

Runoff Rundown

A NEWSLETTER OF THE WATER EDUCATION FOUNDATION

NPS Pollution in California's Forested Watersheds: Past, Present and Future Threats

BY KATHERINE NOBLE-GOODMAN

"It is not only delightfully cool and bright, but brisk, sparkling, exhilarating, and so positively delicious to the taste ..."

John Muir's description of the Owens River near its headwaters high in the Eastern Sierra epitomizes the image most Californians have of the mountain streams that run through the state's millions of acres of forest. And it is an image that remains, for the most part, correct. Forests play a starring role in the water cycle – particularly on the clean up side of things – and

the quality of the water that flows down from California's mountains is generally quite high, particularly when compared to storm water and other runoff from lawns and farms. But these forest rivers and streams continue to be threatened by nonpoint source (NPS) pollution, and much like polluted runoff from residential and agricultural sources, reducing or eliminating forest NPS pollution, and undertaking the clean up, is an ongoing challenge.

The situation in forested watersheds is complicated by the fact that three of the main contributors to

NPS pollution are historical – the legacy impacts of mining and logging and the roads built to do both. These legacies, plus a dramatic increase in motorized vehicle recreation, continued timber harvests and more frequent and more intense forest fires, combine to damage forest waters. How to clean up pollution from the past and adopt and enforce forest management policies and practices that maintain water quality into the future are challenges that loom as large as the Sierra itself.

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Dear Readers,

With this issue, I would like to introduce you to Katherine Noble-Goodman, the new writer of *The California Runoff Rundown*. Katherine brings an extensive background in writing and education to the Foundation, having served as a freelance writer for a variety of publications, including U.S. Water News. Most recently, Katherine taught seminars on the environmental history of water in California, as well as problem-solving courses on sustainable water use at the University of Redlands.

We think her passion for writing about California water would be appreciated by Glenn Totten, who died in June after a long battle with cancer. Many of you may have known Glenn personally or through his byline – he was a prolific writer of articles for *Western Water* and *River Report*, our Colorado River newsletter. Closer to home, he became an expert on nonpoint source pollution issues and helped create *The California Runoff Rundown*.

When she came on board, Katherine began researching potential topics and decided to focus on the importance of forests to clean water and healthy watersheds, and the increasing efforts to protect against future damage and clean up contamination from the past.

The next issue of *The California Runoff Rundown* will be published in spring 2007. If you have an example of a successful runoff project, please contact us. ♦

**Email your story ideas to Katherine Noble-Goodman,
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Climate Change and Wildfires: An Explosive, Murky Mix

Wildfires in the West have become more frequent, more intense and longer lasting in the past few decades, leading to an increase in sediment and other nonpoint source (NPS) pollution of forested watersheds both during and after these catastrophic events. Until recently, experts laid most of the blame on historic fire suppression practices. Now, researchers have identified another key contributor, as well: global warming.

According to an analysis of 34 years of forest fire and hydro-climate data published in August in the journal *Science*, earlier spring snowmelt combined with warmer spring and summer temperatures in the western United States caused “an abrupt transition in the mid-1980s from a regime of infrequent large wildfires of short duration to one with much more frequent and longer-burning fires.”

Indeed, in the past few decades, the average fire season has increased by two months, and fires have become more frequent, longer-burning and harder to put out. Last year, wildfires burned 8.53 million acres nationwide by the end of December. As of mid-September, some 82,000 fires had already burned 8.85 million acres this year.

Sediment, nutrients and chemical fire retardants contaminate forest

and downstream waters during and after fires; temperature also can be a NPS pollutant, either temporarily from the heat of the fire itself, or longer-term from the loss of riparian habitat and shade.

No one understands these water quality impacts better than folks in southern California, where 120,000 acres in the San Bernardino National Forest burned in 2003, and sediment and other NPS pollutants continue to run off into the Santa Ana River watershed.

Some 20,000 acre-feet of sediment-laden runoff flowed into the basins from the 91,000-acre “Old Fire” alone, according to the Santa Ana Watershed Project Authority. “People described some of those waters as looking like chocolate pudding,” said Daniel Cozad, former general manager of the Authority.

Storm water runoff from burned forested areas contains high concentrations of manganese, lead, phosphorus, mercury, total organic carbon and uranium. In the year after the fires in southern California, record rainfall overwhelmed the watershed with sediment-laden runoff, slowing percolation into the watershed’s groundwater basins and causing an overflow problem downstream. Millions of dollars have been spent on sediment removal, but the overall damage to the watershed,

including the impact on numerous threatened and endangered species, is incalculable, said Cozad.

The nutrient-rich runoff from the San Bernardino fires that burned nearly 100 miles inland also contributed to the growing problem of nutrient pollution in the Pacific Ocean. A recent *Los Angeles Times* series entitled *Altered Oceans* examined the devastating, long-term consequences of excessive nutrients on coastal water quality. (<http://www.latimes.com/news/local/oceans/la-oceans-series,0,7842752.special>)

These and other consequences of nonpoint source pollution from wildland fires will likely increase as historic fire suppression, massive clear cuts at the turn of the last century, and global warming have created forests that are ripe for catastrophic fire. These conditions are not unique to southern California, said Cozad, and what happened in 2003 is almost certain to happen again in the Santa Ana River watershed and elsewhere throughout the state.

How to best reduce the threat of high intensity, ecologically damaging wildfires is already controversial, and with global warming now entering the discussion, finding solutions will undoubtedly become even more challenging, and more crucial. Some 3,000 scientists, fire fighters, land and water managers, government representatives and others are gathering in San Diego November 13 – 17 for Third International Fire Ecology and Management Congress. One of the major issues on the agenda is the impact climate change has already started to have on wildfires in the West.

The San Diego Declaration on Climate Change and Fire Management is available online at <http://emmps.wsu.edu/firecongress/>.

An online version of the *Science* article is available at <http://www.sciencemag.org/cgi/reprint/313/5789/940.pdf> ♦

Forested Watersheds

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Protecting this water supply is important in California, and across the country. According to the U.S. Forest Service, 80 percent of the nation's freshwater resources originate on forested lands, and as many as 3,400 towns and cities across the country depend on national forest system watersheds for their public water supplies. In California, some 65 percent of the state's water supply flows down from the Sierra Nevada alone, with additional supplies running off the Coast Range and Klamath Mountains. And while it is difficult to place a precise economic value on this mountain water, a 1999 analysis conducted for the Forest Service conservatively estimated the value of forest water used in urban, agricultural and industrial settings at \$40 per acre foot, and the in-stream flow value for recreation and hydropower at \$17 per acre foot. The total annual value of national forest land water was estimated at \$3.7 billion.

