



Irrigation development, institutional blocks to ground-surface-water integration in the Gallatin Valley, Montana
by Ramon Wesley Sammons

A dissertation submitted to the Graduate Faculty in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Agricultural Economics
Montana State University
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Abstract:

This research problem is concerned with the blocks to an integrated irrigation system in southwestern Montana. The reasons for choosing the Gallatin Valley for study are: (1) the valley needs additional water to assure adequate irrigation throughout the irrigation season, (2) a large ground water reservoir exists 10-40 feet below certain parts of the valley, (3) the valley has 100 years of irrigation history, (4) no serious agriculture-industry or agriculture-municipal water conflicts have been experienced, and (5) both ground and surface water resources are used for irrigation.

Mail questionnaires sent directly to farmers and personal interviews with local ditch company officials is the method used to establish the blocks to ground-surface water integration. The Bureau of Reclamation, 1958, established the benefit-cost ratio for a valley wide integrated system to be greater than 1.52. Analysis of collected data indicates the blocks to development are physical, historical and legal. Physical blocks exist because the farm land and the surface and ground water are in different locations. Historical blocks are a result of the way surface water rights have been established in Montana. The lack of a ground water code prior to 1962 created a legal drag on ground water development.

The blocks to integration could possibly be overcome by a project demonstrating the merits of ground-surface water integration. A 25 well pumping system is proposed. This system would supply water to one area of the valley, The High Line Canal Company, for the 45 days during which they usually have little or no irrigation water. Hydro-logical data for this system is taken from secondary sources. Estimated costs of construction and operation of the project were submitted by various irrigation supply companies, well drilling companies and construction companies in Montana. The pumping system is designed to be owned and operated by The High Line Ditch Company. Total head for the 25 wells varies from 30 feet to 259 feet. The estimated pumping cost for the designed system averages \$0.0326 per acre foot of lift.

The overall average cost of delivering water to the ditch is \$4.17 per acre foot.

The decision to install a pump irrigation system is a management function of The High Line Canal Company. A study budgeting the costs for typical farms under The High Line Canal would be helpful in making this decision. A management study could establish the value of additional water, indicate the opportunities to grow crops with high water requirements and show the effects of increased fixed liabilities on the net capital ratio of The High Line Canal Company farmers.

IRRIGATION DEVELOPMENT

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Integration in the Gallatin Valley, Montana

by

RAMON WESLEY SAMMONS

A dissertation submitted to the Graduate Faculty in
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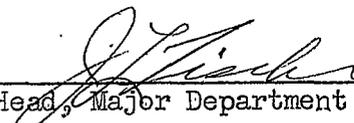
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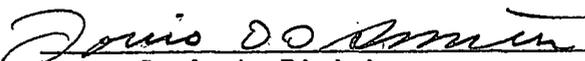
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ABSTRACT

This research problem is concerned with the blocks to an integrated irrigation system in southwestern Montana. The reasons for choosing the Gallatin Valley for study are: (1) the valley needs additional water to assure adequate irrigation throughout the irrigation season, (2) a large ground water reservoir exists 10-40 feet below certain parts of the valley, (3) the valley has 100 years of irrigation history, (4) no serious agriculture-industry or agriculture-municipal water conflicts have been experienced, and (5) both ground and surface water resources are used for irrigation.

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CHAPTER I

The Study in Perspective

Ground water development is generally conducted individually on a well-at-a-time basis. Locations, timing, volumes pumped, and use are most frequently individual decisions unrelated to prior development and resource potential. Surface water, in contrast, is usually developed by water companies, public districts, municipalities, or state and federal government in connection with a long history of water rights. For the most part, ground water and surface water have been brought into use independently of each other, legally and economically. Yet, surface water and ground water are but two parts of the same resource.

In 1961 four western states, recognizing this common water problem, jointly agreed to make an "Economic Analysis of Integrated Ground-Surface Water Resource Management." The 1961 reports of the Senate Select Committee on Water Resources brought the urgency of this study into focus by pointing out that new irrigation development between 1900 and 1909 included only 8 percent ground water. In a similar nine-year period, 1950-1958, 69 percent of the new irrigation was accomplished using ground water. Continued development along these lines would produce a system void of the benefits of integrated management.

