The Watershed Institute is an Educational, Research, Public Outreach, and Service component of the School of Natural Sciences (SNS) at CSUMB.

MISSION
The primary mission of the Watershed Institute is to support the vision and academic programs of SNS and CSUMB through education, research, restoration, and policy that will protect and enhance the watersheds of the Monterey Bay Area and beyond.
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1 Preamble
The Watershed Institute is proud to submit our annual report of activities. This year marks our 23rd year of collaboration between faculty, researchers, outreach specialists, undergraduate and graduate students and community members.

2 Introduction
The Watershed Institute is an educational, research, public outreach, and service component of the School of Natural Sciences (SNS) at CSUMB.
2.1 Primary Mission
The primary mission of the CSUMB Watershed institute is to support the vision and academic programs of SNS and CSUMB through education, research, restoration, and policy that will protect and enhance the watersheds of the Monterey Bay Area and beyond.

2.2 Purpose
The purpose of the Watershed Institute is to:
1) Assist CSUMB to fulfill its mission, goals, and objectives by providing community outreach and education, research, and Service Learning opportunities, environmental restoration, and resource policy development.
2) Provide an institutional base for visiting scholars, adjunct faculty, and post-doctoral and other academic fellows, thus augmenting the teaching and scholarship efforts of CSUMB faculty and students.
3) Provide research opportunities and association for CSUMB faculty, staff, and students.

The CSUMB Watershed Institute has been continuously operational and self-funded since 1994, one year before CSUMB admitted its first students. The mission of the Watershed Institute remains vital and unchanged in 18 years of operation. While the mission statement is specific to conservation and restoration of Monterey Bay watershed systems, our work influences a much broader region, and now continues to spread outward through an army of trained watershed scientists who take the values and skills of the CSUMB Watershed Systems curriculum to their various careers and graduate school experiences.

The Institute was envisioned as a center for research, education, and outreach with the simple goal of improving the flora, land, and water resources of the Monterey Bay region. Today that vision continues to be realized, and the regional scope has increased as new faculty and staff continue to bring diverse interests and expertise to the table.

Figure 1: Carr Lake, Salinas, Feb 17, 2017 after high rainfall periods. The 73 acres to the left of this photo has been purchased (January 2017) by Watershed Institute partner, The Big Sur Land Trust as the first acquisition of what is to be Carr Lake Park. The establishment of this park will provide years of opportunities for Watershed Institute restoration and research.

This Annual Report complies with CSUMB Policy and Procedures for Centers and Institutes (Academic Affairs, 2009a, 2009b).

Annual Report Distribution

Chair, School of Natural Sciences
Dean, College of Science
University Provost
University Associate Vice President for Academic Planning and Institutional Effectiveness
University Corporation
Watershed Institute Advisory Committee

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3 Activities
The 2016-2017 Watershed Institute activities are organized as annotated lists with headings that place the activity within the context of the Watershed Institute mission statement and purpose. While the individual activities usually fulfill more than one part of the mission statement, they are presented only once, under the most representative heading. These lists are renewed annually as evidence of recent mission fulfillment.

3.1 Article One of the Watershed Institute Purpose
Article one of the Watershed Institute purpose states that we will, “Assist CSUMB fulfill its mission, goals, and objectives by providing community outreach and education, research and Service Learning opportunities, environmental restoration, and resource policy development.”

3.1.1 Resource Policy Development and Community Outreach
We are very deeply involved in resource policy development in our region and beyond. We serve the community in this regard by giving lectures, developing curriculum, organizing symposia, and holding community-based watershed restoration events. We have a history of strong civic engagement in local resource management, and currently represent CSUMB at several important venues. Collectively, the Watershed Institute Faculty and Staff serve on numerous technical advisory committees (TAC) and advisory boards to foster science-based environmental decision making, and to advocate for community involvement in environmental decision making. A sample of 2016-2017 activities is presented below.

1) CSU – Water Resources Policy Initiative
   Active participation in the CSU-wide initiative.

2) Integrated Regional Water Management Plan” (IRWMP)
   Charter committee members fostered CSUMB and regional collaboration in the State bond process to develop sustainable water quantity and quality

3) Central Coast Wetlands Working Group

4) Yellowstone Bison Program
   Provides landscape data and model predictions on a routine basis to inform wildlife management activities

5) Zambian Carnivore Program
   Conducts research for protected area management through local capacity building including training and employment of Zambian nationals in ecological research techniques (e.g. habitat mapping)

6) Fort Ord Land Use
   Creates trail master plans, maps, and spatial analyses of Fort Ord Land Cover in collaboration with open-space community groups and agencies.

7) Transportation Agency for Monterey County
   a. Trail Planners Advisory Council
   b. Transportation Safety & Investment Plan - Community Leaders Group

8) CSUMB Master Plan Update
   a. Transportation Committee
   b. Sustainability Committee

9) Fort Ord Rec Trail and Greenway (FORTAG) – See Section 12 of this document.
10) Camp SEA Lab Board
Provides guidance for residential marine science education program

11) Carr Lake Core Planning Group for Community Engagement

12) Satellite Irrigation Management Support (SIMS)
Collaborative effort to develop new information products from satellite data to support optimization of agricultural water management; project partners include NASA Ames Research Center (ARC), CA Department of Water Resources (DWR), CSU Fresno, USDA Agricultural Research Service, UC Davis, UC Cooperative Extension, USGS, Dole, Tanimura and Antle, Chiquita, Driscoll’s, Huntington Farms, and Western Growers Association.
http://ecocast.arc.nasa.gov/sims/

13) Quantifying the benefits of best management practices for irrigation and nutrient management:
Research to compare on-farm water use efficiency, nitrate leaching, nitrous oxide emissions, and fertilizer and pumping costs under different BMPs for irrigation and nutrient management. This research is supported by the CSU Agricultural Research Institute, the CDFA Fertilizer Research Program, and the CDFA Specialty Crop Research Program, and is being conducted in collaboration with UCCE, CSU Fresno, Driscoll’s, D’Arrigo Bros., Dole, and Huntington Farms.

14) Fallowed Area Mapping Project
Research to develop within-season maps of drought impacts on agricultural production, and map land falling across California, Washington and Nevada during drought events. Project partners include NASA ARC, CA DWR, the CA Department of Food and Agriculture, USGS, Washington State Department of Agriculture, Nevada State Engineer’s Office, USDA, and the Nature Conservancy. CSUMB is currently working with NASA and CA DWR to transfer the workflows developed to CA DWR for sustained operational use.