"Water is by far the most valuable commodity to come off of the forest in terms of a dollar value," said Gaylon Lee, forestry specialist with the State Water Resources Control Board (State Board). "It exceeds everything else by a long shot."

The economic value of this water, particularly in California and the arid West, will undoubtedly increase significantly in the coming years as residential and environmental demands for water claim more of agriculture's share, and as the cost of water rises in all sectors in response to increasing demand. And as our understanding and awareness of the cumulative impacts of past and current activities in the forest continues to grow, so too are the restoration and protection efforts of water and land use managers.

California's geologic past created coastal and inland mountain ranges and valleys, and a 1,340 mile ocean border that combines with the state's plentiful sunshine to create

a natural water cycle worthy of inspiring writers to extol its virtues. Yet despite this natural cleansing process, past and current activities in California's forests have impaired many of the state's mountain lakes and streams with sediment, nutrients, temperature and mercury. This issue of *The California Runoff Rundown* focuses on some of the most significant sources of NPS pollution of one of California's most important and still relatively pristine resources – forest water – and the increasing efforts to protect against future damage and clean up contamination from the past.

The Legacy of Mines and Mercury

Most Californians are aware of mercury as a water pollutant because of the well-publicized health risks associated with eating too many mercury-laden fish. What many people don't realize is that in California, the main source of

provided a key ingredient in the quest for gold. More than a century later, this mercury continues to be a major, and very poorly understood, source of NPS pollution of forest waters.

Thousands of abandoned mine sites are scattered throughout the Sierra Nevada and Coast ranges. No one knows how many and no one knows how much new mercury these sites are adding to the water courses each year. Stopping more mercury from entering the system, and cleaning up what is already there, would be a monumental undertaking. On a national level, Congress is holding hearings on how to craft legislation to remove some of the many legal obstacles to abandoned mine clean up.

Some argue that because most of the mercury from mining was washed into streams years ago, limited resources should focus primarily on mines with significant mercury loads or ones that have



Cache Creek carries mercury-laden sediment off the Coast Range.

mercury contamination isn't coal-fired power plants – it's the Gold Rush.

The Sierra Nevada gold miners used mercury to separate gold from rock, gravel or soil, and since it was in plentiful supply in the nearby Coast Range, mercury mining there

been discovered by recreational gold miners, said Rick Humphreys, abandoned mines coordinators at the State Board.

Indeed, some 11 million pounds of mercury were "lost" during gold mining between 1848 and 1884, and that mercury is now either

trapped in sediment on stream banks and bottoms or has been released into the water column and is accumulating up the food chain.

"There's so much mercury already in the system that the top priority should be addressing what was dumped into creeks and rivers a hundred years ago," said Humphreys.

The science of understanding mercury and how it moves and changes as it travels in water is still in its infancy. In fact, scientists only identified mercury from mining as a water pollution problem a decade ago; even more recently they realized that as it moves through the water, a complex process can change it from a relatively benign substance (elemental mercury) into a neurotoxin (methyl mercury) that builds up or bioaccumulates in the food chain.

"The mercury gets transported from somewhere where it isn't causing a problem to somewhere where it can," said Humphreys.

One spot where conditions are often ripe for the production of methyl mercury is the Delta, where both Coastal and Sierra streams deposit mercury-laden sediment into the relatively warmer coastal waters. The Delta is one of several bodies of water in the state that are on Environmental Protection Agency's 303(d) list for mercury, which requires the development of an action plan, called a Total Maximum Daily Load (TMDL), to improve water quality.

In August, the San Francisco Regional Water Quality Control Board adopted a Basin Plan amendment including a revised TMDL for mercury in San Francisco Bay. The TMDL is pending State Board approval. The State Board also recently approved a TMDL for mercury in the Cache, Bear and Sulphur creeks and Harley Gulch, all of which carry mercury-laden sediment off the Coast Range.

Information and updates on mercury in the Delta are available through the Delta Tributaries

Mercury Council of the Sacramento River Watershed Program at <http://www.sacriver.org/subcommittees/index.php>. For an in-depth discussion of mercury in the Delta, see CALFED's report at <http://science.calwater.ca.gov/library.shtml>.

Timber Harvesting: Past Damage, Improved Practices

Another ghost of California's past that continues to contribute to NPS pollution of forest water is the legacy of aggressive, wholesale logging that left hillsides bare and streams clogged with sediment and debris. "These legacy impacts, even eight decades later, are still heavily influencing the streams," said Lee of the State Board.

Most water and forestry experts agree that timber harvests today are much less damaging to water quality than they used to be, and there is a general consensus that the most significant legacy and continuing impact from timber operations are the thousands of miles of logging roads built after World War II. Not everyone agrees, however, if today's logging practices adequately protect fragile forest ecosystems and water quality.

Regulatory Framework

Charged with protecting water on national forest land is the U.S. Forest Service. The State Water Board's role in this management is outlined in a Management Agency Agreement (MAA) between the two agencies, and "for the most part," said Lee, "relations are smooth."

Things aren't quite so smooth when it comes to timber operations on state and private land. Some 20 years ago, California amended its Forest Practice Rules and the State Board, the State Board of Forestry and Fire Protection (BOF) and California Department of Forestry and Fire Protection (CDF) also signed an MAA. Water quality began to figure more prominently in (CDF-issued) Timber Harvest Plans (THPs) at that point, although relations between the agencies remained rocky.

In 1999 and 2004, the state Legislature mandated more rigorous regulatory controls for all potential waste discharges into the state's waters and in 2003, it granted Regional Water Quality Control Boards (Regional Boards) the authority to essentially veto nonfederal timber operations that might further impact already-impaired waters. The timber industry challenged this ruling, and in 2005, the State Supreme Court upheld the Regional Boards' authority. Today, timber harvests on state or private lands

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must be both approved by CDF and separately regulated by a Regional Board.

