National Water Research Institute

Briefings

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Dr. Nancy N. Rabalais Awarded the 2008 Clarke Prize

For over a decade, the Athalie Richardson Irvine Clarke Prize has been awarded to outstanding scientists for excellence in water research. This year, the Prize was presented to Nancy N. Rabalais, Ph.D., for her seminal research on understanding and characterizing hypoxia, or severe oxygen depletion in water resources, and her commitment to improving marine water quality through public policy.

"This is truly an honor, and I am awed to be among the list of prior awardees," said Dr. Rabalais, Executive Director and Professor of the Louisiana Universities Marine Consortium (LUMCON) in Chauvin, Louisiana.

Established by NWRI in 1993, the Clarke Prize is only one among a dozen water prizes awarded worldwide. It has been named by the International Congress of Distinguished Awards as one of the most prestigious awards in the world. Mrs. Joan Irvine Smith, patron of the award, presented Dr. Rabalais with the Clarke Prize medallion and $50,000 check at the Fifteenth Annual Clarke Prize Award Ceremony and Lecture, held on July 10, 2008, at the Hilton Waterfront Beach Resort in Huntington Beach, California.

California Lieutenant Governor John Garamendi joined the Ceremony as a special guest speaker, highlighting the importance of Dr. Rabalais' work and the critical need for continued research.

"Policymakers like myself and others need to base our policies on fundamental, sound science," said Lieutenant Governor Garamendi, who is also the former U.S. Deputy Secretary of the Interior. He pointed out how most water management policies in the Western U.S. are based on the history of the last 50 to 60 years, "Which is not relevant anymore. We are going to have to have new science … We are going to have to adapt to the reality of climate change and the reality of human impacts on our water systems."

California Lieutenant Governor John Garamendi presented Dr. Rabalais with a State of California Resolution.

In addition to an official State of California Resolution presented to Dr. Rabalais by the Lieutenant Governor, Dr. Rabalais also received honors in the form of letters of commendation from distinguished admirers, including university presidents, governors, senators, congressmen, and the President of the United States.

"Congratulations to Dr. Nancy N. Rabalais on being recognized for your work," wrote President George W. Bush. "Your efforts assure continuing stewardship and wise development of our water resources for now and into the future."

Aquatic scientist, marine ecologist, and oceanographer are among the many terms used to describe

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Hypoxia Expert Receives Clarke Prize

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Dr. Rabalais, who – for over 25 years – has dedicated her career to understanding and mitigating the effects of human-induced changes in water quality.

After receiving a bachelors and masters degree in Biology from Texas A&I University (Kingsville, Texas) and doctorate in Zoology at the University of Texas at Austin, Dr. Rabalais began her research career at LUMCON, studying the environmental effects of oil and gas development on the marine environment. Her research team found that toxic discharge streams being released by the oil and gas producers in Louisiana severely reduced the abundance and diversity of benthic creatures (organisms found in the sediments). Because of her persistence in raising concern about the water quality – and with the support of similar findings from other research projects – the U.S. Environmental Protection Agency established new national standards for discharges in inshore waters and tighter restrictions for offshore waste disposal sites.

"As a young postdoctoral scientist, Nancy essentially took over the research and not only made it her own, but also made it known to the world – not just the world scientific community, but also the public and policymakers," wrote Donald Boesch, former Executive Director of LUMCON and mentor for Dr. Rabalais.

Her innate ability to meaningfully communicate science to the public and resource managers carried over in her subsequent dealings with hypoxia in coastal Louisiana.

Commonly known as "dead zones," hypoxic waters force fish and crabs to flee large areas of water and cause the widespread death of organisms that make up a healthy ecosystem. In conjunction with other research, Dr. Rabalais' research in the Gulf of Mexico established a clear link between hypoxia and excess nutrients in the water – a phenomenon known as eutrophication. Excess nutrients lead to an overgrowth of algae and oxygen-consuming bacteria. Her team recognized that the nutrients fueling hypoxia were excess nitrogen and phosphorus found in the Mississippi River that originated from agricultural runoff caused by increased fertilizer application and artificial soil drainage. Along with others, her team then developed an extensive list of management strategies that would help reduce nutrient-loading and, therefore, hypoxia.