15) Expanded Bioreactor Project
Four new four-channel research bioreactors have been built on campus. These research bioreactors are used for investigating different types of support matricies, elevated temperature operation, and supplemental carbon injection with the intent of improving bioreactor efficiency by a factor 10X. A larger, field scale, comparative reactor is being constructed in collaboration with the Central Coast Wetlands Group and Waterways Consulting Inc. The goal is to use a model based approach to compare treatment systems in triplicate, simulating a 5-10 acre farm runoff volume through each reactor. The projects are funded through the California Department of Pesticide Regulation the ARI, and UROC.

16) Return of the Natives Advisory Board—meets annually to advise RON program.

17) Carmel River Watershed Conservancy Advisory Board.

18) Moro Cojo Technical Advisory Committee

19) FogNET research collaborative
Dedicated to measuring and analyzing the impact of fog water as a resource in California coastal ecosystems. Research has been supported by grants from the National Science Foundation, a contract with a startup called NBD Nano, and a donation from Proximo Spirits.
20) 21) Sustainable City Year Program: A new campus program that began in 2015 that integrates class projects with city sustainability needs. The City of Salinas is our first city partner (from 2015-2017). Several of the projects with the City (taken from across campus) addressed issues of environmental education and environmental literacy, consistent with the stated purposes of the Watershed Institute.

21) Greater Monterey County Regional Water Management Group

3.1.2 Service Learning
Each semester, the Watershed Institute Staff provide many undergraduate students with service learning opportunities through a course called “Community-Based Watershed Restoration.” In that experience, students come to understand the value of creating community events where residents can emotionally connect with the land on which they live. It is believed that through this connection individual citizens grow to become better stewards of the environment. A key component of this effort is working with K-12 students on hands-on plant ecology restoration projects that foster good stewardship at a young age. Other service learning courses from across campus also utilize watershed topics in their curricula with their students completing their service through the Watershed Institute’s Return of the Natives Restoration Education Project, RON. These classes include, ENSTU349S, ENSTU 369S, ENSTU384S, BIO 379S, MSCI 361S, and SL200s.

3.1.3 Environmental Restoration
Environmental restoration is the intentional, incremental improvement of natural ecological or resource function of the landscape in direct response to centuries of unintentional incremental degradation. The Watershed Institute is directly involved with environmental restoration in three ways. First, we have led community-based restoration efforts for many years in the region around CSUMB. This effort has brought thousands of hands, young and old, to work on ecological restoration of native plant communities and the eradication of non-native invasive species. Second, we design and implement river/floodplain restoration projects, and review and improve the designs of others. Faculty and students have been the primary researchers monitoring the positive and negative impacts of the San Clemente dam removal (the largest in such project in CA history). There is a Watershed Institute presence on a variety of technical advisory committees whose purpose is to restore specific sites in California. Examples of these TAC positions are listed in Resource Policy Development section. Less directly, we have educated hundreds of CSUMB students in the value and skills of environmental- and community based-habitat restoration and restoration monitoring.

3.1.4 Presentations to the local community


Fernandez, D., June 2016, Integration of both on-and off-campus transportation projects within two different classes at CSUMB. California Higher Education Sustainability Conference, CSU Fullerton.

Smith, D., Regional Geology for Naturalists presentation to the California Science Naturalists Course at PG Museum of Natural History.

Smith, D., CSUMB OLLI and MPC Gentrain Society-- Geomorphology: The Science Behind Stunning Central Coast Landscapes

Smith, D. Monterey Kiwanis: Dams---The Good, Bad, and Ugly

Smith, D., Expert Panel for “Just Water” organization.

Watson F. and Waltz, S. 11 May 2017. Fort Ord Rec Trail and Greenway. Presentation to Fort Ord Recreational Trails (FORT) Friends group


Watson F. and Waltz, S. 14 Feb 2017. FORTAG presentation to Monterey County Hospitality Association, Board of Directors


Watson F. and Waltz, S. 10 Nov 2016. Fort Ord Rec Trail and Greenway. Presentation to Rotary Club of Monterey

Watson F. and Waltz, S. 10 Oct 2016. Fort Ord Rec Trail and Greenway. Presentation to CSUMB Academic Senate

Worcester S., Interpreting Natural History presentation to the California Science Naturalists Course at the PG Museum.

3.2 **Article Two of the Watershed Institute Purpose**

The second article of the Watershed Institute purpose states that we will, “Provide an institutional base for visiting scholars, adjunct faculty, and post-doctoral and other academic fellows, thus augmenting the teaching and scholarship efforts of CSUMB faculty and students.”

Dr. Lars Pierce, Forrest Melton, and Kirk Post are adjunct professors currently associated with the Watershed Institute. Their research, which is briefly described below, provides multiple opportunities for CSUMB students to engage in cutting edge research in the use of satellite data and sensor networks to enhance the sustainability and efficiency of agricultural operations in California.

Dr. Pierce is leading plant and fire ecology studies on Fort Ord FORA and ESCA property located adjacent to campus. These projects have involved local land management agencies, including the Ft. Ord Reuse Authority, the US Army BRAC, the BLM, and Fort Ord Coordinated Resource Management and Planning Group. Beginning in 2004 several CSUMB student have been employed by the project. Several of these students have gone on to careers in the environmental sciences. In conjunction with researchers at NASA Ames Research Center, he is also working...
to combine a suite of geospatial and modeling tools to help improve irrigation efficiency in California vineyards. Dr. Pierce and his group are providing weekly irrigation forecasts to vineyard managers at 30+ California vineyards in 2015. He has been associated with CSUMB for over a decade and continues to serve CSUMB in a variety of ways through his association with the Watershed Institute. Dr. Pierce has continuously generated financial support and mentorship for student researchers; he maintains excellent relationships with community partners. For more information on Dr. Pierce's research and outreach activities, see https://sites.google.com/a/csumb.edu/lars/.

Forrest Melton is leading a research mission to develop new information products from satellite data and surface sensor networks to address agricultural water management challenges in the western U.S. Ongoing work conducted in collaboration with growers in the Salinas Valley and across California is developing near real-time estimates of crop conditions, crop water requirements, and land-fallowing across millions of acres of irrigated farmland. The project is also developing web and mobile data interfaces to enhance the ability of growers to access and use satellite information in irrigation management. His work integrates CSUMB students in a variety of paid, research and technology-based internships. Forrest is also a co-investigator on the NASA Earth Exchange project at NASA Ames Research Center, which integrates NASA's supercomputing resources and large Earth observation datasets to accelerate global change research and quantify the impacts of climate change on ecosystem, water resources and agricultural production. Forrest is one of our key collaborative links with the NASA Ames Research Center research group. For more information, please see http://ecocast.arc.nasa.gov/peop/forrest.php.