The fact that the Regional Boards now have authority to regulate timber operations is a “step in the right direction” in balancing the objectives of state forest policy and water policy, said Lee, “but there is still far more dissatisfaction with timber operations on non-federal lands than on federal lands.” The State Board and the BOF are working toward drafting a joint policy statement that seeks to balance the agencies’ respective mandates for environmental protection.

The North Coast Regional Board has also recently adopted a new strategy for minimizing NPS pollution during and after timber harvests: the Watershed Wide Waste

us away from the THP by THP approach and into more of a watershed perspective.”

Timber Harvests Standards Continue to Improve

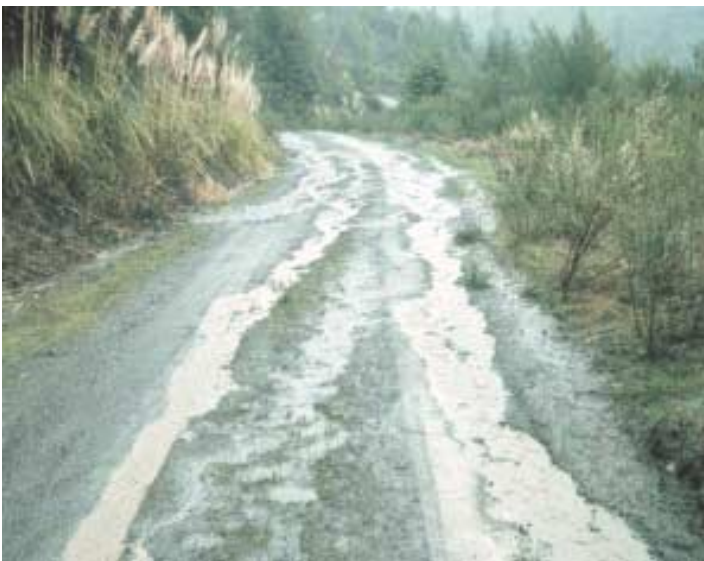
As the regulatory framework for water quality and timber harvests continues to evolve and improve, so too do timber harvesting practices. In the past, loggers dragged trees across the forest floor with tractors, swept logs downstream by releasing water from “splash dams” and felled streamside trees. “It was an era of extremely heavy impact on streams and water quality in the forests,” Lee said.

The 1973 California Forest Practice Act was the beginning of the end of that era, and today, most logging practices are much less

roads – built mostly for logging and mining – wind through the forest. That’s four times more miles of road than all of the state’s highways combined.

In addition to sheer magnitude, roads constructed before the mid-1980s were often built too close to streams, without road surfacing, such as pavement or gravel, and with slopes that send water down the adjacent unprotected hillside and into gullies that carry water, and sediment, directly into forest streams. Stream crossings also were often poorly constructed in the past, with culverts that were too small to handle runoff from a major storm.

Although it may seem like an insurmountable challenge to improve and maintain tens of thousands of miles of poorly constructed



Old, rutted roads send storm water directly into streams. New road designs that protect forest water quality slope outward with rolling dips sending dispersed runoff to the forest floor.

Discharge Requirement (WWWDR). Using these discharge requirements as a guide, Regional Boards can evaluate the cumulative impacts of timber harvests from a watershed perspective.

“This process is more ecologically significant and deals with the water and sediment interactions and processes,” said Robert Klamt, environmental program manager for the North Coast Regional Board Timber Harvest Division. “It gets

damaging. One legacy of logging that can’t be easily changed, however, is roads, and the sediment that runs off these old surfaces.

The Legacy of Roads

The number one cause of NPS pollution in the forests, far and above everything else, are the road systems, said Chris Knopp, deputy director for ecosystem conservation with the Forest Service. On public lands alone, some 50,000 miles of

roads, experts say it is crucial to protecting water quality in the forest. Limiting the use of the roads when it is raining, repairing stream crossings, limiting new construction and decommissioning unnecessary existing roads would all help reduce NPS pollution.

Bill Weaver, a geologist with Pacific Watershed Associates in Arcata, Calif., and author of the *Handbook for Forest and Ranch Roads*, said one of the top priorities for

reducing sediment runoff from forest roads “is to hydrologically disconnect road systems from stream channels.”

“On average, in 100 miles of typical forest road, about half is plumbed directly into streams,” he said.

For example, a road that slopes inward (an insloped road) causes water and eroded sediment to run off the road surface and into the roadside ditch where it then collects and travels to the nearest culvert and is dumped into a nearby stream. In the past, this was actually the preferred engineering design for collecting and discharging road runoff, said Weaver. Today, new roads are built and old roads improved by building into the road frequent rolling dips and by adding ditch relief culverts or outward slopes to road surfaces. More than 80 percent of sediment and runoff delivery to streams can be eliminated by adding these elements to forest roads, said Weaver. “It is a reasonably inexpensive and cost effective way to immediately cut off fine sediment from entering the stream system.”

Unfortunately, he said, funding for such repairs on old roads “is not even close to adequate.”

“We’re just slowly chipping away at the problem,” he said.

Scott Greacen of the Environmental Protection Information Center (EPIC) in Garberville, Calif., said his organization is advocating for forest management policies that base road building and maintenance plans on quantifiable parameters of how many miles of road a watershed can handle before it becomes sediment impaired.

Establishing road construction, road maintenance and road closing policies based on “miles of road per square mile of watershed” parameters would help policy makers establish a systematic process to begin to reduce the negative impacts of forest roads on water quality. For example, said Greacen,



Managed growth from an even-aged timber harvest.

in a watershed that already has three to six miles of roads per square mile of forest, new road construction would not be allowed.

“Roads are better constructed today than they used to be, but they still have tremendous impacts, and the legacy of an already-roaded landscape, is a major, major problem,” he said.

Clear Cuts: Can They Be Sustainable?

Second only to roads in contributing to NPS pollution in the forest is pollution that runs off of clear cuts. Some argue, however, that clear-cut or “even-aged” harvests, when done correctly, can return a second-growth forest to a natural condition that helps maintain a healthy watershed.

Thomas Lisle, research hydrologist at the Pacific Southwest Research Station in Arcata, Calif., studies the impact of timber harvesting practices on water quality in the Casper Creek Watershed, an experimental watershed managed by the U.S. Forest Service and the CDF.

What researchers there have learned is that there’s no getting around the fact that harvesting timber damages water quality.