Dr. Rabalais has published nearly 100 scientific papers and is seen by her peers as one of the foremost authorities on hypoxia and nutrient management. She has gone beyond the scientific realm, advocating changes in public policy and playing a key role in the development of the policy within EPA's Hypoxia Task Force. In addition to providing scientific insight and congressional testimonies as a means of public outreach, Dr. Rabalais gives freely of her time for public lectures; gives interviews for numerous national newspapers and magazines, such as *National Geographic* and *Time* magazine; has served on National Research Council committees, including the Mississippi River and the Clean Water Act Committee; and also mentors graduate students.

"Nancy has kept the issue of marine hypoxia in the public focus for more than a decade," wrote long-time friend and colleague, Dr. John A. Downing, Professor of Agricultural and Biosystems Engineering, and Ecology, Evolution, and Organismal Biology at Iowa State University of Science. "There is simply no aquatic scientist in the nation who has done so much to maintain and protect water resources."

Dr. Rabalais' research on aspects of water quality, eutrophication, and hypoxia have garnered her many scientific and environmental awards, among them being the BH Ketchum award from Woods Hole Oceanographic Institute and, more recently,

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Clarke Laureates with Clarke Prize Award patron, Mrs. Joan Irvine Smith. (Top row, from left): Dr. Menachem Elimelech, Dr. Charles O'Melia, Dr. Harry Ridgway, Dr. James Barnard, Dr. Walter Weber Jr., Dr. Joan Rose, and Dr. Perry McCarty. (Bottom row, from left) Dr. George Tchobanoglous, Dr. Nancy Rabalais, Mrs. Joan Irvine Smith, and Dr. Philip Singer.

Workshop Sheds Light on the Use of Ultraviolet Disinfection in Wastewater and Reuse

A simple, low-cost, and highly efficient technology, ultraviolet (UV) disinfection is a proven tool for selectively destroying pathogens in drinking water.

"As wastewater treatment moves forward in recycling wastewater into drinking water, it is becoming more important to replace conventional technologies with new ones that use the most advanced disinfection tools available," said Paul Overbeck, Executive Director of the International Ultraviolet Association (IUVA). "The benefits of UV use in water treatment are evident – it's just a matter of getting the message out."

The message was underscored at NWRI's "UV for Wastewater and Reuse Workshop" held in Orlando, Florida, on March 18, 2008. Co-sponsored with IUVA and WateReuse Florida, and in partnership with Black & Veatch and Carollo Engineers, the purpose of the workshop was to provide agency staff, consultants, and wastewater treatment professionals with the tools and resources needed to implement cost- and performance-effective systems for the future.

NWRI Executive Director, Jeff Mosher (left), with workshop instructors and co-sponsors (from left): Paul Overbeck (IUVA), Erica Mahar (Carrollo Engineers), David York (York Water Circle), Gary Hunter (Black & Veatch), Keith Bourgeous (Carrollo Engineers), Jim Malley (University of New Hampshire), and James Crook (Consultant).

Typically, water systems use chemicals to provide high-level disinfection of wastewater, which may require the removal, or control, of disinfection byproducts. UV disinfection uses high levels of radiation to disinfect water and wastewater, damaging the genetic structure of waterborne pathogens, such as bacteria, viruses, and protozoa, and rendering them non-infectious.

Over 90 participants came together at the UV workshop to learn about topics that included the following:

- **The public health relevance of disinfection.** Mechanisms for survival in waterborne pathogens, federal guidelines of bacterial indicators, and discussion of limits and advantages of certain treatment processes.
- **Certification processes and certified UV reactors.** What are the protocols for reclaimed water UV certification? What are the differences between UV systems and modeling processes?
- **Capital costs and operation costs.** An overview of cost for all parts of implementing UV treatment systems, including costs for construction, labor, power, and replacement parts.

