

# Animal Life

If we were to go back in time more than three billion years, we would find prolific volcanic activity cooking up a primordial soup containing single-celled organisms – the beginnings of life. The broth of this soup also contained complex molecule chains which were the food source for these early life forms. Survival consisted of locating some of the nutritious portions of this “soup broth” and consuming it, developing some adaptations along the way to assist in this endeavor.

Life continued quite happily, until, over eons of time, the molecular food supply became limited. With increased competition, there were two ways to adapt: devour the other primitive cells floating about, or become proficient at producing their own food source out of the inorganic materials available. Thus evolved the beginnings of autotrophic versus heterotrophic life:

- ✓ **Autotrophs**, meaning “self-feeders”, evolved into photosynthetic plants, without which life on earth would soon have come to an end.
- ✓ **Heterotrophs**, or organisms that feed on other organisms, are what all animals are today.

From those aquatic beginnings, life evolved, first hugging the warmer, lighter waters of the continental shelf, spilling into the fingers of creeks and other freshwater sources and finally making its way onto land. Photosynthetic autotrophs were the pioneers onto dry land, slowly raising the levels of oxygen from 1 percent around 600 to 1,000 million years ago, to 10 percent 400 million years ago, finally reaching the current level of 21 percent. Once the levels of atmospheric oxygen reached sufficient proportions, organisms that produced their chemical energy through respiration were able to follow the plants onto land. Thus did the heterotrophs gain a terrestrial foothold, based, however, on the existence of autotrophs.

Today’s animals are multi-celled heterotrophs that must directly or indirectly feed on autotrophs. They have evolved into a diverse collection that have several general characteristics:

- ✓ Food digestion occurs in an internal cavity.
- ✓ They store excess food in the form of fat or glycogen.
- ✓ They are able to move about, usually using some sort of muscle tissue.
- ✓ They have no cell walls.
- ✓ Reproduction is usually sexual.
- ✓ Most of them grow to a maximum size and shape, as opposed to plants that continue growing throughout their lives.

There is something about the human mind that loves to classify and organize in order to develop an understanding. In the case of all the myriad organisms that inhabit the earth, about five million have been classified into a system consisting of kingdom, phylum, class, order, family, genus, and species names. So most organisms have a very long name formally consisting of at least seven parts. We say “at least” because, more often, there is also a collection of sub-phylum, sub-classes, and sub-orders too.

Names, in and of themselves, do not mean much, however in classifying a species it becomes necessary to know all its characteristics, which is a step in gaining an understanding. For the purposes of this manual, we will look at the animals found at Quail Hollow, presenting them in a limited version of this binomial system: looking at invertebrate versus vertebrate sub-phyla as well as some of their classes and orders.

# Invertebrate Animals

“My spading fork turning the earth, turns  
This fellow out – without touching him this time.  
Robbed of all resistance to his progress  
He squirms awhile in the too-easy air  
Before an ancient and implicit purpose  
Starts him traveling in one direction  
Reaching out, contracting, reaching out,  
Contracting – a clean and glistening earth-pink.  
He has turned more earth than I have with my fork.  
He has lifted more earth than all men have or will.  
Breaking the earth in spring men break his body.  
And it is broken in the beaks of birds.  
He has become and will again become  
The flying and singing of birds. Yet another spring  
I shall find him working noiselessly in the earth.  
When I am earth again he will be there.”

- Robert Francis, “*Earthworm*”

**Invertebrates** – animals with no backbone – come in a million different shapes and sizes. Earthworms are invertebrates, as are sponges, jellyfish, snails, spiders, sea stars, ants, grasshoppers, butterflies, and a whole host of other colorful critters. Over 90 percent of the animal species in the world are invertebrates, and most of these are insects. As you explore the nooks and crannies of Quail Hollow Ranch, you will eventually discover invertebrates like banana slugs, various spiders, and a myriad of insects.

## The Insect Order

(Adapted from *Hands-On Nature*)

There are more insects than any other group of animals in the world. They live on top of mountains, in underground caves, in deserts and rivers, and in fields and forests. Their numbers are enormous, with over 900,000 species identified. There is great diversity within this large population, but all insects have the same basic structure, with each species adapted to meet the demands of its own particular environment.

Insects are **arthropods** – related to spiders, crabs, and lobsters, and, like these cousins, they have jointed legs and an exterior skeleton. An insect’s body consists of three main parts: head, thorax, and abdomen.



The **head** contains the eyes, one pair of antennae, and mouthparts. The antennae are finely-tuned sense organs, capable of feeling, tasting, smelling, detecting temperature, and receiving chemical stimuli. Some are long and slender, some quite feathery, and others club-like. The mouth of the insect is adapted to the food it eats. Thus a grasshopper’s mouthparts are adapted for biting and chewing, a housefly’s for lapping, a

butterfly’s for sucking, and a mosquito’s for piercing and sucking. A few species, such as the mayfly, live as adults only long enough to mate and have no mouthparts with which to eat.

The middle section, or **thorax**, has three pairs of legs and usually two pairs of wings – although sometimes the number of wings can be one and occasionally none. For this reason, many muscles are located in the thorax. Insect musculature is highly specialized in many species – grasshoppers have about 900 muscles compared to a human’s 800, and an ant can carry 50 times its own weight. Legs are adapted in as many ways as mouthparts. The grasshopper has hind legs specialized for jumping; the housefly has sticky pads on its feet, allowing it to walk up vertical walls; honeybees have specialized hairs on the hind legs that form “baskets” in which to carry pollen. The wings may be long, short, narrow, wide, leathery, or quite delicate depending on the type and amount of flying the insect does.

The **abdomen** is divided into many segments and contains the heart, the digestive system, and the reproductive organs. On females of some species, the egg-laying device, or **ovipositor**, protrudes noticeably from the end of the abdomen.

Breathing is done through holes, or **spiracles**, in the abdomen, leading to the tubes that carry air throughout the body – there are also some spiracles on the thorax. Air is pumped in and out by the swelling and relaxing of the abdomen. The challenge of breathing under water has produced some remarkable insect adaptations, including the breathing tube of the mosquito larva; gills of immature caddisflies, damselflies, and mayflies; and a system for carrying an air bubble used by certain water beetles.

Almost 90 percent of all insects undergo a process called **complete metamorphosis** in which the young is completely different from the adult form. The **larva**, or immature insect spends much of its time feeding and is followed by an immobile period of transformation, called the **pupa** stage. Finally, upon emerging from the pupa, the **adult** appears, often with a body completely different from its larval beginnings.

For at least a third of a billion years, insects have been adapting to their environment. Of great importance to their flexibility in coping with harsh seasonal variations is the evolution of this process of metamorphosis, resulting in the utilization of new habitats and food sources. The success of insects as a group is due to their having several major assets: flight, adaptability, external skeleton, small size, metamorphosis, and the ability to produce multiple offspring rapidly.

Flight has given insects an advantage over land-bound animals in being able to search actively for their mates, forage widely for food, escape from their enemies, and leave areas that no longer provide for their needs.

Insects are remarkable in their ability to adapt so well to extreme living conditions. With short life cycles and rapid reproduction, insects can change, if necessary, in a relatively short time to meet the requirements of a changing environment. For instance, when smoke from the Industrial Revolution darkened buildings and vegetation in England, one light-colored species of moth eventually produced generations with a darker color. The lighter moths were visible to predators and did not survive. (See Ecology section for more information.)

The external skeleton is vital to insects as a suit of protective armor. Its essential ingredient is chitin, which is flexible, lightweight, tough, and very resistant to most chemicals. A growing insect simply sheds its old skeleton or skin and the new one inside quickly dries and hardens.

The small size of insects acts to their advantage. The speck of food that is a feast for an insect is usually much too small to be noticed by a larger animal. Being small, most insects can readily find shelter, even in tiny cracks, thus escaping detection and predation.

Timing is important for insect survival. Insect eggs are timed to hatch when the proper food and living conditions are available for the young. Also, with metamorphosis, the immature insect can use one food

supply while the adult nourishes itself on something completely different.

Here at Quail Hollow Ranch there are species of insects that are listed as endangered and are worth mention. They include the Mount Hermon June beetle and the Zayante band-winged grasshopper, with the Santa Cruz rain beetle under concern.

You have to be at the right place, at the right time to witness the male **Mount Hermon June beetle's**, or *Polyphylla barbata's*, slow, haltering flight, which occurs only to locate the larger, non-flying females during the mating season. The place would have to be a sandhills habitat, within the Ben Lomond-Mt. Hermon-Scotts Valley area. And the time would have to be from mid-June to late-July between 8:45 and 9:30 pm. Otherwise, most of their life cycle is spent in its sandy, subterranean world, feeding on the roots of pines and grasses. However, during this one-to-two-month time period, males emerge briefly, flying low to the ground, tracking the female's pheromone signals. After mating, females will lay eggs at the bottom of their burrow and die, while males will emerge the following evening to mate again until his nutrient supplies run out.

Another inhabitant of high-quality sand parkland is the **Zayante band-winged grasshopper**, or *Trimerotropis infantilis*. As the name suggests, dark cross-bands appear on its forewings, with lighter bands on its hindwings and around the eyes. During the flight season, which extends from May through August, they become conspicuous due to the pale-yellow flash of the hind wings and the crackling, buzzing sound that accompanies their flight.



Santa Cruz rain beetle  
*Pleocoma conjugens conjugens*

Another one of those beetles that emerges at specific times is the **Santa Cruz rain beetle**, or *Pleocoma conjugens conjugens*. As you may have already guessed, after the first soaking rain of the season, the male will take flight with one goal in mind: to locate a female and mate. Like the Mt Hermon June beetle, the Santa Cruz rain beetle will spend most of its life underground feeding on plant roots throughout its larval stage. However when it reaches the adult stage, it lives on food reserves, having poorly-developed mouth parts.

Whether you are watching a train of ants or stalking the elusive June beetle, insects are fun to study and exciting to watch. There are far too many to be able to identify all of them, but a close look can reveal remarkable adaptations.

## Spiders and their Webs

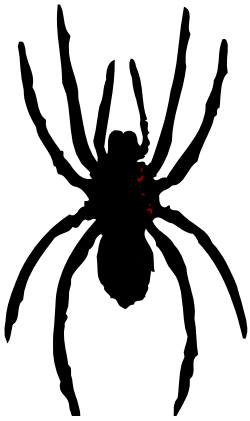
(Adapted from *Hands-On Nature*)

Among nature's beautiful designs, few can surpass the intricate beauty of a spider web glistening with dew drops in the early morning sun. And few are so immediately and obviously functional. To watch a fly's unsuccessful twistings and turnings in the sticky strands of a web is to observe what an effective device a web can be for trapping food for its maker.

To many, the spider is far less worthy of admiration than its web, but, in fact, they are marvelous creatures. Spiders are not insects, although some people may think so. They are related in that they are both arthropods and thus share jointed legs as well as external skeletons, but much of the similarity ends there. Spiders have eight legs, insect six; spiders lack both antennae and wings, both of which most insects possess; spiders have two body parts – **cephalothorax** and **abdomen**, and insects three – head, thorax, and abdomen.

Spiders belong to the class **Arachnida**, as do mites and daddy longlegs. The scientific name is derived

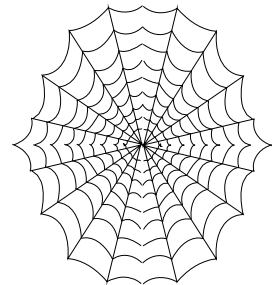
from the Greek word for spider, arachne, which commemorates the name of a legendary Greek maiden who challenged the Goddess Athena's spinning ability and was turned into a spider.



