Observations of Fish Migration and Habitat in Northshore Tributaries, Clear Lake Basin, Spring 2018

S Franson

Over years I have enjoyed monitoring fish migration, contemplating habitat and ecology as a whole, observing amazing intricacies over time. Nature is exquisite. After working with and researching hitch, for me monitoring is quite natural. Hitch are beautifully, specifically, temporally, and spatially adapted to a changing and extremely challenging environment. I am humbled, fascinated, and learning never stops.

Hitch face complex problems. Working together toward solutions makes sense.

Simple observations that are specific to a time and place are offered here. SF

Synopsis

Five locations were monitored during peak migration and spawning, 9.March.2018 to 29.May.2018, for sightings of Clear Lake Hitch, *Lavinia exilicauida chi*: adults migrating upstream and juveniles returning downstream. Monitoring ended when numbers of juveniles diminished to very few or none.

Large numbers of fish migrated in northshore tributaries this spring. Nearly all fish this observer saw were Sacramento suckers, *Catostomus occidentalis*, with which hitch have been seen before (anecdotal information). Over an interval of about 20 minutes and migrating with them, a group of 7 adults seen at one location and 3 adults at another appeared to be hitch. Features that were apparent in flowing, sunlit, dappled, rippling water, were consistent with those of Clear Lake hitch, regarding head size, snout, mouth parts, eye size and placement, body style including body depth and width, and coloration. Throughout monitoring, no juvenile hitch were observed heading downstream, although numerous juvenile suckers were observed.

The five locations that have been monitored since 2013 were checked weekly for *Lavinia exilicauda chi*, more frequently during spawning season, for sightings of adults migrating upstream and then for juveniles heading downstream.

Late winter rains freshened creeks. Egg masses along banks had disappeared in weeks following observations of large numbers of migrating fish and rain events, with very few deteriorating eggs remaining. As normally happens, water levels in all creeks fell after rains ended. Levels were more stable at the Tulelake location, where water levels did fall although not to the extent as at other locations that are at higher elevations.

As water levels receded in streams, riffles appeared and became gravel bars that in some instances created or enhanced channeling. This year until 29.May when monitoring ceased, late rains helped to maintain flows, with decreasing water levels over time. Although streams narrowed, fish passage for juveniles of 1.5 to 5 cm, that were observed on 29.May, still existed.

Water temperatures were chilly before March 3, warmed during periods of warm weather, and cooled during late rains. Overall they steadily grew warmer over time.

Methods

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, cloud cover, wind speed and direction, ambient air and water temperatures, wildlife heard, seen, in flight, on and in water, and evidence consisting of scat, tracks, paths, bowers, hollows, or what would suggest its presence, and changes such as algal growth. The first day of monitoring included a description of immediate and peripheral vegetation, substrate, creek and bank degradation, and significant features, for example, the presence of a dam.

Depth was estimated using permanent reference points, bank and main channel, as depth across a stream often varied considerably. Flow was estimated by timing the movement of light

surface debris. While depth and flow estimates are inexact, consistency indicates changes over time and over years, suggests trends.

Time taken for observations was not extensive but consistent, occurring at least weekly, and more frequently during fish migration, requiring 2 to 2.5 hours to complete. Counts were not based on timed intervals but on careful observation. The exception was timed intervals to scrutinize and identify what appeared to be adult hitch within large numbers of migrating fish.

Digital images were taken at each location during each monitoring event.

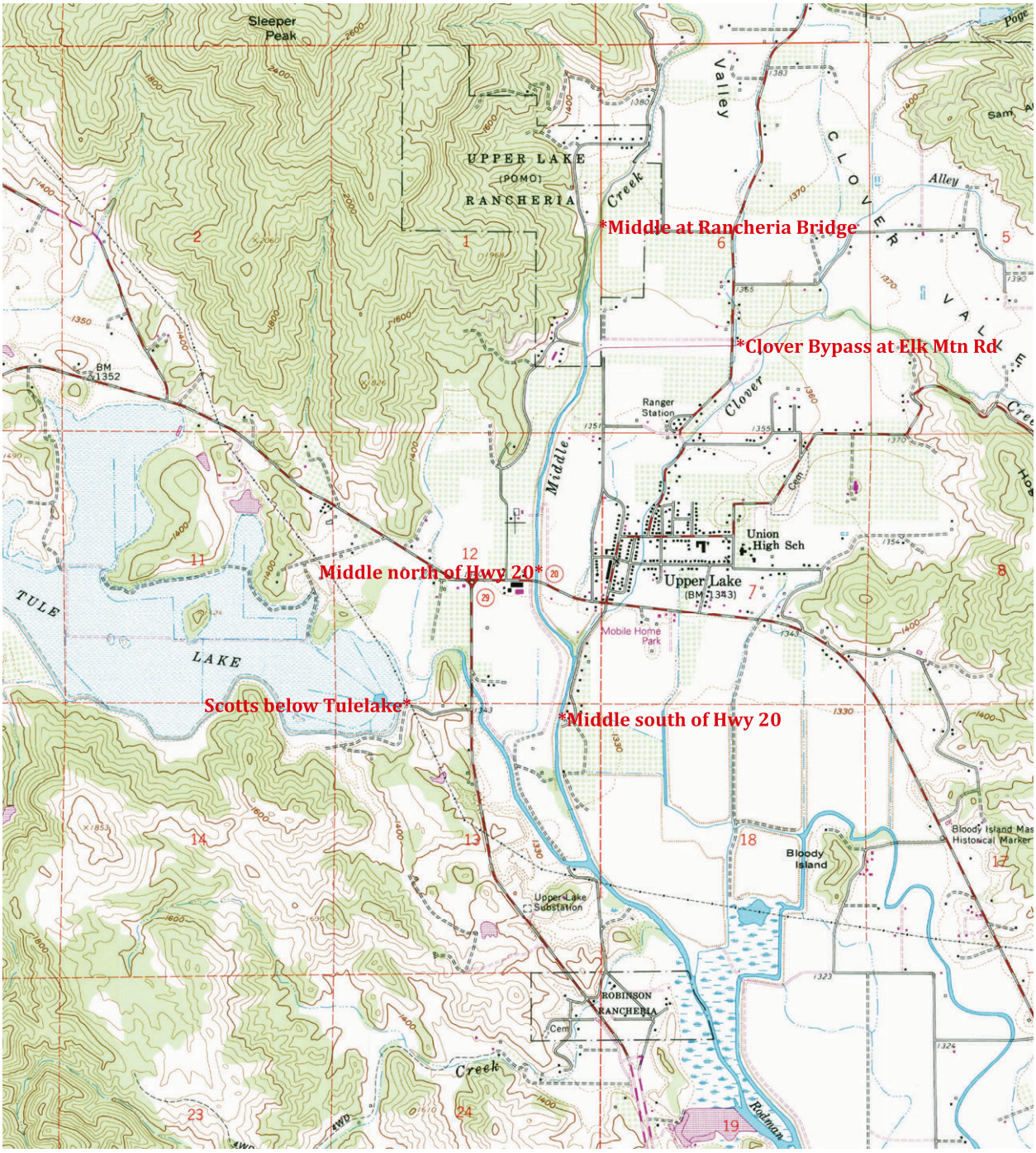
Monitoring ceased after water levels substantially subsided and gravel bars increased, well after the few egg masses that still remained after rain events were on dry gravel or had deteriorated and were clearly no longer viable, and when numbers of 0 to 12 juveniles, this year Sacramento suckers, *Catostomus* o*ccidentalis*, were seen at various locations. For numbers of adult and juvenile fish observed, please see graphs for individual locations.

