RESEARCH REPORT

OWRT TITLE II CONTRACT C-4202

ECONOMIC AND ECOLOGICAL HISTORY SUPPORT STUDY

FOR

A CASE STUDY OF FEDERAL EXPENDITURES ON A WATER AND RELATED LAND RESOURCE PROJECT

BOISE PROJECT, IDAHO AND OREGON

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June 1974

ACKNOWLEDGEMENTS

The authors wish to acknowledge the financial support of the Office of Water Research and Technology through the Title II Grant C-4202, and the Idaho Water Resource Board for its participation in this joint study. The supervision and guidance of joint leaders for the overall research project, Mr. Wayne Haas of the Idaho Water Resource Board and Dr. Richard Schermerhorn of the University of Idaho is also acknowledged. Mr. Warren Reynolds of the Idaho Water Resource Board provided direct agency contact with the investigators. Contributions from staff members of the U.S. Bureau of Reclamation, U.S. Corps of Engineers, U.S. Forest Service, U.S. Soil Conservation Service and various other federal and state agencies is gratefully acknowledged. Our thanks also to the secretarial staff of the Idaho Historical Society for the typing and proofreading of this publication.

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PROJECT BACKGROUND

There have been numerous feasibility studies made in advance of major projects that ascertain their technical and economic practicability as well as the anticipated costs and presumed benefits. On the other hand, the literature is sparse in regard to the reexamination of projects with hindsight perspective either in terms of comparing actual accomplishments and changed objectives with the original plans or in terms of new values, environmental impacts, technology economics and concerns of society.

The proposal for this post audit project was conceived by staff members of the Idaho Water Resources Board (IWRB) in consultation with a number of individuals and research groups in the state. It was intended as a 4-year study "to conduct a comprehensive social, economic and environmental post audit of the federal expenditure that was utilized to develop the water and related land resources in southwest Idaho and eastern Oregon". The study, as originally conceived, provided for a number of investigational subprojects entitled "Economic Development," "Environmental Impacts," "Irrigation," "Sociological Characteristics," "Flood Control," "History," "Fish and Wildlife," "Land Use," "Hydrology," and Summary.

Funded for one year by the Office of Water Resources Research, the initial objective was to produce several reports and support studies.

The hydrology support study focuses on surface and groundwater changes and a basin model to permit simulation of hydrologic situations both forwards and backwards in time. Another support study developes a four year plan of study and procedures for a comprehensive regional analysis along economic, sociological and environmental dimensions. A unit entitled, History Subproject, was requested to provide the historic development of the project. The Land Use Subproject focuses on the nature, causes and distribution of Land Use Changes and its implications.

Intended for completion in the April 1, 1973 - April 1, 1974 time frame, project funding, initiation and completion was delayed. In anticipation of expected overlap, the land use and history support studies were fused into a common outline, titled Economic History, by IWRB economist Jim Wrigley, and reviewed by the subcontractors. There were a number of suggested changes and an allocation of responsibility between one team headed by Merle Wells and Judith Austin and Tom McFadden of the Idaho Historical Society and the Land Use project team of Harry Caldwell and Stephen T. Rice of the Geography Department of the University of Idaho. The Section on Ecologic history was solely the responsiblity of Alan E. Stanford.

Following a July 1973 meeting of the national advisory committee dealing with the post audit study, further modifications were recommended, new outlines proposed, and the support study was launched.

Study Objectives

The overall focus is with the "effect and impact of the federal expenditures and the combined consdquences of that expenditure" on the historical development of the natural resources and the related economic factors in the Boise Project. The study utilizes prior available studies, reports, and news accounts, and supplements these with some original research and field studies within the time and funding restraints provided.

Specific Objectives

1. To bring together into a single place a comprehensive historic study of the project - from its conception through its authorization, funding, construction and operation.
2. To relate this project in time and place to local, regional and national goals, concerns and policies from its inception to the present.
3. To relate this project to prior settlement and to subsequent developments both related and unrelated to the project.
4. To relate subsequent and secondary developments in the project area to legislation, communication and transportation developments, urban trends, agricultural markets and pricing conditions.
5. To study the urban land use and population dynamics in the project and adjacent lands.
6. To hypothesize a probable sequence of events and developments which might have taken place without the massive federal project expenditures in this area.
7. To hypothesize on the relative impact of the project on a number of regional developments.
8. To prepare an annotated bibliography of materials examined and used.
9. To prepare an overview ecologic history of the area showing sequential impact of settlement, irrigation, and other land and water uses.
10. To assemble details concerning each of the irrigation subunits.

The proposed 4-year plan of study, focusing on social, economic and environmental questions, is intended to provide both greater detail and insight into the questions handled in this section. Probably many of the conclusions in this initial study will be corroborated but some may be revised upon the basis of further investigation.

POLITICAL HISTORY OVERVIEW

With the coming of the twentieth century, business leaders in the United States anticipated a new era of national achievement that would surpass the remarkable earlier accomplishments which already had transformed the country. Some of their dreams of peace and progress were realized. An automobile age soon affected the country more dramatically than steamboat and rail transportation had revolutionized the past. Practical aviation was on the way. Formation of the billion dollar United States Steel Corporation--a leading example of a new form of integrated business operation, in contrast to the old style horizontal trust--showed how the promise of the twentieth century might be realized through industrial expansion on a colossal scale. John D. Rockefeller's oil refining empire indicated the magnitude of business development in another major field. Growth of large cities all over the nation after the Civil War had made the United States into an urban land. By 1890 the old frontier line of settlement had disappeared, and the traditional low cost or free western farm land no longer was available for agricultural expansion. The importance of the disappearance of the traditional frontier was recognized at the time. But opportunities for continued western development through irrigation of large tracts of arid lands, on a scale as yet unrealized, offered an outlet for farmers who preferred not to respond to the lure of the city.

In the nineteenth century race to exploit and develop economic resources of the nation--mines and forests as well as farmlands and river systems--an energetic people remade a wilderness west of the Mississippi into a decidedly different land. Until the end of the century when the frontier had mostly disappeared, and when the vast forests of the Great Lakes region had been largely cut out, natural resources had seemed largely unlimited--at least in comparison to demand for utilization. Little thought had gone into the subject of resource management to ensure future economic stability. And even less concern had been expressed for adverse environmental impact of farm and industrial expansion. Lumbermen who looked to the future still could see vast forests in the south and the Pacific Northwest to cut after they had finished their work around the Great Lakes. Farmers could see possibilities for reclamation of arid western lands. But a national conservation movement was just starting to respond to the obvious limitations that would attend future development of the remaining resources. It was manifest in a system of federal forest reserves to provide better management for surviving timber resources. Several national parks were created and an ambitious national reclamation movement offered waste-conscious conservationists an opportunity to support an important effort to provide water for lands too dry to farm with conventional systems.

Federally assisted reclamation projects fitted in well with national policies which had evolved through more than a century of economic growth and territorial expansion. A nation of opportunity for everyone, the United States still would be able to offer superior irrigated land to enterprising farmers even though the

traditional frontier of western settlement had come to an end. Frontier virtues of individual initiative and self reliance would be promoted in a society that had valued the small, independent farmer as a pillar of a rural community that provided a base for everything else in the nation's development. Early in the nineteenth century, as the frontier had expanded westward across the Mississippi valley, a militant democracy in a midwestern farm society had offered the world a model of political and social order that would solve the problems of any people smart enough to follow their example. These audacious Mississippi valley expansionists had realized the manifest destiny of the United States to expand from the Atlantic to the Pacific. By 1867, they had made a good start with Alaska, and the frontier of settlement had turned northward from the United States into western Canada after 1890. But in 1900, acquisition of Canada remained an unrealized hope, and expansion farther into Mexico had become unlikely. In this context of economic as well as geographic expansion, with the United States showing the world the way toward a new and better political and social order, the Reclamation Act of 1902 came as an appropriate climax to a long series of federal accomplishments in land development and farm expansion. And in the twentieth century, during the time that federal reclamation projects were contributing to the national economy, federal land and farm policy continued to change with new legislation to meet new conditions as they emerged.

Right from the beginning, when the United States emerged from the British empire with a massive public domain of western lands, national leaders had foreseen the economic and society impact which would come with disposal of that major national resource. Two contrary views, part of a broader difference in outlook that distinguished the followers of Alexander Hamilton from the supporters of Thomas Jefferson, guided the conflict over public land policy. Hamilton favored a strong wealthy aristocracy committed to support a new national government under a new United States constitution which went into effect in 1789. Along with other policies (a high protective tariff and a United States bank, for example) to build a powerful financial and industrial class interested in strengthening the central government, Hamilton preferred a land policy which would release large tracts of public domain to speculators. They would pay little per acre, but they would bring a substantial amount of revenue into the national treasury (over which Hamilton presided) through enormous land purchases. Then they would become wealthy adherents to Hamilton's cause of developing a strong central government. Jefferson, in contrast, preferred a country of independent small farmers. He objected to Hamilton's system of a strong central government and opposed underwriting and aristocracy to maintain any such undesirable national government.

In the Northwest Ordinances of the Confederation Congress (1794-1878), Jefferson's principles showed clearly. Land was to be surveyed into sections a mile square, rather than to have large choice tracts identified for speculators. Territorial government was provided for, under a plan through which western territories would become republican states. And the new western territories had a bill of rights to protect individual farmers who would settle on the land. Before

provision was made for general sales of public lands under this system, Hamilton tried to get Congress to give speculators two years of credit in return for handling large tracts. Under his proposal, small tract purchasers would pay cash. But western opposition defeated Hamilton's plan to abandon the land survey system in favor of letting the best tracts go to speculators. In the land act of 1796, an unworkable compromise emerged. Half of each township was to be available to speculators, and the other half was to be surveyed into sections for individual purchasers. A year's credit was extended for part of the purchase price. But Hamilton's plan to gain revenue from small land holders resulted in too large a minimum tract at too much per acre to be practical. So in 1800, William Henry Harrison, representing western interests, got Congress to reduce the minimum tract from 640 to 320 acres, and to extend credit to four years instead of one. Settlement came rapidly to Ohio under this change. Then in 1804, the minimum farm was cut to 160 acres, so that anyone with $80 could make a down payment. That was about all many of the purchasers bothered to pay. A series of relief acts (1806-1820), made general in 1821 after a financial panic of 1819 destroyed the credit system, saved insolvent purchasers (normally most purchasers) from eviction upon default of payment. A new land act of 1820 reduced the minimum farm to 80 acres, at a charge of only $1.25 an acre. Speculators still handled most of the best lands, but not on the vast scale that Hamilton had planned. And the land system was designed to develop a class of small farmers, rather than large landholders.

Conflict between those who wanted to maintain the land sale system, and those who wanted to let settlers acquire lands simply by occupying them, continued until the time of the Civil War. Henry Clay proposed that land sale revenue be used to support a system of internal improvements (roads and canals, primarily) that would develop the west and make the lands more valuable. (Later on, this system was used too as an essential feature of the Reclamation Act of 1902.) But Andrew Jackson, with more support from the west, objected to Clay's plan for federally financed internal improvement. And western farmers kept working for a system under which settlers could appropriate land prior to survey (perhaps starting an Indian war in the process) and buy at minimum rates when their lands were ready for sale. This system of preemption gradually came into practice through local pressure when lands were offered for sale; in 1841, Congress adopted this system by statute. Then in Oregon territory, settlers were allowed free lands in 1850, and slightly more than a decade later--after the Civil War removed southern opponents from Congress--a general homestead system of free lands was extended to the entire country. With the homestead act of 1862, Jefferson's principle of developing a society of small free farmers finally was realized about as completely as possible. Western views of the importance of free, or nearly free, farm land distribution had prevailed over most of the nineteenth century, and efforts were made after 1862 to extend this system to mine and timber lands as well.

Some time after the Civil War, timber cutters felt they were providing useful public service in clearing commercial lumber from public lands. Miners also took great pride in contributing to the national economy by mining gold, silver,

and other valuable mineral resources on public lands. Through legislation of 1866 and 1872 miners finally obtained congressional approval for their system of taking up free mining claims. (These at least were held in sizes appropriate for an individual miner, along the farm size model, although for lode claims, such individual sized operations did not work at all.) Plains and desert cattlemen also volunteered, in a tradition well established in law applicable to a different situation, to herd stock on the public lands without any payment of any land acquisition throughout most of the open range. They also took pride in their contribution to the national economy, but did not get around to payment for grazing rights (aside from United States forest service lands) until 1934. Meanwhile, generally absurd efforts were made to modify the farm land acquisition system to meet special needs in utilization of timber and desert lands.

When the Homestead act went into effect in 1862, most of the land for which it was designed already had been taken up. Arid lands of the west did not provide such suitable homesteads. In the Great Plains and the Interior Deserts farther west the location of potable water sources (unrelated to the public survey grid) proved to be the key value. In the dry and mountainous areas, Hamilton's distribution system (aside from the question of aristocracy and large land disposal arrangements) would have proven superior to Jefferson's rectilinear survey. Grazing land suitable for livestock could have been combined with approriate river bottom cropping areas to form large ranches. But under the homestead act, farmers could get only 160 acres free by settling in such a farm for five years. Vast tracts were plowed up and ruined for grazing, under the Homestead act, in country too arid for sustained farming. Then, after an attempt at farming had failed, this kind of abandoned homestead land either was returned to the public domain (if the five year homestead process had not been completed) or let go for failure to pay taxes (if title had been perfected), all with sad results. Such land often was taken over (sometimes by purchase at nominal prices) by stockmen, who also were using public lands for cattle and sheep range anyway.

In recognition of the benefits to be achieved from irrigation in large areas of the west, Congress began to encourage irrigation right after the Civil War. An act of 1866 confirmed local legislation and customary procedure for regulating irrigation and removed any possibility of conflicting federal claims to water of streams that could not be navigated. A homestead farm in arid areas lacked the size necessary for efficient operation. So some modest compromises toward Hamilton's land disposal system, along with some more generous allocations of land under Jefferson's arrangement, were introduced.

The Timber Culture Act of 1873 attempted to improve in the climate of the plains states. Tree planting was expected to provide increased humidity and perhaps rainfall. The act provided that any settler (who had previously been limited to a claim of 320 acres) might claim an additional 160 acres of public land if he would plant 40 acres of that with trees. But the act failed to increase precipitation on the Great Plains (or Idaho, for that matter) and encouraged fraud and

abuse. In 1878 the Timber Cutting Act (which allowed for the cutting of timber on the public domain by settlers and miners for their own use without charge) and the Timber and Stone Act (which allowed for the sale of land unfit for cultivation in unites of not more than 160 acres for $2.50 per acre and did not apply to Idaho until 1892) were passed. Unfortunately, these Acts did not stop the timber frauds.

The Desert Land Act of 1877 allowed claimants a maximum of 640 acres of desert land (thought to be the minimum size worthy of the investment by a prudent man for irrigating, given the state of the art at that time). Settlers were required to carry on a certain amount of ditch construction before final proof of their land, the fee for which was $1.25 per acre. President Rutherford B. Hayes suggested that some form of leasehold and the encouragement of livestock grazing on such lands would really make more sense. In any case, most land that could be irrigated successfully by individual farmers had already been appropriated. Most of this land had to be on river bottoms that could be watered without large canal systems, and that kind of land went fast when mining or other settlement brought farmers to a new desert region. Even though the Desert Land Act did not work out quite the way that Congress had planned, in less than sixty years a large total of 32,573,970 acres had been entered under terms of that faulty statute. Title for only 8,579,664 of these acres was perfected under the Desert Land Act, but that still was a lot of land.

When the western reclamation movement gained strength, Congress arranged, by act of October 2, 1888, to have the United States Geological Survey investigate the desert lands of the west in order to determine the extent to which irrigation might be feasible. Once lands suitable for reclamation were identified, and reservoir sites and canal systems planned, Congress would be in a better position to deal with desert land problem.

To correct obvious defects in the Desert Land Act, Congress turned first to the states. The Carey Act of August 18, 1894 provided for the donation of up to 1,000,000 acres of public land to each of the reclamation states. This land was to be held "in trust" by the state pending, first, approval of a private reclamation proposal for a given tract; and, second, individual claims of up to 160-acre units of this land within a specified time. Upon successful proving, patents on the land were issued by the federal government to the state and subsequently by the state to the settler. To qualify for Carey Act benefits, a state had to establish an approved reclamation engineer's office and to arrange for adequate supervision of private canal company development of appropriate tracts of land.

Idaho was almost the only state to make successful use of the Carey Act, with the Twin Falls project the nation's outstanding example of a state sponsored irrigation development. And Idaho's effective use of the Carey act did not come until after 1902. So, as part of the conservation movement at the turn of the century, Congress responded to Theodore Roosevelt's suggestion for a federal system of irrigation development. The Reclamation act of June 17, 1902, came at a time

when the resources of private enterprise for the development of arid lands were no longer able to meet the demands of complex engineering problems, and when cultivatable public lands without resort to irrigation had been almost completely taken up.

The act allowed all proceeds from the disposition of public lands to be channeled to the construction of reclamation projects, under which additional lands could then be claimed and the monies received from those claims channeled back into further reclamation projects. The requirements for proving up a claim were the same as those under the Homestead Act.

Under the act, the United States Reclamation Service was established, and its sole concern was getting water onto the land. No attention was paid to the problems that might be faced by experienced farmers facing radically different soil and water problems, much less the problems of neophyte farmers. Twenty-one years later, a Fact-Finders' Committee was established to examine all the problems to which the Service and settlers had been subjected: settlers' inability to repay construction charges as fast as the original (and amended) law required; slowness of construction and of taking up land; lack of guidance for farmers; lact of adequate repayment into the Reclamation Fund to keep up a working balance. One consequence of the committee report was the reorganization of the Reclamation Service into the Bureau of Reclamation, with former Idaho Governor D.W. Davis as the first Commissioner. Secretary of the Interior Hubert Work made clear from the beginning of the Committee's study that its purpose was not to do away with the government's role in reclamation; but to correct existing problems, or to suggest solutions. Thus the whole system might work more smoothly.

After the Reclamation Act went into effect in 1902, economic benefits accrued to the nation as a whole, to large regions in the west, to each of the sixteen reclamation states (a number increased with the addition of Texas in 1910), and to a substantial number of project localities. For the nation as a whole, economic growth with increased federal revenue was a basic objective. Productive value of land watered by Reclamation Service projects increased ten fold. Federal revenue returned from these projects (in the form of increased taxes collected from wealth drived from reclamation service acres) proved substantial: for the Boise project alone, this added federal income tax revenue amounted to $43,750,000 during the years 1928-1947. This sum, compared with an announced federal capital investment of $17,000,000, suggests a substantial national economic benefit derived from an interest free loan repaid from revenue independent of the income tax attributed or project development. Actually many of these increments might have accrued even without the federal capital investment. For the arid interior western region, an agricultural base relieved a vast area from dependence upon farm product imports from other parts of the country. Mining, lumbering, ranching, and industrial areas that would have been settled (on a lesser scale) without reclamation emerged with an expanded, more diversified economy, realizing an objective of increased economic stability and maturity.

In Idaho, federal projects had, as a primary objective, reclamation of land that other approaches to the problem had not met. Idaho had extensive early experience with small scale individual or cooperative efforts at irrigation, successful mainly on lands adjacent to streams where ditches could be constructed easily. Larger canal companies, often the product of private or community investment, tried to expand the irrigated area. When many of these showed no conspicuous success, two federal alternatives were tried. Carey Act projects, particularly in the Twin Falls area, provided water to large tracts of land. Finally, Reclamation Service projects were utilized to irrigate new land above the Twin Falls tract and to repair failures of a number of other attempts at large scale irrigation.

For the Boise valley, a Reclamation Service project provided an acceptable, and eagerly sought, solution to several major irrigation problems that canal companies had been unable to solve. In realizing this objective of bringing economic stability and financial solvency to a chaotic irrigation system in which only the easily constructed ditches near the river were showing much in the way of success, the Boise project offered Idaho's prime example of this kind of federal reclamation effort.

As a state that depended largely upon irrigation for commerical farming in much of Snake river valley, Idaho had a special interest in federally supported reclamation. Mormon communities with their successful cooperative irrigation enterprises did not need such help. But Mormon settlers turned up in the Carey Act and Reclamation Act areas, some of which were later subject of systematic Mormon colonization. And Mormons naturally had no cause to resent the requirement that the United States Reclamation Service deal with irrigation districts, rather than with private companies with which the state contracted under the Carey Act. Much of the most effective support for Idaho's provision for irrigation districts (an arrangement developed antecedent to the reclamation act anyway) came from conservative McKinley Republicans who were hard to find in Idaho anyway. Irrigation districts--special districts like cemetery districts, mining districts, fire districts, or school districts--scarcely were too radical a device for assuring community cooperation in an important kind of enterprise. Unlike most reclamation states, Idaho offered compatibility for developing Carey Act or Reclamation Act projects. Idaho met the formal requirements for operating under the Carey Act within a year after that statute went into effect, and had irrigation district legislation and water right legislation necessary for reclamation service projects before the federal system was established. A few farmers hesitated to join in the cooperative movement required for a federal reclamation projects, but they did not impede project development. On the contrary, Boise valley farmers showed more than modest enthusiasm for adopting a federal solution to their irrigation problems. Both the Boise and Minidoka proposals--Idaho's two original federal reclamation projects--had favorable cost ratios, and these enterprises gained political support from the state administration as well as from local units of government. Idaho was a state with geographic problems that had provoked sectional conflict for over forty years by the time that the Reclamation Act went into effect. But sectional hostility

did not rise up to embarrass federal reclamation. State development seemed essential to just about everyone, and as was the case over the nation at the time, little or no thought was given to problems of environmental impact or degradation that might come with expanded reclamation. Compensation and mitigation for values affected by such projects--with the exception of financial compensation to individuals whose lands had to be acquired for reservoir sites, and of provisions made for fish ladders at dams--were mostly unheard of. A good deal of attention was being paid to the effects of dams upon migratory fish, but no one worried too much about making Deer Flat (formerly providing winter range for local deer) into a reservoir. As a matter of fact, settlers already had appropriated Deer Flat, and those owners--not the deer--were the ones compensated. In the context of early twentieth century development, Idaho, along with the rest of the reclamation states, did not hesitate to go about land reclamation and conservation in a major way. And the Reclamation Act of 1902 offered the biggest opportunity to develop irrigation in arid western lands.

