

SECURE WATER ACT

HEARING BEFORE THE COMMITTEE ON ENERGY AND NATURAL RESOURCES UNITED STATES SENATE ONE HUNDRED TENTH CONGRESS

FIRST SESSION

TO

RECEIVE TESTIMONY ON S. 2156 (SECURE WATER ACT), A BILL TO AUTHORIZE AND FACILITATE THE IMPROVEMENT OF WATER MANAGEMENT BY THE BUREAU OF RECLAMATION, TO REQUIRE THE SECRETARY OF THE INTERIOR AND THE SECRETARY OF ENERGY TO INCREASE THE ACQUISITION AND ANALYSIS OF WATER-RELATED DATA TO ASSESS THE LONG-TERM AVAILABILITY OF WATER RESOURCES FOR IRRIGATION, HYDROELECTRIC POWER, MUNICIPAL, AND ENVIRONMENTAL USES, AND FOR OTHER PURPOSES

DECEMBER 11, 2007



Printed for the use of the
Committee on Energy and Natural Resources

U.S. GOVERNMENT PRINTING OFFICE

41-273 PDF

WASHINGTON : 2008

For sale by the Superintendent of Documents, U.S. Government Printing Office
Internet: bookstore.gpo.gov Phone: toll free (866) 512-1800; DC area (202) 512-1800
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SECURE WATER ACT

TUESDAY, DECEMBER 11, 2007

U.S. SENATE,
COMMITTEE ON ENERGY AND NATURAL RESOURCES,
Washington, DC.

The committee met, pursuant to notice, at 2:34 p.m., in room SD-366, Dirksen Senate Office Building, Hon. Jeff Bingaman, chairman, presiding.

OPENING STATEMENT OF HON. JEFF BINGAMAN, U.S. SENATOR FROM NEW MEXICO

The CHAIRMAN. Good afternoon. It's a pleasure to welcome everyone to this afternoon's hearing. We're lucky to have some very well-qualified witnesses here to discuss water-related challenges facing the Nation. The committee appreciates everyone's effort to be here and to testify.

The purpose of the hearing is to receive testimony on S. 2156, which is entitled the SECURE Water Act. This is a bill that I'm sponsoring, along with Senator Domenici, Senators Cantwell, Johnson, Salazar, and Tester. The bill would initiate a range of Federal actions to help address water resource issues across the country. While States and local communities bear the primary responsibilities for allocating and managing water, the Federal Government has a responsibility to be a worthy partner in that effort, and the SECURE Water Act was drafted to accomplish that objective.

Water has always been a priority in the West. Nonetheless, the stakes are higher now than ever before as the confluence of drought and climate change and population increases and environmental needs are testing water managers in unprecedented ways. Added to the mix is the increasing reliance on water resources to help produce electricity and fuel.

Almost daily, we're seeing disturbing news reports describing conflicts over water. These conflicts continue in the West, as they have since the West was settled, but we're also seeing them spread to other areas, such as the Southeast, where drought has resulted in a heated dispute between Georgia and Alabama and Florida over flows in the Chattahoochee River. News is also filled with dire predictions about water supply. For example, there are reports now forecasting significant reductions in snowpack. Snowpack is the source of 80 percent of stream flows in the West. Perhaps more alarming, USGS testified before this committee in June that a majority of climate models are in agreement that the Southwest, which is the fastest-growing region in the country, will likely face

a 20-percent to 40-percent reduction in overall water supply as a result of global warming.

In light of these conflicts and projected uncertainty over future water supplies, it's alarming that the funding available for water resource programs has fallen significantly in recent years. Accounting for inflation, total appropriations for water infrastructure, management, restoration, and monitoring programs at the Corps of Engineers, the Bureau of Reclamation, EPA, USDA, and the U.S. Geological Survey, fell by 11 percent, or \$1.2 billion, between 2001 and 2007. If the President's 2008 budget were to be implemented, the reduction would be 19 percent, or \$2.2 billion. In my view, these cuts have been ill-advised. They have left many communities vulnerable.

Water issues are complicated, and the strategies intended to solve them are, as well. Nonetheless, the premise of the SECURE Water Act is simple: effectively addressing water issues requires a better understanding of the resource and increasing the efficiency with which water is used. For that reason, the bill seeks to strengthen the National Stream Flow Program, to improve groundwater monitoring efforts, to enhance an understanding of water uses and availability, and to provide grants to implement water conservation and efficiency projects. It's also focused on improving our understanding of the impacts of climate change on water and ensuring that adaptation strategies are implemented.

So, I look forward to the testimony. I think this is legislation that I believe will be very constructive for the Nation, and I appreciate people being here to discuss it.

Let me defer to Senator Domenici for any opening comments he has.

**STATEMENT OF HON. PETE DOMENICI, U.S. SENATOR FROM
NEW MEXICO**

Senator DOMENICI. Mr. Chairman, thank you.

Thanks, to all of you. To the witnesses who have come from afar to help us here today, we want to thank you very much.

I will speak about a minute.

Essentially, this legislation is an effort on our part to put the U.S. Government in a better position of knowing what we should know about water, water rights, water availability, and trends in water, because we are going to authorize the study of facts that will give us the answers to what I have just described. There is no question in my mind that Senator Bingaman has put his finger on the issue when he talks about spending less money each year. I would tell him, this year in the energy and water bill—it's not yet confirmed—we did put more in, rather than what the President asked for. Now, we haven't got it past muster yet, but the committee itself found that it was time to put more in.

The U.S. Government must spend more money in the future, in my opinion, on water—in some cases, on the water supply; in other cases, in areas we're speaking of here—to enhance and make better the resources that we use and the tools that we use, to find out the facts about America's water or America's water problems.

Thank you, Senator Bingaman. I'm on your bill, and hope we can pass it quickly.

The CHAIRMAN. Thank you very much.

Let me just indicate, we do have some additional statements that have been provided to the committee, commenting on this legislation, that we will incorporate into the record today.

Of course, the full written statements of today's witnesses will be included in the record, as well.

The first panel is made up of two witnesses that represent the Administration: Robert Johnson, who is the commissioner of the Bureau of Reclamation, and also Robert Hirsch, who is the associate director for water at the U.S. Geological Survey. We welcome both of you. If you'll go ahead and summarize your testimony, then I'm sure each of us will have some questions.

Senator DOMENICI. Senator Bingaman.

The CHAIRMAN. Yes.

Senator DOMENICI. Mr. Chairman, I have been asked by our two Senators—if they might make a couple of—

The CHAIRMAN. Sure.

Senator DOMENICI [continuing]. Observations.

The CHAIRMAN. No, that's fine.

Senator Craig, you go ahead, and we'll let all Senators make comments if they want to.

Senator DOMENICI. Thank you, Senator.

**STATEMENT OF HON. LARRY E. CRAIG, U.S. SENATOR
FROM IDAHO**

Senator CRAIG. Mr. Chairman, when you're a westerner and you're not allowed to speak out about water, you feel a bit frustrated, because it is all that you've just said it is, and it's even more important than that.

I don't know that this phrase was coined in Idaho or in New Mexico a long time ago, but the phrase goes something like this, "Whiskey is for drinkin', and water is for fightin'." That still remains a very valid statement today in a State—in a region of our country that may even grow more arid and more populated; and, of course, water, as you know, Mr. Chairman, is the key to that.

So, whether it is in Santa Fe or in Boise, I'm going to want to insist that the prior application—or appropriations doctrine be fought out in our State capitals—and I think you've basically said that—when it comes to allocation and ownership.

But clearly the Federal Government has always played a valuable role in western water issues. You're going to hear that from Bob today, or from Dr. Hirsch here, or others; the West would not be what it is today if it hadn't have been for the Federal taxpayer, through the Bureau of Reclamation and other approaches, watering the West, the arid West. We have great concerns. Idaho is a very fast-growing State. The Idaho Department of Water Resources is in its third week of hearings right now over what to do. We're consulting with the best water experts we can. Our State legislature has been involved now for several years, wrestling over appropriation of water—who's on first and who's on second, in other words—to try to avoid that old argument about "Water is for fightin'." But, certainly, fights will occur, because water is the very sustenance of life in the West as we know it.

So, I think you're most appropriate, Mr. Chairman, to push the issue of the Federal knowledge and the Federal largesse when it comes to helping the West shape its water future and understanding it in a way that we might be missing.

I'm on the board of directors of the Center for the New West, and we've held water hearings across the West, both urban and rural, as it relates to the very issue you're concerned about and that is reflective in S. 2156.

Thank you for the hearing today.

The CHAIRMAN. Thank you very much.
Senator Tester.

**STATEMENT OF HON. JON TESTER, U.S. SENATOR
FROM MONTANA**

Senator TESTER. Yes, thank you, Mr. Chairman. I want to thank you for bringing S. 2156 forward, the SECURE Water Act.

We all know water is important, because, quite simply, water is life. If we don't manage what we have, we're all going to be in a lot of trouble. It is our responsibility to ensure that the people on the ground making the management decisions have the information they need in a format that they can understand. You really can't manage something unless you know how much you have, where it is, and how it changes over time. This bill will provide State managers with the data they need to efficiently and cost-effectively manage our Nation's water resources.

In Montana, we understand that local and State governments are in the best position to appropriately manage our water resources, but that Federal support is critically important to guarantee those State and local governments have the information that they need.

Montana is currently suffering through its arguably seventh year of drought; it may be longer than that. Without a thorough understanding of how climate change will affect our water resources—especially the timing of precipitation and snowmelt—Montana's already stressed farmers and ranchers, as well as its water utilities, are sure to experience further hardships and uncertainty.

As water is a vital, yet exhaustible, resource, a national water-use and availability assessment is crucial to the future prosperity of this country. It is better to find out what we have, before we find out we don't have enough.

Montana, I'm proud to say, has been a leader in implementing new and innovative water-management methods, such as water trading and efficient irrigation technologies. The funding provided in this bill will allow Montanans to more efficiently harness those methodologies in order to promote the wise use and conservation of our water resources.

Once again, I want to thank you, Mr. Chairman. I want to welcome the members of the panel. I look forward to your testimony.

The CHAIRMAN. Thank you very much.
Senator Barrasso.

**STATEMENT OF HON. JOHN BARRASSO, U.S. SENATOR
FROM WYOMING**

Senator BARRASSO. Thank you very much, Mr. Chairman.

I especially welcome Pat O'Toole here, all the way from Savery, Wyoming. Mr. Chairman, he fought his way across I-80, as it was closed on Saturday afternoon, to get from where he is, in Savery, all the way across the State to get to an airport to ultimately get to Denver and then to get here to Washington. So, welcome, Pat. Pat served in the Wyoming legislature a number of years before I did, but he is well respected on both sides of the aisle.

Mr. Chairman, I do have some concerns with the underlying legislation which is presented today, because, to me, this bill is not a comprehensive analysis of water resources of the West, but, in spite of what the title says, the bill assesses western resources as it relates specifically to the impacts of climate change on these resources. The language in the bill, about collecting data, appears to be limited to the impacts of climate change.

I have another concern, and that's the effort to establish additional water resources. Those that I identify in the bill specifically deal with reclamation.

I also have concerns about section 4, which establishes a new Climate Change Adaptation Program that analyzes the changes in water supply due to global warming on listed or candidate endangered species.

When I look at this, I ask myself, Will proposed strategies developed by the Federal Government, if not fully implemented, open the door to environmental lawsuits to open up existing habitat restoration plans? Is this section of the bill a way to open up all these habitat recovery plans? I would submit that we allow and help the States to develop their own comprehensive inventories. The States could look at all factors affecting water supply, not just the impacts of global warming on these resources.

Wyoming's Department of Environmental Quality or Wyoming's Water Development Office have qualified individuals more than ready to accomplish this task on behalf of our State.

The bill, as it is currently written, establishes two new Federal panels and five new Federal grant programs at a sizable cost to the taxpayer. In return, the concern is—from the taxpayers of the West—is, Will they get more lawsuits and more uncertainty for businesses, for landowners, and for local governments? We all know there isn't adequate water in the West. I support efforts to improve the availability of this resource. I look forward to hearing the comments of those testifying today.

Thank you, Mr. Chairman.
The CHAIRMAN. Thank you.
Senator Salazar.

**STATEMENT OF HON. KEN SALAZAR, U.S. SENATOR
FROM COLORADO**

Senator SALAZAR. Thank you very much, Senator Bingaman, chairman of the committee, and to Senator Domenici, for moving forward with this important legislation.

Let me also just thank Patrick O'Toole, whom I happened to serve on a national water commission many years ago, and look forward to his testimony; Senator Barrasso, here later on today.

From my point of view, this is a very important piece of legislation, because when we look at our States in the West, the Land of

Enchantment in New Mexico, Idaho, Wyoming, the State of Colorado, we know the importance of water there perhaps more than any other place. As I often say in Colorado when I talk about water, I say, "Water is for fighting, and whiskey is for drinking." That's the way it's done in Colorado. So, it's important for us to look ahead at the issues of water and the challenges that we're going to face in the western United States, especially as we start seeing the impacts of climate change with respect to what that means relative to the timing of water runoff and storage and a whole host of other things.

So, I think the assessment that is called for in this legislation that also asks to address some of the water management challenges that we're going to face is a timely assessment, and I'm proud to be a cosponsor of this legislation.

I have a full statement, Mr. Chairman, that I will just submit to the record.

The CHAIRMAN. Very good, we'll be glad to include that in the record.

[The prepared statement of Senator Salazar follows:]

PREPARED STATEMENT OF HON. KEN SALAZAR, U.S. SENATOR FROM COLORADO

Thank you Chairman Bingaman and Ranking Member Domenici for holding this important hearing today on the SECURE Water Act. I am proud to be a co-sponsor of this important bill, and welcome this legislative hearing.

Climate change is a very real problem that is caused primarily the burning of fossil fuels. This Congress has worked hard to promote clean energy technologies that will significantly reduce the amount of greenhouse gas emissions released to the atmosphere, and also reduce our country's dependence on foreign oil. The energy bill Congress is considering will ramp up domestic renewable fuel production, promote efficiency throughout the U.S. economy and invest in groundbreaking research designed to reduce carbon emissions. This energy bill is critically important for our country, and I am committed to working to find a bipartisan way forward on the energy bill.

Even if we move forward with significant increases in the use of renewable energies, we are learning that some adaptation measures are inevitable to reduce the harm from climate change that proves to be unavoidable. Today's hearing is particularly important for those of us from the Western states of the U.S. because many scientists are now saying the American West will experience the effects of climate change sooner and more intensely than most other regions. Our scarce snow and water of the West is already being impacted, much of it in ways that we do not clearly understand.

Colorado, my State, has a lot at stake when it comes to global warming. For example, parts of my State have incredibly rich, productive farmland that depends heavily on irrigation. The SECURE Water Act is exceedingly important to help us increase the acquisition and analysis of water-related data in order to assess the impacts of climate change on the long-term availability of our water resources. It is also important to help us understand what adaptation measures must be planned for to ensure adequate water supplies for agricultural, industrial, business and residential uses.

Chairman Bingaman and Ranking Member Domenici, I thank you again for holding this important hearing so that we can learn from the experts testifying today.

The CHAIRMAN. Commissioner Johnson, why don't you go right ahead.

STATEMENT OF ROBERT JOHNSON, COMMISSIONER, BUREAU OF RECLAMATION, DEPARTMENT OF THE INTERIOR

Mr. JOHNSON. Thank you, Chairman Bingaman and Ranking Member Domenici and other members of the committee. I am pleased to be here today, along with Bob Hirsch from the U.S. Geological Survey, to discuss S. 2156, the SECURE Water Act.

We have submitted a written statement for the record which provides detailed comments of the Department on the bill. I will summarize just a few highlights from that testimony.

Water is the lifeblood of the Nation and the foundation of our economy. It is easy to forget that water is a limited resource, particularly in some of the fastest-growing areas of the country. The U.S. population is growing quickly in regions of water scarcity, irrigated agriculture is changing, and our increasing focus on biofuels will lead to significant water needs. Additionally, climate change is predicted to change precipitation types and amounts, runoff, and groundwater recharge. The SECURE Water Act contains measures designed to take proactive steps toward addressing the water challenges of the 21st century.

Before agencies can plan for, and react to, these variations, we need data, and that's the major consideration in the bill before us today. Our Nation's network of stream gauges, weather monitors, snow sensors, and soil moisture measurements is extensive, but it will never cover every stream of every basin in totality. S. 2156 seeks to narrow the gaps in this data.

The Department supports the goals of S. 2156, and believes it is a logical continuation of the work undertaken by Secretary Kempthorne's Climate Change Task Force. The Department also appreciates the fact that Section 5 of the bill provides a new permanent authority for the Bureau of Reclamation to issue water conservation grants for qualified entities. This section would, in essence, authorize the Water 2025 Program, and is similar to authorizing legislation we submitted to the committee as an administration proposal this year. For the first years of this program, from 2004 to the present, Water 2025 has been funded through annual appropriation process. Permanent authorization would improve the long-term effectiveness of Water 2025 by allowing eligible entities to rely on the availability of the grants, and therefore, to invest resources in developing potential projects.

However, S. 2156 does contain some provisions that are of concern to the Department. Section 4 and 6 direct the Secretary to prepare reports describing each effect and each impact of global climate change on operations, hydropower production, or in major river basins. While the time is right for gathering more data in these areas, the Department is not yet able to recommend strategies to draw the kind of final conclusions called for in these reports within the timeframes allowed. My written statement expands on this further, and we'd be glad to talk about timeframes with your staff or with you in more detail.

Also, the Department recommends that the legislation specifically designate the authority to enter into cooperative agreements for research as not only limited to activities carried out under the appropriations ceiling established by this section, but also authority specifically for reclamation, which is sometimes interpreted to have limited authority for these types of grants. We think this legislation could clarify our ability to use grants in our programs.

Finally, the Administration is concerned about the potential cost of the bill and its impact on budget formulation.

This concludes my remarks. I look forward to working with the committee on this legislation, and will be pleased to answer any questions.

[The joint prepared statement of Mr. Johnson and Mr. Hirsch follows:]

JOINT PREPARED STATEMENT OF ROBERT JOHNSON, COMMISSIONER, BUREAU OF RECLAMATION, AND ROBERT M. HIRSCH, ASSOCIATE DIRECTOR FOR WATER, GEOLOGICAL SURVEY, DEPARTMENT OF THE INTERIOR

Chairman Bingaman and Ranking Member Domenici, we would like to thank you for the opportunity to appear today to present the Department of the Interior's views on S. 2156, a bill titled the "Science and Engineering to Comprehensively Understand and Responsibly Enhance Water Act" or the "SECURE Water Act." This legislation would authorize substantial new investments in our nation's understanding of the water resources vital to our way of life. S. 2156 contemplates a number of task forces, data gathering efforts, grant authorities, and assessments prepared by key federal agencies covering many of the Nation's water basins.

While some of the activities authorized in the legislation are consistent with initiatives and research areas that are already being pursued by the Department, we have strong concerns with certain parts of this legislation. One concern is that many of the activities called for in this bill are not in the President's budget. While some of the bill's provisions have the potential to strengthen existing programs, there are additional requirements in the legislation that would compete with ongoing, high-priority Administration programs. In addition, we note that the Bureau of Reclamation and the United States Geological Survey (USGS) are already authorized to carry out many of the activities provided for in this bill.

We believe, however, that many of the goals of this bill—expanding data acquisition and analysis to improve water management and ensuring that decisionmakers have reliable information about water resources and climate change impacts on water availability and energy production—are critically important. We support these goals, which are similar to those outlined in a number of recent plans and reports issued by the National Science and Technology Council's Committee on Environment and Natural Resources, Subcommittee on Water Availability and Quality (SWAQ), and the National Research Council (NRC).

In particular, the bill tracks closely with five of the seven elements of implementation identified by the SWAQ report, *A Strategy for Federal Science and Technology to Support Water Availability and Quality in the United States* (September 2007), which has been endorsed by the Office of Management and Budget and the Office of Science and Technology Policy in their FY 09 guidance to the agencies. The areas of congruence include calls for implementing a national water census, developing a new generation of water-monitoring techniques, developing and expanding technologies for enhancing reliable water supply, improving understanding of the water-related ecosystem services and ecosystem needs for water, and improving hydrologic prediction models and their applications. Existing authorities are generally adequate to pursue these activities.

In 2004, the National Research Council warned that "[t]he strategic challenge for the future is to ensure adequate quantity and quality of water to meet human and ecological needs in the face of growing competition among domestic, industrial-commercial, agricultural, and environmental uses." The USGS has described a possible approach to quantifying, forecasting, and securing freshwater for America's future by developing a water census of the United States. Such a census could include the status of the Nation's freshwater resources and how they are changing, a more precise determination of water use for human and environmental needs, the relationship of water availability to natural and engineered storage and movement of water, and other key issues (see *Facing Tomorrow's Challenges—U.S. Geological Survey Science in the Decade 2007-2017*, USGS Circular 1309).

Water is the lifeblood of the Nation and the foundation of our economy. It is easy to forget that water is a limited resource, particularly in some of the fastest growing areas of the country. Improving water security is important to our Nation's energy, agricultural, and environmental future. The U.S. population is growing quickly in regions of water scarcity, irrigated agriculture is moving into new areas, and our increasing focus on biofuels will lead to significant associated water needs. Additionally, climate change is predicted to change evapotranspiration, precipitation types and amounts, runoff, and ground-water recharge. The SECURE Water Act contains measures designed to take proactive steps towards addressing the water challenges of the 21st century. The remainder of this statement will discuss each of the sub-

stantive sections of this bill and discuss Administration concerns about each section, including concerns about the need to take into account budgetary parameters.

CLIMATE CHANGE ADAPTATION

Section 4 of the legislation authorizes a Climate Change Adaptation Program, and requires that the Secretary report to Congress on the effect of global climate change on each major Reclamation river basin. Monitoring and reporting increments are all detailed in this section, and much of it is focused on the potential effects of climate change on Reclamation projects and developing mitigation strategies. Reclamation testified before this Committee on June 6, 2007 regarding the widely acknowledged need to improve the quantity and resolution of our basin-specific data related to climate change. Existing authorities are generally adequate for this purpose. The SECURE Water Act requires that the Secretary collect information and provide annual reports to “assess the effect, and the risk resulting from, global climate change.” While the Administration acknowledges the relevance of this information, acquiring sufficient data to enable a comprehensive assessment of the risk to water supplies at the basin level associated with climate change, and then to develop and implement appropriate mitigation strategies, is a significant challenge that would require much more time than the one year allowed under this bill. In order to carry out the necessary data acquisition to complete these reports, we suggest that the 8 major river basin studies, or portions of the basins as appropriate, could be completed in five years, and updated every three to five years. This research and reporting activity would need to compete among the Administration’s other priorities for funding. We also recommend that the bill make clear how it impacts basin-specific statutes with existing obligations such as the Truckee-Carson-Pyramid Lake Water Rights Settlement Act of 1990, Pub. L. 101-618.

Despite these concerns, we recognize and agree with the premise of this section: that it is important to develop collaborative approaches to assess the potential impacts of climate change on water supplies and to develop strategies to address potential water shortages, conflicts, and other impacts. Although it is widely agreed that climate change will have significant impacts on water supplies and flood hazards, there is a great deal of uncertainty about the nature of the change that can be expected. Effective adaptation to these changes will depend on better monitoring, better climatic and hydrologic models, and new thinking about water-resource system operations. The USGS, Reclamation, the U.S. Army Corps of Engineers, the EPA, and the National Oceanic and Atmospheric Administration (NOAA) are already working together to develop comprehensive approaches to water planning and management in a more uncertain world. Federal agencies are also working with non-Federal entities regarding climate change and water resource management challenges in the United States.

WATER 2025 GRANTS

Section 5 provides a new permanent authority for the Bureau of Reclamation to issue water conservation grants for qualified entities. This section would authorize the Water 2025 Program and is similar to authorizing legislation we submitted to the Committee as an administration proposal. This section would provide permanent authorization for the Challenge Grant component of the Department of the Interior’s Water 2025 program.

Water 2025 is intended to focus attention on the reality that rapid population growth in western urban areas, the emerging need for water for environmental uses, and the national importance of western farms and ranches are driving major conflicts between competing uses of water. Water 2025 recognizes that State and local government should play leading roles in meeting these challenges, and that the Department of the Interior should focus its attention and existing resources on areas where Federal dollars can provide the greatest benefits to the West and the rest of the Nation.

Water 2025 has two purposes. First, it provides a basis for a public discussion of the realities that face the West so that decisions can be made at the appropriate level in advance of water supply crises. Second, it sets forth a framework to identify the problems, solutions, and a plan of action to focus limited resources as the Department of the Interior works with States, Tribes, local government, and others to meet water supply challenges.

For the first years of the program, FY 2004 through the present, Water 2025 has been funded through the annual appropriation process. Permanent authorization would improve the long-term effectiveness of Water 2025 by allowing eligible entities to rely on the availability of the grants and therefore to invest resources in developing potential projects.

While the Department supports this provision, the requirement in Section 5(a) contains overly proscriptive language relative to which entities may receive the grants. The directive to provide grants only in watersheds that have a nexus to federal Reclamation projects would limit the flexibility of the current Water 2025 Program, and constrain our ability to select projects that best match the Program's mandate to remove institutional barriers to increase cooperation and collaboration among Federal, State, Tribal, and other organizations. In the Administration proposal, we suggested language limiting the grants to activities "in watersheds that have a nexus to Federal water projects" in Reclamation States. Federal water projects encompass a larger number of projects than "federal Reclamation projects," and given the active role of agencies such as the Corps of Engineers and the Bureau of Indian Affairs in developing water resources throughout the West, this language is preferable to language in S. 2156 as introduced limiting the grants to projects "that have a nexus to federal Reclamation projects."

Additionally, the Department recommends that the legislation specifically designate the authority to enter into Cooperative Agreements for research as not limited only to activities carried out under the appropriation ceiling established by this section. This authority exists for almost all federal agencies, but it is not clear whether Reclamation's authority, often contained in appropriations bills, has general applicability. This legislation could clarify this situation.

EFFECT OF CLIMATE CHANGE ON HYDROELECTRIC POWER GENERATION

Section 6(a) tasks the Secretary of Energy, in consultation with each Power Marketing Administration (PMA), to "assess each effect of, and risk resulting from, global climate change with respect to water supplies that are required for the generation of hydroelectric power at each Federal water project that is applicable to a Federal Power Marketing Administration."

While the responsibilities of transmission and marketing of federal hydroelectric power lies with the PMA's (P.L. 95-91), hydrologic scheduling and facility operations and maintenance still lie with Reclamation and the U.S. Army Corps of Engineers (Corps). There may be some duplication of effort between DOI and the Department of Energy given the requirements on Interior in Section 4, and Interior would expect that much of the information generated for a Section 4 report could be useful for the Section 6 assessments. Finally, as the nation's first and second largest producers of hydroelectric power in the nation, respectively, the Corps and Reclamation should be included in the Section 6(a) consultations with the Secretary of Energy and the PMAs in order to ensure a full assessment of risks to water supplies used for federal hydroelectric generation.

CLIMATE CHANGE AND WATER INTRAGOVERNMENTAL PANEL

Section 7 of the SECURE Water Act directs the Secretary to establish and lead a climate change and water intragovernmental panel to review the current scientific understanding of global climate change impacts on the water resources of the United States and to develop strategies to improve observational capabilities and expand data acquisition to increase the reliability and accuracy of modeling and prediction systems to benefit water managers at the Federal, State, and local levels.

This is a commendable goal and, by directing multiple agencies to participate, should foster coordination among the agencies and lead to improved integration of water resources-related capabilities of the numerous agencies with water-resources responsibilities. The Secretary has already taken action on this front, by establishing a climate change team, internal to DOI, to evaluate climate change science, management, and policy issues. The proposed intragovernmental panel is consistent with this effort and a logical next step. We suggest adding the Secretary of Energy to the panel. In addition, the panel's efforts should be coordinated with the work of the interagency Climate Change Science Program. However, as we stated with respect to section 4, the activities of this panel must compete against other programs for funding, and under existing budget constraints the number and timing of the reporting requirements may pose a resource and practical challenge.

USGS WATER DATA ENHANCEMENT

The USGS has played an essential role in monitoring the Nation's rivers for well over a century, providing streamflow information that is critical for protecting life and property from floods, assessing and allocating water resources, managing water quality, supporting engineering design of water projects, and ensuring the safety and enjoyment of the many people who fish and boat in the Nation's rivers and streams. The USGS currently operates more than 7,000 streamgages nationwide that provide daily streamflow records accessible to the public. This national system

of streamgages provides information that is vital to water resources management throughout the country, providing accurate measurements that protect human life, health, welfare, and property.

We appreciate the emphasis that this legislation places on this valuable network, for which the Administration has twice proposed increases in the Federal funding (in the FY07 and FY08 budgets). We have recently conducted an extensive review of the plans for the National Streamflow Information Program (NSIP), including reports by the National Research Council and the Advisory Council on Water Information (ACWI), and several national and regional stakeholder meetings. Section 8(a)(1) of the proposed legislation calls for a review of the NSIP plan. We are concerned about the additional time and expense associated with such a review, in light of the recent extensive, and expensive, reviews that have already been conducted. We are also concerned that the legislation does not consider the important role that cost-sharing plays in the funding of streamgages. We continue to believe that cost-sharing by State and local agencies should be a prerequisite for national funding. The lack of a cost-share requirement would hinder efforts to meet the measurement goal identified in section 8(a)(4) of the bill, and could undermine the current cost-sharing structure between the USGS and State and local agencies.

The SECURE Water Act requires the USGS to work with Federal, state, and local entities to implement a systematic ground-water monitoring program for major aquifer systems in the United States and to support the ground-water climate response network. The USGS co-chairs the Subcommittee on Ground Water under ACWI that was formed in January 2007 with the goal of creating a framework for ground-water monitoring across the Nation. This effort, involving more than 60 people from the private sector, academia, and Federal, State, and local governments, is currently under way. If this legislation were enacted, the Secretary would use the established ACWI mechanism to develop the plans called for in Section 8(b). However, no new authorities are needed to move this process forward.

The SECURE Water Act authorizes the Secretary to provide grants to develop new methods and technologies to estimate or measure water-resources data in a cost-efficient manner. Given the high level of experience and capability of Federal agencies, including the USGS, NOAA, Reclamation, the Corps of Engineers, and the Agricultural Research Service, we think that the use of grants only would be less effective than a broader approach involving Federal agencies, academia, and the private sector.

USGS WATER USE AND AVAILABILITY ASSESSMENT PROGRAM

It has been said that “you can’t manage what you don’t measure.” The last overall assessment of water resources for the Nation was published by the Water Resources Council in 1978. Since that time, dramatic changes in water availability and use have occurred as a result of demographics, economic development, environmental issues, technology, law, and a changing climate. Our ability to manage water in the context of competing demands would be significantly enhanced with an up-to-date water census that includes a national ground-water information system, new technology that integrates surface- and ground-water information, and better measurement that leads to better management of water resources.

Section 9 of the SECURE Water Act directs the USGS to implement a program to provide a more accurate assessment of the status of the water resources of the United States; to assist in the determination of the quantity of water that is available for beneficial uses; to identify long-term trends in water availability; to provide a more accurate assessment of the change in the availability of water in the United States; and to develop the basis for an improved ability to forecast the availability of water for future economic, energy production, and environmental uses. This information would help us advance from our current understanding of water availability toward a more comprehensive, “big picture” assessment of available water supplies.

Some work towards this assessment has been started pursuant to a directive made by the House Appropriations Committee in their report language on the FY 2002 budget. The USGS has responded to the Congress with a plan for a comprehensive water assessment: USGS Circular 1223, “Concepts for National Assessment of Water Availability and Use” [see <http://pubs.usgs.gov/circ/circ1223/>]. It is also consistent with the NRC report *Estimating Water Use in the United States* (2002), which called for the USGS to strengthen its National Water Use Information Program in order to maintain a comprehensive national water inventory, help assure the Nation’s water supply, and help preserve water quality and protect ecological resources. The usefulness of this kind of information can be seen from a pilot effort in the Great Lakes Basin to assess how much water is in the region now, how the region is using water, how water availability is changing, and how much water

the region can expect to have in the future. Through this pilot effort, the USGS has published a number of products that we believe will help water managers understand the water resources of that region, including reports on estimates of ground water in storage, ground-water recharge rates, lake-level variability, and historical changes in precipitation and streamflow. We believe that this Great Lakes Basin pilot is a good model of a water census as defined in the SWAQ report mentioned above, A Strategy for Federal Science and Technology to Support Water Availability and Quality in the United States.

Recognizing that the goal is to develop and maintain a comprehensive national water resource inventory, help assure the Nation's water supply, and help preserve water availability and protect water resources, we would be pleased to work with the Committee to refine this section in order to put together a program that is fiscally sustainable and appropriately integrated with State and local efforts.

CONCLUSION

In conclusion, the Department is currently pursuing many of the goals of this legislation, which include enhancing our understanding of our Nation's water resources and encouraging collaborative efforts to improve water management. While some of the actions authorized in the SECURE Water Act have the potential to strengthen the Nation's ability to address water-related challenges beyond activities currently underway, funding requests for new activities will have to compete with other high-priority programs for funds. We also have concerns with the specific language in the bill, particularly relating to the need for consistent terminology usage and definition of key terms that may be defined differently in other environmental and natural resources statutes. We have identified several other areas in which technical changes may be needed. We would be happy to work with the Committee to revise the bill to address our concerns.

Thank you for the opportunity to comment on S. 2156. The Department looks forward to working with the Committee to advance the objectives described in the bill.

The CHAIRMAN. Thank you very much.
Dr. Hirsch.

STATEMENT OF ROBERT M. HIRSCH, PH.D., ASSOCIATE DIRECTOR FOR WATER, GEOLOGICAL SURVEY, DEPARTMENT OF THE INTERIOR

Mr. HIRSCH. Thank you, Mr. Chairman and members of the committee. I'm Dr. Robert Hirsch, associate director for water at the U.S. Geological Survey. I'm happy to be here today, with my colleague Bob Johnson, to provide the views of the USGS on the SECURE Water Act.

The goals of the bill are vital to the Nation's future. Similar goals are outlined in reports issued recently by the National Research Council, the Subcommittee on Water Availability and Quality of the National Science and Technology Council, and by the USGS. Managing our water resources in a sustainable manner is crucial to our economy and to our environment, and a strong base of science is crucial to sustainable water management.

As we plan for the coming decades, we must consider not only stresses from population growth and new needs of water for agriculture and energy, but also from—due to changes in climate. I am pleased to say that the USGS and Reclamation, along with the Corps of Engineers and NOAA, are working together to identify best practices for managing our water resources in the face of the additional uncertainty of climate-change impacts.

The USGS has played an essential role in monitoring the Nation's rivers for well over a century. In fact, the first efforts at stream gauging were conducted by the USGS in 1888, at Embudo, New Mexico, on the Rio Grande River. Our second director, John Wesley Powell, recognized that, in order to develop and manage the

resources of the West, we had to have sound scientific knowledge of that, and he began that process in New Mexico, at Embudo.

Providing stream flow information for protecting—provides information for protecting life and property from floods, assessing and allocating water resources, managing water quality, supporting engineering design, and ensuring safe and enjoyable recreation on the Nation's rivers and streams.

The USGS operates more than 7500 stream gauges nationwide, in cooperation with over 800 State and local partners, to provide daily streamflow data accessible to the public. We are pleased to see that the SECURE Water Act specifically points to the National Stream Flow Information Program. This program has enjoyed strong support from the Administration and Congress in the last two budget cycles, helping to stabilize and modernize this vital monitoring system.

The SECURE Water Act calls on the USGS to work with Federal, State, and local entities to implement a systematic national groundwater monitoring program. Monitoring the changing status of our Nation's aquifers is crucial to sound water management. Through the Subcommittee on Groundwater that was formed in January of this year under the Advisory Committee on Water Information, the USGS is working with more than 60 people from the private sector, academia, and Federal, State, and local governments to develop a framework for enhanced monitoring and data-sharing that draws on the talents of Federal, State, and local agencies.

It has been said that you can't manage what you don't measure. The last assessment of the Nation's water resources was published in 1978. Since then, dramatic changes in water availability and use have occurred as a result of demographics, economic development, environmental issues, technology, law, and a changing climate. Our ability to manage water in the context of competing demands would be significantly enhanced with an up-to-date water census that includes improved information on water use, surface water, and groundwater. Managing water in a sustainable manner has to start with knowledge of the resource and knowledge of—about how it is being used.

I am pleased to report that efforts toward the kind of water use and availability assessment program called for in Section 9 of this bill has already begun. The USGS has developed a plan for such an assessment, and a pilot effort is underway in the Great Lakes Basin. We believe that this is a good model for a national water census.

In conclusion, I would say that in 2004 the National Research Council warned, and I quote, "The strategic challenge for the future is to ensure adequate quantity and quality of water to meet human and ecological needs in the face of growing competition among domestic, industrial, commercial, agricultural, and environmental issues," end quote. The SECURE Water bill is an important step toward addressing that challenge, and the Department of the Interior is already pursuing many of the goals of the legislation; however, we note that the funding for these activities would have to compete with other high-priority Administration programs for funds.

In our written statement, we have also noted a few concerns with specific language in the bill, and we'd be pleased to work with the committee to revise the bill to address those concerns.

Thank you, Mr. Chairman, for the opportunity to present this testimony, and I'm happy to respond to questions that you or other members of the committee may have.

The CHAIRMAN. Thank you very much. Let me start with a couple of questions.

Mr. Johnson, let me start with you. I believe in your testimony, you refer to Reclamation's Water 2025 Program. This would be authorized under Title 5 of this bill that we're talking about here. You make reference to the fact that it has been funded on a year-to-year basis up until now. Could you give us some indication as to the extent of the applications for grants under this program? What has been the amount of demand? How much of it have you been able to meet with your available funds? Anything else you can tell us about the progress that you've made with this Reclamation Water 2025 Program?

Mr. JOHNSON. Yes, Senator. Water 2025 has been a very successful program. It's gained a lot of interest throughout the West. We do have a lot of competition. It's a challenge grant program, where water districts—West-wide, not just Reclamation districts, but other water entities, as well—submit applications for proposals for water conservation projects. We review those applications and grant loans of up to—or, not loans, but make grants of up to \$300,000 to assist in implementing those projects.

We've had, you know, around 100 applications on an annual basis. I think we've—and I can't remember the exact number. If we could fully fund all of those applications, it would require, on average, about \$30 million. Our funding levels have been in the \$5 to \$10 million range. This past year, 2007, I think, was the highest funding level we had, which was \$11 million for the Water 2025 Program. So, it's a very popular program. It does a lot of good things, in terms of conserving water on the ground in a relatively short period of time. The language here could certainly boost our efforts in that program.

The CHAIRMAN. Thank you very much.

Mr. Hirsch, let me ask you, this National Stream Flow Information Program, as I understand it, was intended to create a base nationwide stream gauge network that was to be funded 100 percent by the Federal Government, or at least that was my understanding. Your written testimony states that the stream gauges under the NSIP program should be cost-shared rather than federally funded. Is that a change in position, what's your explanation on that?

Mr. HIRSCH. No, Senator, there's no change in position. Perhaps just some of the vagaries of our interpretation of some of the language of the bill may have resulted in that.