Middle Creek South, 3.31.2018

Equipment included an Olympus digital camera, a DeLorme Earthmate PN-60, and a Cooper handheld digital thermometer. Resources occasionally consulted were Google Earth 7.1.5.1557, 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).

Note: Numbers and TL of fish at all locations were estimated as accurately as possible. They were not removed from streams to be examined and measured.

Monitoring Locations

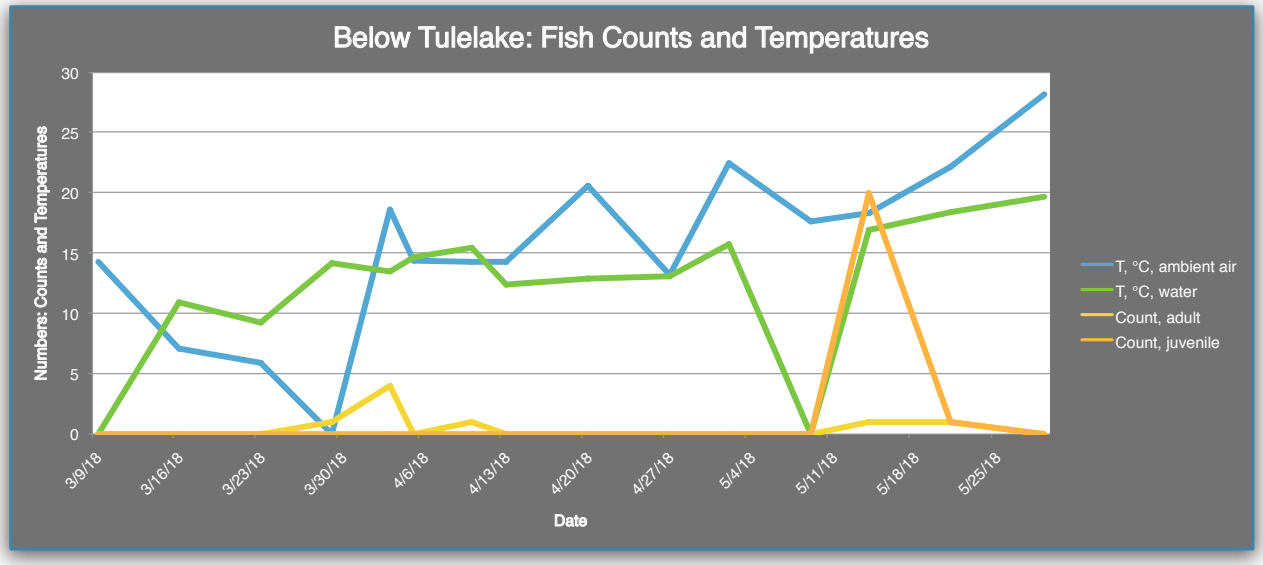


Map derived from a portion of quadrangle map, Upper Lake, CA 39122-B8-TF-024, courtesy of United States Geological survey, in cooperation with California Department of Water Resources; Control by USGS, NOS.NOAA, and USCE, compiled from imagery taken 1957

Scotts Creek below Tulelake dam

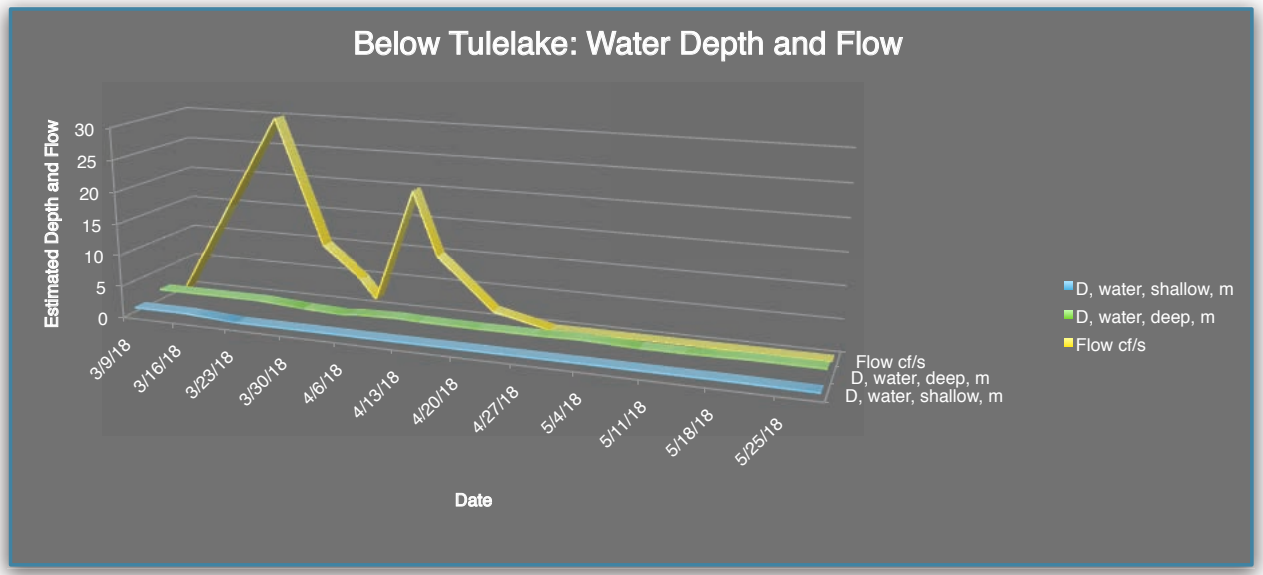
N 39° 9.9847', W 122° 55.1615' elev. 1330

