Sustainable Water Resources Roundtable

Meeting at National Wind Technology Center
Louisville, Colorado, May 22/23 2007

Proceedings (6/29/07)

Participating in the meeting were:

Tom Acker, Northern Arizona University
Bob Anderson, Bob Anderson Consulting
Douglas Arent, NREL
David Berry, SWRR
Curt Brown, Director of Research, USBR
Roger Claff, American Petroleum Institute,
R. Nolan Clark, Director, USDA ARS
Kelly Elder, USFS Rocky Mtn Research Ctr.
Larry Flowers, NREL
Mark Glauth, NAU
Robert Goldstein, EPRI
Bill Hogrewe, RCAP
Sheldon Jones, Co. Dept. of Agriculture
Jim Kinney, Water & Env't Resources, USBR,
Rhonda Kranz, Kranz Consulting
Ronald Lehr, American Wind Energy Assoc.
Ralph Marra, City of Tucson Water Dept.
Shaun P. McKinney, NRCS, USDA
Bart Miller, Western Resource Advocates
E. John Sadler, USDA-ARS
Brennan Smith, Oak Ridge National Lab
Deanna Stouder. USDA, Forest Service
Andy Swift, Texas Tech University
Roger Taylor, NREL
Stacy Tellinghuisen, Bren School, UCSB
Janice Ward, Office of Water Quality, USGS
John Wells, MN Environmental Quality Board
Bob Wilkinson, Bren School, UCSB
Derek Winstanley, Illinois State Water Survey
Karl Wunderlich, USBR

Day 1 Tuesday, May 22, 2007

Opening:

Larry Flowers, Team Leader at the National Wind Technology Center welcomed the participants with some background comments on NREL and NWTC.

Robert Goldstein of EPRI and co-chair of SWRR welcomed the participants and outlined SWRR's role as a subgroup to the federal Advisory Committee on Water Information and relationship to the White House Council on Environmental Quality's work on environmental indicators. He also outlined SWRR's activities over the past few years including panels at national meetings on water resources, workshops, papers published, indicators developed and sharing information on water related research. Bob invited each attendee to be a full participant in SWRR and to benefit from the collaboration.

David Berry, SWRR manager and facilitator gave a summary of the agenda and goals for the meeting.

SWRR Background   Context of SWRR in national efforts: Rhonda Kranz, Kranz Consulting

Rhonda brought the participants up to date on the work of several major national indicator projects and the relationships among them including the Heinz Center: State of the Nation's Indicators, the EPA: Report on the Environment, the other Natural Resource Roundtables:

Forests   Water   Rangelands   Minerals

and the participation of all the projects with the White House's Collaboration on Indicators on the Nation's Environment (CINE)

There are different types of indicators used for different purposes:

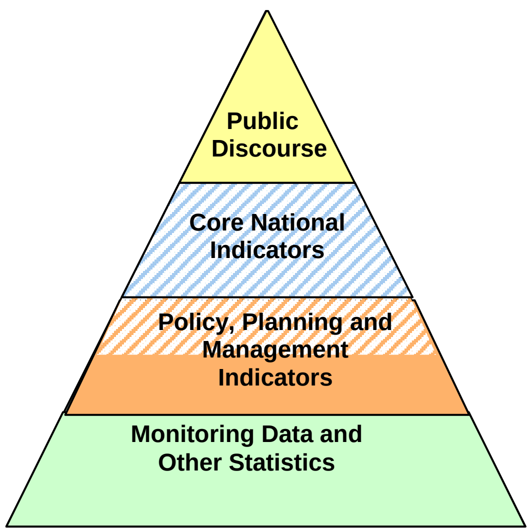
- **Core National Indicators** (e.g. SWRR, Heinz)
  - Consistent National coverage
  - Focused on the most important conditions

Examples of Possible Core National Indicators:

- Extent of various land cover types
  - Forests
  - Wetlands
- Concentrations of air pollutants
- Movement of nitrogen
- Carbon storage
- Non-native species
- Water levels and flows

- **Policy, Planning and Management Indicators** (CINE)
  - Coverage is related to policies and programs
  - Focus is on goals, objectives, causal relationships and performance

The goal of the CINE is more targeted result-focused Indicators:



CINE is

- An extension of the collaborative processes used in most indicator projects
- Focused on institutions needed to produce indicators rather than what to measure
- Supports and incorporates indicator sets from other indicator projects

The goal of CINE is to build the **capacity** for the development, regular production, and ongoing reporting of indicators, statistics, and data on the nation's environment and natural resources.   The CINE seeks development of a set of options for enduring institutional capabilities. Better institutional arrangements are needed to overcome limitations caused by the fragmentation of responsibilities for environmental monitoring and reporting.

Measuring the Sustainability of Water Management in the U.S.
John Wells, MN Environmental Quality Board

SWRR's Mission: To promote sustainability of our nation's resources through …

- Evaluation of information
- Development & use of indicators
- Targeting of research
- Engagement of people & partners

SWRR's Vision: A future in which our nation's water resources support the integrity of economic, social and ecological systems and enhance the capacity of these systems to benefit people and nature

Principles of Water Sustainability

1. *The value & limits of water*
   People need to understand the value and appreciate the limits of water resources and the risks to people and ecosystems of unbounded water and land use.
2. *Shared responsibility*
   Because water does not respect political boundaries, its management requires shared consideration of the needs of people and ecosystems up- and downstream and throughout the hydrologic cycle.
3. *Equitable access*
   Sustainability suggests fair and equitable access to water, water dependent resources and related infrastructure.
4. *Stewardship*
   Managing water to achieve sustainability challenges us while meeting today's needs to address the implications of our decisions on future generations and the ecosystems upon which they will rely.

The Framework for Indicators

- Water availability for people and the environment
  - Renewable water
  - Capacity of infrastructure
  - Water in the environment after withdrawals for human use
  - Water use sustainability

- Water quality for people and the environment
  - Quality of water for human uses
  - Quality of water in the environment
  - Water quality sustainability

- Human uses and health
  - Withdrawal and use of water
  - Human uses of water in the environment
  - Water dependant resource use
  - Human health
- Environmental health
  - Indices of biological condition
  - Amounts and quality of living resources

Rough notes from Breakouts on current state of SWRR indicators:

Breakout Group 1
Key points

- Make framework as a circle showing the inter-relationships and flows among characteristics
- BOX I Renewable Water – needs to add a future component
- Capacity of infrastructure –Adequacy of supply / delivery structure
- Add legal institutional framework
- BOX4 - Add indices of watershed and biological Condition
- Local discussion and future growth
- Risks: who, why, and what
- How well is information and data we know used on indicators, policy, etc?

