Watershed Investigations: How to Assess the Health of a Stream

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Why Monitor Streams?

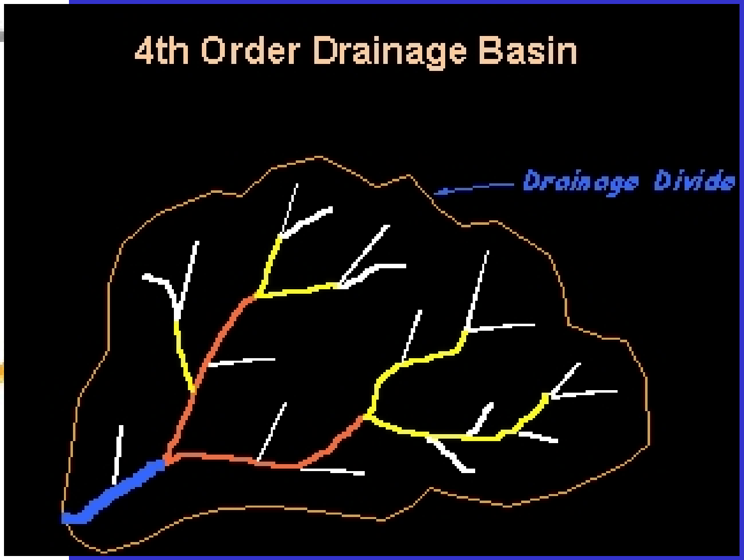
- Michigan streams are part of the Great Lakes watershed.

- Once baseline data are collected, you can use the data to monitor future changes: impacts *or* improvements.

- If you identify problems, you can develop a plan to improve the aquatic habitat.

- If you identify a healthy stream, you can take actions to protect the stream from future impairments.

Michigan streams are part of the Great Lakes watershed.



Source: http://www.geo.wvu.edu/~kite/Geol321Lect09_2002Zone1/sld005.htm

What is a Watershed or Drainage Basin?

The land area that drains runoff to a lake, stream or river.

The boundaries of a watershed are hilltops and ridges.

Designing A Stream Monitoring Project

1) State your question.

2) Investigate past & present watershed land uses

3) Collect and analyze data.

4) Form a conclusion - is your stream healthy? Why or why not?

What are some questions that can be answered by stream monitoring?

Possible Questions

1. Is the stream changing over time?
2. Is the stream cleaner upstream or downstream from a certain place?
3. How do the habitat quality, water chemistry, biological diversity, and physical characteristics compare among different streams.
4. Does the stream change throughout the year?
5. What lives in this stream?
6. Will this stream support trout or another species of fish?
7. Are land use activities affecting stream health?

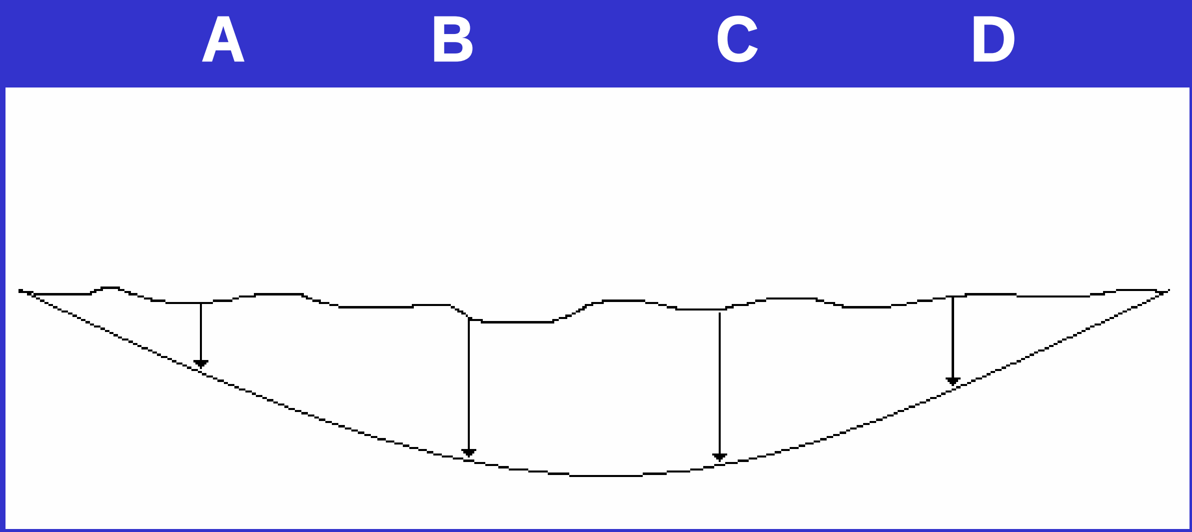
Monitoring Provides Data to Assess Which Stream Is Healthier

What do we monitor?