PHYSICAL DESCRIPTION

The Boise River, a westward flowing tributary of the Snake River and a part of the Columbia River drainage system, lies in southwestern Idaho. The lower watershed, with an average elevation of 2500 feet, is composed of river bottom lands, a series of terraces and low rolling to steep hills with few distinct mountains. The upper watershed with an average elevation of 5800 feet, is composed largely of steep, precipitous mountains which attain elevations of over 10,000 feet and which are intricately dissected by deep canyons.

Adjoining the Boise River are strips of flat bottom land, varying in width from 1/4 to 3 miles which constitute the normal flood plain. On the outer edges there are a series of terraces which rise gradually above the bottom lands and from 2 distinct levels, one of an elevation of about 2300 to 2500 feet and the higher one ranging from 3000 to 4000 feet above sea level. The lowest elevation in the drainage is 2200 feet at the confluence of the Boise and Snake Rivers.

The four main tributary streams within the lower watershed are Indian Creek, Willow Creek, Fifteen Mile Creek and Dry Creek. All the tributaries are intermittent and flow only during the spring and early summer months. At times their flow is augmented by return irrigation or drainage water. The upstream tributaries with significant impact on the Boise area are More's Creek and Grimes Creek.

The climate of the Boise River watershed shows a west coast pattern with wet winters, dry summers and temperatures modified by the prevailing westerlies of the Pacific Ocean. The precipitation ranges from 8.5" to 13" in the lower valley to 30", largely in the form of snow, in the headwaters of the Boise River. Winter snowfall amounts to 25" in the Boise-Caldwell area and over 100" in the

upper river basin. The normal flood or high water season is April to June. From December to March, the area is characterized by freezing temperatures and high relative humidity. From July to September temperatures are high and relative humidities are low. About 70% of the precipitation occurs during the winter and spring months.

The Boise valley is somewhat sheltered from the cold continental Polar air masses that occasionally move southward from Canada during winter. However, it is fairly common in winter for high pressure systems of stagnant maritime air to stay in the Boise Basin for several weeks along with favorable conditions for temperature inversions.

ECOLOGICAL HISTORY - EARLY STAGES
(Alan Stanford)

This section reconstructs the presumed natural biological environment in the Boise Valley prior to major impact of human activities in the region (mainly 1811-1880) and again as a highly altered ecosystem (since 1880).

An accurate view of a completely unaltered and balanced Boise Valley exosystem is impossible to obtain. However, it may be possible to reconstitute a reasonably accurate picture from the records of early observers, trappers and explorers. Although the area had already been inhabited by the native Indians for many centuries when white men first came, these people were, with few exceptions, largely functioning units within their ecological web, taking from this environment mainly what was needed for survival on a day to day basis. White men generally created a large disruptive influence on their surroundings.

Many accounts of the early chroniclers concerning the pre-white influence in the Boise Valley are sketchy and incomplete. They also contain many hastily recorded colloquial names and descriptions which are suspect. Combining the accounts of these pioneers with an analysis of what should have been the biological native conditions permits one to extrapolate beyond the available early records and reconstruct the area as it must have appeared.

Prior to 1910, the acreage under cultivation was mainly along the Boise river flood plain. With completion of several major storage reservoirs, many new tracts were made available for irrigated farming. Thus we designate the period 1811-1910 as one of minor change to the native environment.

Today the Boise Valley ecosystem does not have a uniform plant cover nor are the types and numbers of the various animals evenly distributed. There is no reason to believe the situation was different in the early years. In order to fully understand the situation it is necessary to subdivide the region into various plant

and animal communities, each with its characteristic forms. For the sake of simplicity, only four such communities are recognized here. Further breakdown is possible, however, such detail may serve only to obscure the overall pictures.

The Flood Plain and Desert Streamside Woodlands

Lining the river banks of the semi-desert Boise Valley is a gallery forest of willows and poplars (cottonwoods). Their presence was recognized by the earliest trappers in the area (notably Wilson Price Hunt). Many later explorers also were impressed by the green belt of trees bordering the Boise river. The native cottonwoods (poplar) were probably either Populus trichocarpa, or P. acruminata, and the willows Salix arnyguloides, S. exigua, S. laciolepsis, or S. lasiandra. Lining the stream bank beneath the canopy was an understory of various shrubs and low trees. Some of the dominant forms were Woods rose (Rosa woodsil), golden currant (Ribes aureum), chokecherry (Prunus virginiana), alder (aluns incana), servisberries (Symphoricarpus albus), and dogwood (Cornus stolenifera). At the lowest level grow a complement of annual, biennial and perennial herbaceous plants. (See Appendix for lists).

A floodplain of one to three miles in width, borders the Boise river along much of its course from five or six miles southwest of Boise City down the river to its confluence with the Snake river near Parma. Much of the plain is underlain by gravelly river deposits and a high water table. Locally poor drainage on the plain resulted in some alkaline flats. Abandoned river channels sculpture its surface and in places marshes and sloughs occupy these old waterways. Ponds and marshes on the plain are bordered by the same trees, shrubs and herbs grading into less dense stands of mainly grasses and herbaceous forms and possibly some semi-desert shrubs such as rabbit brush (Chrysothamnus nauseousus), sagebrush (Artemisia tridentata), wingscale (Artriplex confertifolia), shade scale (A. conescens), and in highly alkaline areas, greasewood (Sarcabatus vermiculatus). Here bunch grasses such as the robust giant wild rye (Elymus cinereus) were cited in several early pioneer narrations.

Bordering the flood plain on the south and to a lesser extent on the north was a series of stream terraces cut into ancient lake deposits and locally into basalts (i.e. Canyon Hill area of Caldwell). Water seepage at the base of these bluffs often enhances growth. At Caldwell the Boise river emerges from the Canyon Hill Gap onto a broad lowland. The unusually extensive plain in the Caldwell area is probably created by the merging of Indian creek with the Boise river and then the riverine type of vegetation probably extended up Indian creek. Soils in the low lying territory west of the Canyon Hill Gap to the Boise-Snake confluence and along Indian creek were probably alkaline. Fremont (Jackson and Spence, 1970:537) in 1843, made special note in his journal of the "Saline Sails" in the territory surrounding Fort Boise (near the mouth of the Boise river), and recognized a particular group of plants associated with the salty soils. The most important plant associates of such an area are the native black greasewoods

(Sarcobatus verniculatus) and desert saltgrass (Distichlis stricta). In general the goosefoot family, Chenopodiaceae, is well represented in Alkali flats. Many of the alkaline flats along the lower Boise and Indian creek described by the pioneers remain in that condition today. Russian olive (Elaeagnus angustifolia), an introduced treeform is a highly successful endeavor in such areas today.

The Artemesian Tridentata - Agropyron Spicatum (Sagebrush-Wheatgrass) - Desert Community

Most of the Boise Valley lies south and southwest of the Boise river in Ada and Canyon counties above the flood plain level. Here the water table was deep and the summer climatic conditions generally hot and dry. The vegetation cover type could be referred to as a Big Sagebrush-Blue bunch wheat grass association. It covered the miles of bench terraces and uplands with deep to moderately deep loam or sandy loam and 8 to 12 inches of annual precipitation. Big sagebrush (Artemisia tridentata), was by far the most common shrub. Other grey desert shrubs present included rabbitbrush (Chrysothamnus nauseosus) on disturbed or sandy spots, occasional horsebrush (Tetradymia spp.), hopsage (Atriplex spinosa) and others.

Herbaceous species were abundant and became more conspicuous than the sage on the moister slopes. Arrowleaf balsamroot (Balsamorhiza sagittata), Mariposa lily (Calochortus macrocarpus), globe mallow (Sphaeralcea munroana), a number of species of desert-parsley (Lomatium spp.), several kinds of phlox (Phlox spp.), and host of composites (Family Compositae), were among the many species common to the open sage areas in the spring, with lesser numbers of species blooming throughout the summer and early fall.

The Atriplex Confertifolia - Desert Community

Along the southern edge of the Boise drainage the rainfall is only 7-10" annually, and the soil is still shallower. Here sagebrush gave way to shadescale (Atriplex confertifolia), winterfat (Eurotia lanata), horsebrush (Tetradymia canescens), hopsage (Atriplex spinosa), rabbitbrush (Chrysothamnus nauseosus), and other desert shrubs. As with the sagebrush-wheatgrass community, there were a number of herbaceous annual or biennial associates. The shrubby forms probably occurred as mixed stands or a mosaic of alternating dominants. Grass was often deficient in these areas but the tracts of winter fat were probably relished by sheep and cattle. It was on these areas that the first herds of beef cattle from Texas were fed in the 1860's. They still graze today on a fairly extensive remnant of this vegetative community south of Boise.

The Agropyron spicatum - Poa sandbergii - Desert Community

Where moisture is more abundant, sagebrush yields to grass, such as on the hills between the Boise and Payette drainage. On the higher parts, there is

a grassland prairie with the dominant forms being Blue bunch wheatgrass and Sandbergs bluegrass. The lower parts of this hill are cultivated, the upper parts are used for grazing. Other native species of the lower elections include several of the shrubby forms found in the other major desert areas, and a complement of herbaceous varieties.

The journals of the early trappers and explorers have repeated references of the clarity of the Boise and Snake rivers. They are reported as clear as late as 1900 (personal interview, Mr. Paul Tracy and Mr. Glenn L. Evans). Samples from such cold stream bottom gravels are presumed to have yielded a low bacterial count and a variety of invertebrates: such as the larvae of mayflies, stone flies, caddis flies, dragon flies, true flies, and beetles. Snails and clams are also assumed to have been present. The presumed low bacteria concentrations was based on a small riverside domestic animal and human population. Bacteria would include the coliform species (Escherichia coli) and fecal streptococci and various species of intestinal Clostridium. In addition, the odor producing species and occasional pathogenic species which occasionally appear today, probably were not present. It is likely that the level of total dissolved solids and the biological oxygen demand were low. The likelihood of large "algae blooms" (eutrophication) in the summer is presumed to have been low as the nitrate, phosphate, and potassium and other nutrients necessary for their growth were absent. Today the nutrients come from agricultural, industrial and domestic sources adding to complex chemical agents that gain their way into either surface or ground waters.

The Boise river and its tributaries once supported a large variety of fish species. As late as 1910 at least four species of anadromous fish frequented the area including the chinook (Oncorhynchus tshawytscha), sockeye (O. nerka), steelhead Salmo gairdneri and white sturgeon (Accipenser transmontanus) (personal interview; Paul Tracy, Glenn L. Evans). One and possibly two species of anadramous lamprey were formerly reported in the Boise system. The Pacific lamprey, Entosphenus tridentates was certainly present and possibly also the river lamprey (Lampetra ayresii). A number of other warm and cold water species were native to the drainage.

Many of the early travelers in the Boise Valley recount either seeing or catching salmon in the rivers and observing that the Indians (Shoshoni) harvested and ate large quantities of fish. Several note that the White sturgeon was often caught and sold for meat. The prevailing attitude toward the harvest of native game was--"Take all you can when you can". Conservation was not mentioned or practiced. The pioneer homesteader was poor and often lived at a subsistence level. Initially without irrigation, they depended upon the scant rain to make their dry land crops grow. Any opportunity to bag as much game as possible was seldom passed up. Some viewed catching a hundred fish or shooting fifty quail not as wanton slaughter but the difference between eating animal protein or doing without.

Early travelers documented sightings or killings of the larger mammals. In 1824 Alexander Ross reported herds of deer, probably mule deer (Odocoileus hemionus) and elk (Cervus canadensis) along the Boise river bottoms. The Deer Flat area, on the present site of Lake Lowell, was a favorite spot for a large concentration of wintering mule deer. Occasionally antelope (Antilocapra americana) must have moved from adjacent sagebrush areas to the river for water. Only relic herds of deer remain along the river and in the brush surrounding Lake Lowell. Elk and antelope have since disappeared from the cultivated lands. Early trapper accounts indicate that the buffalo (Bison bison) never occurred further west than the south central sections of the state. The buffalo robes used by the Snake Indians for clothing and in building were evidently obtained either through trade with other tribes or from hunting expeditions to the east. Beaver (Castor canadensis) were taken along the Boise river by trappers as late as 1910, and they had also been trapped on the Snake river and on Indian creek. Otter (Lutra canadensis) were occasionally taken on the Boise river, but like the beaver these are now rare in the area.

Representatives of the weasel family in the valley were mink (Mustela vison), badger (Taxidea taxus), spotted skunks (Spilogale gracilis), the striped skunks (Mephitis mephitis) and the short tailed weasel (Mustela erminea. All are still present now but in reduced numbers. Three species of native dog could have inhabited the region; the wolf (Canislupis), coyote, (Canis latrans) and red fox (Vulpes vulpes). While wolves are no longer in the area, coyotes have adapted and exist even in agricultural areas. The same is true of the red fox which has been reported as common along the river. In at least one early account, mention is made of domestic dogs in the Indian camps along the river. Black bears Ursus americanus and possibly the grizzly bear (Ursus horribilis) may have occaionally visited the lower reaches of the Boise. Several early Boise newspapers tell of marauding black bears. The bobcat (Lynx rufus) may once have been in the area as there is favorable habitat in the basaltic rimrock areas. As to smaller mammals, little early information is available. However, by studying relatively undisturbed relict tracts we can derive insight as to the species originally inhabited the areas now under cultivation. We can be reasonably sure that the region once supported diverse ground squirrels (Spermophilus). These animals prefer open, brush and grassy areas and their numbers were curtailed by replacement of this native flora. There were once large populations of other small rodents such as the kangaroo rat (Dipodomys ordii), the deer mouse (Peromyscus maniculatus), montane meadow mouse (Microtus montanus), and the desert wood rat (Neotoma lepida).

Several early travelers remarked about the large numbers of jackrabbits. These were probably mainly black-tailed jackrabbits (Lepus californicus) the most common rabbit in southern Idaho. Cyclic population fluctuations are common in the species and 1851 and 1852 may have been a peak period and account for the unusually large numbers seen. Several other native rabbits occur.

Early accounts of birds mention only the upland game species and mention shooting grouse and quail along the river. Native to these sagebrush plains are sharptailed grouse (Pedioecetes phasianellus) and the sage grouse (Centrocercus urophasianus). The most likely native quail would have been the California quail (Lophortyx californicus). The ruffed grouse (Bonasa umbellus) another native species, may have resided in the thickets along the river. Also the mountain quail (Oreortyx pictus) and other species may have been indigenous to the area.

ECOLOGICAL HISTORY - ALTERED CONDITIONS
(Alan Stanford)

Although some assume 1910 as the start of the "modern" period of man's impingment, the thirty years between 1880 and 1910 were critical for the native wild life. This era marked the beginning of widespread cultivation in the Boise Valley, the construction of major private and public reclamation projects in the region, the disappearance of many native forms of wildlife, and the introduction of new species of fauna and flora.

Hitherto, the area along the Boise river and its tributaries had been viewed as a stable semi-desert scrub and flood plain communities with a huge variety of plant and animal species. Most of the endemic forms can be found today only in the undisturbed desert borders, on relic waste lands or on uncultivated areas along streams. Cultivated monocultures have replaced nearly all the native flora in the developed areas and the habitat of the native wildlife has been greatly altered.

Normal inhabitants of the sagebrush desert and stream bottom communities became highly adapted to that environment and found it difficult to adjust to this new situation. Croplands are highly simplified environments with a few major plant species and their particular plant and animal associates. Some associates are eliminated by chemicals. The diverse native desert and flood plains flora are better able to support an assortment of plant and insect associations for food and shelter.

Flora

The major part of the original native cover of the Boise Valley has long since disappeared with the introduction of monocultures crops, pasture lands and, in increasing numbers, housing developments, railroad, airport and highway right of ways, and industrial parks. Often native flora is discouraged through spraying, burning and other control measures. Even earlier, there had been alteration of the flora due to the increasing size of the herds of cattle and sheep and by 1890 serious deterioration had occurred. The original vegetation, which consisted chiefly of perennial bunchgrasses and some palatable weeds, had been overgrazed allowing increased growth of sagebrush and less valuable annual grasses. This situation can be observed today in the sage-grasslands of the Mountain Home

desert. At that time the stock, first cattle and then sheep, were allowed to roam freely over the flats where they would usually obtain sufficient grass and white sage to bring them through the winter. In the late 1880's, fences began to appear on the plains and new sources of winter feed had to be found. As these "free ranges" were taken over by homesteaders in the 1880's, federal and state lands were made available to grazers for a small annual fee.

The present-day flora of Idaho is characterized by a large number of introduced species, many considered "weeds". The majority of these exotics probably invaded Idaho during the period 1880-1910. Paradoxically, a major portion of the responsibility for their introduction rested with the farmers. The arrival of foreign species was usually accidental but perhaps unavoidable. One foreign seed in a bag of crop seed shipped from the east constituted an introduction. Other sources of weed seed were the cattle and sheep driven from distant localities to or through the Boise Valley. Seeds and fruits were lodged in animal fur. Following construction of the railroad, trains were a new important means of dispersal for foreign plants. Subsequently, the automobile and the aeroplane contributed to the problem.

Here are a few examples of such introductions. Since its appearance in southern Idaho in 1900, cheat grass (Bromus tectorum) has become an important feature of nearly every plant community. Its presence has created a major fire hazard on the ranges and, while generally useful to grazing stock, its dried seeds represent a hazard to cattle. Halogeton, (Halogeton glomeratus), bull thistle (Cirsium vulgare), and Russian thistle (Salsola kali) are three Eurasian introductions which have become the bane of many farmers.

From the early records of pioneers it is obvious that a large change has occurred in the composition of the wildlife. The displacement of native species has been an almost unavoidable consequence of the changing land uses.

There are many introduced species of fish in the Snake and Boise rivers. Early fish plantings include: carp (Cyprinus carpio) 1886, large mouth bass (Micropterus salmoides) 1898, bluegill (Lepomis macrochirus) 1893, black and white crappie (Pomoxis annularis) 1890, brown and black catfish (Ictalurus nebulosus and I. melas respectively) early 1900's. Channel catfish (Ictalurus punctatus) 1893, yellow perch (Perca flavescens) no date, brown trout (Salmo trutta) 1890, brook trout (Salvelinus fontinalis) 1907 and the madton (Schelbeodes sp.) introduction accidental, first seen in 1943 (Lyle Stanford).

The bull frog (Rana catesbeiana) is probably the only introduced amphibian species. Bull frogs have been quite successful and competitive with native fish and amphibians in parts of the area. No introduced species of reptiles are known in the Valley and most species once common in the presently cultivated areas have been eliminated.

Coincident with the disappearance of many endemic species of birds has been the introduction of various exotic, largely game, varieties. Most of these were purposely released in the area (by private citizens and by the Idaho Fish and Game Department), while others arrived accidentally. Exact dates of the earliest introductions are difficult to obtain. The bobwhite (Colinus virginianus), probably appeared around 1882, and the ring-necked pheasant (Phasianus colchicus) in 1903. Two additional game birds later released in the region were the Hungarian partridge (Perdix perdix), 1912-1920, and the chukar partridge (Alectoris graeca) in 1933. Bobwhites and "Huns" have become well established in the Valley, particularly where suitable escape cover exists (i.e., fencerows in farmed areas and thickets along streams). Pheasants are abundant on croplands, and the canyons and the Boise foothills provide an excellent habitat for chukar. The starling (Sturnus vulgaris), introduced to New York from Europe in 1900, probably reached Idaho by 1910. This highly competitive bird with a wide food, human, and shelter adaptability has displaced many local species and become a nuisance.

The domestic pigeon (Columbia livia), probably introduced locally between 1900 and 1910, has adapted well to the rocky canyons of Ada, Canyon and Owyhee counties. House sparrows were reported in Boise City as early as 1888. These introduced species along with several native species (e.g., the house finch (Carpodacus mexicanus) and the black billed magpie (Pica pica), are examples of opportunists. They find human habitation and agricultural activities advantageous to their population sizes, and subsequently become pests.

Mammals

Of the several mammals that moved into the Boise Valley with white man, the red squirrel (Sciurus niger) fits into a new niche. Its numbers have increased with more residential areas and the planted yard tree that provide the arboreal habitat, nuts, seeds and other foods. Several other mammals which followed man to the Valley are the Norway rat (Rattus norvegicus) and the house mouse (Mus musculus). Both are now reported in the Valley. The nutria (Myocastor coypus), introduced to Idaho in the late 1960's is reported to be increasing.

Prior to white man's presense, deer herds migrated annually from the upper Boise river drainage, across the Boise front onto the plain near Deer Flats (now Lake Lowell) for winter range. Development of dams, reservoirs, canals, housing projects, highways, and farming activities have almost ended this movement. Winter range for Idaho largest herd of mule deer is now in the foothills northeast of Boise. Now this range is partly threatened by new housing, overgrazing by domestic stock, and degradation of privacy and habitat by off-road vehicles and other recreational uses. Although cattle do not normally compete with the deer for food, as summer progresses and range grasses dry up or are grazed, stock will eat such important deer browse as bitterbrush, choke cherry, and other shrubs. There have been a few deer losses resulting from collapse of thin ice on the reservoirs.

Antelope, once common in the area, have nearly disappeared due to overgrazing by domestic stock, lack of water sources, and various other man-made causes.

Major efforts are now under way to improve big game browse habitats with plantings of bitterbrush, multiflora rose, ceanothus, southern wood, Nanking cherry, Siberian pea, choke cherry, cottoneaster, autumn olive, rosa rugosa, honeysuckle, and lead plant.

In addition, there have been plantings to provide food and cover for waterfowl, upland game birds and possibly escape cover for deer. This land is adjacent to 200 acres of ponds and marshes near the mouth of the river. Corn, wheat, barley, and legumes are being planted for use by wildlife. Mature crops are left standing for their use. In recent years the Fish and Game Department has developed a series of springs and watering facilities for the Boise deer herds.

Habitat loss for upland game birds is a continuing problem with clean cultivation up to the fence rows, canals or drain ditches in an effort to make full use of all lands. As some gravity irrigation is gradually being replaced with high pressure sprinkler systems, irrigation ditches are leveled and brush removed. This affects the upland birds by (1) removal of escape cover, and (2) loss of water supply. Other activities often hazardous to wildlife are burning or spraying of weeds and brush from ditch banks and fencerows.

Ring necked pheasant numbers have dropped in recent years due mainly to loss of waste lands and "buffer" zones in agricultural areas. In most areas they prefer croplands which are adjacent to sagebrush or other brushy areas. Bobwhite, Mountain and Valley quail likewise require escape cover in the form of brambles and fence or hedgerows.