Both clear cuts and selective harvesting contribute to temperature and sediment pollution, he said, and streams running through forests that are clear cut are at particular risk for sediment pollution during major storm events. Storm water erosion is especially a problem on the North Coast where soils are highly erosive.

“The trees’ roots help hold the soils together on steep slopes, and they (the slopes) are more prone to landslides and debris flows when the trees are gone,” said Lisle.

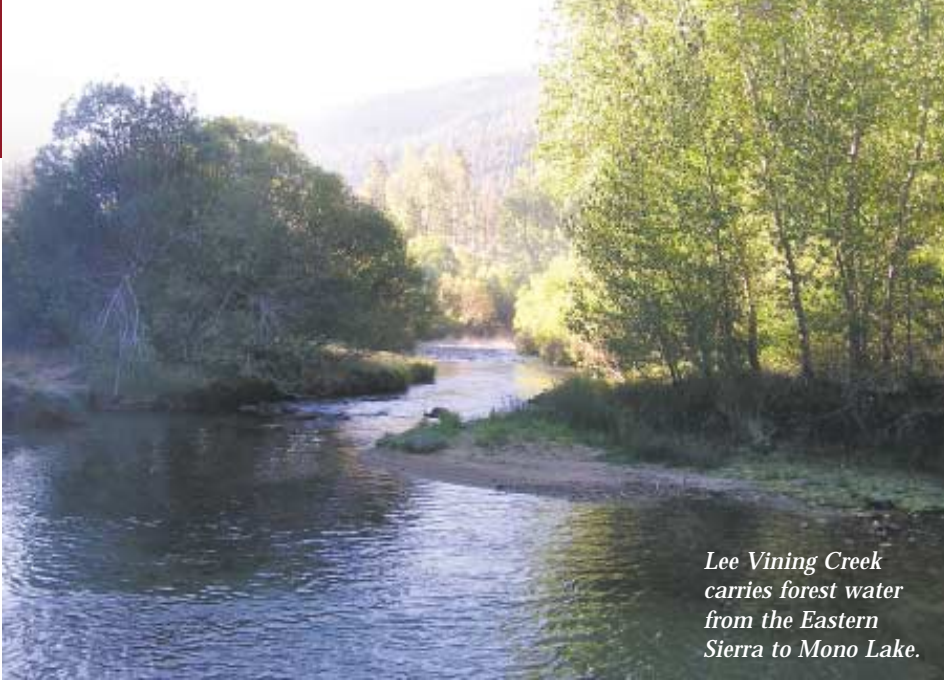
Mark Neely, an engineering geologist with the timber harvest division of the North Coast Regional Board, agrees.

“There is still a lot of clear cutting (on the North Coast) and that runs the biggest risk to water quality from landslides and temperature increases,” he said. “There are no pros to clear cutting in terms of water quality. It would be better if we didn’t clear cut.”

Still, he and other water quality experts say that clear cutting techniques used today are much less damaging to water quality than those used in the past.

Tim Feller, Sierra Pacific Industries

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Lee Vining Creek carries forest water from the Eastern Sierra to Mono Lake.

district manager and a registered professional forester, said that his company's 100-year, even-aged harvest strategy protects water quality and promotes a healthy forest ecosystem. Here's how it works:

Sierra Pacific divides the area to be harvested into 10,000-acre sections, clear cutting 10 percent or 1,000 non-adjacent acres each decade. After each harvest, the company plants a diversity of species that replicates how the forest would grow naturally in that area. At the end of a 20-year period, trees planted on the acres that were harvested in the first decade (10 percent of the total forest) will be 20 years old, and trees planted in the area harvested in the second decade will be 10 years old. After 10 decades of even-aged timber harvesting using this strategy, a 10,000-acre watershed would contain a natural diversity of species, from saplings to 100-year-old trees.

"The key is to get yourself to a point where you have a nice distribution of habitat types," said Feller. "This can be a practice that goes on for centuries."

Some argue that the cumulative effects of roads and past, damaging logging practices necessitate more stringent forest harvest rules that eliminate all clear cuts.

"The negative impacts of clear cutting, especially down to the edge of a water course under old standards, are difficult to exaggerate," said EPIC's Greacen. "You can't get

much worse unless you are talking about hydraulic mining where (miners) were literally ripping the mountainside down with a fire hose." He said that California's forested ecosystems have been rendered so fragile from past practices, that even "sustainable" strategies like those practiced by Sierra Pacific cause more damage than the system can handle.

And California's forest lands are now under a new, rapidly growing threat: motorized recreation.

Growing Impact of Recreation on Forest Water Quality

The U.S. Forest Service has identified off road or off highway vehicles (OHVs) as one of the top four threats to forests and grasslands in the United States. Nowhere is this threat more prevalent than in the mountains and deserts of California, where improper OHV use leads to NPS pollution.

Environmental and OHV organizations, as well as government agencies, are working to reduce the impact of OHVs on forest water quality by identifying appropriate routes, educating riders and closing poorly designed trails.

Currently, thousands of miles of poorly designed or unauthorized trails pass near or sometimes directly over streams and rivers and through lakes and wet meadows, causing stream bank erosion, increasing

nutrient loads and turbidity, and destroying riparian vegetation. Other routes cut channels and gullies onto the forest floor and when it rains, water that flows through these unnatural water courses gains speed, changing the quantity and quality of surface runoff.

Russ Ehnes, executive director of the National Off-Highway Vehicle Conservation Council, said water quality is one of his organization's "primary concerns" when it comes to OHV management.

"Properly designed trails are crucial to maintaining water quality," he said. Such trails have minimal stream crossings, stay away from riparian areas and drain so that water can't travel long distances and directly into streams.

Perhaps most significant in terms of water quality impairment is the simple fact that motorized recreation in the forest has become so popular. In the national forest alone, the number of OHV users grew from 5 million annually in 1972 to 36 million in 2000. By 2004, that number had grown to more than 50 million.

In response to this explosion and the plethora of unauthorized new trails and poorly designed old routes, California is in the process of designating official OHV routes in its 18 national forests. The goal is to establish a legal system of routes that protect water quality, soils, vegetation and wildlife habitat, and minimize contact between motorized and non-motorized recreation.

"The purpose of the route designation is to continue the use of off road vehicles on national forest land but to do it in a way that is not harmful to water quality," said Knopp of the Forest Service. "Most off road vehicle users understand the dilemma of leaving things undesignated. Without it, they won't be able to have any off road vehicle use whatsoever."

