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UTAH Master Naturalist

Watershed Wildlife Field Book

Mark Larese-Casanova





Revised 2014- Minor corrections and additions were made to this edition.

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The moose is the largest member of the deer family. It can be found all across the northern hemisphere in cool areas, generally at high elevation and close to water. Males are larger than females and have a large rack of antlers.

Moose eat twigs, leaves, aquatic plants, and other plant growth, the diet varies according to season. In the winter, moose eat whatever twigs they can find, generally new growth. In the summer, moose browse on fresh twig growth and leaves. Aquatic plant growth provides a very important component of the summer diet. They do not have incisors on the top jaw, but do have a rough tongue and gums that enable them to browse on plant growth, as well as large flat molars in the back of the mouth to thoroughly masticate food.

Moose have relatively long legs compared their body size. Long legs allow the moose to move in deep snow in the summer and to wade into ponds and marshes in search of food. The hip joints can dislocate, allowing the moose to pull its leg directly up into the body, reducing the amount of energy expended dragging their feet in the snow. Moose hair is also adapted to enable the moose to survive cold mountain winters. The hairs have kinks and bends which create pockets in the coat. These pockets trap air and provide insulation against the cold and snow.

The rut (breeding season) occurs in the fall. Moose courtship is complicated and involves many different physical and chemical signals. Each female generally births one calf per year. The calf stays with the mother throughout the year until the next breeding season, when the mother forces it away to fend for itself. An adult, healthy moose does not have much to fear from predators. Packs of wolves and grizzly bears will hunt moose, but they generally take the young, sick, or old.

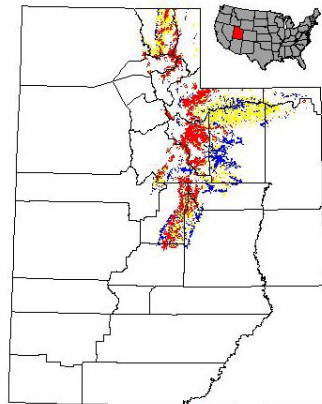
Moose

Alces alces



© Joe Ford

- Utah's largest ungulate
- High elevation, latitude
- Found near water
- Adapted for cold climates & aquatic habitats
- Aquatic vegetation is an important food



How to Use this Field Book:

The Utah Master Naturalist Watershed Wildlife Field Book is meant to provide you with an annotated look at some of the common, rare, and invasive wildlife and other consumers of Utah's watershed ecosystems. This book provides photographic examples of each species along with useful information on the species' life history and ecology. When used alongside a detailed field guide, this book will help you learn about wildlife during your watershed explorations. Have fun!

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All wildlife maps are courtesy of Utah Conservation Data Center at the Utah Department of Natural Resources. Color-coded maps indicate habitat value for each species. Red=Critical, Yellow=High, Green=Substantial, and Blue=Limited

Protozoa



- Single-celled with a nucleus
- Primary consumers
- Unique adaptations
 - Locomotion
 - Feeding
- Food for invertebrates



Coyotes are the most common wild dogs in North America. They live throughout the continent, excluding northern Canada and in areas with healthy wolf populations. They are very adaptive, living in almost any habitat, and are opportunistic omnivores.

Coyotes are smaller than wolves, 30-40 inches long and weigh 15-45 pounds. They have characteristic pointed ears, which are large in comparison to head size, and a bottle shaped tail with a black tip. Coyotes are mostly carnivorous, eating primarily small mammals and scavenged meat. They will also eat plant matter, including fruit, balsam fir and white cedar leaves, and sarsaparilla.

Coyotes are crepuscular, meaning they are primarily active during the early morning and late evening. They have very good senses of smell and vision, which are used in hunting. Coyotes sometimes form packs to hunt, but not to the extent of wolves. They will also form mutualist hunting parties with badgers, pairing the coyote's land speed with the badger's digging ability to catch rodents.

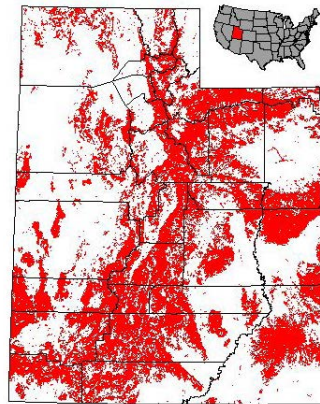
Mating pairs are monogamous for years. Courtship lasts 2-3 months, at which point the female chooses her mate. The mating season is in the early spring. Gestation lasts about 2 months. Litter size is between 1 and 19 pups, usually about 5 or 6. The young are weaned after 5-7 weeks. Males leave the den after 6-9 months; females stay longer and make up the bulk of the pack. Female young will sometimes stay with the parents until they reach full adulthood at a year. Coyotes play an important part in an ecosystem, keeping small mammal populations at healthy levels.

Coyote

Canis latrans



- Common throughout Utah
- Habitat generalist
- Eat small mammals, carrion
- Crepuscular, active year-round



The protozoa, or “first animals”, are in the Kingdom Protista, which is comprised primarily of single-celled organisms possessing a nucleus. Some of the common freshwater protozoa include flagellates, ciliates, amoebae, and heliozoa, each having unique adaptations for feeding and locomotion.

Flagellates have a whip-like appendage (i.e., flagellum) that is used in propulsion through the water. Flagellates are capable of preying upon other organisms of equal size due to its ability to greatly expand its cytostome (i.e., mouth).

Ciliates are characterized by a covering of little hairs, or cilia, that are used to both propel the organism and generate a current of water to direct food to their mouths. Certain paramecia, which are a kind of ciliate, consume single-celled algae, which, if not digested, will continue to photosynthesize and provide the paramecium with sugars to supplement its regular diet. As long as the conditions are suitable, these symbiotic algae living inside the paramecium will replicate, and when the paramecium divides, an approximately equal number of algal cells will be present in each daughter cell.

Amoebae move by extending pseudopodia (i.e., “false feet”), which absorbs food particles with which they come in contact. Most amoebae maintain a fairly definite shape, and are not the random moving blob that they have long been considered.

Heliozoa are radially symmetrical cells that have long “arms” called axopodia that direct anything that they come in contact with back to the body to be engulfed.

Water Flea

Daphnia spp.



- Order Cladocera
- Filter feeders
- Swim using antennae
- Varying reproduction
- Indicator species

Northern raccoons are a common mammal all across North America. They were not originally found in Utah, but moved west with human settlement. Their habitat always includes a source of open water. Their size ranges from 2 to 3 feet in length, and they can weigh up to 20 pounds. Raccoons in northern habitats can have up to 50% body fat. Males are generally larger than females.

Raccoons are solitary and territorial animals, except during the mating season (in the spring, peak in March) when males increase their home range to increase the likelihood of coming into contact with females. Litters are born during the summer after a gestation period of slightly more than two months. They consist of 3-7 young, typically 4. The female raises the young alone for around 10 months. They are weaned after around 70 days, and after 20 weeks they begin typically foraging for food with the mother. Females are sexually mature by their first year; males are mature by the second. Raccoons can live up to 16 years in the wild, though most don't make it to adulthood. Animals that make it to adulthood usually live about 5 years.

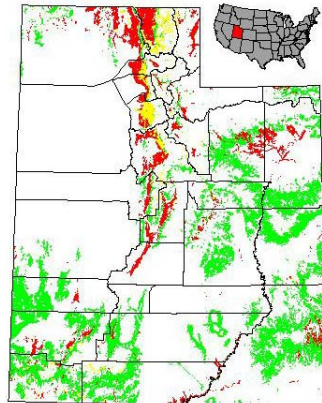
Raccoons will eat fruits, nuts, tubers, invertebrates, reptiles, amphibians, fish, birds, eggs, and almost anything else they can catch or find. They adapt well to human development, and will cause extensive damage to orchards and cornfields. Raccoons hunt with their front paws, which look similar to human hands and are very sensitive. Coyotes, wolves, large hawks, and owls will eat raccoons, but raccoons avoid most predators by remaining inactive during the day. The major sources of death are human related (hunting, trapping, and cars) and malnutrition.

Northern raccoon

Procyon lotor



- Native to eastern US, Common throughout N. Am.
- Opportunistic omnivores
- Devastate shorebird populations
- Found near water
- Solitary



Water fleas, or *Daphnia*, are a common inhabitant of freshwater systems in Utah. They are minute crustaceans that have unique adaptations for feeding and propulsion. The carapace, or shell, has two halves and is split down the middle, where 5-6 pairs of legs exist. Continual movement of the legs creates a current of water through the shell, from which they can filter out food particles. *Daphnia* feed primarily upon algae, bacteria, and protists. Propulsion is carried out not by the legs, but rather by a set of large antennae that act like a set of oars.

Throughout the warmer months, *Daphnia* reproduce asexually through parthenogenesis, in which young females are hatched without fertilization from males. As environmental conditions deteriorate due to drought, cold, or other factors, parthenogenetic males are produced, which then aid the females in the sexual reproduction of eggs. Due to a protective shell, these eggs are capable of overwintering.

Daphnia are useful in the field of aquatic toxicology. Due to their relatively short lifespan (i.e., one week to a year, depending on conditions) and ease of rearing in the laboratory, they are frequently used to test the effects of toxicants on reproduction and survival. In addition, *Daphnia* are considered to be an indicator species, due to their sensitivity to environmental pollutants.

Nematode/Roundworm

Phylum Nematoda



The northern river otter is found in high-flowing rivers across the North American continent. It reaches a length of about 4 feet, with its muscular tail making up nearly half. The river otter is built to be at home both on land and in the water. It has a long and strong tail, short and strong legs, webbed toes on all four feet, and a long, hydrodynamic body. Its fur is similar to beaver fur, with long waterproof guard hairs and dense underfur which traps air and insulates the body when swimming in cold water. It can dive for minutes at a time and has sensory adaptations to hunt underwater. The otter's main source of food is fish.

River otters prefer to live in deep rivers with abundant bank vegetation, preferably with undercut shores. This provides the otter with excellent cover. It moves well on land, generally traveling in pairs. River otters breed once every 2-3 years. This gives the parents enough time to raise the young before another litter arrives. As with the beaver, river otters have been trapped extensively throughout North America.

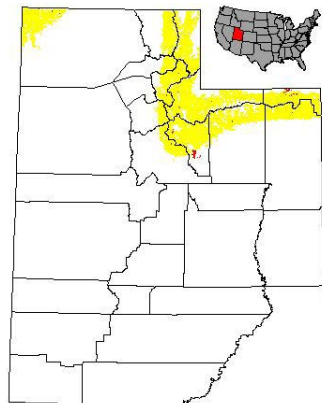
- Most common phyla of animals
- Parasitic and free-living
- Important to the environment
 - Nutrient cycling
 - Parasites regulate populations
 - Indicator species

Northern river otter

Lontra canadensis



- Adapted to rivers & streams
- Active year-round
- Hunts underwater
- Small populations in UT



Nematodes, which are generally tiny (i.e., up to 5-10 mm in length) round worms, are the most common phyla of animals. Nematodes are so common that it was estimated that one out of every five multicellular animals on Earth is a nematode! Many are parasites of plants and/or animals, but other species are also free-living, feeding on bacteria, fungi, algae, and other nematodes.