The English word for spider is a corruption of "spinder," one who spins. Almost all spiders can spin silk and are able to do so from birth. The spinning organs are finger-like projections called **spinnerets** that can be extended, withdrawn, compressed, and to some extent, aimed. They are located near the end of the abdomen on the undersurface. These spinnerets are tipped with many tiny spinning tubes as well as with "spigots" from which liquid silk comes. The silk, at least seven different kinds, is produced from glands within the abdomen. As soon as the fluid leaves the spider's body, it hardens quickly to form the familiar silken thread.

Spider silk has considerable strength and elasticity. A rope of spider's silk one inch thick would be stronger than a steel cable. Some of the threads will stretch one-half their length before they break. The thinnest lines are only one-millionth of an inch wide and thus invisible to humans, but other lines are much heavier.

Not all spiders spin webs, but those that do, do so in order to catch insects. When an insect is caught in a web, the spider – often hiding off to the side – feels its struggle to escape. A spider can determine from the strength of the vibration whether prey has been caught, or a predator is approaching. If an insect is caught, the spider then rushes toward the prey, injects it with a poison that paralyzes it, and eventually ingests it. Spiders have small mouths and cannot eat solid food. They must either inject digestive fluids into the insect's body or secrete these fluids over it to dissolve the tissues, which they then suck in. Some spiders wrap the insect in silk and save it to eat later.



Webs vary greatly in complexity and structure, but there are a few common and distinctive types.

- ✓ **Sheet webs** are easily recognizable. The principle part of the web consists of a more or less closely woven sheet in a single, usually horizontal plane.
- ✓ A **funnel web** is similar to a sheet web, the difference being that a funnel descends from it to the spider's hiding place.
- ✓ The large conspicuous webs often seen on tall grass or suspended between dead tree branches during the summer are **orb webs**. They resemble a large wheel, sometimes with a zig-zag band of silk running through the middle, which is thought to serve as a lure for flying insects. The characteristic design of this kind of web includes a number of supporting spokes made with dry and inelastic silk on which has been spun a sticky spiral elastic thread. The spider does not become entangled in its web, stepping only on the dry spokes and not on the sticky spiral lines.

During the late summer and early fall, spiders are apt to make a new web every 24 hours, as the large insects, once entangled, quickly destroys the webs. Most of this activity takes place around sundown.

Besides being used for webs, silk is also used for draglines. Wherever the spider goes, it always plays out a silken line that acts as a securing thread preventing falls and helping spiders to escape predators. Young spiders of most species, and adults of very small ones, spin unattached draglines in conditions of warm, fairly still air. The line is lifted by rising air currents and carries the young spider away with it. This is called ballooning and helps spiders reach new habitats.

Some spiders do not build webs, but instead stalk or ambush their prey. Wolf spiders, jumping spiders, and fishing spiders all go out and hunt their prey, whereas crab spiders wait in ambush for unsuspecting insects, capturing them without webs.

It would seem logical that spider silk, being so abundant, might be used commercially by humans. It is usable as fabric material in the same way as the silk of the silkworm. However, the practical difficulties of rearing and feeding large numbers of spiders are great because spiders are cannibalistic. Therefore, you will have to observe these wonderful silk creation and their creators in the natural world, or perhaps in your very own kitchen corner.

## Mollusks and the Infamous Banana Slug

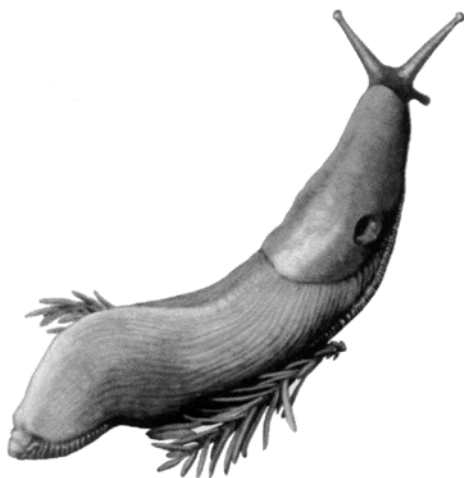
We've seen them crawling along the forest floor, their bright yellow bodies looking a lot like fallen, yellow bay leaves, a trail of slime in their wake. The **banana slug**, or *Ariolimax dolichophallus*, is a member of the **mollusk** phylum, whose members usually have a soft body with hard, calcium-rich shell. In the case of the banana slug, however, this shell has been lost, leaving the soft, shiny – or some would say, slimy – body.

There are seven classes of mollusks:

- ✓ **Bivalves** are comprised of clams, oysters, and mussels
- ✓ **Cephalopods** consist of squids, octopuses, and cuttlefish
- ✓ **Gastropods** include snails and slugs, among others
- ✓ **Polyplacophora** are the chitons
- ✓ **Monoplacophora**, **Aplacophora**, and **scaphapoda** are rare and or deep-water animals.

The class of gastropods is one of the largest and most successful, containing 50,000 species with another 50,000 fossilized examples. These “sluggish” creatures move about on one foot that is adept at traversing the sharpest, most uncomfortable terrain.

Banana slugs – one of the many gastropods – are **detritus feeders**, meaning that they feed on anything dead, laying on the forest floor, recycling the material into the soil. Protruding out from the foot and from under the mantle is a head with four tentacles and a mouth that contains a tongue designed for scraping. When their tentacles are fully extended, you might see the black eyes at the tips of the upper ones, designed to detect shades of light and darkness, with the lower tentacles close to the ground feeling and smelling. Hold the banana slug in your hand and with time you may feel a ticklish sensation as it begins to scrape your skin with its **radula**, or spiny tongue, looking for food.

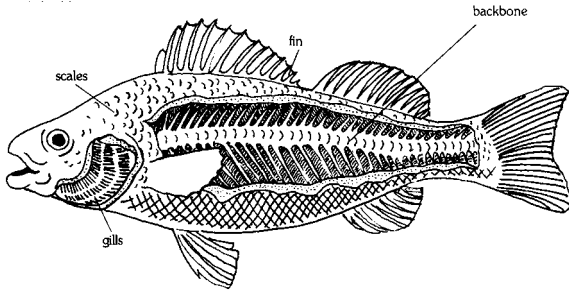


Reproduction in banana slugs is **hermaphroditic**, meaning that one individual contains both sexes. This trait is an advantage because they are such slow-moving creatures that when they bump into another – which is only an occasional occurrence – they are both able to impregnate the other. Internal fertilization occurs with a penis that is longer than its body. A clutch of 30 or more pea-sized eggs hatch in about 46 days. The one-inch-long young will eventually grow up to ten inches – one of the largest slugs in the world.

Predators include salamanders, snakes, newts, shrews, moles, raccoons, foxes, crows, ducks, beetles, other slugs, and even humans. The lack of a shell can sometimes be an advantage by allowing them to squeeze into small cracks, or “balling up” to keep a predator from swallowing them. This methodical debris-feeder

has adapted well, and plays a valuable role in the health of the forest.

## Vertebrate Animals



If you were to reach your hand to your back, running your fingers up and down the spine, you would feel the bony projections of your **vertebral column**, or backbone. Humans are one of the many examples of vertebrate animals which include the classes of fish, amphibians, reptiles, birds, and mammals. (In addition, the oldest known member of the vertebrate class is the cyclostomes or the jawless fish consisting of the hagfish and lampreys.)

All vertebrates have this backbone as a structural axis, also encasing and protecting the nerve cord. Movement and flexibility are allowed through cartilaginous plates located between each vertebrae. At the top of the vertebral column is the brain, also surrounded by bony plates for protection. The combination of bone and cartilage is a great advantage, allowing the animal to grow, gradually replacing cartilage with bone by adulthood.

The sub-phylum vertebrata contains some of the more visible and familiar animals with whom we identify. This successful group of animals contains about 43,000 species, and will be the subject of the remainder of this section.

### The Fish Class

Plato once described fish as “senseless beings... which have received the most remote habitations as a punishment for their extreme ignorance.” And unless you are a sport fisherman or marine biologist, most of us would be about as appreciative of fish as Plato. However, these masters of the aquatic environment number more than 20,000 species, more than all four terrestrial vertebrate classes combined.

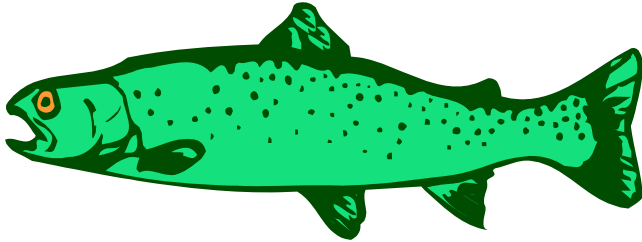
Their highly adaptive bodies have found homes anywhere there is habitable water: from the blind, pale creatures found at the bottom of the ocean to the slinky rainbow trout romping in the highly oxygenated waters of the tallest mountains. They have an incredible sensitivity to water currents and motions which leads to a system of fins and swim bladders that allow them to maneuver with grace, speed, and accuracy. They have an excellent sense of sight and smell, as well as the most effective underwater breathing apparatus ever evolved: gills.

Many of the fish that inhabit the San Lorenzo watershed have an additional adaptation that allows them to cross the deadly boundary between salt and fresh water. These osmotic regulators monitor the exchange of salt and water so that they can effectively survive in both environments. All fish have at least some amount of salt in their bodies, higher than the amounts found in freshwater. Those that live in freshwater are inundated with this saltless liquid and respond by producing lots of dilute urine, which takes energy. In the same way, saltwater species are surrounded by saltier water than what their bodies produce. Osmotic pressure causes the freshwater to escape the body, resulting in dehydration. The fish responds by drinking the saltwater and releasing the accumulated salt later – a process that also requires energy. **Euryhaline fish**, or fish that can live in salt and fresh water, have to cope with both these problems.

You may be wondering what the advantages are to being an euryhaline fish. If conditions decline in any given stream, the fish can escape to the ocean and locate another one. In addition, if salinity levels in a

fresh water source change, like in those areas that are closer to the river's mouth, the euryhaline species can remain, while non-euryhalin species will be forced out or perish.

Euryhaline fish that spawn in freshwater are called **anadromous**, which means "running up." These fish spend at least part of their lives in the ocean and move to freshwater to spawn. The terms euryhaline and anadromous are not interchangeable. Some species, like the starry flounder are euryhaline but not anadromous, whereas steelhead are both. The advantages of being anadromous lie in the greater safety of freshwater habitats.



**Steelhead Rainbow Trout** - That flashing rainbow streak is a dead giveaway. We've seen them as we peer into the streams and rivers that they inhabit. But what is the difference between rainbow trout and the **steelhead rainbow trout**, both known as *Oncorhynchus gairdnerii*? It appears that there is some debate surrounding that point, however a primary difference lies in their migration habits. Rainbow trout are homebodies,

not venturing far from where they were born. Steelhead, on the other hand, will often make their way to the ocean within the first couple of years of life, feeding voraciously and growing quickly, before returning to the rivers and streams to spawn.

This salmon family member can be found from Japan to Russia, and from Alaska to Baja California. Most adults weigh less than ten pounds, however occasionally, larger individuals have been caught. They spawn three to four times in their six-year lifetime, with the urge to migrate being size-related. So a fast-growing fish feeding in an abundant lagoon may head to sea within the first year or two, while its cousin upstream may take three to four seasons to leave home.

