

Biodiversity: A Guide to Agricultural Wildlife

A Senior Project

presented to

the Faculty of the Animal Science Department

California Polytechnic State University, San Luis Obispo

In Partial Fulfillment

of the Requirements for the Degree

Bachelor of Science

by

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BIODIVERSITY

A GUIDE TO AGRICULTURAL WILDLIFE

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Introduction

This project would not exist without the influence of several Cal Poly classes and professors. These professors and their courses have inspired us to seek a better understanding of the world around us and to take up important roles in it. After taking Field Vertebrate Zoology, Ornithology, Rangeland Management, and Holistic Management classes here at Cal Poly, we could not help but notice the interconnected ecological processes going on around us. We also came to realize that there are many who are unaware of the ecosystems that are within close proximity at any given moment, particularly on campus.

We have compiled a list of the birds and mammals that we documented at selected locations on campus. Through this document we aim to offer an easily accessible resource that students, faculty, and visitors can utilize to not just satisfy their curiosity but also spark further contemplation. Just as our Cal Poly classes have helped foster long-term curiosity, awareness, and critical thinking within us, through this guide we aspire to do the same for others. For each species and for each location, we have also summarized the possible implications of our observations from a holistic perspective. The purpose of this is to get people to think about the way land is managed and what may indicate that it is being mismanaged or that the certain aspects of current management need to be changed. Our interpretations may not always apply, as ecosystems and management change, but we hope that they are of some value to decision makers/unit managers for future decisions.

About the Authors



In 2010, **Elaina** left Dayton, Ohio to attend the Animal Science program at California Polytechnic State University as an undergraduate. Since then, she has added a Biology & Rangeland Resource Management minor. Upon graduation, she hopes to educate middle school to college age students in holistic management and to restore rangelands across the world. When she is not studying, Elaina spends her time running around San Luis Obispo, horseback riding with friends and birdwatching.

Rebecca is extremely thankful that she discovered Cal Poly, where she has enjoyed unparalleled opportunities for hands-on experience with animals. After she graduates, Rebecca plans to attend Montana State University for a master's program in Animal and Range Science. Ultimately Rebecca hopes to work with Cooperative Extension mediating agriculture-wildlife conflicts and promoting diverse, sustainable agriculture in the western United States. In her spare time, Rebecca reads, follows her dog on walks, and is easily distracted by things with wings.

Research Methods

Materials:

- Binoculars (8x zoom, 42mm aperture)
- Sibley Guide to Birds* (2000 edition)
- Camera trap
- Digital camera

Methods:

While we could have simply listed out the wildlife that should be found around San Luis Obispo County, we believed it valuable to have personal experience with identifying the animals ourselves. Without taking the time to become familiar with the wildlife in its natural environment, we would not have the passion that we do for each species and collection of species in each location that we have become fond of. Furthermore, we would not have been able to confirm the presence of some unusual species - such as the Nutmeg Mannikin - on campus, nor in which areas of campus one should expect to see a species.

During the planning stage, we decided to make at least three visits lasting an hour or more in seven different locations around campus. Some sort of human development surrounds each location: crop agriculture, roads, buildings, or livestock pastures. We randomly assigned morning, afternoon, and evening observation times to each location throughout Fall Quarter so that we would have an equal number of mornings, afternoons, and evenings spent at each location. At every location we recorded weather, start time, habitat, and all the species that we saw.

In order to control for our presence and to get an idea of the animals that may only appear at night, we installed a camera trap in the sheep unit. After we determined an area that appeared to have significant animal usage, we assembled and installed the camera there and left it for about a month. During that time, the camera captured dozens of photos of nocturnal mammals, many of which we never saw or heard during our regular observation times.

Table of Contents (Birds)

Click on a species name to view its information.

Aves (confirmed unique species on campus: 75)

Waterbirds (14):

Pied-billed Grebe
Brown Pelican
Double-crested Cormorant
Great Blue Heron
Great Egret
Black-crowned Night Heron
Bufflehead
Ruddy Duck
Mallard
Northern Shoveler
Cackling Goose
American Coot
Killdeer
Spotted Sandpiper

Raptors and soaring birds (7):

Turkey Vulture
Red-shouldered Hawk
Osprey
Red-tailed Hawk
Cooper's Hawk
Prairie Falcon
American Kestrel

Chicken-like birds (1):

Wild Turkey

Owls and nocturnal birds (2):

Barn Owl
Common Poorwill

Crows, jays and similar large passerines (6):

Mourning Dove
Rock Pigeon
Eurasian Collared-Dove
Western Scrub-Jay
American Crow
Steller's Jay

Woodpeckers (4):

Northern Flicker
Downy Woodpecker
Nuttall's Woodpecker
Acorn Woodpecker

Robins and medium passerines (18):

Western Kingbird
Say's Phoebe
Black Phoebe
Loggerhead Shrike
Hermit Thrush
Western Bluebird
American Robin
Wrentit
Northern Mockingbird
European Starling
Western Tanager
California Towhee
Brown-headed Cowbird
Great-tailed Grackle
Red-winged Blackbird
Tricolored Blackbird
Western Meadowlark
Brewer's Blackbird

Warblers and tiny passerines (23):

Anna's Hummingbird
Barn Swallow
Northern Rough-winged Swallow
Oak Titmouse
Chestnut-backed Chickadee
Bushtit
House Wren
Bewick's Wren
Ruby-crowned Kinglet
Common Yellowthroat
Yellow Warbler
Yellow-rumped Warbler
Townsend's Warbler
Song Sparrow
Lincoln's Sparrow
White-crowned Sparrow
Golden-crowned Sparrow
Dark-eyed Junco
American Goldfinch
Lesser Goldfinch
House Finch
House Sparrow
Nutmeg Mannikin

Table of Contents (Mammals)

Click on a species name to view its information.

Mammalia

Marsupials:

Virginia Opossum

Lagomorphs:

Brush Rabbit

Black-Tailed Jackrabbit

Rodents:

Western Gray Squirrel

California Ground Squirrel

Botta's Pocket Gopher

Carnivores:

Coyote

Raccoon

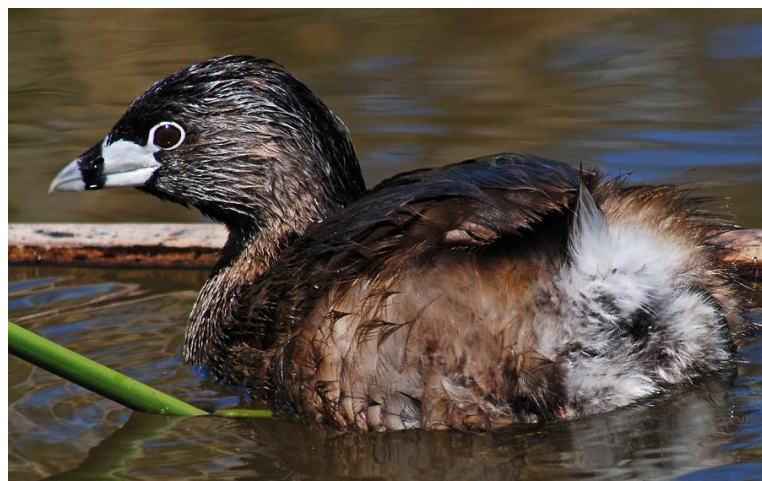
Striped Skunk

Bobcat

Ungulates:

Black-tailed Deer (Mule Deer)

Pied-billed Grebe



Size:	Small
At-a-glance coloration:	Brown, white sexes same
Common sound(s):	http://www.xeno-canto.org/109908
Behavior:	diving for food
Species of confusion:	None on campus
Cal Poly Habitats:	Indonesian Reservoir, Shepard Reservoir

Implications: The Pied-billed Grebe is a somewhat reclusive species that relies on a so-called "hemi-marsh" habitat involving deep brackish to fresh water with a mixture of deeply rooted and floating plants (NYDEC, Wetlands). Pied-billed Grebes tend to prefer open, calm water for nesting, within 5-10m from shorelines. They forage underwater on fish (especially in winter), crustaceans and insects (USFWS). Grebes were one of many species whose populations were decreased as a result of widespread DDT use; today, their reliance on the hemi marsh habitat may become difficult as wetlands become rarer with human development (NYDEC).

Literature Cited:

New York Department of Environmental Conservation. (n.d.). Pied-billed Grebe Fact Sheet. In *Animals, Plants, Aquatic Life*. Retrieved from <http://www.dec.ny.gov/animals/85203.html>.

U.S. Fish & Wildlife Service. (2001). Pied-billed Grebe Habitat Model. In *Species/model Narratives and Metadata for the ARCINFO Grids of Important Gulf of Maine Fish and Wildlife Habitats*. Retrieved from http://www.fws.gov/r5gomp/gom/habitatstudy/metadata/pied-billed_grebe_model.htm.

The Wetlands Initiative. (n.d.). What is a wetland?. In *Why Wetlands?*. Retrieved from <https://www.wetlands-initiative.org/why-wetlands/what-is-a-wetland.html>

Brown Pelican



Size:	Large
At-a-glance coloration:	Brown, white, yellow sexes same
Sound(s):	No common call
Behavior:	Will plunge into the water from flight to catch fish
Species of confusion:	None on campus
Cal Poly Habitats:	Shepard Reservoir



Implications: Sighting a Brown Pelican on campus was probably a fluke. They generally spend all their time near the shoreline, either feeding on shallow fish, nesting on small islands, or resting on rocky regions (Cornell). It is likely that any Brown Pelican at Cal Poly was blown inland by a storm or otherwise detoured during migration.

Literature Cited:

Cornell Lab of Ornithology. (n.d.). Life History. In *Brown Pelican*. Retrieved from http://www.allaboutbirds.org/guide/Brown_Pelican/lifehistory.

Double-crested Cormorant



Size:	Large
At-a-glance coloration:	Brown, cream (juvenile), black Yellow around bill, white crests sexes same
Sound(s):	Call uncommon; http://www.xeno-canto.org/145781
Behavior:	Often spread wings to dry them off after swimming
Species of confusion:	Other cormorants
Cal Poly Habitats:	Indonesian Reservoir

Implications: Double-crested Cormorants feed on small fish, often in large groups. Large colonies accumulate to nest, with the potential to out-compete other waterbirds (such as Black-crowned Night Herons) for habitat. They may not be particularly good indicator species for environment quality, because now that DDT is no longer a problem, their populations have exploded to the point of competing with humans for sportfish. Double-crested Cormorants nest in trees (EPA).

Literature Cited:

Environmental Protection Agency. (n.d.). Double-crested Cormorant Population. In *Detroit River-Western Lake Erie Basin Indicator Project*. Retrieved from http://www.epa.gov/med/grosseile_site/indicators/cormorants.html.

Great Blue Heron



Size:	Large
At-a-glance coloration:	Blue-gray, some dark and/or rusty patches sexes same
Sound(s):	http://www.xeno-canto.org/162099
Behavior:	Wading; low, broad-winged flight with legs trailing
Species of confusion:	None on campus
Cal Poly Habitats:	Shepard Reservoir Sheep Unit

Implications: Great Blue Herons nest in large colonies in trees. Continued use of a tree or patch of trees may cause a "bullseye" effect of killing off trees in the center of a stand, expanding outward with subsequent use. This could result in economic losses if the herons were to select an agriculturally producing tree as nesting site. Human interference in natural erosion – which impacts the formation of nesting islands – and declining water quality may ultimately reduce reproductive success. Great Blue Herons need shallow water with adequate submerged vegetation in which to hunt for fish, and so coastal populations may become impacted by rising sea levels (USFWS).

Literature Cited:

U.S. Fish & Wildlife Service. (2011). Great Blue Heron (*Ardea herodias*). In *Chesapeake Bay Field Office: Northeast Region*. Retrieved from <http://www.fws.gov/chesapeakebay/heron.html>.

Great Egret



Size:	Large
At-a-glance coloration:	White, yellow black legs and feet sexes same
Sound(s):	http://www.xeno-canto.org/167108
Behavior:	Wading; low, broad-winged flight with legs trailing
Species of confusion:	Snowy Egret (smaller, yellow feet)
Cal Poly Habitats:	Parker Barn Dairy

Implications: Great Egrets are seasonally monogamous and nest in colonies in trees. They are highly territorial and can be aggressive and steal food from other (smaller) heron species. Fish and other small vertebrates and invertebrates form the majority of their diet. Adult egrets are at the top of the food chain, but eggs and nestlings are at risk from raccoon, crow and vulture predation. Some protections against humans have been instated to support the species due to prior harvesting for their lacy plumage. Hydrocarbons and mercury in their environments can cause shell thinning (CHs) or accumulate in the feathers (Hg) and potentially impact behavior and reproduction (Jones).

Literature Cited:

Jones, J. (2002). *Ardea alba*: great egret. In *Animal Diversity Web*. Retrieved from http://animaldiversity.ummz.umich.edu/accounts/Ardea_alba/.

Black-crowned Night Heron



Size:	Large
At-a-glance coloration:	Gray, black; yellow legs red eyes (adult) sexes same
Sound(s):	http://www.xeno-canto.org/176645
Behavior:	Wading; often appears hunched over
Species of confusion:	American Bittern (has streaky brown plumage similar to juvenile Night Heron)
Cal Poly Habitats:	Shepard Reservoir

Implications: Black-crowned Night Herons are largely nocturnal, and so are difficult to identify. Additionally, habitat loss (loss of wetlands) is likely contributing to an overall decline in the national population. Cormorants may be responsible for displacing herons from prime nesting and foraging habitats. Their position as predators also puts Black-crowned Night Herons at risk of accumulating environmental pollutants (Scharf). They require dense coverage during the day, but may roost and nest as high up as 50m in trees. Night Herons can be found in most marshy, freshwater or brackish aquatic environments including agricultural fields, ponds, and reservoirs. They tend to nest in large colonies, often with other waterbirds, and may even steal the young of other nesting birds to feed themselves and their own nestlings (A&M Extension).

Literature Cited:

Scharf, W. C. (2011). Black-crowned Night Heron. In *Michigan Bird Atlas*. Retrieved from www.mibirdatlas.org/Portals/12/MBA2010/BCNHaccount.pdf.

Texas A&M AgriLife Extension. (n.d.). Black-crowned Night Heron. In *The Texas Breeding Bird Atlas*. Retrieved from <http://txtbba.tamu.edu/species-accounts/black-crowned-night-heron/>.

Bufflehead



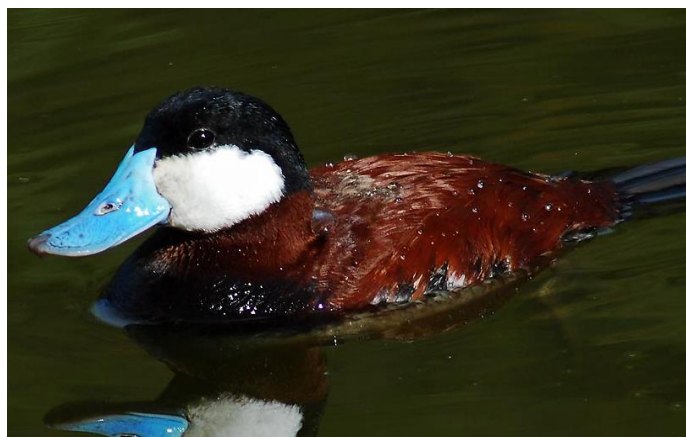
Size:	Small
At-a-glance coloration:	Black, white females darker overall with gray body and small white cheek patch just behind eye
Sound(s):	http://www.xeno-canto.org/152601
Behavior:	Dives and bobs back to the surface
Species of confusion:	Since they are smaller than other ducks, males tend not to be mistaken for other species. Ruddy Duck (females; paler brown)
Cal Poly Habitats:	Indonesian Reservoir

Implications: Bufflehead winter in the lower 48, often using Northern Flickers' nests in tree cavities, thus limiting breeding range; they tend to be monogamous across the years. They avoid open coastline and concentrate in sheltered saltwater bodies or smaller freshwater bodies. Bufflehead feed on aquatic insects and larvae, small mollusks, large zooplankton, and some plant matter in fall/winter by diving. Due to their preferred habitat, they are at risk of being hunted, and logging threatens the loss of their nest sites in aspen parklands. Nest boxes with 2.5-inch diameters can provide them new sites (Cornell).

Literature Cited:

Cornell Lab of Ornithology. (n.d.). Life History. In *Bufflehead*. Retrieved from <http://www.allaboutbirds.org/guide/bufflehead/lifehistory>.

Ruddy Duck



Size:	Medium
At-a-glance coloration:	Red-brown, white, black Blue bill juvenile males brown but follow same plumage pattern; females brown with dark cheek stripe on creamy face
Sound(s):	http://www.xeno-canto.org/169402
Behavior:	Male will smack his chest with his bill to court females
Species of confusion:	Bufflehead (females); Northern Shoveler (male)
Cal Poly Habitats:	Indonesian Reservoir

Implications: Aggressive toward others of their own species and others, Ruddy Ducks can also be harassed by grebes and coots (aggressive behaviors seem to be associated with breeding season). Ruddy Ducks nest above the water level in reeds and other plant matter. They feed on insects (including mosquitoes), crustaceans and other invertebrates by filtering mud on the bottoms of freshwater bodies, and eat plant matter during migration and winter. Predators of ducklings include raccoons, California Gulls, and black-crowned night herons, while red-tailed hawks, great horned owls, raccoons and red foxes prey upon adults. Ruddy Ducks are not commonly hunted or otherwise at risk of seriously decreased populations (Cornell).

Literature Cited:

Cornell Lab of Ornithology. (n.d.). Life History. In *Ruddy Duck*. Retrieved from http://www.allaboutbirds.org/guide/ruddy_duck/lifehistory.