3.3 Article Three of the Watershed Institute Purpose

The third article of the Article of the Watershed Institute purpose states that we will, “Provide research opportunities and association for CSUMB faculty, staff, and students.”

The faculty, staff, and students of the Watershed Institute have published a great number of peer-review journal articles, abstracts, technical reports, and theses as evidence of the research opportunities we enjoy. Since 2000, over 200 publications have been generated by the Watershed Institute faculty, and a great number of those have student coauthors. A nearly complete list of publications is kept up to date at the Watershed Institute Publications website http://ccows.csumb.edu/pubs/. These publications focus on serving community research needs, so they represent solid evidence of CSUMB community outreach via Watershed Institute associates. One tangible way that the Watershed Institute enables publication is through the “Watershed Institute Publication Series,” an internally-reviewed and moderated technical report series that archives applied science performed by the research arm of the Watershed Institute. To date there are over 170 Watershed Institute technical reports published on the Watershed Institute Publications website; virtually all of them have at least one student co-author. The great majority of the technical reports were commissioned contract products, underscoring a strong record of grantsmanship through the CSUMB University Corporation. The Watershed Institute Publication Series has been highlighted in the Environmental Monitor, the quarterly publication of the Association of Environmental professionals http://ccows.csumb.edu/pubs/magazine_articles/EM-Summer-2012.pdf.

Occasionally, the Watershed Institute publishes a digital newsletter. http://watershed.csumb.edu/wi/
Publications representing activity in 2016-2017 are listed below, including CSUMB student co-authors.

Peer-Reviewed Journal Articles 2016-2017


Editor-reviewed journal articles:

3.3.1 Book Chapters 2016-2017


3.3.2 Published Abstracts/Posters 2016-2017


### 3.3.4 Theses and PSM Internships (Master of Science in Applied Marine and Watershed Science)

<table>
<thead>
<tr>
<th>Student</th>
<th>Project Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ryan Bassett</td>
<td>Sediment budget through a Large-Scale Wetland Restoration Project: Implications for Climate Change</td>
</tr>
<tr>
<td>Kaitlyn Chow</td>
<td>Watershed Monitoring and Assessment at Hollister Hills State Vehicular Recreation Area</td>
</tr>
<tr>
<td>Anna Conlen</td>
<td>Sediment lab and field office technician with USGS - California Water Science Center</td>
</tr>
<tr>
<td>Julia Fields</td>
<td>Vegetation Mapping of Point Lobos State Natural Reserve</td>
</tr>
<tr>
<td>Steve Flores</td>
<td>Assessing the physical, chemical, and biological parameters of stream communities before and after fish passage removals along watersheds of the Los Padres National Forest</td>
</tr>
<tr>
<td>Michael Hang</td>
<td>NASA ARC-CREST Fallowed area mapping in California</td>
</tr>
<tr>
<td>Kristen Hart</td>
<td>Monterey Bay National Marine Sanctuary Management Plan Review</td>
</tr>
<tr>
<td>Alex Henson</td>
<td>Species composition and community structure analyses, former Fort Ord, California with Burleson Consulting</td>
</tr>
<tr>
<td>Lauren Luna</td>
<td>Evaluating trail erosion in the Hollister Hills State Vehicular Recreation Area</td>
</tr>
<tr>
<td>Leah Mccarter</td>
<td>Land Stewardship and Conservation Easement Monitoring Internship with Big Sur Land Trust</td>
</tr>
</tbody>
</table>
3.3.5 Undergraduate Student Reports/Capstones

An Examination of Elevated Nitrate Concentrations on Microbial Denitrification Rates and Populations”
CSUPERB Biotechnology Symposium; Poster Presentation, Z. Mortensen, M. Leandro, A. Carpenter, A. Ball, A. Haffa, and J. Silveus, January 2017

Determination of Bacterial Colonization of Woodchip Denitrifying Bioreactors Using Different Wavelengths for a Turbidity Measurement, A. Carpenter, BIO Research Capstone, Spring 2017


Efficacy of Bioremediation of Agricultural Runoff Using Bacterial Communities in Woodchip Bioreactors Z. Mortensen, M. Leandro, A. Carpenter, A. Ball, A. Haffa, and J. Silveus, CSU Monterey Bay Summer Symposium; Poster Presentation August 2016

Efficacy of Bioremediation of Agricultural Runoff Using Bacterial Communities in Woodchip Bioreactors , Z. Mortensen, M. Leandro, and J. Silveus, American Geophysical Union (AGU) Fall Meeting; Poster Presentation December 2016


Nitrate Reducing Bacteria in Woodchip versus Bioball Bioreactors from California State University, Monterey Bay (4 posters), Denise Paciotti, Adrianna Arreola, Aileen Arreola, Iris Rivera, Brianne Shea, Andre Shabazian, Samuel Cude, Elise Vickland Melia Susilowati, Victoria Montoya, Jazmine Ahumada, Tiffany Lee Kevin Luong, Oscar Pioquinto, Yasmine Santos, Katia Pardo Ortiz, Kirstyn Nimmers Kevin Laires, Silvia Casillas-Fernandez, Victoria Thornton, Nancy Mendoza, Courtney Yarber, BIO Course Based Capstone, Spring 2017.

Temporal and spatial patterns of predation by domestic cats in Monterey County, CA. Brown Carman, S., Foster, R., Hernandez, M., Menor, M., Wilson, S. ENVS Course Based Capstone, Fall 2016.

Undergraduate Research Opportunity Center Fall Showcase; Oral Presentation November 2016 An Examination of Nitrate Concentrations and Bacterial Denitrification Rates in Woodchip Bioreactors , Z. Mortensen, M. Leandro, A. Carpenter, A. Ball, A. Haffa, and J. Silveus

San Clemente Dam Removal: Modeling Steelhead Migration in Year Two (oral and poster), Capstone Research: Tianxin Wang, Alixandra Rachman, Joey Klein, Alejandra Reyes, Justin Bolger, Zane Mortensen, Stephen Georgianni, Max Hofmarcher, Brittany Venlet, D. Smith advisor.

