!Waters Collaborative
SSU Center for Environmental Inquiry / Sonoma County Water Agency

2018-19 WATERS COLLABORATIVE ACCOMPLISHMENTS

The WATERS Collaborative boosts funding, logistics support, and awareness of water-related studies on the SSU campus. Not all projects included in the list below received direct support through the Collaborative. All were eligible for the Best Water Poster award.

The Year in Numbers

- 617 students participated in 56 projects with 30 faculty. Participants included students in 21 courses, 10 departments, and 3 schools.
- 1500 additional students, faculty, staff and community members SSU Symposium on Research and Creativity (April 30, 2019) participated in the SSU Symposium on Research and Creativity, April 30, 2019
- 21 organizations worked with faculty and students on water projects: Americorps, California Department of Water Resources, Center for Environmental Inquiry, Cotati Fire Department, D'Argenzio Winery, JUMP, NASA, Pepperwood Preserve, Petaluma Wetlands Alliance, Re-Oaking Coalition, Sacramento Municipal Utility District, SCYEC, Shiloh Ranch Regional Preserve, Sonoma Mountain Ranch Preservation Foundation, Sonoma State University, Sonoma Water, SSU, SSU Facilities, SSU Police Department, Trout Unlimited, Yorkville Market.

Project Results

Land Use Planning Projects

- **Integrating water and land use planning** – The Land Use and Water Resources Planning course (GEP 379 Course Syllabus; GEP 379 Regional Plan Assignment) teaches students about trade-offs in water resources development and ways to integrate water issues into land use planning. Students undertook projects that provide recommendations for integrating water resources planning into regional general plans (Alchin 2019, Nelson 2019, Thompson 2019).

Habitat Management Projects

- **Copeland Creek Restoration Project** – This multi-year project engages students in developing grant applications, restoration planning and implementation, plant propagation, and monitoring of a 1-acre restoration project on the campus portion of Copeland Creek. This year, we established four new planting zones (325 m^2) between the bike path and creek behind the Art Building, and planted this area with natives (propagated in the greenhouse during Spring 2018), including grasses, rushes, sedges, bee plant, California rose, California buckeye, and coast live oak. We continued invasive species removal with teams of students and community volunteers, including regular volunteer workdays sponsored by JUMP (Join Us in Making Progress student organization). Student monitoring projects this year included:
    - **Benthic Macroinvertebrates –** the macroinvertebrate community in Copeland Creek continues to include a wide variety of organisms, including many with extremely low pollution tolerance, which indicates excellent water quality during the wet season (Lozano and Gonzalez 2019; May et al 2019; St. John data 2019).
    - **Vertebrate surveys on Copeland Creek -** Camera traps documented vertebrate species on the SSU section of Copeland Creek, including raccoon, opossum, Columbian black-tailed deer, striped skunk, grey fox, wild turkey, barn owl, river otter, and bobcat (Dansie 2019; Wirtz et al 2019; Hughes data 2018; St. John data 2019).

    - **Stream flow and deposition –** a correlation was found between faster flow rates and smaller cobble size, with an overall trend of smaller cobble sizes upstream in faster, higher elevated areas, and larger cobble sizes in slower, lower elevated areas (Mazzoni and Zhuravskaya 2019).
    - **Blackberry monitoring –** native and non-native blackberries were mapped as part of a long term restoration success monitoring – (Goman data 2019).
- **Changes in abundance of aquatic invertebrates since 1980 at the Fairfield Osborn Preserve** - Nearly all species of aquatic macroinvertebrates that were abundant in Copeland Creek in 1980, we also common in 2019 (Morales 2019).
- **Variation in carbon sequestration: a comparison of wetlands on Sonoma Mountain** – Sequestered carbon was greatest at pond margins, slightly less in the marsh, and lowest in the ephemeral pond. Historically, values peaked in the 1950s (Riordan 2019).
- **Exploring Interactions among Disease, Fuel Loads, and Fire Intensity in Sonoma County Oak Woodlands** – We evaluated the relationship between sudden oak death (SOD) severity and wildfire intensity in the recent Atlas/Nuns/Tubbs Fire complex (Hernandez et al. 2019).
- **Habitat Use and Movement of the Threatened California Red-Legged Frog (*Rana draytonii*)** - Red-legged frog distance range is highly variable, especially compared with bullfrogs (Surber et al 2019).
- **Characterizing the Laguna de Santa Rosa at Stony Point Road Prior to Sediment Removal** - We characterized water depth, amount of canopy cover, and plant types present in areas of the Laguna de Santa Rosa that have been invaded by non-native Ludwigia, and will be part of a Sonoma Water sedimentation removal project later this year (Brewer et al. 2019).
- **An Evaluation of Movement Patterns of California Tiger Salamanders (*Ambystoma californiense*) Using Individual Identification based on Spot Patterns** - Using demographic and morphologic data of reproductive adults, we evaluated whether males exit at the same region of the pond as they entered, indicating a preference for specific upland habitat, or if their movement patterns are random (Brunal et al. 2019).
- **eDNA sampling of the California Tiger Salamander (*Ambystoma californiense*) in Vernal Pools of the Santa Rosa Plain** - Larval dipnet counts and eDNA samples were collected from various preserves located on the Santa Rosa Plain to compare the effectiveness of eDNA methodology to that of traditional dipnet surveys (Juarez et al. 2019).
- **Factors Influencing Growth Rates of Head-Started Western Pond Turtles (Emys marmorata) and Consequences for Conservation** - The maternal identity of hatchling turtles accounts for 47.8% of the variation in juvenile growth rate (pending).
- **TroutLab** - We created a device to monitor water quality in tanks used by Trout Unlimited to raise the trout eggs they provide at schools for programs like Steelhead in the Classroom, and alerts the user via SMS text message if sensors surpasse a threshold value (pending).
- **Bird Diversity in Petaluma Wetlands** - Bird diversity recorded during Petaluma Wetlands Alliance surveys has declined over the past few years (Glazier et al 2019).
- **Freshmen studies in habitat management –** In heavily vegetated areas, CO2 flux from the soil declined with distance from stream (Howell et al. 2019); Data from Thermochron iButton temperature sensors placed in Copeland Creek suggest that canopy cover has no measurable effect on diurnal stream temperature fluctuations. (Spencer et al 2019); Copeland Creek possessed a greater abundance and species diversity of macroinvertebrates than Pieta Creek in Mendocino County. (Volkman et al 2019); Organisms prefer man-made cover over natural cover (Demitriou et al 2019).