Also featured were manufacturer equipment displays, and the opportunity to join in roundtable discussions about UV technology and the different types of resources and suppliers that were available to support UV systems.

"This workshop served as a forum to deliver the technological support and backup materials that have culminated from years of research," said Overbeck. "The next step requires continuing research and preparing for future UV workshops."

2008 Clarke Prize Recipient

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the 2008 Ruth Patrick Award for advancing the science of limnology and oceanography from the American Society of Limnology and Oceanography. But despite all of her well-deserved accolades, Dr. Rabalais remains humble, wishing to share praise with her colleagues and friends.

"The Clarke Prize identifies me as 'the driving force behind identifying and characterizing the dynamics of the large hypoxic region in the Gulf of Mexico,' but I would not be standing here if it were not for the creative and dedicated colleagues who have been instrumental in defining the how, where, when, and why of watershed changes and coastal water quality," said Dr. Rabalais. Her Clarke Prize Lecture, *Ecosystem Science Informs Sound Policy ... or Does It?*, presented at the Ceremony, was dedicated to those colleagues. "It has truly been a collegial and exciting trip."

True to her selfless nature, Dr. Rabalais will donate her prize to the LUMCON Foundation to go back into research. Her reward, she said, is in turning science into policy decisions, and the "very cooperative interactions with scientists, research teams, technicians, and boat crews. I really do enjoy it."

A full copy of the 2008 Clarke Prize Lecture by Dr. Rabalais may be downloaded at www.NWRI-USA.org/ClarkePrize.

NWRI-AMTA Fellowships in Membrane Research

Established in 2007, the NWRI-AMTA Fellowship for Membrane Technology awards $10,000 per year to two graduate students helping to solve water supply and quality issues through the widespread application of membrane technology. The 2007-2008 Fellowship recipients – Eva Steinle-Darling of Stanford University and Kendra Colyar of the University of Colorado – were selected for their original and outstanding research projects and their potential for advancing membrane technology.

Membranes are used to filter unwanted particles and pathogens from target water sources and are important tools in the water treatment industry. As the leading advocate of membrane processes in the United States, the American Membrane Technology Association (AMTA) is committed to promoting and advancing the understanding and application of membrane technology.

"The purpose of this Fellowship is to give back to the membrane industry," said Steven Duranceau, who is a member of the Board of Directors for AMTA, as well as NWRI's Research Advisory Board. "Everyone benefits from services such as the Fellowship because the knowledge that results from research builds the clearinghouse of information for the industry."

Setting Standards for Membrane Use in Water Recycling

Eva Steinle-Darling, *Stanford University*

A lifelong competitive athlete, Eva Steinle-Darling is unfazed by mental and physical challenges. So when her advisor at Stanford University gave her the unusual assignment of advising another masters student during her own second year of graduate study, Eva grabbed the reigns and began by asking, "What are your interests? Let's see what I can advise you on."

Eva Steinle-Darling

Together, Eva and "her" masters student studied membrane rejection of nitrosamines, a disinfection byproduct of water treatment. Using this topic, her student wrote his master thesis and Eva returned to the field to further investigate the extent to which membranes are effective in removing other trace organic contaminants.

Eva's research, "Rejection of Trace Organics – Nitrosamines, Perfluorochemicals, and Others – via Reverse Osmosis and Nanofiltration: Influence of Feed and Solute Characteristics," aims to build on the field of knowledge on the mechanistic effects of size, charge, and solute-membrane affinity on the rejection of three families of contaminants that may have adverse health effects on humans and aquatic life: nitrosamines, perfluorochemicals (PFCs), and pharmaceuticals and personal care products (PPCPs).

"There may be many chemicals in our waters that we don't know about yet," said Eva. "It's important to understand the rejection mechanisms of these trace organic contaminants, such as those in PPCPs, so that future membrane technologies can be more efficiently implemented in water, wastewater, and recycled water treatment processes."

