

LIVING THINGS in their Habitats



What is in your local ecosystem? There is no better way to know your environment than by going out and taking a close look. It be the beginning of an *ecological study*.

Ecology
Types of Ecosystems
Tundra
Forests
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Oceans
(posters of each type)
(posters of Alaska Trees)
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ORIGINS OF "ECOLOGY"

The term **ecology** was introduced in 1866 by a German biologist Ernst Heinrich Haeckel. It is derived from the Greek words for "household" and "economy" giving it a meaning close to the *economy of nature*.

Ecology is now defined as the **study of relationships of organisms to other organisms and their physical environment**. The science developed in part from Charles Darwin's studies of adaptations of organisms to their environment and from plant geographers' studies of world plant distribution.

Alaska's earliest scientific study was conducted in 1741 by Georg Steller, the naturalist on Vitus Bering's voyage.

Steller was allowed less than a day ashore on Kayak Island east of Prince William Sound. In that time, however, he determined the land they saw was indeed North America – because he found a bird in the jay family he knew to exist only on this continent. (*That bird is now known as the Steller's jay.*)

ECOLOGY TODAY: Modern ecologists are still asking questions about how each organism interacts with its fellow species, with other species, and with all the elements of its nonliving environment.

Support from Many Fields of Study. In the quest for answers, ecology draws on other sciences — geology, climatology, hydrology, oceanography, soil analysis, physics, and chemistry, biology, animal behavior, taxonomy, physiology, mathematics, — and many more.

TYPES OF ECOSYSTEMS

Ecologists have identified hundreds of types of ecosystems in the United States and the world, defining many to very specific levels at specific locations. Each system is a collection of interdependent parts functioning as a unit.

Also Called Biomes. Often ecosystems are identified by their **biomes** – their living community of plants and associated animals. For use in this text, however, we use the concept of ecosystems in order to explore the nonliving components, the interactions, the energy flow, and the mineral cycling.



Alaska has four major ecosystem types: tundra, forests, wetlands, and ocean. Within each major category are further divisions.

TUNDRA: Alaska has both alpine or high elevation (*mountain*) tundra and arctic or (*high latitude*) tundra. Alpine tundra exists anywhere in the world there are mountains – even on the equator. Climate and other nonliving elements prevent the growth of trees. The name *tundra* came from the Finnish word meaning treeless.

Adapted for the Physical Environment. The plants and wildlife that do live in tundra ecosystems have adaptations to survive freezing temperatures, short summers, and slow mineral cycling. Rainfall is so low, tundra would qualify as a desert.

Some birds fly thousands of miles to partake in the tundra's summer abundance of insect life. These birds and some of the mammals (*such as caribou*) then **migrate** elsewhere for the winter. Others find life under the snow a cozy way to survive harsh winters.

Where to Find More Information. The *Alaska's Tundra & Wildlife* is a companion book in the *Alaska Wildlife Curriculum* series with detailed information and student activities using tundra environments to study ecology.

FORESTS: Alaska has two main forest ecosystems – boreal forest and temperate rainforest. The boreal forest reaches to the lower edge of the tundra and its organisms face some of the same rigorous climatic conditions.

Trees Protect their Environment. The temperate rainforest fringes the coastline. In keeping with its name, Some coastal rainforest areas collect more than 200 inches of rain. Forests protect our water table and our streams by preventing erosion. Trees also play a major role in the water cycle by returning water vapor to the atmosphere.

More than any other ecosystem, forests help to maintain the balance of oxygen and carbon dioxide in our atmosphere, keeping the air breathable for all living things.

Multiple Layers, Multiple Homes. With many layers – from sky-scraping tree tops to mossy ground cover, forest ecosystems provide homes to a variety of wildlife. The increased plant life supports greater populations of **herbivores** and they, in turn, support more **carnivores** than in tundra ecosystems. The **detritivores** are plentiful – and busy.

Alaska's Forests & Wildlife is a companion book in the *Alaska Wildlife Curriculum* series with detailed information and student activities using forest environments to study ecology.

WETLANDS: Wetland ecosystems are found within tundra and forest ecosystems and many others. Coastal wetlands types include estuaries, river deltas, and saltwater marshes. Inland wetlands include stream and river corridors, marshes, ponds, lake shores, bogs, muskegs.

What Makes It a Wetland? Three factors help to define what makes a wetland.

- (1) how much water is present (the water regime),
- (2) water-retaining soil,
- (3) plants adapted to growing in soils with low or no oxygen.

