



The Health of Our Local Rivers

Green Acton, Acton Senior Center

January 22, 2020

Alison Field-Juma, Executive Director





Science-based Advocacy
Recreation • Education

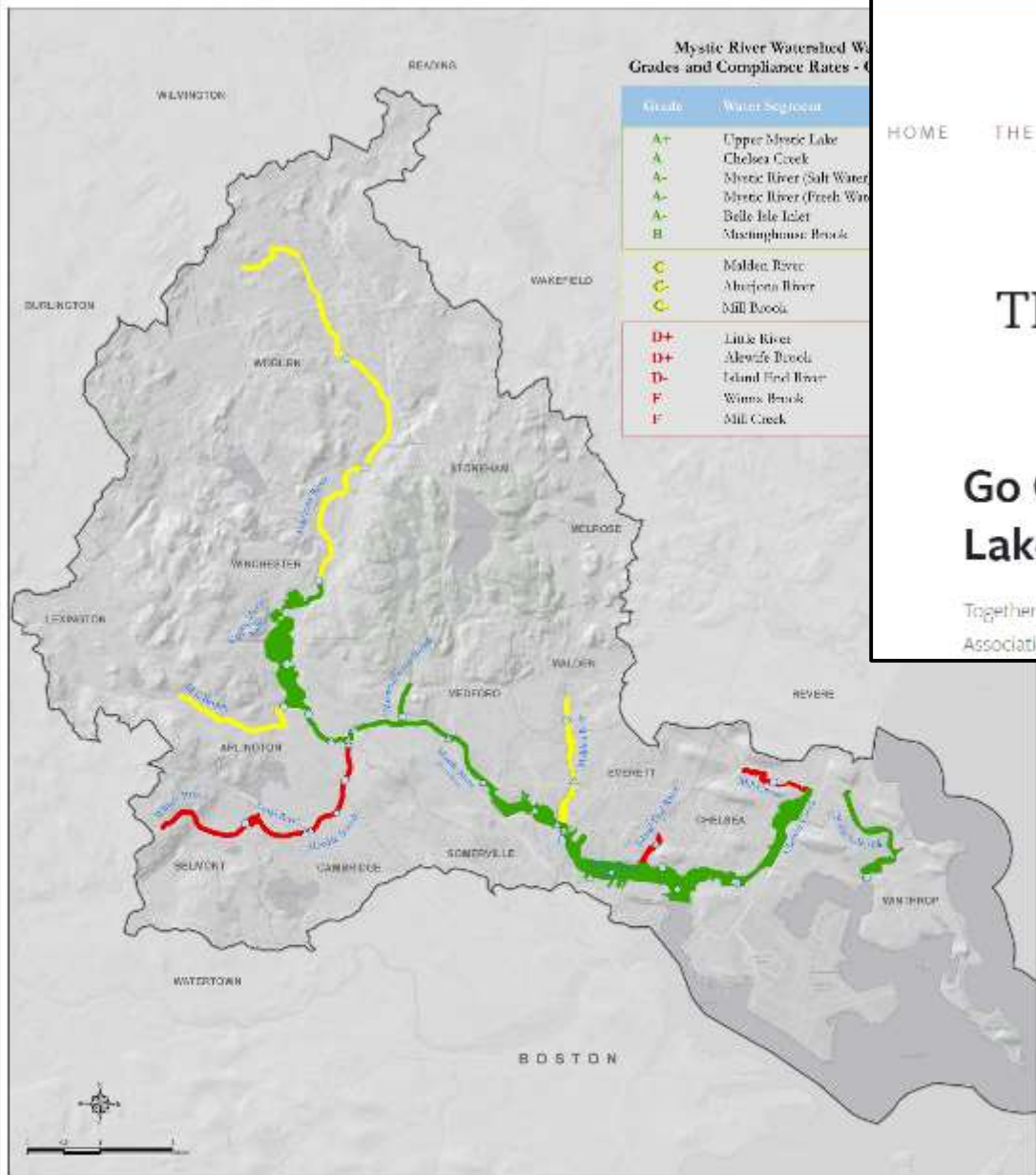


JUN 14, 2018

The Mystic River Made the Grade: A-

Go Out and Enjoy Your River & Lakes!

Together with the US Environmental Protection Agency (EPA), the Mystic River Watershed Association issued the 2017 Water Quality Report Card for the Mystic River watershed



Average Compliance Data for Swimming and Boating Standards



Monitoring Point

 Mystic River Watershed Association
 National Sanitation Foundation
 Massachusetts Water Resources Institute

2017 Mystic River Watershed Report Card

(based on 2015-2017 bacterial data)





Iconic ecosystems around the world

Mississippi River
USA



Chesapeake Bay
USA



Long Island Sound
USA



Chilika Lake
India



Upolu
Samoa



Us!

Willamette River
Oregon, USA



Gulf of Mexico
USA



Orinoco River
Venezuela



Kura River Basin
Armenia, Georgia,
Azerbaijan

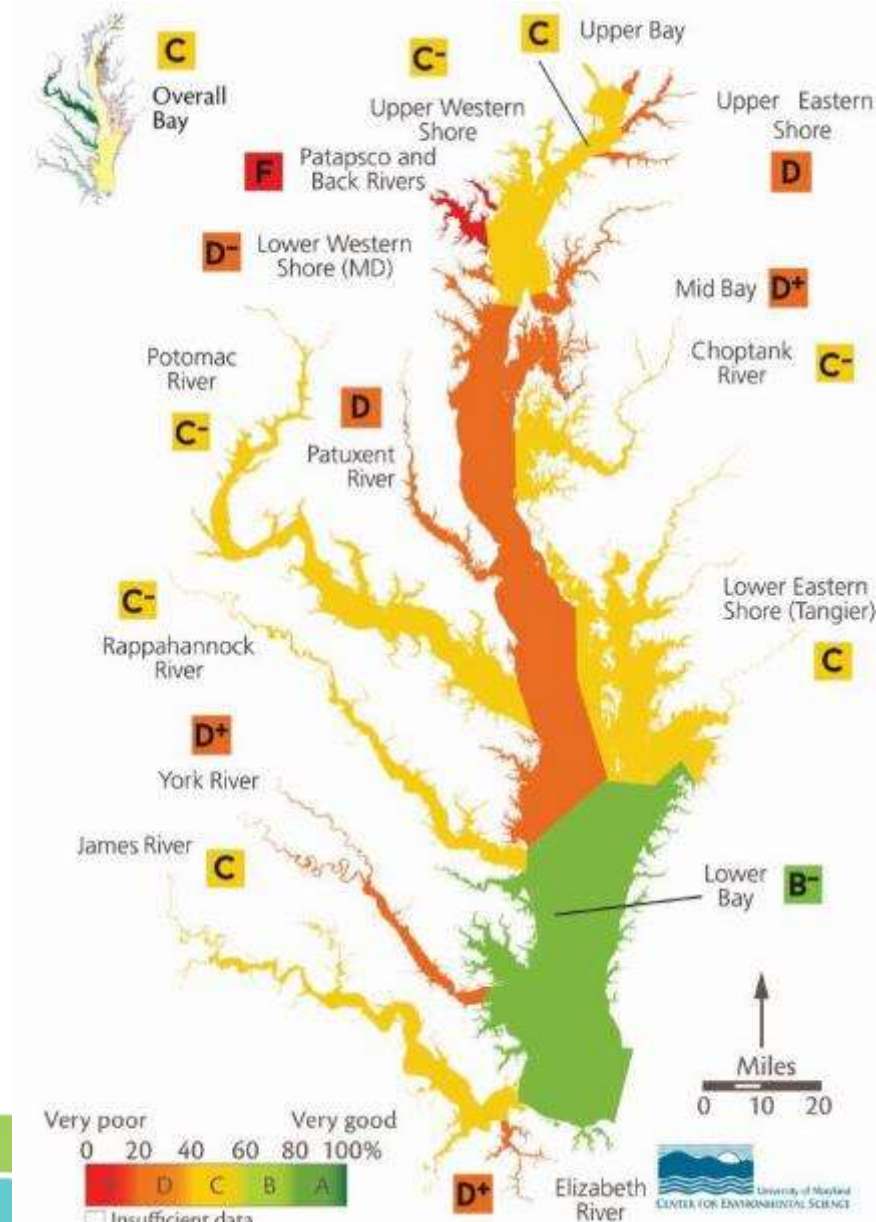


Great Barrier
Reef, Australia

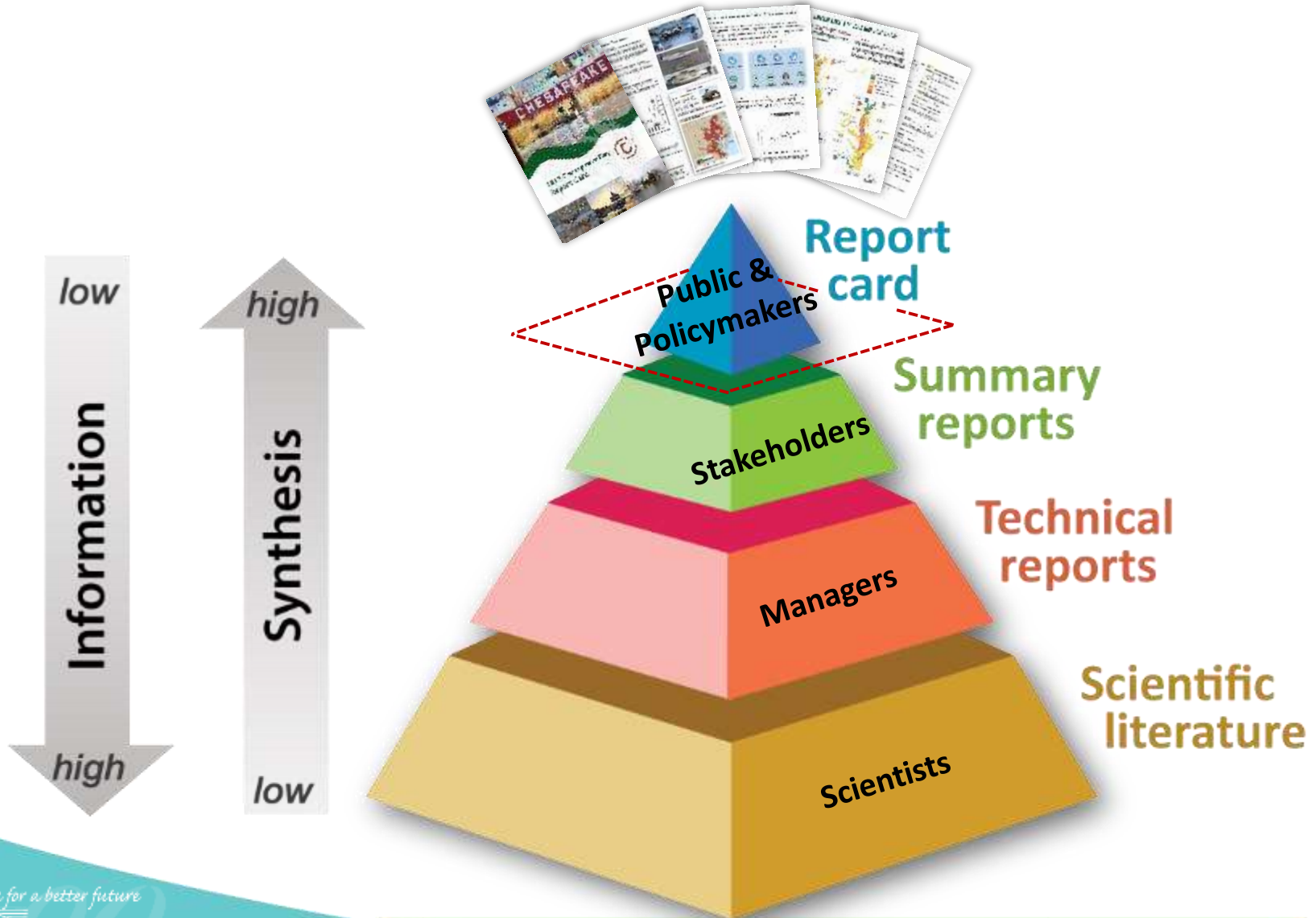


What is a river health report card?

- Assessment of social, cultural and economic health of a river basin
- Based on defensible scientific data
- Synthesizes complex information
- Stakeholder-driven and engaging
- Provides a common vision



Many audiences



How do you make a report card?

