

# Chapter 16: Benthic Stream Algae Distribution and Structure

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# What are Algae?

- Algae are photosynthetic organisms that are primary producers in streams.
- An alga or algae are organisms lacking true tissues and multi cellular gametangia and containing chlorophyll a, and their colorless relatives.

# What are Algae?

- The term algae is used to group several evolutionarily distant organisms together into a single ecological group.
  - Some algal divisions can also be classified as bacteria, protozoa, but most are classified as protista.
- Only green algae are true plants in the evolutionary sense.

# Classification of Algae

- Taxonomic classification uses four major characteristics:
  - 1. Pigmentation
  - 2. Storage Products
  - 3. Cell Wall
  - 4. Flagellation

# 5 Types of Algae

The five algal phyla are:

Bacillariophyta (Diatoms)

Chlorophyta (Green Algae)

Cyanopyta (Blue-Green Algae)

Chrysophyta (Yellow-Green Algae)

Rhodophyta (Red Algae)

TABLE 16.1

Patterns of Pigment Content, Cell Wall Chemistry, Storage Chemistry, and Flagellation Among the Divisions of Algae Most Commonly Encountered in Freshwater Periphyton.

<u>Division</u>	<u>Pigmentation</u>	<u>Cell Wall</u>	<u>Storage Products</u>	<u>Flagellae</u>
Bacillariophyta (diatoms)	Chlorophylls <i>a</i> and <i>c</i> but with carotenoid pigments dominant; cells usually gold to brown in color	Mostly SiO <sub>2</sub> and composed of two overlapping halves	Oil and leucosin	Absent vegetatively
Chlorophyta (green algae)	Chlorophylls <i>a</i> and <i>b</i> dominant	Cellulose and pectin	Plant starch	Usually 2–4 of equal length when present
Cyanophyta (blue-green algae)	Chlorophyll <i>a</i> and phycobilins; blue-green to olive-green in color	Peptidoglycan, gram-negative	Glycogen-like	Absent
Chrysophyta (yellow-green algae)	Chlorophylls <i>a</i> and <i>c</i> ; yellow-green in color	Pectin and cellulose	Oil and leucosin	Absent vegetatively
Rhodophyta (red algae)	Chlorophyll <i>a</i> and phycoerythrin; olive-green to maroon in color	Mannans and xylans (slimy)	Glycogen-like	Absent

# Diatoms (Bacillariophyta)

- Widespread
- Produce a brownish to gold color in the field.
  - Cell wall is formed from silica.
    - Petri dish example
  - Valve single, Frustiule double
  - Punctae in rows called striae.
    - Motile and non motile.

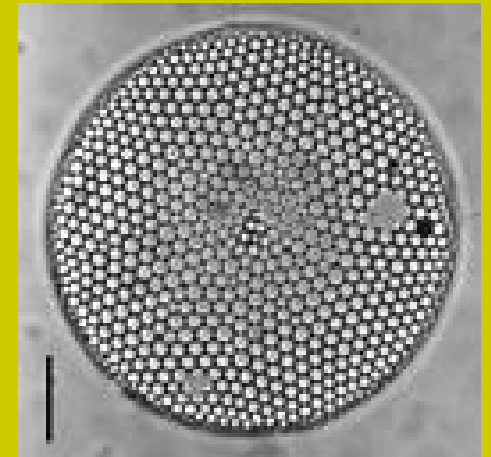
# Diatoms (Bacillariophyta)



*Cymbella*

wfrc.usgs.gov

*Gyrosigma*



*Coscinodiscus*



*Cocconeis*



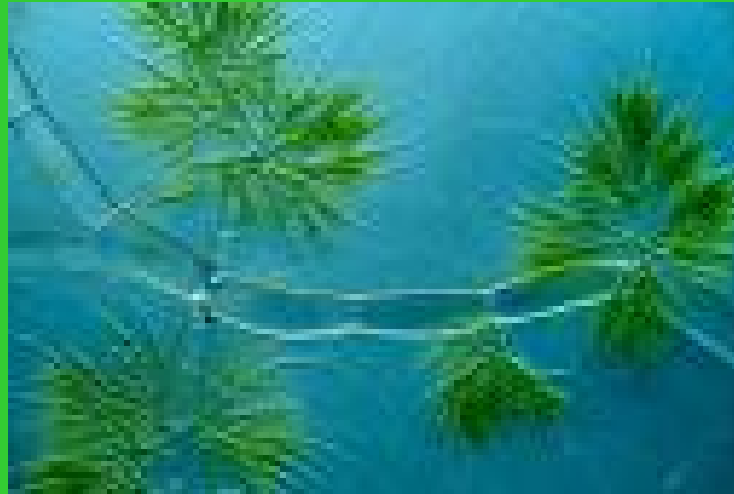
# Green Algae (Chlorophyta)

- Grass green color.
- Usually filamentous but not always.
- Can be branching
- Rarely will single cell colonies dominate.
- Most like plants
- Can be motile
- Chaetophora strands