I think what we were trying to express was the fact that stream-gauging—the whole stream-gauging activity of the United States Geological Survey is very much currently funded on a cost-share basis. In fact, more than half of the money that is used in this effort comes from 800 other State—800 State and local agencies, plus other Federal agencies. We are trying to build what we are calling

a national backbone network in this National Stream Flow Information Program that would be federally funded, and we continue to take that position and have been working in that direction. I think our point was simply that, in considering the entire enterprise of stream-gauging on a national basis, which is currently about a \$120-million-a-year enterprise, that there is a very, very important role for cost-sharing, in that it drives all of us to be very efficient and to work with the needs of people like State engineers and other officials. But our goal for this backbone network, in fact, is for it to be federally funded.

The CHAIRMAN. All right. Why don't I stop with that. Senator Domenici, go ahead.

Senator DOMENICI. I'll yield to Senator Craig.

Senator CRAIG. Thank you, Mr. Chairman. Thanks, Pete.

A couple of questions of you, Bob. Certainly, Dr. Hirsch, you can chime into this. For about 100 years, Idaho and western States watered themselves. By the time most of the great projects of the Bureau of Rec and others were completed, most arid western States had substantially more water inside their boundaries than they had historically had under just stream flow and no storage.

Of course, it's become persona non grata today to even suggest new impoundments. Yet, we know that in some areas if you simply added a couple of feet to the top of an existing reservoir, you could double the size or the capacity of a given reservoir, because of—you know better than anyone else, that's where the greater water storage capability is. There are even some off-main-stem-type basins that certainly could provide additional water.

When I look at the State of Idaho, for example, and I look at our historic needs, both human and agricultural, versus our new needs, versus the demands downstream—by the Endangered Species Act—of fish, primarily in the salmon—the salmon-type species of fish in the Snake and the Columbia system, it isn't a matter of just reshaping our existing water in a more arid environment, it is the possibility of getting more water.

Then I add the equation of energy in. Let's say, down the road a few years, Idaho decides to build a nuclear reactor. Those require a substantial amount of energy. If that new reactor is a new reactor—meaning, a new generation high-temperature gas reactor that could make hydrogen—that would be through the electrolysis of water. All new energy-related sources, be they the synthetics, ethanol—corn or cellulosic—all require substantial amounts of water. Is the Bureau of Reclamation—or, dare the Bureau of Reclamation even think about new water when we are so busy scurrying around trying to manage an even scarcer water supply to a much broader demand?

Mr. JOHNSON. Certainly, there are lots of new demands for water out there, and there's certainly a lot of change—or a lot of concern about the impacts climate change may have on that water in the future. I think there are a broad range of tools that the Bureau of Reclamation, along with other State and local agencies, ought to be considering to meet those demands, and water conservation, water reuse, water transfers in markets where you package them in ways that protect traditional rural values, and, certainly in cases, new infrastructure may, in fact, be an appropriate way to address fu-

ture water needs. I think it depends on the basin, it depends on the alternatives that are out there, and the individual circumstances that may exist. So, certainly I think that's an alternative. In various parts of the country, storage is being looked at fairly optimistically. State of California, for example, Governor Schwarzenegger and the State legislature are looking at a \$9 billion water bond. A fairly significant amount would go toward actually building new storage in that State. So, there are areas where that's certainly a consideration, and ought to be part of what we look at when we look at the whole toolbox on how we should manage our water supplies.

Senator CRAIG. Good.

Thank you.

The CHAIRMAN. Senator Tester.

Senator TESTER. Yes, thank you, Mr. Chairman. I will continue along those same lines.

I don't know if you can speak for Montana, specifically, but generally in the West would you say that there is enough storage to take care of the needs? You know, our snowpacks are melting off quicker, and our irrigation season is shorter, in particular. That is what I'm talking about.

Mr. JOHNSON. In some areas, there's probably as much storage as can reasonably be built and justified. I mean, depending on how much storage is there and what the annual stream flow might be, it may or may not make sense to add additional storage to take care of needs. I think, in most places of the West, there is concern about there being enough water supply to meet all the demands.

Senator TESTER. OK.

Mr. JOHNSON. So, certainly there's a concern about future water supplies and being able to meet those demands.

Senator TESTER. Have you done any estimates as to how much storage we'd have to build, on a percentage basis, to meet future demand?

Mr. JOHNSON. No. No.

Senator TESTER. OK.

Mr. JOHNSON. Not on any kind of a West-wide basis.

Senator TESTER. All right. 2025, you talked about, \$11 million is your highest funding level. How many States is that program in right now?

Mr. JOHNSON. Seventeen.

Senator TESTER. Are they all in the West?

Mr. JOHNSON. All in the West, yes.

Senator TESTER. OK. You might have said it already, but refresh my memory, how much would it be for that to be fully funded, was that 30 million?

Mr. JOHNSON. \$30 or \$40 million has been the amount of the applications that have been submitted, yes.

Senator TESTER. OK.

Dr. Hirsch, you talked about the last evaluation, done in 1978. Did that include rivers, streams, and aquifers?

Mr. HIRSCH. It did include all of them, although it's a—its look at groundwater was quite limited at that time, and groundwater development has moved rather rapidly since that time.

Senator TESTER. Did it give you enough information, where if a new evaluation was done, you could make some pretty informed decisions as to how quickly the aquifers are being depleted and what it would take to change that?

Mr. HIRSCH. That particular study would probably not shed very much light on that, although I think there are studies that have been done in the intervening years, such as our analysis of the high plains aquifer, as an example, where we track, every couple of years, what the changes in storage are in that aquifer. It's quite varied, from one system to another, what is our state of knowledge about how much water is in storage and what the impacts are of the changes in storage that are occurring.

Senator TESTER. Could you say, generally, overall, that the aquifers are being depleted quicker than they're being recharged?

Mr. HIRSCH. There are many aquifers that are being depleted, having a net depletion in—not only in the West, but in many other parts of the country, as well.

Senator TESTER. OK. Is there an opportunity—or, is it a viable option, I should say, to artificially recharge aquifers?

Mr. HIRSCH. Yes. I think this speaks to the previous question about storage. Artificial recharge and something called “aquifer storage and recovery,” which is really a subset of that, are quite viable tools, and we are very actively engaged in study of a number of those systems, working with State and local governments to determine how useful they are. The whole idea of storage, whether it's surface water or groundwater, is to take water from a wet season or a wet year and hold it over in storage to use in a dry season or a dry year. All of these systems have their drawbacks. We know some of the drawbacks of surface water storage, in terms of what it can do to the biota, as well as the evaporative losses that come from surface water storage. Groundwater storage isn't perfect, and there are losses, and there are energy costs associated with it, but it can be an effective method of storing water from wet years or wet season into dry years.

Senator TESTER. Are there negative environmental impacts with artificial recharge?

Mr. HIRSCH. I would say not significant ones. I think there are—when the water is to be used for drinking water, I think there are some questions that need to be carefully examined, particularly with the injection of chlorinated water, because of the potential formation of trihalomethanes. But I would also point out that in—particularly in southern California, those water agencies, such as Orange County and others, have been using these approaches for quite a number of years, and are producing very, very high-quality water. So, in southern California, these methods have been put to use quite effectively, and, I would say, with little significant environmental impact.

Senator TESTER. Thank you.

The CHAIRMAN. Senator Domenici, did you want to go ahead now, or Senator Barrasso?

Senator BARRASSO. Thank you very much, Mr. Chairman.

Mr. Johnson, if I could, in reading your testimony, it seems that you believe that the Bureau of Reclamation is already authorized to carry out many of the activities provided for in the bill. You may

want to comment on that a little bit more and tell me if you believe this provides good value for taxpayers.

Mr. JOHNSON. We do have existing authorities. We have a general authority in the Reclamation Authorizing Act that can be—the original organic act—that could be interpreted to authorize these kinds of activities. There was another act, back in the 1940s—and I don't have the specific cite on it, but I could get it for you—that authorized research related to reclamation projects, in general.

Aside from that, we do have individual authorizations for reclamation projects, and many of those provide authority for operating and maintaining our facilities, and looking at the operation of our facilities, and certainly those authorities, I think, could be used to support, on a project-by-project basis, these kinds of—these kinds of activities.

So, we do have existing authorities. I think that this bill does, however, focus the authority, and provides, maybe in one place, some fairly specific direction from Congress, from doing those kinds of—these kinds of climate-related research, how do we operate our projects, what kinds of water basins ought to we be looking at, and those sorts of things. So, I think there's some helpful parts of this bill that does add to our authority.

Senator BARRASSO. From the standpoint of the taxpayers and value for their money, how do you think this stacks up, Mr. Johnson?

Mr. JOHNSON. I think, you know, it's always a struggle to get the right balance in the budget process, and certainly those are part of the concerns that we expressed in our testimony, is that there's concerns about what, ultimately, the impact of the bill might be on the budget. So, I think it depends on the magnitude of the funding. Certainly, we're funding some of these activities already. To the extent that we increase the funding for these kinds of activities, they'll have to be prioritized in the context of the broader budget, and that's really the struggle we have is, What is the right mix of priorities? Certainly, this is important, but I think it really becomes a question of degree.

Senator BARRASSO. Thank you, Mr. Johnson.

Thank you, Mr. Chairman.

The CHAIRMAN. Senator Domenici, did you have questions for these two witnesses, or should we go to the second panel?

Senator DOMENICI. We have a Senator over there.

The CHAIRMAN. Oh. Senator Salazar. Go ahead. I'm sorry. I thought you had had a chance.

Senator SALAZAR. I might have had one, but I want another one. [Laughter.]

The CHAIRMAN. We'll give you multiple chances. Go ahead.

Senator SALAZAR. Thank you very much, Chairman Bingaman.

Commissioner Johnson and Dr. Hirsch, my question to you is, How, from the perspective of your two agencies, are you anticipating what many of the water agencies across the West are already doing? That is, taking a look at climate change and what that's going to do with respect to their water supply. Just looking at the note from the Denver Water Board, which both of you know well, in Colorado, the Denver Water Board has estimated that a 2-degree Fahrenheit increase in temperature would cause a 6-percent

increase in the demand for water. OK, so, 2-temperature-degree increase, 6-percent increase in demand for water, and a 12-percent decrease in water supply. So, as this major entity in my State is doing its water supply planning for the 2 million people served by the Denver Water Board, they're taking these parameters into account, and most water agencies across the West are starting to do that. Some of them are further along than others. How, within your respective two agencies, are you doing something that is similar and more coherent on a national scale?

Mr. HIRSCH. Thank you for that question. The subject of climate change is one that we, in fact, in the water programs of the USGS, have been actively engaged in working on for nearly two decades. Many of the studies that have looked at the changes, for example, in the timing of stream flow, the fact that runoff is occurring earlier in the year, we have less snowpack storage, that these were works that—work that we accomplished in the USGS, both in the east and the western United States. We've also done a great deal of work on paleoclimate, understanding the climate of the last several hundred years and those kinds of variations, and understanding the underlying natural variability of climate, which is extremely important to look at.

I think—we're also working closely with our partners, the key two most important operating agencies in water resources at the Federal level, the Bureau of Reclamation and the Army Corps of Engineers. In fact, we have a small group that's beginning to work on what we're calling a paper on best practices for looking at how to operate in this more uncertain world that we live in.

I would just want to say—and we also work with the global climate modeling community on the hydrologic aspects of the global climate models. In fact, one of our scientists testified before this committee—

Senator SALAZAR. If I may, Dr. Hirsch—

Mr. HIRSCH. Yes.

Senator SALAZAR [continuing]. What I'm—

Mr. HIRSCH. Let me—

Senator SALAZAR [continuing]. What I'm trying to get to, though—and part of it is support of this bill, because I think what—

Mr. HIRSCH. Right.

Senator SALAZAR [continuing]. This bill is trying to do is to give us some coherency, in terms of—

Mr. HIRSCH. Right.

Senator SALAZAR [continuing]. How we move forward. Right now, I know, you're working with the Bureau of Reclamation, with the Army Corps of Engineers, and looking at the issue of climate change. But, from your point of view as the director of USGS, do you think we have that coherent plan, moving forward, making this assessment, that you could present to this committee, present to those of us who have an interest? I would ask the same of you, Commissioner Johnson.

Mr. HIRSCH. I would say this, that I think that the status of the science of climate change and its impacts on water is still really in its infancy, and that ability to predict the specific consequences in specific parts of the country is still very limited, and we need to

recognize that. In fact, I think the study of climate is one of learning about a lot of surprises—

Senator SALAZAR. Let me have Commissioner Johnson have a few seconds to respond.

Mr. JOHNSON. We're doing lots of things related to climate change. We have partnerships with a lot of universities and research agencies, partnerships with other government agencies. We're trying to get more specific data on a basin-by-basin basis, which I think is what this bill is, kind of, asking us to do, is—it's identified basins, and saying we ought to get more research in those basins on climate change. In fact, that is something that we're trying to do. I think it's good direction for Congress to tell us to do that. I think it's something that we're already doing.

I agree with Dr. Hirsch, it's complicated. We have broad climate models that are giving us indications on a broad regional basis. But getting that down to specific basins is very complicated and requires time and effort, and it's something that we're currently working on.

So, yes, we have a plan, and yes, this one is very similar to many of the things that we're already doing, what's being offered in the bill.

Senator SALAZAR. I take it—

Mr. HIRSCH. If I could—

Senator SALAZAR. I take it from your testimony that our bill would be helpful in moving that whole effort along.

Let me just make a quick comment, because I only have 20 seconds left here. In my view, Chairman Bingaman and Senator Domenici and my members—my colleagues on this committee—it seems to me that, when you take a look at the last time when this kind of water assessment was done, 1978, that was 30 years ago, and I know that, in each of our respective States, there are huge things that have changed in that 30-year period, in how we manage the integration of surface water supplies and groundwater, how we deal with new water efficiency measures, how we institutionalize new water-sharing arrangements between agriculture and municipal uses. There has been a huge change taking place with respect to water and water supply management in the West. I think that a 30-year passage of time makes it imperative for us to really move forward and to support this legislation which you have introduced.

The CHAIRMAN. Senator Domenici.

Senator DOMENICI. Mr. Chairman, first let me say, to my friend from Colorado, thank you for your questions and focusing in the way you have. To our new Senator from Wyoming, I'm sure that you handle your work as a U.S. Senator in exactly the same way you handled your work as a surgeon, because you do come here prepared, and I assume your life has been one where you don't go unprepared to do your work. You will find that many of us go unprepared. If you haven't made that observation yet, you are less astute than I think. The reason I wait til the end is so I can learn from all of you, so I can ask something intelligent, because I have been too busy to work very hard on this. I am now getting a little excited, so I'll ask a couple of questions. Thank you.

Dr. Hirsch, Mr. Johnson, we're getting down to the point where—just like almost every other committee that has any big environmental authority—this issue of climate change haunts us, because we are haunted as representatives of our people, by the people talking and whispering and wondering about what it means. I gathered, from what you've just said, that neither of you would feel uncomfortable if we passed this bill. Of course, we have to modify it here and there—after the hearing. But neither of you would feel uncomfortable, both of you are indicating that, to the extent that you have capacity now to measure global warming and its impacts, you are trying to do that in your respective jurisdictions. Is that correct? Both of you. Let's start with you, Dr. Hirsch.

Mr. HIRSCH. Yes, we certainly are. I think the—we make a lot of measurements of surface water and groundwater. The tricky part is understanding what's the signal, if you will, that's coming from natural variability, the signal that's coming from effects of humans on the landscape—say, in developing groundwater—and the signal that's coming from climate change. We continue to work on it, and we're learning, all the time. But it's a subject that demands continuing attention.

Senator DOMENICI. Mr. Johnson.

Mr. JOHNSON. Yes, yes, it's something that we are working on—

Senator DOMENICI. OK.

Mr. JOHNSON [continuing]. No question about it.

Senator DOMENICI. So, now, it seems to me that the question that we have to know is, Do you think that you should do more in this area, and that we should be considering giving you more to do this work with, or do you feel comfortable, as the chief professionals in your fields? I know, Dr. Hirsch, you're not in charge, but you're second in charge of what is clearly the world's best at what it does. I'm not sure, Director Johnson, what that bodes for you, excepting we know that we have nobody to look to for many other things, other than your Department.

Now, having said that, do you feel you need more to be able to do more, or are we on the right path, and do you have the resources and the agreements with other agencies and departments to be doing this monitoring on climate change?

Dr. Hirsch.

Mr. HIRSCH. That's a lot of aspects to that question that we could go into, and you ended up by mentioning monitoring.

Senator DOMENICI. Be simple.

Mr. HIRSCH. OK. I would say that we're very concerned, when it comes to monitoring, with the continuity of the monitoring. One of the reasons for this National Stream Flow Information Program, which is a part of this bill, is that we have found, in the last couple of decades, that long-term stream gauges that really are one of our best indicators of climate from a water perspective, that we have to shut many of them down because of lack of funding from our partners or from our own budget. In the last couple of years, each year—we've shut down about 100 of them each year for that reason. It is for that reason that the Administration has come forward with proposed increased. In fact, the Congress has even gone beyond what the Administration has proposed to make sure that

we're able to keep the continuity of that monitoring going. We also believe that we need to build that long-term record in groundwater, which we don't have in surface water today. So, those are a couple of considerations.

Senator DOMENICI. Right. Very good.

Johnson.

Mr. JOHNSON. There's always more that we can do. We're doing, I think, a reasonable amount now to be looking at climate change. I do believe that there is more. I think this bill helps focus in a single authority and provide direction from Congress on what we would do. I come back to the limitations that we talked about in our testimony, and we always have to find the right balance in the budget. But, certainly, this is a high priority and is something that we do need to be focusing on and putting resources on.

Senator DOMENICI. Thanks to both of you.

Thank you, Mr. Chairman.

Senator CRAIG. Mr. Chairman.

The CHAIRMAN. Yes.

Senator CRAIG. One last question, if I might?

The CHAIRMAN. Senator Craig.

Senator CRAIG. It is consistent with what you said in your opening comments, Mr. Chairman.

Are either of you working with our national laboratories, at this moment, that are out, many of them, in the West and in the arid West? I know that they all have projects in relation to future energy demands and water consumption. Is there a relationship there at all? If there isn't, I am one who believes there ought be.

Mr. HIRSCH. Let me comment on—and this committee, I think, sponsored the legislation a few years ago, and the common term we use for it is the water/energy nexus, and looking at that relationship. That effort is being led up at Sandia National Labs. Many of our scientists have participated in that exploration of that water/energy nexus, and, in fact, I'm a member of the steering committee of the group that's putting that picture together. So, it's an important issue, and we are, in fact, engaged with the National Labs on that topic.

Senator CRAIG. Thank you.

Mr. JOHNSON. We are, as well, as long—along with a lot of other academic institutions, universities, Scripps Institute; so, very much using that resource.

Senator CRAIG. Thank you.

The CHAIRMAN. OK. Thank you all very much.

Why don't we move to Panel 2. We have a vote in about 17 minutes, so why don't we ask the second panel to come forward. While they're coming forward, I'll indicate who's on the panel.

John D'Antonio, who's our State engineer in New Mexico, is here, representing the Western States Water Council, in Santa Fe, and we appreciate him being here. Jon Lambeck is the Metropolitan Water District of Southern California representative here, from Los Angeles. David Wunsch is here representing the National Groundwater Association, from Concord, New Hampshire. Patrick O'Toole is with the Family Farm Alliance, in Savery, Wyoming, and we appreciate Patrick being here. Brian Richter is with The Nature Con-

servancy, from Charlottesville, Virginia, and we appreciate him being here.

Let me just start with John, over on the left, and just proceed across the panel there. If each of you could take 5 minutes or so, and summarize the main points, we'll include your full statement in the record. We, again, appreciate your being here.

John, why don't you go right ahead.

STATEMENT OF JOHN D'ANTONIO, REPRESENTING WESTERN STATES WATER COUNCIL, SANTA FE, NM

Mr. D'ANTONIO. Mr. Chairman, thank you, and members of the committee. My name's John D'Antonio. I'm the State engineer for the State of New Mexico, and today I'm representing the Western States Water Council.

The Western States Water Council is affiliated with the Western Governors Association. I'll refer to things in my testimony. When I say WGA, it's Western Governors Association.

The Council supports enactment of Senate bill 2156, the SECURE Water Act. This bill addresses many needs identified in the June 2006 WGA water report, entitled "Water Needs and Strategies for a Sustainable Future." The WGA report recommendation 2A calls for a summary of existing uses, ground and surface water supplies, and anticipated future demands. There is now not sufficient water data for a firm foundation for decisionmaking. This bill authorizes a National Water Use and Availability Assessment Program to provide better information and identify trends in use and availability.

Section 9 includes grants to assist States in developing needed datasets and data bases. The WGA report 2A also suggests State and Federal agencies should increase funding for basic data gathering, as well as find ways to reduce costs to gather and distribute data.

Section 8 authorizes a USGS Water Data Enhancement Program that includes an expanded National Stream Flow Information Program and Systematic National Groundwater Resources Monitoring Program. The Council strongly supports expanding the current Stream Gauging Program. It is increasingly evident that there is often not sufficient data to support conjunctive State administration and management of surface and ground waters.

The bill also directs the USGS to identify significant brackish U.S. aquifers. Waters of impaired quality can offer an effective alternative to traditional supplies.

Section 8 also authorizes grants to develop new methodologies, technologies to cost-efficiently estimate or measure water resources data, such as stream flows, groundwater storage, precipitation, evapotranspiration, water withdrawals, return flows, and consumptive use, as well as improved data standards and methods of analysis.

I'd like to highlight the current use of Landsat to promote sensing and thermal infrared imaging—it's known as TIR—for monitoring and—evapotranspiration and calculating consumptive agricultural uses. This type of applied research and technology is something that should be supported, and is supported in this bill. Unfortunately, the joint USGS–NASA program is threatened by a failure

to fund a TIR instrument on Landsat 8, due to be launched in 2011. Again, we'll lose all capabilities if that happens. We should not lose this valuable tool for present and future water management, while authorizing research for, and development of, other unknown possibilities.

We appreciate the interest of the chairman and other members of the committee in this issue, and urge you to support appropriations language directing NASA to immediately begin work to design and produce a TIR instrument for Landsat 8.

The WGA report 2A says we should explore ways to promote water conservation and greater water use efficiency, better manage demand, reuse water, and use water banking and water transfers to maximize existing water supplies.

Section 5 of that bill authorizes a Reclamation Water Management Improvement Program to provide financial assistance to non-Federal entities to help conserve water, facilitate water markets, and enhance water and watershed management in areas with a nexus to the U.S. Bureau of Reclamation projects or to address climate-related impacts. We support continuing activities under Reclamation's Water 2025 Challenge Grants and Field Services Program and the Bridging the Headgate Partnership, which is intended to promote both on- and off-farm management improvements.

WGA report 2A calls for a focus on grassroots watershed approaches to water supply-and-demand management problems, to find solutions. The assistance of—authorized by the bill will be a welcome addition to our toolbox.

WGA report 3B suggests that the Congress should increase appropriations from the Reclamation Fund, as we would urge the committee to use the Reclamation Fund for appropriate purposes and programs authorized by this bill.

WGA report 2B recommends we use our existing research capabilities at State universities to focus on promising applied technologies, to improve water data acquisition, water treatment, and water energy efficiency.

Section 5 of the bill also authorizes cooperative agreements with any university, nonprofit research institution, and other organizations to fund such research.

The WGA water report highlights the need to prepare for the impacts of increasing climate variability and change on water resources, focusing on vulnerabilities, building resiliency, monitoring and assessing future supplies, improving our predictive capabilities, and mitigating anticipated impacts. This needs to be done at the watershed level in the context of current planning under various climate change and impact scenarios, which requires modeling at a finer scale.

Section 4 of the bill establishes a Reclamation Climate Change Adaptation Program to assess risks to water resources and develop mitigation strategies to address shortages.

Section 7 creates a Climate Change and Water Intra-Governmental Panel to review the science and develop ways to better forecast water availability impacts.

Section 6 mandates hydroelectric power assessment of the effects of climate change on power production.

I wish to express our appreciation for the recognition of Senate bill 2156, that States bear the primary responsibility and authority for managing water resources, and its provisions requiring Federal agencies to consult and coordinate with State water agencies. Moreover, the bill states, “Nothing in this Act preempts or affects any (a) State water law, or (b) interstate compact governing water.” It also directs the Secretary to comply with applicable State water laws.

We recommend the committee, its members and staff, for their initiative—or, we commend the committee—and look forward to working together toward passage and implementation of legislation to address our pressing current and future water needs.

Again, thank you for this opportunity to testify.

[The prepared statement of Mr. D’Antonio follows:]

PREPARED STATEMENT OF JOHN D’ANTONIO, REPRESENTING WESTERN STATES WATER COUNCIL, SANTA FE, NM

INTRODUCTION

My name is John D’Antonio, the New Mexico State Engineer, and I am representing the Western States Water Council (WSWC), whose members are appointed by the Governors of eighteen states. We are an advisory body on water policy issues affiliated with the Western Governors’ Association (WGA).

The Council supports enactment of the SECURE Water Act, introduced by the Chairman, Senator Bingaman (and cosponsored by Senators Cantwell, Domenici, Johnson, Salazar and Tester). The stated purposes of S. 2156 are to: (1) increase water use efficiency; (2) expand data acquisition and analysis of the Nation’s water; and (3) enhance the understanding of climate change impacts on water availability and energy production in the U.S.

Specifically, we support the financial assistance to non-federal entities for water-use efficiency improvements, enhanced spending authority for USGS streamgaging activities, a ground water monitoring system, brackish water study, new methods to estimate and measure water use, a national water use and availability assessment, establishment of an intra-governmental panel on climate change and water resources, a Reclamation Climate Change Adaptation Program, and a hydroelectric power assessment given the potential effects of climate change.

The bill addresses many of the needs identified in the June 2006 WGA Water Report, “Water Needs and Strategies for a Sustainable Future,” which was prepared by the Council and adopted by the governors.

Over the past year and a half, in cooperation with western governors, western water state officials, federal agency representatives and many stakeholders, we have been working to implement and refine the recommendations in the WGA Water Report. The report recognizes that the means to meet our future needs will need to come from a variety of sources, and that federal, state and local partnerships are one way to leverage limited budgets and staff. We must face our future water resources challenges together.

S. 2156 authorizes additional programs and spending to help meet some of the challenges related to ensuring we have sufficient supplies of water of suitable quality to meet the future demands related to our increasing population, economic growth, food, fiber and energy production, as well as environmental and recreational uses.

One of the first challenges is to better identify and quantify our existing uses, our anticipated future needs, and available supplies. This is a monumental task. As the Council has consulted with our member states, it has become evident that there is not now sufficient information available to provide a comprehensive and firm foundation for future decisionmaking.

The WGA Report Recommendation 2A states that—*A west-wide summary of existing water uses, water plans and planning efforts, current ground and surface water supplies, and anticipated future demands should be developed, then trends and common themes identified and evaluated. This summary should address both consumptive and non-consumptive uses and demands.*

S. 2156 authorizes a National Water Use and Availability Assessment Program. The Secretary of Interior, acting through the U.S. Geological Survey (USGS) and “in coordination with . . . State and local water resource agencies,” is to undertake a

program to provide better information on water resources and identify trends in use and availability, as well as help forecast water availability for future economic, energy production and environmental needs. USGS is also to maintain a national inventory on water, and provide grants to States to enable locally-generated data to be integrated with national datasets.

We strongly support and are particularly interested in the provisions under Section 9 for grants to State water resource agencies to assist in developing and integrating water use and availability datasets into a comprehensive database. This section should include gathering information on environmental water uses, including instream uses and outflows for bays and estuaries, as well as traditional consumptive water uses.

As present, western states' water planning capabilities (and spending) vary widely from state-to-state, particularly as it relates to estimating future water uses and needs. The numbers are often no more than "unsubstantiated estimates." The Council is actively working with the U.S. Geological Survey (the Bureau of Reclamation, Corps of Engineers and Environmental Protection Agency) to better define current capabilities and future data needs.

WGA Report Recommendation 2A also states that—*Federal and State agencies should increase support and funding for state and federal basic water data gathering activities that can serve as the basis for sound decision-making. Further, state and federal agencies must find ways to reduce costs related to gathering and disseminating real-time water data/information, including the acceptance of more in-kind contributions from cooperators. Moreover, new and stable sources of funding are needed. Basic data gathering is an appropriate governmental activity.*

S. 2156, under Section 8, authorizes a USGS Water Data Enhancement Program that includes expanding the National Streamflow Information Program (NSIP), a base network of streamgages, and integrating NSIP with other state and federal water data collection activities. The objective is to establish and maintain a minimum of 4,700 NSIP measuring sites over the next 10 years.

The WSWC has a long history of working with the U.S. Geological Survey, Interstate Council on Water Policy (ICWP) and streamgaging network stakeholders to support and improve the USGS Cooperative Water Program and National Streamflow Information Program. We welcome efforts to authorize greater expenditures for both programs, as well as actions to achieve our future streamflow data needs in the most cost-efficient manner possible.

The bill also directs the USGS to work with federal, state, and local entities to implement a systematic national ground water resources monitoring program for major aquifer systems in the U.S. It has become increasingly evident that there is not sufficient ground water data available, both quantity and quality, to support all the administrative actions (at the state and local levels) needed to understand and effectively manage ground and surface waters conjunctively. Many wells are not metered, and increasing ground water development is having a significant impact on surface water resources in some areas. We must increase and improve our knowledge of our ground water resources, and present and future challenges to ground water management, including climate change.

More and more often, the use of waters of impaired quality, such as brackish ground waters, offer an effective alternative to the development of surface water supplies and their transport over long distances. S. 2156 directs USGS to work with appropriate state and local entities to conduct a study identifying significant brackish U.S. aquifers. Desalination of brackish ground water and other impaired waters promises to be an important alternate source of supply for some uses and users.

Section 8 also authorizes the Secretary to provide grants to appropriate entities to develop new methodologies and technologies to estimate or measure water resources data in a cost-efficient manner. Priority is to be given to: (1) predicting and measuring streamflows; (2) estimating changes in ground water storage; (3) improving data standards and methods of analysis; (4) measuring precipitation and evapotranspiration; (5) developing descriptive and predictive models; and (6) water withdrawals, return flows and consumptive use. All of these are significant areas in need of greater emphasis.

I would like to highlight one technology of growing importance in many western states that presently has the capability to provide critical information on ground water withdrawals, agricultural and other outdoor water uses, evapotranspiration rates and consumptive uses. The USGS and National Aeronautics and Space Administration (NASA) now jointly operate a system of earth observation satellites that include a thermal infrared (TIR) sensor on Landsat 5 and Landsat 7, which are over due for replacement. Data from this sensor is now used by western states (and others) to measure and monitor evapotranspiration and consumptive uses from irrigated areas (and other land cover) by calculating the "residual" energy balance. The

Landsat Data Continuity Mission (LDCM), under NASA's Earth Sciences Directorate, currently has scheduled the launch of Landsat 8 for 2011. Once in orbit, NASA will turn over satellite operations and data management to USGS. However, NASA's FY 2008 budget did not include funding for a TIR instrument, and without immediate action by the Congress, this important tool could be lost for the foreseeable future.

We appreciate the Chairman's interest in this issue, as well as the efforts of several members on this committee, in asking NASA to explain how it intends to continue to provide this thermal data to USGS. At present, I am not aware of any other alternative source of this data on a comparable scale that would allow western water managers to continue to meet the growing need for this type of information. For example, Idaho uses this information to conjunctively administer rights to use both surface and ground waters on the Snake Plain. Colorado uses this data to assure its compliance with interstate compacts governing its water use on the Arkansas River. This technology has also been used in California, Montana, Nevada, New Mexico, Texas, Utah, Washington and Wyoming, and other states, including Arizona, Kansas, Nebraska, Oklahoma, Oregon and South Dakota have expressed interest in its use. It could be used in the Colorado River basin to verify extraordinary conservation actions undertaken under the Seven Basin States shortage sharing agreement currently being negotiated. This is the type of use of technological applications that S. 2156 would appropriately promote. Ironically, without prompt congressional action, we now face the loss of this conservation and management tool.

WGA Report Recommendation 2E reads—*Water conservation and water use efficiency, demand management (including pricing structures), water and water rights transfers, water banking, water reuse, revolving fallowing of agricultural lands and other means should be explored to augment existing supplies, as well as the relative merits and obstacles related to various programs and technologies.*

S. 2156, Section 5, authorizes a program for Reclamation Water Management Improvement and allows the Secretary of Interior to provide grants or enter into cooperative agreements with eligible applicants to help conserve water, increase water use efficiency, facilitate water markets, enhance water management or carry out similar activities in any watershed with a Reclamation project nexus or to address climate-related impacts to U.S. water supplies.

Reclamation may provide financial assistance to States, Tribes, and local entities to construct improvements or take actions to increase water-use efficiency to address drought, climate change, or other water-related crises.

We support authorization for these and other continuing actions taken under such programs as the Bureau of Reclamation's Water 2025 Challenge Grants and Field Services Programs, and the Bridging-the-Headgate Partnership, of which the WSWC is a signatory. Further, we strongly support the inclusion of in-kind services in calculating non-federal cost sharing contributions, as provided under Section 5(3)(E)(ii).

WGA Recommendation 2A states—*A summary should be developed of existing water supply and demand management policies and programs, as well as planned or potential activities. The focus should be on a grassroots, watershed approach to identifying water problems and potential solutions.*

In November, a workshop was held by the Council, along with the WGA that focused on past and present efforts to meet western water supply challenges through various policies and programs to improve water management and increase supplies. It is important to recognize and support grassroots, local initiatives to identify, assess and work out solutions to water related problems. State and local agencies and others are working to solve their own water problems, and it is important that federal efforts complement and supplement these efforts. S. 2156 authorizes such assistance and will be a welcome addition to our present box of water management tools.

WGA Recommendation 3B suggests—*The Congress should increase appropriations from annual receipts accruing to the Reclamation Fund for authorized Bureau of Reclamation projects and purposes to help meet western water supply needs, especially for rural communities, to maintain and replace past projects and to build new capacity necessary to meet demands related to growth and environmental protection.*

May we suggest that such sums as are authorized under S. 2156 for Reclamation-related programs and purposes should be made available from the Reclamation Fund. Current receipts are not now fully used for authorized purposes. It is our understanding the amounts authorized for expenditure under the bill are in addition to assistance authorized and provided pursuant to other provisions of federal law. As a general comment, we are concerned that the amounts authorized be sufficient to reasonably support the mandated activities—and it follows that there is a need for sufficient appropriations to match the authorization.

WGA Recommendation 2B directs we—*Use the research programs at western state universities to focus research on practical applications of promising new technologies, and to identify areas where the increased use of technology (e.g. remote sensing, supervisory control and data acquisition, new water and wastewater treatment, and energy and water efficiency) should be promoted to enable more efficient and cost effective operations.*

S. 2156, Section 5, also authorizes the Secretary to enter into cooperative agreements with any university, nonprofit research institution or organization with water or power delivery authority to fund research to conserve water, increase efficiency or enhance management.

The WGA Water Report includes a section highlighting the need to prepare for the increasing of climate variability and change on western water resources. Warming in the West would lead to significant changes, such as a more precipitation falling as rain rather than snow. This has the potential to upset the current balance achieved through the storage of seasonal surpluses. Snow is a major source of water in the West. It is a critical element in the current hydrologic cycle, and it is an irreplaceable water storage medium. Increasing future climate variability will bring new water management challenges involving not only the quantity of water available, but changes in its form and the timing with which it arrives. Several WGA report recommendations related to climate would be addressed by S. 2156's provisions.

- WGA Recommendation 5—*While recognizing the uncertainties inherent in climate prediction, efforts should be made to focus on vulnerabilities and building increased resiliency to climatic extremes.*
- WGA Recommendation 5A—*Federal agencies must continue and expand funding for activities necessary for monitoring, assessing and predicting future water supplies.*
- WGA Recommendation 5B—*The Congress should fund research for improving the predictive capabilities for climate change, and assessment and mitigation of its impacts. Given the complex climatology in the West, it is important that climate change modeling be conducted at a much finer resolution, e.g. watersheds and sub-watersheds.*
- WGA Recommendation 5C(2)—*Particular emphasis should be placed on climate change within the context of watershed planning and the impacts of climate-change scenarios on energy, economic development and forest management.*

S. 2156, Sections 4 and 7 respectively, direct the Secretary to establish a Reclamation Climate Change Adaptation Program, and a Climate Change and Water Intra-Governmental (I-G) Panel. Reclamation is to assess the risks of climate change to water resources in its service area and develop strategies and conduct feasibility studies to address water shortages, conflicts and other impacts to water users and the environment. The I-G Panel is to review the science on climate change and water, and develop ways to better forecast impacts to water availability. The Secretary, acting through the Bureau of Reclamation, is to consult with State water resource agencies in assessing specific risks to the water supply of each “major Reclamation river basin.” Similarly, the I-G Panel is to consult with States and the Advisory Committee on Water Information (ACWI).

May we suggest that the definition of “major Reclamation river basin” in the bill be expanded to include the Arkansas, Republican and Pecos River Basins, and the Great Basin.

S. 2156, Section 6, also mandates a Hydroelectric Power Assessment and directs the Secretary of Energy, in consultation with the federal Power Marketing Administrations (PMAs), and other federal and state agencies, to assess the effects of climate change on the water available for facilities producing hydropower marketed by the PMAs.

Lastly, we appreciate the explicit recognition that “. . . States bear the primary responsibility and authority for managing the water resources of the United States” and that “the Federal Government should support the States, as well as regional, local and tribal governments . . .” We appreciate the many provisions in the bill requiring federal agencies to consult and coordinate with the applicable State water resource agency with jurisdiction. The savings clause is also important which states that: “Nothing in this Act preempts or affects any—(A) State water law; or (B) interstate compact governing water.” So is the requirement that the Secretary comply with applicable State water laws.

In conclusion, we commend the Committee, its members and staff, for their initiative in addressing these critical water issues. While recognizing the jurisdictional limits of the Committee, we would also urge you to ensure that water quality issues,

which are inextricably linked to water quantity issues, are considered together in collaboration with all applicable federal and state agencies.

The CHAIRMAN. Thank you very much.
Mr. O'Toole, go right ahead.

STATEMENT OF PATRICK O'TOOLE, PRESIDENT, FAMILY FARM ALLIANCE, SAVERY, WY

Mr. O'TOOLE. Thank you, Mr. Chairman. I appreciate the kind words of some of the Senators. I've had the opportunity to work with several of you in different instances, and this room contains many people that are champions of water in the West, and appreciate it.

I'm representing the Family Farm Alliance, and we support this bill. We represent farmers in the 17 western States, and our perspective is that there are things happening. We talked to this committee about a report that we developed. It's called "Water Supply and in a Changing Climate." I'll leave copies available to the committee. But we've been looking at this for about 4 years, not only because of the climate implications, but also because of the impact to farmers on population growth and lack of supply. We are the shock absorber for western growth and the shock absorber for climate change. It's farmers whose water is moving away from farms as this happens. I had the opportunity last week to speak, in Sante Fe at the La Fonda, to the New Mexico water users, and it was very clear how emotional an issue it is there. It's the same in every western State.

