Bren Project: Ecological and economic implications of invasive giant reed (*Arundo donax*) control for the Santa Clara River watershed

Problem: Much attention and effort is directed to the control and eventual eradication of *Arundo* from the Santa Clara River, however support for this program may hinge on whether the benefits of control are sufficient to justify allocation of resources towards *Arundo* control and its replacement with native riparian vegetation.

2. Proposers:
   Tom Dudley, Marine Science Institute, UCSB; tdudley@msi.ucsb.edu; 805-893-2911
   Adam Lambert, Marine Science Institute, UCSB; lambert@msi.ucsb.edu; 805-451-7465
   Robert Wilkinson, Environmental Studies, UCSB; wilkinson@es.ucsb.edu; 805-893-8768

3. Client:
   Same as proposers (Dudley & Lambert, Riparian Invasion Research Lab-RIVRLab, MSI-UCSB, same contacts as above), but the project is supported through Ventura Co. Planning Office/Watershed Coalition of Ventura County, Santa Clara River Trustee Council (US-FWS & Calif Dept Fish & Wildlife) and the Ventura Co. Watershed Protection District

4. Proposed Project
   4a. Objectives. The over-arching Goal of this project is to use a broad interpretation of cost/benefit/risk assessment to better understand whether the benefits from removal of invasive *Arundo donax* (Giant reed) justify the costs of its control for the Santa Clara River. Information would be used to formulate planning for invasive species management in this River system, and to provide a coherent and objective framework for implementation of control programs.

   Obj 1. Evaluate the economic consequences of invasive *Arundo donax* control, including costs of planning and implementation, balanced against the direct benefits from water savings and the implicit benefits from reduction of risk otherwise resulting from wildfire, flooding and erosion in the Santa Clara watershed;

   Obj 2. Estimate the less-tangible benefits of *Arundo* control and riparian restoration for wildlife (esp. endangered species), carbon sequestration and water resource retention as valuable ecosystem services;

   Obj 3. Evaluate how coordinated and comprehensive riparian management can improve the cost/benefit/risk relationships for invasive plant control and riparian ecosystem restoration, and enhance public awareness of river conservation.

4b. & c. Project Background and Significance.
   The Santa Clara River in Ventura/Los Angeles Counties is unique in southern California in retaining much of its natural hydrologic integrity, and is host to 17 or more federally protected species. However this watershed, and particularly the mainstream floodplain, also faces numerous threats to biodiversity and ecosystem function such as increasingly intensive agriculture, residential development, urban and industrial pollution, and invasions by non-native aquatic and riparian species. The California Coastal Conservancy, The Nature Conservancy, and many regional agencies and organizations are cooperating to promote conservation measures that maintain and
restore natural ecosystems of the Santa Clara River (SCR) in a sustainable and economically viable manner.

A primary stressor in this system is the dominance of riparian vegetation by the invasive grass, *Arundo donax* or Giant reed. This bamboo-like plant can reach >8 meters in height, and occupies over 4,000 hectares of the SCR floodplain. Negative impacts of *Arundo* invasion include:

i. Displacement of native vegetation and riparian-dependent wildlife species, including federally protected species;

ii. Excessive loss of groundwater to evapotranspiration, at rates substantially greater than those of native vegetation;

iii. Increased erosion and sedimentation, and alteration of geomorphic processes;

iv. Damage to infrastructure (bridges and roadways, irrigation pumps, etc.) and recreational areas by transport and deposition of *Arundo* biomass in stormwaters, including into offshore waters;

v. Increased risk of wildfire owing to high flammability of standing plant material.

Programs to remove *Arundo* and restore native vegetation are underway, but continuing such programs can be inhibited by the high cost of labor and materials for removal, complex regulatory constraints, and the absence of quantitative documentation of the economic and environmental benefits to society that can accrue from *Arundo* control. Thus, an objective analysis of the cost/benefit/risk relationships could provide important information needed for managers and regulatory agencies to justify allocation of resources to invasive plant management.

4d & e. Approaches and Available data.

There are two basic approaches that this Bren project would take, one using information that our research group generates directly from prior and current fieldwork, and the other a collation and synthesis of information from agencies and organizations that work with natural resource and risk management in Ventura, and secondarily Los Angeles, Counties.

