Water, Ecosystem Services, and Society in the Changing Western United States

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Historical Terrestrial Water Limitation

Months where Precipitation < Potential Evapotranspiration (30 year average)
(Blue = Never)

Data from Ahn and Tateishi 1994; Cramer on going
Future Western Climate Projections

Recent Droughts

Future Average Conditions

Hoerling 2007
Mortality Impacts of Recent Drought


Local Estimates of Mortality 2003

Breshears et al. 2005
Ecosystem Services

ECOSYSTEM SERVICES

Supporting
- NUTRIENT CYCLING
- SOIL FORMATION
- PRIMARY PRODUCTION

Provisioning
- FOOD
- FRESH WATER
- WOOD AND FIBER
- FUEL

Regulating
- CLIMATE REGULATION
- FLOOD REGULATION
- DISEASE REGULATION
- WATER PURIFICATION

Cultural
- AESTHETIC
- SPIRITUAL
- EDUCATIONAL
- RECREATIONAL

CONSTITUENTS OF WELL-BEING

Security
- PERSONAL SAFETY
- SECURE RESOURCE ACCESS
- SECURITY FROM DISASTERS

Basic material for good life
- ADEQUATE LIVELIHOODS
- SUFFICIENT NUTRITIOUS FOOD
- SHELTER
- ACCESS TO GOODS

Freedom of choice and action
- OPPORTUNITY TO BE ABLE TO ACHIEVE WHAT AN INDIVIDUAL VALUES DOING AND BEING

Health
- STRENGTH
- FEELING WELL
- ACCESS TO CLEAN AIR AND WATER

Good social relations
- SOCIAL COHESION
- MUTUAL RESPECT
- ABILITY TO HELP OTHERS

Source: Millennium Ecosystem Assessment

More Information From Millennium Ecosystem Assessment: www.millenniumassessment.org
Ecosystem Services and Water Distribution

Drinking Water Supply

- Pest regulation
- Flood control
- Recreation
- Water Storage
- Industrial Processing
- Fiber production
- Food production
- Pollution removal
- Riparian Biodiversity
- Energy
- Available Water

Modified from Jenerette and Alstad In Press
Trade-offs in Ecosystem Service Production and Water Management Decisions

• Water management decisions leads to changes in ecosystem services

• Ecosystem service decisions leads to altered water needs
Policy Options For Adaptation

- Water pricing
- Agricultural policy
- Housing policy
- Virtual water
Role of Ecological Research in Addressing Water Issues

• Predict future vegetation and soil responses and likely feedbacks to altered water availability

• Quantify the mix of ecosystem services produced by allocated water

• Improve efficiencies in the delivery of ecosystem services from water use