Our family ranches on the Colorado/Wyoming line. We have cattle and sheep, and irrigate. The State line splits our ranch, and so, we have experience with both Wyoming and Colorado water law. I can tell you from personal experience that we're seeing things on the ground that really tell me, as a farmer and rancher, that things are changing. Places that I would never go in the springtime with a horse, you go right over, because of the cumulative effect of lack of water. This is right at the top of the Continental Divide. We're 25 miles from the split between the Platte and the Colorado River. So, we know the country pretty well, and we know what we're used to seeing. We know that things are changing. So, we try to react accordingly.

The Family Farm Alliance has a very simple mission statement, "Adequate supply of affordable water for farmers." That's what we feel like is in great jeopardy as we move into a different climate regime.

Again, as I said earlier, you know, we support this bill; specifically, things like the coordination of Federal agencies. I'll talk a little bit later about some recommendations. But it's very important that, in today's world, that we have uniform information, and I think we have a dearth of information. Certainly the stream gauging information has got to be accelerated. We lost a lot of that over the last couple of decades, and we've got to have that. We've just got to have information. As Senator Tester said, "Water is life, and knowledge is power." That's how we're going to solve these problems. As farmers, our report was really about looking at a broad set of recommendations, including storage. We think storage is certainly going to be on the table. If you get to the watershed level

now, and you talk to people in their own watersheds, they're going to tell you about storage. It happened on the Rio Grande last week. If you guys can believe it, the forest guardian fellow who is on a committee to work on the Rio Grande, talked about storage. The days that that's—that that isn't a subject that we can talk about are over. We have to make watershed-by-watershed decisions about the appropriateness of what we're doing.

This bill also authorizes cost-shared grants for coordination with those Federal agencies. I think that's very important for local districts. Again, the Family Farm Alliance represents people at the district level in every one of the western States. What we think we bring to the table—we're celebrating our 20th anniversary this year—is a in-depth knowledge of what's going on in the ground, and that's what we try to bring to you all and others in the policy area, is that we will tell you what really is happening. We began this water supply issue—I know there was a question earlier, Is there evidence, for example, in the Bureau of Rec? In the last energy bill, we asked that all nonconstructed projects in the Bureau of Rec be listed. Those that are there because of some of the work that you all and we have done. I think there's a lot of projects that have been authorized and still have all the geology and all of the infrastructure described in detail, that still have the possibility of construction. So, I think that's a resource that we can take advantage of.

One of the things I wanted to mention real quickly is this new responsibility of farmers to not only feed the Nation—and food security is certainly one of our recommendations, a look at food security—but the responsibility to produce fuel is huge. My wife called me, just before, to wish me good luck in this hearing, and she's in a ground blizzard north of I-80, bringing in the truckload of corn that we're going to feed to our sheep through the winter. That truckload of corn is about double what it was last year, with the combination of diesel and the acceleration of cost of grains because of the ethanol and the fuel issues. I believe that anything that helps farmers make more money is a good thing, but we have to realize that, in this push that has been policy implemented to produce fuel for the Nation, there are winners and there are losers, and it is creating quite a lot of change in the industry. Feeding livestock, for example, is a much more rigorous process than it was a year ago, I can tell you that.

A couple of things that we would like to suggest for the bill is certainly what Senator Barrasso referred to, and that's a coordination with the States. As we all know, I mean, everybody knows that in the West, if you don't work with the States, there's going to be a pushback. I think the more coordination we have with the States, the better off the process is going to be. That's where the information is, that's where the people on the ground are. So, we would really recommend that.

One that hasn't been talked about very much, but I think is very, very important—and in the next Administration, it needs to continue on—but it's the fact that the water resides in the forest. Most of the water in the West is in the U.S. Forest Service, in the snowpack. My experiences, as I've related them to you, about crossing rivers and all the things that we have a creek that runs

through, so you'd better have some sharp spurs and be ready to have a ride to cross when it's in high water. We didn't have that last year, didn't have high water, because the April 80-degree weather took that hydrograph that was supposed to be like this and made it like this. We have to understand that if there's going to be storage built, a lot of it's going to be built with forests—relationship with a national forest.

Another one of our recommendations is regulatory reform. Our community built a project, 23,000-acre-foot project, that saved our community, really—took 24 years to permit. That just can't keep happening.

So, this bill, I think, does an awful lot of good things. We support it. We have some recommendations. I really appreciate the opportunity to speak to you.

[The prepared statement of Mr. O'Toole follows:]

PREPARED STATEMENT OF PATRICK O'TOOLE, PRESIDENT, FAMILY FARM ALLIANCE,
SAVERY, WY

INTRODUCTION

Good afternoon, Chairman Bingaman, Ranking Member Domenici, and Committee Members. My name is Patrick O'Toole, and I serve as the president of the Family Farm Alliance (Alliance).

The Alliance is a grassroots organization of family farmers, ranchers, irrigation districts and allied industries in 16 Western states. The Alliance is focused on one mission: To ensure the availability of reliable, affordable irrigation water supplies to Western farmers and ranchers. We are also committed to the fundamental proposition that Western irrigated agriculture must be preserved and protected for a host of economic, sociological, environmental and national security reasons—many of which are often overlooked in the context of other policy decisions.

My family operates a cattle, sheep and hay ranch in the Little Snake River Valley on the Wyoming-Colorado border. I am a former member of Wyoming's House of Representatives and I served on the federal government's Western Water Policy Review Advisory Commission in the late 1990's.

I am honored to be here today and grateful that Senators Bingaman, Domenici, Cantwell, and Johnson have introduced S. 2156, The SECURE Water Act. This legislation is not only important to the Alliance; it also is immediately relevant to me and other Wyoming water users, and to farmers, ranchers and small communities all over the West. We were pleased to see that this bill contains some provisions that are very close to recommendations we provided in my testimony before the Water and Power Subcommittee last June.

ALLIANCE INVOLVEMENT WITH CLIMATE CHANGE ISSUES

The Family Farm Alliance Board of Directors at its 19th Annual Meeting in Las Vegas last February established a subcommittee to develop a white paper that addresses the important issue of climate change, its possible impact on Western water supplies and irrigated agriculture, and recommendations on how to plan and provide stewardship for this change. The report was prepared by a Family Farm Alliance climate change subcommittee, our Advisory Committee, and water resources experts from around the West. That document—titled "Water Supply in a Changing Climate: The Perspective of Family Farmers and Ranchers in the Irrigated West"—was released in early September. If you have not already received a copy of our report, we have additional copies that we can make available to you.

Our report shows that climate change could further strain fresh water supplies in the American West. We must begin to plan for that now, and not wait until we are forced to make decisions during a crisis.

S. 2156 REPRESENTS A POSITIVE STEP TOWARDS ADDRESSING CLIMATE CHANGE IMPACTS TO WESTERN WATER RESOURCES

Western water supplies are already inadequate to the demands of agriculture, urban growth and environmental enhancement. Global climate change, we're told, will further reduce those supplies. Working with farmers has made us incredibly sensitive to the big picture ramifications facing the future of Western agriculture,

and the critical role reliable water supplies play in that big picture. We must immediately begin to address the critical challenges we face. A practical, prioritized approach to addressing these challenges is possible, and essential. We believe that S. 2156 takes a positive step towards addressing two of the Alliance's key recommendations.

1. S. 2156 will promote coordination of federal agencies and resources in assessing, monitoring, and planning for future water supply impacts and trends

In our view, S. 2156 will promote coordination of federal agencies and resources in assessing, monitoring, and planning for future water supply impacts and trends—an important first step in developing an adaptive approach to climate change and water. The Alliance supports this approach as embodied in S. 2156 because it provides additional authorities for federal agencies to offer grants and agreements for demonstration, research, or methodology development in this coordinative effort. Such partnerships with local water authorities, universities, and local governments are key to providing localized solutions to vexing water supply problems.

Our country has tremendous, but limited, resources available to fix our problems, so we must prioritize and sequence our actions, including those authorized or facilitated by S. 2156.

The Alliance recommends that an initial priority research item carried out under S. 2156 be a comprehensive quantification of West-wide changes in climate change-driven streamflow. This should be followed by quantification of the amount of additional above-and below-ground reservoir storage, conservation targets, etc. required to re-regulate the anticipated hydrologic regime changes. To optimize water management for beneficial use, researchers should look at scenarios where storage is spaced through the drainage. Potential storage sites should be located at high and low elevations to regulate and subsequently re-regulate the water supply to maximize beneficial use. A study of this type would quickly illustrate to policy makers the need to start modernizing our water infrastructure.

The potential water impacts associated with use of alternative fuels must also be studied. Throughout the West, we are seeing proposals to build plants to make ethanol, another “answer” that may (or may not) lower greenhouse gas emissions. An April 2007 Sacramento Bee editorial provides a reality check on how much water it would take to grow all the corn required to meet California's goal of producing a billion gallons of ethanol a year. According to the Bee's calculations, that's about 2.5 trillion gallons of water for 1 billion gallons of ethanol, which is more than all the water from the Sacramento-San Joaquin Delta that now goes to Southern California and valley farms. Because there is only so much water for agriculture in California and other Western states, this means that some other existing crops will not be grown, thus furthering our dependence on imported food sources.

Another growing demand that will be placed on Western water resources is driven by power requirements. The total water consumed by electric utilities accounts for 20 percent of all the nonfarm water consumed in the United States. By 2030, utilities could account for up to 60 percent of the nonfarm water, to meet the water needs required for cooling and pollutant scrubbing. This new demand will likely have the most serious impacts in fast-growing regions of the U.S., such as the Southwest. Even without warming climate conditions, continued growth in these regions will put the squeeze on both water and power use. When you throw in climate change considerations, the projections look worse.

Studies of these types of issues lend themselves well to a private-public partnership that would add non-governmental farming organizations, state agencies and academic institutions to a team of federal agencies including the expertise found within the Natural Resources Conservation Service, Bureau of Reclamation, and U.S. Geological Survey. For example, the Family Farm Alliance has partnered with Colorado State University and recently developed a proposal to the USDA for a project that would assess public attitudes and perceptions regarding agricultural water use in the West.

2. S. 2156 will provide water managers with highly beneficial “on-the-ground” solutions to infrastructure problems exacerbated by global climate change

S. 2156 authorizes the Secretary of the Interior to provide cost-shared grants for planning, designing, or constructing improvements to water infrastructure that conserve water, provide management improvements, and promote increased efficiencies. These grants will provide water managers with highly beneficial “on-the-ground” solutions to infrastructure problems exacerbated by global climate change. These projects provide for improved water management, enhanced supplies, water conservation, and greater efficiencies, thereby stretching dwindling water supplies.

Temporary water transfers, conservation, recycling, and desalination efforts must continue. However, these demand-management actions must be balanced with supply enhancement measures that provide the proper mix of solutions for the varying specific circumstances in the West.

Supply enhancement actions should include rehabilitation of existing facilities and construction of new infrastructure. Many of the West's Reclamation projects are nearly a century old and many are badly in need of repair and/or modernizing. Rehabilitation measures should focus on maximizing the conservation effort through increased delivery efficiencies, construction of re-regulation reservoirs to minimize operational waste, and construction of new dams and reservoirs in watersheds with inadequate storage capacity to increase beneficial use and provide operational flexibility. Additional groundwater supplies should also be developed, but in a manner where groundwater use falls within the safe yield or recharge parameters of the aquifer. Conjunctive management of surface and groundwater supplies should be encouraged. Installation of additional stream gauges, water meters, groundwater recharge projects to employ during times of high surface flow, groundwater monitoring wells and better estimates of consumptive use are of paramount importance for the equitable management of available water supplies.

Many water projects are ready to be developed in the West (see Family Farm Alliance, 2005; also U.S. Bureau of Reclamation, 2005). While conservation and recycling programs have done a tremendous job of meeting new growth, only a small amount of new water storage capacity has been developed in the past 30 years. Maintaining the status quo simply isn't sustainable in the face of unstoppable population growth, diminishing snow pack, increased water consumption to support domestic energy, and increased environmental demands. It's time to start implementing the water infrastructure needed to cope with a changing climate, meet the needs of a burgeoning population, and support a healthy agricultural base in the West.

3. S. 2156 will improve streamflow measurement and data collection efforts

Improved understanding and knowledge of existing water supply inventories, the interrelationships between surface and groundwater resources, and the impacts of predicted climate change on watersheds will be critical to water managers and at the local, regional, state, and national levels in adapting to and managing for climate change.

Most of the recent reports and studies on climate change and water supply impacts suggest that federal agencies must focus on vulnerabilities and improve knowledge-based data collection activities. Current predictive models for future climate change scenarios, while useful in illustrating general areas of impact, are not particularly accurate at the local or regional scale. We support provisions in S. 2156 to improvement in streamflow measurement and data collection efforts. We also support the development of more cost-effective methodologies in accomplishing these goals.

SUGGESTIONS TO IMPROVE S. 2156

The membership of the Family Farm Alliance fully supports S. 2156, and encourages its enactment. The Alliance, however, believes that there are additional tools that are not included within the provisions of S. 2156 and that should be made available in order for western water managers and agricultural producers to adequately deal with the effects of global climate change.

1. S. 2156 Should Encourage the Federal Government to Partner with States on Groundwater Monitoring

S. 2156 directs the Secretary of the Interior to develop a systematic groundwater monitoring program for each major aquifer system located in the United States. We believe this can best be accomplished in partnership with the states and their respective water resource agencies. While we understand the utility of a national perspective in understanding the status of groundwater resources in the U.S. and in setting a standard criteria for comparative purposes, we also recognize the important work the states have already accomplished in characterizing these resources, and partnering with the states will ensure the federal government is not "reinventing the wheel" in implementing this provision of S. 2156. The bill only requires "consultation and coordination" with state and local water resource agencies. We believe a stronger bond between the states and the federal government through partnerships in this effort is a better approach and will result in a better product. Any "partnering" should rely heavily on the actual experience of those actively using groundwater supplies.

2. *S. 2156 Should Strongly Encourage the Federal Government to Partner with States on Water Use and Availability Assessments*

We have similar concerns with the provisions calling for the development of a water use and availability assessment program. Without the complete involvement of state water resource agencies, this program will not be successful. We are supportive of the grant authorities provided through S. 2156 for implementation of this program, but more assertive language with regard to Federal consultation is needed to attract state participation and cooperation.

We appreciate and support the provisions of S. 2156 requiring the federal agencies to comply with state water laws and compacts.

OTHER NEEDS

Outside the scope of S. 2156, we will continue to advocate for solutions that will mitigate for climate change impacts to Western water resources, as well as ensuring the availability of reliable, affordable irrigation supplies. Critical problems remain to be solved.

1. *Create Flexible Financing Options to Help Water Managers Proactively Deal with Aging Infrastructure, Modernization and Climate Impacts to Western Water Supplies*

Such tools include new, innovative, federally-enhanced financing instruments, such as expanded federal loan guarantees, tax-credit bonds, private equity bonds, and municipal bonds to finance aging federal and local infrastructure rehabilitation, modernization, and technological improvements—especially where such financial tools are currently not available.

Some of these financing options are already authorized and await implementation by the responsible agencies. In the last Congress, this Committee wrote rural water supply project legislation that authorized the Secretary of the Interior to provide federal loan guarantees to local water agencies to help them meet their obligations to pay for costs of rehabilitating and improving aging Bureau of Reclamation facilities. Congress enacted the Committee loan guarantee provisions, yet they have not been implemented. Congressional inquiry and oversight might be necessary in order to assist the responsible federal agencies in achieving the goals of the loan guarantee program and to help western water managers proactively deal with an aging water infrastructure and global climate impacts to western water supplies.

2. *Streamline the Regulatory Permitting Process*

Modern, integrated water storage and distribution systems can provide tremendous physical and economic flexibility to address climate transformation and population growth. However, this flexibility is limited by legal, regulatory, or other institutional constraints, which can take longer to address than actually constructing the physical infrastructure. The often slow and cumbersome federal regulatory process is a major obstacle to realization of projects and actions that could enhance Western water supplies.

3. *Make the U.S. Self-Sufficient in Food Production*

Remarkably absent from the newly-ignited dialogue about food safety is a recognition of the importance of a secure and sustainable domestic food supply. While much is made of the need to end our reliance on foreign energy sources, nobody is talking about food independence. In the big picture, a national response to climate change should include as one of its goals self-sufficiency in food production. It is time for our national leaders to stand up and focus on improving the security, stability, and economic aspects of domestic food production so that our food remains readily available, ample, affordable, and safe.

4. *Protect Farmland*

New research suggests that irrigation has kept croplands cool, essentially countering rising temperatures caused by greenhouse gas emissions over the last half century. Crops also turn carbon dioxide into oxygen. In addition to a multitude of other benefits (economic, security, habitat and open spaces, to name a few), our diminishing farmland needs to be protected. Federal funds and other money should also be authorized to help local governments protect farmland, analyze ways to keep farmland in production, set up grant programs for local governments and provide technical assistance to farmers. Congress should consider the option to encourage states to lease development rights from farmers to buffer their farmland.

CONCLUSION

The impacts of climate change on sensitive Western water supplies, while not totally understood today, will significantly challenge all water users in the West—municipal, industrial, agricultural, and environmental—in the near future. Being prepared requires investment and adaptation in the management of Western water supplies. To meet these challenges our efforts need to begin today—before crises, before conflict, and before there are winners and losers. S. 2156 is a very positive step in the right direction, providing much needed opportunities for partnerships with federal agencies; providing direction for federal policymakers in dealing with the impacts of climate change on our precious water supplies; and providing some innovative new tools that will be necessary in order for the federal government to proactively work with local and state water authorities on real solutions.

We stand ready to assist you, Mr. Chairman, and the Members of this Committee in improving upon, and enacting this legislation so important to all our communities in the face of such an uncertain and challenging future. We must emphasize, however, that we are facing water problems right now. Legislation, water transfers and data collection alone will not resolve these problems. The amount of water on the planet remains the same. Only the infrastructure to conserve, reuse, store, treat, manage and convey water to where and when it is needed, at the quality and quantity needed, will resolve these problems and avoid even more severe consequences that loom on the horizon.

Thank you for the opportunity to testify before this Committee today. I would be happy to answer any questions you might have.

The CHAIRMAN. Thank you very much for your testimony.
Mr. Lambeck, why don't you go right ahead.

STATEMENT OF JON C. LAMBECK, POWER SYSTEMS MANAGER, METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA, LOS ANGELES, CA

Mr. LAMBECK. Thank you.

Mr. Bingaman, Ranking Member Domenici, and members of the committee, the Metropolitan Water District of Southern California is honored to be invited to participate in today's hearing.

Although I've provided a copy of my oral comments, I would respectfully request permission to provide written comments in due time.

The CHAIRMAN. We will certainly be glad to get any comments you want to provide.

Mr. LAMBECK. Thank you.

Again, thank you for inviting Metropolitan to testify before the committee on S. 2156, as it addresses the important issue of climate change and its effects on water supply management, particularly in the arid West. I am Jon Lambeck, and my responsibilities at Metropolitan are to oversee the energy needs of our extensive water supply system.

Metropolitan is the Nation's largest provider of imported water to an urban area, serving a population of over 18 million. Our region is expected to increase to 25 million over the next 25 years. The sources of southern California's imported water are from northern California and the Colorado River Basin. Our mandate, to provide a reliable, long-term wholesale supply of water to our high-growth region, is now rendered more challenging in the face of unmistakable impacts on water supplies, due to climate change. We are managing this through a dynamic integrated resources plan that is designed to respond to the rapidly changing water supply conditions first evident in the West, and now emerging in other regions of the country.

However, no water agency can respond alone, and that is why legislation like 2156 is essential to define and authorize the crucial role the Federal Government must play in obtaining vital information to better understand the situation we are facing, to assist in evaluating alternative solutions, and to support the changes that will be necessary to mitigate the challenges of climate change to the water industry.

There are many problems that must be addressed, as 2156 makes clear, but today I want to focus, in my brief remarks, on the relationship of water resources and power generation. We are also attaching previous testimony by our chairman to Congress on the broader policy implications of climate change for water agencies.

2156 is legislation that again proves the wisdom of a committee having jurisdiction over both natural resources and energy. As an example, one of the key issues encountered by water managers in responding to climate change is the lower water levels in storage facilities and the resulting decrease in hydropower capability. The diminished storage can limit the amount of water available to meet the needs of a growing population and reduce the amount of clean hydropower available to move the water. The result can be increased costs and increased emissions of greenhouse gases.

For Metropolitan, water stored in Lake Mead on the Colorado River is released to meet our water demands, while, at the same time, it produces electric energy at Hoover Dam. From the start of Metropolitan's water operations in 1939, the generators at Hoover Dam have annually supplied over half the power needed to move Metropolitan's water through its Colorado River aqueduct. With storage elevations at both Lakes Powell and Mead down by 50 percent, the seriousness of the situation is obvious for both water and power.

Metropolitan's planning assumptions are conservative, meaning that we assume the effects of climate change will continue and low storage elevations will be a factor for years to come. This requires innovative responses, starting now.

Let me suggest two immediate areas in which Federal assistance would be of immense importance on this set of problems.

First, we need to understand how to optimize power production with reduced water supply, such as more efficient low head turbines. The Federal Government could undertake studies itself, or support studies by others, to create models and help develop and improve the design of more efficient turbines. This would allow the most benefit and value to be obtained from existing Federal hydropower assets under adverse storage conditions. This would also provide power contractors and water agencies with the technical means and credibility to finance the construction of new facilities.

Second, other studies might address operational modifications under reduced water levels or the potential for physical changes, such as dredging at existing hydroelectric facilities. Relatively minor actions could result in measurable generation improvements.

If these studies show the potential to make generation more efficient, they might be implemented relatively quickly, assuming there is limited structural modifications that would be required.

2156 does an admirable job of conveying many of the issues that now allow water systems to respond to the effects of climate

change, and we support the bill, for that reason. Nevertheless, we believe the legislation could be strengthened by an addition to Section 6, which specifies additional research the Secretary could perform, or contract to have performed, to address the problems of hydropower generation under reduced water conditions.

Although the existing language of 2156 may cover these issues, the three areas of new generation equipment, operational changes, and physical modifications are all specified in the amendment that is attached, which we hope you will consider.

It is important to maximize the efficiency of our clean, noncarbon power sources in this era of climate change, and these are some of the first steps we can take.

In closing, Mr. Chairman, I want to compliment the committee for moving so quickly and comprehensively on these SECURE Water issues. As our chairman, Mr. Brick, told the Water and Power Subcommittee in June, the uncertain effects of climate change and increasing demands on the scarce fresh water supply mean we cannot afford to wait. Metropolitan's climate change policy encourages research and other efforts to better understand the effects of this global issue as 2156 would provide, and you can count on Metropolitan's support.

Thank you.

[The prepared statement of Mr. Lambeck follows:]

PREPARED STATEMENT OF POWER SYSTEMS MANAGER, METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA, LOS ANGELES, CA

Mr. Chairman and Committee Members: Thank you for inviting the Metropolitan Water District of Southern California (MWD) to testify before the committee on S. 2156, as it addresses the important issue of climate change and its effects on water supply management, particularly in the arid West. I am Jon Lambeck and my responsibilities at Metropolitan are to oversee the energy needs of our extensive water supply system.

MWD is the nation's largest provider of imported water to an urban area, serving a population of over 18 million. Our region is expected to increase to 25 million over the next 25 years. The sources of Southern California's imported water are from Northern California and the Colorado River Basin. Our mandate is to provide a reliable long-term wholesale supply of water to our high growth region, now rendered more challenging in the face of unmistakable impacts on water supplies due to climate change. We are managing this through a dynamic Integrated Resources Plan (IRP) that is designed to respond to the rapidly changing water supply conditions first evident in the west and now emerging in other regions of the country.

No water agency can respond alone, of course, and that is why legislation like S. 2156 is essential to define and authorize the crucial role the federal government must play in obtaining vital information to better understand the situation we are facing, to assist in evaluating alternative solutions, and to support the changes that will successfully mitigate the challenges of climate change to the water industry. There are many problems that must be addressed, as S. 2156 makes clear, but today I want to focus in my brief remarks on the relationship of water resources and power generation. We are also attaching previous testimony by our Chairman to Congress on the broader policy implications of climate change for water agencies.

S.2156 is legislation that again proves the wisdom of a committee having jurisdiction over both natural resources and energy. As an example, one of the key issues encountered by water managers in responding to climate change is the lower water levels in storage facilities and the resulting decrease in hydropower capability. The diminished storage can limit the amount of water available to meet the needs of a growing population and reduce the amount of clean, hydropower available to move the water. The result can be increased costs and increased emissions of greenhouse gases. For Metropolitan, water stored in Lake Mead on the Colorado River is released to meet our water demands while at the same time it produces hydroelectric energy at Hoover Dam. From the start of Metropolitan's water operations in 1939, the generators at Hoover Dam have supplied over half the power needed to move

MWD's water through its Colorado River Aqueduct. With storage elevations at both Lakes Powell and Mead down by 50%, the seriousness of the situation is obvious for both water and power.

MWD's planning assumptions are conservative, meaning that we assume the effects of climate change will continue, and low storage elevations will be a factor for years to come. This requires innovative responses, starting now. Let me suggest two immediate areas in which federal assistance would be of immense importance on this set of problems.

First, we need to understand how to optimize power production with reduced water supply, such as more efficient low head turbines. The federal government could undertake the studies itself, or support studies by others, to create models and help develop and improve the design of more efficient turbines. This would allow the most benefit and value to be obtained from existing federal hydropower assets under adverse storage conditions. This would also provide power contractors and water agencies with the technical means and credibility to finance the constructing of new facilities.

Second, other studies might address operational modifications under reduced water levels or the potential for physical changes, such as dredging, at existing hydroelectric facilities. Relatively minor actions could result in measurable generation improvements. If these studies show the potential to make generation more efficient, they might be implemented relatively quickly assuming there is limited structural modifications that would be required.

S. 2156 does an admirable job of covering many of the issues that will allow water systems to respond to the effects of climate change, and we support the bill for that reason. Nevertheless, we believe the legislation would be strengthened by an addition to Section 6 which specifies additional research the Secretary could perform, or contract to have performed, to address the problems of hydropower generation under reduced water conditions. Although the existing language of S. 2156 may cover these issues, the three areas of new generation equipment, operational changes and physical modifications are all specified in the amendment (attached) which we hope you will consider. It is important to maximize the efficiency of our clean, non-carbon power resources in this era of climate change and these are some of the first steps we can take.

In closing, Mr. Chairman, I want to compliment the committee for moving so quickly and comprehensively on these SECURE Water issues. As our Chairman, Mr. Brick, told the Water and Power Subcommittee in June, ". . . the uncertain effects of climate change and increasing demands on the scarce freshwater supply mean we cannot afford to wait." Metropolitan's climate change policy encourages research and other efforts to better understand the effects of this global issue as S.2156 would provide, and you can count on Metropolitan's support.

AMENDMENT

Insert a new (b) in Section 6.

(b) Authorization of Research—

(1) **AUTHORITY OF SECRETARY**—The Secretary may perform or have performed research by an appropriate party, to provide the following:

(A) analysis of operational changes at federal hydroelectric power plants to mitigate adverse impacts to power production from reduced water supplies caused by climate change

(B) simulations and models to test and verify potential equipment changes that would achieve higher power production at lower water storage levels

(C) recommendations of physical changes to federal hydroelectric power plants and dams to increase power production during periods of reduced water supplies

(2) **TITLE TO IMPROVEMENTS**—Any infrastructure improvement to a facility under the jurisdiction of a Federal agency that results from the activities listed in Paragraph (1), shall be the property of the Federal Government

(3) **COST SHARING**

(A) **FEDERAL SHARE**—Research performed at the request of the Secretary shall be paid entirely by the Federal Government and shall be non-reimbursable.

The CHAIRMAN. Thank you very much.
Senator Domenici.

Senator DOMENICI. Mr. Chairman, might I say to you that I have a number of constituents waiting and I am going to have to leave and let them walk with me to the vote. I want to just comment on two things.

First, Mr. O'Toole, you raised the issue of how long it took to license—24 years.

Mr. O'TOOLE. Yes, sir.

Senator DOMENICI. I wanted to tell you that, in the Comprehensive Energy Policy Act, that's 3 years old, the section on licensing—and it affects you—has been dramatically changed, and, I think, if you were doing that now, you would find that it would not take 24 years. I'm just guessing, but I know what we did.

Mr. O'TOOLE. That's important. Yes, sir.

Senator DOMENICI. I want to say to the witness that just testified, next year we'll introduce a bill—hopefully, our chairman will support it—called “Energy for Water, Water for Energy”—a play on words. It will have a section on researching—you know, urgency of research in the areas that you have alluded to, and because of just what you've said.

Mr. LAMBECK. Thank you.

Senator DOMENICI. Thank you very much, Mr. Chairman.

The CHAIRMAN. Thank you very much.

We are already into a vote, nearly halfway through a vote, so I think the best course is to take a short break, and then I'll come back in about 10 or 15 minutes, and we will hear from the final two witnesses. I apologize for having to do that, but that's the schedule around this place. We'll adjourn for about 15 minutes.

[Recess.]

The CHAIRMAN. Why don't we get started again. Sorry for that interruption.

We have two additional witnesses here.

Mr. Richter, why don't you go right ahead.

STATEMENT OF BRIAN RICHTER, CO-DIRECTOR, GLOBAL FRESHWATER INITIATIVE, THE NATURE CONSERVANCY, CHARLOTTESVILLE, VA

Mr. RICHTER. Mr. Chairman and members of the committee, thank you for this opportunity to testify on the SECURE Water Act and the impacts of climate change on the management of our water resources.

My name is Brian Richter, and I'm the director of the Global Fresh Water Program for The Nature Conservancy. The Nature Conservancy is a leading conservation organization that protects ecologically important places for nature and people. Our on-the-ground conservation work is carried out in all 50 States and in more than 30 countries now.

While The Nature Conservancy's mission is focused on sustaining the Earth's diversity of plants and animals, we know that protection of ecosystems is also critical to human well-being; therefore, we are gravely concerned about the potential for climate change to substantially disrupt the things that everyone in this room cares about: our economy, our culture, and the ecosystems that support our way of life. That's why The Nature Conservancy is calling for legislation and policies to address greenhouse gas emissions by es-

tablishing a strong, cost-effective cap and a market-based program to reduce emissions.

As we all know, even immediate reductions in greenhouse gas emissions cannot arrest the expected climate impacts of gases we've already put into the atmosphere. Therefore, we must also develop adaptation programs, like the one proposed in the SECURE Water Act, to help ecosystems, and the human communities relying upon them, to cope with the impacts of climate change.

Mr. Chairman and Senator Domenici, we applaud you and other cosponsors of the SECURE Water Act for introducing legislation that will help us to better understand the impacts of climate change and what that will mean for the management of our water resources, and to begin to prepare strategies now to adapt to these changes.

I would like to focus the rest of my remarks on strategies that will help better manage our water systems in response to climate change and provide specific recommendations on how to improve the SECURE Water Act to incorporate these strategies.

To meet both human and ecosystems needs in the face of climate change, we must do a much better job of comprehensively managing our water resources. First, we need to assimilate much better data on the availability of water and how it is being used. Today, most States possess only a rudimentary understanding of who is using the water, how much they're using, when they use it, and how much is left for other purposes.

To ensure that all States have the ability to account for and manage water resources comprehensively, we must substantially increase State and Federal investment in basic water accounting, particularly for the U.S. Geological Survey. In fact, each and every one of the activities I will highlight today is strongly dependent upon the science provided by the USGS.

By providing support for the USGS National Stream Flow Information Program, establishing new monitoring programs, and providing incentives to integrate and standardize water availability data, the SECURE Water Act will do a great deal to fulfill this need.

Comprehensive water management will also require improved management of our existing water infrastructure. By re-evaluating current operations, we can better serve human needs and adapt to changing climate conditions while protecting natural systems. We appreciate the focus in the SECURE Water Act on reassessing current operations of water supply and hydropower dams, but we believe this assessment must also include an evaluation of the water needs of downstream ecosystems, referred to as environmental flow needs, so that we can sustain the productivity and many benefits, such as healthy fisheries, that freshwater ecosystems provide for our society. For example, through a national partnership with the Army Corps of Engineers and the U.S. Geological Survey, called the Sustainable Rivers Project, we are now working together to improve the management of 27 dams and nine river basins in the United States. Together, we're finding abundant opportunities to better protect the river ecosystems affected by these dams, while continuing to provide flood control, water supply, hydropower generation, and recreational benefits.

Another important approach to provide for future water supply needs without compromising our natural resources is to implement nonstructural and natural means of water storage. For example, floodplains and wetlands can store excess flood waters and recharge our depleted aquifers. Conjunctive management, also known as aquifer storage and recovery, of surface-and groundwater can provide an integrated solution to meeting water supply needs without building additional surface reservoirs by artificially recharging aquifers that can store water for later use. We believe these and other nonstructural approaches will be critical for adapting to climate change. The adaptation strategies and grants in the SECURE Water Act should incorporate incentives for natural methods of water storage and seek to minimize new infrastructure needs.

One of the most promising ways to improve our use of existing reservoir storage is to reduce our reliance on dams to provide flood control. I can illustrate this concept through our work on the Yangtze River in China. We have developed a proposal, now under serious consideration by the Central Chinese Government, that calls for large-scale restoration of the Yangtze River's floodplain to enable safe storage of flood waters on the floodplain. This proposal would relieve the upstream dams of having to provide flood control, and this would free up considerable space in the upstream reservoirs, that can be used for other purposes, including water supply and hydropower generation.

Finally, all of our action must be based on sound science; therefore, we would recommend an even stronger science component in the development and implementation of adaptation strategies in the SECURE Water Act.

In closing, it's important that all of our policy and on-the-ground adaptation measures recognize the need to maintain healthy and resilient ecosystems that preserve the ability to adapt in the face of climate change and continue to meet the needs of both humans and wildlife. With the improvements suggested here, we believe this legislation will provide a good first step in assisting humans and ecosystems in adapting to climate change.

Thank you for your attention and in this opportunity to share our thoughts with you today.

[The prepared statement of Mr. Richter follows:]

PREPARED STATEMENT OF BRIAN RICHTER, CO-DIRECTOR, GLOBAL FRESHWATER INITIATIVE, THE NATURE CONSERVANCY, CHARLOTTESVILLE, VA

Mr. Chairman and members of the Committee, thank you for the opportunity to testify on the SECURE Water Act and strategies to adapt our water management practices for the impacts of climate change. I am Brian Richter, the Co-Director of the Global Freshwater Program for The Nature Conservancy. In addition to providing specific recommendations on the SECURE Water Act, my comments today will focus on three themes:

- impacts of climate change to streamflow, water temperature, and water quality,
- the need to balance human and ecosystem water requirements in the wake of these changes,
- and management strategies to achieve this goal.

The Nature Conservancy is an international, nonprofit organization dedicated to the conservation of biological diversity. Our mission is to preserve the plants, animals and natural communities that represent the diversity of life on Earth by protecting the lands and waters they need to survive. Our on-the-ground conservation work is carried out in all 50 states and in more than 30 countries and is supported by approximately one million individual members. The Nature Conservancy has pro-

tected more than 117 million acres of land and 5,000 miles of river around the world. Our work also includes more than 100 marine conservation projects in 21 countries and 22 U.S. states.

While The Nature Conservancy's mission is focused on sustaining the Earth's diversity of plants and animals, our broader contribution to society is in the protection of the life support systems of our planet—we cannot protect the diversity of life on this planet, including human life, without protecting the ecosystems that sustain us all. Natural ecosystems provide humanity with clean water, food and fiber. Natural resources derived from ecosystems support major sectors of our economy, whether in the form of fisheries that sustain coastal communities or through tourism economies that rely so heavily upon nature-based recreation. Healthy natural ecosystems perform an array of valuable services with substantial economic values, including purifying our water supplies, sequestering carbon, and regulating the climate and hydrologic cycles of our planet, and this work is provided to humanity free of cost.

Climate change is perhaps the greatest long-term threat to the health of aquatic ecosystems that support people, economies, and fish and wildlife. Prompt action to address this threat is critical to minimize future harm to nature and to the social and economic fabric of our communities. While the testimony provided today will focus on adaptation strategies in order to avert the most extreme effects, strong action to address the causes of climate change is essential. The Nature Conservancy is calling for legislation and policies that include three paramount concepts:

- A strong cost-effective cap on emissions and a market-based program designed to stabilize atmospheric greenhouse gas concentrations at a level that ensures the well-being of human communities and ecosystems worldwide. As a member of the U.S. Climate Action Partnership, the Conservancy endorses the coalition's call for specific U.S. emissions reductions to achieve the goal of limiting global atmospheric greenhouse gas concentrations to a level that minimizes large-scale adverse climate change impacts to human populations and the natural environment.¹
- Reduction of emissions from forest and land-use practices through the incorporation of verified credits from these practices in a cap-and-trade program.
- Support for adaptation programs designed to help ecosystems and the human communities that rely on them to cope with the impacts of climate change.

The principles outlined here recognize that strong measures are needed now to reduce the sources of greenhouse gases that contribute to global climate change, but significant effort is also required to mitigate projected impacts. Uncertainties in future human responses and the persistence of previously emitted gases mean that even with reductions in greenhouse gas emissions, we will continue to feel the effects of climate change for decades to come. We can already see the effects of a changed climate, including increases in global average air and ocean temperatures, increased precipitation in some areas and more frequent and severe droughts in others, and an increase in the occurrence of intense weather events. These impacts are here today, and they are projected to continue and, in many cases, intensify in the future.

It is important for organizations, agencies and individuals to identify strategies and policies to help human communities and ecosystems adapt to a changing climate. We applaud the proactive approach embodied in S. 2156, the SECURE Water Act, that recognizes the need to better understand the impacts climate change will have on the management of our water resources and to prepare strategies now to adapt to these changes.

I. STREAMFLOW

Streamflow patterns rise and fall seasonally with changes in precipitation, evaporation and snowmelt. Flow increases during rainy seasons or as snow melts and declines with the higher temperatures of summer. Freshwater and estuarine plants and wildlife have evolved in concert with and are sustained by the natural variations in water flow that occur seasonally, annually and over the course of many

¹The US CAP's Call to Action states: "We recommend Congress establish a mandatory emission reduction pathway with specific targets that are: between 100–105% of today's levels within five years of rapid enactment; between 90–100% of today's levels within ten years of rapid enactment; between 70–90% of today's levels within fifteen years of rapid enactment. The short- and mid-term targets selected by Congress should be aimed at making it clear to the millions of actors in our economy and to other nations that we are committed to a pathway that will slow, stop and reverse the growth of U.S. emissions. Furthermore, Congress should specify an emission target zone aimed at reducing emissions by 60% to 80% from current levels by 2050." The Call to Action and more information on US CAP is available at www.us-cap.org.

years. Human alterations to natural flow patterns take a serious toll on the plants, animals, and freshwater ecosystems that depend on it. Environmental flows are the amount and timing of water flows required to maintain healthy freshwater ecosystems and their benefits to human communities. A well-managed water resource is allocated to people and to environmental flows according to the needs of both.

Climate Change Impacts

Global climate change will exacerbate the changes to natural streamflow patterns already caused by other human influences. The anticipated changes in climate are predicted to happen at an unprecedented rate, challenging any natural adaptation capacity and affecting entire ecosystems. Managing our natural ecosystems to persist during such rapid change will require fundamental changes in our traditional water management approaches. Specifically, water managers will need to fully consider not only the human needs like water supply, hydropower, and recreation that are served by removing water from rivers and lakes, but also the amount of water that must remain in these ecosystems to support wildlife and other human benefits.