> *"The purpose of this Fellowship is to give back to the membrane industry."*
>
> ~ Steven Duranceau
> *Member, AMTA Board of Directors*

By amassing fundamental information about compound rejection mechanisms and their treatment, Eva's research will facilitate the work of those designing treatment systems in the future. They will simply have to look to Eva's work to determine whether or not certain compounds in question would be effectively removed by membranes. Her research also aspires to provide predictive capabilities for other compounds found in water.

"One significant finding in my work is that there is a clear correlation between the rejection behavior of a compound and the amount of compound that ends up sorbed to the membrane material," explained Eva. "More generally, I hope that one of the contributions of my work in the water and wastewater field will be to help practitioners decide whether membranes are the best treatment option for their particular contaminants of concern."

Although her research with PPCPs is still ongoing, Eva's findings on membranes and PFCs has already been published in *Environmental Science and Technology*. She graduated this summer with her Ph.D. in Environmental Engineering, and plans on spending the rest of the summer traveling – first to present her research findings at the AMTA/SEDA 2008 Joint Conference and Exposition and then to Europe to visit friends and family. This fall, she will begin work with Erler & Kalinowski, Inc. in Burlingame, California, an engineering and environmental consulting firm that provides complete engineering services with a focus on the environment, water, wastewater, and water resources.

Powering Towns with Plant Fuel

Kendra Colyar, *University of Colorado at Boulder*

As an avid runner and Washington native, Kendra Colyar – a master's student at the University of Colorado at Boulder – is no stranger to the outdoors or hard work.

While studying physics and engineering as an undergraduate, Kendra turned to running for peace and meditation. She was a member of the cross-country team in college, and her first marathon ran through Boulder County's countryside alongside farms and cottonweed groves on rural roads. With so much time spent outdoors, it is no surprise that her research would focus on nature and the environment. What separated her research from that of her peers was her impressive use of membranes in tying both the environment and technology, which garnered her the NWRI-AMTA Fellowship Award.

Kendra's research on the "Evaluation of Nutrient Extraction and Membrane Processes to Facilitate the Reuse of Water and Macronutrients Prior to Lignocellulosic Biomass-to-Fuel Processing in Rural Communities" involves the use of membrane separation processes to recycle water back to biorefineries to conserve water and improve the economics of producing biofuel.

"Today, we have the capability to create cellulosic ethanol – fuel derived from plant matter – but there are many environmental and economical barriers associated within the plant-to-fuel conversion process," explained Kendra. "The purpose of this study was to address two of those current drawbacks: water consumption and nutrient depletion."

Corn stover, which consists of corn husks and stalks, is the feedstock used by process facilities to create biofuel, which can in turn be used to power cars and even power plants.

Kendra Colyar

"Our research was geared towards rural communities that could benefit a great deal from having their own biorefinery," said Kendra. "An agricultural population could save money by providing their own fuel for transportation and harvesting equipment, and they could even power the biorefinery and the community by burning byproducts produced in the conversion process."

Conducting preliminary experiments with corn stover from Imperial, Nebraska, Kendra proposed a two-stage nutrient extraction-filtration process that would facilitate the reuse of macronutrients, and possibly increase the overall benefits gained from plant-to-fuel processing.

"There are still variables that need to be looked at," said Kendra of her research on Imperial, Nebraska. "I would love to be a size contributor in the next step and to the overall process in the future."

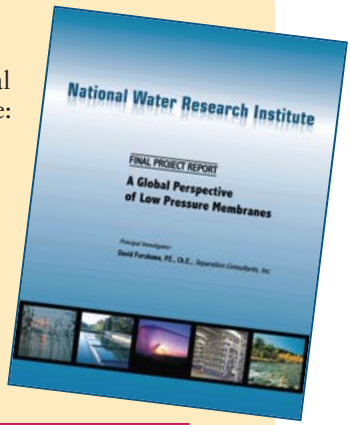
With her research in its final stages, Kendra graduated in May 2008, receiving an M.S. in Civil Engineering with an environmental emphasis. Her plans for the future include a possible relocation to San Diego, California, where she has received an offer from the United States Department of the Navy for a position in which she will acquire the skills necessary to become a project manager for future environmental remediation projects.

