THE UNIVERSITY OF MAINE

Senator George J. Mitchell Center for Environmental and Watershed Research

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A FIELD GUIDE TO AQUATIC PHENOMENA

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MITCHELL CENTER
at the University of Maine,
the U.S. Geological Survey
Water Resources Research
Institutes Program
5710 Norman Smith Hall
Orono, ME 04469-5710
tel: 207/581-3244
fax: 207/581-3320
www.umaine.edu/WaterResearch

MAINE DEPARTMENT
OF ENVIRONMENTAL
PROTECTION
17 State House Station
Augusta, ME 04333-0017
tel: 207/287-7688
800/452-1942
tty: 800/492-0859
www.maine.gov/dep/index.shtml

Prepared by:
Catherine Schmitt

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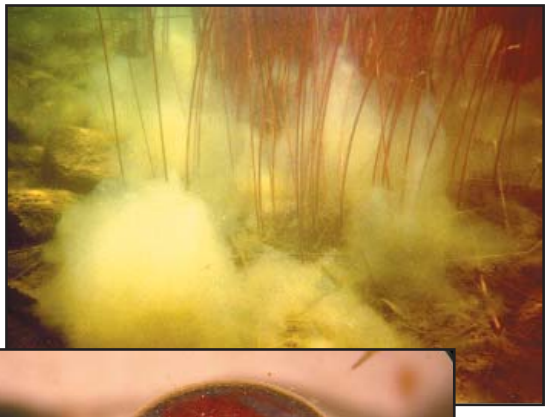
WHY IS WATER DIFFERENT COLORS?

WHAT'S THAT FLOATING ON THE WATER SURFACE?

Lakes and streams don't always look or behave the way we expect. Water can be full of strange colors, unidentified blobs, and swimming creatures. Something that at first glance looks like pollution actually might be a natural phenomenon. The aquatic world is diverse. There are all kinds of cool, weird, and interesting things waiting to be discovered in your nearby lake or stream. This field guide will help you identify some common phenomena, and help you distinguish pollution from something natural. To see more, visit www.umaine.edu/WaterResearch/FieldGuide.

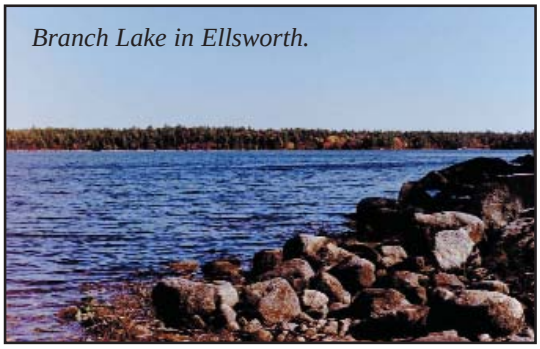
WHAT'S THAT STUFF IN THE WATER?



SPECKS, BLOBS, AND CLUMPS?

Field Guide Website
www.umaine.edu/WaterResearch/FieldGuide

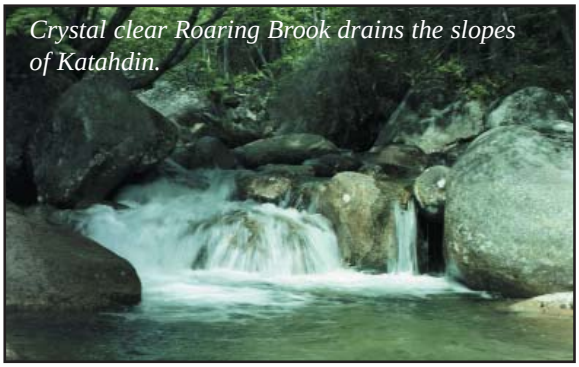
WHY IS WATER DIFFERENT COLORS?


Branch Lake in Ellsworth.

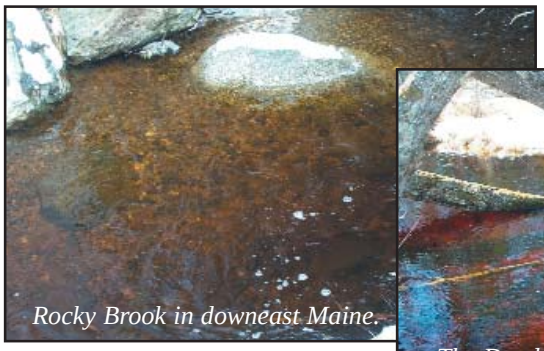
When we think of a lake or river, we picture clear, blue water. But the color of rivers and ponds can range from red to brown to green to gray. Color is the result of material in the water that reflects back different wavelengths of the light spectrum. This material can be either dissolved or suspended. Dissolved material may make water look clear and blue or clear and brown.

