**WATERS Collaborative**

Watershed Academics to Enhance Regional Sustainability

Sonoma State University / Sonoma County Water Agency

**2014-15 WATERS Accomplishments**

Participating Students and Faculty

* 326 students participated in 25 WATERS projects with 12 faculty. Participants included students in 16 courses, 12 departments, and 3 schools. Students engaged in service-learning, independent research, senior capstone projects and student assistantships.
* WATERS additionally engaged 340 students, faculty, staff and community members with two events:
	+ 2014 SSU Science Symposium - WATERS collaborated with the School of Science & Technology to host the 3rd annual science symposium which celebrated the achievements of SSU students engaged in scientific research. Over 300 attendees talked to students about their research projects. WATERS presentations included student posters, and freshmen oral presentations. The best water-related poster was awarded by Supervisor Efren Carrillo.
	+ Hydrological Stream Channel Restoration – WATERS provided contact for Roger Leventhal from the Marin County Flood Control Division who was hosted by the Geography Department and the Geology Club to speak about “Natural Stream Channel Restoration: Developing and Using Updated Marin/Sonoma County Creek Design Curves.” We hope to engage Dr. Leventhal in additional water restoration projects.

Partnerships: Staff from 16 organizations worked with faculty and students on WATERS projects.

* Sonoma County Water Agency
* SSU Center for Environmental Inquiry
* SSU Facilities
* Sonoma County Youth Ecology Corps
* Friends of Copeland Creek
* CSU Campus as a Living Lab Program
* WRPI Faculty Incentive Fund
* PG&E (LiDAR data)
* City of Santa Rosa
* City of Rohnert Park
* Gold Ridge Resource Conservation District
* UC Davis Bodega Marine Reserve
* Occidental Arts and Ecology Center
* Pepperwood Preserve
* The Digital/Critical Cohort
* D’Argenzio Winery

Matching Funds

* Faculty working on WATERS projects contributed an additional $61,300 in matching funds for WATERS projects (see 2014-15 WATERS Project Summary)

Summary of Findings

*Erosion and Sedimentation*

* On-going monitoring of Copeland Creek in the upper watershed revealed annual erosion on banks of the main stem of the creek (8-12 cm) even prior to a large December storm that caused flooding on campus. Project: [Long-Term Erosion Monitoring in the Copeland Creek Headwaters](http://www.sonoma.edu/waters/projects/sediment/sediment_erosion_monitoring.html)
* A trail erosion survey identified trail sections with elevated levels of erosion. A new section was treated using best management practices and evaluated for effectiveness. Project: [Mitigating Trail Erosion at SSU'S Fairfield Osborn Preserve](http://www.sonoma.edu/waters/projects/sediment/trail_erosion.html)

*Riparian Restoration*

* SSU Preserves and SSU Facilities works each summer with the Sonoma County Youth Ecology Corps program to employ 5 youth at risk to remove blackberry on Copeland Creek. Project: [SSU Copeland Creek Restoration Project](http://www.sonoma.edu/waters/projects/vegmanagement/ssu_copeland.html)
* Pre- and post-restoration sampling of insects at Colgan Creek revealed that while the diversity of insect orders decreased, parasitoids and pollinators increased, creating a more even representation of ecological types (e.g., pollinators, herbivores, scavengers, etc.) Project: [Insect Biodiversity Monitoring at Riparian Restoration Sites in the City of Santa Rosa](http://www.sonoma.edu/waters/projects/vegmanagement/insect_biodiversity.html)
* Twenty undergraduates were trained as land managers as part of the CEI’s Land Management Training program. Project: [Center for Environmental Inquiry's Land Management Training Program](http://www.sonoma.edu/cei/programs/grasslands.html)
* Restoration activities (e.g., shoveling, raking, carrying dirt in a wheelbarrow) showed similar increases in heart rate and blood glucose depletion when compared to walking. However restoration activities showed higher levels of energy expenditure. While both walking and restoration generally showed increases in positive emotions and decrease in negative emotions, restoration was dramatically better at decreasing feelings of fatigue, being worn out, and exhaustion. Project: [Copeland Creek Riparian Restoration Exercise Project](http://www.sonoma.edu/waters/projects/vegmanagement/kinesiology.html)