# Green Algae (Chlorophyta)



*Bulbochaete*



*Draparnaldia*



*Tetraspora*

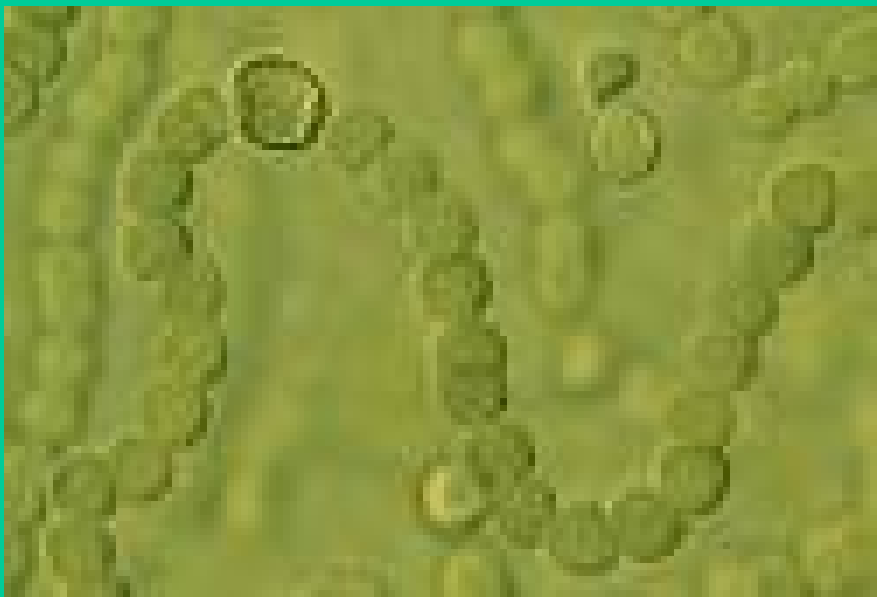


*Chaetophora*

# Blue-Green Algae (Cyanopyta)

- Cyanobacteria since they are prokaryotic
- Olive green, bluish green, brown.
  - Smell musty
- Filamentous forms most common
  - Nutrient Enrichment

# Blue-Green Algae (Cyanopyta)



*Nostoc*

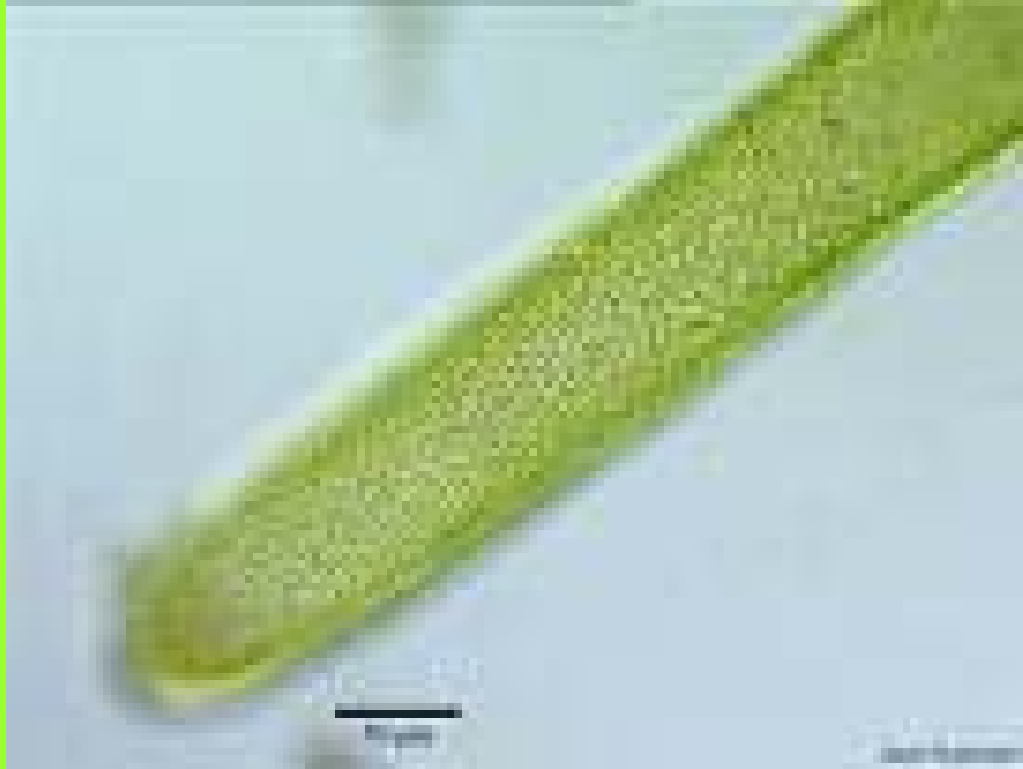


*Oscillatoria*

# Yellow-Green Algae (Chrysophyta)

- Yellowish green
- Only a few genera
- All are filamentous.
- Oil is the storage product.
  - Vaucheria-felt like feel

# Yellow-Green Algae (Chrysophyta)



*Vaucheria*

# Ecological Classifications

- Epilithion- on top of rocks usually, fast current areas. Most algae are tightly attached in this habitat.
- Epidendron or Epixylon- on top of woody debris or submerged woody tissue
- Epipelon- on top of fine sediment in low current areas. These alga are usually highly mobile.

# Ecological Classifications

- Epiphyton- on top of plants either filamentous algae or macrophytes, tightly attached.
  - Epipsammon- on top of sand.
- Epizoon- on top of animals with ridged shell like turtles, snails, clams, midges, or even caddis fly cases.



# Physogamy

- Structure in algal communities is present and can be compared to a terrestrial forest.
  - Must think small though.
    - This in turn can affect other algae, invertebrates, fish, and amphibian larva.

# Ecosystem Roles of Algae

- Production of oxygen.
- They are the base of the food web and generate food for many other organisms.
- They can enter the food web directly from the substratum and also be collected by filter feeders.
- Algae can also act as indicators of water quality.

# Site Selection for Collecting

- When sampling for algae look for a variety of current speeds, substrates, light intensities, and depths.
- Qualitative- general species composition.
- Quantitative sampling- bio volume and cells per centimeter.

# Laboratory

- Microscope is usually needed for most algal identification.

- Cleaning Diatoms

- When keying out use several different fields