They can't tolerate warm water, needing temperatures below 70 degrees to survive and eggs requiring 58 degrees or lower. Spawning occurs when a female digs a nest, called a **redd**, deposits her eggs which are promptly fertilized by the male, and then covers them with enough gravel to cover them, yet still allow a flow of oxygenated water. Two months later, fry hatch, looking much like tadpoles and eating anything available. Once they reach a large enough size and the sand bars at the mouth of local rivers open, they will head to sea, feeding on krill, copepods, amphipods, shrimp, crab larva, squid, and fish. A few years later they will return to spawn, connecting the cycle into a repeating loop.

**Striped Bass** - The year was 1879. That was when the **striped bass** was brought from New Jersey to San Francisco, introducing the beginnings of a range that would expand from British Columbia to Baja California. These hefty fish can weigh as much as 90 pounds, with five-year-old, mature females measuring 24 inches and two-year-old, mature males measuring 11 inches. Spawning in swift-moving streams, a five-pound fish can spawn 25,000 eggs and a 75 pound bass can lay 10 million eggs. Knowing this we can see the reason for their successful introduction.

**Threespine Stickleback** - Within the San Lorenzo river and its tributaries, one can find a small, inconspicuous, greenish fish covered with bony plates rather than the more typical scales. Its name, the **threespine stickleback**, comes from the three sharp spines that protrude just in front of the dorsal fin. There are three sub-species found in the watershed, one which is anadromous, and the other two living full-time in the local creeks and streams. Their food sources include small aquatic insects, crustaceans, and algae, but they have also been known to wreak havoc in fish hatcheries, consuming trout fry. In turn, they are eaten by other larger fish, birds like heron and egrets, and occasionally even humans.

**Mosquitofish** - A member of the minnow family, the **mosquitofish** was introduced to California in 1922 in order to control mosquitos, as the name suggests. In fact mosquito larva comprise the main diet



for this small, olive-colored fish, flanked by a narrow, dark streak and with rounded tail fin. The male has a distinctive, elongated anal fin which is designed to impregnate a female, after which the female may bear 10 to 30 live young.

**Pacific Lamprey** - This eel-like creature is one of the more primitive forms of vertebrates, and in fact, is not a fish at all – growing a skeleton made of cartilage rather than bone. The **Pacific lamprey's** long, slimy body with short head containing a round, sucking mouth, is well adapted for attaching itself to other fish, extracting blood and body fluids for food. They will make their way into local rivers and streams to spawn in rocky nests before dying. Upon hatching, the young dig into the stream bottom and remain for three to four years in a larval stage feeding on material that filters through the sediment. Once they reach a length of about six inches, they migrate to the ocean where they parasitize fish like striped bass and salmon. Six to eighteen months later, they will return to the coastal streams to spawn and die, thus completing the cycle.

## The Amphibian Class

Historically, amphibians have been looked down on, seen as a source of warts or as a prop for a good prank. However, they were the first vertebrates to face terrestrial life, and have adaptations that make them unique in the animal kingdom. They may have been able to survive on land early, but they were never able to completely divorce themselves from the aquatic environment, leaving them tied to a local water source. Indeed, the term amphibian comes from the Greek word “*amphibios*”, meaning “being with a double life.”

Like their reptilian cousins, amphibians are **cold-blooded**, sometimes called **ectothermic**, in which their body temperature is maintained at the same level as the air temperature. In fact, when they are on land, they are cooler than the surrounding air because of the evaporation of water from their skin. Their skin,

which is smooth and warty, allows moisture to pass freely through it – a reason not to handle these critters too much. Lotions, soaps, ink, and the like can be toxic to these animals, absorbing them as easily as water.



Most amphibians undergo metamorphosis, with a few exceptions known as “direct-developers,” who give birth to miniature versions of adults.

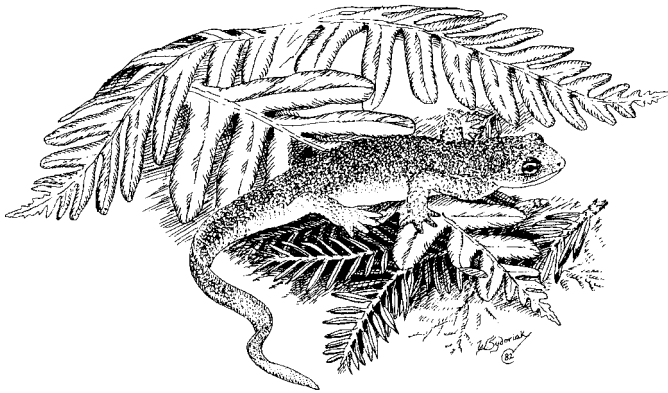
The majority begin life in the water as a gelatinous collection of eggs, numbering as few as a dozen and as many as thousands. Upon hatching, the larva will eat and grow... and change: intestines become shorter, gills are replaced with lungs, in some species legs grow while the tail shrinks, and the mouth expands into one capable of eating large insects and other food.

Unfortunately, reptiles got the bad rap in being labeled “slimy,” when in reality it is their amphibious cousins that really deserve the title. Mucus produced from glands, help keep its skin moist – an important factor in respiration – as well as control the amount of water absorption. Another set of glands, the poison glands, generally produce a foul-tasting irritant, designed to deter predators – although some poisons can be extremely toxic.

Approximately 2,500 species of amphibians can be divided into three orders: the caecilians, or the order *Gymnophiona*; the newts and salamanders, making up the order *Urodela*; and frogs and toads, otherwise called *Salientia*. The caecilians are colorful, smooth-skinned animals that have transverse lines, or ring-like annuli, that give them a worm-like appearance. Because they are tropical in nature we will focus our attention on the latter two groups.

**Newts and Salamanders (The Order Urodela)** - Some of us have been lucky enough to have gone hiking in the rain and seen the forest and riparian floors come alive with a slow, methodical movement. Upon closer inspection, one might notice the quiet and shy newts and salamanders which occur in surprisingly sizeable numbers, preferring to keep to themselves until a good drenching allows them to reveal their presence.

These are the tailed amphibians, sometimes confused with lizards, but lacking scales and preferring a moist habitat to call home. Their primitive limbs are of equal size and located at right angles to the body. They prey on worms, small insects, small snails, and anything else that offers a high protein source, enabling them to forgo the need to store large quantities of fat in their bodies.



Back in medieval times, the English word “ewt” referred to both lizards and salamanders. Today, we have changed “ewt,” to “newt” and narrowed its definition to include those species that are part of the *Salamandridae* family. The **California newt**, or *Taricha torosa*, and the **rough-skinned newt**, or *Taricha granulosa*, are the local family examples. At first glimpse you would think that their chocolate-brown coloration was a perfect camouflaging technique, until you notice their bright orange underside usually signifying a warning. Indeed their poisonous skin secretions

repels most predators and can cause death if eaten in large quantities. They can be handled, however it is a good idea to wash your hands upon their release.

There are several families of salamanders that can be found locally. The **lungless salamanders**, found in the *Plethodontidae* family, have the ability to breathe through their moist, thin skin and include the following species:

- ✓ **Ensatina**, or *Ensatina eschscholtzii*, can live 10 to 15 years. If it feels threatened it will stiffly arch its back and tail to the point where its tail can be snapped off.
- ✓ The **arboreal salamander**, or *Aneides lugubris*, has the habit of climbing trees, sometimes as high as 60 feet. It squeaks like a mouse and has been known to bite.
- ✓ The **California slender salamander**, or *Batrachoseps attenuatus*, differs from other salamanders in that they have four toes on the front and back feet, instead of four in front and five in back like other salamanders.

Contrast this group with the **mole salamanders**, which are seldom seen except during their breeding season when they migrate from their homes in rotten logs or underground burrows to nearby ponds and streams. They include the following local species:

- ✓ The **California giant salamander**, or *Dicamptodon ensatus*, has been known to complain with a low-pitched bark when they are bothered and are the largest land salamander in the world, reaching

as much as a foot in length and weighing up to three pounds.

- ✓ The **tiger salamander**, or *Ambystoma californiense*, tend to travel at night as they migrate to and from their breeding sites. They are also now federally protected as a threatened species.

**Frogs and Toads – (The Order Salientia)** - “Ribbit . . . croak.” As soon as the first rains hit, you will hear these extroverts making their presence known with loud, distinctive calls. Eighty-five percent of the amphibian class, or about 2,000 species, are part of the familiar and successful *Salientia* order. The name *Salientia* means leaping, and refers to the main mode of locomotion for these vertebrates. Another characteristic of these animals is the absence of a tail as adults, although one does appear in earlier stages of their life cycle.

The metamorphosis of frogs and toads is quite dramatic, with the larva – sometimes called a **tadpole** or “polliwog” – looking vastly different from the adult stage. Upon hatching from the soft-shelled eggs, the legless tadpoles appear with a long, finned tail, gills, a specialized mouth for eating plants, and a specialized internal anatomy. As they develop into the adult stage, their tail disappears as legs emerge; gills are replaced with lungs; the mouth expands into one that can eat insects, worms, or even small fish; and the anatomy changes to accommodate this new diet.

What are the differences between toads and frogs? Generally speaking, frogs have the smoother skin and tend to stay closer to water, while toads are the warty, chubby ones that can be found further away from the ponds and streams. But really, the differences are determined by the different family distinctions.



The **true toads** fall in the family *Bufo* *idae*, which have **parotoid** glands along with warts that secrete a sticky, white poison, having varying toxic effects on different predators. Handling these animals poses no danger, not even the chance of contracting warts. Locally, the **western toad**, or *Bufo boreas*, located in a variety of habitats, catching insects by shooting out a long, hinged tongue. It is **nocturnal**, or active at night, calling with a mellow chirruping that sounds like a peeping chick.

Those slim, long-legged jumpers, on the other hand are members of the **true frogs**, or the *Rana* *idae* family. These smooth-skinned, webbed-footed vertebrates include some 250 species, of which, locally, one might find the native **red-legged frog**, or *Rana aurora*, or the introduced **bullfrog**, or *Rana catesbeiana*.

The distinctive red flash on the leg, as it jumps away is the tell-tale sign that you’ve spotted a red-legged frog. These pond inhabitants are primarily **diurnal**, meaning that they are active during the daytime. In the late 1800s and early 1900s, these frogs were marketed as a source of frog legs. Couple this collecting with the introduction of the bullfrog which successfully competes for the same habitat, and you can see why the red-legged frog has been listed as a threatened species.

There is one more family of frogs that should be mentioned, and they are the **tree frogs**, or the family *Hyla* *idae*. These slim-wasted, long-legged frogs have characteristic swollen toe pads designed to assist in climbing trees. The pads contain millions of microscopic bristles which insert themselves into crevices and provide traction as the frog climbs – even on glass. The local example of this family is the **Pacific tree frog**, or *Hyla regilla*, which has that classic nighttime frog sound: a high-pitched, two-part “kreck-ek.” In fact, this frog has been used extensively in Hollywood movies as an “authentic” frog background, often produced in places where tree frogs would not be found.

## The Reptile Class

For 160 million years, they reigned supreme across the land. It was a time of warmer temperatures, drowned swamps, and birdless forests, before the advent of flowers, when the world was a monotonous green. Loren Eiseley described a 20<sup>th</sup> century version of the Age of the Reptiles in her book *How the Flowers Changed the World*:

“In all that world of living things nothing saw save with the intense concentration of the hunt, nothing moved except with the grave sleepwalking intentness of the instinct-driven brain. Judged by modern standards, it was a world in slow motion, a cold-blooded world whose occupants were most active at noonday but torpid on chill nights, their brains damped by a slower metabolism than any known to even the most primitive of warm-blooded animals today.”

Based on what we know of today's reptiles, this vivid description of a tropical world inhabited by cold-blooded giants would seem accurate enough. However, current research is beginning to paint a different picture. Today, they may be considered active, warm-blooded animals with a penchant for parenting their young. Either way, the fact remains that they ruled much of the Mesozoic era, from 225 to 65 million years ago.