*Water Quality*

* *E. coli* concentrations greater than the US EPA regulatory limit were found in the SSU lakes (both east and west lake) in October. Levels did not reach EPA regulatory limits in nearby Copeland Creek in either October or March despite an overflow connection between the lakes and the creek. Project: [Nutrient and *E. coli* Levels Upstream and Downstream of the Proposed Detention and Recharge Basin](http://www.sonoma.edu/waters/projects/water_quality/bacteria.html#collapse4)
* Species richness of macro-invertebrates in the two SSU Lakes (which overflow into Copeland Creek) are lower than Turtle Pond (also man-made) at the Fairfield Osborn Preserve. Species richness was startlingly low in the East Lake (only one species). Project: [Assessing Invertebrate Diversity in Highly-Altered Aquatic Ecosystems](http://www.sonoma.edu/waters/projects/water_quality/ponds.html) This project won “Best Water Poster” at the 2015 Science Symposium.
* Phosphorus and nitrogen exceeded the maximum allowable levels at two sites on Copeland Creek and two sites on the Laguna de Santa Rosa during 7 sampling days between August and February. Dissolved oxygen was often below accepted levels. All samples were analyzed by a certified laboratory. Project: [Rohnert Park Nutrient Loading](http://www.sonoma.edu/waters/projects/water_quality/rohnert_park.html)
* As part of long-term water quality monitoring, an unexpected rise in Total Dissolved Solids on the campus section of Copeland Creek was detected. The rise was attributed to runoff from the Beaujolais Pond on the SSU campus. Project: [Copeland Creek Water Quality Monitoring Project](http://www.sonoma.edu/waters/projects/water%20quality/water_quality.html)
* Dense mats of the water fern, *Azolla sp.*, were observed this year in many ponds throughout the county. The overgrowth blocks sunlight and depletes oxygen. Initial measurements by a freshman student found that oxygen levels were sufficiently low to exclude fish and other forms of life. Project: [Oxygen Depletion by the Water Fern, *Azolla sp*.](http://www.sonoma.edu/waters/projects/water_quality/pond-oxygen.html)

*Water Availability and Use*

* Students found a high correlation (r2 = 0.84) between rainfall at the Bodega Marine Laboratory and the Fairfield Osborn Preserve suggesting that rainfall totals at Bodega Bay can be used to warn Rohnert Park about flood conditions. Project: [Predicting Extreme Rainfall at Fairfield Osborn Preserve](http://www.sonoma.edu/waters/projects/availability_use/extreme_rainfall.html)
* Advances in the Osborn Sensor Network in the Upper Watershed included establishment of real-time data communication and power support for the weather station (calibration, wireless connection, 1,000 W solar power). Installations provided ½ mile of wifi coverage on the preserve. Project: [Automated Sensor Network for Copeland Creek Headwaters](http://www.sonoma.edu/waters/projects/availability_use/sensor_network.html)
* An evaluation of 116 urinals and 2,304 toilets on the SSU campus found that the cost of switching from low-flow to no-flow urinals would pay for itself within two years. However, a second study which estimated that actual electrical costs to SSU (SSU pumps its own well water, rather than purchasing it) found that savings in electrical costs are half that assumed for the other analysis, doubling the time it would take for urinal replacement to pay for itself. Projects: [Water Efficiency Projects on the SSU Campus](http://www.sonoma.edu/waters/projects/availability_use/water_efficiency.html)
* Philosophy students evaluated the ethics of water use. Projects: [Philosophical and Ethical Values of Water Choice](http://www.sonoma.edu/waters/projects/availability_use/philosophy_technology.html)

*Projects in Development*

* An evaluation of constructed fish refuge habitat on Dry Creek was undertaken. Results and presentation are planned for Spring 2016. Project: [Evaluation of Fish Habitat Restoration on Dry Creek](http://www.sonoma.edu/waters/projects/vegmanagement/fish_channel.html)
* Copeland Creek traverses the Sonoma State University Campus. For years, faculty and student volunteers have worked with SSU Facilities personnel, under the Copeland Creek Master Plan, to try reduce the dense undergrowth of blackberry. Yet with the sporadic approaches, blackberries have grown back in abundance. A more strategic approach is needed to plan long-term solutions that will improve habitat. Project: [SSU Copeland Creek Restoration Project](http://www.sonoma.edu/waters/projects/vegmanagement/ssu_copeland.html)
* Microbial Fuel Cell (MFC) treatment systems can extract and utilize chemical energy. This project is developing an MFC that can extract energy and purify water from high-strength winery and brewery wastewater. Project: [Modular Biotreatment for Wine and Brewery Waste Water](http://www.sonoma.edu/waters/projects/availability_use/biotreatment.html)