SLIDES: Overview of Groundwater Management Laws in the Western United States

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Overview of Groundwater Management
Laws in the Western United States

Groundwater in the West
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Three Questions:

► What are the challenges in managing groundwater in Western states?
► How do state water laws address groundwater?
► What state legal and management practices are most promising and what challenges remain?

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The State of Groundwater around the World

► Advantages of groundwater
  ▪ Most is high quality, available year round, laws encourage withdrawal

► Problem of overdrafts
  ▪ Aquifers are stressed in many places
  ▪ Subsidence, intrusion of salt water, impact on surface waters
    ▶ China, much of Africa, Southern Europe, and Saudi Arabia suffer from falling water tables
    ▶ Mexico City: sinking by almost a foot a year
  ▪ Part of chronic problem of lack of access to clean water

► Enduring issue of protecting the commons
Groundwater in the United States

- 90% of freshwater in US is groundwater
  - Provides 40% of public water supply
  - 33% of fresh water used in Western States
  - 28 trillion gallons of water pumped each year in the U.S.

Groundwater uses:
- 78%: Irrigation
- 14%: Public supply systems
- 4%: Rural domestic and livestock uses
Percentages of state populations using groundwater for drinking water in 1995

- Arizona 60%
- California 45%
- Colorado 22%
- Idaho 96%
- Montana 53%
- Nevada 31%
- New Mexico 90%
- Oregon 40%
- Utah 56%
- Washington 61%
- Wyoming 57%
Groundwater Problems throughout the U.S.

- Pima County, Arizona
- Fissure near Picacho, Arizona

California’s Central Valley: once rich in wildlife, now a desert

Dock on Crooked Lake in Central Florida in the 1970’s

The same dock in 1990
Challenges in Managing Western Groundwater:

- Dealing with severity of current drought in the West; one of most severe in past 100 years
  - Extreme drought in most of Rocky Mountains
  - Exceptional drought in SE ID, SW MT, SW WY, NE&S UT
- Meeting burgeoning human needs and ecosystem protection requirements
  - Water crises even in normal years in the future
- Protecting quality of surface and ground waters
- Securing maximum benefit of water resources
  - How to encourage conservation and protect water rights
Management Challenges

▶ Understanding interaction of ground and surface waters and impacts of natural processes and human actions
  ▪ Surface water sometimes gains water and solutes from aquifers
  ▪ Ground water is sometimes recharged by surface water, affecting quality
  ▪ Surface water and groundwater watershed may not coincide

▶ Accounting for surface-water diversions and return flows
  ▪ Diversions from streams resulting from groundwater withdrawal
  ▪ Groundwater return flows from irrigation and other water uses
  ▪ Trading groundwater and surface water rights

▶ Managing water quality
  ▪ Determining contributions of groundwater to stream and lake contamination and surface water contamination of groundwater in meeting water quality standards

▶ Protecting and creating wetlands
Ecologically Sustainable Groundwater Management

- Sustainable long-term yields from aquifers
- Effective use of the water stored in aquifers
- Preservation of groundwater quality
- Preservation of aquatic environment by prudent use of groundwater

- Integration of groundwater and surface water management
- Balance between consumption and ecosystem protection
- Conservation and efficient use of resources

Source: U.K vision statement, USGS: “Sustainability of Ground-water Resources”
Legal Challenges

- **Fragmented legal approaches**
  - Traditional management and laws treat groundwater and surface waters as separate rather than integrated resource.
  - Four different legal doctrines govern groundwater:
    - Common law: Rule of capture—unlimited withdrawal of water below owner’s land.
    - American rule: Reasonable use, withdrawal for reasonable and beneficial purposes.
    - Correlative rights: Landowners have right to proportionate share of water.
    - Prior appropriation: First to put water to beneficial use can continue to do so.

