

# Let's Go Snorkeling!

Become Jacques Cousteau and explore the exciting underwater world of Vermont lakes.

## Summary

Skip the flight to the Caribbean, and grab your snorkel to discover the amazing diversity of aquatic plants and fish in a Vermont lake!

## Objectives

- ♣ To discover the elements that make up an ecosystem.
- ♣ To be submerged in exploring the world of lake animals and plants.
- ♣ To increase appreciation for the diversity of Vermont lake life.

**Chapter Connections:** *All About Vermont Lakes*, Chapter 3, *Lake Habitat*

## Background

Many people have enjoyed the lakes in Vermont by fishing, boating, swimming, or some other fun activity. However, most of these experiences probably have taken place above the water surface. Underwater, a very exciting world awaits to be discovered!

With just a swimming mask or a viewing scope, you can dive into another world. This is what Jacques Cousteau discovered, while attending summer camp as a 10 year-old boy at Harvey's Lake in Barnet, Vermont. While diving to clean-up trash along the lake's shore, Cousteau became fascinated with the underwater world. His interest grew and eventually lead him into marine ecology and ultimately to become the world's most famous aquatic biologist and conservationist.

Many of the Vermont State Parks are located on lakes and offer easy and safe access for snorkeling. Beyond a sandy beach, look for aquatic plant beds, rocky shores, or natural shorelands with little development. It's more likely to see fish at these sites. The more diverse the habitat (submerged woody structure,

## Vermont Standards

7.13 The Living World

7.16 Natural Resources and Agriculture

3.9 Sustainability



varied aquatic plants, shaded versus full sun areas, deep and shallow waters, etc.), the greater chance of seeing a variety of species.

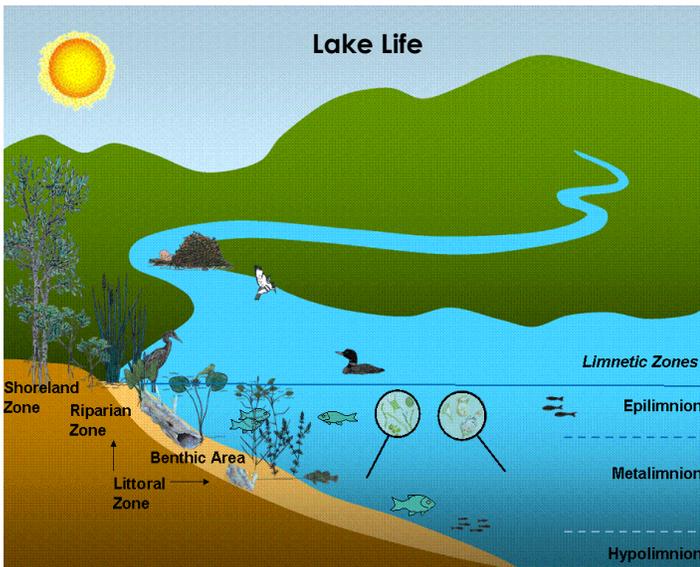
Appendix A provides a set of field sheets to use to help identify what you see as you swim and snorkel in a Vermont lake.

Since lakes stratify (upper top layer of the lake is warmer than the lower layers), its possible to feel the thermocline while swimming.

## Limnetic or Pelagic Zones

These zones refer to the open water areas of a lake and occur because of temperature gradients, or lake stratification. Because water becomes more dense as it decreases in tempera-

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ture, the colder layers of water are at the bottom of the lake. *(The exception to this principle is that water reaches its maximum density at approximately 40° F, and as it cools further and freezes into ice, it actually becomes less dense, allowing ice to float!)*

- The Epilimnion** is the upper, warmest layer.
- The Metalimnion** is the middle layer.
- The Hypolimnion** is the bottom, coldest layer.

Lake shore areas greatly influence the health of an entire lake ecosystem. A lake's shore area is divided into several zones, each of which offer unique lake protection and aquatic habitat features.

**Shoreland Zone**

This is the area on the shore above the high water line and vegetated with a mixture of trees, shrubs and plants.

**Riparian Zone**

The riparian zone sits between the shoreland and littoral zones with some overlap on both sides. It consists of vegetated uplands that are influenced by the lake level and water quality.

**Littoral Zone**

This area starts from the riparian zone and extends down to the furthest extent of rooted plant growth in the lake. It is shallow with sunlight penetrating to the bottom.

