of how natural systems in that location would function if they were in optimal health. Of course, many places are not currently in optimal health and there may be no existing reference condition to explore and understand for comparison.

Read here

STEP 2 - VIEWING HEALTH SCORES

Home > Assistance > Natural resource planning > Big picture tools >

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Home Page | Health Index List | Map Your Watershed

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Learn about health scores: Creating a **health index**.

Learn about natural systems:

- What is a watershed?
- What are the five ecological components?
- What natural resource features are in

A team of experts explored a wide variety of data sets to create a suite of statewide watershed health scores. The purpose is to provide the public and working professionals a platform for understanding how healthy, or unhealthy, our watersheds are. Then we can make informed decisions about how we can best protect and restore our lands and waters. The five-component framework is used throughout:

- Hydrology
- Geomorphology
- Biology
- Connectivity
- Water quality

Click here

1. Take a few minutes to explore the variety of statewide results by expanding the drop-down menu on right and clicking on the various indices

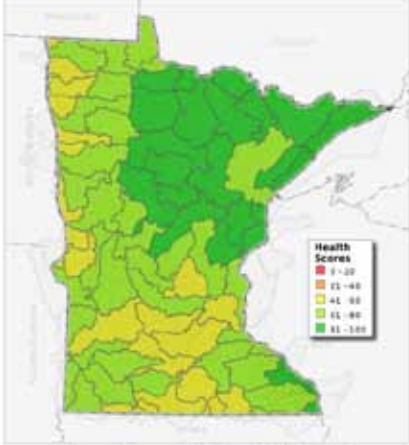
2. Now click on "Perennial Cover" under "Hydrology"

Note: Low scores (red) indicate poor health. High scores (green) indicate better health.

Home > Assistance > Natural resource planning > Big picture tools > Watershed Assessment Tool > Scores >

Watershed Scores

Current Map: Mean Hydrology Health Score



Select a map:

- Overall Health Score
- Hydrology**
- Mean Score
- Minimum Score
- (I) Perennial Cover
- (I) Impervious Surface
- (I) Water Withdrawal
- (I) Hydrologic Storage
- (I) Flow Variability
- Geomorphology
- Biology
- Connectivity
- Water Quality

Health Scores

- 0 - 20
- 21 - 40
- 41 - 60
- 61 - 80
- 81 - 100

Please click on watershed for a detailed report.

Click here

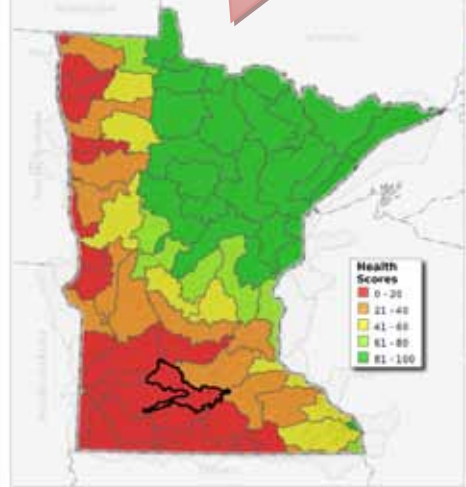
This index scores the loss of permanent vegetation (prairie, forests). Notice the lowest scores, or least healthy, watersheds are in areas dominated by cropland that were once extensive, diverse prairies.

3. Find the watershed you live in then click in it to open a health report

- Notice the summary information on the right for the watershed.
- Is your watershed highly developed, forested, or predominately in agricultural production?*

Select a map:

- Overall Health Score
- Hydrology**
- Mean Score
- Minimum Score
- (I) Perennial Cover
- (I) Impervious Surface
- (I) Water Withdrawal
- (I) Hydrologic Storage
- (I) Flow Variability
- Geomorphology
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- Water Quality



Health Scores

- 0 - 20
- 21 - 40
- 41 - 60
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Please click on watershed for a detailed report.

Watershed Health Report



Minnesota River - Mankato Watershed

HUC 8: 07020007 DNR Major: 28
Major River Basin: Minnesota
Area: 1,347 square miles
Stream Length: 1,586 miles
Lakes Area: 20,594 acres
Watershed Mean Health Score: 45
[download health report \(PDF/0.5MB\)](#)



Click here

5. Click on the “[download health report](#)” to view a printable health report summary for that watershed (shown on the next page).