4 Connection to University

The Watershed Institute exists to serve the CSUMB mission. That commitment is explicitly stated in the mission and purpose statements of the Watershed Institute and is demonstrated in evidence throughout the report. The Watershed Institute is fully integrated with the University because it is run by dedicated CSUMB professors and long-term staff.
5 Impact of Activities on the Academic Program(s) of the University

The Watershed Institute positively impacts the academic programs of the university in a variety of significant ways. The Watershed Institute faculty design, continually improve, and deliver the core curriculum in the Watershed Systems concentration of the B.S. in Environmental Science, the B.A. in Environmental Studies, and the watershed emphasis of the M.S. in Coastal and Watershed Science & Policy. Course activities within this core curriculum are often tied to real-world projects based in the local community. We teach watershed-centric service learning courses and coordinate service learning for the Service Learning Institute. Research projects and contracts associated with The Watershed Institute provide continual student opportunities for meaningful work, internships, research, and publication. These projects provide CSUMB students with hands-on experience in real-world projects, and provide external funding to support undergraduate capstone projects and graduate theses.

The “Bob Curry Watershed Scholarship Fund” was established by the Institute in early 2012 for the annual benefit of a Watershed Science graduate student and a Watershed Concentration undergraduate student. Funds were obtained from a gift from Bob Curry and the sale of a collection of 19th Century maps. Dr. Robert Curry was the founding faculty member of the Watershed Institute. Bob also mentored numerous CSUMB faculty as they became acquainted with the unique geology and hydrology of Central California. The 2016-2017 “Bob Curry Watershed Scholarship Fund” recipients are: Graduate Student- Elizabeth Eichorn and Undergrad Student-Tessa Munsen.

The Watershed Institute is also instrumental in choosing winners of CSUMB’s annual “Garden Club of America” scholarship. The 2017-2018 Winner is Nancy Vilemas, who has worked with Return of the Natives for two years of her undergraduate education.

The Watershed Institute has been a key organizer of the yearly Central Coast Invasive Plant Conference (formerly the "War on Weeds" Conference). November 2016 featured the 18th annual conference attended by 110+ agency and academic personnel. The Institute also hosts an annual welcome reception for incoming science graduate students, and an annual post-semester reception celebrating students finishing their degrees.

Watershed Institute Faculty continue to mentor the student chapter of the Association of Environmental Professionals.

Watershed Institute Faculty Member Dr. Jennifer Dugan, is one of the advisers for the CSUMB Chapter of SEEDS. SEEDS is the flagship award-winning education program of the Ecological Society of America. Its mission is to diversify and advance the ecology profession through opportunities that stimulate and nurture the interest of underrepresented students to participate, and to lead in ecology. Focused mainly at the undergraduate level, with extension services for communities, high schools, graduate students, and international collaborations, the SEEDS program promotes an ecology profession with wide representation to ensure environmental understanding and a sustainable future for all. The core SEEDS program components offer hands-on, engaging experiences with ecology that exhibit the relevance and applications of the science. Each experience also provides opportunities to interact with a diverse group of ecologists and other motivated students to both broaden and deepen students’ understanding of ecology and potential careers.
6 Finances

The Watershed Institute has an incentive account that was funded by the University Corporation as part of PI grant overhead. As of April 9, 2007, institutional incentive overhead generated by Watershed PI’s is now pooled with SEP.org incentive funds. Institute activities this year were supported by the following categorized expenses (Table 1). The total budget is provided in Table 2.

<table>
<thead>
<tr>
<th>Category</th>
<th>Amount ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Starting balance June 5, 2016</td>
<td>$6,426.39</td>
</tr>
<tr>
<td>Income</td>
<td>0</td>
</tr>
<tr>
<td>Expenses</td>
<td></td>
</tr>
<tr>
<td>Ending Balance May 8, 2017</td>
<td>$6,426.39</td>
</tr>
</tbody>
</table>

* $4,500 of this amount (2016) is a donation from PG &E to support a graduate student who would work with PG&E on a local gas-line improvement project in regard to plant surveys.

Table 2: Watershed Institute Incentive Fund #10002143 Annual budget between June 2, 2015 and May 31, 2017

<table>
<thead>
<tr>
<th>Category</th>
<th>Amount ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Starting balance May 27, 2014</td>
<td>$8,644.96</td>
</tr>
<tr>
<td>Income</td>
<td>0</td>
</tr>
<tr>
<td>Expenses (Transferred to PG Stormwater project)</td>
<td>$6,948.96</td>
</tr>
<tr>
<td>Ending balance May 28, 2017</td>
<td>$1,696</td>
</tr>
</tbody>
</table>

7 Budget Forecast

The Watershed Institute personnel continue to actively pursuing extramural finds to support ongoing, new, and future research and outreach activities. Evidence is provided in the following two lists of current and proposed contracts. None of these contracts have increased the Watershed Institute operating budget since 2007, when all grant incentive funds were pooled with SEP.org.

7.1 Research Grants Received and Current Contracts 2016-2017


Burleson Consulting. For Restoration Consulting on CEMEX restoration programs ($7300) 2015-2017 LLLienk, PI

CA Department of Food and Agriculture FREP, Quantifying N2O Emissions under Different On-farm Irrigation and Nutrient Management BMPs that Reduce Groundwater Nitrate Loading and Applied Water, $270,000, July 2015-June 2018, A. Haffa (PI), K. Post (Co-PI).

CA Department of Pesticide Regulation, Isolating and Characterizing Microbial Bioremediators of Pesticides and Quantifying Bioremediation Rates in Multichannel Wood Chip Bioreactors, $150,000, PI A. Haffa, 01/01/2017-06/30/2019
CA Dept of Food and Ag., 2015. CDFA Specialty Crop Block Grant Program – Real-Time Irrigation Metrics for Improved Water Use Efficiency in Orchards and Vineyards, L. Pierce subcontract with Dr. David Smart, Dept. of Viticulture and Enology, UC Davis, 2015-2017.

CA Dept. of Water Resources, Automated farm-based irrigation scheduling using VSIM/TOPS ($192,390 / 2 yrs ; 2014-16), L. Pierce PI.

CA Dept. of Water Resources, Satellite Irrigation Management Support (SIMS); Mapping of Crop Water Requirements through Integration of Satellite Observations and CIMIS data. ($198,116 / 2 years ; 2015-2017). F. Melton PI.

