Observations of Fish Migration with a Focus on Hitch, *Lavinia exilicauda chi*: Fish, Wildlife, and Habitat in Northshore Tributaries, Clear Lake Basin, Spring 2019

S Franson

Simple observations that are specific to a time and place are offered. Expanded information was included this year but had been habitually gathered on monitoring field sheets since 2013. SF

Summary

This year monitoring occurred from 14.March.2018 to 13.June.2018, during fish migration and spawning in northshore tributaries of Clear Lake, for sightings of Clear Lake Hitch, *Lavinia exilicauda chi*.

Locations were monitored once weekly, mid-morning Thursdays, for adults migrating upstream and juveniles returning downstream. Monitoring ended when numbers of juveniles diminished to very few or none, with one exception: about 75 1.5 cm juvenile Sacramento suckers, *Catostomus occidentalis*, were observed at the Clover Bypass site on 13.June.2019. This made sense, given a prior late rain event causing stream levels to rise over several days, possibly encouraging adults to migrate and spawn.

All fish observed this year were adult and juvenile Sacramento suckers, *Catostomus occidentalis,* adult and juvenile carp*, Cyprinus cardio ssp.*, juvenile bass, *Micropterus sp*., and 1 juvenile prickly sculpin, *Cottus asper*. Throughout monitoring no juvenile hitch and numerous juvenile suckers were observed heading downstream.

Water levels in all creeks fell after rains ended. Some fell precipitously when irrigation practices began. An agricultural easement, in place for several years now, helped maintain levels at Tulelake, where they initially fell but subsequently remained at Clear Lake levels falling only when it appeared water was released from Clear Lake.

With receding water levels, creek banks extended into channels and created riffles and occasional braiding in substrate with much gravel. This year there appeared to be adequate fish passage, although barriers can result, for example, at the confluence of Clover Bypass and Middle Creek. Access to that particular area is posted, although apparently in that area there were adult fish in a pool (pers. communication).

This spring, more rain and later rain events, thunderstorms, at times winds with gusts to 25 mph, and an early June heat wave occurred. Wind, wind gusts, rain or light rain, and cloud cover impacted wildlife. Rain and light rain occurred on two monitoring days: 3.18.19 and 5.16.19. Wildlife activity increased as ambient air temperatures rose and trees leafed out.

Methods

The same methods for collecting field data have been used since 2013, at the same locations, using the same field sheets.

The first day of monitoring allowed for recording GPS coordinates, a description of immediate and peripheral vegetation, substrate, creek and bank degradation, aquatic, horizontal, and vertical habitat, and significant features in the environment. Creek bank degradation was estimated as a function of *current* creek banks. Only in upper reaches of tributaries would creek banks be described as natural. Northshore creeks are leveed.

Numbers and TL of fish at all locations were estimated as accurately as possible, because fish were not removed from streams to be examined and measured. At each instance of monitoring, at each location, field notes included but were not limited to fish counts, estimates for water depth and flow, water clarity that varied in storm events, cloud cover, wind speed and direction, ambient air and water temperatures, wildlife heard, seen, in flight, on and in water, evidence suggesting its presence including scat, tracks, paths, bowers, hollows, disturbed brush or grasses, and alterations in the environment that might indicate its presence. If wildlife were able to be identified accurately by sight or vocalization, those species were noted. Unidentified individuals that clearly belonged to large groups such as passerines were counted in that manner.

Wind and wind direction was estimated along with gusts. Wind direction at the five locations can vary due to weather, biogeography, and geomorphology. A mean for estimated wind speed was used for graphs. Wind directions were summarized for each location. Access to the creek is posted at the Rancheria Bridge site, and water temperatures could not be monitored.

At all locations water clarity was diminished, silt load increased, and surface debris widespread during and after rain events, after which water clarity eventually improved, except for the Tulelake site where water was always brown to greenish-brown and opaque with varying degrees of translucence. As temperatures warmed and water levels dropped, several species of algae grew on substrate. Algal mats had not yet formed when monitoring drew to a close.

At each location depth was estimated using permanent reference points on creek banks and in channels. Water levels in these streams can vary quickly and considerably.

Flow was estimated by timing the movement of light surface debris, inexact by nature but consistent over years.

Monitoring normally required 2 to 2.5 hours to complete. Counts were based on observation rather than timed intervals. Digital images were taken at each location, at each monitoring event, with care for angle and approach, for recording small changes in environment digitally as well as on field sheets.

Monitoring ceased after water levels substantially subsided, gravel bars increased, and juvenile fish were few or absent. Egg masses were not seen this year.

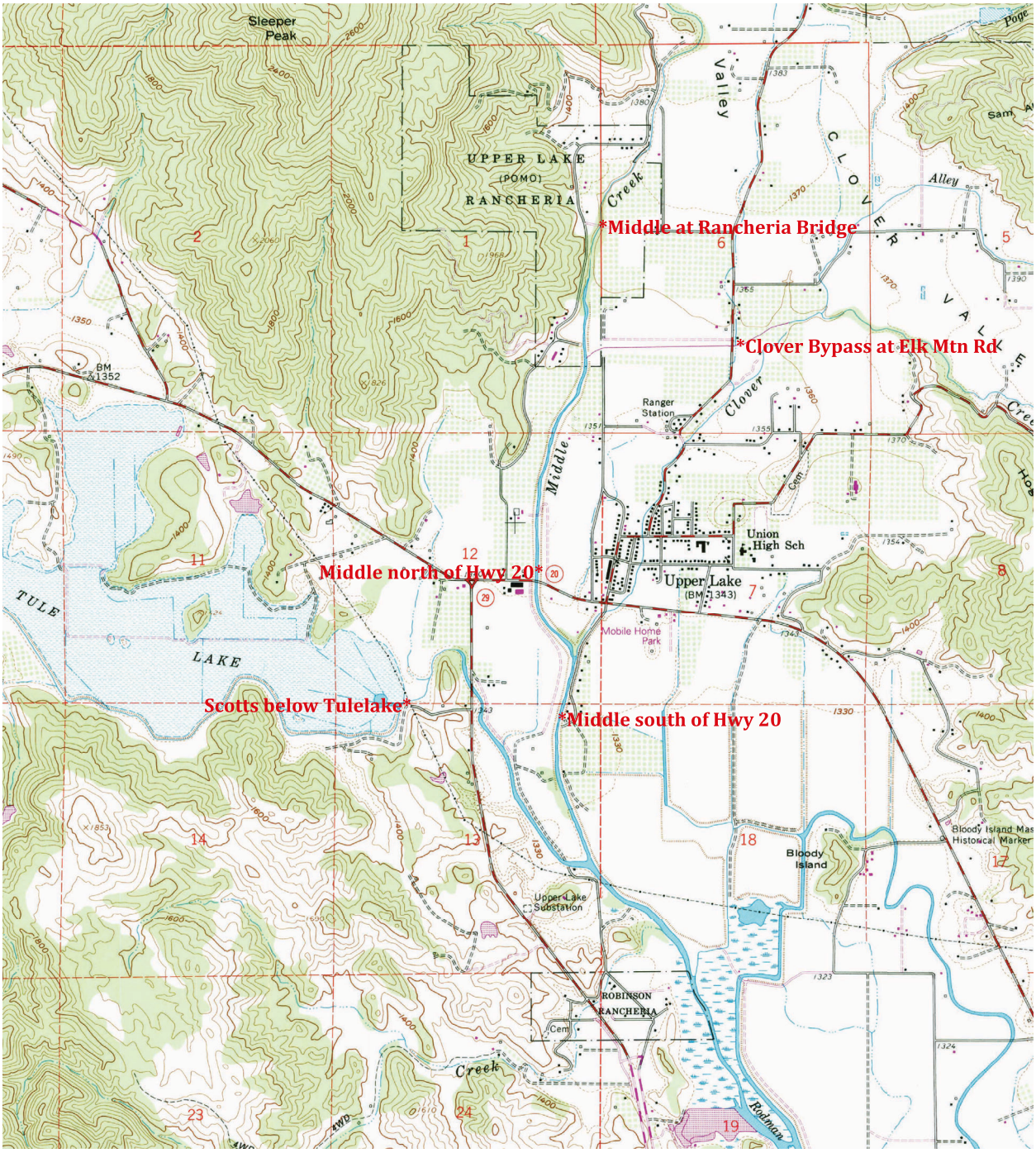
Equipment

Equipment consisted of an Olympus digital camera, a DeLorme Earthmate PN-60, and a Cooper handheld digital thermometer. Among resources consulted were Google Earth 7.3.2.5776, a Jepson manual (University of California Press, ©1993), the Guide to the Coastal Marine Fishes of California (Daniel J. Miller and Robert N. Lea, California Fish Bulletin Number 157, Department of Fish and Game, State of California, 1972), the Handbook to the Orders and Families of Living Mammals (Timothy E. Lawlor, 2nd ed., Mad River Press, Rt. 1, Box 151-B, Eureka, CA 95501, 1979), A Field Guide to the Mammals, North America north of Mexico (William H. Burt, and Richard P. Grossenheider, Peterson Field Guides, 3rd Ed., Houghton Mifflin Co., Boston, New York, ©1980), and the Field Guide to the Birds of North America (2nd Ed., National Geographic Society).