Public framework

- Within categories of indicators needs examples to make it clearer
- Indicators translated into pictures
- Include a Box with economic, social, and legal factors
- Indicators need to be quantified: how much water used, how effectively, etc
- Apply within regional context: relate within political boundaries to influence policy & legal processes
- Water Availability: Different spatial and temporal scales with variability reflected
- Second major piece- water use and future water use
    - Human and Environment
    - Quality and Quantity
    - Macro scale indicators indication of current conditions and changes
    - Local planners need to know how their feed to big picture

Breakout Group 2
1) Water Availability

- What does "availability" mean? Terminology: To Bob Goldstein, it means to meet demand
- Not just what's available, but where. Is it sustainable yield of a ground water basin?
- Surface water: unimpaired waters?
- Should define availability
- Should humans and environment be together or separate?
- Should clarify what the indicators are
- Water budget there is tremendous variability- needs to be captured
- On what <u>time scale?</u>
- <u>"Renewable Water"</u> is too much jargon , as is "<u>water availability"</u>

2) Water Use

- demand (measure) for humans and environment
- Society drives all the decisions
- Do we want the economic sector to drive the social sector?
- Should split humans and environment needs even in the availability piece
- What are the indicators for each of the systems
- Sustainability depends on both quality and quantity
- Quality and quantity are a vector
- Create macro scale measures that can be translated into local management

- Per person “water foot print”
- Include direct use & indirect use (e.g. water to produce energy or agriculture.)
- Indicator: effectiveness of water use (productivity per unit can be agric productivity, eco. Production and population Supported.
- Indicator that demonstrates “system “constraints. Examples are legal constraint , regulatory constraint , water rights maybe , create an indicator that demonstrates now our social / institutional structures promote effective use of water
- Indicator : How well is water planned in an integrated sense with other resources that interact with water (e.g. Power)
- Indicator must address policy issues and must be simply captured; help develop. Policies for sustainable use of resources.
- Indicators of Cost: socio-economic piece
- 5th Indicator box : Social ability, institutional , Economic
    - Capacity to plan for sustainable use of water
    - Characteristics of water management

Indicators Breakout 3

1) Water Supply Information base measure

What does the pie chart look like?

Including variability, time scales (historic only or future too?)

-Ground water and surface water

-on different scales%

How much water is needed for ecological systems?

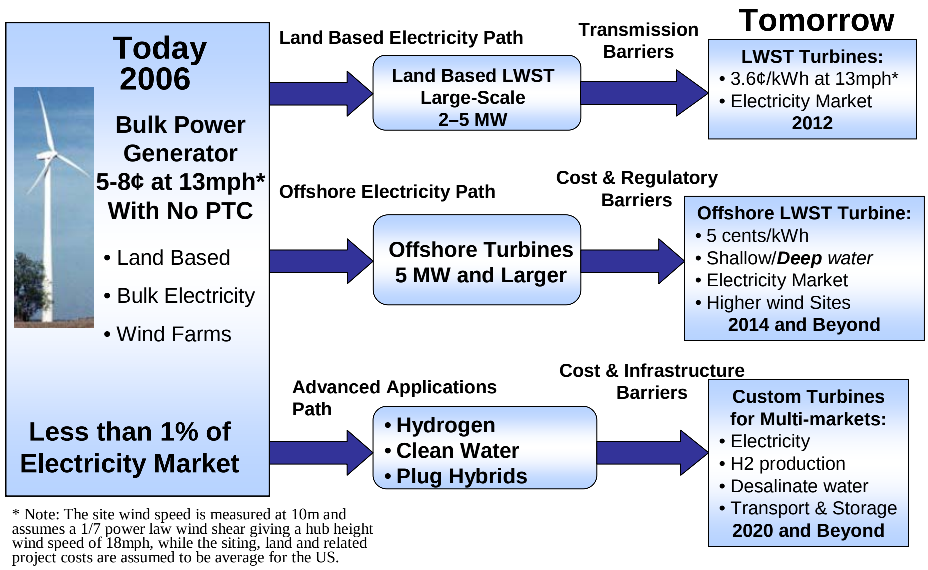
What is left for human uses?

2) Water Use

- All socially determined
- Budget between use and availability must be balanced
- Need indicators for demand, both human and environment
- Not fine scale indicators, focus on macro indicators
- Link the humans and environment in an interactive relationship
- Environmental water quantity, biodiversity, capstone species, humans:
    - What are the trends? look at future time scales
    - How do we measure sustainability?

Special Forum: Sustainable Water Resources and Energy Generation Introduction Larry Flowers, NREL

A Future Vision for Wind Energy Markets



Wind/Hydropower Integration Project, Tom Acker and Brennan Smith, Northern Arizona University

The integration of wind and hydropower resources occurs in the context of the electrical balancing area on the grid, and the market system and resources it operates in. That is one does not look at coupling wind and hydropower in isolation of all the others resources.

- Hydropower generators are fast responding and often have some built in storage capacity (keeping water in the reservoir). Thus they are effective in serving load and its variations .To the extent that introducing wind energy into a balancing area incrementally increases the availability and uncertainty that operators must deal with, hydropower is also effective in serving these variations