1 What is the big picture?



IDENTIFYING BASIN
VALUES AND THREATS

2 What do we measure?



CHOOSING INDICATORS

3 What is healthy?



DEFINING THRESHOLDS
FOR INDICATORS

4 How does it add up?



CALCULATING SCORES
AND DETERMINING
GRADES

5 What is the story?



COMMUNICATING
RESULTS

Developing an Assabet, Sudbury, and Concord River Health Report Card



Step 1: What is the big picture?

Identifying basin values and threats



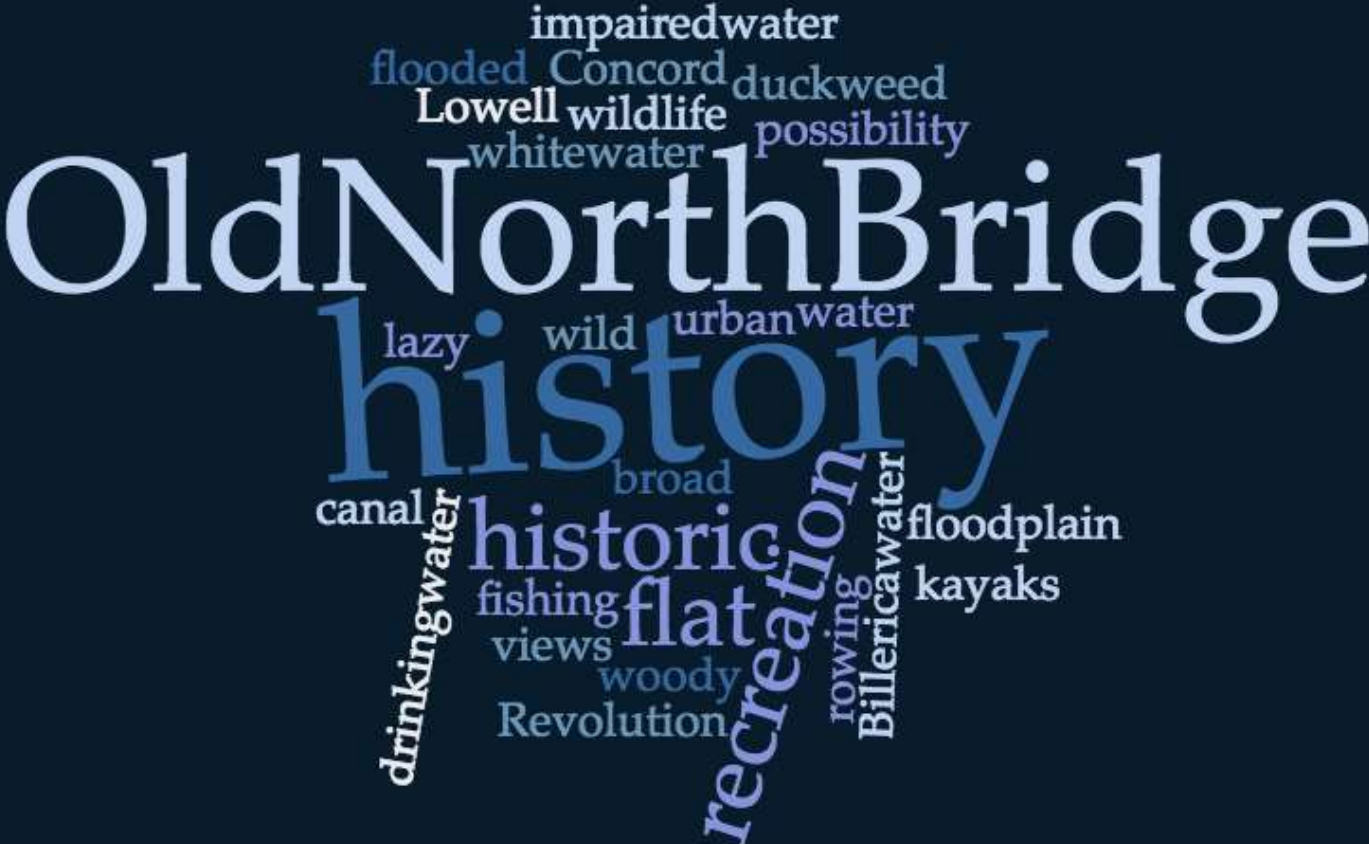
Stakeholder Workshop #1



Assabet River

A word cloud centered around the Assabet River. The most prominent words are 'canoeing' and 'scenic', both in large white font. Other significant words include 'wild' (in a large, blue, slanted font), 'winding', 'remote', 'downed', 'water', 'wildlife', 'nice', 'duckweed', 'turtles', 'leaner', 'plants', 'river', 'works', 'sewer', 'dry', 'herons', 'Assabet', 'home', 'trees', 'refuge', 'dams', 'fast', 'complex', 'national', 'beauty', 'snapping', 'flint', 'damned', 'hidden', 'flowing', 'white', 'urban', 'mill', and 'dams'. The words are arranged in a roughly circular pattern, with some overlapping.

Concord River



Step 1: What is the big picture?

Identify basin values and threats



Step 1: What is the big picture?

Identifying basin values and threats



SNAP - Values



Values for the watershed— first cut

1. Water quality, quantity
2. Ecological (habitat/wildlife)
3. Public health/safety
4. Cultural/scenic
5. Recreation
6. Economy



Climate vulnerability and resilience

Diverse stakeholders



Step 2: What do we measure?

Choosing indicators

Stakeholder workshop #2



Step 2: What do we measure?

Choosing indicators



pH



Flow



Nutrients



Dissolved oxygen

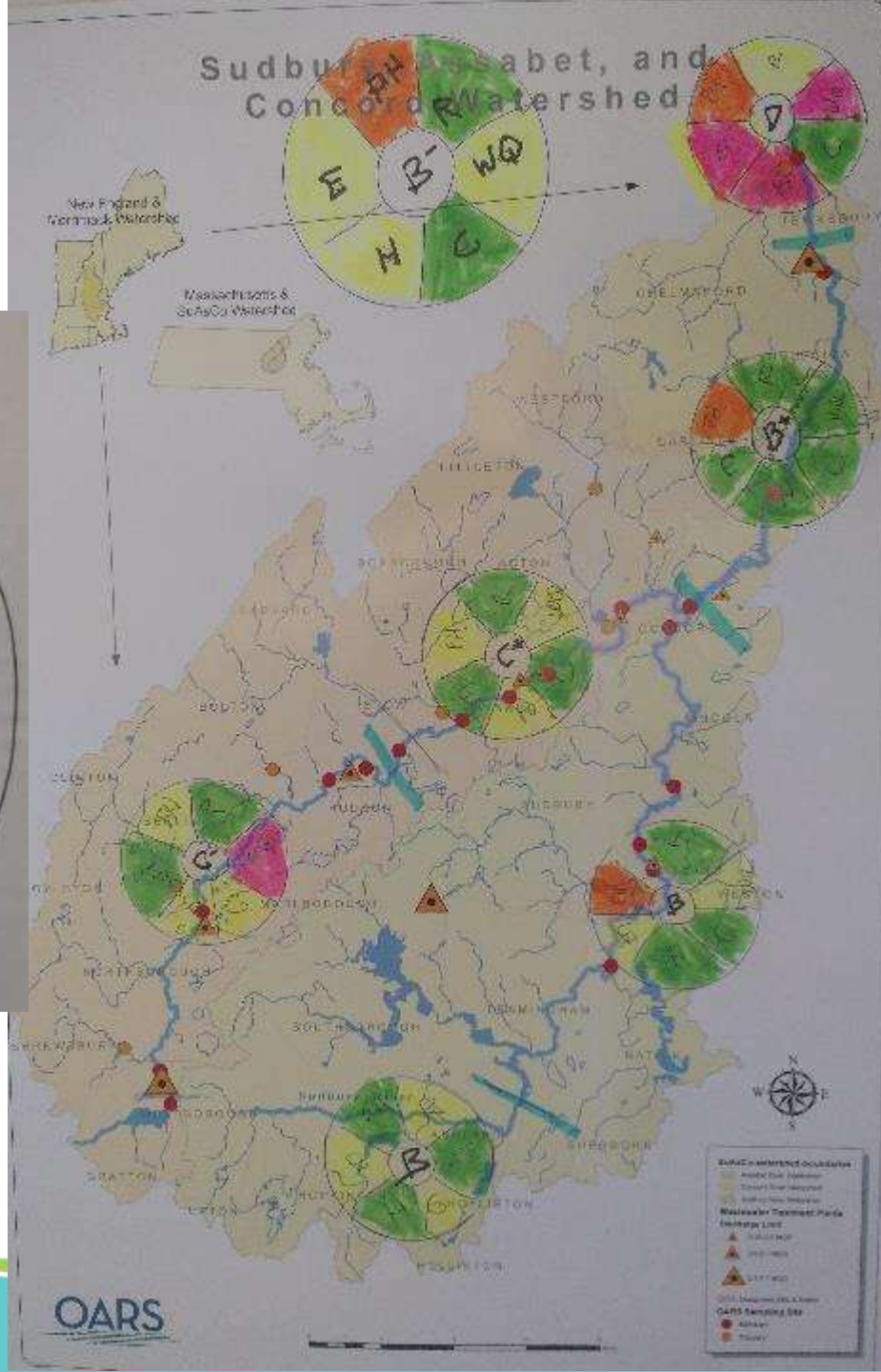


Temperature



Contaminants

Test run!



Identified the need to divide analysis into upper and lower segments of each river

Newsletter

- Taking stock of our progress
- Getting feedback

The Sudbury, Assabet, and Concord Rivers Developing a Report Card Stakeholder Workshop Newsletter Great Meadows National Wildlife Refuge February - March 2018

As part of the landscape that saw the start of both the American revolution and the industrial revolution, the Sudbury, Assabet, and Concord Rivers in Massachusetts have a long history of use and abuse. Restoring the health of these three interconnected rivers has been the mission of OARS, the watershed organization for the Sudbury, Assabet, and Concord Rivers, for 31 years. Restoration takes many years of committed work by local communities and support from many sources. Effective actions depend on a sound understanding of the science and the local context, which must be broadly understood and communicated.

In 2018, OARS partnered with the Integration and Application Network, University of Maryland Center for Environmental Science to initiate a river report card for the region. The report card will provide a snapshot of current river conditions and the historical trends and context of those conditions.

To start the process, two workshops were held at Great Meadows National Wildlife Refuge on 28 February and 1 March 2018, with key stakeholders from all three river basins. The initial workshop elicited what stakeholders value about the rivers, and the subsequent workshop focused on how to measure those values, and where to find data.



Location of the Sudbury, Assabet, and Concord River watersheds within the Commonwealth of Massachusetts.



The Old North Bridge, spanning the Concord River, was the site of the first battle of the American Revolution. Photo: Massachusetts Office of Travel and Tourism.



In April and May, natural spring flows allow for whitewater rafting on the Concord River. Photo: Zoar Outdoor.



A great blue heron on the Assabet River. Photo: Dave Griffin.