Overall Watershed Score

Hydrology Health Scores

Geomorphology Health Scores

Biology Health Scores

Connectivity Health Scores

Water Quality Health Scores

WAT Score

The Watershed Assessment Tool measures five watershed health components: Hydrology, Geomorphology, Biology, Connectivity and Water Quality. Each component contains 3-5 health index scores. The index scores are combined to create a component score. The component scores are also combined into an overall mean (average) watershed health score; and the index identified with lowest score is the watershed minimum health score.

Please go to the [Watershed Health Assessment Results](#) page for more information.

Click here

Each component name opens a drop down menu of watershed index scores. When you hover over the scale below the index, the text box on the right gives a brief description and a link to more detail.

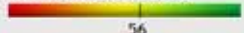
4. Take a few minutes to read these summaries, to help understand what these 5 components and 18 indices measure.

Note: The 5 components have **mean scores** (the average of the 3-5 indices) and **minimum scores** (the lowest of the 3-5 indices).

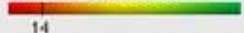
Overall Watershed Score

Hydrology Health Scores

Mean Watershed Score:

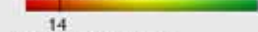


Minimum Index Score:

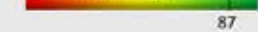


Index:

Perennial Cover:



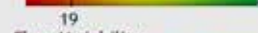
Impervious Surface:



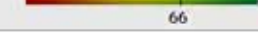
Water Withdrawal:



Hydrologic Storage:



Flow Variability:



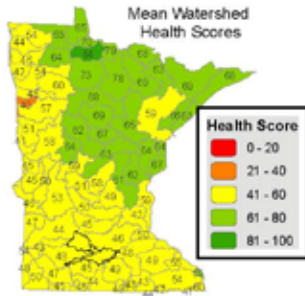
Perennial Cover

Perennial cover is permanent vegetation that covers the landscape year-round. Permanent vegetation is removed from land when it is converted to cropland, or developed for human use, such as roads, buildings and homes. This index compares the amount of permanent vegetation that covered the watershed land surface in the 1890's to the amount of year-round vegetation that was measured in 2001.

Please go to the [Watershed Health Assessment Results](#) page for more information.

Click here

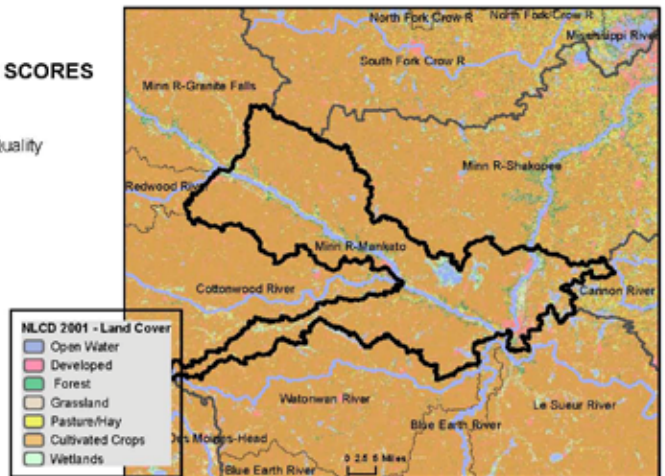
For even more information about a component or index, click “[Watershed Health Assessment Results](#)” to open a new page with statewide results and more detailed information.



Minn R-Mankato WATERSHED HEALTH ASSESSMENT SCORES

Mean (average) Health Score 45
 Minimum Health Index Score 5
 Minimum Health Index: Biology - Habitat Quality

Watershed Assessment Tool
http://www.dnr.state.mn.us/watershed_tool



Watershed Health Scores compare and rank various aspects of ecological health across Minnesota. Index values are based on a variety of data sources, calculations and scientific approaches. Each index is scored on a scale from 0 to 100, with 0 being the least desirable result or condition to 100 being the best existing condition or most desirable result. Major watershed scale rankings may mask the range of conditions that occur at more local scales. A high score may indicate the least impacted condition in Minnesota, not necessarily a healthy condition.