Rancheria Bridge below bridge apron, 4.18.19

Bottom left and right: Rancheria Bridge, above bridge apron, 4.25.19

Monitoring Locations



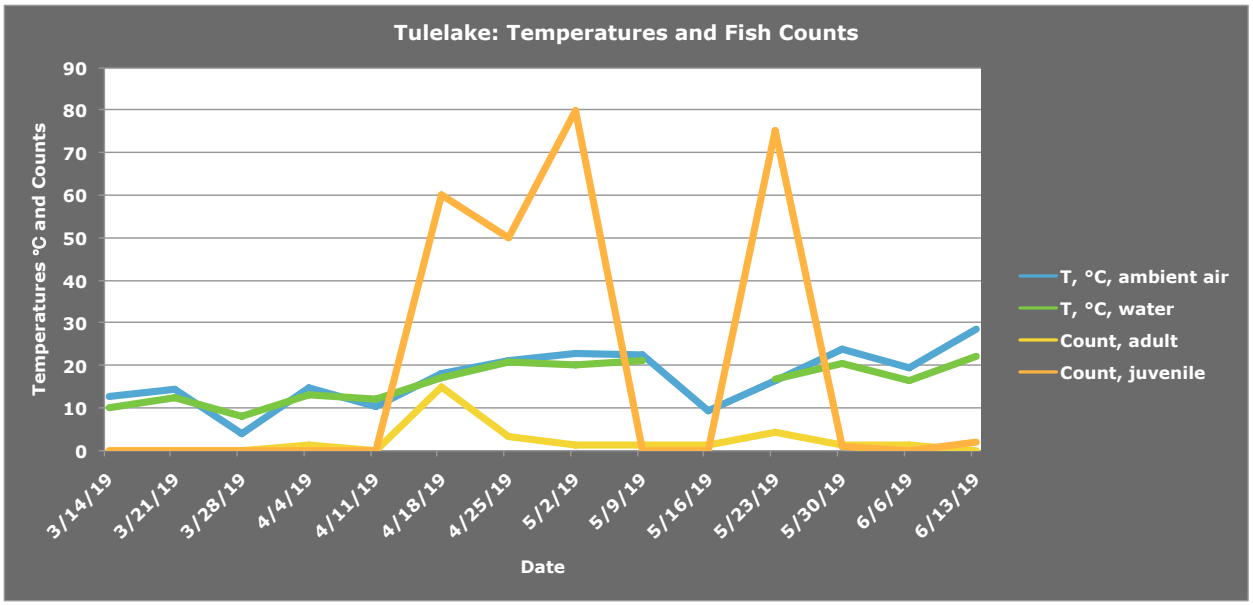
Map derived from a portion of quadrangle map, Upper Lake, CA 39122-B8-TF-024, courtesy of United States Geological survey, in cooperation with California Department of Water Resources; Control by USGS, NOS.NOAA, and USCE, compiled from imagery taken 1957

Scotts Creek below Tulelake Dam

N 39° 9.3982', W 122° 55.5369' elev. 1330

Any adult fish migrating upstream and juveniles returning downstream travel from or to Clear Lake and Rodman Slough via Scotts Creek.

Visibility at this location is generally poor. Water closer to the banks is more translucent. Adult fish were observed or known to be feeding through sight, sound, ripples, or presence of foraging predators. Juveniles were seen near water's edge. Adult fish when seen were carp, and juveniles were Sacramento suckers, carp, and bass.

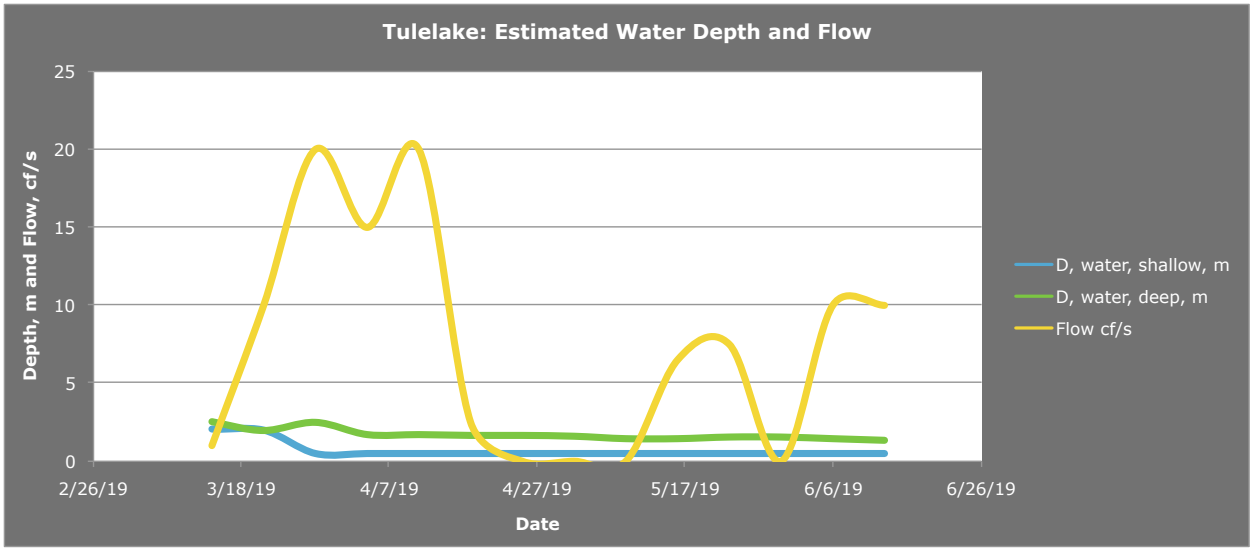


The dam was under water when water levels were high and partially exposed as they fell. It is a partial barrier and attracts predators including larger fish when fish are above or below it. It is no longer used for pumping water out of the lake and into the pool to its southeast, as it is under agricultural easement and has water the year round, and manmade islands. After runoff from rain events has settled, water levels are basically the same as Clear Lake. Wildlife frequents this area.

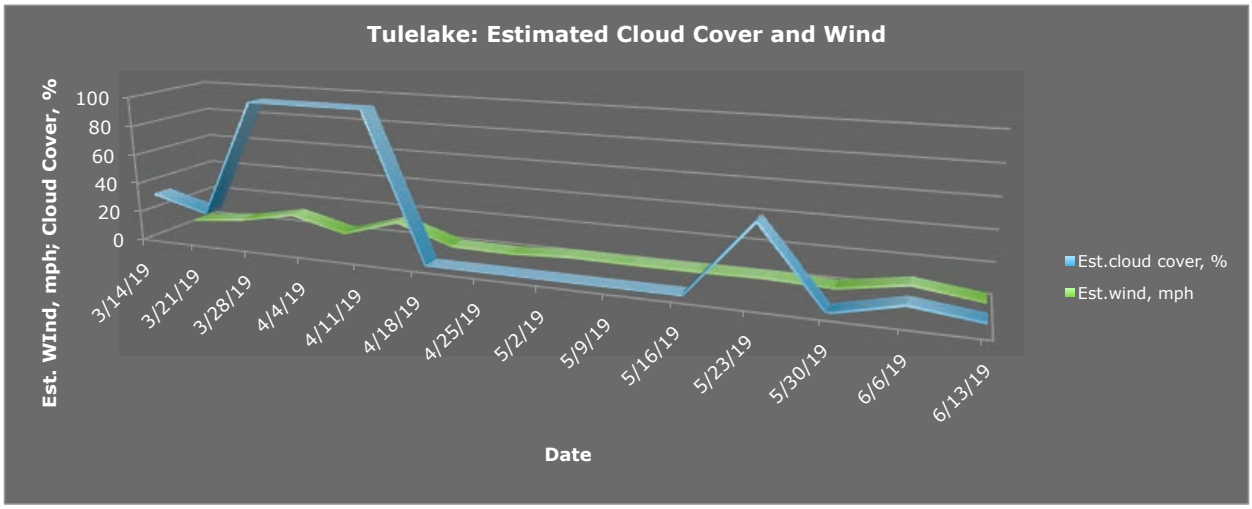
There is both horizontal and vertical riparian habitat, the pool is surrounded by tules, shrubs, and trees, and habitat on adjacent hills is primarily grasses and oak woodland.

Water levels and flow were estimated for the pool below the dam, where a contained Scotts Creek enters via a culvert. Scotts Creek continues toward Rodman Slough at the outlet of this pool.

Substrate was estimated at 10% cobble, 10% gravel, 15% sand, and 65% silt.



Wind direction was NNE, NE, ENE, SSE, NW, and W. Gusts were primarily W.



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Overall, numbers of individuals and species of avian wildlife that can include fish as a prey item increased and then decreased. Numbers of juvenile fish observed began at zero, then swelled, and then decreased. As water and environment grew warmer, insects in flight, on the ground, and aquatic macroinvertebrates became plentiful and varied, including spiders on ground and water, bees, butterflies, dragonflies, and damselflies in flight.

