

# Benthic Algae and Muck: Overview

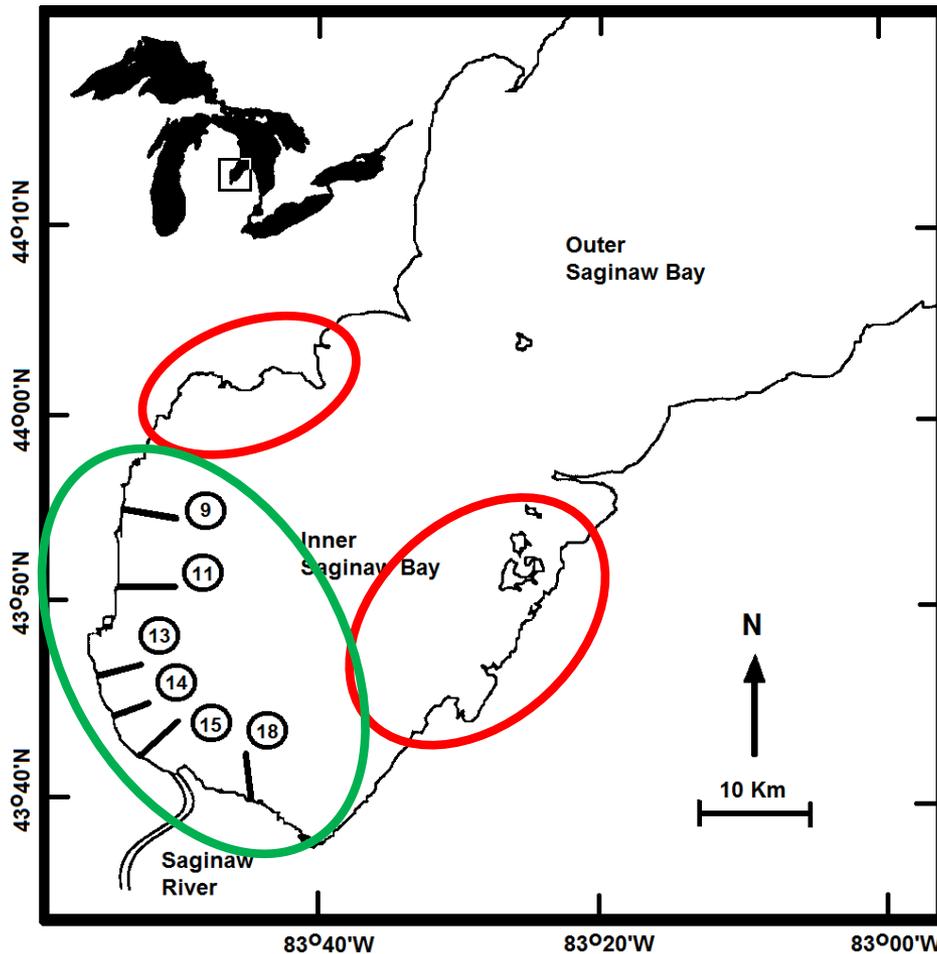
- We need to know about muck and algae in order to **model algal growth and predict muck**
- Algae Approach:
  - Survey the spatial and temporal distribution of different algae
  - Quantify factors affecting algal growth in the bay
    - Nutrients, temperature, light, water clarity
  - Conduct measurements to parameterize algal growth
    - PAM fluorometry, internal nutrient content, in-situ experiments
- Muck Approach:
  - Survey the spatial and temporal distribution of muck
  - Factors affecting muck deposition
    - Storms, weather, bay hydrology

# Benthic Algae Sampling

- What algae do we see and where do we see it?
- Algal community composition = muck composition?
- Benthic algae growth model
  - Benthic algae growth
  - Substrate
    - Mussels
  - Sloughing
  - Transport