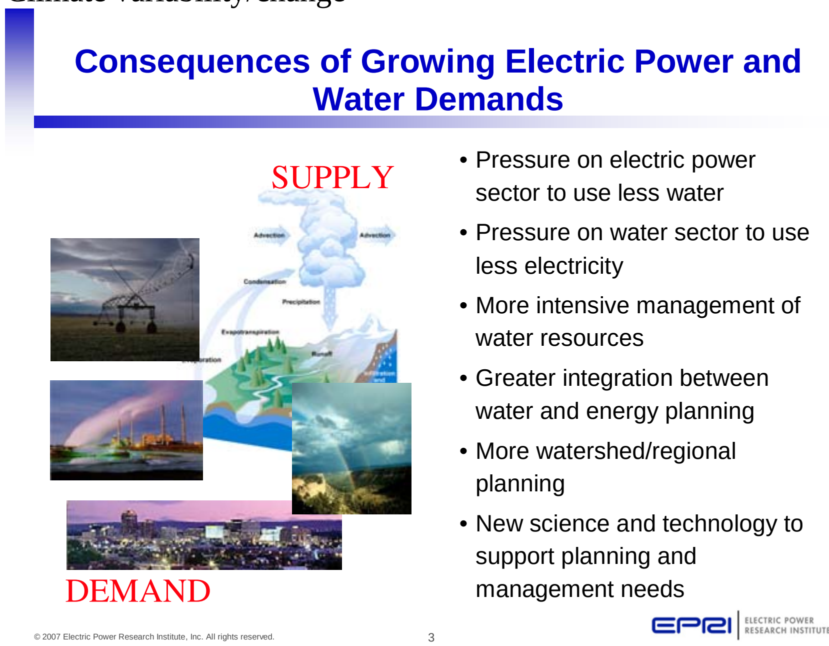
- Hydro system capacity and operational flexibility may be sufficient to address the variability introduced by a very significant amount of wind energy (Thousands of MW) into the electrical system. However, there are competing uses for this flexibility. Utilities will use their hydropower to their maximum economic benefit, within the constraints governing it use. Wind energy will compete for this use, for example versus saving water to run through the generators when the electricity lost is high

- When considering the value of integrating wind and hydropower, it is important to consider the overall value in the system, including impacts on energy security, hedge value in price volatility, carbon emissions, etc

- For above reasons , value and cost of integrating wind into hydro/ utility systems is very system-specific

Thermoelectric Power Generation and Water
Robert Goldstein, Electric Power Research Institute

- Greater demand on nation's water resources resulting from
  - Increased population
  - Increased electricity demand
  - Increased concern about aquatic ecosystem protection
  - Climate variability/change



- Strategies to increase water use efficiency and water conservation in thermoelectric power generation
  - Increase efficiency of conversion of thermal to electric energy
  - Use dry/hybrid cooling
  - Recycle water within generating facility
  - Use degraded waters
- Conclusions
  - Potential exists to increase water use efficiency and water conservation in thermoelectric generation
  - Potential and cost savings can be enhanced through research
  - Relative benefits of individual technologies and practices are site dependent
  - There is value to creating tool box of technologies and practices
  - Increased efficiency and conservation are necessary but not sufficient conditions for water resource sustainability

California's Energy Water Nexus: Water Use in Electricity Generation, Stacy Tellinghuisen, Bren School, UCSB (Stacy was introduced by Bob Wilkinson of the Bren School, UCSB who also gave a brief summary of the UC Santa Barbera Meeting on Energy and Water)

Water and energy are inextricably linked. Water is needed for energy production, and energy is needed for extraction, conveyance, treatment, and distribution of water. Water requirements for electricity generation vary significantly, depending on the energy source, conversion technologies, and cooling technologies. Therefore, to meet future demands, integrated planning between both the energy and water sectors is essential. This analysis provides a tool that supports integrated planning by quantifying water requirements for electricity generation from both renewable and non-renewable sources.

Using California as a case study, we assess the freshwater requirements for current and future electricity generation under several different energy portfolios. Our analysis demonstrates the potentially positive effects of investment in certain renewable resources such as solar photovoltaics, wind power, and waste-based bioenergy. Similarly, dry cooling technologies, if employed in thermoelectric power plants, can greatly diminish the electricity sector's impacts on freshwater resources. Conversely, increased reliance on dedicated energy crops or geothermal sources may have extraordinary impacts on freshwater resources. As existing freshwater supplies become increasingly taxed, allocations to the electricity sector may become limited. Consequently, policies that encourage resource conservation and integrated planning will be imperative.

Municipalities, the Wind/Water Connection:
Bart Miller, Director, Western Resource Advocates

Over-Arching Policy Issues

- National and Regional Drivers for Wind
- Intermittency
- Drought and Climate
- Water Quality Issues
- Proximity of wind resources to pumping loads

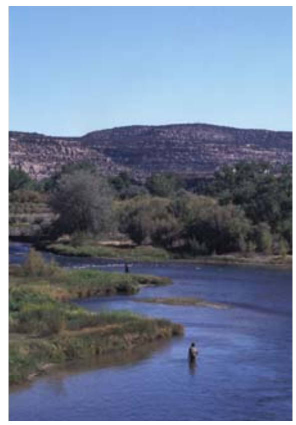


Photo by Jeff Widen

Dramatic population growth (especially in southwestern states) is increasing municipal water demand and the energy used to collect, deliver, and treat municipal water supplies. Western Resource Advocates research set out to survey cities across the country to locate success stories and future potential in wind power applications to meet energy demands related to municipal water supplies.

Western Resource Advocates surveyed 21 cities and received thorough responses from 14: Tucson, AZ; Riverside, CA; Fort Collins, CO; Hull, MA; Traverse City, MI; Grand Rapids, MI; Las Vegas, NV; Austin, TX; Cleveland, OH; Cody, WY; Salt Lake City, UT; Great Falls, MT; Anchorage, AK; and Denver, CO. Through the surveys and independent research, they gathered information on population and water demand growth, water scarcity, cost of energy sources, proximity to quality wind resources, state-level interest (e.g., RPS), and demonstrated community interest.

Bart and his associates presented four case studies (Austin, Traverse City, Denver, and Hull) [see PowerPoint city-specific data] While fast-paced growth, water scarcity, cost of traditional energy sources, and proximity to wind resources all play a role, it appears the single most important factor in whether a city has or is likely to have wind power is local community support. Community support is evidenced by voluntary wind power purchase programs, state- or municipal-level renewable portfolio standards, city council resolutions, etc. Two of the four case study cities received Wind Power Pioneer awards: Austin (2005); Hull (2006).

Community Wind Water Desalination:

Andy Swift, Director, Wind Science and Energy Research Center, Texas Tech University.