California American Water, “Carmel Watershed Dam Removal Studies” ($19,999) D. Smith

California Coastal Commission-Whale Tail Grant-”Flows to the Bay-environmental stewardship-Salinas” ($28,000) 2014-2015. LLLienk, PI


California Fish and Wildlife. Community Based Restoration on the Fort Ord Dunes State Park Aids Coastal Species (7963) 2014-2016

California Sea Grant Program “Climate change and restoration factors affecting fecal pathogen

California State Parks Foundation: For native plant restoration on the Ft. Ord Dunes State Park ($6000) LLLienk, PI


Central Coast Wetlands Group for restoration on Salinas River State Beach (~$10,000) LLLienk, PI

Dynamics in wetland systems” (3rd year, at ~$22K/year to CSUMB as both a grant and a scholarship)

Effectiveness Study of Multiple Off-Farm Water Treatment Practices for Specialty Crop Farmers, CDFA, Watson, $52K to CSUMB

Habitat Conservation Fund of CA State Parks for weekend programs in Salinas ($71,240) Funded through 2019 LLLienk, PI

Monterey County Gives a project of the Community Foundation for Monterey County ($2700) 2016-2017 LLLienk, PI

Monterey Peninsula Management District, “2016 Carmel River Dam Removal Studies” ($14,040) D. Smith PI

Monterey Peninsula Management District, “Post-Soberanes Fire Bathymetry of Los Padres Reservoir” ($16,000) R. Kvitek PI, D. Smith Co-PI

Monterey Peninsula Unified School District in support of 5th grade “Eco-Ambassadors” Program with Return of the Natives. ($26,000) LLLienk, PI

NASA Climate & Biodiversity, 2011-2015. A. Hansen, MSU (PI), F. Melton (Co-I), Using NASA resources to inform climate and land use adaptation: Ecological forecasting, vulnerability assessment, and evaluation of management options across two USDI Landscape Conservation Cooperatives. $1.8M.


National Park Service. Snow modeling for bison/elk habitat assessments. ~$11K

NOAA SeaGrant, “Community Risk Assessment Process for Shoreline Erosion in Southern Monterey Bay” (4,361 subaward on $60,000). Collaborative work with MIIS and Center for Blue Economy. Doug Smith PI
NOAA/BWET “Flows to the Bay” with Save The Whales for Salinas Schools $13,000 LLLienk, PI

Packard Foundation, Making Climate Change Matter through Visualization of Climate Change Impacts at Local Scales. 2016-2017. F Melton (PI), $75,000.

REI Bannff Mountain Film Festival Co-sponsorship (~$12,000) 2017 LLLienk, PI
Rose Family Foundation for weekend funding in Creeks of Salinas Parks ($20,000) Funded. LLLienk, PI


Santa Rita School District “Science Learning in the Earth, Sky and Water Lab Modules and Garden Assistance” (~$16,000) LLLienk, PISouthern California Coastal Water Research Project, Biological indicators for assessment of intermittent and ephemeral rivers during dry phase ($32,945) PI: Olson

Sean Parker Conservation Fund: Bringing Marginalized Students to Monterey Coast ($200,000 2014-2017) still active funding LLLienk, PI

State Farm Insurance Youth Advisory Board in support of Return of the Natives work with MPUSD schools ($25,000) completed in Spring 2017 LLLienk, PI

UCSC Foundation: Nature Detectives: Exposing nature to children at the UCSC Ft. Ord Reserve in Marina ($5,000) LLLienk, PI

US Department of Interior/BLM to hire CSUMB science grads as Weed Interns working under BLM supervision ($50,000) 2016-2017 LLLienk, PI

US Department of Interior/BLM. For Return of the Natives’ community based restoration programs in schools and with general public, includes plant production and out-planting. Many student assistant positions ($30,000) 2016-2017 LLLienk, PI

US Environmental Protection Agency People, Prosperity and the Planet: Advanced Bioreactor, J. Skardon (PI), A. Haffa (co-PI), $15,000, 09/01/15-08/31/16.

US Fish and Wildlife Service: For Restoration at Monterey State Beach ($73,911 over 2 years) funding to be extended into 2018 LLLienk, PI

USDA NIFA, Improving Student Success in Agriculturally-related Sciences with Academic Support and Career Mentoring, $290,000, USDA, A. Haffa (PD), S. Anderson (Co-PD), Fall 2014-Summer 2017.


7.2 Research Grants and Contract Proposals Submitted 2016-2017

CA Department of Fish and Game: Restoration of Brackish and Freshwater Wetlands in the Coastal Monterey Bay Area. With MLML partnership ($90,000)


CSUMB’s Provost’s Office. 2016. Expanding undergraduate opportunities for research experience in terrestrial wildlife ecology ($5,800) J. Duggan.


National Science Foundation, MacroSystems Biology and Early NEON Science, Modeling the determinants of lotic ecosystem biodiversity from local to continental scales and predicting vulnerability to environmental alteration, collaborative research with Utah State University and University of Notre Dame ($390,624, CSUMB), J. Olson Co-PI, submitted October 2016.


Monterey Peninsula Management District, “2017 Carmel River Dam Removal Studies” (19,000) Doug Smith PI

7.3 Future Income

While the Watershed Institute continues to be a very productive source of extramural funds, the Watershed Institute incentive account no longer receives direct incentive fund deposits. On April 9, 2007, SEP.org was established to pool and manage institutional incentive funds for all institutes under the Division of Science and Environmental Policy. Watershed Institute faculty have no direct management or oversight of those funds, other than by providing single votes on spending proposals that are brought to the table, in accordance with the bylaws of SEP.org. Incentive funds used to support Watershed Institute activities must be approved by a majority of voting members present at SEP.org meetings, including those members not related to the Watershed Institute. The direct benefit of membership with SEP.org is indispensable post-award accounting and budget tracking support for Watershed Institute principal investigators. SEP.org has supported Watershed Institute projects such as purchase of necessary technology, small salaries for graduate students attending meetings on behalf of Watershed Institute PI’s, production of an e-newsletter and travel funds for PIs to attend in-state watershed meetings.

8 Current Income

As reported above, the Watershed Institute has two small sources of residual funds, the Watershed Institute Donation Fund and the Watershed Institute Incentive Account.

9 Personnel

The following list includes CSUMB faculty and staff who identify themselves with the Mission of the Watershed Institute via grant-funded activities, unfunded service, or by providing mission-specific curriculum in SEP courses during the 2016-2017 year in review.