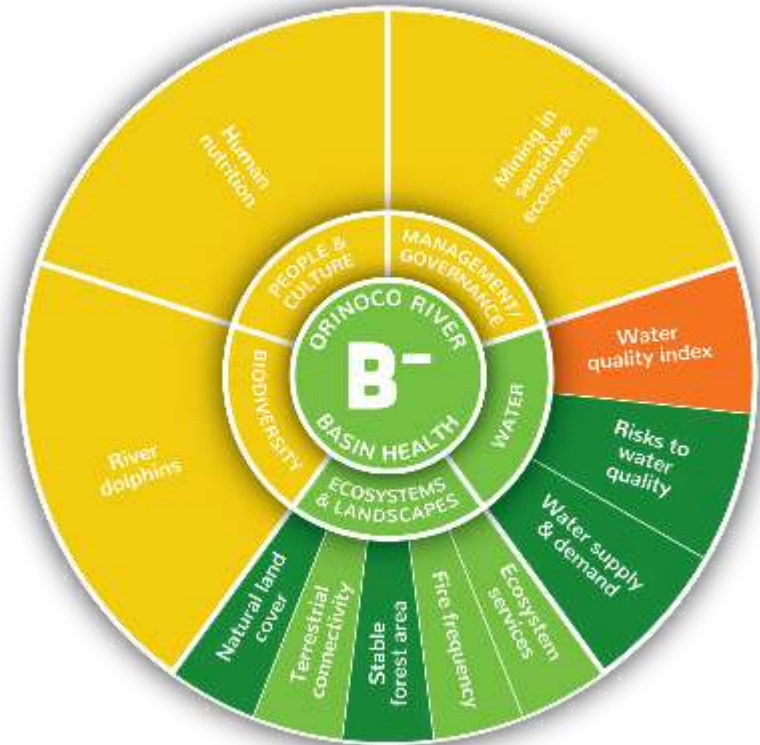
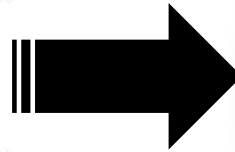
Step 3: What is healthy

Defining thresholds for indicators



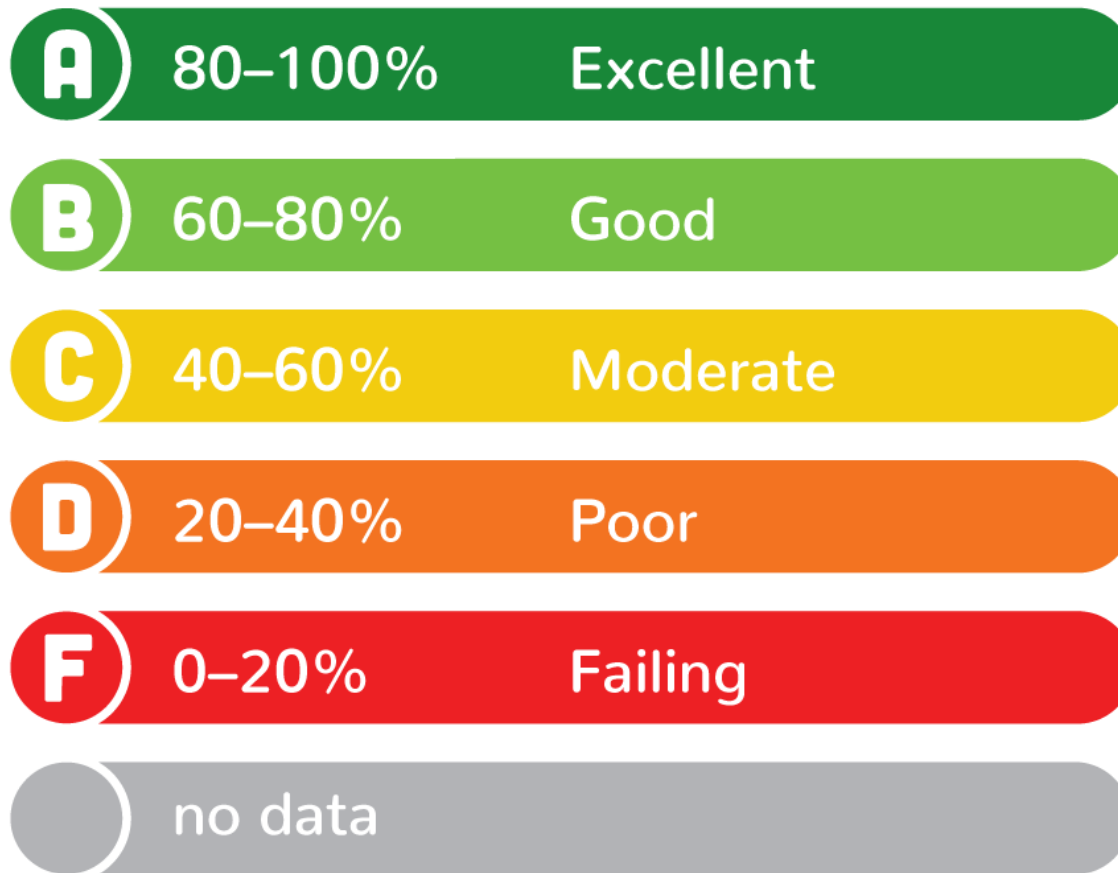
Step 4: How does it add up?

Calculating scores and determining grades



Step 4: How does it add up?

Calculating scores and determining grades



Steps 2-4 Feedback: Indicators, Thresholds and Scoring

Stakeholder Workshop #3





Value Categories

1. Water Quality
2. Streamflow
3. Habitat
- ~~4. Economy~~
5. Recreation
6. Scenery
- ~~7. Public Health~~

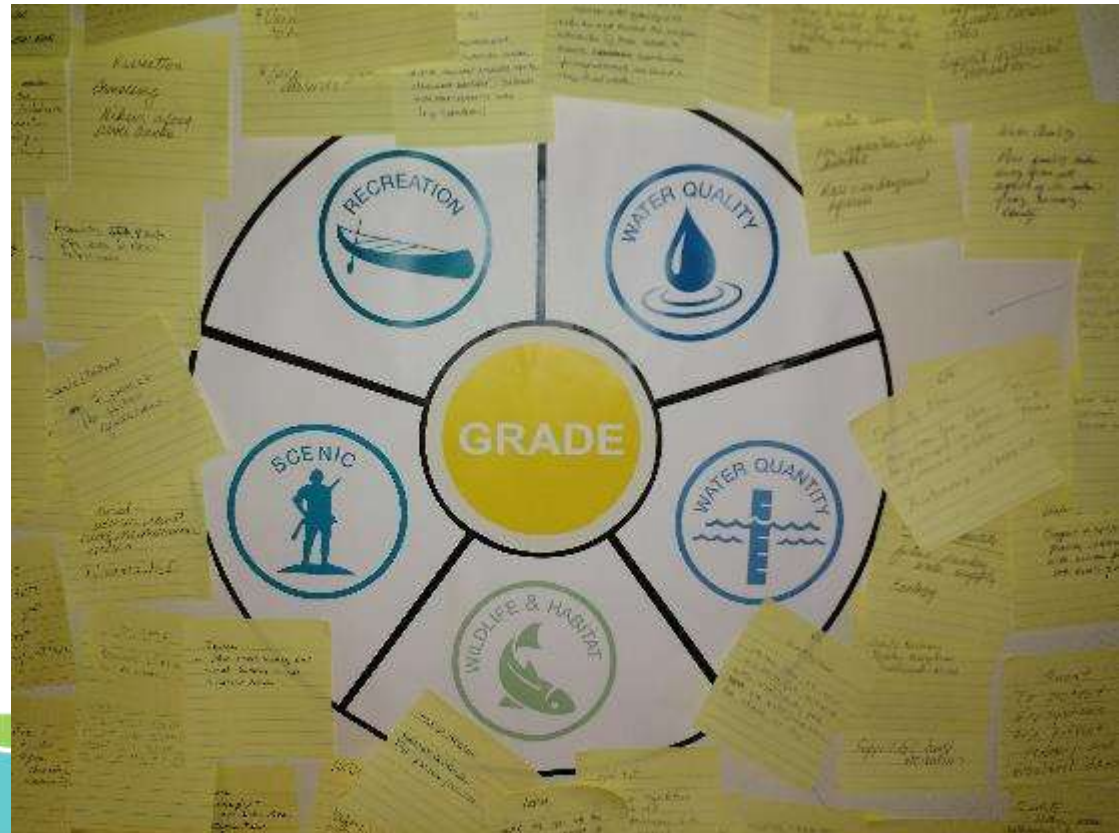
Statements for each Value

SCENIC

The scenery of rivers provides joy and serenity in our hectic lives. This is available to everyone for free and should be available to future generations. It changes constantly especially with the seasons—from subtle to dramatic—always something new to inspire us.

RECREATION

Recreation is how people connect to the river and is important for public wellbeing and local economies. These rivers should be a destination for hiking, biking, boating, fishing, swimming and birdwatching and accessible to everyone.





Steps 3-4, revisited: What is Healthy? How Does it Add Up?

Indicators, Thresholds and Scoring

*Stakeholder Workshop #3
And then OARS Board Retreat*

A peek at the Gory Details

It's all in the Methods Report



ECO HEALTH



REPORT CARDS

HOME

HEALTH

INDICATORS

REGIONS

ISSUES

PUBLICATIONS

TAKE ACTION

ABOUT

HOME / REPORT CARDS / SUDBURY, ASSABET & CONCORD RIVERS / PUBLICATIONS

2018 Sudbury-Assabet-Concord River Report Card

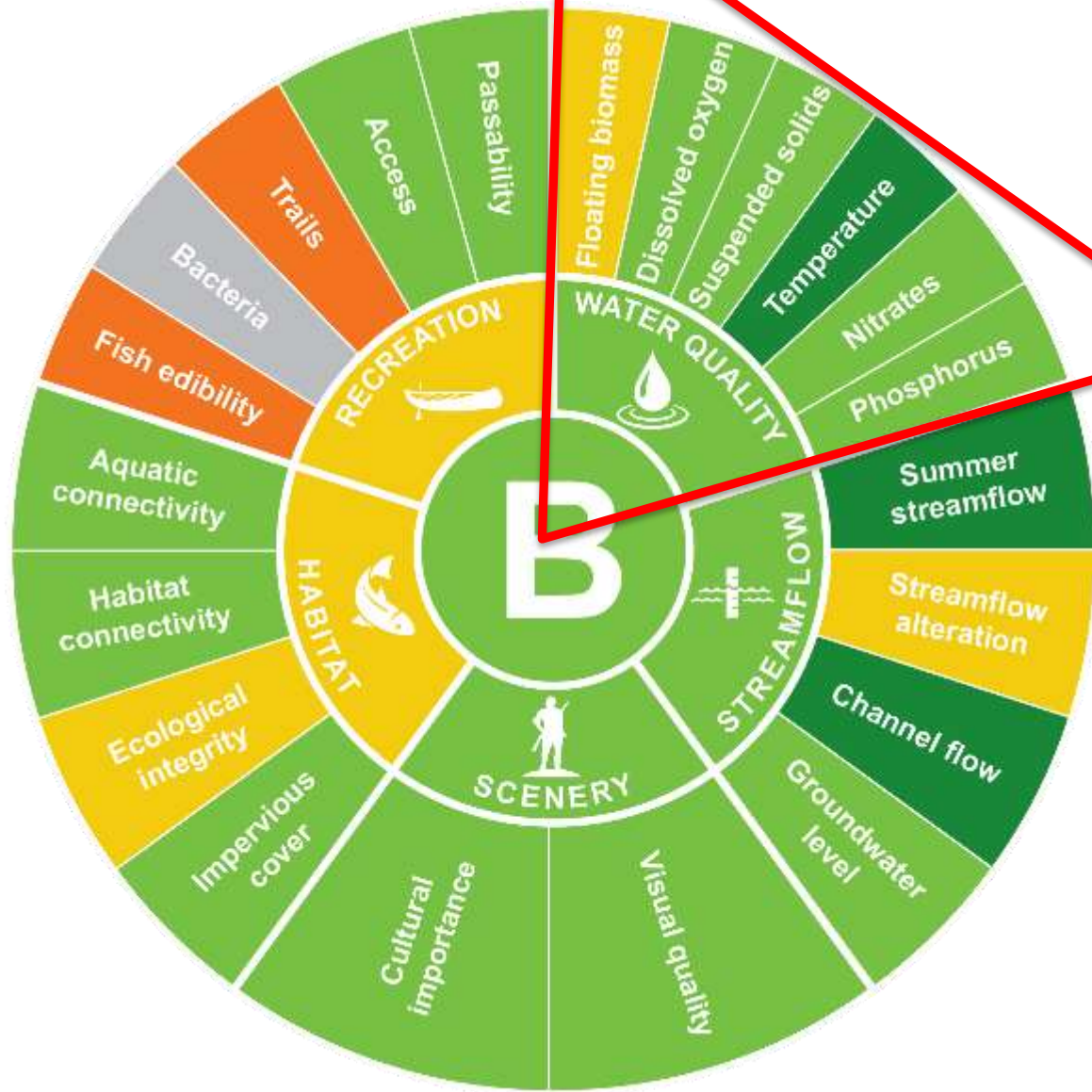
In 2017, OARS, the watershed organization for the three rivers, brought together funding and 52 key stakeholders and technical experts to help create the first Sudbury-Assabet-Concord River report card. Guided by the University of Maryland Center for Environmental Science and OARS, the team of experts and stakeholders identified key indicators of river health and the data needed to measure the status of each indicator. The Report Card was released in June 2019 in both on-line and printed versions. Download the printed Report Card or explore this website to learn more about the health of the Sudbury, Assabet and Concord rivers, and what you can do to make them better. You can also request a printed copy from OARS. [\[upload pdf\]](#)



River Report Card Methods Report

The Methods Report for the Sudbury, Concord and Assabet River Report Card describes in detail how each indicator was measured and corresponding grades calculated. [\[upload pdf\]](#)