COMPONENT SCORES

| HYDROLOGY | GEOMORPHOLOGY | BIOLOGY | CONNECTIVITY | WATER QUALITY |
|---|---|--|---|--|
| Mean (Ave.) 56 Minimum Index 14 | Mean (Ave.) 66 Minimum Index 58 | Mean (Ave.) 31 Minimum Index 5 | Mean (Ave.) 24 Minimum Index 7 | Mean (Ave.) 47 Minimum Index 26 |
| INDEX SCORES | INDEX SCORES | INDEX SCORES | INDEX SCORES | INDEX SCORES |
| Perennial Cover 14 Impervious Cover 87* Withdrawal 95* Storage 19 Flow Variability 66 | Soil Erosion Susceptibility 76 Groundwater Susceptibility 58 Climate Vulnerability 64 | Terrestrial Habitat Quality 5 Stream Species 49 Species Richness 49 At-Risk Species Richness 19 | Terrestrial Habitat Connectivity 7 Aquatic Connectivity 21 Riparian Connectivity 45 | Non-Point Source 29 Point Source 86* Assessments 26 |
| Metric Sub-Scores | | | Metric Sub-Scores | Metric Sub-Scores |
| Storage: Stream/Ditch Ratio 17 Surface storage 21 | | | Aquatic Connectivity: Bridges/Culverts 8 Dams 35 | Non-Point Source: Nutrient Application 29 Riparian Impervious 29 |

*These index values are influenced by very low scores associated with dense urban use of resources. This gives comparatively high scores for outstate Minnesota. Viewing input data is necessary to evaluate possible watershed scale concerns.

November, 2011

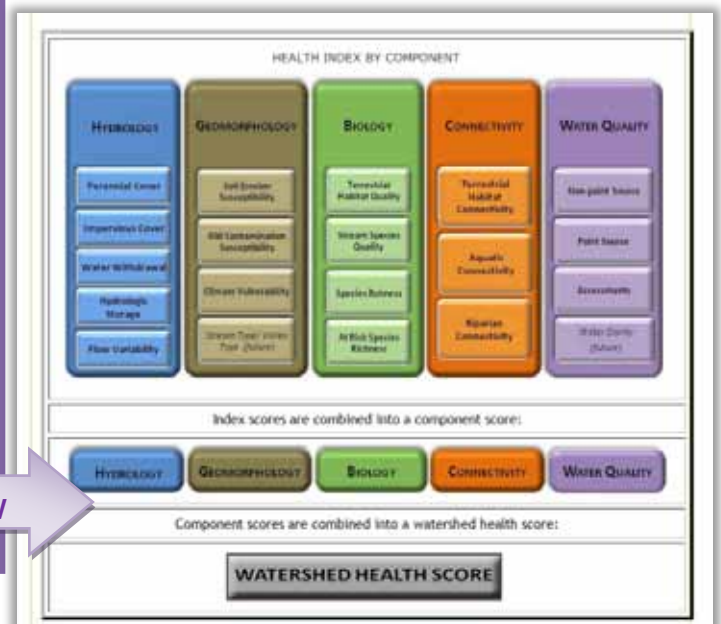
This summary sheet conveniently shows all health scores for your watershed.

View and compare the scores for each component and each index. Here are some things to look for:

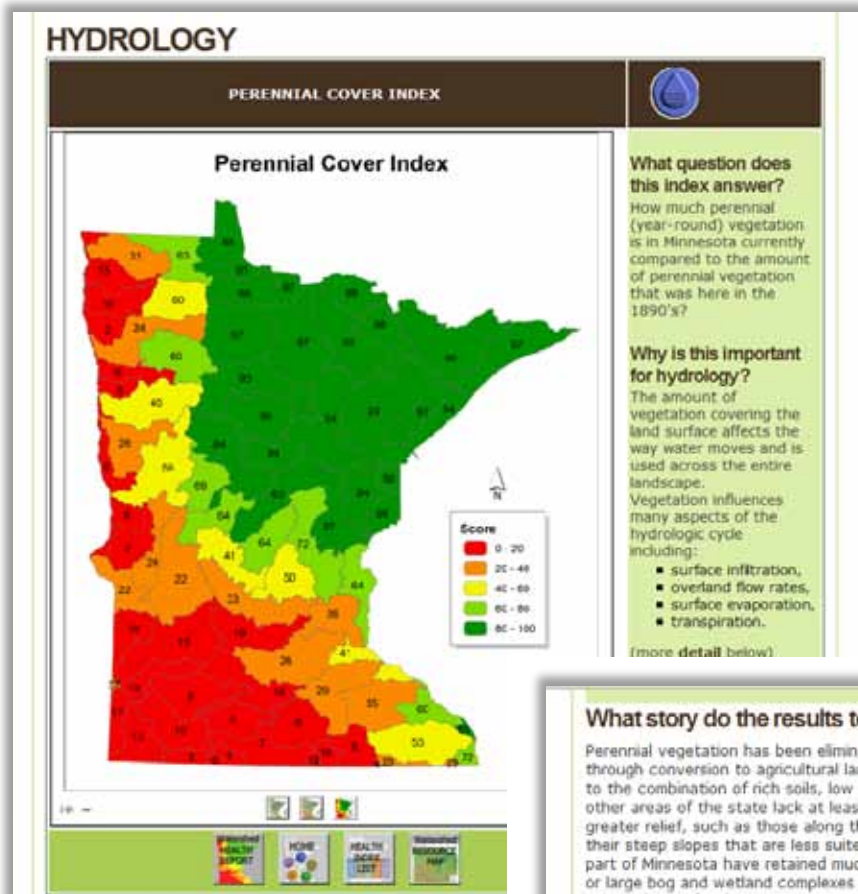
- Which of the 5 components had the highest mean score?
- Which of the 5 components had the lowest minimum index score?
- Does one component in the system seem to have mostly high or mostly low scores?
- Do these scores make sense with what you know about your watershed?