Alaska's wetland ecosystems are some of the most productive wildlife habitats. For example, many of our commercial fisheries depend on fish hatched in freshwater streams. Alaska's wetlands are also the primary nursery for much of our nation's waterfowl.

Large Food Base. Wetlands are so productive for the larger, more visible wildlife because this ecosystem includes an abundance of microscopic organisms and small invertebrates that serve as food for high level **consumers**.

Wetlands & Wildlife, K-12 Curriculum, is a good source of information and student activities about wetlands by the US Fish & Wildlife Service and the Alaska Department of Fish and Game.

OCEAN: With 34,000 miles of marine coastline, Alaska has all varieties of ocean ecosystems from tidal flats and lagoons to deep sea trenches and sea mount upwellings.



Zooplankton to Whales. The ocean ecosystems are highly productive despite Alaska’s harsh climate. They support a **food web** that ranges from tiny zooplankton to humpback whales.

Millions of seabirds are a vital part of the ocean ecosystem. They spend nine months of the year at sea, coming to land only to nest. Salmon, herring, halibut, and pollock are some of the major fishes.

Calling all Ecologists. But Alaska’s marine ecosystems have shown signs trouble. In some areas the once abundant Steller sea lion and sea otter have declined sharply, for reasons yet unclear. Ecologists have been called to discover the causes.

Sea Week Curriculum by the University of Alaska – Fairbanks is a good source of information and student activities about the ocean ecosystem. *Alaska Oil Spill Curriculum* published by the Prince William Sound Science Center is another source, as is *Learn About Seabirds*, by the U.S. Fish & Wildlife Service.

HOME SWEET HABITAT

Who lives in each ecosystem? Only the organisms that find suitable **habitat** (*food, water, shelter, and space*) within a particular ecosystem. (*Some wildlife use multiple habitats, either daily, periodically, or seasonally.*)

The Right Stuff. Sitka black-tailed deer cannot survive in the arctic tundra ecosystem even though there are food, water, shelter, and space – they are NOT *the right kind* of food, water, shelter, and space for a temperate rainforest mammal. The environment that meets all of the needs of an animal is called its habitat.

The habitat of the red squirrel, for example, is a spruce forest – a place where trees provide plentiful seeds to eat, hiding places to escape from predators, and nesting areas to raise young squirrels.

Different in Different Seasons. An animal’s habitat requirements may be different at different seasons and times in its life. Here are two examples. A female polar bear will den (*shelter*) from November through

April to give birth to cubs. After the cubs are old enough to emerge from the den, she will not use a den again until the next time she is pregnant.

A brown bear will dine hungrily on tender roots and sedges in spring when few other foods are available. When salmon swim into nearby streams from the ocean, the brown bear will walk past sedges to fish for the high protein salmon. In early fall, the bear will gorge itself on berries.

Where Do I Find It? The key to understanding habitat – and knowing where to find an animal – is to look at each animal’s specific needs and where in nature those needs are met. The *Alaska Ecology Cards* available as part of this curriculum are handy references for habitat and food requirements of Alaska organisms from all five kingdoms.

SMALL IS INTERESTING TOO – TIPS FOR INVESTIGATING

When Alaskan’s hear the word “animal,” we think about large furry **mammals** such as moose or bears. The investigations included in this section remind students to take a close look at all living organisms to discover the richness of the local ecosystem.

SOIL ANIMALS: There are many animals that live on and in the soil including **insect larvae**, snails, worms, spiders, and small mammals. These animals spend most of their life in the dark, living on other animals or nutrients found in the soil.

Many of the soil critters that students might find have special **adaptations** that allow them to thrive on or in the soil. While investigating the soil habitat, look for evidence left by soil animals, as well as for the animals themselves.

WATER ANIMALS: Not all water animals are fish, ducks, or sea otters. Ponds, streams, rivers, and other wetlands are rich with kinds of animal life that we seldom see.



Each spring as ice thaws, wet areas in Alaska erupt with young **invertebrates** (*animals such as worms and insects that have no backbone*). These invertebrates are extremely important food sources for many of the fish that other animals eat (*including humans*).