Most of California's national forest regions have completed the

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Nonpoint Source News



UC Davis Tahoe Environmental Research Center scientist Brant Allen demonstrates how a white Secchi disc is used to measure lake clarity. June 18 2002.

Reducing Runoff Will Help Make Tahoe Clear Again

Using data from a computer model that simulates Lake Tahoe's response to various combinations of pollution, researchers have determined that a 35 percent reduction in nitrogen, phosphorus and fine sediment runoff into the lake could make Tahoe clear again.

The Lahontan Regional Water Quality Control Board and others will use the new data to devise strategies to reduce nonpoint source and other pollution of the water. The Lahontan Board is working on a TMDL for Lake Tahoe, and it also is working with the Forest Service and Tahoe Regional Planning Agency (TRPA) to develop strategies to improve the Lake's water quality and clarity.

The Lake Tahoe Clarity Model is part of a joint California-Nevada effort to establish allowable levels of pollutants to meet water quality standards in Lake Tahoe under the federal Clean Water Act. In July, the

Lahontan Board announced the latest pollution reduction findings.

So far, most pollution reduction efforts have focused on runoff from construction and traffic, as well as on restoring nearby wetlands and

Reducing Damage to Water Quality from Hydromodification

EPA recently issued a draft *National Management Measures to Control Nonpoint Source Pollution from Hydromodification*, to help states, agencies and organizations reduce nonpoint source pollution from stream channelization and channel modification, dams, and streambank and shoreline erosion.

These activities, known collectively as hydrologic modification or hydromodification, disturb the natural flow patterns of surface water

waterways as natural filters. Based on the new data, planners may adopt policies to limit runoff from lawns. The research revealed that nitrogen – the primary ingredient in lawn fertilizer – is part of what makes Tahoe's water murky.

Erosion and air pollution also play a major role, and together, these fine particles and nutrients fuel algae growth, causing the Lake's clarity to plummet. A 35 percent reduction overall would clear things up.

University of California, Davis scientists have been monitoring the Lake's clarity since 1968. The Lake used to be clear to more than 100 feet. Today, the water becomes murky at about 70 feet.

"It's exciting to have the knowledge that it's possible to restore Lake Tahoe's water clarity to historic levels within our lifetime," said John Singlaub, executive director of the TRPA. "We'll have many tough decisions to make about how to achieve the goal, but to know it's scientifically possible is a breakthrough."

The water quality restoration plan for Lake Tahoe is part of Pathway 2007. To read the plan or for more information on the TMDL see www.pathway2007.org. ♦

and groundwater, often contributing to NPS pollution. According to EPA, hydromodification is one of the leading sources of impairment in our nation's waters, and is second only to agriculture as a pollution source of streams, lakes, ponds and reservoirs.

The document includes management practices and techniques that EPA considers effective for reducing the negative impacts to water quality from hydromodification activities such as dredging and snag

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removal, stream straightening or relocation, channelization and construction on or along streams. Water quality impairments caused by dams and impoundments is also addressed in the draft report.

EPA requested comments on the draft and is now in the process of reviewing them and finalizing the publication. Staff expected signifi-

cant public comment on stream-bank and shoreline erosion issues, as well as on the dam section, and in particular, on the increasingly debated issue of dam removal. EPA plans to issue a final version of the publication in January.

The draft document is available for download or order at <http://www.epa.gov/owow/nps/pubs.html> ♦

Coastal Contamination Contributes to Rising Healthcare Costs

Reducing storm water and other polluted runoff in coastal southern California could save the state millions of

dollars in healthcare costs, according to a new study published in August in the journal *Environmental Science and Technology*. Up to 1.5

million cases of diarrhea, vomiting and other related symptoms are caused by swimming at southern California beaches.

Healthcare costs from these illnesses may be as high as \$414 million annually, according to the research.

University of California, Los Angeles, and Stanford University scientists entered beach attendance and fecal coliform densities data into two epidemiological models and used the results to estimate the risk of contracting a GI illness from swimming in the ocean in Los Angeles and Orange counties.

The study, which includes data for individual beaches, concludes that water quality improvements in the region could have substantial public health benefits. Data on individual beaches includes:

- Doheny, Malibu, Marina del Rey, Cabrillo and Las Tunas had the worst water quality. Newport, Hermosa, Abalone Cove, Manhattan, Torrance and Bolsa Chica are the cleanest.
- The three beaches with the lowest incidence of gastrointestinal illness due to fewer visitors were San Clemente's city beach, Nichols Canyon and Las Tunas.
- Storm water runoff is the chief cause of dirty ocean water in southern California and cleaning it up would prevent 394,000 to 804,000 gastrointestinal cases and save \$13 million to \$28 million in annual health costs in Los Angeles County alone.

In August, the Natural Resources Defense Council filed a lawsuit against EPA for failing to adopt tougher water quality standards to protect beachgoers from waterborne illnesses.

The *Environmental Science and Technology* article can be downloaded at <http://pubs.acs.org/cgi-bin/sample.cgi/esthag/asap/pdf/es060679s.pdf> ♦





CABY's IRWMP includes strategies to protect the Yuba River Watershed.

State Funding Encourages Regional Focus

In November, the State Water Resources Control Board (State Board) and Department of Water Resources (DWR) will announce \$150 million in grants to selected regional watershed groups to begin implementing Integrated Regional Watershed Management Plans (IRWMPs). DWR and the State Board expect to hold a second competition for an additional \$150 million in implementation funding in 2007.

In 2005, DWR and the State Board awarded 33 groups \$14.7 million in planning funds to de-

velop regional strategies for managing water resources. The process began in 2002 under Proposition 50, the Water Security, Clean Drinking Water, Coastal and Beach Protection Act. Since then, diverse water interests have formed coalitions throughout the state to develop plans for solving water quality, environmental and water supply challenges in their watersheds.

"It's exciting to see that the water community is starting to coordinate with land managers to look at long-term water supply

issues and to really incorporate watershed-wide water protection measures into their planning," said Jason Rainey of the South Yuba River Citizens League.

Rainey's organization is participating in the Consumnes, American, Bear and Yuba watersheds (CABY) group. CABY is one of 33 coalitions that received a planning grant to develop new or update existing integrated watershed plans. Some 85 local governments, water agencies, power companies, tribes, farmers, and conservation and recreation organizations are participating in the CABY planning process.