Mallard



Size:	Medium
At-a-glance coloration:	Green, gray, brown Orange legs/feet females drab brown
Sound(s):	classic "quack": http://www.xeno-canto.org/170678
Behavior:	Up-end or "dabble" to feed
Species of confusion:	Northern Shoveler (females very similar, look for larger bill; males have bright white alternating with red-brown on sides)
Cal Poly Habitats:	Indonesian Reservoir Shepard Reservoir

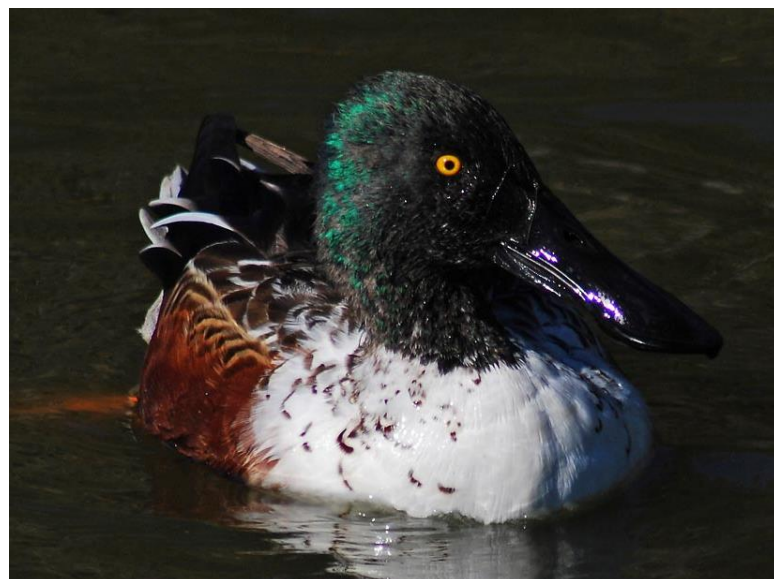
Females can be confused with many other duck species females; when in flight, Mallard females and males have a purple speculum, or wing patch, that can help with distinguishing the females. Their "quack" is also very unique.

Implications: Habitat generalists, Mallards will be found in essentially every body of water, including prairie potholes, ephemeral wetlands, rice fields, and around agriculture. Mallards "dabble" to feed - they tip forward, rather than dive, to feed. Their diets ranges from aquatic vegetation and seeds to insect larvae and freshwater shrimp. Animal prey is eaten during breeding season, while plants and seeds are eaten during migration. Mallards nest in moist depressions in the ground, covering the nest with nearby plant matter and the female's feathers; they also willingly nest in artificial nesting structures. Since Mallards are the United States' most prevalent duck species, their presence is not a good indicator of environmental quality or overall health (Cornell).

Literature Cited:

Cornell Lab of Ornithology. (n.d.). Life History. In *Mallard*. Retrieved from <http://www.allaboutbirds.org/guide/Mallard/lifehistory>.

Northern Shoveler



Size:	Medium
At-a-glance coloration:	Green, white Red-brown females drab
Sound(s):	http://www.xeno-canto.org/168803
Behavior:	Filter mud through their bills as they swim
Species of confusion:	Mallard (females almost identical, have purple speculum and shorter bill), Ruddy Duck (doesn't have bright white on males, head black and white)
Cal Poly Habitats:	Indonesian Reservoir Shepard Reservoir

Implications: Shovelers feed on seeds and small aquatic invertebrates and will reside in both fresh- and salt-water marshes during winter, later breeding in shallow, open wetlands with short grasses for nesting (Cornell, Illinois). Northern Shovelers can also be found in or near pastures and field crops. Unlike Mallards, the Northern Shoveler rarely tips into the water when feeding, sifting food instead from the top layer of water. Omnivorous, they will eat plant matter (tubers, shoots, leaves, seeds) as well as aquatic invertebrates, insect larvae, and some small fishes and juvenile amphibians. They can be highly territorial in defense of mates and nesting area. Northern Shovelers are sensitive to herbicides, pesticides and insecticides; maintaining wetlands and streams will encourage populations (Illinois).

Literature Cited:

Cornell Lab of Ornithology. (n.d.). Identification. In *Northern Shoveler*. Retrieved from http://www.allaboutbirds.org/guide/Northern_Shoveler/id.

Illinois Natural History Survey. (n.d.). Northern Shoveler. In *Birds of Illinois*. Retrieved from <http://www.inhs.illinois.edu/collections/birds/ilbirds/49/>.

Cackling Goose



Size:	Medium
At-a-glance coloration:	Black, white, brown sexes same
Sound(s):	http://www.xeno-canto.org/92018
Behavior:	Usually forage and fly in flocks
Species of confusion:	The larger Canada Goose (doesn't usually have white neck ring; tends to have longer neck, bill)
Cal Poly Habitats:	Indonesian Reservoir

Implications: Like with the Brown Pelican, Cackling Geese are likely only going to occur in SLO due to migration routes, and are not likely to be seen. Even so, they and their larger relative the Canada Goose are entirely herbivorous, eating grasses, sedges, grains and berries (Cornell). As a result, Cackling Geese may cause conflict with ranchers due to large flocks competing with livestock for grasses in pastures (Drucker).

Literature Cited:

Cornell Lab of Ornithology. (n.d.). Identification. In *Cackling Goose*. Retrieved from http://www.allaboutbirds.org/guide/cackling_goose/lifehistory.

Drucker, B. (April 2013). Creature Feature- Aleutian Cackling Goose. *EcoNews*, 43(2). Retrieved from <http://yournec.org/content/creature-feature-aleutian-cackling-goose>.

American Coot



Size:	Medium
At-a-glance coloration:	Black, white Dark red on adult bill sexes same
Sound(s):	grunting clicks: http://www.xeno-canto.org/172862
Behavior:	Rarely fly
Species of confusion:	None on campus
Cal Poly Habitats:	Indonesian Reservoir Shepard Reservoir

Implications: American Coots are found in most freshwater habitats with thick emergent vegetation and standing water amongst the vegetation, for floating but anchored nests. When drought limits areas of standing fresh water, they may breed only in permanent wetlands. Coots eat mainly aquatic plants, supplementing with some terrestrial plant leaves, invertebrates and tadpoles. They may steal food from others, and lay eggs in nests of other waterbirds (other coots as well as ducks) (Bridgman, Cornell). Ospreys and bald eagles are their primary predators. Not typically hunted as game, they may be disliked for residing in parks or golf courses and excreting on the greenery (Bridgman).

Literature Cited:

Bridgman, A. (2003). *Fulica americana*: American coot. In *Animal Diversity Web*. Retrieved from http://animaldiversity.ummz.umich.edu/accounts/Fulica_americana/.

Cornell Lab of Ornithology. (n.d.). Life History. In *American Coot*. Retrieved from http://www.allaboutbirds.org/guide/american_coot/lifehistory.

Killdeer



Size:	Small
At-a-glance coloration:	Brown, white, black sexes same
Sound(s):	high-pitched: http://www.xeno-canto.org/160292
Behavior:	Can be heard at dusk
Species of confusion:	None on campus
Cal Poly Habitats:	Indonesian Reservoir

Implications: Almost always found in open habitats, including lawns and grazed pastures, Killdeer are most likely in places with vegetation no taller than an inch. Killdeer feed on invertebrates, including grasshoppers and beetles, as well as small amphibians, seeds and berries. They can be beneficial to field crops and livestock by eating mosquitoes, ticks and locusts. Nests are simply small scrapes on the ground with light-colored debris inside (rocks, sticks, shells), which Killdeer often make in excess to confuse predators. Killdeer will readily nest in human-inhabited areas, so they are at risk of being hit by cars, flying into buildings, and pesticide poisoning. Predators include gulls, crows, foxes, coyotes, raccoons, skunks, opossums, and domestic cats and dogs (Cornell, Dewey).

Literature Cited:

Cornell Lab of Ornithology. (n.d.). Life History. In *Killdeer*. Retrieved from <http://www.allaboutbirds.org/guide/killdeer/lifehistory>.

Dewey, T. and Chung, H. (2001). *Charadrius vociferus*: Killdeer. In *Animal Diversity Web*. Retrieved from http://animaldiversity.ummz.umich.edu/accounts/Charadrius_vociferus/.

Spotted Sandpiper



Above: breeding plumage.

Left: non-breeding, lacks spots and may appear more gray.

Size:	Small
At-a-glance coloration:	Gray-brown, white, yellow Adults have dark black spots on breast, sides, flanks and belly sexes same
Sound(s):	http://www.xeno-canto.org/66260
Behavior:	When walking or foraging, will bounce up and down on their legs, bobbing their tails
Species of confusion:	None on campus
Cal Poly Habitats:	Indonesian Reservoir

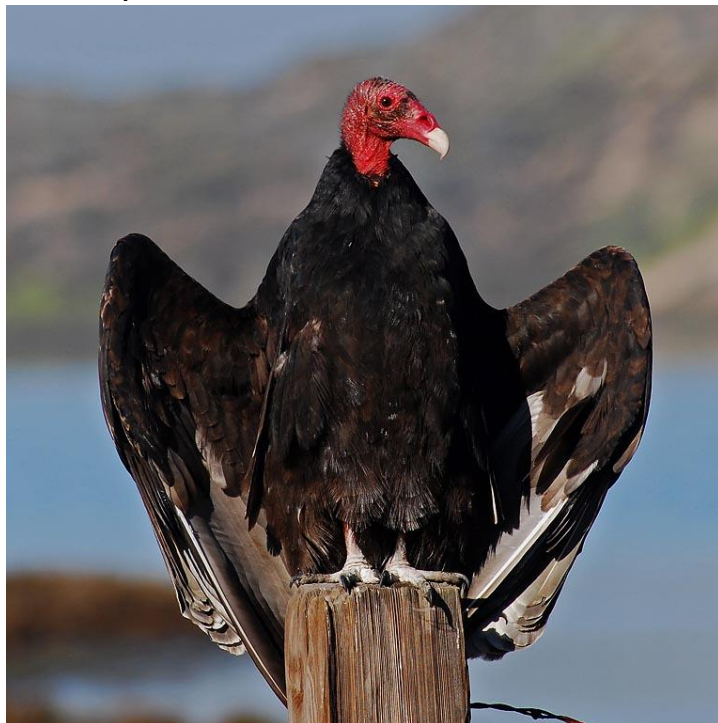
Implications: Spotted Sandpipers are early to populate new habitat and breeds across the United States, eating small invertebrates and insects. Some populations are threatened by loss of habitat and poor water quality, but on the whole they are a widespread species of shorebird (Conserve Wildlife). Females are physically capable of having up to five broods throughout the breeding season due to polyandry, or having multiple male mates to one female. However, they are limited by the population of available males, and so tend to only have two broods of up to four large eggs each. Nestlings rely on large insect populations for food, so the breeding season is limited to a yearly increase in insect prevalence (Ehrlich, Dobkin, and Wheye).

Literature Cited:

Ehrlich, P. R., Dobkin, D.S., and Wheye, D. (1988). Polyandry in the Spotted Sandpiper. In *Essays*. Retrieved from http://www.stanford.edu/group/stanfordbirds/text/essays/Polyandry_in_the_Spotted.html.

Heiser, Emily. (2011). Spotted Sandpiper. In *New Jersey Endangered and Threatened Species Field Guide*. Retrieved from <http://www.conservewildlifenj.org/species/fieldguide/view/Actitis%20macularius/>.

Turkey Vulture



Size:	Large
At-a-glance coloration:	Black with paler undersides to their wings Red head sexes same
Sound(s):	No common call
Behavior:	Soar with wings angled upward in a “tippy v”; will hold wings out like cormorants do to warm themselves
Species of confusion:	Soaring hawks
Cal Poly Habitats:	All

Implications: One of the most widespread bird species, from the northern United States to Tierra del Fuego, Turkey Vultures are common in all environments from residential to wild. These vultures rely on their keen sense of smell to find carrion of all types, usually fresh. They don't tend to attack live prey. Strong immune systems help Turkey Vultures avoid contracting botulism, anthrax, cholera, and salmonella from their meals. They tend to nest away from human civilization, though they are comfortable feeding nearby in groups. Turkey Vultures can be vulnerable to eating lead shot in hunted or poached prey, and are sometimes threatened by people with the mistaken belief that they spread disease (Cornell).

Literature Cited:

Cornell Lab of Ornithology. (n.d.). Life History. In *Turkey Vulture*. Retrieved from http://www.allaboutbirds.org/guide/Turkey_vulture/lifehistory.

Red-shouldered Hawk



Size:	Medium
At-a-glance coloration:	Red-brown Black and white sexes same
Sound(s):	high-pitched; can sound like gulls calling: http://www.xeno-canto.org/168959
Behavior:	Soaring, perching on trees; often harassed by crows
Species of confusion:	Cooper's Hawk (check tail color and pattern)
Cal Poly Habitats:	Indonesian Reservoir, Sheep Unit, main campus

Implications: Most often found in habitats with dense tree cover but open subcanopy (forests), Red-shouldered Hawks will also be found in suburban or riparian environments. The Red-shouldered Hawk has mutually aggressive relationships with both American Crows and Great Horned Owls. They will nest annually in the same territory, rebuilding or refurbishing the nest each year. They hunt small mammals, some birds, reptiles and amphibians by perching near bodies of water and gliding down to grab prey. Not of national population concern, this hawk has been listed as threatened in some eastern states (Cornell). Nesting almost always occurs near open water. Human development has decreased breeding territory (NY DEC).

Literature Cited:

Cornell Lab of Ornithology. (n.d.). Life History. In *Red-shouldered Hawk*. Retrieved from http://www.allaboutbirds.org/guide/red-shouldered_hawk/lifehistory.

New York Department of Environmental Conservation. (n.d.) Red-shouldered Hawk Fact Sheet. In *Animals, Plants, Aquatic Life*. Retrieved from <http://www.dec.ny.gov/animals/7082.html>.

Osprey



Size:	Medium
At-a-glance coloration:	Black and white sexes similar; female has black “collar” visible between throat and breast when flying
Sound(s):	http://www.xeno-canto.org/174765
Behavior:	Will perch on man-made structures to eat fish; have proportionally longer wings in flight than most hawks
Species of confusion:	Flying hawks
Cal Poly Habitats:	Indonesian Reservoir Organic Farm



Implications: Ospreys are known to be one of the indicators of environmental quality; they were in decline due to DDT, and especially due to fish-only diet, can also reveal accumulation of other toxins in water bodies. They are being monitored for population decline due to overfishing, water pollution or other causes. Ospreys have been found in freshwater, brackish and saltwater bodies (Citizens United, Springston). They will nest on human-made structures including telephone poles and manufactured nesting platforms where there is good visibility of the surrounding environment and sources of fish are within a certain radius (about 12 miles). Some unfortunate consequences of nesting with human materials have included chick entanglement in twine and wires (Cornell). Interestingly, to establish new populations young males are better candidates, since they tend to stay within 20 miles of their birthplace while females will disperse hundreds of miles (Schlarbaum).

Literature Cited:

Citizens United. (n.d.). Osprey Colony Project. In *Citizens United*. Retrieved from <http://www.cumauriceriver.org/pages/osprey.html>

Cornell Lab of Ornithology. (n.d.). Life History. In *Osprey*. Retrieved from <http://www.allaboutbirds.org/guide/osprey/lifehistory>

Springston, R. (18 Mar. 2013). Ospreys Offer Clues on the Environment. *Richmond Times-Dispatch*. Retrieved from http://www.timesdispatch.com/news/state-regional/ospreys-offer-clues-on-the-environment/article_f497f261-a705-580d-a168-f404a3514d6d.html

Schlarbaum, P. (n.d.). Osprey “Fishing Perfection”. In *Diversity Projects*. Retrieved from <http://www.iowadnr.gov/Environment/WildlifeStewardship/NonGameWildlife/DiversityProjects/OspreyRestoration.aspx>

Red-tailed Hawk



Size:	Medium
At-a-glance coloration:	Brown, cream Red-brown sexes same
Sound(s):	Classic hawk cry: http://www.xeno-canto.org/173875
Behavior:	Very flat, stable gliders (compare to Turkey Vulture)
Species of confusion:	Red-shouldered Hawk in flight (black and white tail and wing patterns)
Cal Poly Habitats:	Sheep Unit, Indonesian Reservoir, Slack Pasture (etc.)



Implications: Red-tailed Hawks occupy most open environments including deserts, open woodlands, parks and roadsides. They prey on mammals ranging in size from voles to jackrabbits, but will also eat smaller birds, snakes, and carrion. They nest near the tops of trees for a broad view of the landscape and will also nest on artificial platforms and structures. Mated pairs tend to be monogamous until one of the pair dies. Red-tailed Hawks will aggressively chase off other hawks, eagles, and Great Horned Owls. Not a good indicator species of environmental conditions, Red-tailed Hawks have relatively steady populations (Cornell).

Literature Cited:

Cornell Lab of Ornithology. (n.d.). Life History. In *Red-tailed Hawk*. Retrieved from http://www.allaboutbirds.org/guide/red-tailed_hawk/lifehistory.

Cooper's Hawk



Size:	Medium
At-a-glance coloration:	Red-brown, gray and black tail Brown, cream (juvenile) sexes same
Sound(s):	http://www.xeno-canto.org/177270
Behavior:	Chase prey on the wing; seen perched on tree branches
Species of confusion:	Red-shouldered Hawk (has black and white tail, red tint on shoulders) Red-tailed Hawk (juveniles similar, but solid-color tail) Sharp-shinned Hawk (smaller)
Cal Poly Habitats:	Sheep Unit, Indonesian Reservoir, Parker Barn

Implications: Preferring habitats with lots of tree cover to hunt prey, Red-shouldered Hawks will be found in forests and in well-canopied suburbs and parks. They feed on medium-sized birds (such as Starlings, Mourning Doves, and Northern Flickers) more than small ones but will occasionally eat small mammals such as chipmunks, bats and hares, especially in western environments (i.e., here at Cal Poly). They tend to nest on flat ground in dense woods. Strong populations have rebounded today although this species had been a victim of DDT (Cornell).