Nematodes are important to all of Utah's natural systems for several reasons. Some nematodes have major roles in decomposition, facilitating the cycling of nutrients and minerals within systems. Other parasitic nematodes reproduce by infecting organisms and laying eggs in the dying and decomposing body. In this manner, insect parasitic nematodes can serve as effective biological controls. Due to varying levels of tolerance to pollutants, the occurrence and abundance of certain species of nematodes serve as an indicator of environmental quality.

"If all the matter in the universe except the nematodes were swept away, our world would still be dimly recognizable, and if, as disembodied spirits, we could then investigate it, we should find its mountains, hills, vales, rivers, lakes and oceans represented by a thin film of nematodes. The location of towns would be decipherable, since for every massing of human beings there would be a corresponding massing of certain nematodes. Trees would still stand in ghostly rows representing our streets and highways. The location of the various plants and animals would still be decipherable, and, had we sufficient knowledge, in many cases even their species could be determined by an examination of their erstwhile nematode parasites." -N.A.Cobb

New Zealand mud snail

Potamopyrgus antipodarum



- Exotic invasive species
- Found in many Utah rivers
- Little nutrition for fish
- Reproduces asexually
 - Spreads quickly

Like the beaver, the muskrat is another rodent that spends much of its time in the water. Muskrats are smaller than beavers, have thin tails, and a different diet. They primarily eat plant matter, but also hunt for mollusks, fish, and crustaceans on the stream bottom.

Muskrats and beavers share habitat, both preferring slow moving water with abundant plant growth in the area. Both are trapped for their fur throughout the country. Like beavers, muskrats are highly adapted for aquatic life. Muskrats have waterproof fur, partially webbed hind feet, and a long, laterally-flattened tail that aids in swimming.

Muskrats prefer to excavate burrows in banks around water bodies. They can sometimes be a nuisance as they dig holes in dikes, weakening their ability to hold water. Muskrats help increase habitat diversity in marshes by cutting large stands of vegetation. This results in large, open areas suitable for some bird and mammal species.

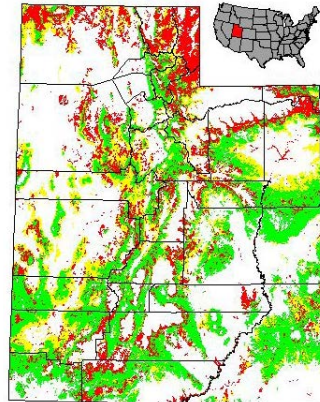
Breeding occurs in the spring and summer, with females capable of producing several litters of one to twelve offspring each year. Muskrats are active throughout the year, and are primarily nocturnal, although daytime activity is not unusual. Muskrats are trapped for their fur throughout much of their range.

Muskrat

Ondatra zibethicus



- Fully aquatic
- Omnivorous
- Highly adapted



New Zealand mud snails are a concern due to their introduction to many of the large rivers in Utah. They have been found in the Green, Logan, Provo, Bear, Weber, and Ogden Rivers, and tend to prefer riverine systems with stable flows. In sections of rivers in the western US where New Zealand mud snails have become established, they can occur in concentrations greater than 100,000 per square meter and can comprise approximately 95% of the invertebrate biomass.

In addition to outcompeting native invertebrates, the New Zealand mud snail provides little or no nutritional value to fish. Fish that consume a diet entirely of mud snails lost 2% of their body weight each day and eventually died. This is partly due to the difficulty of fish in digesting mud snails, which can close their operculum so tightly that they can live out of water for several weeks. It is believed that the mud snails are spread by attaching to boats or the clothing of fishermen. Because they reproduce asexually, only one snail is required to establish a new colony. A long term monitoring project is currently being carried out by the National Aquatic Monitoring Center (i.e., Buglab) at Utah State University.

Mosquito

Family Culicidae



- Aquatic larva and pupa
 - Food for other animals
 - Do not require dissolved oxygen
 - Highly tolerant of pollution
- Vectors for disease

American beavers are one of Utah's mammals that live primarily in aquatic habitats. They have oily fur, paddle-like tails, specialized eyelids, and other adaptations that allow them to spend most of their time in the water.

Beavers are well known for their dam building, and fell trees for use in dam construction. Beaver dams help increase habitat complexity in streams, benefitting a diversity of other terrestrial and aquatic wildlife species. Beaver dams help trap sediment, create wetlands, mitigate flooding, and extend stream flow through the summer.

Beavers are rodents, with large incisor teeth that do not stop growing. They use these teeth to chew through tree trunks and remove tree bark. Beavers eat plant matter, bark and other woody growth in the winter and green aquatic plants in the summer. Beavers construct lodges for shelter, food storage, and to raise young. They are nocturnal, usually coming out at night to forage for food.

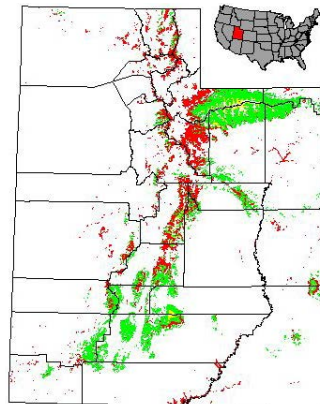
Beavers were nearly hunted to extinction during the 19th century, but their population has made a substantial recovery. This is due to changing European fashions as much as any direct conservation actions.

American beaver

Castor canadensis



- Large rodent
- Adapted to aquatic systems
- Build dams & dens
- Eat bark & aquatic plants



Mosquitoes are one of the most common invertebrates in Utah's aquatic and wetland systems. It's almost impossible to visit a river, lake, or wetland during the warm months without being bitten by a mosquito! The prevalence of mosquitoes near water is due to their semi-aquatic life cycle. The eggs are laid one at a time or in rafts on the water surface. The larvae that hatch from the eggs are fully aquatic, consuming microorganisms and detritus for food. Nearly all mosquito larvae have a breathing tube at the end of the abdomen, with which they obtain oxygen from the air. Because of this adaptation, mosquito larvae can live in water that has little or no dissolved oxygen, an environment unsuitable to most other aquatic invertebrates. Mosquitoes pupate for about two days, developing into an adult while floating at the water surface. Both larval and pupal mosquitoes are an abundant food source for animals, including other invertebrates and fish. In addition, the larvae and pupae have a relatively high tolerance for pollution, enabling them to live in a wide range of habitats. The emerging adult must rest on the surface of the water so that all of its body parts, especially the wings, can dry and harden. It takes, on average, 14 days to complete the cycle from egg to adult.

Both male and female mosquitoes are nectar feeders. However, female mosquitoes require a meal of blood to obtain substances like protein and iron to complete the development and laying of eggs. Because of this, mosquitoes have throughout history been highly efficient vectors for disease, carrying viruses and parasites from person to person without itself being affected.

Water boatman

Family Corixidae



- Diverse Family
- Fully aquatic
- Omnivorous
- Highly adapted swimmers

The American mink is an important predator found in Utah wetlands. Male minks are about 2 feet long and weigh 2.5 to 3 pounds; females are around 20% smaller. Like most weasels, the mink has a long body and short legs. Its fur is highly valued by trappers because it is so glossy and thick. The fur is waterproof and keeps the mink warm as it swims and hunts. The mink is an excellent swimmer. Most of its life is spent in aquatic habitat. They can be found in fresh water lakes, rivers, and marshes.

Minks are efficient hunters, primarily depending on their keen sense of smell. They will eat small mammals, birds, eggs, frogs, crayfish, fish, lizards, snakes, insects, and anything else they can catch. They are often a nuisance to ground-nesting birds. Mink live in dens close to water. They either move into abandoned beaver or muskrat dens, live in hollow logs, or dig their own burrows. Both sexes of mink live solitary lives, and they are very territorial, marking territory with scent glands in the throat and chest.

Mink raise one litter a year, and the breeding season is between January and April. Litter size is usually between 2 to 6 young, sometimes as many as 10. After 25 days, the young's eyes have opened, and they are weaned at around 6 weeks. At 8 weeks the young begin to hunt with their mother. After they have learned to fend for themselves, they leave the mother's care and become sexually mature at less than a year old.

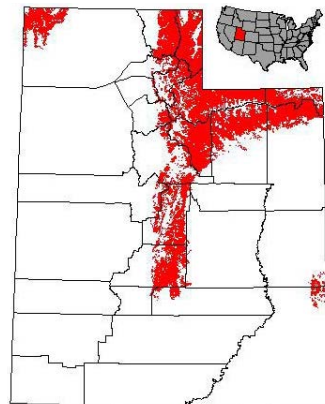
North American mink populations are expanding in Utah, but degradation of wetlands and other habitats pose a threat. Species on the top of the food chain are affected soonest if the health of the habitat deteriorates.

American mink

Mustela vison



- Found in or near aquatic systems
- Prefers forested areas
- Solitary & territorial
- Opportunistic carnivores



True bugs of the order Hemiptera are insects with probe-like sucking mouthparts, such as the water boatman. They have an elongated, flat, oval body, which is grayish in color. The middle and hind pairs of legs are elongated. The back legs serve as oars, with stiff hairs that push the boatman through the water. The front legs are used during the mating process. Males make a chirping sound by rubbing the front legs over the head, which attracts females. Eggs are laid on submerged vegetation. Water boatman nymphs undergo an incomplete metamorphosis, meaning that the transition from juvenile to adult takes place gradually. Water boatman nymphs have five instars, or growth stages, during their life cycle. True bugs do not have gills, so the boatman spends much of its time swimming at the surface of the water. It will also trap air with its wing covers or under its body while it dives. The boatman's mouthparts are broader than most true bugs, and can both suck up liquid food and consume solid pieces. As an omnivore, the water boatman eats algae and other plant matter, as well as preying on small aquatic invertebrates like mosquito larvae. This helps to reduce abundance of mosquitoes and other flies, rendering the water boatman a good pest manager. It is also an important source of food for other, larger organisms. Water boatmen live in fresh and brackish waters all around the world, and are common throughout Utah.

Dragonfly & Damselfly

Order Odonata



- Common in wetlands
- Aquatic nymphs, terrestrial adults
- Predatory nymphs and adults
- Excellent fliers

Water shrews are a small mammal that lives across northern North America. Their fur holds an air layer close to the skin when the shrew enters the water, keeping it from losing body heat to the cold water. Without this insulation, the tiny body of the shrew would succumb to hypothermia within seconds after entering cold water. After leaving the water, the shrew grooms and fluffs its fur to keep itself dry and warm. Water shrews have long tails and large feet. The feet have a fringe of stiff hairs, and the hind feet have webbing between the toes. These adaptations aid in swimming and diving.

Water shrews live near any water source with adequate vegetative cover on the shores. They dig short tunnels by the shore and build nests out of plant material. Shrews are generally insectivores. Water shrews swim and dive, hunting for aquatic insects and larvae. They use their tactile whiskers to seek out prey, and may also use echolocation. Water shrews have sharp teeth reinforced by iron compounds to break through the exoskeletons of insects. They are in turn prey for weasels, minks, fish, hawks, and other predators.

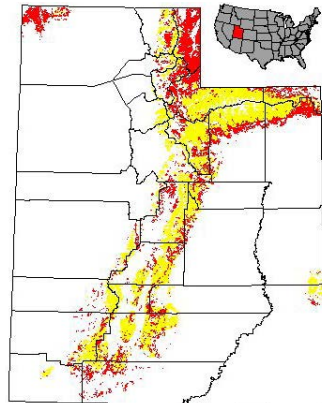
Water shrews are almost constantly active. Their high metabolism makes it necessary to eat many times their body weight every day. Shrews are antisocial animals, if they come into contact with another individual there is usually a short confrontation followed by one of the two leaving. The breeding season lasts from April to September, gestation lasts around three weeks and litter size is between 3 and 15, though usually around 6. Females will raise one or two litters per year.