Proposition 50 funding is part of the state's efforts to encourage and support regional efforts to tackle complex water problems specific to each region. Early in the IRWMP planning stage in the Sacramento region, representatives from CABY organizations realized they needed their own IRWMP.

"Once you get into the foothills and mountains, you are dealing with very different resource issues, especially for water quality and water supply," said Liz Manfield, director of CABY and watershed manager for the El Dorado Irrigation District. The regional planning process encourages water and land use organizations to focus on these unique issues. In the foothill and Sierra regions, CABY is developing a plan to address the legacy of mining and logging operations, the dramatic increase in recreation and development, wildfires and the impact of climate change on both fire and precipitation patterns.

The IRWMP is a "very good, collaborative process," said Mansfield. "People are very engaged and people are very serious about this."

More information on the regional planning and implementation process and funding is available at <http://www.grantsloans.water.ca.gov/grants/integregio.cfm> or <http://www.waterboards.ca.gov/funding/irwmp/index.html> ♦

TMDL Roundup

San Francisco Bay (Region 2)

Regional Board approved June 14 a TMDL for pathogens in the Sonoma Creek Watershed

Contact: Tina Low, 510/622-5682; link to staff report at: www.waterboards.ca.gov/sanfranciscobay/Agenda/06-14-06/SonomaAppC.pdf

Central Coast (Region 3)

Regional Board approved July 7 a TMDL for nutrients and dissolved oxygen for Chorro Creek

Contact: Chris Rose, 805/542/4770; link to staff report at: www.waterboards.ca.gov/centralcoast/Board/Agendas/070706/Item9/documents/Item9StaffReport.pdf

Los Angeles (Region 4)

Regional Board approved July 13 a TMDL for metals and selenium in the San Gabriel River

Contact: Jenny Newman, 213/576/6691; link to staff report at: www.waterboards.ca.gov/losangeles/html/bpaRes/bpa_td/48_New/SGR%20Metals_Final%20Staff%20Report.pdf

Regional Board approved June 8 a TMDL for metals in the Calleguas Creek Watershed

Contact: Thanhloan Nguyen, 213/576/6690; link to staff report at: www.waterboards.ca.gov/losangeles/html/bpaRes/bpa_td/44_New/06_0602/07%20Staff%20Report.pdf

Regional Board approved June 8 a TMDL for bacteria in Ballona Creek, Ballona Estuary, and Sepulveda Channel

Contact: Ginachi I. Amah, 213/576/6685; link to staff report at: www.waterboards.ca.gov/losangeles/html/bpaRes/bpa_td/2006-011/Final%20TMDL%20Staff%20Report.pdf

Central Valley (Region 5)

Regional Board approved June 22 a TMDL for diazinon and chlorpyrifos in the Sacramento-San Joaquin Delta

Contact: Danny McClure, 916/464/4751; link to staff report at: www.waterboards.ca.gov/centralvalley/tentative/0606/delta-dc/delta-dc-staff-rpt.pdf

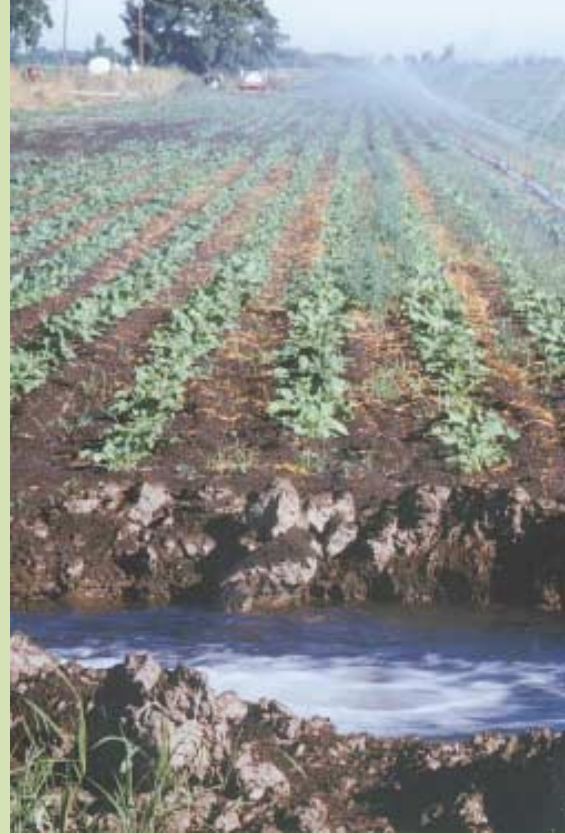
Regional Water Board approved June 22 a TMDL for nutrients in Clear Lake

Contact: Lori Webber, 916/464/4745; link to staff report at: www.waterboards.ca.gov/centralvalley/tentative/0606/clearlake-bpa/cl-staff-rpt.pdf

Santa Ana (Region 8)

Regional Board approved April 21 a dry season TMDL for nutrients in Big Bear Lake

Contact: Heather Boyd, 951-320-2006; link to staff report at: www.waterboards.ca.gov/santaana/pdf/tmdl/bigbear/03-06%20Final%20staff%20report.pdf



Ag Waiver Update: Central Valley Requires Participant List

The Central Valley Regional Water Quality Control Board extended its agricultural waiver program in June for another five years, but added the requirement that each coalition submit its list of individual participants annually.

Growers have until the end of the year to join a coalition and participate in the waiver program. The conditional waiver requires participants to monitor tailwater, wastewater and storm water discharges for sediment, pesticides, nutrients and other contaminants.

The participant list requirement was opposed by the regulated community because of concerns that the list will make it possible for



Forested Watersheds

CONTINUED FROM PAGE 8

route mapping process; the next step is to decide which roads and trails to permanently designate for OHV use, and which ones to close. The process includes public input and expert evaluation.

In addition to the route designation process, other OHV organizations are working to educate their members about sustainable motorized recreation in the forest. Tread Lightly offers "Tread Trainer" programs across the country to train individuals "in innovative, practical methods of spreading outdoor ethics to the public with a curriculum specifically focused on motorized and mechanized recreation."