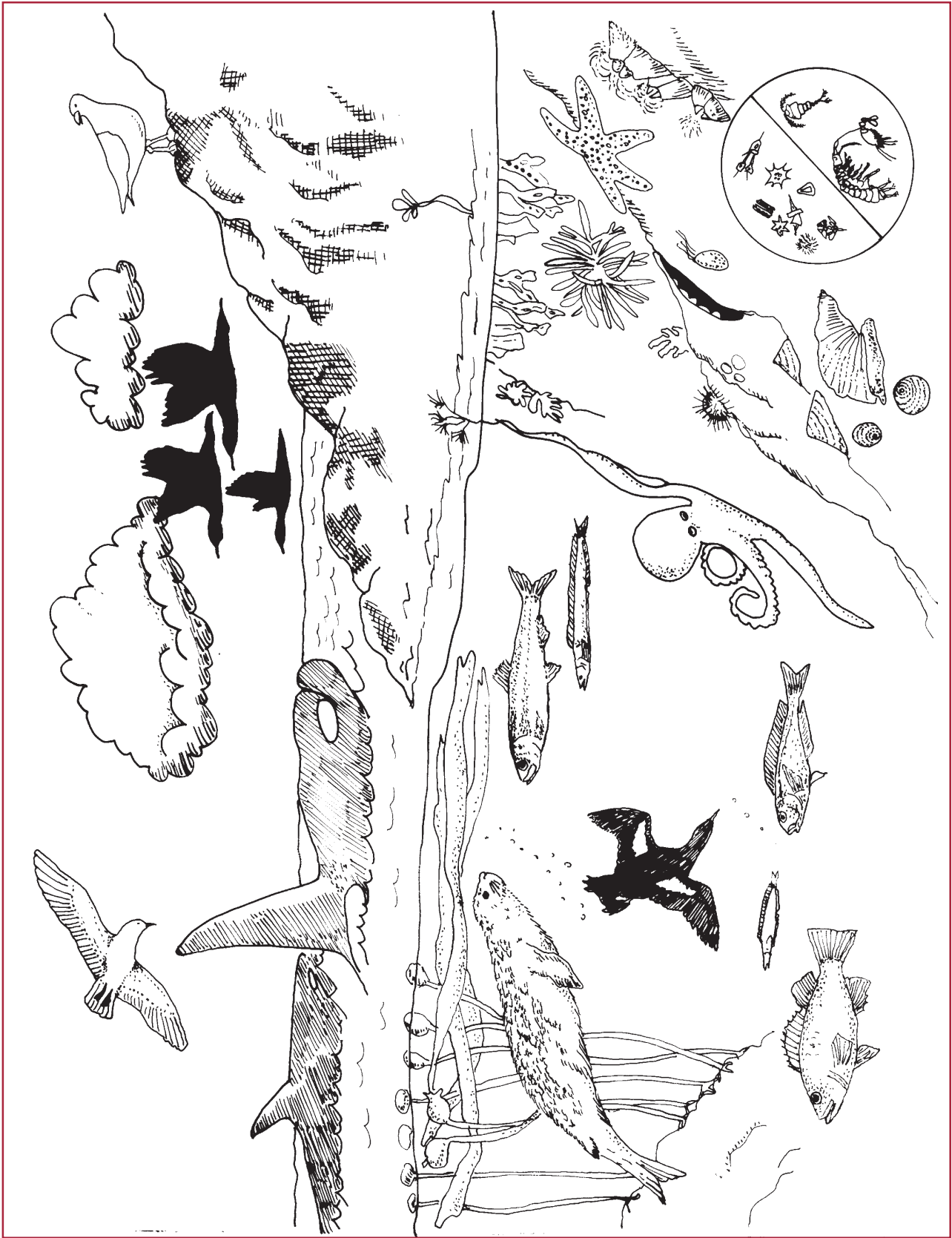
Don't Forget Mosquitoes! Many of the easily recognizable flying insects in Alaska such as mosquitoes and dragonflies lay their eggs in water. **Larvae** and **pupae** develop from these eggs and carry on complex predator – prey, and consumer – consumed relationships.

Investigating water habitats reveals usually hidden creatures that form essential links in the food chains of wetland ecosystems. A pond will never seem so ordinary again!

PLANTS: Within one calendar year **annual plants** grow from seeds or buried roots, flower, produce new seeds, and die. In fall and winter only remnants of annual plants such as dead leaves, tubers, seed pods, and roots are left as evidence of their presence. They are providing energy for the decomposers and detritivores.

While investigating the plants in your local ecosystem, look also for evidence of perennial plants such as fireweed, dwarf dogwood, and cow parsnip. Though their summer appearance is fleeting, plants are vital in the web of ecosystem interactions of living and nonliving things.





Ocean Ecosystem



Wetlands Ecosystem





Tundra Ecosystem



Forest Ecosystem