Literature Cited:

Cornell Lab of Ornithology. (n.d.). Life History. In *Cooper's Hawk*. Retrieved from http://www.allaboutbirds.org/guide/Coopers_Hawk/lifehistory.

Prairie Falcon



Size:	Medium
At-a-glance coloration:	Brown, white sexes same
Sound(s):	http://www.xeno-canto.org/109298
Behavior:	Soar then stoop to catch prey
Species of confusion:	American Kestrel (when flying), Red-tailed Hawk -similar pale belly
Cal Poly Habitats:	Indonesian Reservoir Slack Pasture

Implications: Prairie Falcons are found in open, low-elevation (below about 10,000 ft) habitats, sometimes including feedlots and cultivated fields where prey is abundant. When available, ground squirrels will provide the majority of this falcon's diet, as well as many bird species such as Starlings, Mourning Doves, and Cliff Swallows. Lizards and insects are occasionally eaten. Prairie Falcons nest on cliffs by making a scrape, or in old raven or eagle nests. They are highly territorial in the breeding season. Stable populations persist today (Cornell).

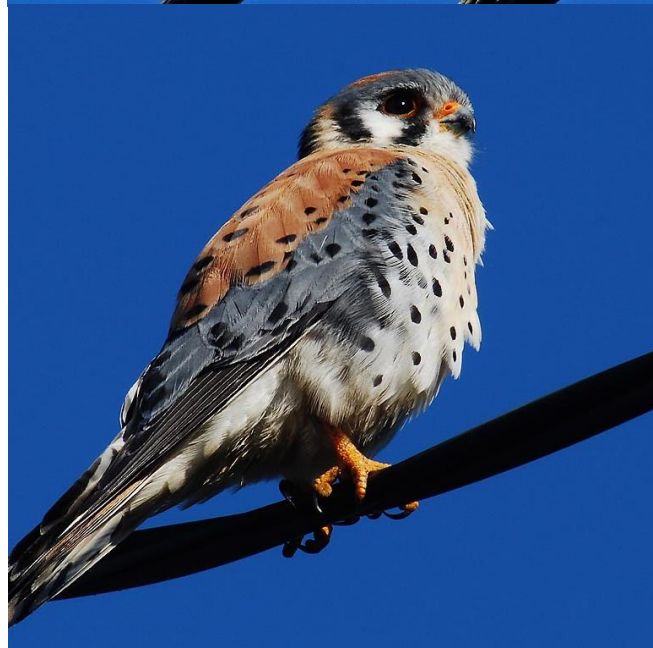
Literature Cited:

Cornell Lab of Ornithology. (n.d.). Life History. In *Prairie Falcon*. Retrieved from http://www.allaboutbirds.org/guide/prairie_falcon/lifehistory.

American Kestrel



Size:	Small
At-a-glance coloration:	Brown, white, black Blue-gray (heads of both sexes, wings of males)
Sound(s):	Rapid, in flight: http://www.xeno-canto.org/160904
Behavior:	Often perch on telephone wires, will "kite" - rapidly flap wings to hover - while they observe prey
Species of confusion:	Prairie Falcon (when flying)
Cal Poly Habitats:	Indonesian Reservoir Sheep Unit



Above left: Female. Left: Male.

Implications: This small raptor can be prey for Red-tailed Hawks, Barn Owls, American Crows, Sharpshinned and Cooper's Hawks, corn snakes, and fire ants. American Kestrels will stash leftovers of their own prey for later or to protect it from scavengers/thieves. They prefer open areas with only enough trees with cavities for nesting; since they can't make their own cavities, kestrels will use nesting boxes. They primarily eat invertebrates (cicadas, grasshoppers, beetles, scorpions, spiders), followed by small mammals (voles, bats) and songbirds. Declining populations can occur due to logging or felling of the dead trees they use to nest; additional clearing of brush has removed prey habitat and sources in agricultural areas, and pesticides directly decrease their prey populations (Cornell).

Literature Cited:

Cornell Lab of Ornithology. (n.d.). Life History. In *American Kestrel*. Retrieved from http://www.allaboutbirds.org/guide/american_kestrel/lifehistory.

Wild Turkey



Size:	Large
At-a-glance coloration:	Brown, white, black
Sound(s):	Distinctive “gobble”: http://www.xeno-canto.org/71044 Alarm call: http://www.xeno-canto.org/134744
Behavior:	Gregarious: males often have a “harem” of females with them
Species of confusion:	None on campus
Cal Poly Habitats:	Slack Pasture, main campus

Implications: Often found in forested areas or oak woodlands, Wild Turkeys may be found in very large groups during winter as females and their growing chicks accumulate in an area. They forage on the ground for nuts, seeds, and berries, sometimes eating insects or small vertebrates. They primarily walk and run, but can fly to escape or to help them move up the branches of trees to roost near the tops. Though they have many predators both of nestlings and adults, including humans, the Wild Turkey population is quite stable and widespread (Cornell).

Literature Cited:

Cornell Lab of Ornithology. (n.d.). Life History. In *Wild Turkey*. Retrieved from http://www.allaboutbirds.org/guide/wild_turkey/lifehistory.

Barn Owl




Size:	Medium
At-a-glance coloration:	Tan, white sexes same
Sound(s):	Shriek: http://www.xeno-canto.org/133628
Behavior:	Silent flight Often spotted on road signs
Species of confusion:	None on campus
Cal Poly Habitats:	Sheep Unit

Implications: Barn Owls primarily live in open habitats including deserts, agricultural fields, grasslands and suburbs. They feed mainly on rodents, but also on bats, rabbits and other nocturnal small mammals. Occasionally, they will hunt smaller birds, such as starlings and meadowlarks. Nests can be found in tree holes, cliff ledges, caves, houses and other human structures. Only territorial around nest sites, Barn Owls will allow other owls and pairs to hunt in the same hunting territory. Populations may be declining due to loss of nesting sites and hunting habitat; nesting boxes have helped offset nest loss, but these owls are also common roadkill due to their low flight while hunting. Hedgerows along roadsides may help decrease the number of owls hit by cars. Since they feed primarily on rodents, they are susceptible to the accumulation of rodent poisons and pesticides (Cornell).

Literature Cited:

Cornell Lab of Ornithology. (n.d.). Life History. In *Barn Owl*. Retrieved from http://www.allaboutbirds.org/guide/barn_owl/lifehistory.

Common Poorwill

	Size:	Small
	At-a-glance coloration:	Brown, gray, tan White on tail seen in flight sexes same
	Sound(s):	"Poor-will": http://www.xeno-canto.org/173009
	Behavior:	Often spotted on the ground; very fluttery flight may make it seem like a large bat
	Species of confusion:	None on campus
	Cal Poly Habitats:	Indonesian Reservoir

Implications: Common Poorwill are unique in their ability to enter torpor of very low core body temperatures, if not full hibernation, in times of low food and temperature, and can hibernate for several days to weeks in winter. They feed on flying insects during the crepuscular hours at dawn and dusk. Mainly found in open, dry areas with grasses and shrubs, Poorwills nest directly on the ground. Well-camouflaged plumage makes them very difficult to find, so they are most often seen at night due to cars' headlights reflecting in the backs of their eyes. Common Poorwills have large populations but provide easy prey for domestic cats and dogs, coyotes, owls, foxes, skunks and snakes. They thrive in open habitats that facilitate their mode of hunting, such as pastures and agricultural fields (Cornell, Reid, Johnson).

Literature Cited:

Cornell Lab of Ornithology. (n.d.). Life History. In *Common Poorwill*. Retrieved from http://www.allaboutbirds.org/guide/common_poorwill/lifehistory.

Johnson, S. (n.d.). Common Poorwills. In *Nightjars*. Retrieved from <http://www.avianweb.com/commonpoorwill.html>.

Reid, W. M. (n.d.). Poorwill Success. In *MetroWild of British Columbia*. Retrieved from <http://www.metrowild.ca/poorwill.html>.

Mourning Dove



Size:	Medium
At-a-glance coloration:	Brown, black wing spots; white on tail seen in flight sexes same
Sound(s):	Distinctive wingbeat flutter: http://www.xeno-canto.org/35100 1 two-tone coo, then 3 low coos: http://www.xeno-canto.org/153653
Behavior:	Tail fans out, is pointed in flight
Species of confusion:	Eurasian Collared-Dove (flat, broad tail; different call; larger)
Cal Poly Habitats:	Indonesian Reservoir, Shepard Reservoir

Above left: tail much narrower, more pointed than Eurasian Collared-Dove's, and Mourning Dove lacks dark collar. Right: Dark spotting on wings can be seen when stationary.



Implications: Mourning Doves tend to be common in open areas, such as as backyards, grasslands and crop fields, though they may roost in forested areas during winter. Almost obligate seed-eaters, these doves will occasionally eat snails, berries, green plants, and peanuts. Due to this consumption, they may be perceived as pests in agricultural fields. Generally, Mourning Doves nest in pine-needle and twig woven nests in trees or on ground, house eaves and abandoned equipment. Doves are the most commonly-hunted bird species in North America, and are at risk of ingesting scattered lead pellets due to foraging on ground. Predators include raccoons, raptors (especially falcons), snakes, and domestic cats and dogs (Cornell, Emiley).

Literature Cited:

Cornell Lab of Ornithology. (n.d.). Life History. In *Mourning Dove*. Retrieved from http://www.allaboutbirds.org/guide/mourning_dove/lifehistory.

Emiley, A. and Dewey, T. (2007). *Zenaida macroura*: mourning dove. In *Animal Diversity Web*. Retrieved from http://animaldiversity.ummz.umich.edu/accounts/Zenaida_macroura/.

Rock Pigeon



Size:	Medium
At-a-glance coloration:	Black, gray Iridescent neck feathers sexes same
Sound(s):	Low cooing: http://www.xeno-canto.org/92264
Behavior:	Often in large flocks
Species of confusion:	None on campus
Cal Poly Habitats:	Parker Barn, Beef Unit

Implications: Common in urban and suburban areas, these birds will primarily eat seeds, fruits, and leftover human food, rarely eating invertebrates. They prefer to eat on open ground where they can see their food - this includes agricultural fields, so can become pests. They will nest in buildings, including stairwells, rain gutters and roof edges, and on cliffs. Often reuse nests multiple times. Extremely well-spread (across entire continental US, Central and South America) (Cornell).

Literature Cited:

Cornell Lab of Ornithology. (n.d.). Life History. In *Rock Pigeon*. Retrieved from http://www.allaboutbirds.org/guide/rock_pigeon/lifehistory.

Eurasian Collared-Dove



Size:	Medium
At-a-glance coloration:	Gray, black neck ring White tail tips sexes same
Sound(s):	Low cooing, and/or harsh cawing (with wing sounds at the end): http://www.xeno-canto.org/129508
Behavior:	Tail fans out, is rounded in flight
Species of confusion:	Mourning Dove (smaller, with pointed tail)
Cal Poly Habitats:	Indonesian Reservoir, Shepard Reservoir, Beef Unit, Parker Barn, Sheep Unit

Implications: Similar to Rock Pigeons, Eurasian Collared-Doves are found commonly in urban settings and open agricultural areas, avoiding thick forests and extreme cold. They also tend to concentrate on eating grain seeds, but will supplement with fruits, plant materials, and invertebrates. Eurasian Collared-Doves nest in trees and on buildings, often reusing nests, for up to six broods per year. They forage in large flocks, often chasing away birds of other species (Cornell). This species may be successfully outcompeting the native Mourning Dove for habitat and ecological niche, and it is more likely of the two to be found in suburban and urban areas.

Literature Cited:

Cornell Lab of Ornithology. (n.d.). Life History. In Eurasian Collared-Dove. Retrieved from http://www.allaboutbirds.org/guide/eurasian_collared-dove/lifehistory.

Western Scrub-Jay



Size:	Medium
At-a-glance coloration:	Blue, gray sexes same
Sound(s):	Harsh caw/shriek, faster when in flight: http://www.xeno-canto.org/105756
Behavior:	Highly vocal Forage on ground
Species of confusion:	Steller's Jay (similar call, but prefers less open habitats, and much darker overall)
Cal Poly Habitats:	All

Implications: Western Scrub-Jays are known to host West Nile Virus, though don't appear to show the same susceptibility as crows. Domestic cats are a common cause of death, as are wind turbines. In less urban environments, these jays are also preyed upon by snakes, bobcats, skunks, hawks and eagles. Western Scrub-Jays are commonly found in dry, brushy habitats, and do well in the vicinity of humans. Because they cache nuts, seeds, and fruits underground, Western Scrub-Jays are a vital vector for some plants' germination, including oaks. When coexisting with Black-tailed Deer, they have been known to eat ticks, keds, and deer flies off of their skin. However, their appetite for nuts can cause losses in fruit and pistachio orchards (Scott).

Literature Cited:

Scott, J. (2014). *Aphelocoma californica* (Western Scrub-Jay). In *Animal Diversity Web*. Retrieved from http://animaldiversity.ummz.umich.edu/accounts/Aphelocoma_californica/.

American Crow



Size:	Medium
At-a-glance coloration:	Black sexes same
Sound(s):	Harsh caw: http://www.xeno-canto.org/172878
Behavior:	Fluid wing motion in flight Common in human environments
Species of confusion:	None at Cal Poly
Cal Poly Habitats:	All

Implications: Crows are generalists, eating anything from carrion to nuts, pet food, fish, garbage, and fruits, even stealing from other animals and using tools to extract or modify their food. They are known to join large flocks in agricultural fields eating the leftover grains, though generally American Crows only live and forage with their family groups. Fortunately, these crows will also eat insect pests in agricultural areas. One concern is that American Crows appear highly vulnerable to West Nile Virus, with all individuals in a group contracting the disease and high proportions of infected individuals dying within one week (Cornell).

Literature Cited:

Cornell Lab of Ornithology. (n.d.). Life History. In *American Crow*. Retrieved from http://www.allaboutbirds.org/guide/american_crow/lifehistory.

Steller's Jay



Size:	Medium
At-a-glance coloration:	Black, blue, crested sexes same
Sound(s):	Raspy shrieks: http://www.xeno-canto.org/172422 Also mimics other birds (Red-tailed Hawk in this clip): http://www.xeno-canto.org/170836
Behavior:	Somewhat reclusive, usually solitary
Species of confusion:	Western Scrub-Jay (much lighter overall, similar calls but much more common in open areas and around people)
Cal Poly Habitats:	Sheep Unit, Slack Pasture

Implications: Compared to the Western Scrub-Jay, the Steller's Jay is more commonly found in heavily wooded areas consisting of tall trees. We have found this to be true throughout our observations. Riparian and woody areas are key habitat for the Steller's Jay. Interestingly, their population has been reported to increase in areas after logging. They like to scavenge food left behind by campers as well. Steller's Jays are thought to not respond well to human pressures and development, but that is mostly because the Scrub-Jay adapts better and is more competitive. Western Scrub-Jay presence likely prevents the Steller's Jay from establishing in areas more densely populated with humans. With this being said, it is possible for Steller's Jays to live in developed areas (Cornell). This explains how three or more of them were flying together over the Slack Street Pasture, which borders suburban housing neighborhoods.

Literature Cited:

Cornell Lab of Ornithology. (n.d.). Life History. In *Steller's Jay*. Retrieved from http://www.allaboutbirds.org/guide/stellers_jay/lifehistory.

Northern Flicker



Size:	Medium
At-a-glance coloration:	Tan, black, red (males) Bright white rump patch seen in flight
Sound(s):	Somewhat like American Kestrel, high and rapid: http://www.xeno-canto.org/173967
Behavior:	Drills only to make cavities, forages mostly on the ground
Species of confusion:	No visual confounders on campus
Cal Poly Habitats:	Sheep Unit, Slack Pasture



Males (left) have a bright red malar (cheek stripe); females (right) lack the red but otherwise appear similar.

Implications: Northern Flickers eat insects, often foraging on the ground for ants and beetle larvae. They will sometimes eat thousands of ants, which might be beneficial for homeowners. Flickers will also eat fruits and seeds. They are cavity nesters, excavating old utility poles, dead or dying tree trunks, fence posts, and even human houses, but will also use nest boxes. They tend to live in areas with lots of trees for nesting purposes, but if there is enough human infrastructure that they can use as substitute, they willingly live in those regions as well (such as suburbs). This can cause problems if they begin drilling into the sides of a home, but there are simple ways to deter Flickers from doing so (Link).

Literature Cited:

Link, R. (n.d.) Woodpeckers (Northern Flickers). In *Living with Wildlife*. Retrieved from <http://wdfw.wa.gov/living/woodpeckers.html>.

Downy Woodpecker



Size:	Medium
At-a-glance coloration:	Black, white, red (males)
Sound(s):	Single <i>pip</i> turns into maniacal laughter: http://www.xeno-canto.org/89855
Behavior:	Flight pattern a flap-flap-swoop (wings tucked in)
Species of confusion:	Hairy Woodpecker (essentially identical but larger body, proportionally longer bill)
Cal Poly Habitats:	Parker Barn, Sheep Unit

Females (left) lack red. Males (right) will have a bright red spot on the crown very close to the nape (back of the neck).

Implications: Interestingly, Downy Woodpeckers are more likely than other woodpecker species to utilize backyard feeders, sometimes drinking from hummingbird feeders. They eat primarily insects, including corn earworm, tent caterpillars, bark beetles, and apple borers, sometimes ground-feeding in grasses and tall weeds. They will also eat a substantial amount (about 25% of diet) of plant matter such as acorns, berries and grains. Downy Woodpeckers nest in (often deciduous) tree cavities, so they are commonly found in woodlands and near streams. They thrive in young forests (relatively open) but have been known to nest along wooden fences, whose removal may cause the birds to have to relocate (Cornell).

Literature Cited:

Cornell Lab of Ornithology. (n.d.). Life History. In *Downy Woodpecker*. Retrieved from http://www.allaboutbirds.org/guide/downy_woodpecker/lifehistory.