Click back to WAT Home page, then click **Health Index List** icon

- Use the Index list to see how your watershed compares to other MN watersheds.



STEP 3 -UNDERSTANDING HEALTH SCORES



From the Home page, click **Health Index List** icon, then click **Perennial Cover** under **Hydrology**.

Take some time to read about **perennial vegetation**, especially “**Why is this important?**” and “**What story do the results tell?**”

Go back to the **Health Index List** and explore other indices you are interested in, such as **Point Sources in Water Quality** or **Species Richness in Biology**.

When you are ready to move on, click on the **Watershed RESOURCE MAP** icon to “**Map your Watershed**”

Click here

What story do the results tell?

Perennial vegetation has been eliminated from much of western and southern Minnesota, primarily through conversion to agricultural land uses. This high proportion of converted land use is largely due to the combination of rich soils, low relief, and drainage, making land accessible for farming. Most other areas of the state lack at least one of these three characteristics. The watersheds with greater relief, such as those along the Mississippi River, have more remaining perennial cover due to their steep slopes that are less suited for farming and development. The north central and north east part of Minnesota have retained much of their perennial cover, due to shallow, rocky, or sandy soils, or large bog and wetland complexes that are difficult to drain. These features reduced the rate of conversion to farming.

Urban and suburban development removed additional perennial vegetation. Although the impacts cover a small area of Minnesota they are dominant in watersheds near the Twin Cities Metropolitan area. However, urban landcover is generally less than 20% in the most affected large watersheds.

The highest percentages of remaining perennial vegetation are in the largely forested northeastern portion of the state, through the central and eastern portions of the state, including substantial grassland in the Pine Moraine and Outwash Plains of eastern Becker County and the Mile Lacs Uplands in eastern Chisago County.

A high percentage of remaining perennial vegetation does not imply that vegetative communities are those that were present at the time of the presettlement land survey. This index simply quantifies how much perennial vegetation is on the landscape now compared to a century ago. Much of the forested regions of northeast Minnesota have been harvested, some farmed and abandoned to forests, and some affected by higher or lower fire frequencies, invasive species, or other non-natural disturbance regimes. These alterations undoubtedly will have changed perennial vegetation composition and structure.

How does the amount of perennial cover impact the other components?

Connectivity

Vegetation provides documented corridors for dispersal for a broad range of terrestrial organisms, and so conversion affects connectivity, particularly for less mobile organisms. Impacts are greatest for terrestrial organisms, but because near-stream conversion also may affect temperature, sediment, and other important aquatic variables, stream segments may have reduced connectivity.

Water quality

Vegetation provides documented corridors for dispersal for a broad range of terrestrial organisms, and so conversion affects connectivity, particularly for less mobile organisms. Impacts are greatest for terrestrial organisms, but because near-stream conversion also may affect temperature, sediment, and other important aquatic variables, stream segments may have reduced connectivity.

Geomorphology

Soils with perennial vegetation have better water-holding capacity. Stream entrenchment and accelerated erosion occurs when perennial cover is replaced by annual cropping systems and impervious surfaces.

Biology

A landscape with perennial cover provides a continuous mosaic of habitat and is more likely to provide for the life cycle needs of diverse plant and animal species. Small patches of perennial habitat within a landscape dominated by annual crops or human development limits species richness and abundance.

