



# CREEK LIFE & CREEK ECOLOGY

A QUICK GUIDE





The dictionary says “A creek is a natural stream of water normally smaller than and often a tributary to a river.” But what is a creek really? It is an enchanting, flowing body of life that draws children and adults to its banks where an intricate ecosystem offers many rich and fascinating lessons. Creeks are avenues for wildlife and wildlife observers. They are tranquil havens amid urban bustle. Creeks recharge the water table and, in the process, roots of plants and creek bottom sediments filter and purify surface water runoff. Creeks are essential to management of storm water drainage and flood control. And their *riparian* corridors serve as habitat for mammals, birds, reptiles, amphibians, fish and countless species of invertebrates. More than 90 percent of all wildlife in urban areas depends upon creeks.

Like other riparian and wetland areas, creeks have become victims of increasing urbanization. In many places creeks have been put underground or converted into concrete channels bordered with chain link fences. As we look at the natural values of creeks and learn more about them, perhaps we can also learn to protect those that still grace our communities. May this guide lead you in that direction.

## PREFACE

As the title states, this guide is just a quick introduction to the creek life of California's Central Valley. It is not intended to list every organism that might inhabit a riparian system. Rather, it presents the most common aquatic life and the most common creekside residents that make up a typical creek community and, at the same time, shows how their interactions function within that community.

The guide uses a format that reflects the structure of a creek ecosystem. It is organized into sections, with each section representing a part of the larger community where all parts are interconnected by feeding relationships called *food chains*.

In every natural community, food chains begin with green plants – *the producers*. The energy stored as carbohydrates in plants passes on to the plant eaters – the herbivores, also called *first order consumers*. Herbivores are then eaten by carnivores – *second order consumers*, which can be eaten by still larger carnivores – *third order consumers*. Each section of the guide represents one of these feeding levels in the creek community.

Riparian food chains and food webs can be long and complicated because there are so many types of *niches* (ecological jobs or roles) available in this ecosystem. In the creek, for instance, plant eaters can be plankton filter feeders, algae scrapers, leaf chewers, and dead plant decomposers. On the creek edge, animals can consume all sorts of plants and their various parts. This large number of plant eaters in turn attracts many types of meat eaters.

Scavengers come in at the end to clean up and recycle organic debris into nutrients and raw materials to start another chain. In this format, too, scavengers and decomposers make up the final section.

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## The PRODUCERS

Green plants capture the energy of the sun and use it to “fuel” the process of photosynthesis whereby carbon dioxide and water are transformed into free oxygen and simple carbohydrates. Because plants produce their own food they are called “*producers*.” In most natural communities plants make up the greatest portion of living things. The greater the number and variety of plants, the greater will be the number and variety of animals depending upon them.

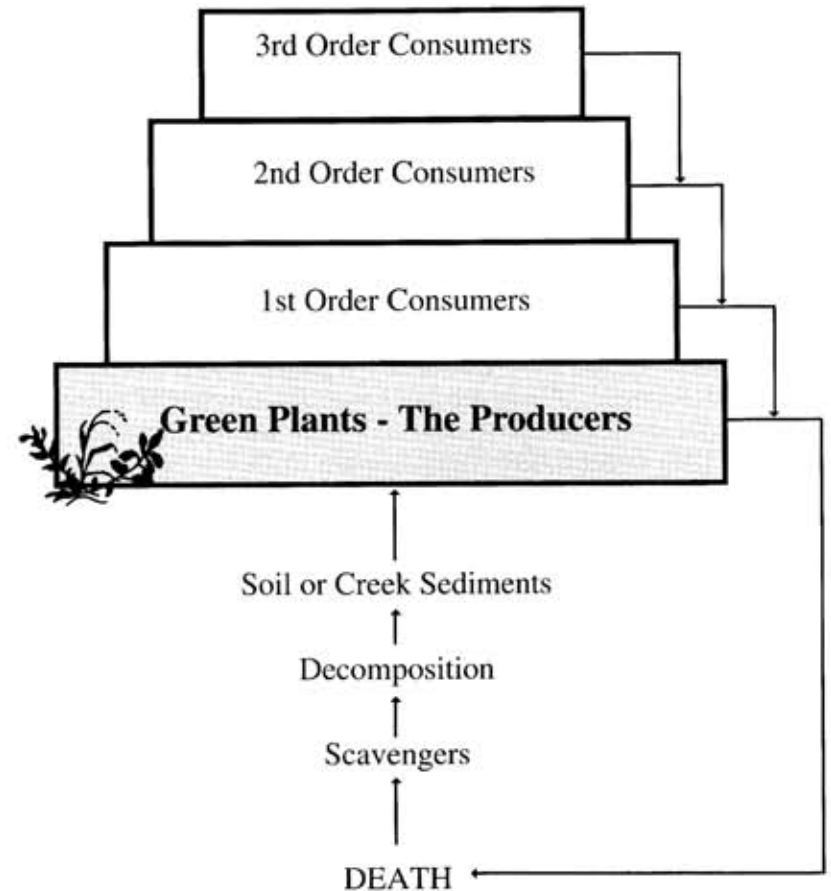
The creek environment and the adjacent riparian woodlands are two distinct types of communities. So the area where they merge, *the ecotone*, is especially rich and diverse, containing plants and wildlife from both communities.

In the riparian woodland, as in other forests, there is the added complexity of the mini habitats contained in each layer of growth. The woodland floor community differs from the tree top community, with steps in between.

All of these portions of the broad ecosystem make creek studies especially exciting and interesting.

## The Producers

### GREEN PLANTS





## Water Plants

### Floaters and Sinkers in the Mud

*A healthy creek will support a rich variety of floating and submerged plant life. Look for water plants where the water flow slows down or where patches of the riparian canopy (tree top leaves) open up and allow sun to shine into the water. Also search the areas where creeks enter a pond or river.*

**Algae** comprise a primitive group of plants which forms the basis of the food web upon which the rest of life in the creek depends. Algae are microscopic, single-celled plants. Many types aggregate into colonies and become so thick that they form dense floating mats.

Algae provide a rich source of food, cover and shelter for many small creek creatures, while oxygenating the water. Although they reproduce most of the year, they "bloom" (have a quick burst of growth) in the spring and provide a much needed food source for zooplankton and larval insects and fish which have just survived the harsh months of winter.

Occasionally, this natural process goes awry. Organic pollution from farm and urban runoff can bring excess nutrients into the creek. This excess nutrient load can cause dense algal blooms. Toxins produced by their decay, and decomposition and low oxygen levels resulting from these processes, can cause all life in the creek to perish. Other sources of pollution entering the creek can also cause algal death and collapse of the fragile creek community.

**Blue-green algae** are the simplest of all green plants. They can occur as single cells or as chains of single cells and are often covered by a thick, jelly-like coating.

As summer progresses, blue-green algae can become so plentiful that they form dense mats, coat rocks and, eventually, the entire creek surface. Toxins produced by their decay can taint the water and render it unfit for human or wildlife use.



*Anabaena*



*Oscillatoria*

**Green algae** get their name from their bright green color. They are the most common type of creek algae found and can appear as single cells, in round or flattened colonies and as filaments. Look in a microscope to observe their beautiful shapes and designs.



*Chlorella*



*Hydrodictyon*



*Closterium*



*Spirogyra*



*Micrasterias*



*Volvox*

**Water Fern** (*Azolla sp.*) can be found floating on the surface of the water in quiet pockets along creeks and rivers. Under a hand lens you can see beautiful, scale-like overlapping leaves and tiny roots growing from the stems. Water fern is one of the more primitive plants. Like its relatives, land ferns, it does not flower, but reproduces by spores. Water fern also reproduces by breaking apart.



**Duckweed** (*Spirodela sp.*) is a very small, floating aquatic plant. In fact, it is the world's smallest flowering plant. It often occurs in such large numbers that it can form a green carpet over the water surface. Individual plants are often under 1/4 inch across, consisting of only one to four minute leaves with 1/2 inch roots extending down into the water. As the name suggests, this plant is a favorite food of ducks.



**Arrowhead** or Tule Potato (*Sagittaria latifolia*) is a water loving plant. Both floating and emergent leaves grow each year from the stored food in the plant's underwater tubers. The small white flowers have three petals and grow on the tips of long slender stems. The leaves' shape resemble arrowheads, as one of the plant's names suggests. The name "tule potato" comes from Chinese immigrants, who ate the starchy tubers. Native Americans also use this food source. Arrowhead plants can be found in relatively shallow water along stream and pond edges.



**Water Plantain** (*Alisma plantago-aquatica*) is related to Arrowhead and grows in the same types of places. The oval pointed leaves grow straight up from the base of the plant. The small white flowers grow in clusters on the tips of long stems. When the flowers go to seed they form decorative sprays of small round balls.



**Water Primrose** or Yellow Water Weed (*Ludwigia peploides*) with its bright yellow flowers forms a green and yellow carpet over many local shallow streams and drainage areas by mid-summer. This plant is frequently washed away by high winter flows, but reestablishes itself when water levels fall. The lower stem and roots of the primrose can be completely submerged, with the leaves and flowers extending yards out over the water surface. This plant also grows in moist soil along the water's edge. One group of aphids finds this water plant particularly appealing.



**Water Cress** (*Nasturtium officinale*) is a mustard family member introduced from Europe and used in salads and as a garnish. Like other members of this family its flowers come with four petals. Those of the watercress are white. The leaves are compound with roundish leaflets. Found in colder springs and creeks, its sprawling stems will take root where they come in contact with bottom muds and sands.



