

RENEW-SD

Regional Ecology Network and Environmental Workbench for Sustainable Development

A Flagship Project of UCSD's new Environment and Sustainability Initiative

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² For a list of those who have been participating in the Flagship's evolution, see:

<http://regionalworkbench.org/education/flagship.php>

PREFACE:

This text describes the first collaborative multidisciplinary research project of UCSD's new Environment and Sustainability Initiative—henceforth referred to as the *Flagship*. A team of scholars and researchers from across UCSD took part in its conceptualization and design. Details about the various Flagship development meetings, criteria for success, as well as background documents and links can be found on the Regional Workbench Consortium web site: <http://regionalworkbench.org/education/flagship.php>

PROBLEM STATEMENT

Worldwide, the cumulative contribution of non-point source (NPS) pollution to the degradation of water reservoirs, rivers, bays and the ocean often exceeds that of point sources like wastewater treatment plants and industrial discharges.¹ NPS pollution originates from diffuse sources (e.g., storm water, dry weather runoff and atmospheric deposition) and increases with development and population growth. This makes NPS an extremely challenging problem to address, particularly in the rapidly growing urban centers of the world like the Tijuana-San Diego region. Depending on its severity, NPS pollution can have negative impacts on a region's economy, natural resources (including water supply), public health and quality of life and as such can hinder sustainability.² In the San Diego region, the most salient example of the result of years of combined point and non-point source pollution discharges is the presence of five known toxic hot spots in San Diego Bay found within the drainage of the Pueblo San Diego (Pueblo) watershed.³ The Pueblo watershed is one of three major watersheds that drain directly into San Diego Bay, which—in spite of its beauty—is considered to be the second most polluted bay in the country next to Newark, New Jersey.^{4,5} The Pueblo watershed covers some 50 square miles of the most urbanized and densely populated areas of the City of San Diego (including downtown), La Mesa, Lemon Grove, National City and the County San Diego and also includes many waterbody segments and areas that are listed as impaired under the CWA section 303(d)⁴ (see map in the Appendix below).

Currently, many federal, state, regional and local government agencies—along with academic and community stakeholders—are focused on trying to resolve pollution problems in the Pueblo watershed. The EPA is overseeing a broad multi-stakeholder effort to deal with some of these problems through the recently established Total Maximum Daily Load (TMDL) regulatory process.⁶ A TMDL is “a calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards, and an allocation of that amount to the pollutant's sources” (EPA <http://www.epa.gov/owow/tmdl/intro.html>). In other words, a TMDL is the sum of the allowable loads of a single pollutant from all contributing point and nonpoint sources (ibid). Regulators are using TMDL calculations to allocate how much each source must cut back on the release of the pollutant in question. Yet, it is difficult to determine how much each pollutant source must reduce its contribution to assure compliance with water quality standards.

The regulatory effort underway in the Pueblo watershed is the first attempt in our region to complete TMDLs for impaired waterbodies as required by the federal Clean Water Act. The outcome of this collective effort will set a precedent for how other pollution issues in the region are managed, including pending issues related to 303(d) impairments in the Tijuana River watershed, among others.

As with any other problem, a major consideration for addressing pollution is cost. Organic pollutants are particularly costly to analyze and monitor on an ongoing basis. Recent studies conducted in some of the most contaminated sites in the Pueblo watershed have found organic contaminants (i.e., PAHs, PCBs, DDT and Chlordane) to be the principal sources of impairment and both ecological and potential human health risk.⁷ High costs limit the degree and extent to which testing and ongoing monitoring takes place. This limitation can lead to inadequate risk estimations, insufficient measures to protect environmental and human health and even greater costs in the future.