1. Physical Channel Measurements
2. Water Chemistry
3. Biological Assessment - what lives in the stream (bioindicators)
4. Streamside Habitat Assessment

Physical Channel Measurements

- Velocity (meters/second)
- Width
- Average Depth



- Discharge = Width x Average Depth x Velocity

Physical Channel Measurements

Physical Channel Measurements

Physical Channel Measurements

MDEQ aquatic biologist, Bill Taft, measures water depth.

Water Chemistry

- Dissolved oxygen > 6 ppm is required for most fish
- Nitrates < 2.5 ppm to prevent excessive plant growth
- pH: 6.5-8.2 optimal
- Total Phosphate < .03 ppm to prevent excessive plant growth
- Turbidity < 1.0 NTUs or JTUs
- Water temperature < 20^0C for sensitive macroinvertebrates, trout, and other cold water species

Water Chemistry

pH Ranges that Support Aquatic Life

1 2 3 4 5 6 **7** 8 9 10 11 12 13 14

Bacteria: 1.5_______________________________13.5

Plants: 6.5_____________12.0

Carp,suckers,catfish: 6.0_____9.0

Bass, crappies: 6.5___8.5

Snails, clams, mussels: 7.5__9.0

Trout, aquatic invertebrates: (most mayfly, stonefly, and caddisfly nymphs) 6.5_7.5

Water Chemistry

Temperature Ranges for Aquatic Life

More than 20 °C (>68 °F):
Many plants, warm water fish such as bass, crappie, bluegill, carp, sucker, many fish diseases

20 - 14 °C (68 - 57 °F):
Some plant life, walleye, northern pike, caddisfly larvae

Less than 14 °C (<57 °F):
Few plants, cold water fish such as salmon and trout; aquatic insects such as stonefly and mayfly nymphs; few fish diseases

Water Chemistry

Dissolved Oxygen Requirements for Aquatic Life

Trout spawning . . . . >7 ppm

Trout growth and well-being . . ... >6 ppm

Bass growth and well-being . . . >5 ppm

Bioindicators = Benthic Macroinvertebrates

Benthic = bottom-dwelling
Macroinvertebrates = large enough to see, no backbone

Why are benthic macroinvertebrates used to indicate health of the stream? because:

- spend up to one year in the stream.
- have little mobility

Bioindicators

3 Categories of Stream Macroinvertebrates:

Group 1 - pollution sensitive

Ex. mayflies, stoneflies, caddisflies

Group 2 – somewhat tolerant

Ex. scuds, dragonflies, damselflies

Group 3 - pollution tolerant

Ex. aquatic worms, midge larva

Bioindicators

Biodindicators

MDEQ aguatic biologist, Bill Taft, looks carefully through his sample.

Stream Habitat Assessment

(300’ stream reach; need to WALK and observe!)

- Channel bottom materials: sand or gravels?
- Diversity of in-stream habitats: pools, riffles, runs?
- Streambank well-vegetated with trees, shrubs, and grasses?
- Channel shaded by overhanging vegetation?
- Sediment deposition?
- Has channel been altered? Straightened?
- Is streambank eroding? Falling into stream?
- Does channel have curves & bends?

Which streamside area provides better habitat for trout and other aquatic organisms? Why?

Huron Creek

Close-up of stream bottom

Coles Creek

Trout Spawning Habitat

- Female digs “redd” and bury eggs in bottom materials (substrate); hatched fry

  emerge in spring
- Good spawning habitat
  - Cobble, mixed gravels
  - Low to moderate current velocity
  - No sediment to bury eggs or young fry, or cover their food sources.

Take Photos!

A picture is worth 1000 words - document your work!

Safety & Logistics for
A Stream Monitoring Field Trip

i) Bus parking; safety loading & unloading bus.

ii) Stream is safely accessible to students.

iii) Monitor during low stream flows.

iv) Have permission of property owner to use site with students.

v) Avoid lightning and thunderstorms.

vi) *All participants must wear* closed-toe shoes.

vii) Bring a change of clothes to avoid hypothermia