

**Developing a Framework for Land Use Based Pollution Monitoring
In Urban Creeks**

Group Project Proposal to the Donald Bren School of Environmental Science and Management,
University of California, Santa Barbara

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Problem Statement

Coastal communities in California and around the country are grappling with the poor surface water quality in creeks, rivers and oceans due to polluted storm water and urban runoff discharges. Runoff pollutants can include pesticides, fertilizers, green waste, animal waste, human waste, petroleum hydrocarbons (gasoline, motor oil), trash and other constituents. Urban sources of bacterial pollution are of particular concern because they are believed to contribute to polluted creek and ocean water and unsafe swimming conditions. Since 1998, in an effort to better inform the public on the safety of ocean swimming, coastal communities have gathered extensive data on the presence of indicator bacteria (total coliform, fecal coliform and enterococcus) at storm drain and creek outfalls. As a result, there is greater knowledge about the presence of indicator bacteria under dry and wet weather conditions, but at the same time there is a lack of knowledge about its sources and therefore pollution reduction methods. Moreover, due to the focus on bacteria, there is a lack of data about sources and presence of other urban pollutants.

Given this incomplete understanding, it is important to characterize the possible sources of pollutants and their potential impact on our creeks and coastal waters. Once this is achieved, it will be important to develop a management plan for those sources of pollution that affect our health and the ecosystems.

Project Background and Significance

The City of Santa Barbara established its Creek Restoration and Water Quality Improvement Program (Creeks Program) in January 2001 with the mission of improving creek and ocean water quality and restoring natural creek systems. Since May 2001, the program has gathered extensive data on the presence of bacteria in the creeks of its three major watersheds: Arroyo Burro, Mission and Sycamore. Concurrently, the program has undertaken studies to identify key areas for the installation of both natural (bioswales) and active (Ultraviolet) treatment systems. A number of projects are in the process of either design, evaluation or implementation. These projects are focused on treating and removing the problem rather than reducing or eliminating the problem to avoid storm drain and creek pollution.

Although the City has a better understanding of the extent of bacterial pollution in its creeks, it does not yet understand the extent to which urban activities and land uses contribute to bacteria pollution or any other pollutants that may be present in creeks and whether these activities and therefore pollutant levels, vary from watershed to watershed. In order for the Creeks Program to achieve its mission, it must move toward developing and implementing programs to reduce the introduction of bacteria and other sources of urban pollutants in storm water and urban runoff. A key first step is to utilize available literature and the City's data to specifically relate land use to pollutant loading. Currently, data are not interpretable as such and thus monitoring programs that would be implemented from baseline data could not strategically focus on specific land uses and specific pollutants arising

from those land uses. However, as the City moves forward towards a long-term plan for creek and coastal ocean water quality improvement, it is imperative that links between land use and pollutants are understood so that the investment in monitoring is sound.

Work performed by researchers in the Santa Barbara Coastal Long Term Ecological Research program has begun to characterize the pollutant load from certain specific land uses in these watersheds, such as low and high density residential, nurseries, greenhouses and commercial sites. However, this research focuses mostly on nutrients and it has not provided direct insight into the relationship between land use and toxic pollutants. What the City sorely needs at this time is a strategy for focusing its monitoring efforts towards specific land use and pollutant combinations. In addition to that strategy, recommendations for the formulation of that strategy into a monitoring program are also needed. Finally, the legal, policy and regulatory constraints to implementing a monitoring program and to implementing select pollution reduction strategies (i.e. constraining or converting land use, installation of treatment systems) need to be understood.

Project Objectives and Approach

The proposed project has three major objectives:

1. Determine the existence and extent of a relationship between different land use types (low-high density residential, commercial, industrial, etc) and the potential presence of pollutants in storm water and urban runoff.
2. Develop a creek and storm drain water quality monitoring framework that provides guidance to the City's existing and future efforts to identify the presence of pollutants, select areas for treatment systems and monitor the effectiveness of the treatment systems once installed.
3. Develop policy recommendations for the City of Santa Barbara that identifies regulatory actions needed to reduce pollutant sources. Include how any regulatory solutions might be implemented.

Data available from the City would include its creek water quality monitoring data, zoning and parcel database, storm drain maps, creek inventory and assessment GIS maps, and likely other information. Depending on the types of pollutants that are delineated by the group project as important concerns, additional research may be needed on potential sources of pollutants by land use type (lawn and garden centers, pesticide use reports, business types and locations, human use and impact on the creeks). Data from the Santa Barbara Coastal Long Term Ecological Research program <http://sbc.lternet.edu/> is also available, which includes water quality data for a number of creeks in Santa Barbara City and County.

The approach would involve taking City data collected between May 2001 and December 2003 for several watersheds including Arroyo Burro, Mission and Sycamore, and creating a geographically referenced database coupled with land use (zoning, parcel) information and infrastructure (storm drain, sanitary sewer) data. Some field reconnaissance would be performed to refine and confirm existing spatial data. Importantly, the parcel and zoning

databases are already in ArcView GIS format. The integration of monitoring data into a spatial context is expected to reveal relationships between land use and specific pollutant output. These observations will be compared to what is reported in the published literature from other Cities; gray literature from other agencies will also be solicited to help in comparing the results of this study to other similar studies. Based on the observations, recommendations for monitoring specific pollutants (where and what) will be made, as well as recommendations for targeting treatment or land use constraints. These recommendations will be made within a legal context which will require the students on this project to investigate, understand and communicate the options that the City has under the law to install treatment systems in creeks and/or constrain land use.

Stakeholders

In addition to Santa Barbara policy makers, residents and visitors to the City of Santa Barbara will benefit from the project. However, this project will more broadly provide a template for many coastal locales as they design and implement nonpoint source pollution monitoring and control programs.

Deliverables

A report that will outline our findings with regards to the magnitude of pollutant loads from various land uses around the city, their temporal and spatial nature, and the policy recommendations to reduce loads that have an impact on the intended uses of the receiving water bodies.

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Financial Support

The City of Santa Barbara Creeks Division will provide financial support in an amount up to \$7,500 for two part-time summer internships and any supplies that may be needed.