Wildlife was always present although far less visible and audible during storm events. Wildlife included turtles in water, numerous and various passerines seen and heard, titmouse, American crows often seen and heard, acorn and Nuttall's woodpeckers often heard and occasionally seen; scrub jays and Stellar's jays heard; red-shouldered hawks often heard and occasionally seen; ospreys seen and heard; cliff swallows often seen and heard; Brewers blackbirds and red-winged blackbirds occasionally seen and often heard; loggerhead shrike heard; mourning

doves often heard and occasionally seen; California quail heard; meadowlark seen in flight; frogs heard; grasshoppers and other unseen insects audible as ambient air temperatures increased; ground squirrels seen, and ground squirrel, feral pig, and raccoon tracks often seen; odor of skunk occasionally noticed.

Often wind, highway traffic, planes, and an ag sprayer were audible. Few humans save those passing in cars on Tulelake Road were seen. Not all animals that were seen in previous years were observed this year, and some observed this year were not seen in the previous year.

The table below relates to fish and wildlife more directly associated with fish.

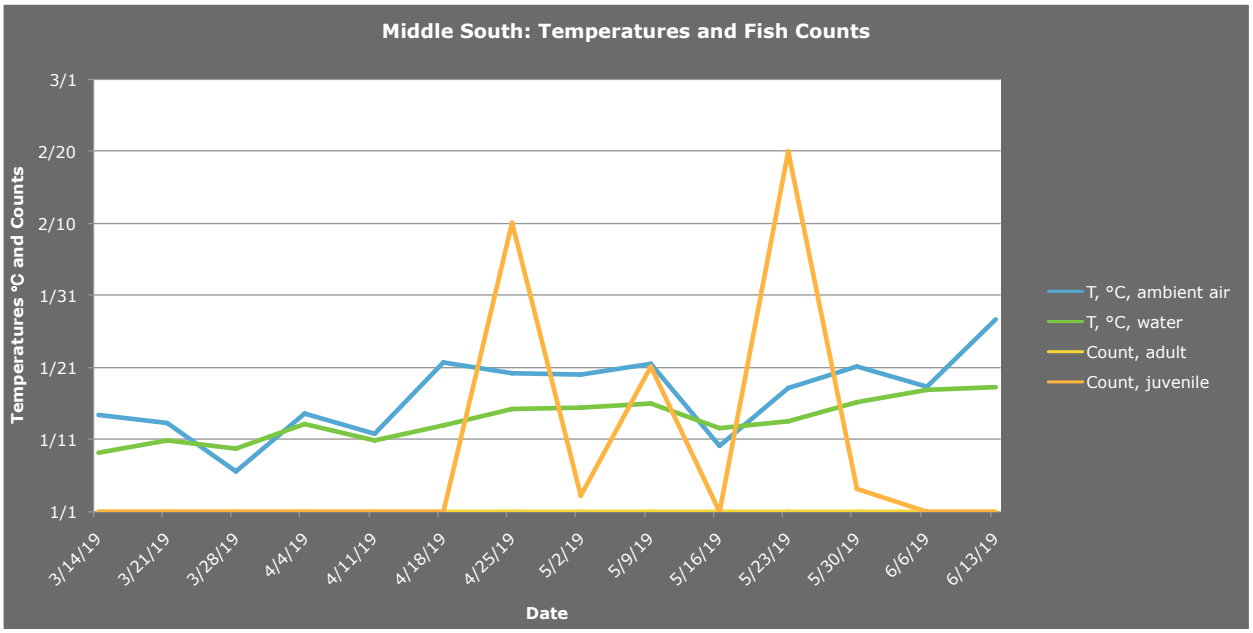
Brief Summary, Fish Count and Related Observations: observation site, pool, Tulelake, dam

3/14/19	3/21/19	3/28/19	4/4/19	4/11/19	4/18/19	4/25/19
no fish seen; 2 American white pelicans observed on water's surface	no fish seen; 2 pelagic cormorants observed on water's surface	no fish seen; weather stormy, with thunder: no wildlife observed	1 adult carp observed feeding below pool, in Scotts Creek; 3 American white pelicans on water's surface; 3 gulls, 1 pelagic cormorant in flight; 1 duck, sp. heard	no fish seen; an osprey was heard, 1 pelagic cormorant, 1 osprey, and 2 crows in flight	~60 1-1.5 cm. juvenile fish: bass, carp, suckers; carp feeding above dam; in flight: black crowned night heron, 2 A.w. pelicans and 8 on water, plus 1 pelagic cormorant and 6 Western grebes	~50 juvenile fish, sucker and bass; 1 dead carp, few carp feeding above dam; 1 A.w.pelican and turtle observed on water; 1 A.w.pelican in flight; 1 great blue heron observed; insects appearing in flight and water
5/2/19	**5/9/19**	**5/16/19**	**5/23/19**	**5/30/19**	**6/6/19**	**6/13/19**
~80 juvenile fish: suckers, bass; 1 dead carp; 4 fish jumped; green heron, grebe, passerines, other species heard; p. cormorant, A.w.pelican, Canada goose, great blue heron in flight; many insects, aquatic and terrestrial	1 large fish heard jumping; no juveniles seen; on water, 2 pie-billed grebes, 1 American coot seen; in flight, 1 great white egret, 1 great blue heron observed; bees and dragonfly seen in flight	1 fish jumped; no juveniles seen; on banks, 1 green heron, 1 great blue heron, 1 great white egret seen; 1 Canada goose on water; 2 black crowned night herons in flight	4 large fish jumped; ~75 juveniles seen: bass, Sacramento suckers 2-4 cm; 3 Western grebes on water; 1 great blue heron, 1 pie-billed grebe in flight; numerous insect in flight	1 fish jumped; 1 juvenile bass 3 cm; 2 crayfish 6 cm. seen; 1 black crowned night heron heard; 1 pelagic cormorant, numerous insects in flight; on water, 1 A.w.pelican, 1 great blue heron, 3 Western grebes; great blue heron seen	1 fish jumped: ripples seen; green heron heard; pie-billed grebe in flight; 2 Western grebes on water; 1 great blue heron seen	Ripples: fish or diving grebe; 2 juvenile bass 3 cm. near edge of bank; 3 Western grebes on water

Middle Creek South

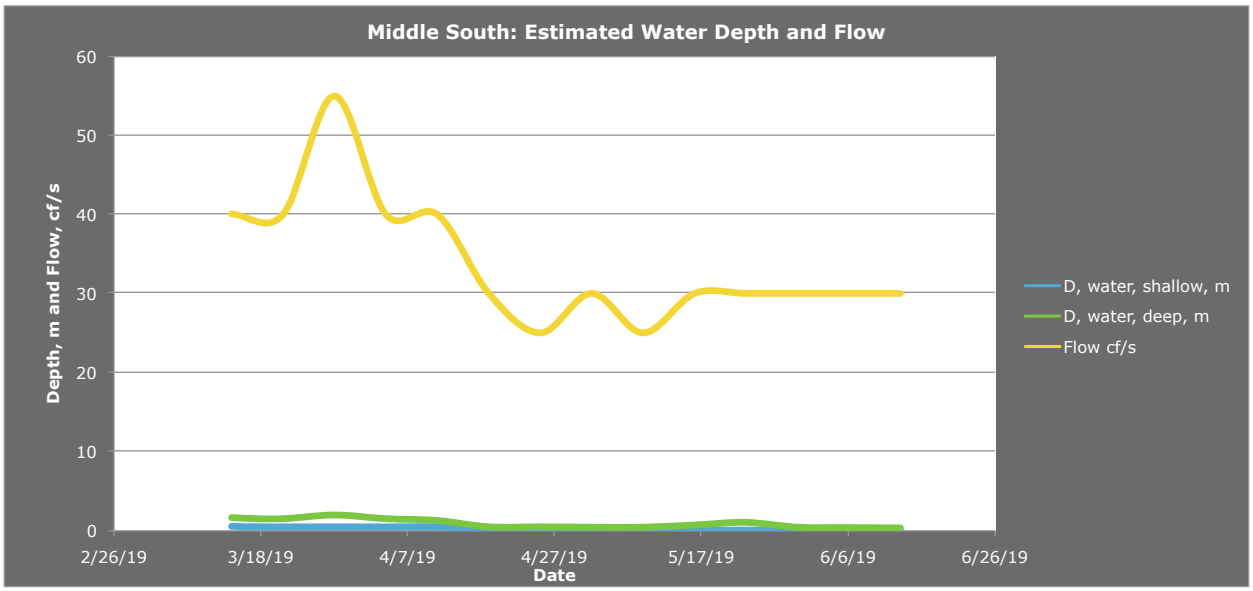
N 39° 7.1174', W 122° 53.2457' elev. 1332

Any migrating adults and returning juveniles in Middle Creek pass this location. Only juvenile Sacramento suckers and one juvenile prickly sculpin were observed here. Sightings of juvenile fish began about 1.3 months into monitoring, were seen weekly with the exception of 16.May.2019, until the last two weeks of monitoring.