STEP 4 - VIEWING WATERSHED FEATURES

Map Instructions
I've read the instructions, go to "[Map Your Watershed](#)"

Getting started

- Click on watershed you are interested in
- Wait for watershed map to load
- Use the (+) and (-) to expand or collapse legend items and view the color keys. Note "grayed out" items will display when you zoom in
- Click check box of item of interest, then "redraw map" to add layers to your map

NOTE: To increase the size of the map display, use Display Properties on the desktop to increase your screen resolution.

Navigation

Use the interface icons to navigate the map and get info. When an icon is active, it will be highlighted in maroon.

Minnesota icon - Click on this icon to show the entire state.

Zoom in tool - Use to zoom in on map. Click the zoom in tool, then click a spot on the map on which to zoom in.

Information tool - Use to get to more information about the watershed on your map. Click inside any watershed to get a table of summary information. Click on point features to display information about that feature. Click directly on a lake, water quality or gaging station, or public land to open the associated web page.

Above Map

Find Place - Use to get map of a location, such as a city.

Layer Information - Use to list data layers, link to water

Measure - Use to find distances between points you draw

Area - Use to find area of a shape you draw (in square m)

Print - Use to open a print window to view and print current map

Click here

Read through the instructions, then follow the "[Map your Watershed](#)" link to select a watershed of interest.

Home > Assistance > Natural resource planning > Big picture tools > Watershed A

Launch the Watershed Assessment Map

Pick your watershed of interest:

Click any watershed

To view features in your watershed, try these different steps:

1. Scroll to the bottom of the menu list and check one of the five options under "Background Layers". HINT: Remember to click the "redraw map" button to add the new layer.
2. In the menu list, turn on another layer of interest, remember to click the "+" to show color scales. (Notice the data layers are organized using the 5 components)
3. Use the "i" tool to click:
 - point features (e.g. dams, wells, etc.) to learn about each one
 - gaging stations and lakes to link to more information
 - within the watershed boundary to display a summary page
4. Click on "[layer information](#)" for more information about each data layer.
5. Try other tools - measure distance and area, print a map, or navigate using a place name.

Minnesota Department of Natural Resources

Home > Assistance > Natural resource planning > Big picture tools > Watershed Assessment Tool

Selected watershed (in blue) is Mississippi River - Non-Redacted (28)

Layer Information

- Background Layers
 - Water Quality Monitoring
 - Truncated Stream 2009
 - Public Land
 - Stream-Aquatic Life Assessment 2009
 - Stream-Aquatic Assessment 2009
 - Stream-Aquatic Consumption Assess 2009
 - Truncated Stream 2009
- Water Quality Layers
 - Water Quality Monitoring
 - Truncated Stream 2009
 - Public Land
 - Stream-Aquatic Life Assessment 2009
 - Stream-Aquatic Assessment 2009
 - Stream-Aquatic Consumption Assess 2009
 - Truncated Stream 2009
- Background Layers
 - Water Quality Monitoring
 - Truncated Stream 2009
 - Public Land
 - Stream-Aquatic Life Assessment 2009
 - Stream-Aquatic Assessment 2009
 - Stream-Aquatic Consumption Assess 2009
 - Truncated Stream 2009

STEP 5 - REVIEWING WATERSHED INFORMATION

Using the information you have gathered, does your answer to any of these questions change?

WATERSHED ASSESSMENT TOOL:

How healthy is your watershed?

What do you know about the watershed you live in?

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(For example: cropland, grassland/pastures, urban/rural development, roads & highways, industry, mining, forest harvest, parks & wilderness areas)
- How much has the landscape changed in the past 100+ years?
- Are there **rare animals & plants** or **biologically diverse sites** found in your watershed?
- How many **dams, superfund sites, and wastewater treatment plants** are in your watershed?

Map of Minnesota's 81 major watersheds.



- Is the **water** pretty **clean** in your watershed for swimming, fishing and drinking?
- Have any lakes or stretches of river been declared impaired? What does **impaired** mean?
- If you were to compare the health of your watershed to other watersheds in Minnesota, do you think it is lower or higher than the average health of watersheds across the state? Lower or higher than other watersheds that flow to the same major river?

Hopefully the Watershed Assessment Tool helped you answer these questions. If not, go back and keep exploring to learn all about your watershed!

Watershed Assessment Tool

www.dnr.state.mn.us/watershed_tool/index.html

To request the Word version of this exercise, please send request to amy.r.childers@state.mn.us



MN DNR

**Division of Ecological
& Water Resources**

Stream Habitat Program
www.mndnr.gov/eco/streamhab