Nuttall's Woodpecker



Size:	Medium
At-a-glance coloration:	Black, white, red (males)
Sound(s):	Repeated two-tone <i>pitik</i> : http://www.xeno-canto.org/161357 Often turns into trilled call: http://www.xeno-canto.org/17797
Behavior:	Flight pattern a flap-flap-swoop (wings tucked in)
Species of confusion:	No visual confounders; calls can be confused for Downy Woodpecker
Cal Poly Habitats:	Parker Barn, Sheep Unit

In contrast to the Downy Woodpecker, Nuttall's Woodpecker has a barred back. Males (inset) also have a red crown patch.

Implications: Almost the entire species is found living in California oak woodlands and riparian woods, nesting in tree cavities and feeding on insects and arthropods. Nuttall's Woodpecker will occasionally eat fruit (Cornell). Blue oak appears to be a highly utilized tree species, and especially large trees as the likelihood of plentiful prey is greater with more branches upon which to forage. If oak woodlands continue to have less-than-replacement oak survival, habitat may begin decreasing for Nuttall's Woodpeckers in California (Block).

Literature Cited:

Block, W. M. (1991). Foraging Ecology of Nuttall's Woodpecker. *The Auk*, 108, 303-317. Retrieved from <https://sora.unm.edu/sites/default/files/journals/auk/v108n02/p0303-p0317.pdf>.

Cornell Lab of Ornithology. (n.d.). Life History. In *Nuttall's Woodpecker*. Retrieved from http://www.allaboutbirds.org/guide/nuttalls_woodpecker/lifehistory.

Acorn Woodpecker



Size:	Medium
At-a-glance coloration:	Black, white, red; white wing patches distinct in flight; red on females doesn't touch white face
Sound(s):	Often a laughter-like <i>yukka yukka</i> : http://www.xeno-canto.org/57098 Alarm call is harsher: http://www.xeno-canto.org/125478
Behavior:	Will stuff acorns into large holes in a single granary tree
Species of confusion:	Other woodpeckers; note lack of white back, no barring on wings
Cal Poly Habitats:	Parker Barn, Sheep Unit, Slack Pasture

Implications: Concentrated in areas of oak woodlands, pine-oak woodlands, or other habitats with access to oaks, Acorn Woodpeckers are commonly found in parks, redwood forests and streamside forests. They will create granary trees to store acorns and other available nuts through winter, but primarily eat insects as well as some fruits, sap, lizards and grass seeds. Acorn Woodpeckers occasionally will create granaries in human structures that aren't intended to withstand such excavation. In these instances, they can be scared away with shiny strips of ribbon, or balloons. They nest in tree cavities, sometimes communally, resulting in some egg losses before all females are laying. Aside from nesting, they will also roost in cavities, so a group may create several cavities in an area. Acorn Woodpeckers will defend granaries and about 15 acres of territory around a granary. Nests are vulnerable to starling invasion, and overgrazing and slow oak regeneration may threaten their preferred habitats; they are at risk of being shot if farmers are concerned about nut or fruit crops (Cornell).

Literature Cited:

Cornell Lab of Ornithology. (n.d.). Life History. In *Acorn Woodpecker*. Retrieved from http://www.allaboutbirds.org/guide/acorn_woodpecker/lifehistory.

Western Kingbird



Size:	Medium
At-a-glance coloration:	Gray, yellow, white edge to tail
Sound(s):	Bubbly, chattering calls: http://www.xeno-canto.org/161768
Behavior:	“Sally” or “hawk” to catch insects and return to perch
Species of confusion:	Cassin's Kingbird (darker gray head with brighter white cheek, no white on outer tail feathers)
Cal Poly Habitats:	Indonesian Reservoir

Implications: Western Kingbirds not only build their nests in the crooks of trees but also make use of man-made structures for nesting and foraging posts. The Western Kingbird enjoys a diet of insects and spiders, either snatched from the air or found on the ground. This can be highly beneficial to a farmer, but it also makes the Kingbird highly susceptible to the accumulation of insecticides. Nest predators include snakes, squirrels, owls, hawks, crows, and shrikes. Western Kingbirds will aggressively defend their territory against predators and other kingbirds, but seem to allow completely unrelated small bird species to coexist and nest in the same trees (Cornell).

Literature Cited:

Cornell Lab of Ornithology. (n.d.). Life History. In *Western Kingbird*. Retrieved from http://www.allaboutbirds.org/guide/western_kingbird/lifehistory.

Say's Phoebe



Size:	Medium
At-a-glance coloration:	Gray, red-brown sexes same
Sound(s):	Simple descending whistle: http://www.xeno-canto.org/174099
Behavior:	Often perched on machinery and other human structures
Species of confusion:	Western Bluebird, American Robin, California Towhee
Cal Poly Habitats:	Organic Farm, Sheep Unit, Indonesian Reservoir

Implications: Say's Phoebes prefer open or shrubby areas, and can be found in the majority of western North America. They eat insects in flight or on the ground, and have benefited from human structures and buildings as sheltered platforms for nesting (Cornell). Their "hawking" mode of flycatching is facilitated by having plenty of perches, which often appear in the form of farm equipment or buildings.

Literature Cited:

Cornell Lab of Ornithology. (n.d.). Life History. In *Say's Phoebe*. Retrieved from http://www.allaboutbirds.org/guide/Says_Phoebe/lifehistory.

Black Phoebe



Size:	Medium
At-a-glance coloration:	Black, white
Sound(s):	“Song” is two-toned whistles: http://www.xeno-canto.org/34647
Behavior:	Often perched on machinery and other human structures
Species of confusion:	At a distance, Say's Phoebe; Dark-eyed Junco (has pink bill, no crest, smaller)
Cal Poly Habitats:	All

Entirely black and white, the Black Phoebe has a distinct heart-shaped pattern on its chest (inset).

Implications: Like their relatives Say’s Phoebes, Black Phoebes follow the same pattern of aerial insect catching known as “hawking” or “sallying”, only rarely grabbing prey insects from branches and even less likely to do so on the ground. Because they nest with mud, Black Phoebes must reside near a source of water. Unlike many small birds, this phoebe’s national population has experienced a gradual increase since the mid 1960s, probably thanks to its ability to utilize human structures for nesting and foraging locations (Audubon).

Literature Cited:

National Audubon Society. (n.d.). Black Phoebe. In *Birds*. Retrieved from <http://birds.audubon.org/species/blapho>

Loggerhead Shrike



Size:	Medium
At-a-glance coloration:	Gray, black, white
Sound(s):	http://www.xeno-canto.org/173277
Behavior:	May impale their prey on barbed wire or thorny plants
Species of confusion:	None on campus
Cal Poly Habitats:	Indonesian Reservoir

Implications: Though Loggerhead Shrikes primarily eat insects such as grasshoppers, they will prey upon small mammals, other birds, and reptiles during winter. Their consumption of both large insects and small rodents may contribute to fewer pests in an agricultural setting. Shrikes are likely to use barbed wire or thorns to pin their prey on if available, often to anchor their meal while they eat or to keep it in a known location until later. These birds prefer relatively open habitats with only scattered trees, such as grasslands, orchards, or open woodlands (Cornell).

Literature Cited:

National Audubon Society. (n.d.). Loggerhead Shrike. In *Birds*. Retrieved from <http://birds.audubon.org/birds/loggerhead-shrike>

Hermit Thrush



Size:	Medium
At-a-glance coloration:	Brown, white
Sound(s):	Single-tone call: http://www.xeno-canto.org/80754
Behavior:	Ground foragers, often solitary
Species of confusion:	Swainson's Thrush (redder throat spots)
Cal Poly Habitats:	Beef Unit, Sheep Unit, Parker Barn

Implications: Hermit Thrushes are often found in the interior of forest vegetation near openings (such as ponds, meadows, small man-made clearings) (Blasch), but they live in a variety of habitats, ranging from boreal forests of the far north to deciduous woods and mountain forests. Look for them in open areas inside forests, such as trails, pond edges, mountain glades, or areas partially opened up by fallen trees. In winter, Hermit Thrushes often occupy lower-elevation forests with dense understory and berry bushes, including pine, broadleaf evergreen, and deciduous woods. In Mexico, they have been seen around streams and urban lawns (Cornell).

Literature Cited:

Blasch, C. (2002). *Catharus guttatus* (Hermit Thrush). In *Animal Diversity Web*. Retrieved from http://animaldiversity.ummz.umich.edu/accounts/Catharus_guttatus/.

Cornell Lab of Ornithology. (n.d.). Life History. In *Hermit Thrush*. Retrieved from http://www.allaboutbirds.org/guide/hermit_thrush/lifehistory.

Western Bluebird



Size:	Medium
At-a-glance coloration:	Blue, rufous, white; females grayer blue and tan
Sound(s):	Chittering calls: http://www.xeno-canto.org/12086 Single-tone repeated in song: http://www.xeno-canto.org/172425
Behavior:	Often in pairs, will fly down from perches to the ground and back up again
Species of confusion:	American Robin (much grayer, slightly larger); Say's Phoebe (pale gray overall with rufous on lower belly)
Cal Poly Habitats:	Indonesian Reservoir, Sheep Unit

Implications: Western Bluebirds as a species are quite stable and not listed as a species of concern. However, individual populations can be threatened by logging and extensive growth of forest due to lack of natural forest fires. Even dead trees can be home to bluebirds. Additionally, European Starlings and House Sparrows can take over nest cavity sites, which are in high demand and often low supply. The simplest way that people can help Western Bluebirds is by putting nesting boxes on their property. Like many insectivorous birds, Western Bluebirds will resort to fruits and seeds in winter, even eating mistletoe, sumac and poison oak berries (Cornell).

Literature Cited:

Cornell Lab of Ornithology. (n.d.). Life History. In *Western Bluebird*. Retrieved from http://www.allaboutbirds.org/guide/western_bluebird/lifehistory.

American Robin



Size:	Medium
At-a-glance coloration:	Gray, red-brown
Sound(s):	Slightly variable, cheerful song: http://www.xeno-canto.org/172423
Behavior:	Run and stop frequently to look around when foraging
Species of confusion:	None on campus
Cal Poly Habitats:	Slack Pasture, Parker Barn

Implications: Another species of least concern, American Robins have adapted well to human interaction and alteration of the landscape. They like big open spaces and may specialize in eating worms as well as common pest insects. Their presence may indicate good rains because of the higher availability of worms after a rain. Robins often nest in the dense foliage of trees and shrubs, and roost in trees together at night (Dewey & Middlebrook).

Literature Cited:

Dewey, T. and Middlebrook, C. (2001). *Turdus migratorius* (American Robin). In *Animal Diversity Web*. Retrieved from http://animaldiversity.ummz.umich.edu/accounts/Turdus_migratorius/.

Wrentit



Size:	Medium
At-a-glance coloration:	Brown, gray, pale eyes
Sound(s):	“Ping pong ball falling down stairs”: http://www.xeno-canto.org/149649
Behavior:	Somewhat elusive, easier to identify by sound
Species of confusion:	Call may be confused with California Towhee's
Cal Poly Habitats:	Slack Pasture

Wrentits have long tails and pale eyes (inset).

Implications: The Wrentit has been severely impacted by human development due to habitat fragmentation by roads. Roadways and other similar fragmenting barriers present a major problem for the genetic variation within this species (Landis). Feral cats may also threaten individuals as a novel source of predation. Wrentits are very discreet – it is common to hear calls but never see an individual in their preferred habitat of chaparral brush and coastal brushy thickets (Audubon).

Literature Cited:

Landis, B.Y. (2010). Urban Sprawl Disrupts Wrentit Gene Flow. In *WERC from the Field*. Retrieved from <http://www.werc.usgs.gov/outreach.aspx?RecordID=5>.

National Audubon Society. Wrentit (*Chamaea fasciata*). In *Birds*. Retrieved from <http://birds.audubon.org/species/wrenti>.

Northern Mockingbird



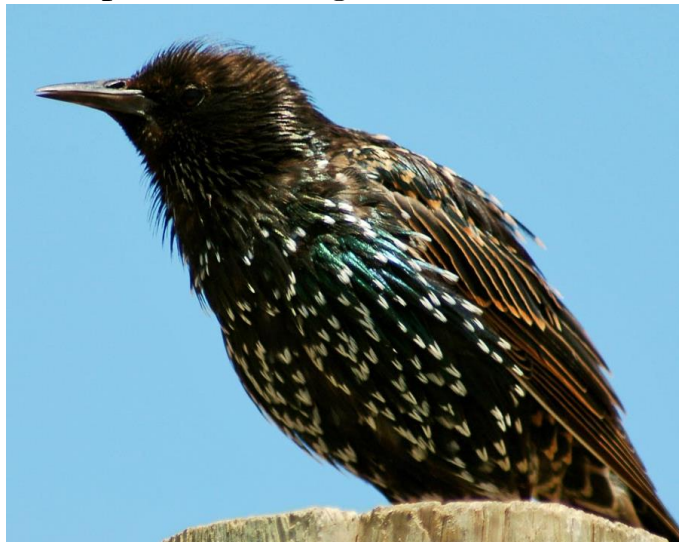
Size:	Medium
At-a-glance coloration:	Gray, white; has white wing patches in flight
Sound(s):	Mimics other species: http://www.xeno-canto.org/170052
Behavior:	Usually solitary
Species of confusion:	None on campus
Cal Poly Habitats:	Parker Barn, Slack Pasture

Implications: Northern Mockingbirds are widespread, permanent residents across the United States, but surprisingly uncommon on campus. Well-adapted to cohabiting with humans, Northern Mockingbirds will eat insects and disperse seeds even in suburban environments. While mockingbirds seem aggressive, they are vulnerable to predation by larger birds of prey, jays, and crows. Adults and their eggs and/or chicks can be vulnerable to predation by snakes and squirrels. It is possible that their aggressive character comes from having to defend themselves from their predators. It is important to note that Northern Mockingbird nest sites can be taken advantage of by cowbirds. The cowbirds parasitize the mockingbird nest by laying their eggs in the nests of the mockingbirds so that the mockingbird takes the brunt of the work required to incubate and feed the young (Breitmeyer).

Literature Cited:

Breitmeyer, E. (2004). *Mimus polyglottos* (Northern Mockingbird). In *Animal Diversity Web*. Retrieved from http://animaldiversity.ummz.umich.edu/accounts/Mimus_polyglottos/.

European Starling



Size:	Medium
At-a-glance coloration:	Black, speckled (males); Females drabber, browner
Sound(s):	Varied, but commonly make screechy calls when flocked: http://www.xeno-canto.org/103551
Behavior:	Often in large flocks, especially with Brewer's and/or Red-winged Blackbirds
Species of confusion:	Brewer's Blackbird (male has yellow eyes, no speckling)
Cal Poly Habitats:	Beef Unit, Sheep Unit, Parker Barn, Indonesian Reservoir, Organic Farm, Slack Pasture

Implications: European Starlings are considered problematic due to the fact that they are cavity nesters and will outcompete native species for nest locations. They have also been known to leave their eggs in other nests, relying on the mother of the nest to feed their young as well as her own. European Starlings are also unwanted by ranchers because as a flock, they can consume a large portion of high-protein supplements and grain that are often expensive livestock feed. They can also transfer disease from one livestock facility to another. Furthermore, Starlings can have a negative impact on plant agriculture by consuming and/or damaging crops (Johnson & Glahn). This species does need to be actively managed but it is important to make sure that other (non-target) species will not be negatively influenced by them or by control methods applied to their populations.

Literature Cited:

Johnson, R.J. and Glahn, J.F. (1994). European Starlings and their control. In *Internet Center for Wildlife Damage Management*. Retrieved from <http://icwdm.org/handbook/birds/EuropeanStarlings.asp>.

Western Tanager



Males have black wings and red on the face.

Size:	Medium
At-a-glance coloration:	Yellow, red, black (males) Females lack red head, have more olive-toned wings
Sound(s):	Song like American Robin's: http://www.xeno-canto.org/113834 Chirpy call like finches: http://www.xeno-canto.org/169392
Behavior:	Often solitary
Species of confusion:	American and Lesser Goldfinch (all females similarly drab olive yellow; look at bill shape, back color, overall size of goldfinch much smaller)
Cal Poly Habitats:	Parker Barn, main campus (near parking garages)

Implications: The Western Tanager has done relatively well despite habitat fragmentation across the country. This is probably related to the fact that they are migratory, and inhabit not only secluded coniferous forests and open areas but also suburban areas (Cornell). They play an important role in maintaining insect populations and dispersing seeds. It has been noted that destruction of their breeding habitat has impacted the species population, and that tall, man-made structures can be dangerous to the Western Tanager during nocturnal migrations (Kirschbaum & Ivory). Here at Cal Poly, the Western Tanager is more likely to appear during the late spring and summer months, although one was identified at Parker Barn as late as October, which would have been towards the end of fall migration out of the area.

Literature Cited:

Cornell Lab of Ornithology. (n.d.). Life History. In *Western Tanager*. Retrieved from http://www.allaboutbirds.org/guide/western_tanager/lifehistory.

Kirschbaum, K. and Ivory, A. (2002). *Piranga rubra* (Western Tanager). In *Animal Diversity Web*. http://animaldiversity.ummz.umich.edu/accounts/Piranga_rubra/.