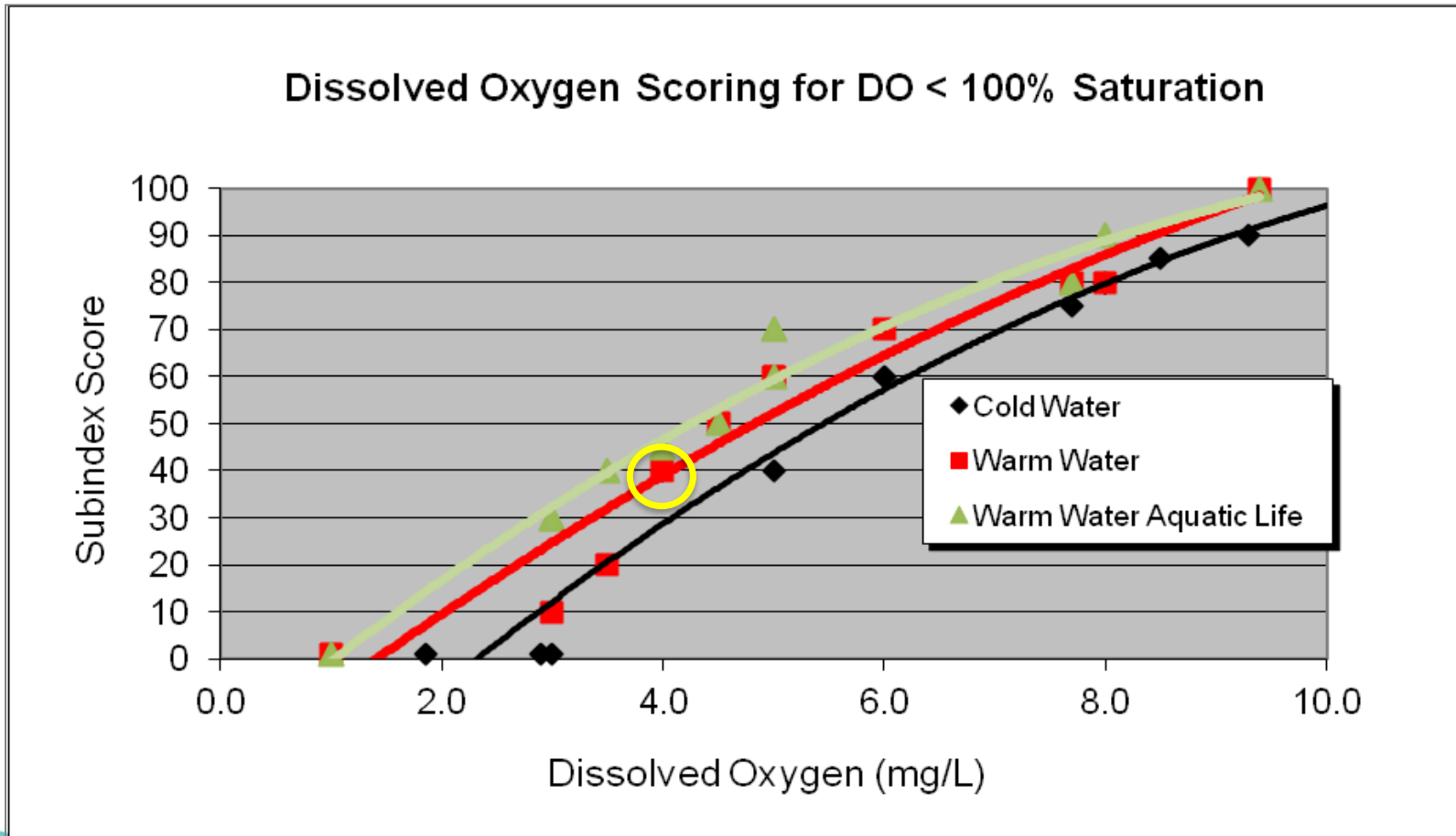
Phew!
What questions do you have?



Water Quality

Value	Indicator	Scoring Criteria (on a scale of 1 - 100)
Water Quality	DO concentration (min.)	Massachusetts Water Quality Standards (WQSs) for cold water fisheries and warm water fisheries; fish tolerances; EPA criteria; EPA Ecoregion XIV data
	DO % saturation (min.)	
	Temperature	Mass WQSs for cold and warm water fisheries, published fish tolerances
	pH -FLOATING BIOMASS	OARS biomass assessment for Assabet River only
	Total phosphorus	EPA Ecoregion XIV data
	Nitrates	EPA Ecoregion XIV data
	Total Suspended Solids	Washington data Region 1; published fish tolerances; Mass DEP criteria

Scoring Equation

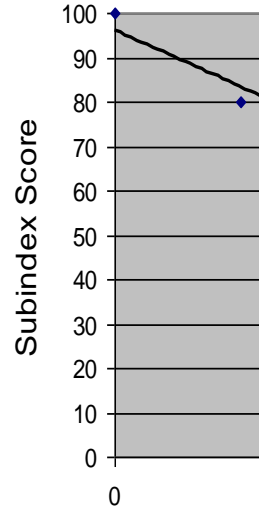
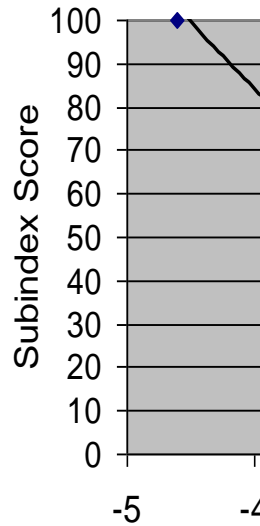
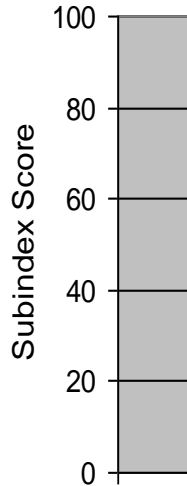
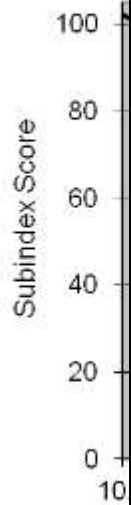


Water Temperature Scoring

pH Scoring for $\text{pH} \leq 7.5$

Total Phosphorus Scoring

Total Suspended Solids Scoring

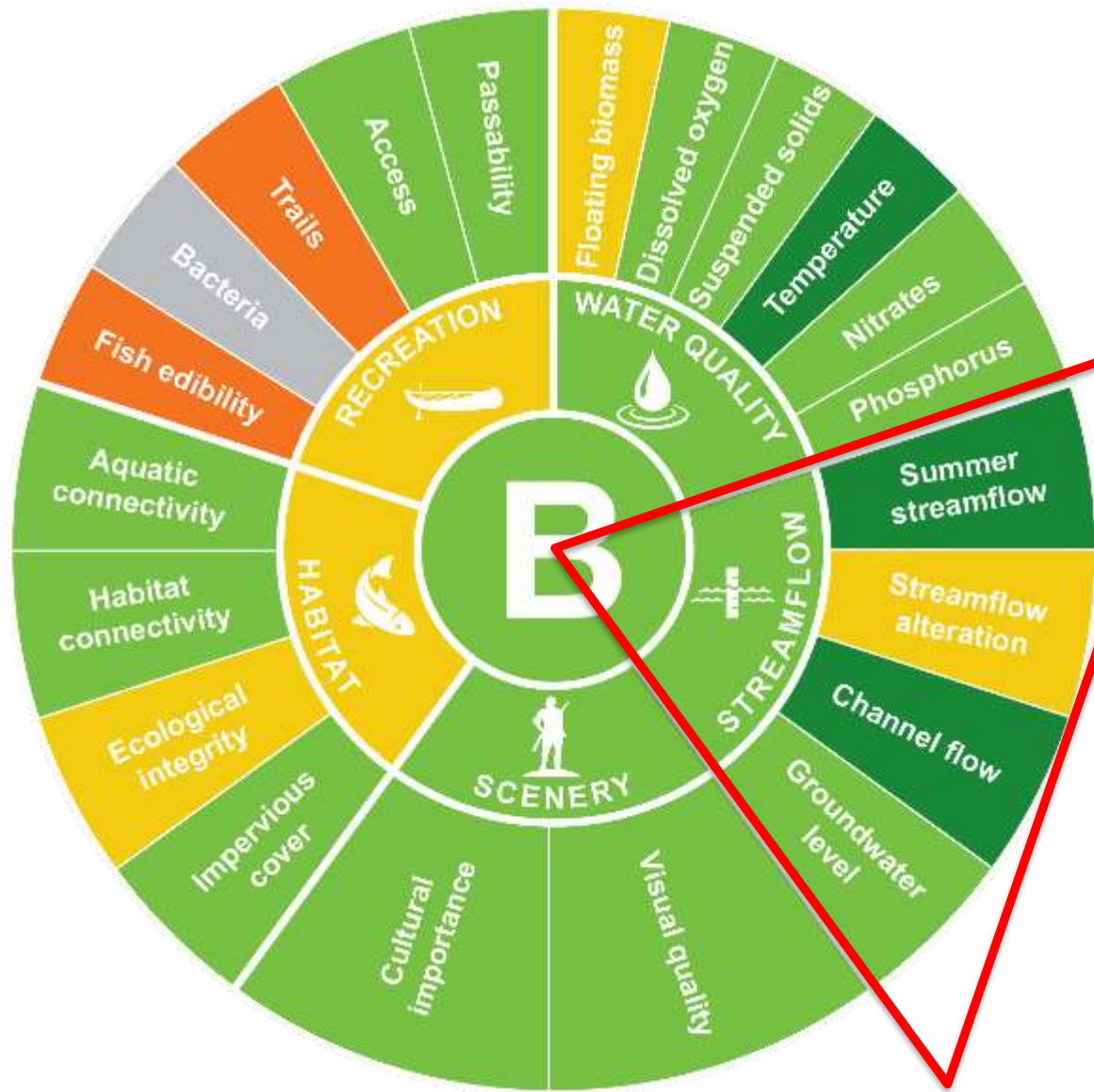


4.0

-5

-4

Natural Log Total Suspended Solids



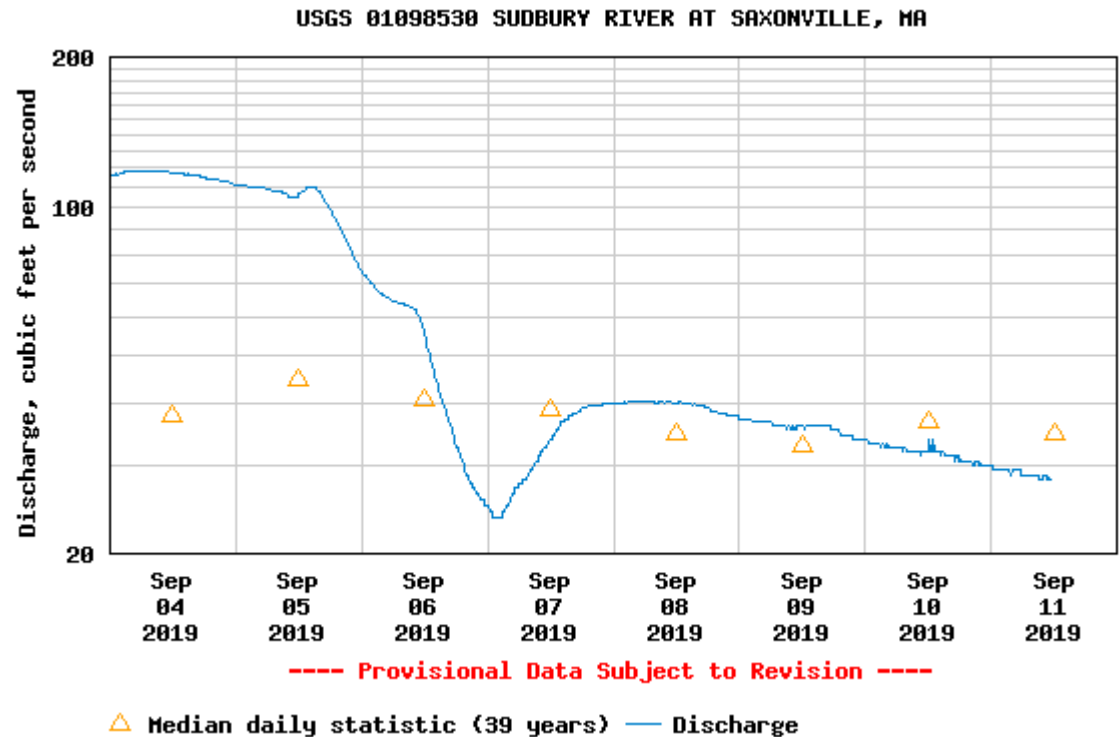
Streamflow

Value	Indicators	Scoring Criteria (on a scale of 1 - 100)
Streamflow	Summer Streamflow	Tennant method flow recommendations for summer conditions; 40%, 30%, and 10 % of mean annual discharge (Q_{MA}) create “good,” “fair,” and “poor” habitat conditions, respectively (Tennant , 1976).
		StreamStats-calculated August median flows “good”
		StreamStats-calculated 7Q10 flows “very poor”
		R2Cross criteria (SITE SPECIFIC – this was done for tributary sites); 3/3 criteria and 2/3 criteria
	Streamflow Alteration	TNC’s Indicators of Hydrologic Alteration (to assess flow durations, flood volume and frequency, rates of change) compared to a natural flow (Squannacook River).
Groundwater levels online readings of USGS Acton well	Long term records for the Acton well; quartiles of the monthly statistics	
Channel flow status	Rapid Bioassessment from OARS WQ monitoring	

Annual Stream Flows

How to assess flow duration, flood volume and frequency, rates of change?