- **Improving governance of watersheds**
- **Legislating ecologically sustainable development**
Arizona

- Leader in development of groundwater policy; 1st law in 1945
- Ground and surface waters not managed conjunctively
- 1980 Groundwater Management Code
  - Comprehensive framework governing withdrawal, transportation, use, conservation, and conveyance of rights; goals are to
    - Control overdrafting
    - Allocate limited groundwater efficiently
    - Augment supply through development
  - Different management requirements for different areas:
    - Active management areas: strictest level of management
    - Irrigation non-expansion areas: only if irrigated between 1975-1980
    - Reasonable and beneficial use limits on groundwater rights elsewhere
Permits required for all non-grandfathered wells in AMA

Each AMA has detailed management plan for specific time period; conservation requirements are tightened in each new time period

Developers must certify adequate water to meet needs for 100 years

Owners with surplus supplies of water can store underground for later use, including Colorado River interstate water
California

- Chronic problem of insufficient water; groundwater supplies at least part of drinking water for ½ its population

- State law:
  - Ground and surface waters not managed conjunctively, but surface waters include subterranean streams flowing through definite and known channels
  - Encourages management at local level through creation of special districts (ag interests resist centralization)
  - Three basic rights in groundwater, in priority:
    - Overlying landowners have equal, correlative right to withdraw water; each to use reasonable share; no permits required
    - Others may appropriate surplus rights
    - Prescriptive rights can ripen under adverse possession by developing wells and conveyance systems
Special enabling acts for groundwater districts in specific basins govern:
- Conservation
- Extraction
- Replenishment programs
- Rights in times of shortages
- Priorities for use
- Riparian and prior appropriation

General acts create irrigation and other water districts with no authority to limit extractions

Counties have passed ordinances to govern groundwater withdrawal:
- Some provide for conjunctive use
- Some allow export of groundwater

Uncertainty over relative powers of state, counties and cities to regulate groundwater
Colorado

Complex system of water law

- Groundwater is assumed to be tributary to surface water and is governed by prior appropriation
- Conjunctive use and management system
- 1965 Ground Water Act and 1969 Water Right Act identified 4 types of groundwater
- Goal is full economic development; ok to mine some aquifers
- Evolving definition of beneficial use
- Number of agencies involved:
  - Water Conservation Board authorizes creation of boards and districts
  - Groundwater Commission governs water rights in 8 designated basins
  - State engineer and water courts regulate non-designated groundwater and groundwater in Denver Basin aquifers
- Interbasin transfers of water are allowed except for designated basins
Types of groundwater

- Deep groundwater—not connected to surface waters
  - Designated Water—under natural conditions does not recharge or supplement surface streams
    - 8 designated basins on eastern plain; <40% depletion within 100 yrs
  - Nontributary Groundwater—outside of a designated basin
    - pumping will not affect surface waters within 100 years, can withdraw at 1%/year by overlying landowner
    - Well permit from state engineer is required
    - Water judges determine water rights
  - Not Nontributary and nontributary Denver basin groundwater

- Tributary Water—water below the surface that is connected to a river
  - Governed like surface waters—prior appropriation, permit from state engineer required for wells
8 designated basins
Denver Basin:

- Allocated to overlying landowners except the part of the basin included in a designated groundwater basin
- Two types of water outside of designated basins
  - Not nontributary groundwater
  - Nontributary groundwater
  - Pumping of either requires replacement of water to surface stream (presumption of connection with South Platte Basin)
- Denver basin aquifers:
  - Landowners can withdraw at rate of 1%/year until exhausted
- Denver basin groundwater outside of any designated basin:
  - Allocated like nontributary groundwater
  - Use must be replaced or augmented by returning part of pumped water to the stream
Began regulating groundwater in 1951, permits required since 1963 except for domestic use to drill and to appropriate water

Groundwater and surface water both subject to prior appropriation

Director of Department of Water Resources:
- identifies critical groundwater areas, approves plan
  - insufficient to provide “reasonably safe supply” at current withdrawal rates
  - Can deny permits and curtail withdrawals
  - Requires reporting and measuring
- Identifies groundwater management areas that may become critical areas
Conjunctive management of ground and surface water rights

- Recent developments in response to drought
- All water in Snake River Basin is presumed to be connected
- Rules curtail use of junior groundwater rights when shortfalls occur
- If groundwater districts can’t provide share of water, prorata reduction of water for irrigation