Recommendation: Broaden the focus of adaptation strategies in Section 4 of the SECURE Water Act beyond threatened and endangered species and fish and wildlife habitats to protection of ecosystems and specifically the environmental flow needs of freshwater ecosystems.

Streamflow in regions across the United States will be affected by climate change in differing ways. Alaska anticipates and is already seeing some of the most profound changes, including increased flooding, especially in ecologically critical coastal wetlands; the thawing of permafrost, which will lead lakes and wetlands to drain in some areas; and earlier Spring peak flows that will cause northern freshwater fisheries, central to local diets, to suffer.² Pacific coastal and Rocky Mountain states expect earlier spring peak runoff, more winter flooding and less summer streamflow. Southwestern states are bracing for lower summer flows due to reduced groundwater recharge and for increased flash flooding. Midwestern states may expect more severe droughts and possible steep declines in summer streamflow. The Great Lakes are likely to recede due to reduced tributary streamflow. Northeastern states may contend with large reductions in streamflow and changes in the magnitude and timing of spring floods. Southeastern and Mid-Atlantic states may have lower base flows, larger peak flows and longer droughts. Every region anticipates higher water temperatures, which weaken the ability of freshwater plants and animals to tolerate the other changes in water conditions.³ And every region is faced with uncertainty regarding the magnitude and timing of climate change impacts.

Climate change impacts to streamflow will severely impair our ability to meet human water needs. Already, competition for limited water resources between irrigators, municipalities, industrial users and hydropower generators has ignited untold conflict in this country. Even water-rich eastern states are mired in “water wars” that we usually associate with the waterstrapped western region. Georgia, Alabama and Florida, for example, have involved no less than twelve federal agencies in attempting to resolve long-standing disputes over water allocation in the Apalachicola-Chattahoochee-Flint and Alabama-Coosa-Tallapoosa river basins. Climate-change induced reductions in water supplies during critical seasons will only exacerbate the competition for water nationwide.

It is critical that providing for these competing demands in the face of climate change does not come at the expense of our natural aquatic systems. The key to providing for all demands efficiently is flexibility to adapt in the face of uncertainty. Healthy natural ecosystems and watersupply systems that are flexible to respond to both short-and long-term changes in streamflow patterns have built-in resiliency to floods, droughts and rising temperatures. And resiliency secures water supplies both for direct human demands and for the healthy aquatic ecosystems that support them.

²Arctic Climate Impact Assessment, Impacts of a Warming Arctic, 2004.

³http://www.isse.ucar.edu/water_climate/html_map.html (Specific sources for each prediction are fully cited here.)

Recommendation: To ensure that the appropriate balance between healthy natural ecosystems and water supply is achieved, language should be added to the SECURE Water Act to clarify that adaptation strategies developed under The Climate Change Adaptation Program in Section 4 and the Water Management Improvement grants in Section 5 must seek to balance water supply and ecosystem needs while preventing further degradation of aquatic ecosystems.

Adaptation Strategies

Any adaptation strategies implemented at the federal, state or local level must balance human and ecosystem needs for water. Below we offer a number of management approaches that achieve this balance and increase our ability to provide for both humans and ecosystems in the wake of the impacts to streamflow described above.

COMPREHENSIVE WATER RESOURCE MANAGEMENT

Changes in climate and water availability will present new and complex challenges for water managers. Fortunately, proven approaches for comprehensively managing water resources for humans and nature already exist. But in the vast majority of the country, water managers still lack the basic knowledge of when and where water is physically and legally available in the basins they manage. Despite the availability of sophisticated water accounting tools and methods, very few are actually applied to real-world regional water management in the United States.

Texas leads the nation with its Water Availability Modeling (WAM) system. WAM, which was implemented in 1997 by the Texas Commission on Environmental Quality in collaboration with water users and managers, computes water availability and reliability at 13,000 stream sites within 20 watersheds covering 685,000 square kilometers. By systematically accounting for the cumulative effects of all natural and engineered controls on streamflow, including diversions, return flows and reservoir storage, WAM enables competing demands on each stream segment to be managed efficiently, taking into account both upstream and downstream flow requirements. Through WAM, the state incorporates environmental flow requirements into each new water permit, thus integrating ecological resiliency into statewide water management. Although the 5 state does not currently consider climate change in its permitting decisions, WAM is a flexible tool with the proven capability of modeling the impacts of climate change on water availability.⁴

The ability to manage water comprehensively over entire basins is fundamental to ensuring flexibility in the overall system and is particularly important in the wake of a changing climate. A key component of comprehensive management is increasing our understanding of water availability, which the SECURE Water Act will help to do by providing support for USGS' national streamflow information program, establishing new monitoring programs, and providing incentives to integrate and standardize water availability data. In addition to gathering the necessary data, it is important that all areas of the country adopt and implement comprehensive approaches to water accounting and management. Therefore, we would support more explicit incentives in this legislation to ensure adoption of comprehensive management approaches by states and localities.

Recommendation: The SECURE Water Act should provide incentives for implementation of comprehensive water accounting and management approaches by explicitly including comprehensive water assessments and management, which includes environmental flows, as a component of the climate change adaptation strategies under Section 4 and water management improvement grants authorized in Section 5.

DEMAND MANAGEMENT

Equally critical to adaptive, resilient water resource systems is to have water-demand management plans in place for times of drought. Even in water-scarce western states, innovative drought management has successfully averted ecological disaster without threatening senior water rights. The Big Hole basin in Montana is one such stirring example. After nearly a decade of chronic water shortages and ensuing conflicts, state and federal agencies, working together with local stakeholders, have implemented rules for voluntary cutbacks in irrigation diversions and sport fishing,

⁴Wurbs, Ralph A., Ranjan S. Muttiah, and Fabrice Felden. 2005. Incorporation of climate change in water availability modeling. *Journal of Hydrologic Engineering* 10 (5):375-385; Wurbs RA. 2005. Texas water availability modeling system. *Journal of Water Resources Planning and Management* 131(4):270-279.

triggered by measured drops in streamflow. Meanwhile, applied hydrologic research has targeted irrigation efficiency measures to specific stream reaches where they most benefit the rest of the basin. Finally, The Nature Conservancy and others are working to improve degraded stream habitat to enable water to move more freely downstream, helping to maintain cool temperatures and good water quality in the otherwise drought-stressed river.

Thus, after years of distrust and debate among ranchers and agencies over irrigation water use, compounded by the threat of federal listing of the imperiled Arctic Grayling fish as an endangered species, and water rights laws that discourage water conservation, the tables are starting to turn. Working together, the people in the Big Hole basin have shown that strategically reducing consumption during periods of drought and restoring stream habitat increases the resiliency of the river and of both the human livelihoods and native species that depend on it. As changes in climate increase the likelihood of drought conditions in parts of the country, states and localities should develop similar demand management plans that enable water users to reduce consumption during periods of drought. Federal funding and policy should support these efforts.

Recommendation: The SECURE Water Act should provide incentives for development of demand management plans that protect both human water supplies and ecosystem health by explicitly including demand management plans that incorporate environmental flow needs during droughts as a component of the climate change adaptation strategies under Section 4 and the water management improvement grants authorized in Section 5.

In addition to planning ahead for management during times of drought, it is important that we begin now to reduce our demand on increasingly scarce water resources by implementing proactive water conservation and efficiency practices. We appreciate the focus on water conservation and efficiency in both the development of adaptation strategies and water management improvement grants authorized in this legislation. However, it is often difficult to see a measurable impact from water conservation practices unless they are coordinated on a regional or watershed basis and measured to demonstrate the benefit to the resource. Such an approach should be incorporated into any funding distributed under this legislation for the purpose of reducing consumption or increasing efficiency.

Recommendation: Demand reduction and water efficiency practices funded through the SECURE Water Act should be delivered on a regional or watershed basis and involve measurement of the practices' impact in the delivery area.

SUSTAINABLE WATER STORAGE

Historically, society's response to floods and droughts has been to impound surface water in reservoirs and to release it as needed. However, a dearth of geologically suitable locations for new dams, a decrease in the reliability of water available to fill dams, and an increased awareness of their ecological consequences will hinder this response to future hydrologic extremes, even as their frequency and intensity increase. In many areas, an integrated solution can be achieved by managing ground water and surface water together. The legislation's creation of a National Groundwater Resources Monitoring program will provide key data useful for implementing conjunctive management of ground and surface water.

By naturally or artificially recharging excess runoff, depleted aquifers can be transformed into underground "reservoirs" to supplement the flood-and drought-buffering capacity of existing surface-water reservoirs. Existing infrastructure such as irrigation systems can be used to distribute water and recharge aquifers. In addition, wetland ecosystems play a very important role in naturally storing water. By slowing the flow of water, wetlands facilitate the percolation of water into aquifers that can later be used for water supply during dry periods. In light of the environmental consequences and costs of new dams and reservoirs, it is important that this legislation provide incentives for natural and non-structural approaches to water storage, such as artificial aquifer recharge and wetland restoration.

Recommendation: The SECURE Water Act should incorporate incentives for natural water storage such as conjunctive ground and surface water management, artificial aquifer recharge, and wetland restoration, while minimizing any focus on building new water storage infrastructure.

Another way to increase water storage without building new reservoirs is to increase the capacity of existing dams and manage the stored water in environmentally sensitive ways. One of the most promising ways to improve our use of existing reservoir storage is to reduce our reliance on dams to provide flood control.

Presently, a tremendous volume of potential storage space is left empty behind dams because that space is reserved to capture incoming floods and protect downstream structures and roads. If those downstream structures could be moved out of harm's way, and if natural floodplain areas could be restored for the purpose of storing floodwaters, the immense volume of usually-empty flood storage in our nation's reservoirs presently being reserved for flood control can be converted into storing water to supply cities and farms, generating hydro-electric power, and releasing improved environmental flows into downstream ecosystems. Moreover, floods that are allowed to return to their natural floodplains recharge underlying aquifers, which slowly release groundwater back to the river as cool, steady baseflows. Additionally, restoring natural floodplain areas will greatly benefit many plants and animals that have become endangered due to excessive floodplain development.

Through our work on the Yangtze River in China, we have developed a proposal—now under serious consideration by the central Chinese government—that calls for large-scale restoration of the Yangtze valley's floodplain and illustrates the potential benefits of using floodplains instead of dams for flood management. This proposal would enable the flood control volume planned for the new reservoirs on the Yangtze to be reduced substantially and would instead use the available reservoir volume to produce much more hydropower from the Yangtze dams. In fact, we estimate that as much as \$1 billion per year of additional revenue could be generated from increased electricity production on the Yangtze River, which in turn would be used to fund floodplain restoration and other non-structural forms of flood management. It will also enable the Chinese to produce badly-needed electricity in a relatively clean manner that does not exacerbate climate change.

We must integrate the role of healthy and functioning floodplains and wetlands into our flood management and not rely solely on dams and reservoirs to meet these needs, particularly as climate change makes the other purposes of these reservoirs even more important. A national assessment should be conducted to identify locations at which the operating purposes of flood control dams can be modified by shifting flood management to floodplains by removing or relocating roads and structures or by removing or setting back levees that constrain floodplain areas. Further, incentives are needed to both protect and restore wetlands and floodplains, as these valuable areas continue to be lost to urban development or agricultural expansion. By thinking about flood management and water storage in a more comprehensive manner and focusing funding, which may include revenues generated by additional hydropower production or water supply, toward floodplain restoration and flood mitigation below existing dams, aquatic ecosystems, energy customers and water users benefit.

Recommendation: The SECURE Water Act should provide incentives for restoring the natural flood storage capacities of floodplains and wetlands and encourage dam owners and operators to assess the potential for converting the available flood storage volume in the nation's reservoirs into storage for water supply, power generation, and environmental flow releases. To ensure the ability of natural systems to provide flood reduction benefits, the incentives in this legislation must be coupled with additional strong disincentives for new development in floodplains and wetland areas.

MODIFYING DAM OPERATIONS TO IMPROVE ENVIRONMENTAL FLOWS

While the construction and operation of dams and reservoirs has benefited the nation greatly by providing water supply, flood control, and electricity production, dams have also had serious impacts on the health of river ecosystems and are a leading cause of aquatic species endangerment, including many fish species that are of considerable economic value. The hydroelectric power assessment called for in Section 6 of the SECURE Water Act and the adaptation strategies to be developed under Section 4 present an excellent means for identifying ways to modify dam operations to improve downstream environmental flows that will benefit ecosystems made increasingly vulnerable by climate change.

The Army Corps of Engineers and Bureau of Reclamation have a critical role to play in maintaining adequate environmental flows. The operating procedures for the hundreds of dams that the Corps and Bureau own and operate seek to optimize inexpensive water, power and flood control, but have largely ignored environmental flow needs downstream of these facilities. The Sustainable Rivers Project, an innovative partnership between the Corps of Engineers and The Nature Conservancy, has already demonstrated at several sites that modest adjustments to existing dam operations can yield substantial improvements in ecosystem health by improving environmental flow releases from the dams, while only minimally affecting other dam

functions and keeping operational changes within the project's authorized purposes.⁵ Updating operating instructions by specifically incorporating flow releases that benefit the river ecosystem at the nearly two thousand dams under federal control could do a great deal to improve river health and increase resiliency to climate change. Following the example set working with the Corps on the Sustainable Rivers Project, we would support including an evaluation of environmental flow needs in the assessment of hydroelectric power dams required in Section 6 of the legislation.

Recommendation: The SECURE Water Act should include evaluation of environmental flow needs in response to climate change as a component of the hydroelectric power assessment to be conducted by the Secretary of Energy under Section 6 of the Act and the development of adaptation strategies under Section 4.

II. WATER TEMPERATURE

Climate Change Impacts

In addition to the effects discussed above, climate change will also cause a rise in water temperatures. Water temperature plays a crucial role in the health of river and stream ecosystems. The distribution of aquatic species and their growth and reproduction rates are determined, in large part, by water temperature. Stream temperatures are projected to rise 0.9° C for each 1° C rise in air temperature.⁶ In some places, water temperatures have already reached the lethal limits for some fish species. A recent analysis projects that thermally suitable habitat for 57 species of cool- and cold-water fish will decline by 50 percent in U.S. rivers if air temperatures rise by 4° C.⁷

Adaptation Strategies

As water temperatures rise, the survival of many aquatic species may depend on stream connectivity and their ability to migrate upstream or in a northerly direction to cooler waters. Access to suitable migration corridors is necessary for this movement to succeed.⁸ Across the nation, state agencies and private conservation groups are seeking to improve stream connectivity by actively removing old, unused dams that block fish migration. Allowing these fish to migrate to higher elevations and latitudes as temperatures increase may be the key to their surviving climate change. Similarly, road culverts that pose impediments to fish movements are being replaced with fish-friendly structures.

Recommendation: Water Management Improvement grants under Section 5 of the SECURE Water Act should include funding for activities to improve stream connectivity, which will enable the removal of unnecessary dams, replacement of inadequate road culverts with fish-friendly structures, and incorporation of improved drainage structures into new construction.

III. WATER QUALITY

Change Impacts Climate

Climate change will adversely affect water quality in some regions of the U.S. by altering water temperature, dissolved oxygen levels, salinity, and assimilative capacity for point and non-point source pollutants. There is an inverse relationship between water temperature and dissolved oxygen levels, which plays a critical role in the health of aquatic ecosystems. As water temperatures rise, dissolved oxygen levels will decrease. Pollution, in addition to temperature, also influences dissolved oxygen levels; when increased organic matter flows into water systems dissolved oxygen levels decrease as bacteria and other organisms consume oxygen while working to break down the organic matter.⁹ So, ecosystems currently under stress from pol-

⁵Postel S, Richter B. 2003. Rivers for Life: Managing Water for People and Nature. Washington, D.C.: Island Press, p. 92-102.

⁶Schindler, D.W. 1997. Widespread effects of climate warming on freshwater ecosystems in North America. Hydrol Proc.

⁷Poff, N. L., M. Brinson, and J. B. Day. 2002. Freshwater and coastal ecosystems and global climate change: a review of projected impacts for the United States. Pew Center on Global Climate Change, Arlington, VA.

⁸Poff, N. L., M. Brinson, and J. B. Day. 2002. Freshwater and coastal ecosystems and global climate change: a review of projected impacts for the United States. Pew Center on Global Climate Change, Arlington, VA.

⁹National Estuarine Research Reserve System, NOAA, www.nerrs.noaa.gov/Monitoring/WaterOxygen.html

lution levels will see increased stress as water temperatures rise from climate change.

As discussed earlier, some regions in the U.S. will see decreased streamflow due to changes in precipitation patterns caused by climate change. In some areas, decreased streamflow can lead to increased water salinity. One such example is Southern New Mexico. There the Rio Grande picks up water on its journey south from upwellings of salt concentrated spring waters. With less streamflow and runoff to dilute the water, the river will become more saline causing problems for water users in the area such as farmers who use the water for irrigation.¹⁰

Finally, with reduced streamflow, the assimilative capacity for point and non-point source pollutants is lowered. Using again the example of the Rio Grande watershed in New Mexico, Brian Hurd of New Mexico State University and Julie Coonrod of the University of New Mexico point out that with less water, in non-attainment reaches of the Rio Grande, lower total maximum daily loads (TMDLs) might be expected and this could raise control costs. Additionally, new reaches of the river may fall out of attainment causing higher pollution control costs.¹¹

Adaptation Strategies

Climate change will exacerbate existing water quality impairments. To respond it is important that we both continue and give renewed focus to current efforts to address these water quality issues. Further, many of the strategies described above to better manage water in the wake of climate change will help to mitigate the expected impacts to water quality.

IV. CLIMATE CHANGE ADAPTATION RESEARCH

All of the strategies outlined above will prove useful as water managers respond to climate change. However, we must continue to conduct research to better understand the climate impacts and necessary responses in specific places. Scientists at the Conservancy are actively monitoring climate change impacts around the world to better understand climate change and how wildlife and ecosystems may adapt. With a growing understanding of present and future scenarios, we will be better equipped to help water managers and the ecosystems affected by our management cope with warming, changes in precipitation and other impacts of climate change.

Over the course of the past 12 months, The Nature Conservancy in New Mexico has initiated a state-wide climate change vulnerability assessment and adaptive management program which we hope will serve as a blueprint for other states and regions. The primary goals of this program is to provide specific science-based information on the current and projected impacts of climate change on wildlife habitats, and to work with key land managers and conservation practitioners to collaboratively design and implement adaptive management strategies and actions.

The project currently includes three core components: (1) analysis of recent changes in climate, hydrology, and ecology and how these relate to priority conservation areas and target species (as identified in TNC's ecoregional analyses and the New Mexico Comprehensive Wildlife Conservation Strategy), (2) assessment of potential changes in the target species and ecosystem distribution under a suite of future climate change scenarios and projection of implications for the priority conservation areas, and (3) identification of adaptation strategies that managers can use to promote ecological resilience that will ultimately facilitate the conservation of biodiversity and associated ecosystem services.

Climate change will alter landscapes, rivers, streams and seascapes as we know them. It is important that we build our adaptation strategies on sound science and seek to ensure that approaches to address the consequences of a changing water supply balance the need to protect our aquatic ecosystems. Projects such as the Conservancy's climate adaptation program in New Mexico will help us analyze the impacts of climate change on plants, animals and natural communities and will help to create innovative conservation solutions that will enable humans and natural areas to cope with and adapt to what may be the unavoidable effects of climate change. Therefore, we recommend that the SECURE Water Act take a similar approach by using scientific input on climate adaptation in the development of the adaptation strategies and linking the implementation of adaptation activities to the science-based strategies being developed by the Department of Interior.

¹⁰Hurd, B., Coonrod, J., Climate Change and Its Implications for New Mexico's Water Resources and Economic Opportunities, July 2007.

¹¹ibid

Recommendation: The development of adaptation strategies in Section 4 of the SECURE Water Act should be based on scientific input regarding climate change impact to water supply and aquatic ecosystems. In addition, the Water Management Improvement grants in Section 5 should be linked to the science-based adaptation strategies developed in Section 4.

V. CONCLUSION

The impacts of climate change on freshwater systems will be profound. Water flows in rivers will be altered, incidents of flooding and droughts will increase, water temperature will rise, and water quality will be degraded. Failing to protect freshwater ecosystems from these changes will have tangible societal, cultural and economic consequences, putting great pressure on our water managers. Our response to climate change must recognize the role that healthy ecosystems can play in mitigating these impacts to both humans and natural communities. It is important that all of our policy and on-the-ground adaptation approaches recognize the need to maintain healthy and resilient ecosystems that preserve the ability to adapt in the face of climate change and continue to meet the needs of both humans and wildlife.

In order to enable aquatic ecosystems to provide for human and wildlife needs in the face of a changing climate we must:

- Design water-supply systems that are flexible to both short-and long-term changes in streamflow patterns including increased floods, droughts and rising temperatures. Specifically, states and localities should develop demand-management plans that enable water users to reduce consumption during periods of drought. Federal funding and policies should support these efforts.
- Adopt comprehensive basin-wide approaches to water accounting and management to preserve the flexibility of the water system to adapt to change—all water management plans should give due consideration to environmental flows needed to sustain healthy freshwater ecosystems. This includes acquisition and coordination of data on water availability that will be necessary to inform comprehensive management.
- Manage existing water infrastructure in a manner that both meets human needs for water and sustains healthy freshwater ecosystems. This includes providing appropriate environmental flow releases from dams.
- Restore floodplains and wetlands that can provide needed flood storage and help to recharge aquifers, while freeing up valuable storage space previously allocated to flood control. The reservoir volume made available by non-structural flood management downstream of dams can be used for improved water supply, electricity production, and environmental flow releases.
- Remove barriers that constrain the ability of fish and other aquatic organisms to move to cooler waters as the climate warms. Unnecessary dams and road culverts that block aquatic organisms from migrating should be removed or replaced.
- Invest in applied research on the impacts of climate change on specific ecosystems and link adaptation strategies to this research.

We believe the SECURE Water Act is an important first step in addressing many of the impacts climate change will have on our water resources. We look forward to working with the committee to incorporate the principles above into this legislation.

Thank you again for this opportunity to testify and to comment on this important legislation.

The CHAIRMAN. Thank you very much.

Dr. Wunsch, you're our final witness, go right ahead.

STATEMENT OF DAVID R. WUNSCH, PH.D., P.G., REPRESENTING NATIONAL GROUNDWATER ASSOCIATION, CONCORD, NH

Mr. WUNSCH. Thank you, Mr. Chairman. Thank you for the opportunity to testify today in support of Senate bill 2156, the SECURE Water Act.

My name is Dr. David Wunsch, and I'm representing the National Groundwater Association, which is an association of over 14,000 members that include drilling contractors, manufacturers, scientists, and engineers, many of whom are national leaders in the

groundwater industry. On behalf of the Association, I would like to applaud the committee's leadership in the legislative initiative directed toward improving the Nation's ability to manage and assess its water resources. This action is overdue.

Developing scientifically based strategies for developing sustainable groundwater resources is a key component in our ability to address the growing demands of an increasing population and the uncertainties of global climate change.

The Association concurs with the bill's statement, "States bear the primary responsibility and authority for managing water resources of the United States," but we also agree that the Federal Government should play a support role to the States, as well as regional, local, and tribal governments.

One overriding theme that we would like to express is that groundwater and quantity are inextricably linked when discussing water availability, because water must be of sufficient quality for designated or intended uses. Thus, all programs promoted in this bill should recognize that fact. National Groundwater supports the development of a climate adaptation program which can help resource managers respond to changes in the distribution of water resources.

While the bill requires an assessment of specific risks to the Nation's water supply, there's no mention of assessing changes in groundwater recharge or discharge, which we feel are equally important. For example, land-use changes that create impervious cover, such as parking lots, can critically alter the amount of recharge to aquifers, and adequate recharge is critical for maintaining sustainable groundwater supplies. The Association also strongly supports the inclusion of conjunctive use of groundwater and surface water, and also recommends examining groundwater storage and recovery as ways to integrate and enhance water availability.

Relative to the groundwater management section of the legislation, we would like to emphasize that groundwater will play an expanding and crucial role in the Nation's water resource portfolio, and we will need to improve management, planning, and policy tools to provide citizens with safe, reliable water supplies.

In terms of increasing available, NGWA recommends adding language under the section to include treating brackish or impaired groundwaters, which would expand limits on what is currently viewed as available. The Association supports the creation of a Climate Change and Water Intergovernmental Panel, but we suggest including the U.S. EPA, U.S. Fish and Wildlife Service, Bureau of Land Management, and the U.S. Forest Service, in addition to the members currently named.

Senate bill 2156 would establish a Water Data Enhancement and Water Use and Availability Assessment Program.

In regard to both of these proposed programs, the Association supported the formation of the Subcommittee on Groundwater under the auspices of the Federal Advisory Committee on Water Information. With approximately 60 members, this diverse body is working collaboratively to develop a nationwide framework for monitoring groundwater quality and quantity, and the Association recognizes the primary role the States play relative to water re-

sources management, and therefore, we encourage ongoing dialog regarding the Subcommittee on Groundwater to encourage the directives for Federal agencies, as outlined in this bill, and to complement the efforts of the subcommittee.

National Groundwater did have some concerns regarding the funding mechanisms for these funding programs, particularly concerns that some States may not be able to participate without Federal support. The Association has long supported increased Federal funding for cooperative groundwater quantity and quality data collection, and encourages the committee to consider the funding model that's provided through the National Cooperative Geological Mapping Program, which I know the Chairman is very familiar with. In the State map component of this program, Federal dollars are provided on a 50/50 matching basis for cooperative data collection, and encourages the States directing the data collection to meet the States' needs, while simultaneously providing data to the Federal Government for an integrated national mapping program. This may be a good model for creating a national monitoring program, as well.

We are concerned, however, that State funding shortfalls would keep many States from participating, and we suggest Federal Government provide a maximum of 100 percent of funding, or a minimum of 60 percent. Further, on funding questions it is not clear as to if grants under the Water Use Availability Assessment Program could be used by the States to support their groundwater monitoring networks or efforts, which include the actual data-gathering, with the idea of submitting and sharing this information with the U.S. Geological Survey.

NGWA is currently completing work on a groundwater monitoring survey with other cooperating associations, and preliminary results show that several States do not have statewide groundwater monitoring programs, or their programs may not be sufficient for compiling a national assessment of water availability without additional fiscal support.

In closing, the National Groundwater Association looks forward to working with this committee and the entire Senate to ensure passage of the SECURE Water Act. As always, our Association is available to serve as a resource for scientific information, as well as a conduit for further discussions related to the Nation's water resource issues.

[The prepared statement of Mr. Wunsch follows:]

PREPARED STATEMENT OF DAVID R. WUNSCH, PH.D., P.G., REPRESENTING NATIONAL GROUNDWATER ASSOCIATION, CONCORD, NH

Good afternoon. My name is David Wunsch and I am here to speak on behalf of the National Ground Water Association (NGWA). We appreciate the opportunity to provide the perspective of its members on the SECURE Water Act.

The National Ground Water Association is a not for profit professional society and trade association for the ground water industry. Our more than 14,500 members include some of the country's leading public and private sector ground water scientists, engineers, water well contractors, manufacturers and suppliers of ground water related products and services. The Association's vision is to be the leading community of ground water professionals that promotes the responsible development, use and management of ground water resources.

I would like to begin my testimony commending the Committee's leadership in the introduction and dialogue occurring here today on an issue of vital importance for the United States—improving our ability to assess and manage our nation's water

resources. NGWA has continuously encouraged lawmakers to consider the importance of assessing, protecting and developing long-term strategies for one of our most critical resources—ground water. Developing scientifically based strategies for sustainable use of our nation’s ground water resources is a key component in our ability to address the growing demands of an increasing population and to prepare for the potential adverse effects of climate change.

NGWA strongly supports the bill’s findings that adequate and safe supplies of water are fundamental to sustain the health, economy, security and ecology of the United States. We also support the bill’s goals of developing and implementing systematic data gathering programs. Implementing the SECURE Water Act will help ensure data are available to effectively manage our water supplies and maintain their chemical quality to support population growth, economic growth, irrigated agriculture, energy production and sustain ecosystems. NGWA also concurs with the bill’s statement “States bear the primary responsibility and authority for managing water resources of the United States” but “the federal government should support the states, as well as regional, local and tribal governments . . .”

One overriding theme that NGWA would like to present to the Committee for consideration is to ensure the bill promotes programs that recognize water quality and quantity are inextricably linked when discussing water availability. Water must be of sufficient quality for designated or intended uses. Knowledge of both quality and quantity are required for state and local water management and development and should be treated with equal importance particularly when this bill promotes building communication channels among various agencies and organizations. Promoting collaborations on quality and quantity would also ensure that data collection efforts could serve to develop water management strategies that not only work to protect our nation’s water resources, but also provide information as to what water is available, and for what use.

CLIMATE ADAPTATION PROGRAM

NGWA supports the bill’s inclusion of establishing a climate change adaptation program. Climate change has the potential to cause significant impacts on the distribution of the nation’s water resources, and subsequent water demand. Changes in local and regional temperature and precipitation patterns in the nation have been observed and well documented over the past century.^{1 2} Further climate change related modifications of temperature and precipitation patterns are expected to occur over the next century creating greater uncertainty in water supply reliability. In addition, changes in sea level in response to the changing climate may have profound impacts on state and national ecologic and water resource systems.

The bill requires an assessment of specific risks to the nation’s water supply including changes in snow pack, timing of runoff, reservoir evaporation rates, and any increase in the demand for water. However, there is no mention of assessing changes in ground water recharge and discharge, which are equally important. While other parts of the bill recognize ground water-surface water interactions, it is not reflected in this section. NGWA recommends adding that the assessment of changes in ground water recharge and discharge be specifically listed as an important component of an integrated water resources management framework for planning.

Ground water, the nation’s subsurface reservoir, will be relied on more in the future to help balance larger swings in precipitation and temperature, and to increase the water supply reliability in the more uncertain times caused by climate fluctuations. NGWA strongly supports the bill’s inclusion of conjunctive ground water and surface water storage as a viable strategy to mitigate water supply changes from climate change. There will be more emphasis on conjunctive use, which involves the coordinated and planned operation of both surface and ground water resources for conservation and optimal use.³ However, NGWA recommends the Committee also include examining enhanced ground water storage and availability as a potential strategy for mitigating water supply shortages, in addition to conjunctive ground water and surface water storage.

¹Preparing for a Changing Climate, the Potential Consequences of Climate Variability and Change, a Report of the California Regional Assessment Group for the US Global Change Research Program, June 2002.

²Progress on Incorporating Climate Change into Management of California’s Water Resources, Technical Memorandum Report, California Department of Water Resources, July 2006.

³Groundwater Hydrology, 3rd Edition, David K. Todd and Larry W. May, John Wiley & Sons, Inc. New Jersey, 2005.

WATER MANAGEMENT IMPROVEMENT

Ground water has and continues to play an expanding and pivotal role in national, state and regional water management planning. The expanding emphasis on the need and use of ground water resources will require improved management, planning and policy tools to provide citizens with safe, reliable water supplies. National leadership and cooperation with state and local governments are necessary to ensure these tools are made available to water professionals to develop strategies for long-term sustainable use of our ground water resources.

NGWA recommends adding language under this section to include treating brackish ground water or other impaired waters. Treating brackish ground water, utilizing gray water and remediated contaminated ground water, as well as, innovative uses of water impaired by either natural or manmade substances would expand the water supply from what is currently viewed as available.

CLIMATE CHANGE AND WATER INTRAGOVERNMENTAL PANEL

NGWA supports the creation of an intragovernmental panel to develop a comprehensive understanding of global climate change potential impacts on the water resources of the United States. In order to ensure the panel maximizes the resources of governmental experts and data collections, NGWA recommends including the U.S. EPA, the U.S. Fish and Wildlife Service, the Bureau of Land Management and U.S. Forest Service to the panel.

WATER DATA ENHANCEMENT PROGRAM AND WATER USE AVAILABILITY
ASSESSMENT PROGRAM

In recognition of the primary role states play, NGWA supported the formation of the Subcommittee on Ground Water (SOGW) under the auspices of the Federal Advisory Committee on Water Information, wherein the federal, state and private sectors could come together collaboratively to develop and encourage implementation of a nationwide framework for ground water quality and quantity monitoring. SOGW has grown and is continuing to grow. Currently, more than 60 individuals from around the country, representing a wide range of organizations as well as individual interests, have volunteered their time and energy in specific work group assignments. We appreciate the bill's incorporation of consultation with ACWI and believe the SOGW can help in achieving some of the legislation's aims set out in these sections. We encourage on-going dialogue regarding the SOGW to ensure the directives for federal agencies as outlined in S. 2156 complement the efforts of the SOGW. To that point, NGWA would recommend adding to the objectives for the National Groundwater Resources Monitoring Program the following "to provide information necessary for the planning, management and development of ground water supplies to meet current and future water needs and sustain ecosystems as necessary."

FUNDING FOR WATER DATA ENHANCEMENT/WATER USE AND AVAILABILITY
ASSESSMENT PROGRAM

NGWA did have some concerns regarding the funding mechanisms for the Water Data Enhancement and Water Use and Availability Assessment Programs. We have submitted questions for clarification to the Committee to determine if it intended that only federal agency personnel do the actual ground water monitoring data collection or can state agency staff or others do the work and provide the data to the federal agency if it proves more cost-efficient or for other reasons determined to be more beneficial. NGWA is also concerned states may not be able to participate without sufficient federal support.

NGWA has long supported increased federal funding for cooperative ground water quantity and quality data collection. A possible model to consider is the National Cooperative Geologic Mapping Program (NCGMP). This popular program includes a core federal program, FEDMAP, as well as two additional cooperative funding programs. Federal funding available to the states is provided to state geological surveys through the USGS STATEMAP program, which is the state component of the NCGMP. The STATEMAP program utilizes state staff knowledgeable in the local geology to maintain the data upon which much of the mapping is based. The states, not the federal government, also select the areas of the state that are in most need of mapping data. The program provides a comprehensive understanding of the geology at/near land surface, in which ground water is commonly a major consideration. However, limitations of the program are that it requires a 1:1 matching of state funds, which can prove to be a burden in some states. Thus we would encourage the Committee to allow states to have personnel actively involved and provide a

funding stream that will not prohibit states unable to provide cost-share from being involved (i.e. the federal government may at a maximum provide 100% of the funding and at a minimum provide 60%).

NGWA also requested clarification as to whether grant funds under the Water Use Availability Assessment Program could be used by the states to support their state ground water monitoring networks—the actual data gathering—with the idea of submitting the information to USGS. NGWA is currently completing work on a ground water monitoring survey with other cooperating associations. Preliminary results show several states do not have a statewide ground water monitoring level program and for other states, their programs may not currently be sufficient for the purposes of pulling and compiling a national assessment of water availability without increased fiscal support.

CONCLUDING REMARKS

NGWA again would like to express its appreciation of the Committee for the introduction and discussion of the SECURE Water Act. We commend your leadership for recognizing and addressing data, tools and communication channels that need to be supported and implemented in order for the United States to develop long-term water management strategies. The need for sound water policies and management is especially vital with current drought conditions and growing population. We look forward to working with this Committee and the entire Senate to ensure passage of the SECURE Water Act. The NGWA is, as always, available to this Committee to act as a resource for scientific data as well as a conduit for further discussions with our leading ground water scientists.

The CHAIRMAN. Thank you very much. Thank all of you for your excellent testimony. I know the time is late, and some of you have planes to catch.

Let me ask one question that may show my ignorance. To what extent are we actually seeing groundwater storage of water—purposeful groundwater storage, or recharge of groundwater, in the West? Let me ask John D'Antonio, first, if he has a perspective on that.

Mr. D'ANTONIO. Mr. Chairman, we are looking at aquifer storage and recovery in the State of New Mexico. Obviously, there are several States that are using it. It's very important to gain that extra storage space by using groundwater storage opportunities. Again, we get rid of the evaporative loss factor if we're able to do that. One of the things, again, that we need to know more, is the condition of that aquifer—essentially, quality and quantity of those aquifers—and to determine where their availability is to deposit water in, and making sure that the water quality issues are addressed. So, we're looking at those issues.

The CHAIRMAN. Is there a good scientific consensus as to the extent to which the evaporation problem is reduced by using groundwater aquifer storage as distinct from surface reservoir storage?

Mr. D'ANTONIO. Mr. Chairman, you completely get rid of the evaporative loss component if you can store the water underground. We use a significant amount of and lose a significant amount of water in New Mexico with respect to our evaporative losses.

The CHAIRMAN. OK.

Any of the others have a comment on this issue? Yes, Mr. O'Toole.

Mr. O'TOOLE. Yes, sir. I think it's—we call it a balanced suite of opportunities. In the Green River Basin—I know Wyoming did a study in the Upper Green River Basin about recharge, and the formations did not allow it. I think it's a case-by-case basis. Arizona clearly did it successfully in its relationship with California, earlier

in the last decade. So, I think some places, it's really worked. We, in our valley, used wetlands as a water storage——

The CHAIRMAN. As an alternative?

Mr. O'TOOLE.—alternative. Right.

The CHAIRMAN. Yes, Mr. Lambeck.

Mr. LAMBECK. At Metropolitan Water District, we have a number of agreements, both within California and outside of California, to store groundwater. Matter of fact, we've spent over \$400 million through 2006 to develop these efforts, and we have several hundreds of thousands of acre feet stored in aquifers——

The CHAIRMAN. This is water that's been reinjected into the aquifers, or is it just water that has been there naturally?

Mr. O'TOOLE. No, this is new water——

The CHAIRMAN. OK.

Mr. O'TOOLE.—going into the aquifers.

The CHAIRMAN. Very good.

Yes, Mr. Wunsch—Dr. Wunsch.

Mr. WUNSCH. My home State of New Hampshire, believe it or not, a State that would probably not be normally equated with having a dry, arid climate, does, indeed, have localized water problems in such that we have a artificial recharge plan being implemented right now by areas of our State for that same reason, to inject recharge——

The CHAIRMAN. OK.

Mr. WUNSCH [continuing]. During the high times of flow, after snowmelt in the springtime, to capitalize on that water.

The CHAIRMAN. Very good.

Again, thank you all for your testimony. Mike Connor, of course, has been the key person working on this legislation. I hope you'll continue to give us feedback on it as we try to finalize this and move ahead with it.

But, why don't we stop the hearing, at this point, so everybody can get on to whatever they have to do.

Thank you.

[Whereupon, at 4:25 p.m., the hearing was adjourned.]

APPENDIXES

APPENDIX I

Responses to Additional Questions

RESPONSE OF DAVID R. WUNSCH TO QUESTIONS FROM SENATOR BINGAMAN

Question 1a. Your testimony advocates evaluating “enhanced ground water storage and availability as a potential strategy for mitigating water supply shortages.” How widespread is the use of ground water storage in the United States right now?

Answer. In the face of the concern about the depletion of ground water reserves and the potential reduction in surface water flows that result, ground water storage projects are being implemented throughout the United States. These ground water storage projects may employ wells to pump water underground for storage and later recovery. Ground water supplies are also recharged through the use of spreading basins and other recycling and reuse programs (see Figure 1).^{* 1} These augmentation strategies are generally employed to prevent saltwater intrusion and land subsidence, maintain base flow in streams, and store excess water to sustain drinking water or other water supplies during periods of peak demand, or to address seasonal and drought cycles.