Used TNC's Indicators of Hydrologic Alteration—compares our rivers with a relatively natural river (Squannacook).



Groundwater: Acton USGS groundwater well

Groundwater levels scoring curve for Acton MA-ACW 158 Acton, MA (period of record Jan 1965 – Sept 2001)						
Historic Ground water level statistics	groundwater level (ft below surface)					
	June	July	August	Sept	June - Sept	Score
Highest monthly reading	15.55	16.56	17.71	18.60	15.55	100
Upper quartile	17.48	18.15	18.97	19.50	18.56	80
Median	18.06	18.89	19.43	19.85	19.16	60
Lower quartile	18.85	19.40	19.85	20.15	19.63	20
Lowest monthly reading	20.34	20.62	21.00	21.36	21.36	1



Habitat

CAPS Index and Biological Integrity

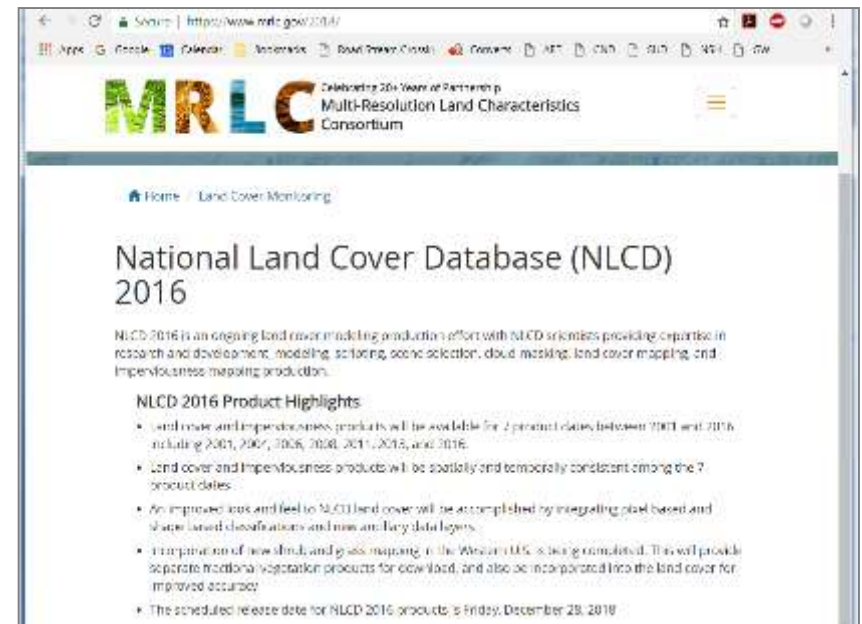
- Over 400 metrics used to assess biological integrity
 - many metrics related to habitat health
 - estimating biological integrity
 - total impervious cover
 - % impervious cover adjacent to water
 - road traffic, density
 - dams, impoundments
 - habitat connectedness, fragmentation
 - aquatic habitat connectivity, fragmentation
 - flow gradient and volume, variability
 - and development

**Collaborate with
your local land
trust!**



Percent Impervious

- Using the NLCD
- 2016 data just about to be issued
- Other years available: 2001, 2004, 2006, 2008, 2011, 2013





Scenery

Visual Resource Inventory

National Park Service
methodology—first use on rivers!

Graded 11 views in the watershed

Indicators:

- Visual Quality
- Cultural Importance



- Webinar training
- 2 days of fieldwork
- Lots of thought . . .



Upper Assabet: Hudson Library

Scenic Quality: **C**

View Importance: 4

Overall score: Low



Lower Assabet: Maynard, Ice House Landing

Scenic Quality: **B** View Importance: 3

Overall score: High



Lower Assabet: Concord, Nashoba Brook Confluence

Scenic Quality: **C+** View Importance: 5

Overall score: Low



Confluence: Concord, Egg Rock

Scenic Quality: **B** View Importance: 2

Overall score: **Very High**



Lower Sudbury: Sherman's Bridge

Scenic Quality: **A** View Importance: 2

Overall score: Very High



Lower Sudbury: Fairhaven Bay

Scenic Quality: **B** View Importance: 3

Overall score: High



Upper Concord: North Bridge

Scenic Quality: **A+** View Importance: 1

Overall score: Very High



Upper Concord: Billerica, Bartlett's Landing

Scenic Quality: **B-** View Importance: 3

Overall score: High





Upper Concord: Billerica dam

Scenic Quality: **C+**

View Importance: 4

Overall score: Medium

Lower Concord: Lowell, E. Merrimack St.

Scenic Quality: **C+** View Importance: 4

Overall score: Medium





Recreation

Indicators :

- Boating access: # put-ins/rivermile
- Passage: dams/rivermile + ease of portage
- Fish edibility: Fish Consumption Advisories
- Swimmability: bacteria—monitoring 2019-



There's a website—see the indicators!

i BY VALUES |

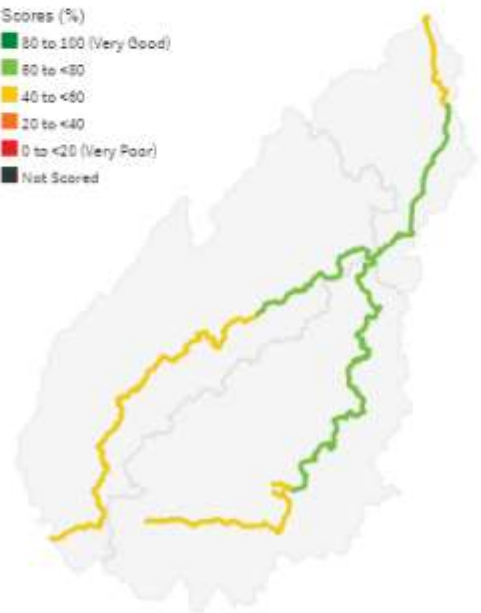


i BY INDICATOR |



i BY REGION | Overall

- Scores (%)
- 80 to 100 (Very Good)
 - 60 to <80
 - 40 to <60
 - 20 to <40
 - 0 to <20 (Very Poor)
 - Not Scored



And a simpler version as a tri-fold card.



Step 5: What's the story?

Communicating Results



- What is the message?
- What actions?



Launched: **June 26, 2019**

NEWS

Waterway Health: River grades revealed



By **ELIZABETH DOBBINS** | edobbins@lowellsun.com | Lowell Sun
PUBLISHED: July 6, 2019 at 12:00 am | UPDATED: July 11, 2019 at 12:00 am



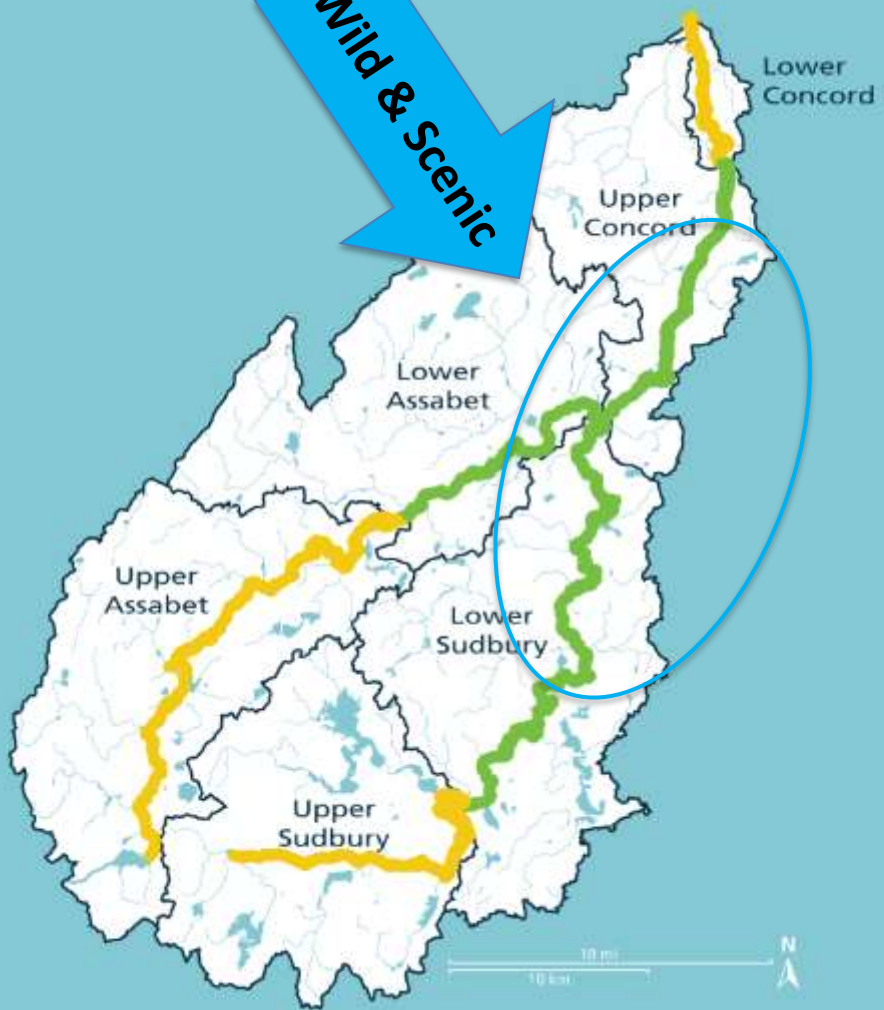
School may be out, but the grades are just now rolling in for the region's rivers.

This year, for the first time ever, a local organization that seeks to protect the rivers graded the Lower Concord River from North Billerica to Lowell.

It received a C+ based on factors like water quality, stream flow, scenery, habitat and recreation. The larger region — including the Assabet and Sudbury rivers, which feed into the Concord River — received a B from OARS, a watershed organization for the three rivers.

Your questions!