Sage and sharp-tailed grouse (both native and once common) are now confined to relatively small areas in southern Ada county. Military activities in the Mountain Home desert have probably further reduced their numbers. In most cases the game bird populations are suffering more from a loss of escape cover and breeding grounds than from loss of food sources. The game bird experiencing, perhaps, the most success in the area is the chukar partridge, introduced into the area in the 1930's. It prefers the canyon lands where man's incursions are minimal.

Agricultural pressures have also caused large numbers of rodents and rabbits to disappear from much of the Valley. Decreases in populations of these animals jeopardizes the food source of many raptors (hawks and eagles) and terrestrial predators (coyotes, bobcats, weasels, badgers, etc.). Much of the displaced native mammalian fauna survives in the arid southern section of the region. Cottontails and jackrabbits, ground squirrels and mice live in the sage desert along with a number of carnivorous species such as weasels, badgers, coyotes, and bobcats. A large population of birds of prey nests in the cliffs of the Snake river canyon and hunts the strip of desert within several miles of the river. This

strip of land is important for another reason. Growing here is a relict stand of Eurotia lanata, white sage or winter fat.

The public attitude toward the terrestrial and aerial predators of the region has never been favorable. Their populations severely reduced and maintained at a low level by irradication programs. Paradoxically, those rodents which have been able to survive (and cause considerable damage) in cultivated areas, experience reduced pressure from natural predator control. Populations of gophers, for example, have exploded simultaneous with removal of their natural enemies.

Human influences are evident in nearly all the common bird habitats in the valley--sagebrush, riparian, grassland, marsh, river, lake and pond.

The more adaptive species have been able to adjust to the changes (i.e., clearance of sagebrush and draining of marshes), others have been forced into undisturbed adjacent habitats of their particular liking. The void of many passerine species (sparrow, wrens, etc.) from their native habitats and aquatic species (heron, cranes, waterfowl) from the riparian environment is especially noticeable. There are undoubtedly some mitigating side effects for wildlife food and shelter stemming from human activities in the Boise Valley. For example, the proximity of Deer Flat Wildlife Refuge to irrigated croplands has created an advantageous situation for waterfowl.. Birds residing on the lake in the fall can fly to nearby fields and find sufficient food left on the ground following harvest. Lake Lowell also creates a habitat for some warm water fish (e.g., yellow perch and catfish), and the shrubs and trees lined its shores shelter some waterfowl and upland game species.

Here again, as with larger species, construction of fence lined highways, rail lines, complex canal systems and extensive rural developments, have all done their part in preventing wildlife migrations and in isolating of populations. Each time humans attempt to manipulate the natural state of the environment, a strand in the delicate normal ecological web is broken. This, in turn, results in a weakening of other parts of the network (e.g., expulsion of native rodent fauna results in decreased numbers of raptors).

In 1901 a power dam was completed at Swan Falls on the Snake river to supply electricity to the Silver City mines. On the Boise river, Barber dam was completed in 1906 and the New York Canal diversion weir in 1908. Anadromous fish migrations further up the Snake and Boise rivers were effectively blocked by these barriers. Prior to this time the Snake river had been a major migration route for steelhead and salmon from the ocean to their upstream spawning beds. All major Snake river tributaries in southwestern Idaho, the Weiser, Boise and Bruneau rivers, had earlier supported populations of spawning salmonids and some residents still remember seeing them. In addition, the waters contained resident game fish, cutthroat trout, rainbow trout, dolly varden, white sturgeon and mountain whitefish. Sucker, squawfish and chiselmouth were also present. In seventy years the Boise and Snake river (in the valley) have changed from clear, healthy streams harboring cold water fisheries to murky, highly regulated canals supporting mainly rough warm water fish.

MINING AND TRANSPORTATION

Placer gold discoveries in Boise Basin, August 2, 1862, brought thousands of miners to the region. Pioneerville and Idaho City were founded October 7, and by December, a major gold rush had commenced. The new Boise mines, including placer and lode operations along the South Fork (Rocky Bar) and Middle Fork (Atlanta) as well as other tributaries, provided some economic strength to the region. Important silver mines in the Owyhee country, while not on Boise river, contributed similar economic support to the Boise region for a half century after their discovery in 1863.

Because of the seasonal water availability, early placer mines in Boise Basin could only be worked intermittently. During the short mining season, after early high water had gone down enough to permit mining and before water had given out entirely, work went on day and night. Placerville, important in 1862, lost out to Idaho City which had a longer water season. With water available for a relatively short time each year, placer mining in the basin continued for many more years than would have been possible if most of the gravel could have been processed on a year around schedule. Both mining communities in the basin as well as farming and service communities in the valley were thus supported far longer than expected because of limited availability of surface water. Mining communities--both Boise river and adjacent Owyhee-- provided farm markets for the early valley settlements, and by 1864, all the easily irrigable land along the river had gone into production.

Lode mining further extended Boise valley's mining development. By 1864 arastras were common around the South Boise and Boise Basin lode mines. Arastras were simple rock crushers that worked slowly, required little capital investment for installation and little advance ore preparation. They were replaced by expensive, large, fast stamp mills in the 1864-1866 period and by 1866, after only a season or so of operation, most of the stamp milling enterprises had failed. High initial costs for transportation and installation in remote areas, a shortage of required skilled labor,and an over-estimation of the size of the ore body hastened the failures. Most mining companies had just about enough ore to keep an arastra or two going. Their handsome new stampmills sat idle after rapidly exhausting available ores. In some places like Atlanta more than Rocky Bar, slowly developing technology for gold and silver recovery still remained unavailable for these refractory ores. With widespread failure of Boise area stamp milling experiments in 1866-1867, mining suffered a severe setback. Over the next decade or two only a few gougers managed to work a little of the highest grade ores in the lodes. Efforts to get major properties into production went on year after year, but by 1870 the lodes were largely shut down and the typical remaining Boise Basin placer miner was Chinese who just eked out a small income. By 1870 Boise had shrunk to a thousand people compared to 1600 in 1864; the entire basin population had declined to 3800 from a peak of well over 20,000 during the gold rush period. The Boise economy still benefited from transient groups, farming, and the military

expenditures at Fort Boise. As capital of Idaho since 1864, Boise got income from other federal expenditures and the beginning of state income.

Transportation improvements followed after mining began in 1862. Stage lines from Umatilla on the Columbia and Atchison, Kansas on the Missouri began to operate by 1864. Boise served as western terminal for Ben Holladay's Overland Stage Company which offered service to Salt Lake, Denver, and points east, with another branch to Virginia City, Montana. Way stations evolved at ten to fifteen mile intervals along these routes, as well as road improvements and ferries at river crossings. This transportation development sought to serve the new mining country. Competition from the Sacramento valley for the Boise trade forced rate reductions from the Portland and Columbia river route freighters.

Rail service was also coming closer with completion of the Central Pacific across Nevada, but Kelton (Boise's eastern teminus on the transcontinental railroad) to the northwest of Salt Lake was 232 miles over a hard, dusty stage and freight road. Other roads to the Central Pacific (Toano, Elko, and Winnemucca) also shared in the Boise trade, but they were not a lot closer. An early concerted effort to promote a Snake River valley rail line had got well under way in 1868 and showed considerable promise until the Panic of 1873 discouraged most railway builders for a few years. Finally, after construction of the Southern Pacific, the Union Pacific needed its own access to the Pacific in order to respond to Southern Pacific's threats to take traffic from the Central Pacific and use the Southern Pacific route instead. With an outlet past Boise to Portland, the Union Pacific could retaliate if the Southern Pacific diverted traffic from the overland route. In 1880, construction of the Oregon Short Line commenced in Wyoming, and three years later tracklaying reached Indian creek. In order to avoid difficult grades, the OSL simply descended Indian creek to the river, where a new town of Caldwell immediately began to prosper.

Rail service, extended farther to the northwest in 1884, transformed the Boise region. Farming, hitherto dependent largely upon local mining for its markets, now could develop national markets. Meanwhile the local mining market also expanded after 1882 as Rocky Bar and Silver City enjoyed their major years of production. Now that rail transportation reduced their geographical isolation, Boise Basin placers were reactivated using new approaches. Hydraulic elevators--a water system designed to lift placer gravel to a level at which sluicing could be managed--came into operation. Rocky Bar lode mining mostly came to an end by 1892, while Atlanta lode miners still were searching for an efficient recovery process. One Boise Basin lode--Gold Hill near Quartzburg--produced gold until 1934. A new system of gold removal came with dredging the flat stream beds at the turn of the century, and with one or two exceptions, this lasted until 1942. The Atlanta area finally obtained an effective flotation process in 1932 and it operated for two decades. Most of Atlanta's $18,000,000 production came in this later period, and consequently had lesser economic impact on the Boise area because the valley had grown so much more by then. When Atlanta finally shut down, the

mining era in the Boise region came to an end. Boise Basin mines had produced over $60,000,000 (or over a hundred million at 1934 prices) in a period of less than a century. Part of this mining wealth and the money spent to obtain it made substantial contributions to the Boise valley economy. As a result of early mining, extensive settlement (with irrigated farming) reached the area many years in advance of the regular westward movement of the frontier. Water resource development for placer mining in the upstream gold country thus led directly to irrigated farming in the valley below.

BANKING

When the gold rush began in 1862, banking services in the Boise region were offered by merchants, assayers, and express companies. Problems of dealing with bogus and adulterated gold, and with gold of varying fineness from different districts, could be handled by assayers who performed a banking service. Assaying enterprises sometimes grew into banking institutions in western mining communities, and banks, when they came, were likely to maintain an assaying department. Problems of shipping gold could be handled, at more than slight expense, by express companies; merchants and commission or forwarding agents could provide bills of exchange on remote banks, along with other credit services. In the Boise region, a fast freight and expressman, who had an associated assaying service, finally undertook in 1866 to organize a bank as an expansion of his mercantile business. Idaho had no territorial banking law. But B. M. DuRell went east to obtain a charter for a national bank under the federal banking act of 1863. Finally successful, he returned to Boise to open the First National Bank of Idaho, June 6, 1867. A bank of issue (of national bank notes which served as currency in a remote area where depreciated United States notes, or greenbacks, did not meet community needs) and of discount (of notes or loans, by which borrowers obtained credit and the bank obtained securities upon which bank notes could be issued to serve as money) as well as of deposit, DuRell's new venture met several important banking needs. By determining which business enterprises to back with credit, the local bank pretty largely regulated economic development of the community it served.

After rail service reached Boise valley and the region entered a period of rapid growth, new banks came to help meet new financial needs. In 1886, the Boise City National Bank was organized, and Howard Sebree opened a bank in Caldwell to serve the lower valley. Sebree's bank became a national bank in 1892, and had major impact in developing irrigation in the valley. Sebree invested heavily in a ditch project that finally proved to be beyond the resources of his bank. Eventually the Boise project of the United States Reclamation Service provided the capital to make irrigation a success on a larger scale. In the meantime, local bank capital brought reclamation expansion to the valley. Nampa had a bank in 1890 and Caldwell grew enough to support a second bank in 1894.

Other towns got their banks also, mainly at the time the Boise project was getting under way. Meridian and Parma had banks by 1903, and Middleton followed in 1906. Nampa and Caldwell managed additional banks in 1906, and Star rated a bank in 1907. A number of others followed in the larger communities while the early phases of the Boise project were under construction. A state bank in Kuna in 1918 also came as part of war time farm expansion and rapid growth of the valley after water from Arrowrock brought a lot more land under cultivation.

A series of bank failures during 1921-1922, and again in 1932, cut back many of the smaller, along with some of the larger, banks during the years of farm depression. Boise valley may have experienced less failures than the rest of the state, but a major collapse in the summer of 1932 shut down one national bank entirely and closed another for two months. The third weathered the financial storm only by the most carefully planned precautions. New federal banking legislation brought stability the next year, and the rise of branch banking led to the development of several major chains with outlets over the valley.

LUMBERING

Sawmills developed during the gold rush as mining, whether placer or lode, required lumber for sluice boxes, long flumes, buildings, mills, and timbers for stopes and tunnels. A still greater lumber market grew up in mining towns--Idaho City, Placerville, Centerville, Pioneerville, Rocky Bar, Atlanta, Banner, and Quartzburg, particularly--and service communities (primarily Boise) which owed their establishment and development to mining. Sawmills were started near the forested slopes close to the mines they served. Boise had more of an access problem, but early sawmills on Boise ridge (some on Shafer creek on the Payette) could provide lumber reasonably close to market.

Commercial lumbering for the regional market awaited rail transportation. Export possibilities still were limited. Shipping to major metropolitan centers on the northwest coast (such as Portland or Seattle) made no sense as both cities were adjacent to much larger forest and a major lumber industry. This left a modest regional intermountain and upper Mississippi valley market, which slowly emerged in the twentieth century.

The main national lumber market in the latter part of the nineteenth century was served from the Great Lakes area. When the Great Lakes timber supply was about exhausted, lumberman turned to the southern states. They held the Pacific Northwest in reserve and in 1900 began to acquire large tracts in Idaho. (Shipping time and distance east from North Idaho gave that area an advantage over the more remote Pacific coast for entry into the national market.) The Boise lumber region emerged as an appendage to North Idaho timber development with access to the market via the Oregon Short Line (Union Pacific) railroad.

In anticipation of commercial interest in Boise forest lands, real estate dealers went to work right after 1900 in a flourishing timber entry business. They had a considerable problem, though. Under the timber statute, designed as an inappropriate imitation of homestead laws for helping individuals acquire family sized farms, each entry had to be filed for the benefit of only one person. In theory, individual lumbermen, each with his own 640 acre family sized forest, would harvest and process his own lumber in his family sized sawmill. Each individual timber entry was supposed to last the family a generation or so, after which the next generation might go to work on a new stand. Because of slow timber growth and the ability of a farm family to utilize the entire yield within one generation, the concept was not applicable.

Resourceful and imaginative attorneys then figured out a way to consolidate many of these individual, family-sized timber claims in order to provide a basis for commercial Boise forest products industry. In the meantime, prior to establishment of Boise National Forest (which got something like its present boundaries in 1906), a substantial number of Boise forest timber lands were entered by hopeful investors.

Shortly after leaving office as governor of Idaho at the end of the nineteenth century, Frank Steunenberg tried to interest Wisconsin and Minnesota lumbermen in Boise forest lands. His efforts lead to organization of the Barber Lumber Company in the summer of 1902. With extensive holdings (25,000 acres) of Boise Basin and Crooked river timber lands, this company prepared to bring commerical lumbering to the Boise region. A sawmill, dam, and mill pond was installed at Barber in 1906. At first the Barber company tried log drives down the river to supply this new mill. But log drives did not work too well. And in any case, the operation had to shut down the next year while attorneys for the Barber interests worked out problems of land title that took until 1912. Originally W. E. Borah served as an attorney for the Barber company, and complications over title to the Boise Basin and Crooked river timber lands grew out of a Republican factional struggle associated with Borah's nomination for United States Senate in 1906. Borah won the election, but some of his adversaries tried to embarrass him by bringing criminal charges concerning the Barber timber land entries. Borah easily secured vindication, but his Barber clients had to spend another couple of years disposing of the rest of the litigation incidental to this political battle. By 1912, the company had $1,600,000 invested in the Barber operation, but no prospect of any return. And then Arrowrock dam had cut off river access to the north fork (Crooked river) logging area. Merger of the Barber Lumber Company with a similar Payette river enterprise, December 24, 1913, brought additional capital and new management to the Barber operation. Some 12,000 additional acres of Barber timberland had been obtained, and a large, additional Boise Payette mill was built at Emmett.

To supply the Barber mill, the Intermountain railway was built for $1,037,499 on up Boise river, More's creek, and Grimes creek to Centerville in

1915. This line came as an extension from a United States Reclamation Service railway to Arrowrock, and the Boise project had power arrangements as well as transportation connections with the Barber enterprise.

When the Barber mill finally came into production, the marketing situation proved to be less favorable than had been anticipated in 1900. Meanwhile, completion of the Panama Canal had given Pacific coast lumbermen a freight rate advantage to east coast markets. This new ocean route established the eastern limit of the Idaho lumber market at Cleveland, Ohio. Southern forests with a rapid nearly year around growth and with much of it growing on flat, easily accessible terrain started to encroach on more of the markets using Pacific Northwest lumber. Boise-Payette and the other Idaho lumber companies had to confine their sales efforts to the midwest and intermountain area, with Boise forest products concentrating mainly in the latter. By 1922 a system of 72 Boise Payette intermountain retail lumber yards made the company solvent. These yards, in fact, covered manufacturing losses until 1929. But with net profits of less than 1% from 1924-1929, and $600,000 net losses from 1930-1932, Boise Payette finally decided upon a policy of severe retrenchment. Their Emmett mill closed from 1931-1934, and their Barber mill ran only periodically. Finally in 1934 the Barber mill was dismantled and the Intermountain Railway was abandoned the next year. (The railway grade up More's creek then became a highway route for the state road between Boise and Idaho City.) At that point, Boise-Payette managed to return to profitable operations. But these profitable operations came primarily in other parts of southern Idaho. Their Boise timberlands, located in rough country in which logging trucks could not operate before 1934, had stands too scattered and too expensive to process when the national market was depressed.

For a time Boise-Payette handled logging operations through contractors. Heavy production during the war exhausted most of the company lands, though, and by 1949 the company was about ready to abandon logging and milling altogether. An expanded retail lumber yard system in the intermountain west continued to provide the company most of its profit.

Then in 1949 company reorganization (with new management and new arrangements with the Forest Service) brought back the production phase of Boise-Payette operations. Higher lumber prices, tree farms, and improved forest management practices helped. A long series of mergers, particularly after 1957 when the company became Boise-Cascade, made the revived enterprise the largest lumber corporation in Idaho. With integrated operations and diversified plants (including pulp and paper mills, paper products and new brands), the company's net worth rose from $7,830,000 in 1935 to $45,431,000 in 1959--two years after consolidation with the Cascade company of Yakima. That was only a beginning. By 1970, this figure had risen to $2,196,394,000. Except for corporate headquarters in Boise and some operating plants in the valley (including reentry at Barber), most of this total income came from other portions of the company's operations, both national and international.

POWER

The main private source of electrical energy in the Boise Project area today comes from the Idaho Power Company, a firm whose involvement in the region dates to 1916 but whose predecessors date to 1887--as do its ties with the Boise Project antecedents.

The first electric service in Boise, the Capital Electric Light, Motor and Gas Company, took water from the Ridenbaugh Canal up onto the first bench across the river from Boise and then dropped it some 62 feet to power a turbine. At the time--the company began operations in the summer of 1887--the total capacity was 30 kilowatts; by 1900 capacity power was 460 kilowatts and it powered Boise's first electric street railway.

In 1902 that company was bought out by the Boise-Payette River Electric Power Company, which had constructed a power plant near Horseshoe Bend the year before that could produce 1000 kilowatts. Transmission lines were run not only to Boise (at which point the old power plant on the bench closed down) but also to the mining camp of Pearl.

The next power company in the area, the Electric Power Company, also drew upon irrigation water to help produce its 300 kilowatts; the other source of power was steam generation. Other small plants sprang up in the region in the next few years, but none relied upon irrigation water as a source or power generation and only one provided substantial service to the valley.

That one, however, covered a considerable amount of territory. In 1901 the Trade Dollar Consolidated Mining Company completed the power plant at Swan Falls on the Snake river, originally providing 900 kilowatts; and although the primary purpose was to serve the mining camps in the Owyhees, lines reached Nampa and Caldwell in 1906 and the Pierce Park area (then separate, now a part of west Boise) in 1907. Even allowing for the area served by the Swan Falls plant, there was very little power available in the valley by 1907.

However, service increased rapidly in the next ten years, paralleling the growth of population and of irrigated acreage. The total mileage of power lines in the Snake River Valley in 1910 was 626 miles; in 1914, 1510 miles. In 1907, there were some nineteen companies in the entire Snake Valley producing power; by 1914 they had expanded production and contracted in number to five.

Finally, one company--the Idaho-Oregon Light and Power Company--emerged to serve the Boise Project area. Although its intention originally was to build a plant at Oxbow on the Snake, long before that could be done power demands had increased so much that the company had to add a third unit at Horseshoe Bend (1908), take over the power plant at Barber Dam (1909), and construct a transmission line to Pierce Park in order to interconnect with the Swan Falls

system (1910). Meanwhile, the company was having difficulty selling enough bonds to finance the expensive Oxbow project (among other problems, just getting materials down into the canyon was quite an enterprise) and the Great Shoshone and Twin Falls Water Power Company was edging its transmission lines toward Boise to provide competition. Both firms entered into negotiations to buy the Swan Falls plant. Meanwhile the Idaho-Oregon company began to add new irrigation-pumping customers thereby overtaxing its facilities and the Great Shoshone company bought the Boise Interurban Railway Company, thus taking away one of Idaho-Oregon's steady customers.

Fortunately for Idaho-Oregon, a syndicate of its stock and bond-holders managed to persuade Great Shoshone to withdraw from competition in the Boise region. The syndicate, later incorporated as the Idaho Railway Light and Power Company, also purchased several of the remaining power and power-using companies in the Boise valley; and by the beginning of 1912 only the two financially and electrically connected companies remained in the area.

However, in that year the Beaver River Power Company, whose chief source of generation was the Malad River, began soliciting customers in the rapidly growing Boise area. Such pressure was too much for Idaho-Oregon, and Idaho Railway was not willing to risk further loss; so the Oxbow plant remained uncompleted and Idaho-Oregon went into receivership at the end of 1913. So did Idaho Railway. As the two companies had separate receivers, they found themselves back in competition; and in order to provide some chance for survival Idaho-Oregon managed to complete a 1400-kilowatt plant at Oxbow and tie it into its transmission grid. Meanwhile, Beaver River was taken over by a new company, Idaho Power and Light--which was itself taken over by Idaho Railway just before that company went into receivership. However, Idaho Power and Light remained a separate entity and was, by the end of 1914, the only power company in the Boise are not in receivership. The actual and potential growth of the valley attracted power company investors who did not watch carefully both the slowness of construction of the Project facilities and the activities of their rival companies. The companies had overextended themselves in an area where there were not enough customers to amortize the high costs of construction. Furthermore, the larger power plants in the state were in the south-central part, while the center of population was in the southwest--thus requiring high cost transmission lines that stretched the distance limits for cost effluences. This set the scene for yet another merger.