Water banking

- Idaho Water Resources Board operates bank
- Authorized in 1979
- Junior groundwater users provide replacement water to senior surface water users
- Local groundwater boards formed to hear claims
- Consists of: director, engineer or geologist, and resident irrigation farmer
Montana

- Groundwater defined as any water beneath surface

- State law seeks to:
  - Ensure optimal beneficial use and no waste
  - Secure maximum economic and social prosperity
  - Conserve supplies for recreation and conservation
  - Systematically monitor and assess quality of aquifers and maintain long-term records of chemistry and water level
  - Ensure beneficial use without waste

- Reasonable use requirements for permit to appropriate water, including groundwater:
  - Minimum stream flows
  - Projected demands on state water supply
  - Feasibility of using low-water quality to meet needs
  - Probability of adverse environmental impact
  - Legislature must approve withdrawals >3,000 AC/year
Limiting groundwater withdrawals:

- Department of Natural Resources creates controlled area
  - Withdrawals exceed recharge or likely to occur in future
  - Significant disputes over rights
  - Declining groundwater levels
  - Withdrawals adversely affect water quality
  - 1979- Claims to water filed

Areas designated as controlled:

- Can close area to further appropriation
- Can apportion withdrawal limits among rights holders based on priority dates
- Can give preference to domestic and other uses
- Can designate temporary areas for 2 years

Has been done primarily for surface water
Nevada

- Ground and surface water regulated separately by law under prior appropriation rules
- State Engineer issues permits to appropriate groundwater
  - Permits granted even if water level will be lowered, as long as other right-holders are protected
  - Must deny application if detrimental to public interest
- In practice, managed conjunctively
  - Engineer can issue rights to underground water to supplement inadequate surface supplies
- Surface water can be stored underground for later use
Engineer can designate a groundwater basin for administration:

- Permit required for wells
- If basin is being depleted, can issue rules “essential for the welfare of area involved”

California-Nevada Interstate Compact:

- Each state can develop groundwater as long as it doesn’t reduce amount of water other state would have received if groundwater not developed
New Mexico

- Almost 90% of population dependent on groundwater
- Worst drought in last 50 years
- Groundwater governed by prior appropriation
  - 33 groundwater basins
    - Water put to beneficial use before designated date is a right
    - Water used after requires a permit
- State engineer issues criteria for gradual mining of mined basins (aquifers unconnected to surface waters)
  - Each driller has a correlative right to take his/her share over a designated period of time
  - For groundwater connected to surface water, Engineer protects existing wells and surface water rights
Ground and surface water conjunctively managed

- Conflicts over denial of well applications because of impact on surface right holders in Rio Grande Basin
- Engineer may require depletion of groundwater offset by return of water such as treated effluent to the river
- State law authorizes injecting treated water into depleted aquifers

Out-of-state groundwater transfers

- State law banned them
- Federal court ruled violation of commerce clause

Water banking:

- Farmers can lease water without losing long-term rights
Oregon

► Prior appropriation—permits required for both surface and groundwater appropriation
  ▪ Conjunctive management where surface and groundwaters are connected
    ► Water Resources Dept to ensure groundwater appropriations don’t interfere with more senior surface rights
  ▪ Certain water uses are exempt from permit, such as domestic use <15,000 gal/day; commercial use <5,000 gal/day and watering stock
    ► Problem of thousands of exempt wells

► Aquifer storage and recharge
  ▪ License needed to divert, store, and recover water
  ▪ Water withdrawn only for original beneficial use
  ▪ License good for not more than 5 years
Basin programs
- Water management policies and objectives governing appropriation within each basin
- Critical basins are more regulated

Commission encourages voluntary agreements among users

Conservation projects can result in right to conserved water, minus $\frac{1}{4}$ of water saved for environmental purposes

Water Resource Commission can designate critical groundwater management areas if overdrafts, contamination, other problems

- Close to further appropriation or limit withdrawals by existing right holders
- Rules require groundwater users to drill wells away from watercourse to protect surface waters
Prior appropriation for surface and groundwater

