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# The Washington Water RESOURCE

The quarterly report of the Center for Urban Water Resources Management

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## Message from the Director

A variety of recent and upcoming events have made the time since the last newsletter particularly active here at the Center. Most notably, our major proposal to the joint National Science Foundation and Environmental Protection Agency grant program, "Waters and Watersheds," was funded in full for the period April 1997-June 2000, one of only seven successful applications out of 300 submitted. This \$663,000 project will be a centerpiece of our activity here over the next several years. The anticipated work is described in some detail later in this newsletter.

The other major event is the acceptance and entry of new graduate students. The Center itself will house two new students, Jenna Leavitt (B.S. in Biology from Oregon State University) and Karen Comings (B.S.C.E. from Seattle University). In addition, students likely to be (or already) working on Center-related projects include Kathy Troost (a senior geologist for Shannon and Wilson consulting firm for the past 15 years, and now a concurrent graduate student in Geological Sciences), Craig Doberstein (B.S.C.E. from the University of Illinois), Tracy Chollak (B.S.C.E. from West Virginia University), and Owen Reese (B.S.C.E. from the University of Washington).

I also had the opportunity to attend the Engineering Foundation Conference on the "Effects of Watershed Development and Management on Aquatic Ecosystems," cosponsored by the American Society of Civil Engineers, the American Public Works Association, and the U. S. Environmental Protection Agency, as an invited speaker. I was struck by three particulars at this meeting: (1) the Pacific Northwest is far advanced over most of the country, and certainly equal to the rest, in the sophistication and effectiveness of our stormwater management; (2) a tremendous number and variety of researchers are quite active in this field, with new results appearing with great frequency; and (3) many of the fundamental questions of *how* landscape development alters water resources (and what can be done about those alterations) remain largely unanswered. The conference will generate a proceedings document later this fall or winter; selected papers from it (and in-

## Annual Review of Center Research

On **October 18th, 1996**, faculty and students affiliated with the Center will summarize our results from this last year's research. The presentations will take place from 9:00 a.m. until 12:00 noon at the Waterfront Activities Center (WAC) on the University of Washington campus. The WAC is a low building on the shore of Union Bay, southeast of Husky Stadium and northeast of the Montlake Bridge. To get there drive on SR 520 (Evergreen Point Bridge) towards the University from I-5 or I-405 and take the Montlake Boulevard NE exit northbound, cross the Montlake Bridge, continue north a few hundred yards through the major fork in the road at the Pacific Street traffic light and turn right at the next light, 0.1 mile beyond, immediately opposite the stadium (a large sign, "West Plaza," will be on your right). Double back to the south to the parking kiosk (\$5.00 for the day, pay as you enter). The WAC is at the rear of parking lot "E12" south of the stadium; we will be on the upper (parking-level) floor. Metro buses 43 and 44 also stop nearby.

The schedule of presentations is still being confirmed as this newsletter goes to press, but the following reports are anticipated:

- Infiltrative parking surface demonstration project
- Soil amendments for improved infiltration
- Alternative road shoulder surfaces
- Water-quality sampling in tidal environments
- Update on low-cost water-quality samplers
- Maintenance of berms in R/D ponds
- Retrofit of failed biofiltration swales
- Lakemont Boulevard construction oversight
- Improved metrics for Puget Lowland urban streams
- Upcoming NSF-EPA urban stream restoration project ❖

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## MESSAGE (from page 1)

formation on how to order the entire text) will be available from the Center's publication distribution service when they become available.

We are particularly pleased to be presenting some of the results of this last year's Center-related research projects on October 18. Details of that gathering appear in the adjacent article, and I hope you and your colleagues are able to attend.

Derek Booth ❖

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## Aquatic Invertebrates: Sentinels of Watershed Condition

A commentary by James R. Karr, Professor of Fisheries, Zoology, Environmental Health, and Public Affairs, Box 352200, University of Washington, Seattle, WA 98195-2200, [jrkarr@u.washington.edu](mailto:jrkarr@u.washington.edu)

Humans depend on water resources, but because society has chronically placed little value on water, water bodies, or the aquatic ecosystems they sustain, our supplies are threatened. Degraded water bodies cannot produce either the goods or the services that are vital to society.