For more information about the AMTA Fellowship and other NWRI Fellowships, please visit our Fellowship Program webpage at www.NWRI-USA.org/Fellowship.

Download the Latest NWRI E-Publications

NWRI's most recent publications are available online in PDF format, including white papers, final research project reports, and conference proceedings. Examples of current e-publications include:

- *Second Annual NWRI Graduate Research Fellowship Conference Proceedings*
- *A Global Perspective of Low Pressure Membranes* by David Furukawa P.E., Ch.E., Separation Consultants, Inc.
- *Cross Flow Sampler Fouling Index* by Dr. Samer Adham, MWH Americas, Inc., and Dr. Anthony Fane, University of New South Wales
- *Water 2010: A "Near-Sighted" Program of Water Resource Management* by Dr. William Blomquist, Indiana University Purdue University of Indianapolis
- And more!



E-Publications are available for complimentary download at: www.NWRI-USA.org/e-publications

Fellowship Students Gather in Washington, D.C. to Share Advances in Water Research

Eighteen graduate students from universities across the nation gathered on April 4, 2008, to attend the Second Annual NWRI Graduate Fellowship Research Conference, which was held in Washington, D.C. The conference, an event established to showcase the innovative research being conducted by NWRI Fellows, is one highlight of NWRI's Fellowship Program, which provides Fellowship funding to students conducting innovative research in water science, policy, engineering, and technology.

This year's conference sponsors included the Joan Irvine Smith & Athalie R. Clarke Foundation; American Membrane Technology Association; Boyle Engineering Corporation; Cargill, Inc; Carollo Engineers; CDM; CH2M Hill; Kennedy/Jenks Consultants; Malcolm Pirnie, Inc.; and MWH.

Eighteen student presenters from universities across the U.S. spoke about water and wastewater research at the Second Annual NWRI Graduate Fellowship Research Conference.

"The conference brings together bright, enthusiastic students conducting high-caliber research in their respective fields," said conference organizer Bruce Macler, National Microbial Risk Assessment Expert of the U.S. Environmental Protection Agency. "The quality and nature of the research being done by some of these students are astonishing."

With water as the main focus, students from the biological, engineering, and public policy fields joined to discuss their research in areas including treatment technologies, energy and water, and water resources.

Examples of speakers and their conference topics included:

- Doug Call, of The Pennsylvania State University and recipient of the Ronald B. Linsky Fellowship, spoke about using microbial electrolysis cells to produce high-efficiency hydrogen gas to be used as energy, while simultaneously treating wastewater.
- Dr. Melissa A. Kenney, of Johns Hopkins University, developed a novel procedure that statistically links water quality variables to water quality goals, and then analyzed a decision maker's requirements and needs to suggest water-quality standards that would benefit the community.
- Manish Kumar, of the University of Illinois at Urbana-Champaign, spoke about developing biomimetic polymeric membranes to remove dissolved contaminants from drinking water.

Brian Badgley, a fourth-year doctoral student at the University of South Florida, found the diverse representation of backgrounds to be a valuable learning experience. "Many of the other presenters were in fields that I don't normally interact with," said Badgley, whose own research dealt with water quality indicator bacteria in benthic watersheds. "It was great to discuss their approaches to questions similar to those we deal with in biology."

Industry representatives from the water and wastewater fields, such as environmental consultants, lawyers, research experts, and water and wastewater managers, were also invited to the event, giving students the unique opportunity to network with an intimate group of industry veterans.

"One of the benefits of having this year's conference in Washington, D.C., was that so many government and industry contacts were able to attend," noted Erin Towler, a second-year doctoral student from the University of Colorado, Boulder. At the conference, Towler – whose research focused on the development of water policy through climate change – forged a relationship with a member of the American Water Works Association and, as a result, is "now providing them with feedback on a climate change/water utilities draft document for the U.S. Environmental Protection Agency."

"These students are reaching the status of being peers to the other conference attendees," added Macler. "It makes the conference a learning experience for everyone who attends."