**Hornwort** (*Ceratophyllum sp.*) or Coontail, is a submerged plant. Its narrow, brittle leaves are arranged in whorls around slender stems. Hornwort's small white flowers are pollinated underwater. The tough coated seeds are food for waterfowl. Like *Elodea*, it is often sold for aquarium use. Do you think Coontail is an appropriate name?



**Waterweed** (*Anacharis sp.*) is commonly found in rivers, streams and ponds. It is a favored food of muskrat which will gather its long stems onto the shore and strip them of their succulent leaves. Many invertebrates hide in waterweed, and it is a particularly good place to net amphipods and copepods for study under magnification. *Elodea*, a close relative introduced from South America, is sold in pet stores for aquarium use.



## Plants of the Water's Edge

**Mosses and Liverworts** These Bryophytes are very simple plants. They do not produce flowers or seeds but rather spore sacs on minute umbrella-like structures.

**Mosses** cover the moist and shady surfaces of rocks, soil and trees and are one kind of plant that children will bend over and pet. Think of them as "pioneers." They are often the first plants to become established along the banks of a creek or stream after high water has eroded the edges. They begin to stabilize the banks and then other plants can move in and do the same.



**Liverworts** are harder to find but well worth the effort. Look near the water's edge for tiny, flat, green lobed plants. Some may have a liver shape. There are both male and female plants and they reproduce from spores carried in the umbrella-like structures. They can also spread from buds on each plant.





**Horsetails** (*Equisetum sp.*) have been on earth since before the dinosaurs. Like ferns, they produce spores rather than flowers and seeds. They are often seen along the edges of creeks and other waterways. Pioneers used their rough, silica laden stems like scouring pads, hence the name "scouring rush." Look closely at the horsetail plant and try to figure out how it got its name.



**Sedges** (*Carex sp.*) are grass-like plants often found along creeks and other wetlands. Their solid stems are often triangular.



The sedge, nut grass, can be identified by its clumps of feathery brownish-green flowers that are surrounded by grass-like leaves spreading out like spokes on a wheel. The sedge, slough grass, has flowering heads that look like tiny pine cones. Native Americans used several species of sedge for basket weaving. Sedge seeds and roots are good waterfowl food.

**Rushes** (*Juncus sp.*) look like grasses. Their hollow pithy stems are round and unjointed. Clumps, growing 2 to 4 feet tall, can be found in wet or moist areas along creeks. Small greenish or brownish flowers grow in clusters at the side or the top of the stems. Native Americans call some species "wire grass" and use it like wire to string beads or tie up bunches of willow or other plants.



**Tules** (*Scirpus sp.*) fill swamps and marshes and historically they covered much of California's low-lying valleys. Many Native Americans used this reed-like plant for thatching on their houses and shelters, clothing, mats for sitting and sleeping upon, and for constructing boats. Tules, like other rushes, still grow in many wet areas and in shallow waters along streams and ponds. The tall leafless stems, anywhere from 3 to 9 feet, are dark green in color, and grow in large clumps from creeping root stalks.



**Cattails** (*Typhus sp.*) grow in shallow water much like the tules. They are a lighter green, and have broad, flat leaves as opposed to the rounded leaves of tules and other rushes. Cattails are easily distinguished by the "cattail" itself at the top of many of the stems. This structure is the female, seed-bearing part of the plant. Cattails grow from starchy underground stems which are eaten by beaver and muskrats. Native Americans also used these for food, as well as the flower heads. Large clumps of cattails provide shelter and nesting cover for many wildlife species, especially black-birds and ducks.



## Plants of the Creek Corridors

Hundreds of species of plants may line a creek corridor ranging from tiny grasses to majestic trees. Try looking for these more common and interesting "producers" that belong in the creek ecosystem.

**Grasses** There are many different species of grasses growing in creek corridors but all of them have some characteristics in common. Look for the narrow linear leaves with parallel veins and joints in the stems. Grasses produce seeds that are an important food source for birds and small mammals.

**Mugwort** (*Artemisia vulgaris*) is an aromatic plant which grows in clumps up to 3 feet high. The grayish green leaves are notched and pointed on the tips. The clumps of flowers are so tiny that they are usually overlooked. Crush a leaf of mugwort between your fingers and sniff the pungent oils that make this plant a natural mosquito repellent and a cure for stuffy noses and headaches. It was a favorite plant of the Native Americans who found many uses for it, and even used it as a symbol of peace – as others use the olive branch.



**Nettle** (*Urtica holosericea*) is a tall plant with opposite toothed leaves. Watch with care for the stinging hairs on the stems and leaves that can cause an uncomfortable skin irritation. Caterpillars of the red admiral butterfly aren't bothered by these hairs; they feed on the plant and when they want to rest, they roll up in a leaf for protection. The tiny clusters of flowers that grow in the leaf axils produce seeds that are food for birds like the California towhee.



**Poison Hemlock** (*Conium maculatum*) often grows in dense patches in shady places and its fine carrot-like leaves can resemble a fern forest. In summer, the plant grows to be several feet high with broad heads of tiny white flowers at the tops of sturdy hollow stems. Look at the stems carefully and note the purple markings. These spots warn you that the plant is indeed poison hemlock. It is not poisonous to touch but eating or tasting any part of the plant can be deadly.



**Cockle Burs** (*Xanthium strumarium*) like to grow in moist places. This large bushy plant thrives in the summertime. The flowers are inconspicuous, but the seeds are unmistakable. In fact you are very likely to bring some home with you after a visit to a creek where they grow. The large seeds are covered with hooks that cling to socks, shoes, and clothes.



**Curly Dock** (*Rumex crispus*) has large lance-shaped leaves with wavy edges. The inconspicuous flowers produce clusters of showy three-sided seeds. Green in spring, they turn cinnamon brown in fall. Try crushing a dock leaf and rubbing it on a mosquito bite or a nettle sting. The moisture from the leaf has soothing qualities. Often in the summer you will see curly dock covered with the shiny dark dock beetle.



**Blackberry** (*Rubus ursinus*) is a native evergreen shrub with long trailing, spiny stems forming dense mounds along creeks. These bramble patches are effective shelters for wildlife. Small white flowers develop into sweet berries in the summer, providing food for a variety of animals. Places where native blackberries once grew are now usually full of the aggressive Himalaya berry brought to California and planted by early settlers. These vines escaped from abandoned berry patches and now grow “really wild.”



**Wild Rose** (*Rosa californica*) often grows along streams and woodland edges. It has thorny branches and compound leaves like the common garden rose. The flowers have five simple petals, which are light pink or rose-colored, and measure up to 2 inches across. Later in the season, the flowers mature to form rose hips which are fleshy, almost round, and bright orange or red.



**Wild Grape** (*Vitis californica*) is a large woody vine which can grow up to 60 feet or longer and is often draped over large trees near creeks and ponds. In summer, the many small blue-black grapes ripen and provide food for many birds and other animals. Native Americans used many parts of this plant. Stems were twisted into twine for binding huts and rafts. The leaves were used for wrapping foods for roasting. The fruit was either eaten fresh or dried for later use.



**Blue Elderberry** (*Sambucus mexicana*) is a small tree or shrub with many branches rising from the ground. The tiny white flowers form flat-topped clusters. These mature into blue-black, waxy coated fruits, which provide food for birds and mammals. People should take care, however, for the berries are somewhat toxic and should be cooked before eating. The hollow stems of elderberry were used by Native Americans to make musical instruments – flutes and clapping sticks. Sometimes elderberries are called the “tree of music.”



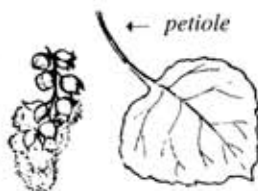
**Button Bush** (*Cephalanthus occidentalis*) is a small tree or shrub, round in shape and usually found right at the water’s edge. The glossy green, rather narrow, leaves are arranged opposite each other on the branches. This plant gets its name from the balls of small white flowers that can cover the shrub in spring. The fragrance of the flowers often attracts crowds of butterflies which come to feed on the sweet nectar.



**Poison Oak** (*Toxicodendron diversilobum*) is a common creekside plant. It may grow as a shrub 2 - 8 feet high or as a vine, climbing 15 - 20 feet under a canopy of trees. Leaves with three glossy green leaflets turn bright red in late summer and fall. This plant can cause an unpleasant skin irritation in humans, but the fruits are an important food source for wildlife.



**Fremont Cottonwood** (*Populus fremontii*) grows along creeks and reaches heights of 40 - 90 feet. Trunks of old cottonwoods are wide and thick with rough cracked bark. Bright green leaves are toothed and triangular. Their flattened petioles let the foliage “quake” in the breeze. Small dangling flowers form seed capsules in soft, cottony masses.



**Willow** (*Salix sp.*) There are many different species of willows along creeks. Some are erect shrubs, others are small trees.



Their stems are slender, grey and often reddish towards the tips. Catkins or pussy-willows appear in the spring before the trees show their narrow thin leaves. Willow roots help stabilize stream banks, and if shrubs are browsed or cut, they quickly resprout.

**Buckeye** (*Aesculus californica*), a large deciduous bush or small tree with a broad canopy, is generally found growing on dry hills and canyon slopes. Some are found growing along our creeks – maybe from seeds gathered by the local Native Americans for food and left at a village site. Their palmate leaves are divided into 5 to 7 leaflets. White plume-like blossoms later form leathery pear-shaped fruits which hang from the branches. The “buckeye” is the large shiny seed inside. Buckeyes drop their leaves during the hot summertime, helping them conserve water.