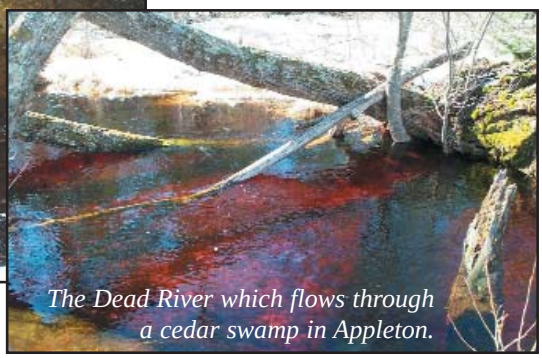
Clear **BLUE WATER** does not contain a lot of particles or dissolved, colored material to intercept and reflect other colors. Blue wavelengths of sunlight are longer, and penetrate into deeper water. The darker the blue, the deeper the water. Shallow areas appear lighter blue or greenish.

Why do some lakes and rivers have no color? **CLEAR WATER** has less dissolved and suspended material. Mountain streams that start as snowmelt or runoff are often clear, because they run over bare rock without sediment or vegetation. Seepage lakes in sand and gravel settings may also look clear, and very shallow water is clear because there is not enough depth for the long, blue wavelengths of light to travel and be reflected back, so instead we see the color of the river or lake bottom.


Crystal clear Roaring Brook drains the slopes of Katahdin.

What about water that is **TRANSPARENT, BUT BROWN** like tea or root beer? This color is the result of dissolved organic material from the breakdown of plants. The material leaches into slow moving streams and lakes from surrounding forests, bogs and wetlands.


Rocky Brook in downeast Maine.


The Dead River which flows through a cedar swamp in Appleton.

Suspended material makes water look **MURKY OR CLOUDY** (this is sometimes referred to as turbidity). Eroding soil can make water muddy brown in color. Strong winds and waves may stir up sediment from a lake bottom, and water near shore may look cloudy as a result. Runoff from urban areas can make water look gray.


The gray color of an urban stream.

Particles of living material can also be suspended in the water. **GREEN WATER** probably has a large population of algae (microscopic plants). Algae and other microscopic organisms have colored pigments. When they grow in large numbers ("bloom"), they can color certain areas or entire lakes and streams. Blooms of an organism called *Euglena* may appear red. A bloom of diatoms, a kind of algae, can look brown. (See inside for more about blooms.)


Algae have colored this lake green. Photo courtesy SCSWCD.

An **OILY SHEEN** that reminds you of rainbow puddles in an asphalt parking lot might be from spilled petroleum. But "oil" can also come from natural sources. Some bacteria that live in waterlogged places get their energy from iron and manganese, and as these bacteria grow and decompose, they may appear oily, or slimy black, red or orange as the iron and manganese solidify. • In the spring and summer, a dark cloud in the water accompanied by an oily sheen could also be the outer skeletons of insect cases left behind from a hatch of aquatic insects. A bloom of diatoms, a kind of algae, can leave an oil behind as the algal cells die. • How to tell the difference between petroleum spills and natural oil sheens? Poke the sheen with a stick. If the sheen swirls back together immediately, it's petroleum. If the sheen breaks apart and does not flow back together, it is from bacteria or plant or animal decomposition.

Oily sheen near a stream.

On a windy day, **LINES OF FOAM OR DEBRIS** may form along the length of a lake, reservoir, or river. These lines are called windrows or Langmuir streaks. Wind can cause water to circulate in a pattern that makes material collect in lines on the surface. The lines are roughly parallel to the wind direction, and the windier it is, the further apart the lines.

Langmuir streaks. Photo courtesy A. Thurnherr.

WHAT'S THAT FLOATING ON THE WATER SURFACE?

Clumps of pollen.

Pollen collects in a cove. Photo courtesy C. Smith.

A **YELLOWISH POWDER OR DUST** on the surface of still water in spring and early summer is probably pollen from pine and other trees. After becoming water-logged, the pollen sinks to the bottom or may collect along the shore. Lines of pollen may be left on rocks as water levels drop in summer. Sometimes pollen clumps together and forms small blobs.