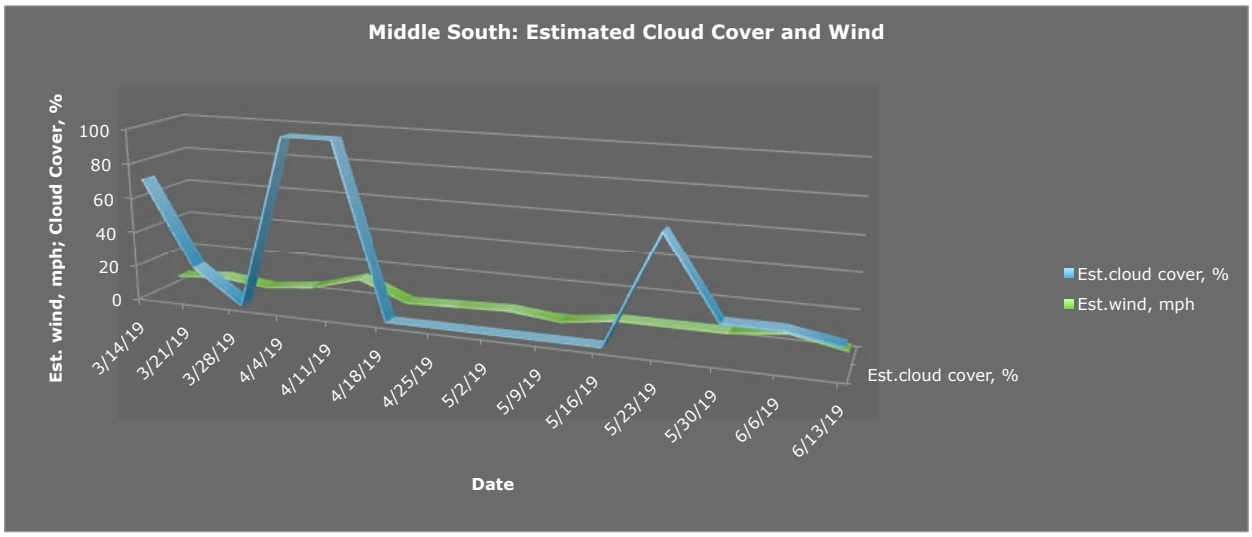


Banks on the east side are lined with riparian vegetation, offering horizontal and vertical habitat near the creek. The levee to the east is further removed from the main channel, it is paved, and it protects homes, orchards, and vineyards beyond. Non-native grasses, herbs, and Himalayan blackberries are profuse here. On the west side, vegetation exists in a narrow band before the levee rise occurs, on the other side of which is a pear orchard.

Water was generally clear except during and after storm events, when water levels rose and fell quickly. During the winter both the main channel and upper levee tier were inundated during storm events. Braiding and riffles created instream channels but did not appear to impede flow. Substrate was estimated at 15% cobble, 45% gravel, and 40% sand.



Wind direction was S, SE, SSE, ESE, W, W, SW, NW, NNW, and N, but mostly southerly.



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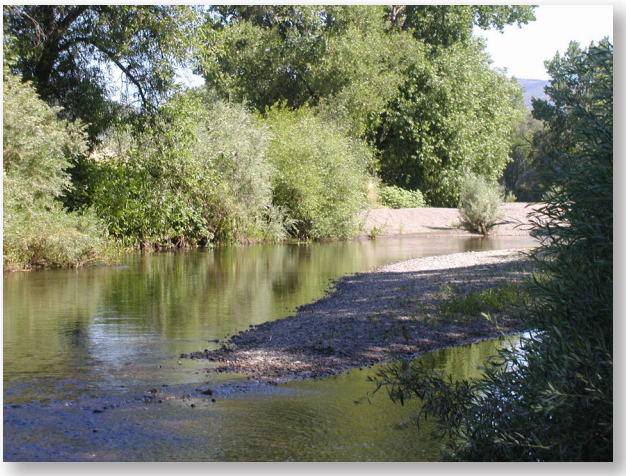


Rain events were more frequent this spring than in years past, with a few dry, hot spells. Wildlife was less visible and audible during storm systems but was always at hand at this location.

Wildlife not included in the table below were American crows occasionally seen, heard and in flight; numerous and various passerines heard and in flight; Brewers blackbirds heard and seen at water's edge; mourning doves heard and in flight; golden crowned sparrows seen on the ground; American kestrel heard; Canada geese heard and seen in flight; turkey vultures observed in flight; scrub jays heard and seen; Stellar's jay heard and seen; bushtit heard; Acorn, Nuttall's, downy, and hairy woodpeckers heard and Acorn woodpecker seen in flight; northern mockingbird heard; loggerhead shrike occasionally seen and heard; American robins often seen and heard; California towhees seen; white crowned sparrow heard; Cliff swallows in flight; California quail heard;

mourning dove heard; red-shouldered hawk heard and in flight; Swainson's hawk in flight; frog heard.

Tracks seen this year were raccoon, skunk, domestic dog, coyote, feral pig, deer, domestic feline, and human, but no bear or mountain lion tracks although they have been seen here before. A domestic feline was observed as it watched various birds, causing alarm calls. Wind, highway traffic, ag sprayer, plane, human voices, and baying dogs were heard, and human and dog were seen.

Sightings of insects increased as days grew warmer and storms abated. These were terrestrial and aquatic macroinvertebrates, and included ants, bees, spiders, ladybeetles, butterflies, and mosquitoe.

The table below includes fish and wildlife more directly associated with fish.

Brief Summary, Fish Count and Related Observations: Middle S site, surrounding, N and S

3/14/19	3/21/19	3/28/19	4/4/19	4/11/19	4/18/19	4/25/19
no fish seen; skunk and raccoon tracks were seen	no fish seen; Canada geese heard and 2 seen in fight; 1 turkey vulture in flight; tracks: raccoon	no fish seen; 1 American crow seen and heard; 1 great white egret in flight	no fish seen; 1 A. crow seen; 2 mallards, 2 A. crows, a male common merganser observed in flight	no fish seen; 1 green heron heard; 2 A.crows in flight; skunk and raccoon tracks observed	no fish seen; ducks, sp., heard; A.crow observed in tree and in flight; raccoon tracks observed	~40 juvenile Sacramento suckers ~1.5 cm.; 1 prickly sculpin 1.0 cm.; great blue heron, 2 mallards in flight; raccoon tracks
5/2/19	**5/9/19**	**5/16/19**	**5/23/19**	**5/30/19**	**6/6/19**	**6/13/19**
2 juvenile Sacramento suckers, 1.5 cm.; mallard, frog heard; great blue heron, 1 mallard in flight; 1 female common merganser on water; raccoon tracks	~20 juvenile Sacramento suckers 1.5-3.5 cm.; 1 larger fish heard;2 male common mergansers on water; 1 great blue heron in flight, 3 at water's edge	no fish seen; no wildlife seen in or on water	~50 juvenile Sacramento suckers 2.5 cm; 1 at 5 cm; ~150 tadpoles 1.5-4 cm	2 juvenile Sacramento suckers 2.5 cm, 1 at 5 cm; great blue heron in flight; 3 mallards on water	no fish seen; great blue heron seen	no fish seen;

Middle Creek at Rancheria Bridge

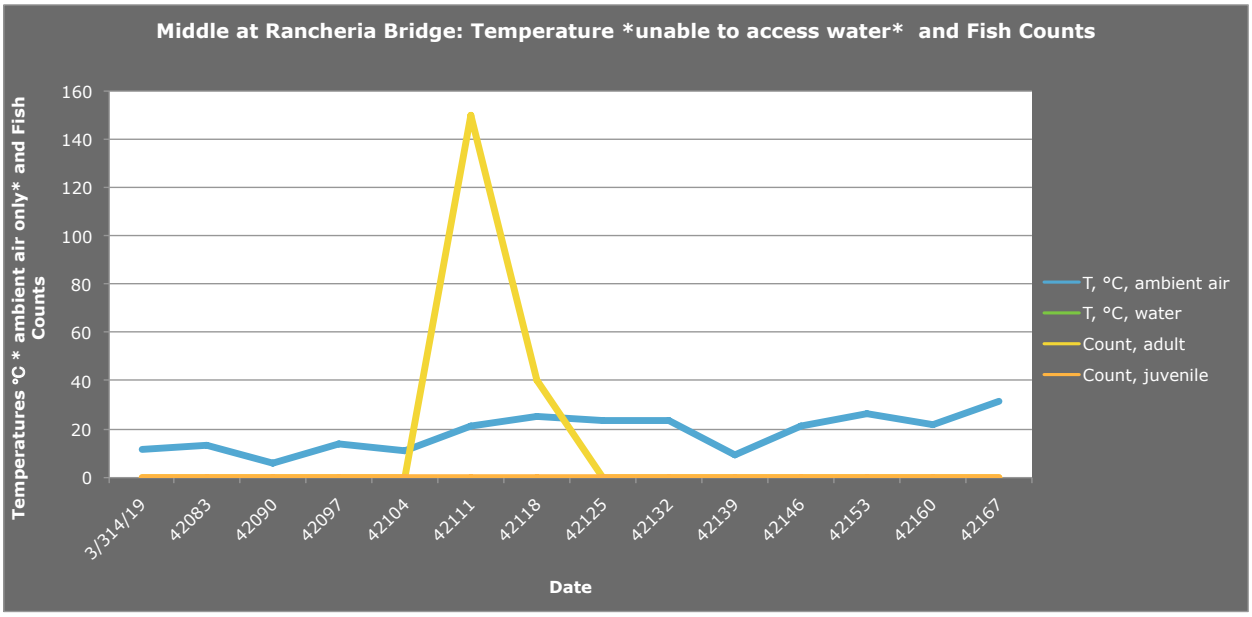
N 39° 10.9539', W 122° 54.7062' elev. 1376

This location is on a bridge over Middle Creek, on Rancheria Road. The channel is against hills on its west, with primarily oak woodland, madrone, manzanita, some white pine, and shrubs, grasses, and herbaceous growth. It is contained by a levee to the east, beyond which are orchards and vineyards. Miles upstream, it forks into Middle Creek West and Middle Creek East, both of which continue for many more miles.