California Towhee



Size:	Medium
At-a-glance coloration:	Brown, red-brown under tail sexes same
Sound(s):	Single tone like tapping on glass, may be repeated quickly: http://www.xeno-canto.org/131478
Behavior:	Ground foragers
Species of confusion:	Sometimes call may be confused for Wrentit, but Wrentit's starts much slower and at a lower pitch
Cal Poly Habitats:	Sheep Unit

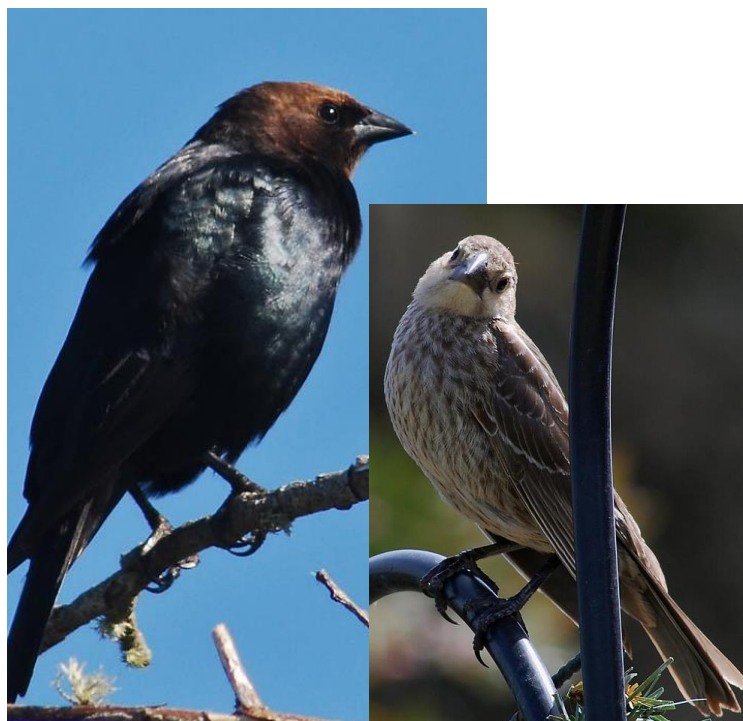
The reddish undertail coverts are difficult to see unless the California Towhee is perched overhead.

Implications: In general the California Towhee is a species of least concern that is doing well despite human development. They thrive in habitats with dense underbrush close to the ground and are commonly found among poison oak. They forage for seeds and insects among leaf litter, and the small white berries produced by the poison oak are an important part of their diet. Poison oak itself provides important nesting habitat for the California Towhee, so this may create a management conflict between poison oak management and providing adequate habitat for these birds. Having natural, covered space, away from human development is important for the everyday life of this species (Cornell).

Literature Cited:

Cornell Lab of Ornithology. (n.d.). Life History. In *California Towhee*. Retrieved from http://www.allaboutbirds.org/guide/california_towhee/lifehistory.

Brown-headed Cowbird



Males (left) are glossy black with a dark brown head; females (right) are paler brown overall.

Size:	Medium
At-a-glance coloration:	Black, brown (males) Females drab light brown and slightly streaky
Sound(s):	Watery, like Red-winged Blackbird: http://www.xeno-canto.org/160791
Behavior:	Ground foragers, often around livestock
Species of confusion:	Brewer's Blackbird (males with yellow eye; females solid brown; longer, narrower bill)
Cal Poly Habitats:	Shepard Reservoir, Parker Barn (BCEC)

Implications: This bird is a well-known brood parasite to mockingbird and meadowlark nests, among others. The female Brown-headed Cowbird will spend most of her energy laying eggs in the summer since she does not have to spend calorie reserves actively raising her young. Cowbirds can lay up to three dozen eggs in one summer. They can also be considered pests due to the fact that a large portion of their diet comes from grass seeds. However, Brown-headed Cowbirds also eat seeds from various weeds and a quarter of their diet consists of insects. The national population has declined slightly since 1966, according to the North American Breeding Bird Survey, but their numbers are much larger in comparison to other species. The most concerning impact of this species is their effect on smaller bird populations.

Literature Cited:

Cornell Lab of Ornithology. (2011). Brown-headed Cowbirds. In *General Nest and Bird Info*. Retrieved from <http://nestwatch.org/learn/general-bird-nest-info/brown-headed-cowbirds/>.

Great-tailed Grackle



Size:	Medium
At-a-glance coloration:	Black, iridescent (males) Brown, drabber (females)
Sound(s):	http://www.xeno-canto.org/127638
Behavior:	Flight similar to crow's fluid flap but with occasional wing tuck like starling
Species of confusion:	American Crow (shorter tail, much more common, flight pattern); Brewer's Blackbird (females very similar but much smaller, dark-eyed; both sexes shorter, thinner bill, shorter tail, and much more common)
Cal Poly Habitats:	Organic Farm, Swine Unit

Implications: Grackles may become pests in orchards or fields, feasting on fruits and grains. They feed their young insect larvae and must nest and roost within a few kilometers of a fresh water source, often in locations with tall, dense vegetation. Farm managers have resorted to shooting Grackles when their densities threaten serious crop damage (Rappole). Grackles are extremely successful in human-altered environments, having one of the highest population growth rates in North America. They will often forage in large groups, resulting in potential crop damage as well as lots of noise. They are omnivorous, and will eat not only plant material but also invertebrates (beetles, grasshoppers, wasps, snails), amphibians, snakes, fish, small mammals and other birds' eggs or nestlings. Nests are placed as high up as possible, often in tall trees, and will readily use human-made materials such as plastics and string (Cornell).

Literature Cited:

Cornell Lab of Ornithology. (n.d.). Life History. In *Great-tailed Grackle*. Retrieved from http://www.allaboutbirds.org/guide/Great-tailed_Grackle/lifehistory.

Rappole, J. H., Tipton, W. R., Kane, A. H., Flores, R. H., Hobbs, J., and Palacios, J. (1989). Seasonal Effects on Control Methods for the Great-tailed Grackle. *Great Plains Wildlife Damage Control Workshop Proceedings (Paper 408)*. Retrieved from digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1407&context=gpwdcwp.

Red-winged Blackbird



Males may have orange-yellow at the base of the red patch; in California it is common to just see bright red.

Size:	Medium
At-a-glance coloration:	Black, red (males) Brown and streaky (females; may look like large, brown-cream Song Sparrows)
Sound(s):	Watery trill (males) and chattery calls (females): http://www.xeno-canto.org/177303
Behavior:	Ground foragers, often around livestock, reeds or telephone wires
Species of confusion:	Tricolored Blackbird (males have white border on wing patch, females gray); Brewer's Blackbird (females solid drab brown, males no red); Song Sparrow (much smaller, white breast streaked with black that converges in the center)
Cal Poly Habitats:	Sheep Unit, Parker Barn, Indonesian Reservoir, Shepard Reservoir

Implications: Red-winged Blackbirds usually nest in wet, marshy areas, but can be found in other habitats as long as fresh water is nearby. They feed on insects during summer and supplement their diet with seeds, both agricultural leftovers and weed seeds, in fall and winter (Cornell). Red-winged Blackbirds will roost and nest in large colonies, and many males may help defend a region when during the nesting season. Their presence in large groups can both help and damage plant growth, depending on food availability and season: when insects are plentiful, the blackbirds' consumption of insects can have a measurable positive impact on plant (crop) growth. Conversely, they may also feed directly on grains, damaging or depleting crops. If unwanted, the presence of these blackbirds is best prevented by reducing grain waste that might attract them and by using noisemakers in crop fields (Rosenthal).

Literature Cited:

Cornell Lab of Ornithology. (n.d.). Life History. In *Red-winged Blackbird*. Retrieved from http://www.allaboutbirds.org/guide/red-winged_blackbird/lifehistory.

Rosenthal, A. (). *Agelaius phoeniceus* (Red-winged Blackbird). In *Animal Diversity Web*. Retrieved from http://animaldiversity.ummz.umich.edu/accounts/Agelaius_phoeniceus/.

Tricolored Blackbird



Males tend to have a thinner red patch than the Red-winged males, and a bright white at the bottom.

Size:	Medium
At-a-glance coloration:	Black, red, white (males) Brown, slightly streaky (females; grayer than Red-winged females)
Sound(s):	Very different from Red-winged Blackbird, more chatter: http://www.xeno-canto.org/143192
Behavior:	Ground foragers, often around livestock, reeds or telephone wires
Species of confusion:	Red-winged Blackbird (males with only red, or red and yellow – not white – on wings); Brewer's Blackbird (females solid drab brown, males no red); Song Sparrow (much smaller, white breast streaked with black that converges in the center)
Cal Poly Habitats:	Parker Barn

Implications: Though the Tricolored Blackbird used to have vast populations, it is now almost exclusively a California species with far fewer individuals (Audubon). It breeds in colonies of tens of thousands of birds, relying on marshy areas or grain silage fields, where several farmers have made the decision to postpone harvest and support the birds' populations (Brown & Ogden). Tricolored Blackbirds can also be found nesting in cattails near flooded rice fields. They follow growing insect populations, eating any of several insect species when they are plentiful: grasshoppers, caddis fly larvae, midges, beetles and more. Tricolored Blackbirds will eat grains during fall, winter and very early spring including alfalfa, barley, rice, and others found in easily accessible livestock feed (Hamilton).

Literature Cited:

Brown, A. and Ogden, D. (2013). Local farmers and conservationists save 65,000 rare Tricolored Blackbirds. In *Newsroom*. Retrieved from http://www.nrcs.usda.gov/wps/portal/nrcs/detail/ca/newsroom/?cid=nrcs144p2_064315.

Hamilton, W. J. (2004). Tricolored Blackbird (*Agelaius tricolor*). In *The Riparian Bird Conservation Plan: a strategy for reversing the decline of riparian-associated birds in California*. Retrieved from http://www.prbo.org/calpif/htmldocs/species/riparian/tricolored_blackbird.htm.

National Audubon Society. (n.d.). Tricolored Blackbird. In *Key Species*. Retrieved from <http://ca.audubon.org/tricolored-blackbird-0>.

Western Meadowlark



Size:	Medium
At-a-glance coloration:	Yellow, black, white sexes same
Sound(s):	Musical and watery, revealing close relationship to blackbirds: http://www.xeno-canto.org/172625
Behavior:	Often in large flocks, foraging in thick ground cover; also seen singing alone on a post, fence, or large rock
Species of confusion:	None on campus
Cal Poly Habitats:	Sheep Unit

Implications: Western Meadowlarks are easily identified by their black throat patch and bright yellow belly. They prefer to inhabit dense grassy areas and avoid areas with thick tree cover (Cornell). It has been found that meadowlarks are more likely to be present where there has been light or moderate grazing, but are less common in areas of heavy grazing (Dechant et al.). Fire suppression also has a negative correlation with meadowlark populations (Cornell, Dechant et al.). Meadowlarks were considered pests, but after some study, it has been shown that this species does more help by eating crop damaging insects than it does harm by eating grass seed (Cornell); furthermore, they may be vulnerable to the accumulation of certain pesticides (Dechant et al.). The primary reason for the gradual decline of the meadowlark is the conversion of grassland to other agricultural uses (Cornell). It is important to maintain grasslands in order to provide this species with ideal habitat.

Literature Cited:

Cornell Lab of Ornithology. (n.d.). Life History. In *Western Meadowlark*. Retrieved from http://www.allaboutbirds.org/guide/western_meadowlark/lifehistory.

Dechant, J. A., M. L. Sondreal, D. H. Johnson, L. D. Igl, C. M. Goldade, A. L. Zimmerman, and B. R. Euliss. 2003. Effects of management practices on grassland birds: Western Meadowlark. In *Northern Prairie Wildlife Research Center Online*. Retrieved from <http://www.npwrc.usgs.gov/resource/literatr/grasbird/weme/weme.htm>.

Brewer's Blackbird



Size:	Medium
At-a-glance coloration:	Black, yellow eye (males) Brown, dark eye (females)
Sound(s):	http://www.xeno-canto.org/160351
Behavior:	Ground foragers, often found around livestock
Species of confusion:	Red-winged Blackbird, European Starling (females especially similar), Great-tailed Grackle (females have yellow eye; both sexes much larger, with longer tails)
Cal Poly Habitats:	Sheep Unit, Parker Barn

Males (above) have bright yellow eyes, while females (below) have duller plumage and dark eyes.

Implications: Surprisingly, Brewer's Blackbirds are more help than hindrance to farmers. Similar to the meadowlark, these blackbirds have often been considered pests because they are known to consume grains and seeds. However, they have the capacity to utilize extremely diverse food sources, including pest insects. They can be found in almost any habitat, and have done well cohabiting with humans. There is no research that suggests that these birds present a threat to any other species (Cornell).

Literature Cited:

Cornell Lab of Ornithology. (n.d.). Life History. In *Brewer's Blackbird*. Retrieved from http://www.allaboutbirds.org/guide/brewers_blackbird/lifehistory.

Anna's Hummingbird



Size:	Small
At-a-glance coloration:	Green, gray, iridescent; red throat/face (males), females with small reddish throat patch
Sound(s):	“Scolding” song from males: http://www.xeno-canto.org/160259
Behavior:	Hovering, very rarely perches; may see males' mating displays, where they dive in a J shape and make a loud “peep”
Species of confusion:	Allen's Hummingbird (bright orange gorget on males, but still green back)
Cal Poly Habitats:	All

Males have a brilliant red-purple gorget (throat), while females (inset) have a gray throat with an occasional dark spot.

Implications: Very common in suburban settings and other open areas with some trees, especially eucalyptus, such as chaparral and oak woodland settings. Will enter torpor when ambient temperatures drop, lowering their own body temperatures down to as low as 48 degrees Fahrenheit. Feed on not just nectar of flowering plants but also sap and tiny insects such as midges and leafhoppers. Nest on tree branches, generally broadleaved trees rather than conifers, but also in poison oak and other vines or shrubs, near a source of nectar. Thrives in human-developed areas as long as flowers and trees provide plentiful food, but can be preyed upon by domestic cats (Cornell).

Literature Cited:

Cornell Lab of Ornithology. (n.d.). Life History. In *Anna's Hummingbird*. Retrieved from http://www.allaboutbirds.org/guide/annas_hummingbird/lifehistory.

Barn Swallow



Right: close-up of long, forked tail

Size:	Small
At-a-glance coloration:	Blue-black, orange, forked tail sexes same
Sound(s):	Squeaky chatter during flight: http://www.xeno-canto.org/176625
Behavior:	Often in large groups over bodies of water, swooping and soaring to catch insects
Species of confusion:	Northern Rough-winged Swallow (in flight; all brown, no forked tail, and paler belly with dark tail)
Cal Poly Habitats:	Beef Unit (Drumm Reservoir)

Implications: Barn swallows contribute immensely to maintaining populations of grasshoppers, crickets, flies, moths, beetles, and other insects (MNR, Steinau). As a migratory bird, the barn swallow is important to many ecosystems around the world. Some of the major threats to these birds include the removal of old barns or other structures used as a nesting site by the birds, pesticides, loss of agricultural and grassland habitats, and natural predators (MNR). Interestingly, being in the presence of ospreys appears to provide protection for Barn Swallow from other hawks (Steinau).

Literature Cited:

Ontario Ministry of Natural Resources. (2014). Barn Swallow. In *Birds at Risk*.
http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/MNR_SAR_BRN_SWLLW_EN.html.

Steinau, Rick. (2011). Barn Swallows. In *Birds*. Retrieved from
http://www.asktheexterminator.com/birds/Barn_Swallows.shtml.

Northern Rough-winged Swallow



Size:	Small
At-a-glance coloration:	Brown, cream sexes same
Sound(s):	Sound like blowing raspberries: http://www.xeno-canto.org/143790
Behavior:	Commonly seen in pairs, not nearly as gregarious as other swallows
Species of confusion:	Barn Swallow (in flight; long, forked tail, and has orange belly with dark blue-black back)
Cal Poly Habitats:	Beef Unit (Drumm Reservoir)

Implications: This species prefers open habitats for its breeding grounds. Northern Rough-winged Swallows have been noted for their tolerance of human disturbance near their nesting sites, even relying on human structures with suitable cavities for their nests. Our only observation of this species was in late spring, when they migrate from Mexico and Central America to breed and raise young over summer. As do other swallows, Northern Rough-winged Swallows eat flying insects (Cornell). These swallows are much less colonial than some species such as Barn and Cliff Swallows and are less likely to be seen in large groups.

Literature Cited:

Cornell Lab of Ornithology. (n.d.). Life History. In *Northern Rough-winged Swallow*. Retrieved from http://www.allaboutbirds.org/guide/northern_rough-winged_swallow/lifehistory.

Oak Titmouse



Size:	Small
At-a-glance coloration:	Gray, crested sexes same
Sound(s):	Screechy chatter: http://www.xeno-canto.org/149473
Behavior:	Nest in cavities, usually solitary or in very small groups
Species of confusion:	Bushtit (has no crest, often seen in large noisy groups); Chestnut-backed Chickadee (calls similar, but tend to be less screechy than the Titmouse)
Cal Poly Habitats:	Slack Pasture, Parker Barn

Implications: Oak Titmice do well in oak woodlands, and appear to have stronger populations on the central coast than throughout much of inland California. They require relatively densely treed or shrubby habitats, so open rangeland and large pastures may contribute to their decline in agricultural areas. They are territorial year-round, residing solely in California and Baja California. Oak Titmice eat seeds, some berries, and insects such as ants, aphids, spiders and wasps, from leaves or crevices in tree bark. They are vulnerable to predation by snakes, jays, small owls, and short-winged hawks such as Cooper's Hawks.

Literature Cited:

Cornell Lab of Ornithology. (n.d.). Life History. In *Oak Titmouse*. Retrieved from http://www.allaboutbirds.org/guide/oak_titmouse/lifehistory.

Chestnut-backed Chickadee



Size:	Small
At-a-glance coloration:	Black, white, brown sexes same
Sound(s):	“Chicka-dee-dee”, with a squeaky-toy quality: http://www.xeno-canto.org/28258
Behavior:	Will hold onto tiny twigs upside down in order to grab small insects
Species of confusion:	Oak Titmouse (call only)
Cal Poly Habitats:	Slack Pasture, Parker Barn, Sheep Unit

Implications: Chestnut-backed Chickadees have stable populations in western North America. They often prefer dense, forested areas especially with conifers, but on campus they are commonly seen in eucalyptus and oak trees. The majority of their diet consists of insects and other invertebrates taken directly off of tree branches and leaves, similar to the Oak Titmouse, though they do supplement with some fruits and seeds. Chestnut-backed Chickadees nest in small cavities, and will take advantage of nest boxes if provided. This reliance on cavities means that the removal of trees providing nest spots might harm the reproductive success of these birds (Cornell).