Wild & Scenic



- B** Overall
- C+** Lower Concord
- B** Upper Concord
- B** Lower Assabet
- C+** Upper Assabet
- B** Lower Sudbury
- C** Upper Sudbury

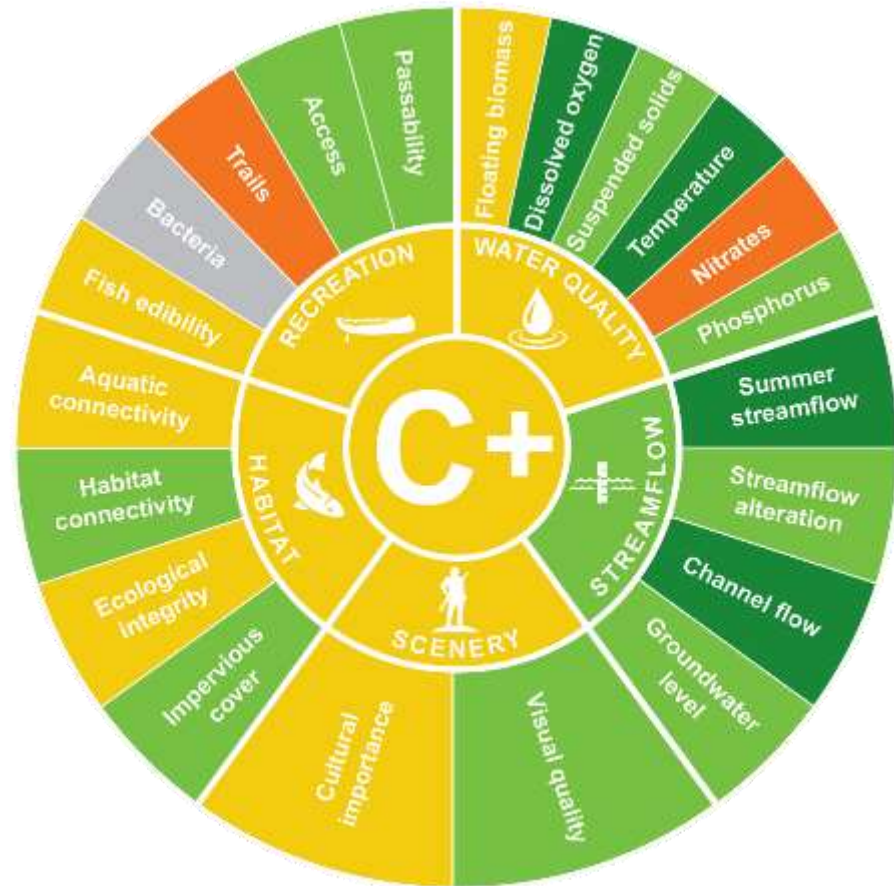
Our health scale





Upper Assabet River

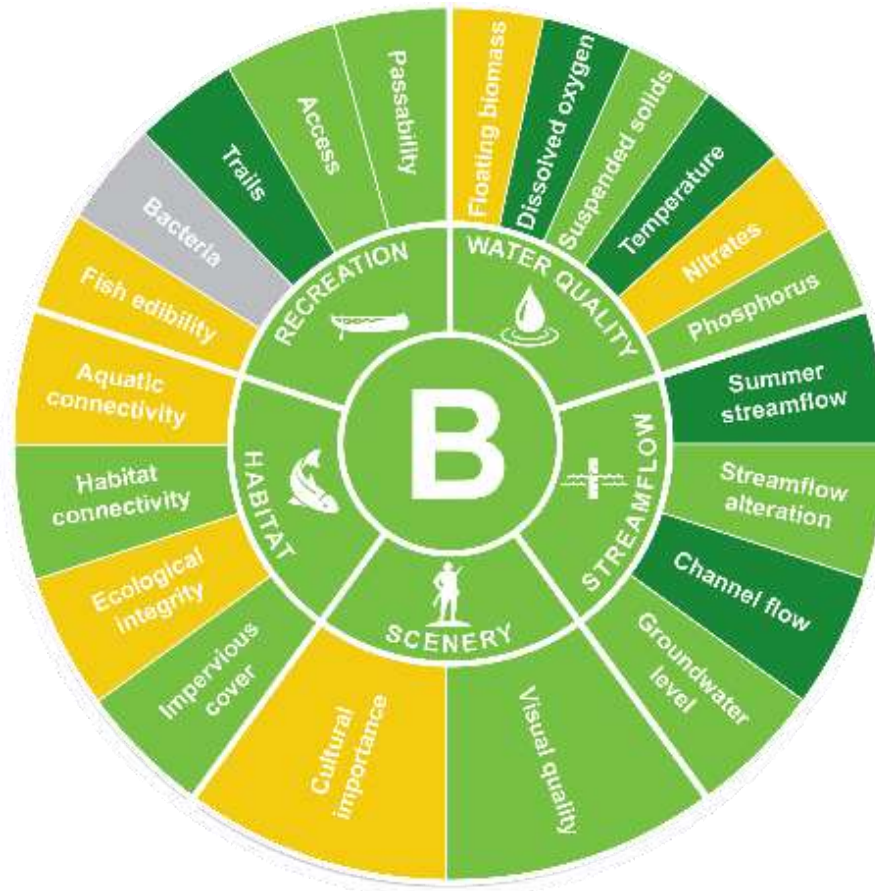
- No drought in 2018!
- Big wastewater influence
- Floating biomass problems
- Good number of put-ins
- Few trails along the river
- Room for improvement!





Lower Assabet River

- The Assabet always flows
- Less wastewater influence, but still a problem
- Good number of put-ins
- Great trails along the river
- “weeds”: Free-flowing sections good, impoundments worse



ISSUES

- **Wastewater: Nitrates**
- **Impoundments/dams:**
 - Many pond fish, **few river fish**
 - Too much **floating biomass**
 - Increased potential for **cyanobacteria** blooms and **fish kills** with climate change
 - **Invasive aquatic plants**—water chestnut
 - **Dams** block habitat continuity



Crow Island 2013-----Gleasondale 2017



Powdermill, Acton/Maynard





OARS - For the Assabet, Sudbury, and Concord Rivers



Published by Alison Field-Juma [?] · Yesterday at 1:05 PM · 🌐

Important study showing the importance of investing in stormwater and wastewater pollution control, recharge, and green infrastructure.



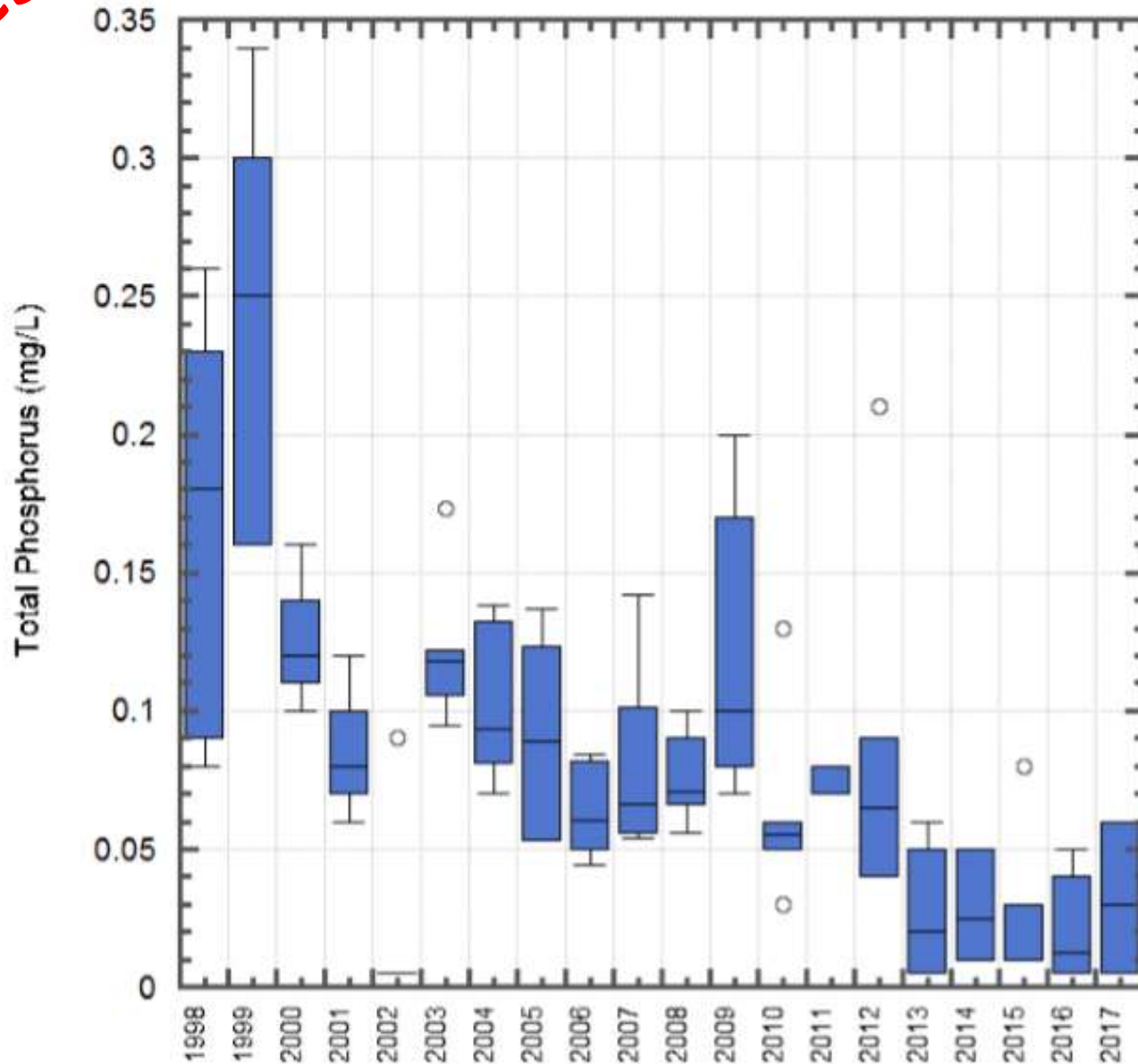
PHYS.ORG

Pollution control of rivers can reduce impact of climate warming



Progress!

Summer Total Phosphorus Lower Assabet Mainstem (ABT-077 & ABT-026)

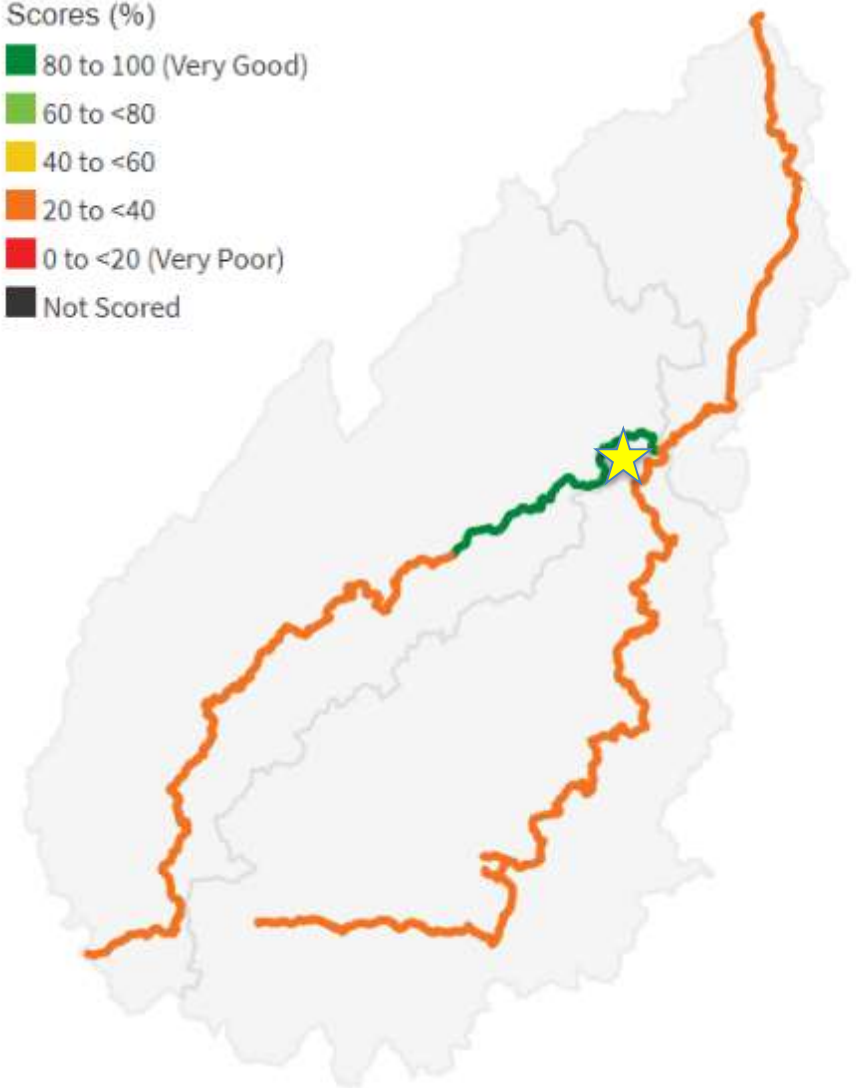
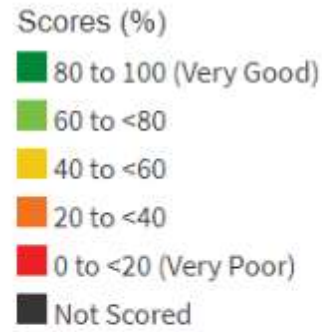




Trails within 200 feet of the river

Scoring: Trails along 25% of the rivermiles is considered optimal.