Historically hitch migrated and spawned over several miles north of Rancheria Bridge (anecdotal information, pers.communication). In the latter part of the second half, four weirs were constructed to deter graveling, braiding, and silt deposition, from immediately below the Rancheria Bridge downstream to the confluence of Middle Creek and Clover Bypass (public information). The lowest weir at the confluence silted over time and does not appear to be a barrier for hitch, as four or five were seen in Clover Bypass in 2009. The weir immediately below the bridge still has a reach for fish to jump but it also offers rough fish passage near one bank.

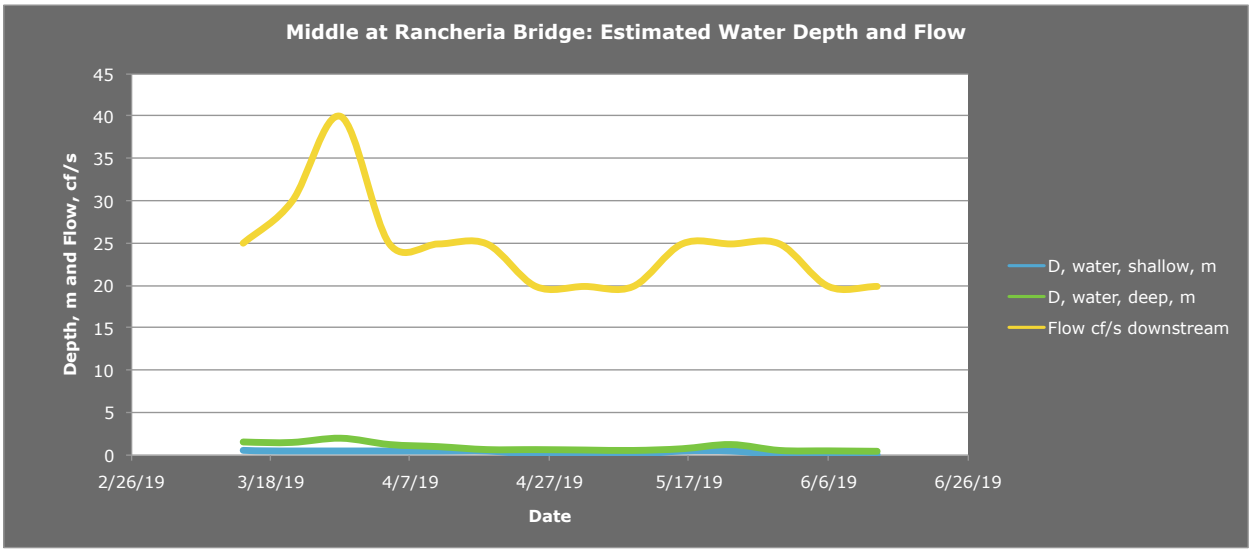
In 2004 a feed ball of threadfin shad was in a pool below the uppermost weir, and rainbow trout live in the upper reaches of Middle Creek. Adult Sacramento suckers were seen migrating upstream of the bridge (pers.observation). Boulders and two weirs in between appear to be barriers for hitch; hitch have not been seen above the lowest weir from 2004 (pers.observation. From 2008 to 2010, this area of Middle Creek was not personally checked for hitch.

This year, only adult Sacramento suckers exhibiting spawning behavior and breeding colors were seen. Access to the creek is posted, only ambient air temperatures were recorded, and juvenile fish could not be seen.

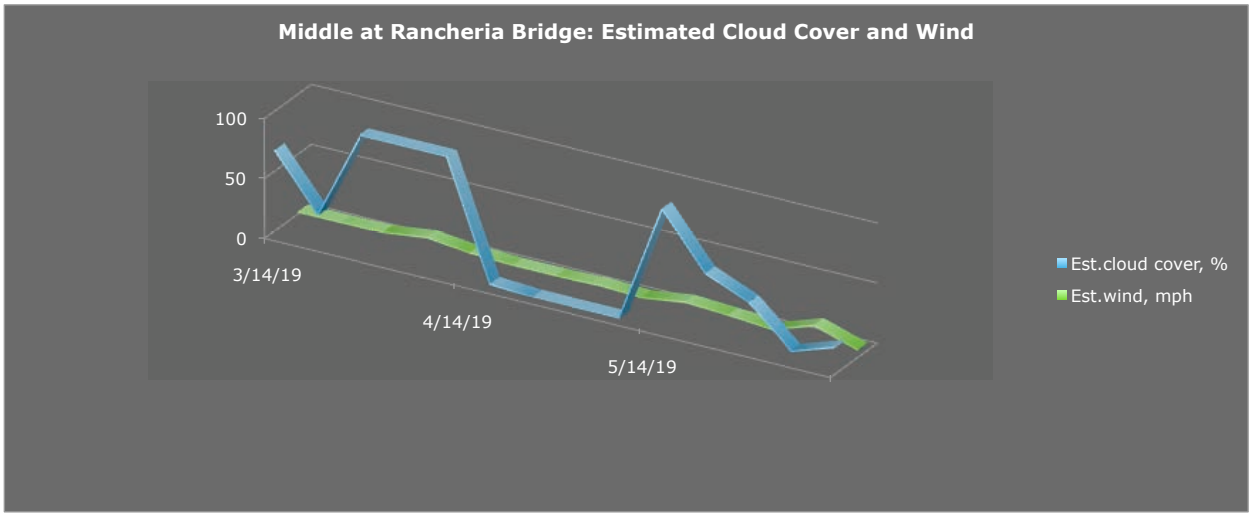


Riparian vegetation, with horizontal and vertical habitat, lines both sides of the channel that is quiet and shallow upstream from the bridge apron but with good flow below it. Woody debris creates small, protected areas instream near banks. Water was clear, only slightly muddied even after heavy rains.

Water depth and flow varied with rain events. As the channel is enclosed by hills and a levee, depth did not vary as much as at locations downstream, and flow was stable. Flow rate was observed and approximated at a point below the bridge apron. Water was forceful there. Substrate was estimated at 40% cobble, 40% gravel, and 20% sand.



Wind direction was S, SE, SSE , ESE, E, SW, WSW, and NW, but predominantly southerly.



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Rushing water can always be heard at this site, traffic also and occasionally wind. Farmers and equipment sometimes worked in orchards bordering the east levee. Bees and other insects were seen in flight.

Wild mustard in bloom is prevalent. Often, people were using weedeaters and chain saws near the creek, in a meadow with brush and trees burned by the Ranch fire last year.

Wildlife included: passerines seen and heard; cliff swallows seen, heard, in flight, and nesting under bridge; Brewer's blackbirds heard; wren in flight; scrub jay seen; American kestrel heard; Acorn woodpecker heard; northern mockingbird in flight; turkey vultures in flight; crows in flight; a frog swimming in water.

Wildlife is not abundant at this location. Fish, fish counts, and wildlife more directly associated with fish are in the table below.

Brief Summary, Fish Count and Related Observations: Rancheria Bridge site, N, and S

3/14/19	3/21/19	3/28/19	4/4/19	4/11/19	4/18/19	4/25/19
no fish seen	no fish seen	no fish seen	no fish seen	no fish seen	~150 adult Sacramento suckers migrating upstream, many exhibiting striping and a few exhibiting spawning behavior	~450 migrating adult Sacramento suckers north of bridge
5/2/19	**5/9/19**	**5/16/19**	**5/23/19**	**5/30/19**	**6/6/19**	**6/13/19**
no fish seen	no fish seen	no fish seen	no fish seen	no fish seen; anecdotal information: numerous fish at confluence of Middle Creek and Clover Bypass; there was no public access.(Only Sacramento suckers, adults in Middle and juveniles in Clover, were observed this year.)	no fish seen; great blue heron in flight	no fish seen