After a battle among various bondholder groups of the companies in receivership, and after investigation by the Idaho Public Utilities commission, the Idaho Power Company acquired or absorbed all other companies during 1915 and 1916. At the same time, better interconnections were established with the power plants to the east of the Boise Valley.

When Idaho Power Company came into being in 1916, it's total generating capacity was rated at 20,340 kilowatts and it was serving 17,786 customers.

Within the Boise Basin electricity has been produced at Barber Dam (1906), Boise River Diversion (1908), and Anderson Ranch Dam (1950). The unit at Barber Dam, constructed with private capital and located approximately six (6) miles east of the Capitol, was later removed from production. The federally owned units at Boise River Diversion Dam (1500KW) located approximately eight (8) miles east of the Capitol, and Anderson Ranch Dam (27,000 KW), located approximately forty (40) air miles southeast of Boise are owned and operated by the United States Bureau of Reclamation, with power marketing and distribution provided by the Bonneville Power Administration. The construction of Arrowrock Dam necessitated high energy requirements for that time and power produced at Diversion Dam was utilized in its construction.

Another generating facility, the Black Canyon Dam, operates within the Boise Project on the Payette Division and is managed by the United States Bureau of Reclamation. Located on the Payette river approximately twenty five (25) air miles northwest of the Capitol, the Black Canyon facility with an installed capacity of 8,000 KW is used to pump water into the Black Canyon Canal which irrigates land directly north of the Boise Project.

There is a privately owned dam and generator at Atlanta, in the upper portion of the basin run by the Atlanta Power Company with an installed capacity of 150 KW. It operates only when the demand is sufficient.

Boise river power is added to other regionally generated federal and private power which is placed in the total electric reservoir of generating capacity and the Idaho Power Company handles all of the electrical distribution. The main production comes from generators and dams on the Snake river though the major regional demand comes from the Boise valley.

The regional electric production and potential production data are for Boise valley and subarea 4 (see Table 1).

For this discussion "installed capacity" indicates the normal upper limit of a unit's potential in KW. The statistics include main generating units without regard to possible auxiliary units that may be present. The "average annual generation" is the average annual amount of electricity for the previous year expressed in KW. Finally, "consumption" express especially the amount of electricity, in KW, that was actually used without regard to the losses which result from transmission of the current before it can be utilized. (Average Annual Generation = Consumption + Losses.)

The three generating facilities located within the Boise River Drainage Basin are the Atlanta Dam, Boise River Diversion Dam, and Anderson Ranch Dam

TABLE 1

HYDROELECTRIC FACILITIES IN BOISE VALLEY
AND SUBAREA FOUR (1968)

NAME OF FACILITY	OWNER	RIVER	DEVELOPED (KW) INSTALLED CAP.	AV. AN. GENER.
Boise River Diversion	U.S. Bureau Rec.	Main Boise	1,500	7,000,000
Atlanta Dam	Atlanta Power Co.	Middle Boise	150	100,000
Anderson Ranch Dam	U. S. Bureau Rec.	South Boise	27,000	156,000,000
Total			28,650	163,100,000
Area Four (4) Total			490,415	3,529,900,000

Source: Appendix #1, Electric Power Water Needs, Idaho Water Resource Board, Boise, Idaho, prepared by The Idaho Power Company, December 1970.

indicate a 1968 combined "installed capacity" of 28,650 KW. (Atlanta: 150 KW; Boise Diversion: 1500KW; Anderson Ranch: 27,000KW.) Subarea four consists of Adams, Valley, Washington, Payette, Boise, Gem, Canyon, Elmore, Owyhee, and Ada counties with a combined "installed capacity" of 490,415 KW. The facilities in the Ada-Canyon area account for 5.84% of the "installed capacity" for Subarea Four (1968 data).

Consumption figures for the Boise area are quite different. The total consumption of electricity for Subarea Four (in 1972 was 2,085,033,820 KW, the Ada-Canyon area accounting for 1,498,809,430 KW, or 71.4% of the total.) (From Mr. Don Barclay of Idaho Power Co., 11/13/73.)

Though Boise Valley production data comparisons were for 1968 and the consumption comparions were for 1972 it is believed that there has not been any substantial change in earlier pattern. It still leads to the conclusion that Boise Valley imports mostly its electrical energy though Subarea Four is generally an exporter of same. This comparison has little relevance to self-sufficiency because few local areas of high demand are self-sufficient.

The Idaho Power Company has planned additional hydroelectric capacity on the Snake river outside of the Basin. It has also shared in the construction of a major thermal (coal) generating facility in Wyoming and is hoping to start another large thermal (coal) generating unit to be located south of the Idaho State Penitentiary along railroad trackage in the sagebrush desert land about 24 miles southeast of Boise.

EARLY IRRIGATION CANALS PRE-PROJECT VENTURES

Boise Valley water has been not only a major source of its current wealth but also one of the original reasons for travel through the valley. The Wilson Price Hunt party, financed by John Jacob Astor, came through the area in 1811--following the watercourse in order to survive. Later fur trappers and traders followed the water of the river and its tributary streams, not only for potable water, but also for beaver. And as the river valley became an obvious, more steadily used travel route, the Hudson's Bay Company set up Fort Boise, at the Boise river's confluence with the Snake, which was one of the earliest sites of irrigated farming in the valley. John C. Fremont, exploring the area in 1843, suggested that more irrigation at that point (implying that irrigation was already being provided by some means) would produce increased crops for the residents of the fort.

When mining began in the Boise Basin, northeast of the river valley, in 1862, everything had to be freighted in--equipment, food, clothing, most of it either up the Columbia and Snake rivers from the Portland and Willamette Valley

area or overland from Salt Lake City. Some moving into the area were convinced farming and ranching might well be profitable enterprises. So diversified farming began in 1863--diversified because, with no other ready source of food, the market was also diversified. With the development of the Owyhee mines, centered at Silver City to the south, farmers and ranchers in the valley had yet another market outlet for their goods.

With a relatively large nearby mining market for farm produce, Boise river bottom lands were irrigated in the summer of 1863, and by 1864 all of the easily watered riverside farm land was in agricultural production. By the early spring of 1863 there were about a hundred people in the valley; and they were promptly raided by the Indians who had formerly had exclusive use of the bottom lands chiefly as campsites and as a base for fishing. Partly because of the Indian raids, partly because of increased use of the Oregon Trail through the region and the two nearby mining areas, the United States Army established a militiary post --also called Fort Boise--toward the upper end of the valley in June of 1863. Shortly thereafter, the residents of the valley--who were fairly well concentrated in the area near the river south of the post--laid out and established the city of Boise; it has remained the focus of the valley ever since.

When Boise was founded, irrigation already was underway. Tom Davis' canal took water out of the river about a mile and a half above the town. In 1864 he built a headgate and in 1864 and 1865 a good substantial ditch. His first crop--and that for which he and the valley became famous--was fruit; in 1864 Frank Davis set out seven thousand fruit trees, the produce of which was shipped as far as the Montana mines. The system was sold in 1872 and became the Jacobs Canal Company. The ditch eventually went all the way through Boise and was used not only for irrigation, but also for sewage and pumping.

By the end of 1863, there were three cooperative canal companies in the valley with twenty-one miles of canal among them. The first stock company, the Vallisco Water Company, was incorporated by the territorial legislature in late 1864; it constructed works on the north side of the river and turned the first water onto its land in the spring of 1865. The company went through various enlargements and name changes over the years, and its water also was used not only for irrigation but also for milling, manufacturing, and sewage transport. One offshoot of this company was the Boise City Canal Company, incorporated on March 8, 1869.

Two other early ditch systems near town were what eventually became the Ridenbaugh Canal, first developed in 1865, and the Thurman Ditch, west of town, which powered a flour mill. As early as 1864, Eagle Island--downstream from the town of Boise--was crossed with ditches and successful crop production. A ditch in the Middleton area (known as the Middleton Mill Ditch), began in 1864 to carry 1200 inches of water, was by 1900 twenty miles long, supplying water to 3000 acres, and running a flour mill. Chiefly as a result of that ditch's early success, Middleton became one of the early settled areas in the valley.

In 1876 another Middleton organization--the Middleton Water Company--was formed as a cooperative to alleviate the problems which arose when the Mill Ditch Company shut off water for repairs to either the ditch system or the mill. The two Middleton projects were among the most successful projects in the valley. In addition, the Pioneer Ditch, begun in 1864, led to the founding of Star in 1870; and the Dry Creek ditch, also on the north side of the river, begun in 1879, was irrigating 2433 acres by 1902. The western end of the vally had fewer and smaller projects, but the few which were there were the only reason at all for settlement at that end.

The early growth of the valley--attributable almost exclusively to the availability of water, directly or indirectly--is impressive. From 1863 to 1870 land under cultivation grew from almost nothing to 19,180 acres with a farm value of $319,300 and of production worth $431,199. By 1880 there were 256 farms, with a total of 80,853 acres, farm value of $800,475, and farm production value of $1,040,073. The valley's incorporated villages contained 2675 people in 1870 and 4674 in 1880; it is probable that an equal number of people lived on farms outside the incorporated communities. But by the 1880's, individuals and cooperative projects had accomplished about as much as they could with limited resources of money and equipment to bring water onto the land. The bottom lands, fertile and easily irrigated without complex engineering projects, were just about all taken up. Although the Homestead Act of 1862, The Timber Culture Act of 1873, and the Desert Land Act of 1877 all made it much easier and (inexpensive) for the prospective settler to obtain land, without water he had no way to substantiate his claim and establish a stable economic situation.

However, there was considerable potential money available to finance the next stage in water development. The large eastern investor--the same sort of person attracted to invest in often highly speculative western mining ventures, regarded western irrigation projects as another related speculative opportunity. Perhaps the highly romantic image of "making the desert bloom like a rose " with water appealed to some with a passive sense of adventure. Proposals for irrigation ventures were accompanied by technical and detailed engineering reports that made a faint possibility seem like certain success. The possible romantic appeal interpretation is at least somewhat borne out by the fact that speculators intended to terminate their financial involvement and sell their works to the settlers on the land--before they had actually realized much return on their investment. Getting one's initial investment back on an irrigation project is a long, slow process and this belated realization may have accelerated sales to settlers.

Two additional factors encouraged major investment ventures in the Boise Valley after 1880. One was the coming of the railroad to the area, making Nampa and Caldwell--though not Boise--shipping points to both east and west and opening up the possibility of a national market for valley crops. The other was the "discovery" of placer gold in the Snake river. Recovering that gold would require much the same sort of water diversion and canal system as irrigating farmland. One particular venture, which went through all the ups and downs that might be expected

of such speculation and which presented a most difficult and costly engineering problem, was the construction of the New York Canal--which later became a part of the Boise project.

The story of the New York Canal is recounted elsewhere in this report.

The largest early pre-federal project in the Boise Valley was the Ridenbaugh Canal system, which began in a very small way in 1865. In 1877 its founder, William Morris, claimed 17,076 acres under the Desert Land Act on the first bench across the river from Boise; he then proceeded to find both buyers for his own claimed land and other settlers who would claim adjacent lands which he would then supply with water. Morris used local, farmer work crews--an arrangement that gave the settlers a sense of commitment to the project even though they were not owners or shareholders in it--and he planned his ditch not only for irrigation but to carry lumber and run sawmills. The plan ran out of capital when Morris died suddenly in 1878. Some of the settlers, wishing to keep their land and unable to develop it without water, continued the work.

In 1878 Morris' heir, his nephew William Ridenbaugh, took over the system. Within two years he had sold it; and it was sold again or contracted out three times more before it was completed. Still, by 1891 there were 100 miles of main ditches and 153 of laterals within the system, with ten lakes and reservoirs stretching all the way to Deer Flat south of Caldwell. It irrigated 22,000 acres and also supplied Boise with power for lights. By 1900, 80,000 acres had water available to them and 49,000 of those acres were under cultivation. There were 700 consumers of the irrigation water from the Ridenbaugh system, and the value of their farms and homes was over $3,000,000.

All three of the early large systems, the New York, Phyllis, and Ridenbaugh canal works, remain at the heart of modern irrigation in the Boise Valley. Although their construction was--especially in the first two cases--highly speculative, obviously the men who originally suggested their development could see what would be needed to provide water adequate to the continued growth of the valley. But these were not the only longlasting irrigation systems built in the valley before 1902. In 1875 the Johnson Ditch was constructed west of Middleton, and it was expanded in 1883 by the farmers who owned it. In 1887 it was bought by Howard Sebree, whose name it continues to bear, and that year and the next Sebree began a large northside canal. By June of 1888 it was twenty-three miles long and could serve about 22,000 acres. But the system suffered regularly from maintenance problems (most notably the frequent and disastrous collapse of ditchbanks), and eventually--in 1902--the farmers it served bought it themselves, handled the maintenance themselves, and renamed it the Farmers Cooperative Ditch. In 1882 the Dixie Canal (as three of its founders were Methodist ministers, it quickly became known as the Methodist Ditch) was begun in the Roswell area near Parma with a filing for 6000 inches of water. It too had construction and maintenance problems, caused largely by its location on a hillside to the south of the river.

In 1886 it was extended somewhat by placer miners on the Snake who needed water and finally in 1892 it was sold under the name of the Riverside Canal to a group of valley investors that included later state engineer D. W. Ross and later leader in the development of the Boise Project J. W. Lowell. These men also used farmer labor to do maintenance and repair work, a job opportunity that was particularly welcome during the depression (and short-water year) of 1893. By 1900, some 3000 of a potential 12,000 acres were under irrigation, and the system was operating as a cooperative.

The other two major works in the valley were began as, and remained, cooperatives. The Farmers Union Ditch Company on the north side, based on an 1865 canal, was begun in 1894. By 1899 the main ditch was twenty-four miles long, and by 1902, 9000 acres were being irrigated from it; the system is still in use. In 1884, the Settlers Ditch was begun near Meridian. At first farmer labor on this system did not work well--apparently few members of the cooperative were prepared to fully meet their labor obligation. John Lemp, a prominent and substantial Boise businessman, took over the system, got it working smoothly, and it 1901 sold it back to another farmer group. Both he and they were so successful that they could not supply enough water to fill the demand of farmers on land under the system.

By 1900 there were 19,056 people in the valley, with 1650 farms on 113,205 acres of land. Farm property itself was valued in 1899 at $750,000; there were 568 miles of ditches, irrigating 96,652 acres. A variety of financial problems plagued the various systems; there was no completely satisfactory way of providing some kind of income and expense money as well for the operators of the commercial systems. Water rent charges, soon resorted to, were a burden on the farmers who had already had to pay for water rights. But generally farmers dealt directly with the companies that supplied them with water--whether cooperative or privately owned--and not only worked out solutions to immediate problems but became more and more involved in the companies themselves. There was a great variety of management plans among the canal systems; indeed, there still is.

The ultimate pre-federal solution to operational difficulties came as a result of conflicts over the Sebree Ditch system. In 1891 the California State Legislature had passed the Wright Act, allowing the formation of irrigation districts, and in 1895 the Idaho Legislature passed a similar law. In that latter year, the farmers under both the Sebree and the Phyllis system began the legal procedures necessary to form such a district, which in effect would turn those systems into public systems. Their progress was halted by a challenge in the courts to the constitutionality of the Wright Act; and by the time that was settled (in favor of the Act) in 1896 apparently the Sebree and Phyllis farmers had lost interest in such a step. But other farmers, in 1900, formed the Pioneer Irrigation District in Canyon County to purchase and operate the Phyllis and Caldwell systems. The establishment of this district was brought about not only by the farmers who

received water from the two systems but also by the townspeople of Canyon County, who were well aware that their livelihood depended completely upon the successful operation of the irrigation systems in the valley. The Settlers and Nampa-Meridian irrigation districts came after 1902; but the reasons for their establishment were the same as those of the earlier systems.

As with the Settlers Ditch, the other irrigation systems in the valley faced the problem of bringing about too much success. The river water was being used, by the turn of the century, at about its maximum capacity given the extreme dryness of late summer--when irrigated crops need water most. The only possible solution to this--the only possible provision for continued growth in the valley--was provision for water storage. And this could only be provided at a cost far beyond that which speculative or cooperative development could handle.

A complete listing of the irrigation canals in the Boise Project is included in an appendix.

NEW YORK CANAL

With rail service about to reach Boise Valley and to bring the possibility of a national market for local farm produce, a major canal was needed to bring water to more desert land. New York capitalists, in search of promising opportunities for large scale investment, undertook that project after 1882. Mining possibilities as well as reclamation prospects entered into the plans of the New York investors, incorporating the Idaho Mining and Irrigation Company, June 23, 1882, they hoped, through gold production to recover some (if not all) of their cost of building a major canal that would have a permanent future serving potential farm land that existing irrigation systems could not reach. Water not needed for reclamation during the summer could be used to work many miles of Snake river placers. Snake river fine gold was attracting much attention but there was no economical way to recover the flour sized gold particles. But that discouraging aspect of the canal project could not be foreseen in 1882. Something like two million dollars came from Snake river placers in spite of production difficulties. Even without the mining possibilities, the New York canal project had great merit.

From the beginning, the New York canal was planned on an imperial scale. John H. Burns filed a claim for 3000 second feet of water, November 13, 1882, and A. D. Foote, the company engineer, located 1500 more the next year. With a canal capable of handling 4500 second feet of water, they hoped eventually to irrigate 500,000 acres. In 1883, Foote surveyed a 75 mile main canal, along with a system of lateral ditches. By fall he had a truly handsome promotional map of a massive reclamation system for Boise Valley. Provision was made for 5000 miles of lateral ditches. He had to spend $4000 a month to get this work done. Still, it was worth the cost. Without such an elaborate (if over-expensive) survey, investors would not

be interested in providing the million or one and a half million dollars required for the initial stage of construction.

Foote did not propose to begin with a canal large enough to deliver 4500 second feet of water. Still, he located his canal so that, when enlarged to that capacity, a 500,000 acre tract of land requiring that much water could be served. Actually, until large storage reservoirs could be build on the river above his canal, he had no prospect of obtaining anywhere near that much water anyway. Although the river ran more than 10,000 second feet during spring runoff, and 20,000 and more during a good flood, conditions were different in August when irrigation water was critical. Anywhere from 600 to 800 second feet might be available during mid-summer, with low water running even less toward the end of the season. His plan called for a canal 27 feet wide on the bottom, 47 feet on top, and 17 1/2 feet deep. To run his canal at the highest practical elevation, he planned to start it in the river canyon above the valley. He estimated that the initial three miles in the canyon, would require $75,000 per mile. Five years work, he hoped, would get the main canal built. Work on his diversion facility, though, could not commence until low water at the end of the season in 1884. Meanwhile, pending the subscription of capital investment, he had a small crew begin to clear rocks along the canyon route. Then a modest beginning stage, with a canal that later could be enlarged, might follow if capital were forthcoming to underwrite the project.

With 12 to 24 men at work over the valley surveying and preparing promotional material, the project attracted local interest as well as eastern investment. On the strength of apparently excellent propects for water to be delivered through the New York Canal, homesteaders went out into the desert to take up land. Even if the whole system might take five years for construction, water was expected to transform some of the land in two or three years. Agents of the company said little concerning their financial resources or their backing. Their silence proved to be an asset for the company, but a disaster for the prospective farmers.

A national financial panic in February, 1884, delayed the ambitious New York canal project. Failure of a Baltimore firm, which had subscribed the necessary capital, forced Foote's company to deal with the firm's creditors. When the creditors refused to negotiate, Foote could consider nothing but assessment work through 1886. He kept a small crew at work rolling and blasting rock in the canyon. This enabled the company to retain its water claim, made a fair amount of noise and attracted attention without costing the company much money.

Some Nampa promoters tried in 1886 to bring water into part of the New York canal tract so that New York canal homesteaders might avert disaster. Their newly organized Phyllis canal company, regarded as part of the dormant New York project, sought to extend the Settlers ditch into some of the projected New York canal system. After this effort collapsed in the fall of 1886, C. H. Tompkins, (president of the Idaho Mining and Canal Company) finally secured a stock option

from the company's recalcitrant creditors in December 1886. By purchasing the creditor's stock for a small amount, he planned to clear out the old obligations at a small fraction of their value so that he could proceed to raise construction funds for the New York and Phyllis canals. Meanwhile, builders of the Idaho Central Railway also expressed interest in taking over the defunct Phyllis canal in order to help the ruined homesteaders and to develop increased traffic for their line designed to connect Boise with the Oregon Short Line and Nampa. When the Phyllis company resisted this possibility, the New York canal, along with the Phyllis, appeared to be a fraud of the first magnitude. Only $500 worth of work had been done on the Phyllis, and the two men equipped with wheel barrows seemed to be making little or no headway in the canyon on the mammoth New York canal. The Statesman, July 23, 1887, complained that "they could bale out the Pacific Ocean as soon [as] they could paw the dirt off this ditch from its beginning to its ending . . . If a corporation entices innocent men, with or without families into such a trap [of homesteading desert land for which water is not provided] it should be made to pay the damages which these parties have suffered . . . But judging from the amount of work done on this imaginative canal their exchequer needs to be replenished."

In order to get the New York canal started the Idaho Mining and Irrigation Company began surveying, February 3, 1888, for a ditch that they could afford to construct. Later that year, the Phyllis canal enterprise was returned to the parent company, and serious work finally began on the system in the spring of 1890. Under contract from the Idaho Mining and Irrigation Company, W. C. Bradbury quickly put the Phyllis canal into operation. Aside from getting water to farmers who had desert land in the original New York canal system, this ditch gave the company access (through a short cut) to some of the Snake river placers which also constituted part of their objective. Then in July, 1890, Bradbury began construction of the New York canal, two years after the original projected completion date.

Bradbury managed to build only six of the sixty miles New York canal project during the year that he worked on the project. By March, 1891, a dispute between New York and British bondholders led to termination of funding for the Idaho Mining and Irrigation Company. Some of the subcontractors quit at that point, but Bradbury continued under his 60 mile contract until July, with 200 to 500 men and 100 to 250 teams of horses. He spent $208,000 of his own funds. His resources exhausted, Bradbury had to quit without a usable canal to justify his efforts. Bradbury had spent $150,000 in the three mile canyon stretch without actually getting a canal finished there. He had 14 miles of canal under construction, but less that half of that portion finished when he had to halt work. The completed six miles extended from the head of the valley onto the benches above Boise. The New York canal now started several miles below the source for water, or to look at the situation another way, quite a number of feet above the nearest possible diversion point in the river. Worse still, the canal ended about three miles from Boise at a spot quite a few miles from most of the lands that were to

be watered. Either a high diversion dam or the canyon stretch of the canal (necessary to close the gap from the original diversion point to the section Bradbury had built) could be built only at a lot more expense.