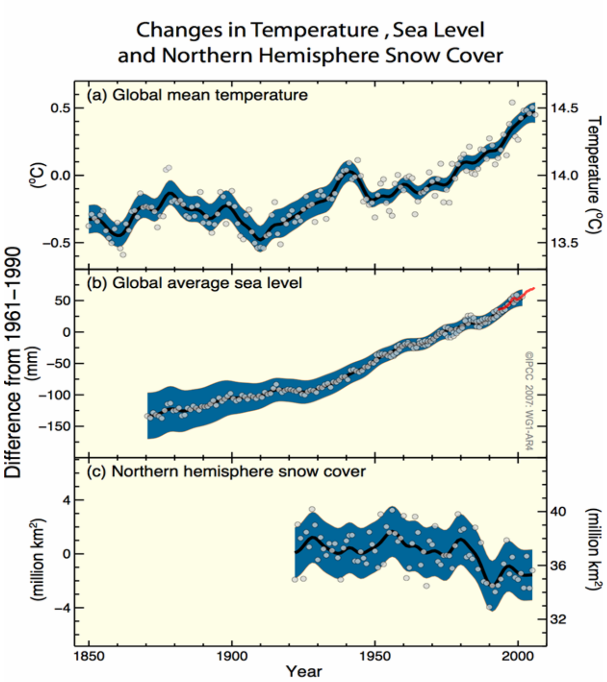
Combining wind with desalination in Texas panhandle

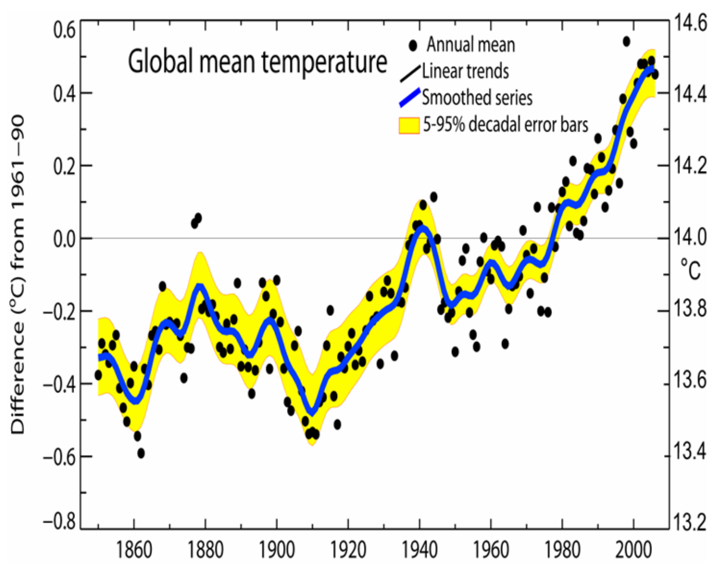
Climate Change Impacts on Water: Kelly Elder, USFS Rocky Mountain Research Center

Climate: mean and variability of weather— temperature & precipitation—over a period of time in a particular geographic region

The difference between weather and climate is really statistical. Climate is weather with a long enough record to characterize in statistical terms, such as mean and variance.

Direct Observations of Recent Climate Change: Warming of the climate system is unequivocal, and is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global mean sea level.





North Atlantic hurricanes have increased with SSTs

Heat waves are increasing: one example: Extreme Heat Wave Summer 2003 Europe 35,000 deaths

Frost-Free Days Are Increasing

Glaciers and frozen ground are receding

Changes in Precipitation, Increased Drought

On Average, the US Warmed 0.5–1.0 °C in the Past 100 Years

Conclusions from the IPCC (Intergovernmental Panel on Climate Change)

- An increasing body of observations gives a collective picture of a warming world and other changes in the climate system.
- Emissions of greenhouse gases and aerosols due to human activities continue to alter the atmosphere in ways that are expected to affect the climate throughout the 21st century.

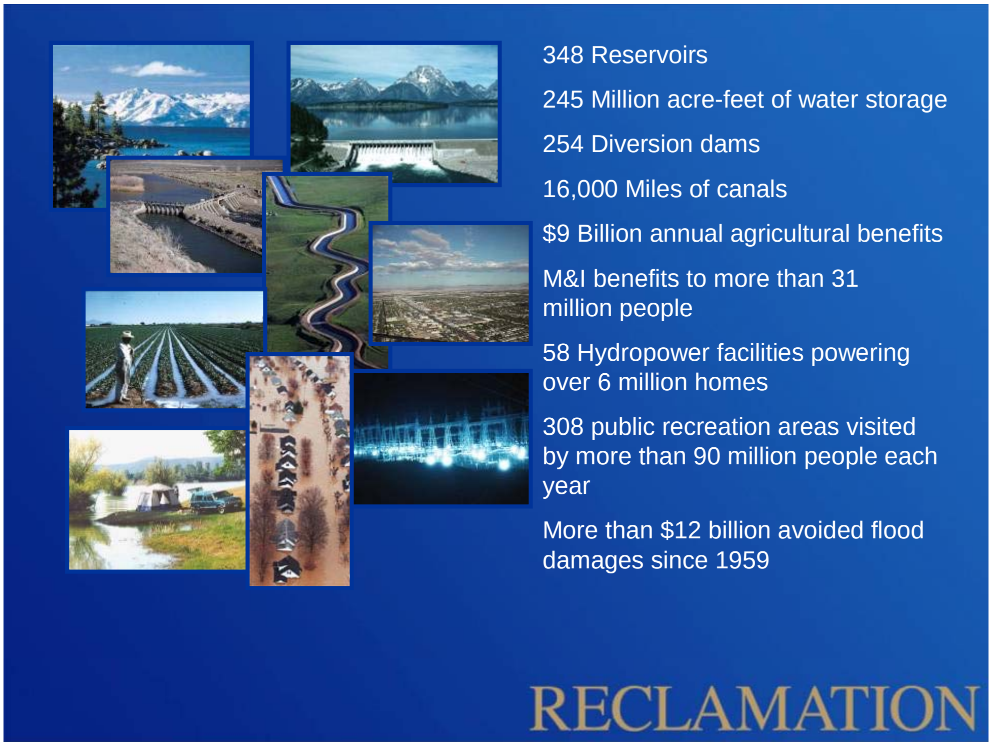
Conclusions

- Climate is changing
  - Temperature and atmospheric CO2 will continue to increase
  - Precipitation patterns and amounts will change
- Climate change is uncertain and subject to many interacting factors, but it is real
- Feedbacks and interactions make planning challenging
- Our knowledge base is shifting
- Management must be tailored to local conditions
- A “learn as we go” strategy will be necessary
- Collaboration, cooperation, and communication between managers and scientists will result in the best response to climate change issues

Day 2

Panel on Western Water Issues Moderator: David Berry, SWRR

Research Program of US Bureau of Reclamation on Western Water Issues: Curt Brown, Director of Research, USBR



Science and Technology Program (S&T)