	Percent Rivermiles with trail	Score
Upper Assabet	7	28
Lower Assabet	22	88
Upper Sudbury	6	24
Lower Sudbury	6	24
Upper Concord	9	36
Lower Concord	9	36





Passability

Scoring: ownership, ease of access, length of portage, road crossings, and if breached. Scores summed and divided by number of river miles in the section

	# River miles	# Dams	Avg. miles between dams	Average dams/rivermile	Score
Upper Assabet	25.8	6	4.30	0.23	77
Lower Assabet	9.5	2	4.75	0.21	79
Upper Sudbury	12.9	8	1.61	0.62	38
Lower Sudbury	22.1	2	11.05	0.09	91
Upper Concord	13.2	1	13.20	0.08	92
Lower Concord	6.7	2	3.35	0.30	70

BY REGION |

Scores (%)

- 80 to 100 (Very Good)
- 60 to <80
- 40 to <60
- 20 to <40
- 0 to <20 (Very Poor)
- Not Scored





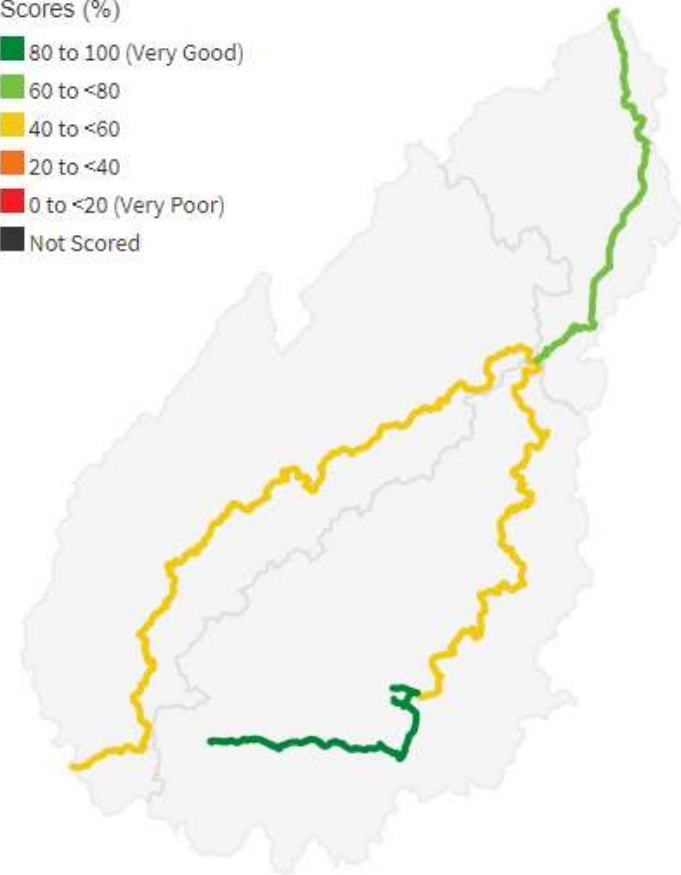
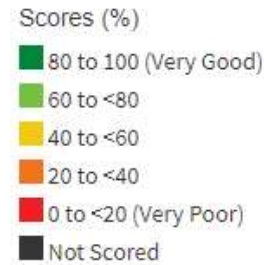
Aquatic Connectivity

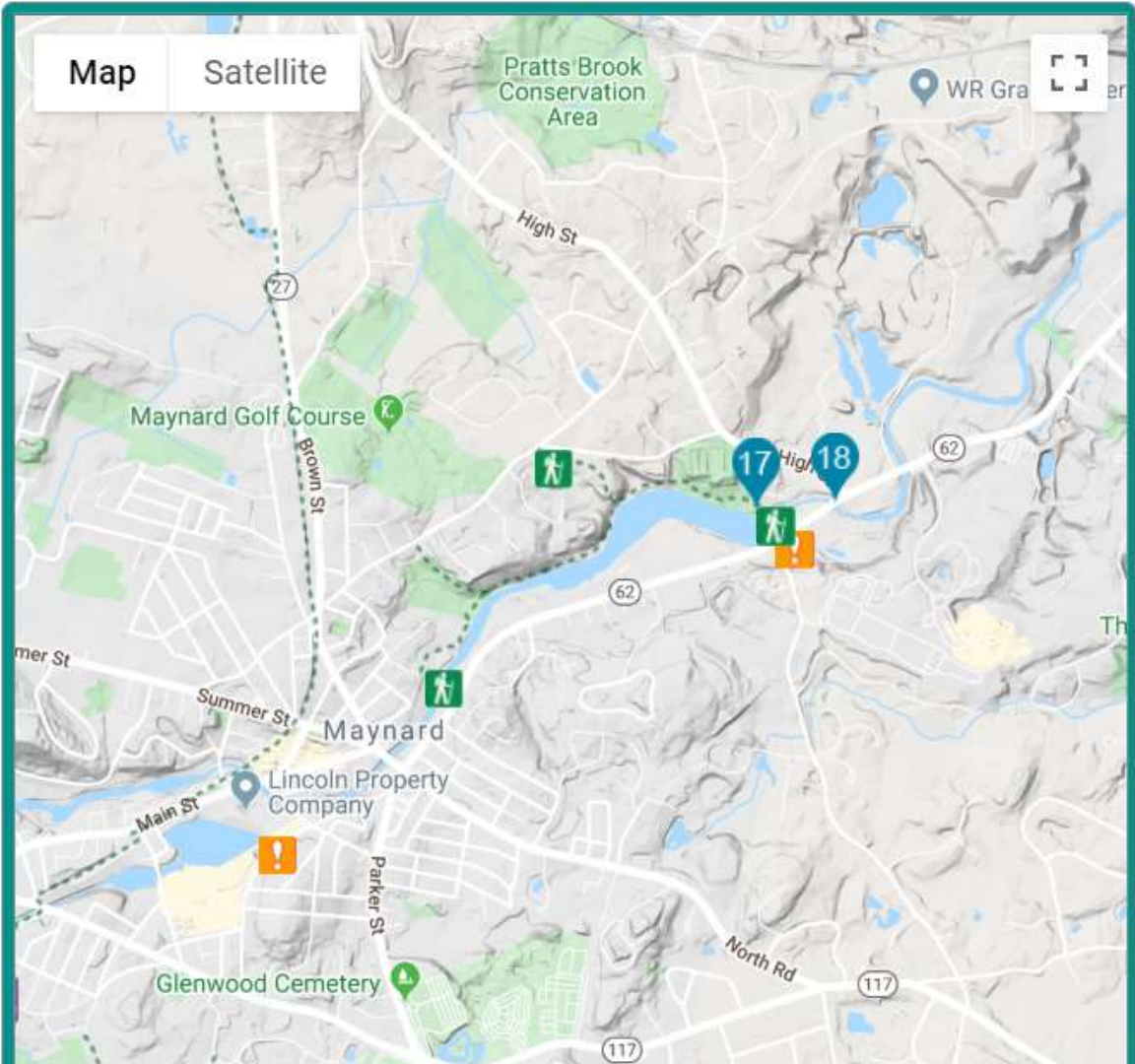
Scoring: How the movement of primarily aquatic organisms is restricted due to culverts, bridges, and dams.

	Score
Upper Assabet	47
Lower Assabet	51
Upper Sudbury	93
Lower Sudbury	60
Upper Concord	61
Lower Concord	69

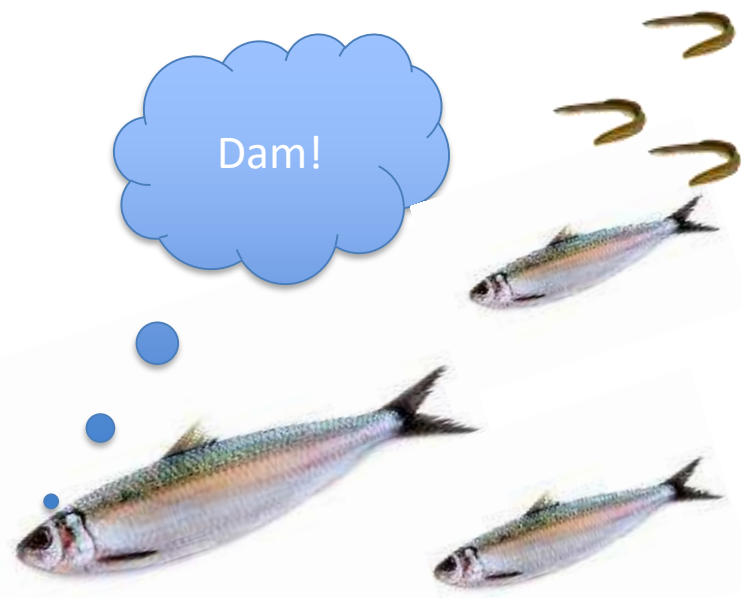


BY REGION |





Dam!



**Directions to eels and herring:
Go up the Merrimack, take your second left into the Concord, bear right at the fork**



Fish edibility

Scores (%)

80 to 100 (Very Good)