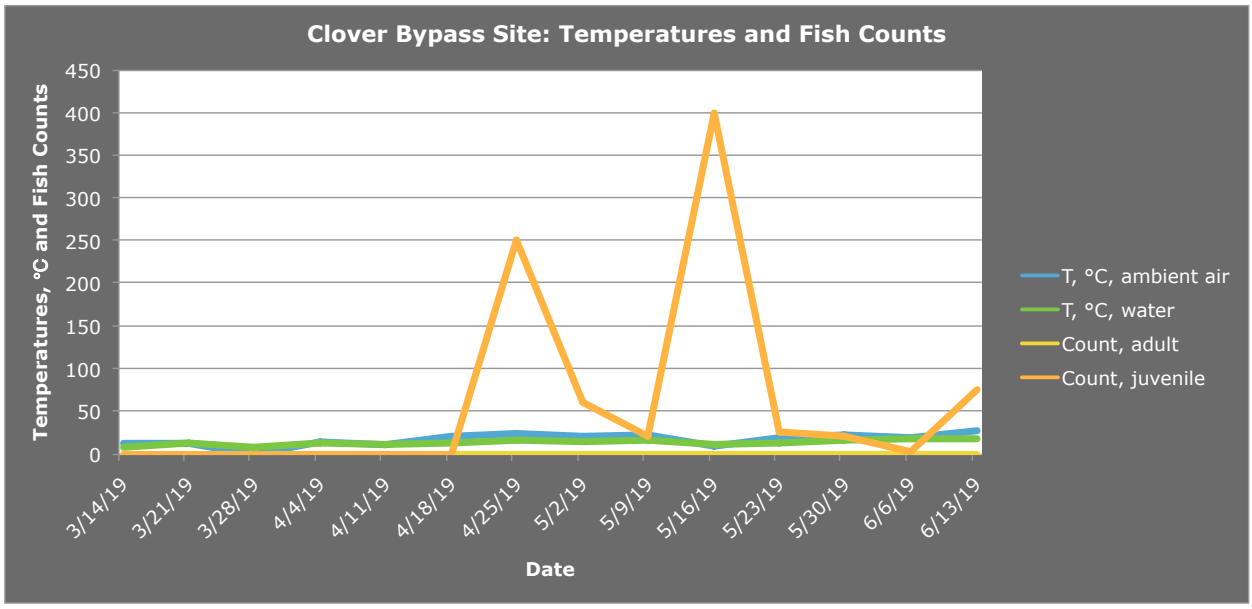
Clover Bypass at Elk Mountain Road

N 39° 10.5671', W 122° 54.1723' elev 1368

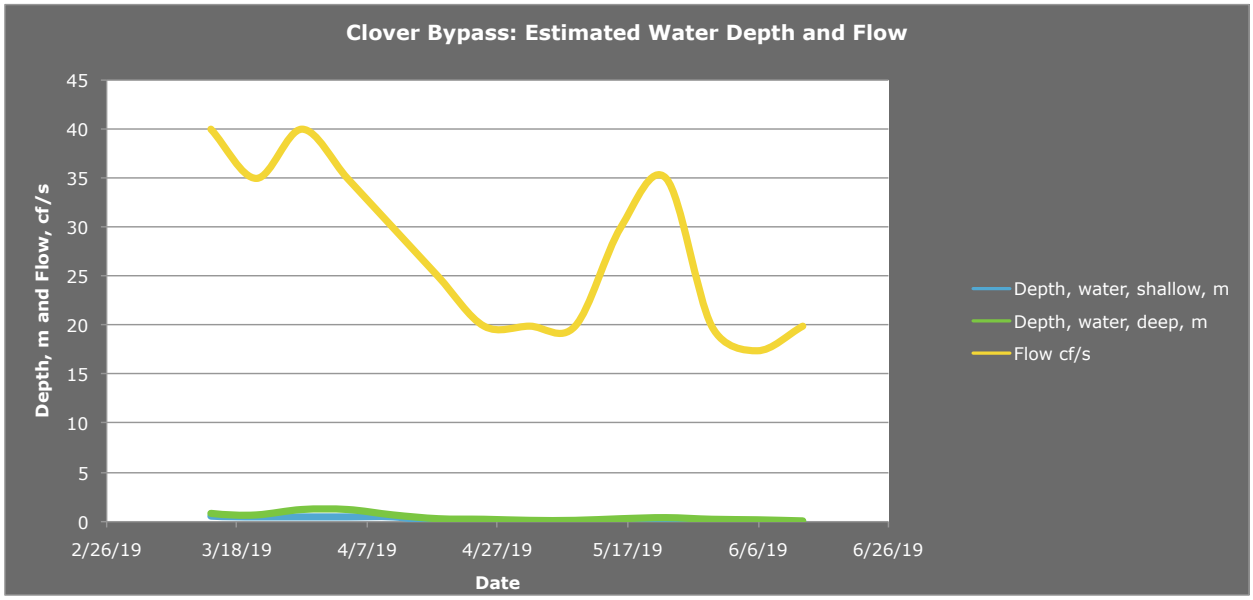
Because of available access, this site is under a bridge that crosses levees lining either side of the bypass, levee tiers, and creek channel. The area levee to levee is broad, to contain heavy runoff from Alley and Clover Creeks and potential flooding away from Upper Lake. In 2005 it overtopped, and parts of Upper Lake were under water (pers.communication, pers.observation). Water levels rise, fall, and in late spring can disappear quickly, leaving the channel dry.

Migrating adults from Middle Creek and juveniles returning to Middle Creek use this channel. This spring, only returning juvenile Sacramento suckers were observed. The confluence of Middle Creek and Clover Bypass is not far downstream, where a barrier to fish passage from braiding and debris have occurred in past years. That area is now posted.

In 2018 a few adult hitch appeared to be migrating in the midst of several hundred Sacramento suckers (ref. observations 2018; pers.observation).



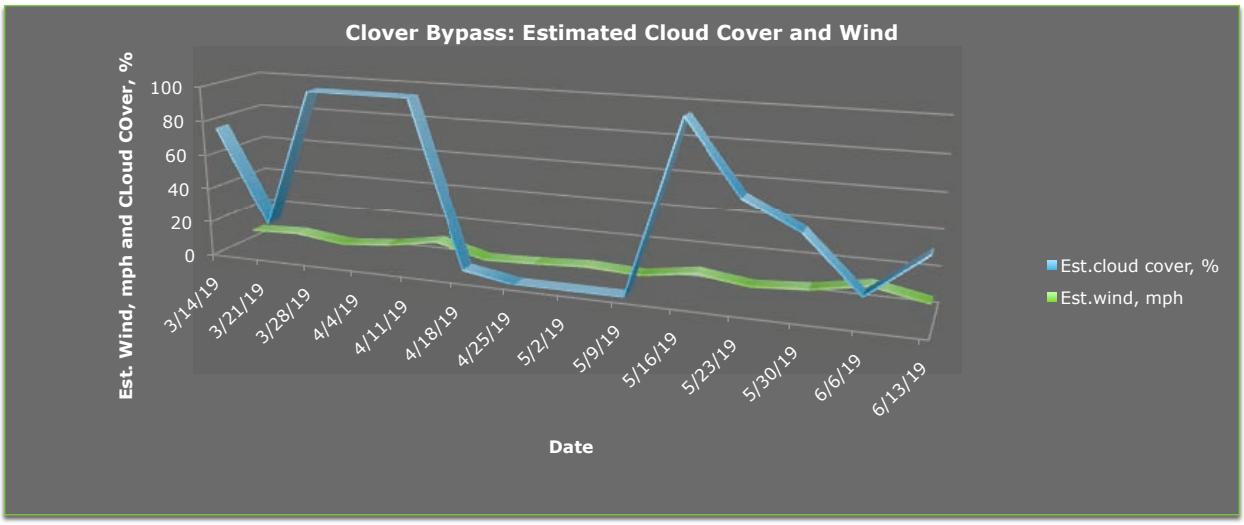
Grasses and herbaceous vegetation grow thickly on levee shelves. Minimal riparian vegetation can be seen downstream and upstream and only a few shrubs grow on the channel's



opposite bank at the site. Little to no resting areas or cover exist for migrating adults and juveniles. Vertical habitat is little to none.

Water was normally clear except immediately after heavy rain events and flow was unimpeded. Substrate was estimated to be 10% cobble, 30% gravel, 40% sand, and 20% silt, and bank degradation at 40%.

Wind direction was S, SE, SSE, ESE, W, SW, and WSW, predominantly S and W.



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Various grasses on levee slopes grew tall and thick as temperatures warmed. They were interspersed with wildflowers and vetch that bloomed during much of the time when monitoring occurred. Bees were always present. Bowers in tall grasses appeared. When monitoring ceased, grasses were drying.

Other wildlife included: numerous passerines heard; northern mockingbird heard; 2 scrub jays seen; Acorn woodpecker heard; mourning dove heard; dark headed junco seen; Brewer's blackbirds heard; red-winged blackbirds seen and heard; American kestrel seen; crows in flight; pheasant in flight; California quail heard; American robin heard; cliff swallows heard, in flight, and nesting under bridge; frog heard.

Aquatic macroinvertebrates were seen, and terrestrial insects observed were spiders, butterflies, mosquitoes, and numerous flying insects. Crickets were heard. Insects were plucked from water, air, and ground by swallows and from water and ground by various birds. Small fish were also prey items.

Tracks observed were raccoon, feral pig, skunk, deer, dog, human, and ORV that created deep grooves. A mammal was seen further upstream but could not be identified. A deer was seen further upstream. Once, a strong odor of skunk moved about in tall grass about 15 feet from the site.

Occasional chain saws and ag equipment could be heard in the distance. Rarely, water from the channel could be heard. Traffic was always audible.

The table below includes fish counts and wildlife more directly associated with fish.