Currently we are not aware that a comprehensive data-base of current and planned ground water storage projects exists nationwide. Many of these projects are implemented by state and local jurisdictions. In 2004, Topper et al. reported that artificial recharge was being “used in at least 32 states in the U.S., and at least 26 countries worldwide.”²

U.S. EPA in a 1999 study reported that there were 1,185 documented aquifer recharge and aquifer storage and recovery wells in the United States but that the actual number of aquifer recharge and aquifer storage and recovery wells could be “greater than 1,695 but unlikely to be higher than 2,000.”³ As of 2005, there were approximately 72 aquifer storage recovery well fields in the United States, and an estimated 100 more in various stages of development (see Figure 2).^{*4} The well fields contain one or more aquifer storage and recovery wells.⁵

Suburban communities in the northwest and southwest are developing underground storage capacity to meet their growing water demands, rather than relying on agreements with larger cities possessing surface storage facilities.⁷ Even in the New England states, which are not normally thought of as having severe water shortages, aquifer storage and recovery programs are being developed and tested. Attachment 1 provides descriptions of some aquifer recharge projects that were discussed at a 2007 NGWA conference or that were provided as examples by the NGWA membership.

Question 1b. Do you think its use can be significantly expanded?

* Figures 1 and 2 have been retained in committee files.

¹ Graphic courtesy of Ralf Topper, Colorado Geological Survey. Artificial Recharge of Ground Water in Colorado—A Statewide Assessment, p.6.

² Topper, R et al. Artificial Recharge of Ground Water in Colorado—A Statewide Assessment. 2004, p. ii.

³ U.S. EPA. Class V UIC Study Fact Sheet. Aquifer Recharge Wells and Aquifer Storage and Recovery Wells. 1999.

⁴ Pyne, R. David G. Aquifer Storage Recovery—a Guide to Ground Water Recharge Through Wells, Second Edition., ASR Press, Gainesville, FL, 2005. p. 13

⁵ Pyne, R. David G. Where is ASR? Retrieved January 10, 2008 at <http://www.asrforum.com/where.html>

⁷ Committee on Sustainable Underground Storage of Recoverable Water, National Research Council. Prospects for Managed Underground Storage of Recoverable Water. Prepublication Copy, 2007. p. 18.

Answer. The capacity to store excess water in the subsurface is significant. However, ground water systems are complex and development of these augmentation strategies need to be based on sound science. Ground water storage can be significantly expanded; and as mentioned previously, many water providers are moving forward with plans to increase water supplies by developing local ground water storage programs.

While there is currently no comprehensive, nationwide assessment of ground water storage potential, there is some state specific information. In 2004, the Colorado Geological Survey published a statewide assessment that included an estimate of storage capacity in all of Colorado's major aquifers. They concluded that from a "regional perspective large storage capacities (greater than 100,000 acre feet) are available in both unconsolidated alluvial and consolidated bedrock aquifers." Additionally, they found opportunities for local, smaller aquifer storage projects are "tremendous, and potential source waters exist even in over-appropriated surface water drainages."⁸

Conservative estimates in California indicate the potential to increase average annual water deliveries throughout the state by 500,000 acre-feet with 9 million acre-feet of "new" ground water storage. New storage includes both re-operation of existing ground water storage and recharging water into de-watered aquifer space. More aggressive estimates from screening level studies indicate the potential to increase average annual water deliveries by 2 million acre-feet with about 20 million acre-feet of new storage.⁹

Question 1c. What are some of the obstacles and challenges to implementing a ground water storage system?

Answer. Increasing the availability and capacity of ground water use and storage to augment and sustain water supplies and ecosystem services is a complex challenge. With limited federal mandates for water supply planning, variability in data collection and evaluation techniques result on a state-by-state basis. The obstacles to widespread implementation of ground water supply augmentation are numerous and include a broad range of scientific, economic, legal, and institutional issues that will need to be addressed. They include:

HYDROGEOLOGIC SYSTEM CHARACTERIZATION

- The subsurface geologic and hydrogeologic systems are complex and as a consequence expensive to adequately characterize.
- The density and sufficiency of ground water level and ground water quality monitoring information to properly characterize the ground water storage receiving zone(s) is limited both spatially and temporally.
- There is insufficient geologic mapping identifying appropriate geologic, hydrologic, and hydrogeochemical characteristics of aquifer storage.
- Currently, the scale and density of data collected to characterize hydrogeologic systems may not be appropriate for evaluation and selection of sites, locally.
- The impact of global climate change on ground water reservoirs is only now being investigated.
- Surface and ground water interaction, in light of global climate change and land development practices, is not well understood.

WATER QUALITY CHARACTERIZATION AND INTERACTION

- Both ground water quality and the hydrogeochemical characteristics of aquifers and potential receiving zones will require additional assessment
- The potential interaction of the water injected or otherwise used to augment ground water supplies will need to be carefully studied. The mixing of often chemically and microbiologically different waters may lead to potentially harmful reactions with each other and with materials comprising the aquifer matrix

ECONOMICS AND FINANCE

- The cost to adequately characterize and evaluate aquifer systems is high
- The level of funding for characterization is variable from state to state and may not be adequate to assess risks of ground water recharge.
- Funding for basic research on the federal level is fragmented throughout several agencies with appropriately different missions.

⁸Topper, R. "Nature's Underground Reservoir: Aquifer Storage (abstract)". 21st Century Ground Water Systems Conference Abstracts. National Ground Water Association. October, 2006.

⁹California Water Plan Update 2005, California Department of Water Resources Bulletin 160-05, December 2005, Volume 2, Chapter 4.

- The price of water is typically undervalued and obtaining the capital funds for planning and constructing a ground water storage project is a challenge
- Capital funds for planning and constructing a ground water storage project must compete with funds and obligations for other more traditional water and wastewater treatment projects

LEGAL AND INSTITUTIONAL

- Water laws and ownership rights to the water stored in the subsurface are being debated in the courts.
- Allocation of water rights is markedly different in the eastern and western United States, along with the ability to transfer water and water rights.
- Subsurface aquifers may cross multiple political subdivisions/boundaries and their management may be subject to multiple jurisdictions.
- Institutional control questions may arise where multiple local agencies have responsibility for water and ground water. Cooperative agreements may be required to develop ground water storage projects in a region
- Regulatory issues are complex with overlapping federal and state laws and regulations. Water quality regulations are typically based on protection from pollution and not based on sustainability of water supplies or ecosystem services.
- Property rights issues for easements and right-of-ways to transfer water to be stored to appropriate injection well locations.

Question 1c. Can the Secure Water Act help address some of these obstacles and challenges?

Answer. The SECURE Water Act provides an opportunity to address some of the obstacles described above. Several programs contained in the SECURE Water will improve data collection and monitoring, which would benefit the expanded use of ground water storage and enhanced water storage recovery systems in the United States. NGWA supports providing grants and cooperative agreements to improve ground water data collection and management, which could also include the integration of these systems. Monitoring our nation's ground water in an integrated and comprehensive fashion would augment efforts towards monitoring and managing enhanced ground water storage programs, and establish suitable sites for their use. For example, it is important to monitor ground water to determine which regions of the country would be the most likely candidates for developing this management strategy. In addition, ground water monitoring is important in determining the volume of the aquifer that would be available for enhanced storage, and changes that would occur during storage and recovery cycles. From the water quality side, it is important to monitor ground water quality continuously because even high quality treated water can react with geologic materials in the aquifer and change the water chemistry while underground. There have been documented cases where elevated concentrations of unwanted natural chemicals, such as arsenic, have been detected in the recovered water.

It should be noted that successful aquifer storage and recovery programs are critically dependent on sound characterization of the geological formations that would host the ground water. This requires accurate and advanced geologic studies and mapping of aquifers. This task may be accomplished in part by Section 8 which establishes a Brackish Groundwater Assessment in the United States. However, NGWA would encourage the addition of language to enhance the programmatic advancement of detailed aquifer mapping across the nation.

Also, as noted in our testimony, NGWA is concerned about the language in the SECURE Water Act which requires the Secretary to prioritize states or local government entities to provide for a "substantial" share of the cost of operating a monitoring well network or other measuring devices. NGWA is concerned because regions in the country in most need, or those that are most geologically suited for hosting enhanced recovery systems, could miss out on opportunities because of a lack of state or local resources.

Question 1e. What are the tradeoffs of ground water storage versus surface water storage?

Answer. Storing surface water underground may seem counterintuitive to the public who cannot see the water and its impact on water availability. Some recharged water will not be recovered at all, although, the same is true of surface water stored in reservoirs. Storing water below the ground is slower than surface water storage, and you cannot capture storm flows as efficiently as with surface reservoirs, and extracting the water from the subsurface reservoir is slower being dependent upon the number of wells and pumping rates. There needs to be in place

sound ground water management practices for ground water storage to be a viable option.¹⁰

Advantages of ground water storage versus surface water storage include:

- Ground water storage systems are, by design, more secure and less vulnerable to accidental contamination, acts of sabotage, or terrorism
- Little, if any, water is lost through evaporation
- Usually, there are fewer and less significant environmental impacts associated with ground water storage projects. Impacts to threatened or endangered species are greatly minimized, if not avoided altogether.
- Dams and surface water flows associated with surface storage reservoirs can cause damage to riparian habitat and otherwise impact fish and wildlife.
- Ground water storage and recovery well systems allow for the continued use of overlying land and reduce or eliminate the potential for displacements of humans and wildlife. Acreage that would be consumed or covered by water within surface storage reservoirs remains available for other use and provides continuing economic and environmental benefits.
- While moderately expensive, it may be the least expensive option¹¹
- Over time, surface water reservoirs fill up with sediment, reducing overall storage capacity.

Question 2. What are some of the key water quality parameters that need to be measured? Would securing water quality information greatly add to the cost of monitoring aquifer water levels?

(Note: On behalf of NGWA, I am responding to this question as it relates to the establishment of a ground water monitoring network. If the question relates, instead, to water quality monitoring needed for aquifer storage projects, we will be happy to develop and provide a response to that question, as well.)

If very basic parameters, such as pH, temperature, and electrical conductivity, are included, testing costs will be relatively inexpensive. The electrical conductivity of ground water can be used as a proxy for estimating the amount of dissolved solids, or saltiness of the water. If the numbers and types of water quality parameters expand, costs would as well. Ground water quality data are needed to evaluate changes in ground water quality over time and to be able to assess what water is available for specific uses or purposes, such as domestic consumption, irrigation, livestock watering, or industrial use. Further discussion on the need for, and importance of collecting ground water quality (in addition to water level) data is contained within NGWA's Issue Paper titled "Ground Water Level and Quality Monitoring".¹²

The NGWA and some of its members played an important role in the formation of the federal Advisory Committee on Water Information's Subcommittee on Ground Water (SOGW) and continue to provide supporting roles. As noted in our earlier testimony, the SOGW includes more than 60 individuals representing a wide range of organizations (federal, state and private sector) as well as individual interests. Work groups associated with this effort have identified the importance of and need for ground water quality testing within a national ground water monitoring network. They are analyzing information on existing state ground water quality monitoring programs and also have an awareness of on-going federal efforts, such as the National Water Quality Assessment Program. While yet preliminary, an initial list of ground water quality analytes the group recommends as necessary to characterize general water quality includes calcium, magnesium, sodium, potassium, dissolved solids, chloride, sulfate, nitrate/nitrite, ammonia and orthophosphate. To this draft list, I would add alkalinity.

NGWA would be pleased to keep the Senator and Committee updated as the SOGW moves forward with its deliberations as to water quality testing parameters.

RESPONSES OF DAVID R. WUNSCH TO QUESTIONS FROM SENATOR DOMENICI

Question 1. Please describe successful models involving the coordinated and planned operation of both surface and ground water resources for conservation and optimal use.

¹⁰Hanak, Ellen. *Water for Growth: California's New Frontier*, Public Policy Institute of California, San Francisco, California. 2005.

¹¹Committee on Sustainable Underground Storage of Recoverable Water, National Research Council. "Prospects for Managed Underground Storage of Recoverable Water". Prepublication Copy, 2007. p. 215

¹²Ground Water Level and Quality Monitoring. National Ground Water Association. 2005.

Answer. The following highlight a few examples of the successful operation of both surface and ground water resources for conservation and optimal use. See Attachment 2 for additional examples.

ARIZONA

Arizona Water Bank: Ground water may be withdrawn from underground storage and used during dry periods. This will result in a short-term reduction in ground water levels. If this short term reduction is balanced in the long term with replenishment, ground water can be used much like an above-ground reservoir to store water for use when other sources are in short supply. The Arizona Water Bank is an example of this strategy. Nevada and California store excess Colorado River water underground in Arizona. During drought periods, Nevada and California divert surface water flow from the Colorado River while Arizona recovers the underground stored water for its uses.

CALIFORNIA

Orange County Water District: With a largely agriculture economy, including substantial orange groves siphoning more than 200,000 acre-feet of the ground water out of the Coastal Santa Ana basin annually, in the early of the 20th century ground water levels dropped more than 65 feet. The Orange County Water District (OCWD) was formed in 1933 by a special act of the California Legislature, and was empowered to protect the water supply and the rights of those who depended upon it, which at that time was 60,000 people with 86 percent agricultural water use. This type of institution is unique in California, with significant powers to manage, regulate, control, purchase, acquire, transport, exchange water and ground water within the basin. Over time, dams were constructed on the Santa Ana River, which limited the flow into the basin, and a growing practice of importation of large quantities of water to recharge the basin began to occur. Ground water extraction continued to outpace recharge and by the mid 1950's seawater intrusion was evidenced more than 3 miles inland. Today's OCWD covers well over 300 square miles, serves 20 cities and water agencies and a population in excess of 2 million. In the forebay area, managed aquifer recharge consisting of spreading basins along the Santa Ana River facilities receive a combination of treated wastewater, Santa Ana River water, and imported water, and these recharge facilities provide the majority of recharge to the ground water basin, recharging approximately 250,000 to 275,000 acre-feet per year. Seawater intrusion is mitigated by pumping a blend of recycled water and deep well water into a series of injection wells near the coast. The recycled water treatment train includes chemical clarification, re-carbonation, multimedia filtration, granular activated carbon, reverse osmosis, chlorination and blending.¹³

FLORIDA

Peace River/Manasota Regional Water Supply Authority: Operating as a regional partnership with its members—Charlotte, DeSoto, Manatee and Sarasota counties—the Authority works collectively to ensure adequate water supplies for an ever-growing population of more than 750,000 people in the region. The Authority supplies an average of 18 million gallons of water to its members. This water, skimmed from the Peace River, is treated at the main facility located on the Peace River in DeSoto County near Fort Ogden. This facility treats up to 24 million gallons per day and has been withdrawing water from the river since 1980. Treated water is then injected into an aquifer and recovered as needed. This ASR process is an ideal method for meeting seasonal water demands. This allows the Authority to withdraw water during “wet” months and then store for use during “dry” periods when river levels are low. A regional reservoir expansion, slated to be completed by 2010, will provide an additional 24 million gallons per day of treatment capacity. The Peace River, as are other surface water supplies, is susceptible to drought conditions. The addition of a ground water supply through the Authority itself or its members would add a significant degree of reliability to the public supply system.¹⁴

¹³Fox, Peter, editor. Management of Aquifer Recharge for Sustainability, Proceedings of the 6th International Symposium on Managed Aquifer Recharge of Ground Water, ISMAR6, Phoenix, Arizona, USA, October 28-November 2, 2007. Acacia Publishing Incorporated, Phoenix, Arizona.

¹⁴Personal communication. Jennifer Steadman Ryan, Sarasota County Water Resources. 2008.

San Antonio: San Antonio Water System's Twin Oaks Aquifer Storage and Recovery Facility (ASR) currently stores about 40,000 acre feet of potable water, which equals about 12 billion gallons of water. The ASR's technology and science has been successfully proven as an economical and environmentally sensitive alternative in helping to meet the city's future water needs, especially if faced with environmental change issues resulting in reductions in rainfall.

The ASR withdraws water from the Edwards Aquifer—a karst-based limestone aquifer—in wet weather when water is abundant, and stores it in the Carrizo sandstone-based aquifer south of the city. Since the water tends to stay in place in the sandstone of the Carrizo Aquifer, the transferred Edwards water remains in a “bubble” near the injection site.

The facility proved itself to the community in 2006 when the region experienced extreme drought. San Antonio Water System placed the ASR in recovery mode. San Antonio was in drought restrictions during much of that year, but retrieval of water from the ASR reduced the city's pumping from the Edwards Aquifer while providing much-needed water.

San Antonio Water System's Aquifer Storage and Recovery facility opened in 2004, and has the capacity to pump more than 30 million gallons per day. It features 16 wells, a high-service pump station and 30 miles of large-diameter transmission main to convey water to ground storage tanks. While there is currently about 40,000 acre feet of storage at the site, San Antonio Water System is expanding the ASR system and studying what the maximum potential of the facility may be.¹⁵

Question 2. Please describe the role of enhanced ground water storage and availability as referenced in your testimony?

Answer. The role of enhanced ground water storage is but one element of a balanced water management portfolio that will be needed to sustain our resources into the distant future. Continued investment in existing facilities and carefully planned new water developments will also be required to provide a strong foundation to meet future demands from continued growth. In addition to enhanced ground water storage, we must also promote actions such as sound ground water management, ground water protection and treatment, water conservation and recycling, and support innovative technologies such as desalination of seawater and brackish water to meet our future water needs.

Question 3. Please describe why several states do not have statewide ground water monitoring level programs. If it is a financial reason, please describe how money is allocated within State water resources agencies that do not currently monitor this data.

Considering all of the federal agencies that provide funding to the states for resource management and environmental protection programs, there is no unique program that specifically provides funding for creating or cost-sharing the development of statewide ground water monitoring networks. As a result, there is a significant amount of disparity between the states with respect to the number, distribution, and quality of wells used for monitoring ground water. For example, several states use available domestic water wells as the backbone of a monitoring network, or irrigation wells that become hybrid monitoring wells. However, these networks can have significant scientific and statistical shortcomings because the wells were not planned, designed, or installed with scientific collection of ground water information as their primary purpose. In these cases there are also usually local anthropogenic effects that can interfere with the ground water system being monitoring, which does not give an accurate sample of basic or ambient ground water conditions. Some states may have created networks from orphaned wells installed for a specific water management project, or from a specific permitting process.

For example, in my state of New Hampshire, the wells the state uses for monitoring the state's ground water were installed during a cooperative State/USGS study of the shallow, surficial aquifer that overlies about 13 percent of the state's area. However, these wells are biased with respect to the shallow ground water system, leaving the state with few wells installed in the important, deeper bedrock aquifer that is used throughout the entire state. States have recognized the importance of ground water to their overall water management strategies, and many states, including New Hampshire, have dedicated resources to installing more infrastructure to monitor ground water. However, in New Hampshire's case, the network is still inadequate for meeting the state's long-term needs. Other states, such as South Dakota, have successfully been able to build networks with funding from EPA

¹⁵ Personal communication. Anne Hayden. San Antonio Water Systems. 2008

programs. However, funding for programs such as Section 319 that provide funds for monitoring for promoting best management practices for non-point source pollution from agriculture may not be applicable in all states, or in regions within a state, depending on designated land uses.

Vermont has a small program with the U.S. Geological Survey under which the USGS monitors the ground water levels in less than 12 wells in the state. The program is not a comprehensive statewide ground water level monitoring program.

The state has a very active permitting system. In order to obtain a permit, a public community water supply system must demonstrate that they have access to a supply of water that would sustain their system in the face of a 180-day drought. The hydrogeologic study to prove the availability of an adequate water supply is done by the permit applicant or its consultants.

The reason that they do not have a statewide ground water level monitoring program is that the state does not have adequate funds for existing programs that are viewed as higher priority. State implementation of the Safe Drinking Water Act consumes approximately 99 percent of the available current funding. Additional funding would be beneficial for state SDWA oversight and to assist public water systems in meeting existing and upcoming regulations.

If there is targeted funding for a statewide ground water level program, implementing such a program may still prove problematic if the agency cannot overcome barriers to the hiring of additional state staff to oversee the monitoring. Currently, there is a hiring freeze for additional state employees. Existing state staff are stretched in administering and undertaking current agency priority program duties and obligations.¹⁶

Colorado has no statewide ground water level monitoring network. The state does have one or more regional (large, multi-county areas) ground water level monitoring networks.

The lack of a statewide network is largely a reflection of the state's geology. The Rocky Mountains cut through the mid-state area and are underlain by fractured bedrock aquifers. There is no ground water monitoring network in this area, given the difficulty in monitoring such aquifer settings and the lack of large-scale use of the ground water. The Rocky Mountains play a critical part in the water supply for Colorado and surrounding states, but in the form of a snow pack reservoir which converts gradually over the spring and summer into surface water runoff. The major aquifer systems in the state are the Denver Basin Aquifer, Ogallala Aquifer and the San Luis Basin. Ground water levels in these aquifers are monitored in the Ogallala and Denver Basin aquifers by the State of Colorado and the San Luis Valley aquifer is monitored by the USGS.

There are other regional bedrock aquifers in the state for which there is little or no monitoring. However, these aquifers tend to lie in areas of the state which are sparsely populated. If additional targeted money were provided for ground water monitoring, the greater need would be to augment the monitoring program in the Denver Basin aquifer in those areas which are currently being highly stressed before efforts were made to cover areas underlain by fractured bedrock in the mid-state area or the other regional bedrock aquifers.¹⁷

ATTACHMENT 1.—EXAMPLES OF AQUIFER STORAGE PROJECTS

EXCERPT FROM 2007 NGWA GROUND WATER SUMMIT AND PROVIDED BY NGWA MEMBERS

MAKING THE CONNECTION: JOINING THE RIO HONDO AND SAN GABRIEL RIVER SPREADING GROUNDS FOR MAXIMUM OPERATIONAL FLEXIBILITY

The Water Replenishment District of Southern California (WRD or the District) manages two of the most utilized ground water basins in Southern California, the Central and West Coast Ground water Basins (CWCB). The CWCB were adjudicated in the 1960s to limit ground water production and to stabilize declining ground water levels. Since that time, natural recharge has been supplemented through artificial replenishment activities, including injection at coastal seawater intrusion barriers and surface spreading at percolation basins ("spreading grounds"). WRD spends over \$20 million annually to purchase imported and recycled water for these artificial replenishment activities, owns and operates several replenishment-

¹⁶ Personal communication. Rodney Pingree. Vermont Agency of Natural Resources, Water Supply Division, Water Resources Section. 2008

¹⁷ Personal Communication. Michael Schaub. Office of State Engineer, Division of Water Resources. 2008

related facilities, and works closely with the owners and operators of other such facilities within the District.

The Los Angeles County Department of Public Works (LACDPW) owns and operates the majority of the replenishment facilities throughout Los Angeles County. Their Rio Hondo Coastal Basin Spreading Grounds (RHCBSG) and San Gabriel Coastal Basin Spreading Grounds (SGCBSG) are the primary locations for artificial replenishment in the CWCB. The RHCBSG are fed from the Rio Hondo, while the nearby SGCBSG are fed primarily from the parallel San Gabriel River. An average of 125,000 AF of water (consisting of imported, recycled and local water) is conserved between the RHCBSG and SGCBSG each year.

The RHCBSG and SGCBSG receive imported, recycled and local water from the same sources, but are not directly connected to each other. This has led to missed opportunities for ground water recharge, when one of the spreading grounds is available but the other is not.

WRD and LACDPW have worked closely together to identify and quantify these missed opportunities for ground water recharge, so that an appropriate connection may be designed and constructed between the RHCBSG and SGCBSG to allow water to be shifted between the two spreading grounds as needed, thus improving operational flexibility and increasing the total amount of water conserved each year.

Nancy Matsumoto, P.G., C.H.G., Water Replenishment District of Southern California
Kenneth A. Zimmer, P.E., Los Angeles County Department of Public Works

SUMMARY OF AQUIFER STORAGE AND RECOVERY PERFORMANCE IN THE UPPER FLORIDAN AQUIFER, SOUTHERN FLORIDA

Interest and activity in aquifer storage and recovery (ASR) in southern Florida has increased greatly during the past 10 to 15 years. The storage zone in ASR wells drilled at 29 of the 30 sites in the carbonate Floridan aquifer system is contained within the brackish to saline Upper Floridan aquifer. The strategy for use of ASR in southern Florida is to store excess freshwater that is available during the wet season in an aquifer and recover it during the dry season when needed to supplement water supplies. Each ASR cycle is defined by three periods: recharge, storage, and recovery.

The primary measure used to evaluate ASR site performance is the potable water per-cycle recovery efficiency. This measure, calculated for 18 sites, is defined as the percentage of the volume of freshwater recharged that is recovered prior to exceeding a recovered water chloride concentration of 250 mg/L. Cumulative potable recovery efficiencies also were calculated and display substantially less variability than per-cycle efficiencies.

Per-cycle potable water recovery efficiencies vary from 0 to 94 percent. High potable efficiency on a per cycle basis can be related to water banking—an operational approach in which a large volume of water is recharged during an initial cycle. This process flushes out the aquifer around the well and can build up a temporary buffer zone that increases recovery efficiency substantially during subsequent cycles conducted with much lower recharge volumes.

The relative performance for 15 of the 30 sites was determined by arbitrarily grouping performance into “low” (0-20 percent cumulative potable recovery efficiency), “medium” (20-40 percent) and “high” (>40 percent) categories; 3 sites were rated high, 6 were rated medium, and 6 were rated low. Although six sites have a high overall recharge rate that is associated with water banking, three of these are rated low.

Ronald S. Reese, Hydrologist, U. S. Geological Survey

COLORADO PURSUES MANAGED AQUIFER RECHARGE AS AN ALTERNATIVE FOR WATER STORAGE AT THE START OF THE 21ST CENTURY

For Colorado and much of the West the 21st Century began with one of the most severe droughts of record. This drought helped raise the awareness of the important role that ground water, and perhaps more importantly, the aquifers that hold ground water, can have in management of water resources in this rapidly growing semi-arid region. In 2003 the Colorado Geological Survey (CGS) embarked on a statewide assessment of managed aquifer recharge (MAR) that included an inventory of existing practices at the time and went on to evaluate the geological potential for water storage in aquifers and aquifer systems across the entire state. This assessment is a cornerstone for current, more detailed investigations into widespread utilization of this water storage option.

Subsequent to, and in part as a result of, this assessment several prospects for new managed aquifer recharge projects have arisen. These projects include a detailed evaluation of MAR potential in the Arkansas and South Platte River basins

and a pre-feasibility investigation identifying specific recharge sites in the Upper Black Squirrel Creek basin of El Paso County. MAR is also being introduced to the water community across the state through Colorado's Interbasin Compact Committee Roundtable process.

Although awareness of the potential for MAR throughout the state is increasing, many challenges remain. Acceptance by communities that are traditionally surface-water dependant will depend on locating the best convergences of favorable geology, source water availability, land availability, proximity to water demand, proximity to established infrastructure, and motivated funding sources.

Peter Barkmann, CPG, Colorado Geological Survey

PILOT STUDY TO DETERMINE THE FEASIBILITY OF ARTIFICIAL RECHARGE IN THE SAN BERNARDINO MOUNTAINS, SOUTHERN CALIFORNIA

The Big Bear Valley encompasses an area of approximately 70 square miles in the San Bernardino Mountains of southern California. Historically, local purveyors have met municipal water demand in this weekend recreation area using ground and surface water resources that are replenished from precipitation within the watershed. Imported water is not available to the area. However, artificial recharge of recycled water has been identified as a potential water source to augment the existing ground water supply.

In order to evaluate the feasibility of artificial recharge in the Big Bear Valley, a phased investigation program was developed for multiple potential sites. The program included field reconnaissance, borehole drilling and testing, monitoring well construction, and pilot testing. Key criteria for evaluating recharge feasibility included: horizontal and vertical extent of low permeability layers, infiltration rates of applied recharge water, aquifer characteristics which affect the storage and recovery of ground water, changes in the quality of recharge water in the vadose and saturated zones, and seepage rates and stored water residence time.

Pilot testing results show that recharge water introduced during pilot testing reached the ground water within a few days of introduction to the pilot spreading basin. Soil moisture instrumentation showed that, in some cases, percolating water reached deeper portions of the unsaturated zone first and ponded up into the more shallow sediments before saturating the entire soil column beneath the basin. A surface infiltration rate of approximately 3 ft per day was maintained throughout the test. Analysis of artificial recharge scenarios using a calibrated ground water flow model show that the recharged water can be stored in the aquifer system for more than 6 months before extraction, a major regulatory criteria for recycled water. In summary, the testing showed that artificial recharge is feasible in this mountain area.

Thomas E. Harder, P.G., CH.G., GEOSCIENCE Support Services Inc.

THE EFFECTS OF ARTIFICIAL RECHARGE ON NITRATE CONCENTRATIONS IN GROUND WATER IN THE UNSEWERED WARREN SUBBASIN, CALIFORNIA

In 1995, the Hi-Desert Water District (HDWD) implemented an artificial ground-water recharge program in the unsewered 19 mi² Warren subbasin in the Mojave Desert. Artificial recharge from imported water in spreading ponds in the eastern part of the subbasin increased ground-water levels by as much as 250 feet. As water levels rose, nitrate concentrations increased from 10 to more than 110 milligrams per liter (mg/L), due to the entrainment of septage. In 2006, HDWD constructed additional spreading ponds to recharge the western part of the subbasin. A ground-water management and monitoring plan was developed to maximize recharge and minimize increases in nitrate concentrations. Monitoring sites were installed at the recharge pond (YVUZ-1) and a nearby residential area with high septic-tank density (YVUZ-2). The sites contain heat-dissipation probes, suction-cup lysimeters, advanced tensiometers, and piezometers to monitor the artificial recharge.

Prior to artificial recharge, nitrate concentrations in pore-water samples collected from the unsaturated zone at YVUZ-1 and YVUZ-2 ranged from 10 to 66 mg/L and 10 to 2,100 mg/L, respectively. Data collected from YVUZ-2 indicate that septage has not migrated deeper than 130 feet below land surface (bls). Monitoring at YVUZ-1 indicates that artificial recharge reached the water table at 360 feet bls in 42 days, for an average velocity of 8.6 feet per day. A total of 1,685 acre-feet of imported water was recharged over five months, resulting in a water-level rise of less than 10 feet beneath the ponds and less than 5 feet beneath the residential area. Nitrate concentrations in samples collected from the unsaturated and saturated zones at YVUZ-1 decreased to less than 12 mg/L and increased to 18 mg/L, respectively, in response to the recharge. Continued monitoring will assist water managers

in making decisions that will help ensure that the water table remains lower than septage-related high-nitrate zones.

Rhett R. Everett, Hydrologist1, Tracy Nishikawa1, Peter Martin1 and Lee Pearl, General, Manager2, (1)U.S. Geological Survey, (2)Hi-Desert Water District

DIVERSE APPLICATIONS OF THE GROUND WATER RECHARGE TECHNOLOGY

Concerns from western communities include; the growth is straining the water system; the water treatment plant is undersized, but growth is not enough to fund additions; undersized transmission lines are incapable of moving water to locations of development or for peak day delivery; development is increasing runoff and flooding; or the wastewater treatment plant is at capacity with concerns of expansion and additional effluent discharge.

With the exodus of families from the overpopulated urban centers to our peaceful communities, we are finding strains placed on the infrastructure and resources. Communities will quickly find ways to maximize the efficiency of the existing treatment and delivery systems, though are lacking in the application of efficient source water management. Water companies work hardest to make peak day delivery. In all reality, this should be the easiest day of the year if the water resources are efficiently managed in the fall, winter, and spring seasons.

Placing potable water underground provides an alternative to surface tanks or large earthen reservoirs. The water is secure, does not require chlorination, and uses only the property required for the recharge/recovery wells. Using underground storage, water can be moved to location of demand when the pipelines are under low demand or water is available, recovering the water for peak delivery at location of need. Excess storm run-off water can be polished through simple, natural means, and placed into the underground aquifer. Placing water underground should become a common tool to all agencies to round out the management of our water resources during the off seasons. Recharge technology applications will be discussed from California, Nevada, Arizona, New Mexico, Utah, Colorado, Texas, Iowa, Wisconsin, Florida, North Carolina, New Jersey, New York, New Hampshire, and across the globe in Norway, Japan, China, Brazil, and Australia.

Tom Morris, ASR Systems LLC

OVERVIEW OF UNDERGROUND RECHARGE FACILITIES IN ARIZONA

In 1986, the Arizona Legislature established the Underground Water Storage and Recovery Program which is administered by the Arizona Department of Water Resources (ADWR). This program was designed to promote the underground storage and use of the State's renewable water supplies, such as effluent, surface water, and Colorado River-Central Arizona Project (CAP) water, instead of non-renewable ground water. In 1994, the Legislature enacted the Underground Water Storage, Savings, and Replenishment Act (UWS), which further expanded and defined ADWR's Recharge Program. There are two types of recharge facilities or Underground Storage Facilities (USF's) permitted by ADWR; managed and constructed. A managed facility is designed to utilize the natural channel of a stream to store water through the controlled release and subsequent infiltration of effluent or other renewable water supplies that are not part of the natural flow of the stream or river. A constructed facility is designed and constructed to store water underground by a variety of methods such as direct injection wells, ASR wells, vadose zone wells, trenches and/or basins. Both types of facilities can be permitted to recharge treated effluent, surface water and/or CAP water. Currently, there are six managed recharge facilities and 53 constructed recharge facilities permitted by ADWR across the State. The annual permitted recharge volumes for these USF's range from 150 acre-feet per annum (AFA) up to 200,000 AFA. Since the inception of the Recharge Program, ADWR has encountered unique and challenging technical issues associated with permitting various recharge facilities. This presentation will highlight these challenges and also present a virtual tour of Arizona's permitted USF's, showcasing the array of methodologies used at these facilities as well as their common and/or unique issues and achievements.

Drew Swieczkowski, Manager, Tracey Carpenter and Sharon Morris, Arizona Department of Water Resources

PLANNING, DEVELOPMENT, AND OPERATION OF LARGE AQUIFER STORAGE FACILITIES

The Salt River Project (SRP), the largest water purveyor of the Phoenix metropolitan area, operates two large ground water recharge facilities: the Granite Reef Underground Storage Project (GRUSP) and the New River-Agua Fria Underground Storage Project (NAUSP). The GRUSP has been in operation for twelve years and has stored nearly 1,000,000 acre-feet of water. It is the largest underground storage

facility in Arizona with a capacity in excess of 100,000 acre-feet per year. Water stored at GRUSP is from two sources: Colorado River water delivered by the Central Arizona Project Aqueduct (CAP water) and water from the Salt and Verde Rivers (SRP water). Recharge at GRUSP is by water-spreading in seven basins with a total surface area of 225 acres. The basins are constructed on the dry channel of the Salt River, three miles downstream of SRP's Granite Reef Dam. All water to be stored is delivered by gravity. Recharge rates range from three to seven feet per day. The site was selected because of its very favorable hydrogeologic characteristics. The vadose zone and aquifer underlying the facility are part of a thick alluvial fan composed mostly of unconsolidated coarse detritic sediments at the base of the Mc Dowell Mountains. The NAUSP is designed for a storage capacity of 75,000 acre-feet per year. It consists of six off-channel basins. Total infiltration surface is 180 acres. Recharge rates exceed 2.5 feet per day. The site was selected on an area of thick alluvial sediments that are part of the valley of the Agua Fria River and very favorable for recharge and underground water storage. The GRUSP and the NAUSP are an integral part of the large water resources management system of the SRP.

Mario Lluria, Salt River Project

PLANNING AND LIFE-CYCLE COST ANALYSIS OF AN AQUIFER STORAGE AND RECOVERY SYSTEM (WELL #299) IN THE NORTHEAST REGIONAL AQUIFER, CITY OF PHOENIX

Due to the disconnection and or abandonment of wells because of water quality issues and aging equipment, the City of Phoenix has the capability of currently meeting 10 to 15 percent of its peak day demand with ground water. A need to rebuild this well capacity for drought redundancy, operating flexibility, system emergencies, and managing surface water supplies has been identified. It is anticipated that ground water needs for operating flexibility and system emergencies are more compelling in the short term than demands to offset drought impacts. The City's objective is to manage aquifers to ensure the future availability of good quality ground water when needed, and to reduce the risks of land subsidence and other adverse environmental impacts. A life-cycle cost analysis and planning study was conducted for an Aquifer Storage and Recovery (ASR) well to assess whether this system is economically and technically feasible. Based on the life-cycle cost analysis for treated Central Arizona Project (CAP) water coupled with the operational management of our distribution and treatment system, the following findings were identified:

- Existing infrastructure and treatment system can be utilized for the ASR system;
- Additional land acquisition is not required;
- From a well clogging/operational perspective, utilizing injected treated CAP water will not be as problematic as other water sources (i.e., raw CAP and reclaimed water);
- Operational flexibility and redundancy is achieved during emergency and drought conditions; and
- Injection/recharge demands are easily assessable through the CAP water wheeling process.

Our future goal is to develop a network of ASR wells that will meet our long-term water resources needs and to implement a joint management/planning strategy with City of Scottsdale so that both Cities can manage and sustain ground water levels and our future water resource supplies within the northeast aquifer.

Gary M. Gin, R.G.1, Marshall Brown, P.E.2, Aimee Conroy, P.E.1 and Andy Terrey1, (1)City of Phoenix, (2)City of Scottsdale

PROPOSITION 13 GROUND WATER GRANTS AND LOANS PROGRAM SUMMARY, CALIFORNIA DEPARTMENT OF WATER RESOURCES

In California, under Proposition 13 the Safe Drinking Water, Clean Water, Watershed Protection and Flood Protection Act, between 2001 and 2004 a total of approximately \$206 million in grant and loan funds were awarded to 62 local projects whose total cost exceeded \$1 billion.⁽⁴⁾ These 62 projects when completed are estimated to increase ground water storage yield by 300,000 acre-feet per year. The California State Water Plan calls for increasing average annual water deliveries by between 1/2 million and 2 million acre-feet by the year 2030 by using between 9 million to 20 million acre-feet of new ground water storage.⁶

California Department of Water Resources, 2005.

ATTACHMENT 2.—ADDITIONAL EXAMPLES OF CONJUNCTIVE USE PROJECTS

PROVIDED BY NGWA MEMBERS

Metropolitan Water District—California: The Metropolitan Water District of Southern California is often cited for their aggressive program to expand and optimize their water supply. The Metropolitan Water District of Southern California, the primary wholesale provider of imported water for the southern California regions, has a portfolio of diversified supplies. They include water conservation, water recycling, desalination, Colorado River deliveries, state water project deliveries, water transfers, storage in ground water basins and surface reservoirs, and drought contingencies.

Kern County—California: Intensive agricultural beginning in the latter half of the 19th century and continuing throughout the 20th century with related ground-water development resulted in ground-water-level declines of more than 190 feet and land subsidence of as much as 9 feet in the early- to mid-1900s in the Kern County ground water basin. The Kern County ground water basin is situated in the southern end of the Central Valley of California, a 500 mile long valley which provides have the fruits, nuts of vegetables in the US, or about one-quarter of the nation's table food on only 1 percent of the country's farmland. Water banking was initiated in the subbasin in 1978, and seven projects with facilities including over 15 square miles of recharge basins and more than 120 recovery wells, now contain nearly 4 million acre-feet of banked water in dewatered aquifer storage space. Approximately two thirds of this storage is in the Kern River Fan area west of Bakersfield; the remainder is in the Arvin-Edison Water Storage District in the southeastern subbasin or in the Semitropic Water Storage District in the northwestern subbasin.⁸

Tampa Bay Water—Florida: This regional water supply authority consists of three surface water sources, one surface water treatment facility, 13 wellfields, and six ground water treatment facilities. It delivers approximately 182 million gallons per day of drinking water to customers. The desalination facility, which came online in December 2007, will provide an additional 24 million gallons per day and will be used to offset ground water supplies. The Tampa Bay area is in the Southern Water Use Caution Area of the Southwest Florida Water Management District and in an area where ground water levels have been severely impacted.

