National Biological Assessment and Criteria Workshop

Advancing State and Tribal Programs

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LR 101

Section 4g: Methods for Sampling Algae in Large Rivers

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Algae (Microalgae)

- Freshwater dominated by:
  - Diatoms
  - Blue-green algae
  - Red algae
- Two major ecological categories
  - Benthic Algae (Periphyton)
  - Planktonic Algae (Phytoplankton)

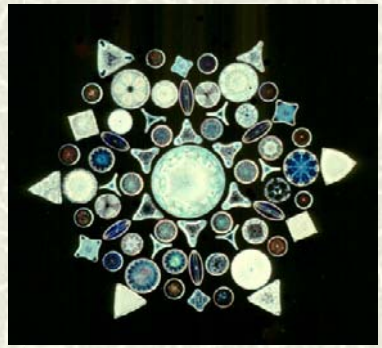
Periphyton: Why are they useful indicators?

- Primary Producers: link nutrients to food web
- Sessile
- Relatively Diverse
- Short Life Cycle
- Spatially Compact
- Consistent sampling techniques
- Standard taxonomy
- Known Sensitivities

- Are generally receiving increased attention, especially for nutrient criteria

Important questions to consider during program development....

- When to sample?
- What type of samples?
  - Qualitative or Quantitative
- What methods?
- What substrates?
- Target indicator?
- Composite?
- Location of samples?
- Identification level of effort?



Active Sampling Method Examples

- Quantitative (single composite index sample)
  - USEPA-EMAP – from erosional and depositional habitats at 11 assigned transects
  - USGS-NAWQA (richest-targeted habitat) - at five locations, five representative substrates are sampled
- Qualitative (single composite index sample)
  - USGS-NAWQA – samples collected at all available habitats

How are actual samples collected

- **Erosional habitats:**
  - Substrate removed from stream
  - Attached periphyton are dislodged from upper surface
  - Dislodged periphyton washed into a sample bottle

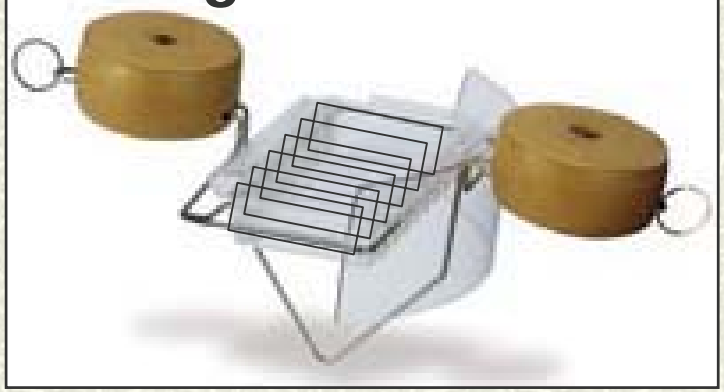
- **Depositional habitats:**
  - Soft sediment is collected
  - Transferred to the sample bottle

Passive Sampling Methods (Artificial Substrates)

- Benthic Substrates - Rocks, bricks, clay tiles, glass or plastic rods, wood dowels

- Suspended substrates – styrofoam, periphytometers (with glass or plexiglas slides or coverslips)

Periphytometer with glass slides



Typical Field and Laboratory Processing of Samples

- ID/Enumeration samples
  - 50 ml subsample
  - Preserved w/ formalin (4-5% final concentration)
- Chlorophyll & Biomass samples
  - Filtered aliquot (volume varies)
  - Stored on dry ice or in portable freezer

Common Indicators of Condition
(and associated parameters)

Species composition - Species diversity, evenness, autecological indices

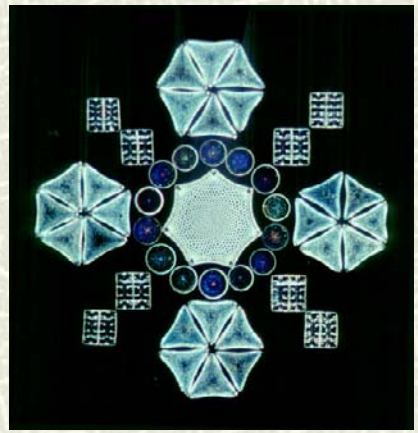
Cell density (cells/cm^2) – Abundance

Chlorophyll (µg/cm^2; surrogate for biomass) - standing stock, productivity, trophic status

Ash Free Dry Mass – Biomass, trophic status

Planktonic Algae (Phytoplankton)

- Poorly developed as large river indicator
  - Generally not very useful in smaller, more free-flowing rivers.
  - More useful in larger rivers
- Important questions to consider
  - When to take samples?
  - What type of sampler?
  - What is the target indicator?
  - Where are samples located?
  - To composite or not to composite



Phytoplankton: Why are they useful indicators?

- Reflect water quality conditions of the water mass in which they occur
  - However, may be dominated by dislodged benthic algae
- Substantial communities may develop in rivers during stable hydrologic conditions, particularly in large, impounded rivers.
- Sample is easy to collect, handle and curate

Phytoplankton collection method example…

- Quantitative
  - USGS-NAWQA – 1 liter depth and width integrated sample

Common indicators of condition parallel to those listed for benthic algae (periphyton)

Typical Field and Laboratory Processing of Samples...

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  - 1000 ml subsample
  - Preserved w/ formalin (4-5% final concentration)
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The Top Eleven Worst Algae Jokes... *Ever*

#11. What do the mothers of blue-green algae hope for?

That their daughter cells will grow up and marry pond scum.

#10. What kind of algae most often joins the military?

Fighter-planktons.

#9. What is the most common form of algae transportation?

A nitrogyn cycle.

#8. Why did the algae fail math?

He divided when multiplying.

The Top Eleven Worst Algae Jokes... *Ever* (continued)

#7. Why did the algae get pulled over on his way to the pond?

He was chloro-plastered.

#6. What do they sell at the Red Tide lingerie shop?

Algae bloomers.

#5. What happened when the fungus met the algae?

He took a lichen to her.

#4. Why couldn't the algae keep a girlfriend?

He wasn't a fungi.

The Top Eleven Worst Algae Jokes... *Ever* (continued)

#3. What do you call a filamentous algae sandwich?

A spiro-gyro.

#2. What did they call the guy who beat Fred and Wilma's pet?

A dino-flagellate.

And the absolute worst algae joke ever

#1. Why do many algae couples drift apart?

They prefer planktonic relationships.