Discouraged by this unfortunate turn of events, A. J. Foote withdrew from the New York canal project altogether, and started a new Boise City canal enterprise in 1892, which the city council accepted because of an offer for free water. In the absence of token efforts by two men equipped with wheel barrows in the canyon, D. H. Tompkins had to keep relocating his New York canal water rights of 2000 second feet every sixty days. He kept up this poor man's substitute for doing assessment work "for a long time".

By the end of 1892, the Idaho Mining and Irrigation Company bondholders' conflict was reported solved. But funding to resume construction of the New York canal failed to materialize during the panic of 1893. Worse still, the Phyllis canal (the only part of the development that Bradbury had completed) had gone into receivership for two years. Obtaining the legal counsel of William E. Borah, a young Boise attorney, Bradbury had a mechanics lien filed for $208,000 against the Idaho Mining and Irrigation Company, April 8, 1893. Finally, on February 8, 1894, Borah purchased all of the New York and Phyllis canal property for Bradbury at a sheriff's sale, February 8, 1894. When the time approached for the New York canal water right to expire (because of failure to do assessment work) two groups of builders competed to take over the project. Ern Eagleson, who had extensive holdings in need of water on the bench above Boise, located a water right about a mile above the proposed New York canal diversion, January 18, 1896. He and his associates proposed to open their enterprise to interested farmers, and organized the Ada County Farmers Irrigation Company, February 10, 1896, for that purpose. A number of valley farmers, including some of Bradbury's subcontractors, also began to jump the New York canal claim. Organized as the Farmers' Canal Company of Ada County, they filed on 1500 second feet of New York canal water right, January 24, 1896. With about 175 farmers for stockholders, this group decided to finish the canal themselves. They agreed, February 21, to purchase whatever interest Bradbury had in the New York canal, and on April 20, 1896, these farmers drove the Eagleson group (already at work building the canal) out by force. This conflict went to the State Supreme Court, which gave the Eagleson company the canyon portion of the canal and other farmers the rest. W. D. Bradbury now planned a new diversion dam to turn water into the canal at the head of the valley where his six mile canal stretch already was completed. That way the expensive canyon section could be eliminated from the project, and the Eagleson part of the canal need not be finished.

Prior to settlement of the New York canal litigation by the supreme court, January 24, 1898, the Farmers Canal Company did about $3000 worth of work on the ditch, using anywhere from four to twenty teams provided by those farmers who were inspired to go out to work on the canal during slack times. They hoped to get a ditch through to their lands by that voluntary system within five years.

But such an effort did not get them very far. Eagleson, who had put 12 to 15 teams in the canyon before his scrap with the other farmers, finished between 2600 and 3000 feet a ditch 10 feet wide and 5 feet deep after the supreme court awarded him the canyon stretch. Then a flood washed out the upper part of his work. He also had to bring a right of way suit against the farmers who had the lower part of the canal. Whether a ditch ever would have been finished under such adverse circumstances hardly can be determined. Finally, in 1899, Charles Fifer brought both companies into a new combine--The New York Canal Company. Owned by stockholders, who got water in proportion to their shares of stock, this enterprise was also exempt from taxation under legislation of 1897. Another $100,000 spent by the new company got a small 300 second foot canal through the canyon, as well as a total of 25 miles in main canal and laterals that reached the lands of the stockholders. Water was turned in June 20, 1900. Another $25,000 was sufficient to complete this initial development.

With a canal built to carry only 300 second feet through the first three miles in the canyon, and 2200 second feet for the next six miles built in 1890-1891, and then 200 to 300 second feet on down to the farms where irrigation commenced in 1900, much remained to be done to realize anything like A. J. Foote's original plan for a project of 300,000 to 500,000 acres. A rubble diversion dam of hay, straw, and loose rock had to be replaced and torn out each season at an annual cost of $2000. This arrangement, along with the canyon part of the canal--a ditch 6 feet deep and 23 feet 3 inches down to 16 feet wide from top to bottom, with a grade of 19 inches to the mile--could be abandoned if a permanent diversion dam were constructed at the lower end of the canyon. When storage facilities made more water available, the lower portion of the canal could be enlarged to handle a great deal more water. Only a small part of the project was opened in 1900; after the canal was filled that year with 200 second feet of water, only small amounts went through while the farmers were getting started: 60 second feet in 1901 and 80 in 1902. But by the time the national reclamation act was adopted, water at least had begun to flow through the canal. For practical purposes, though, Foote's ambitious project still required massive capital for development.

BOISE PROJECT HISTORY

When the United States Reclamation Service was established in 1902, a major search for appropriate projects was made. Each of the sixteen reclamation states had attractive possibilities. Some potential projects were designed to overcome failures of existing private ventures to realize anything like their expected potential. (For a time, though, the Reclamation Service hesitated to get into this kind of complicated enterprise.) Particularly favored were plans to bring water to lands in an entirely new area. These projects had the advantage of simplicity: no complex arrangements had to be worked out with existing landowners or irrigators, and no previous canals or water rights would have to be incorporated into the proposed system. But partially developed projects had a greater political and

economic urgency. Farmers struggling to get started in areas developed with only partial success often were in dire need of help, while in entirely new areas, no one had to obtain help to avoid ruin that so often accompanied failure or delay of existing projects.

Idaho had a 1902 possibility of each kind. In the Twin Falls area, the nation's major Carey act project was getting underway. A proposed Reclamation Service Minidoka project could be developed upstream from the Twin Falls project upon land no one had commenced to reclaim. Without excessive complication from dealing with existing landowners and canal companies, the new federal agency contemplated initiating a Minidoka project quickly. (Several thousand dollars had been invested there in a preliminary survey and planning for a Carey act project, but the Reclamation Service blocked that enterprise by having all the land there withdrawn for their federal project only.) Early success in such a venture would give the newly established Reclamation Service a good example for promotion of future developments. Farther west, Boise valley offered an opportunity for the Reclamation Service to take over and expand a complex group of existing canals which needed enlargement to cover an area where irrigation had been planned and promised for twenty years. Dealings with existing water users might complicate and delay a reclamation project, but the need to bring in additional water could not be denied. To answer problems that farmers there had to face each season, the potential Boise project had an urgency unmatched in other parts of the state. So preliminary planning got underway for both projects in the early stages of the new Reclamation Service operations.

In anticipation of Congressional adoption of the Reclamation Act, Idaho's state engineer had joined the United States Geological Survey in a thorough search for water storage sites in the upper Boise drainage in the spring of 1902. In support of this search, all the major Boise valley canal companies formed the Boise Valley Irrigation Association, June 6, 1902. (The Reclamation Act got through Congress a week later, so the water companies had more than one option for obtaining storage reservoirs.) Representatives of the landowner interests thus were prepared to cooperate with any funding agency--state (under the Carey Act) or federal (Reclamation Act)--which might help solve the storage problem. In addition, the associated companies commenced action, August 20, to adjudicate a highly complex tangle of Boise river water rights. By that time, the various canals needed more water than the natural flow of the river provided. So the companies arranged to determine priorities for existing water and to investigate storage possibilities. Both of these actions served to support a potential Boise valley reclamation project.

Surveyors looking for good, inexpensive reservoir sites in the rough country and deep canyons of the upper Boise had a hard time in August of 1902. Most of the possible reservoirs offered little in the way of potential storage if low dams were constructed in the higher country. Stream courses were too steep to provide the kind of modest reservoirs desired at that time. (In 1902 the sites for

later major dams did not merit any consideration because small, relatively low dams that could be afforded then could not be built to any advantage at the major reservoir locations.) One possibility on the South Fork a few miles below Anderson ranch might have provided in excess of 110,000 acre feet, but a 600 foot wide dam would have to rise 180 feet to accomplish that. And 180 feet seemed entirely too high for anyone to afford when the survey began in April, 1902. Some other slightly more modest storage facilities might have been built at Alexander flat or on Little Smokey. The latter, with a hundred foot dam (400 feet wide) still would contribute only about 10,000 acre feet. Almost as large an installation below Alexander flat would provide a little more storage. All of these might have been rejected in preference for storage out in the valley below Boise. But they appeared to be the only feasible small reservoir possibilities in the upper river drainage. If these were beyond the resources of the community before the reclamation act was approved, June 17, 1902, anything else in the way of upstream storage would be still more difficult to manage.

When the summer search for storage sites showed that more water would be needed, the irrigation association, which had helped complete the upper river reservoir survey, backed additional surveys that fall. Two locations at Deer Flat were examined in November, 1902. Modest embankments would provide more storage than all the upper sites, aside from the prohibitively high possibility below Anderson ranch. At that time, an upper earth embankment (55 feet high and 3000 feet long) would store 45,000 acre feet, and a lower embankment (25 feet high and 2600 feet long) would hold an additional 22,908 acre feet. Five other small valley sites were investigated that fall; all ten feasible dams (the three upper South Fork possibilities as well as the valley sites) would impound 232,946 acre feet, but the 180 foot high south fork dam contributed about half the total. Assuming that natural flow of the river would take care of 75,000 acres of the 310,000 acres regarded as available for Boise valley irrigation, all ten sites (if eventually utilized) could take care of all but 40,000 to 50,000 acres in need of water. Water from the Payette (assuming that a canal could be constructed for the purpose) might provide for the remainder. Late in November, 1902, an additional survey showed the possibility for building a canal from Black canyon on the Payette to serve the lower Boise Valley.

From A. D. Foote's previous design of a Boise Valley canal system and from storage and Payette diversion investigations that D. W. Ross worked out as state reclamation engineer in 1902, a general outline for the Boise project had emerged within a few months after passage of the Reclamation act. On March 1, 1903, Ross became a United States Reclamation Service engineer directing project investigation in Idaho, and four days later the secretary of the Interior withdrew Boise Valley lands for entry under the R_e clamation act. That way, other projects or enterprises would not compete with a Reclamation Service Boise project should Ross show that his basic plan was feasible. In order to determine the issue, the Reclamation Service authorized a preliminary Payette-Boise project survey on April 23.

Satisfactory field results were obtained that summer. So in December, a series of meetings were held to interest established Boise Valley farmers in joining in a Reclamation Service project. Most of them needed supplemental water to extend their irrigation season. Expansion of the valley irrigation system appealed to almost everyone, and an assembly of delegates from valley communities met in Nampa, January 10, 1904, with F. H. Newell, who managed the Reclamation Service. They learned that to deal with his agency, they would have to organize a water user's association. In reply to suggestions for two associations--one for Boise Valley, and the other for Payette--Newell asked that all the farmers combine into one. This procedure, developed in Arizona with establishment of the Salt River Valley Water Users' Association, February 19, 1903, met conditions imposed by the secretary of the Interior under the Reclamation Act for organization of an acceptable project. The Boise Valley Irrigation Association--an agency of canal companies more than of individual farmers--would not do. Yet providing the necessary water user's association posed no particular problem. Two others had followed the original Arizona model, and Boise Valley easily could provide a fourth. D. W. Ross and J. H. Lowell got a Nampa meeting, February 1, to divide the area into fourteen districts, with two committee representatives from each district appointed to pursue the matter. Lowell continued to assemble support for the irrigation venture. He got formal endorsements from the city councils of Boise, Nampa, Caldwell, Emmett, Meridian, and Parma. Then in Roswell, February 29, the Riverside Irrigation District asked to have the project funded. In Caldwell, the Pioneer District, and in Meridian, the Nampa-Meridian District followed. Next, the State Land Board endorsed the project, bringing 60,000 acres of state land into the venture. When this strongly supported irrigators movement emerged as the Payette-Boise Water User's Association, organized formally in D. W. Ross' reclamation office in Boise, March 4, 1904, some 1200 land owners, representing 94,664 acres of irrigated land, were committed to cooperating in the project.

But before Boise valley farmers could get organized, they had a financial setback in getting their federal project underway. Each state had federal land sale revenues available for reclamation, and Idaho's fund amounted to $2,600,000 at that time. This would not get too far in building the Boise project, let alone take care of the rest of the state's reclamation needs. The Reclamation Service had some interest in a potential Minidoka project also, and another possibility could be found around Mud Lake west of Dubois. Compared with their valley, Minidoka had little urgency, the way Boise project supporters like Rees Davis looked at the situation:

"Stretching forth in all directions from Minidoka is a vast sage brush plain inhabited by jackrabbits, coyotes, gophers and sage hens. Nothing more. We believe it is safe to say that none of those inhabitants is in immediate pressing need of water for irrigation purposes. Indeed, they seem to prosper abundantly on dry farming. Nevertheless the flower of the Hydrographic Survey of these United States has been profoundly engaged for months past evolving engineering schemes for which the waters of the Snake River can be conveyed to the jackrabbits, coyotes,

gophers and sage hens on Minidoka plains. Now, we have no desire to work injustice on the inhabitants of Minidoka plain. They deserve the fostering care of the Great Father at Washington, D. C. They are part and parcel of the aborigines. Their forefathers dwelled in the land long before the advent of the pale face. No doubt the Reclamation act was meant for them as much as any other of the inhabitants of the arid west. But, Mr. Secretary, they don't really need water. Moreover, they droop and perish before the civilizing progress of your Hydrographic Survey. A civil engineer in hunting jacket and spectacles alarms them. They don't know what to make of it, and many are contemplating going away. We don't see any use in forcing irrigation upon a class of arid inhabitants that does not want it, and is getting along first rate without it, especially when there is another and quite considerable class that actually needs it. Now, it has occurred to us that you might let the jackrabbits, coyotes, gophers and sage hens of Minidoka plain go for awhile --let 'em bide until their need is more pressing--and put the business end of your Hydrographic Survey at work in some locality where it will be appreciated, say on Pennsylvania Avenue. Then select some hard headed arid west man to take charge of things out here and instruct him to see what can be done toward supplying water to those who actually need it."

Yet in spite of hostility from already settled regions in dire need for reclamation development capital, Minidoka had some attractions. Only a year would be needed. A. P. Davis expected, to get water to much of the land. A rival Carey act project there might have provided the newly organized Reclamation Service a good excuse to stay out. (In other parts of the country, the Reclamation Service backed out of areas where other investment capital could found: generally the Service preferred to work in places that had no other alternative.) Rivalry between Reclamation Service and Carey act projects, though, developed over the years. In any case more compelling reasons encouraged development of a Minidoka project. Surveys in February, 1904, had showed that a Minidoka canal system (with electricity for pumping supplied by water going past Minidoka for the Twin Falls project) would irrigate an important section of arid land. Funding Minidoka, though, would preclude construction of a Boise project for a few years, at least.

While the Boise project had engineering feasibility, "the vested rights [of prior irrigators] and present condition of irrigation development necessitate a very careful study of the situation". (That, anyway, was how Boise prospects looked to the Reclamation Service.) Although adjudication of the Boise river water rights already had commenced, the Reclamation Service could not enter the valley until all prior rights had been established. That would require several years. Meanwhile, the Minidoka project could be constructed. So the Minidoka engineering board which met in Boise to review the situation, March 16-22, 1904, recommended that Idaho's entire reclamation fund be allocated to that project. (Then, when Boise valley was ready to go, new funds would be available.) So most Reclamation surveying in 1904 went into design of the Minidoka canal system. But Boise valley farmers had enough influence to arrange, April 2, for careful 1904 surveys for their project also. So even though the Reclamation Service office designated the entire Idaho

fund for Minidoka, April 23, planning for southwestern Idaho went right on. D. W. Ross, in charge of the Idaho operations office, preferred to develop his Black canyon scheme to meet Boise valley's irrigation needs, and that helped keep the project going.

Since the Payette diversion scheme appeared practical, the state engineer approved a claim for 2400 second feet of water for this purpose, June 19. Under this proposal, 47,000 acres (18,000 on the Payette) would receive water through a major canal from Black canyon to a tunnel that would reach Boise valley at Graveyard Gulch. Some of the best land for irrigation in the Pacific Northwest would be made available for farming through a proposed Black canyon canal. Landowners there were eager to pay $30 an acre for water provided through such a canal, and when surveying came to a conclusion in November, Ross went ahead with an ambitious plan to take care of the needs of the entire Boise valley, using Payette river water to cover areas that limited storage possibilities could not provide for without this essential supplement. After the Payette-Boise Water Users' Association was incorporated, September 9, 1904, under arrangements acceptable to the Reclamation Service, and after careful surveys of canal and reservoir sites were completed in November, the entire reclamation project faced only two major hurdles. Adjudication of established water rights still had to be completed. (That required more than another year of hearings and investigation.) And funding still had to be obtained. Great economic advantages were promised to justify federal investment in the enterprise. For a projected outlay of $9,876,000 (at a rate of $26.55 an acre) a 375,000 acre system could be constructed and operated during a projected ten-year repayment period. This would include 18,000 acres on the Payette (out of 72,000 acres served by a Black canyon canal) and 29,000 on Snake river near later Homedale. Some of the best irrigable land in the Pacific Northwest would rise to $150 an acre on value if watered, and a lot of other good potential farm land would be provided for, with an overall anticipated average value of $100 per acre. From not much more than nominal origianl worth as desert land, the entire project would reach $37,000,000 upon completion. Out of 101,000 irrigated acres in Boise valley, 72,000 would become part of the project. Since that part of the 432,000 project acreage already had water, around $7,200,000 of this total land value appreciation already had been realized: purchase costs for existing canals to serve the entire project had been figured at $660,000. A $29,800,000 gain from a $9,867,800 investment suggested a highly favorable cost ratio.

To obtain water for this additional land in Boise valley, considerable storage would be needed. The existing 101,000 acres required the entire natural flow of the river and then some. (Supplemental water was needed already for use late in the irrigating season, and part of the merit of the reclamation project would come from providing for a longer season. Existing lands thus would gain value from availability of additional water.) For a total possible 383,000 irrigable acreage in Boise valley, new water would be needed for 202,000. Storage to accommodate 156,000 acre feet would be required for these additional acres. Of this total, storage for

148,270 acre feet could be provided in the Boise drainage. That left at least 8000 acre feet to come through a projected Black canyon canal from the Payette. But more than 200,000 acre feet could be stored at Payette Lake. So availability of water for transfer posed no problem.

Storage possibilities for the upper Boise watershed changed considerably with more thorough surveys in 1904. Alexander Flat, with 25,000 acre feet behind a 135 foot $398,450 dam, was retained. Both south fork sites--below Anderson ranch and Little Smoky--were rejected. Another $830,540 south fork site (Bascom Ranch) above Featherville near Dutch Flat, proved eligible for 155 foot dam storing 54,020 acae feet of water. And Barber Flat on the North Fork was assigned 34,000 acre feet above a 140 foot, $475,900 dam. Upstream storage capability now amounted to 113,020 acre feet. Including Deer Flat and six other small sites out in the valley, an additional 148,270 acre feet could be found at a cost of $887,900. Inexpensive valley storage could be obtained for a project average of six dollars an acre foot, mostly at Deer Flat that required only five dollars. Upstream sites ranged from $14 to $16 an acre foot with the lowest figure assigned to Barber Flat on the North Fork proposal.

And additional, relatively inexpensive source for water was available across the Sawtooth range near the head of Stanley basin. Alturas Lake, with a modest $160,000 embankment, could offer 145,000 acre feet. A 31,000 foot tunnel through the Sawtooth range would deliver this water to the middle fork of the Boise for $1,240,000 with help from a $1,400,000 canal. This entire diversion of surplus Stanley basin water could be accomplished for less than ten dollars an acre foot.

Additional storage to be delivered from Payette Lake through a Black canyon canal would take sixty-nine cents an acre foot for a 100,000 acre foot capacity, and sixty-seven cents for 200,000. Modification of the lake outlet would require $69,000 for the smaller storage area, and $133,400 for the larger. Or the project could be increased to provide 250,000 acre feet by installing a dam 300 feet long designed to raise the lake 30 feet. Also incorporated into this arrangement, a 400 foot tunnel and 1300 foot cut would lower the lake 22 feet. Though this would significantly change the shape, size and ecology of the lake, this kind of storage possibility appealed to the engineers with the same approach Jackson Lake was enlarged for the Minidoka project, and large lakes in Yellowstone National Park were regarded as a desirable storage source (complete with canals across the continental divide) for proposed Reclamation Service project west of Dubois. Property owners along these lakes were to be compensated for flooding. Otherwise, project designers did not worry excessively over how their storage facilities altered important lakes.

Promotion of this ambitious project, as modified by surveys in 1904, had been easy. H. J. Lowell had little trouble selling the plan to farmers who would benefit at reduced costs, compared with their outlay to get the water they needed

through more expensive Carey act or private investment sources. Under a Reclamation Service project, benefits would go the greatest possible number of small farmers. Land monopolists and non-resident owners would be excluded, and the entire system would wind up in community ownership. Arrangements to provide for cooperation among water users had been perfected in 1902, and even those who felt reluctant to go into a community-owned project got reconciled to the inevitable. Loan holders had hesitated to endorse a Reclamation Service project because they would have to relinquish possibilities of foreclosure from which landholders would have to be protected. In only ten weeks J. H. Lowell had signed up 1509 land owners (454 in Ada County, and 1055 in Canyon and Owyhee) holding 125,736 acres. Absentee owners whom he could not solicit were about all who had not been contracted to work through his water users' association. This impressive demonstration of support greatly strengthened his Payette-Boise Project proposal.

When the Boise Project engineering review board considered the report offered by D. W. Ross and the support marshalled by J. H. Lowell, February 13-16, 1905, they had only to find out how fast the project could go. Arrangements had been made to shift half of the $2,600,000 Minidoka allotment of 1904 to get part of this new one started. (Bids for Minidoka dam had been opened July 2, 1904, and that project was under way. So the entire amount could not be transferred.) When they tried to go beyond the $1,300,000 that could be obtained from Minidoka, though, their efforts were blocked in Washington, D. C. So they decided to start the Deer Flat reservoir stage, along with a diversion dam for the New York Canal and an enlarged canal system to accommodate additional water required for this increased level of operation. Acting upon this proposal, the director of the United States Geological Survey recommended approval of a 372,000 acre project including 300,000 acres in desert land, March 24. Construction would begin, though, at the $1,300,000 level agreed to by the engineering board. Three days later the secretary of the Interior authorized the Boise-Payette project.