Literature Cited:

Cornell Lab of Ornithology. (n.d.). Life History. In *Chestnut-backed Chickadee*. Retrieved from http://www.allaboutbirds.org/guide/chestnut-backed_chickadee/lifehistory.

Bushtit



Size:	Small
At-a-glance coloration:	Gray, occasional brown tinge sexes same
Sound(s):	High-pitched, near-constant chattering: http://www.xeno-canto.org/159147
Behavior:	Often in flocks, very active moving between trees and limbs. Can look like tiny flying ping-pong balls or helicopters, with long tails behind nearly spherical bodies.
Species of confusion:	Oak Titmouse (has crest, usually solitary, screechier call)
Cal Poly Habitats:	Slack Pasture, Parker Barn, Sheep Unit, Indonesian Reservoir

Implications: The Breeding Bird Survey has recorded a significant decline of Bushtits in Washington since 1966. Disturbance may be a factor, as Bushtits will abandon their nests in the early stages of building, although they seem to tolerate disturbance later in the nesting cycle. An increase in the crow population may also be a factor, as they often rip up Bushtits' nests in urban areas where Bushtits are slowly adapting to the urban environment. Mostly, Bushtits live in mixed deciduous and coniferous forest, chaparral, or oak woodlands (BirdWeb). Regardless of the specific habitat, Bushtits primarily utilize dense undergrowth and foliage, foraging for insects and spiders on branches and leaves. They reside in most of the western United States and western central Mexico (Cornell).

Literature Cited:

BirdWeb. (n.d.). Bushtit. In *Flycatchers, Songbirds and Allies*. Retrieved from <http://www.birdweb.org/birdweb/bird/bushtit>.

Cornell Lab of Ornithology. (n.d.). Life History. In *Bushtit*. Retrieved from <http://www.allaboutbirds.org/guide/bushtit/lifehistory>.

House Wren



Size:	Small
At-a-glance coloration:	Brown, black-barred wings and tail sexes same
Sound(s):	http://www.xeno-canto.org/176254
Behavior:	Relatively solitary, can be found with short tail upright in or near trees with small cavities
Species of confusion:	Bewick's Wren (behavior; gray belly, white supercilium, and slightly larger with longer tail)
Cal Poly Habitats:	Horse Unit

Implications: House Wrens may be problematic for many other cavity-nesting species – including other wrens, bluebirds, and some swallows – due to their habit of ejecting eggs, nestlings, and sometimes even fighting off adults from occupied nests. They are extremely widespread throughout North, Central and South America. House Wrens will eat snails and their shells, earwigs, beetles, and flies among other invertebrates, foraging in dense shrubby areas similar to the Bewick's Wren (Cornell).

Literature Cited:

Cornell Lab of Ornithology. (n.d.). Life History. In *House Wren*. Retrieved from http://www.allaboutbirds.org/guide/house_wren/lifehistory.

Bewick's Wren



On campus, these wrens are likely to be found in dark environments where they camouflage well (lower left).

Implications: Bewick's Wrens and House Wrens have overlapping ranges. Some studies have shown that neither has a measurable impact on the other (Verner & Purcell), while others have concluded that House Wrens may be responsible for the destruction of Bewick's Wrens' eggs. Bewick's Wrens are vulnerable to agricultural pesticides as well as competition from European Starlings, Song Sparrows and House Sparrows for food and territory. They tend to be found in dense, shrubby environments, especially close to the ground in on-campus habitats. Bewick's Wrens eat many insects and supplement with fruit and seeds during winter (Cornell).

Size:	Small
At-a-glance coloration:	Gray, brown, white supercilium sexes same
Sound(s):	Complex, musical song: http://www.xeno-canto.org/178139
Behavior:	Often in underbrush, flicking tail
Species of confusion:	House Wren (behavior; shorter tail); Marsh Wren (call; shorter tail, browner overall)
Cal Poly Habitats:	Slack Pasture, Parker Barn, Indonesian Reservoir, Beef Unit

Literature Cited:

Cornell Lab of Ornithology. (n.d.). Life History. In *Bewick's Wren*. Retrieved from http://www.allaboutbirds.org/guide/bewicks_wren/lifehistory.

Verner, J., and Purcell, K. (1999). Fluctuating populations of House Wrens and Bewick's Wrens in foothills of the western Sierra Nevada of California. *The Condor*, 101(2), 219-229.

Ruby-crowned Kinglet



White eye-ring and olive-gray plumage very closely match Hutton's Vireo, but the Ruby-crowned Kinglet male has a bright red crown (inset) that he can reveal.

Size:	Small
At-a-glance coloration:	Olive-gray, white, red Females don't have red crown
Sound(s):	Tiny machine gun chittering: http://www.xeno-canto.org/175094 High-pitched, whistling song: http://www.xeno-canto.org/175095
Behavior:	Very active, will fly quickly in and out of trees
Species of confusion:	Hutton's Vireo (has thicker bill, different call, no red)
Cal Poly Habitats:	Slack Pasture, Parker Barn, Sheep Unit

Implications: Ruby-crowned Kinglets primarily inhabit coniferous forests in summer, and deciduous forests or woodlands in winter. They can be seen hovering above or perched on tiny twigs, looking for insect prey such as caterpillars and aphids (Audubon). Annual bird counts indicate that populations seem to be increasing, possibly due to breeding in northern habitats where there is less disturbance (Chipper Woods). On campus, they were a common sight during fall and winter, often flying directly overhead and fluttering back to a tree.

Literature Cited:

Chipper Woods Bird Observatory. (2001). Ruby-crowned Kinglet. In *Bird Photos and Videos*. Retrieved from <http://www.wbu.com/chipperwoods/photos/rckinglet.htm>.

National Audubon Society. (n.d.). Retrieved from <http://birds.audubon.org/birds/ruby-crowned-kinglet>.

Common Yellowthroat



Size:	Small
At-a-glance coloration:	Yellow, olive, black (males) Females no black, mostly olive with yellow throat
Sound(s):	Call like the twang of a rubber band: http://www.xeno-canto.org/167832 Musical song has a peak in intensity: http://www.xeno-canto.org/137738
Behavior:	Often hidden in marshy reeds
Species of confusion:	None on campus
Cal Poly Habitats:	Indonesian Reservoir, Shepard Reservoir, Organic Farm

Males (left) are more strikingly colored, but even the females (right) have a bright yellow throat.

Implications: Common Yellowthroats are usually found in dense, low habitats near water such as marshes and shrublands, though they will also occupy orchards, pastures, and recently disturbed areas. Like many small birds, they are a target of Brown-headed Cowbird nest parasitism, and will either desert a parasitized nest or will rebuild atop the parasitized nest. Skunks, snakes, opossums and even mice may eat eggs or nestlings from the nest, while hawks, falcons and shrikes are the primary predators of adults. Yellowthroats are entirely insectivorous and will eat insects and spiders off of leaves, fruits and branches. Because the Common Yellowthroat eats insects and is often near fresh water, they are vulnerable to the accumulation of pesticides and water pollution (Cornell).

Literature Cited:

Cornell Lab of Ornithology. (n.d.). Life History. In *Common Yellowthroat*. Retrieved from http://www.allaboutbirds.org/guide/common_yellowthroat/lifehistory.

Yellow Warbler



Size:	Small
At-a-glance coloration:	Yellow, red streaks (males only); males brighter yellow
Sound(s):	http://www.xeno-canto.org/129810
Behavior:	Tree-foragers; uncommonly seen on campus
Species of confusion:	Western Tanager (females in particular; larger; males have black wings, red head)
Cal Poly Habitats:	Parker Barn

Implications: Yellow Warblers tend to be seen in San Luis Obispo only in summer, living in thick habitats near fresh water. They feed on insects from leaves or while hovering just above leaves, such as caterpillars, leafhoppers, and wasps. Yellow Warblers' nests may be parasitized by Brown-headed Cowbirds, and the warblers will – sometimes successfully – attempt to rebuild nests atop the parasitized nests. Snakes, jays, crows, raccoons, skunks and domestic cats commonly prey upon Yellow Warblers (Cornell).

Literature Cited:

Cornell Lab of Ornithology. (n.d.). Life History. In *Yellow Warbler*. Retrieved from http://www.allaboutbirds.org/guide/yellow_warbler/lifehistory.

Yellow-rumped Warbler



Above and left inset: Yellow-rumped Warblers have a wide range of bright to drab depending on sex, age, and season. The rump is always a bright flash (right inset).

Size:	Small
At-a-glance coloration:	Yellow, gray, white; breeding males tend to be darker, brighter gray and yellow
Sound(s):	Short call: http://www.xeno-canto.org/91227 Up-and-down song: http://www.xeno-canto.org/172402
Behavior:	Very commonly found in groups in most habitats
Species of confusion:	Townsend's Warbler (black mask, more yellow and black)
Cal Poly Habitats:	All

Implications: Yellow-rumped Warblers are a species of least concern and, especially given the number of times that we have observed them, we can attest to their prolific populations. Due to their abundance, they can consume a large amount of small insects including the spruce budworm, which is a serious pest among forests. They also eat seeds, which makes them an important vector for plants' dispersal (Cornell). Paul Strode writes that the Yellow-rumped Warbler may be better suited than other bird species to dealing with the effects of global climate change thanks to their short migrations. They can easily move from one area to another depending on where the most available resource is located (Strode).

Literature Cited:

Cornell Lab of Ornithology. (n.d.). Life History. In *Yellow-rumped Warbler*. Retrieved from http://www.allaboutbirds.org/guide/yellow-rumped_warbler/lifehistory.

Strode, P.K. (2009). Spring tree species use by migrating Yellow-Rumped Warblers in relation to phenology and food availability. In *The Wilson Journal of Ornithology* 121(3):457-468. Retrieved from <http://www.bioone.org/doi/abs/10.1676/05-148.1>.

Townsend's Warbler



Size:	Small
At-a-glance coloration:	Yellow, black, white
Sound(s):	Slow, whistling song: http://www.xeno-canto.org/160220
Behavior:	Somewhat reclusive tree-foragers
Species of confusion:	Yellow-rumped Warbler (grayer, no black mask)
Cal Poly Habitats:	Organic Farm

Implications: According to Paul Cotter, clear cutting could pose a major threat to Townsend's Warblers since they make their homes primarily in coniferous forests. Good needle or leaf cover is important for nest shelter from predation (Cotter). Not much is known about this warbler, though its population appears stable across North America. Townsend's Warblers are only found in coastal California during the winter, though migration can take them throughout the state. They eat insects and the honeydew that some insects secrete (Cornell).

Literature Cited:

Cornell Lab of Ornithology. (n.d.). Life History. In *Townsend's Warbler*. Retrieved from http://www.allaboutbirds.org/guide/townsend_s_warbler/lifehistory.

Cotter, P. (n.d.). Townsend's Warbler (*Dendroica townsend*). In *Southeast Alaska Conservation Assessment*. Retrieved from <http://www.conservationgateway.org/ConservationByGeography/NorthAmerica/UnitedStates/alaska/seak/era/cfm/Pages/RS-AKCFM.aspx>.

Song Sparrow



Size:	Small
At-a-glance coloration:	Black, brown, white sexes same
Sound(s):	Multisyllabic whistles and variations: http://www.xeno-canto.org/143923
Behavior:	Often solitary, singing from the top of a shrub or reed
Species of confusion:	Lincoln's Sparrow (cream base to chest, fainter streaking)
Cal Poly Habitats:	Indonesian Reservoir, Shepard Reservoir, Parker Barn

Implications: Song Sparrows are rather abundant and can be found in a wide range of habitats, including at many locations on campus. However, they do not inhabit suburban areas and are mostly found in open fields or on the edge of the woods or riparian habitats. The song sparrow is important for dispersing seeds and eating insects (Gomez). There is potential for conflict if they are found eating crop seeds such as wheat and sunflower seeds, but they are beneficial in their consumption of grasshoppers, midges, and other invertebrates. In some isolated parts of California, such as near the San Francisco Bay and off the coast on two small islands, the song sparrow is disappearing due to habitat loss. Nevertheless, as a species Song Sparrows have stable populations (Cornell).

Literature Cited:

Cornell Lab of Ornithology. (n.d.). Life History. In *Song Sparrow*. Retrieved from http://www.allaboutbirds.org/guide/song_sparrow/lifehistory.

Gomez, E. (2000). *Melospiza melodia* (Song Sparrow). In *Animal Diversity Web*. Retrieved from http://animaldiversity.ummz.umich.edu/accounts/Melospiza_melodia/.

Lincoln's Sparrow



Size:	Small
At-a-glance coloration:	Black, brown, white, cream sexes same
Sound(s):	Complex, somewhat like Song Sparrow's: http://www.xeno-canto.org/140281
Behavior:	Somewhat reclusive
Species of confusion:	Song Sparrow (white base to chest plumage, thicker streaking)
Cal Poly Habitats:	Indonesian Reservoir, Shepard Reservoir, Parker Barn

Implications: The most important area of concern for this bird species is their breeding habitat. While they do migrate, Lincoln's Sparrows have highly specialized breeding sites including dense, low, shrub or wetland habitats. The secretive behavior of this species allows them to go unnoticed. For this reason it is important to make careful observations of an area before making any management decisions or changing the habitat in any way. Further, Lincoln's Sparrows forage for their meals of seeds and invertebrates in grassy or weedy areas (BirdWeb). It is important to note that cattle grazing can expose nesting sites, making the offspring vulnerable to predation, or reducing the expanse of available nesting habitat. Being aware of potential locations for nesting sites is recommended. Logging is also a cause of nesting losses, since many Lincoln's Sparrows nest on the forest floor (Audubon).

Literature Cited:

National Audubon Society. (n.d.). Lincoln's Sparrow (*Melospiza lincolnii*). In *Birds*. Retrieved from <http://birds.audubon.org/species/linspa>.

BirdWeb. (n.d.). Lincoln's Sparrow. In *Sparrows, Towhees, Longspurs and Allies*. Retrieved from http://birdweb.org/birdweb/bird/lincolns_sparrow.

White-crowned Sparrow



Size:	Small
At-a-glance coloration:	Gray, black/ white, brown sexes similar
Sound(s):	Slightly shorter, less complex song than Song and Lincoln's Sparrows: http://www.xeno-canto.org/158956
Behavior:	Ground foragers, gregarious, bold
Species of confusion:	Golden-crowned Sparrow (juveniles all have similar brown/cream crown; adults have thicker black stripe from crown to eye, with bright yellow between eyes)
Cal Poly Habitats:	All

Implications: Though the national population declined between the 1960s and 2010, the White-crowned Sparrow is still a species of least concern. There has not been a major loss in their population, but any shift in population size could be an indicator of overall ecosystem health across the ranges in which they are present. These sparrows forage by scratching on the ground, eating weed and grass seeds, invertebrates like wasps and beetles, grain crops such as oats or corn, and fruits like blackberries. Though some populations of white-crowned sparrows migrate distances up to 2,600 miles, the white-crowned sparrow on the Pacific coast does not migrate (Cornell).

Literature Cited:

Cornell Lab of Ornithology. (n.d.). Life History. In *White-crowned Sparrow*. Retrieved from http://www.allaboutbirds.org/guide/white-crowned_sparrow/lifehistory.

Golden-crowned Sparrow



Size:	Small
At-a-glance coloration:	Gray, brown, black Yellow crown in adults sexes similar
Sound(s):	Song sounds like “Oh dear me”: http://www.xeno-canto.org/134498
Behavior:	Usually solitary or in small groups, more reclusive than White-crowned Sparrow
Species of confusion:	White-crowned Sparrow (head has more distinct striping, though can be brown in juveniles)
Cal Poly Habitats:	Organic Farm, Parker Barn

Implications: The Golden-crowned Sparrow breeds in thick, brushy or densely treed areas from northern Washington toward the northernmost parts of North America. During winter, this sparrow can be seen from southern British Columbia to northern Baja California. Golden-crowned Sparrows will eat weed seeds, newly sprouted annuals after fall rains, buds and flowers (Davis). On campus, these sparrows are much less common than their relative the White-crowned Sparrow.

Literature Cited:

Davis, John. (1973). Habitat Preferences and Competition of Wintering Juncos and Golden-Crowned Sparrows. In *Ecology* 54.1: 174-80. JSTOR. Retrieved from <http://www.jstor.org/stable/10.2307/1934387?ref=search-gateway:bdf9db38a79ecef7fcd481bcb5ebf06>.

Dark-eyed Junco



Size:	Small
At-a-glance coloration:	Black, brown, white; pink bill Some are only black and white sexes same
Sound(s):	Short “chip” call repeated: http://www.xeno-canto.org/172408 Rapid song: http://www.xeno-canto.org/152586
Behavior:	Ground foragers, common near human structures such as the library
Species of confusion:	Black Phoebe (distinct crest on head, larger and flicks tail often; black bill)
Cal Poly Habitats:	Slack Pasture

Implications: When compared to the Golden-crowned Sparrow, Dark-eyed Juncos are found over a larger expanse of the country and not just among west coast states. They must have some cover from trees or brush in their environments and will almost never be seen in open habitats. Seeds from weeds provide for the majority of their dietary needs. Juncos consume much less green vegetation than the Golden-crowned Sparrow (Davis). Dark-eyed Juncos are much bolder as well, and may also be seen around buildings such as the library in the main part of campus.

Literature Cited:

Davis, John. (1973). Habitat Preferences and Competition of Wintering Juncos and Golden-Crowned Sparrows. In *Ecology* 54.1: 174-80. JSTOR. Retrieved from <http://www.jstor.org/stable/10.2307/1934387?ref=search-gateway:bdf9db38a79ecef7cd481bcb5ebf06>.