The goal of the regional study, begun in 1961, is to provide the West with valuable information needed in counseling legislative committees, private organizations and others about the development of ground and surface water as one common resource. Montana has a unique posi-

tion in the regional mosaic since water development here is in its infancy. Only 13 percent of the hydroelectric power potential has been developed, vast possibilities remain in recreation development, and countless opportunities remain for agricultural and industrial uses. Montana is fortunate in that a critical water shortage has not yet developed. In the future water is expected to become an increasingly important resource in Montana's social and economic development with more pressing demands for water being made by rapidly expanding agricultural, industrial and recreational development.

Montana's unique contribution to the regional economic study is focused on the Gallatin Valley, Figure 1. This valley has irrigation history dating back to 1864. Currently the valley relies on both surface and ground water as a source of irrigation water and there is a wealth of hydrological data available about the ground and surface water resources. The valley has never experienced serious agriculture-industry or agriculture-municipal conflicts over water usage. The valley does experience irrigation water shortages but it possesses water resources sufficient in quantity to fill its needs. These characteristics make the Gallatin Valley an ideal case study area for ground-surface water integration.

Objectives

The objectives for this study are:

1. To estimate the amount of agricultural water usage that can be expected to develop within the Gallatin Valley in the foreseeable future.

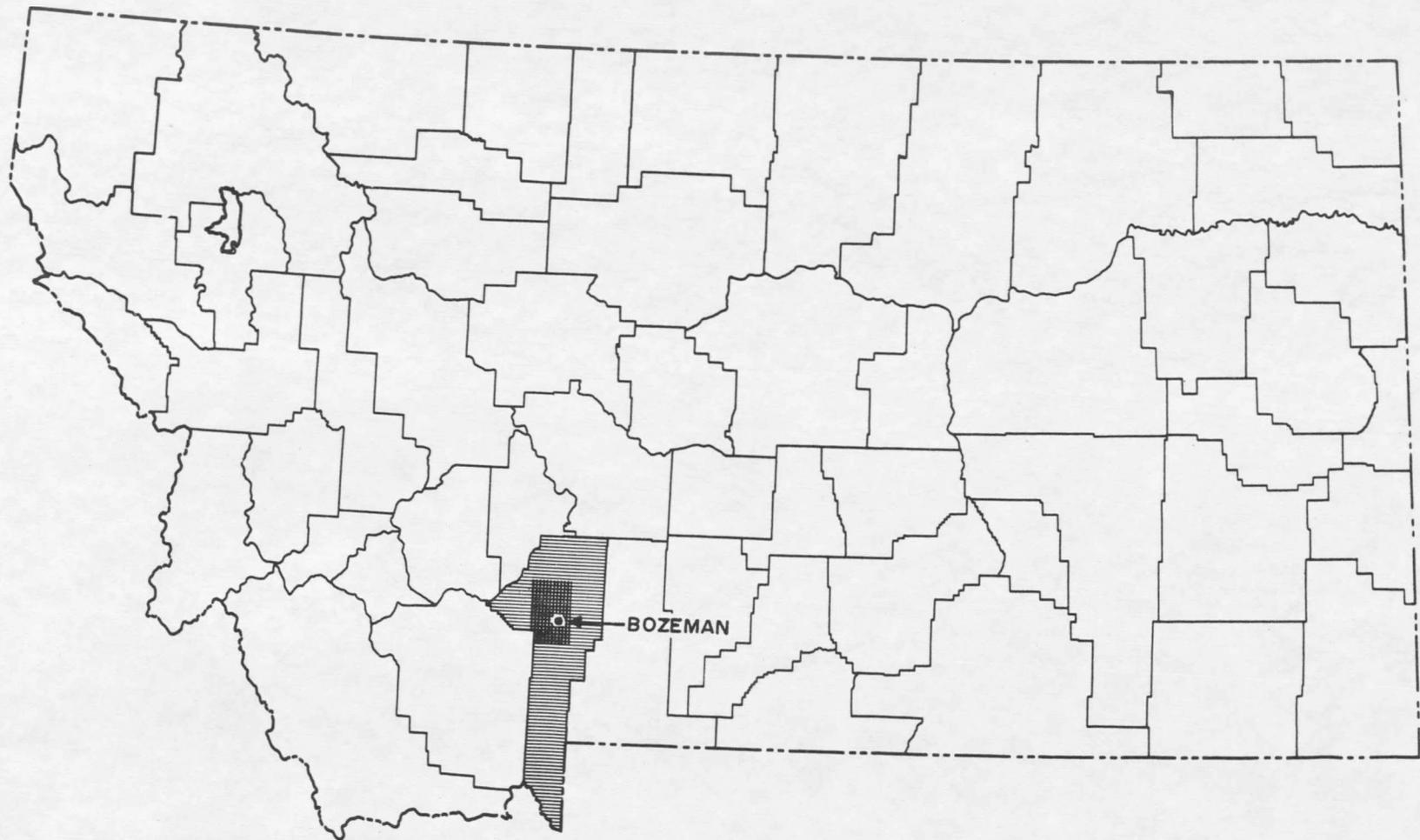


Figure 1. Gallatin County and Gallatin Valley, Montana, 1964.

2. To identify and delineate the present institutional, legal and technological blocks to the development and coordination of ground-surface water integration.
3. To recommend policies and programs to coordinate the use of ground and surface water.

Procedures

The procedures for pursuing each objective are as follows:

Objective 1.--Future agricultural needs for irrigation water will be estimated using primary and secondary data.

Objective 2.--The interest groups involved are farmers, ditch companies, local courts and others. Each of these groups can contribute unique information to the mosaic pattern of this study.

1. Farmers