- Appropriations are treated identically
- Conjunctive management of surface and groundwater
  - Key to meeting demand during current severe drought
- Water is fully appropriated and agricultural rights are often senior
  - Need to convert from agricultural to M&I, conserve, and treated wastewater to meet growing demand
  - 2002 law: if water users fail to use entire water allocation for five years, unused portion is forfeited and reverts to public
State Engineer adopts groundwater management plans where overdrafting occurs:
- Places cap on total maximum annual withdrawals
- Sets well spacing requirements

Artificial recharge and recovery:
- Permit allows appropriator to trace water in and out of reservoir and avoid conflicting claims
- Pilot projects
- Interstate transfers allowed under permits
- Limited water banking
Prior appropriation for surface and groundwater

- Groundwater code enacted 1945
  - Groundwater is all waters existing beneath the land surface or bed of stream or lake or other surface water body
  - Permits required for all withdrawals except watering stock, watering lawns or gardens <1/2 acre, or 5,000 gal/day for domestic or industrial purposes
- Two types of groundwater
  - Natural: exists wholly due to natural processes
  - Artificial: intentionally or incidentally from irrigation
  - Only natural groundwaters and abandoned artificial waters are subject to appropriation (abandoned requires 5 years nonuse)

Comprehensive state water resources plan

- Watershed Resource Inventory Areas for areas with allocation problems
- Department of Ecology sets minimum water flows for streams and lakes
Department can designate groundwater areas and manage to prevent overdrafts.

- Can order decrease in withdrawals according to priority of rights
- Create groundwater management program for each area
  - Long-term monitoring
  - Annual withdrawal rates and safe-yield guidelines
  - Ensure long-term benefits to residents of the state

Out-of-state water use allowed

Aquifer storage and recovery projects require water right and reservoir permit

- Must be reviewed by Dept of Fish and Wildlife and affected Tribes to ensure no adverse impact on fish and residents of the state
1947 law: prior appropriation for groundwater

- 1957 law required permits for withdrawals
- Groundwater is any water under the surface of land or bed of surface waters

Where ground and surface waters are connected, priorities of rights to use it are to be correlated and single schedule of priorities established

- Groundwater permits specify that they are subject to regulation and correlation with surface water rights if waters are determined to be connected

Control areas created where withdrawals are approaching recharge rate, levels are declining, waste is occurring, or need to protect public interest
Control areas:
- Create control area advisory board—5 people living in area
- If state engineer finds insufficient water, can:
  - Close area to further appropriation
  - Determine permissible withdrawal and apportion total among appropriators
  - Specify well spacing
- Domestic and stock use have preference

Noncontrol areas:
- Permits granted unless not in public’s interest
- Special rules for appropriation in Yellowstone Park
- Legislature must approve export of water outside the state
- Domestic and stock use have preference
Summing Up:
What state legal and management practices are most promising?

► Recognition of interconnectedness of surface and groundwater in many areas
► Designation and careful management of groundwater basins
► Regulatory power to protect long term viability of aquifers
► Careful assessments and monitoring of aquifer water quality and quantity
► Recognition of value of ecosystem services and minimum water requirements for ecosystem health
► Recognition of the value of injecting water for underground storage
► Prospective actions to manage limited water resources
► Allowing transfer of water rights for highest value uses
► Others?
What are the some challenges in state groundwater law?

► How to integrate surface and groundwater management
  - Interactions are often complex, uncertain; how to understand them better?
  - Very difficult to do now; how to integrate separate rights and priorities?
  - How to monitor and regulate millions of small, exempt wells?

► How to secure adequate water to meet growing needs
  - What mix of conservation standards, infrastructure improvements, increased prices and other approaches are appropriate?
  - Should new applicants for water rights be required to purchase and retire existing ones?
  - Should states allow mining of separated aquifers?
  - Should states raise water prices so they reflect the true cost of using water and encourage the most valued use?

► How to balance consumption and ecosystem protection
  - Both are in our interest; ecological economics demonstrates the economic value of ecosystem services; how does that value compare with other values—agriculture, industry, stock watering, domestic use?

► Others?