Construction plans for the Payette-Boise project were prepared quickly after funding became available. By 1906 all essential steps had been taken to get development underway. Adjudication of all water rights prior to April 1, 1904 were completed in a court decree, January 18, 1906. Under the arrangement that was adopted, water right priorities were established, with provision for reduced water delivery, dependent upon earlier appropriation and use, favorable to earlier claimants but providing for later users during times of shortage. (These original pre-1904 water rights required 304,000 acre feet during the flood season and 288,000 during the low water period: in an average season that would leave about 946,000 acre feet of unusable foot water that might be stored in reclamation reservoirs.) An agreement, February 12, with the water users, establishing the value of existing canals and improvements incorporated into the federal project, gave them credit at $14 an acre for their earlier investment. So just at the time that construction of Diversion dam, enlargment of the New York Canal, and preparation of the Deer Flat embankments were about to begin, these necessary preliminary steps had been accomplished.

When bids were opened for Diversion dam, canal enlargement, and Deer Flat construction, February 1, 1906, most of them ran disappointingly high. Improvements of the Idaho-Iowa lateral from Indian Creek to Deer Flat came in at an acceptable level, and bids for three New York canal segments, opened April 16, were better with revised specifications. Then the lower Deer Flat embankment was rebid so that a contract, for $256,550 could be let June 6. In the meantime, the Reclamation Service began proceedings to purchase two Atlantic steam shovels, four locomotives, sixty dump cars, and all the rest of the equipment necessary to allow the Reclamation Service to construct the larger upper Deer Flat embankment. All this work finally was completed by the Reclamation Service, which also had to take over one of the New York canal segments when the contractor proved incapable of doing the work. With construction underway that summer, another $190,000 was allocated to the project, July 12, and additional funding became available as needed. By 1909, when these contracts were completed, $2,500,000 had been allocated to the project.

Since the Reclamation Service was enlarging the New York canal, provision had to be made to take over its operation. So on March 3, 1906, the federal project contracted to manage, as well as to enlarge, the canal and to provide the canal company with 266.86 second feet of water in the bigger ditch. Contracts followed with the water users' association, April 14, the Riverside irrigation district, July 16, and the Nampa-Meridian district, October 12. The New York canal company did not need to come into the project for expanded operations, but each of the others received the $14 an acre credit for value of prior investment contributed to the federal project. These contracts remained in force until after provision for upstream storage led to their replacement a decade later.

When the time came in 1908 to construct all the small canals that did not require major contracts, established Reclamation Service policy was followed. Reclamation engineers did the planning, and farmers to be served by the project did the actual work. Their compensation took the form of certificates that credited them for part of the payments they would have otherwise had to make to obtain water. Except for a few major components, farmers to be served by the project built the irrigation works that they needed. In 1909, when water was turned from Diversion dam through the New York canal to Deer Flat reservoir (where the lower embankment had been completed), incidental construction of an initial set of lateral ditches and other necessary works was largely completed by farmers compensated by water certificates. Their work proved entirely adequate and accelerated the repayment schedule for the project.

From a small start in 1906 when the Reclamation Service took over the New York canal, lands actually served by federal project began to increase, especially after 1909. About ten thousand acres got water from the project in 1907, with fifteen thousand in 1908, and eighteen thousand in 1909 and 1910. Around four thousand additional acres had rental water in 1909, a figure that increased to twelve thousand in 1910. A substantial increase had to wait for storage facilities,

commencing with Deer Flat on a modest scale in 1909. With the original, relatively inexpensive stage about finished, another source for storage would have to be developed. Of the possibilities for upstream storage, Payette Lake offered by far the least expensive option. But canal construction from Black Canyon would more than offset economy in upstream storage.

And in any event, title litigation over lands needed for Black Canyon reservoir had delayed any prospect of development there. (J. H. Lowell had achieved early success in purchasing Deer Flat reservoir lands--a bit of fortune that advanced that part of the project substantially.) Then, after D. W. Ross left the project July 1, 1908, Black Canyon lacked a strong proponent. Ross had worked out the plan in the first place, although as his years of service went on, he knew that Black Canyon would be subject to delay. And his successor lacked the confidence, determination, and financial resources essential to bring a Black Canyon canal from Payette river to Boise valley. So, in spite of considerable dissatisfaction from farmers in the Black Canyon part of the project, that enterprise was dropped entirely by 1910. Senator Borah did what he could to keep Black Canyon an active proposition, and the national management of the Reclamation Service felt embarrassed to have to back out and abandon a lot of water users (or potential water users), only a few of whom could find half way suitable alternatives. Some of the Riverside Canal farmers could substitute wells and pumping for Black Canyon water, but that solution did not begin to meet their entire problem.

With funding becoming available, after completion of the initial stage of project construction, for additional Boise river storage, all of the 1904 proposals for modest upstream claims were rejected. By the summer of 1910, $6,767,000 was in sight for major development. (A loan fund act of Congress of June 25, 1910 contributed two million, and an expected 1911 allotment would complete the total.) A major storage dam could be built with this amount, and F. E. Weymouth already had found a suitable site at Arrowrock for 150,000 acre foot reservoir. Although the cost of the project would rise substantially with investment necessary for so high a dam, A. P. Davis advised, December 14,1910, that Arrowrock be enlarged to provide still more storage. Cost estimates for the entire project rose to $12,800,000 the next summer, with $4,677,000 already expended. Of the new total the distribution system would require $4,480,000; a drainage system added $390,000; Deer Flat reservoir (completed March 24, 1911) finally cost $939,000; and Arrowrock was projected for $7,000,000. Construction at this major damsite got underway immediately, although the height of the dam was increased again after construction began. Most of the general design of the dam had been worked out by February 2, 1912, but final plans were not completed until July 20. At that time, Arrowrock was the highest dam in the world, and it provided 276,500 acre feet of storage which was increased to 286,500 acre feet in 1937 when the height of the dam was raised by five feet.

This greatly enlarged arrangement for Boise river storage eleiminated the necessity for diversion from Black Canyon to serve the original project, and even

though another Black Canyon scheme was advanced in 1912, the Reclamation Service lost interest in the Payette division. Senator Borah proposed legislation for another large reclamation loan ($30,000,000 to supplement the earlier 1910 advance) to take care of Black Canyon and a lot of smaller projects, but Black Canyon had a long wait for funding. On February 13, 1913, the secretary of the Interior released the affected Riverside district lands from their stock subscription in the project--a fair enough action considering they were not going to receive any water, Compared with Minidoka, though, the Boise Project had fared pretty well, with Black Canyon the only major early fiasco.

With prospects for a major addition in upstream storage once Arrowrock water became available--and for a major increase in project cost to supply the additional water--new repayment contracts had to be negotiaged with the irrigation districts which would benefit. Thus, on February 27, 1913, a new Pioneer district agreement supplanted the earlier one of April 3, 1905. The district agreed to purchase Arrowrock storage to the extent of $560,000. Cancellation of the $14 an acre credit for previous improvement came with an arrangement for the Reclamation Service to install a drainage system not to exceed $350,000 in cost. Before the year was over, electric dredges were at work on the drainage system. Similar contracts followed with the other districts. In addition, the New York Canal applied for 8537 acre feet of Arrowrock storage in the spring of 1915. This small amount disappointed the Reclamation Service, but surplus Arrowrock water could be disposed of without undue difficulty.

Arrowrock, however, turned out to hold more surplus than the Reclamation Service had anticipated. When the spillway finally overflowed, June 18, 1916, and Arrowrock water was on land for a full irrigation season, engineers there found that the reservoir held about forty thousand more acre feet than the 244,000 contemplated originally. As a result, the Boise Project could undergo substantial irrigation acreage enlargment. With unexpected additional storage, even much of the Black Canyon lands (which had been taken up in 1904 when D. W. Ross had expected the Payette division to be developed ahead of the New York Canal) could be irrigated. Since Arrowrock had cost only $4,725,000 (compared with the $7,000,000 estimated originally), funding was available to build additional canals to serve the new lands.

To help dispose of extra storage, a contract to provide supplemental water for late season use by farmers with early, high priority water rights came into effect August 25, 1916. (These irrigators had avoided expensive investment in Arrowrock water because they could get by most of the year on the river's natural flow as allocated then by the count decree of January 18, 1906. But a modest amount of more costly Arrowrock water would help them greatly at the end of the season.) A wartime national agricultural expansion came just after Arrowrock's completion, and Boise valley profited far more than if additional lands had come into production at a less favored time.

At the end of a full season of irrigation using Arrowrock water in 1916, the project could accommodate 1167 new farms of 67,454 acres still in public land. Of the 223,866 irrigable acres at that stage, the remaining 151,212, representing 2635 farms, already were watered. Of these, 71,156 acres depended entirely upon the project for full storage, and would have to cover high costs incurred in building Arrowrock. (Farmers in these lands soon were to complain about this situation.) That left 80,056 acres served partly by the project and partly through prior, inexpensive water rights established in 1906 by court decree. Of those lands, 34,400 acres in the Pioneer district and 24,158 in the Nampa-Meridian district (which also included other lands) had new contracts and were released from the Water Users' Association by January 6, 1916. That left 21,498 acres of New York Canal Company lands in need of some kind of supplemental water arrangement.

Except for the New York Canal and the early new contracts with the water users' association, the various irrigation districts had developed without undue difficulty. Unlike the others, the New York Canal still lacked irrigation district organization. Anticipating problems unless the New York Canal farmers converted their organization from a cooperative company to an irrigation district, Boise project officials tried in 1915 to get a district established. Their efforts failed as large and small landholders had conflicts. Large owners controlled the company and, with an 80 acre limit for irrigated farms served by the project, had an incentive not to go into a district that would get water mostly for small farmers. When Boise project staff tried to get the small farmers to arrange to establish a district anyway, large holders in the company management took over the campaign to organize the district, but quietly shelved the proposal.

In any event, unless the company farmers wanted late season supplemental water, they had little need to revise their original contract. They already had their enlarged canal maintained by the Boise project in return for allowing the Reclamation Service to deliver water through it to additional users and to Deer Flat reservoir. They preferred to arrange to let each farmer buy needed supplemental water from the Reclamation Service. (Demand for supplemental water varied with priority of water rights, and with each farmer's individual needs.) But the Reclamation Service declined to consider any such deal. Then the New York Canal Company wanted to pay for less total water than the Reclamation Service computed as necessary for farms served entirely from Arrowrock water. An incidental result of expanded irrigation in the valley, drainage water kept up the flow of the river beyond the level that would have been available without irrigation water from Arrowrock. Valley farmers with old water rights used this kind of surplus water and the Reclamation Service wanted to charge the New York Canal irrigators for it. Since the high priority users could get by later in the season with drainage water from the Boise project, their decreed water right no longer cut off water deliveries to latecomers along the New York Canal. That way, the New York Canal farmers' season lasted longer, and they did not need supplemental water from Arrowrock so soon. So, in effect, Boise project drainage return used by high priority farmers down the

valley actually gave more water to farmers on the New York Canal, and the Reclamation Service wanted to charge the latter for this indirect water source. As viewed by Reclamation Service engineers, through this means and by estimating their needs more conservatively, the original farmers on the New York Canal wanted to irrigate more than 20,000 acres while paying only enough to irrigate 14,000 acres. After Arrowrock had been completed, any attempt to irrigate part of the valley independently from the Boise project, and the rest through the Reclamation Service system--while potentially an unearned benefit to the prior users--only would create difficulty.

With new contracts favorable to early water users of the Pioneer, Nampa-Meridian, and Riverside districts, those fortunate farmers were released from the obligations of the water users' association. As a result, the association management changed greatly. After the district farmers were released from the old contracts, they no longer participated in the association. A new element took over when their conservative influence was withdrawn. And the remainder of the water users had financial interests directly in conflict with the district users. The less that Pioneer and other district farmers were charged for Arrowrock storage repayments, the greater the burden would be for those who were left. And any arrangement helpful to the old New York Canal farmers would transfer Arrowrock costs to the remaining water users who already were assessed most of the costs. These less favored water users started a campaign in 1915 to limit Arrowrock repayments to $28 (instead of $35) an acre. This kind of conflict among various classes of water users--each trying to shift more of the charges to the other--created great difficulty for the project. Unable to work out final repayment arrangements in 1916, the Reclamation Service had an unsatisfactory temporary water rental agreement that season with the New York Canal Company. After a settlement was reached with the Farmers' Union Canal Company (a similar cooperative body), the New York group wanted equally favorable terms. Considerable pressure was applied to the Reclamation Service in 1916, and a lot of unflattering publicity resulted from this campaign. Their complaints increased when the Reclamation Service, unable to peddle all their Arrowrock water too easily, decided to reserve the extra 40,000 feet of storage for contingency during dry seasons. Finally, after long and complicated negotiations, the Reclamation Service established the conditions for future water delivery to farmers without contracts, July 2, 1917. These terms did not satisfy the New York farmers, but repayment arrangements could be postponed no longer. Because of greater ease, and legal advantage, in dealing with irrigation districts, individual New York farmers wanting to deal with the Boise project had to pay $35 an acre, compared with $27 should the group organize as a district. Water no longer could be acquired through rental, as before, and the company had to go to the expense of a district election.

In the proposed district for the New York Canal, a substantial number of new farmers (with about 18,000 acres of land intermingled with the holdings of the original claimants) were included. This almost matched the 21,000 acre holdings of the old company farmers. Since the new farmers, like the new farmers else-

where on the project, would have to pay for all their water at the higher rate for Arrowrock storage, their interest conflicted with the needs of the company farmers. In the referendum, only 66% voted for organizing the necessary district. A 2/3 majority was required, so the unhappy new farmers beat down the proposition by by the narrowest of margins. At that point, after long, difficult negotiation, the company was given an option of getting a water contract at the district rate or letting individual farmers come in at the higher rate. Enough held out that the later form was used in the final contract of July 2, 1919. But as the proportion of farmers entering the agreement rose, their rate would approach the district rate.

While the New York Canal contract was being completed, litigation from the water users association annoyed the Reclamation Service. Under the old agreement, the Boise project collected assessments for the water users' association, which existed to assure project repayments. Now, with new management representing the interests of the more recent farmers, funds were being collected to send lobbyists to Congress to upset the repayment schedule. Next, an attorney was hired to bring litigation designed to overthrow the Pioneer, Nampa-Meridian, and Riverside contracts that the new settlers disliked. Court action did not get the new water users too far, but the Reclamation Service soon tired of forcing all the farmers still outside the districts to contribute attorney's fees to be used to battle against the Reclamation Service. On May 4, 1918, the Boise project no longer required members of the water users' association to pay assessments in order to obtain water.

During the time of this complicated repayment squabble--arising from conflicting interests of the Reclamation Service (which had to get Arrowrock paid for) and various groups of farmers with different water rights and varying contractual commitments--farmers in the Boise valley gained a great economic advantage from exceptionally high wartime crop prices. If they could have forseen their next difficulties, they might have wanted an accelerated repayment program. But the long argument over which farmers should assume that part of the obligation delayed repayment at a time when conditions were favorable. Overexpansion in expensive farm lands--their values increased greatly in the same inflation that gave farmers high prices for their crops--absorbed much of the wartime farm price profits. Investments in farm machinery, necessary to increase production, also consumed a substantial part of this increased farm income. By 1919, farmers had gone into debt to increase their operating income with apparently good prospects to recover on their investments. Somehow they did not figure on a next to complete price collapse after the war. Idaho corn which went at $1.65 a bushel in 1919 fell to 50 cents in 1921; Idaho potatoes that brought $1.51 in 1919 sank to 31 cents in 1922. This kind of disaster brought on a twenty year depression for the farmers. After 1940, another great war restored prices sufficiently to permit repayment of some of the wartime debts incurred just after Arrowrock was constructed. Boise valley, which had grown remarkably until 1920, went through a tough decade of little or no growth. Unlike other segments of the national economy, farming did not participate too successfully in the prosperity that preceded the stock market collapse of 1929.

There was little change in the population of the Boise Project area in the early 1920's. The 1920 project history reported 2652 farms, with 2020 of them farmed by their owners and 632 farmed by tenants. By 1924 the number of farms had increased by only 50, to 2702; however, the number of tenant farmers had increased considerably, from 632 to 1147. Nearly all the farms were reported as being run by "experienced farmers"; and most by farmers experienced in irrigation farming. Presumably a good deal of that experience had been gained on the Boise Project during its early years.

There were several changes in crops during those years. The number of acres of clover hay, for example, was cut nearly in half, and that of alfalfa cut over ten percent. Barley and Indian corn, on the other hand, nearly doubled in acreage; while beans quadrupled. The number of beef cattle and sheep remained stable, although the number of dairy cattle increased by about a quarter. Although the value of farm lands themselves did not increase very much, the value of farm equipment much more than doubled--from $893,937.00 in 1920 to $1,989,910.00 in 1924.

The crop and population statistics reflect the stability of the project itself. The miles of canals operated increased from 1920 to 1924 only from 1002 to 1019, and the number of acres actually irrigated decreased.

However, 1924 was a bad year for comparisons as it was a low-water year, with the river running approximately 61 per cent below normal during the summer. Also the agricultural depression of the 1920's was beginning to be felt--livestock prices declined in the area because a number of farmers and tenants were moving away and selling their livestock rather than having to pay to move them.

The next major construction work on the Project came in these years, too, when the Black Canyon Dam--first segment of the Payette Division except for the Notus Canal (1919-1920) was authorized in 1922. The site had been surveyed in 1915, provoking a rush of settlers to the Emmett area who had no possibility of "new" water until the dam was built. The dam is primarily a diversion dam (replacing a small one built earlier at the site, some five miles above Emmett on the Payette river, to supply water to the orchards of the Emmett Valley), but there is also a power plant producing about 8000 kilowatts used for pumping in the Emmett and Payette irrigation districts. Although the dam was finished in 1924, the canals to distribute the water collected behind it were not built--or even begun --for over ten years. The first of these, the Black Canyon Canal, was built between 1936 and 1940 to carry 1300 cubic feet per second some twenty-nine miles west from the dam. The next two, the A line and D line canals, divert from the main canal, the former some fifteen miles from the dam for thirty-three miles west to the Snake, and the latter from nearly the same point thirty-nine miles south and then west. Two other canals were later also built off the system, the C line east and C line west between 1946 and 1948.

Quite aside from the new construction (which, because of lack of canals, had little immediate practical value), the outlook improved in 1925. Drains were constructed in several locations, thereby solving some seepage problems, farm prices rose and the percentage of tenant farmers dropped. The most significant action on the project taken during the year was the formation of a "board of survey and adjustments", which first met in March of 1925. The board represented settlers, the Bureau of Reclamation, the Idaho Department of Reclamation and economists as well as the project supervisor. It drafted contracts with the various irrigation districts and in 1926 in effect turned itself into the Boise Project Board of Control, which continues to manage the Boise Project. The stability which this produced involved also a rearrangement of the way in which settlers could pay off their shares of construction costs, contingent on the value of their crops from year to year. The Bureau of Reclamation retained control of the more complex segments of the project--Arrowrock Reservoir, the Diversion Dam, the headworks of the New York Canal, and the first half-mile of that canal. Otherwise, operation and maintenance of the system came under the Board as representative of the five irrigation districts under the project. In many ways, the evolution of this system of control may be as significant as the construction of any single part of the whole project.

The 1927 season showed an improved market for crops and an increased number of prospective farm buyers. There was no increase in land under irrigation, no addition to the system, and thus no additional farms. One interesting statistical commentary is an increase in automobiles during 1927 from 131 to 180 in the project region.

During 1928, nearly all the farms which had been foreclosed in the preceding years were sold again into private hands and land values had increased with an improved national economy. Though faced with problems of perishability and only one railroad line, a good market for dairy products developed in the Los Angeles area. Because of the high cost of shipping bulky low value milk, concentration was implemented with expansion of dairy processing. The Caldwell based cooperative creamery with a 1929 membership of 2400 shipped most of its output to Southern California. Another dairy cooperative in Ada County was begun in 1929 to ship to the same market.

In 1929 and 1930 there were test plot experiments in the western end of the valley for greenpeas and beans. By 1931, the project history's enthusiasm for such new ventures had lessened considerably. This reflected the depression and loss of markets rather than crop adaptibility. In the 1932 report, bartering was noted as a partial solution to the lack of market for farm produce, and it was noted that crops were left unharvested. Although the acreage planted was almost identical with that of 1930, the crop value had dropped by two-thirds, and a moratorium was declared on both water tolls and seed loans, in an effort to keep farms functioning. By 1933, although dairying was increasing, the plight of some farmers was described as "desperate". And 1934 was a short-water year, which did not

help. However, farm produce prices improved as did the morale of the settlers. By 1935 land values seemed to be increasing slightly. Completion of the U. S. 95 route south to Winnemucca for connections to California via U. S. 40 was planned and it was to make possible the shipment of goods by motor freight to California.

Also in 1935 three Civilian Conservation Corps camps were established on the project, providing a new market and a new source of labor on the project works. The camps and WPA projects were welcomed in the community.

By 1936, more farmers, including new immigrants from the drought stricken middle west were looking at the Payette Division lands, where work had begun on the first canal. There was some concern that the new farmers who were unfamiliar with the region or irrigation agriculture might not be able to survive.

A beet-sugar factory was being planning in Nyssa, Oregon in 1936 and another was possible for the valley (later built in Nampa). As a result, sugar beet production increased as did other truck and seed crops. Alfalfa--long the principal crop--was on the decline on the older lands, and apples, as well as other fruits, also declined.

Noteworthy project changes for 1937 included the raising of Arrowrock Dam by 5 feet, increased educational programs for farmers, government agencies and private farmer control of noxious weeds, and the increased use of commercial fertilizers. Expansion of sugar beets and truck crops meant more imported seasonal labor and the arrival of Mexican and Philippine laborers in the valley. With new economic gains, the farmers themselves urged an end to the project-cost repayment moratorium.

By 1938, the Bureau of Reclamation was looking for additional water storage facilities. Test drilling were conducted at the Twin Springs site, some twenty-five miles above Arrowrock, and a final report was submitted in early 1939. In November, 1939, a topographic survey was conducted at the Anderson Ranch site on the South Fork of the Boise, and it was this site which was later selected to provide additional storage. Meanwhile, farmers actually grew crops on the Payette Division in 1939, and new settlers were moving in rapidly. Though the new highway route to California still was not completed, some distant marketing improved with the coming of regular air freight service at the new Boise airport.