**California Sycamore** (*Platanus racemosa*) is a large tree which usually grows along sunny stream bottoms. It has long thick irregular branches. The fuzzy yellowish green leaves resemble a maple leaf. On mature trees the smooth bark sheds in pieces creating a patchwork of green and light brown on the trunk and large branches. The round ball-like flowers hang in clusters. In winter these dried flower heads release nut-like seeds – food for many seed-eating birds.



**Black Walnut** (*Juglans hindsii*) is often identified by the characteristic smell of the crushed leaves and the husks of the nuts, as well as the shape of the long compound leaves. The leaves can grow to a foot long with 9 to 17 dark green



leaflets. The walnuts grow inside thick green husks, which dry out in the fall to become brown or black as the nuts inside ripen. Squirrels love the nuts, and people also gather them for a treat. Groves of these native walnut trees have been associated with sites of old Native American Villages that border creeks and rivers. Could some of these groves have come from nuts discarded at a village site?



**Oregon Ash** (*Fraxinus latifolia*) is a tall, deep-rooted, deciduous tree that grows along rivers, creeks, and near ponds. The leaves are long, light green on the top side, with 5 to 7 leaflets. Winged seeds hang in dense clusters in the spring. If you can find a dried seed, try tossing it in the air to see how the “wings” fly.



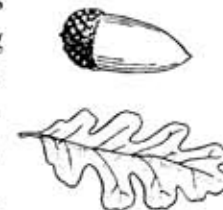
**Box Elder** (*Acer negundo*) grows along creek banks with willows and cottonwoods. The broad crown of the box elder may reach to 50 feet in height. Leaves, lobed and covered with soft down, are made up of 3 leaflets. Drooping clusters of male and female flowers produce V-shaped, winged seeds which often stay on the bare tree through the winter.



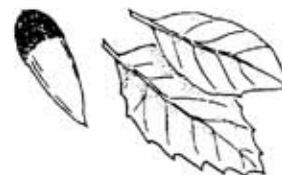
**White Alder** (*Alnus rhombifolia*) usually grows as a small, shrubby tree, rarely exceeding 20 feet in height. The water-loving alder is often a favorite perching tree for many of the larger riparian birds. Its long oval leaves are shiny on top and fuzzy underneath. The male blossoms, looking like clusters of caterpillars, appear early in the year hanging from bare branches. The female flowers produce woody cones that look much like miniature pine cones.



**Valley Oak** (*Quercus lobata*) is the largest of California's oaks. It is often found growing in rich, loamy soil near creeks. Many of these magnificent trees grow to over 100 feet in height. Their limbs spread at wide angles into a broad canopy of slender drooping branches. The bark is thick and checkered. The acorns are long and conical, with a warty cap. These acorns were an important source of food for Native Americans. Today, they provide a tasty meal for jays, woodpeckers, and squirrels.



**Interior Live Oak** (*Quercus wislizenii*) is typically found near creeks where water is in constant supply. This short trunked oak grows to between 15 and 30 feet high and forms a round crown of gnarled branches. The evergreen foliage is dense with dark green, flat leathery leaves. Young leaves are prickly and lobed; older leaves are almost smooth. The acorns are slim and much smaller than the other native oaks.



**Blue Oak** (*Quercus douglasii*) grows 20 to 70 feet high in the dry, hot foothills. Along creeks where the tree's deep roots have access to water they grow to match the heights and widths of the valley oaks. Deciduous trees, their leaves are pale bluish-green, unevenly lobed and come in a variety of shapes. The bark is pale and formed in small scales.





## The CONSUMERS

“Consumer” is the name ecologists give the animals in general because they consume, or live off of, other organisms. Consumers that eat plant material only are called **herbivores** or **first order consumers**. In nature, herbivores tend to be small and nonaggressive, and produce many offspring.

Animals that consume herbivores are called **carnivores** or **second order consumers**. Second order consumers tend to be smallish predators such as a song bird that eats an insect, a fish that eats a tadpole, or a predaceous aquatic insect feeding on other invertebrates.

Large carnivores that consume a wide variety of animals and tend to be at the **top of their food chain** are called **third order consumers**. The skunk, great blue heron, and great horned owl fit into this group.

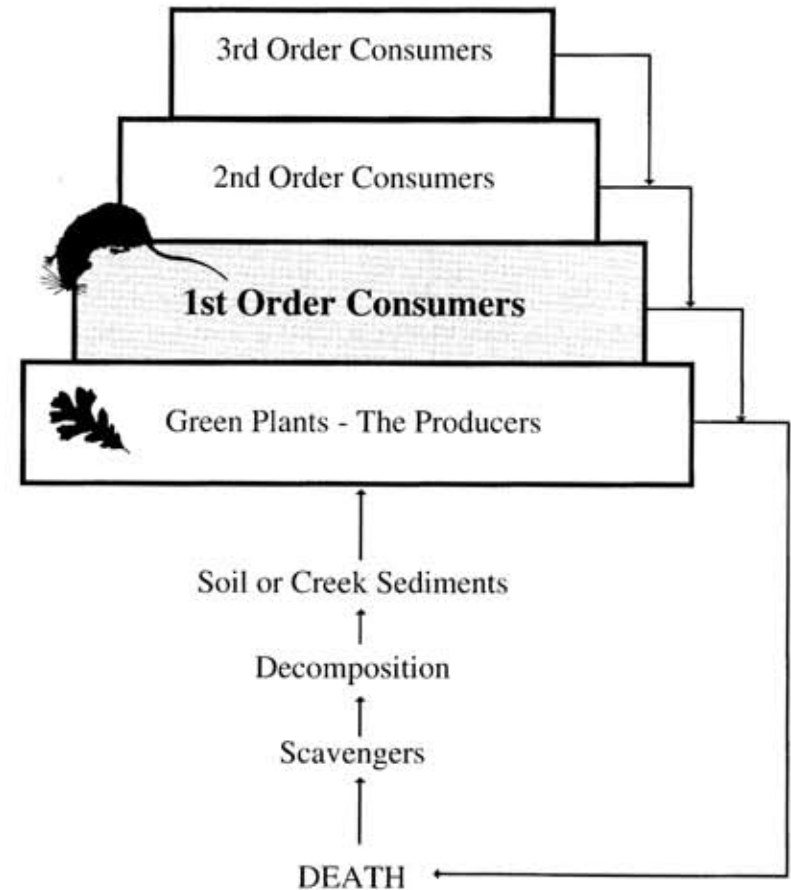
Living things do not always fit into standard groupings. There is a group of consumers that are less specialized and can consume a wide variety of plant and animal material. These are called **omnivores** and can fit into **either the second order or third order consumer level**. Raccoons, foxes, and people are examples.

When living things die, the nutrients and energy stored in their bodies are released through decay and decomposition. Certain organisms are specialized to make this happen. The major workers in this group of consumers are bacteria, molds and fungi. They are all called **decomposers**.

In these next sections, we take a look at some of the common consumers in the creek community. Most are identified by species but, because of the vast number of invertebrate species, these are identified by order or family only.

## The First Order Consumers

### HERBIVORES



## CRUSTACEANS

**Crustaceans** are tiny aquatic invertebrates whose segmented bodies are covered by a jointed shell or *exoskeleton*. Nearly all of the 30,000+ species are marine, but several important groups are found in fresh water habitats. The four groups that follow are the most common of fresh water crustaceans. For the most part, they feed on plant material or scavenge through organic debris. Some are predators and a few are parasites. The four mentioned below are primarily herbivores. They are easily found hiding in the submerged vegetation of ponds, creeks and rivers. They are particularly abundant in the warm, shallow waters of flooded fields and other wetlands. The spring bloom of algae results in a crustacean population explosion. This thick rich organic soup, in turn, attracts countless numbers of ducks and other water birds.

**Ostracods**, or Seed Shrimp, look like very small floating pearls or jewels. With magnification, they appear as tiny shrimp-like animals in a clam-like shell. Large, branched antennae and miniscule feet “kick” microscopic plants and animals into their mouths. They are abundant in shallow, marshy areas and are consumed in great numbers by waterfowl and immature insects and fish.



**Cladocera**, called Water Fleas or *Daphnia*, are about half the size of a flea and inhabit all kinds of fresh water habitats. They swim in jerking movements by “rowing” with their enlarged second pair of antennae. Waving legs, seen through their transparent “shells,” “kick” microscopic algae and other organic debris into their mouths. *Daphnia* are an important food source for small fish, insects and other invertebrates.



**Copepods** are bullet-shaped, shrimp-like animals about the size of two periods. They jerk and dart around looking for algae, bacteria and other organic debris to eat. Females are easy to identify as they drag around grape-like clusters of eggs. Copepods are food for many larger invertebrates.



**Amphipods** or Scuds are flattened sideways and are about the size of a comma. They are widely distributed in ponds and lakes but prefer sheltered areas, avoiding light. They eat anything smaller than they are, and are eaten by most things larger. Like their marine cousins, krill, they are very important in aquatic food chains.



**Gastropods**, or snails, are among the easiest aquatic animals to find. Look on algae-covered rocks, twigs and leaves where they search for food. They help to break down and recycle dead leaves which “rain” down upon the water from the deciduous trees of the riparian woodland. They often leave jelly-like egg masses on decomposing leaves and twigs. Look for different shapes of shells. The most common are the flat spiral and the turban shape.