- R&D focused on innovative solutions to Reclamation's water and power challenges
- Internal researchers and outside partners join forces to produce complementary R&D outcomes
- FY07 is about $6m -- 107 research projects
- Desalination and Water Purification Research Program (DWPR)
    - External cost-shared R&D agreements to expand national water supplies

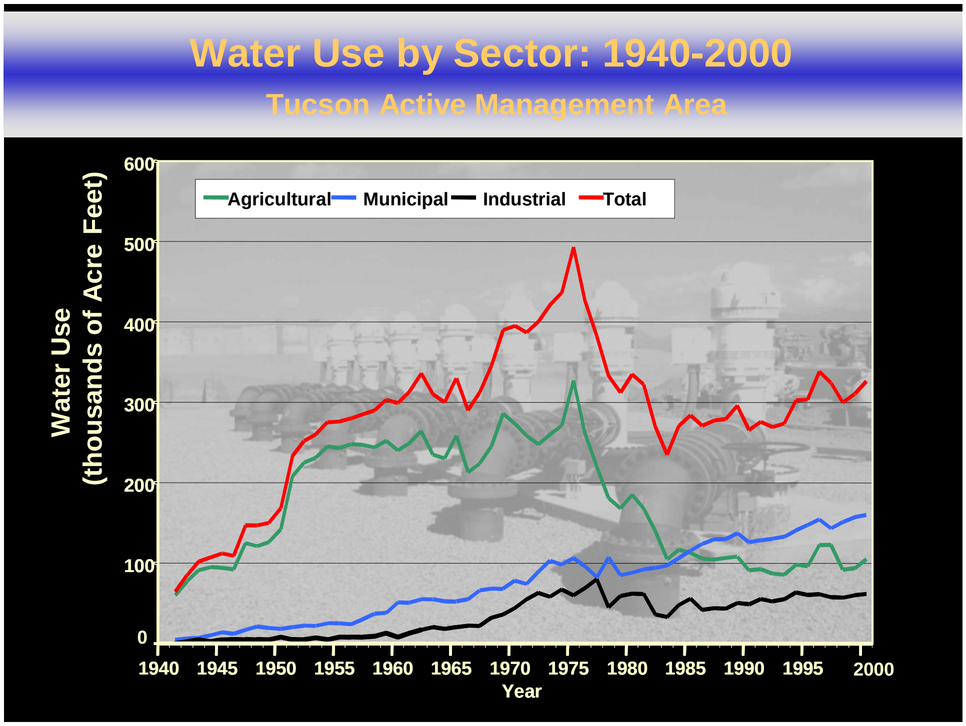
Advancing Water Supply Technologies

- Conjunctive Ground and Surface Water Use
- Desalination and Water Purification Technologies
- Agricultural Water Efficiency
- Institutional Approaches to Water Solutions
- Reducing System Water Losses and Other Conservation Practices

1.5% increase in efficiency in big dam like Grand Coulee nets $11 M annually

Control of invasives (e.g., tamarisk) with beetle that eats only target species, but USBR has not found that water will actually get back for use

Planning for a Sustainable Water Future: Ralph P. Marra, City of Tucson Water Department



Tucson Water, the largest municipal water provider in southern Arizona, is engaged in a dialogue with the community regarding the long-term sustainability of its water supply. The basis for this exchange is *Water Plan: 2000-2050* which was developed to inform the community and decision makers about the water-resource challenges that lie ahead. Until recently, the City of Tucson and all other water users in the greater Tucson region relied almost exclusively on ground-water pumping to satisfy water demand. Over time, the regional aquifer has been overdrawn resulting in declining ground-water levels, measurable aquifer compaction and land subsidence, and environmental degradation. Given that Tucson Water's current service area population of about 700,000 is projected to almost double by 2050, decision makers recognize that the Utility's continuing dependence on ground water for supply cannot sustain the community in the longer term.

The Plan identifies the need to implement a three-fold water management strategy to address current supply issues and to prepare for the future. This strategy emphasizes more aggressive demand management, supply augmentation, and the full utilization of available renewable water supplies. The renewable source waters that are currently available are imported Colorado River water and locally-generated municipal effluent. The community, in partnership with Tucson Water, will make a series of threshold water-resource decisions in the coming years. These decisions will focus on how best to utilize these renewable supplies since each presents unique challenges and uncertainties with regard to treatment, operational flexibility, and supply reliability. The general challenges and uncertainties are summarized in the following questions:

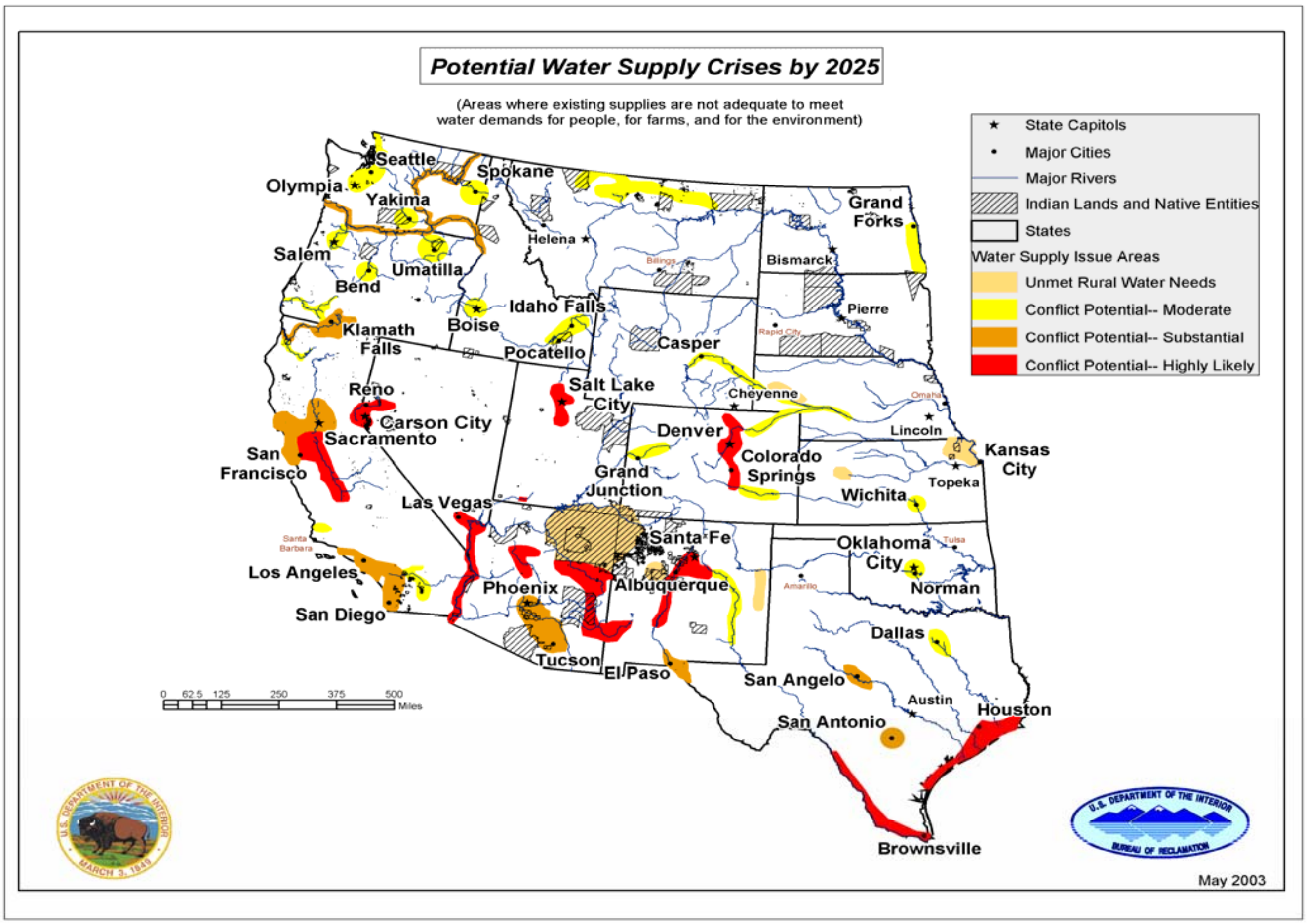
- Will additional renewable water supplies become available?
- When will a shortage be declared on the Colorado River and how soon might it impact Tucson's Central Arizona Project allocation?
- Will Tucsonans accept <u>indirect</u> potable reuse of effluent?
- Will emerging contaminants reduce the availability of supplies?

