Groundwater: Allocation, Development and Pollution (Summer Conference, June 6-9) 1983

6-8-1983

Ogallala Ground Water

Morton W. Bittinger

Morton W. Bittinger, *Ogallala Ground Water*, *in* GROUNDWATER: ALLOCATION, DEVELOPMENT AND POLLUTION (Natural Res. Law Ctr., Univ. of Colo. Sch. of Law 1983).

OGALLALA GROUND WATER

Morton W. Bittinger

GROUNDWATER: ALLOCATION, DEVELOPMENT AND POLLUTION

4th Annual Natural Resources Law Short Course

Natural Resources Law Center
University of Colorado School of Law
Boulder, June 6-9, 1983

OGALLALA GROUND WATER

I. Background

A. Geology

1. Ogallala formation is a "debris apron" of materials eroded from Rocky Mountains during Tertiary geologic time.
2. The "debris apron" has since become detached from Rocky Mountains by erosion.
3. The Ogallala formation is essentially coterminus with the physiographic unit called the High Plains--a portion of the Great Plains.

B. Climate

1. Semiarid to subhumid.
2. Average of 15 to 20 inches precipitation per year, but highly variable.
3. Many weather extremes; tornadoes, droughts, hail, blizzards.
4. Typically windy and dry with high evaporation rates.

C. Physiography

1. Level, essentially treeless.
2. Native vegetation principally grass.

D. Hydrology

1. Only source of recharge is precipitation on surface.

2. Recharge varies from less than ½ inch per year in "hardlands" to several inches per year in sand dune areas.
3. Surface streams are generally dry, surface-water supplies scarce and undependable.
4. Ogallala ground water is only source of water available to many communities, industries, farms and ranches.
5. An estimated 3 billion acre-feet of water in storage under portions of six states (Nebraska, Kansas, Oklahoma, Texas, Colorado and New Mexico).

E. Settlement and development history

1. High Plains considered useless Indian country, an obstacle to exploration and development of the far West prior to Civil War.
2. Commonly labeled the "Great American Desert" on maps and in textbooks until 1860.
3. Cattle ranching took over during the 15 years after the Civil War. The invention of the windmill was significant in making this possible.
4. Federal legislation (Homestead Act of 1862, Desert Land Act of 1875) and the introduction of barbed wire brought in farmers.

5. Dryland farming, principally wheat and sorghum became predominant on the tillable land. Boom or bust conditions prevailed, as influenced by variable weather and markets.

6. Irrigation using Ogallala ground water started as early as 1911, but most has been developed since 1950. Contributing factors making it possible include:

   a. Drough of the 1950's.

   b. High commodity prices.

   c. Development of deep-well turbine pumps.

   d. Development of new well-drilling methods.

   e. Inexpensive energy (REA, local natural gas).

   f. Increasing knowledge of the aquifer.

   g. Rush to drill wells before controls imposed.

   h. Development of center-pivot irrigation equipment.

F. Ground-water law evolution

1. Water-law systems in each of the six Ogallala states generally applied first to surface water only (except Oklahoma

Territorial Legislature did specifically define ground-water ownership as early as 1890).

2. The basic water-law doctrines originally established in the eastern tier of Ogallala states (Nebraska, Kansas, Oklahoma and Texas) was modified English Common Law and private ownership. The two western tier Ogallala states (Colorado and New Mexico) rejected the English Common Law in favor of public ownership and the Prior Appropriation Doctrine.

3. Kansas and Oklahoma have since passed legislation specifically declaring ground water to be the property of the public. Nebraska has not passed such legislation, but many interpret the Sporhase decision to have established the same. Texas remains as the only Ogallala state which specifically recognizes private ownership of ground water as a part of land ownership.

4. Local Ground-Water Management Districts have been established in several Ogallala states, each having their own rules and regulations.

Declared Districts

II. The Present Situation

A. More than 150,000 wells used to irrigate about 14.3 million acres.

B. Six-state Ogallala area produces over 15% of total U. S. wheat, corn, sorghum and cotton.

C. Over 38% of total U. S. livestock value produced in 6-state Ogallala area.

C. Wide variation in rates of ground-water level decline and longevity of supply. Some areas are in trouble already, other areas have tremendous volumes of water yet in storage.

III. High Plains Study Council Recommendations

A. Water conservation research and demonstration

1. Restore to pre-1970 levels both public and private funding of research to increase water use efficiencies, decrease erosion losses and improve agricultural productivity for both irrigated and dryland farms throughout the High Plains Region.

2. Expand programs to demonstrate the use of water-efficient irrigation techniques and practices, and soil/water conservation management systems.

3. Increase public and private funding for research, demonstration and market development for more water-efficient crops adapted to High Plains growing conditions.