Water shrew

Sorex palustris



- High metabolism
- Insectivores
- Smallest mammalian diver
- Waterproof fur
- Webbed hind toes



Dragonflies and damselflies are commonly seen flying around aquatic and wetland systems in Utah. Adults of this order can be identified by their distinctive two pairs of long, thin wings. These wings beat very quickly, between 20 and 30 times a second, and move in opposition to each other. In other words, when the front set is moving up the back set is moving down. This allows for very agile flight, dragonflies and damselflies can hover, fly backwards, and make very quick changes in direction. They also have large compound eyes that take up most of the head. These are adaptations for both hunting and avoiding larger predators.

However, the majority of these insect's lives are not spent in the adult form. They lay eggs in standing water, and Odonata nymphs will live in this aquatic habitat for 1 to 2 and sometimes up to 6 years, depending on the climate and elevation. The nymphs molt 6-15 times, the final molt exposing fully developed wings and an adult body. Odonata are carnivorous in both life stages. They have distinctive mouthparts, which hinge underneath the head and can expand at very fast speeds.

There are several ways to distinguish dragonflies and damselflies. The nymphs have different body shapes, dragonflies are stouter and have internal gills, while damselflies are narrow and have three feather-like gills that expand from the tip of the abdomen. The back set of wings on dragonflies is broader than the front, whereas damselflies have the same shape in both sets. This enables dragonflies to fly faster (i.e., up to 55 mph) than damselflies. Dragonflies hold their wings horizontally while at rest, whereas damselflies fold their wings back.

Predaceous diving beetle

Family Dytiscidae



- Common throughout the world
- Dive underwater
- Eat invertebrates, fish, tadpoles
- Sit and wait predators
- Adults carry air bubbles

American mallards are one of the most familiar ducks found in Utah's freshwater systems. Males have a characteristic green iridescent head, a white ring on the neck, a rusty chest, gray body, and black tail. Females are drab speckled brown. Both sexes have a blue stripe on the wing.

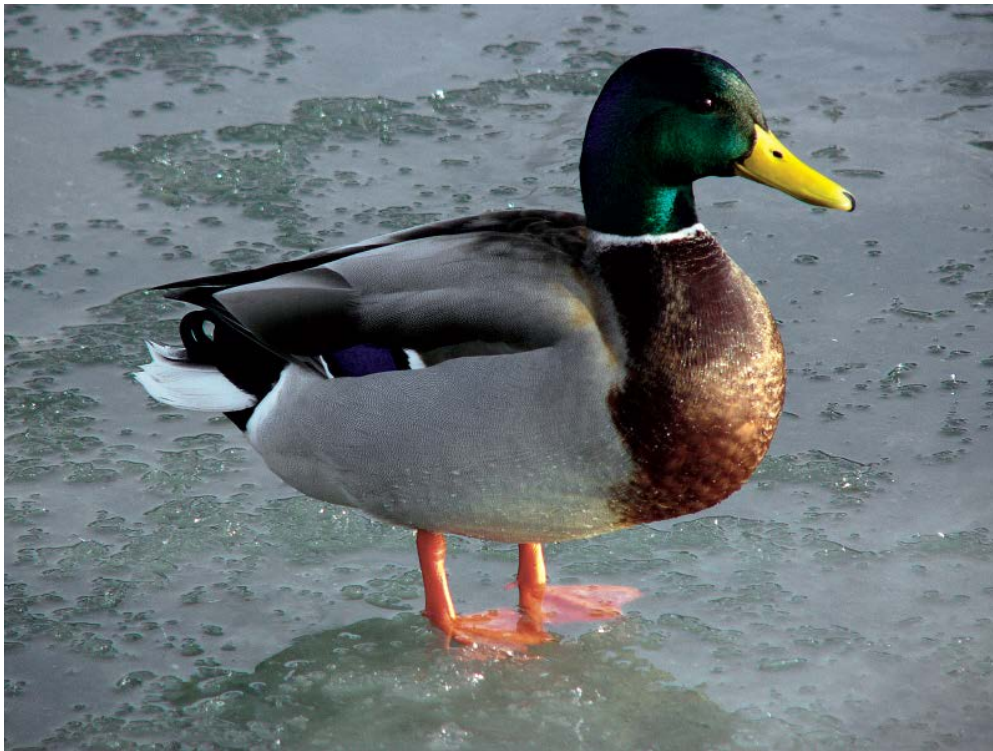
Mallards live in wetlands and other bodies of water where food is plentiful. Mallards are a common urban species, found in city ponds and canals, and are well-adapted to human presence. Mallards are dabbling ducks that look for food on the bottom of the water body. They are omnivorous, and will eat aquatic plants, insects, worms, gastropods, and arthropods. They also take advantage of human foods where available.

Mallards are monogamous. Breeding pairs begin courtship during the fall, and courtship displays continue all winter. The female lays eggs in the spring, at which point the male disappears. Females build a nest on the ground close to open water. They lay around 9-13 eggs, which hatch after 4 weeks of incubation. Once hatched, the female leads the ducklings to the water and does not revisit the nest. Yearling females will breed, but they usually are not as successful as older hens.

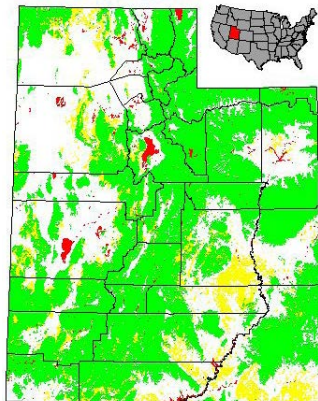
The two sexes have different vocal calls. The common 'quack' of a duck comes from a female mallard. Males make a softer, rasping 'rab,' as well as grunts and whistles during courtship displays. Mallards are the most prevalent waterfowl species in the country, and are a primary game bird in Utah.

American mallard

Anas platyrhynchos



- Common in Utah wetlands
- Popular game bird
- Usually migratory
- Adapt to feeding from humans
- Hybridize with domestic ducks



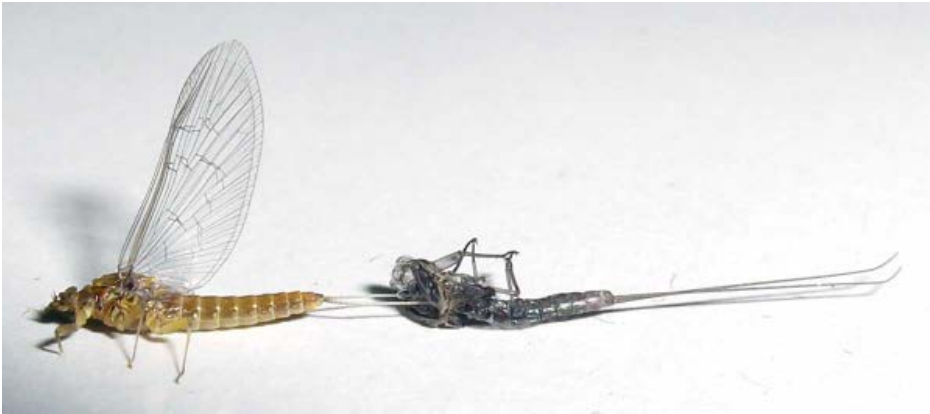
Freshwater beetles are common in Utah. Beetles are one of few aquatic insects with both aquatic larval and adult stages. There is great diversity among aquatic beetles, with different levels of adaptation to aquatic life. Some have breathing tubes or other breathing apparatuses that require them to surface, while others have gills. Some have lost their wings, while others use wings to move from one habitat to another. Some are free swimming, but most crawl on submerged plants and other substrate. Feeding habits are also highly variable.

Predaceous diving beetles of the family Dytiscidae are effective predators of other aquatic organisms. When hunting, they cling to grasses or pieces of wood along the bottom, and hold perfectly still until prey passes by, then they lunge, trapping their prey between their front legs and biting down with its pincers. Their usual prey includes tadpoles, invertebrates, and even small fish. Larval predaceous diving beetles, often referred to as water tigers, are even more formidable predators than the adults. Whereas the adults are typically 1-1.5 inches long, the larvae can grow up to 3 inches long and are known to feed on up to 20 tadpoles each day.

Although the larva is fully aquatic, the adult predaceous diving beetle must breathe air. The adult can stay underwater for several minutes because it carries an air bubble on its abdomen, serving as a kind of scuba tank. As the beetle consumes the oxygen, dissolved oxygen from the water diffuses into the bubble to replace it.

Mayfly

Order Ephemeroptera



- Nearly all of the life cycle is aquatic
- Adults emerge and live for ~1 day
- Sensitive to pollution

American coots are a member of the rail family and are commonly found in Utah wetlands and lakes. They are aggressively territorial throughout the year. Breeding pairs are monogamous and highly territorial. If an intruder is detected the male will defend the female. If the male is not present females will fight off intruders. During a confrontation the coot heads quickly towards the intruder, sometimes rising out of the water and running across the surface with wings flapping. While fighting, the coots sit back in the water and grab and slap at each other with long clawed feet.

Coots have unique feet for rails. They are long, flat, and lobed, and very effective in transferring heat out of the body. In experiments coots have been observed to handle 104-degree heat without difficulty.

During the breeding season, coots build up to 9 floating nest structures. These nests are built on a platform of aquatic vegetation from dead plant material, lined with fine grasses, and are anchored to living aquatic plants. They only incubate eggs in one or two of these structures; the others are used for displaying, copulating, or brooding. Both males and females incubate the clutch of 8 to 12 eggs for 21 to 25 days. The chicks fledge at around 8 weeks, until then the parents provide protection and food for the young. Coots sometimes raise a second brood, which is laid before the first brood has hatched.

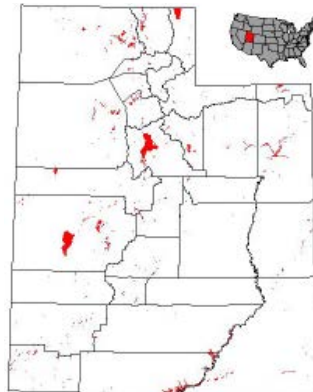
American coots are opportunistic omnivores. They feed by turning upside down on the surface of the water to scour the bottom for aquatic plant matter, insects, and small vertebrates. The coot will also steal food from other waterfowl and prey upon the nests of other birds.

American coot

Fulica americana



- Common in Utah wetlands
- Year-round residents
- Opportunistic omnivores
- Highly territorial
- Lobed toes



Aquatic invertebrates are found in a variety of aquatic and wetland systems, from snow-fed mountain streams and desert pools to slow-flowing murky rivers. Many species of invertebrates only live in the water during the larval stage. Examples of these include mayflies, stoneflies, caddisflies, dragonflies, and black flies. All aquatic larvae have gills for breathing. Most have mouthparts for filter feeding, though some are more active predators. Maintaining position against the current is one major concern for small organisms. Large substrate provides refuge for many, including mayflies, stoneflies, and caddisflies. These species also have hooked feet to hold onto the surface of rocks, and tails to help stabilize their bodies in the moving water. Other species, including black flies, caddisflies, and some mayflies, produce adhesive compounds that bind them to the stream bottom.