This spring, few fish were seen in comparison with previous years. However water was consistently brown and visibility poor. Adult fish were usually observed while feeding, or the presence of larger fish, such as carp, was obvious from wakes and ripples. Juveniles were observed at water's edge, about 20 individuals on 5.14.2018, 2.5 to 3.5 cm, appearing to be bass with 2 juvenile carp or white catfish. A juvenile carp, 5 cm, was seen on 5.21.2018.



The existing dam has not been removed, but it is no longer used as a barrier for pumping water from Tulelake for planting crops. Tulelake has water and small manmade islands year round. After runoff from rains, water levels are basically the same as Clear Lake. Wildlife of many kinds and species are present, or they frequent the area; they are seen, heard, on the water, on banks, in flight, and leave tracks, scat, and sometimes odor.

Water levels were estimated for the pool at the southern end of Tulelake, below the dam, where a completely contained Scotts Creek enters it via a culvert. Scotts Creek continues toward Rodman Slough at the outlet of this pool.



3.9.2018

3.9.2018

3…9.2018

3.23.2018

Juveniles, 5.14.2018

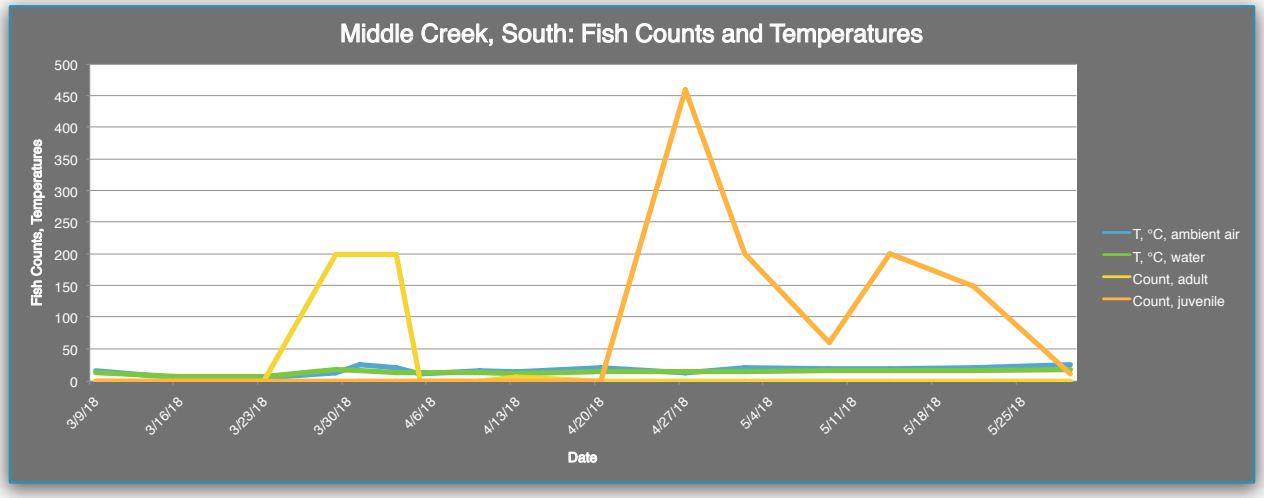
5.29.2018

Middle Creek South

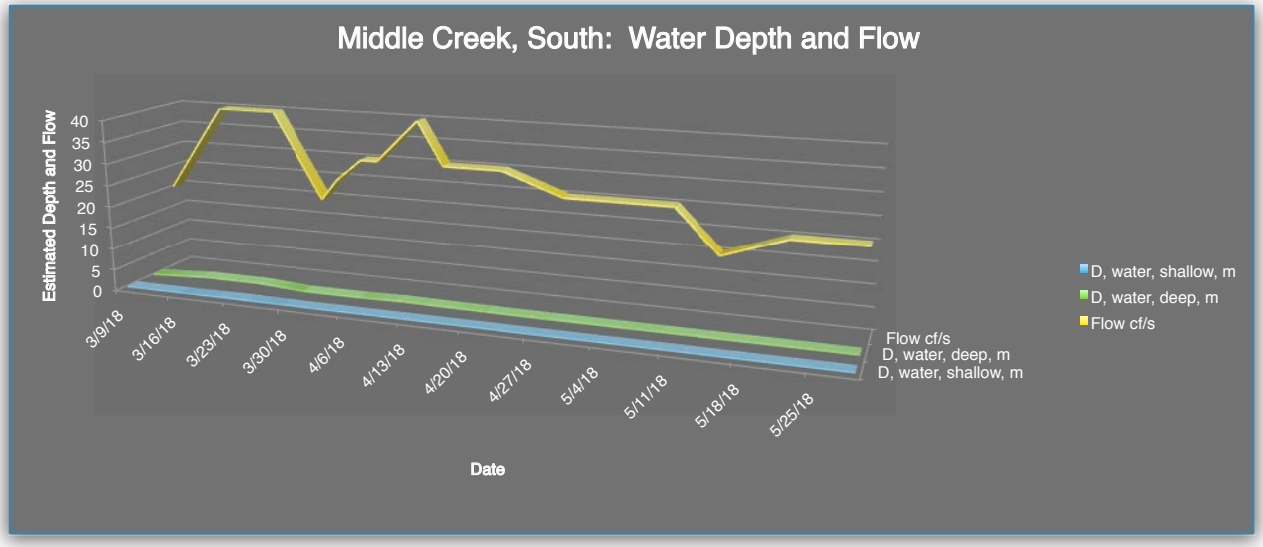
N 39° 7.1174', W 122° 53.2457' elev. 1332

Migrating adults passed this location and other monitored locations with the exception of Tulelake/Scotts Creek, and juveniles passed it when returning downstream.