RESPONSES OF BRIAN RITCHER TO QUESTIONS FROM SENATOR BINGAMAN

Question 1. Your testimony contains a number of recommendations intended to ensure that environmental flows are incorporated into adaptation strategies and general water management goals. Currently, however, it seems that environmental flow targets are only incorporated into river management when endangered species are present.

Do you agree with this assessment, or do you think that water managers are striking a better balance in providing water for consumptive uses while addressing environmental needs outside the Endangered Species Act?

Answer. It is certainly true that environmental flow issues are given greatest attention when ESA-listed species are the driver. In fact, the environmental flow studies conducted in rivers such as the Colorado (Grand Canyon), Klamath, Trinity, Platte, Utah's Green, or Sacramento related to endangered species recovery have considerably advanced the science of environmental flow assessment, largely because of the considerable funding resources and expertise that have been committed to these efforts.

The re-balancing of water uses and changes in dam operations required to restore adequate flow conditions in these rivers is also spurring innovation in water engineering and policy, enabling precious-scarce water supplies to serve multiple purposes including endangered species protection. In a partnership with the Army Corps of Engineers (called the "Sustainable Rivers Project"), The Nature Conservancy is helping to demonstrate that important ecological, social, and economic benefits can be realized in rivers such as the Willamette in Oregon, the Bill Williams in Arizona, or the Savannah in Georgia by restoring environmental flows through modified dam operations, even when endangered species are not involved. More information can be found at: <http://www.nature.org/success/dams.html>

Many states have adopted environmental flow policies and apply these policies when issuing water rights or permits, and sometimes in authorizing new reservoirs. Some states, such as Florida, Maine, and Arizona, have been able to determine environmental flow needs for many rivers within their jurisdictions, and are actively protecting environmental flows through their water supply planning and manage-

ment efforts. However, the protection afforded environmental flows suffers from one or more shortcomings in every single state.

These shortcomings include: (1) Environmental flow needs have been determined for some but not all rivers, leaving the natural, cultural, and economic values of the majority of rivers in every state in considerable jeopardy; (2) The scientific methods being used to determine environmental flow needs are, with few exceptions, grossly outdated and lagging behind the progress made in scientific knowledge by decades; and (3) Environmental flow requirements are usually specified only for the largest water allocations and are generally not applied to dam operations, particularly federal dams, which have pervasive and severe impacts on environmental flows.

Healthy rivers are essential to the economic vitality, quality of life, and cultural identity in every state, and there is nothing more important to the health of our rivers than the protection of adequate environmental flows. The scientific community has recently developed methods that could enable state governments to determine the environmental flow needs of every river and stream in their state in a highly cost-effective manner.¹ By determining environmental flow needs for all rivers and using this information in water planning and allocation, the states can substantially avoid the “train wrecks” that have arisen in river basins where species have become endangered because of lack of attention to environmental flow needs, or where river flow depletions are causing severe water quality problems and economic consequences.

The SECURE Water Act can facilitate the application of scientific methods and data needed to define environmental flow needs for all rivers and streams in each state by providing funding support for this work.

Question 2. You mention that existing reservoir space could be made available and no longer reserved for flood control purposes if the floodplain below the reservoir could be restored, including the removal of existing structures.

Are there some examples you can cite to in the United States where this has been done or where it might be possible?

Answer. In our committee testimony, we referred to the example of our work in the Yangtze River basin in China. Early results from our feasibility assessment suggest that rather than depending heavily on new dams to provide flood control, it would be far preferable to manage flood risk by utilizing the Yangtze’s floodplain to maximum advantage. By doing so, we can create the opportunity to maintain adequate environmental flows in the middle reaches of the river and enable the managers of new dams being built on the Yangtze to use the new dams to generate much more hydropower.

We do not know of any similar analyses in the United States. Until now, there has not been sufficient motivation to give this idea the attention it deserves. It is difficult to justify the considerable expense associated with restoring natural floodplains solely on the basis of endangered species or biodiversity. However, a number of emerging factors suggest that it is time to give this idea serious consideration: (1) One of the most certain predictions about climate change is that floods will become more frequent and severe, and improved floodplain management can minimize increasing flood risks; (2) Economic losses and deaths associated with flooding are already rising in the U.S. due to continuing encroachment of human populations and infrastructure into floodplains, a false sense of security that dams can protect us from large floods, and possible changes in flood frequency associated with climate change; (3) The economic value of “ecosystem services” such as the provision of natural flood storage in floodplains, purification of water supplies by floodplain wetlands, recreation and tourism opportunities, and commercial fisheries strongly justify investigating this idea; and (4) The list of aquatic species endangered by flow alteration, including alteration of natural flooding patterns by flood control dams, is growing longer every year.

The potential benefits of implementing this idea are huge, and the number of possible places in the US to implement it is great. The most obvious candidates for these changes in reservoir operations would be dams that are presently being operated for flood control and other purposes already. According to the National Inventory of Dams, there are 640 dams in the US being operated for flood control and water supply; more than 400 being operated for both flood control and hydropower. If the flood control needs of these dams were to be lessened, specifically by enabling higher levels of flood releases from the dams by moving downstream structures out of harm’s way and appropriately compensating landowners whose existing uses of floodplain lands may be temporarily and occasionally impacted by higher floodwaters, the reservoir space presently allocated to flood control could be reduced. The

¹ See attached fact sheet describing the “Ecological Limits of Hydrologic Alteration” (ELOHA) framework, now being implemented in a number of states.

freed-up space in these reservoirs could then be re-allocated to other purposes, including water supply storage, hydropower generation, and restoration of environmental flows.

We can illustrate the potential benefits of re-allocating reservoir space in a flood control with the example of Lake o' the Pines in Texas, owned and managed by the Army Corps of Engineers. The ecological health of Big Cypress Creek and Caddo Lake (the state's only natural lake) located downstream of Lake o' the Pines have suffered greatly since the reservoir was built in 1959, primarily because the river's floods have been reduced from an annual average of 6,000 cubic feet per second (cfs) to a maximum of 3,000 cfs. By enabling higher flood releases from the dam, the ecological health of the river and lake can be restored. Just as importantly, some of the flood control storage space in the reservoir could be made available for additional water supply storage in this water-short region. In fact, approximately 28,000 acre-feet of water supply could become available for every additional vertical foot of storage freed up in the reservoir (presently, 21 feet of flood control storage is reserved in the reservoir). Each foot of freed-up flood control space would store enough water to supply a population of 17,000 people each year. Alternatively, this additional water supply could be held in reserve, for use during the more-frequent droughts expected under climate change.

Another way to illustrate potential benefits of using floodplains to store and convey floods is to review what has taken place in the Sacramento valley, where a floodplain stores much of the floodwaters that enter the valley. This floodplain, called the Yolo Bypass, serves as an effective substitute for an immense amount of reservoir flood storage. During major floods, such as in 1986, the Yolo Bypass safely conveyed approximately 2.4 million acre-feet of water through the valley during a four-day period. It would be prohibitively expensive to provide that amount of storage in upstream reservoirs. The Yolo Bypass provides important habitat for native fish and waterfowl, recreational opportunities, and 2/3 of its area is in productive agriculture.

While the above illustrations and examples give some sense of the potential benefits of this idea, the feasibility of implementation will require rigorous engineering evaluation in each case. The SECURE Water Act could provide funding support for such feasibility evaluations.

ATTACHMENT.—ECOLOGICAL LIMITS OF HYDROLOGIC ALTERATION

INTEGRATING ENVIRONMENTAL FLOWS WITH REGIONAL WATER MANAGEMENT

Worldwide, water conflicts are escalating as cities, industries, agriculture, and energy producers compete for limited supplies. At the same time, there is a growing awareness of the need to dedicate some portion of natural streamflow to sustaining the health and productivity of lakes, rivers, and aquifers that benefit communities and economies. To provide for growing human populations while protecting and restoring natural ecosystems, governments need efficient, integrated water resource management systems.

The integration of ecosystem considerations into water plans has been hampered by the difficulty, cost, and time required for determining environmental flows - the amount and timing of water flows required to maintain the species, functions, and resilience of freshwater ecosystems and the livelihoods of communities that depend on them. When environmental flows are determined, water managers know how much of the remaining flow is available for human uses, and how much alteration of natural water flow patterns by humans is too much. Thus, the specification of environmental flows is a key to sustainable water management.

Despite the existence of more than 200 methods for specifying environmental flows, until now none was suitable for application to the broad regional scales at which state, provincial, and national governments manage water resources. Simple 'rules of thumb' lack scientific credibility, while complex, data-intensive methods are too expensive and time-consuming to apply to every river and stream in a jurisdiction.

The Ecological Limits of Hydrologic Alteration (ELOHA) framework provides a timely and scientifically credible means for broadly assessing environmental flow needs when in-depth studies cannot be performed for all rivers. By linking changes in river flows to changes in ecological conditions, water managers and stakeholders can develop regional environmental flow targets and apply them to all rivers in a region without requiring detailed site-specific hydrologic or biological information for each river. The Nature Conservancy, working with leading international scientists, developed ELOHA specifically to accelerate the integration of environmental flow management into regional water resource planning. ELOHA builds upon the wealth

of knowledge about natural flow variability gained from riverspecific studies and applies that knowledge to geographic areas as large as a state, province, nation, or large river basin. Compared to river-by-river approaches, ELOHA is rapid, flexible, costeffective, and practical to implement.

ELOHA synthesizes existing hydrologic and biological databases from many rivers within a region to generate flow alteration-ecological response relationships for different types of rivers. These flow-ecology relationships correlate ecological condition, which cannot be managed directly, to streamflow conditions, which can be managed through water-use policies. In this way, ELOHA helps water managers comprehensively integrate human and ecosystem water needs throughout their jurisdictions.

THE SCIENTIFIC PROCESS: DEVELOPING FLOW ALTERATION-ECOLOGICAL RESPONSE RELATIONSHIPS

Step 1. Build a hydrologic foundation, a regional database of daily or monthly streamflow hydrographs representing both baseline (undeveloped) and developed conditions for “analysis nodes” throughout the region, for a selected time period long enough to represent past climate variability. (Once built, this foundation also could be used to assess and manage the impacts of future climate variability). Analysis nodes include sites where water managers may want to make allocation or other water management decisions, as well as sites where biological data have been collected. Hydrologic modeling is used to extend the periods of streamflow data for gauged analysis nodes and to synthesize data for ungauged analysis nodes as needed. Alternatively, if a hydrologic model or decision support system for water management already exists, then ELOHA can fully integrate with the existing system.

COMPUTING FLOW STATISTICS AND HYDROLOGIC ALTERATION

Hundreds of flow statistics that are already being used in hydro-ecological research and environmental flow assessments may also be used in ELOHA. Among these are the 34 “Environmental Flow Components,” or EFCs, introduced by The Nature Conservancy to describe the magnitude, duration, frequency, timing, and rate of change of pulses, large and small floods, and low and extreme low flows. EFCs are well suited for ELOHA because they strongly link between environmental flow assessment and implementation, and they have clear ecological relevance. Because EFCs are intuitive to hydrologists, ecologists, and water managers alike, they greatly facilitate communication and understanding between the disciplines. The Nature Conservancy’s Indicators of Hydrologic Alteration (IHA) software (free download at nature.org/freshwaters) calculates hydrologic statistics, including EFCs, and also measures the degree of hydrologic alteration between baseline and developed conditions. ELOHA uses statistical methods to select a small, manageable subset of non-redundant flow variables for analysis of hydrologic alteration.

Step 2. Classify river segments based on similarity of flow regimes, using hydrologic statistics computed from the baseline flow series developed in Step 1. Subclassify according to geomorphology. The number of river types in a region ranges from one to as many as ten, depending on the region’s inherent heterogeneity.

Step 3. Compute hydrologic alteration for each analysis node, expressed as the percentage deviation of developed-condition flows from baseline conditions at each analysis node, using six to ten flow variables that are strongly linked to ecological conditions and are amenable for use as water management targets.

Step 4. Develop flow alteration-ecological response relationships by associating percentages of hydrologic alteration with associated changes in ecological condition. A family of curves is developed for each river type, using a variety of flow and ecology variables. Ecological data used to develop the flow-ecology relationships - for example, aquatic invertebrate species richness, riparian vegetation recruitment, or larval fish abundance - ideally are sensitive to existing or proposed flow alterations, can be validated with monitoring data, and are valued by society. All stakeholders need to understand the development and application of these flow-ecology relationships.

THE SOCIAL PROCESS: USING FLOW ALTERATION-ECOLOGICAL RESPONSE RELATIONSHIPS TO MANAGE ENVIRONMENTAL FLOWS

Step 1. Determine acceptable ecological conditions for each river segment or river type, according to societal values. The goal of ELOHA is not to maintain pristine conditions in all rivers; rather, it is to understand and manage the tradeoffs between flow alteration and ecological degradation. Stakeholders might, for instance, decide that the goal for a particular “working” river is to achieve fair, not excellent, ecological condition. A gradational approach like this lends flexibility to governments overseeing variable levels of water development within their jurisdictions.

Step 2. Develop environmental flow targets for each river segment or river type by using flow-ecology relationship to associate the desired ecological condition with the corresponding degree of flow alteration. The allowable degree of flow alteration is the environmental flow target. The development of regional environmental flow targets is an on-going, iterative process in which additional data collection, monitoring, testing and evaluation, and evolving social values continually refine the targets and the flowecology relationships upon which they are based.

Step 3. Implement environmental flow management by incorporating environmental flow targets into the hydrologic model developed in Step 1 of the Scientific Process. Because that model accounts for the cumulative effects of all water uses, it can be used to assess the practical limitations to, and opportunities for, implementing environmental flow targets at any analysis node in the project area, or for every node simultaneously. It can be used, for example, to prioritize restoration projects, optimize water supply efficiency, or account for cumulative upstream and downstream impacts in permitting decisions. For basins in which water is already over-allocated, it can help target flow restoration options such as dam reoperation, conjunctive management of ground water and surface water, drought management planning, demand management (conservation), and water transactions (leasing, trading, purchasing, banking) transactions (leasing, trading, purchasing, banking) mediated by water trusts and markets.

The hydrologic model used to build the hydrologic foundation is, in essence, a comprehensive regional water management tool into which environmental flow targets are integrated. Thus, ELOHA's hydrologic foundation anchors decisions about future water allocation and river management to a comprehensive understanding of the availability, location, and timing of the flows needed to maintain or restore the overall health of a region's river ecosystems.

WHO DOES ELOHA?

Because environmental flows sustain ecosystems critical to human livelihoods, successful implementation of ELOHA necessarily involves many people, from scientists to water managers to citizen stakeholders.

Engaging an interdisciplinary team of hydrologists, hydrogeologists, aquatic entomologists, geomorphologists, water quality and hydraulics specialists, fish biologists, and riparian vegetation ecologists from government agencies and universities broadens and strengthens the scientific products.

Both funding and expertise can come from a variety of sources. In the United States, for example, The Nature Conservancy has cost-shared with state governments and the federal government to have U.S. Geological Survey scientists lead the scientific process. The Conservancy coordinates the overall process, and the state government adopts and implements the results.

CONCLUSION

ELOHA is a robust regional environmental flow framework grounded in scientifically-defined flowecology linkages that are subject to empirical testing and validation. It is applicable worldwide across a spectrum of social, political and governance contexts, and is useful regardless of the stage of water resource development and historical status of environmental flow protection. It also is applicable across an array of flow alteration, from modified land use, to water diversions, to river regulation by dams. And, notably, it is applicable across a wide range of available data and scientific capacity.

While ELOHA is a necessary new advance in environmental flow determination, it does not supplant river-specific approaches for certain rivers that require more in-depth analysis where political or economic issues are of such magnitude that only a river-specific treatment will suffice. But at a time when population increase, land-use change, economic development, and climate change are amplifying demands for sound science to inform decision making, ELOHA fills an urgent need to jump start the comprehensive management of streamflow for people and for nature.

RESPONSES OF PATRICK O'TOOLE TO QUESTIONS FROM SENATOR BINGAMAN

Question 1a. Your testimony recommends a comprehensive quantification of climate change induced streamflow reductions to help plan for developing supplies necessary to replace the loss of those flows.

Do you believe that the data is currently available to perform this analysis or do we still need to develop that database before proceeding?

Answer. The answer to this question is both “yes” and “no”. In some parts of the West, we may have enough data, in others, not enough. We need to focus the research that is out there to deal with a comprehensive quantification of climate change induced streamflow reductions. Sometimes, the desire for more research and more data stifles actual progress required to reach solutions.

In the big picture, we understand that prehistoric climate and hydrology research, such as Greenland ice studies and tree-ring analysis, indicates that the climate in North America has been the most stable from 1850 to the present. This type of research suggest that we will likely see much more volatile climate conditions and longer drought periods at some point in the future, similar to what occurred centuries ago.

With that said, we have enormous amounts of data that tell the story of recent climate conditions. However, even with all the data we have today—we will ultimately only know the real facts regarding climate change-induced prolonged drought “after the fact”. We will not have the right data until decades from now when we have actually experienced such a drought. Often times, you only know you are in a problem situation once you are three years into the drought.

Focused research must lay out a range of expected scenarios that prudent water managers should use in their planning.

An initial priority research item should be a comprehensive validation of West-wide changes in climate change-driven streamflow. We offer the following recommendations that might be used to guide a comprehensive quantification of watershed yield in the Western United States:

- Catalog the research and data collection that has already been completed, on a watershed-by-watershed basis;
- As these studies are assessed and compiled, the margin of error associated with different climate change models and data sets must be acknowledged so that realistic plans lead to real political solutions for Western watersheds.
- A range of predicted watershed yield values should be developed for each watershed, reflecting the variability and uncertainty associated with climate change models.
- Consideration of legal and political influences should also be assessed. For example, in North Dakota and other states, pending Native American water rights settlements create tremendous uncertainty regarding potential impacts to water supply on sources like the Upper Missouri River. Understanding these ramifications is critical for water managers and decision-makers. Similarly, we believe it is important for policy makers to understand the often significant differences that exist between what natural stream flows are what regulatory agency-driven biological assessments and opinions call for. We need to recognize that a changed hydrology could change the resultant biology which in turn may lead to a change of biological / hydrological expectations that are more realistic.
- Quantify the amount of additional above-and below-ground reservoir storage, conservation targets, and other actions that would be required to address anticipated hydrologic changes. To optimize water management for beneficial use, researchers should look at scenarios where storage is spaced through the drainage. Potential storage sites should be located at high and low elevations to regulate and subsequently re-regulate the water supply to maximize beneficial use. We believe a study of this type would quickly illustrate to policy makers the need to start modernizing our water infrastructure.
- Data collection and research on climate change must be properly peer-reviewed. Climate change research and data collection must be guided by neutral, peer-reviewed processes and diligence will be required to minimize political manipulation of these efforts. Agricultural water users and their communities need to be confident climate research will be used to develop the best solutions, not simply the most expedient solutions, which always seem to focus on transferring agricultural water to urban and environmental uses without regard for the long-term consequences.

Question 1b. Can you provide some specific examples of the water supply enhancement projects that the Family Farm Alliance has looked at to make up for streamflow losses?

Answer. The Board of Directors of the Family Farm Alliance in 2005 launched a project that pulled together a master data base of potential water supply enhancement projects from throughout the West. Our goal was to gather together ideas from around the West and put them into one master data base.

The types of projects contained in the resulting Western Water Supply Enhancement Study database are not monstrous dams like China’s Three Gorges project. Instead, they are supply enhancement projects that range from canal lining and pip-

ing, to reconstruction of existing dams, to integrated resource management plans. There are also some very feasible new surface storage projects. The benefits from these projects include providing certainty for rural family farms and ranches, additional flows and habitat for fish, and cleaner water.

Along with basic information included on a CD-ROM, the database that was generated from the compilation of the survey has a Global Information System (GIS) element and includes pictures, maps and a description of up to 500 words for each project or proposal. New GIS format technology is embedded that permits viewers to see a map of 17 Western states and then "drill down" to see map details of a project area.

Examples

There are over 100 projects included in our data base. Some specific projects include:

- Atterberry Irrigation Reservoir (Washington) is a small proposed project that involves construction of an irrigation water reservoir (500 acre-feet) which would reduce irrigation water withdrawal from the Dungeness River during periods of low streamflow. The project will provide substantial increases in available side channel spawning/rearing habitat as well as reduced water temperature benefits.
- Plateau Reservoir (Colorado) would be operated in conjunction with McPhee Reservoir to improve downstream fishery habitat. The Dolores Water Conservancy District (DWCD), Bureau of Reclamation, State of Colorado and Federal fishery agencies have identified the need to provide at least 3,300 acre-feet per year of additional water for the fishery flow downstream of McPhee Reservoir in southwest Colorado. McPhee Reservoir and related delivery facilities are part of the Bureau of Reclamation Dolores Project a multi-purpose water storage project that supplies water for irrigation, municipal, fishery below the dam, and other uses. The fishery downstream of McPhee Dam is an excellent cold water trout fishery. DWCD has been studying methods to provide the additional fishery water and has identified the construction of Plateau Reservoir as an option to supply additional fishery water. Plateau Reservoir would be approximately 21,000 acre-feet in capacity formed by a 120 foot high dam with a surface area of approximately 750 acres. Detailed topography and preliminary soils testing has been conducted to confirm the availability of suitable embankment material. A preliminary embankment design, including spillway location and sizing, has been prepared for the selected dam site. Discussions are ongoing with the involved entities to assess the available methods to supply additional fishery water and the development of Plateau Reservoir is one of the considerations.
- Viva Naughton Reservoir (Wyoming) is one of several alternative storage sites under investigation on the Hams Fork River above Kemmerer. The recent drought has greatly changed the water agreement between downstream irrigators and PacifiCorp, the owner of Viva Naughton Reservoir. Local sponsors are interested in proceeding forward with permitting of the most desirable reservoir alternatives, but that process cannot begin until more information is obtained on site specific geology and wetlands. Investigations completed for the Green River Groundwater Recharge and Alternate Storage Study published in late 2001 indicate enlarging Viva Naughton Reservoir is one of the more efficient water development projects in the state. The permitted enlargement of Viva Naughton Reservoir reserves 10,752 acre-feet for irrigation on the Hams Fork downstream of the dam, and would provide a much needed source of late season water for users below the dam, like the Hams Fork Water Users Association, and the Towns of Kemmerer and Diamondville.
- Santa Cruz River Offstream Storage (Arizona) would aid the Tohono O'odham Nation reservation, located in the desert of south central Arizona. Groundwater forms the primary locally available water supply. The Santa Cruz River, once a perennial river, now only flows intermittently for most of its course except for stretches supported by discharges from municipal wastewater plants. At times these flows are great enough to cause extensive flood damages at the village of Chui Chu and surrounding areas on the reservation and on the surrounding non-Indian lands and communities. The Nation and others have investigated opportunities to capture the intermittent flows of the Santa Cruz River and put them to beneficial use on the reservation.
- Sites Reservoir (California) has been identified by the Department of Water Resources and the CALFED Program as one of the most cost-effective and environmentally beneficial new facilities under consideration in California. The Sites project would enhance water supply reliability for environmental, urban and agricultural uses throughout the state. It would provide water supplies in average

and dry years for urban, agricultural and environmental purposes, increase San Francisco Bay-Sacramento / San Joaquin Delta outflows during critical times, improve flood control, enhance groundwater recharge, bolster fish flows, and improve flexibility for existing projects, such as Shasta Reservoir. Sites reservoir can greatly increase reliability of water supplies by reducing water diversions on the Sacramento River during critical fish migration periods.

- Strawberry Valley Rehabilitation and Betterment Projects (Utah) are proposed to decrease the water seepage and losses in the Strawberry Valley Project, as well as provide gravity pressure for the continued migration toward sprinkler irrigation systems, which would then provide additional water savings. These projects could save approximately 15,000 to 20,000 acre-feet of water per year in an agricultural area that is rapidly urbanizing.
- Temperance Flat Dam (California) would be a new structure constructed on the San Joaquin River, above Friant Dam, which would provide much needed water supplies and hydroelectric power. The Upper San Joaquin River Basin Storage Investigation was completed by the U.S. Bureau of Reclamation, in cooperation with the California Department of Water Resources, consistent with recommendations in the CALFED Bay Delta Program Record of Decision.
- Teton Dam Re-Construction (Idaho) would replace Teton Dam, which failed in 1976 just as it was completed, causing massive flooding in the Rexburg, Idaho, area. Fremont-Madison Irrigation District is considering participating in a reconstruction of this dam, which, in 1990, was estimated to cost \$168—\$265 million. The project would yield 41,000 acre-feet of water to benefit the fishery, 24,000 acre-feet for trumpeter swans, and 20,000 acre-feet for irrigation.
- Water for Irrigation, Streams, and Economy Project (WISE—Oregon), is a collaborative effort in Oregon to improve the health of the Little Butte Creek and Bear Creek systems and increase the effectiveness and efficiency of local irrigation districts. The WISE Project utilizes a combination of strategies including: piping and lining canals, increasing the storage capacity of selected reservoirs, and installing a pumping system that will provide access to water that has been allocated for agricultural purposes. Collectively, more water will be available for management for irrigation and environmental instream purposes.

Shortly after the Alliance's data base was released, the Bureau of Reclamation in November 2005 submitted a report to Congress that identifies nearly one thousand potential hydroelectric and water supply projects in the Western United States that have been studied, but not constructed. The report was required by the Energy Act of 2005.

The 2005 Alliance and Reclamation efforts show that, in most areas of the West, water resources are available to be developed. Environmentally-safe and cost-effective projects exist. They await the vision and leadership needed to move them to implementation.

Question 2. In addition to streamflow losses, increasing temperatures and a drying climate will likely dry rangelands and have other negative impacts to agriculture. This industry, particularly in the Rocky Mountain region, is already stressed.

What is your sense of the future of agriculture in the West—do the opportunities outweigh the challenges or do you have concerns about the long-term viability of family farms?

Answer. The family farmers and ranchers that make up the membership of our organization convey varying degrees of optimism and pessimism when they discuss the future of irrigated agriculture in the West. Unfortunately, in recent years, when our association gathers in Nevada for our annual meeting and irrigators from Western states begin to swap stories, the mood appears to be getting more pessimistic each year.

DEFINING OPTIMISM

Where does our wealth come from, if we have it? How do we measure up with others? The answers to these questions are also factors that influence how optimistic today's family farmers and ranchers are. Farming is unique because of the tremendous amount of money that is tied up in our investment to work the land. By the time the year is over, despite good markets and efficient operations, the financial pickings are slim, compared to other occupations. One of the founding members of the Family Farm Alliance—a successful rancher and businessman from Arizona—was astounded later in life when he found out how relatively easy it was to make money running an auto parts store. The rate of investment in farming is very high, but the rate of return is often very low. It's easy to sound like a pessimist when you look at how all of your money is tied up, with very little return to show

for, and your kids are leaving the farm to try to live like the people they see on television.

TOUGH TIMES TO GET THINGS DONE

Many farmers and ranchers are pessimistic about the future of agriculture because it is getting increasingly more difficult to accomplish anything. As a nation, it seems that we have become rich, spoiled losing the drive to get things done the way we used to. One of my fellow board members is a farmer in the Dolores Water Conservancy District in Colorado. His district put together a plan for an outstanding and feasible water delivery project that would have added another 4,000 acres of productive farmland to his community. The project was ready to go, but then the 2002 drought arrived, and community leaders became gun shy, and reigned in their efforts. When interest was revived a few years later, the price of petroleum (and thus, piping) had risen considerably. The district had to scale back its original plan, re-engage with the regulatory agencies, and before long, the momentum faltered, and the project never materialized.

We built Hoover Dam in less than five years, ahead of schedule and under budget, during the midst of the Great Depression. In this day and age, the environmental permitting and litigation alone for such a project would take at least twice that time.

FAMILY FARMS IN CRISIS

Family farms and ranches are experiencing a crisis in numbers. In the 1930s, there were close to seven million farms in the United States. Today, just over two million farms remain. Of the remaining farms, roughly 565,000 are family operations, farming just over 415 million acres or 44 percent of total farmland. And 330 farm operators leave their land every week.

One of the most troubling aspects of the on-going farm crisis is the decline in the number of young farmers entering the field. More than half of today's farmers are between the ages of 45 and 64, and only six percent of our farmers are younger than 35. Some of my fellow directors on the Alliance board will admit that we ranchers are becoming dinosaurs. Both statistically and anecdotally, for the first time in many generations we see sons and daughters of farmers opting to leave the family farm because of uncertainty about agriculture as a career.

Urbanization and competition for water supplies are driving Western farmers off the land at a time when American food production in general is following other industries "off-shore" in search of lower costs. Traditional farms and ranches are disappearing, and our country is becoming a net importer of food, drawing frightening parallels to our dependence on foreign sources of energy.

Meanwhile, according to USDA's Economic Research Service statistics for 2005, Americans are spending, on average, 9.9 percent of their disposable income on food. To put this into perspective, just 70 years ago, the figure was more than 25 percent. So, while more, better and safer food is being produced by our farmers, they continue to feel the pinch—and it is only a matter of time before that pinch translates itself back into the supermarket.

Ironically, it is because Western irrigated agriculture has been so adaptive and successful at providing plentiful, safe and affordable food that it is now jeopardized—nobody believes there can be a problem. The last Americans to experience food shortages are members of the so-called Greatest Generation and their parents. For the most part, they have left us, taking with them the memories of empty supermarket shelves. When the issue has never been personalized, it's easy to be complacent.

AGRICULTURE IS NOT THE RESERVOIR OF THE WEST

A February 2007 report by a National Research Council (NRC) committee says agriculture is the likeliest target for shifting use to urban needs in the fast growing West. But that study—which focuses on the Colorado River—cautions that "the availability of agricultural water is finite." It adds that rising population and water demands "will inevitably result in increasingly costly, controversial and unavoidable trade-off choices" in managing a shrinking resource.

We are also troubled to hear more and more anecdotal accounts from Western farmers and ranchers of important agricultural lands being converted to residential and commercial development and of agricultural water being used (transferred or bought) to support these new demands. New environmental water demands imposed by regulatory agencies or courts also first look to agriculture. This is happening in every state, but farmers and ranchers point to some striking examples:

- A report released in April by Environment Colorado found that, from 1987-2002, Colorado lost an average of 460 acres per day of agricultural land. The report predicts 3.1 million more acres will be lost to development by 2022.
- Arizona's Salt River Project (SRP) is the "poster child" for transfers of agricultural water to urban areas. In a few years, the SRP will cease to provide water to agriculture in order to meet new demands exerted by development.
- In Las Vegas, over 70,000 new residents are moving in every year, and Southern Nevada Water Authority is looking to rural areas to satisfy its growing thirst.
- A restoration agreement developed for the Platte River could potentially dry up hundreds of thousands of acres of farmland in Nebraska and Wyoming, in order to reallocate water to meet the perceived needs of ESA-listed fish and wildlife.
- According to the American Farmland Trust, the California Department of Conservation documented more than 1 million acres of farmland in the state that were converted between 1988 and 1998. Last year, California's population officially topped 37 million, and it is predicted that the state's population will reach 59.5 million by the year 2050.

The continued focus on moving agricultural water to meet other Western water demands—urban, industrial, and environmental—is very disturbing to us. It is shortsighted and complacent to believe the illusion that water can be taken from agriculture to take care of new urban and environmental demands.

We cannot continue long-term hypothetical processes that focus primarily on continued conservation and downsizing of Western agriculture. The U.S. needs a stable domestic food supply, just as it needs a stable energy supply. The post 9/11 world of terrorist threats makes the stability of domestic food supply even more pressing.

In this era of shrinking agricultural landscapes, there does not appear to be much talk of saving agriculture, let alone trying to increase production acreage. If these things are not done, we're afraid we will lose it all. The continued focus on eliminating farming and tightening water conservation as means of freeing up water to meet other demands could set us up for a train wreck. While we are a free-market country, some of our members believe we need to get aggressive about finding ways to keep water available for agriculture rather than just allowing individuals to sell their water—developed with government assistance to encourage agricultural development decades ago—to fund their retirement.

Our entire society needs that water because we need a strong domestic agricultural base. Americans are justifiably concerned about the recent contamination of wheat gluten imported from China and used in pet food that killed thousands of animals in the United States. Yes, the U.S. has recently experienced failures in its own food safety systems. But domestic food safety issues are within our power to address. Contamination of food stuffs produced by factories and farms beyond our borders is not. That is why the Family Farm Alliance believes that a national response to climate change should include as one of its goals self-sufficiency in food production. It is time for our national leaders to stand up and focus on improving the security, stability, and economic aspects of domestic food production so that our food remains readily available, ample, affordable, and safe.

If Congress wants to do something truly meaningful, it too, should look at the bigger picture. For farmers to survive; for food to be produced in America; a stable water supply must be available. The federal government must adopt a policy of supporting new projects to enhance water supplies while encouraging state and local interests to take the lead in the implementation of those projects.

RESPONSES OF PATRICK O'TOOLE TO QUESTIONS FROM SENATOR DOMENICI

Question 1. Do you believe that the inter-agency coordination required by the bill will help achieve federal coordination of water resources research?

Answer. Section 7 of the SECURE Water Act outlines the climate change and water intragovernmental panel, which would be comprised of federal agency leaders. We believe this proposed panel and the actions they will be tasked with should improve federal coordination of water resources research. We support the Section 7 provisions that direct this panel to coordinate with state water resources agencies and relevant water user, environmental and non-governmental organizations. For this panel to achieve success, coordinating with the state water resources agencies is critical.

Question 2. Please describe the opportunities and challenges in the West regarding the current and future water demands for energy production.

Answer. Throughout the West, we are seeing proposals to build plants to make ethanol, another "answer" that may (or may not) lower greenhouse gas emissions. An April 2007 Sacramento Bee editorial provides a reality check on how much water

it would take to grow all the corn required to meet California's goal of producing a billion gallons of ethanol a year. According to the Bee's calculations, that's about 2.5 trillion gallons of water for 1 billion gallons of ethanol, which is more than all the water from the Sacramento-San Joaquin Delta that now goes to Southern California and valley farms. Because there is only so much water for agriculture in California and other Western states, this means that some other existing crops will not be grown, thus furthering our dependence on imported food sources.

We believe a thorough, comprehensive and peer-reviewed analysis is also needed to pin down future water needs for ethanol production, followed by identification of measures required to meet that new demand.

Another growing demand that will be placed on Western water resources is driven by power requirements. The total water consumed by electric utilities accounts for 20 percent of all the non-farm water consumed in the United States. By 2030, utilities could account for up to 60 percent of the nonfarm water, to meet the water needs required for cooling and pollutant scrubbing. This new demand will likely have the most serious impacts in fast-growing regions of the U.S., such as the Southwest. Even without warming climate conditions, continued growth in these regions will put the squeeze on both water and power use. When you throw in climate change considerations, the projections look worse.

Elsewhere in the energy sector, opportunities exist to better manage water produced in the development of coal bed natural gas resources in Rocky Mountain states. Large amounts of water, sometimes saline, are produced from coalbed methane wells, especially in the early stages of production. While economic quantities of methane can be produced, water disposal options that are environmentally acceptable and yet economically feasible, are a concern. Water may be discharged on the surface if it is relatively fresh, but often it is injected into rock at a depth where the quality of the injected water is less than that of the host rock. According to the U.S. Geological Survey, another alternative, not yet attempted, is to evaporate the water and collect the potentially saleable solid residues; this scheme might be feasible in regions having high evaporation rates.

Question 3. Please describe the relative costs of demand-management actions in relation to supply-enhancement measures as described in your written testimony.

Answer. Individual supply enhancement proposals and proposed demand management actions must be evaluated and the associated benefits and risks must be viewed in a net, comprehensive manner. While some environmental groups focus on perceived negative impacts associated with new facility construction (e.g. loss of habitat, disruption of "natural" stream flow patterns, and potential evaporative losses), these perceived impacts must also be compared to the wide range of multipurpose benefits that storage projects can provide. Properly designed and constructed surface storage projects provide additional water management flexibility to better meet downstream urban, industrial and agricultural water needs, improve flood control, generate clean hydropower, provide recreation opportunities, and—yes, create additional flows that can benefit downstream fish and wildlife species.

Conservation is often seen as the solution to water supply issues. While conservation is surely a tool that can assist in overcoming water supply problems, it cannot be viewed as the single answer to water shortages. Conserved water cannot realistically be applied to instream uses, as it will more likely be put to beneficial use by the next downstream appropriator or held in carryover storage for the following irrigation season. Also, reliance on demand management alone—particularly to meet growing municipal and industrial water demands—ultimately leads to "hardened" demand that could lead to volatility in extended droughts. A more productive federal role in conservation would involve the development of programs that foster locally-based conservation tailored to the unique circumstances of each region by providing genuine incentives, rather than the issuance of directives or attempts to inspire conservation by artificially manipulating economics through vehicles like compelled tiered pricing.

The Alliance supports continued voluntary implementation of efficient water management practices and opposes mandatory or enforceable requirements for agricultural water use efficiency. Only practices that reduce irrecoverable losses actually increase the total useable water supply. Furthermore, water saved within a water district or on-farm is used elsewhere within the same district or farm. Western agriculture in many areas is already highly efficient in its use of water and that more efficient water application does not necessarily increase useable water supplies.

The relative costs of demand and supply management actions can only be properly assessed by looking at the full range of benefits generated and beneficiaries served. For the most part, new water supplies are not being proposed to meet the expanding needs of agriculture. On the contrary, we are seeing a move in the opposite direction, where agricultural lands are going out of production and being lost to expand-

ing urban development. Water that was originally established for agriculture and the communities it supports is now being reallocated to meet new growing urban and environmental water demands. The growing numbers of urban water users in the West and the public interest served through improved environmental water supplies should naturally be part of equitable financing schemes.

In addition to developing the proper mix of demand management actions and new water supply infrastructure, it is imperative that we find creative ways to provide for the operation, maintenance, and modernization of existing water supply infrastructure. In 2005, we attended a briefing with the Bureau of Reclamation and learned at that time that there were 80 Western water projects in need of repair in the next ten years and that 40% of those would require major rehabilitation. The total estimated cost, including dam safety projects, was estimated to be \$800 million. Sound business practices dictate that this existing infrastructure, and the water supply provided by these facilities, be protected and preserved.

Question 4. Please describe the current interest within your membership to implement the rural water project Federal loan guarantee program.

Answer. The Family Farm Alliance—driven by its members (particularly in Washington and Idaho)—advocated for the loan guarantee provisions contained in the Rural Water Supply Act of 2005. This new program addresses an important issue to western water users: the inability of irrigation and water districts to pay for expensive repairs to Bureau of Reclamation dams, canals and other facilities.