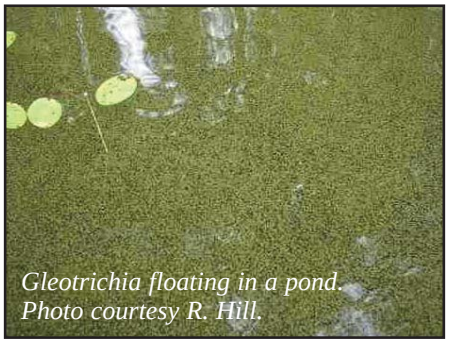
ORANGE OR REDDISH BROWN SLIME OR FLUFF is produced by a group of bacteria that use iron as an energy source. This is the same group of bacteria that create oily sheens. The masses of bacteria excrete slimy or fuzzy-looking material as they grow and reproduce, and the slime becomes coated with rusty iron hydroxide. This is usually a natural phenomenon and is generally associated with acidic soils. However in large amounts (orange fluff that fills a stream bed) iron bacteria might indicate pollution. • In some areas, iron-rich groundwater may seep to the surface, and the iron solidifies and settles to the bottom as it becomes exposed to air. In this case, the iron will appear as an orange crust or stain, and will not be fuzzy-looking.

Iron bacteria. Photo courtesy C. Smith.

Iron precipitate at a groundwater seep.

WHAT'S THAT STUFF IN THE WATER?

Fuzzy, **GREEN FLOATING DOTS** on lakes and in the top few feet of water, or tiny green tapioca-like balls might be an alga (microscopic plant) called *Gleotrichia echinulata*. Gleotrichia usually appear mid-summer for brief periods, but can persist longer in some lakes. The presence of Gleotrichia does not necessarily indicate poor water quality since it is commonly present in Maine lakes that have good water clarity. Wind and currents can concentrate them in one part of the lake and high densities can collect in coves.



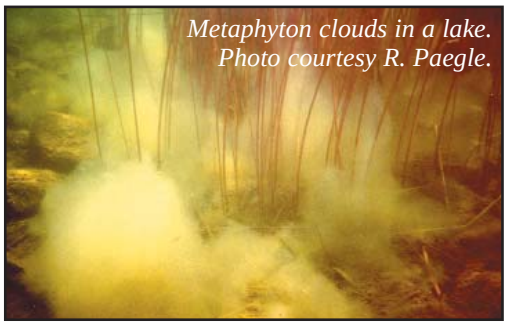
Gleotrichia floating in a pond. Photo courtesy R. Hill.

Strands of algae from a drainage pipe.

FLOATING GREEN STRANDS, "cotton candy", and **GREEN CLUMPS** are formed by filamentous algae. These colonies of microscopic plants live in shallow water on the bottom near shore or on submerged objects.

Clumps of algae in a stream

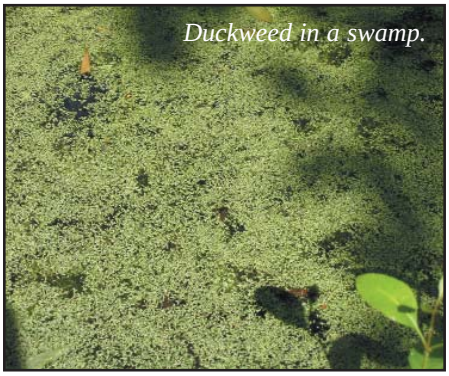
GREENISH-YELLOW CLOUDS that look like cotton candy in shallow water along the shoreline are groups of algae known as metaphyton. Clouds often form in spring after heavy runoff or following a long hot spell in the summer. Metaphyton clouds, made up of several different kinds of algae, may be a foot or more in length. This kind of algae does not necessarily indicate that there are excess nutrient levels in the water.



Metaphyton clouds in a lake. Photo courtesy R. Paegle.

Algae bloom in a lake. Photo courtesy SCSWCD.

Don't mistake floating plants like **DUCKWEED** and water meal for algae. Duckweed (*Lemna* spp.) look like miniature lily pads, with a flat, round floating leaf and a tiny root. Water meal (*Wolffia* spp.) also floats but does not have a root, it is a round grain-like plant, about the size of a poppy seed.



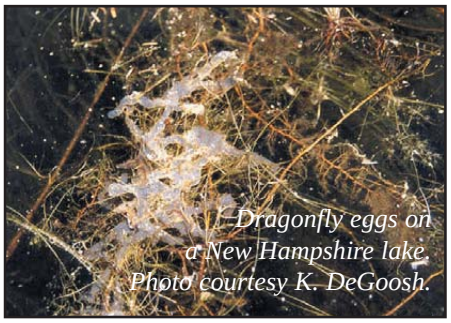
Duckweed in a swamp.