SOLUTIONS: PART I. *Implementing field-based applications of new biomolecular tools to improve environmental monitoring and risk assessment.*

A great opportunity exists for the UCSD community to contribute to important TMDL and other pollution abatement efforts by leveraging UCSD's expertise and emerging environmental technologies. New biomolecular tools—including the EPA approved P450 Human Reporter Gene System (EPA Method 4425) developed in the UCSD Tukey Lab—can provide reliable, more sensitive, faster and cheaper means to assess sites contaminated with PCBs, PAHs, Dioxins/Furans. The Tukey lab is part of UCSD's Superfund Basic Research Program (SBRP) funded by the National Institute of Environmental Health Sciences (NIEHS), 2000-2010. The central goal of the SBRP is to identify and characterize genomic stress responses elicited by waterborne pollutants. By developing innovative methodologies to identify biological responses that are caused by exposure to environmental contaminants and by defining the exposure pathway, UCSD's SBRP is creating tools that can assess mechanisms of toxicity mediated through cell signaling and gene expression. The SBRP's central hypothesis is that "alterations in cellular signaling and gene expression by Superfund site chemicals can be exploited to develop biological models for the detection and bioremediation of chemical toxicants". Analysis of patterns of gene expression in vivo and in vitro can identify biomarkers of environmental injury and lead to more accurate mechanistic endpoints that can be used for risk assessment and remediation decisions. Investigators with complimentary expertise from 10 UCSD Departments, Organized Research Units and Centers are participating in UCSD's SBRP. The program's multidisciplinary team consists of 5 biomedical research projects, 2 non-biomedical research projects and 3 research support cores. The research is supported by an administrative core. Three additional cores focus on Ph.D. training, research translation, and community outreach.

ESI's Flagship team will leverage the efforts underway in UCSD's SBRP by using the program's new biomolecular technologies (in partnership with government and community-based organizations) to collect and analyze pollutant data in the targeted study region. But the mission does not stop here. ESI resources will enable the Flagship to take the SBRP's research translation and community outreach efforts to a higher level than would otherwise be possible. ESI resources will enable the Flagship team to begin relating SBRP efforts to a wealth of other UCSD advances in research, engineering, management, education, outreach, citizen science, and information and communications technology. The Flagship can thus serve as a catalyst to stimulate connections among otherwise separate research, pedagogy and outreach endeavors. Success on this score hinges on our ability to create a useful overarching conceptual framework (informed by principles of sustainability) and internet portal capable of federate distributed intelligence. We also need to create (1) incentives for data sharing and collaboration, (2) measures to protect intellectual property, and (3) user-friendly cyberinfrastructure including state-of-the-art software and hardware. Not all of this can be created in the short timeframe and with the limited funds provided by ESI. Nor should it be attempted in isolation (no need to reinvent the wheel; we need to build on existing

efforts). The Flagship will build on UCSD's Regional Workbench Consortium (RWBC) and move forward in coordination with other key regional and global IT systems (e.g., at SIO, SDSC, Calit2).

SOLUTIONS: PART II. *Creating the Regional Ecology Network and Environmental Workbench for Sustainable Development (RENEW-SD).*

Applying UCSD's intellectual capital to a specific problem (e.g., non-point source pollution in the Pueblo Watershed of San Diego) will provide a model for linking science-to-society. But the ESI mission is not limited to merely solving specific problems at the local or regional level—as important as this may be. ESI also emphasizes the importance of local-global interdependencies and the need to get proactive in defining new frontiers for sustainability science (in theory and practice across academic disciplines). In this light, the Flagship project described here will initiate the *Regional Ecology Network and Environmental Workbench for Sustainable Development (RENEW-SD)*. This effort will take full advantage of UCSD's Regional Workbench Consortium (RWBC) including its academic networks regionally and globally, relationships with community-based organizations, archival resources, project and case study ontologies, infocartography, and lessons learned since 2000.