As noted above, many Reclamation facilities are near the end of their design life, and maintaining the West's aging water infrastructure is a major financial challenge for Reclamation. It is also a challenge for irrigation districts and communities that depend upon these projects because in most cases, project beneficiaries are obligated by contract to pay 100 percent of operation, maintenance and repair costs at Reclamation facilities. Repair and replacement of aging gates, canals and other facilities often involve major construction projects costing millions of dollars. Under Reclamation law, project beneficiaries are required to pay these costs immediately; they cannot be repaid over time.

Private financing is difficult for many local entities to obtain because they do not own the facilities that are being repaired. In the past, programs such as the Rehabilitation and Betterment Act provided federal loans and other assistance for meeting the costs of repairs and replacement of equipment. However, such programs are no longer available.

The alternative financing mechanism contained in the Rural Water Supply Act—which would provide a government loan guarantee to allow local entities to amortize expensive operation, maintenance and replacement (OM&R) projects—will be helpful to some local agencies struggling to afford repairs to federally owned facilities. By making it easier for certain local agencies to meet their financial responsibilities, loan guarantees would make it easier to protect the federal investment in the West water supply infrastructure.

The Alliance is very concerned that the Department of the Interior has not yet implemented the loan guarantee. The Department's apparent lack of action is difficult to understand given the Administration's strong support for the Act when it was pending in Congress. We urge the Committee to take a close look at the Department's handling of the program and to take steps to remedy whatever problems are hindering the full implementation of the law.

Question 5. Please describe how you could streamline the regulator permitting process to provide for the necessary improvements to augment our existing and future water supply systems.

Answer. The Family Farm Alliance believes that without new sources of water, increasing urban and environmental demands will deplete existing agricultural supplies and seriously threaten the future of Western irrigated agriculture. The often slow and cumbersome federal regulatory process is a major obstacle to realization of projects and actions that could enhance Western water supplies.

The federal government has played a pivotal role in the development and subsequent regulation of water resources in the West over the past century. However, this involvement has grown exponentially over the past several decades through legislative enactments such as the Endangered Species Act (ESA), National Environmental Protection Act (NEPA) and the Clean Water Act (CWA). Implementation of these and other laws has challenged traditional notions about continued control of water resources by the States. In addition, there exists within some agencies a defeatist attitude that no dams or water supply projects will be built. So, there is no commitment to earnestly begin and engage the difficult problems we face. The increased control exerted by federal agencies through a variety of means has led to gridlock in the management of water supplies in the West.

For the most part, expanding agricultural development is not driving the need for new water supplies. Those new demands are coming from expanding urban development and more emphasis on environmental water needs. New water does not necessarily have to be developed for agriculture but it can be developed to prevent water from being taken from agriculture. That means regulatory streamlining will benefit urban water managers as well as Western irrigators.

The Family Farm Alliance is hopeful that a concerted good-faith effort to address these problems will result in a streamlined regulatory process that will be efficient, fair and effective. Over the past three years, we have developed and proposed specific recommendations on how to streamline ESA and NEPA processes, which we believe would make the regulatory process less daunting for state and local water agencies trying to enhance water supplies.

RECOMMENDED CHANGES TO MODERNIZE AND STREAMLINE ESA IMPLEMENTATION

The Family Farm Alliance strongly affirms the goals of the ESA. However, this 30-year old law could stand some targeted reforms, including common-sense changes to make it work better, encourage incentive-driven recovery efforts, and discourage litigation. Our specific recommendations—developed by our members in 2005—include:

- Encourage regulatory agencies to pull in senior policy officials to help solve ESA problems. Districts should be able to meet directly with upper level managers.
- Find ways to streamline the consultation process. Establish time limits, and force the agencies to comply.
- Require agency work on biological opinions to keep pace with development of NEPA compliance documents.
- Enhance congressional budgets of the lead agency (often Bureau of Reclamation) to cover additional costs associated with consultation.
- Employ better science in the consultation process.

RECOMMENDED CHANGES TO STREAMLINE NEPA IMPLEMENTATION

The Alliance also developed a number of recommendations to streamline NEPA implementation associated with new water supply enhancement projects. These include:

- Implement—either legislatively or administratively, the recommendations of the 2006 final report of the NEPA Task Force, chaired by U.S. Rep. McMorris-Rodgers (Washington).
- Restrict agency NEPA regulators from dismissing potential benefits or uses of future water supplies from “Purpose and need” requirements. Planning opportunities and purposes for which a project may be permitted should not be restricted, which narrows the planning horizon, and makes it impossible to plan for projects with long-term benefits.
- Require that impacts of drought and continuing water demands be assessed and built into the NEPA process.
- Amend NEPA to create a “NEPA Ombudsman” within the CEQ. This recommendation would direct the CEQ to create a NEPA Ombudsman with decision making authority to resolve conflicts within the NEPA process.
- Direct CEQ to control NEPA-related costs.
- Amend NEPA to add mandatory timelines for the completion of NEPA documents.
- Amend NEPA to create a citizen suit provision. This provision would clarify the standards and procedures for judicial review of NEPA actions.
- Amend NEPA to clarify that the alternative analysis must include consideration of the environmental impact of not taking an action on any proposed project.
- Require that “reasonable alternatives” analyzed in NEPA documents be limited to those which are economically and technically feasible.

NEPA documents should only pertain to the proposed action and only address issues raised in public scoping that are directly tied to the proposed action. A common ploy of certain activist groups is to throw a “laundry list” of issues and concerns at a federal agency, knowing full well it will distract, confuse, and lengthen the process, thereby creating a document with potential loop holes that might later be appealed. We believe alternatives should be limited to the proposed action being analyzed. The number of alternatives should be constrained only to the range of activities and associated impacts of the proposed action.

RESPONSE OF PATRICK O'TOOLE TO QUESTION FROM SENATOR SALAZAR

Question 1. The Family Farm Alliance's recent report, *Water Supply in a Changing Climate*, discusses the increase in ethanol and energy production as another demand on water resources in the West. Do you think the SECURE Water Act goes far enough in assessing impacts to water from energy use, or would you suggest other changes to the Act?

Answer. Section 9 of the SECURE Water Act directs the Secretary of Interior to work with an advisory committee and state and local water resource agencies to develop a water use and availability assessment. One of the tasks charged to this group is to work towards an improved ability to forecast the ability of water required for energy production uses. This specific charge—while fairly broad—should provide a vehicle to develop a thorough, comprehensive and peer-reviewed analysis to pin down future water needs for ethanol production, and new power plants, followed by identification of measures required to meet that new demand.

We also recommend that this assessment identify opportunities to better manage water produced in the development of coal bed natural gas resources in the Rocky Mountain states. A basin-by-basin quantification of the potential “new” water that could be generated through coal bed methane production operations should also be undertaken.

RESPONSES OF JON C. LAMBECK TO QUESTIONS FROM SENATOR BINGAMAN

Question 1a. MWD is one of the largest water utilities in the nation, and perhaps the one facing the greatest number of challenges. Based on current and long-term projections, you face the distinct likelihood of reduced Colorado River supplies, potential reductions in State project water because of environmental issues in the Sacramento-San Joaquin Bay-Delta area, and an ongoing local drought.

Is MWD facing the possibility of rationing water to its 18 million customers? If not, what strategies have you implemented to help avoid that possibility?

Answer. Metropolitan is preparing for the possibility of allocating supplies to its 26 public member agencies by developing an allocation plan for adoption by its Board. This plan sets in place a formula to equitably cut supplies through all of Southern California should that become necessary.

However, Metropolitan is acting to avoid allocation by utilizing its drought storage reserves and pursuing water transfers. Further, Metropolitan has embarked on a regional education and media campaign to reduce water use and encourage conservation, including the promotion of California native (low water use) plants and landscaping. This is in addition to stepped up incentive programs to cause retail customers to install water saving appliances and plumbing fixtures, and to use recycled water whenever available and appropriate for use.

Question 1b. Can you estimate how much water MWD has been able to save because of conservation efforts over the last 10-15 years? Do you anticipate that additional savings are possible?

Answer. Metropolitan's modern water conservation efforts date back to the prolonged drought of the 1980s. Since 1990, conservation efforts in the Metropolitan service area have saved approximately 10 million acre-feet (AF). Conservation savings have reduced regional water demands by about 15%. In fact, conservation has provided almost 800,000 AF of water in our service area this past year—that is more water than we will receive from the Colorado River. It should be noted that 1 AF typically meets all the indoor and outdoor water needs of two average Southern California families.

However, our conservation efforts are nowhere near complete and many new opportunities exist. Most water savings in California have come from indoor plumbing improvements such as changing to low flow shower heads and retrofitting residential toilets to ultra-low flush models. The commercial, industrial, institutional, and landscape sectors still have significant opportunity for savings. These sectors have not participated in efficiency programs in the past due to complexities in business practices, procurement processes, institutional barriers, and a lack of water saving technologies. Most of these obstacles have been or are now being overcome. New landscape efficiency devices, like Smart Irrigation Timers and high efficiency spray nozzles that ensure more of the water gets to the plants, can greatly reduce water use in commercial and residential landscapes. Industrial process improvement programs are seeing a large increase in participation in Metropolitan's service area as corporations and local businesses begin to see the financial and social benefits of conserving. A recent example is the partnership between Metropolitan and Kimberly-Clark in which Metropolitan paid approximately \$500,000 to offset some of the costs of Kimberly-Clark's industrial process improvements in a paper production fa-

cilities, saving about 500 acre-feet per year. But even with the best corporate citizens, bad choices are sometimes made when they cannot tell the difference between efficient and non-efficient devices in the marketplace. Because of this, Metropolitan supports national labeling of water efficient devices through EPA's WaterSense Program. Continued Congressional support of this program will leverage local effort to get businesses to make water efficient choices.

Question 2a. Your testimony recommends evaluating ways to optimize hydropower production at federal facilities due to the likelihood that power production will continue to be impacted by low reservoir elevations in the future.

What is the current state of research associated with developing more efficient low head turbines? Is it realistic to expect that it will be technically and economically feasible to retrofit such equipment on existing facilities in the near future?

Answer. Turbine manufacturers have developed different designs over the years that have higher efficiency or generation output under specific reservoir elevations or head. As reservoirs in the western US have been drawn down as a consequence of continuing drought, the head under which the existing turbines are operating has moved further outside their optimum operating range. Hydrologists and other experts have questioned whether we can expect the western reservoirs to return to their historical operating elevations anytime in the near future.

The studies recommended in the testimony would take available designs and technology and analyze the technical challenges and improved power production that would be achieved under current and continuing reduced head conditions. The studies would provide the expected increase in power and the cost to implement the equipment change. With the information produced, stakeholders could make decisions on whether the increased value is worth the required expenditures.

Question 2b. What other sources is MWD looking at to potentially replace the hydropower it currently uses to move water through the Colorado River Aqueduct?

Answer. Metropolitan is looking at several options to replace the possible reduction in federal hydro power. With wind measurement equipment (wind speed and direction) supplied through the Western Area Power Administration as part of their customer service program for renewable energy development and equipment purchased directly by Metropolitan, the wind along the Colorado River Aqueduct (CRA) is being monitored for potential use as part of a multi-year program. The data from this monitoring will be analyzed to determine the economics of wind power development along the CRA.

Metropolitan is also analyzing the potential for solar power along the CRA as an expansion of solar power development already underway at Metropolitan facilities in its Southern California service territory. These current solar power developments are at existing facilities such as water treatment plants served under retail electricity service tariffs by utilities such as the Southern California Edison Company or the Los Angeles Department of Water and Power.

Another option is the use of power Metropolitan produces at its 16 small hydroelectric power plants located along its pipelines in Southern California. The energy produced at these hydroelectric plants is presently sold to electric utilities. If economically feasible, Metropolitan could utilize the power from these hydroplants to meet some of its own CRA energy demand.

Other options include purchasing addition energy from the wholesale energy marketplace to replace the declining Hoover energy or develop contracts for a firm supply of power from new facilities owned by others or in partnership with Metropolitan.

RESPONSES OF JON C. LAMBECK TO QUESTIONS FROM SENATOR DOMENICI

Question 1. In addition to the correlation between energy and hydro production, please describe what Metropolitan is doing to reduce their energy demands on moving water through the system and developing new water supplies through desalination and the recycling of brackish water.

In regards to reducing energy demands, Metropolitan has always been proactive in identifying and implementing energy saving improvements. For example, beginning in the earlier 1980's, Metropolitan initiated an aggressive construction program to install small hydroelectric generators at pressure control facilities on its water distribution system. This allowed the production of clean, zero-emission, renewable electric power from the energy in water flowing through distribution pipelines that previously had gone untapped. In 2007, Metropolitan produced approximately 500,000 MWh from its 16 small hydro generators.

Also starting in the 1980's and continuing into the 90's, Metropolitan spent over \$32 million rehabilitating its Colorado River Aqueduct structures and electric equipment, including 45 electric motors ranging in size from 4300 HP to 12,500 HP. This

rehabilitation project resulted in annual savings of over 110,000 MWh during periods of high water deliveries.

Finally, in 2005, Metropolitan completed the redesign of one of its major distribution system pumping plants. The new design reduced the energy requirement to pump water from 400 kWh/acre-foot (AF) to 200 kWh/AF and has resulted in energy savings of over 9,000 MWh annually.

The above examples are some of the larger efforts Metropolitan has undertaken to reduce its energy use. There are many other smaller efforts have been completed or that are continuing, including: implementing energy audit recommendations at all its major facilities (such as lighting retrofits, installation of variable speed motors, HVAC improvements and motion sensing light switches); utilizing high efficiency equipment in new installations; installing photovoltaic solar generation at its treatment plants; and replacement of old CRT monitors.

Lastly, Metropolitan is championing an effort that would provide recognition to electric utilities who support water conservation efforts by allowing them to obtain the credit for energy saved from reduced water conveyance, treatment and distribution energy requirements.

Concerning new water supplies in Southern California, recycled water production is used to offset potable water demands to irrigate golf courses and public parks, offset imported water demands for industrial process water, and protect groundwater basins from seawater intrusion that could impair groundwater production and storage. Groundwater recovery programs desalt brackish groundwater to create a new supply while cleaning up groundwater basins to enable better groundwater storage and management. Seawater desalination is not currently in large-scale production in Southern California, but advances in membrane and energy recovery technologies have brought the cost of this supply to levels where it can be considered as part of a diverse portfolio of a reliable water supply.

In 2006, Metropolitan set a regional target of 750,000 acre-feet of annual production for the combined resources of water recycling, groundwater recovery (brackish water desalting), and seawater desalination. Currently, the region has approximately 320 TAF per year of recycling and groundwater recovery production. Metropolitan offers financial incentives up to \$250 per acre-foot of produced water through its member agencies. Metropolitan financially supports over 150 TAF of the existing annual production. Finally, Metropolitan has signed or is in the final process of signing five contracts to provide financial assistance to local seawater desalination projects that are expected to be online as early as 2015.

Question 2. In what areas should the federal government focus its research on water for energy and energy for water?

Answer. As mentioned in the response to the previous question, improvements in the design and technology of the desalination process continues to result in lower energy requirements for the water produced. Metropolitan has done extensive research to improve the efficiency of the desalination process and to lower the overall cost of desalination for brackish waters through improvements in pretreatment, membrane fouling, scale-up of membranes, and brine treatment. Federal research in these areas, along with improvements in energy recovery devices, may result in further cost reductions for desalination and help reduce energy usage, not only for brackish waters but also for other water sources such as seawater.

Another area where research could provide significant benefits regarding energy for water would be in raw water treatment. Many of the newer water treatment processes, including ozone and ultraviolet disinfection are very energy intensive. Advances in reducing the energy requirements for water treatment could result in significant cumulative energy savings throughout the country.

Regarding the issue of water for energy, large quantities of water can be consumed in energy related activities such as thermal power plant cooling, fuel refining and oil and gas exploration and extraction. Any research that could result in new industrial processes that require less water would be beneficial by allowing the conserved water to be available for other critical purposes.

Research by the federal government in the above areas could provide substantial benefits, especially to regions of the country where existing and new supplies of water are limited or constrained. Metropolitan would support such federal efforts.

RESPONSES OF JOHN D'ANTONIO TO QUESTIONS FROM SENATOR BINGAMAN

Question 1a. Water allocation and management are primarily a state and local responsibility. At the same time, with the number of water issues increasing, there seems to be a growing need for more federal assistance in this area.

What is your sense of the role the Federal government should have in water management? What is the States' perspective on recent federal budgets for water resource programs?

Answer. It is imperative that the federal government be a strong, committed partner in assisting state and local communities with current and future water supply challenges. Recent federal budgets have not kept pace with the urgent water resources challenges faced by state and federal water managers, especially in the western United States. S.2156 would provide the financial assistance to non-federal entities for water use efficiency improvements, enhanced spending authority for USGS stream-gauging activities, a ground water monitoring system, brackish water study, new methods to estimate and measure water use, a new water use and availability assessment, establishment of intra-governmental panel on climate change and water resources, a Reclamation Climate Change Adaptation Program, and a hydroelectric power assessment given the potential effects of climate change.

S.2156 authorizes a National Water Use and Availability Assessment Program. The Secretary of Interior, acting through the USGS and in coordination with state and local water resource agencies, is to undertake a program to provide better information on water resources and identify trends in use and availability, as well as help forecast water availability for future economic, energy production and environmental needs. The USGS is also to maintain a national inventory on water, and provide grants to states to enable locally generated data to be integrated with national datasets. Using federal grants and state cost sharing, this essential partnership will develop and integrate water use and availability datasets into a comprehensive database and can serve as the basis for sound decision making.

I would like to highlight one technology of growing importance in many western states that presently has the capability to provide critical information on ground water withdrawals, agricultural and other outdoor water uses, evapotranspiration rates and consumptive uses. The USGS and National Aeronautics and Space Administration (NASA) now jointly operate a system of earth observation satellites that include a thermal infrared (TIR) sensor on Landsat 5 and Landsat 7, which are over due for replacement. Data from this sensor is now used by western states (and others) to measure and monitor evapotranspiration and consumptive uses from irrigated areas (and other land cover) by calculating the "residual" energy balance. The Landsat Data Continuity Mission (LDCM), under NASA's Earth Sciences Directorate, currently has scheduled the launch of Landsat 8 for 2011. Once in orbit, NASA will turn over satellite operations and data management to USGS. However, NASA's FY 2008 budget did not include funding for a TIR instrument, and without immediate action by the Congress, this important tool could be lost for the foreseeable future.

Question 1b. In your view, does the SECURE Water Act respect state primacy over water rights while properly addressing a federal role that will help address water resource issues?

Answer. Yes, we appreciate the explicit recognition that ". . . States bear the primary responsibility and authority for managing the water resources of the United States" and that "the Federal Government should support the States, as well as regional, local and tribal governments . . ." We appreciate the many provisions in the bill requiring federal agencies to consult and coordinate with the applicable state water resource agency with jurisdiction. The savings clause is also important which states that: "Nothing in this Act preempts or affects any—(A) State water law; or (B) interstate compact governing water." So is the requirement that the Secretary comply with applicable State water laws.

Question 2. Some of the impacts of climate change on water resources are pretty well understood, such as reduced snow-pack, earlier runoff, and increased evaporation.

Are the Western States actively dealing with these impacts, either individually or collectively, or is more information still needed to better understand the specific impacts and to be able to tailor solutions to identified areas of concern?

Answer. The Western States Water Council has consulted with its member states and it is evident that there is not sufficient information available to provide a comprehensive and firm foundation for future decision making. Presently, western states water planning capabilities vary widely from state to state, particularly as it relates to estimating future water uses and needs.

Changes in climate variability due to warming temperatures in the West has the potential to upset the current balance achieved through the storage of seasonal surpluses. The Congress should fund research for improving the predictive capabilities for climate change, and assessment and mitigation of its impacts. Based on the complex climatology in the West, it is important that climate change modeling be conducted at a much finer resolution such as at the watershed and sub-watershed level.

Also, it is unclear how temperatures affect summer monsoonal activity in several western states and efforts should be made to focus on vulnerabilities and building increased resiliency to climate extremes.

RESPONSES OF JOHN D'ANTONIO TO QUESTIONS FROM SENATOR DOMENICI

Question 1. Do you believe that the inter-agency coordination required in the bill will help achieve federal coordination of water resources research?

Answer. Yes, interagency coordination will greatly enhance the cost effectiveness of the necessary water resources research and avoid the potential duplication of efforts that would likely occur under a non-coordinated approach. The bill specifies how the Secretary of Interior will interact through the USGS and the USBR in coordination with state and local water resource agencies and promote the development and integration of locally generated data with national datasets. The efforts will include the expansion of the USGS' National Streamflow Information Program (NSIP), the implementation of a systematic national ground water resources monitoring program for major aquifer systems in the U.S. to identify significant brackish aquifers that could use desalination technologies as an important alternate source of supply. Also, the Secretary shall establish a Reclamation Climate Change Adaptation Program and a Climate Change and Water Intra-Governmental (I-G) Panel to assess risk of climate change to water resources and to review the science on climate change and water, and develop ways to better forecast impacts.

The bill also mandates a Hydroelectric Power Assessment and directs the Secretary of Energy, in consultation with the federal Power Marketing Administrations (PMAs), and other federal and state agencies, to assess the effects of climate change on the water available for facilities producing hydropower marketed by the PMAs.

The USGS and National Aeronautics and Space Administration (NASA) now jointly operate a system of earth observation satellites that include a thermal infrared (TIR) sensor on Landsat 5 and Landsat 7, which are over due for replacement. Data from this sensor is now used by western states (and others) to measure and monitor evapotranspiration and consumptive uses from irrigated areas (and other land cover) by calculating the "residual" energy balance. The Landsat Data Continuity Mission (LDCM), under NASA's Earth Sciences Directorate, currently has scheduled the launch of Landsat 8 for 2011. Once in orbit, NASA will turn over satellite operations and data management to USGS. However, NASA's FY 2008 budget did not include funding for a TIR instrument, and without immediate action by the Congress, this important tool could be lost for the foreseeable future.

Question 2. Please describe the type of water assessments you would undertake if grants were provided to State water resource agencies.

Answer. The Office of the State Engineer (OSE), the New Mexico Interstate Stream Commission (ISC) and the New Mexico Bureau of Geology and Mineral Resources through (NMBGMR) will work in coordination with the U.S. Geological Survey (USGS) to undertake a program to provide better information on water resources and identify trends in use and availability, as well as help forecast water availability for future economic, energy production and environmental needs. State agencies will help integrate locally generated data with national datasets compiled by the USGS and other federal agencies to update and maintain a national inventory of water resource information.

The OSE, ISC, NMBGMR and New Mexico Environment Department (NMED) will assist the USGS with implementing a systematic national ground water resources monitoring program for major aquifer systems that extend into New Mexico. It has become increasingly evident that there is not sufficient ground water data available, both quantity and quality, to support all the administrative actions (at the state and local levels) needed to understand and effectively manage ground and surface waters conjunctively. Many wells are not metered, and increasing ground water development is having a significant impact on surface water resources in some areas. The OSE will continue to actively pursue metering and measuring of water use in seven key basins under our Active Water Resource Management initiative.

More and more often, the use of waters of impaired quality, such as brackish ground waters, offer an effective alternative to the development of surface water supplies and their transport over long distances. Federal grants to the State's water resource agencies would allow state and local entities to work with the USGS to conduct assessments identifying significant brackish aquifers. Desalination of brackish ground water and other impaired waters promises to be an important alternate source of supply for some uses and users.

Under federal grants, state agencies could enter into cooperative agreements to help conserve water, increase water use efficiency, facilitate water markets, enhance

water management or carry out similar activities in any watershed with a Reclamation project nexus or to address water use efficiencies, drought, and climate-related impacts to water supplies.

Question 3. Please describe the States that have the most complete understanding of their groundwater resources. What are these States doing to better understand this important water resource?

Answer. It is difficult to address which states have the most complete understanding of their groundwater resources. In my experience in attending Association of Western State Engineer and Western State Water Council meetings, it seems that the vast majority of western states are having extreme difficulty in managing their surface and groundwater together. As is evident by all of the past and current interstate litigation between states, the effect of groundwater withdrawals on surface water supplies has had deleterious effects on compact deliveries to neighboring states. Resulting damages as a result of these interstate lawsuits is in the hundreds of millions of dollars. A better understanding of how to conjunctively manage groundwater and surface water would greatly reduce these interstate conflicts.

Question 4. Do you believe anything in this legislation would lead to the federalization of State water rights?

Answer. No, as the legislation has been drafted we appreciate the explicit recognition that “. . . States bear the primary responsibility and authority for managing the water resources of the United States” and that “the Federal Government should support the States, as well as regional, local and tribal governments . . .”. We appreciate the many provisions in the bill requiring federal agencies to consult and coordinate with the applicable state water resource agency with jurisdiction. The savings clause is also important which states that: “Nothing in this Act preempts or affects any—(A) State water law; or (B) interstate compact governing water.” So is the requirement that the Secretary comply with applicable State water laws.

[Responses to the following questions were not received at the time the hearing went to press:]

QUESTIONS FOR ROBERT M. HIRSCH FROM SENATOR BINGAMAN

Question 1a. Your testimony sends mixed signals. It expresses support for the SECURE Water Act’s goals, but then expresses concern because many of the activities called for in the bill are not in the President’s budget.

At present budget levels, will Reclamation and USGS be able to carry-out the objectives of this bill, such as effectively responding to the water challenges posed by climate change, increasing water use efficiency, substantially increasing the National Streamflow Information Program, expanding groundwater monitoring, and implementing a comprehensive national water census?

Question 1b. Will Reclamation be able to continue the Water 2025 grant programs without the long-term authority provided by the SECURE Water Act?

Question 2a. It’s my understanding that a fundamental purpose of the National Streamflow Information Program (NSIP) was to create a base nationwide streamgauge network that would be 100% federally-funded. The SECURE Water Act is intended to implement NSIP as originally envisioned, including its current goal of establishing 4,700 monitored sites, which the bill requires to be done within the next 10 years. Your written testimony, however, states that the streamgages under the NSIP program should be cost-shared, rather than federally-funded.

Does your testimony represent a change in the structure of the NSIP program and its purpose of having a base network designed to meet federal science objectives?

Question 2b. As a follow-up—is the current NSIP network stable and functioning as intended, or does the system need to be updated with new equipment and technology?

Question 2c. Is there anything in the SECURE Water Act that would alter the existing cooperative water program under which USGS also installs and maintains streamgages?

Question 3a. Bob Hirsch, USGS—Earlier this year, USGS indicated there was general agreement among climate models projecting a long-term drying trend in the Southwest. Subsequently, an August 2007 report noted that current climate models predict a decrease of 15-20% in precipitation during the 21st century in the Upper Colorado River Basin. Under these models, the Colorado River Compact and U.S. water treaties with Mexico will be met only 60% of the time by 2070. In New Mexico, a report was recently released predicting a 12-33% decline in surface water availability in the Rio Grande basin over the next 20 to 70 years.

What current degree of confidence exists in these projections?

Question 3b. Can the accuracy of the projections be improved by the actions called for in this bill? If so, what are the most important steps that need to be taken?

Question 4a. The National Ground Water Association's testimony raises questions about whether states are adequately monitoring water resources to help compile a national assessment of water availability.

Does USGS have a similar concern? If so, how long do you think it will take to establish the monitoring necessary to accurately assess long-term water availability in this country?

Question 4b. What does USGS expect to learn from a national water census? Who will use that information and for what purposes? Will it help avoid water conflicts?

QUESTIONS FOR ROBERT M. HIRSCH FROM SENATOR DOMENICI

Question 1. You indicate that much of the Secure Water Act can be done under existing authorities. Will you please provide the Committee with these existing authorities and how you have used them in the past, and will use them in the future?

Question 2. Please describe the current Federal interagency process, identified in your written testimony, to develop comprehensive approaches to water planning and management throughout the United States.

Question 3. Please describe the non-federal entities you are working with on climate change and the type of research currently being undertaken.

Question 4. Has the Department of the Interior created an intergovernmental panel, similar to the interagency Climate Change Science Program, to address the water needs for energy production?

Question 5. Please describe the current research that the Subcommittee on Ground Water is undertaking. How much of the research is being done by outside groups?

Question 6. Please describe the effort being undertaken in the Great Lakes Basin to assess how much water is in the region now, how the region is using water, how water availability is changing, and how much water the region can expect to have in the future. In addition, please describe the opportunities and challenges that have resulted from the study, and whether this pilot program can be replicated elsewhere.

QUESTIONS FOR ROBERT M. HIRSCH FROM SENATOR SALAZAR

Question 1. Mr. Hirsch, I am aware of the Landsat Data Continuity Mission program jointly managed by NASA and USGS. Currently, the thermal infrared sensor that is so important to providing data to water managers is not budgeted to be included in Landsat 8. Can you discuss USGS's use of the data from the thermal infrared sensor, and the importance USGS places on the continuity of this data?

Question 2. Mr. Hirsch, the USGS is one of the participating federal agencies in the U.S. Climate Change Program that is conducting research on climate change, including impacts on water. Do you have any recommendations for ensuring coordination between the work the U.S. Climate Change Program is doing and the Climate Change and Water Intra-Governmental Panel the SECURE Water Act proposes to establish?

QUESTIONS FOR ROBERT JOHNSON FROM SENATOR BINGAMAN

Question 1a. Your testimony sends mixed signals. It expresses support for the SECURE Water Act's goals, but then expresses concern because many of the activities called for in the bill are not in the President's budget.

At present budget levels, will Reclamation and USGS be able to carry-out the objectives of this bill, such as effectively responding to the water challenges posed by climate change, increasing water use efficiency, substantially increasing the National Streamflow Information Program, expanding groundwater monitoring, and implementing a comprehensive national water census?

Question 1b. Will Reclamation be able to continue the Water 2025 grant programs without the long-term authority provided by the SECURE Water Act?

Question 2a. Reclamation's Water 2025 program has been funded on a year-to-year basis through the annual appropriations process.

Has the demand for grants under the program exceeded the annual amounts so far available? Can you provide for the record an estimate of the average annual demand for federal funding under the program over the last several years?

Question 2b. Has the program been implemented in a manner that gives priority to projects that will help minimize or reduce water-related conflicts? Are grants co-

ordinated on a watershed basis to leverage the maximum benefits for both water users and environmental needs?

Question 2c. Could you please summarize the grants or other financial assistance provided under the Water 2025 program since it was initiated? What are the benefits of the program?

Question 3. One of the purposes of the SECURE Water Act is to ensure that water managers and the scientific community are working together to avoid water-related crises to the extent possible. Question 4 outlined some of the dire predictions currently out there with respect to water supply in the West.

Is Reclamation currently using this information to engage in long-term planning in the affected river basins? What needs to be done to make this information more applicable for water managers?

Question 4. Testimony by the Nature Conservancy indicates that there is a tremendous volume of reservoir space available behind existing dams because that space is reserved to capture incoming floods and protect downstream structures. If those structures were removed and some amount of the natural floodplain could be restored, then the reservoir space could possibly be used to meet water user and environmental needs.

Has Reclamation studied this possibility as it applies to its facilities? Do you agree that the potential exists to secure the use of existing reservoir space if some floodplain restoration were undertaken?

QUESTIONS FOR ROBERT JOHNSON FROM SENATOR DOMENICI

Question 1. You indicate that much of the Secure Water Act can be done under existing authorities. Will you please provide the Committee with these existing authorities and how you have used them in the past, and will use them in the future?

Question 2. Please describe the current Federal interagency process, identified in your written testimony, to develop comprehensive approaches to water planning and management throughout the United States.

Question 3. Please describe the non-federal entities you are working with on climate change and the type of research currently being undertaken.

Question 4. Has the Department of the Interior created an intergovernmental panel, similar to the interagency Climate Change Science Program, to address the water needs for energy production?

Question 5. Please describe the current research that the Subcommittee on Ground Water is undertaking. How much of the research is being done by outside groups?

Question 6. Please describe the effort being undertaken in the Great Lakes Basin to assess how much water is in the region now, how the region is using water, how water availability is changing, and how much water the region can expect to have in the future. In addition, please describe the opportunities and challenges that have resulted from the study, and whether this pilot program can be replicated elsewhere.

QUESTIONS FOR ROBERT JOHNSON FROM SENATOR SALAZAR

Question 1. Many of the Bureau of Reclamation water projects in the West are nearing a century in age, and badly in need of repair. More than 300 dams in Colorado are classified as high hazard dams meaning the loss of human life is expected in the event of dam failure. Forty five of these high hazard dams are owned by the Bureau of Reclamation.

The SECURE Water Act would authorize grants to provide financial assistance to States, Tribes, & local entities to construct improvements or take actions to address drought, climate change, or other water-related crises. Do you foresee opportunities to simultaneously address drought/climate change issues and high hazard dams?

Question 2. In your's and Mr. Hirsch's testimony, you discuss a review of the National Streamflow Information Program which has been conducted. Can you tell describe the results of that review in terms of the need for additional streamflow stations? Can you also describe the cost-share arrangements you have with State and local governments when new streamgages are added?

APPENDIX II

Additional Material Submitted for the Record

STATEMENT OF THE WESTERN COALITION OF ARID STATES (WESTCAS)

The Western Coalition of Arid States (WESTCAS) offers the following statement regarding our support and recommendations regarding the Senate Energy and Natural Resources Committee hearing on S. 2156, the SECURE Water Act.

WESTCAS is a coalition of approximately 125 water and wastewater districts, cities and towns and water resource professionals focused on water quality and water quantity issues in the states of Arizona, California, Colorado, Idaho, Nevada, New Mexico, Oregon and Texas. Established in 1992, our vision has been to ensure sustainable water quality and quantity in the arid West. Our mission has been to work with state, regional, and federal water quality and quantity agencies to promote scientifically-sound laws, regulations, funding, and policies that protect the public health and the environment in the arid West.

The Southwestern United States is the fastest growing region in the country, with a 100% + population growth increase projection for Arizona and Nevada by 2030, and nearly 60% increase in Utah and Texas, and yet most areas in these states have suffered multiyear droughts over the last decade. This rapid growth projection, along with the consequences of a changing climate, requires communities to have a diverse water supply portfolio; and new approaches to creating higher quality sources of water supply need to be undertaken to meet the region's essential needs. Not unlike the arid West, there is already recognition that new water conservation skills will be critical for each region of the country to manage their water resources properly, as highlighted by the recent events in the Southeast.

The issue of climate change is global in nature but, for our purposes, national in scope and not just limited to the West. WESTCAS is supportive of addressing water quality and quantity problems in the East, Southeast, and other regions, but we deserve reciprocity in having our unique resource challenges met in a responsible fashion. Though much has been done on the issue of climate change in terms of broad research, we believe in the need to approach the issue in terms of practical preparedness in a comprehensive manner. This includes: water resources and the related issues of energy generation and use, sustainable agriculture, environmental conservation, public health and safety, and national security. In this context, we must highlight our concern that the federal government is inadequately addressing funding upgrades to existing water infrastructure, and is not focusing on federal agency outreach/coordination programs for at-risk sectors. These elements are necessary and vital adaptations in any national, climate change mitigation strategy.

Preparedness can be a strong cornerstone for such a strategy. In our view, what is missing is a nationwide approach where state and local governments, the private sector, non-governmental entities with expertise in the subject area, and the incubators of new ideas (i.e. the university system), become part a national dialogue and national plan for addressing these pressing concerns.

WESTCAS supports the SECURE Water Act, and in particular one of the principles behind the SECURE Water Act that mandates routine reports to Congress on the effect of climate change on water resources and the quantity of brackish water within the United States. We believe that collection and reporting of independent scientific data, free of political posture, should be the basis for such policies and program development. Investing in more robust data collection, monitoring efforts, and modeling is important if we are to engage in the business of proper planning and making decisions which impact (what some refer to as) the triple bottom line: the economic, environmental and social agendas of this country. As such, the SECURE Water Act provides federal requirements to monitor and manage limited water resources to ensure adequate supplies for the future, and this is important if we are to convene a national strategy for addressing climate change as an issue that can be reconciled with population growth.

Although we support the proposed legislation, WESTCAS poses the following question regarding the expected direction to the Bureau of Reclamation to initiate a climate change adaptation program to develop strategies and conduct feasibility studies to address water shortages, conflicts, and other impacts to water users and the environment. Although WESTCAS is a historical and ardent supporter of the Bureau of Reclamation, we raise the question of whether the Bureau of Reclamation, at the present time, is the best federal agency to carry out such a mission, i.e. should the new mission go to another federal agency? Although we have been impressed with the Bureau's recent effort on the Modeling of the Boise Reservoir System with Climate Change, we wonder if the Bureau resources are being over-taxed, considering their massive backlog of authorized projects. Although, we can envision that with adequate Congressional funding and a serious commitment by the Bureau, when the backlog of work in their Construction Program is addressed, that they could play a positive role in the future of this key undertaking.

In posing this question regarding which federal agency is best to lead this proposed initiative, WESTCAS draws your attention to specific information that provokes our question on this issue, which can be found in the Bureau of Reclamation budget, through their Science and Technology program, which is currently funded at less than \$10 million dollars. When you examine the Bureau's Water Conservation Field Services program you see only \$6 million and less than \$1.5 million for Emergency Planning and Disaster Response. The Bureau of Reclamation's Water Investigations program ranges from the thousands to a couple of hundred thousand, and is not even active in every state of the arid West. Even more to the point, in 1997 a document was produced by the Western Water Policy Review Commission, which included numerous recommendations and studies that the Bureau could have taken advantage of in order to address the new mission that this legislation is now proposing. Instead, the Bureau embarked on their own initiative called Water 2025 which offered no scientific basis for their decisions, as to where to provide minimal 'seed' money for projects—that do not even relate to a larger strategic plan as envisioned by the SECURE Water Act.

Although it is not our intent to appear critical, the Bureau is facing two other issues that raise this "best agency" question regarding the assignment of carrying out this proposed new mission. The first, the aging of its infrastructure, has hopefully been addressed by the last Congress with the passage of the Rural Water Supply legislation and the 21st Century Water Works Act, though we note the delays by the Bureau to advance the guidelines for this new effort. Of additional concern is the Bureau's increased funding of their Operation and Maintenance program; this is the first year it has exceeded the budget for their Construction program. In our view, this has important ramifications for the Bureau's undertaking of new missions.

The downsizing of the Bureau's staff also has implications for their engaging in new program work. The Bureau has been engaged in a 'Managing For Excellence' effort for the past two years, and like many other federal agencies, there are a large percentage of employees who are now eligible to retire. This retirement pool represents a huge institutional knowledge base, especially with regard to the unique character of the West. This, too, will have an impact on the Bureau's ability to perform additional new work in the future.

On a more positive note, WESTCAS participated in an effort—the Invest In the West Campaign—several years ago to increase the budget of the Bureau of Reclamation, which had been chronically under-funded. Thankfully, Congress recognized the need and through its leadership, the budget was increased several hundred million dollars over several years. Still, our WESTCAS members, particularly those in California, have been concerned with the on-going lack of funding for the backlog of the authorized projects within the Bureau's Title 16 Water Reuse and Reclamation Program. With over \$300 million needed, (and more authorizations pending in this Congress) these new 'rivers' of water are the future supplies for many in the West, and play an important role in addressing the conditions of future climate change. Reuse projects represent one of the most cost-effective approaches to meeting new water needs throughout the United States; WESTCAS would be pleased to work with Committee Members and their staffs on funding strategies to reduce the Bureau's Title 16 backlog.