Aquatic ecosystems comprise an interactive mosaic of environments extending from headwater streams and wet meadows through mainstem rivers to the sea. Water, plants, animals, nutrients, debris, and society's by-products move among these environments regardless of the political boundaries or legal constructs we establish that ignore these connections.

But present American water law fragments these systems. From the first-come, first-served system for allocating water in the arid West to the implementation of the Clean Water Act as if crystal-clear distilled water running down concrete conduits were the goal, water law denies that nonhuman living systems have any relevance to societal needs. This denial, and its resulting degradation, continue even though the Clean Water Act specifically mandates efforts to "restore and maintain the . . . biological integrity of the nation's waters."

The cumulative impacts of human actions go well beyond chemical pollution—the focus of most management programs. Habitat loss and fragmentation, exotic species, excessive water withdrawals, and overfishing all contribute to degradation. To reverse the pattern, society must assess resource condition by using biological criteria or measurement endpoints. The status of living systems provides the most direct and most effective measure of the health and integrity of water bodies and, thus, the best compass for guiding management policies.

The ecological integrity of water bodies rests on the well-being of all their biological components, not just the size of commercially important populations. Failing to protect phytoplankton, zooplankton, insects, other plants, bacteria, or fungi ignores the key contributions of these groups to healthy biotic communities. No species, no matter how important to humans, can persist outside the biological context that sustains it.

Biological monitoring—assessing species richness, species composition, individual health and feeding relationships among resident organisms—is the most direct approach to meeting the mandate of the Clean Water Act. In contrast to technology-based approaches, biological monitoring makes it more likely managers will detect unanticipated effects of water use sooner rather than later.

Benthic invertebrates and fish are particularly appropriate indicators of the condition of water resources. Invertebrates are abundant and easily sampled, and the species living in virtually any water body represent a diversity of morphological, ecological, and behavioral adaptations to their natural habi-

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## AQUATIC INVERTEBRATES (from page 2)

As humans alter watersheds and water bodies, changes in various aspects of this project over its three-year duration, together with what we hope to be the active participation of water-resource agencies across the region. A summary of the project proposal follows:

For example, samples of invertebrates from one of the best streams in rural King County, Washington, contain 27 taxa of invertebrates; similar samples from an urban stream in Seattle contain only 7 invertebrate taxa. The rural stream harbors 18 taxa of mayflies, stoneflies, and caddisflies, the urban stream only 2 or 3.

A recently developed method to evaluate the condition of water resources using benthic invertebrates is the benthic index of biological integrity (B-IBI). It scores the rural stream at 43 (maximum score for this index is 45) and the urban stream at 9 (minimum 9). By comparison, near-pristine streams in Grand Teton National Park scored 43, and an urban stream in Jackson, Wyoming, scored 21. Sites in Grand Teton National Park with light recreation had scores only slightly below the near-pristine streams, but streams with heavy recreational activity had much lower scores (27-30). This numeric index makes it possible to compare stream quality across geographic areas so that citizens can establish priorities for protection and restoration.

Biological monitoring and criteria must be used to assess and characterize resource status. Biological criteria can diagnose and identify chemical, physical, and biological impacts as well as their cumulative effects; they can serve many kinds of environmental and regulatory programs when integrated with chemical and toxicity testing; and they are cost effective. Furthermore, because biological criteria account for many different impacts of human activity, they are less likely than chemical criteria to underprotect water resources.

Perhaps the most important step toward real protection of aquatic resources is to stop talking about chemical water quality and start formulating policy focused on protecting the biological integrity of waterways. Let us adopt a broader concept of water; redefine societal goals based on that concept; forge partnerships among scientists, policymakers, resource managers, and citizens to attain those goals; revise the legal framework guiding water resource policy; and redouble our efforts to protect existing waters and restore those that are degraded.

In short, programs to protect aquatic resources should be broadly conceived and explicitly biological; clean water is not enough.

### **New Grant-Funded Project on Urban Stream Rehabilitation**

The Center was recently notified that a grant proposal prepared last spring to the joint National Science Foundation/U.S. Environmental Protection Agency program, "Waters and Watersheds," was successful and has been awarded the full requested amount of \$663,000. The project was developed by four faculty from the University of Washington affiliated with the Center, Derek Booth and Stephen Burges (Civil Engineering), Sally Schauman, (Landscape Architecture), and James Karr (Departments of Fisheries, Public Affairs, and Zoology). In addition, three full-time Ph.D. students will work on the