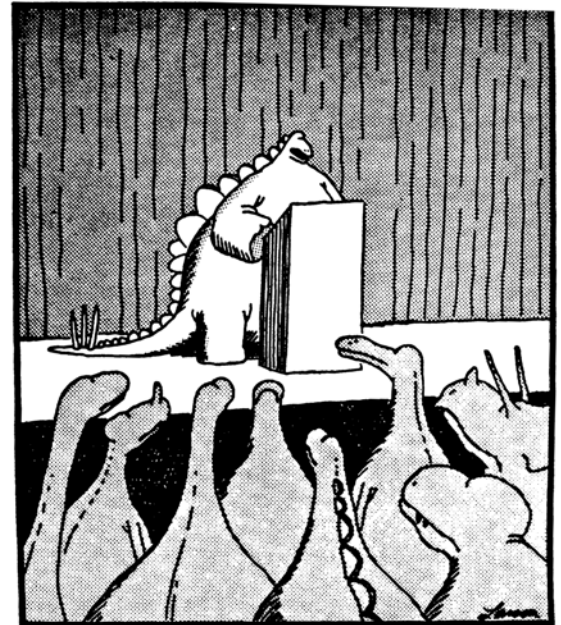
Perhaps the dinosaur's success was due to the fact that reptiles were the first truly terrestrial animals, having developed a shelled egg which contained an aquatic environment and could be laid on land, away from those predators that fed on amphibious eggs. Like fish, reptiles developed a backbone and scales, but, like their amphibious cousins, they were able to live on dry land, breathing with lungs rather than gills, and with time, these vertebrates would eventually give rise to birds and mammals.

From these beginnings some 300 million years ago, they have evolved into an amazing collection of critters ranging from snakes as long as a bus, lizards with tongues as long as their bodies, and turtles that weigh as much as a large horse. But, don't worry, none of these examples are found locally.

These cold-blooded animals are adept at maintaining their body temperature at a fairly constant level despite having to derive its heat from the surrounding air temperature. This is done by moving from sun to shade, below to above ground, or from land to water. In fact, the Western fence lizard can often maintain its body temperature at about the same level as people, merely by changing locations. The class of reptiles can further be divided into the following orders:

- ✓ The **turtles**, or *Testudines*, have a shell into which they can withdraw their head and limbs for protection.
- ✓ The **lizards** and **snakes**, in the order *Squamata*, can be differentiated by the fact that lizards have eyelids, external ear openings, and usually legs, whereas snakes do not.
- ✓ Within the order *Crocodylia* are the **crocodiles** and **alligators**, which are left-overs from those ancient archosaurs. These same animals also gave rise to dinosaurs.

Far Side Gary Larson



“The picture's pretty bleak, gentlemen. ... The world's climates are changing, the mammals are taking over, and we all have a brain about the size of a walnut.”

- ✓ The **tuatara**, of the order *Rhynchocephalia*, is native to New Zealand and is almost identical to some long-extinct, 200-million-year-old fossils.

Of the 6,000 species of reptiles that can be found world wide, we will focus on just those local representatives: the turtles, lizards, and snakes.

**Turtles – (The Order Testudines)** - They're know as having a slow and leisurely pace, which is accurate enough in describing the tortoise. However, the water turtles are capable of astonishing speed. Nevertheless, the slow and ponderous nature of the tortoise is how the order's evolution has unfolded, plodding their way to the present with very little change to their anatomy. One of the turtle's most obvious adaptations that has evolved through this long evolution has been the shell, which actually contains the vertebrae and ribs. It is made up of three parts:

- ✓ the **carapace** covers the back and is blanketed with either horny plates or a tough, leathery skin,
- ✓ the **plastron** covers part or all of the belly,
- ✓ and the **bridge** connects the two.

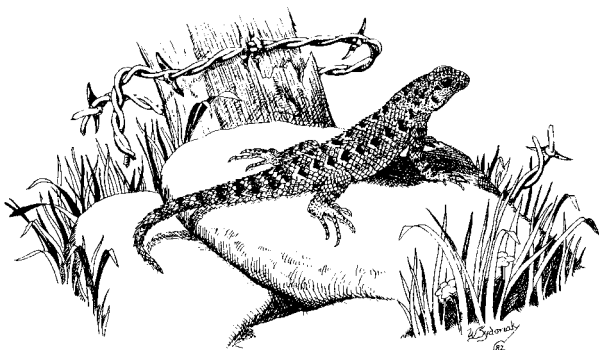
The 257 species of turtles found world wide eat anything from insects and fish, to mushrooms and other plants. They do this without the use of teeth, but use a horny beak assisted by their feet instead. They have lungs, although some aquatic turtles are able to survive under water, absorbing oxygen through their skin and throat linings.

The only fresh-water turtle native to our area is the **Western pond turtle**, or *Clemmys marmorata*. They are difficult to locate because of their reclusive nature, tending to hang out in quiet, tule-infested, marshes, streams, or ponds, feeding on aquatic plants and insects. They are adapted to the seasonal nature of coastal streams and will move as necessary to find water. Here at Quail Hollow Ranch, they can occasionally be seen basking on logs or shorelines within close proximity to water, escaping to its watery depths at the first sign of voices or steps.

### **Lizards – (The Sub-order Sauria) -**

Most of us have a clear idea in mind when lizards are mentioned: a scaly, tailed creature scurrying about on four legs. However they are extremely varied with some gliding from tree to tree, running on hind legs, or slithering legless as snakes do. They can be terrestrial, burrowing, aquatic, arboreal, or aerial and vary in color, shape, and size, but all retaining those eyelids and external ear openings.

Their survival strategies are as varied as their locomotion: some freeze and wait for the danger to go away, others run and hide at the first sign of danger, some will act tough but scramble out of sight in the end, while still others will stand their ground and fight. In addition, their tails are sometimes used to aid in escape – detaching at a fracture joint to wiggle and twitch, capturing the predator's attention, while the lizard makes its get-away.



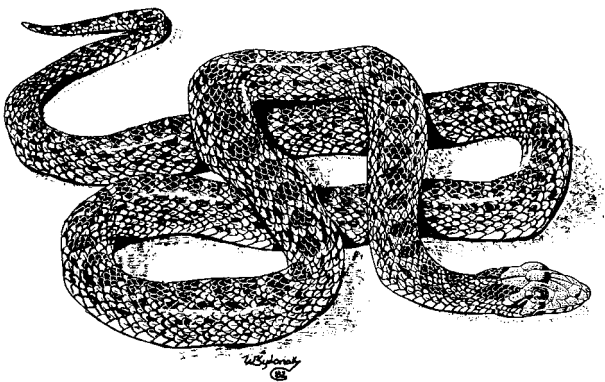
Their food consists of anything that they can catch and swallow including fruit, flowers, leaves, insects, spiders, worms, small mammals, and even other reptiles. Their well-developed tongue aids in capturing their prey, as well as smelling, and scaring their enemies.

Walking along the warmer trails of the park, you might come upon one of the local lizards like the **Western fence lizard**, or *Sceloporus occidentalis*, sometimes called a “blue-belly”. The males are territorial and defend their claim by giving a warning signal that resembles push-ups, flashing the blue coloring on their flanks which have been inflated and angled toward the intruder. This threatening male behavior is so common that he will also threaten a prospective mate. Usually, her response is to hold her ground and eventually he catches on and changes his tactics.

Contrast this behavior with that of the **coast horned lizard**, or *Phrynosoma coronatum*, which relies on camouflage and its sharp spines for protection. Many a hiker have nearly stepped on this lizard as its shaded markings on its back blend in with irregular backgrounds.

Unlike some of its cold-blooded relatives, the **alligator lizard**, or *Elgaria sp.*, is able to remain active in cooler temperatures which gives it an advantage hunting especially on overcast days. As the name suggests, it resembles an alligator, however tends to avoid its namesake’s watery habitat. This lizard is able to do some pretty tricky gymnastic maneuvers with its tail. You might not want to try suspending it by its tail, because it can draw itself up to bite your fingers by tail movements alone. Also it has been observed surviving a snake attack by grabbing its tail in its mouth, becoming too large for the snake to consume.

The **Western skink**, or *Eumeces skiltonianus*, is an agile, slim lizard with bright blue tail designed for several possible reasons. One reason may be to draw a predator’s attention away from the more vital areas of the body. The tail will disconnect when the animal is alarmed to violently wriggle, flashing the blue color in distraction while the skink escapes. This behavior is probably used as an escape mechanism against their predators like jays and crows.



**Snakes** – (The Sub-order Serpentes) - Many people don’t like snakes. They’re seen as slimy creatures that coldly stare, unblinking, as they slither around, no doubt trying to catch you off guard. To call someone a “snake” is to call them sneaky, creepy, and somehow evil. This could not be further from the truth.

What many identify as “slimy” is, in reality, cool to the touch, with the cold-blooded frogs and salamanders being much more slimy than snakes. The unnerving stare occurs because snakes have no moveable eyelids, their eyes protected by a clear scale that is shed when

the skin is shed. And where the “evil” connotation came from is unknown – perhaps derived from the numerous differences from us: having no arms or legs, no eyelids, no external ear opening, no bladders, and only one lung instead of a pair.

Their long, slender bodies have the ability to twist and contort into knots due to their very flexible spine made up of 100 to 400 vertebrae, with two, thin ribs attached to each. Their legless bodies are able to move either by a series of S-shaped curves, called **lateral undulation**, pushing off plants, rocks, sticks, or other irregularities; through the overlapping belly-scales, or **scutes**, on their undersides, called **rectilinear movement**; or through a combination of both.

Spend a little time watching a snake and you’ll eventually notice their tongue flicking in and out of their mouth. They’re not trying to send you a haughty message of annoyance, but rather using this sense organ to smell. Their excellent sense of smell is accomplished through the use of their forked tongue and their **Jacobson’s organ**, located on the roof of the mouth. The tongue collects particles floating in the air and deposits them in the Jacobson’s organ which acts in a similar capacity as the lining of our

nose, sending messages to the brain identifying the scent.

Their ability to see close-up is fairly good. Their sense of hearing is done more through low-frequency sounds and vibrations, so they can feel your footsteps approaching long before you may appear. In addition, they have a **heat sensor**, located in the side of their face or on their lips, that give them the ability to detect slight differences in the heat that an animal may give off. They not only can tell the direction of an animal, but its distance too, giving them a predatory edge especially when hunting at night.

Snakes can do quite well eating only a few times per year. The reason for this is because:

- ✓ they are cold-blooded – periodically living with a slow metabolism, and
- ✓ they eat large quantities at one sitting – consuming their prey whole.

Their hunting strategies are varied, using venom to poison their prey, as in the case of rattlesnakes; jaws and curved teeth to keep a hold of their struggling prey – garter snakes being an example; or by constriction, squeezing their prey to death, like gopher snakes do. Once they have captured their food, they use an incredible collection of “mouth machinery” for accomplishing the gulping of their food in one swallow. This comes in the form of elastic muscles and ligaments between the jaw bones that allow the jaw bones to dislocate and stretch apart to accommodate the entire body of their prey.

Here at Quail Hollow, there are several different families of snakes including the boas and pythons, or the family *Boidae*. The local member is the **rubber boa**, or *Charina bottae*, which is sometimes called the “two-headed “ snake because it has a blunt tail that resembles the head. This tail comes in handy when attackers mistake it for the head, giving this rubber-looking boa an advantage in escaping. In addition, when it is feeding on nesting mice, the parent mouse often strikes its elevated tail, thinking that it is the head. This effectively keeps mom busy while giving the snake the opportunity to feed on the unprotected young.