Mayflies are insects that spend most of their lives in streams, emerging briefly, usually for just one day, in large clouds of adults to mate and lay eggs. If an aquatic invertebrate has three tails it's usually a mayfly or damselfly; but some mayflies have two tails. Mayfly nymphs are strong swimmers and can be discerned from damselfly larvae by the fact that they move like dolphins. Damselfly larvae move side-to-side like fish. Gills of mayfly nymphs are often visible along the abdomen as they flutter. As immature nymphs, many mayflies feed on algae, but as adults they do not eat. Mayfly diversity declines as streams are degraded because mayflies are particularly sensitive to water pollution.

Stonefly

Order Plecoptera



- Aquatic nymphs
- Claws for crawling
- Primary consumers
- Intolerant of pollution

The red-winged blackbird is a common inhabitant of Utah's wetlands. It is a medium-sized bird, mostly black with a red patch ringed with yellow on the shoulder. Females are smaller, dark, and streaked. This streaked patterning helps to break up the female's outline and provides camouflage.

Ideal habitats are wetlands with emergent vegetation, although the birds will live in upland shrub areas and forests. Red-winged blackbirds breed in the spring. Males become territorial during the breeding season, perching on cattails or other emergent vegetation and surveying their territory. The species is polygynous, males generally have 2-4 mates, and sometimes up to 15. The female lays 3 or 4 eggs, which hatch after 11-13 days. Males sometimes choose a primary mate to help raise the young. After hatching, the young leave the nest after approximately 2 weeks, and stay on the territory for another 2 weeks while the adults provide food.

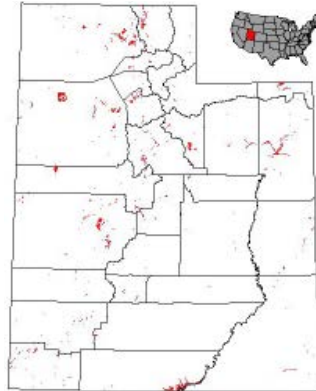
Red-winged blackbirds are almost exclusively insectivorous during the breeding season, but also eat seeds. The breeding season coincides with the emergence of insects from aquatic larval stage, and during this time the birds will also eat dragonflies, mayflies, and caddisflies. During the winter, grain is an important food source, and blackbirds will congregate in large flocks around farms to scavenge food. Because of this, red-winged blackbirds are considered pests in some parts of the country. In Utah, they are usually year-round residents. Northern breeding populations will migrate to the southern US during the winter.

Red-winged blackbird

Agelaius phoeniceus



- Common in Utah wetlands
- Year-round residents
- Prefer tall emergent vegetation
- Adapt to different habitats
 - Seasonal diet variation



While stonefly and mayfly nymphs may look similar, there are a few ways to tell them apart. Stoneflies possess two tails as opposed to the typical three tails of a mayfly. Stoneflies tend to be benthic (i.e., bottom-dwelling) crawlers and rarely swim like mayflies. Stoneflies are often larger and more stout than mayflies, and their gills are bunches of “hairs” along the thorax, rather than the abdomen.

Stoneflies typically inhabit cold rivers and streams with a swift current. However, some cold, high-altitude lakes are also suitable habitat. Some stoneflies are carnivorous, but most feed on algae, bacteria, and plant debris. In turn, stoneflies are eaten by a variety of fish species. Adult stoneflies have two pairs of wings, which fold under each other along the abdomen. Like mayflies, stoneflies are intolerant of water pollution and require relatively high levels of dissolved oxygen.

Caddisfly

Order Trichoptera



- Aquatic larvae
- Build cases
- Moderately intolerant of pollution

The snowy plover is a small shorebird found throughout the world, and common in the Great Salt Lake ecosystem and other areas of Utah. Although, it is mostly terrestrial and rarely wades in the water.

The snowy plover is about 6 inches in length, has black legs and a short, thin black bill. Its upper body and the top of its head are light gray/brown. The belly, chest, and face are white. It has black spots on the forehead, behind the eye, and on the shoulder. The tips of its tail feathers are also black. The two sexes are similar. Juveniles are similar as well, but without the black patches. Snowy plovers are very cryptic, and are usually not seen unless they are moving.

Snowy plovers eat primarily aquatic insects. Great Salt Lake has the largest assemblage of snowy plovers in the world, representing over half of the population west of the Rocky Mountains. The preferred habitat of snowy plovers is salt playas, but also includes beaches, ponds, and shorelines.

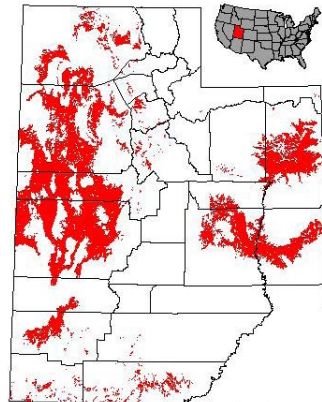
Nests are shallow scrapes built on open, sandy ground, in which clutches of 3 cryptic eggs are laid. The female will sometimes lay a second clutch in a new nest with another male once the first clutch hatches in about 4 weeks. The male is then left to tend the young alone. The young fledge after about a month. Snowy plovers migrate to the coast, where there are also resident populations, during the winter.

Snowy plover

Charadrius alexandrinus



- Common throughout the world
- World's largest assemblage
 - 55% of population west of the Rockies
- May lay 2nd brood with 2nd male

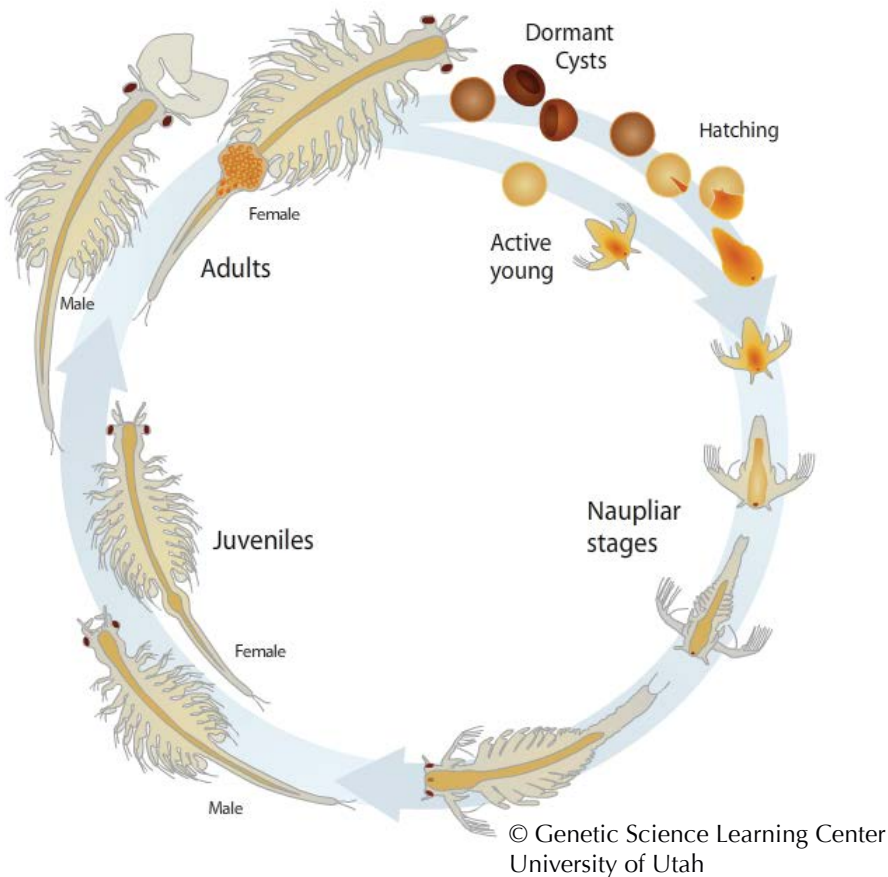


Caddisflies are found in or near aquatic habitats, such as lakes, rivers, and streams, for their entire life cycle. Caddisflies are closely related to butterflies and moths (Order Lepidoptera), bearing a resemblance in the dense scales or hairs on the wings, as well as the larva's ability to produce silk. Caddisfly larvae use this silk to make cases out of small rocks, sand, or plant matter, to surround their bodies. In addition, the larva pupates inside its case, which is attached to the substrate of the streambed. These cases add weight, which stabilizes them in the stream channel, as well as provides protection from larger predators.

Along with mayflies and stoneflies, caddisflies can be used to determine the water quality of a river or stream by calculating the EPT value. The EPT value (E=Ephemeroptera, P=Plecoptera, T=Trichoptera) is a total number of taxa (i.e., kinds) of mayflies, stoneflies, and caddisflies found in a particular stream or river. An EPT value greater than 10 is an indication of excellent water quality.

Brine shrimp

Artemia franciscana



- Adapted to salt water (up to 25%)
- Feed on phytoplankton
- Important food for birds
- Complex life cycle
- Reproduce sexually
- Ovoviviparous and Oviparous

The black-necked stilt, closely related to the American avocet, is another wading bird common in the Great Salt Lake ecosystem. It is about 1 foot long, with a thin black bill and long pink legs. The legs are so long they extend past the tail while the bird is flying. The male's back, wings, hindneck, and top of the head are black. It has a white spot above the eye, a white forehead, face, foreneck, chest, belly, and tail. The female is similarly pattern, with more brown on the back. Juveniles look similar to the female, but with pale brown edges to the back feathers.

Nesting typically occurs in a built-up cup structure in areas adjacent to salt ponds, mudflats, potholes, and shallow alkaline wetlands. The birds lay clutches of 4 eggs, which they incubate for 22-26 days before hatching. The young fledge after 28-32 days.

Stilts are wading birds. They feed mostly on aquatic invertebrates, but will also eat fish, reptiles, and amphibians. Stilts summer across the southern and western United States. They winter along the southwest coast of the North American continent, throughout Mexico and Central and South America. Great Salt Lake has the largest population of black-necked stilts in the Pacific Flyway.

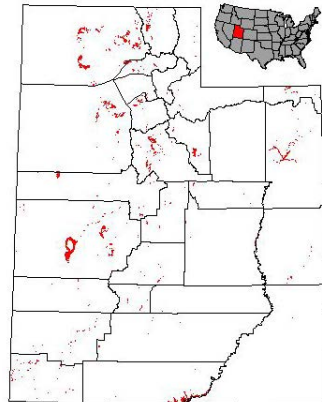
Black-necked stilt

Himantopus mexicanus



© Joe Ford

- Largest population in the Pacific Flyway (~65,000)
- Eats aquatic & flying invertebrates
- Monogamous colonial nesters
- Often nest with avocets



Brine shrimp are one of the most well-known inhabitants of the Great Salt Lake. They are crustaceans, belonging to the genus *Artemia*. There are many species of *Artemia* around the world, they all live in water with salt concentrations up to 25%.