Sediment and Erosion Projects

- **Investigating Groundwater-Atmosphere Connectivity in a Headwater System** - Groundwater response to local convective storms is stronger than the response to atmospheric river events, and groundwater levels also spiked in the absence of strong precipitation events (Thompson and Glas 2019).
- **Freshmen studies in erosion** – Soils from burned areas in the 2017 fires were more hydrophobic than soils from unburned areas (Vargas & Ortiz 2019); Using a chloride, calcium, and potassium ion selective probe to track ionic composition while sampling downstream along the creek, we conclude that groundwater is being discharged into the creek (Ivani et al 2019); More erosion has taken place on the upper cross section at Fairfield Osborn Preserve than the lower cross section(Cleveland et al 2019); Evidence of water-rock interaction within the Fairfield Osborn Preserve indicates that Copeland Creek is a mixture of groundwater and surface water (Obrien et al 2019).

Water Quality Projects

- **Effects of Wastewater Treatments on Antibiotics -** Research on the effects of wastewater treatment on the commonly used antibiotics Azithromycin and Doxycycline (pending).
- **Exploration of Remote Sensing for Water Quality/Application of Landsat imagery for the quantification of Chlorophyll -** By obtaining NASA Landsat imagery it is possible to make a valid quantification of the amount of chlorophyll in any bodies of water (pending).
- **Employing microbes and earthworms to treat winery and brewery wastewaters** - Filters efficiently remove organics from brewery wastewater irrespective of the presence of earthworms (Ramirez et al 2019).
- **Increases in densities of the fecal indicator E. coli in Copeland Creek following a rain event** - Fecal matter arising from restorative grazing on Sonoma Mountain may travel into Copeland Creek during periods of heavy rain (Criddle and Wickenden 2019).
- **Partial Purification of Chromium Reducing enzyme, Chromate Reductase, from *Pseudomonas Veronii*** - Several protein purification methods were used to quantify protein concentration and determine the specific activity of Chromate Reductase (pending).
- **Interactive effects of ocean acidification and elevated temperature differentially impact acid-base balance in Antarctic fish** - Some species of Antarctic fishes are able to robustly defend acid-base balance under these conditions; however, this response was not ubiquitous (pending).
- **Freshmen studies in water quality** - Pieta Creek in Mendocino County has a slightly higher Water Quality Index score (70) than Copeland Creek (61) (Weinzierl and Pruden 2019); A literature search revealed that concentrations of microplastics in rivers varied by location, and that factors such as distance from wastewater treatment plants and tributaries play a role in distribution (Obrien et al 2019); Soil porewater was extracted from post-fire samples collected at Pepperwood Preserve showed lower nitrogen levels than Crane Creek Regional Park samples (Cleveland et al 2019); No differences were found in water quality or taste from various water sources on the SSU campus (Ivanov et al 2019); Presence of biofilm in Fairfield Osborn Preserve creek was negatively correlated with canopy cover (Wagner et al 2019); The farther water travels through urban and agricultural land the less dissolved oxygen it contains (Pruden et al 2019).

Water Availability and Use Projects

- **Acquiring a Water Consumption Baseline at the Yorkville Market -** In order to establish efficient water conservation and usage for the Yorkville Market in Mendocino County, CA, new measures are being undertaken to monitor volumetric water quantities both in usage and waste for this business (Brewer and Soto 2019).

- **Women in Technology Solar Powered Boat -** Co-ed team competed in the Sacramento Municipal Utility District's (SMUD) annual Solar Regatta Competition at Rancho Seco Recreational Area on May 4 (Medina et al 2019).
- **Rainfall Visualization** – A mobile virtual reality program represents rainfall visualization at the Osborn Preserves, and allows the user to learn statistical data about when it starts to rain on a sunny day (pending).

Arts

- **Making Mountains: Landform Modeling Using Makerspace Technology -** To explore different ways topographical landform models could be created, this project utilized 3-D printing to create a topographical model of the Fairfield Osborn Preserve (pending).