<table>
<thead>
<tr>
<th>Name</th>
<th>Affiliation</th>
<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laura Lee Lienk</td>
<td>Adjunct Faculty</td>
<td>Co-Director, PI, instructor</td>
</tr>
<tr>
<td>Dr. Lars Pierce</td>
<td>Adjunct Faculty</td>
<td>Co-Director, PI</td>
</tr>
<tr>
<td>Dr. Fred Watson</td>
<td>Faculty</td>
<td>PI, instructor</td>
</tr>
<tr>
<td>Dr. Suzanne Worcester</td>
<td>Faculty</td>
<td>PI, instructor</td>
</tr>
<tr>
<td>Dr. Dan Fernandez</td>
<td>Faculty</td>
<td>PI, instructor</td>
</tr>
<tr>
<td>Dr. Arlene Haffa</td>
<td>Faculty</td>
<td>PI, instructor</td>
</tr>
<tr>
<td>Dr. Doug Smith</td>
<td>Faculty</td>
<td>PI, instructor</td>
</tr>
<tr>
<td>Name</td>
<td>Title/Position</td>
<td>Role</td>
</tr>
<tr>
<td>--------------------</td>
<td>---------------------------------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>Dr. Timothy Miles</td>
<td>Faculty</td>
<td>PI, instructor</td>
</tr>
<tr>
<td>Dr. John Olson</td>
<td>Faculty</td>
<td>PI, instructor</td>
</tr>
<tr>
<td>Forrest Melton</td>
<td>Adjunct Faculty</td>
<td>PI</td>
</tr>
<tr>
<td>Kirk Post</td>
<td>Adjunct Faculty</td>
<td>PI, instructor</td>
</tr>
<tr>
<td>Dr. Jennifer Duggan</td>
<td>Faculty</td>
<td>PI, instructor</td>
</tr>
<tr>
<td>Christina McKnew</td>
<td>Staff</td>
<td>Return of the Natives</td>
</tr>
<tr>
<td>Dr. Hester Parker</td>
<td>Instructor/Soon to be adjunct Faculty</td>
<td>Instructor-soon to be PI</td>
</tr>
</tbody>
</table>
10 Organizational Structure

The organizational structure of the Watershed Institute includes a director (or two co-directors) nominated and elected by simple majority of the SNS faculty who actively lead, or participate in, Watershed Institute activities (Figure 2). The directorship involves oversight of Watershed Institute incentive and donation accounts, setting meeting agendas, scheduling meetings, research and writing of the annual report, and fostering periodic institute review. In collaboration with the Watershed institute Advisory Board, the director fosters work leading toward achieving the Institute Mission.

While not officially part of the Institute Structure, several “programs” have emerged as distinct entities. These programs are shown schematically below. The research arm represents faculty, staff, and students involved in applied science driven by community needs. The community outreach arm includes faculty and staff involved in several long-term initiatives to improve the environment through community education and community-based restoration projects.
College of Science, (COS; Dean)

School of Natural Sciences (SNS; Chair)

Watershed Institute Advisory Board
(COS Dean, SNS chair, SNS faculty, Community members)

The Watershed Institute
(Laura Lee Lienk, Lars Pierce co-directors)
Watershed-based SNS faculty, staff, students, alumni

Local Community
(e.g. Resource Management, Agriculture, Education, etc.)

Environmental Ed & Service Learning
Conservation & Restoration
Central Coast Watershed Studies
Crop Water & Nutrient Management
11 Facilities
Between 1994 and 2003, the Watershed institute housed many of its core faculty, researchers, and operations in Building 42. Building 42 provides 2400 sq ft of space for offices, restroom, utility room and hallway. It also provides a 760 sq ft teaching space. The Watershed Institute nursery, occupies approximately 3000 sq ft of open land. The nursery is essential to cornerstones of the Watershed Institute mission--community outreach, education, and restoration. The native plant nursery is used to grow thousands of plants every year in support of WI restoration projects, and provide meaningful activities for a variety of community members, including a developmentally disabled adult group the “Green Thumbs.”

The 7+ acre field where the Watershed Institute nursery, the CSUMB Garden Club garden, and the Bio-Reactors are located was renamed the “Sustainability Commons” in late 2015 after a name vetting process involving all members of the WI team. The name “Sustainability Commons” can now be found on campus planning documents and maps.

In 2003, simultaneous overcrowding in Building 42, and opportunities for office and teaching lab space in the new Chapman Science Center (Bldg. 53) led to decentralization of Watershed Institute operations and faculty. In essence, the research arm of the Watershed Institute moved offices to building 53 and expanded the research and teaching laboratory operations to available space in Building 13 and the new capstone laboratory spaces in Building 53.

It is now very difficult to judge how much space the Watershed Institute operations occupy, since faculty activities are inextricably integrated with everyday operations of SEP and State teaching space and State offices. While we distinguish State-funded and Corporation-funded activities and equipment, they occur seamlessly in shared spaces across campus, including Building 42, where the Institute was founded and still thrives today.

The space needs of the Watershed Institute are forecast to increase as new science analytical equipment is purchased. Nursery operations will need to expand in response to funded community needs. In 2015 the addition of space for the Bio-reactor complex and its assorted structures has been absorbed into the WI Greenhouse Area. Building 13 space is efficiently utilized to employ 2 staff and a number of graduate and undergraduate students who work on externally funded projects. Currently, all the available office space is being used, and there remains a critical need for more office space, especially if more students are to benefit from grant-funded research.

12 Community Service
The CSUMB Watershed Institute has a very strong presence in the community. Community service is central to the Watershed Institute mission, and is embodied in its support of the CSUMB mission statement. The community we serve includes students, local, state, federal, and international resource agencies, NGOs, municipalities, other academic institutions, and individual stakeholders.

As detailed in section 2.1 of this report, the faculty volunteer on several regional technical advisory committees and advisory boards. In that role, we provide scientific input aimed at sound environmental policy decisions. As detailed in section 2 of this report we serve the community’s environmental needs through funded research, technical reports, and very substantially through community-based restoration projects (Tables 3 and 4).
Table 3: Return of the Natives Participants August 1, 2016-May 31, 2017

<table>
<thead>
<tr>
<th>Activity</th>
<th># Community Served</th>
</tr>
</thead>
<tbody>
<tr>
<td>General public Involved in watershed restoration with Return of the Natives</td>
<td>1375</td>
</tr>
<tr>
<td>K-12 school children contact experience in watershed restoration with Return of the Natives single activities</td>
<td>8056</td>
</tr>
<tr>
<td>K-12 individual children involved in multiple activities</td>
<td>7,482*</td>
</tr>
<tr>
<td>Number of Classroom Teachers Involved in RON Programs</td>
<td>35</td>
</tr>
<tr>
<td>Weekend Stewardship Activities--youth</td>
<td>1100</td>
</tr>
<tr>
<td>Weekend Stewardship Activities--families</td>
<td>275</td>
</tr>
</tbody>
</table>

