The Water Center's
Watershed Review
information on water and watersheds

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Director's message

Anne C. Steinemann

Happy New Year! Although the rainy season is here, concerns about water resources remain. Accordingly, our issue features pieces on water challenges and solutions. In our lead article, Professor Jim Agee, of the College of Forest Resources, examines California's efforts to divert water from the Klamath River to meet water demands in the southern part of the state. In Snapshots of Research, we present work from two of the Center's graduate students. Jennifer Adam, of Civil and Environmental Engineering, uses historical data to correct estimates of precipitation in order to improve hydrologic forecasts. Sergio Camacho, of the College of Forest Resources, examines stormwater structures and the effectiveness of native copepods as biological control agents for West Nile Virus.

The past year has been a productive one at the Center, and I'm pleased to announce five pieces of good news.

First, please mark your calendars for our 16th Annual Review of Research. It will be held on Thursday, February 16th, from 8:00 a.m.-5:00 p.m., at the HUB West Ballroom, on the UW campus—and it will be free of charge to attendees. Please visit our website for details on the exciting line-up of speakers!

Second, after a year-long process, I would like to share with you our new Strategic Plan, which is posted on our website. I welcome your comments, and will launch the final version after obtaining and incorporating your feedback.

Third, along with the launch of our new Strategic Plan, we are pleased to unveil the Center's new name: "The Water Center." After an intensive review process, we selected "The Water Center" to reflect more accurately our strategic vision and expanded partnerships. Look for a gradual rollout of the new name on our web site and print materials.

Fourth, the Center has been successful in obtaining more than $500,000 in federal, state, and local grants this year, focusing on topics related to water management, watershed health, stormwater management, climate impacts, and drought. This funding will enable the Center to address some of the most pressing water-related issues in the region, and to involve students in practice-based research in the community.

Finally, I am delighted to introduce our new Program Coordinator, Debbie Livingstone, who will join Dan Ribeiro (our Program Coordinator/Operations Specialist) at the Center. Debbie comes to us with impressive experience. She worked on campus over 20 years ago as a conference coordinator and is delighted to be back at the UW. She spent the last 20 years as a medical speech pathologist at Seattle VA Medical Center and is now a graduate student in the Midcareer Evening Program in Public Affairs at the UW Evans School. We are excited to have her pursuing her passion for environmental issues and public policy with us.

Thank you for your enthusiasm and support, and I look forward to seeing you at the Annual Review and to the year ahead! ♦

Join us February 16th for the Annual Review of Research!
http://depts.washington.edu/cwws/Outreach/Events/AR2006.html

In this issue

The Steward's Fork

The following is excerpted from chapter 11 of the new book on the history of water resources in California by James K. Agee, Water Center affiliate faculty member and Professor in the College of Forest Resources, provisionally accepted by University of California Press.

The title of the book follows a fork of northwestern California's Trinity River, the Stuart Fork, which I know more intimately than any other river. Its initial name, according to Issac Cox, the first biographer of the region, was the Steward's Fork. Like the many forks of a river, a steward's fork represents different pathways for the many sustainable futures we can hope for these landscapes. The book focuses on forest, mining, and water issues of the region.

Excerpts from Chapter 11, "Dam the World":

The story of California is essentially a story of water. The northwestern California portion of that story began in earnest in 1933, when the state legislature

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Continued from page 1

passed a plan to allow damming of the Sacramento River north of Redding. The Federal Bureau of Reclamation eventually built Shasta Dam, but Federal restriction on who could use the water initiated independent planning for water resources by California after World War II.

In California, Bureau planning focused on diverting the Klamath River system inland and to southern California. They could easily divert it above Shasta Dam, but the real water lay to the west where precipitation and runoff were much higher. The Klamath diversion was first proposed in a document called the United Western Investigation, which Marc Reisner in his book *Cadillac Desert* called "…the best kept secret in the history of water development in the West." The diversion was but one of a large number of grand schemes that might be described as "engineering on steroids." The centerpiece of the project would be an 813-foot high dam near the mouth of the Klamath named in the language of the Yurok people: Ah Pah Dam. It would stand almost as tall as the Transamerica Pyramid building in San Francisco, but of course be much more massive. It would flood 40 miles of the Trinity River, including the Hoopa (Hupa) Indian Reservation, the lower Salmon River, and 70 miles of the Klamath River. All of this water would be pumped back upstream in the Trinity and through a large tunnel to the Sacramento River. The reservoirs would capture 15 million acre-feet of water for the south.