Work started on the Anderson Ranch damsite in 1941 with a completion date set for August 24, 1946. Wartime produced new priorities and both men and materials. Work continued on the dam at a greatly reduced scale. By December of 1945, water was being stored; and by the end of 1950, the dam was regarded as compete--with an active storage capacity of 423,200 acre-feet. Like Diversion Dam and Black Canyon Dam, it has power-generating facilities with a capacity of 27,000 kilowatts and space for another 13,500 kilowatt generator. Anderson Ranch is a noteworthy example of what delays in construction can cost in a time of inflation.

Its original expected cost was under $10,000,000 but its final cost (if slightly less than half was assigned to water users) was $26,122,800. Power sales were expected to repay a fourth of the cost of the dam.

Anderson Ranch Dam was not the only factor encouraging project farmers. A commitment had been made for a new sugar factory at Nampa, and 1941 crop values were some forty percent over 1940. The main regional economic impact during 1941 came from completion of the U.S. 95 - U.S. 40 connection to California. Wartime labor shortages resulted in some dairy herds being broken up, and during peak labor demand periods local white-collar workers and school children headed for the fields. During the war years there was high demand for the onion and potato products of the Simplot dehydrating plant in Caldwell. Corporate farming also was appearing on leased land at several spots in the valley.

Two other major construction projects--one actually under the Bureau of Reclamation, the other closely related to Bureau projects--took place soon after the war. The first of these was Cascade Reservoir, on the North Fork of the Payette river, which was built between 1946 and 1948. Its purpose is storage for the Payette Division, and it holds back the largest reservoir in the system: an active capacity of 653,200 acre feet. The original preliminary work--relocating a railway--had begun in the year before the war but was halted in the summer of 1942. The other dam was Lucky Peak, ten miles above Boise on the Boise river. Lucky Peak is an Army Corps of Engineers project, exclusively for flood control with neither power nor diversion facilities; but its value as a storage facility, supplementing Arrowrock and making the dam even more useful, has been great. The dam was begun in 1949 and completed in 1955, at a cost of $19,900,000 well under the estimate of $22,000,000.

AGRICULTURE AND LAND USE CHANGES

To gain accurate data on the agricultural yields, prices and profits of the pre-project period is difficult. Most early sources of information were newspapers, promotional pamphlets and some dubious statistics of the State Agricultural and Immigration Office. Early federal agricultural census data is sparse.

A.D. Foote's volume has an account of yields for about 1881 on the I.N. Coston farm in the upper end of the Boise valley. He reports 40 tons of red clover hay raised on 10 acres of the "poorest" land, 75,000 lbs (1250 bushels) of onions from two acres, and 200 bushels of potatoes per acre. His other reported yields per acre on this farm were 113 bushels of barley, 40-60 bushels of wheat, 100-150 bushels of oats, carrots and turnips, and 60 bushels of connecticut flint corn.

An 1889 publication by the Boise City Board of Trade entitled "Boise City, Idaho 1888" spoke of existing Ridenbaugh and Settlers irrigation facilities and then listed the following reputedly average crop yields per acre.

Table 2 - 1888 Reported Yields

Wheat	Bushels	26
Rye	Bushels	21
Oats	Bushels	41
Barley	Bushels	44
Corn	Bushels	35
Potatoes	Bushels	315
Apples	Bushels	935
Alfalfa	Tons	5
Clover	Tons	4 1/2
Timothy	Tons	2

The value of this listing comes from identifying the crops grown rather than the seemingly specious yields.

The yields cited for 1913 in the project history show some significent disparities from Table 2.

Table 3 - 1913 Reported Yield per Acre

Alfalfa	Tons	3.5
Clover	Tons	1.5
Barley	Bushels	18.7
Corn	Bushels	20
Oats	Bushels	24.3
Wheat	Bushels	15.8
Potatoes	Bushels	90
Onions	Bushels	81

Crops

The 1880 Census of Agriculture listed 13,656 acres in grain, 6,277 in forage and hay and only 10 acres in seed crops for the Boise valley. Fruit trees were not counted that year. By 1900 there were major increases in hay and forage crops particularly alfalfa reflecting the growth of dairying. Grains, though of declining importance, remained a significant crop in the rotation system and also as feed for livestock.

Fruit orchards on the sunny and warm south facing slopes responded to abundant and reliable water supplies, good air drainage which minimized the effects of frost, and the absence of summer rainfall which reduced the hazards of fungus. In common with many areas of the Pacific Northwest there was a rapid

early increase in the number of fruit trees. In the Boise valley, these increased from 56,345 in 1890 to 625,557 in 1900.

Table 4 - Crop Acreage in Boise Valley 1880-1950 #

Year	Grains	Forage & Hay	Veg. & Truck	Seed Crops	Beets	Fruit (trees)**
1880*	13,656	6,277	---	10	---	---
1890*	7,655	15,881	227	262	---	56,345
1900*	20,692	45,366	1,716	833	---	625,357
1910*	41,234	60,616	3,420	972	513	408,644
1920	89,502	98,033	4,439	8,367	1	869,976
1930	85,994	109,008	4,818	15,867	25	637,138
1940	69,791	105,402	14,018	17,519	5,360	442,790
1950#	62,144	77,242	12,016	11,861	17,164	426,210

#U. S. Census of Agriculture, Tables 1880-1940. 1950 Census Preliminary.
*Figures for these years include crop acreage of Payette and Gem Counties which then were part of Ada County.
**Acreage for fruit trees in not reported consistently in the Census and therefore the number of trees is used instead.

No part of the valley is exclusively devoted to grains, hay or forage. On new land brought into production, grains (mainly wheat) are initially favored because of the lower cost of production, guaranteed market, small seed cost and small land preparation costs. In certain parts of the lower terrace grains rank high and wheat (mainly winter wheat) comprise 70% of the grain crop. In newly irrigated areas, barley may be preferred initially to wheat because of greater resistance to harsh physical conditions. Oats are the third major grain. Canyon County has over twice the grain acreage of Ada County and its yields are higher.

Table 5 - Grain Comparisons - Ada & Canyon Counties 1970-71

	Ada		Canyon	
	1970	1971	1970	1971
All Wheat				
Acres harvested	9200	10,700	19,400	18,500
Yield: Bushels/acre	48.9	49.4	73,5	81.3
Winter Wheat				
Irrigated Acres	3800	800	13,200	14,300
Yield/acre	74.0	83.0	77.0	85.3
Unirrigated acres harvested	4200	5,200	-	-
Yield: Bushels/acre	20.6	28.9	-	-

Table 5 Cont.

	Ada		Canyon	
	1970	1971	1970	1971
Spring Wheat				
Irrigated acres	1100	4,500	4,400	4,200
Bushels/acre	63.0	68.0	64.0	67.9
Unirrigated acres	100	200	-	-
Bushels/acre	25.0	30.0	-	-
All Barley				
Acres harvested	9700	7100	20,500	18,400
Bushels/acre	67.5	73.7	71.0	75.0

Source: 1972 Idaho Agricultural Statistics
USDA Statistical Reporting Service

Of 3695 farms in Canyon County in 1945, there were twice as many (1398) dairy farms as those in any other category. Dairy farms reported the smallest income per farm. Many were small, under 30 acres, with few cows, and run by part time farmers. Some of the farms were on land unfit for crops but suitable for pasture. The cool nights were good for milk preservation.

The development of dairy cooperatives in the 1920's helped provide a secure steady, though unsepectacular market. The checks from milk sales provided the stability; the sale of row crops provided the lump sum income for debt removal and new equipment. Most Canyon County farms produced a surplus of hay that was shipped out of the region or else was sold to horse owners in the nearby suburban or urban areas.

Alfalfa is a key crop in Canyon County and it dominates the entire hay crop. Only during the high food demand period of World War II did its acreage decrease. When grain prices were high and alfalfa was cheap, many cows got only alfalfa hay in winter and field hay in summer. Long rows of hay stored under cloth tarpaulins and more recently under plastic, typify the irrigated parcels.

There are few regular shelters for dairy cattle as the main function of the barns has been as milking sheds. Since the 1960's some of the larger operations developed fairly elaborate "milking parlors". Canyon County dairy farms sold most of their fresh milk to the condensery at Nampa or to the cooperative creameries in Caldwell and Meridian for processing.

Livestock

Grazing by domestic livestock was the most extensive land use in the Boise basin. Sheep or cattle, and some horses grazed on practically all of the uncultivated land in the basin for short periods in the mountain areas to as long as year-round on the lower valley lands. The general practice was to graze the animals in the valley and foothills for one to three months in the spring, then to ship or trail the stock to the mountains and to graze them there for a period of 2-5 months and then back through the foothills and finally to the low pastures for the winter.

Grazing use began with settlement. Estimates are given in animal unit months (one animal unit month is the equivalent of 1 cow month or 5 sheep months of grazing use). The intensity of range use peaked by 1900 and then started to decline. (See Table 6) By 1949 over 1/2 of the cattle and sheep in the valley were raised and pastured within the valley rather than moved to summer mountain ranges.

Table 6 - Estimated Livestock Grazing Use - Boise Basin

Years	Animal Unit Month
1870	230,000
1880	320,000
1890	420,000
1900	500,000
1910	429,000
1920	451,000
1930	269,500
1940	180,000

Most of the earlier grazing took place on the upper reaches of the basin rather than in the foothills and the cattle and sheep came mainly from farms and ranches within the basin though some came from ranches along the Snake river and also from eastern Oregon.

The impact of irrigation on the livestock industry of southwestern Idaho was in its stabilization. Overgrazing of natural grasslands by livestock in the 1880's and sheep in the 1890's caused serious deterioration to the grassland. Perennial grasses with high feed value were reduced to only 1/4 of their density ("The Western Range", 74th Congress, 2nd Session, Senate Document No. 199, 1936, p.94) and the carrying capacity of this range land was greatly reduced.

To maintain cattle numbers at existing levels the stockmen turned to irrigated hay and forage crops and lent their full support to the development of irrigation. For the most part, farming was viewed as an ally of grazing in this region rather than as a competitor, as was the case in the Great Plains where dry farming constantly encroached upon the domain of the cattlemen.

The Boise valley is Idaho's most important sheep center, but the sheep are raised here in connection with range lands in nearby and distant mountains. Land values are too high to justify the permanent use of irrigated lands for the raising of sheep. Hot summer temperatures in the valley are also not favorable for sheep. Thus the sheep are moved seasonally to the higher altitudes during the summer and back to the lower valley elevations, starting usually in September when they are turned into the irrigated fields, where they remain through January. Sheep are raised here primarily for mutton though wool once provided a substantial income.

Sheep production is steadily declining in the valley as a response to high labor and production costs, increased displacement of the wool market by synthetics, a limited market for lamb and mutton and an inability to compete with imports from New Zealand. There is also difficulty in recruiting sheep herders and the reduction of animal units allowed for grazing in the public domain.

Prior to the establishment of the national forests, the Boise river watershed was part of the public domain and as such was open to unlimited grazing. Competing stockmen raced with each other to be the first on the pasture as soon as it appeared. Some of the early environmental impact was noted in the 19th century by geologist I. C. Russell, "A recent change has occurred which has caused fresh stream channels to appear in previously streamless depressions, gulches, etc., and even on hillsides formerly completely soil-covered. . . . The change referred to it well known to ranchers and others, and is said to have been begun about 1880. At present there are numerous lateral depressions and gulches, branching from the larger valleys, which have fresh channels out in their floors and in the sides of the adjacent hills, that are from 10 to 15 or more feet deep and a mile or more feet deep and a mile or more long, with perhaps several branches, but which previous to the date just given are known to have had smooth, unbroken contours." ("Geology and Water Resources of the Snake River Plains of Idaho", U.S. Geol. Survey, Bull. 199, 1902, p. 145.)

The introduction of irrigation and the longer stays of cattle and sheep on irrigated lands reduced some pressure on the rangelands (see Table 5) and provided for their gradual rehabilitation. The foothills remained under grazing pressure as sheep and cattle operators moved their animals across these hills for spring range.

Reductions in the number of animals grazing resulted from the creation of the National Forests and the implementation of the Taylor Grazing Act which ended free and unlimited grazing on the public domain. On U.S.F.S. lands such as in the Boise National Forest, there have been significant reductions in the allowed number of animal grazing units per month. On lands administered by the Bureau of Land Management, there have been less significant reductions in the number of animal units permitted.

At the start of the 1910 period, the project area had its largest cultivated acreage in alfalfa (about 1/3) followed by wheat (about 1/4) and other grains (about 1/5). This ranking bore no relation to crop values. The reason for the rise and fall in the acreage devoted to specific crops in subsequent years reflected market conditions, frost, disease, competition by producers, differentials in transportation costs, inflation, depression and several wars.

Official project histories dealing with per acre value of crops (see Table 7) reflect many of the same factors enumerated in the previous paragraph. Despite increased yields, the low prices in the midst of the 1932 depression produced the lowest per acre crop values. The higher prices for the next two years reflected drought conditions in the "Dust Bowl" region and the onset of World War II showed a steady rise in values.

Table 7

Average Per Acre Value of Crops - Boise Project (1913-1945)

1913	#16.32
1914	17.80
1915	21.87
1916	32.07
1917	49.44
1919	63.12
1920	46.20
1922	36.80
1923	41.07
1924	24.40
1925	35.14
1931	15.34
1932	10.86
1933	18.98
1934	22.86
1935	25.02
1936	31.36
1939	23.98
1940	23.99
1941	34.00
1942	54.27
1943	79.52
1944	78.22
1945	84.30

Other factors altering the planting of crops were such items as price and demand structures in the hay market and federal progress and subsidies for sugar beets and other crops.

With the opening of the Owyhee project and the Black Canyon Division of the Boise Project, alfalfa was planted in the new lands and removed from some of the older irrigated lands. Sugar beet acreage expansion was rapid in areas with easy access to the Nyssa, Oregon processing plant and after the company established a sugar plant branch in Nampa, there was another reshuffling of regional crop distributions.

Seed production in Canyon County has been for alfalfa and several types of clover. Since seed purity is of prime importance, there has been a tendency to grow seed on the newly irrigated areas or isolated plots where weeds are less established and contamination is less likely.

Sweet and field corn are of growing importance in the area; the former for a regional fresh, frozen and canned market and the latter in conjunction with the rapidly growing feed lot industry.

The vegetable industry expanded as a World War II "war baby" aimed at supplying regional military installations and thus reduce the demand for long haul shipping. Dehydration, canning and freezing plants have provided ways of storing the harvest surpluses. In 1949, Canyon County shipped out 1519 carloads of onions, 612 of lettuce, 164 of green peas, and 42 of green corn. Many of the dry onions were once dehydrated at the Simplot plant in Caldwell but the more recent hybrid sweet onions are shipped fresh to a regional market. Most popular is the Idaho Yellow Spanish Onion.

Potato production tends to be concentrated in the lands northwest of Deer Flat Reservoir and also on the north side of the Boise river in the area between Parma and Middleton. Despite these local concentrations, potatoes and beets are produced in most of the irrigated areas.

Hops are a relatively recent crop in Canyon County expanding from 143 acres in 1943 to 1200 acres in 1949 and 4100 acres in 1974. Wilder has been the center of the hop industry though some fields have been found as far north as Parma. This is a capital intensive activity because of the large costs in land preparation and trellis construction. Several dozen families tend to dominate Idaho hop production.

In addition to the seeds already identified, Boise project lands, mainly in Canyon County, produce significant national quantities of grass seed, onion seed, sweet corn seed, rutabaga seed, lima bean seed, lettuce seed and even turnip seed. Some years Canyon County has produced 75% of the nation's sweet corn seed. All seed production has a high dollar per acre yield and there are local patterns concentration as processors prefer to contract with adjacent farms to produce the same kind of seeds.

Seed production has a high seasonal labor demand and it also requires ample water throughout the season even in late summer. During World War II some of the competing foreign seed sources were not accessible and the local industry expanded to meet a national market. Since 1950, a few of the specialized seed producers have shifted to other crops.

Fruit trees have been in production for a long time in the Boise project area but a series of bad frost years have forced a distributional shift. Most of the current orchards are on south facing slopes but there are some north facing slopes southwest of Lake Lowell. The greatest concentration is on the slopes of the Snake river south of Wilder. Little fruit is grown north of the Boise river because of poorer land and a tendency for late spring frosts. Cherries, prune plums, apples, and peaches are the major types produced.

The main handicaps related to production problems are fluctuating market conditions, weeds and insects, new diseases, labor supply, frosts and periodic water shortages. The frequency of water shortages was quite high prior to the construction of Anderson Ranch Dam and the years from 1924 to 1938 recall many sad tales to the region's farmers. Since Anderson Ranch, only a few problems developed such as in 1973 with its extended dry period.

Summer labor has also been a bit of a problem. Imported labor, school holidays and rapid development and use of labor saving machinery have helped alleviate the problem. Labor camps for transient groups have been maintained at Wilder, Caldwell, and Upper Deer Flat as well as on a number of the individual farms. There was an importation of Mexican and Jamaican nationals during World War II and the use of Japanese evacuees assigned from federal relocation camps. In 1946 some German Prisoners of War were used as farm workers. Since that time there has been a periodic importation of migrating Mexican nationals, though mechanization has reduced some of the large labor demands.

For most of the products produced in the Boise Project area, transport costs favor west coast markets though some potatoes, fruit, vegetables and sugar enjoy a much wider distribution. With the shift from fresh to processed potatoes, the resultant dewatered high value item can now compete easily on the national and even international market.

A summary of recent project area agriculture can be obtained from a study of Table 8. However, it fails to note that project lands are not self sufficient in chicken or swine production, nor that the horse propulation of Ada County is oriented to pleasure riding rather that agriculture.

A comparison of the two counties show continued agriculture dominance in Canyon County and the results of urban influence and extensive range land in Ada County.

Table 8: Agricultural Summary (1970)

Items	Canyon	Ada
No. Farms	2,395	1,524
Av. size (acres	130.7	210.6
Total Co. Land Area (acres)	370,112	667,712
% in Farms	84.6	48.1
Value of Land & Bldgs ($000's)	183,093	122,987
Avg. Value per Farm ($)	76.447	80,700
Avg. Value per Acre ($)	585	383
Cropland in Acres	241,747	122,289
Harvested Cropland Acres	191,587	81,447
Pasture & Grazing Acres (on Cropland)	37,716	23,849
Irrigated Acres	217,240	84,428
Av. Age of Farmer (years)	50.7	50.4
No. Cattle and Calves	123,731	75,102
No. Hogs and Pigs	8,491	6,132
No. Sheep and Lambs	6,695	14,095
No. Horses and Ponies	1,986	2,106
No. Chickens	117,770	145,645
Acres - Field corn	6,352	2,893
Bushels - Field corn	590,185	242,841
Acres - Wheat	10,768	10,649
Bushels - Wheat	665,297	235,612
Acres - Hay	35,474	35,077
Tons - Hay	149,482	136,833
Potatoes - Acres	12,638	1,416
Vegetables for sale (acres)	9,005	1,716
Orchards (acres)	4,686	144

Source: U. S. Census

ACREAGE, FARMS, AND FARM SIZE

After examining a variety of different federal, state, local and private reports presumably dealing with the same area, it appears that the areas frequently do not have the same boundaries and consequently the data collected is at variance.

Some of the causes for this problem stem from the following:

1. The interchangeable use of "Boise Project" with "Boise Valley".
2. The use of some data on the Boise Project that includes both the Arrowrock and Payette Divisions and some data that includes only the Arrowrock Division.
3. The inclusion or elimination of the small section of land in the state of Oregon.
4. Some studies focus on the downstream portions of the Boise Valley but the statistics represent all of Ada and Canyon counties and thereby include sections of the Snake river drainage.
5. The use of Boise Basin almost interchangeably with Boise Valley.
6. Use of the term flood plain with different concepts.
7. Changes in the guidelines for gathering and reporting of data within a single agency. Between the years of 1929 and 1953, no distinction was made between acres irrigated and acres cultivated. The acres cultivated, a larger figure, also included idle and fallow land. The two statistics are reported separately after 1953.
8. Confusion between wholly project lands, those under the Board of Control, and pre-Project lands that get supplemental water.

In addition there is also some confusion between irrigated land and irrigable land. Reports from Project histories, including both the Arrowrock and Payette divisions with full and supplemental water right show a 1971 total of 349,023 irrigated acres and 390,126 irrigable acres. Using only full water rights for both divisions, we obtain a 1971 statistic of 195,955 irrigated acres and 224,761 irrigable acres but that includes Payette lands.

In the Arrowrock division, the main thrust of this study, the 1971 figure with full and supplemental water rights is 242,089 irrigated acres, down from its peak size of 253,113 acres in 1957. The breakdown consists of 139,489 irrigated acres of project lands who get their entire water supply from the project as delivered from the Boise Project Board of Control and 101,456 acres of land with pre-Project rights that received only supplemental water from the Project. Were one to use the larger concept of irrigable lands in the Arrowrock division, then the full water rights go to 164,680 acres and supplemental rights go to 111,115 acres for a total of 275,795 acres. (See Table 9)

The five year agricultural census data for Ada and Canyon counties approximates the areas incolved in the Boise Project but it also includes non-project dry land, some private irrigation ventures, some Snake river irrigated areas and some

suburban tracts. Plates 1 and 2 and Tables 10 and 11 have been prepared to show this data. The use of selected census years fails to reaveal significant annual changes within project borders. Annual data is available from the Board of Control and from project histories. The substantive conclusions drawn from both sources of data is the decrease in farm and irrigated acreage in Project lands. Ada county with Boise and its strong urban orientation shows these changes about 20 years before Canyon county.