SHOULD YOU BE CONCERNED ABOUT ALGAE BLOOMS?

Algae are an important source of food and oxygen for other plants and animals in the water, and a diverse community of algae is healthy. Sometimes, certain conditions might favor a species that is normally rare in a lake or stream. With the right temperature, light, and nutrients in the water, the organism might multiply rapidly, forming a "bloom". When an algae bloom is persistent or occurs routinely, too many nutrients may be entering the water. Nutrients (especially phosphorus) fertilize a lake just as they fertilize your lawn or garden, causing microscopic plants in the lake to grow. In Maine, to report an algae bloom call DEP at 1-800-452-1942.

GREEN OR BLUISH-GREEN SCUM on the surface of a lake, pond, or stream might be a bloom of blue-green algae (cyanobacteria).

Jelly-like masses and clumps floating on the surface of shallow, calm waters or attached to sticks under the water might be **EGG MASSES** of insects, fish, or amphibians. Frog eggs usually look like a round mass and float on the water surface. Salamander eggs are huge masses with lots of jelly, and may or may not be attached to plants or sticks below the surface of the water. Toad eggs are laid in a string and usually are attached to plants and sticks. While amphibian eggs are found in masses, fish eggs and other eggs



Dragonfly eggs on a New Hampshire lake. Photo courtesy K. DeGoosh.

may be found individually or in small groups. • Female "basket tail" dragonflies (*Epitheca* spp.) carry a batch of eggs and drag their abdomen across the water surface to deposit their eggs in long gelatinous strings. They are clear to milky white with tiny spots of embryos. Toad eggs look similar but they are larger and more silty in appearance. Also, toad eggs are often right along the shoreline in weedy shallows among plant stems, and dragonfly eggs will be slightly further out in deeper water. • In early spring, long, flat, purplish ribbons wrapped around plant stems or on sand bars are yellow perch eggs.

Perch eggs. Photo courtesy S. Diamond.

A water mite trapped inside of an aquatic, carnivorous plant. Photo by K. Ness.

Small, red specks swimming in shallow waters are most likely **WATER MITES**. Often found in and around plant beds, water mites can range in size from a pinhead to a pencil eraser. With eight legs, water mites look like tiny spiders but closer inspection will show they only have one body part, unlike spiders which have two.

The freshwater sponge Spongilla lacustris. Photo courtesy Hugh Clifford & Bio-DiTRL.

Greenish spongy-looking clumps attached to submerged sticks and plant stems in clear, well-oxygenated lakes might be **FRESHWATER SPONGES**. Sponges are members of the animal kingdom but are often mistaken for aquatic plants or algae. Most sponges are green, because they have algae living in their tissues. Freshwater sponges vary in size from a less than an inch to three feet. They are usually finger-shaped, and can look soft or hard. They are most commonly seen in summer or fall. They may appear sporadically and be abundant in a lake one year and absent the following year.

SPECKS, BLOBS, AND CLUMPS: MINERAL, PLANT, OR…*ANIMAL?*

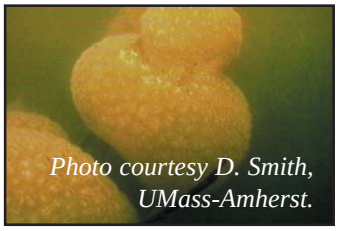


Photo courtesy D. Smith, UMass-Amherst.

Jelly-like blobs, sometimes seen attached to submerged sticks or docks, might be a colony of **BRYOZOANS**. These can be confused with egg masses. Bryozoans are animals, similar but unrelated to corals. Some byrozoans are wispy and moss-like (giving rise to a common name of "moss animals"), others are large and round, gelatinous, firm, and slimy to the touch. While they may be unsightly on piers and docks, bryozoans are not a water pollution problem and in fact help to filter water.

About the size of a quarter, with hundreds of tentacles, the **FRESHWATER JELLYFISH** can occur sporadically as populations explode and decline. They are translucent but may have a white or green tinge. Freshwater jellyfish have been found in rivers but prefer standing water and are most likely to be seen in lakes and reservoirs in late summer, just below the water surface. They do have stinging cells but are not harmful to humans. Only small fish and insects are harmed by their stings.

Photo courtesy T. Peard.