- How much more will Tucsonans be willing to conserve?
- Can Arizona’s regulatory framework shift its water-management emphasis from paper-water accounting to wet-water sustainability?
- How much are Tucsonans willing to pay for the next bucket of water?

Water 2025: Jim Kinney, Water & Environmental Resource Services, Program & Policy Service, USBR,

Water 2025 began as an initiative of the Secretary of Interior in 2003 with an intention to focus attention on the reality that explosive growth in western urban areas, the emerging need for water for environmental and recreational uses, and the national importance of the domestic production of food and fiber from western farms and ranches is driving major conflicts between these competing uses of water.

The initiative provides a basis for a public discussion in advance of water crises and sets forth a framework to focus on meeting water supply challenges in the future. It recognizes that <u>states</u>, <u>tribes</u>, and <u>local governments</u> should have a leading role in meeting these challenges, and that the Department of the Interior should focus its attention and resources on areas where scarce federal dollars can provide the greatest benefits to the West and the rest of the Nation.



Four Key Tools of 2025

- Conservation, Efficiency, and Markets
- Collaboration
- Improved technology
- Remove Institutional Barriers and Increase Interagency Cooperation

Water 2025 Activities

- Identify potential crises
- Challenge Grants
- System Optimization Reviews (just getting started)

Water 2025 Accomplishments

- Challenge Grants FY 2004 – FY 2006
  - Awarded Grants for 78 projects to states and districts
  - $64 million in total project costs
  - $16 million in Federal share
  - 26 projects collectively will convert 81 miles of dirt canals to pipeline
  - 53 projects install water measurement devices, install SCADA systems and automate water delivery systems
  - 12 projects include water marketing plans

Agriculture and Water Sustainability: Moderator: Rhonda Kranz, Kranz Consulting

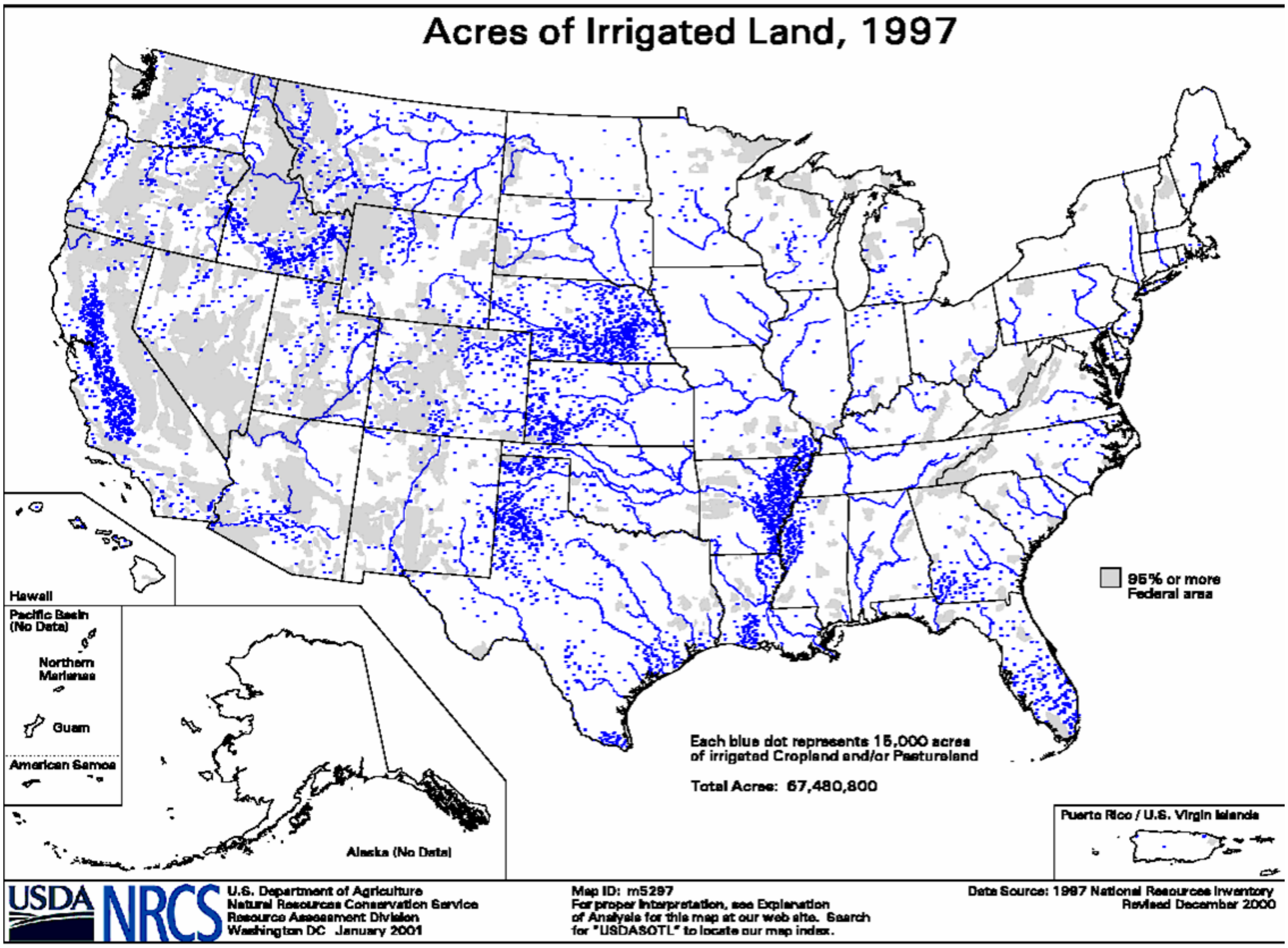
Water and irrigation: Nolan Clark, Director, USDA Agricultural Research Service
Conservation & Production Research Laboratory