The RWBC is an internet based knowledge-action collaborative aimed at promoting sustainable city-region development. The RWBC recently won two awards from the American Planning Association—one for academic leadership in 2004, and one for Best Use of Technology in a University Urban and Regional Planning Program in 2006. The RWBC aims to build capacity for science-to-science integration (multidisciplinarity) as well as science-to-society integration (through civically-engaged approaches). This type of integration and the quest for sustainability requires cyberinfrastructure. Cyberinfrastructure is needed on many fronts, including: (1) guiding science and technology for the common good, (2) enabling multidisciplinary work that is civically-engaged and aims for continual improvement through problem-solving, (3) creating and sharing critically constructive visions/stories of alternative development, (4) improving access to archives by federating distributed sources and intelligence, and (5) bridging the digital divide, plus much more.

ESI's Flagship project will leverage the RWBC's cyberinfrastructure to create an Environmental Workbench and Regional Ecology Network—a web of relationships linking UCSD faculty, researchers, staff and students to other individuals, organizations, sensors and machines aimed at fostering sustainable development. This is clearly a long term effort. Only limited progress can be made in a six month period. The important thing is this. As we go about working on the specific problem identified above (non-point source pollution), we will simultaneously lay the foundation for RENEW-SD.

The Flagship's initial focus on the Pueblo Watershed will draw out additional regional sustainability issues dealing with, but not limited to, water supply, renewable energy, transportation, economy, equity and social justice, and green building. At the same time, development of RENEW-SD will take place in coordination with ESI's other funded work to implement "Sustainability Across the Curriculum." The RENEW-SD part of the Flagship will create the first planks in a platform that will ultimately provide faculty with a unique, complex and dynamic urban setting in which to examine sustainability issues (including the environmental health dimension of sustainability). It will also help identify opportunities for students to gain hands-on field experience and marketable skills through field studies and community-based "citizen science" projects.

FLAGSHIP AIMS AND APPROACH (near and long term):

The near term goal of this project is to produce knowledge and apply tools that will help address significant non-point source pollution problems—including PCBs, PAHs and other known sources raising ecological and human health risks—in the Pueblo Watershed while taking into account work that has already been completed or is taking place. In addition, this project will help establish collaborations with

the existing stakeholder community in the Pueblo Watershed and identify a clear niche for UCSD's work. This latter point lays ground work for the longer term goal aimed at creating RENEW-SD.

At the core of this effort is a focused but flexible approach that emphasizes (1) the assessment of significant community needs--i.e., local issues that have a known impact on ecological and human health and quality of life and that are also important at a national and global scale, (2) the identification of a value added niche for UCSD that will augment the work of others and enable collaboration and interaction with a wide-range of regional, state and federal stakeholders, building strong ties to the community through effective communication and opening opportunities for residents to become involved and take ownership of sustainability efforts in their own community. We believe that this project can help build a bridge between the community and UCSD—a bridge that will allow the university to better understand and respond to the sustainability needs of the region while helping identify fundable research opportunities for faculty and service learning opportunities for students. Key criteria that guided us in the articulation of this effort are listed below:

- The project already has committed faculty/institutional support/ funds-resources/forward motion.
- The project emphasizes multidisciplinary place-based research in a scalable context (i.e., a conceptual and methodological space that takes into account the interplay of local, regional and global dynamics).
- The project places a premium on enabling science-science integration and science-society linkages through “knowledge-action collaboratives” (i.e., civically-engaged science of the sort promoted by the National Research Council).
- The project has the promise of appealing to diverse groups on and off campus (i.e., it will attract top notch researchers, community-based partners, stakeholders in government and industry, and donors).
- The project includes a service learning component (i.e., research internships, field/lab research opportunities for undergraduate and graduate students that compliment UCSD's pedagogy mission).
- The project promotes discovery and innovation.
- The project has a sustainability and community development informatics component and is geared to making change happen (actually improving quality of life and place).