**Benthic area**

The benthic area makes up the bottom sediments, which support many organisms.



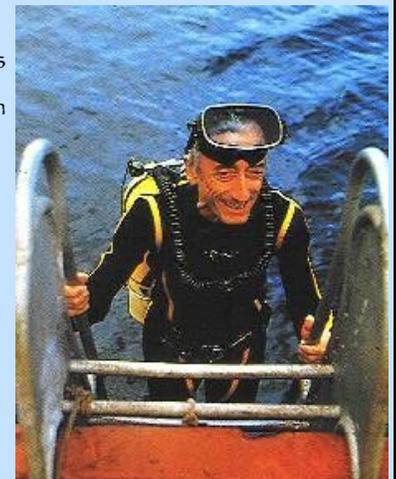
Cousteau (CNN)

**Jacques Cousteau  
1910—1997**

Cousteau is the most famous marine biologist, known for his outstanding contributions towards understanding ocean life. While studying the underwater life, Cousteau taught the rest of the world about the unique problems aquatic life faces because of human encroachment in these environments.

- ◆ Cousteau's first dive was in Lake Harvey, Vermont in the summer of 1920.

"From birth man carries the weight of gravity on his shoulders. — But man has only to sink beneath the surface and he is free. — Underwater, man becomes an archangel."  
Jacques Cousteau



Cousteau's team diving off his research boat, the Calypso

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Fresh Water Sponge  
Lake Maidstone, Maidstone

## The Activity

### Materials Needed:

- bathing suit and towel
- swimming goggles
- snorkel
- water shoes (nice, but not essential)
- field sheets (see Appendix A)

### Get Started

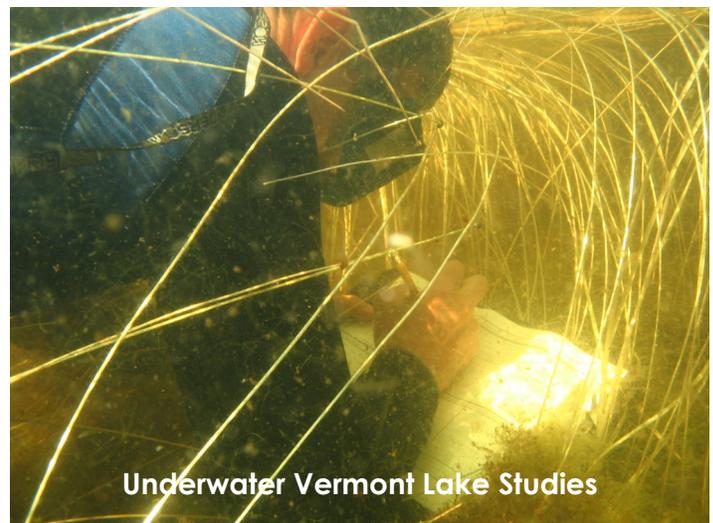
This activity takes place in the field, using a lake as a living classroom. Before heading to the lake, ask the students what they expect to see while snorkeling? Have them keep their list, or keep a class list, to use to compare to the list of things they actually find.

This activity is about discovery. Students can learn a lot about an ecosystem by exploring what lies beneath the surface of our Vermont lakes. Seeing is believing and learning. Use the Field Sheets in Appendix A to help identify the things found. They also can serve as guides (check lists) for keeping track of what is seen.

The Habitat Assessment sheet offers students a way to determine the health of the aquatic habitat.



Underwater Lake Life with Pumpkinseed Fish  
Rescue Lake, Ludlow



Underwater Vermont Lake Studies

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## Additional Resources:

Check out the Vermont State Parks web page for information of parks located on lakes. [www.vtstateparks.com](http://www.vtstateparks.com)

The Vermont Lakes and Ponds Section has aquatic plant dichotomous keys that are available upon request by calling 802-241-3777.

The Vermont Project WET program has an aquatic plant guide that can be loaned out. This guide shows full page, beautiful colored pictures of most aquatic plants. Call the Vermont Lakes and Ponds Section at 802-241-3777 to arrange to borrow this guide.

The Lake Champlain Committee has a wonderful dichotomous fish key for easy identification of most of the fish in Vermont. Contact them at: [www.lakechamplaincommittee.org](http://www.lakechamplaincommittee.org), or by calling 802-658-1414.