No fish were observed at this location until 3.29.2018, when continuous groups of migrating adults passed by during monitoring. They were observed as suckers although on 3.31.2018, a group of 7 that were believed to be hitch were migrating with them. Numerous migrating adults were observed 4.3.2018, then small numbers after that including a few returning downstream. No adults were seen after 4.20.2018. Large numbers of juveniles were observed on 4.27.2018 and continued to be seen although in lesser numbers, until on 5.29.2018, 12 individuals were observed.



Aquatic insects, tadpoles, avian wildlife of numerous species, and mammal tracks and scat of several species were habitually seen here. Rain events swelled Middle Creek occasionally inundating banks. Later on during monitoring, water usage lowered water levels. Emerging gravel bars created channels and barriers. Flow remained due to late rains although the creek narrowed and grew quite shallow.



3.9.2018

3.23.2018

3.31.2018

4.5.2018

5.21.2018

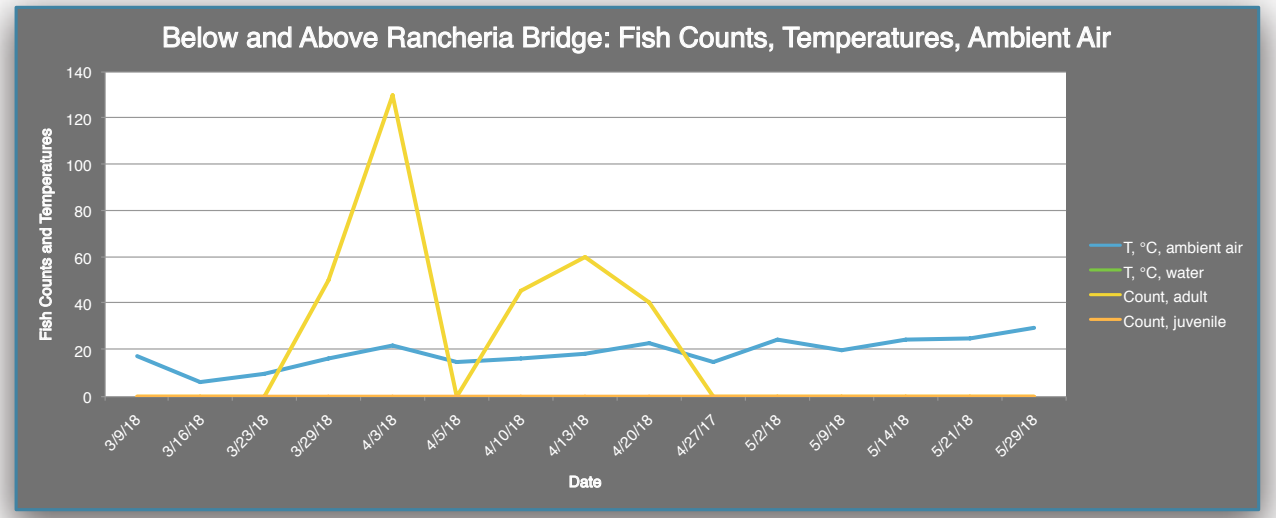
5.29.2018

Middle Creek at Rancheria Bridge

N 39° 10.9526', W 122° 54.7084' elev. 1376

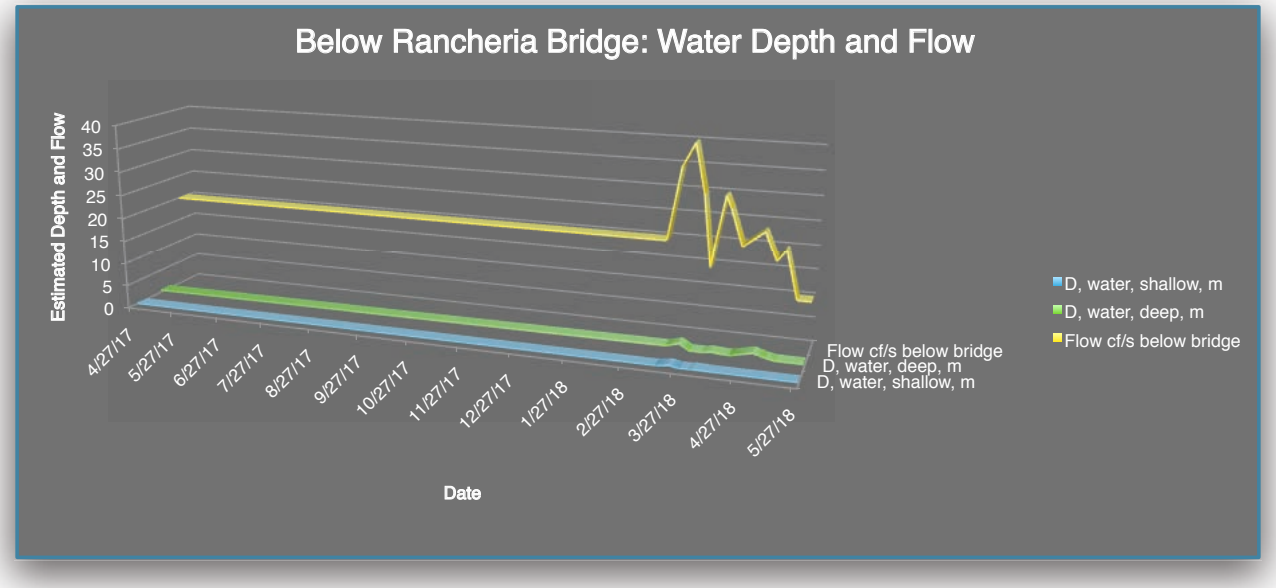
Adult suckers were observed on 3.29.2018, on 4.3.2018, on 4.10.2018, on 4.13.2018, and last observed on 4.20.2018. The last group was headed downstream. Altogether, fish were seen north of the bridge, just south of the bridge apron and above a weir about 20 ft. downstream, where there is a small opening in boulders near the west bank, and below the weir.