WORK PLAN

The project duration is six months (Feb07-July07). During this time the Flagship team will conduct a series of meetings, workshops and field work involving the collection and analysis of environmental samples in the study region. Over the same period, the Flagship team will begin defining the conceptual framework and web resources necessary to initiate the *Regional Ecology Network and Environmental Workbench for Sustainable Development (RENEW-SD)*. Key phases of the project are listed below:

1. Conduct an initial workshop/needs assessment

Conduct a non-point source pollution workshop/needs assessment to identify past, present and future work in the Pueblo Watershed with a focus on known organic pollutants of concern. The workshop/needs assessment will help us identify current knowledge gaps, short and long-term research opportunities and a clear niche for UCSD's work in the watershed. This workshop will also

formalize working relationships with key stakeholders conducting monitoring and research in the study area. Stakeholders to be invited include: UCSD researchers, City of San Diego, City of La Mesa, City of Lemon Grove, County Department of Environmental Health, Port of San Diego, RWQCB, SWRCB, SCCWRP, Navy SPAWAR, SDSU, USD, Weston Solutions, Nautilus, CSC and San Diego Citizen Watershed Monitoring Consortium, EHC, Coastkeeper, among others. We will capture all or parts of the workshop in digital video and make it available on Regional Workbench web site.

2. Based on the initial workshop's results and needs assessment, prepare a strategic plan

Based on the information gathered during the workshop, prepare a formal research proposal and circulate the proposal among the stakeholders to receive feedback and finalize our six month work plan and collaborations. Also, form a Technical Advisory Committee composed in part by UCSD faculty and stakeholders participating in the workshop to oversee implementation of the study including Quality Assurance and Quality Control (QA/QC) aspects.

3. Conduct a community meeting/workshop

Conduct a community meeting/workshop in the Pueblo watershed to present the project, communicate the relevance of work to community members, gather feedback on communicating findings to the community and identify opportunities for community involvement. Opportunities for direct citizen participation ("citizen science") in this and future projects will be explored. Capture project presentations in video and make available to public on the Regional Workbench web site.

4. Implement field data collection and analysis phase of project. Publish web resources (e.g., macromedia flash narrative, maps, database) for presenting details of this project and for relating this project to other ESI sustainability efforts, including the educational initiative.

5. Conduct a public meeting to report findings and present recommendations for future work. Release report on findings. Capture results presentation on video.

6. Publish Final Report and Multimedia Narrative

EXPECTED OUTCOMES:

- New knowledge to help address significant environmental health issues in the Pueblo watershed
- Network of collaborators
- Identification of community partners and audience for future projects
- Documentation and evaluation of each step of project implementation (including videos and other media).
- Presentation of data in conference and possible publication
- Final Report and initiation of RENEW-SD (conceptualization, interdisciplinary knowledge maps/ontologies, pedagogical resources, web design)

EVALUATION:

- Degree of participation of and collaboration with environmental health stakeholders in the region
 - Survey evaluations by stakeholders of process and outcomes
- Contributing value added knowledge and resources towards addressing a significant environmental health issue as evaluated by stakeholders
 - Survey evaluation of stakeholders
- Inclusion of findings in management and/or policy decisions
- New projects emerging from this effort

PROJECT SCHEDULE: February 2007 – July 2007

Project Phase	Feb 2007	Mar 2007	Apr 2007	May 2007	Jun 2007	Jul 2007	Aug 2007
(1) Initial Meeting / Workshop; Asset mapping of work being done in the study region							
(2) Project Design; Process input and modify strategic plan							
(3) Public Meeting / Workshop; Publish web archive of key stakeholder presentations							
(4) Data collection and analysis; Initial designs/publication of RENEW-SD							
(5) Report findings; Create multimedia project narrative 1							
(6) Final Report; Create multimedia project narrative 2; Create pedagogical resources as part of RENEW-SD							