The farmers will be divided into those with a full supply of water and those needing additional irrigation water. By means of personal interviews, present water costs can be established for both groups and these costs will allow some limits to be set, if there are any, on the technical and economic possibilities of private development of the local ground water resource. Secondly, from the farmers that actually have a need for more water, the amount of water needed and the price they can afford to pay for more water will be determined.

A third area to be explored is the attitude of both groups of farmers toward integration of ground and surface water. Reactions here may set some limits upon the institutional alternatives that can be considered.

2. Ditch Companies

Ditch companies can roughly be divided into those with a full or nearly full supply of water and those with mostly flood water rights. These two groups will be interviewed regarding their interest in and ability to carry out a ground-surface water exchange.

3. Local Courts

The local court has jurisdiction over the decreed water rights of the valley. The legal status of ground-surface water integration is paramount in this study, therefore the court will be consulted in order to determine any existing legal blocks to integration, or to future expansion of industrial and other uses.

Objective 3.--A study of the economic feasibility of privately developing a pumping project will be made. The feasibility of such a project will give direction to recommended policies and programs to coordinate the use of ground and surface water.

CHAPTER II

National Importance of Water

Water is deemed so important that plans are being made for a 10-year study of the earth's water resources. Plans include an International Hydrological Decade to begin January 1, 1965 with scientists from 100 nations gathering data on the earth's water cycle with special emphasis on infiltration, evaporation, streamflow, underground reservoirs, and erosion. Some of these projects may continue for a century in an effort to know more about our water.¹

Present Water Supply

As a nation we have acknowledged the importance of water to the extent that during the past 50 years our national government has authorized over 20 commissions or committees to examine our national water policies and problems. Until fresh water can be taken from the ocean, precipitation will remain the world's only supply of fresh water. For the United States as a whole the present precipitation supply is staggering. In a normal year, mother nature delivers enough water onto the United States to cover the whole country to a depth of 30 inches! However, about 21 of these 30 inches, after supporting our forests and non-irrigated farms, return to the atmosphere by evaporation and transpiration and are not available for human use, Figure 2. The nine inches remaining go into surface run-off or ground water storage. These nine

¹/Bozeman Daily Chronicle, November 3, 1963, p. 13.

