Human Dimensions

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Climate Impacts Group
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Research questions

• What decision structures best enhance adaptation to climate variability and change?

• What are the likely significant socioeconomic impacts of climate change?

• How might alternative policies affect adaptation?
Research context

• Availability and uses of water East of the Cascades
  – Irrigated agriculture, hydropower, municipal, and competing uses in the Snake Basin
  – Integrated over time and inland Northwest
    • findings extensible to other socioeconomic contexts and snowmelt systems
  – Water is the CIG defined impact pathway
    • 98% of water in Idaho is used in agriculture

• End to End analysis: Climate to human behavior and economic impacts
Findings - water markets

- Water marketing is increasingly viable as supporting institutions develop
- Water markets operate best under regulation due to asset specificity - regulation for process, not for outcome
- Water markets are based in well defined property rights, transfer procedures, and technologies that enable measurement of injury and mitigation requirements. Prices will vary by market and basin
- Administratively based allocation tends to become politicized when allocations change
- Evolving market mechanisms in Idaho support transfers between uses and users, both instate and inter-state, and currently provide the basis for resolution of major allocation conflicts
Findings - Economic Impacts

• Ski area investment after 2020 will depend increasingly on water availability for snowmaking as well as altitude.
• Expected streamflow change resulting from climate change has no discernable impact on Snake River hydro values except in multiple, consecutive wet years, due to reservoir management.
Current and proposed research

Fully integrated allocation & policy model of climate change impacts in the Snake Basin
Research direction

• Fully integrated climate/hydrological/socioeconomic model of Snake Basin
  – Downscaled climate impacts, hydrology from CIG: scenarios from Snakesim, SIRAS
  – Water allocation determined by existing law, markets, and procedures
  – Model impact of alternative policies
    • Recharge
    • Buyout of marginal lands
    • Changing crop, power, and water prices
    • Nez Perce and 1000 Springs settlements
Existing Disputes

Hells Canyon:
Tribal claims to 100% of Snake flow

Thousand Springs:
Surface-groundwater conflict due to growth, more efficient irrigation technology, and drought
Fact Sheet on Snake River Water Agreement

May 15, 2004

- **NEZ PERCE TRIBAL COMPONENT** which, among other things, quantifies the Tribe’s on-reservation, consumptive use reserved water right at 50,000 acre feet a year with a priority date of 1855; establishes a $50 million multiple-use water and fisheries resources trust fund; provides $23 million for the design and construction of a water supply and sewer system on the reservation; transfers management authority of Kooskia National Fish Hatchery to the Tribe; and transfers a portion of Bureau of Land Management-administered land within the reservation valued at $7 million to the Tribe.

- **SALMON/CLEARWATER HABITAT MANAGEMENT AND RESTORATION INITIATIVE** which, among other things, provides that instream flows will be established and held by the Idaho Water Resources Board for selected streams of importance to the Tribe; requires the State of Idaho to administer a cooperative agreement under the Endangered Species Act; and establishes a Habitat Fund to provide funding for habitat improvement projects.

- **SNAKE RIVER FLOW COMPONENT** which, among other things, provides that certain minimum flows will be decreed by the SRBA Court to the ID Water Resources Board; requires the State of Idaho to extend the provisions of State law for the term of the agreement to allow the Bureau of Reclamation to lease up to 427,000 acre feet of water from ID water banks for flow augmentation; and allows Reclamation to acquire up to 60,000 acre feet of consumptive natural flow water rights from the Snake River, with compensation to local communities for impacts caused by this acquisition.

State and Federal legislation and Tribal approval will be necessary to implement the provisions of the Term Sheet. In addition, a final consent decree must be entered by the SRBA court.
Proposed water re-allocation to resolve water rights issues and to partially fulfill obligations under Nezperce Agreement. Existing water marketing and Federal programs facilitate the transfers. Nezperce agreement approved by Congress November 2004; Legislative approval pending.

<table>
<thead>
<tr>
<th>Water Source [acre feet]</th>
<th>Water Use [acre feet]</th>
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<tbody>
<tr>
<td>Purchase of natural flow water rights from willing sellers [200,000 to 260,000]</td>
<td>Average annual recharge [200,000]</td>
</tr>
<tr>
<td>Management efficiency/conservation [100,000 to 150,000]</td>
<td>Surface irrigation (formally ground water) [100,000]</td>
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<td>CREP [100,000 to 200,000]</td>
<td>Ground water mitigation [250,000 +]</td>
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<tr>
<td>Purchase of ground water and spring water rights - [150,000 to 250,000]</td>
<td>Flow augmentation [427,000]</td>
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<td>Managed recharge from natural flow [200,000]</td>
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<tr>
<td>Payette/Boise/Weiser [200,000]</td>
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Upper Snake

Payette/Boise/Weiser

Aquifer Restoration/Recharge

Flow Augmentation

1000 Springs Settlement Proposal
State looks for creative ways to buy water

By Rocky Barker
The Idaho Statesman

Idaho water officials will ask farmers this week to make an offer if they want to sell water.

The request for water, which is limited to people who divert water from the Snake and its tributaries above Hells Canyon, is aimed at finding out how much water is available. The Idaho Water Board, a panel appointed by the governor that plans and helps fund water development, wants to buy 280,000 acre-feet of water to settle a dispute between groundwater and spring users in the Magic Valley and eastern Idaho. It also wants to ensure the state can meet its commitments to flush water downstream to aid endangered salmon migration.