Since 2003, 981 volunteers have been trained through the Tread Trainer program and those volunteers have reached more than 40,000 outdoor enthusiasts. Included in Tread Lightly's educational literature are OHV driving tips designed to protect water quality, including: cross streams only at designated fording points or where the road crosses the stream; avoid riding in mud; don't ride in meadows or marshy areas; and straddle ruts, gullies and washouts.

Tread Lightly also raises funds and organizes volunteers to work in collaboration with public agencies on trail repair and bridge construction through a program called "Restoration for Recreation." Since 1997, it has provided funding for at least 15 major projects throughout the United States and generated thousands of volunteer hours.

In California, local watershed groups are working to make sure that water quality is protected by the new trail system in the national forest. The South Yuba River Citizens League in Nevada City held a public meeting in August on the OHV route designation process and created what it calls a citizen's "soft recreation committee." The committee will provide input to the

road designation process in the Tahoe National Forest and "advocate for recreational uses that are compatible with maintaining water quality and ecological health."

Jason Rainey, the Citizens League's executive director, said the Tahoe Forest is one of California's most popular areas for OHV recreation, in part because of its close proximity to Sacramento and the Bay Area.

"It's a straight shot up here for a lot of folks on I-80," said Rainey. "The forest is being loved to death."

For more information or to find out how to participate in California's Route Designation program, see <http://www.fs.fed.us/r5/routedesignation/index.shtml>. For information on Tread Lightly programs, see <http://www.treadlightly.org/>.

Summary

The legacy impacts from historic mining and logging of California's resource-rich mountains and foothills will undoubtedly continue to plague the state's forest land waters into the foreseeable future. Clean up and monitoring efforts are underway and resource extraction practices on California's forest lands are increasingly designed to protect water quality and minimize ecosystem damage. But the sediment, mercury and other NPS pollutants from historic logging and mining, combined with new, mounting challenges from motorized vehicle recreation and more frequent, intense wildfires means that protecting California's forested watersheds will continue to be a one of the state's most significant natural resource challenges.

Forest land waters are "the hearts of our forested ecosystems," said EPIC's Greacen. "We need to practice forestry in a way that brings back the characteristics of an older forest – forests with big trees, lots of shade and substantial soil. That's the type of forest that gives you clear, clean cold water." ♦

environmental organizations to target individual growers with water pollution lawsuits. Environmentalists and rural residents have expressed concern that the waiver program doesn't stop irrigated agricultural runoff from contaminating the water supply.

Farmers irrigate nearly 10 million acres of cropland in the state, using some 35 million acre-feet of water each year, and agricultural runoff is a significant source of nonpoint source pollution.

The Central Valley's Irrigated Lands Discharge Waiver was particularly contentious, and the Regional Board debated for several hours before a majority voted in support of extending the waiver.

The Central Coast (Region 3), Central Valley (Region 5) and Los Angeles (Region 4) regional boards have all adopted conditional waivers for wastewater discharges from irrigated agriculture. The other five Regional Boards have no immediate plans to adopt agricultural waivers. Some officials speculate that these boards will adopt waivers as they work to implement TMDLs in their regions. ♦

NPS Pollution From Lawns

By KATHERINE NOBLE-GOODMAN

Throughout the state, water providers have launched outreach programs, adopted tiered rate structures and offered rebates to encourage customers to conserve water, both indoors and out. Now, some outdoor water use campaigns are beginning to focus on water quality issues, as well.

A typical suburban lot generates more than three times as much runoff as a wooded area of equal size, and what Americans put on these green spaces – water, fertilizer, pesticides and herbicides – either seeps into the ground or runs off as nonpoint source pollution.

A recent U.S. Geological Survey analysis of 20 major river basins across the nation found common lawn and garden pesticides in both surface and groundwater. Not surprising, considering that accord-

ing to EPA estimates, Americans put more than 100 million pounds of chemicals on their lawns each year.

“Many people apply fertilizers and pesticides as a ‘routine practice’ when lawns and landscapes don’t need it,” said Karl Kurka, assistant director of the California Urban Water Conservation Council.

“Pesticides should only be used when a pest is actually present and causing problems.” Residents should exercise similar caution with fertilizer, he said. “If you do fertilize, use fertilizer with ‘slow release’ nitrogen and apply the correct amount.”

It’s not only chemicals that contribute to nonpoint source pollution, however. Watering too much does, as well. For example, when residents don’t turn off their sprinklers when it rains, lawns

become saturated and run off increases, carrying with it sediments, nutrients, salts and other pollutants.

“Over irrigation of lawns and landscapes carries pollutants into streams, rivers and groundwater,” said Kurka. “If people would just cut back on irrigation to what their landscapes actually need, this problem could be eliminated.”

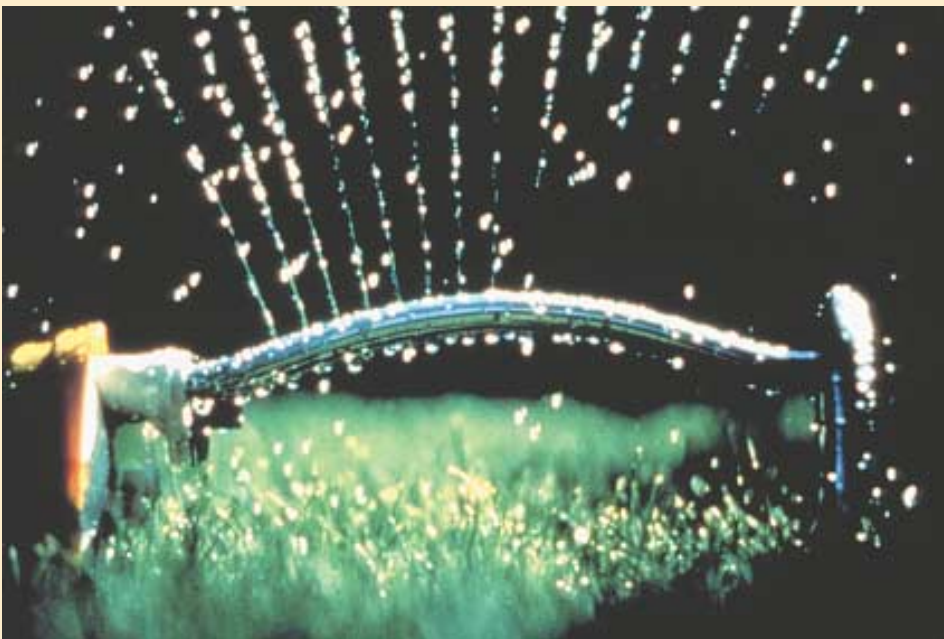
For a perspective on the significance of lawns to the nation’s landscape and the potential impact growing all this turf has on water quality, NASA Earth System researchers recently calculated the total acres of lawn in the country. They discovered that lawns cover more land than any other single irrigated crop in the United States, or some 40 million acres. And the suburban landscape, where most lawns are grown, is expanding.