*Fishes of Vermont*, written by three Agency of Natural Resources biologists, provides color pictures of the 92 fish species in Vermont. This field guide offers fascinating natural history



accounts for all Vermont's fish species. Books cost \$24.95, with proceeds from sales supporting the Fish and Wildlife Department's Nongame and Natural Heritage Program. To order a copy, call: 1-800-515-2475.

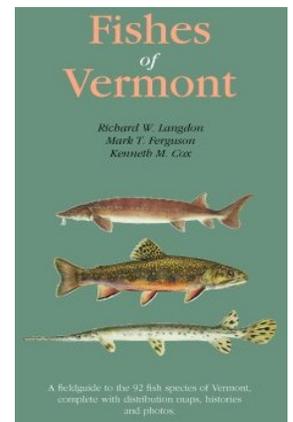
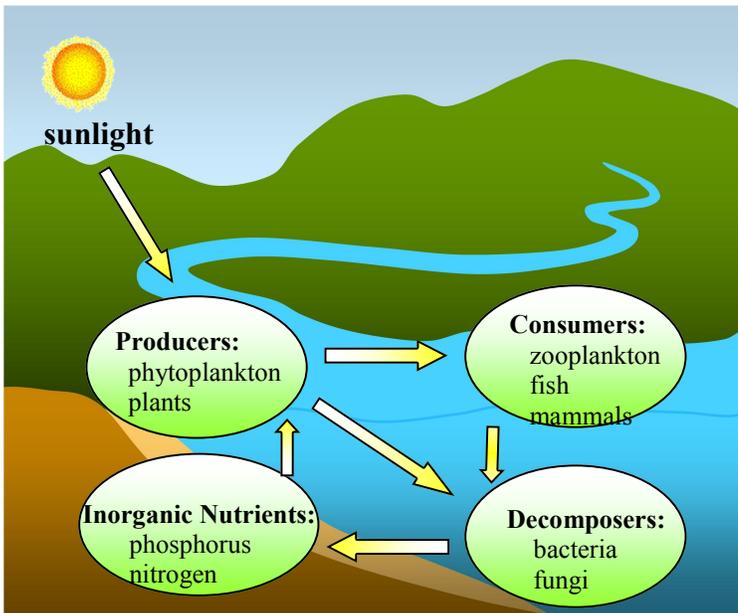
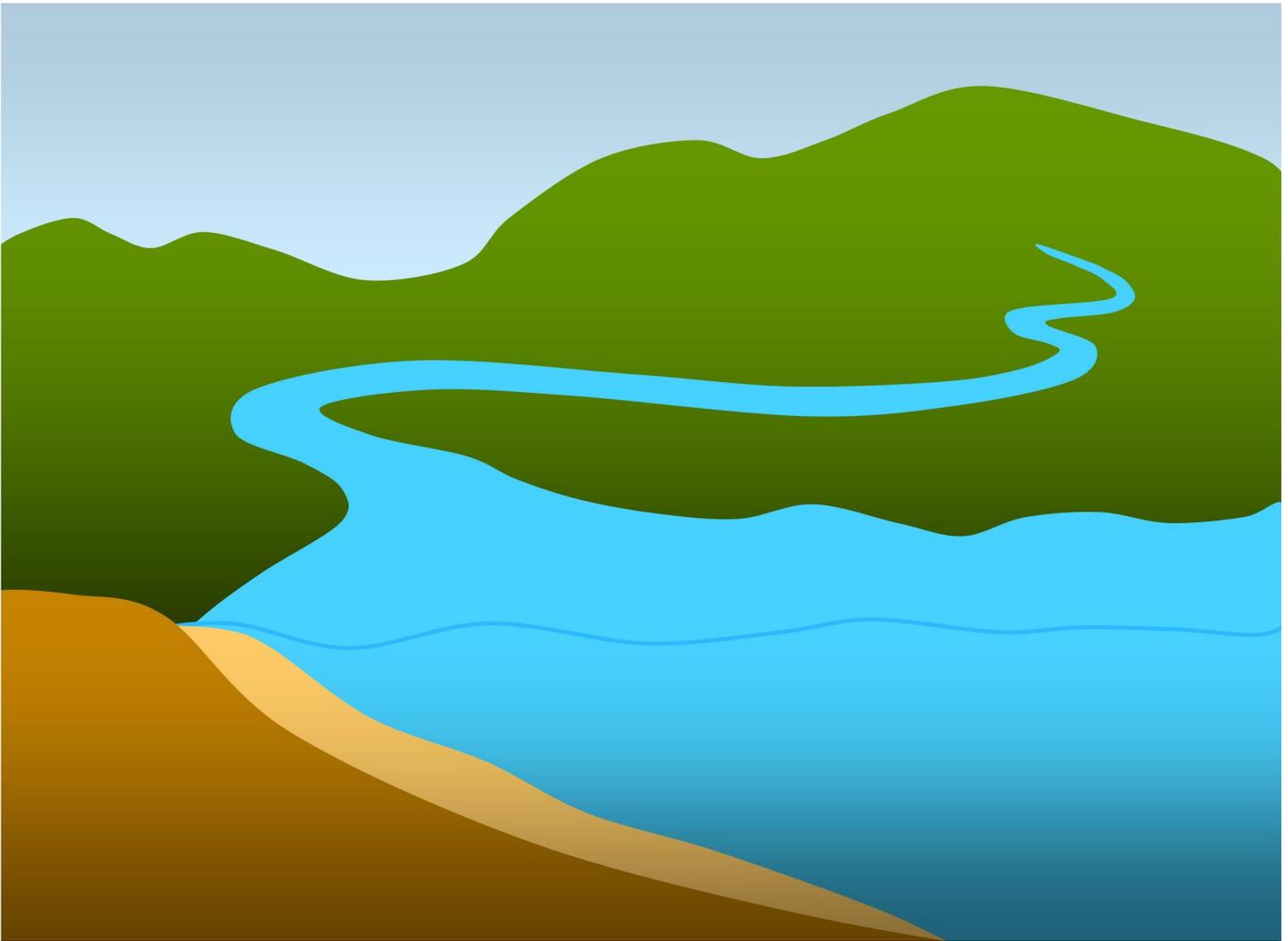