Brine shrimp emerge from dormant cysts, which contain embryos in a suspended metabolic state called diapause. These cysts are extremely resilient, and can survive years, even decades, of dry conditions and extreme temperatures. In the Great Salt Lake, the brine shrimp population emerges in February, when changes in the lake's hydrology (eggs hatch at about 2-3% salinity) spur the emergence of shrimp larvae. The initial larval stage, or nauplius larvae, survives off an embryonic yolk sack for the first 12 hours. The larvae then molts to the second nauplius stage. The second stage feeds on algal cells and detritus, using hair-like setae to create a current into the mouthparts. The brine shrimp reach full adult size, about 10 mm in length, after around 15 molts.

Some species of *Artemia* are parthenogenic and have only females. The Great Salt Lake population, however, has both males and females and reproduces sexually. An individual's sex can be distinguished by the modified 'grasper' antennae on the male, which is used to hold the female during mating. Females either reproduce via oviparous reproduction, which makes cysts when hydrologic conditions are not as favorable (e.g., increased salinity or decreased dissolved oxygen), or by ovoviviparous reproduction, which produces live nauplius larvae. In December, colder lake temperatures reduce the brine shrimps' ability to reproduce, and they make cysts to ensure future generations after the winter. Brine shrimp feed primarily upon bacteria and benthic algae. When salinity in Great Salt Lake declines and diatoms begin to replace algae, nauplii survival tends to decline, because diatoms are not as easily ingested as other algae and bacteria. Brine shrimp serve as an important foundation for the food web in Great Salt Lake, where they are eaten in large numbers by several bird species.

Brine fly

Ephydra hians & *E. cinerea*



- Drifting, herbivorous larvae
- Benthic & floating pupae
- Adults live for 3-5 days
- Important food for birds

The white-faced ibis is another seasonal resident of the Great Salt Lake ecosystem. It is about 20 inches tall, with a 37-inch wingspan. The feathers have an iridescent sheen when viewed in the light, though the bird appears drab and dark brown from far away. The face of this ibis is very distinctive. The eyes are red, and the skin on the face is exposed and also bright red. A single row of feathers around the bare face are white, but they are often hard to discern. The bill is a creamy grey and curves downward, and the legs are red. The different sexes are similarly colored, though males are generally larger. Juveniles have dark eyes until the first fall. The facial skin is a drab gray-blue, and the legs are gray-green. Feathers on young birds are more drab, and mostly brown-gray. The white face coloration is absent.

White-faced ibis breed in the summer through the western US and on the western coast of the Gulf of Mexico. Great Salt Lake has the largest breeding population, approximately 7,500, of white-faced ibis in the world. Ibis primarily nest along freshwater marshes, swamps, ponds, and rivers. White-faced ibis pairs are monogamous, and typically nest in small colonies. They lay 2-7 eggs per clutch, and incubate them for 3 weeks. Both parents incubate the nest- the male during the day and the female at night- and the young fledge after 4 weeks. White-faced ibis leave the summer breeding grounds in September to October, and winter in the interior of Mexico. White-faced ibis are wading birds, and eat aquatic invertebrates (primarily crayfish) but also worms, fish, and small mammals.

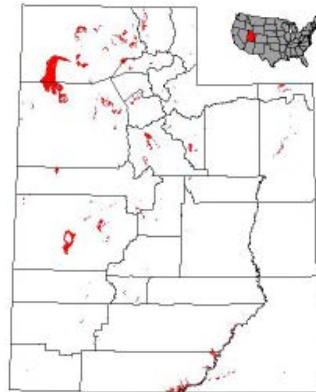
White-faced ibis

Plegadis chihi



© Joe Ford

- World's largest breeding population (~7,500)
- Eat aquatic invertebrates
- Monogamous, colonial nesters
- Cooperative parental care



Brine Flies are another common inhabitant of Great Salt Lake. The Great Salt Lake has two different species of Brine Fly. *Ephydra cinerea* is smaller and much more prevalent, outnumbering the other larger species *Ephydra hians* by 100:1. Clouds of the black insects are often seen around the shore of the lake. While most people consider them unpleasant and an annoyance they are very important for the ecology of the lake and surrounding area. Brine flies, the larvae, and pupae are all major sources of food for migratory birds.

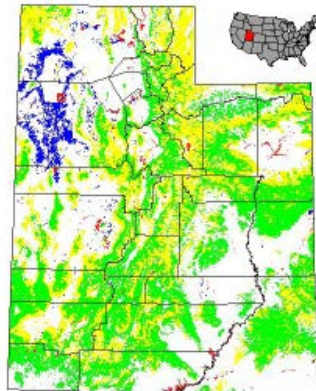
Adult flies only live about 3-5 days, during which time the females lay eggs that sink to the bottom of Great Salt Lake. The larvae are aquatic, consuming dissolved oxygen produced by algal photosynthesis, and can be found throughout the water column. Brine fly larvae graze on algae, bacteria, and detritus found on the lake bottom or in drifting mats. The larvae develop into pupae, which attach to either the bottom substrate, often organic mounds called bioherms, or drifting debris. The pupae trap air bubbles for the developing fly to breathe. During emergence, the pupae surround themselves with an air bubble and float to the surface. The wind carries them to the shore where they emerge as adults, leaving the pupal case behind. This results in the large piles of pupal cases found on the shore of the Great Salt Lake. This cycle continues throughout the summer months.

Northern leopard frog

Rana pipiens



- Common, but possibly declining
- Dense vegetation
- Omnivore
- Competes with non-native frogs



American Avocets are elegant shorebirds that frequent the Great Salt Lake area. They are medium-sized for shorebirds, about 15 inches in length. They have very long legs and a characteristic long, thin, upturned bill. The head, neck, and chest are rusty brown, with white rings around the eye and bill. The body is mostly white, with black stripes on the scapulars (area between the body and wing). The wings have bands of black and white, with the outer wing black and the inner wing white with another black stripe. The legs are bluish grey, and the bill is black. Males and females look similar, though the female's bill has more of an upward curve. American avocets are one of a few shorebirds that will swim, using its one partially-webbed toe.

American avocets feed by wading in shallow water, scything through the water to collect food with their bills. They eat mostly aquatic invertebrates, but will also eat seeds. Avocets will feed in both freshwater habitats and the saline water of Great Salt Lake.

Avocets are migratory, spending the summer at breeding grounds, including the Great Salt Lake and associated wetlands, and winter on the southern coast of the US and western Mexico.

Breeding occurs on mudflats and in wetlands associated with Great Salt Lake, as well as other lakes and rivers in Utah. The clutch size is 4 eggs, which are incubated for 3-4 weeks, and young fledge after 4-5 weeks. Juveniles have a grey face and rusty back of the neck and head.

American avocet

Recurvirostra americana



© Joe Ford

- Largest population in Pacific Flyway (~250,000)
- Breed in the vicinity of GSL - mudflats & wetlands
- Feed mostly on invertebrates



Frogs and toads are found throughout Utah. They have a unique life cycle for chordates, with a complete metamorphosis between juvenile and adult forms. They lay externally fertilized eggs in a freshwater systems. The eggs hatch into tadpoles. Tadpoles are entirely aquatic; they have gills and a tail used for swimming, but no legs. Their mouthparts are designed primarily to eat algae, bacteria, plankton, and other small organic matter suspended in the water. After a season of growth the tadpoles begin to change. The tails recede and legs appear, the gills disappear in favor of lungs. The mouthparts change, developing jaws, teeth, and a tongue for eating insects and other invertebrates. Once the metamorphosis is complete the adult frog or toad can leave the water in search of food or mates. Frogs are characterized by large hind legs built for jumping. They have mucus-covered skin, and continue to live in aquatic habitats.

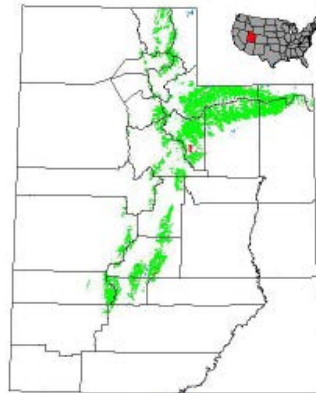
The northern leopard frog is found throughout much of the northern United States. The northern leopard frog is fairly common in Utah, but some reports indicate that its numbers may be declining. This frog occurs in a variety of aquatic habitats, but it may be found foraging relatively far from water. During cold winter months, this species is inactive, and takes cover underwater or in damp burrows. Females lay eggs in the spring, typically on vegetation just below the surface of the water in areas exposed to sunlight. The northern leopard frog is a slim, long-legged frog with a green or brownish colored back that has dark oval or round spots. The bellies of northern leopard frogs are white or cream colored.

Boreal toad

Bufo boreas boreas



- Found at high elevations (7-12K ft)
- Lives in water and on land
- Declining, possibly due to chitrid fungus
- Not protected under ESA



The American white pelican is the largest shore bird common to the Great Salt Lake ecosystem. It is very distinctive, with a solid white body and bright orange or yellow bill. The different sexes look similar, however the male develops a characteristic fin or hump in its bill during the breeding season. The primary and outer secondary flight feathers are black, and can be observed while the bird is in flight. While in flight, the bird also tucks its long neck back on itself.

American white pelicans feed while swimming, unlike other pelican species. Pelicans feed exclusively on fish, and spend most of their time on open water feeding. Groups of white pelicans feed cooperatively by herding fish into the shallow portions of a pond or lake, then dipping their heads in the water to catch the fish.

Since pelicans are migratory, they spend summers in breeding grounds, including the Great Salt Lake area and other sites across western North America, and winters on the southern and southwest coasts of North America. Egg clutches range from 1 to 3 eggs, and incubation lasts for 29-36 days. The young are mottled brown-grey, with grey to flesh-colored bills. They remain flightless for over 2 months before fledging. Approximately 10,00 American white pelicans nest on Gunnison Island in the western part of Great Salt Lake and travel hundreds of miles each day to fresh water to feed on fish. Gunnison Island is the only known colonial nesting site for pelicans in Utah, and has one of the largest breeding colonies in North America.

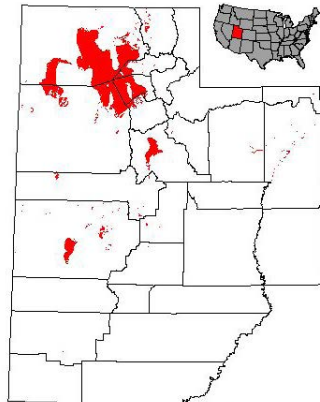
American white pelican

Pelecanus erythrorhynchos



© Joe Ford

- One of the 3 largest nesting colonies in W. N. Am.
 - Gunnison Island
 - Travel 100's of miles daily to feed
- Cooperative piscivores



The boreal toad was once common throughout the western United States. In the past few decades, its population has declined dramatically. This is part of a larger decrease in amphibian numbers, possibly due to the prevalence of chytrid fungus. Boreal toads are greenish brown with reddish warts on the back surrounded by dark pigment. Females are slightly larger than males. The webbing on the toes of toads is less pronounced than in frogs, but they are still adapted to live in the water.

Boreal toads live in a wide variety of aquatic habitats, generally near still, shallow waters with muddy bottoms, such as ponds, lakes, wetlands, meadows, and woodlands. When it is not active, it burrows into the mud or seeks shelter in small cavities under rocks and logs. During the day, they stay close to the water, which provides protection from terrestrial predators. During the night, boreal toads will move further from the aquatic habitat hunting for insects. The toads are active during both the day and night, juveniles more so in the day and adults at night. In the spring breeding season, adults are active during the day. The male boreal toad does not have a vocal sack but will make chirping noises during the breeding season.