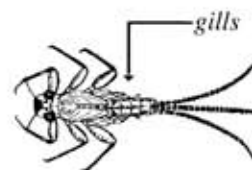
**Pelecycods** include the fresh water clams that can be found in the sandy bottoms of shallow creeks and rivers. Sometimes one finds an empty shell that once covered a soft body – evidence that a clam was a meal for a raccoon, muskrat, or heron. Clams have a muscular digging foot and siphons that suck water into the body where microscopic organisms are filtered out for food. Another siphon carries off wastes.



## INSECTS

**Insects** make up over 80 percent of the known kinds of animals on Earth. Like Crustaceans, they have jointed bodies encased in a hard exoskeleton. What make insects unique are their **three body parts** and **three pairs of legs**. All insects go through change (*metamorphosis*) as they grow. Most start life as an egg which hatches into a *larva*. The role of a larval insect is to eat, grow and molt until it is big enough or old enough to pass through a *pupal stage* which prepares the insect for *adulthood*. There are about 50,000 kinds of aquatic or partially aquatic insects. Only a few are herbivorous.

**Mayflies** (Order *Ephemeroptera*) spend virtually their entire life under water. Because mayflies do not undergo complete metamorphosis, they do not have a larva or pupa form. Instead, their immature form is called a *nyad* or *nymph*. Nymphs usually have three long, feathery tails and flap-like gills on their abdomens. Mayfly nymphs consume plant material in a number of ways and fill several niches. Some are algae scrapers, some leaf chewers, and some leaf shredders. They remain under water for up to two years, shedding their skins as they grow. Adults emerge from the water, shedding their skins twice before flying about to find a mate. The female then lays her eggs in the water to start a new life cycle. The adults' short or “ephemeral” life is the basis for the order name. Mayflies are eaten by other aquatic insects and fish. They range in size from 0.8 inch to 2.5 inches ( 2 to 6.5 cm).



Mayfly Nymph



Mayfly Adult



**Waterboatmen** (Order *Hemiptera*), are about 1/2 inch (1.5 cm) in length, with long paddle-like hind legs and are one of the few aquatic “true bugs” that eat plants. They either chew on submerged vegetation or pierce the stems of aquatic plants and suck out the juices. They also sift through organic debris for edibles. When not swimming jerkily through the water they can be found clinging to underwater objects. Waterboatmen are very common and often seen in such large numbers that they seem to “coat” the sediments with their numbers.



**Caddisflies** (Order *Trichoptera*), as adults, resemble moths with enormous antennae. The larvae and pupae are soft bodied and a favorite food of fish, particularly trout. To protect this soft body, many build elaborate cases using silk and bits of plant material or sand grains. Each of the many species of caddisfly has its own unique type of case. Some caddis larvae are free living. All are easy to identify by the hook-like structures on their rear ends. These hooks hold them in their cases or help the free-living varieties cling to rocks. Cases are enlarged as the larvae grows and can be an inch (2.5 cm) or more. Caddisflies, like mayflies, are very sensitive to water pollution and can be an excellent indicator of water quality.



Caddisfly Larva



Caddisfly Adult

## FLIES (Order *Diptera*)

**Flies** have one pair of delicate, transparent front wings. They feed in a variety of ways. The larvae and pupae of many flies are aquatic but no adults live in water.

**Mosquitos** are very common aquatic insects and breed almost anywhere that there is standing water. The female lays a clump of eggs that float on the water like a miniature raft. The 1/2 inch (1.25 cm) larvae have tufts of hair on their bodies while the pupae seem hunch-backed. The larvae filter phytoplankton from the water and, as a result, are often green. Adult male mosquitos feed on fruit and nectar while the adult female is a notorious blood sucker. Larvae, pupae, and adult mosquitos are food for fish and larger insects.



Mosquito Larva



Mosquito Adult

**Midges** are also very common aquatic insects, but they prefer flowing waters. They can reproduce very rapidly and sometimes are extremely abundant. Some adult midges are carnivorous, but most do not bite. All have feathery antennae. Midge larvae rarely get above 1/4 inch (0.65 cm) in length. One species of midge has a bright red larva, hence the name blood worm. Its blood contains a hemoglobin-like pigment which enables the midge to live in very low oxygen environments.



Midgefly Larva



Midgefly Adult

## AMPHIBIANS

### Larval Stage

**Amphibian** larvae have gills for underwater life. As they grow and mature, they change into air-breathing adults. The larvae – tadpoles (sometimes called polliwogs) – and the adult frogs and toads are quite common around natural creeks and streams and seem to have adapted to channeled habitats and man-made ponds.

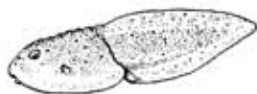
**Western Toad Tadpoles** are very dark, almost black, and hatch from dark eggs laid in long, bead-like strands.



**Pacific Tree Frog Tadpoles** are small and grey-green. They hatch from eggs laid in jelly-like masses which are attached to plant stems or other objects in shallow water.



**Bullfrog Tadpoles** are larger, spotted and mud-green. They take two years to mature. The eggs are laid in large floating clusters.

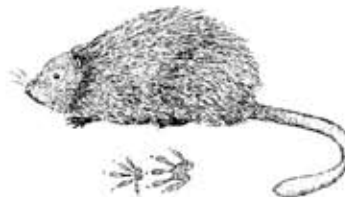


*Because tadpoles can easily be caught, it is tempting to take some home to watch them grow into adult amphibians. If you do, be sure to provide them with the proper care and when metamorphosis is complete, return them to their original home. Watching them grow and develop in their natural habitat can be very interesting for you – and infinitely better for the tadpoles.*

## MAMMALS

Most of the common plant eating mammals of the riparian habitat are **rodents**. All members of this group have large, ever-growing incisors which gives them a "buck toothed" appearance. Rodents gnaw at plants with their incisors and grind tough plants with their flat but rough molars.

**Muskrats** (*Ondatra zibethica*) have a vertically flattened tail and partially webbed hind feet to help them move easily up and down creeks and other waterways. They feed on aquatic plants and find shelter in burrows dug in the stream bank. Often the entrances are under water. Though common, they are non-natives, introduced because of their fur. Their name comes from musk glands – scent-producing glands that help muskrats find each other. **Look for their signs** – foot prints, holes in the bank, piles of aquatic plants or clam shells and clumps of watery scat left on rocks or branches to mark territory.



**Beavers** (*Castor canadensis*) are North America's largest rodent. They often come up from the rivers to build dams and raise a family along the larger creeks. Their strong front teeth are efficient tools for cutting trees for food and building materials, and their fully webbed hind feet and broad flat tails help them move quietly through the water. Beavers that settle along creeks make their homes in burrows along the bank, unlike those that live by large ponds and lakes and build lodges in a mound of sticks. **Look for** tracks, mudslides, and chewed tree trunks and branches.



**Grey Squirrel** (*Sciurus griseus*) These tree squirrels find the oak trees that border the creeks inviting spots to settle down. Grey squirrels are the original inhabitants of the area. Fox squirrels were brought in from the east to live in city parks. With a very aggressive nature, they have moved into grey squirrel country and now compete with the natives for living space. Both species share the tree canopy where they establish homes and gather acorns for food. The long bushy tails help them balance as they make daring leaps from branch to branch. They do spend time on the ground, burying acorns for future meals and, in that process, plant more oak trees along our creeks. **Look for** tracks, bits of chewed acorn or black walnut, huge nests in trees, and shallow diggings. **Listen for** their noisy chatter.



**California Ground Squirrel** (*Spermophilus beecheyi*) As the name implies, these squirrels live in underground burrows. A silvery mantle, a less bushy tail, as well as their home sites, help you tell them apart from the tree squirrels. Ground squirrels can be found in many habitats. They feed on grasses and other plants, and in the process, consume insects too. **Look for** their burrows and **listen for** the chirp-like bark.



**Black Rat** (*Rattus rattus*) Of the Old World rats that migrated to the New World with the first colonists, the black rat is the one that seems to like creeks best. It is identified by its black fur and scaly tail that is longer than the combined length of head and body. The Norway Rat, also found in this area, is a little larger with a shorter tail. Both of these rats take advantage of urban development by scavenging garbage and finding shelter in buildings, frequently making themselves serious pests. **Look for** footprints along stream edges and owl pellets containing rat skulls with their long, yellow, narrow, sharp incisors.



**California Vole** (*Microtus californicus*) These chunky, short-tailed "mice" live mostly in moist grasslands and meadows and along the grassy edges of creeks. Active night and day, they are secretive and rarely seen. The **most visible signs** of their presence are the runways they make as they travel from burrow to burrow hunting for the seeds and insects that make up most of their diet. They in turn provide food for the snakes, hawks, owls, herons, egrets, and other animals that also live along creeks.



**Deer Mouse** (*Peromyscus maniculatus*) This is the most abundant and widely distributed mouse in California and is an important part of the food chain for all of the creatures that live along our creeks. The large ears and dark eyes and coloring suggest the name. These mice occasionally are seen in buildings but prefer to make a nest lined with soft grasses in a rotting log or among rocks.