An excellent platform is available for such analyses because we are conducting a major demonstration project to remove *Arundo* from several hundred riparian acres of the Santa Clara floodplain, supported by the California Department of Water Resources (Proposition 84 Water Conservation program). Other regional projects conducted by our team and by other organizations can provide additional baseline and ecosystem response information to go into a resource economics analysis. In conjunction with invasive plant removal, native vegetation will also be restored to this landscape, combined with outreach to bring school groups and community members into the watershed conservation program.

Our research team will conduct ecophysiological studies to document the quantities of water used by *Arundo* vs. native vegetation, thereby providing a basis for estimating economic values of water conservation. Wildlife species, including terrestrial arthropods, birds and bats will be monitored which may enable valuation of native ecosystem restoration for wildlife population enhancement, including several of the rare or listed species present in this watershed.

Furthermore, there is extensive information (much of which is housed in the California Coastal Conservancy’s SCR Parkway website: http://www.santaclarariverparkway.org/) on hydrological processes, fire histories, and infrastructure development available from County agencies, consultancies, and agricultural and irrigation entities which can be applied to evaluating benefits of *Arundo* control, including cost savings owing to reducing the risks of catastrophic events. Plus, this is an opportunity to have an active role in restoration planning and implementation, and in promoting one of the most significant watershed conservation programs currently underway in the State. In particular, the Santa Clara River has been the focus of a major conservation program carried out by the California Coastal Conservancy, The Nature Conservancy (TNC), and their many consultants as well as the UCSB RIVRLab that will provide the framework for this invasive
species/restoration program analysis. Several prior Bren student projects have been conducted in this watershed, primarily with TNC as the client organization.

4f. Deliverables.

The final reporting from this project will consist of the standard reporting required by the Bren program, but particularly including presentations in various forms to the government agencies, NGO’s and other parties involved in Santa Clara watershed planning, such as the Watershed Coalition of Ventura County. We anticipate that professional publications and technical reporting resulting from the analytical work can be used to guide current and future decision-making by agencies and others tasked with floodplain management and wildlife protection.

4g. Internships.

Resources available for study: Summer internships would provide an excellent approach for allocating the time necessary to develop and synthesize the multiple forms of data and information necessary for these analyses. Our 4-year funding period starts in January 2015 and builds on the prior 3 years of restoration work that is on-going. We will have funds that cover costs of internships for at least two students, including part-time or full-time summer salary and travel expenses to the Ventura County area where much of the information, as well as the project sites, are located.

References related to the proposed project:


Post-fire *Arundo* dominance with skeletons of burned willows, and one method of *Arundo* control.
To: Bren School – Group Projects Program  
From: Tom Dudley, Riparian Invasion Research Lab, UCSB 

Re: Project proposal – “Ecological and economic implications of invasive giant reed (Arundo donax) control for the Santa Clara River watershed” 

Dear Bren Group Project administrators; 

The above-named project would involve as Co-Advisors Adam Lambert (MSI), Robt. Wilkinson Envir. Studies) and myself. Our Riparian Invasion Research Lab would be serving as the ‘client’ for this project, which is based on our on-going research and implementation project for riparian restoration at the Santa Clara River project sites. We will be providing a large part of the information relevant to carrying out this group project resulting from our 15 years experience with invasive plant management and ecological restoration in this river system, and are closely affiliated with several regional resource management agencies and organizations (Ventura Co. Planning, Watershed Council of Ventura County, federal and state wildlife agencies, Watershed Protection District, California Coastal Conservancy, The Nature Conservancy, Friends of the Santa Clara River, CalFire/Ventura Co Fire Dept, Army Corps of Engin., US Forest Service, etc.) who would also provide data relevant to answering the questions posed. 

We also have funds that could be directed to an internship program for one or more students to conduct these studies. Our program is in Year 4 of a 5-year $675,000 grant funded by the Santa Clara River Trustee Council (a joint US-Fish & Wildlife Service and California Dept. of Fish & Wildlife group) and we are just starting another 5-year, $2 million project funded by the Calif. Dept. of Water Resources (Proposition 84) as part of the Ventura County Integrated Regional Water Management (IRWM) program. These funds are available to support the internship program. 

We are enthusiastic about the possibility of cooperating on a Bren Group Masters Project on the given topic, as it would contribute not only to supporting our own work, but is considered very useful for the partnering agencies to better understand how to protect and manage biodiversity and natural resources for this high value river system. 

Tom Dudley  
Director, Riparian Invasion Research Lab, MSI-UCSB