American Goldfinch



Size:	Small
At-a-glance coloration:	Yellow, black (males) Females duller olive-yellow, no black cap or wings Pink bill
Sound(s):	Call followed by series of songs: http://www.xeno-canto.org/169080
Behavior:	Often call while flying, usually in pairs or small groups
Species of confusion:	Lesser Goldfinch (light gray-billed; females very similar, males have black or olive on back where American is yellow)
Cal Poly Habitats:	Indonesian Reservoir, main campus

Implications: From what we have observed of the goldfinches present on Cal Poly's campus, the American Goldfinch is the least common except in the winter. Their breeding habitat includes meadows, brushy fields, and even suburban backyards. They are typically seen eating seeds from trees, flower heads, and bird feeders. Goldfinches are especially fond of thistle plants. It will be important to consider this when making management decisions especially since ranchers are determined to eliminate thistle from their ranches; on the other hand, their presence may indicate the status of the land and thistle presence and be helpful for ranchers to determine the success of their thistle management. The American Goldfinch has adapted well to human development while maintaining a steady population and has no special conservation status (Cornell, Rumelt).

Literature Cited:

Cornell Lab of Ornithology. (n.d.). Life History. In *American Goldfinch*. Retrieved from http://www.allaboutbirds.org/guide/american_goldfinch/lifehistory.

Rumelt, R. (2012). Brief summary. In *Carduelis tristis: American Goldfinch*. Retrieved from <http://eol.org/pages/1051032/details>.

Lesser Goldfinch



Size:	Small
At-a-glance coloration:	Yellow, black (males) Females duller olive-yellow, no black cap or wings Gray bill
Sound(s):	Call followed by continuous, chattery song: http://www.xeno-canto.org/71959
Behavior:	Often calls while flying; usually in pairs or small groups
Species of confusion:	American Goldfinch (pink-billed; females very similar, males have yellow on back where Lesser is dark)
Cal Poly Habitats:	Indonesian Reservoir, main campus

Implications: Lesser Goldfinches inhabit most of the western U.S, and can be found on campus year-round. They are smaller in comparison to the American Goldfinch, but the two species differ little as far as desired habitat, diet, and adaptation to human encroachment. The goldfinch population may have increased due to land development, which resulted in weedy, suburban and other patchy habitat types. Lesser Goldfinches prefer seeds from sunflowers, thistles and dandelions, though they will also eat some berries and plant buds, rarely supplementing with small insects (Cornell, Audubon).

Literature Cited:

Cornell Lab of Ornithology. (n.d.). Life History. In *Lesser Goldfinch*. Retrieved from http://www.allaboutbirds.org/guide/lesser_goldfinch/lifehistory.

National Audubon Society. (n.d.). Lesser Goldfinch (*Spinus psaltria*). In *Finches*. <http://birds.audubon.org/birds/lesser-goldfinch>.

House Finch



Size:	Small
At-a-glance coloration:	Red, brown, cream; streaky Females no red, streaky
Sound(s):	Males sing varied song but often with a consistent ending: http://www.xeno-canto.org/172419
Behavior:	Males will follow females around; often in pairs or groups, call when in flight
Species of confusion:	Purple Finch (not confirmed on campus; pinker than red, and reddish streaks rather than brown on male)
Cal Poly Habitats:	Indonesian Reservoir, Parker Barn, Organic Farm, Sheep Unit

Usually red-faced, male House Finches may occasionally have golden plumage (inset).

Implications: House Finches as a species appear to be doing well and have established populations in many urban or otherwise developed environments, more so than the Purple Finch. These finches are very common on Cal Poly's campus and most of its agricultural lands. House Finches primarily eat seeds, but can seriously impact fruit crops such as cherries, peaches and similar drupe fruits, pears, strawberries, and figs, with the potential to cause conflicts with orchard managers (Cornell). House Finches may take over the nests of some other species, laying their own eggs in a fresh or even occupied nest. Even so, unlike Brown-headed Cowbirds, the finches don't rely on the other species parents to feed their young but rather take control entirely or even share occasionally with the other parents. It has also been noted that House Finches will eat the seeds of undesirable weedy plants which may help with weed control (Woods).

Literature Cited:

Cornell Lab of Ornithology. (n.d.). Life History. In *House Finch*. Retrieved from http://www.allaboutbirds.org/guide/house_finch/lifehistory.

Woods, R.S. (1968). House Finch. In *Familiar Birds*. Retrieved from www.birdsbybent.com/ch41-50/houfinch.html.

House Sparrow



Size:	Small
At-a-glance coloration:	Gray, brown, black Females drabber, little to no black
Sound(s):	Very chirpy, loud in large groups: http://www.xeno-canto.org/134291
Behavior:	Gregarious, often found in groups and noisily chattering. Often seen in urban and suburban environments.
Species of confusion:	Song Sparrow (much streakier, quieter and less common; more solitary and not in urban settings)
Cal Poly Habitats:	Beef Unit, Dairy, main campus

Implications: House Sparrows have been documented as extremely problematic for native species, by violently attacking their nests, evicting nesting birds, and aggressively defending their territories once established. They may also prove problematic for livestock that receive grain feed substitutes, since House Sparrows eat grains such as millet and cracked corn (Wells). Fortunately, few to no House Sparrows have been noted on most of Cal Poly's agricultural areas, and larger populations appear to prefer more central locations on campus.

Literature Cited:

Wells, A. (2004). Impact of House Sparrow and other invasive bird species being monitored by volunteers in Cornell Lab of Ornithology's Birdhouse Network. In *Cornell Chronicle*. Retrieved from <http://www.news.cornell.edu/stories/2004/04/citizens-asked-monitor-impact-invasive-bird-species>.

Nutmeg Mannikin



Size:	Small
At-a-glance coloration:	Brown, cream, scaly Juveniles solid golden brown
Sound(s):	Generally quiet, occasionally calls single note: http://www.xeno-canto.org/122127
Behavior:	Often in large groups of juveniles, sometimes with adults; smaller groups of adults
Species of confusion:	None on campus
Cal Poly Habitats:	Indonesian Reservoir, Slack Pasture, Beef Unit

Implications: This species is native to eastern India and part of the Philippines and Indonesia. It has been released by pet owners and established itself in the wild within the past few decades (SDSU). We witnessed what was probably a breeding pair of Nutmeg Mannikin exhibiting nest-building behavior in the fall, which was unusual given that it was not the breeding season for any native or migratory North American species. No negative impacts from this species have been made well known. From what we have seen, the species stays together and more withdrawn compared to other exotic species.

Literature Cited:

San Diego State University. (n.d.). Exotic and hypothetical species. In *San Diego Bird Atlas*.
<http://map.sdsu.edu/group2007spring/group2/Exotic%20and%20Hypothetical%20Species.htm>.

Virginia Opossum



Young Opossums look like smaller, shorter versions of their adult selves.

Size:	Medium
At-a-glance coloration:	Gray, white long, scaly pinkish tail
Sound(s):	Silent
Behavior:	Nocturnal
Species of confusion:	None
Cal Poly Habitats:	Sheep Unit

Implications: Opossums are widespread due to being adapted to human environments, having had few historical predators, and being omnivorous to the extreme. They will eat fruit, invertebrates, carrion, nuts, shellfish, bird eggs, birds, pet food, birdseed, and garbage among others. This can be beneficial, by removing rodents and potentially unpleasant carrion from human environments. However, they may also pose threats to native bird, reptile and mammal species, and they can be a source of frustration for gardeners or those with chicken coops. There is some concern that opossums may also be carriers of Equine Protozoal Myoencephalitis, an infection of the central nervous system in horses. Ensuring that horse feed is inaccessible to opossums and that the feed is never exposed to opossum droppings can reduce transmission. The best way to avoid conflicts with opossums is to seal garbage out of their reach, feed pets inside, and block off access to potential denning sites. Their nesting and denning sites can be varied as long as they provide a sheltered, dry safe place such as other animals' burrows, beneath houses, and hollow stumps, and the den site will change frequently to avoid predators. Today, opossums – especially the young – will be preyed upon by coyotes, foxes, raccoons, bobcats, and owls, as well as having high mortality rates due to vehicle impact (WDFW).

Literature Cited:

Link, R. (2004). Opossums. In *Living with Wildlife*. Retrieved from <http://wdfw.wa.gov/living/opossums.html>.

Brush Rabbit



Size:	Small
At-a-glance coloration:	Brown, white sexes same
Sound(s):	Only make vocal sounds when in pain or scared, but will thump their hind feet first when frightened
Behavior:	Mostly crepuscular, and will group to forage but generally solitary
Species of confusion:	Black-tailed Jackrabbit (much larger overall with longer ears, longer face and tawny/black tail)
Cal Poly Habitats:	Sheep Unit, Shepard Reservoir

Implications: One subspecies, the riparian Brush Rabbit, is considered endangered due to loss of riparian habitat in the central valley of California. On the whole, though, they may be pests due to damaging food crops and possibly hindering the growth of seedlings planted in reforestation projects. They preferentially feed on green clover and grasses, also eating the leaves of some forbs and shrubs. They will either sit motionless or run rapidly in a zig-zag pattern to avoid predation. Brush rabbits tend to have three litters of 2-4 young each year, so populations may become large quickly in the absence of predation by other animals or human hunting (Crane and Csomos).

Literature Cited:

Crane, S. and Csomos, R.A. (2002). *Sylvilagus bachmani*: brush rabbit. In *Animal Diversity Web*. Retrieved from http://animaldiversity.ummz.umich.edu/accounts/Sylvilagus_bachmani/.

Black-tailed Jackrabbit



Size:	Medium
At-a-glance coloration:	Brown, black sexes same
Sound(s):	Silent
Behavior:	Mostly nocturnal
Species of confusion:	Brush Rabbit (much smaller overall, with shorter ears and white tail)
Cal Poly Habitats:	Sheep Unit, Indonesian Reservoir, Shepard Reservoir, Organic Farm

Black-tailed Jackrabbits are well camouflaged in dry environments; their black ear and tail tips may be difficult to see (inset).

Implications: Similar to the Brush Rabbit, the Black-tailed Jackrabbit eats primarily grasses and other green plants including cacti, but favoring alfalfa. Their appetite can cause conflict with crop farmers, but despite these encounters, jackrabbit populations are stable and widespread (NatGeo). It will eat woody plants' leaves during the winter. When being chased by a predator such as a fox or bobcat, it also zig-zags and will flash the white underside of its tail at the pursuer to confuse them as well as caution other nearby jackrabbits (NHPTV).

Literature Cited:

National Geographic. <http://animals.nationalgeographic.com/animals/mammals/jackrabbit/>
NatureWorks/NH Public Television. <http://www.nhptv.org/natureworks/blacktailedjack.htm>.

Western Gray Squirrel



Size:	Small
At-a-glance coloration:	Gray, white
Sound(s):	Sounds of crunching pinecones can alert you to their location in a conifer
Behavior:	Commonly seen both in trees and foraging on the ground
Species of confusion:	California Ground Squirrel (usually in more open environments, never in trees)
Cal Poly Habitats:	Sheep Unit, Horse Unit (parking lot)

Implications: Western Gray Squirrels are highly dependent on oak woodlands and oak-conifer forests. In Oregon, they are a threatened species due to the loss of this important habitat as well as some hunting, disease, and unpredictable food availability. Oaks tend to provide these squirrels with arboreal escape routes, food (acorns) and seasonal cover. Squirrels also nest, both to relax and to rear young. Their nests can be found in cavities or in tree branches, made from twigs. These squirrels will eat berries, acorns, seeds, nuts, fungi such as truffles, and even tree bark. Because of their appetite for nuts, they may be considered pests in agricultural areas with fruit and nut orchards. In California they are a common target of traps or poison as a result; they are also at risk of mortality from cars, as well as natural predation by canids, felids, Great Horned Owls and occasionally Red-tailed Hawks. Ground squirrels may be strong competition for Western Gray Squirrels' nest sites, habitat and food, while Steller's Jays may aggressively attack Western Gray Squirrels as well as competing for food (Ryan & Carey).

Literature Cited:

Ryan, L.A. and Carey, A.B. (1995). Biology and management of the Western Gray Squirrel and Oregon White Oak Woodlands: with emphasis on the Puget Trough. In *USDA-FS, Pacific Northwest Research Station General Technical Report 348*. Retrieved from http://www.fs.fed.us/pnw/pubs/pnw_gtr348.pdf.

California Ground Squirrel



Size:	Small
At-a-glance coloration:	Brown/tan, gray sexes same
Sound(s):	Will make high-pitched alarm call
Behavior:	Usually solitary or in small groups, in open habitats
Species of confusion:	Western Gray Squirrel (usually near trees, much fluffier tail and gray)
Cal Poly Habitats:	Parker Barn, Indonesian Reservoir, Slack Pasture

Implications: Most commonly found in open, dry areas where they can have large burrow systems to support up to a few dozen animals. Ground Squirrels are considered problematic due to their consumption of seedling fruit and vegetable plants, tree bark to the extent of “girdling” the tree, and grain, fruit and nut crops. Fleas on California Ground Squirrels can carry bubonic plague, which they are also susceptible to, meaning that a ground squirrel that is discovered dead should not be touched and local wildlife authorities should be contacted. Elimination management of Ground Squirrels can be complicated by the presence of similarly sized animals such as Western Gray Squirrels, Brush Rabbits, and threatened reptile or amphibian species. Food items are commonly used to encourage them to enter a trap; similarly sized animals of other species might just as easily become victim to such bait. Fumigation of burrows requires the use of strong pesticides that may have repercussions on several unintended species. Ground Squirrels are prey for hawks, eagles, rattlesnakes and coyotes as well as domestic dogs, though they will not eradicate the population. One of the best methods of minimizing non-target-species losses while deterring ground squirrel inhabitants is to destroy any existing burrows by ripping them down to about 2 feet, with a tractor. Unlike trying to “fill in” burrows, this removes the ideal habitat and they are more likely to look elsewhere to make a new burrow (Salmon and Gorenzel).

Literature Cited:

Salmon, T.P. and Gorenzel, W.P. (2010). Ground Squirrel Management Guidelines. In *How to manage pests: Pests in gardens and landscapes*. Retrieved from <http://www.ipm.ucdavis.edu/PMG/PESTNOTES/pn7438.html>.

Botta's Pocket Gopher



Size:	Small
At-a-glance coloration:	Brown
Sound(s):	Silent
Behavior:	Digs large holes, most evident sign of presence
Species of confusion:	None
Cal Poly Habitats:	Shepard Reservoir

Implications: Generally underground in grasslands or grasslike crop fields, Botta's Pocket Gophers are most often seen when foraging at the edge of their burrows, digging, or relocating. They are commonly considered pests due to the disruptive nature of their widespread burrows, especially in gardens or irrigated crop fields. It is important to note that their digging also provides beneficial ecological services including soil aeration, improved water infiltration, increased soil fertility and reduced soil compaction (Case and Andelt). Unlike Ground Squirrels, Pocket Gophers don't hibernate, and generally live alone in their burrow systems. They tend to eat roots and other subterranean plant parts of herbaceous plants but will also eat aboveground near a specific burrow opening or pull entire plants into their burrows from below. Alfalfa appears to be a favorite food source for these gophers. Similar to methods used against California Ground Squirrels, many control methods of Pocket Gophers are highly lethal and may have broad impacts on unintended victims. Nonlethal methods of habitat modification may prevent gopher residence. Wire mesh fences can be placed ranging from a couple feet belowground to a foot or so aboveground around the bases of trees to prevent them from being dug around or eaten. Having more dense aboveground vegetation may present a less suitable habitat for the gophers (Salmon and Baldwin). For those producing alfalfa crops, it can help to rotate the crop with annual grains because they don't create enough root material for the gophers to subsist. Another method is to surround the alfalfa fields with annual grains as a buffer zone to gopher invasion (Case and Andelt).

Literature Cited:

Case, R.M. and Andelt, W.F. (2014). Managing Pocket Gophers: Fact Sheet No. 6.515. In *Natural Resource Series*. Retrieved from <http://www.ext.colostate.edu/pubs/natres/06515.html>

Salmon, T.P. and Baldwin, R.A. (2009). Pocket Gophers. In *How to manage pests: Pests in gardens and landscapes*. Retrieved from <http://www.ipm.ucdavis.edu/PMG/PESTNOTES/pn7433.html>

Coyote



Size:	Large
At-a-glance coloration:	Gray, red-brown, tan, dark tail tip sexes same
Sound(s):	Will bark and howl similar to domestic dogs
Behavior:	Tend to be solitary Tracks easily confused for domestic dog
Species of confusion:	None on campus
Cal Poly Habitats:	Sheep Unit, Parker Barn

Implications: Coyotes have colonized almost every North American habitat, ranging from large urban cities (Los Angeles) to deserts and mountains. They are omnivorous, feeding on fruit, grasses, insects, fish, reptiles, birds, and mammals, with the potential to limit populations of Red Foxes and other medium-sized mammals (Ohio State). Coyotes will occasionally hunt large mammals in packs but also scavenge. Because they will hunt and kill domestic livestock, they often create potentially lethal conflicts with ranchers (National Geographic). Coyotes are also at risk of car collisions and predation by bears and mountain lions in extreme situations (Arizona-Sonora Desert Museum). Coyotes use found dens or will dig their own when nesting with pups. Mothers will reuse dens or move their pups from one to another to keep them safe (Ohio State).

Literature Cited:

Arizona-Sonora Desert Museum. (2008). Coyote Fact Sheet. In *Sonoran Desert Fact Sheets*. Retrieved from <http://www.desertmuseum.org/kids/oz/long-fact-sheets/coyote.php>.

National Geographic. (n.d.). Coyote. In *Animals:Mammals*. Retrieved from <http://animals.nationalgeographic.com/animals/mammals/coyote/>.