The garter snakes, in the genus *Thamnophis*, get their name from resembling old-fashioned garters. The local members include the following:

- ✓ The **common garter snake**, or *Thamnophis sirtalis*, will not bite when captured, but will discharge a foul smelling musk. The California red-sided garter and the endangered San Francisco garter are sub-species of this group.
- ✓ The **Western terrestrial garter snake**, or *Thamnophis elegans*, is found in a similar habitat as the common garter but has a more varied diet. They usually escape under brush rather than into water.
- ✓ The **Western aquatic garter**, or *Thamnophis sp*, inhabits areas near rivers, streams, and marshes, escaping there when threatened. It is diurnal, or remaining active during the day.

Within the *Viperidae* family is the **Western rattlesnake**, or *Crotalus viridis*. They are seen in chaparral areas during warmer times of the year, and less commonly in forests. They are fairly passive and will prefer to leave a threatening situation if there is an opportunity. For this reason it is important to allow them that opportunity to escape when you meet one as they are venomous and will bite if there is no other way out.

About 75% of Western snakes are found in the family *Colubridae*, and include several of our local species:

- ✓ The **ringneck**, or *Diadophis punctatus*, is a small, earthworm-sized snake with bright red or orange undersides. The bright coloring is characteristic of poisonous species, causing birds to become violently ill after consuming one. Flashing this bright coloration warns those birds who have already learned this lesson.
- ✓ The slim **racer**, or *Coluber constrictor*, often hangs out in open, grassy habitats near rocks, logs, and other basking sites where you would tend to find lizards – one of their food sources. However, they prefer those habitats that are not extremely dry, but semiarid or moist.
- ✓ Often confused with the rattlesnake, the **gopher snake**, or *Pituophis catenifer*, will often mimic the rattler, hissing loudly, flattening their head, and shaking their tail. However they are not venomous, constricting their prey instead.
- ✓ The broad bands of reddish-chocolate and white are characteristic of the **common kingsnake**, or *Lampropeltis getulus*. This usually gentle snake will eat a variety of prey including other snakes like rattlesnakes. If bothered it may roll into a ball with its head at the center and evert the lining of its vent. This is an effective method of protection: becoming a brown-and-white ball, emitting a flood of urine.
- ✓ The beautiful **California mountain kingsnake**, or *Lampropeltis zonata*, has black, white and red cross-bands and often is confused with the deadly coral snake which does not exist here. One way to remember the difference between the two is through the rhyme:

“Red on yellow, a dangerous fellow,  
Red on black, your friend Jack.”

Within the realms of evolution, the reptiles are an important class of vertebrates. From those pre-historic, dinosaur beginnings, there evolved two other classes of animals that would trade in their cold-blooded tendencies for warm-blooded energy. The mammals would evolve fur in place of scales, where birds would develop feathers instead. Yet both the mammals and birds would not be what they are today without standing on the shoulders of the first, truly-terrestrial animals: the reptiles.

## The Bird Class

It's hard to believe that the tiny, darting hummingbird that gracefully hovers by a flower before flitting off, can be related to the bald, gawky turkey vulture that vomits in defense to startle its enemy. Yet both of these, as well as an abundance of other birds, are part of the class *Aves*.

About 160 million years ago, this branch of reptiles evolved into a completely different animal, keeping some of the reptilian features like laying eggs, similarities in skull and ear bones, and scales covering parts of their bodies. However, their differences led to a specialized way of life, namely that of becoming a flying machine, which means that even though there is a variety of different shapes, sizes and adaptation of birds, there is still a structural and functional uniformity to them.

What do all birds have in common? One of their foolproof identification tags is the presence of feathers which originally evolved from scales. Feathers range from the fluffy **down**, which helps keep the bird warm, to the strong but lightweight **contour feathers**, which helps streamline the animal, giving it that smooth, sleek look. Feathers act a lot like our own hair – growing from a follicle, protecting the sensitive skin, and insulating them.





In addition to feathers, all birds have wings that have been modified from forelimbs – even in the flightless penguins or ostriches. Different shaped wings are adapted for different purposes. For example, the short, broad wings of owls and songbirds are designed for flying in and out of vegetation; while the long, broad wings of hawks and vultures help in soaring; and the falcons and swifts have long pointed wings designed for speed. Their bones also have been modified, becoming hollow and at times fused, to allow for light weight and strength, both which are necessary for flight.

Bird's senses rely heavily on vision, with the red-tailed hawk, for example, having eyesight 80 times better than our own. Some have **monocular vision**, meaning that they can see two different images at the same time, focusing independently of each other, and giving a wider field of vision. Others, like owls, have **binocular vision**, with their eyes facing the same direction, allowing them to judge distance better. However, they cannot move their eyes in their sockets like we can, forcing them to cock their heads around in that twittery frenzy of motion that is so characteristic of birds.

They have a keen sense of hearing, with holes on each side of the head, behind the eyes, leading to the middle and inner ear. You will have a difficult time in locating these openings, however, because they are usually covered with feathers. Their sense of smell, on the other hand, is poor, forcing them to rely more on the other senses for survival.

Depending on the type of food they eat, birds have a colorful and assorted collection of beaks, used mostly for gathering food and water, but also for preening, scratching, attacking enemies, caressing mates, building nests, and feeding young. They range from the hooked bills of the hawk designed for tearing meat, to the chisel-shape of the woodpecker for drilling holes, to the delicate, nectar-slurping bill of the hummingbird, and more.

Once food is swallowed, it enters the **crop** which stores food until the stomach is ready for it. The presence of a crop allows birds to gorge on food while it is available, digesting it later. When it enters the stomach, strong digestive enzymes dissolve it, after which it enters the **gizzard**. This is a specialized muscular part of the stomach that acts like teeth, grinding and crushing the hard-to-digest food, making it available to be digested.

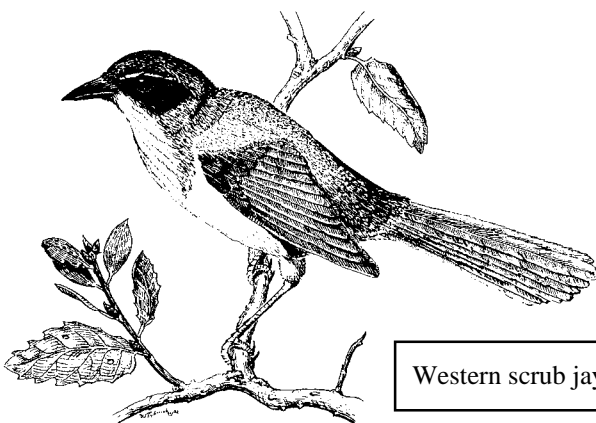
Cleveland P. Hickman Sr., in his book *Integrated Principles of Zoology*, commented about the bird's evolutionary development: "Birds share with mammals the highest organ system development in the animal kingdom. But a bird's entire anatomy is designed around flight and its perfection. An airborne life for a large vertebrate is a highly demanding evolutionary challenge. A bird, must, of course, have wings for support and propulsion. Bones must be light and hollow yet serve as a rigid airframe. The respiratory system must be incredibly efficient to meet the intense metabolic demands of flight and serve also as a thermoregulatory device to maintain a constant body temperature. A bird must have a rapid and efficient digestion to process an energy-rich diet, it must have a high metabolic rate, and it must have a high-pressure circulatory system. Above all, birds must have a finely tuned nervous system and acute senses, especially superb vision, to handle the complex problems of headfirst, high-velocity flight over the landscape."

Given the fact that birds fly, and that in order to accomplish this feat they require certain adaptations, it is amazing that they have been able to diversify into an incredible collection of songbirds, raptors, hummers, tweeters, honkers, swimmers, runners, flappers, and soarers.

## **Bird Identification** - (Adapted from *Nature Briefs*)

“More than 800 species of birds breed in North America, or visit the continent regularly, or drop in occasionally” begins National Geographic Society’s *Birds of North America*. At first, this may seem intimidating, but birding can be an enjoyable, exciting and life-long hobby. Here are some important tips to use as a beginning birder:

- ✓ Go out with experienced birders – befriend them and drag them to the area in which you have an interest in order to pick their brain.
- ✓ It is very helpful to learn the vocalizations of the most common birds of the area in which you are focusing. You may never see the birds that are most commonly asked about by visitors, only hear them, especially in the redwoods.
- ✓ Learn one bird at a time. Don’t let the first attempts to mentally organize the birds’ characteristics baffle you. Everything takes time.
- ✓ Keep a notebook and write down clues the bird gives you. There are many people who can help you identify it after the fact, but you must provide them with good information. Write down everything that you notice: where you heard or saw the bird, the type of voice or song, and its physical appearance. Then look up in your field guides and consult established birders.
- ✓ Someone on your nature walk may be a birder. Sometimes it is obvious from the binoculars around the neck and a “life-list” hanging out of their pocket, but most of the time it isn’t. Take advantage of these people. I have learned at least 50 percent of my bird knowledge from park visitors. Birding is a hobby (or to some an obsession) that can be a life-long interest. Birders take it seriously, and usually love to share their knowledge with you. Remember, if you don’t know the bird, just admit it, and ask if anyone else does.
- ✓ Don’t forget to take the time to enjoy the antics, activity, and lessons that they offer during your brief encounters with them.



### **A Few of the Quail Hollow Birds**

Those early morning risers, who visit the park upon first opening, are rewarded for their endeavors. As they get out of their car, the first thing they hear is the wide variety of “cheeps”, “caws”, “coos”, “screeches” and “honks” that sound like an avian orchestra warming up. Then out come the binoculars as they hunt down the source of all that racket.

The *Quail Hollow Ranch Bird List* includes a collection of 118 species that have been found in the park. Some of them are elusive, causing even the most experienced birders to stop and take notice.

Others are common, advertising their presence from the moment you arrive. One of the birds from the latter group is the loud, boisterous **Western scrub jay**, or *Aphelocoma coerulescens*, and its dark-crested cousin, the **Steller’s jay**, or *Cyanocitta stelleri*. These are aggressive birds who are opportunists when it comes to feeding – occasionally inviting themselves to your picnic. But their beautiful, blue coat of feathers make them a handsome guest.

You may have noticed the large ponderosa pine next to the ranch house that is riddled with holes, some of them filled with acorns – depending on the time of year that you are looking. That pine is a granary for the **acorn woodpecker**, or *Melanerpes formicivorus*. This clown-faced bird, with bright red cap, powerful, pointed bill, and black chin and wings have been known to store just a few hundred acorns for the season, consuming most all of them instead of leaving some behind as other acorn-collectors do. Often a “family” of Acorn Woodpeckers will harvest a crop of acorns together, collectively defending the granary and munching on this tasty, nutritious meal when it suits them.

Occasionally you may see a simple, brown bird about the size of a robin pecking at seeds along dirt trail edges or under thick coyote brush. This is the **California towhee**, or *Pipilo fuscus*. They have an **anisodactyl toe formation**, meaning that their toes are arranged with three in front and one in back, which is ideal for scratching along the ground, only leaping to flight when they are threatened or ready to move to another spot.

As you hike the park trails, there are times when the brush along the sides become alive with bird activity. Upon closer inspection you might notice a sparrow with white and black alternating stripes on its head, yellow or orange beak, whitish throat, and grey underparts, which is the **white-crowned sparrow**, or *Zonotrichia albicollis*. Their elliptical wings are designed for maneuverability in dense undergrowth and allow them the opportunity to easily go back and forth between the ground and shrubs.