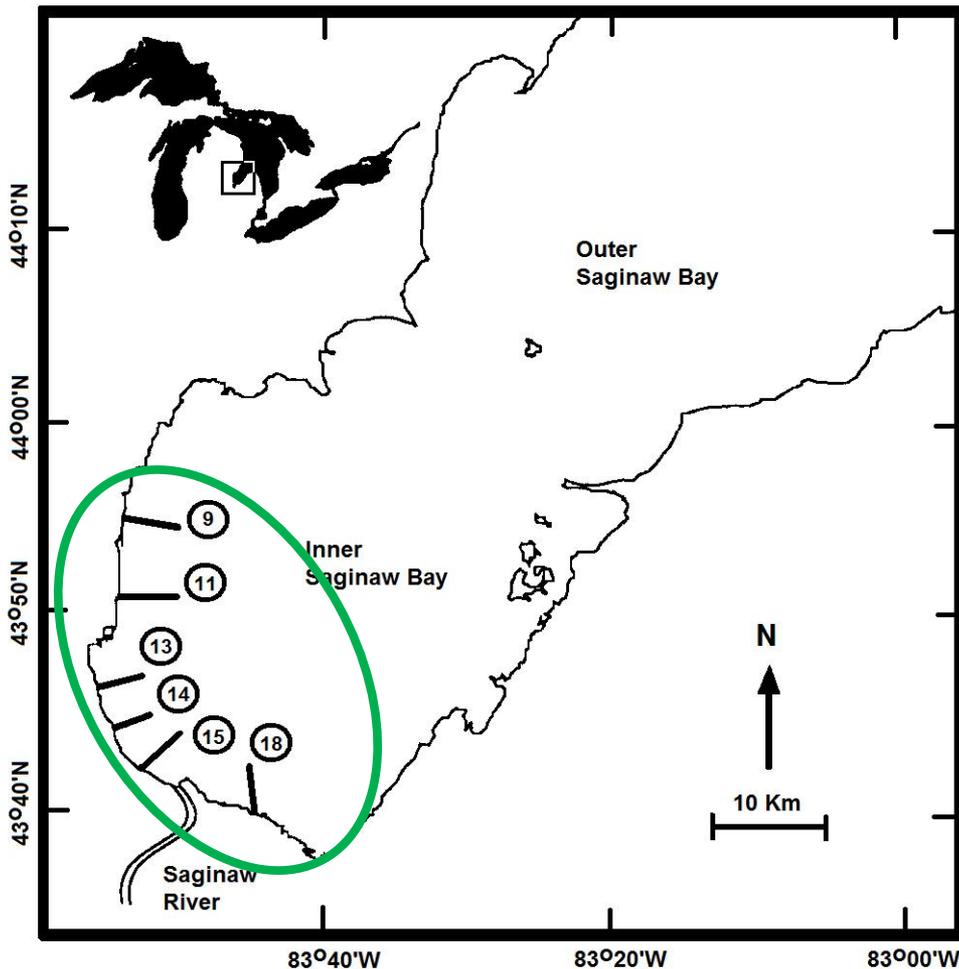


# Benthic Algae Methods



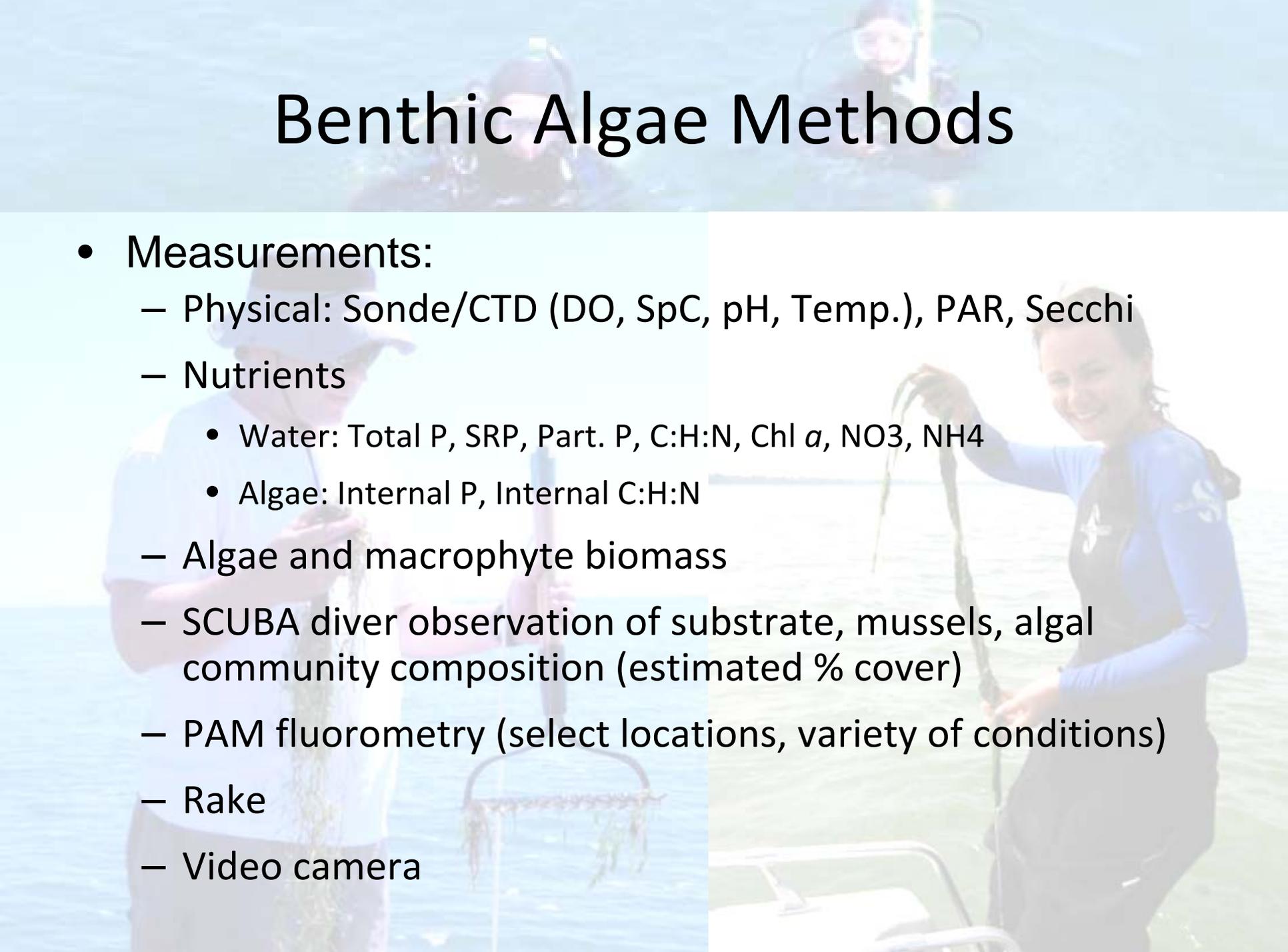
- Early season - surveyed entire inner bay
  - Mixed substrate
  - Found primarily *Chara*
  - Some macrophytes
  - Little filamentous algae growth, mostly in southwestern region

# Benthic Algae Methods



- Focused efforts in southwestern inner bay
- Six transects:
  - Depths: 0.5, 1.0, 2.0, 3.0, 4.0 meters
  - Deeper if algae still present
- Surveyed all transects twice (July and August)
- Transect 11 surveyed five times between July and September

# Benthic Algae Methods

The background image is a composite of three scenes related to marine research. At the top, two divers are visible underwater, looking towards the camera. Below them, on the left, a person in a white t-shirt and a light-colored hat is holding a large, tangled mass of brown and green algae. On the right, a woman in a blue wetsuit is smiling and holding a long, dark, vertical sample, possibly a piece of seaweed or a core sample, next to a boat.