The final product of the conference is the NWRI Annual Graduate Fellowship Research Conference *Proceedings*, a publication of all the students' abstracts that can be downloaded from NWRI's website at www.NWRI-USA.org/fellowship.

Meet Our Research Advisory Board

Richard H. Sakaji, Ph.D., P.E.

"The Earth Day movement was still going strong when I attended high school," said Richard "Rick" Sakaji, Ph.D., P.E., a lifelong environmentalist and water specialist. Growing up in Northern California, Sakaji first became involved in the environment after joining a scuba diving club in high school. It was there – where school met the ocean – that his lifelong career in water would begin.

His interest in the ocean led him to study marine sciences at the University of California, Berkeley, but in his senior year, he realized that "there weren't many job opportunities then with just a bachelor's degree in marine biology."

"One of my professors – an oceanographer working in the environmental engineering department – started talking to me about jobs and introduced me to two other Berkeley professors, David Jenkins and Jerry Thomas," recalled Sakaji. "Their class in water chemistry was interesting and practical, and directed me towards the environmental engineering program."

After receiving an A.B. in Marine Biological Studies and an M.S. and Ph.D. in Environmental Engineering, Sakaji joined the California Department of Health Services, beginning a career there that would span over 15 years. His duties as a Water Treatment Specialist included providing regulatory oversight in the arena of new and emerging treatment technologies for California's public drinking water systems, as well as enforcement of the Federal and State Safe Drinking Water Acts. Later, as a Senior Sanitary Engineer, he reviewed testing protocols for new water and wastewater treatment processes to ensure that the technology was equivalent in performance to existing practices.

In 2001, Sakaji brought his multidisciplinary background in research, regulatory affairs, and public health to the NWRI's Research Advisory Board (RAB), and contributed to major NWRI projects such as the publication of *UV Disinfection Guidelines for Drinking Water and Water Reuse*, the first guidelines of its kind on UV disinfection for wastewater reclamation in California.

"NWRI sets itself apart from other organizations because it invests in new and fundamental research – the kind of research that other organizations pass on because they are considered too risky," said Sakaji. "That's one of the things that drove me towards NWRI. The RAB is also a good forum for the water reuse field, especially for industry professionals in California. It's one place where the regulators, utilities, and researchers can get together regularly and talk about ideas that would have an impact on the formulation of public policy, as well as pushing water reuse forward."

Dr. Rick Sakaji

Today, Sakaji is the Manager of Planning and Analysis for Water Quality at the East Bay Municipal Utility District (EBMUD), a publicly owned utility that supplies water and provides wastewater treatment for counties on the eastern side of San Francisco Bay in Northern California. There, he helps to develop public policy by pooling research from other scientists and researchers and putting their findings into practical applications. One area of research he is involved in deals with invasive non-native mussels in EBMUD's reservoirs.

Quagga mussels travel through different bodies of water by hitching rides along the hulls of boats, wreaking havoc along the way by proliferating without pause and clogging water pipes and pumps. In an effort to avoid the costly damage of mussel invasion, EBMUD imposed recreational boating restrictions, becoming the first water district in the Bay Area to impose boating restrictions related to mussels.

In addition to his work at EBMUD, Sakaji provides his expertise for several other organizations, serving on project advisory committees for the American Water Works Association Research Foundation, WateReuse Foundation, and U.S. Environmental Protection Agency (EPA). As a member of the EPA's Science Advisory Board Drinking Water Committee, he is helping to review technical documents, such as the *Contaminant Candidate List 3 (CCL3)*, and is working towards developing a procedure that would help decide what contaminants in water the EPA will regulate.

He also provides technical expertise at the international level, and has presented at workshops and conferences in places such as China, Australia, Singapore, Italy, and Spain.

His favorite place in the world, though, is with his wife, Sand, and daughter, Erin.