Paths to creekside and other areas there are posted. Juveniles were likely to be found near the bank, but closer inspection was not possible. Juvenile fish count is 0, although there almost certainly were juveniles returning downstream. Water temperatures could not be taken.



This location has orchards on the east side of Middle Creek beyond levees, and on the west side, houses along a road with hills beyond. Presence of wildlife is not as visible here, although avian wildlife was seen or heard. Domestic animals were occasionally seen or heard. Tracks and scat were evidence of the presence of small mammals.

Middle Creek is narrower here than it is downstream, deeper in some areas, and it widens above the bridge. Three more weirs exist further downstream, two that have some height with large boulders, are not graveled in, and appear to create barriers for hitch. Rain events created surges.



3.9.2018

3.15.2018, after rain

4.3.2018

4.20.2018

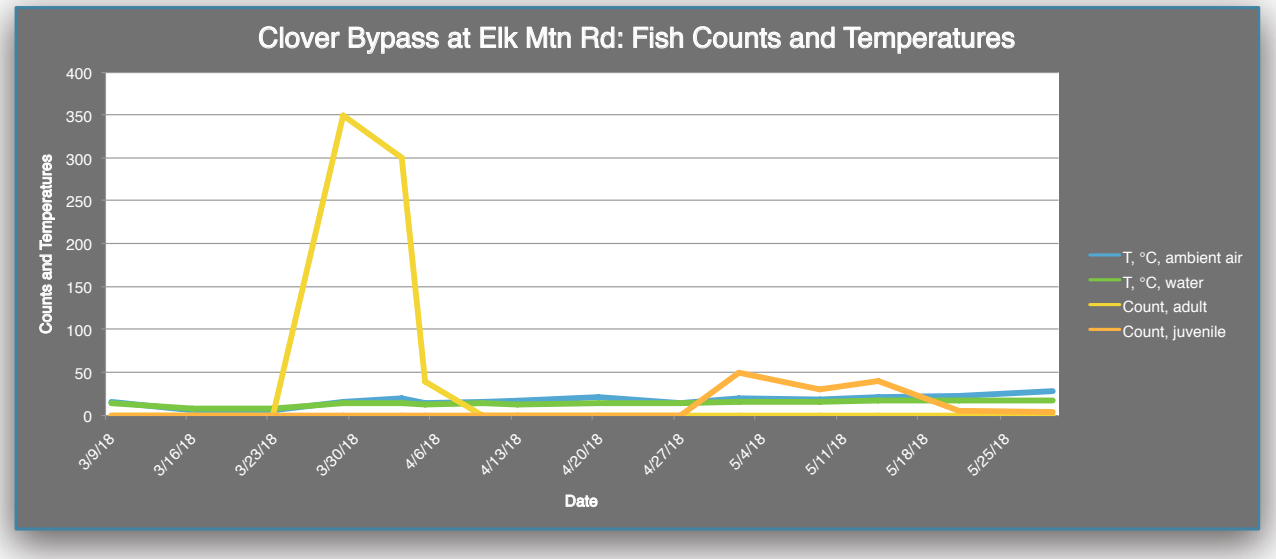
5.29.2018

Clover Bypass at Elk Mountain Road

N 39° 10.5670', W 122° 54.1741' elev 1368

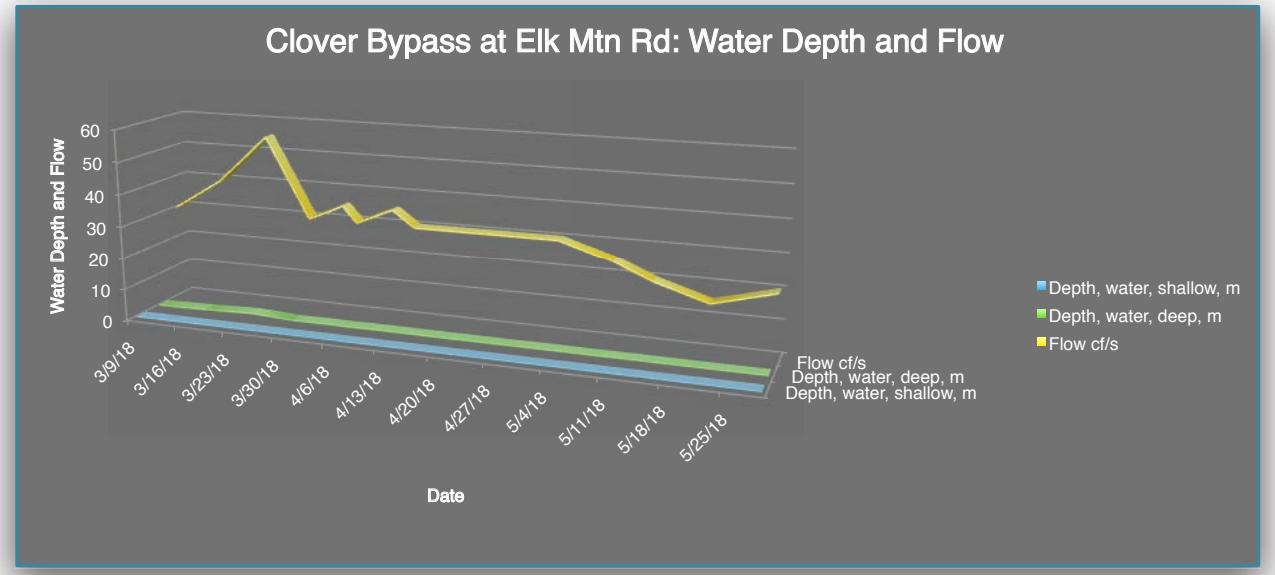
Migrating adult fish were seen on 3.29.2018, 4.3.2018, and 4.5.2018, Sacramento suckers and, it was believed, a few hitch with them. 3 individuals that were likely hitch were observed over a 20 minute period. As noted above, water was clear with ripples, light, dapples, and movement, rendering identification difficult. These numbers are what this observer can truthfully note.