The **American kestrel**, or *Falco sparverius*, is one of the birds of prey that inhabit the park. They are known to hunt by hovering over their prey, descending upon them by surprise, using their sharp talons and hooked beak to tear its flesh. These fierce falcons have been observed ardently defending their territory or nesting sites, including chasing off larger, more powerful birds like red-tailed hawks.

One of the smallest birds in the area, as well as one of the most easily spooked, is the **Anna’s hummingbird**, or *Calypte anna*. This tiny bird measures only about 4 inches, which is about an inch longer than a stick of gum. Its long, thin beak is well designed for obtaining the nectar of flowers, however, the beak is not what actually slurps up the liquid food. It has a long tongue that can extend twice as long as its beak. If we had a tongue of similar proportions, we would be able to wrap it around our heads nearly twice!

Contrast the smallest bird in the park with one of the largest, and we would be looking at the **great blue heron**, or *Ardea herodias*. This terridactyl-looking bird hangs out at the pond, where it stands on its long, spindly legs and uses its elongated, narrow, spear-like beak for stabbing unwary fish.

These are just a few of the local birds that are waiting for you, as you explore the trails of Quail Hollow Ranch County Park. But remember, patience is required as you wait for them to reveal their hiding places and their secrets. When you take the necessary time, you might find out that the gifts you receive are more than just the identification of a species but an appreciation for the adaptive qualities of our fine-feathered friends.

## **The Mammal Class**

It has been estimated that there are 900,000 species of insects, 20,000 species of fish, 8,600 species of birds, and only 4,500 species of mammals. Yet, despite these small numbers, mammals are the most successful class in the animal kingdom. What other group has mastered the land, sea, air, and underground worlds and has as diverse forms as a whale, porcupine, bat, or giraffe.

But what does a 100-ton whale have in common with the pygmy shrew which is only about four centimeters in length and weighing only a couple of grams? They have the same traits as us:

- ✓ We're vertebrates, having a backbone and braincase that houses a central nervous system that is unlike any other group in its complexity.
- ✓ Like birds, we're **warm-blooded**, meaning that our body temperatures are regulated internally, remaining about the same, despite the air temperature. This allows us to remain active even though the temperature may drop. The down-side of this adaptation is that larger quantities of food are required for survival.
- ✓ The term "mammal" comes from the marvelous **mammary gland**, which produces milk for the young of all members of this class. In addition to the mammary gland, some mammals have other skin glands that produce oil to lubricate hair and skin, sweat to cool the body, and/or scents used in communication – or occasionally for defense as in skunks.
- ✓ Hair is another characteristic that only mammals have, although some species like dolphins or some whales have none. This hair can range from thick **fur** designed for maintaining body heat, to sensory hairs called **whiskers**, or **vibrissae**.
- ✓ We have a very efficient metabolism, with blood cells that can transport more oxygen than any other type of animal, allowing us to remain more active than non-mammals.
- ✓ No other class of animals has a **diaphragm**, which is a muscle that expands the chest cavity as we breathe, making for a very efficient respiratory system.
- ✓ Most mammals have teeth which differ depending on the diet of each species. They can include **incisors**, or front teeth which snip and cut material; **canines**, designed for tearing; and **molars** and **premolars** which grind up or crush material.

Most mammals are different from humans in that they place a great emphasis on senses like smell and hearing. Their noses help them to find food, a mate, their enemies, or even a place to live, as well as assisting in communication – think of a dog and how it marks its territory with urine. In addition, an external ear opening helps funnel sound waves into the middle and inner ear, allowing for an exceptional sense of hearing.

The primates, including monkeys, apes, and humans, hold the record for the best vision of the mammal class, with only some birds being able to beat them. Many nocturnal mammals have a reflective layer in their eyes that assist in night vision – pointing the light toward the retina so they can see better. That is why cat's or raccoon's eyes shine at night when you point a flashlight at them.

Most insects, fish, amphibians, and reptiles are born in large numbers and having to defend themselves right away. Not so for the birds and mammals. They have only a few young at a time and pour a lot of time and energy into assuring their survival. When it comes to family life, mammals can be divided into three categories:

- ✓ **Placental mammals** are those animals whose embryos develop in a womb using the placenta to transport oxygen and nourishment from the mother to the young.

- ✓ **Marsupials** have a very short gestation period – like 12 days or less – after which the honey-  
bee-sized young crawls into its mother’s marsupium, or pouch on her belly, attaches to a nipple,  
and nurses until it is more fully developed.
- ✓ Finally, the **monotremes** are the exceptions to the live-bearing rule. These are the platypuses  
and echidnas who lay flexible, leathery eggs instead of giving birth to live young. Like many  
birds, they incubate the eggs until they hatch.

**Opossums and the Order Marsupialia** - Australia is full of them: kangaroos, koalas, wombats,  
wallabies, and others, but in the United States, the only living, native marsupial is the **common**  
**opossum**, or *Didelphis marsupialis*, although it is not native to the Pacific states. If you have ever heard  
a racket outside of your home at night and caught a glimpse of a cat-sized animal with light fur overlaid  
with guard hairs, long nose, and naked ears and tail, then you’ve been introduced to the opossum.

The term “playing possum” comes from its behavior of pretending to be dead when it is attacked or  
threatened. However, not all opossums play this game. According to Leonard Lee Rue in his book on  
game animals, “When scared, they fall on their sides, their mouths gape open and they become  
completely limp. If picked up and shaken, they flap around like a rag doll. Yet of the thousands of  
opossums that I have encountered and personally handled, not more than 50 reacted in this manner. The  
majority of opossums dash for safety, dodging down a hole in the earth or scrambling up a nearby tree.  
Those that cannot escape turn to face their attacker with their large mouths open and emitting strings of  
saliva.”

One of the reasons why there seem to be so many opossum is because they have the ability to reproduce  
twice per season and can have as many as 13 young, although most litters range from five to ten. At  
birth they are about one centimeter in length and weigh about 0.4 grams. After 20 days, the young’s  
weight balloon ten times its birth weight, to about four grams. Ninety to one hundred days later, the  
baby opossums are weaned and leave the pouch.

### **Bats – (The Order Chiroptera)**



Bats eat bugs, they don’t eat people  
Bats eat bugs, they don’t fly in your hair  
Bats eat bugs, they eat insects for dinner  
That’s what they’re doin’ up there.

- The Banana Slug String Band, “Bats Eat Bugs”

Most people are misinformed about bats. They think they are blind,  
dirty animals that infest your home with bedbugs, suck your blood, or  
fly in your hair. Although some do contract rabies – less than 0.5  
percent – records show that it is far more likely to be harmed by a pet  
dog than by a bat.

There are nearly 1,000 different species of bats, which make them one  
of the most diverse mammal orders in the world. They can catch fish,  
eat scorpions, swim, crawl, jump, hop, migrate hundreds of miles, and live to be more than 30 years old.

Oh, and they can eat 3,000 insects each night – including mosquitos.

What separates bats from other mammals is their ability to fly. Their wings are modified arms, similar to a human's, with a skin-like covering that is thinner than the thickness of a plastic bag. They also can climb using the claws on their wings and some can swim, using their wings as paddles. In addition they are well known for their ability to hang up-side-down, a feat that is accomplished with the use of hooked claws on their hind legs.

The myth that bats are blind may have come from the fact that many bats use their sense of hearing to obtain information about their surroundings. This system of sending out sound waves and listening for the echo is called **echolocation** and not only tells them where their food is, but also gives them information about where obstacle like branches, wires, and people may be located.

Over the years, bad press and myths have given bats a bad name, even though there are many benefits to having bats around:

- ✓ They control the insect population.
- ✓ They pollinate flowers, many of which turn into fruit that humans enjoy.
- ✓ Their waste, called **guano**, is used for fertilizer.
- ✓ And they have provided valuable research information, including navigational aids for the blind, studies in aging, and speech pathology.

The more that people learn about these benefits, the more they come to appreciate this diverse group of mammals.

**Shrews and Moles** – (**The Order Insectivora**) - There's one thing that insectivores have in common: they're small. Some of them weigh no less than a dime with the larger ones no bigger than a rabbit. They are also nocturnal and somewhat secretive, making them hard to study. If you are lucky enough to see one, you would find it has a pointed nose, tiny eyes, small brain, primitive teeth, and, as the name suggests, it tends to eat insects – although they will eat worms, spiders, fish, frogs, lizards, mice, and carrion too.

If you have ever come upon an aggressive, mouse-like animal with long, pointed nose, tiny eyes usually hidden by fur, clearly visible external ears, and scaly tail, then you've met a member of the **shrew family**, or *Soricidae* family. They locate their food via a keen sense of smell and hearing. Their high metabolic rate is important for keeping their tiny body warm and therefore requires feeding around the clock. Captive shrews have been known to die of starvation if deprived of food for only a few hours.

Locally, the **Trowbridge's shrew**, or *Sorex trowbridgei*, can be found in the Santa Cruz Mountains. Robert Piwarski, et al. in their book *Animals of the Santa Cruz Mountains* stated that "Trowbridge's shrews are proof that life in the fast lane is short-lived." They grow rapidly from the size of a honey bee at birth, spend much of their time eating or sleeping, giving birth two or three times in rapid succession, and seldom live more than 18 months. Generally there is a new generation every year.

When I mention the word "**mole**", usually what comes to mind is a burrowing animal that is rarely seen above ground, and indeed this insectivore is well equipped for subterranean life. It has powerful hands that seem to be attached directly to the shoulders and are well designed for digging. Their thick fur lies

flat against their body which is tapered at each end, allowing for easy tunneling. As they tunnel, they “swim” through the earth, twisting their bodies forward and pushing the dirt away and to the sides with their hands and feet. Moles have no use for vision, relying on their sensitive whiskers, nose, tail, and sense of touch to locate their food, escape from harm, and even to feel sound vibrations in the earth. They can easily run either forward or backward if necessary. The local example of this group is the **broad-footed** or **broad-handed mole**, or *Scapanus latimanus*.

**Rodents – (The Order Rodentia)** - Some can be as small as a 0.2-ounce harvest mouse or as large as the 150-pound capybara and live anywhere from the wet and humid tropics, to the scorching hot desert,



to the icy tundra. The 1,500 species of rodents comprise the largest order of runners, hoppers, gliders, swimmers, and burrowers in the mammal class. Their chisel-shaped incisors are an important adaptation that all members of the *Rodentia* order have in common. They are designed for gnawing through nuts, tree bark, hard-pack soil, or anything else that needs piercing. In fact, even when the animal is not hungry, making a home, or burrowing through soil, they still gnaw and chew on whatever handy surface is available. This is because these specialized teeth never stop growing and therefore never wear out, but also require constant trimming or they will grow into the animal’s skull.

Because rodents spend a lot of time gnawing, they have developed specialized jaw muscles for this purpose. In fact, this order is sometimes divided into three categories depending on how these jaw muscles are arranged:

- ✓ The squirrel-like rodents, which include the squirrels, pocket gophers, beavers, and others
- ✓ The mouse-like rodents like mice, rats, gerbils, etc.
- ✓ And the porcupine-like rodents including porcupines, guinea pigs, and others.

Depending on the amount of available food, many rodents have the ability to produce a sizeable population. For example, the Norway lemming has the capacity to bear a litter of seven every three to four weeks for their entire adult life. It is for this reason that they hold such an important and popular niche as prey in the web of life.