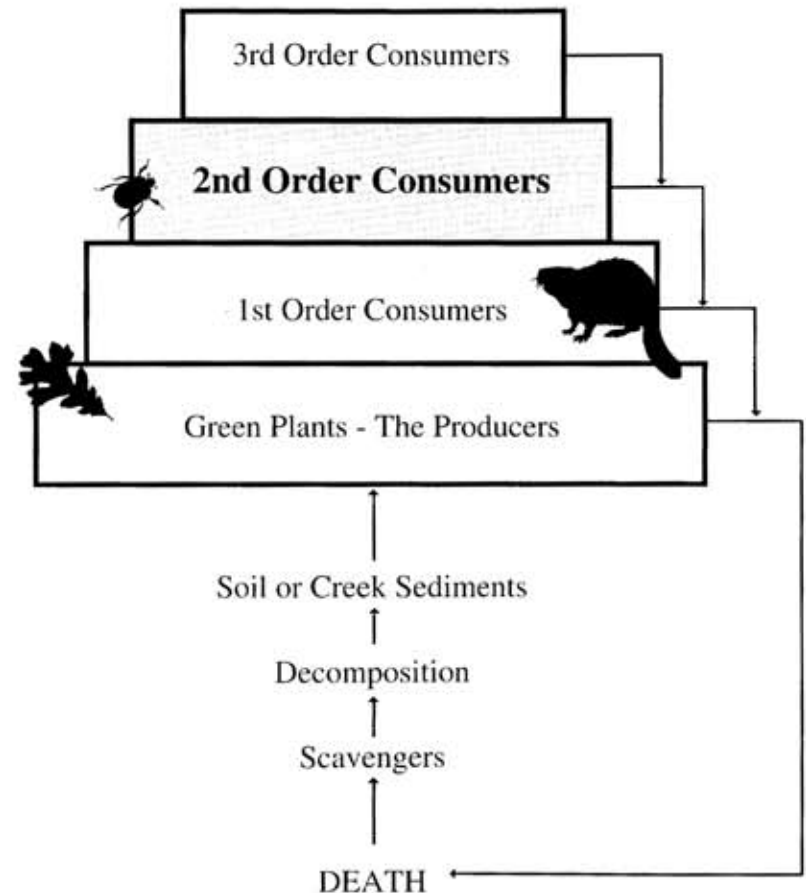
## The SECOND ORDER CONSUMERS

In most terrestrial communities, the second order consumers are medium to large size birds and mammals. However, in aquatic communities the second order consumers are generally very small. When you consider that the first order consumers – the herbivores – are macroscopic, it makes sense to find that the majority of second order consumers – the carnivores and omnivores – are also made up of small species, with the greatest portion of them being insects and other arthropods.

In the adjacent riparian community, second order consumers – again, those that feed upon herbivores – include larger species, such as the songbird that eats a caterpillar, or a toad that eats a beetle.

## The Second Order Consumers

### CARNIVORES AND OMNIVORES



## ARACHNIDS

**Water Mites**, like all arachnids, have eight legs and two body parts. While spiders are easily seen above water, mites are tiny and very difficult to find under the water. Look at some pond water under magnification. If you see a little round, brown-spotted or red creature about the size of a pin head rolling around and it has eight legs, it is a mite!

These tiny active predators survive by sucking the body fluids of the smaller prey they are able to catch.



**Spiders** take advantage of the rich insect supply around creek edges. Some spin webs to catch emerging damselflies, mayflies, caddisflies and other flying insects; others lie in wait for a passing meal. Some spiders are found in or on the water. Keep a lookout for these resourceful arachnids and see how many kinds you can find.



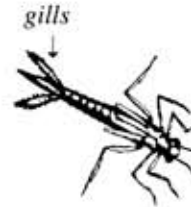
## PREDACEOUS INSECTS

Most aquatic insects make a living by eating other aquatic insects. The larger and more aggressive species will even prey upon fish, tadpoles, leeches and other larger invertebrates. A close study of these hunting insects will reveal unique body shapes, specialized swimming legs, unusual mouth parts, and strange behaviors. These are the *adaptations* that keep them alive and well fed.

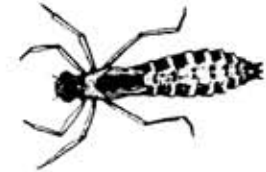
## DRAGONFLIES AND DAMSELFLIES

(Order *Odonata*)

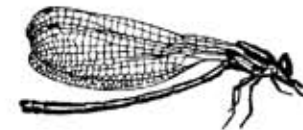
These showy insects spend one to two years as aquatic nymphs. Damselfly nymphs have three long feather-like gills at the tip of their tails while dragonfly nymphs have gills within their abdomens. Water is drawn into the abdominal cavity where oxygen is extracted. When danger threatens the dragonfly nymph will force the water out and “jet propel” itself out of harm’s way.



Damselfly Nymph



Dragonfly Nymph



Damselfly Adult



Dragonfly Adult

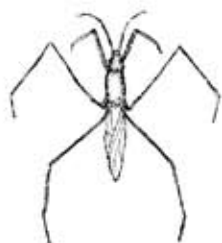
Dragonfly and damselfly nymphs are eaten by fish and larger insects. They in turn feed upon smaller invertebrates. The blockier nymphs of this group tend to lie in ambush and grab a passing meal with a lower lip that folds out a third again the body length. Some even disguise themselves with bits of organic debris. The more slender dragons and damsels tend to be good swimmers and will chase down a meal. Adult dragonflies and damselflies, in contrast to other creek insects, are often very colorful, showing iridescent blue or orange bodies.



### TRUE BUGS (Order Hemiptera)

**True bugs** have piercing, sucking mouth parts. **Watch out!** These consumers have a mean bite. Although some are wingless, most species have four wings which cross over their backs and form an "X" or triangle shape. Most aquatic bugs feed on insects and other invertebrates. Some can fly, others walk on the surface, but most are adapted for swimming, diving or crawling underwater.

**Water Striders** "skate" on the surface of the water and catch insects trapped on the surface film. They range in size from 0.3 to 1.0 inches (.5 to 2.5 cm). Four of their six feet touch the water; the front pair are raised and used for catching prey. Where their hind feet touch the water, they make small depressions in the surface. These circles often cast interesting shadows on the creek bottom.



**Backswimmers** are shaped like row boats and are easily confused with water boatmen (see page 24 ). They swim on their backs, which are keeled, and "row" along with powerful hind legs. They feed on any small water insects or any other animals they can catch. Backswimmers are often seen hanging upside down from the surface. Their body and legs are covered with "hairs" that trap air. This trapped air gives the insect a silver glow underwater. The hairs further function to increase the surface area of the legs and make larger "paddles." Backswimmers can grow up to 1/2 inch (1.3 cm) in length.



**Giant Water Bugs**, as the name implies, are quite large – from 3/4 inch (2 cm) to 3 inches (7.5 cm). Our common giant water bug is less than an inch long. They feed on anything they can grab with their claw-like front legs. Poison, injected into fish, tadpoles and other insects, begin the digestion process. Body fluids of the prey are then sucked out. The male carries the eggs on his back until they hatch. Don't you think that this is a good way to protect the developing young?



### BEETLES (Order Coleoptera)

**Beetles** have smooth, hard, front wings which cover the membranous hind wings. Only a few of the over 280,000 species are aquatic. Aquatic beetles are smooth, rounded and possess paddle-like legs. They are good swimmers. Some eat plants, others scavenge, but most are predators – that is, second order consumers that catch and eat other animals. Beetle larvae have six legs, elongated bodies covered with gills, and powerful jaws. There are many varieties.

Beetles range in size from 0.3 inch (.5 cm) to 1.3 inches (3 cm). The little ones are not babies of the bigger ones. Once a beetle pupa changes into an adult beetle, it stops growing. The different sizes are different species.

Examples of typical beetle larva and adult:



Beetle Larva



Beetle Adult



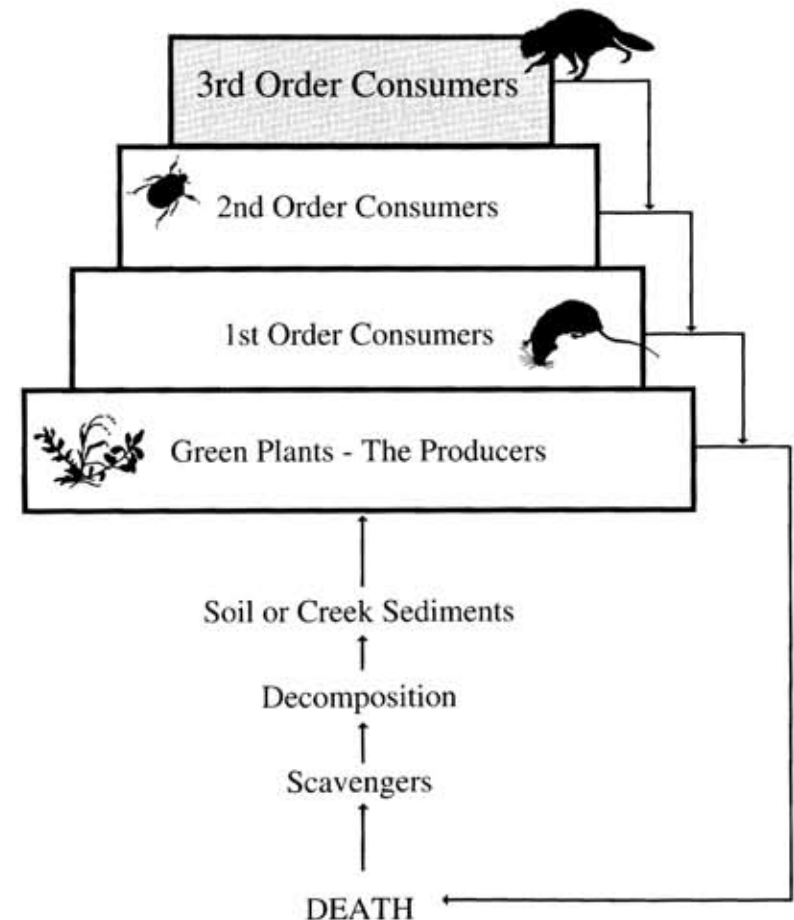
## The THIRD ORDER CONSUMERS

Normally, there are very few third order consumers in natural communities and they are almost always the larger carnivores. However, in our study and observations at the creek, we may see many organisms at this feeding level, and quite a few of them are small. There are two reasons for this. First of all, the rich variety of **Producers** provides an enormous source of energy and raw materials for a vast number of herbivores, the **First Order Consumers**. These in turn provide lots of biomass upon which a great variety and quantity of **Second Order Consumers** can exist. These small Second Order Consumers provide ample food for a large and diverse group of **Third Order Consumers**.