Juveniles were seen on 5.2.2018, 5.9.2018, 5.14.2018, 5.21.2018, and 5.29.2018. Numbers decreased to 5, and then 4 on the final day of monitoring. All juveniles seen were suckers.



Wildlife at this location consisted primarily of passerines, crows, raptors, blackbirds, swallows, an occasional mallard, deer, and raccoon and deer tracks. ORV tracks created paths.

Water at this location often ran dry in previous years, stranding juvenile fish in pools when fish passage downstream was blocked by dry stretches. This year flow continued through spring., and water levels increased briefly after rains.



3.9.2018

3.25.2018

3.29.2018

4.5.2018

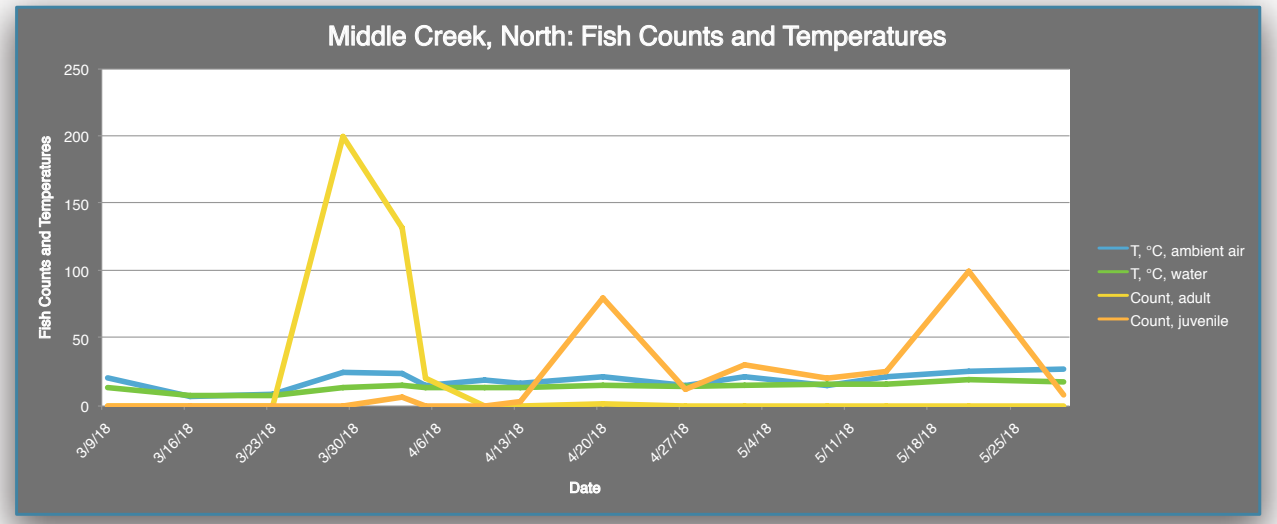
5.2.2018

5.29.2018

Middle Creek North

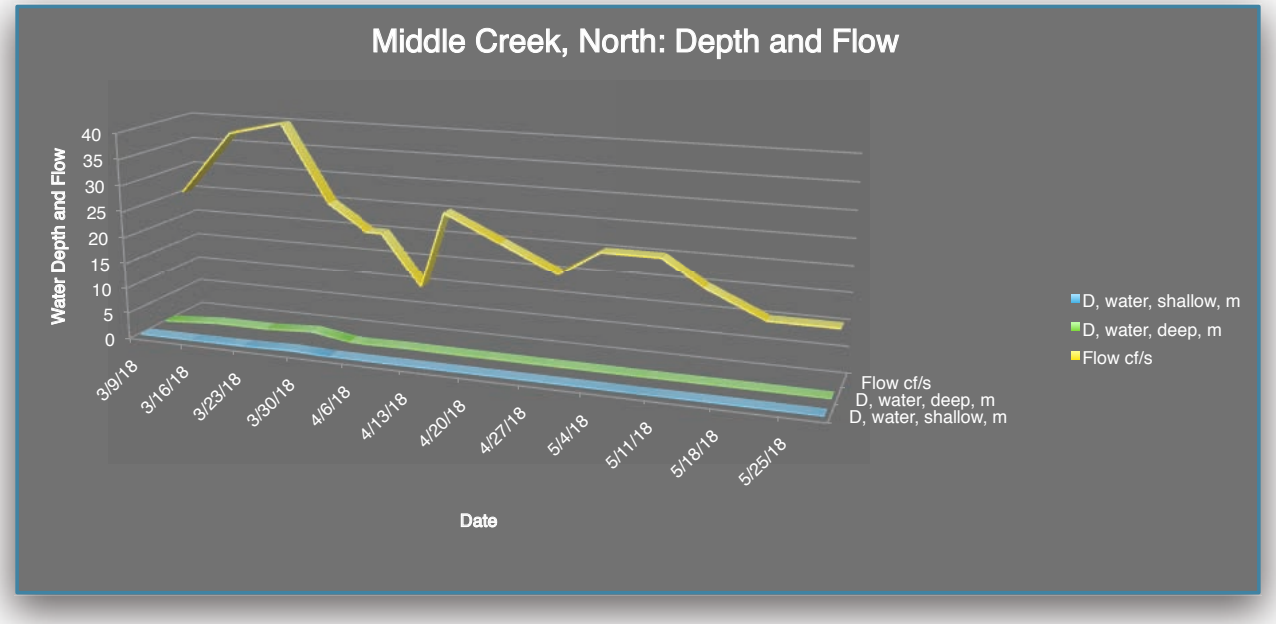
N 39° 9.8454', W 122° 54.9914' elev. 1339

Migrating adult fish and returning juveniles pass by this location as they do at Middle Creek South. Adults were first seen on 3.29.2018 until 4.5.2018, and 1 was observed on 4.20.2018. 6 juveniles were seen on 4.3.2018, then none until 4.13.2018 when 3 were seen. Juveniles continued to be seen until monitoring ended on 5.29.2018, when 8 were seen.