Officials say meeting that commitment will protect access to water in federal reservoirs like Lucky Peak, where Boise gets some of its water.

Water
From page 1

supply.

But a legislative interim panel, seeking to put together a package to resolve the southern Idaho water dispute, isn't done yet. The Expanded Natural Resources Interim Committee planned to finish Monday but did not.

"There's still more work to be done," said Sen. Laird Noh, R-Kimberly, co-chairman of the committee.

The Water Resource Board doesn't have any money yet to buy water. It is considering selling bonds, lawmakers learned Monday that bonding carries with it strict requirements that could limit their options for resolution. The requirements would come from the Internal Revenue Service, if the state wanted to issue lower-interest tax-free bonds, or from bonding companies.

A broad-based fee will be necessary along with strict enforcement provisions to ensure water users pay the fee, said Rick Skinner, a bond attorney from Boise. The fee, along with payments from the federal Bureau of Reclamation for the water used for salmon, would be dedicated to paying back the bonds.

Water districts would have to be required to turn off the water if a user doesn't pay his fee. If they continued to refuse to pay, a lien would have to be placed on their property to give bondholders the security they need, Skinner said.

The payments from the federal government for salmon water are currently lease payments. They would have to change to outright grants or subsidies for the IRS to consider the bonds they secure as tax exempt, Skinner said.

The bonding proposal is part of a wide-ranging plan to dry up hundreds of thousands of acres of farms, buy out spring users, and to soak billions of gallons of water into the ground to stabilize the aquifer that underlies 10,000 square miles of Idaho from Ashton to King Hill. Any settlement will need approval of the Idaho Legislature and Gov. Dirk Kempthorne. A combination of groundwater pumping, reduced flood irrigation and the worst drought on record have dropped the water level in the aquifer by as much as 60 feet in some places and reduced spring flows into the Snake River.

Under state law, Idaho Department of Water Resources Director Karl Drehner could force thousands of farmers and businesses who pump water from the aquifer to shut off their pumps to meet the demands of other water users with older, senior rights. The sudden shutdown would bankrupt thousands of businesses and cost the state's economy up to $900 million, Drehner said.

To offer story ideas or comments, contact reporter Rocky Barker at rbarker@idahostatesman.com or 377-6484.
Allocation decision process

Irrigation and Water Allocation Decision Model (Idaho)

Exogenous
- World crop prices/planting/demand
- Exchange rates
- Weather
- Climate
- Transportation rates
- Processing plant location
- Financial environment

Policy
- Federal: trade policy, mad cow, etc.
- State: sales tax rate, property tax rate, production exemption, personal property exemption
- Utility commission: electricity/gas rates, rate allocation by customer class, buyback during drought

Legal/Political
- Prior appropriation: new appropriations, transfers, priority calls
- Swan Falls subordination
- ESA
- Fish - flow augmentation

Water Resource Board
- Transfers/appropriations
- Water bank
- Mitigation
- Moratoria

Bureau/Corps
- Reservoir management, Contracts

Irrigation District
- Rental pools
- Priority management

Farmer
- Crop selection
- Acres planted
- Water use
- Purchases/rent/fixes
- Feedback from farmers to all upstream boxes except exogenous

Community
- Local budget
- State budget
- Economic viability

Richard Slaughter Associates 2004
Model structure

Water Availability
- Quantity (annual)
- Timing (monthly)
  from SnakeSim

Policy levels:
- real electricity price, agriculture
  value to farms of hydro exchange
  global crop prices
  price of oil
  sales price of water
  BOR, IDWR, etc. price for water
  storage: recharge, surface (to SnakeSim)

Independent variables
- Land Values
  Acre feet diverted/acre
  acre feet consumed/acre
  marginal return on water

- Pumping costs
  lift
  c/kwh
  quantity

Agricultural Sector
- Acres by capability class
- Optimal yield by class by crop
- Acres harvested by crop
- Water consumption
- S production costs
- S value of water (market)
- S return on water use by land class

Municipal Sector
- Population
- Industrial demand
- Agricultural upstream
- Agricultural downstream

Water Rights Constraints

Water Bank, Rental Pools, Transfers

Allocation Buckets

Aquifer
- Above Mtnr
- Below Mtnr

Irrigation
M&I
Stream

Demand Models

Counties (20)
Research products

- Water allocation under alternative climate scenarios
- Water allocation under alternative policy and legal scenarios
- Economic impacts of drought, climate change, and policy change
- Information available to Water Board, Legislature, irrigation districts, and other decision makers
- Model extensible to other basins
Collaboration

- Expanded Natural Resource Committee, Idaho Legislature
- Idaho Department of Water Resources
- Natural Resources Conservation Service
- Idaho Environmental Forum
- City of Boise
- Committee of Nine; Irrigation Districts
- Idaho Attorney General
- Bureau of Reclamation
- Idaho Rivers United; Trout Unlimited
Interaction with Snakesim, SIRAS

- Snakesim, SIRAS provide input scenarios
- Explore policy potential not otherwise considered
  - 1000 Springs: optimize water for irrigation, municipal, hydro and recharge
  - BOR: sufficient water for recharge in only 1 of 10 years
    - Is there sufficient flow to support new storage?
- Socioeconomic model tests policy outcomes, economic impacts
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