The Ohio State University. (n.d.). Urban Coyote Ecology and Management. In *The Cook County, Illinois, Coyote Project*. Retrieved from <http://www.urbancoyotereseach.com/index.htm>.

Raccoon



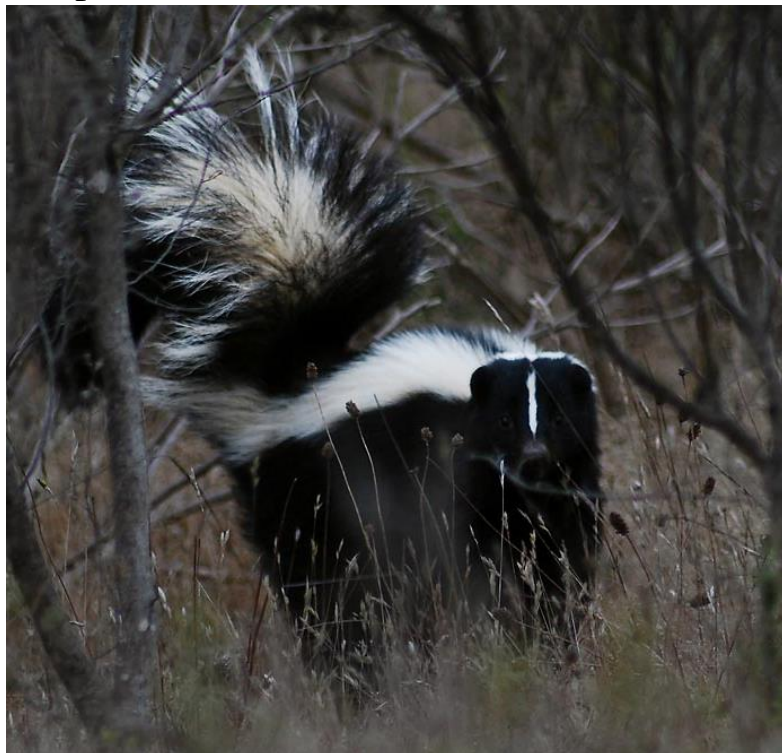
Size:	Medium
At-a-glance coloration:	Black, gray, white sexes same
Sound(s):	Occasional, varied sounds when interacting with humans or other animals range from chattering to hissing and growling
Behavior:	Often seen in groups Mostly crepuscular or nocturnal
Species of confusion:	None on campus
Cal Poly Habitats:	Sheep Unit, Beef Unit

Implications: Raccoons are omnivorous and will sift through garbage in urban and suburban environments for food such as fruits, plants, nuts, berries, insects and rodents. Their extremely dexterous front paws can get them into conflicts with humans by opening doors and garbage cans. Aside from human (and vehicular) encounters, raccoons can also be preyed upon by bobcats, mountain lions and coyotes, and infected by rabies and roundworm, which can be transmitted to humans. Raccoons don't hibernate but may sleep for several weeks in their dens. They are strong swimmers and skilled at problem-solving, so preventing their theft of human food may need ingenious solutions (Nature). They don't appear to present major management concerns for agricultural regions but could be a competitor for fruit and nut crops if in the area.

Literature Cited:

Nature (PBS). (n.d.). Raccoon Fact Sheet. In *Raccoon Nation*. Retrieved from <http://www.pbs.org/wnet/nature/episodes/raccoon-nation/raccoon-fact-sheet/7553/>.

Striped Skunk



Size:	Medium
At-a-glance coloration:	Black, white sexes same
Sound(s):	Silent, except that when preparing to spray, they will hiss
Behavior:	Tend to be solitary Mostly nocturnal
Species of confusion:	None on campus
Cal Poly Habitats:	Sheep Unit

Implications: Skunks are omnivorous, though tend to feed on insects, larvae, carrion, small rodents, and bird eggs. Though they have been reported to kill barnyard chickens, they are often beneficial due to their consumption of mice and rats in barns and other agricultural areas. Skunks are known carriers of rabies, so it is best to avoid close encounters, even if only to avoid startling them into spraying (Minnesota DNR).

Literature Cited:

Minnesota Department of Natural Resources. (n.d.). Striped Skunk. In *Mammals*. Retrieved from <http://www.dnr.state.mn.us/mammals/stripedskunk.html>.

Bobcat



Size:	Large
At-a-glance coloration:	Tan, black, white
Sound(s):	May make yowling scream
Behavior:	Mostly nocturnal
Species of confusion:	None on campus
Cal Poly Habitats:	Sheep Unit

Implications: Bobcats stalk their prey in dense habitats such as forests or shrublands across the entire continental United States. They are extremely solitary and territorial, marking their ranges with scent. Females tend to be more territorial but over smaller areas than males, whose large territories may overlap. Bobcats primarily prey upon lagomorphs (rabbits and hares) but also eat rodents, birds – including chickens – and will attack lambs or young deer if they need to. The species was previously threatened by fur trapping, but since the 1970s bobcat populations have steadily returned to stable sizes. Today, the threat they pose to sheep may bring them into conflict with ranchers (Defenders). Bobcats may also be attracted to a suburban or rural living environment as a result of pet food, thick brushy or weedy areas in which to shelter, or even birdseed if it attracts prey animals. However, they may prove beneficial by eating many of the rodents in these areas which are commonly perceived as pests, as well as opportunistically eating dead animals. It appears that urban bobcats may be best adapted to urban living, whereas bobcats living in “wild” environments are less likely to encroach upon human-altered environments so long as adequate habitat exists. Six-foot-high fences that extend about a foot below ground can prevent bobcat entry into areas where livestock or other animals or resources are kept (Milacek).

Literature Cited:

Defenders of Wildlife. (n.d.). Basic Facts About Bobcats. In *Animal Fact Sheets*. Retrieved from <http://www.defenders.org/bobcat/bobcats>.

Milacek, K. (2008). The Bobcat (*Lynx rufus*). In *National Bobcat Rescue & Research*. Retrieved from <http://www.nbrr.org/whatisabobcat>.

Black-tailed (Mule) Deer



Size:	Large
At-a-glance coloration:	Brown, black/white (tail, face) sexes same colors, females no antlers
Sound(s):	Usually silent in the presence of humans
Behavior:	Tend to be in small family groups; active day/night
Species of confusion:	None on campus
Cal Poly Habitats:	Indonesian Reservoir, Sheep Unit, Beef Unit, Slack Pasture

Implications: The Black-tailed Deer is a subspecies very closely related to the well-known Mule Deer. Adult females tend to have longer lifespans than adult males (due to males being the preferred hunting target). Deer are herbivorous ruminants, so they can obtain all their necessary nutrients from plant matter – primarily leaves and shoots, though they will also take advantage of various hays if accessible. Good quality forage availability is therefore a limiting factor on deer health, as is the availability of free water especially when plants are dry. Black-tailed Deer stay close to habitats that not only provide food but also cover for safety from predators and/or thermal insulation in extreme temperatures; this tends to be available in thickly forested or very shrubby areas (Bunnell). In our area, Black-tailed Deer are vulnerable to car collisions and predation by coyotes, mountain lions, black bears and Golden Eagles.

Literature Cited:

Brewer, Devin. (n.d.) Black-tailed Deer Facts. In *Deer Hunting*. Retrieved from <http://www.hungry-for-hunting.com/black-tailed-deer-facts.html>.

Bunnell, F.L. (1990). Ecology of Black-tailed Deer. In *Deer and Elk Habitats in Coastal Forests of Southern British Columbia*: 31-33. Retrieved from http://www.for.gov.bc.ca/hfd/pubs/docs/srs/Srs05/Srs05_Chapter2.pdf.

Species of Confusion

In case we named a confusing species that we didn't confirm on campus, below are reference photos, linked back to the confirmed species.

Snowy Egret: (Looks like Great Egret)



American Bittern: (Like Black-crowned Night Heron juveniles)



Canada Goose: (Like Cackling Goose)



Sharp-shinned Hawk: (Like Cooper's Hawk)



Hairy Woodpecker: (Like Downy Woodpecker)



Cassin's Kingbird: (Like Western Kingbird)



Swainson's Thrush: (Like Hermit Thrush)



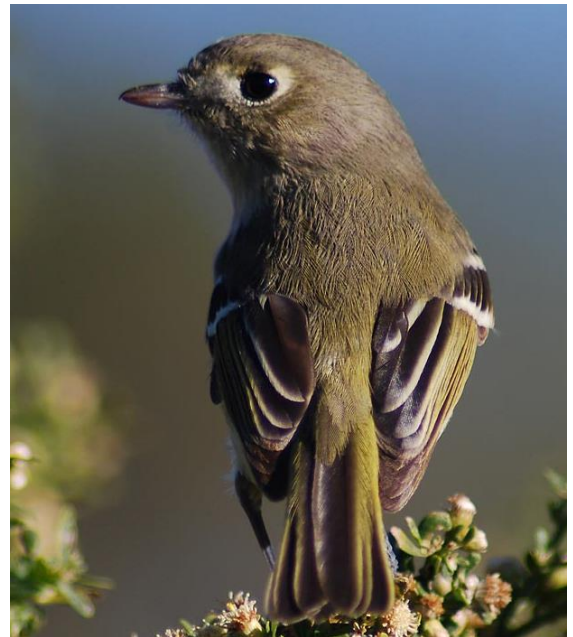
Allen's Hummingbird: (Like Anna's Hummingbird)



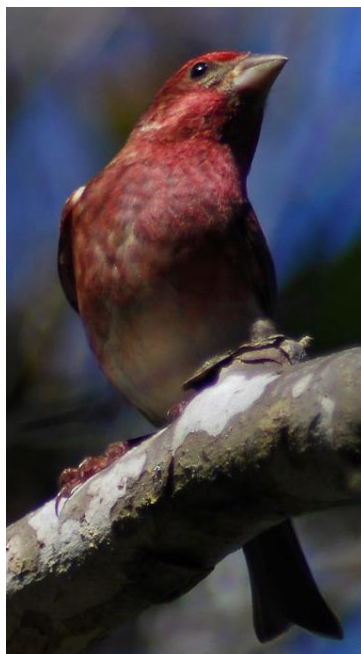
Marsh Wren: (Like Bewick's Wren)



Hutton's Vireo: (Like Ruby-crowned Kinglet)



Purple Finch: (Like House Finch)



Conclusions (part 1 of 2)

Beef Unit (Drumm Res.)

Even though the beef pavilion is immediately adjacent to a busy parking lot, we discovered quite a few unexpected species there. Drumm Reservoir, a waste water treatment area, proved to support many species. Though there may need to be improvements in the way this is done, this is an example of wildlife taking advantage of human systems that created a habitat. Indeed, this entire unit area has developed into an island of suitable habitat amidst the student housing, busy streets and parking lots. Besides the Black-tailed Deer making their presence known almost daily in the large pasture, this was one place where the nonnative House Sparrows made themselves comfortable, reflecting the greater human impact of the parking lot and buildings than in most other units.

BCEC/Parker Barn

Parker Barn, the pasture tucked behind it, and the eucalyptus cluster near some crop fields across the creek created a rich mixture of habitats. The old water trough in the pasture acted as a tiny pond during the dry season, attracting several species of small passerines (songbirds) to drink simultaneously. This was also the first location where we saw Northern Mockingbirds, a species we had expected to see in many more of the units. Just a few hundred feet up Mount Bishop Road, the Beef Cattle Evaluation Center proved to be appealing for most blackbird species, including the somewhat rare Tricolored Blackbird. Cooper's Hawks also made an appearance above the fields and between the BCEC and Parker Barn, which had seemed improbable given that the eucalyptus grove provided the only densely treed habitat in the area.

Horse Unit (Reservoirs)

Due to the proximity of two perennial fresh water sources, Indonesian and Shepard Reservoirs, the Horse Unit as a whole hosts the most diverse assortment of birds. The marshy areas around the reservoirs as well as the reservoirs themselves were clearly essential to many of the species we saw - waterfowl such as ducks were found almost nowhere else, for obvious reasons. The Indonesian Reservoir hosted the rarely seen Loggerhead Shrike and the Common Poorwill, and a local Osprey appeared in Shepard Reservoir. Because of the reservoirs and access to a variety of habitats adjacent to the horse unit, it is likely that visitors to the Equine Center will observe many species flying overhead. Moreover, to maintain this biodiversity and provide adequate wetlands for many of the migratory waterfowl seen here, it is essential to maintain the reservoirs and attempt to protect the water quality.

Organic Farm/Swine Unit

The on-campus organic farm hasn't been actively managed for some time now, so we thought it might be valuable to see whether either the organic practices or the semi-neglect might have attracted unique wildlife in the area. We did not anticipate that the organic farm and surrounding area would actually support less biodiversity than any other unit. The only species not confirmed in any other unit was the Great-tailed Grackle, seen both feeding at the swine unit and flying over the farm. It is possible that due to the lack of active management, the crops within the farm simply weren't growing at a rate or quantity to support species that aren't seen in many other places. In future observations, it might be valuable to compare the active, traditionally managed Crops Unit to the Organic Farm in terms of biodiversity to assess the value of active management with respect to overall ecosystem health.

Conclusions (part 2 of 2)

Sheep Unit

At the relatively uniform sheep unit we discovered many familiar species at every observation time, yet it supports almost as many different species as the reservoirs near the horse unit. Pastures and grassy clearings predominate the landscape at the sheep unit, though Stenner Creek does run through the unit, and avocado orchards border it toward the northeast. The creekbed, though dry for the majority of the year, still clearly provides valuable habitat for many of the species seen on campus. The creek provided ideal cover for our camera station to be installed and successfully document many nocturnal mammals we would otherwise be unable to confirm on campus.

Interestingly, the telephone wires and poles above much of the main pastures east of the creekbed appear to be preferential perches for several species, especially raptors like American Kestrels and Red-tailed Hawks, but also for Western Meadowlarks and Western Bluebirds. Other human infrastructure such as the fences and the barn also provided perches and habitat for birds such as the Black Phoebe and the Barn Owl.

Slack Pasture

The expansive pasture on the corner of Grand and Slack supported a surprising level of biodiversity represented by the species we documented there. The pasture itself appears relatively barren throughout much of the year, and gets constant, low-level wear from the Cal Poly horses as well as occasional hikers. Even so, it is part of a contiguous area that encompasses a variety of habitat types. To the south there is a dense strip of riparian growth, a eucalyptus grove borders the pasture to the north, and small patches of cacti are interspersed with the eucalyptus and near the fence line. The accessibility of a variety of food sources in combination with plentiful borders between habitats probably explains the wide diversity of species we encountered, since many species, such as deer, live in or near the boundaries between habitats. The elusive Nutmeg Mannikin was first spotted in this area, and later seen near Poly Canyon Village and other trails through the main part of campus.

Photo credits

Dr. David Keeling ([flickr.com/photos/dave_morro_bay_keeling/](https://www.flickr.com/photos/dave_morro_bay_keeling/)) kindly provided the vast majority of the photos used in this guide, including the cover photo of two Black-tailed Deer fawns. Additional contributing photographers' names are followed by the species that appears in their photo(s).

Bill Bouton: Nutmeg Mannikin, permission granted via personal communication 18 April 2014.

Matt Knoth: Yellow-rumped Warbler (left inset), taken 10 October 2010. Retrieved from <https://www.flickr.com/photos/mattknoth/warbler>

Rebecca Ozeran: Mourning Dove (right photo), Black Phoebe (inset), female Anna's Hummingbird (inset), Bewick's Wren (bottom photo), Black-tailed Jackrabbit (inset), and Western Gray Squirrel.

D. Gordon E. Robertson. Common Yellowthroat, taken 30 Jul. 2010. Retrieved from http://en.wikipedia.org/wiki/File:Common_Yellowthroat,_female.jpg

Liam Wolff: Virginia Opossum, taken 8 November 2011. Retrieved from http://commons.wikimedia.org/wiki/File:Young_Virginia_Opossum.jpg

Acknowledgments

Thanks to the help of several Cal Poly professors from the departments of Biology, Animal Science, and Crop Science we have been able to better understand the animals that live in this area. These professors' input has greatly informed the methods and structure of this project.

Dr. Mark Edwards originally expressed his interest in identifying what wildlife can be found around the Cal Poly campus, especially at the animal units. After spending countless hours up at the horse unit working on nutrition trials, he has become acquainted with many of the local species that inhabit the area. He suggested to us that people should be aware of the animals living amongst us and it developed into an idea that has fueled the creation of this project. Ever since we took advantage of this opportunity, he has advised us with invaluable support and suggestions to make the project a reality. We have enjoyed sharing our passion to engage students and faculty alike in becoming more knowledgeable of the ongoing processes and ecosystems around them.

We would like to give special thanks to **Dr. John Perrine** since it was his Field Vertebrate Zoology class that gave us the tools to accomplish this project. Dr. Perrine has been a wealth of knowledge for field vertebrate detection techniques. He provided us with the supplies necessary to set up a camera station on our own so that we could confirm the presence of species that we might not see otherwise.

Midway through the project write-up, we came across **Dr. David Keeling's** astounding wildlife photos. Ever since, we kept in contact with him and enjoyed hearing about his photo-taking adventures. He truly loves wildlife and we are fortunate that he took the time to help us by contributing some of his art. Thanks to his connections, we were able to use pictures from **Bill Bouton** who has some fantastic shots of the Nutmeg Mannikin.

When exploring our options of where to observe around the Cal Poly campus, we consulted **Dr. David Headrick**, a professor in the Crop Science department. He gave insight into the history of the organic farm, as we were interested in making observations there. He offered a holistic view that truly appreciates the wildlife that travels through and lives on the Cal Poly campus.

It was also helpful to have **Dr. Emily Taylor** as a resource. She shared her knowledge of the most likely reptile and amphibian species to expect on campus. We hope that this project can serve as a launching pad for a more complete guide that can ultimately include Cal Poly's reptiles and amphibians alongside the birds and mammals.