Wildlife was prevalent here. Predominantly avian wildlife was seen and heard, and there were signs of various mammals crossing the creek and following trails in and along the levee, where vegetative growth became thick and tall.

Water levels rose with rain events and then fell, beginning to expose gravel bars. Water remained clear, with increasing algal growth on the substrate and emerging gravel bars. Toward the end of monitoring, levels grew shallow and creek width decreased.



3.9.2018

3.16.2018

3.29.2018

4/10.2018

5.21.2018

5.29.2018

Vegetation

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 in and around Tulelake. Orchards were often within 50 to 60 m.

With agricultural easements in place in the Tulelake area, water appeared to remain at Clear Lake levels there, with an increase during storm events and a reduction in late spring. Tules, *Schoenoplectus acutus*, are expanding their territory there, especially around artificial islands created when Tulelake was placed into conservation easement, and around berms from former rice paddies.

As temperatures and water warmed, various species of algae grew instream and on substrate in clumps and strands. At the time monitoring ended, surface algae and mats were beginning to form at locations where water was shallow or flow reduced, and water temperature was warming.

Surface vegetative debris was always present after rain events when banks had been inundated and flow had increased.

Wildlife

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

Wildlife, especially avian, was always present, however wildlife is influenced by weather patterns and anything intrusive. Estimated wind speed and direction, wind gusts, cloud cover, ambient air temperatures, and water temperatures near creek banks were included in field notes at each monitoring. Rain, drizzle, and wind ≥ 8-10 mph suppressed wildlife activity.

Except at the Rancheria Bridge location, great blue herons and great white egrets foraged along creek banks when adult fish were migrating, and several species of smaller birds were present on gravel bars and banks when juvenile fish came downstream. An osprey was observed flying up Middle Creek to the flat, shallow area above Rancheria Bridge, passing a mile or more of narrow, rushing water. It dove between trees lining banks and headed back downstream, a large sucker in its talons.

Waterfowl and various species of herons and egrets were consistently clustered around the Scotts Creek location, foraging near the dam and grouped on islands and berms. American white pelicans, green-backed herons, a belted kingfisher, Western and Clark's grebes, greater and lesser scaups, and bald eagles were seen only in that area. Common mergansers were observed at the Tulelake, Middle Creek South, and Rancheria Bridge locations. Mallards, various passerines, woodpeckers, crows, turkey vultures, buteos, especially red-shouldered hawks, accipiters, and kestrels were seen or heard at each location. American cliff swallows nested near or at each location. Squirrel tracks and/or squirrels, ground and grey, were common. A deer walked along the levee at the Elk Mountain Road location. A red fox crossed the road heading to the creek at the Middle Creek South location.

In general there was a greater variety of wildlife at the Scotts Creek location and less variety at the Rancheria Bridge location, where monitoring took place on asphalt on Rancheria Bridge, although raccoon tracks at times led up to the bridge, and scat was seen on the bridge.

As water levels diminished in Middle Creek, ORV's and trucks left tire tracks midstream and along banks. Dogs and/or dog tracks, deer tracks, raccoon tracks, feral pig tracks, and squirrel tracks were at most locations, horse tracks at 1, domestic cats seen at 2, coyote tracks at 1, and

gopher and/or mole mounds at all except Rancheria Bridge. Black bear tracks were seen at 1 location and mountain lion at 3. ORV tracks were at 3 locations, in water at 2.

Animals or their vocalizations, tracks, and scat identified with confidence are listed below, in no particular order. Some are not noted earlier but they were seen, heard, or there was evidence of their presence.

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*
Nuttail's woodpecker, *Picoides nuttallii*
Downy woodpecker, *Picoides pubescens*
Hairy woodpecker, *Leuconotopicus villosus*
Scrub jay, *Aphelocoma coerulescens*
Stellar's jay, *Cyanocitta stelleri*
Rufous sided towhee, *Pipilo erythrophthalmus*
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*,
Red-tailed hawk, *Buteo jamaicensis*
Cooper's hawk, *Accipiter cooperii*
Sharp-shinned hawk, *Accipiter striatus*
American kestrel, *Falco sparverius*
Osprey, *Pandion haliaetus*
Bald eagle, *Haliaeetus leucocephalus*
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*

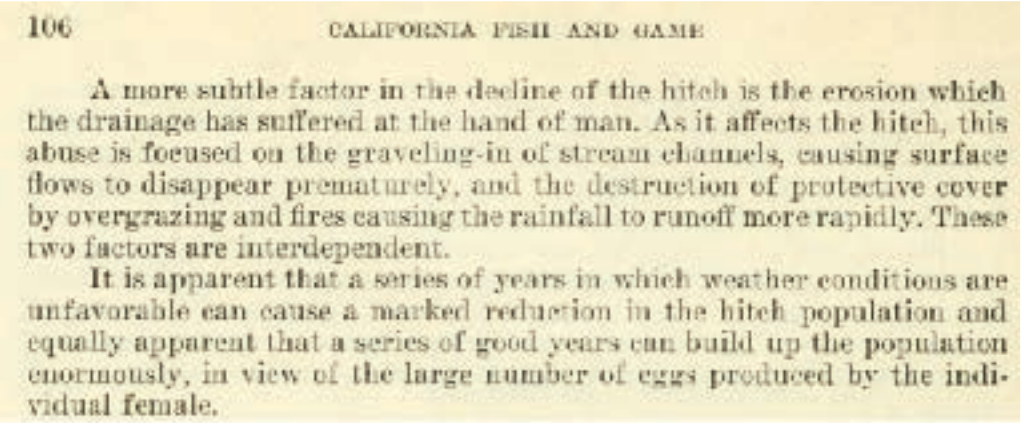
Western grebe, *Aechmophorus occidentalis*
Clark's grebe, *Aechmophorus clarkii*
Flying, terrestrial, and aquatic insects
Tadpoles
California toad, *Bufo boreas*.
Ground squirrel, *Otospermophilus beecheyi*
Grey squirrel, *Sciurus griseus ssp.*
Raccoon, *Procyon lotor*
Skunk, *Mephitis mephitis*
American mink, *Neovison vison*
Red fox, *Vulpes vulpes*
Deer, *Odocoileus virginianus,* and tracks, paths, and hollows seen on creek banks and in tall grasses
Black bear, *Ursus americanus*
Mountain lion, *Puma concolor*
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*

From research: Clear Lake hitch are endemic to the Clear Lake basin that over centuries has been fed by tributaries with low gradients over flood plains, where they have spawned (Murphy, p. 102, Notes on the Biology of the Sacramento Hitch (*Lavinia e. exilicauda*) of Clear Lake, Lake County, CA, p.102; Macedo, p.3; pers.obs.). They have not been observed in Middle Creek above weirs that appear to have created barriers for them (pers.obs.).