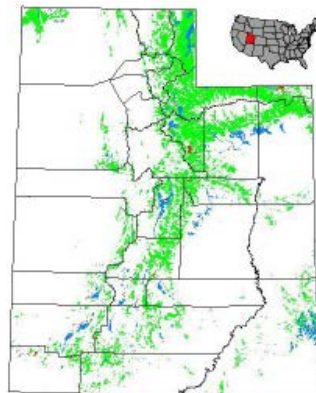
The female lays small black eggs in long double rows, up to 20,000 at a time (around 5000 is more common). The eggs are coated with a double layer of jelly that keeps the eggs stationary. Fertilized eggs hatch in the late spring, tadpoles are present for most of the summer, and metamorphosis is usually completed by early fall. The toads survive the winter by either freezing in mud or by hibernating in a burrow or other small cavity.

Western chorus frog

Pseudacris triseriata



- Common in Utah
- Primarily nocturnal
- Breeds in less permanent water



The Wilson's Phalarope is a shorebird found in the open water marshes surrounding the Great Salt Lake. It is small, about 7.5 inches long, with long legs and a long thin beak. Females and males have different plumage. Females are more vibrant, with a thick dark eyeline that extends down the neck and forms a 'V' on the back. Males are more drab, with a brown eyeline, crown, upper wings, and speckled grey/brown back. Wilson's phalaropes exhibit reverse sexual dimorphism with the female being larger than the male.

Wilson's phalaropes lay nests of 4 eggs, and incubate the clutch for 16-21 days. Contrary to most bird species, the larger, more colorful females actually initiate courtship, while the males do the majority of the incubation. The males most often care for the young.

When foraging in water, Wilson's phalaropes have a somewhat chaotic swim path, spinning in the water to stir up food, and often pick at the water. They also hunt by wading in shallow water or walking along the shore. The main food source is insects, though they will also feed on aquatic invertebrates and seeds.

Wilson's phalaropes migrate long distances, about 5,000 miles, between nesting grounds in the Great Plains and wintering grounds in South America. They stop over at the Great Salt Lake to molt, which takes about 35-40 days, in preparation for the long migration to their wintering grounds. During this time, phalaropes will gorge on brine shrimp and flies, doubling their body weight. Wilson's phalaropes can usually be observed in great numbers at the Great Salt Lake between mid-July and late August.

Wilson's phalarope

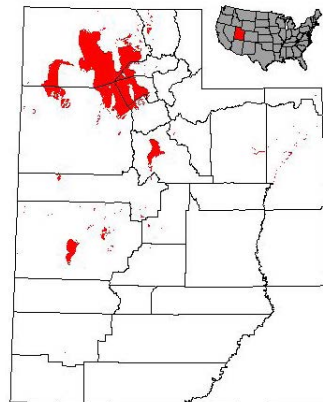
Phalaropus tricolor



© Joe Ford

The western (or boreal) chorus frog is commonly found throughout much of northeastern and central Utah. It is relatively small in size (i.e., less than 1.5 inches), and feeds primarily upon terrestrial insect and spiders. Western chorus frogs can be found in the vicinity of a variety of aquatic habitats, where it breeds between late winter and summer. However, western chorus frogs more often breed in areas with less permanent water. The trade off associated with this behavior is that eggs and tadpoles are less liked to be preyed upon by fish, but these areas can dry up, resulting in reproductive loss. Adult chorus frogs are primarily nocturnal to avoid predators, including birds, snakes, and mammals. Aside from being an important food source for predators, western chorus frogs aid in controlling insect populations. Adult chorus frogs can be heard calling on warm nights even before the snow has melted. Their call sounds like a fingernail being dragged across the teeth of a comb.

- Largest staging population in the world (~500,000)
- Feed on brine shrimp & brine flies
 - Double their body weight in 35-40 days
- Reversed mating roles
- Fly non-stop from GSL to S. Am.

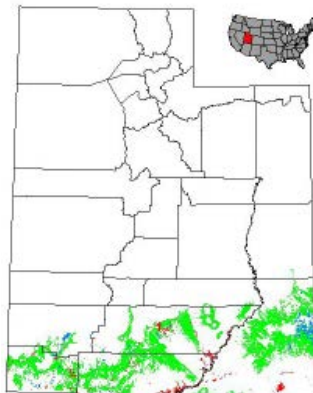


Canyon treefrog

Hyla arenicolor



- Found in canyons of southern Utah
- Live in or near temporary pools & streams
- Camouflaged coloration



Great blue herons are common throughout Utah's aquatic systems. They can be found in marshes, lake shores, and river banks with slow moving water and abundant vegetation. The great blue heron is the largest heron found in Utah, and the most common throughout the country.

A mating pair builds a nest during the spring at the top of a tree close to the waterway, often in the vicinity of other nesting great blue herons. This grouping of nests is called a rookery. Heron rookeries can consist of a few to a hundred nests, sometimes mixed with other other species including cormorants, black-crowned night herons, and even great-horned owls. Pairs are monogamous and will reuse the nest year after year, constantly adding to and renovating it. Occasionally, great blue herons will build stick nests on the ground. A nesting pair will hatch around four young, which will stay under parental care for up to 5 months.

Hérons are carnivorous, eating fish and amphibians. They hunt by wading into the water and holding still, waiting for food to come close enough to spear with its long, sharp beak. Herons sometimes forage on old fields, occasionally eating small mammals.

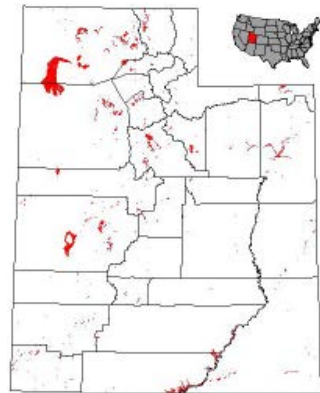
Great blue heron

Ardea herodias



© Joe Ford

- Largest heron in UT
- Carnivorous
- Monogamous
- Form rookeries



Canyon treefrogs are relatively small (i.e., 1-2 inches) frogs found throughout the redrock canyons in southern Utah. Contrary to its name, canyon treefrogs do not often climb trees. Rather, they live on the ground in or near pools left behind by the spring runoff after the stream has stopped flowing. The tadpoles hatch in the early summer, and eat plant and other organic matter. The adults stay near the pools and eat insects and spiders.

Since canyon treefrogs possess little or no defense mechanisms, they attempt to increase survival by blending into their surroundings. Their mottled tan coloration looks very similar to the sandstone on which they are often found. Canyon treefrogs are inactive during the hotter parts of the day, when the harsh desert sun would dry their moist skin, and also during winter. This is a common adaptation among desert animals.

Breeding tends to occur between March and August, depending upon water temperature. It is estimated that only two percent of eggs that are laid will mature into adults. Eggs and tadpoles are vulnerable to predation by fish, invertebrates, other amphibians, and small mammals. Tadpoles mature into adults in approximately 70 days.

Columbia spotted frog

Rana luteiventris



The American dipper is a year-round occupant of Utah streams and rivers. It will stay at a particular stretch of stream as long as there are holes in the ice. It feeds by diving underwater and 'flying' in the current, with its stubby wings angled to keep it near the bottom. It eats insect larvae and other invertebrates from the bottom of the stream.

The dipper has a round, squat body shape. This is an adaptation that minimizes the surface area compared to body size, which reduces the amount of heat lost while swimming in cold mountain streams. The nictitating membrane covering the dipper's eyes allow it to see while under water. It is the only aquatic songbird in America.

Dippers build oven-shaped nests of moss in cliff crevices or on the underside of bridges above water.

- Fully aquatic species
- Population declines in mid-1900's
- Utah Sensitive Species
 - Recovery programs in Utah



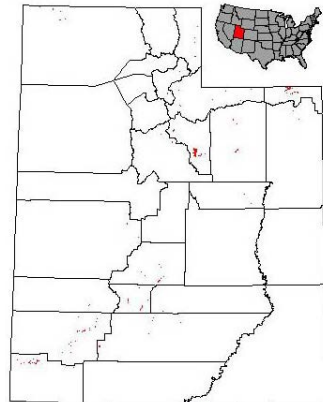
American dipper

Cinclus mexicanus



© Kathy Donnell

- Occupies streams year-round
- Only aquatic songbird in US
- High elev. lakes & streams
- Eats invertebrates, fish



Columbia spotted frogs are relatively small frogs found throughout much of northwestern North America. They are typically found in areas with a permanent source of water, including lakes, wetlands, slow-moving streams, and springs. Adult frogs consume a variety of insects and snails, whereas tadpoles feed on algae, plants, and small aquatic organisms.

As soon as the snow melts in spring, Columbia spotted frogs emerge from hibernation to breed, laying eggs that hatch in 3-21 days depending on temperature. Tadpoles metamorphose into adults in 2-3 months.

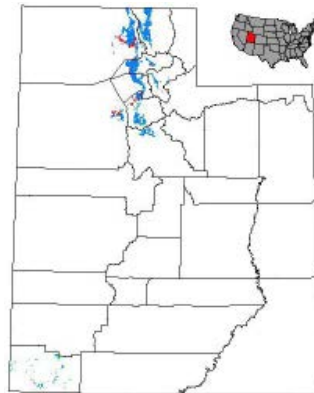
Populations of Columbia spotted frogs were historically found throughout the West Desert and the Wasatch Front. However, habitat degradation has led to a decline in the species within Utah. As a result, the Columbia spotted frog is listed as a Utah Sensitive Species. Several federal and state agencies are working together to minimize impacts to the species, acquire land containing suitable habitat, and re-establish populations in Utah. At the moment, a total of seven Columbia spotted frog populations exist in Utah. One successfully re-established population resides at Swaner Nature Preserve in Park City. In addition, many of the wetlands associated with the Provo River Restoration Project contain breeding populations of Columbia spotted frogs.

American bullfrog

Rana catesbeiana



- Largest frog in N. America
- Outcompetes native frogs
- Eats frogs, fish, rodents



The western grebe is a water bird found in marshy and open water habitats in Utah and across the western US. It is mostly black with a white neck and jaw. Its eyes are bright red surrounded by black, and it has tufts of feathers on the top of its head. The western grebe is closely related and looks very similar to the Clark's grebe, which does not have black feathers surrounding the eye.

The western grebe has a long body with feet set very far back. It is entirely adapted for an aquatic lifestyle; the feet are situated ideally to propel the bird during a dive or on the surface but are virtually useless on land. It has a long spear-like beak, which it uses to hunt fish and other aquatic vertebrates. It is an opportunistic feeder, and will also eat insects, worms, and other invertebrates.

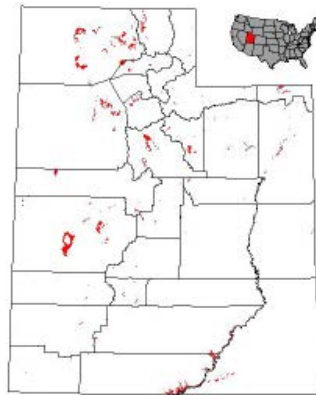
The western grebe's feathers are like other water birds, with an oily outer coat and insulating down nearer to the body. The western grebe is migratory, and courtship takes place during the spring migration. Courtship involves elaborate dances and other rituals that the birds take part in. Once the birds arrive at the summer nesting site, a mating pair build a nest together. Eggs are laid in June, and young can be seen through the summer. Young are carried around on the parents' backs while the partner hunts for food.