Secondly, the creek is an “ecotone” or “edge” between two communities. Here, members of the aquatic habitat mingle with members of the riparian habitat and create an even more complex and interesting web of feeding connections. Some creek inhabitants, such as a few amphibians and insects, become members of the riparian community when, and if, they reach adulthood. Some riparian inhabitants such as garter snakes, wading birds, and raccoons, hunt in both the creek and woodland. These then become members of both community food chains.

## The Third Order Consumers

### CARNIVORES AND OMNIVORES



## AMPHIBIANS (Adult Forms)

**Bull Frog** (*Rana catesbeiana*) This frog is easily recognized by its large size – up to 8 inches in length, not including its powerful hind legs. It is the largest frog in North America. With a dark-colored body and a greenish head it blends into its aquatic environment and is often hard to see. Sometimes all that appears are two large yellow eyes just above the surface of the water. Bullfrogs eat insects and other creatures of swallowing size – including other bullfrogs. Introduced to California, this non-native has eliminated many smaller native frog species by feeding upon them. The female bullfrog lays up to 20,000 eggs in a mass which may measure a yard across. Listen for the deep booming voice calling “Jug-a-rum” in the evening hours.



**Pacific Tree Frog** (*Hyla regilla*) These frogs, also known as “spring peepers,” are named after their very loud “krek-eking” calls in the spring afternoons and evenings. These small frogs are quite common, frequenting streams, ponds and ditches, wherever it is moist. They even seem to do well in channelized creeks. They find shelter in rock



crevices, under bark, and in streamside vegetation. Tree frogs can climb smooth surfaces easily by using the suction disks located on each of their toes. They feed on insects, earthworms, snails, and small fish. Females lay up to 1,000 eggs in a sticky jelly on plant stalks. A new name for this frog is **Pacific Chorus Frog**.

**Western Toad** (*Bufo boreas*) The western toad is our common garden toad. It grows to about 5 inches in length – not including its legs. It is colored brown or olive-green with darker spots and prominent wart-like glands. The light yellowish stripe down its back is a distinctive mark. These toads are commonly found resting under cover during the day, and become active at night when it is cooler and damp. They feed on insects and can eat about 40 medium-sized insects in a single night. The western toad breeds through spring and summer in temporary ponds and other calm water after rains. The female lays 300 - 500 small black eggs hung in long strands through aquatic vegetation. The tadpoles hatch in a few days and develop into inch-long toads within a month or two.



Droppings

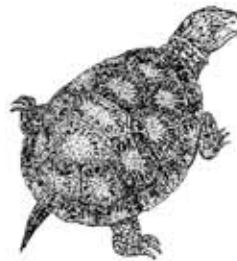
Toads consume a wide variety of invertebrate life including earthworms, slugs, snails, beetles, and other insects. Look for their shiny, dark, inch-long droppings, which contain a mish-mash of insect parts – mostly beetle.

*The larval stage of these amphibians is described in the section covering herbivores – the first order consumers.*



## REPTILES

**Western Pond Turtle** (*Clemmys marmorata*) Our only native aquatic turtle is the western pond turtle, which grows to an adult size of approximately 10 - 12 inches in length. These dark-shelled turtles can be found sunning on logs, rocks, and sections of concrete pipe just above the water along slowly moving streams and in ponds. They feed on aquatic insects, fish, worms, plants, and carrion. Female turtles leave the water to dig holes where they lay their eggs. In winter when the weather turns cold, turtles hibernate in the mud at the bottom of ponds and slow sections of streams. Destruction of their habitat and collecting have greatly reduced turtle numbers.



**Gopher Snake** (*Pituophis melanoleucus*) The diamond and rectangular-shaped markings on the common gopher snake can closely resemble those of a rattlesnake. However, the harmless gopher snake can be distinguished by its slender head (the rattlesnake has a triangular one) and long slender tail (the rattler's is quite blunt, and has rattles). Gopher snakes feed mainly on many kinds of rodents – rats, mice, pocket gophers, and squirrels. These snakes find shelter under rocks, logs, boards, or in old rodent burrows. When cornered, they mimic rattlesnakes, and will coil and vibrate their tails rapidly. In dry leaves this produces a rattling-like sound. The display is very convincing.



**Common Garter Snake** (*Thamnophis sirtalis*) Garter snakes are very common and well-known. They are frequently found in or around water. These small snakes can be identified by their distinctive coloring – light-colored longitudinal stripes against a dark background. They are usually small and quite slender, varying in length from 1 1/2 feet to 4 feet. The aquatic garter snake lives in water and feeds on small fish, amphibians, and water insects. The terrestrial (land) form finds cover in vegetation and eats slugs, salamanders, and mice. Garter snakes are active in daytime and at dusk. Their young are born live in broods of 10 to 20 or more.

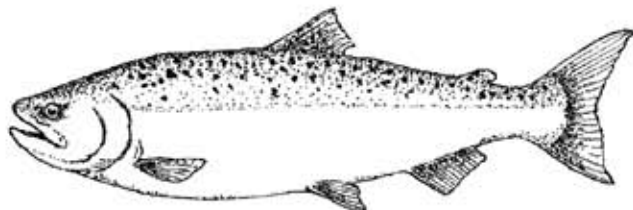


**Sharp-tailed Snake** (*Contia tenuis*) As its name implies, this snake has a very sharp tail. The sharp-tailed snake is small, growing only to 18 inches in length. It is reddish-brown or gray on top, with indistinct yellow or red stripes down the sides. The underside is marked with cream and black bars. The sharp-tailed snake's habits are secretive, but it can be found in moist areas under logs and rocks in the spring sharing space with its favorite food – the slug. As the weather turns hot and dry, this snake will retreat to the cool moist shelter of underground crevices.



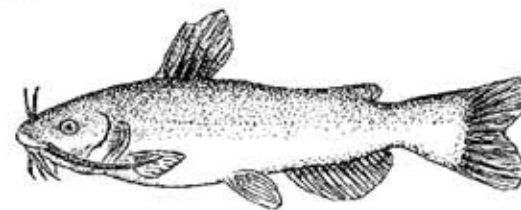
## FISH

**King or Chinook Salmon** (*Oncorhynchus tshawytscha*) Adult salmon are easily recognizable because of their large size, distinctive color, and migratory habit. They are anadromous, hatching in fresh water and migrating to the ocean as fingerlings (finger-sized young fish). After several years of growth there, they return to their home streams to spawn. Between October and November, the now reddish-blackish fish can be observed spawning in coastal and valley creeks and rivers. The female scoops a shallow nest in the gravel to receive the eggs. After fertilization by the male, she covers them over with gravel. Both adults die shortly after spawning.

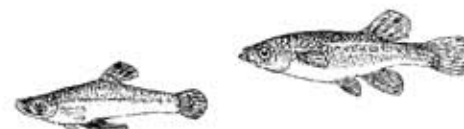


As an animal that depends completely upon the aquatic environment for survival, fish have suffered the most from urbanization around our creeks and streams. As creeks become filled with sediment from erosion and as vegetation is removed, fish habitat is destroyed. When toxic material, such as pesticides and motor oil, is dumped down a storm drain, insect and bird life are affected but can recover as new populations move in. When toxic material kills fish, recovery of the population is unlikely, or very slow. Thus few of our urban streams support fish life. Perhaps one day they will!

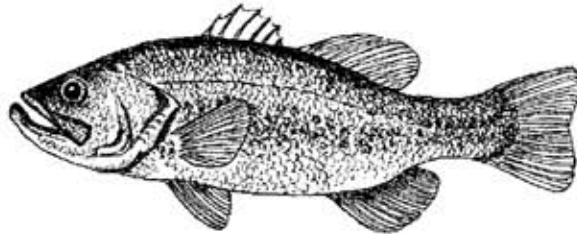
**White Catfish** (*Ictalurus catus*) This introduced fish is now found in warm lakes, ponds and streams and is a favorite food of many fishermen. Catfish themselves feed on both plant and animal material, frequently scavenging on the bottom of the channel or pond. They are active mainly at night, and use their barbels to find food. They usually grow to about 5 pounds, but can reach 12 pounds in weight. Catfish are bluish-black above, with a silvery belly and a deeply forked tail.



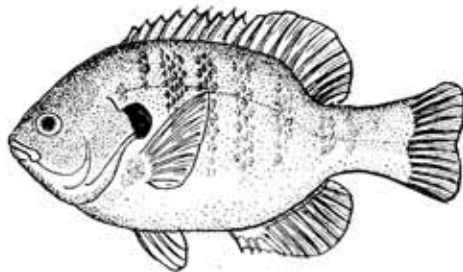
**Mosquito Fish** (*Gambusia affinis*) These non-native, guppy-like fish are widely distributed because they are released into sluggish streams and ponds to control mosquito larvae. Because these fish feed on other aquatic insects, crustaceans and larval amphibians as well as immature mosquitos, they tend to have disastrous effects upon aquatic food chains. Mosquito fish are prolific, bearing 10 to 30 live young at a time. The adults are a transparent olive greenish color. Females grow to about 2 inches in length, and males to only 1 inch. Mosquito fish are relatively pollution tolerant – another reason for their wide distribution.