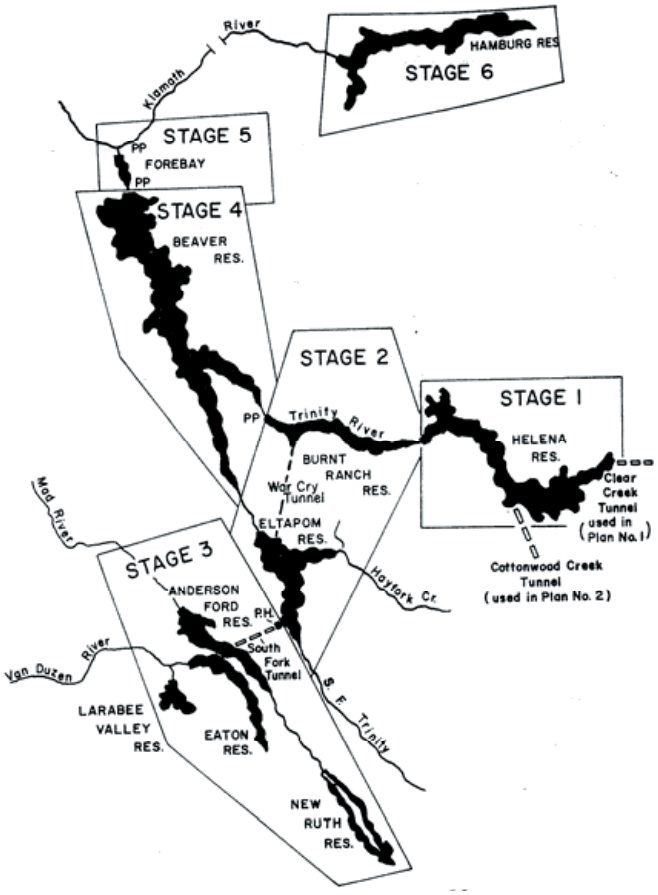

Figure 1. The 1967 California Water Plan would divert most of the North Coast river runoff back upstream, where it would be pumped to the east into the Sacramento river system, diverted around the delta region of Sacramento, and south into the San Joaquin valley. Trinity Dam is not shown but is just north of the Stage 1 area. Source: California Water Plan

What saved the Klamath from the Ah Pah dam had nothing to do with its local impact. The Bureau of Reclamation's multi-state plans depended on diverting the Columbia River, so Washington Senator Henry "Scoop" Jackson slipped a rider onto a fish and wildlife bill that prevented the Bureau from doing feasibility studies without Congressional approval. His rider also slowed down any further Bureau studies in the Klamath River system. Instead, California continued the fight to divert the North Coast rivers through its own California Water Plan (CWP) published in 1957.

The CWP was the master water pirate of all time, and the North Coast rivers were its central theme. Each revision of the plan was a variation on the Bureau of Reclamation's Klamath Diversion. The names of the dams and lakes would change, but the plan was the same: save the great waste of water to the sea. The first issue of the plan included dams along the Klamath, Smith, Van Duzen, Mad, and Trinity Rivers. The main stem of the Klamath was eventually saved from the CWP by reinterpretation of the legal implications of a state initiative passed in 1924 prohibiting any dam construction west of what is now I-5, and legal issues associated with the Indian trust lands. Trinity Dam was built in the early 1960's by the Bureau of Reclamation, and pumped upper Trinity River water through a massive tunnel to the Sacramento River system.

In the midst of new versions of the CWP, Ronald Reagan was elected Governor of California in 1966, and California water planners thought they had gained a new life. The Bureau of Reclamation (irrigation), Corps of Engineers (flooding) and the California Department of Water Resources (DWR) had joined forces in an interagency effort to tame the North Coast rivers after the massive floods of 1964. Within one month of the floods, DWR issued a bulletin documenting the damage and extolling the virtues of flood control dams. With an old movie cowboy in office, almost anything was possible for the State of California. But then the Indians had that old cowboy ride to the rescue.

Some of the worst flooding in 1955 and 1964 had occurred on the Eel River because of development on downstream floodplains. The Eel, like many of the coastal streams in the North Coast province of California, flows southeast to northwest along fault lines, and is separated from the Klamath Province by

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South Fork Mountain, one of the longest continuous mountains in the world. In the aftermath of the 1964 floods, flood control dams were proposed along the Eel, with the Corps of Engineers in charge of planning. The only Eel River dam to survive early planning was the large Dos Rios dam, which would have stored twice as much water as Shasta Lake but affected downstream floods on the main Eel only minimally. The lake would drown the town of Covelo, which included the Round Valley Indian Reservation. In 1969, Governor Reagan decided against the dam, reportedly saying that enough treaties had already been broken with the Indians. The death of Dos Rios, together with the spiraling cost of finishing the original plan of the California Water Project, brought the era of large dams in the Klamath Region to a close.