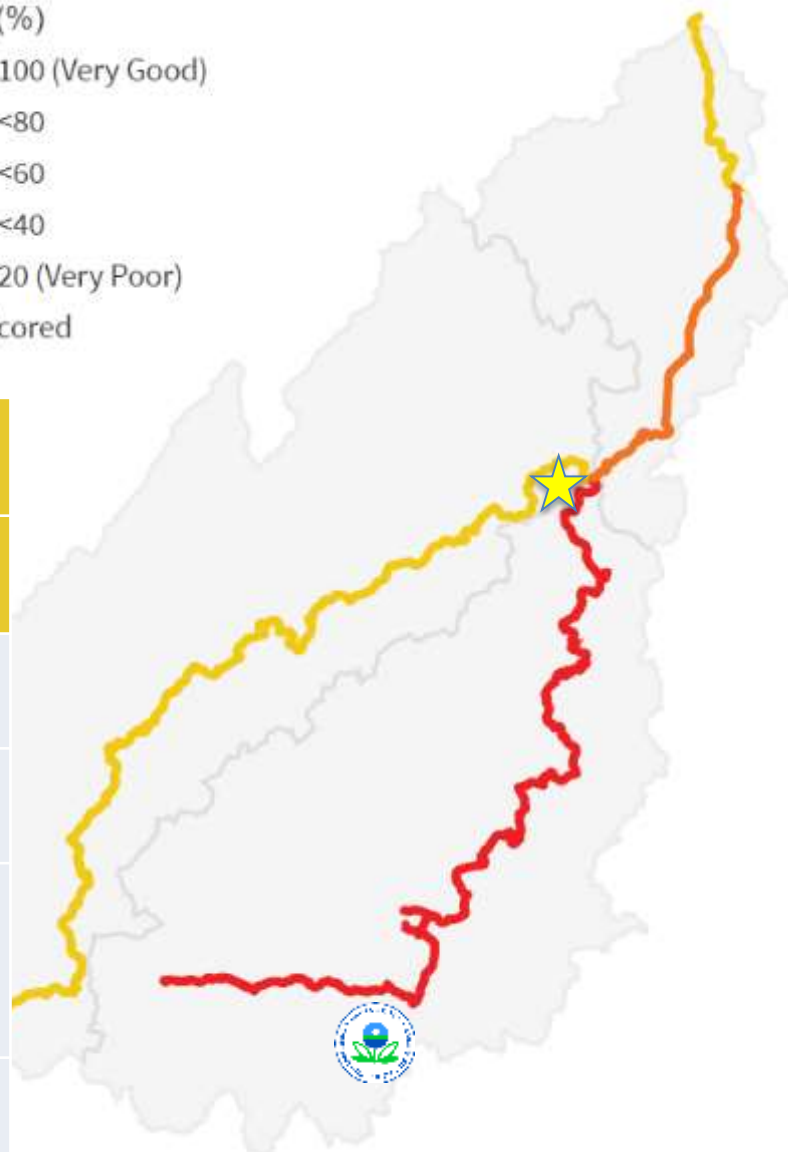
60 to <80

40 to <60

20 to <40

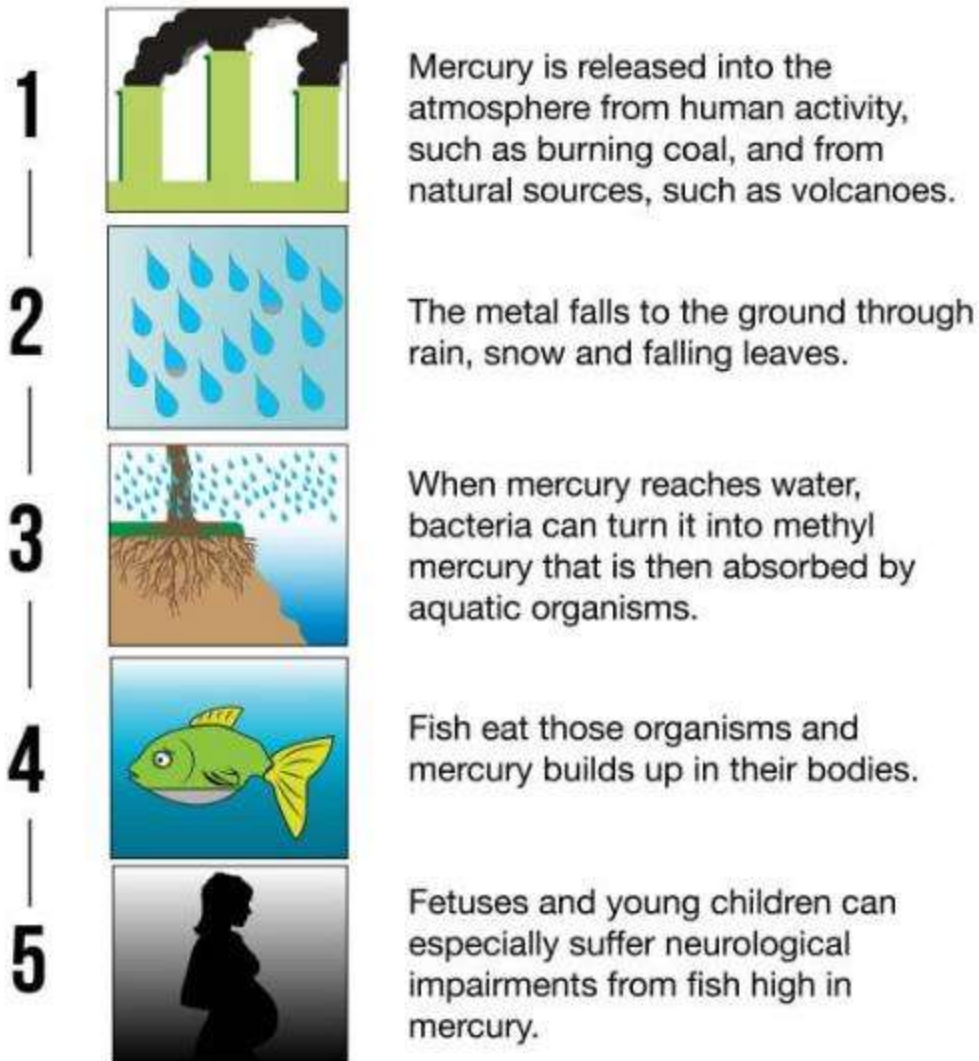
0 to <20 (Very Poor)

Not Scored



Upper Assabet	P1—No children and women of reproductive age	C
Lower Assabet	P1—No children and women of reproductive age	C
Upper Sudbury	P6—No one	F
Lower Sudbury	P6—No one	F
Upper Concord	P4, P2—No LMB, no children and women of reproductive age, others 2/mo.	D
Lower Concord	P1	C

MERCURY'S FALLOUT





ACTIONS



- Support **invasive aquatic plant management** and **pull water chestnut**
- **Clean and recharge stormwater**
- **Protect coldwater** streams (Nagog Brook +)
- **Conserve water during droughts**
- **Monitor for cyanobacteria**
- Support controls on **mercury emissions** from coal-burning power plants
- Consider **dam removal**
- **Be Citizen Scientists!**



Upper Sudbury River

- Lack of data!
- Work needed on recreation access
- Minimum streamflows are far lower than natural
- Mercury contamination—no one can eat the fish





Lower Sudbury River

- Minimum streamflows are far lower than natural
- Low dissolved oxygen
- Little wastewater pollution
- Free flowing—few dams
- Mercury—no one can eat the fish
- Few trails along the river
- Great scenery!





Upper Concord River

- Very good water quality
- Minimum streamflows are lower than natural and maximum flows are higher than natural
- More trails needed along the river
- Fish—men and older women: two meals per month max., nobody eat largemouth bass
- Beautiful and historic scenery





Lower Concord River

- Need to mitigate urban impacts on wildlife habitat
- Work needed on recreation access
- Flows are not natural
- Statewide mercury contamination—children and childbearing women should not eat any fish



ECO HEALTH



REPORT CARDS

www.ecoreportcard.org



HOME HEALTH INDICATORS REGIONS ISSUES PUBLICATIONS TAKE ACTION ABOUT



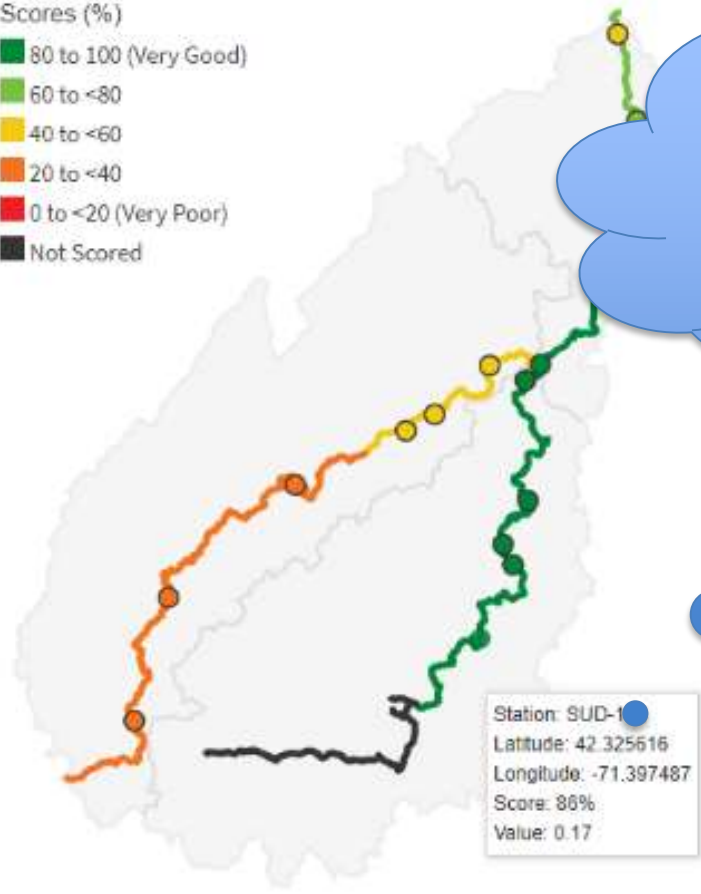
How healthy are your
Sudbury, Assabet & Concord Rivers?

River Report Card

BY REGION |

Scores (%)

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- 40 to <60
- 20 to <40
- 0 to <20 (Very Poor)
- Not Scored



Data from OARS' Water Quality Monitoring Program \$--Thank you!

See the data!



SHOW STATIONS | Scores

- No Stations
- Station Scores**
- Station Data

Indicator: Nitrates



Sudbury, Assabet and Concord River Issues

Our rivers each have their own character and they change as they flow from south to north, passing over old dams in mill towns, and meandering past wetlands, forests and homes. Each segment has its own character and set of challenges.

Invasive aquatic plants: water chestnut

Excessive nutrients, sedimentation and slow flow in impounded sections provide ideal conditions for invasive water chestnut and other invasive aquatic plants. Introduced in the 1870s in the Sudbury River, water chestnut (*Trapa natans*) is rapidly spreading to rivers, lakes and ponds in the watershed, indeed across the region. A rapidly-reproducing annual plant, the hard nuts can lie dormant in the sediment for 10-12 years. Only consistent removal of the plants every year prior to dropping their nuts can keep it at manageable levels. A [management plan](#) for the watershed guides efforts by OARS, other non-profits, the US Fish and Wildlife Service and municipalities. Methods of mapping are being developed so that progress can be



OARS' Rapid Response water chestnut team \$-- Thank you!

Water Chestnut Rapid Response Team



WATER CHESTNUT MANAGEMENT GUIDANCE & FIVE-YEAR MANAGEMENT PLAN FOR THE SUDBURY, ASSABET, AND CONCORD RIVER WATERSHED

FEBRUARY 2017



One acre of water chestnut can produce enough seeds to cover 100 acres the following year.

OARS

FOR THE ASSABET SUDBURY & CONCORD RIVERS

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Chestnut Cover, %
0 - 10%
0 - 20%
0 - 30%
0 - 40%
0 - 50%
0 - 60%
0 - 70%
0 - 80%
0 - 90%
90 - 100%



Become a citizen scientist or advocate

Find out who is working for river health and join in! Join OARS and other groups working for clean water, climate resilience, and healthy habitats in your neighborhood or community. Become a member, attend an event, or make a donation to show your support. You can help collect valuable water quality data by becoming a Citizen Scientist, or volunteer in other ways to keep this important work going! Sign up for Action Alerts by [OARS](#) and other organizations to let you know how to impact critical legislation or policy. Decision-makers need to hear from us—we are the voice of our rivers.

Organizations in the watershed:

- [Assabet River National Wildlife Refuge](#)
- [Great Meadows National Wildlife Refuge](#)
- [Minute Man National Historical Park](#)
- [Native Plant Trust \(New England Wildflower Society\)](#)
- [OARS For the Assabet, Sudbury and Concord Rivers](#)
- [Sudbury, Assabet and Concord Wild & Scenic River Stewardship Council](#)



Thank you:

Massachusetts Environmental Trust
Wild & Scenic River Stewardship Council
The Sudbury Foundation

Project partners: EPA Region 1, MassDEP, Mass Rivers Alliance,
Mass. Division of Ecological Restoration

AND

All the Stakeholders and OARS Staff and Board



The Stakeholder workshop participants

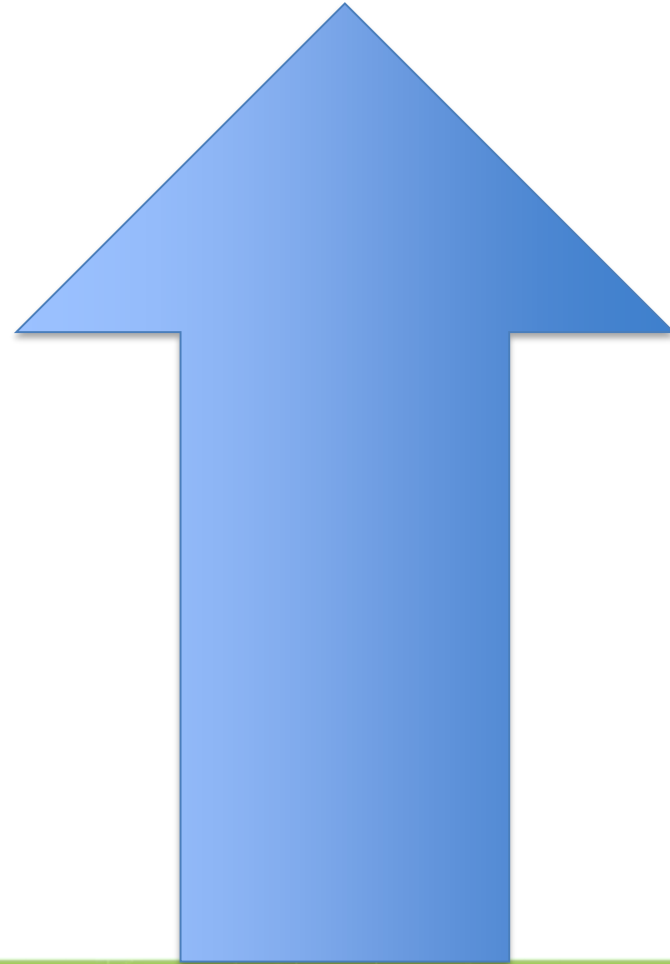
- ❑ **Towns:** Acton, Bedford, Billerica, Concord, Hudson, Maynard, Sudbury and Wayland
- ❑ **Cities:** Framingham and Marlborough
- ❑ **State agencies:** MassDEP
- ❑ **Federal agencies:** US Geological Survey, US Fish & Wildlife Service, EPA
- ❑ **Watershed organizations:** Charles, Ipswich, Merrimack, Mystic, Nashua and Neponset Rivers; Mass Rivers Alliance
- ❑ **Land trusts:** Sudbury Valley Trustees; Lowell Parks & Conservation Trust; Westborough Land Trust, Mass Audubon
- ❑ **Local groups:** Green Acton, Friends of Saxonville, Concord BioCAN
- ❑ **Regional planning:** Metropolitan Area Planning Council, MassBAYS
- ❑ **Consulting firms:** CEI, Geosyntec, HydroAnalysis.

Let's Discuss!

How can we raise the grade?

Tell us:

- What you can do
- What OARS can do



Discussion

- What's missing?
- What needs more work?
- What isn't clear?
- Who can help?