*This means that 93% of the K-12 students reached by RON in 2016-2017 experienced multiple lessons in the classroom, schoolyard, local parks, and restoration sites in Monterey County Wild Areas

Table 4: Return of the Natives Brings CSUMB students to Community Service 2016-2017

<table>
<thead>
<tr>
<th>Annual Activity</th>
<th>Hours of Community Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>Return of the Natives staff supervises CSUMB Learning Students from courses across campus</td>
<td>46 students x 30 hours = 8 hours</td>
</tr>
<tr>
<td>Return of the Natives hires CSUMB student assistants as mentors and leaders in the community</td>
<td>12 students x 10 hours/week x 40 weeks/year =4800 hours</td>
</tr>
<tr>
<td>Return of the Natives hires CSUMB grads for Internships at BLM</td>
<td>3 grads x 1000 hours = 3000 hours</td>
</tr>
<tr>
<td>Return of the Natives staff supervises an AmeriCorps VIP member</td>
<td>1700 hours/year</td>
</tr>
</tbody>
</table>

Dr. Smith engages students in data collection and analysis for a variety of regional resource managers including helping Fort Ord BLM and State parks managers quantify erosion magnitudes and management. We are also working to monitor the extreme environmental changes occurring near the former San Clemente dam site. Students are also assessing the longevity of a beach nourishment project in Monterey.

Further, Watershed Institute faculty regularly train regional environmental docents. Recent activity includes several hours of training on regional geology and natural history interpretation for 30 Docents in training at Pacific Grove Natural History Museum’s “California Naturalists” class.

Dr. Watson works with numerous stakeholders in the reuse of the Former Fort Ord, most actively with respect to the Fort Ord Rec Trail and Greenway (FORTAG) project. Dr Watson co-created and co-leads the FORTAG initiative with Dr Scott Waltz (also at CSUMB). To date, the team has worked with 74 local organizations, convened 196 FORTAG meetings, given 18 public presentations, been highlighted in 12 media articles, and secured $20M in
funding for FORTAG via a voter-approved county sales tax increment (Nov 2016). In May 2017, the team co-led with TAMC a proposal to the federal government for $6M in additional funding (matched by $900K from TAMC). See: http://www.fortag.org

Dr Watson has also created a series of trans-jurisdictional trail maps of the region encompassing the former Fort Ord. See: http://www.fortord.info

Dr. Pierce works with growers on the North Coast and Central Coast, as well as in the San Joaquin Valley, applying remote sensing and water balance modeling towards the design and development of efficient irrigation schedules in winegrape vineyards. He also works with local resource agency personnel (US Army, BLM, FORA) in assessing the effects of prescribed fire on the Fort Ord Maritime Chaparral plant community.

Dr. Worcester works with the BLM on effectively managing grasslands to reduce fire hazard, increase species of interest, and increase biodiversity over all. This includes evaluating the effectiveness of using sheep or goats to manage grasslands for specific goals. This collaborative partnership has led to joint academic-agency presentations at local, state-wide and national conferences on the use of goats to maintain grassland habitats.

13 New and Continuing work from previous year --2016-2017

Sustainability Commons
The 7+ acre field where the Watershed Institute nursery, the CSUMB Garden Club garden, and the Bio-Reactors are located was renamed the “Sustainability Commons” in late 2015 after a name vetting process involving all members of the WI team. The name “Sustainability Commons” can now be found on campus planning documents and maps. In keeping with the underlying theme of sustainability in the renaming of the space, for the past year, members of the WI have been meeting with faculty in Teacher Education, Environmental Studies and the College of Science to discuss the design of a comprehensive outdoor space for sustainability-related activities. The emphasis of these initial discussions has been the identification and inclusion of potential stakeholders and the development of a core mission for the Sustainability Commons in order to eventually seek funding for the planning and infrastructure needs of the space. The mission is to provide experiential course-based learning, research, and co-curricular opportunities for CSUMB undergraduates and community members in sustainable and healthful living practices, habitat restoration, hands-on environmental and informal science education, and small-scale urban and peri-urban agriculture.

Expanded Research into Bioreactors

In the past year, we have expanded our original research on woodchip bioreactors for remediation of agricultural runoff. Four 4 channel bioreactors are now operational at research site on campus, near our existing greenhouse facility. The new complex also consists of outdoor classroom space. The site also has supported –half a dozen funded undergraduates working on bioreactor projects since its inception. Funding for the group has come from the CSUMB Undergraduate Research Opportunity Center (UROC), the CA Department of Pesticide Regulation, the Agricultural Research Institute (ARI), and Water Resources Policy Institute (WRPI).

Unique Partnership with CA State Parks
California State Parks and CSUMB have developed an internship program focusing on research and data analysis that is focused on answering specific natural resource management issues at Pt. Lobos State Natural Reserve, including helping Fort Ord BLM and State parks managers quantify erosion magnitudes and management. We are also working to monitor the extreme environmental changes occurring near the former San Clemente dam site. Students are also assessing the longevity of a beach nourishment project in Monterey.
Data collected will help state park staff manage these critical natural resources while providing a balance between human recreation and natural resource protection. The ENVS 410 Capstone course in Spring 2017 investigated the response of Soberanes Ck in Garrapata State Park to the 2016 Soberanes Fire, presenting their findings to State Park environmental scientists on 15 May 2017. These initial results will be built upon by further research during the summer of 2017.

**Soil Pathogen Learning Experience Pushes WI Nursery Best Management Practices**

Since 1995 the Return of the Natives (RON) has grown over 500,000 native plants at the Watershed Institute greenhouse for restoration sites around the Monterey Bay Region. This restoration came to a halt temporarily in January of 2015, as the nursery rushed to implement new best management practices after a water mold pathogenic to dicots, *Phytophthora tentaculata*, was found in sticky monkey flowers during routine monitoring at one of the restored sites in Fort Ord. This pathogen, native to Europe and Asia, has only recently become a management issue for California nurseries. One of the most infamous *Phytophthora* species was responsible for the Irish potato famine, and other species have already killed thousands of trees along California’s coastline.