Wild and Scenic Rivers legislation finally stopped the arrogant bureaucrats who tried for almost four decades to completely dam the north coast. In January 1981, just before the inauguration of President Ronald Reagan, the Secretary of the Interior proclaimed Wild and Scenic River status for most of the threatened reaches of the Klamath, the Trinity, the Smith, and the Eel Rivers, ending forever the dreams of the dambuilders.

But the battle for water would continue to the present. Almost 90% of the flow of the Trinity River above the dam was being diverted out of the Trinity basin and east through Clear Creek tunnel to Whiskeytown Lake and then to the Sacramento River. The upper Trinity River below the dam, after 1964, became about as exciting as watching a dripping faucet. The whitewater I saw as a child became screened by an overgrown thicket of willow and alder, and anadromous fish habitat precipitously declined. Anadromous fish issues finally gathered the attention of the Federal government, and turned the Bureau of Reclamation into the "Bureau of Restoration", as it led the Trinity River Restoration Program (TRRP), a plan finalized in 2000. After five years of litigation and appeals from southern California water interests, the TRRP began Trinity River channel restoration and naturalization of flow regimes in the spring of 2005. ♦

Snapshots of current research

West Nile Virus mosquitos in Puget Sound stormwater systems

Sergio Camacho, College of Forest Resources-Entomology (MS)

Stormwater systems in the Puget Sound region are extensive and necessary to control flooding. King County has over 700 stormwater ponds and associated underground structures. We are studying the dynamics of macroinvertebrate production in stormwater ponds and their corresponding underground structures. Water quality data from catchbasins, street drains, stormwater ponds, overflow catchbasins, and data on macroinvertebrates will be analyzed. We will compare this data with data from adult mosquitos caught near the ponds and in underground structures. Results from this study will help us better understand where dangerous mosquitos breed in highest numbers and where counties can focus their mosquito control efforts with increased efficacy. In addition, we are looking at microcrustaceans called copepods for possible use in biological control applications. Copepods have been proven effective in other parts of the world and are an active component of Louisiana's Integrated Pest Management Program (IPM). Laboratory experiments with native copepods and mosquito larvae will aid in the identification of particular copepod species as biological control agents. By documenting dragonfly, diving beetle, and other predacious macroinvertebrate numbers, and by tracking changes in dissolved oxygen, temperature, and conductivity we can better understand the reproductive capacity of mosquitos in stormwater structures. In practice, this study will be useful for targeting areas where "species of concern" are most abundant. Information gathered from this study will amend the Integrated Pest Management Programs of some counties and contribute to the decision making process when allocating resources to further develop IPMP's. Preliminary results show that West Nile Virus mosquitos prefer underground structures that house few, if any, natural predators and have ideal water quality conditions for some of the most dangerous mosquito species. ♦

Sergio Camacho collects macroinvertebrate samples from a stormwater pond.

Correction of global precipitation products for orographic effects

Jennifer C. Adam, Civil and Environmental Engineering (PhD)

Underestimation of precipitation in topographically complex regions is a problem with most gauge-based gridded precipitation data sets. Gauge locations tend to be in or near population centers, which usually lie at low elevations relative to the surrounding region. For example, past modeling studies have found that simulated mean annual Columbia River streamflow using gridded precipitation based on Global Precipitation Climatology Center (GPCC) precipitation products is about one-third of the observed discharge.

In an attempt to develop a globally consistent correction for the underestimation of gridded precipitation in mountainous regions, we used a hydrologic water balance approach. The precipitation in orographically-influenced drainage basins was adjusted using a combination of water balance and variations of the Budyko ET/P vs. PET/P curve. The method is similar to other methods in which streamflow measurements are distributed back onto the watershed and a water balance is performed to determine "true" precipitation; but instead of relying on a modeled runoff ratio, evaporation is estimated using the ET/P vs. PET/P curves.

This approach requires annual time-series of hundreds of historical discharge records world-wide, which were obtained from the Global Runoff Data Center (GRDC) and the Global River Discharge Database (RivDIS v1.1). The correction ratios from each of the gauged basins were interpolated to the rest of the orographic domain using dominant wind direction and fine-scale elevation information. These ratios were applied to an existing global precipitation data set (1979 through 1999, 0.5° resolution), following application of adjustments for precipitation catch deficiencies. ♦

Upcoming events

Details for these events can be found at http://depts.washington.edu/cwws/Outreach/Events/seminars.html

February 16	**Annual Review of Research** 8 a.m.-5 p.m., HUB West Ballroom, UW Campus, Free!
January 3-March 7	**Tuesday Morning Seminars**, Tuesdays, 8:30 to 9:20 am, 22 Anderson Hall, UW campus

Professional Development Programs For more information on cost, how to register and other details, see http://www.engr.washington.edu/epp

March 15-16	Biological and Ecological Assessment and Habitat Monitoring

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