2015-16 ACCOMPLISHMENTS

for additional details see www.sonoma.edu/waters

Participating Students and Faculty

* 500 students participated in 34 projects with 21 faculty. Participants included students in 21 courses, 12 departments, and 4 schools. Students engaged in service-learning, independent research, senior capstone projects and student assistantships.
* WATERS engaged more than 600 additional students, faculty, staff and community members at three events:
  + 2016 SSU Symposium on Research and Creativity, May 4, 2016 - WATERS collaborated with the School of Science & Technology, the Office of Undergraduate Research and Creative Experiences (SOURCE), and others to host a campus wide symposium that celebrated the achievements of SSU students engaged in inquiry. This year, 24 posters were submitted to the symposium on water related topics.
  + The Nature!Tech Conference, May 7, 2016 - The WATERS Collaborative served as a model for innovation collaborations between business and academics. Mike Thompson of SCWA served on a Nature!Tech panel exploring how data and technology can be brought to bear on watershed challenges.
  + WATERS at the Sustainable Enterprise Conference, April 7, 2016 - Waters Program Lead and CEI Director Claudia Luke moderated the Sustainable Water panel this year at the 2016 Sustainable Enterprise Conference. Panel speakers included Mark Trotta (SCWA).

Partnerships

Staff from 15 organizations worked with faculty and students on water projects.

* Sonoma County Water Agency
* SSU Facilities
* Center for Environmental Inquiry
* Vintners Square, D’Argenzio Winery
* Sonoma County Youth Ecology Corps
* PG&E
* City of Rohnert Park
* Dew Mobility
* City of Santa Rosa
* Sustainable North Bay
* US Fish & Wildlife
* Pepperwood Preserve
* US Forest Service
* Sustainable SSU
* Sonoma Mountain Ranch Preserve

Summary of Findings

*Habitat Management*

* **Copeland Creek Riparian Restoration -** Students drafted scope of work in grant application format for funds to restore the section of Copeland Creek that crosses campus. Disadvantaged youth undertook black berry removal and other projects on Copeland Creek as part of Sonoma County Youth Ecology Corps
* **Do constructed vernal pools provide habitat for endangered California tiger salamanders**? Constructed vernal pools were found to be as effective as natural pools in supporting tiger salamander populations.
* **Land use changes and their effects on riparian areas -** Interviews with neighbors of SSU preserves documented land use and riparian changes in the last 50 years.
* **Determinants of red-legged frog abundance in critical habitat -** Red-legged frog adult and egg mass abundance were not related to water quality or invertebrate diversity at 3 ponds in Sonoma Mountain critical habitat. A larger sample size is needed.
* **Management implications of climate change impacts on amphibians and reptiles -** Amphibian and reptile abundance varied with soil moisture, with plethodontid (lungless) salamander activity showing the tightest correlation. The data provide a tool for land managers to predict the impacts of climate change on ecosystems. Accuracy of data collected by citizen scientists was also evaluated.
* **Land Management Training -** CEI’s Land Management Program trained 20 students in restoration techniques and they worked on five ecological restoration projects with partners in west Sonoma County.
* **Freshmen studies in habitat management** - Sites at Osborn Preserve (public access restricted) and Sugarloaf State Park (public access) had similar levels of alkalinity, pH, canopy coverage, and pacific giant salamander abundance.

*Water Quality*

* **Quantification of nitrogen and phosphorus in sediments of Copeland Creek and the Laguna de Santa Rosa** - Levels nitrogen and phosphorus in fine sediments increased with distance from the headwaters of Copeland Creek to the Laguna de Santa Rosa. Results suggest that sediment basins installed in the upper watershed could reduce nitrogen and phosphorus levels in the Laguna.
* **Waste water treatment effects on antibiotics -** A growing concern is the fate of antibiotics that end up in our waterways after they are treated at waste water treatment plants. By-products of the antibiotic Azithromycin were identified under conditions that simulated waste water treatment.
* **Copeland Creek water quality monitoring project -** Total Dissolved Solids (TDS) showed a dramatic rise along the SSU campus portion of Copeland Creek.
* **Nutrient and *E. coli* levels upstream and downstream of the proposed detention and recharge basin -** Constructed lakes on the SSU campus overflow into Copeland Creek during storms. In March, bacteria levels at 2 of 6 sample sites on the East Lake exceeded EPA regulatory limits for *E. coli*.
* **Freshmen studies in water quality** - Copeland Creek and a Sonoma County landfill pond showed similarly low levels of nitrate and phosphorus. Compost produced a higher growth rate in radish seedlings when compared to commercial fertilizer but only half the amount of nitrogen in water runoff. A freshwater marsh supported macroinvertebrates with both high and moderate water quality tolerance levels, indicating an intermediate water quality between a nearby pond and section of Copeland Creek.

*Availability and Use*

* **Rohnert Park flood warning system**: Students presented the design for an early flood warning system for the City of Rohnert Park at the Global Cities Team Challenge in Washington D.C. to compete for further funding for the project.
* **Development of a modular biotreatment system for winery and brewery wastewater** - A team of biology and engineering students tested a small-scale microbial fuel cell system for the D’Argenzio winery. The system, which treats waste water and generates electricity, showed treatment efficiencies close to that of full-scale high-efficiency anaerobic digesters but used less energy.
* **Sustainable water solutions -** Six of 9 schools in the North Bay had at least one sustainable water use practice in place on campus, but 4 of the respondents knew very little about sustainable water usage at their school.
* **Graphical user interfaces for non-technical users to explore rainfall, C02, and wildfire data** - Graphical user interfaces (using Matlab) created intuitive interfaces for non-technical users to explore rainfall, C02, and fire data in California and the U.S.
* **Comparing and analyzing climates in the upper watershed and alluvial fan of Copeland Creek -**  Students identified an optimal location for a weather station on the SSU campus that could be used to contrast weather on the creek’s alluvial fan and headwaters.
* **Automated sensor network for Copeland Creek headwaters** - Development of the automated watershed sensor network included solar power design and installation to run sensor platforms, real-time data display, and new methods for data collection, such as backpacks and autonomous vehicles.
* **Philosophy and ethics of water choice -** Students studied the philosophical, political, and social values that influence the decisions we make about water.
* **Predicting extreme rainfall in the Copeland Creek watershed -** Rainfall data from Bodega Bay can be used to predict extreme rainfall in the Copeland Creek headwaters, providing an opportunity for development of an early flood warning system for Rohnert Park.
* **Development of an ultrasonic sensor to monitor water use -** Students developed alow-cost ultrasonic depth sensor that accurately measured water levels in a tank. The sensor does not need to be submerged and can transmit data wirelessly.

*Erosion and Sedimentation*

* **Trail erosion and remediation at the Osborn Preserve** - Students quantified erosion at previous trail work sites and undertook remedial treatments to further reduce soil loss.
* Freshmen studies in erosion and sedimentation - Twelve sites on the Sonoma State campus had a desirable levels of soil porosity. A comparison of Copeland Creek stream channel in the headwaters and alluvial fan showed a greater proportion of fine sediments at the lower elevation site. On Sonoma Creek, sediment in the water column increased from upstream to downstream areas.

*Arts*

* **Raw clay installation at the Fairfield Osborn Preserve** - Students created and installed a raw clay sculpture along trails at the preserve and observed changes with the winter storms. As student artist Briona Hendren commented, "the purpose of these works is that they are to only exist, but for a moment in time, to speak to the ephemeral way life is and how one day everything returns back into the Earth.”