Whether it's snorkeling in Hawaii, admiring antique fountains in Italy, learning about kelp forests at the Monterey Bay Aquarium, or just waiting for fish to catch their lines at a nearby lake, exploring the environment is key for the Sakaji family. "We all try to get involved," said Sakaji. "It's a family thing."

NWRI Member Agency Spotlight: Los Angeles Department of Water and Power

Since its founding in 1902, the Los Angeles Department of Water and Power (LADWP) has become the largest municipal utility in the nation, delivering reliable and affordable water and electricity supplies to just over 4 million residents and businesses in Los Angeles. The Department is one of six agencies that govern NWRI for the common purpose of protecting, maintaining, and restoring water supplies through cooperative research work.

Los Angeles Mayor Antonio Villaraigosa kicks off an extensive water conservation plan for confronting climate change.

LADWP is represented on NWRI's Board of Directors by Thomas Erb, Director of Water Resources at LADWP, and Pankaj Parekh, D.Env, Director of Water Quality Compliance at LADWP.

"Being a member agency to NWRI – one of the few agencies that brings both environment and utilities together – enables LADWP to be a part of an exclusive club of advanced-thinking agencies that helps promote the protection of the environment, while also sustaining the technical, social, and economical issues of utility provision," said Parekh. "For LADWP, the appeal in NWRI is its ability to engage other water agencies in embracing these important issues."

The complex water system network that LADWP engineered in the early twentieth century broke world records and helped mold the metropolis of Los Angeles. Today, despite facing diminishing water supplies, LADWP continues to provide high-quality water to the growing population with innovative approaches, and a twenty-first century stance on environmental protection.

One of LADWP's major efforts in ensuring a safe and clean water supply for future Angelinos is the "Securing L.A.'s Water Supply" plan. Developed in partnership with the Los Angeles Mayor's Office, the plan is a blueprint for creating sustainable sources of water through an aggressive approach that combines short-term steps to conserve water, with long-term investment in water-efficient technology, water recycling, and improvements in the groundwater supply.

Water Conservation

Today, the water usage in Los Angeles is equal to that of 25 years ago despite a population increase of a million people. This achievement is due in part to LADWP's extensive program to replace over 1.3-million toilets with efficient models, saving significant amounts each year. LADWP recently brought back the Drought Busters program, which serves to increase awareness of water waste practices, such as hosing down sidewalks and excessive lawn watering. LADWP has a goal to conserve an additional 50,000 acre-feet per year by 2030.

Water Recycling

Recycled water is currently produced and distributed from the four wastewater treatment plants in Los Angeles. LADWP is putting forth extensive efforts into expanding their water portfolio by increasing the production of recycled water. Their goal is to increase the percentage of the City's water demands met by recycled water from 1 percent to over 6 percent of the total city demand. Their efforts also include a plan to increase water reuse by developing more water pipelines for irrigation and industrial use, as well as increasing the use of indirect potable resources.

Green L.A. Program

LADWP's Green L.A. Program involves a number of environmental programs that stress active community involvement in energy conservation. For example, the Green Power program, which is geared towards medium and large commercial customers such as the Los Angeles World Airport and Park LaBrea, enables Los Angeles businesses to support renewable energy by designating up to 100 percent of their electricity bill to green power. Green power – electricity produced by free and natural sources, such as the sun, wind, and water – produce less pollution and have the least impact on the environment. Earlier this year, LADWP won the 2008 Green California Leadership Award for Climate Change for their Low-Income Refrigerator Exchange Program, which allows low-income residents to trade in old refrigerators for newer, electricity-saving ones.

"One of the best ways we can preserve our limited water resources is to conserve," said Jeff Mosher, Executive Director of NWRI. "LADWP is taking an important and vital step in involving the community in conservation."

National Water Research Institute

18700 Ward Street
P.O. Box 8096
Fountain Valley
California
92728-8096

(714) 378-3278
Fax: (714) 378-3375

www.NWRI-USA.org

Executive Director:
Jeff Mosher

Editor:
Gina Melin Vartanian

E-mail:
gmelin@NWRI-USA.org

Writer:
Angie Im

Graphic Design:
Tim Hogan