Western grebe

Aechmophorus occidentalis



- Open-water, diving bird
- Highly adapted
- Primarily piscivorous
- Dual parental care



The American bullfrog is the largest frog found in Utah and North America, and it remains near water its entire life, dispersing from permanent water bodies only during wet weather. American bullfrogs breed in the spring or early summer in Utah. Adult frogs are carnivorous, eating many types of invertebrate animals, even small vertebrates such as mice and other frogs! Larval bullfrogs (tadpoles) eat plants, detritus, and aquatic invertebrates.

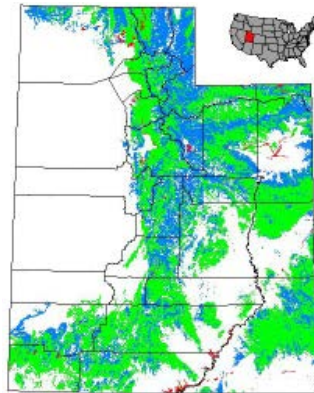
The American bullfrog is not native to Utah; it has been introduced from east of the Rocky Mountains. Introduced frog species, particularly bullfrogs, have detrimental effects on native amphibian population due to predation and resource competition. Unfortunately, these introductions have apparently led to declines in many amphibian species native to Utah.

Tiger salamander

Ambystoma tigrinum



- Only salamander in Utah
- Habitat generalist
- Aquatic larvae, terrestrial adults
 - Some never metamorphose



The bald eagle, once an Endangered species but now recovered, occurs naturally in parts of Utah. Its primary food source is fish, but eagles are both hunters and scavengers, eating carrion whenever available. They have remarkable eyesight and strong talons with rough scales to aid in the gripping of slippery fish. Bald eagles are strong swimmers, and may be dragged into the water while diving for a fish. They can open and close their talons at will, contrary to conventional perception. Stories of drowned eagles are usually eagles struck by hypothermia in cold water.

Bald eagles build nests in forks high in tree branches close to water. These nests are large, on average around 5 feet in diameter. Mating pairs use the nests year after year. In the mountain west, the mating season lasts from January to March. The bald eagle reaches sexual maturity at four years of age, and can breed every year after that. However some mating pairs do not breed every year. One to three eggs are laid per nest, the second coming a few days after the first, and the third after that. The eggs hatch after 35 days of incubation, and the mating pairs provide parental care for the eaglets. Both chicks will sometimes survive, but fratricide (the older chick will kill the younger) is not uncommon. After 10 to 13 weeks the young eagles begin to take their first flights. By the end of the first summer they are on their own.

Although only ten active bald eagles nests can be found in Utah, they are common in winter. Roosting bald eagles can be observed close to rivers, lakes, and ponds, where they feed for fish.

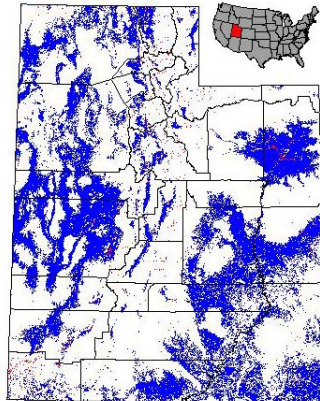
Bald eagle

Haliaeetus leucocephalus



© Joe Ford

- Primarily piscivorous
- Rarely nest in Utah
- Common in winter
- 1-2 eaglets/year
- Extensive parental care



Tiger salamanders are the only salamander species found in Utah, though they live throughout the state and much of North America. They can live in almost any habitat as long as year-round water is present. Adults are rarely seen because they spend most of their life underground. They breed in the spring, often after a rainstorm, and lay aquatic eggs. The larvae are fully aquatic, and possess feathery external gills. It usually takes four months for the larvae to metamorphose into adults, during which time they lose the external gills and develop lungs. Interestingly, if conditions are not suitable, some larvae never metamorphose and lose their gills, but they can grow up to 14 inches long and still reach sexual maturity. The larval salamanders are predators, like the adults, eating insect larvae and larvae of other amphibians.

Tiger salamanders thrive in fishless waters, and often disappear due to predation after fish are introduced. Because tiger salamanders have permeable skin through which they absorb water, they must take refuge underground during droughts and in winter. The coloration of tiger salamanders varies greatly within and between populations.

Aquatic turtles

Order Testudines



- Introduced species
- No natives in Utah
- Omnivorous
- Highly adapted
- Disruptive to food webs

Rainbow trout was introduced throughout Utah, due to its popularity as a sport fish. Although it is found throughout much of the western United States, rainbow trout are not native to Utah. Rainbow trout feed primarily upon aquatic invertebrates, including all life stages of insects as well as worms, but also small fish.

Partly because of their popularity, but also because some rainbow trout do not reproduce in areas of Utah where they are introduced, the Utah Division of Wildlife Resources stocks millions of rainbow trout in Utah's cool and cold waters each year. However, some spawning does occur, and often at the same time as that of native cutthroat trout. This can result in hybridization between the two species, which has caused a loss in genetic purity within cutthroat trout populations.

Rainbow trout

Oncorhynchus mykiss



- Introduced species
- Found in freshwater systems statewide
- Opportunistic carnivores
- Hybridizes with cutthroat trout

Reptiles (i.e., snakes, lizards, turtles, and tortoises) spend most their life cycles on land, with the exception of turtles. However, they lay terrestrial eggs and eat insects and spiders. Reptiles are ectothermic, meaning they rely on the environment to keep their body temperature in an optimal range. Because of this, reptiles are sluggish in the mornings, and can be found sunning themselves on rocks in an attempt to increase their body temperature and metabolic rate.

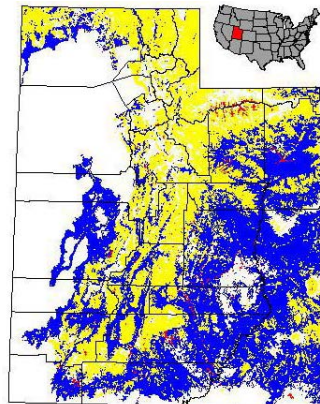
There are no aquatic turtles that are native to Utah, but many species are 'naturalized.' These are species that, while introduced, have established populations in the state. These include painted turtles, red-eared sliders, spiny softshells, and snapping turtles. As is the case with many introduced species, non-native turtles can disrupt the balance of a lake ecosystem. Perhaps the best example of this is the snapping turtle, which is an omnivorous, opportunistic feeder. It will eat plant material, invertebrates, fishes, amphibians, reptiles, small birds, and even rodents. Eggs are laid in late spring to early summer, and clutches can exceed 100 eggs. Eggs hatch in about three months. The snapping turtle is almost always found in or around water, and it prefers to hide among aquatic plants. However, it has been known to travel extensive distances over land in search of other aquatic habitats. The predatory habits of the snapping turtle make it a threat to the endangered native fishes of southwestern Utah's Virgin River system.

Common garter snake

Thamnophis sirtalis



- Common throughout Utah
- Carnivorous
- Ovoviviparous
- Eaten by fish, bullfrogs



Bluegill are closely related to the largemouth bass, as they are both in the sunfish family. The bluegill has also been introduced to Utah because of its value as a sport fish. It is native to the east and central United States. Bluegill are smaller than largemouth bass- adults only reach about 10 inches long. They have rounder bodies and a smaller mouth than the largemouth bass. The dorsal fin has two distinct sections (spinous and soft-ray), but the notch characteristic of largemouth bass is absent.

Spawning behavior is similar between the two species as well. The male bluefish digs a nest in gravel, sand, or muddy substrate for the female to lay eggs in. Once fertilized, the male guards the nesting site until the fry are old enough to swim and find food on their own. Young bluegill eat algae and zooplankton. Older fish add small fish, aquatic insects, and plant matter to their diet.

Bluegills are warm water fish. They prefer habitat with abundant cover, plant growth, logs, and submerged ledges, and are usually found in shallow water. Like the largemouth, bluegills are active through the winter.

Bluegill

Lepomis macrochirus



- Introduced species
- Found in warm waters statewide
- Opportunistic carnivore
- Extensive parental care

The common garter snake is found in many different habitats around the country. It is common in Utah, particularly in wetlands and other areas of high biodiversity. The snake is generally around 1.5-2 feet long, though large specimens are up to 4 feet in length. It is yellow and brown striped, with black splotches all along the body. Like all snakes, garter snakes are carnivores. They hunt for amphibians, earthworms, and insects. Garter snake saliva is toxic, particularly on the sensitive skin of amphibians and worms. They also hunt with their excellent sense of smell and sensitivity to heat. Sensors on the tongue relay scent information to the Jacobson's organ, a specially derived sensory organ, on the roof of the mouth.

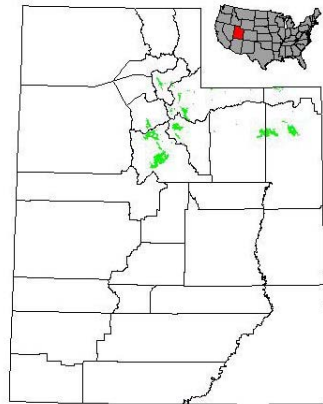
Garter snakes hibernate through the winter, and mate after emerging in the spring. Garter snakes are ovoviviparous, with females producing eggs internally, but giving birth to 12-40 live young anytime between July and October. Garter snakes will live anywhere with sufficient prey populations and ample cover. They are good swimmers and are commonly found in wetlands.

Smooth greensnake

Opheodrys vernalis



- Uncommon in Utah
- Primarily eats invertebrates
- Oviparous
- Hibernates in winter



Many fish are introduced to new habitats because they are valued as sport species, including the largemouth bass. It is native to central and southeastern states, and is stocked in Utah's waterways. Largemouth bass are greenish brown, with a dark streak down the side. It has two dorsal fins, one spinous and one soft-ray, separated by a deep notch. Adults can exceed two feet in length.

Largemouth bass live in warm, shallow, clear water with aquatic plant cover. They spawn during the spring or early summer, but are active all year round. The male digs a nest in gravel or loose substrate, or eggs are laid at the roots of aquatic plants. After about a week the young hatch. Bass fry live in a tight school and stay in the nursery area, protected by the male parent, for about a month.

Largemouth bass are carnivorous. The young hunt for insect larvae and other small aquatic animals, adults hunt for fish, crayfish, and other animals. They live in streams, rivers, lakes, and wetlands across the state. Wetlands provide the still, clear, warm water that the fish prefer.