- Measurements:

- Physical: Sonde/CTD (DO, SpC, pH, Temp.), PAR, Secchi
- Nutrients
  - Water: Total P, SRP, Part. P, C:H:N, Chl  $\alpha$ , NO<sub>3</sub>, NH<sub>4</sub>
  - Algae: Internal P, Internal C:H:N
- Algae and macrophyte biomass
- SCUBA diver observation of substrate, mussels, algal community composition (estimated % cover)
- PAM fluorometry (select locations, variety of conditions)
- Rake
- Video camera

- In following graphs, results split into *Chara*, Macrophytes, and Filamentous algae types

**Filamentous algae  
(*Spirogyra* and *Cladophora*)**



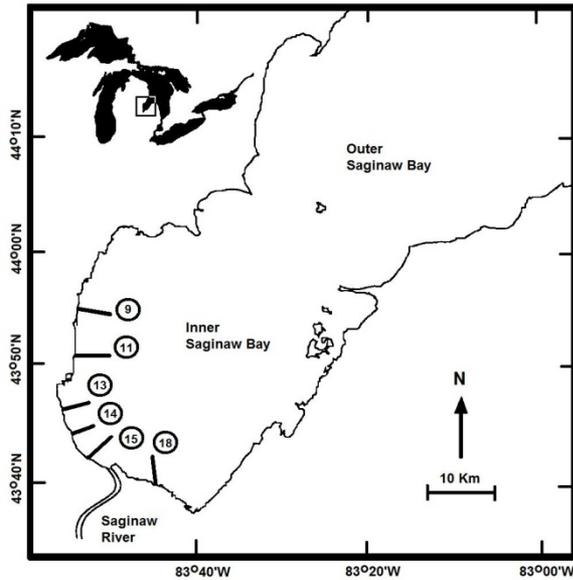
***Chara***



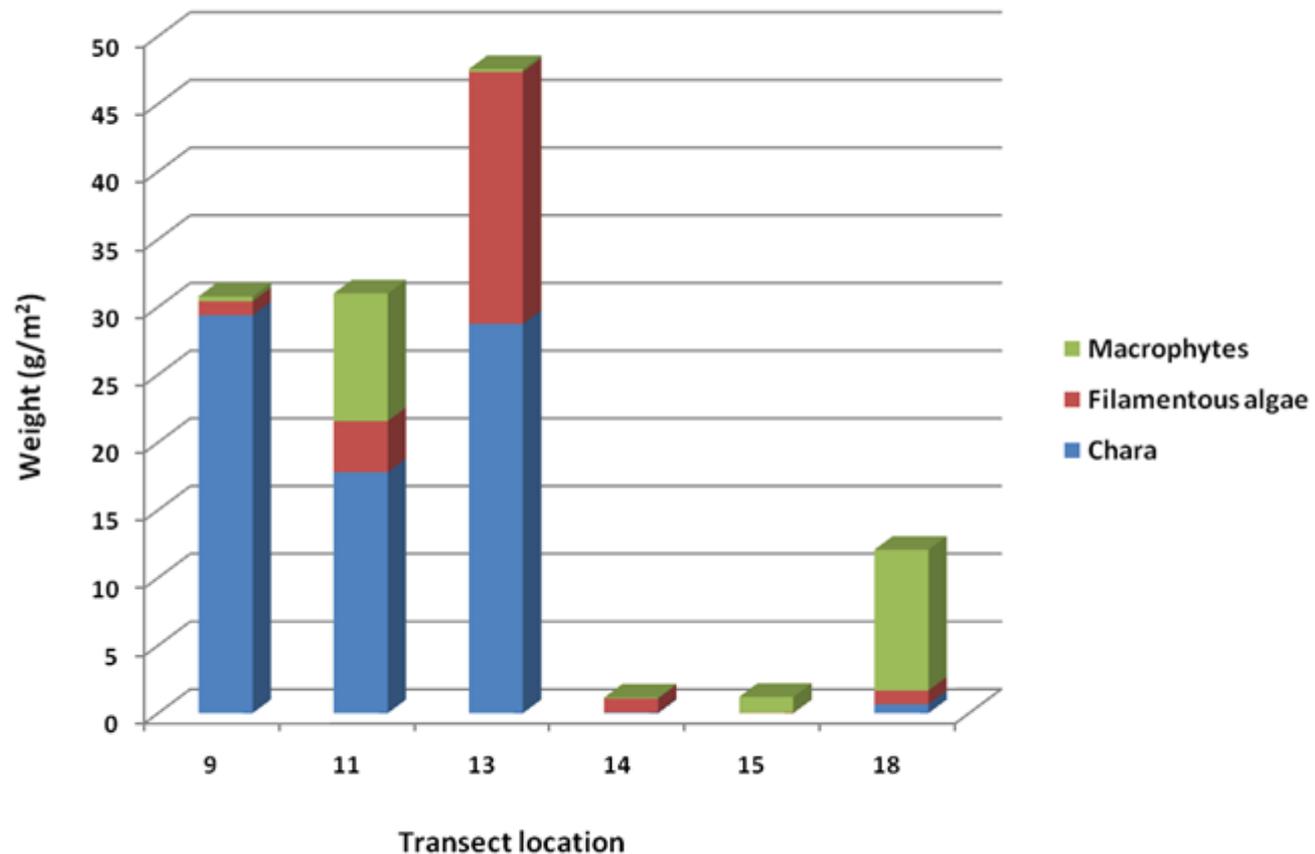
**Macrophytes**



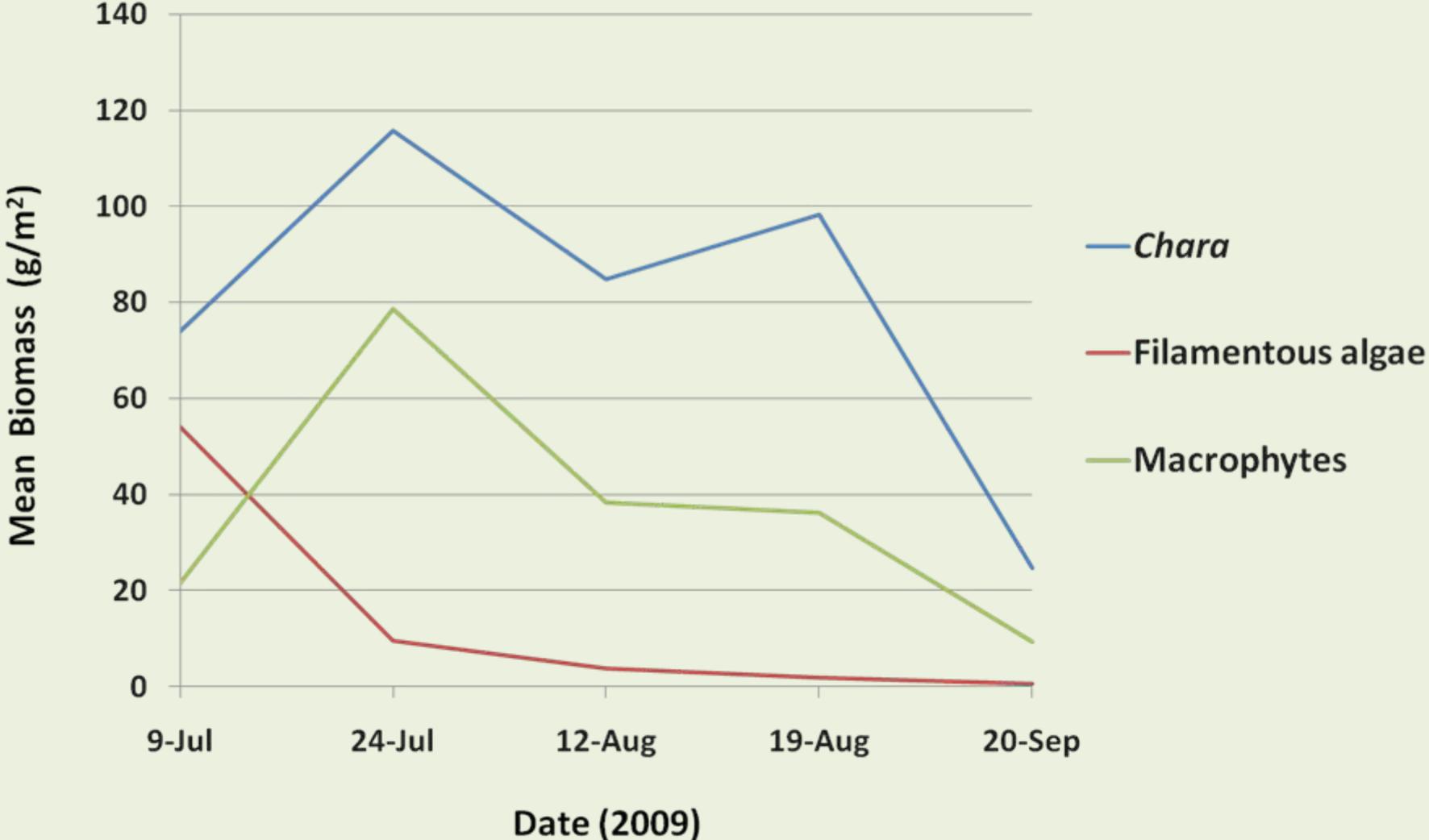
# 2009 Benthic Algae



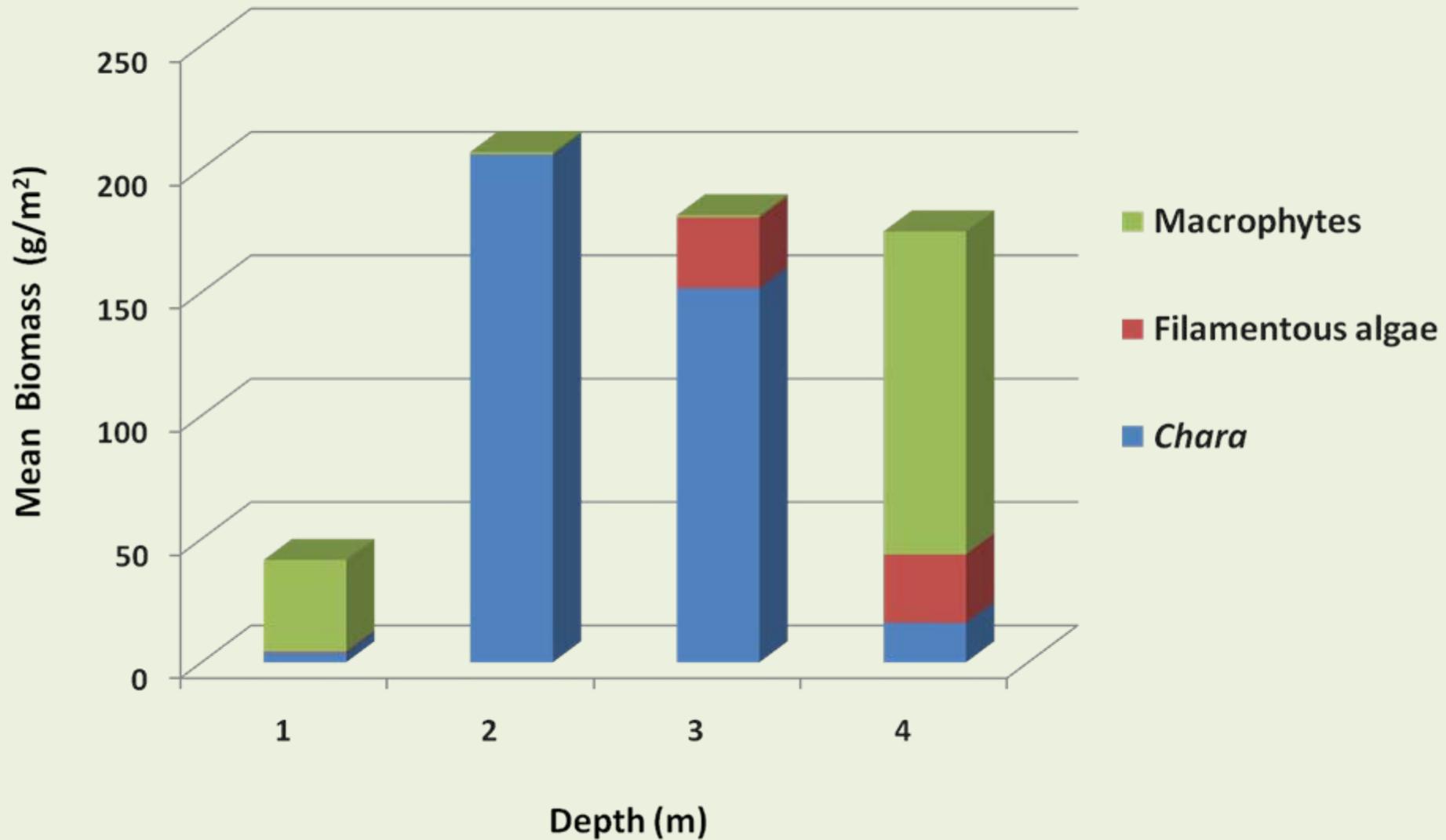
Biomass by Transect Location



# Transect 11 Biomass over Time



# Transect 11 Biomass by Depth



# 2009 Benthic Algae: Conclusions

- Algae difficult to sample
  - Settled on methods combining SCUBA work with rake and video camera methods
  - Faster methods possible for future work (AUVs, more camera)?
- Little algae growth overall
  - Cold, low-light summer
  - Expected mainly *Spirogyra*
  - Found blooms of *Cladophora* early in season (missed peak?) then small *Spirogyra* blooms mid-summer (July)

# 2009 Algae Sample Processing

- Water Samples
  - Nutrients: In process
  - Chl *a*: Not started
- Benthic Algae Samples
  - Nutrients: In process
  - PAM: In process
  - Algal community composition/ cell counts: In process

