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**Design Issues in
Farmer-Managed Irrigation Systems**

Design Issues in Farmer-Managed Irrigation Systems

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The North Poudre Irrigation Company: Farmer-Managed Irrigation in Northeastern Colorado, USA

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THE BASIC APPROACH of this paper is to analyze a successful farmer-managed scheme, the North Poudre Irrigation Company (NPIC), in fundamental terms of water control. The aim of this analysis is to identify the principles that make the system management effective so that they may be applied to irrigation systems elsewhere.

Irrigation development in Colorado began in the southern part of the state as Spanish settlers migrated north from Mexico. The Colorado gold rush of the mid-nineteenth century caused a rapid increase in farming in the area, particularly after the close of the Civil War. Because of the erratic and minimal rainfall, irrigation was a necessity for effective agriculture. Farmers began diverting stream flows to their fields with hand-built ditches. Most of the land currently irrigated by surface water was developed by 1900 although significant groundwater development has occurred more recently (Howard 1986).

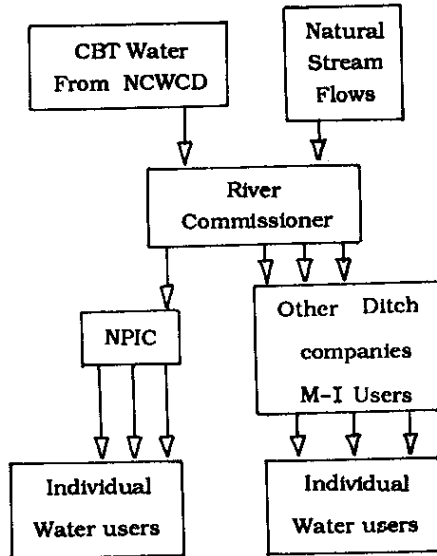
The basic principle behind water rights in Colorado is the Doctrine of Prior Appropriation or "First in Time, First in Right." In essence, if water user A began using water before water user B, user A has the right to take his full allocation before user B gets any, regardless of their respective locations. If the river flow is so low that no water is left after user A takes his allocation, then user B gets none. User A is said to have the senior right and user B has the junior right.

The progression of water through the system is summarized in Figure 1. Water rights are administered by the River Commissioner, a civil servant paid by the State Engineer's Office. The River Commissioner is generally a retired farmer from the local area. His job is to release water to users' oftakes (usually irrigation companies, municipalities, or industrial users) as they request it, in accordance with the water rights. The Colorado-Big Thompson (CBT) reservoir water is released into the Cache la Poudre River by the Northern Colorado Water Conservancy

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District (NCWCD) and the River Commissioner is responsible for making the appropriate deliveries to users.

Figure 1. Generalized diagram of delivery of water from sources to end users.



One of the most successful irrigation companies on the Cache la Poudre River is the North Poudre Irrigation Company. The NPIC is a mutual (nonprofit) company whose stockholders are water users. At its inception, ownership in the company was divided into 10,000 shares of stock. A shareholder has the right to use a volume of water proportional to the number of shares he/she owns. The amount of water available to the NPIC varies from year to year depending on snowpack, weather, and the consumption of water by more senior users. The total amount of water available in a given year is divided into 10,000 shares so that each share gets the same amount of water (NPIC 1988a). In addition to river water, NPIC gets about 1,230 cubic meters per share of Colorado-Big Thompson water. This figure also varies with climatic conditions from year to year. The 10,000 shares are currently owned by about 625 stockholders, and 80 to 85 percent of the system's water goes to agriculture. The remainder goes to municipal and industrial (M-I) users (Stieben 1989).

One of the main features of the management of the Cache la Poudre Basin that makes for an effective system is the buffering effect of the institutions between the regional-scale operations of the Northern Colorado Water Conservancy District and the farm-scale operations of individual irrigators. The Conservancy District facilities are spread out over northern Colorado, on both sides of the continental divide. At this level, reservoir management and forecasting must plan on a five-year or longer basis (Howard 1986). The system gains flexibility as water control is handed to the River Commissioner, who operates on a basin-wide scale, and then to the NPIC which is more local. By the time water reaches the farmer the system has gained enough flexibility to allow the farmer to schedule irrigations only one day in advance. The farmer has the ability to exactly match irrigations to crop water needs.

The NPIC is currently experiencing a very dry year. The seasonal allocation of water is only 4,286 cubic meters (Stieben 1989), the least allocation since 1956 (NPIC 1988b), and no water is available for rent. Farmers have either planted less area than in previous years or are suffering yield loss due to moisture stress. Tension is high, with many arguments between irrigators and ditchriders. During one very hot spell, when the daily high temperature was in the 41-44°C range for five consecutive days, water orders exceeded the capacity of some of the canals. The company bylaws specify what should be done in such situations. The canal capacity is divided equally among the water users who own their own stock, and rented shares get whatever is left. While no one gets the total amount of water they want, the distribution is equitable and follows the rules laid down in the bylaws. As long as each farmer knows that the established rules are followed, equity is preserved. In the words of system manager Robert Stieben, "Conflict comes and goes, but the company always delivers water exactly the way the rules say. When you buy stock, you agree to follow those rules."

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