Largemouth bass

Micropterus salmoides



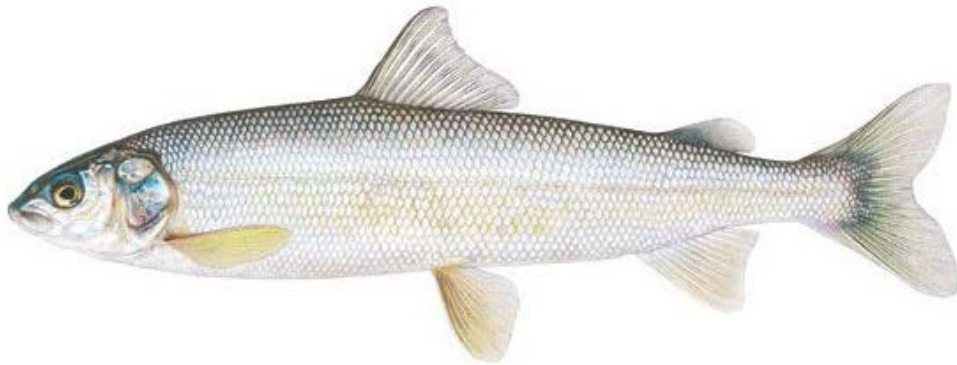
- Introduced species
- Found in warm waters statewide
- Carnivorous
- Compete with or prey upon native fishes

The smooth greensnake is relatively uncommon in Utah. As such, it is listed as a Utah Sensitive Species. It is found in all of the major mountain ranges in Utah. The snake has a bright green back and a light yellow or cream colored belly. Adults are between 10-20 inches long. When the weather gets too cold, greensnakes will hibernate in large groups. Communal nest sites have also been found.

Smooth greensnakes mate in the spring or summer. Females lay 3-11 eggs, which hatch in about a month. It is a carnivore, catching and swallowing prey alive. Spiders and insects make up most of the diet, although the snake will also consume amphibians, snails, slugs, and other small animals. Smooth greensnakes can be found in wet meadows where it is camouflaged due to its green dorsal coloration.

Whitefish

Prosopium spp.



- Three species
 - Bear Lake (*P. abyssicola*)
 - Bonneville (*P. spilonotus*)
 - Mountain (*P. williamsoni*)
- Cold-water species
- Carnivorous
- Coexist in Bear Lake

The least chub is another native Utah fish that is now Federally Endangered. It was once found throughout the Bonneville basin, but the introduction of non-native fish species has greatly reduced its numbers. As such, it is now found only in scattered springs and streams in western Utah.

The least chub is a small silver minnow. They prefer slow moving water with abundant submerged vegetation to provide cover, and are a schooling fish. Fish schools are another adaptation to reduce the risk of predation. When a large group of fish all swim together in close quarters it is much harder for predators to key in on any one individual.

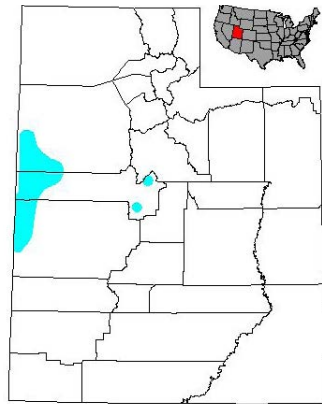
Least chub spawn in the water column. The fertilized eggs then drift down to the bottom where they stick to vegetation or other substrate. The least chub does not provide any parental care for its young, instead producing larger numbers of fertilized eggs than could possibly survive, ensuring that some will survive to breed. Efforts are underway across the state to increase least chub populations and reintroduce them to native habitat.

Least chub

Lotichthys phlegethontis



- Small minnow
- Swims in schools
- Reduced in historic range
- Federally Endangered Species



Bear Lake whitefish (*Prosopium abyssicola*) is a native Utah fish found only in Bear Lake on the Utah-Idaho border. They are a cold-water species, living in the deep waters in the lake during the summer months and feed upon invertebrates, fish eggs, and occasionally other fishes. The Bear Lake whitefish form large schools during its spawning season from February to May. The young fish eat zooplankton and insect larvae. They generally do not get very big, with a maximum size of around 10 inches in length. Larger individuals will prey on other fish species.

The Bonneville whitefish (*Prosopium spilonotus*), also endemic to Bear Lake, is an almost indistinguishably different species, though it gets much larger and has a more widely dispersed range than the Bear Lake whitefish. The best way to tell the two species apart is to count scales.

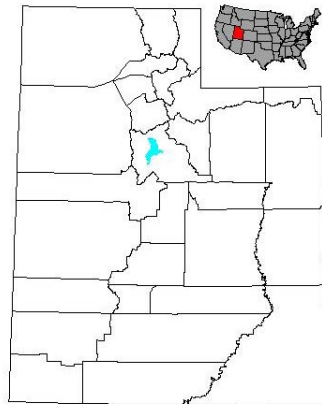
These two species also share habitat with the mountain whitefish (*Prosopium williamsonii*), which is common in lakes throughout Utah. Coexistence may be possible due to the fact that the smaller Bear Lake whitefish spawn in late winter or early spring, whereas the other two species spawn in late fall or early winter. One adaptation that might allow the mountain whitefish to succeed is that it tends to feed most intensively at night and in winter.

June sucker

Chasmistes liorus



- From millions to ~300 individuals
- Impacted by overfishing, water diversion, pollution, non-native fish
- Federally Endangered
- Extensive recovery efforts

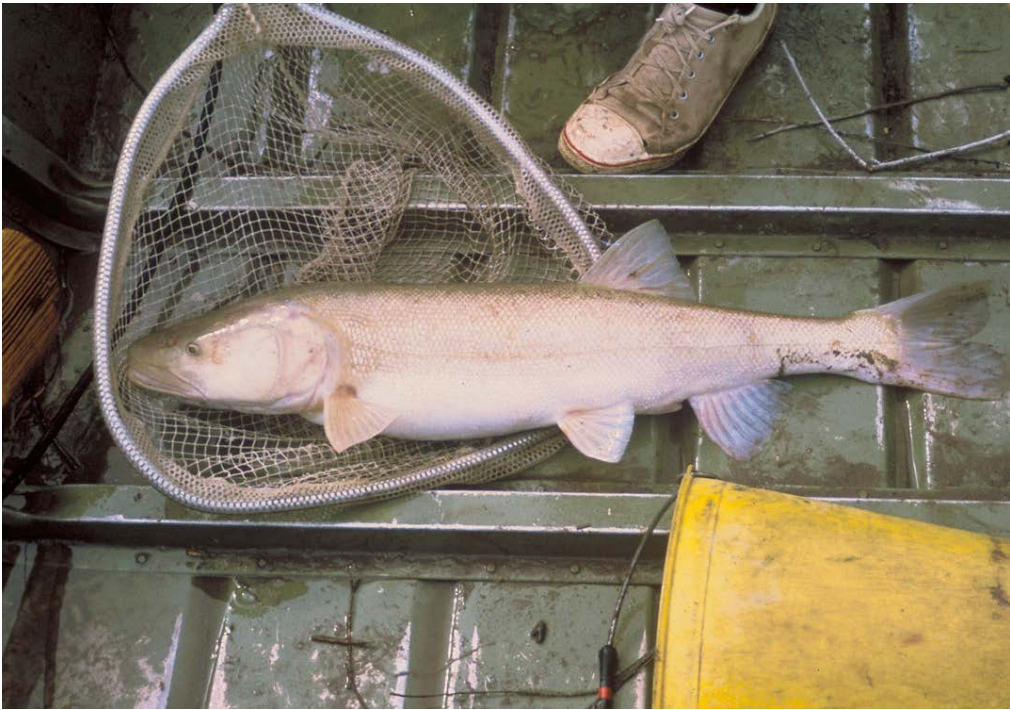


The Colorado pikeminnow is the largest minnow (family Cyprinidae) found in North America, and one of the largest in the world. It can live up to 50 years, reach a length of 6 feet and weigh up to 80 pounds, but since widespread settlement of the Colorado River basin, no wild fish have reached this size. Before the introduction of invasive fish species, the pikeminnow was the top predator in the Colorado River ecosystem. Its range is much smaller than what it was when the first settlers arrived in the area, and it has been Federally listed as Endangered since the 1970's.

The Colorado pikeminnow has a body shaped like a torpedo, giving it maximum hydrodynamic efficiency in the water, and a powerful tail. These adaptations make it an excellent predator of other fishes. It has a speckled olive green and gold back, which helps to break up the shape of the fish when viewed from above, with silver sides and a white belly. Today, the fish can be found in the Colorado River from Palisade, Colorado, to Lake Powell, and in tributary rivers along this stretch. Its population in most of these areas is stable or increasing.

Colorado pikeminnow

Ptychocheilus lucius



- Largest minnow in North America
- Excellent predator
- Reduced range
- Stable or increasing populations
- Federally Endangered Species

The June sucker is a fish species endemic to Utah Lake and the Provo River. Unlike other suckers, the June sucker is not benthic (i.e., bottom feeder). It feeds on zooplankton suspended in the water column. During the month of June, the fish swims up the Provo River to spawn in gravel beds.

The June sucker was once common, numbering in the millions, but the population has declined greatly due to overfishing, pollution, altered stream flow, and competition with exotic species. In the mid-1800's, it was reported that tons of fish were harvested from Utah Lake each year. Later diversions of the Provo River not only destroyed habitat, but routed newly hatched fish into farmer's fields, rather than into Utah Lake. Pollution of the Provo River further degraded spawning habitat over time. To make matters worse, instead of implementing measures to restore the June sucker, they were replaced with non-native fishes, such as walleye, white bass, and carp, that were introduced to Utah Lake. By 1998, it was estimated that only 300 breeding adult June suckers lived in Utah Lake. Along with Utah suckers, June suckers accounted for only 1% of the fish biomass in the lake.

As a result of the decline in June suckers, the species was Federally listed as an Endangered Species in 1986. Since this time, an extensive effort has been undertaken to aid in the recovery of the June sucker in Utah Lake. To date, approximately 43,000 June suckers have been released into Utah Lake. These fish are typically over 8 inches long, which is large enough to avoid predation by other fish. The June Sucker Recovery Implementation Program is attempting to rehabilitate the population of this native and Endangered fish. Research and monitoring, as well as education and information also play important roles in any public natural resource project.

Cutthroat trout

Onchorhynchus clarkii



- Four subspecies (3 native)
 - Bonneville
 - Colorado River
 - Yellowstone
 - Lahontan
- Rare in historic ranges
- Utah Sensitive Species

There are 4 subspecies of cutthroat trout that live in Utah, 3 of these (Bonneville, Colorado River, and Yellowstone) are native. They spawn in gravel beds in stream riffles during the spring and early summer. Intact riparian areas are very important for trout populations. They stabilize the riverbank, keeping erosion to a minimum, and provide shade and cover.

The Bonneville cutthroat trout, once an inhabitant of ancient Lake Bonneville, is now rare within its historic range. It can be found in a variety of stream habitats, including high mountain streams and low grassland streams. The Bonneville cutthroat trout is an opportunistic feeder, eating invertebrates as young and other fish as adults. The major threats facing the Bonneville cutthroat trout are habitat loss or alteration, competition with or predation by nonnative fish species, and hybridization with nonnative fish species, such as the rainbow trout. Because of these threats, the Bonneville cutthroat trout has been placed on the Utah Sensitive Species List. It is the state fish of Utah.

The Colorado River cutthroat trout are, like the Bonneville subspecies, rare within its historic range- the Upper Colorado River drainage. As such, it is also listed as a Sensitive Species in Utah. Faced with the same threats as the Bonneville cutthroat trout, pure Colorado River cutthroat trout are found only in isolated, high-elevation headwaters. Similar in habits to the Bonneville cutthroat trout, the Yellowstone cutthroat trout is native to the Snake River drainage in the northwest corner of Utah.

The Lahontan cutthroat trout is native to Oregon, California, and Nevada, but only occurs in a small portion of its native range. Because of this, it is a Federally Listed Threatened Species. It has been introduced into the Pilot Peak Range of western Box Elder County.