Brief Summary, Fish Count and Related Observations: Elk Mountain Road site, surrounding area

3/14/19	3/21/19	3/28/19	4/4/19	4/11/19	4/18/19	4/25/19
no fish seen; osprey in flight; raccoon tracks seen	no fish seen	no fish seen	no fish seen; osprey in flight	no fish seen	no fish seen	~250 juvenile Sacramento suckers 1-2.5 cm; 1 mallard on water
5/2/19	**5/9/19**	**5/16/19**	**5/23/19**	**5/30/19**	**6/6/19**	**6/13/19**
~60 juvenile Sacramento suckers 1-2 cm seen	~20 juvenile Sacramento suckers 2-3 cm seen;	~400 juvenile Sacramento suckers 1.5-4.0 cm seen	~25 juvenile Sacramento suckers 1.5-3 cm seen; ~25 tadpoles 1-4 cm seen	~20 juvenile Sacramento suckers 2-3 cm seen; several tadpoles 2-4 cm seen	1 juvenile Sacramento sucker 4 cm; ~20 tadpoles 2-4 cm seen	~75 juvenile Sacramento suckers 1.5-2 cm seen; numerous tadpoles 1-5 cm seen; Some weeks earlier late rains, and thunderstorms raised water levels in creeks.

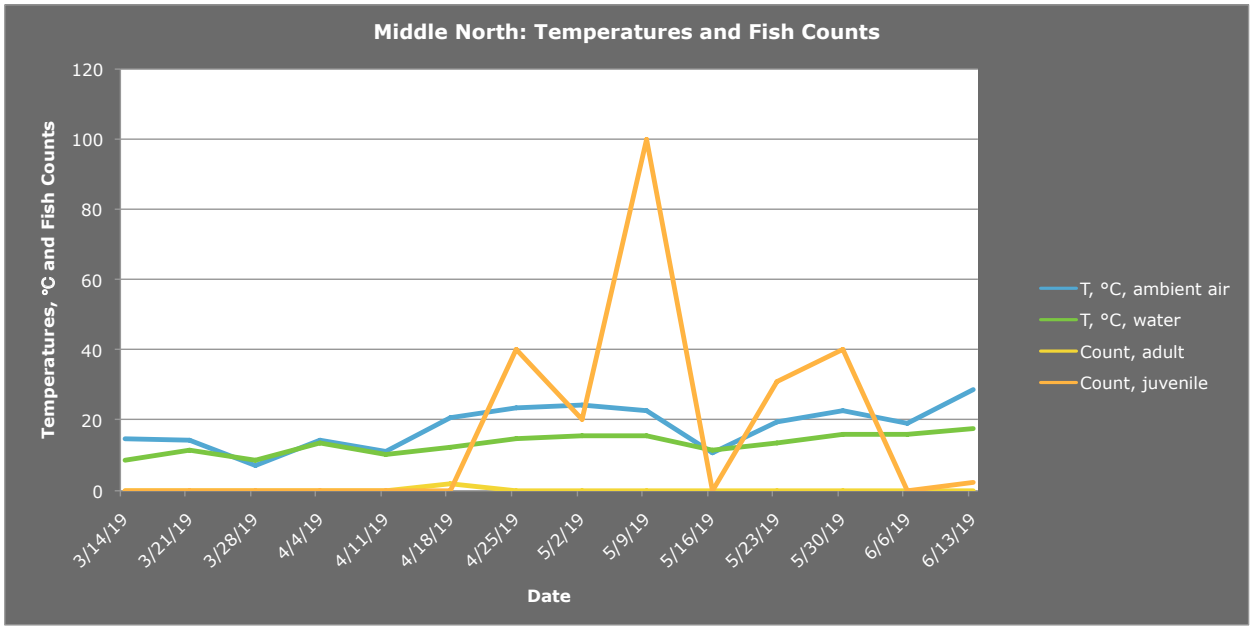
Middle Creek North

N 39° 9.8539', W 122° 54.9634' elev. 1339

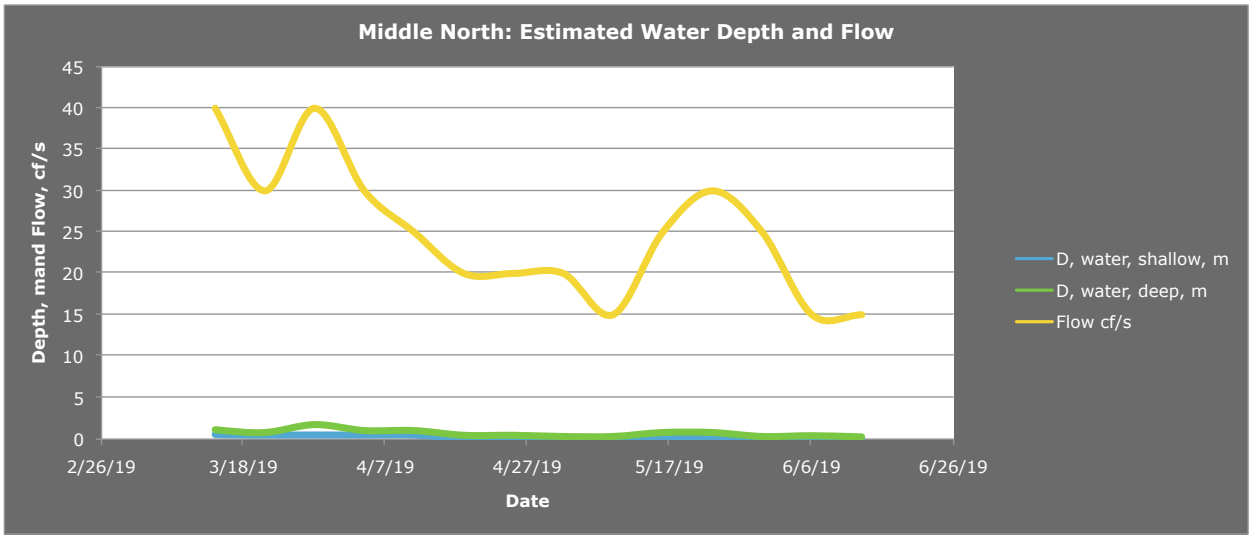
A broad levee bench is east of the Middle Creek channel and of this location. Beyond the levee itself are homes and orchards. To the west, the channel flows next to the levee. A rise, not a bench, exists there. Beyond the levee there are homes and orchards as well.

A bridge over Middle Creek on State Highway 20 is several hundred feet to the south. Traffic is always heard at this location, although it is at times muted by trees. Northshore tributaries are rarely distanced from traffic unless they are followed far upstream, toward hills and mountains that encompass their watersheds.

Adult fish migrating upstream in Middle Creek and juveniles returning downstream pass this location. This year, possibly 2 adults were observed; conditions for determination even of the presence of adult fish were poor, although body style and motion tended to indicate Sacramento suckers. Only juvenile Sacramento suckers were observed later on.

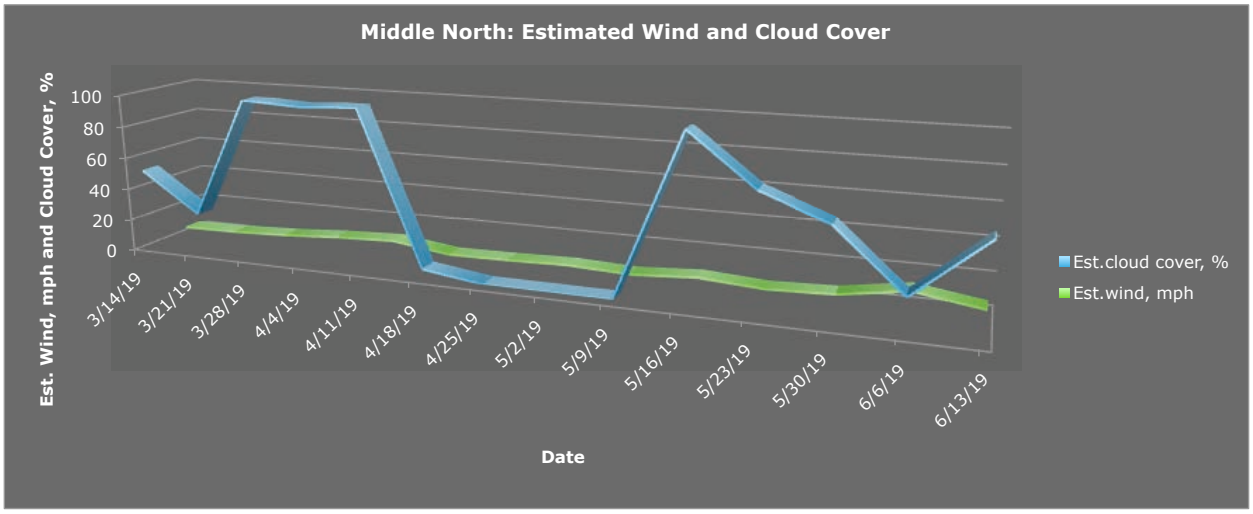


Bordering the channel on both sides are strips of riparian vegetation about 20 feet in breadth, primarily shrubs and trees that offer horizontal and vertical habitat for wildlife, instream shade, and instream niches created by woody debris and gravel bars near banks. The channel is broad and shallow. Various grasses and herbaceous plants such as vetch grow profusely and tall on the broad levee bench, east.