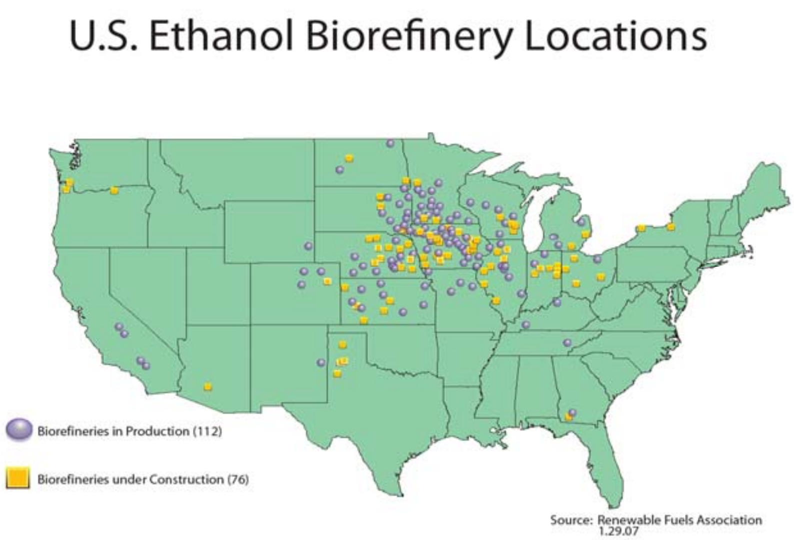
Top 10 States -	**Irrigated Acres**	
State	**USDA**	**USGS**
California	8,709,353	10,100,000
Nebraska	7,625,170	7,820,000
Texas	5,074,638	6,490,000
Arkansas	4,149,766	4,510,000
Idaho	3,288,522	3,750,000
Kansas	2,678,277	3,310,000
Colorado	2,590,654	3,400,000
Montana	1,976,111	1,720,000
Oregon	1,907,627	2,170,000
Washington	1,823,155	1,570,000

Evapotranspiration: Used to describe the water evaporation from vegetated surfaces

- Evaporation of water from soil surface
- Transpiration of water through the plant

- Surface energy balance
  - Latent heat flux equals the incoming radiation less the soil heat flux and the sensible heat flux.
- An aerodynamic model is used to describe heat and water vapor flows
- The Penman-Monteith combination equation is used to calculate evapotranspiration





- Average water use is 5 gallons of water per gallon of ethanol produced.
- New plants are typically 100 millions gallons per year.
- Water use is 500 million gallons or 1,535 acre-feet per year

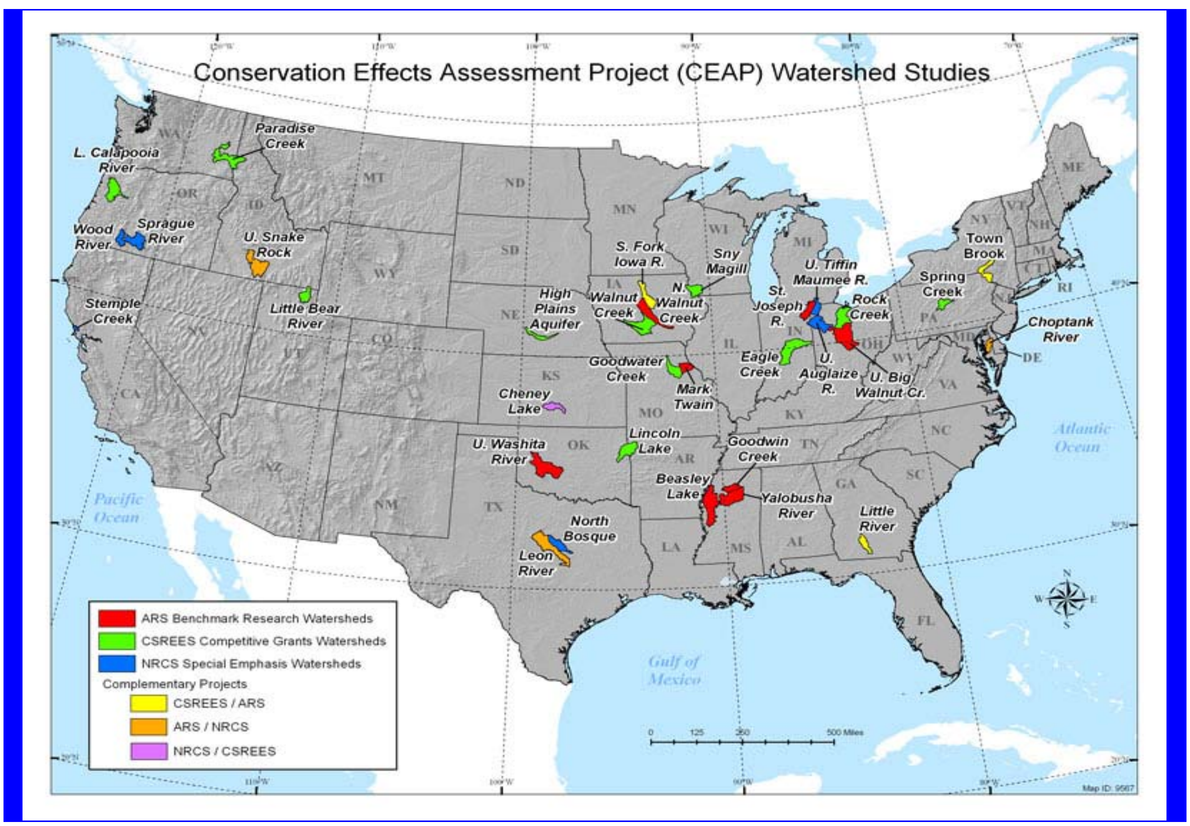
Displaced Acres:

- Assuming an application of 18 inches of water on irrigated corn, then 1000 acres is displaced.
- Assuming an application of 10 inches of water on cotton, then 1850 acres is displaced.
- This is production water only.

USDA Conservation Effects Assessment Project (CEAP), E. John Sadler, Research Leader, USDA-ARS Cropping Systems & Water Quality Research Unit

- CEAP Mandated by Congress OMB to quantify benefits of conservation beginning with cropland.
- NRCS leads National Assessment Study (NAS)
- ARS leads water shed Assessment study, which supports NAS on "ground-truth" scientific basis
- 3 Types of watersheds
  - ARS benchmark, long-term watersheds
  - NRCS Special emphasis watersheds
  - CSRGGS Competition Grant watersheds
- 6 Interdisciplinary teams (with 5 products)
  1) Database for watershed data (STEWARDS)
  2) Watershed monitoring (Infrastructure)
  3) Modeling studies with SWAT, AWNAGNPS, APEX (Calibrated models to test scenarios)
  4) Economics (Integrate biophysical results with economic benefits)
  5) Regionalized modeling (packaged legacy models for use on current platforms)
  6) QA/ QC, which provide higher quality data from watersheds for storage on STEWARDS
- Reports to be made on SWCS meeting July 2007 and published on a special issue of JSWCS
- CEAP work on Grazing lands will start in 2007
- Benefits measured included water quantity and quality parameters (sediment, nutrients, pesticides, pathogens, emerging, contaminants)

For further information see www.nrcs.usda.gov/technical/nri/ceap



USDA Natural Resources Conservation Service: Agriculture and water quality: Shaun P. McKinney, Team Leader, Water Quality and Quantity Team, West National Technology Support Center, NRCS, USDA

Foundation goals:
- High-quality, Productive Soils
- Clean and Abundant Water
- Healthy Plant & Animal Communities

Mission goals
- Clean Air
- An Adequate Energy Supply
- Working Farm and Ranch Lands

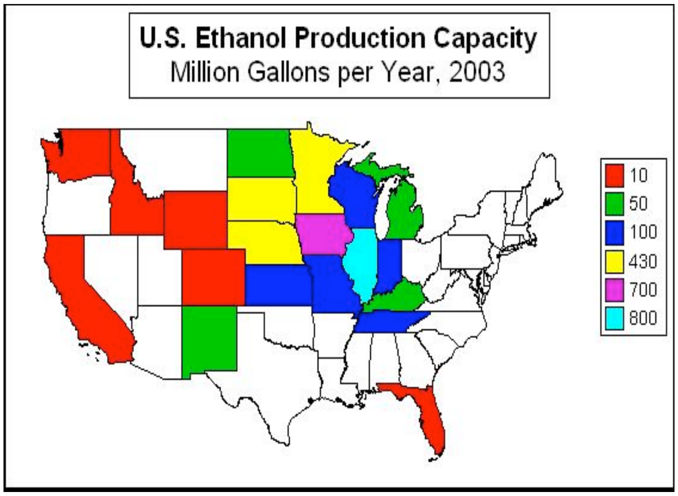
NRCS works on water and water infrastructure through its
- Water Management Center
- National Water and Climate Center
- National Technology Support Centers
  - Water Quality & Quantity Team
  - Energy
  - Soil Productivity
  - Atmospheric Change
  - Wildlife
  - Social Science

The NRSC Water Management Center
- Working with Corp of Engineers
- Rhode Island River Basin Study
- Ohio, Maumee River Basin Study
- Phosphorus and Sediment reductions
- Florida, Big Cypress Creek
- Phosphorus reduction in the Everglades
- Working with USGS
- Water Use and In-stream Habitat Interactions
- Farm Bill Programs
- PL 566
- Emergency Watershed Planning
- Direct assistance to State NRCS Programs
- Conducts Snow Surveys

The Soil Climate Analysis Network:
- Stations located in low elevation agricultural areas
- Joint with National Soil Survey Center
- Expanding primarily through cooperator funding
- Utilizes SNOTEL infrastructure for design, equipment, data management, & user data access

Water Quality & Quantity Team Resources:
- Pest Management
- Soil Science
- Hydrology
- Hydraulic Engineering
- Agricultural Engineering
- Nutrient Management
- Irrigation Management
- Wetland/Drainage Engineering
- Geomorphology
- Environmental Engineering

Shaun concluded his presentation with comments on ethanol production and water and nitrogen trading.



Summary discussion: where is SWRR going from here?

In an animated discussion, participants were open about how deeply the water issues in the west were affecting them and of the need for more sharing of information as we had done over the last two days.

Sheldon Jones, the Colorado Deputy Commissioner of Agriculture talked about formerly living in Arizona which is steadily losing its agriculture as the water rights are being purchased for metropolitan use.

Those familiar with the changes in climate, precipitation, snow pack and the trends in water demand as population grows in the west pointed out that either changes in use and conservation were ahead or major displacement of people. Some said it will become easier to “move the people to the water than to move the water to the people”.

Nolan Clark reminded the group that there have been impressive improvements in conservation and efficiency in irrigation and elsewhere in recent years and that we should keep on doing what is needed to use water more effectively.

There was a consensus that SWRR should hold another meeting in the west to continue the collaboration.

David Berry thanked the participants for their spirited participation saying the voluminous and complex data standing alone can be dry but when we are working on the sustainability of water resources we are indeed working with the basis for life and with the lives of our descendants. So it is appropriate to enter into these discussions with heart as well as our heads.

SWRR will now go on to update its indicator set, create new forums and produce a new report.