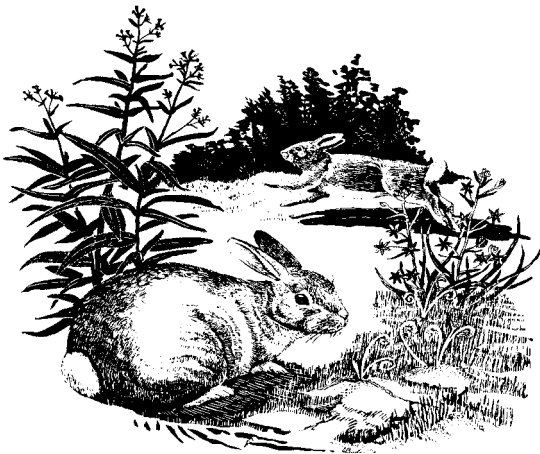
Here at Quail Hollow Ranch, there are several different members of this large order including the **Merriam Chipmunk**, or *Eutamias merriami*. The tell-tale stripes, swishing tail, and scolding chirp are the characteristics that indicate at which species you are looking. This busy herbivore spends much of its time collecting seeds and nuts in its internal cheek pouch, which expands until it cannot hold any more, at which time it digs a cache hiding its food under a thin layer of soil and leaves.

The **Western gray squirrel**, or *Sciurus griseus*, on the other hand, is a member of the tree squirrels, their markings having no stripes or spots, and the lack of a cheek pouch differentiating it from the chipmunks. The Western gray squirrel is an acorn and nut consumer, spending much time on the ground burying their food in three-inch-deep holes for use later. Local trees benefit from this practice when the squirrels forget where they may have buried their stash.

Gardeners do not like them, despite the fact that they aerate the soil with their split-level burrows. The **pocket gopher**, or *Thomomys bottae*, have adapted well to life underground, developing small eyes and ears, pockets to the side of the mouth for transporting materials and food, long claws for digging, and lips that close behind the teeth to prevent dirt from entering the mouth. These solitary animals spend much of their time expanding its intricate maze of burrows and antechambers, pulling roots and stems down through the soil, evicting intruding gophers, and raising their young – which they can produce up to 11 in number, and up to three times per season. Is it any wonder that they are a common food source for snakes who enter their holes to capture them, for coyotes who dig them out, and any other predator who finds them pushing a chest full of soil to the surface.

You can look for them, but you probably won't easily see these nocturnal rodents who have made the oak their ideal plant. In fact, the live oak is so closely linked to the **dusky-footed woodrat**, or *Neotoma fuscipes*, that where you find signs of this animal, a live oak will not be far away. Oak leaves and acorns are an important part of their diet with some individuals storing away as much as 20 pounds of these fat-producing seeds. You know you're in a woodrat neighborhood when you find its large home constructed of sticks, leaves, litter, and other handy material. Inside, they contain several chambers used as bedrooms, bathrooms, and pantries. Successive generations of woodrats may utilize the same lodge for as many as 20 years or more, with each new resident adding to the structure until it may reach a height of 6 feet. The woodrat's proximity to and preference for the live oak make it a true oak tree homebody.

**Hares and Rabbits** – (The Order Lagomorpha, Family Leporidae) Some of the give-away characteristics for those animals in the *Leporidae* family, or the family of hares and rabbits, are ears that are at least twice as long as they are wide, and tails that are short and fluffy. They also move by hopping or running and eat grasses, stems, and bark. So what are the differences?



- **Hares** will wonder further out in open areas and rely on speed, running in a zig-zag pattern to escape their enemies. In addition, their young are **precocial**, meaning that they are born ready to run and move about.
- § **Rabbits** move more slowly than hares and therefore hide in their nearby burrows when threatened. Their young are **altricial**, or born hairless, helpless, and blind.

One of the local rabbits that you may see wondering the trails, is the **brush rabbit**, or *Sylvilagus bachmani*. They have shorter ears and legs as compared to their hare cousins, and tend to prefer dense thickets where they create runways through the undergrowth. Their breeding season is January through June when they can have as many as three litters comprised of two to six young. Her nest is made of fur that she pulls from her own chest which she also covers over her young when she must leave to find food. Only five percent of their young will survive the first year.

Another rabbit that may be found in the park and that can be confused with the bush rabbit, is the **Audubon cottontail**, or *Sylvilagus audubonii*. This rabbit is larger, and has the hairs on its underparts tipped with white, and ears that are tipped with a darker color. The litter size can range from one to five, and it is possible for the mother to nurse her young once in 30 hours or more, although more often they



will nurse 3 to 4 times per night. It is interesting to note that once a mother gives birth to her young, she will hide her newborn and seek a mate to begin the process anew. Within about an hour she is reinpregnated and will return her interest to her young.

One of our local hares is the **black-tailed hare**, or *Lepus californicus*, sometimes referred to as a jackrabbit. The term “jackrabbit” is short for “jackass rabbit” which hints at the long ears – used, in part, as a cooling device through a system of veins that release heat. However, it is not a rabbit at all, but a hare, with adaptations to enable it to survive out in the open. Large eyes for a broad field of vision, long ears for hearing, and long hind legs for jumping as much as twenty feet and sprinting up to 35 miles per hour are typical for hares – as are precocial young.

**Deer** – (The Order Artiodactyla, Family Cervidae) - “Shhh. Look, a deer.” When we notice these shy, nervous animals, the natural tendency is to be quiet and still to keep them from running away. We have learned that they are adapted to locate possible danger and to escape at the first inkling. Indeed, many millenniums of natural selection have lead to many of the **ungulates**, or hoofed animals, to bolt at high speeds when spooked.

The members of the order Artiodactyla are herbivorous ungulates with generally two toes and many having horns. They all have a four-chambered stomach and often are **ruminants**, or animals that chew their cud, giving them the ability to graze continuously and then retire, away from predators or from the heat of the day to re-digest their meals.



Within the park, one can often see **black-tailed deer**, or *Odocoileus hemionus columbianus*, making their way through the seasons. Young fawns are born in spring and early summer with no scent and a coat of spots, which provide them with good camouflage for the first three to four months of life. Many deer spend most of their lives in the same area where they were born, browsing. Males have branched antlers which they shed annually. When new antlers sprout, they are covered with velvet which is supplied by a series of nerves and blood vessels, providing the antlers with food and oxygen as they grow. Eventually the velvet is shed and polished in time to fight other males at the beginning of the breeding season. Females gather in harems and are bred, with gestation lasting from 195 to

212 days – giving birth in the spring again, and thus completing the cycle.

A relative of the black-tailed deer is the **mule deer**. They both share the same scientific name but the mule deer is larger in size. Its tail is white with a two inch black tip as opposed to the black tailed deer’s dark top with white undersides.

**Carnivores** – (The Order Carnivora) - The reaction of most people when they see a puppy dog or kitty cat is to comment on its adorable qualities – being cute, warm, and fuzzy – and indeed, the domestic members of this order have adapted well to the human world. However, most of these strong and intelligent animals are wonderfully designed for hunting, stalking, capturing, and devouring their prey. They are divided into two sub-orders:

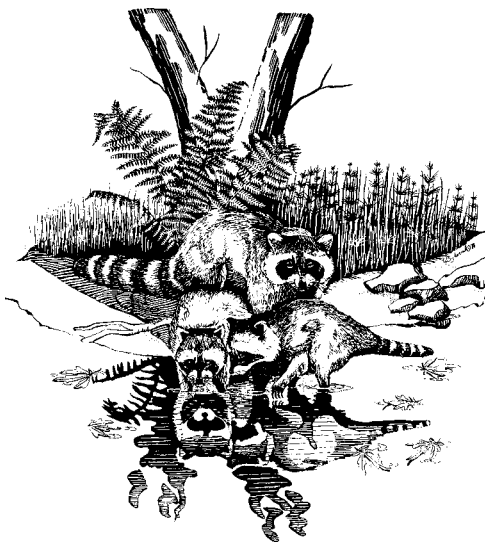
- ✓ The **pinnipeds**, whose limbs are modified for aquatic life and include seals, sea lions, elephant seals, and walruses.
- ✓ And the **fissipeds**, whose feet contain toes and include the terrestrial wolves, tigers, dogs, cats, foxes, weasels, skunks, and raccoons, among others.

Watching our pet dog or cat “play,” as they pounce, run, and tumble around the yard may seem endearing, but it serves a practical use too. Young puppies and kittens are learning coordination and hunting skills as they grow into adulthood. In the wild, these predators have a variety of hunting techniques ranging from the mountain lion that stalks its prey alone, to the pack of wolves that gather in groups to take down a prey that is much larger. They hold an important niche in the web of life: controlling the populations of the animals on which they feed, focusing their energies on the young, old, and sick, because healthy, mature individuals can easily out run, hide, or defend themselves.

How do they survive being kicked with hooves, poked with antlers, or left behind in the dust? They make it by having a collection of adaptations that overcome these problems, like their sense of smell which is about 100 times more sensitive than humans. Their noses help locate their prey as well as communicate with each other, identify territorial boundaries, and tell when a female is ready to mate. In addition, their keen hearing is aided by an external ear flap that funnels sound waves into the ear opening, and they have binocular vision giving them a good depth of field.

Claws also help in capturing their prey, digging dens and burrows, climbing trees, holding their prey, and digging for food. Some of them, like the cats, have **retractable claws**, which means that their claws can be extended or hidden within a sheath. Others, like coyotes, have **non-retractable claws**, or claws that are always present.

Their specialized teeth are adapted for their meat-eating life style, with most of them having long, sharp **canine teeth** for stabbing and killing their prey. Behind these dagger-like teeth are another type of teeth called **carnassials**, which act like scissors, cutting up their meat. There are, however, some members of this order that are omnivorous, like bear or raccoon, whose carnassials are more blunt and who tend to have large rear molars for grinding their food.



We have several members of this order that make Quail Hollow Ranch their home including species in the canine, feline, mustelid, and procyonid families. The local “masked, midnight marauder” is a familiar sight, especially around campgrounds or any other place that offers a free meal. The **raccoon**, or *Procyon lotor*, is a member of the **Procyonidae family**, and is the most omnivorous native carnivore in the area, feeding on anything from crayfish, small mammals, insects, eggs, acorns, watermelons, and grapes, to dog food, ice chest contents, or fresh compost-pile additions. Their territory usually contains a water source of some sort, as they like to wash and handle their food before eating it. In fact, these curious animals enjoy handling pretty much anything with their sensitive dexterous hands. Many people do not appreciate the mess that these opportunists sometimes leave in their wake. However, we have to applaud their adaptability to human encroachment.

The members of the **Mustelidae family**, or skunks and weasels, have short legs with five toes on each foot, also sporting highly developed scent glands, and some members having very valuable fur. One of the members of this family is the **long-tailed weasel**, or *Mustela frenata*. These fierce fighters kill rodents, rabbits, and birds by biting through the base of the skull. They will consume a daily diet totaling 40 percent of their body weight, and in return, they become prey to owls and other birds of prey. One of their worst enemies, however, can be another long-tailed weasel. When the population gets too high, fatal territorial battles can erupt, acting as a built in population control.

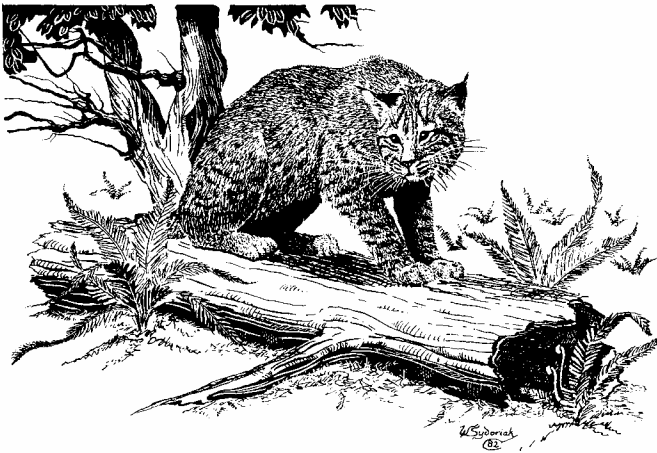
Most people are infinitely aware of the protective adaptation utilized by *Mephitis mephitis*, or the **striped skunk**. Its scent glands, located at the base of the tail, are controlled voluntarily. However, when provoked they will discharge tiny, yellow droplets up to 25 feet. These nocturnal, shy omnivores usually can be found within its 40 acre territory, but can wander up to ten miles, searching for food.