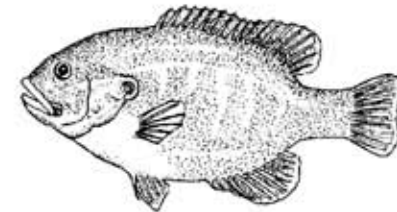
**Largemouth Bass** (*Micropterus malmoides*) Bass were introduced into California in 1874 and are now found in many warm, freshwater habitats, including some of our larger creeks. Largemouth bass are usually less than 20 inches in length and 5 pounds in weight. The body is dark green with a dark horizontal stripe on the side. They feed on insects, smaller fish, frogs, and crayfish.



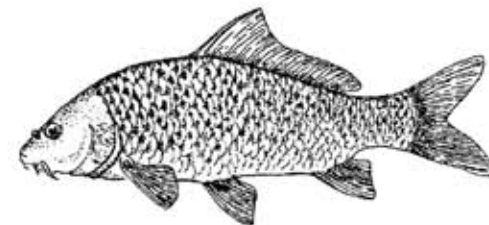
**Bluegill** (*Lepomis macrochirus*) The bluegill is a small, introduced species of sunfish. It grows to about 8 inches in length, although most are smaller. Bluegills are easy to catch, and are a favorite with young anglers. They are also good tasting. As the name implies, these fish have iridescent blue markings along their gills and sides. The rest of their coloring tends toward green with dark vertical stripes on the sides. They have deeply rounded bellies which are often yellowish in color. They eat small fish, crustaceans and other aquatic animals.



**Green Sunfish** (*Lepomis cyanellus*) The green sunfish is one of this area's larger sunfish species. It can be distinguished from the bluegill by its rounded pectoral fins, and the iridescent blue-green markings on its body and head. The green sunfish can reach about 12 inches in length and over 2 pounds in weight. It is a species that can tolerate warm, brackish water low in oxygen. It is also very aggressive and can take over ponds and backwaters of creeks.



**Common Carp** (*Cyprinus carpio*) Carp are a frequent resident of warm water and grow to nearly 2 feet in length. They are a close relative to the goldfish and resemble them in shape, although not in color. Common carp are brassy green to golden with large scales and a deeply forked tail. They feed mainly on aquatic plants, and can be heard making loud sucking noises while feeding on creekside vegetation. Carp frequently stir up large volumes of sediment while feeding, virtually destroying the habitat for any other fish species.



## BIRDS

**Snowy Egret** (*Egretta thula*) Although the white snowy egret roosts and nests with other egrets and herons in large trees, it spends most of its day in treeless, marshy stretches of creeks or in open fields and marshes. This elegant bird often uses one



of its bright yellow feet to stir the bottom of the shallows and frighten prey into view. It feeds on animals such as small fishes, frogs, and aquatic insects that it will stab repeatedly with its slender black bill. It may also be seen running swiftly through the shallows with wings partly raised as it chases its prey.

**Great Blue Heron** (*Ardea herodias*) This expert fisherman, our largest long-necked bird, stands motionless and alone in the creek shallows, waiting to capture small fish, frogs, and aquatic insects with its dagger-like bill. Ashore it stalks small animals like shrews, mice, and lizards. Appearing more grey than blue, this heron has a whitish head and dark underparts. The great blue heron flies with its head folded back on its shoulders, wings beating slowly, long legs trailing behind. Its call, often heard in low flight over the water, is a deep harsh croak.



**Green Heron** (*Butorides striatus*) When a small fish swimming in the creek mistakes a waiting green heron for a bent stick, it is often its last mistake. Other prey for this patient hunter include frogs, mice, crayfish, damselflies, dragonflies, water bugs, and even earthworms. When it knows it is being watched, this bird will raise its shaggy cap into a crest and nervously flick its tail. It often makes its presence known as it flies across the creek calling a loud "skyow." Look for the solitary green – small and chunky as herons go – on dead limbs or stumps close to the ground. Look, too, for the dark head, rusty neck and bright yellow legs.



**Black-crowned Night Heron** (*Nycticorax nycticorax*) Although this stocky heron is mostly nocturnal, occasionally it can be seen hunting during the day. Its main food is fish, but it eats a variety of small animals depending on what is most plentiful. The black-crowned night heron's favorite way to spend the day is resting with others of its kind in large trees near the water. Its back, as well as crown, is black and the underparts are white.

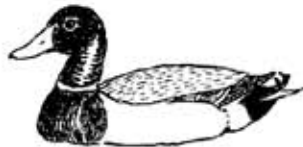


**Wood Duck** (*Aix sponsa*) The most likely place to see this beautiful but shy duck is in a sluggish stream as it eats its favorite food, tiny floating duckweed. The wood duck also wanders into the woods in search of acorns, grapes, and berries. It usually nests in a cavity in a large tree branch but also uses man-made nest boxes. Once the young hatch, they must jump out of the tree, often bouncing on the ground, and follow the mother to water. The male has distinctive, colorful



markings. The plainer female can be told by the white ring around the eye. Why not put up a wood duck nesting box and invite a wood duck to your creek?

**Mallard** (*Anas platyrhynchos*) The boisterous “quack” of a female mallard often announces her presence. Mallards find plant seeds on muddy creek bottoms by “tipping up” and reaching below the surface. They also dabble in shallow water for plants, freshwater snails and other mollusks, aquatic insects, tadpoles, fishes and fish eggs. The nest, lined with down, is usually close to the ground and near the water. The male mallard has a shiny green head with a white neck ring. The female is a plain brownish color with just a touch of blue in the wings.



**Cooper's Hawk** (*Accipiter cooperii*) This hunting bird's short rounded wings and long tail enable it to dash through the woods in low, swift flight, among trees and through brush, before it reaches out in the air or on the ground to catch surprised birds and small mammals. It will often build its nest in a stream-side cottonwood or oak tree. A pair will spend several months raising 2 to 4 young and some pairs return to the same nest site year after year. Look for the dark cap and barred tail and listen for the “ku-ku-ku” call that signals, “My Territory!”



**Red-shouldered Hawk** (*Buteo lineatus*) The creek provides food and shelter for this keen-eyed bird of prey. While soaring or perched in a tree, it looks for frogs, crayfish, mice, squirrels, and sometimes young birds to eat. In spring it locates its well-built nest high in a tree near the creek. The handsome red-shouldered hawk has a dark tail with narrow white bands and its underside is barred with brown, red, and white. Early in the year when these hawks are courting, you may hear their shrill call “Kree-kree” as they circle overhead.





The **Great Horned Owl** (*Bubo virginianus pacificus*) is easy to identify because it is the only large owl with prominent “ears” or ear tufts. It hides during the day in dense vegetation and hunts at night for small and medium-sized mammals. Although it will prey upon rabbits, hares, and skunks, it feeds mostly on the mice and voles of the owl’s woodland habitat. A pair of owls with their two young of the year can consume 8,250 mice in a year! Listen for their distinctive “hoo, hoo-hoo-hoo, hoo” call at night. During the day, look under trees for owl pellets – the fur and bones – that are regurgitated after the owl has digested the rest of the animal it had for a meal.



The **Western Screech Owl** (*Otus kennicottii*) is a small owl with ear tufts and a color and pattern that provide great camouflage. Like the great horned owl it is a bird of the woods and is hard to spot when it is roosting. When darkness falls, listen for a series of whistles that accelerate like a bouncing ball. Search for small pellets and “white-washed” shrubbery below old snags where an owl might roost. The female lays 4 or 5 eggs in a tree cavity. Instead of hatching all at once, young hatch sequentially and vary in age and size. If mice and other small rodents are plentiful, the adults can raise the entire brood. If prey are in short supply, only the largest and strongest owlets will survive.



**Belted Kingfisher** (*Ceryle alcyon*) Whether making a spectacular dive for a fish dinner, flying along the stream as it utters its loud rattling call, or perched on a tree branch watching for prey, this large-headed, blue and white bird is immediately noticed. The belted kingfisher eats mainly fish, but won’t hesitate to make a meal of a tadpole, crayfish, frog, small snake, or insects. The nest is usually a burrow that has been dug in the creek bank by both parents. This is one of the few kinds of birds in which the female is more colorful than the male. She has an extra chestnut band along her belly.



**Black Phoebe** (*Sayornis nigricans*) This trim flycatcher, never far from water, perches in shaded lower branches or on fences, stones or other low objects. Usually swooping downward from its perch, it snaps up insects such as bees, wasps, flies, and moths from within a few inches of the water’s surface. The black phoebe mixes mud with plant fibers to build a nest that may be attached to the rough wall of a cliff bank or under a bridge. Listen for the call. Do you think its says “phoebe”?



More than 200 species of birds can be seen along a creek corridor, either residents or migrants. The birds described here are only those most commonly seen all during the year. The checklist on the following page tells you what other birds you are likely to see.