Note: Boxes shaded with diagonal lines represent half months

REFERENCES

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2. UNEP (United Nations Environment Programme). Global Programme of Action for the Protection of the Marine Environment and Land-based Activities. 2006. The Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities is the only intergovernmental programme that addresses the inter-linkages between freshwater and the coastal environment. <http://www.gpa.unep.org/> [Accessed 12 January 2007]
3. California Environmental Protection Agency. State Water Resources Control Board. Bay Protection and Toxic Cleanup Program. (BPTCP). 2004. Available: <http://www.waterboards.ca.gov/bptcp/> [Accessed 12 January 2007]
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5. SD Earth Times. Pollution Politics Persists. What do you do when the regulators refuse to regulate? 1999. Available: <http://www.sdearthtimes.com/et0499/et0499s5.html> [Accessed 12 January 2007]
6. California Environmental Protection Agency. State Water Resources Control Board. Total Maximum Daily Load (TMDL). 2003. Available: <http://www.swrcb.ca.gov/rwqcb9/tmdls/tmdl.html> [Accessed 12 January 2007]
7. U.S. NAVY Presentation. 2005. Background Studies for TMDL Evaluation. Mouth of Chollas Creek and Paleta Creek. Available: http://www.waterboards.ca.gov/sandiego/tmdls/tmdl_files/multiple%20locations/Navy'Chollas%20Paleta%20Bkg%20Studies%2011Oct05.pdf [Accessed 12 January 2007]

APPENDIX

Environment and Sustainability Initiative (ESI): <http://esi.ucsd.edu/about/>

Individuals who have participated in the evolution/development of the ESI Flagship Project as of January 2007:

Sundari Baru	B. Greg Mitchell	David Schkade
Dan Cayan	Reagan Moore	Lisa Shaffer
David Cleveland	David Pellow	Jim Shea
Teddy Cruz	Keith Pezzoli	Gabriele Wienhausen
Bill Hodgkiss	Hiram Sarabia	Jason Wiskerschen
Charlie Kennel	Cindy Santini	Ilya Zaslavsky
Richard Marciano		

FLAGSHIP DOCS AND OTHER RESOURCES

Links on this page are live at: <http://regionalworkbench.org/education/flagship.php>

1. PowerPoint presentation shown at Jan. 5, 2006 meeting, [click here for ppt](#)
2. Handout distributed at Jan. 5, 2006 meeting outlining initial project focus: "Using new biomolecular technologies to improve environmental monitoring," [click here for pdf](#).
3. Two background docs for the Dec. 7, 2006 ESI Flagship project development meeting, [click here for pdf](#)
4. Documents with details about the prospective study region
 - David Cleveland, TELESIS, Community Mapping and Analysis, [click here for pdf](#)
 - David Cleveland, Community Fact Sheets re prospective study region, [click here for pdf](#).
 - TELESIS Neighborhood Studies Project (partnership with UCSD students), [click here](#)
 - TELESIS San Diego Making Connections project, [click here](#)
 - Weston Solutions, Inc: Chollas Creek TMDL and Source Loading, Best Management Practices, and Monitoring Strategy Assessment, Final Report (Prepared for: City of San Diego), September 2006, [click here](#)
5. Review of a popular academic text: Sustainable Urban Development Reader, which mentions ESI and the Regional Workbench, [click here for pdf](#).
6. Draft Proposal, dated Dec. 15, 2006, written by ESI leaders focused on enabling civically-engaged service learning --- " Sustainability Across the Curriculum: Perspectives of Place - the Scripps Knoll/Coastal Chaparral Project," [click here for pdf](#).

Links to relevant pages on the RWBC web site:

UCSD-TV documentary about the RWBC (28 minutes,[click here for link to UCSD TV archive](#)).

RWBC five year anniversary report (2000-2005), [click here for pdf](#)

Regional Workbench Consortium (RWBC) EXPO (May 29, 2003 Roll Out)

[SBRP outreach_expo03.pdf](#) (23 pages, main report)

[SBRP outreach_expo03_apdx.pdf](#) (22 pages, appendix)

RWBC brochure
[rwbc_brochure_5_28_03.pdf](#) (2 pages)

RWBC projects database, [click here](#).