Legislation for greater research and technology development that promotes additional water reuse is also needed. In addition, we urge a federal agency education program aimed towards community acceptance of water reuse -in partnership with the local project developer-along the lines of the need for, and the benefits of, this technology. Especially in the arid West, recycling and reuse of finite water supplies is undoubtedly one of the major elements of adaptive management strategies in the

face of the impacts of long-term drought and climate change and the burgeoning population growth.

We know the U.S. Army Corps of Engineers is not under the jurisdiction of your Committee. However, the recently passed and enacted Water Resources Development Act (WRDA) for the Corps provides a model that should be considered on a national scale for water resource planning at the state level—the unstated purpose inherent in the proposed language of S. 2156. A recent report that we are familiar with indicated that, in the West, ten states have developed State Water Plans, three rely on annual reports, and four rely on so-called strategic plans for their water resources planning. The WRDA legislation, which WESTCAS supported, authorizes Statewide Comprehensive Water Planning for Oklahoma in Section 5119 of the Act, a section that should be applied nationwide. What is most important is the authorized technical assistance. This provides for the Secretary of the Army to assist in: 1) acquisition of hydrologic data, groundwater characterization, database development, and data distribution; 2) expansion of surface water and groundwater monitoring networks; 3) assessment of existing water resources; 4) numerical analysis and modeling necessary to provide an integrated understanding of water resources and water management options; 5) participation in state planning forums and planning groups; 6) coordination of federal water management planning efforts; and 7) technical review of data, models, planning scenarios, and water plans developed by states. There is \$6.5 million authorized at a twenty-five percent cost-share. We see this approach as the future, and it should be applied nation-wide.

The Texas members of WESTCAS have undertaken in their state, along with others throughout state and local government, the development of a new State Water Plan. That effort will be materially aided by the tremendous water resource planning expertise of the U.S. Army Corps of Engineers and the modeling capabilities within the organization, which is second to none. The Corps' budget far exceeds the U.S. Bureau of Reclamation's, and they are nationwide in scope. We strongly encourage a more pivotal role for the U.S. Army Corps of Engineers in this new legislation, i.e. S.2156.

WESTCAS supports the proposed roles and responsibilities for the USGS in the SECURE Water Act. We have been supportive of the USGS Stream Flow Information Program, and have worked to see that it has been adequately funded as a consequence of the cooperator partnerships that many of our members have undertaken as a result of the program. The inclusion of the USGS in this effort, given their scientific credibility and expertise, will be quite beneficial (as demonstrated later in our testimony) to water resource practitioners at the state and local level who are now challenged to address the climate change issue.

We have been impressed with the modeling efforts of the USGS and we also recognize how much they have done with so small a budget allocation for that effort. The recent announcement of the Instantaneous Data Archive (IDA) website will be extremely valuable for local and state water planners and the engineering community involved in hydrologic analysis. This points to the importance of the stream-gauging program being appropriately funded over the years. In addition, the recent USGS Circular Water Budget: Foundations for Effective Water-Resources and Environmental Management will ultimately prove to be a valuable tool in helping the public and elected decision-makers formulate better policies in the water resources arena.

An area of some concern for WESTCAS is how S. 2156 will be integrated with other Climate and Energy legislation currently before Congress. There are other climate adaptation programs, provisions for national water policy commissions, provisions for other studies to take place, and studies that have been previously authorized that have yet to yield results. In addition, there are new provisions in the Farm Bill legislation before Congress that promise also to be beneficial in this field. In addition, we believe there would be value in federal water agencies providing the Committee Members and staffers with a historical overview of what has been previously funded under loans, grants and cooperative agreements over the past ten years, so that future financial resources are well-directed. In addition, there is language in current legislation for recovery efforts on the Platte River—regarding water and land—that is being considered in the definition of an in-kind contribution. We believe, in these tight budgetary times at the state and local level, that serious consideration ought to be given to this concept.

The Energy and Natural Resources Committee has jurisdiction of the Department of Energy and the National Laboratories. Several WESTCAS members in New Mexico and California have experience with National Laboratory involvement in water resource issues, such as the hydrogeologic and technical assistance work in the Española Basin in New Mexico, and perchlorate research in California. One of the issues regarding Laboratory contributions to water resource problem-solving is al-

ways the cost-of-services for such expertise, and limited access to Laboratory expertise. Although the National Laboratories have a “work for others” program, the bureaucratic requirements often impede its successful utilization. In addition, the lack of a Department of Energy (DOE) Water Program creates a barrier to Laboratory involvement in water resource initiatives due to such work being viewed in variance with current DOE missions. We would encourage the Committee to consider how to bring these talented and valuable scientific resources to the table so that state and local water resource planners and managers could more readily benefit from these institutions and their Federal funding.

The expertise the National Laboratories possess with regard to science, engineering, computational modeling, basic research, and the development of new technologies adds an important new dimension to cutting edge solutions in the national water resource arena. We feel that all the National Laboratory expertise in both the energy and national security areas (that are being addressed by this legislation) can help bring a more holistic approach to all our efforts.

Finally, we would suggest that with regard to the Water Intergovernmental Panel created under Section 7, that the Secretary of Energy and EPA Administrator be added. It is important that both power and water quality issues be integrated into the Panel’s efforts, as they are integrally linked with water quantity issues. We also appreciate the inclusion of the Secretary of Commerce through the Administrator of NOAA, especially given the work of the Climate Prediction Center in Boulder, Colorado and the National Weather Service’s efforts with the development of the National Drought Monitor.

The many members of WESTCAS thank you for considering our views. This hearing is an important first step in considering the issue of the nation’s water resources within the context of global climate change. We would encourage the Committee to engage in field hearings throughout the West to better hear from those likely to be affected and those who are challenged to prepare for the region’s changing water resources future.

We look forward to the opportunity to work with the Committee as you move forward with this legislation.

AMERICAN RIVERS,
Washington, DC, December 21, 2007.

Hon. JEFF BINGAMAN,
Chairman, Committee on Energy and Natural Resources, 304 Dirksen Senate Office Building, Washington, DC.

Hon. PETE V. DOMENICI,
Ranking Member, Committee on Energy and Natural Resources, 304 Dirksen Senate Office Building, Washington, DC.

DEAR CHAIRMAN BINGAMAN AND RANKING MEMBER DOMENICI: On behalf of more than 65,000 members and supporters of American Rivers, I want to thank you for holding a hearing on S. 2156, the SECURE Water Act. This legislation is an important first step in addressing the effects that global climate change will have on our nation’s rivers and other freshwater resources.

Healthy rivers are vital to the health, safety, and quality of life of communities across the country. Many communities already face threats to their local rivers from population growth, unsustainable land use, inefficient agricultural and urban water use, poor dam operations, and unbridled resource extraction, among other factors. Climate change will likely exacerbate the impact of these threats on communities. In light of climate change, it is imperative that we protect and maintain healthy watersheds, restore damaged rivers and floodplains, and begin to manage our water resources and existing water infrastructure more efficiently. These actions will help maintain and improve the condition of our nation’s rivers even in the face of climate change and other pressures. At the same time, they will provide more cost-effective and sustainable ways to meet the needs of communities and agriculture, including providing water for drinking, boating, fishing, irrigation, and for wildlife.

S. 2156, the SECURE Water Act, will expand our knowledge of the nation’s water supplies—especially in the western United States—so that water resources can be managed in an intelligent and efficient manner in the face of global warming. Wisely, the SECURE Water Act does not hold out new surface storage as the primary tool for meeting future water needs, instead including it as one tool among many. This is the right approach, as building new surface storage projects can be prohibitively expensive, is often environmentally damaging, and may be less effective than alternatives.

As the Committee further refines the provisions of the bill relating to water management tools, we urge consideration and incorporation of the following water supply principles throughout the bill.

- 1) Demand for water should be addressed using the most cost-effective tools that maximize environmental benefit, minimize environmental harm, and can be readily adapted to meet changing circumstances;
- 2) The full range of credible alternatives for meeting demonstrated water demand should be evaluated;
- 3) An accurate assessment of current and future water supply tools (including demand-side management such as conservation) and future water demand should precede any commitment to build a water supply project;
- 4) Beneficiaries of water supply projects should pay project costs; and
- 5) Public involvement should be a priority during each stage of evaluating a new water supply project.

In addition to offering these general principles, we urge the Committee to make several changes to the text of the bill to help better realize its purpose of improving water management. The following recommendations are offered to ensure that future water and dam management strategies are cost-effective, enjoy widespread support, and result in minimal harm and maximum benefit for rivers, river ecosystems, and communities that depend on healthy rivers.

Where possible, we propose specific changes to the bill's language. In other places, we flag questions or concerns we have with the existing language. We look forward to continuing discussions with the Committee on how best to craft the bill to ensure that it results in sound management and stewardship of our freshwater resources and ecosystems.

RECOMMENDED CHANGES

Section 2. Findings

Sec. 2(6)(b)(ii)-This section is unclear as to the definition of "reclaimed." This section could be struck; the previous section (Sec. 2(6)(b)(i) on efficient management and use of water resources adequately describes why the information developed by the SECURE Water Act will be helpful.

Section 4. Climate Change Adaptation Program.

Sec. 4(b)(3)(C)-change to "recreation upstream and downstream of reclamation facilities"

Sec. 4(b)(3)(G)-add subsection "environmental flow needs of freshwater ecosystems."

Sec. 4(b)(4)-While consultation with "non-Federal participants" is appropriate, that consultation should always include states and affected tribes in order to ensure broad public support. As such, we recommend revising this language to read "in consultation with states, affected tribes, and other appropriate non-Federal participants..." This broad consultation requirement may be unnecessary for lower impact, less costly projects such as habitat restoration, but since this subsection lumps together evaluation of potentially small scale projects such as restoration or conservation with large projects such as new surface storage, broad consultation is necessary. Alternatively, this subsection could separate large and small projects and subject them to different levels of consultation and scrutiny.

Sec. 4 (b)(4)(C)-change to "water conservation and efficiency, including demand reduction strategies."

Sec. 4(b)(4)(E)—Add subsections (F) "water markets" and (G) "enforcement of state water laws."

Sec. 4(c)(3)-Strike "and implemented." Implementation of these strategies is premature at best until the feasibility study process described in Section 4(d) is complete.

Sec. 4 (d)(1)-The relationship of the "feasibility studies" in this section to the National Environmental Policy Act and Bureau of Reclamation Feasibility Study process is unclear. This language should be clarified to make its relationship to existing law clearer—perhaps the term "feasibility studies" could be changed to "pre-feasibility" studies in order to avoid confusion with existing law.

In addition, the Committee should ensure that projects with a significant environmental impact are subjected to cost-effectiveness/cost-benefit and alternatives analyses. It is important to avoid institutionalizing the assumption that the construction of major new infrastructure, such as a water storage dam, is the only way to meet an identified water need. In addition, this section should require the non-Federal participant to conduct the study in cooperation with affected state and tribal governments—otherwise, there will be a higher risk that federal resources will be spent

studying and possibly constructing unnecessary, environmentally harmful projects backed by narrow interests. We look forward to further discussions with the Committee to refine the language in Sec. 4(d)(1).

Sec. 5. Water Management Improvement

This section does not include a vetting process for the project applications it will solicit, and grants may be given to eligible applicants with no evidence that the project is a feasible, environmentally sound, or cost-effective way to deal with water resource challenges from climate change or that the project has broad support. We suggest that this entire section be deleted unless it is tied to the climate change adaptation program in Section 4 including analyses of alternatives and cost-effectiveness, assuming the above concerns are addressed. In addition, should this section remain in place, states and any affected tribes should be required to partner in applying for a grant with non-sovereign "eligible applicants" in order to ensure the projects have broad public support and provide public benefit.

Section 6. Hydroelectric Power Assessment We recommend that a subsection be added to Section 6 requiring a report be conducted on how climate change is expected to not only affect hydrology, but also ecologically healthy flows and fish and wildlife. The language, which could be appropriately plugged into existing subsection 6(c) as a new subsection 6(c)(1)(C):

(i) how the Bureau of Reclamation and Power Marketing Agencies expect to ensure the provision of "ecologically healthy flows" in light of climate change, including:

I. how flood control rule curves could be safely altered to help meet ecologically healthy flows; and

II. how any increase in flood risk from new flood control rule curves could be addressed by changing land use in floodplains downstream of dams

(ii) Identifying, in consultation with the U.S. Fish and Wildlife Service and NOAA Fisheries, constraints or limitations on hydropower operations at Bureau of Reclamation projects necessary to protect resident and diadromous fish and wildlife, including species listed under the Endangered Species Act or managed pursuant to tribal or international treaties.

Sec. 6(a) should be changed to read "...with respect to water supplies that are required for the generation of hydroelectric power and for the provision of ecologically healthy river flows at each Federal water project..."

Section 8. Water Data Enhancement by United States Geological Survey

Sec. 8(a)(4). We recommend that the number of sites measured under the national streamflow information program be increased sooner than the 10 years specified.

Section 9. Water Use and Availability Assessment Program

Sec. 9(d)(1) Add new subsection (we suggest a new subsection 9(d)(1)(C), moving the other subsections around accordingly)-"to determine the proportion of streams in the United States that have ecologically healthy flows"

All of us at American Rivers applaud the Committee for addressing this issue and for the opportunity to provide written testimony for the record. For our communities to continue to enjoy healthy rivers and the many health, economic, and quality of life benefits they provide, we must help ensure that rivers are protected and well-managed in the face of climate change and growing populations. We look forward to working with the committee on S. 2156 to identify and implement sustainable and cost-effective policies to protect our nation's water resources.

Sincerely,

RANDALL D. SNODGRASS,
Vice President, Government Affairs & Outreach.

ENVIRONMENTAL WORKING GROUP,
Washington, DC, December 11, 2007.

DEAR SENATOR: In preparation for your hearing on the Science and Engineering to Comprehensively Understand and Responsibly Enhance Water Act (SECURE Water Act, S. 2156), the Environmental Working Group would like to provide you with some critical information on water subsidies to inform your decisions on water management for multiple uses. EWG urges you to ensure that federal subsidies are distributed to those truly in need of the funds and that the benefits of these programs flow to the public at large and not into the pockets of a few large farmers in the Westlands Water District and other large irrigation districts in the Central Valley Project.

EWG has extensive expertise in analyzing and tracking water issues as they impact the West, with a particular focus on the largest taxpayer-funded federal irrigation system in the country, the Central Valley Project (CVP), and the Westlands Water District, in California. At a time when western water is scarce and expensive, taxpayers are subsidizing, at well over \$500 million a year, a project that has led to a host of problems, including: inefficient use of water; devastation of fish and wildlife habitat; severe toxic pollution and the subsidization of artificially cheap irrigation water for large agribusiness operations at the expense of local communities.

EWG's analyses of the Central Valley Project found:

- Subsidies are distributed unfairly and are not benefiting small family farms. In 2002, the largest 10 percent of the farms got 67 percent of the water, for an average subsidy worth up to \$349,000 each. Twenty-seven large farms received subsidies each worth \$1 million or more at market rates, compared to a median subsidy for all recipients of \$7,076.¹
- Thousands of agribusinesses are double-and triple-dipping from U.S. taxpayers' pockets. Agribusinesses receive water to grow surplus crops that the government subsidizes a second time with price supports. In 2002, almost one in five CVP farms received water subsidies worth an estimated \$121.5 million and crop subsidy checks totaling another \$122.3 million. Some operations are triple dippers, receiving water subsidies to grow corn, for which they receive crop subsidies, then feeding the corn to cattle, who produce dairy products that are also subsidized.
- The rock-bottom rate the CVP charges agribusinesses for the power needed to move water through the system amounts to an energy subsidy worth more than \$100 million a year, at the same time that a volatile energy market has caused brownouts in the state's major cities and spurred a push to build new power plants.²
- Massive water rerouting and pumping has severely impacted area fish populations, bringing the fragile ecosystem of the San Francisco Bay-San Joaquin Delta to the point of collapse. Billions of dollars have already been spent trying to repair ecosystem damage.²
- Recipients of federally subsidized water often sell their excess water to the state for environmental restoration, or to local utilities at rates well above what they opaid for the water.
- Despite these economic, ecological, and equity concerns, the federal government is poised to increase the amount of taxpayer-subsidized irrigation water by 43 percent over the next 25 years, well beyond what the state's infrastructure can reliably supply, leading to pressure to build expensive new dams and reservoirs, which in turn cause further environmental damage.

In fashioning future water proposals, EWG urges Congress to:

- Encourage water and power conservation and fairness by ensuring contracts are based on prices closer to their actual market price.
- Ensure that recipients of taxpayer-subsidized water are not allowed to profit from resetting their unneeded water back to governments or private utilities at elevated prices.
- Prohibit double-and triple-dipping of subsidies for crops, energy and water.

We hope that you will find this information useful and look forward to working with you on developing water policies that protect our water and our communities. Thank you for your attention to this issue.

Sincerely,

BILL WALKER,
Vice President / West Coast Office.

¹ Environmental Working Group. 2004. California Water Subsidies. 15 Dec 2004. Available online at: <http://archive.ewg.org/reports/Watersubsidies/>.

² Environmental Working Group. 2007. Power Drain. 29 May 2007. Available online at: <http://www.ewg.org/reports/powersubsidies>.

METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA,
EXECUTIVE OFFICE,
Los Angeles, CA, December 6, 2007.

Hon. JEFFREY BINGAMAN,
*Chairman, Senate Committee on Energy and Natural Resources, SD-304 Dirksen
Senate Office Building, Washington, DC.*

DEAR CHAIRMAN BINGAMAN: I want to take this opportunity to thank you for including the Metropolitan Water District of Southern California as part of your Legislative Hearing next week on S. 2156. Although prior commitments in California prevent me from delivering MWD's testimony in person, I am pleased to inform you that Jon Lambeck, Metropolitan's Systems Operations Manager, will be presenting testimony on our behalf.

Again, Metropolitan's Board and management greatly appreciates your leadership in moving forward with this important legislation and we look forward to providing you and your staff with any comments and/or resources that you may find useful in this regard.

Sincerely,

JEFFREY KIGHTLINGER,
General Manager.

NATIONAL WATER RESOURCES ASSOCIATION,
Los Angeles, CA, December 11, 2007.

Hon. JEFF BINGAMAN,
*Chairman, Energy and Natural Resources Committee, United States Senate, Wash-
ington, DC.*

DEAR MR. CHAIRMAN: On behalf of the membership of the National Water Resources Association, I am writing to express our strong support for 5.2156, the SECURE Water Act.

NWRA represents water and power users throughout the Western United States. We applaud your new initiative and look forward to working with you and the Committee to perfect this important legislation. In that regard, a regionally diverse task force of our members has reviewed S.2156 and provides the following recommendations for your consideration:

1. Recognizing that this is an authorization bill and that the Committee cannot obligate the Appropriations Committee, we are concerned that expenditures under this authorization not adversely impact annual appropriations for operations and maintenance, projects and other Bureau of Reclamation programs.

2. Integration of potential impacts of climate change into supply scenarios is now a major feature of most Western water districts long-term local and regional planning. We would recommend that climate change be added to the findings section of the bill.

3. In the next decade, we believe, that one of the most critical problems facing the Bureau of Reclamation and many water districts throughout the West is maintaining the existing water and power infrastructure at peak operational efficiency. Currently, the Bureau of Reclamation does not have a program which enables water users to modernize or rehabilitate their projects and payoff those costs over time under reasonable terms and conditions. The water supply and power infrastructure build over the last century by the Bureau of Reclamation remains vitally important to the West and the nation as a whole. We would recommend that new and innovative federally-enhanced financing tools be established under S. 2156 to address this critical need.

4. In light of the potential impacts of climate change and unprecedented population growth in the West, we would recommend that the Bureau of Reclamation not only "ensure the continued existence of sufficient quantities of water", but also be directed to enhance water supplies in order to meet these challenges.

5. With regard to assessing the status of surface water and groundwater resources in the United States, we believe it is important to recognize the important work some states have already accomplished. While some provisions in the bill only require "consultation and coordination" with state and local water resource agencies, we would recommend a stronger relationship between the states and the federal agencies through direct partnerships be promoted in the bill.

6. The bill currently recognizes the importance of input from water users and many other constituents; we would suggest the inclusion of input from power marketing authority customers and their associations.

Again, NWRA strongly supports 5.2156 and stands ready to assist the Committee in any manner it deems appropriate. We deeply appreciate the opportunity to submit our recommendations and hope that the Committee finds them helpful.

Respectfully submitted,

THOMAS F. DONNELLY,
Executive Vice President.

WESTERN STATES WATER COUNCIL,
Midvale, UT, November 20, 2007.

Hon. ROBERT C. BYRD,
Chairman, Senate Appropriations Committee, United States Senate, The Capitol, Room S-131, Washington, DC.

DEAR CHAIRMAN BYRD: On behalf of the Western States Water Council, representing the governors of eighteen western states, I am writing to again reiterate and express our strong support for maintaining a thermal infrared (TIR) instrument on Landsat 8, as part of NASA's Landsat Data Continuity Mission (LDCM). Attached is a previous letter from the Western Governors' Association that also supports funding.

NASA's recent LDCM "Request for Offer" to build the Landsat 8 spacecraft (under the existing Rapid II contract) does not preclude the addition of a thermal instrument. The selected contractor will design, build, qualify the spacecraft and integrate the Government-furnished instruments. However, NASA has not requested or otherwise found funding to build the TIR instrument. It is estimated that a total of about \$90 million is needed for the TIR instrument, including \$35 million now.

The Senate Appropriations Committee has directed that NASA report as to how it intends to continue providing TIR data in the future, and eight Senator recently wrote the Administrator asking that NASA take immediate action to ensure this capability is not lost. A copy of that letter is attached.

Given this congressional interest, NASA has left open the possibility for a TIR instrument to minimize the impact to LDCM development of adding the instrument to the satellite at a late stage in its development. While the instrument is included in the "preliminary design," without additional funding, Landsat 8 will be deployed without it. Adding TIR may delay deployment by an estimated eight months. However, losing this capability would seriously degrade our future ability to measure, monitor and manage our increasingly scarce water resources, particularly during shortages, such as drought. It would also compromise our ability to observe changing evapotranspiration rates over large areas, due to increasing climate variability, at a scale useful to many decision-makers that will need to prepare and implement appropriate adaptation strategies.

We would respectfully request that you support a specific provision in any CJS appropriation bill, any continuing resolution, or any supplemental FY 2008 appropriation to begin work immediately on a TIR instrument. Further, this should be a vital element in the FY 2009 CJS appropriations bill. Again, we urge you to take whatever steps are necessary to insure that our 25-year investment in Landsat thermal data is preserved and this increasingly valuable tool is not lost.

Sincerely,

DUANE A. SMITH,
Chairman.

September 10, 2007.

Hon. DIRK KEMPTHORNE,
Secretary of the Interior, U.S. Department of the Interior, 1849 C Street, NW., Washington, DC.

Hon. JAMES A. NUSSLE,
Director, Office of Management & Budget, Eisenhower Executive Building, Washington, DC.

Regarding: STREAMGAGE SUPPORT IN FY-2009

DEAR SECRETARY KEMPTHORNE AND DIRECTOR NUSSLE: The undersigned organizations support the US Geological Survey's Cooperative Water Program (CWP) and National Streamflow Information Program (NSIP) and urge your support for full im-

plementation of the NSIP beginning in FY-2009 and for stronger funding of the CWP at approximately \$70 million. Full implementation of the NSIP would require \$110 million in FY-2009, substantially more than the \$16.2 million appropriated in FY-2007.

Our members rely extensively on the trustworthy data and science that these two programs produce and many are active, financial partners (“Cooperators”) in the Cooperative Water Program. Nationwide, our need for a well-informed understanding of streamflow, groundwater, tidal surge, precipitation and other water resource attributes continues to increase as a function of our growing population, economy, land uses and ecological awareness.

The NSIP and CWP have proven to be a source for reliable, scientific information concerning America’s water resources, information that is required by decision makers in both the public and private sectors for a wide variety of planning, design and management functions. Unfortunately, their capacity has not kept up with America’s growing needs despite the strong, national cost-share partnership with over 1,400 Cooperators.

NSIP and CWP data are needed on a regular basis by many federal, state, tribal, and local government agencies, and by many businesses, landowners, public interest organizations and individuals for many essential decisions, including the:

- monitoring compliance with federal treaty, compact and Native American trust responsibilities;
- designing of bridges, dams and other infrastructure;
- forecasting of storm surge, flood and drought conditions and issuing emergency advisories;
- identifying flood-prone areas to protect lives and property and reduce disaster relief expenses;
- administration of water rights and management of hydropower generation, environmental and navigation releases from reservoirs;
- monitoring and protecting water quality, fisheries, wetlands and endangered species;
- providing for public recreation safety;
- analysis of climate change; and
- projecting future water needs and availability for agricultural, municipal, and industrial uses.

The NSIP and CWP inform and guide vital programs and diverse interests in all 50 states, but they do not have the capacity to support future water resource and infrastructure decisions necessary to keep our communities and businesses safe and prosperous. Since 2001, when the NSIP was authorized by Congress, the USGS streamgaging network has depended for more than 80% of its operation and maintenance on funds appropriated for the CWP, which has a distinct and highly valuable role to serve.

The CWP has served us well for more than 110 years as a federal/non-federal partnership funded through 50/50 cost-share agreements. Today, however, less than one-third of the cost is borne by the USGS because of the need to sustain the NSIP. From the combined network of about 7,400 streamgages nationwide, more than 775 have been “discontinued” in the last 10 years due to inadequate funding; many of them had over 30 years of continuous record, which gives their loss even greater significance. More than 175 streamgages were discontinued between 2004 and 2005 and another 174 gages in 24 states are currently identified as being at risk or recently discontinued.

Concern for the long-term continuity and reliability of our national streamgaging data led the USGS to propose the NSIP in 1999. Unlike the CWP, the NSIP was designed as a federally funded “backbone,” supporting a national communications framework and the subset of approximately 4,770 streamgages and tidal gages necessary to meet five specific national purposes. The National Research Council’s Committee on Water Resources Research evaluated the NSIP design in 2004 and concluded that it will provide “a sound, well-conceived program that meets the nation’s needs for streamflow measurement, interpretation, and information delivery.” However, of the 4,770 streamgages needed to meet the specified national goals, at least 425 have never been installed, more than 970 need to be reactivated and approximately 2,550 are funded (wholly or partially) with CWP funds; most of them need to be “flood hardened” and updated with real-time communications equipment in order to provide reliable flow forecast data.

With severe flooding and drought recently causing loss of life and property affecting so many states, including Alabama, Arizona, Arkansas, California, Colorado, Florida, Georgia, Kansas, Indiana, Louisiana, Minnesota, Mississippi, Missouri, Nebraska, Nevada, North Dakota, New Mexico, Ohio, Oklahoma, South Dakota, Ten-

nessee, Texas, Wisconsin and Wyoming, reliable science to support sustainable water resource management has never been more important.

As the NSIP is fully implemented, funding for the CWP streamgages and investigations at \$70 million (about 10% more than FY-2007) will be necessary to reverse the decade of erosion that deficient federal support has caused and to restore the planning, water rights administration, project operation and flow forecasting capabilities that so many people, businesses and agencies depend upon nationwide. Federal support has been far less than the \$138 million contributed annually by Co-operators since FY-2004 and cutting funds from the CWP budget to enhance the NSIP has not helped.

The Interior Department and USGS should commit themselves to full implementation of the NSIP plan as soon as possible and we urge you to seek an appropriation of \$110 million in FY-2009 for that purpose. This represents an appropriate increase, considering the magnitude of our ongoing disaster emergency expenses and the federal responsibilities and programs that depend on information from the NSIP streamgages. Full funding for the NSIP would reverse the loss of long-term streamgages and provide essential information needed to assess water quality and climate change, forecast floods (including storm surge) and droughts and provide emergency warnings, manage interstate water supplies and monitor compliance with federal treaty, compact and Native American trust responsibilities.

We urge you and the Administration to give a higher priority to these vital programs until they are both fully implemented and the cost-share agreements are fully matched.

Sincerely,

Pamela S. Dillon, *Executive Director, American Canoe Association*; Antonius Laenen, *President, American Institute of Hydrology*; Rebecca R. Wodder, *President, American Rivers*; W. F. Marcuson III, Ph.D., P.E., *President, American Society of Civil Engineers*; Gerald Galloway, *President, American Water Resources Association*; Tom Curtis, *Deputy Executive Director, American Water Works Association*; Mark Singleton, *Executive Director, American Whitewater*; Kenneth D. Kimball, *Director of Research, Appalachian Mountain Club*; Chako John, *President, Association of American State Geologists*; Lori Spragens, *Executive Director, Association of State Dam Safety Officials*; Al Goodman, *President, Association of State Floodplain Managers*; Linda Eichmiller, *Executive Director, Association of State & Interstate Water Pollution Control Administrators*; Katherine Andrews, *Executive Director, Coastal States Organization*; James H. Steele Jr, *Tribal Council Chairman, Confederated Salish & Kootenai Tribes*; Carol R. Collier, *Executive Director, Delaware River Basin Commission*; Mary E. Kelly, Sr. *Attorney, Co-Director, Land, Water and Wildlife Program Environmental Defense*; R. P. VanGytenbeek, *CEO, Federation of Flyfishers*; Tim A. Eder, *Executive Director, Great Lakes Commission*; Roger L. Gauthier, *Interim Executive Director, Great Lakes Observing System*; John Seebach, *Chair, Hydropower Reform Coalition*; Hal Beecher, *President, Instream Flow Council*; Sue Lowry, *Chair, Interstate Council on Water Policy*; Deborah Hamlin, *Executive Director, Irrigation Association*; Derek Guthrie, *President, National Association of Flood and Stormwater Management Agencies*; John M Johnson, *Executive Director, National Association of State Boating Law Administrators*; Joe Garcia, *President, National Congress of American Indians*; John Duchouquette, *President, National Flood Determination Association*; Thomas F. Donnelly, *Executive Vice President, National Water Resources Association*; David R. Conrad, Sr. *Water Resource Specialist, National Wildlife Federation*; Larry M. Feazell, *Executive Director, Ohio River Basin Commission*; Mathew E. Menashes, *Executive Director, Paddlesports Industry Association*; Don Eider, *President/CEO, River Network*; Paul O. Swartz, *Executive Director, Susquehanna River Basin Commission*; Ann Yakimovicz, *President, Texas Floodplain Management Association*; Brian Richter, *Co-Leader, Global Freshwater Team, The Nature Conservancy*; Chris Wood, *Vice President for Conservation, Trout Unlimited*; Holly Stoerker, *Executive Director, Upper Mississippi River Basin Association*; Mohamed F. Dahab, *President, Water Environment Federation*; Duane Smith, *Chairman, Western States Water Council*.

October 16, 2007.

Hon. DIRK KEMPTHORNE,
Secretary of the Interior, U.S. Department of the Interior, 1849 C Street, NW., Wash-
ington, DC.

Regarding: STREAMGAGE SUPPORT IN FY-2009

DEAR SECRETARY KEMPTHORNE: The undersigned officials support the US Geological Survey's Cooperative Water Program (CWP) and National Stream flow Information Program (NSIP) and urge your support for full implementation of the NSIP beginning in FY-2009 and for stronger funding of the CWP at approximately \$70 million. Full implementation of the NSIP would require \$110 million in FY-2009, substantially more than the \$16.2 million appropriated in FY-2007.

Our agencies rely extensively on the trustworthy data and science that these two programs produce and most are active, financial partners ("Cooperators") in the Cooperative Water Program. Nationwide, our need for a well-informed understanding of streamflow, groundwater, precipitation and other water resource attributes continues to increase as a function of our growing population, economy, land uses and ecological awareness.

The NSIP and CWP have proven to be a source for reliable, scientific information concerning America's water resources, information that is required by decision makers in both the public and private sectors for a wide variety of planning, design and management functions. Unfortunately, their capacity has not kept up with America's growing needs despite the strong, national cost-share partnership with over 1,400 Cooperators.

NSIP and CWP data are needed on a regular basis by our agencies and other state, tribal, local and federal government agencies, and by many businesses, landowners, public interest organizations and individuals for many essential decisions, including the:

- monitoring compliance with interstate treaty, compact and Native American trust responsibilities;
- designing of bridges, darns and other infrastructure;
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- identifying flood-prone areas to protect lives and property and reduce disaster relief expenses;
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- monitoring and protecting water quality, fisheries, wetlands and endangered species;
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- analysis of climate change; and
- projecting future water needs and availability for agricultural, municipal, and industrial uses.

The NSIP and CWP inform and guide vital programs and diverse interests in all 50 states, but they do not have the capacity to support future water resource and infrastructure decisions necessary to keep our communities and businesses safe and prosperous. Since 2001, when the NSIP was authorized by Congress, the USGS streamgaging network has depended for more than 80% of its operation and maintenance on funds appropriated for the CWP, which has a distinct and highly valuable role to serve.

The CWP has served us well for more than 10 years as a federal/non-federal partnership funded through 50/50 cost-share agreements. Today, however, less than one-third of the cost is borne by the USGS because of the need to sustain the NSIP. From the combined network of about 7,400 streamgages nationwide, more than 775 have been "discontinued" in the last 10 years due to inadequate funding; many of them had over 30 years of continuous record, which gives their loss even greater significance. More than 175 streamgages were discontinued between 2004 and 2005 and another 174 gages in 24 states are currently identified as being at risk or recently discontinued.

Concern for the long-term continuity and reliability of our national streamgaging data led the USGS to propose the NSIP in 1999. Unlike the CWP, the NSIP was designed as a federally funded "backbone," supporting a national communications framework and the subset of approximately 4,770 streamgages and tidal gages necessary to meet five specific national purposes. The National Research Council's Committee on Water Resources Research evaluated the NSIP design in 2004 and concluded that it will provide "a sound, well-conceived program that meets the nation's needs for streamflow measurement, interpretation, and information delivery."

However, of the 4,770 streamgages needed to meet the specified national goals, at least 425 have never been installed, more than 970 need to be reactivated and approximately 2,550 are funded (wholly or partially) with CWP funds; most of them need to be "flood hardened" and updated with real-time communications equipment in order to provide reliable flow forecast data.

Water rights administration, flood protection, infrastructure design, water quality protection, fisheries and wetlands conservation and recreation are vital concerns in every state. With severe flooding and drought recently causing loss of life and property affecting so many states, including Alabama, Arizona, Arkansas, California, Colorado, Florida, Georgia, Indiana, Kansas, Louisiana, Minnesota, Mississippi, Missouri, Nebraska, Nevada, North Dakota, New Mexico, Ohio, Oklahoma, South Dakota, Tennessee, Texas, Wisconsin and Wyoming, reliable science to support sustainable water resource management has never been more important.

As the NSIP is fully implemented, funding for the CWP streamgages and investigations at \$70 million (about 10% more than FY-2007) will be necessary to reverse the decade of erosion that deficient federal support has caused and to restore the planning, water rights administration, project operation and flow forecasting capabilities that so many people, businesses and agencies depend upon nationwide. Federal support has been far less than the \$138 million contributed annually by CWP Cooperators since FY-2004 and cutting funds from the CWP budget to enhance the NSIP has not helped.

The Interior Department and USGS should commit themselves to full implementation of the NSIP plan as soon as possible and we urge you to seek an appropriation of 6110 million in FY-2009 for that purpose. This represents an appropriate increase, considering the magnitude of our ongoing disaster emergency expenses and the federal responsibilities and programs that depend on information from the NSIP streamgages. Full funding for the NSIP would reverse the loss of long-term streamgages and provide essential information needed to assess water quality and climate change, forecast floods and droughts and provide emergency warnings, manage interstate water supplies and monitor compliance with federal treaty, compact and Native American trust responsibilities.

We urge you and the Administration to give a higher priority to these vital programs until they are both fully implemented and the cost-share agreements are fully matched.

Sincerely,

For WYOMING, John Corra, *Director, Dept of Environmental Quality*; Patrick T. Tyrrell, *State Engineer*; Michael K. Purcell, *Director, Water Development Commission*.

For WISCONSIN, Todd L. Ambs, *Water Division Administrator, Department of Natural Resources*.

For WASHINGTON, Jay J. Manning, *Director, Department of Ecology*.

For UTAH, Dennis J. Strong, *Director, Division of Water Resources*; Jerry Olds, *State Engineer*.

For TEXAS, E.G. Rod Pittman, *Chairman, Water Development Board*; Glenn Shankle, *Executive Director, Commission on Environmental Quality*.

For OKLAHOMA, Duane Smith, *Director, Water Resources Board*.

For NORTH DAKOTA, Dale L. Frink, *State Engineer*.

For NORTH CAROLINA, John N. Morris, *Director, Division of Water Resources*.

For NEW MEXICO, John R. D'Antonio, Jr., P.E., *State Engineer*.

For NEBRASKA, Ann Salomon Bleed, *Director, Department of Natural Resources*.

For MISSOURI, Michael D. Wells, *Deputy Director, Dept of Natural Resources*.

For KANSAS, Tracey Streeter, *Director, Kansas Water Office*; Adrian Polansky, *Secretary of Agriculture*; David Barfield, *Acting Chief Engineer*.

For IOWA, Wayne Gieselman, *Administrator, Environmental Services Division, Dept of Natural Resources*.

For ILLINOIS, Gary R. Clark, P.E., *Director, DNR Office of Water Resources*.

For IDAHO, Hal Anderson, *Administrator, Department of Water Resources*.

For COLORADO, Dan McAuliffe, *Acting, Director, Water Conservation Board*; Steve Gunderson, *Director, Water Quality Control Division*; Kenneth W. Knox, *Acting State Engineer*.

For ARKANSAS, J. Randy Young, P.E., *Executive Director, Natural Resources Commission.*
For ARIZONA, Stephen A. Owens, *Director, Department of Environmental Quality.*

ASSOCIATION OF CALIFORNIA WATER AGENCIES,
Sacramento, CA, December 7, 2007.

Hon. JEFF BINGAMAN,
703 Hart Senate Office Building, Washington, DC.
RE: ACWA Support for S. 2156

DEAR SENATOR BINGAMAN: The Association of California Water Agencies (ACWA) is please to write in support of your Secure Water Act, S.2156. ACWA's 447 public agency members are collectively responsible for 90 percent of the water delivered in our state for residential and agricultural purposes.

ACWA is concerned about the potential impact of climate change on our nation's water supply. Increases in average annual temperatures could have a significant impact on California's water resources and ACWA's blueprint, "No Time To Waste", highlights this issue.

California's mountain snowpack serves as a natural reservoir that is fundamental to our water supply, but is also particularly sensitive to climate variability and change. Predictions by the California's Department of Water Resources and others indicate climate change will likely result in a significant reduction in the Sierra Nevada snow pack. Less snowpack means less natural water storage. Since much of the state is highly dependent on existing reservoir storage and snowpack for water supply and flood management, this trend would strain our complex and already stressed water management system.

The SECURE Water Act will finally enable the Bureau of Reclamation and other federal agencies including the U.S. Geological Survey and the U.S. Army Corps of Engineers to better determine how climate change scenarios will affect Bureau projects and identify ways the projects can be operated and augmented to adapt to future challenges. It will also help States and local governments develop long term plans to assess their future water needs. Additionally, the bill strengthens the USGS National Streamflow Information Program so that water managers will have more information on which to base future decisions.

ACWA is pleased to support this legislation and would like to thank you for your leadership on this issue.

Sincerely,

DAVID REYNOLDS,
Director of Federal Relations.

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