Currently it is unknown where the “ground zero” for the *P. tentaculata* infection is. It is possible that it was already existing in one of the nurseries that shared pots with RON, that it already existed in Fort Ord, or that it was carried into the nursery by foot traffic. It is unlikely that it began with WI grown plants as the nursery houses only native species, while an invasive pathogen such as this it typically introduced through an ornamental species. However, in pursuit of transparency and good stewardship, under the direction of the CA Dept of Food and Agriculture and the Monterey County Ag Commissioner’s Office, Christina McKnew, the greenhouse coordinator, and Laura Lee Lienk, director of RON with funding from SEP.org, are implementing best management practices in order to prevent any further spread of the plant disease that could jeopardize our region’s ecosystems. These include:

- Disinfecting shoes upon entering and exiting the nursery
- Sterilizing growing pots before reuse
- Keeping field tools separate from green house tools
- Raising all potted plants off of the ground to prevent contamination from runoff, as the pathogen is carried through water
- Properly disposing of plants found to be contaminated, as well as, all nursery green waste

Dr. Timothy Miles, an expert on *Phytophthora* pathogenesis, was coincidentally and fortunately hired as a new College of Science faculty member and brought onto the WI team just before the infection was reported. He has previously worked with *Phytophthora* in Salinas, and in 2012, his diagnostic markers were utilized by the California Department of Agriculture in identifying some of the first appearances of *P. tentaculata* in California. With the help of student researchers he is currently developing new molecular diagnostic tools for tracking the mold’s spread. He will look to identify other sites in Fort Ord that may be infected in order to characterize and control its spread.

**14 Plans for Future Activities**

We anticipate that the next year will closely follow the success of the past 20 years of operation. The following un-prioritized bullet points provide insight into topical areas where we anticipate expansion of current initiatives and development of new work.

- Continue pro-bono trail & greenway master planning, GIS, & land-use mapping activities on Fort Ord (and surrounding areas) for the general benefit of open-space planning
- Continue to work with the Army, BLM, FORA, and the Ft. Ord CRMP Group to assist with the transition of former Ft. Ord Army lands to the public and private sectors. This will also include subcontract work with numerous Army restoration sub-contractors.
- Include increasing numbers of Environmental Studies undergraduate major students in RON outreach programs.
● Rename both the undergraduate ESTP and graduate AMWS programs Environmental Science. This will coincide with the separation of the marine-focused graduate students, and a renewed focus on watershed and terrestrial issues.
● Initiate opportunities for Applied Marine and Watershed Science graduate students to become more fully involved in strengthening the Watershed Institute infrastructure, i.e., through the re-creation of the Watershed Institute website, or, in representing the Watershed Institute in local and regional meetings/events.
● Increase the number of volunteers working with Return of the Natives through the RON’s DONs Volunteer Program
● Expand the use of GIS and modeling tools in the local agricultural community to enhance grower-understanding of crop water needs and to improve irrigation efficiency.
● Continue to expand the Watershed Institute role in the new CSU-Water Resources Policy Initiative.
● Create a “Growing/Learning Center.” The outreach and education programs of the Watershed Institute have in the past included an active Farm to School Program, the work of this program has been subsumed by a local non-profit agency. However, a great deal of student interest in sustainability, gardening and food production is occurring on campus. In the future, the idea of creating a “Growing/Learning Center” on campus open space may again be possible. Much work and visioning has gone into the creation of rough preliminary designs accompanied by narrative. In 2015 these designs are being shared with campus planners.
● Continue to influence emerging water supply policy along the Central Coast.
● Maintain the capacity to analyze and process water quality samples as a means to provide high quality data in the region and train students in analytic skills for future careers.
● Increase the collaboration with the agricultural industry to promote practices that protect the region’s water quality and water supply using external sponsored funds, e.g. USDA, CSU ARI, etc.
● Continue collaboration with organizations working on wildlife-landscape interactions in primarily international developing regions.
● Develop environmental service and outreach programs for youth in Salinas both for CSUMB outreach but also to address issues of marginalization and violence.
● Expand existing network of regional fog water collection instruments to document the relationships between the fog and the local flora, fauna, geography, and climate change.
● Continue to build linkages to the local agricultural community by providing access to summaries of satellite imagery and weather data, as well as modeling, for use in irrigation planning and assessment.
● Continue collaborations with the US Army, BLM, FORA, and local community to better understand the need for and the effects of fire on plant species composition in maritime chaparral, a special-status plant community with a limited distribution.
● Continue collaborations with the BLM on ways to effectively monitor grasslands to determine if resource management goals are being met.
● Developing closer ties to the Salinas Valley agricultural community by providing funded internships for students through the USDA NIFA grant.

15 Problems to be Addressed
The following bullets identify areas that we would like to improve or explore.
● Future vehicle and vehicle funding  We are working on this and expect to have a new WI Vehicle by mid-summer 2017
● Keeping WI vehicle use consistent so that per mile charge is reasonable
● CSU-support (buyout or overload) for faculty leading the newly mandated annual reports and periodic program reviews.
● Improve web site Review and revise Mission Statement and Purpose – working with SNS staff
● Attracting post docs (from UCSC and elsewhere)
● Solicit community advisory board member(s)
● Updating all computers utilized for grants
● Continued funding for WI greenhouse equipment and supplies not allowed to be charged to grant budgets.
16 Advisory Board
The Founding Agreement between WI and CSUMB (CSUMB, 1999) dictates that we maintain an advisory board that guides the Watershed Institute toward fulfilling its mission to the university and community (Table 1). The Steve Bachman (Monterey District Planner, CA State Parks) indicate interest has become the community member of the advisory board.

<table>
<thead>
<tr>
<th>Required Membership</th>
<th>Spring 2017 Members</th>
</tr>
</thead>
<tbody>
<tr>
<td>COS Dean</td>
<td>Andrew Lawson</td>
</tr>
<tr>
<td>SNS Chair</td>
<td>Worcester</td>
</tr>
<tr>
<td>University Corporation</td>
<td>Lopez</td>
</tr>
<tr>
<td>Watershed Institute Director(s)</td>
<td>Pierce &amp; Lienk</td>
</tr>
<tr>
<td>Two SNS faculty</td>
<td>Watson &amp; Haffa</td>
</tr>
<tr>
<td>One community member</td>
<td>Steve Bachman, CA State Parks</td>
</tr>
</tbody>
</table>

The Watershed Institute Executive Committee is a subset of the Advisory Board (Table 2). The Executive Committee selects the community member and SEP faculty members of the Advisory Board by simple majority vote.

<table>
<thead>
<tr>
<th>Required Membership</th>
<th>Spring 2017 Members</th>
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<tbody>
<tr>
<td>COS Dean</td>
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</tr>
</tbody>
</table>

8 References