Water is normally clear though muddied after storm events. Flow is faster earlier in the year and after rain events and tapers off as spring advances. Substrate was estimated at 20% cobble, 40% gravel, 15% sand, and 25% silt, and bank degradation at 30%.

Wind direction was S, SE, SSE, W, WSW, NW, N, and NE and primarily from a southerly direction but occasionally with westerly gusts.



3.14.19

6.13.19

In tall grasses, herbs, and vetch on the levee bench, east side, paths wound from the creek across the bench, over the levee, and into pear orchards and bowers appeared in grasses that were turning brown when monitoring ceased. Insects including bees were usually seen throughout this area.

Other wildlife included: passerines seen and heard; swallows seen, heard, and in flight; crows seen, heard, and in flight; scrub jays heard; Stellar's jay heard; American robin heard; Nuttall's woodpecker heard; Brewer's blackbirds seen and heard; bullfrog heard; mourning dove heard; pheasant heard; red-shouldered hawk heard; bullfrog heard.

Bees, butterflies, ants, spiders, smaller flying insects, aquatic macroinvertebrates, mosquitoes, dragonfly, butterflies, and ants were seen.

Tracks observed were bird, raccoon, coyote, feral pig, deer, human, truck, and ORV. Two adult deer were observed on the opposite bank, and one group of four browsed its way upstream.

Wind and water were occasionally heard. Chain saws were heard upstream, and ag sprayers and tractors were heard from the neighboring orchard. Traffic was always audible and at times loud. Planes were heard. A rooster from a neighboring property was often heard. People frequently jogged or walked their dogs on the levee road and people worked in the neighboring orchard.

Fish, fish counts, and wildlife more directly associated with fish are in the table below.

Brief Summary, Fish Count and Related Observations: Middle N site, surrounding environment

3/14/19	3/21/19	3/28/19	4/4/19	4/11/19	4/18/19	4/25/19
no fish seen	no fish seen	no fish seen; 2 male mallards, 1 pelagic cormorant in flight	no fish seen	no fish seen; great blue heron in flight	2 migrating adults appearing to be Sacramento suckers seen; 1 mallard on water	~40 juvenile Sacramento suckers 1-2 cm headed downstream
5/2/19	**5/9/19**	**5/16/19**	**5/23/19**	**5/30/19**	**6/6/19**	**6/13/19**
~20 juvenile Sacramento suckers 1-3 cm	~100 juvenile Sacrament suckers; 2 great blue herons in flight	no fish seen; 5 tadpoles 1-2 cm seen; 1 great blue heron in flight	~30 juvenile Sacramento suckers seen; 1 Sacramento sucker 2-4 cm, subs, pale color without markings and heavier but with head and body style off Sacramento sucker seen-have seen in previous years; numerous tadpoles 1-5 cm seen	~40 juvenile Sacramento suckers 1.5-5. cm seen; 8 tadpoles 2.5-4 cm seen	no fish seen; numerous tadpoles 1-2 cm seen	2 Sacramento suckers 2-4 cm seen; tadpoles 3-4 cm seen

Vegetation

With the exception of the Tulelake site, vegetation exists as strips of various breadth along channels. At the Elk Mountain Road site, vegetation other than ruderal grasses and herbs is scarce, and non-existent along some stretches of creek.

Vegetative cover at most sites included willows, *Salix sp.*, oak, *Quercus sp.*, cottonwood, *Populus sp.* primarily *fremonti*, Himalayan blackberries, *Rubus armeniacus*, poison oak, *Toxicodendron diversilobum*, and various ruderal grasses, herbaceous growth indigenous and invasive, and various sedges, Fam. Cyperaceae, along most creek banks and especially in and around Tulelake. Orchards were often within 50 to 100 m.

In and around the Tulelake site, tules, *Schoenoplectus acutus*, are expanding their territory, especially around artificial islands created when Tulelake was placed into conservation easement, and around berms that enclosed rice paddies that were cultivated in the lake bed.

Surface debris increased after rain events and decreased as runoff fell. As temperatures and water warmed, various species of algae was growing on substrate in strands. When monitoring ended, instream algal mats had not yet developed and surface algae was beginning to form in areas of quiet water especially in protected niches close to banks.

Wildlife

In summary, wildlife was noted as being in the area if it was seen, heard, in flight, on water, on land, or leaving evidence such as scat, tracks, fur, or odor. Information about wildlife was incorporated into summaries for each location (see above). Monitoring times were not lengthy.

Wildlife especially avian was always present although influenced by weather patterns and intrusive sounds or activities. Rain, drizzle, sustained winds and gusts subdued movement. In general there was a greater variety of wildlife at the Scotts Creek location. Gopher and/or mole mounds were at all locations except Rancheria Bridge.

A variety of insects, especially bees, butterflies, mosquitoes, and spiders were present at all locations, and aquatic macroinvertebrates were observed at 4 of 5 locations. Crickets and toads were often heard.

Wildlife that was seen in 2018 but that was not noted this year was red-tailed hawk, *Buteo jamaicensis,* Cooper's hawk, *Accipiter cooperii,* Sharp-shinned hawk, *Accipiter striatus,* Bald eagle, *Haliaeetus leucocephalus,* golden eagle, *Aquila chrysaetos*, black bear, *Ursus americanus*, mountain lion, *Puma concolor*, American mink, *Neovison vison,* and red fox, *Vulpes vulpes*.

Undoubtedly these animals, and more, would be expected to frequent the Tulelake area or the Middle Creek corridor because prey items, at times favored prey items, were there. Spring rains likely washed away some evidence. The Ranch fire last summer, 2018, certainly caused habitat loss and will have caused death. It burned hills and mountains bordering the Middle Creek corridor. It can be expected that complex population dynamics for animals at all levels of food webs, not only apex predators, need to adjust to an altered equilibrium that will undergo stages as the environment heals.

Animals or their vocalizations, tracks, and scat identified with confidence are listed below, in no particular order.

White crowned sparrow, *Zonotrichia leucophrys*
Golden crowned sparrow, *Zonotrichia atricapilla*
American and lesser goldfinch, *Carduelis tristis* and *Carduelis psaltria*
American bushtit, *Psaltriparus minimus*
Mountain chickadee, *Poecile gambeli*
Black phoebe, *Sayornis nigricans*
American cliff swallow, *Petrochelidon pyrrhonota*
Red-winged blackbird, *Agelaius phoeniceus*
Brewer's blackbird, *Euphagus cyanocephalus*

Ringnecked dove, *Streptopelia risoria*
Mourning dove, *Zenaida macroura*
California quail, *Callipepla californica*
Wild turkey, *Meleagris gallopavo*
Northern mockingbird, *Mimulus polyglottos*
Acorn woodpecker, *Melanerpes formicivorous*
Nuttall's woodpecker, *Picoides nuttallii*
Downy woodpecker, *Picoides pubescens*
Hairy woodpecker, *Leuconotopicus villosus*
Scrub jay, *Aphelocoma coerulescens*
Stellar's jay, *Cyanocitta stelleri*
California towhee, *Meolzone crissalis*
American robin, *Turdus migratorius*
Bushtit, *Aegithalos caudatus*
American crow, *Corvus brachyrhynchos*
Common raven, *Corvus corax*
Turkey vulture, *Cathartes aura*
Red-shouldered hawk, *Buteo lineatus*,
American kestrel, *Falco sparverius*
Osprey, *Pandion haliaetus*
Waterfowl and herons:
- American white pelican, *Pelecanus erythrorhynchos*
- Canada goose, *Branta canadensis*
- Common merganser, *Mergus merganser*
- American coot, *Fulica americana*
- Mallard, *Anas platyrhynchos*
- Greater and lesser scaups, *Aythya marila* and *Aythya affinis*
- Ring-necked duck, *Aythya collaris*
- Great white egret, *Casmerodius albus*
- Snowy egret, *Egretta thula*
- Green-backed heron, *Butorides striatus*
- Pelagic cormorant, *Phalacrocorax pelagicus*
- Black crowned night heron, *Nycticorax nycticorax*
- Great blue heron, *Ardea herodias*
- Western grebe, *Aechmophorus occidentalis*
- Clark's grebe, *Aechmophorus clarkii*

Flying and terrestrial insects and aquatic macroinvertebrates
Tadpoles
California toad, *Bufo boreas*.
Ground squirrel, *Otospermophilus beecheyi*
Grey squirrel, *Sciurus griseus ssp.*
Raccoon, *Procyon lotor*
Skunk, *Mephitis mephitis*
Red fox, *Vulpes vulpes*
Deer, *Odocoileus virginianus,* and tracks, paths, and hollows seen on creek banks and in tall grasses
Coyote, *Canis latrans*
Gopher, Fam. Geomyidae, fresh mounds
Mole, Fam. Talpidae, fresh mounds and runs
Domestic dog, *Canis familiaris*
Domestic cat, *Felis catus*
Domestic horse, *Equus ferus caballus*
Domestic rooster, *Gallus gallus domesticus*
Feral swine, *Sus scrofa*

Image from field data collected 4.29.12

(pers.data)

References and Resources

Additional resources are at http://www.rootlets.com/environment/listsources.html.

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