## A CHECK LIST OF CREEKSIDE BIRDS

- |  |  |
|--|--|
| <input type="checkbox"/> Great Egret               | <input type="checkbox"/> White-breasted Nuthatch         |
| <input type="checkbox"/> Snowy Egret               | <input type="checkbox"/> Bewick's Wren                   |
| <input type="checkbox"/> Green Heron               | <input type="checkbox"/> House Wren                      |
| <input type="checkbox"/> Black-crowned Night-Heron | <input type="checkbox"/> Ruby-crowned Kinglet *          |
| <input type="checkbox"/> Wood Duck                 | <input type="checkbox"/> <b>American Robin</b>           |
| <input type="checkbox"/> <b>Mallard</b>            | <input type="checkbox"/> <b>Northern Mockingbird</b>     |
| <input type="checkbox"/> Sharp-shinned Hawk        | <input type="checkbox"/> Cedar Waxwing *                 |
| <input type="checkbox"/> Cooper's Hawk             | <input type="checkbox"/> <b>European Starling</b>        |
| <input type="checkbox"/> Red-shouldered Hawk       | <input type="checkbox"/> Orange-crowned Warbler          |
| <input type="checkbox"/> Red-tailed Hawk           | <input type="checkbox"/> <b>Yellow-rumped Warbler *</b>  |
| <input type="checkbox"/> American Kestrel          | <input type="checkbox"/> <b>Rufous-sided Towhee</b>      |
| <input type="checkbox"/> Ring-necked Pheasant      | <input type="checkbox"/> <b>California Towhee</b>        |
| <input type="checkbox"/> California Quail          | <input type="checkbox"/> Song Sparrow                    |
| <input type="checkbox"/> <b>Mourning Dove</b>      | <input type="checkbox"/> Lark Sparrow                    |
| <input type="checkbox"/> Western Screech-Owl       | <input type="checkbox"/> <b>Golden-crowned Sparrow *</b> |
| <input type="checkbox"/> Great Horned Owl          | <input type="checkbox"/> <b>White-crowned Sparrow *</b>  |
| <input type="checkbox"/> <b>Anna's Hummingbird</b> | <input type="checkbox"/> <b>Dark-eyed Junco *</b>        |
| <input type="checkbox"/> <b>Belted Kingfisher</b>  | <input type="checkbox"/> Red-winged Blackbird            |
| <input type="checkbox"/> <b>Acorn Woodpecker</b>   | <input type="checkbox"/> Western Meadowlark              |
| <input type="checkbox"/> Yellow-bellied Sapsucker  | <input type="checkbox"/> Brewer's Blackbird              |
| <input type="checkbox"/> Nuttall's Woodpecker      | <input type="checkbox"/> Brown-headed Cowbird            |
| <input type="checkbox"/> Downy Woodpecker          | <input type="checkbox"/> Northern Oriole •               |
| <input type="checkbox"/> Hairy Woodpecker          | <input type="checkbox"/> <b>House Finch</b>              |
| <input type="checkbox"/> <b>Northern Flicker</b>   | <input type="checkbox"/> Lesser Goldfinch                |
| <input type="checkbox"/> Western Wood-pewee        | <input type="checkbox"/> American Goldfinch              |
| <input type="checkbox"/> Western Flycatcher        | <input type="checkbox"/> <b>House Sparrow</b>            |
| <input type="checkbox"/> <b>Black Phoebe</b>       |  |
| <input type="checkbox"/> Ash-throated Flycatcher   |  |
| <input type="checkbox"/> Tree Swallow •            |  |
| <input type="checkbox"/> <b>Scrub Jay</b>          |  |
| <input type="checkbox"/> Yellow-billed Magpie      |  |
| <input type="checkbox"/> <b>American Crow</b>      |  |
| <input type="checkbox"/> <b>Plain Titmouse</b>     |  |
| <input type="checkbox"/> <b>Bushtit</b>            |  |

- \* winter birds  
• summer birds

The birds you are most likely to see are in bold face.

Contact your local Audubon Society for a full check list

## MAMMALS

**Raccoon** (*Procyon lotor*) Hand-like footprints in the mud and sand of creek borders are the most common clue to the presence of this nocturnal animal. Raccoons find homes in tree hollows and feed upon acorns, berries, crayfish, clams, and insects – almost anything edible found along stream corridors. Their black mask and ringed tail give these creatures a distinctive look. Though they may venture into yards for fruit and nuts or to raid a fish pond, their bright eyes and inquisitive personality generally endear them to their human neighbors.



**Striped Skunk** (*Mephitis mephitis*) Your nose makes you aware of this animal. There's no mistaking the smell skunks produce when they use their defensive spray. Striped skunks make themselves at home under buildings, in culverts, and sometimes share underground burrows with other animals. Coming out at night, they dig up insects to eat, leaving shallow tell-tale holes in the ground – and sometimes lawns. Skunks' pattern of black with white stripes running down the back makes them clearly visible, even at night, and warns would-be attackers to stay away.





## SCAVENGERS AND OTHER DECOMPOSERS

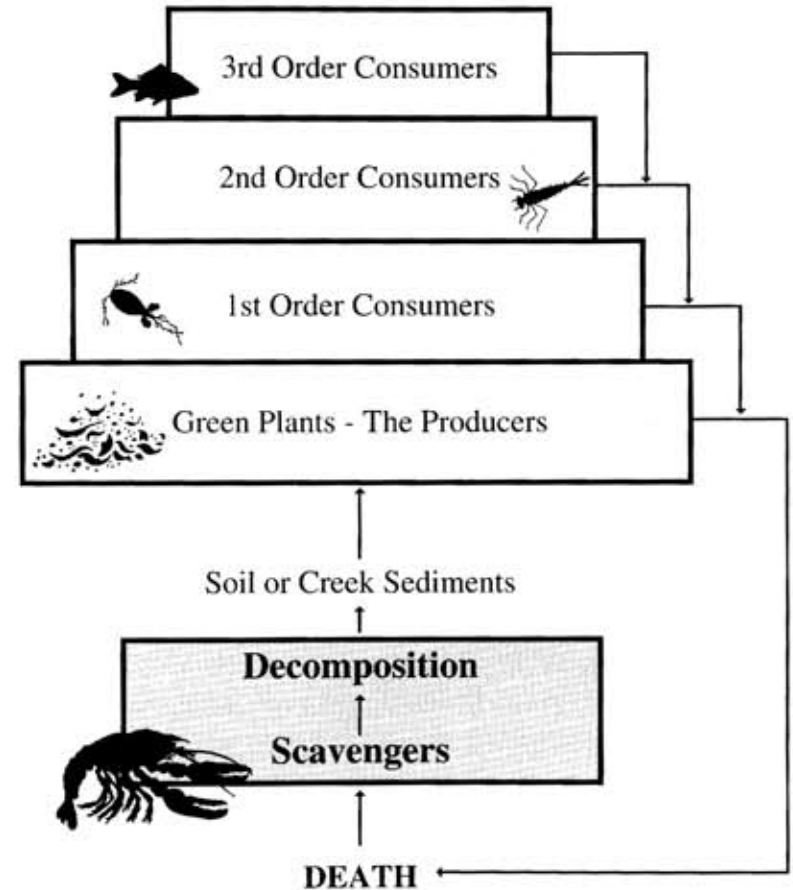
Scavengers are very important members of the communities in which they live. The niche is occupied mostly by bacteria, molds and fungi which break down and consume organic wastes. Occasionally, we see larger decomposers, and it is these that we feature here.

Although the following animals consume a wide variety of plant and animal foods they find in their respective habitats, all will also consume carrion, thereby "cleaning" up their habitats and recycling nutrients through their wastes. In this vital role they ensure that the feeding cycle will continue by nourishing the "Producers."

## The Scavengers



### AND OTHER DECOMPOSERS





**Round Worms** (*Oligochaeta*) There are many kinds of round worms. A few are clear and covered with hair-like tufts while others are brown or red and segmented. Some, called “blood worms,” contain a blood pigment similar to humans that is capable of storing oxygen in low oxygen environments. Because they can tolerate a degraded habitat, scientists use blood worms as an “indicator species” of poor habitats.

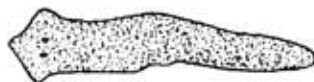
Worms generally feed on algae and other organic debris. Most worms bury themselves in bottom muds where they are easily collected by sweeping nets through bottom sediments.



**Leeches** (*Hirudinea*) These segmented flat worms have a sucking disc at both ends. They move in interesting ways. Some cartwheel while others swim like graceful ribbons. Although some leeches are predators and suck blood, most feed as scavengers on organic debris. They are easily found under rocks and decaying leaves.



**Planeria** (*Platyhelminthes*) These flat worms have a triangular shaped head containing light sensitive eyespots. They avoid light by hiding under rocks. Although planaria reproduce sexually, they also can split down the middle to form two new individuals.



**Crayfish** (*Decapoda*) The crayfish that live in creeks are related to crabs, lobsters and shrimp. They have ten legs but the front pair are enlarged into pinchers. They are reddish brown – seldom more than six inches long. They can walk or swim forward, backwards or sideways. The body is rigid but the tail portion can curl under. It is here that the female carries her eggs and young. They hide under rocks or debris and dart out to catch a meal. Crayfish, or “crawdads,” are the scavengers who clean up the creek bottoms, eating any leftovers they can find. People and other animals, in turn, find them a tasty meal.



**Virginia Opossum** (*Didelphis virginianus*) Hiding by day in trees, under buildings, or in crevices, these opportunistic animals scavenge by night and manage to flourish along creeks and rivers. Brought to the area by early settlers from the southern states, they have adapted well to life in California. The opossum is the only North American mammal with a prehensile tail and opposable thumbs. It is also our only marsupial. The very tiny young spend the first three months of life in their mother’s pouch. Look for the distinctive hand-like footprints along creek corridors.



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How to study the riparian community in terms of feeding relationships.