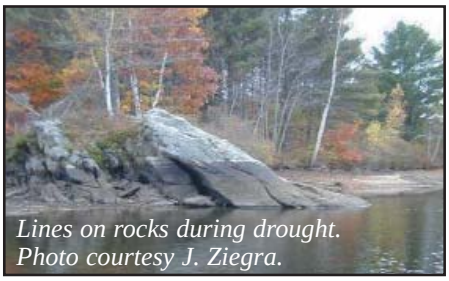
INSECT EXUVIA: The larvae of mayflies and some other aquatic insects molt and shed their skins as they leave the water and become flying adults. The skins are called exuvia, and can be seen floating on the water or piled up on wave-swept shores, where they are sometimes mistaken for fish kills. You can find dragonfly skins attached to docks, plants, and objects near shore. As exuvia decompose, an oily film sometimes forms on the water surface.

The cast-off skin (exuvia) of the damselfly, Calopteryx splendens. *Photo courtesy British Dragonfly Society.*

WHAT'S THAT ALONG THE SHORELINE?

LINES ON ROCKS along the shore are a result of fluctuating water levels, and can be created by several different materials. Pollen that settles on a lake or quiet stream in spring may get left behind on rocks when the water drops in summer. • Algae that live on the surface of the water can likewise adhere to rocks and dry in a line. A white crust on rocks may be leftover diatom shells. Diatoms are a kind of algae with silica in their cells. The hard, white silica may be left behind when the algae die. A wet black zone of algae will form where the water meets the air, similar to bands of seaweed along the coast. • Bands of bare rock just above the black algae layer are areas where winter ice has scoured the rock.

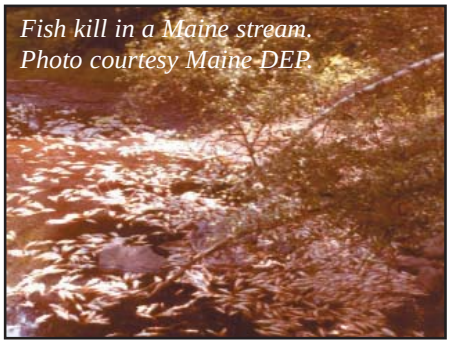
Lines of pollen on rocks in Davis Pond.



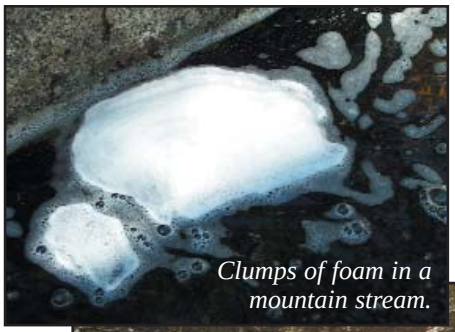
Lines on rocks during drought. Photo courtesy J. Ziegra.

Above the bare scour zone is often a band of moss or lichens, where there is enough water and condensation for the lichen to live but above the zone of ice damage. Lichens grow so slowly that they are a good indicator of how high the ice is pushed in winter.

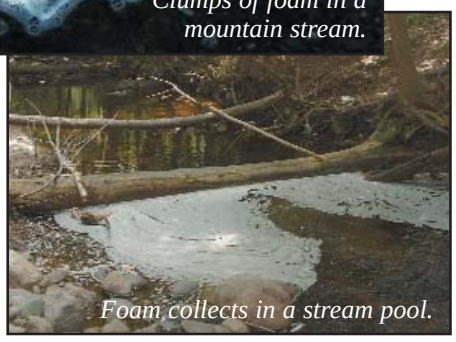
FISH KILLS are rarely the result of toxic pollution. Possible causes include lack of oxygen (especially on hot, windless days where excess nutrients decrease oxygen levels), lack of food, viral or bacterial infections, and fish stranding from low water levels. Some fish die after migration or spawning (like suckers). Smelts die from moderate stress, such as high temperatures or low oxygen. Winter fish kills can occur when oxygen is used up beneath the ice.



Fish kill in a Maine stream. Photo courtesy Maine DEP.



Clumps of foam in a mountain stream.



Foam collects in a stream pool.

Most **FOAM** on lakes and streams is natural and does not indicate pollution. Foam forms when water is mixed with air, such as by a waterfall or waves breaking against shore. Organic material from decomposing plants and animals lessens the surface tension of water and creates bubbles. Natural foam may smell fishy or earthy, and may be white, off-white, or brownish, and breaks apart easily when disturbed.

Additional Information

For more photographs and detailed descriptions of aquatic phenomena, visit the Field Guide website at www.umaine.edu/WaterResearch/FieldGuide.

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Other Resources:

- www.state.me.us/dep/blwq/doclake/FAQs.htm
- http://mainevolunteerlakemonitors.org/index.htm