RWBC Education Center, [click here](#)

RWBC Student research and networking resources, [click here](#)

RWBC Interactive narratives and video documentaries, [click here](#)

RWBC Interactive mapping resources, including the NIEHS Portal [click here](#)

Sample list of funding sources, [click here](#)

Binational Conference on Toxics and Environmental Health, June 2000

[binationalconf_rpt00_main.pdf](#) (English Version, 57 pages)

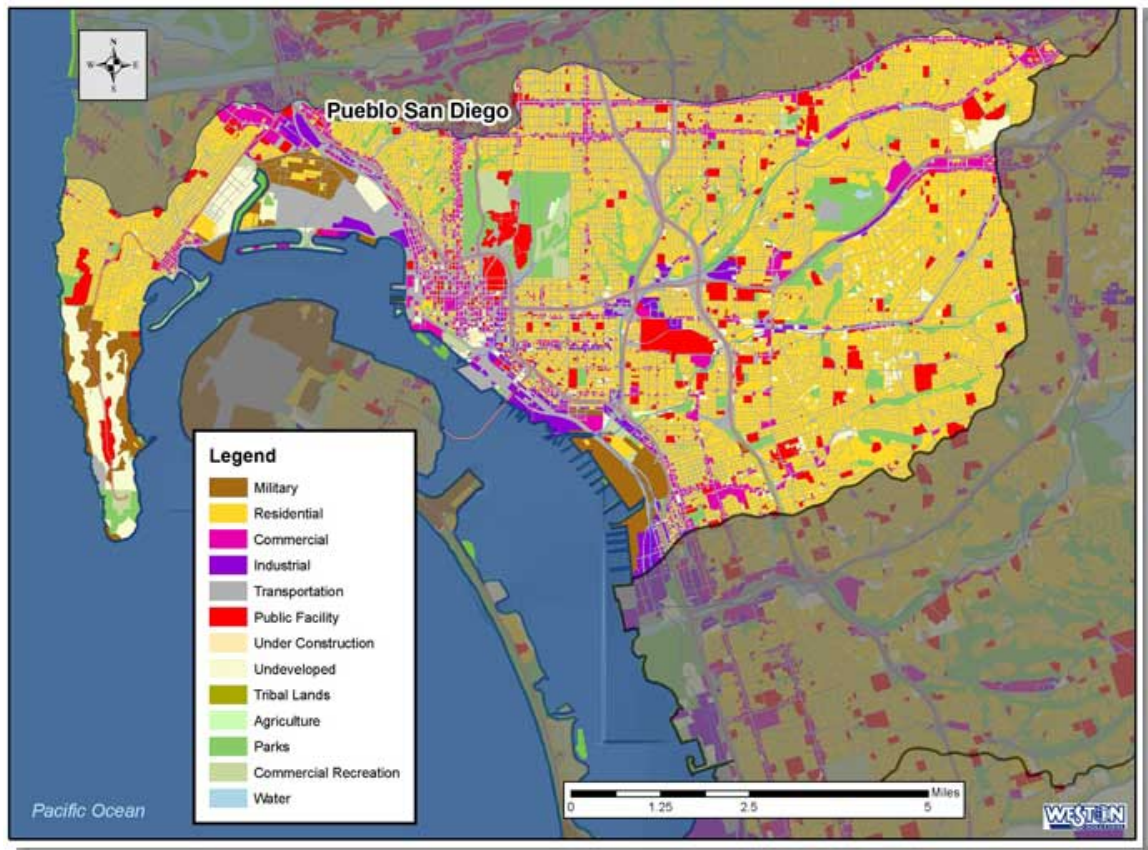
[binationalconf_rpt00_apx.pdf](#) (Appendix, 12 pages)

[binationalconf_rpt00_spanish.pdf](#) (Spanish translation, 11 pages).

Global Planning Grid initiative

<http://gpeig.org/GRID-splash.htm>

Pueblo Watershed in San Diego



Source: www.sdbay.sdsu.edu/education/pueblo.php