The foxes, coyotes, wolves, and dogs are a part of the **Canidae family**, all having long legs for running, non-retractable claws, bushy tails, and able to walk on their toes. The **coyote**, or *Canis latrans*, is one of the larger members of this family and has tracks that closely resemble a domestic dog. They travel only far enough to find food – sometimes only a two to three mile radius when food is abundant. At other times its range increases up to 100 miles in its search. They den in natural crevices and caves, occasionally enlarging burrows made by smaller animals like ground squirrels. The only important enemy of the coyote is the human, even though they have been able to adapt well to human encroachment.

Leonard Lee Rue in his book, *Game Animals*, commented on the coyote's intelligence: "Coyotes frequently team up when hunting and one pair will drive a jackrabbit into the waiting jaws of the other... The coyote often travels with the badger and when the latter discovers the burrow of a ground squirrel and starts to dig it out, the coyote takes a stand at another exit. If the squirrel panics and tries to escape from the badger, it is often killed by the coyote... The badger doesn't benefit from this arrangement, for the coyote doesn't share its catch, but when two coyotes work together both animals eat the prey... Another measure of the animal's intelligence is its fondness for play. Coyotes frequently have been seen engaging in play with each other as well as with other animals and birds."

A much smaller canine is the **gray fox**, or *Urocyon cinereoargenteus*, weighing in at a whopping 14 pounds. Its steel gray coloration give it its name, adding yellowish red fur along the sides and on the legs, and a dark streak running down its back and tail. This nocturnal omnivore can easily run at speeds up to 28 miles per hour within its 100 acre territory. It also has been known to escape danger by climbing trees, pulling itself up by hooking its paws over reachable branches. Predators in pursuit often lose their fox's scent with this maneuver. Foxes, as well as dogs, have the unique ability to visually detect a person or animal even though they remain motionless. Most other animals require motion to visually detect a presence.

Within the **Felidae family**, one will find cats like tigers, lions, cougars, and lynxes, all having sharp, flesh-cutting teeth and retractable claws. The **bobcat**, or *Felis rufus*, is one of the resident species that most closely resembles the familiar domestic cat. It can meow, purr, hiss, or growl, stalking its prey just like a house cat. The short, stubby tail as well as the larger size – weighing 25 pounds – help separate this nocturnal cat from its domestic cousin. In addition, their success as predators has been attributed to adaptations like the ear tufts which contribute to sharper hearing, the vertical pupil helps their eyes adjust to dim light, and their whiskers are valuable nighttime sensory equipment. These stealthy cats are



solitary by nature, having no detectable social order except for the strong relationship between mother and young.

The bobcat is often mistaken for the shy, nocturnal **mountain lion**, or *felis concolor*, however, the differences are quite apparent when compared side by side. Adults mountain lions weigh up to 275 pounds and range from seven to nine-and-a-half feet in length, including a very long tail that is much smaller than its stubby-tailed cousin. Leonard lee Rue has noted of this

cat that “sometimes its only movement is the lashing back and forth of its tail tip. At times it seems almost as if the tail tip moved independently of the cat’s wishes – and perhaps it does. The lashing of the tail usually denotes fear, anger, or anxiety and is a nervous reaction.”

To actually see a mountain lion is fairly rare because of its nocturnal habits and its tendency to avoid open spaces. Therefore, it is much more likely to discover prints with 4 ½ inch pads reflecting a four foot gait. This sandy-colored lion also can make its presence known with growls and hisses, however these vocalizations are not as memorable as the mating call – a blood-curdling scream. There are 42 different names for this beautiful cat including cougar, panther, and puma and if you add Spanish and indigenous names the number raises to more than 100.

At one time the mountain lion had the largest range of any land mammal in the western hemisphere. Today, due to over hunting they require protection. Protecting these wide-ranged, top-predators also requires protecting their habitat – an act that reaps benefits for other wildlife.

## Conclusion

The animal kingdom has undergone a tremendous evolution from those heterotrophic beginnings, billions of years ago, in which single-celled organisms fed on whatever they could find swimming in that primordial soup. The development of species from early heterotrophs has resulted in a cornucopia of terrestrial beings with niches and adaptations that are as different as banana slugs are from bobcats.

One of the gifts of time – especially geologic time – is to view the unfolding of life as it transforms itself from the simple to the complex. Imagine watching these billions of years of evolution in fast-forward, as aquatic species adapted into terrestrial ones: early fish confined to a world of heavy liquid giving rise to amphibians who could leave their watery lives behind. Amphibians, who were forced to return to the aquatic world to lay eggs, evolving to reptiles, laying eggs with shells containing those same aquatic conditions.

Then, as the tape continues to play in fast motion, the reptile body enfolded into birds, exchanging scales for feathers and the lethargic, cold-blooded metabolism for the powerhouse of twittering energy. The mammals developed in a similar capacity from early reptiles, growing hair instead of feathers from

scales, and a mammary gland to nourish their young who were born live.

Even the human, with its erect posture, opposable thumb, and enlarged brain, has been a part of this unfolding story, developing the unique capacity to manipulate its environment instead of being enslaved to adapting to it – which brings up an interesting question: what’s next? The life force that has been powering this whole process of evolution seems to show no signs of halting. Imagine the wild, colorful creations that could arise from the diverse wildlife that already exists. The possibilities are endless – if the process is allowed to continue.

This is where human intervention enters the story and thickens the plot. What is to happen to life on “spaceship earth” with humans at the helm? The future geologic record could show an age coming to an end in the blink of an eye just as the age of reptiles ended without explanation. It is unlikely that a conscious decision on the part of the dinosaurs to act responsibly in relation to their ecological niche played a hand in that ancient ending. But not so with us humans. We have been given the gift of reason with the evolution of our big brain – a gift that some would say we have used selfishly. We are just waking up to the fact that we are not separate from the life force that powers this whole evolutionary process, we are amerced in it – indeed it is what created us.

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## **Appendix G**

### **Wildlife Species Observed or Predicted to Occur In Quail Hollow Ranch County Park**

(Amended from The Quail Hollow Ranch Environmental Impact Report, 1996  
and the Quail Hollow Ranch bird List, 2003)

#### **Key:**

- O = Wildlife species or their signs observed within the park
- P = Wildlife species predicted or expected to occur within the park
- B = Wildlife species breeding in the park
- A = Accidental sighting of species not to be expected in the park

#### **Amphibians**

Pacific giant salamander	O
Rough-skinned newt	O
California newt	O
Ensatina	O
California slender salamander	O
Arboreal salamander	O
Western toad	O
Pacific tree frog	O
California red-legged frog	O
Bullfrog	O

## Reptiles

Western pond turtle	O
Western fence lizard	O
Coast horned lizard	P
Western skink	O
Western whiptail	O
Southern alligator lizard	O
Northern alligator lizard	P
California legless lizard	P
Rubber boa	O
Ringneck snake	O
Sharp-tailed snake	O
Gopher snake	P
California Mountain King Snake	O
Common kingsnake	O
Common garter snake	P
Western terrestrial garter snake	O
Western aquatic garter snake	O
Western rattlesnake	O

## Birds

Pied-billed grebe	O
Double-crested cormorant	O
American Bittern	O
Great blue heron	O
Great egret	O
Snowy egret	O
Green heron	O
Wood duck	O
Mallard duck	B
Green-winged teal	O
American wigeon	O
Northern pintail	O
Ring-necked duck	O
Common goldeneye	O
Bufflehead	O
Hooded Merganser	O
Ruddy duck	O
Turkey vulture	O
Sharp-shinned hawk	O
Cooper's hawk	O
Red-shouldered hawk	O
Red-tailed hawk	O
Ferruginous hawk	A
Golden eagle	O

Osprey	O
American kestrel	B
Merlin	O
California quail	B
Virginia rail	A
American coot	B
Killdeer	O
Least sandpiper	A
Wilson's Snipe	O
California gull	O
Forster's tern	A
Caspian tern	O
Band-tailed Pigeon	O
Mourning dove	O
Barn owl	P
Great horned owl	B
Western screech owl	O
Northern pygmy owl	O
Northern saw-whet owl	B
Vaux's swift	O
White-throated swift	P
Anna's hummingbird	B
Allen's hummingbird	B
Rufous hummingbird	O
Belted kingfisher	O
Acorn Woodpecker	B
Northern Flicker	O
Red-breasted sapsucker	O
Nuttall's woodpecker	B
Downy woodpecker	B
Hairy woodpecker	B
Western wood pewee	B
Pacific slope flycatcher	B
Black phoebe	B
Say's phoebe	A
Olive-sided flycatcher	O
Ash-throated flycatcher	B
Western kingbird	O
Cassin's vireo	O
Hutton's vireo	B
Warbling vireo	O
Steller's jay	O
Western scrub jay	O
Common raven	O
Violet-green swallow	B
Northern rough-winged swallow	O
Cliff swallow	O



Barn-swallow	B
Wrentit	O
Oak titmouse	B
Chestnut-backed chickadee	B
Bushtit	B
Brown creeper	O
White-breasted nuthatch	O
Red-breasted nuthatch	O
Pygmy nuthatch	B
Bewick's wren	B
Ruby-crowned kinglet	O
Blue-gray gnatcatcher	O
Western bluebird	A
Hermit thrush	O
Swainson's thrush	O
Varied thrush	O
Wood thrush	A
American robin	B
California thrasher	B
European starling	B
Cedar waxwing	O
Yellow-rumped warbler	O
Townsend's warbler	O
Orange-crowned warbler	B
Yellow warbler	O
Black-throated gray warbler	O
Wilson's warbler	O
Yellow-breasted chat	A
Western tanager	O
California towhee	B
Spotted towhee	O
Song sparrow	O
Golden-crowned sparrow	O
White-crowned sparrow	O
Fox sparrow	O
Dark-eyed junco	B
Black-headed grosbeak	O
Lazuli bunting	O
Western meadowlark	O
Red-winged blackbird	B
Tri-colored blackbird	O
Brewer's blackbird	O
Brown-headed cowbird	O
Bullock's oriole	B
Purple finch	O
House finch	B
Red crossbill	O

Pine siskin	O
American goldfinch	O
Lesser goldfinch	B

**Mammals**

Virginia opossum	P
Ornate shrew	P
Broad-footed mole	O
Little brown myotis	P
California myotis	O
Big brown bat	P
Pallid bat	P
Brush rabbit	O
Black-tailed hare	O
Merriam's chipmunk	O
California ground squirrel	O
Western gray squirrel	O
Fox squirrel	O
Botta's pocket gopher	O
California pocket mouse	P
Santa Cruz kangaroo rat	P
Western harvest mouse	P
California mouse	O
Deer mouse	P
Brush mouse	P
Pinyon mouse	O
Dusky-footed woodrat	O
California vole	P
Norway rat	P
House mouse	P
Coyote	O
Red fox	P
Gray fox	O
Ringtail	P
Raccoon	O
Long-tailed weasel	P
Striped skunk	O
Mountain lion	O
Bobcat	O
Black tailed deer	O