According to California’s Farmland Mapping and Monitoring Program, suburban land grew by 92,750 acres in 2002. What’s more, most of this growth occurred inland, where residents tend to have large lawns that need a lot of water and fertilizer to stay lush and green in the hot, dry inland climate.

Of the 11 million new residents expected in California by 2030, half will live in these inland regions, according to a July 2006 report by the Public Policy Institute of California.

Recognizing these trends and the link between water conservation and water quality and nonpoint source pollution, agencies and nonprofit organizations are beginning to encourage residents to design and care for their landscapes with water quality in mind.

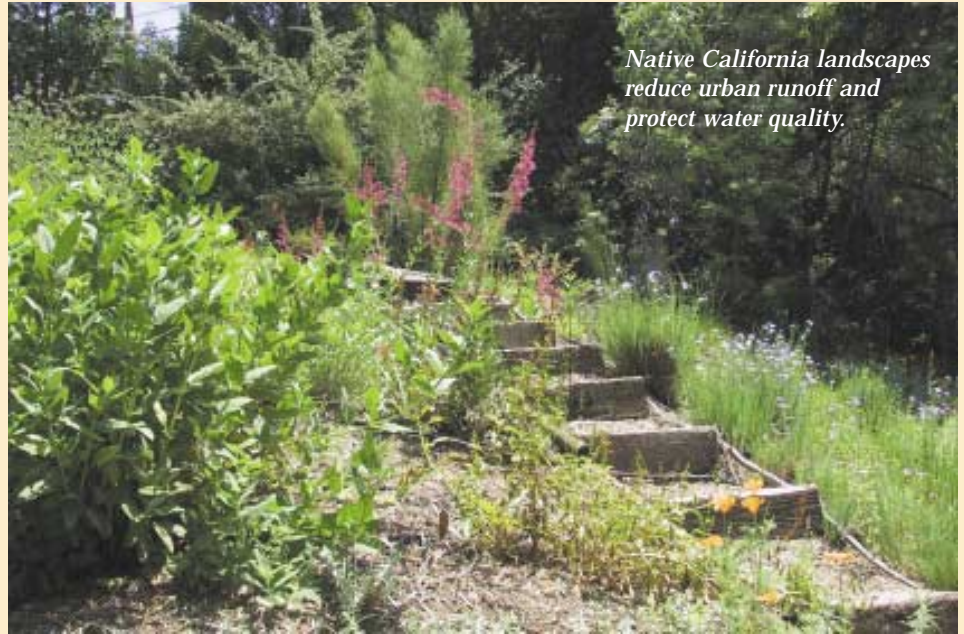
In San Diego, Project Clean Water hosts a web page devoted to educating the public about the how lawn pesticides and fertilizers contribute to nonpoint source pollution. The organization’s Healthy Garden – Healthy Home webpage includes printable tip cards to guide residents in adopting strategies to “protect your children, your pets, and your



watershed." <http://www.projectcleanwater.org/html/ipm.html>

In Los Angeles, the Metropolitan Water District of Southern California's California Friendly campaign encourages residents to plant both native California and other drought-tolerant plants, in part because these plants thrive in nutrient poor soil. That means that for the most part, fertilizer is unnecessary.

Nationally, organizations such as the Audubon Society (http://www.audubon.org/bird/at_home/reduce_pesticides.html) and the National Wildlife Federation (<http://www.nwf.org/backyard/>) encourage residents to consider water quality and watershed health when they decide what type of landscape to plant and how to care for it, and EPA's Nonpoint Source Pollution Pointer (<http://www.epa.gov/owow/nps/facts/point10.htm>) encourages homeowners to consider planting California native plants in their yards.



Native California landscapes reduce urban runoff and protect water quality.

California can improve its water use efficiency in new and existing urban irrigated landscapes. *Water Smart Landscapes for California* includes a focus on nonpoint source pollution.

"Runoff and groundwater percolation from excessive and inefficient

consumption but also reduces urban nonpoint source pollution."

Submitted to the governor and Legislature in January, the Task Force recommended that state water policy should prohibit excessive landscape irrigation that leads to urban runoff and encourage the capture and retention of storm water onsite to improve water use efficiency and reduce water quality problems.

For garden tutorials, landscape designs, plant lists and other resources to help reduce residential water use and improve water quality by planting a California Friendly Landscape, visit <http://www.bewaterwise.com>. For books devoted to non-turf landscapes with information on water quality and residential irrigation, see "How to Get Your Lawn off Grass," by Carole Rubin and "Requiem for a Lawn Mower," by Sally Wasowski.

Nurseries that focus on residential landscapes that protect water quality include Las Pilitas Nursery (<http://www.laspilitas.com/>) with locations in Santa Margarita and Escondido, North Coast Native Nursery in Petaluma (<http://www.northcoastnativenursery.com>) and the Theodore Payne Foundation (<http://www.theodorepayne.org/>) in Sun Valley. ♦



On the policy level, the California Urban Water Conservation Council recently published the recommendations of a state-appointed Landscape Taskforce charged with recommending how

landscape irrigation is one of the largest sources of urban nonpoint source pollution and watershed degradation," states the report. "Improving landscape irrigation efficiency not only reduces water

If you would like to receive this newsletter electronically, please send your email address to: knoblegoodman@watereducation.org

Share Your Success

Have an interesting story to tell about your nonpoint source pollution control or stormwater program? Why not share your experience with others through *The Runoff Rundown*? One of the goals of *The Runoff Rundown* is to be a forum for sharing ideas that have successfully reduced nonpoint source or urban runoff. These can be programs or policies initiated by cities, local and regional agencies, regional water boards, or in the private sector. To share your story, contact Katherine Noble-Goodman, Water Education Foundation, at (916) 444-6240, or send e-mail to knoblegoodman@watereducation.org.



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