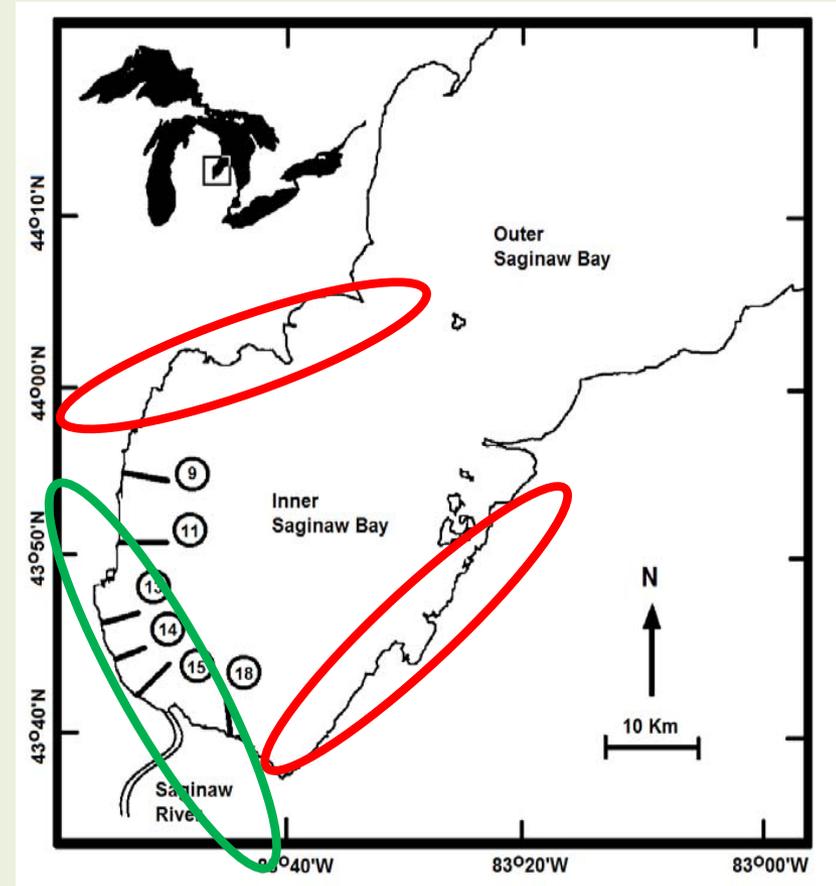
# Muck Sampling

- Driving questions
  - What is muck?
    - Composition
    - Sources
  - When/where do we see it?
    - Spatial and temporal distribution
    - Storm or heavy wind effects?
  - How much are we dealing with?
    - Volume
    - Layering
    - Source pool in bay?



# Muck Methods

- Early season -surveyed shorelines surrounding entire inner bay
  - Muck/algae growth found near agricultural drains
    - Point source loading creating muck on small scale?
    - Muck is different things!
- Most extensive muck deposits along southwestern shorelines
  - Focused efforts there
  - Same region as algae growth



# Muck Methods

- Established plots at Bay City Recreational Area (BCRA)
  - Measurements -weekly:
    - Depth, areal coverage, volume
    - Sample collection (ID, biomass)
    - Photographs



# 2009 Muck

- Early in season we found large deposits of *Cladophora*
  - Similar to that growing in the bay
- Little muck over most of the summer
  - Appeared very decomposed
  - Difficult to distinguish composition
  - Timing appeared to correspond to weather, but further analysis needed
- Late season muck deposits varied
  - Some new material, some older
  - Pool of muck out in bay repeatedly washing up?

# 2009 Muck: Conclusions

- Overall, little muck in 2009
  - Corresponds to low algae in 2009?
  - Similar composition to algae in bay
- Mostly located near BCRA
  - Same region as most of the filamentous algae growth
  - Historic problem in area
  - Related to bay hydrology?



# Benthic Algae Plans for 2010

- Repeat Benthic Algae Survey assessments
  - May need to add/subtract transects based on findings of PAM and nutrient analyses
    - Is most of the algae nutrient or light-limited?
  - Must be sure to begin work **early in season** to avoid missing peak growth
    - Drysuit diving needed?
    - Camera to check under ice in spring?

# Beach Muck Plans for 2010

- Repeat Beach Muck Survey assessments
  - Role of storms and high wind, bay hydrology
  - Tracking of sloughed algae
    - Construct cages to intercept algae?
  - May need to add additional monitoring sites if 2010 turns out to be a high-algae, high-muck year
- Add surveys (paper/online) of concerned bay residents
  - Ran out of time in 2009
  - Better organized for 2010

# New Plans for 2010

- Nutrient experiments
  - Quantify the role of dreissenid-supplied phosphorus for algal growth
  - In-situ incubation chamber experiments
    - Locations based on 2009 findings
    - Encompass variety of conditions (e.g. depth, mussel density)

# Summary of Algae and Muck Plans for 2010

- Repeat: Benthic Algal and Beach Muck assessments
- Add: Nutrient experiments, resident surveys
- Overall, more time doing experimental work, less time completing field surveys/sample processing

# Questions for discussion

- ❖ Should we monitor every month to keep up dataset?
- ❖ What are some ways to test whether beach muck is a localized, seasonal issue (algae growing in nearby areas coming onshore that summer) vs. a bay wide repository
- ❖ Is there a relationship between cooler, cloudier summer with high water levels and relatively low muck and benthic algal biomass?