B. Public information, education, extension and technical assistance.

1. Expand public and privately sponsored programs to publicize the need for water and soil conservation improvements in High Plains agricultural productivity for both irrigated and dryland farms throughout the High Plains Region.

2. Conduct short courses and field tours in order to demonstrate on a farm basis the use of proven and cost effective management methods for both irrigated and dryland farming conditions throughout the High Plains.

3. Initiate a program for informing domestic, municipal, commercial and industrial water users in the High Plains Region of effective methods, practices and devices for improved water use efficiencies and conservation.

C. Water supply

1. Expand research, planning, development and use of technology and programs to increase the quantity and protect the quality of water resources available within the High Plains Region.

2. Continue regional interstate water transfer feasibility and planning studies, with appropriate consideration for the water

needs and concerns of basins and states of origin of potential export waters.

3. Provide state and federal funding to continue monitoring ground-water quantity and quality and its projected effects on the Region and Nation.

D. Agricultural energy alternatives

1. Demonstrate the use of on-farm energy use efficiency and auditing methods and devices to increase energy efficiencies for agricultural purposes.

2. Increase research and demonstration programs and projects for the development and use of alternative energy sources for agricultural uses.

E. Legal and institutional

1. Establish Technical Advisory Committees in each High Plains state to provide ongoing guidance and coordination for research, demonstration, education and technical assistance programs for water and energy use efficiency and conservation programs.

2. Provide financial incentives to encourage the acquisition and use of water, soil and energy conservation and management improvements.

3. Further evaluate existing state laws and institutions for water management and, where appropriate, suggest needed changes for state action to provide improved state or local management capabilities and more efficient use of waters in each state.

F. Environmental maintenance and protection

1. Select and manage cropping systems, irrigation and farm management practices, and irrigated, dryland and rangeland vegetation to conserve soil and water resources and wildlife habitats.

2. Provide technical and financial assistance for re-establishing permanent vegetative cover on all lands going out of cultivation in order to control erosion and to restore habitat.

3. Include provisions for management and protection of fish, wildlife and related environmental resources in all soil and water conservation or water supply development projects and plans.

G. Economic development opportunities

1. Assist ongoing programs to help diversify the economy of the High Plains Region, to develop less water-intensive enterprises and to improve the economic viability of

dryland farming, ranching and nonagricultural opportunities.

IV. Water Importation--Corps of Engineers Studies (limited to adjacent areas)

A. From Missouri River at Fort Randall, South Dakota, southwesterly across Nebraska to terminal storage near Bonny Reservoir in Eastern Colorado--1.91 million acre-feet (maf) at $5.4 billion or 3.40 maf at $8.9 billion construction cost. Average annual water cost $291/acre-foot.

B. From Missouri River at St. Joseph, Missouri, southwesterly across Kansas to terminal storage near Dodge City, Kansas--1.62 maf at $3.6 billion or 3.40 maf at $6.5 billion construction cost. Average annual water cost $255 and $227/acre-foot, respectively.

C. From White and Arkansas rivers at Clarendon and Van Buren, Arkansas, westward through Oklahoma to terminal storage in Texas on the Canadian River--1.26 maf at $7.0 billion or 7.51 maf at $27.8 billion construction cost. Average annual water cost $569 and $430/acre-foot, respectively.

D. From White and Arkansas rivers at Clarendon and Pine Bluff, Arkansas, southwestward across Arkansas to Northeast Texas, then westward across Northern Texas to terminal storage at Bull Lake in the Southern High Plains of Texas--1.55 maf at $5.3 billion or 8.68 maf at $20.6 billion

construction cost. Average annual ground-water cost $490 and $441/acre-foot, respectively.

V. Water Importation--Other Schemes

A. R. W. Beck plan--from Missouri River, up Niobrara River in Nebraska, across Western Nebraska, Eastern Colorado into Southern High Plains; 9-15 maf/year.

B. NAWAPPA plan--from Alaska and Yukon territory along Rocky Mountain trench in Canada and across Idaho, Utah and Arizona, with "Staked Plains Aqueduct" serving the High Plains. One-hundred fifty-eight maf annually (58 maf to Canada, 80 maf to United States in 23 states and 20 maf to Mexico) at 1977 estimated construction cost of $200 billion.

C. Lewis G. Smith plan--from Northwest Canada along Rocky Mountain trench to 17 Western states, including High Plains; 40 maf per year at 1968 estimated construction cost of $75 billion.

D. William G. Dunn (Rocky Mountain) plan--from Northwest Canada along east side of Canadian Rockies to Northwestern Montana and several Western states including the High Plains; 12-25 maf per year at 1977 estimated cost of $44 billion.