They require definitive temperature ranges for healthy egg incubation, larval and juvenile growth, phyto- and zooplankton that hatchlings to juveniles can ingest, and water for adequate fish passage. A sustainable hitch population needs successful migration of adults upstream, successful egg incubation, and successful migration of juvenile hitch downstream mid-to late spring.

Most marshes and seasonal wetlands that historically existed in the northshore watershed have disappeared, along with at least one migration stream that formerly ran most of the year, began to fade in the early 1980's, and is now a runoff channel only during prolonged storm events (pers. obs.). What remains of temporal and spatial critical habitat for hitch is fragile.

They face complex challenges: drought, warming trends, cyclical climate changes, reduced riparian vegetation with increased runoff and reduced groundwater recharge (pers.comm.), water release, and water diversion. Issues and solutions are complicated, and a realistic approach would likely involve many interests. Populations would potentially benefit from increased habitat such as restoration projects that have wetland and marshland connected in some way to Clear Lake the year round, although they would still need low gradient spawning streams.



106 CALIFORNIA FISH AND GAME

A more subtle factor in the decline of the hitch is the erosion which the drainage has suffered at the hand of man. As it affects the hitch, this abuse is focused on the graveling-in of stream channels, causing surface flows to disappear prematurely, and the destruction of protective cover by overgrazing and fires causing the rainfall to runoff more rapidly. These two factors are interdependent.

It is apparent that a series of years in which weather conditions are unfavorable can cause a marked reduction in the hitch population and equally apparent that a series of good years can build up the population enormously, in view of the large number of eggs produced by the individual female.

Murphy, Notes on the Biology of the Sacramento Hitch (*Lavinia exilicauda chi*), of Clear Lake, Lake County, California, 1948 p.106

References and Resources

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

Coleman, George A., A Biological Survey of Clear Lake, Lake County, The Resources Agency of California, Department of Fish and Game online archives, Vol. 16(3), pgs.221-227, July 1930

Draft Adaptive Management Plan for the Clear Lake Hitch, *Lavinia exilicauda chi*, 2010, Robinson Rancheria Environmental Center, PO Box 1580, Nice, CA 95464

Franson, S., Observations of Larval Development of Clear Lake Hitch, *Lavinia exilicauda* chi, with Regard to Differences in Temperature in their Environment, 2012, http://www.rootlets.com/environment/study-spring2012.pdf

Geary, R. Eugene, and Moyle, Peter B., Aspects of the Ecology of the Hitch, *Lavinia exilicauda* (Cyprinidae), a Persistent Native Cyprinid in Clear Lake, California, R. Eugene Geary, and Peter B. Moyle, The Southwestern Naturalist 25 (3): 385-390, November 24, 1980

Hedgpeth, Joel, Livingston Stone and Fish Culture in California, The Resources Agency of California, Department of Fish and Game online archives, Volume 27(3), pgs.126-148, July 1941

Hickman, James c., Ed., The Jepson Manual: Higher Plants of California, University of California Press, Berkeley and Los Angeles, University of California Press, Ltd., London, 1996

Hopkirk, John D., Endemism in Fishes of the Clear Lake Region of Central California, 1973, University of California Publications in Zoology, Volume 96; University of California Press

Lampert, Winfried and Sommer, Ulrich, Limnoecology, The Ecology of Lakes and Streams, 2007, 2nd Ed., Oxford University Press Inc., 198 Madison Avenue, New York, NY 10016

Macedo, Richard, Swimming Upstream without a Hitch, Outdoor California: January/February, 1994

Moyle, Peter B., Kiernan, Joseph D., Crain, Patrick K., and Quiñones, Rebecca M., Climate Change Vulnerability of Native and Alien Freshwater Fishes of California: A Systematic Assessment Approach, , May 2013, PLOS ONE

Moyle, Peter B., Inland Fishes of California, 2008, University of California Press, Berkeley and Los Angeles, California

Murphy, G.I., The Fishery of Clear Lake, Lake County, California, The Resources Agency of California, Department of Fish and Game online Archives, Volume 37(4), Phil M. Roedel, Editor, pgs. 439-484, October 1951

Murphy, G.I., Notes on the Biology of the Sacramento Hitch (*Lavinia exilicauda chi*), of Clear Lake, Lake County, California, The Resources Agency of California, Department of Fish and Game online archives, Volume 34(3), Carlton M. Herman, Editor, pgs. 101-110, July 1948

Shapovalov, Leo, Cordone, Almo J., and Dill, William A., Freshwater and Anadromous Fishes of California, Inland Fisheries Branch, California Department of Fish and Game, 1416 Ninth Street, Sacramento, CA 95814, CAlif. Fish and Game 67 (1):4-38, 1981

Suchanek, T.H., Richardson, P.J., Nelson, D.C., Eagles-Smith, C.A., Anderson, D.W., Cech, J.J., Zierenberg, R., Schladow, G., Mount, J.F., McHatton, S.C, Slotton, D.G, Webber, L.B., Swisher, B.J., Bern, A.L., and Sexton, M., Evaluating and Managing a Multiply-Stressed Ecosystem at Clear Lake, California: a

Holistic Ecosystem Approach, 2002, at http://www.des.ucdavis.edu/faculty/Richerson/Clear%20Lake%20overview.pdf

Swift, Camm, Early Development of the Hitch, Lavinia exilicauda, of Clear Lake, California, The Resources Agency of California, Department of Fish and Game online archives, Volume 51(2), Editor-in-Chief John E. Fitch and Editor for Inland Fisheries James H. Ryan; pgs. 74-78, April 1965