Image from: [www.fcps.edu/islandcreekes/](http://www.fcps.edu/islandcreekes/)

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Lake Ecosystem — Energy Flow

### Follow Up Questions

Use the above diagram to draw in what you saw snorkeling. Compare it to the diagram on the left of how energy flows within a healthy lake ecosystem. Based on what you saw, do you think all four levels of the ecosystem are represented in the lake?

Do you think that the areas you snorkeled are part of a healthy lake ecosystem?

How many lake shore zones (shoreland, riparian, littoral, benthic) could you identify?

What did you expect to see? If you didn't see what you thought you'd find, then why do you think that is the case?

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# Littoral Habitat Assessment

## Part 1. Shoreland Survey

surrounding lake features can greatly influence the quality and quantity of underwater life

## Part 2. Underwater Survey

good habitat includes a diversity of sites, like woody structure, pebbled bottom, and plants

### 1. Shoreland Survey

Place a check next to each item below IF it represents the AVERAGE shoreland condition for approximately a 100 meter stretch of the shore.

#### Shoreland Zone

- Naturally vegetative shore (buffer strip)
- Houses beyond 200 feet of lake
- No houses along shore of lake
- No lawns extended to lake
- No driveways within 200 feet of lake
- Pasture or crop land 200 feet away from lake
- No pasture or crop land present
- No drainage ditches leading to lake
- No pet activity (horses, dogs) within 200 feet of lake
- No people activity (fire pits, beach area, docks)
- Minimal people activity (just for lake access)

#### Riparian Zone

- Vegetated banks
- More than five native plant species (good diversity)
- Banks offer protected access for wildlife
- Shaded water (has tree canopy)

### Part 2. Underwater Survey

#### Littoral Zone

- More than five native aquatic plant species (list species if you can)
- No non-native aquatic plants (no Eurasian watermilfoil or water chestnut)
- Submerged fallen trees
- No trash or human debris found
- Clarity of water is good, not murky or cloudy
- Bottom is not covered with thick benthic algae



Count up all your check marks for your score. Circle the range it falls into to determine the habitat health.

**1-5**  
**Poor Habitat**

**6-10**  
**Fair Habitat**

**11-15**  
**Good Habitat**

**15-20**  
**Excellent Habitat**

Does your score seem accurate? Why or why not?

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