A parallel situation exists in the number of farms in both counties. (Plate 3)

Table 9: Full and Supplemental Water Rights

Boise Project - Full Water Right

Arrowrock Division

1. Big Bend Irrigation District, Oregon
2. Boise-Kuna Irrigation District, Idaho
3. Nampa-Meridian Irrigation District, Idaho
4. New York Irrigation District, Idaho
5. Settler's Irrigation District, Idaho
6. Wilder Irrigation District, Idaho

Payette Division

1. Black Canyon #1 Irrigation District, Idaho
2. Black Canyon #2 Irrigation District, Idaho

Boise Project - Special and Warren Act Contractors (Supplemental Water Rights)

Arrowrock Division

1. Ballentyne Ditch Company
2. Boise Valley Irrigation Ditch Company
3. Capitol View Irrigation District
4. Farmers Cooperative Ditch Company
5. Farmers Union Ditch Company
6. Nampa and Meridian Irrigation District
7. New Dry Creek Ditch Company
8. Pioneer Irrigation District
9. Riverside Irrigation District
10. Settlers Irrigation District (not same as #5 above)
11. South Boise Mutual Irrigation Company

Payette Division

1. Emmett Irrigation District
2. Farmers Cooperative Irrigation Company Ltd.
3. Lower Payette Ditch Company

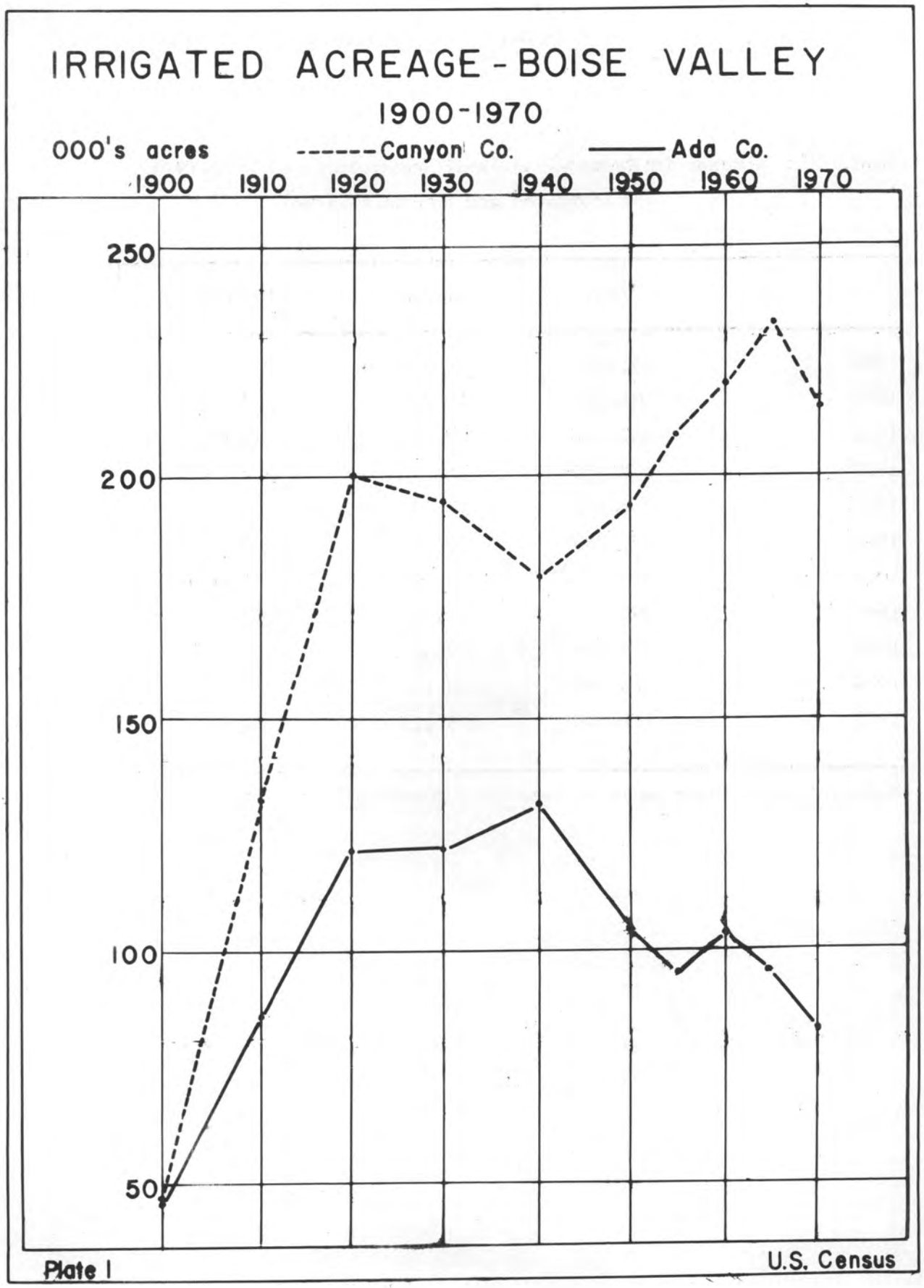

IRRIGATED ACREAGE - BOISE VALLEY
1900-1970
000's acres
------ Canyon Co.
—— Ada Co.
1900
1910
1920
1930
1940
1950
1960
1970
250
200
150
100
50
Plate I
U.S. Census

Table 10: Acreage in Farms -- Ada and Canyon Counties 1900-1970
(Cultivated and Non Cultivated)

	Ada	Canyon	Both Counties
1900	92,161	129,695	221,856
1910	136,067	272,164	408,231
1920	203,651	199,427	403,078
1930	177,470	225,270	402,740
1940	259,072	244,777	503,849
1945	432,180	270,337	702,517
1950	390,647	295,994	686,641
1954	300,310	326,807	627,117
1960	314,976	352,302	667,278
1964	318,985	340,145	659,130
1970	321,035	313,221	634,256

Source: U. S. Department of Commerce, Bureau of the Census

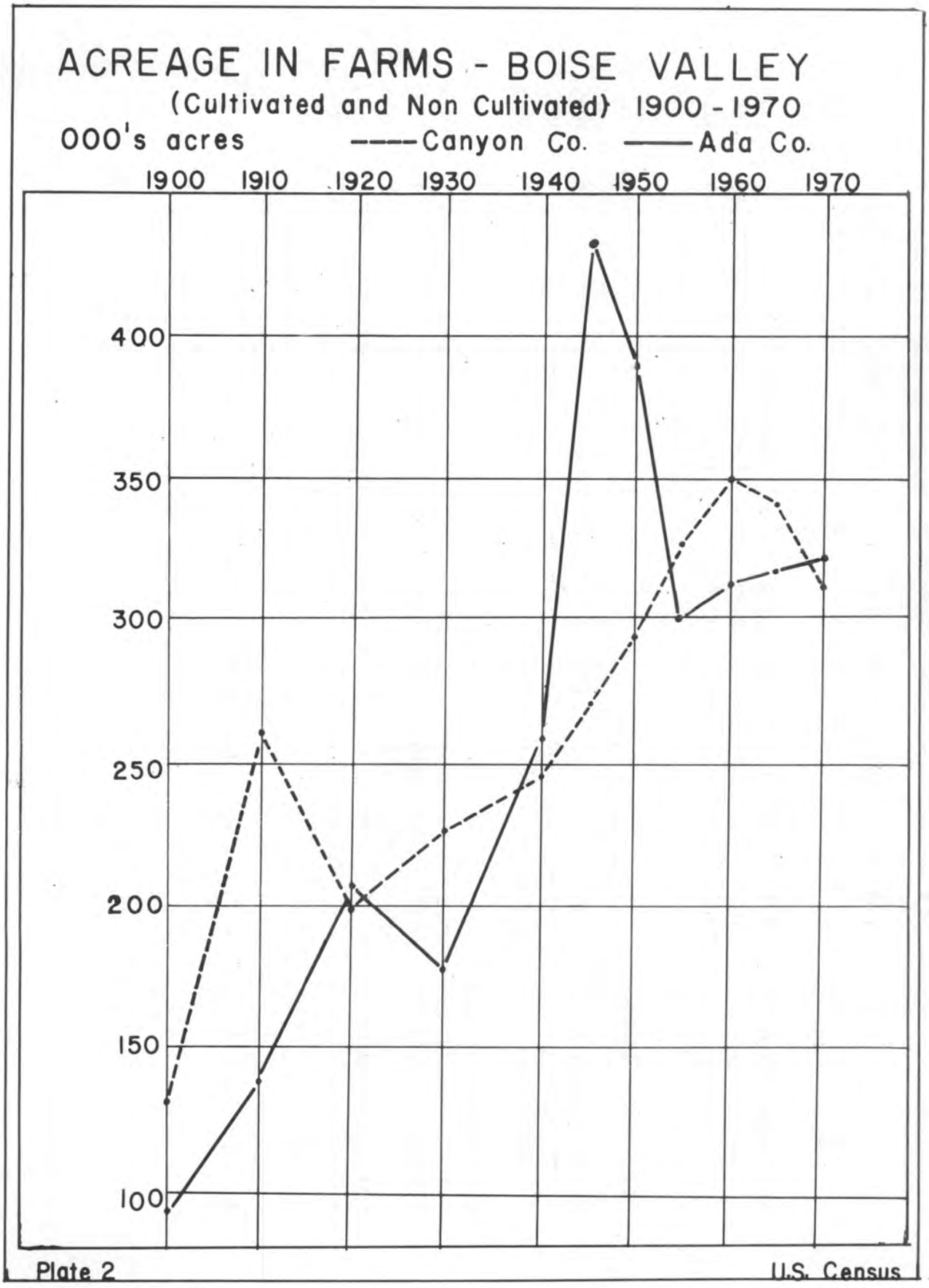
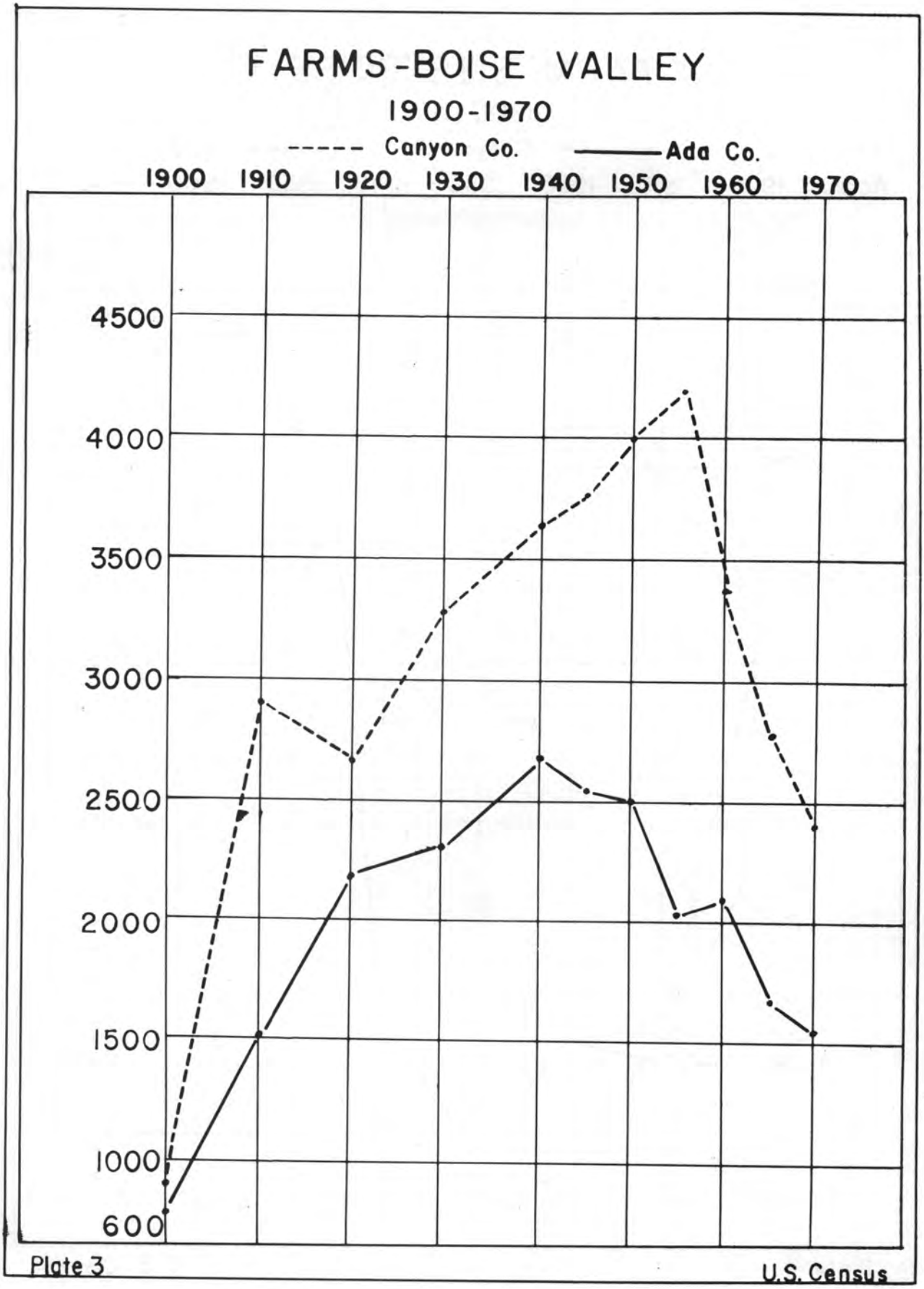
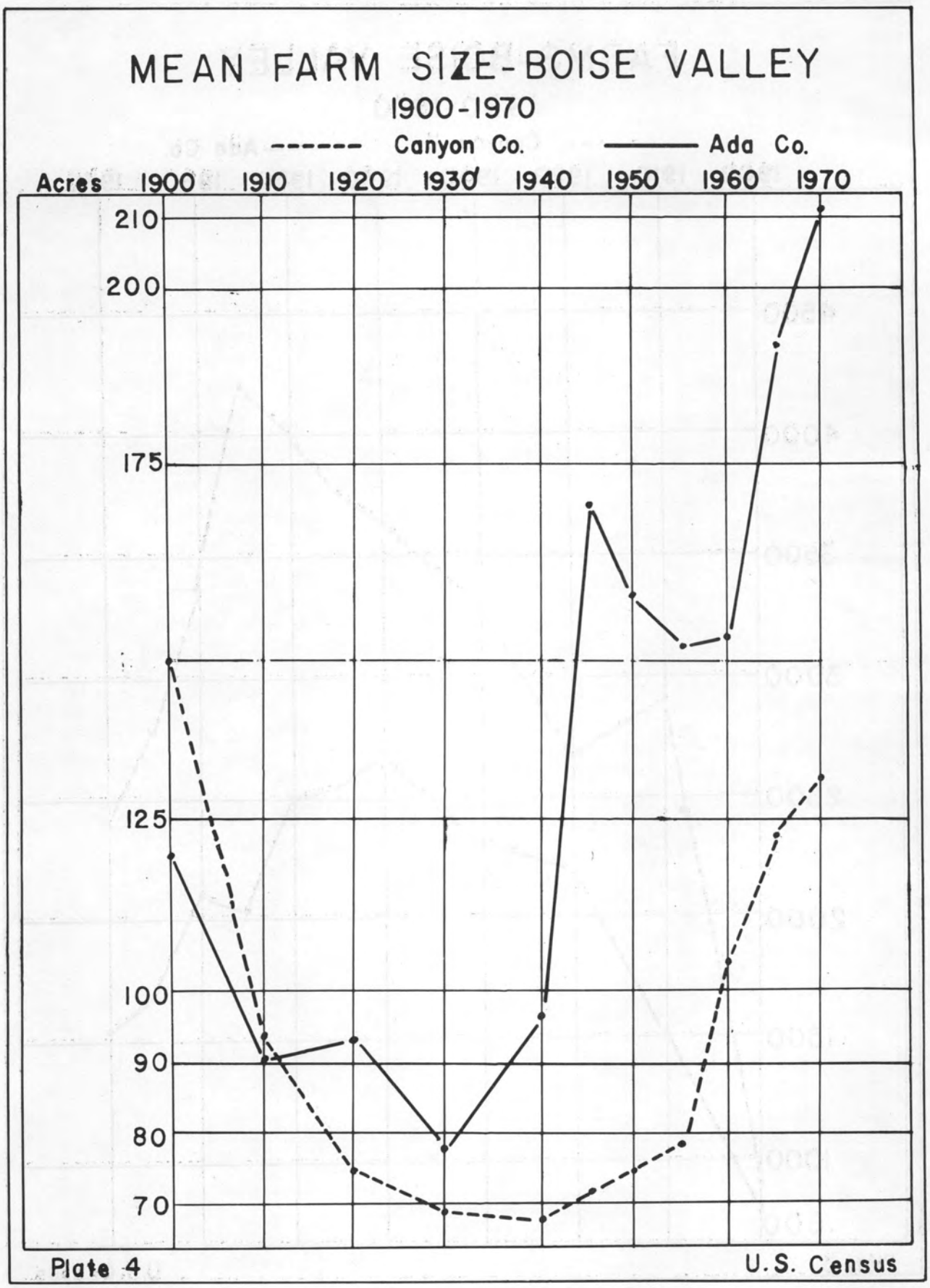

ACREAGE IN FARMS - BOISE VALLEY
(Cultivated and Non Cultivated) 1900 - 1970
000's acres
---- Canyon Co.
—— Ada Co.
1900
1910
1920
1930
1940
1950
1960
1970
400
350
300
250
200
150
100
Plate 2
U.S. Census

Table 11: Number of Farms in Boise Valley (1900-1970) Irrigated and Nonirrigated

	1900	1910	1920	1930	1940	1945	1950	1954	1960	1964	1970
ADA COUNTY											
No. Irrigated Farms	694	1315	1938	2096	2512	2441	2405	1948	2023	1601	1243
Total Farm	769	1503	2198	2305	2689	2545	2503	2007	2093	1667	1524
Percentage	90.2	87.4	88.1	90.9	93.4	95.9	96.0	97.0	96.6	96.0	81.5
CANYON COUNTY											
No. Irrigated Farms	845	2238	2477	3138	3497	3455	3873	3997	3312	2673	2033
Total Farm	881	2912	2660	3279	3631	3777	3985	4183	3394	2791	2395
Percentage	95.9	76.9	93.1	95.6	96.3	91.4	97.1	95.5	97.5	95.7	84.8
% T.I. Farms/T. Farms	93.2	80.4	90.8	93.7	95.0	93.2	96.7	96.0	97.2	95.8	83.5
Total Irr. Farms	1539	3553	4415	5234	6009	5896	6278	5945	5335	4274	3276
Total Farms	1650	4415	4858	5584	6320	6322	6488	6190	5487	4458	3919
(% Change total Farms over previous census)		+167.5	+10.0	+14.9	+13.1	+0.0	+2.6	-4.5	-11.3	-18.7	-12.1

Source: U. S. Department of Commerce, Bureau of the Census.


FARMS-BOISE VALLEY
1900-1970
----- Canyon Co.
——— Ada Co.
1900
1910
1920
1930
1940
1950
1960
1970
4500
4000
3500
3000
2500
2000
1500
1000
600
Plate 3
U.S. Census


MEAN FARM SIZE-BOISE VALLEY
1900-1970
Canyon Co.
Ada Co.
Acres
1900
1910
1920
1930
1940
1950
1960
1970
210
200
175
125
100
90
80
70
Plate 4
U.S. Census

After a spectacular early growth in the number of farms between 1900 and 1910 with the start of the Boise Project, there was growth in the number of farms in Ada county through the 1930's and lasting in Canyon county into the 1950's. However, since that time two factors have been most significant: farm consolidation and the change of land from agricultural to suburban and urban associated uses. The dramatic change has resulted in about the same or fewer number of farms in these respective counties that they had in 1910, even though the irrigated acreage is about twice as great.

Farm size changes (Plate 4) shows several differences not apparent in the previous graphs or tables; namely a steady reduction in the average size of farms from 1900 to 1930-1940, followed by a subsequent dramatically increased size even to the present. The early reduction pattern resulted from the sale of tracts from existing farms to new farmers, the small size of the early tracts sold from the Project, limited capital for labor saving equipment, money and energy commitments to improve yield, depressions and high transportation costs. The main thrust in farm enlargement came with improved machinery and enough capital formation to maximize returns from economies of scale.

LAND USE EVOLUTION: AN OVERVIEW

In the historical evolution of land, any given parcel of land undergoes natural (flooding, erosion, earthquakes, mass wasting, etc.) or artificial (man-induced) alterations to its physical state. Without man, land changes would have been slower and less drastic during the past 150 years. Between the influence of increased population, technologic change and the massive development which has occurred in the Boise valley, large land areas have undergone major transformations. Some are of short duration, others have been cyclic; most are relatively permanent, as long as technology, urbanization, suburbanization and the practice of irrigation continues. Without man and irrigation, today's fertile cropland would dry up and eventually return to grass and sage or some other vegetative climax. Some of man's impacts have been local, such as rock quarries, while others have blanketed the entire project area and extended beyond it.

There are numerous variations in the sequence of events resulting in land use changes. The earliest changes (following the arrival of white men) were perhaps associated with highly localized placer gold operations, logging, and then hard rock mining in the Snake-Boise river basins. In terms of acres directly affected, the changes from mining were relatively small but highly visible. As in most mining ventures of that period small settlements were established and some food was grown locally; the rest was shipped in. This resulted in two land use changes, 1) local agriculture in the bottom lands of Boise river and 2) construction of a rail and road transportation network. These represented one stage transformations which typify a large portion of Boise valley today. The land was converted directly from a grass-sage range land state to its present irrigated cropland

use without any intervening land uses. Two stage transformations involve a third use of the land such as an intermediate dry land farm that was later abandoned or some third present residential, feed lot, industrial or commercial use. Another example of secondary transformation land is found along the Boise river flood plain which moved first to agricultural production, and later became wet marsh land as irrigation moved to the bench lands and the ground water table rose. There are a number of possible stages for any given piece of land throughout time. In the Boise valley it seems that a four or five stage transformation is probably the maximum for the present time. An example of this would be range land originally placed into agricultural production, then transformed into a residential tract, then merged into the City's (Boise) central business district, and then subsequently being cleared as a part of urban renewal. Such examples are presently evident in Boise.

It is hoped that the following examples of various land use changes will provide further insight to the topic:

ONE Stage Transformations:	Sage-grass	Agricultural
	Sage-grass	Urban
	River bottom	Urban
	River bottom	Agricultural
	Sage-grass	Inundated water, reservoir, etc.
	River bottom	" "
TWO Stage Transformations:	Sage Brush	Agricultural-Urban
	Sage Brush	Agricultural-Highways. RRs, etc.
	River bottoms . . .	Agricultural-Urban
	River bottoms . . .	Agricultural-River bottoms (infertile)
	Sage Brush	Urban--Open space
	Sage Brush	Agricultural-Suburban tracts
THREE Stage Transformations:	Sage Brush	Agriculture-Residential-Urban
	River bottom	Agricultural-Urban Urban Renewal

The constraints on this overview study prevent a more complete identification of those portions of the Boise valley that have undergone one or more stage transformations. A study of the accompanying (I-III) Land Use Maps for 1882, 1939-1940 and 1973 provide some of the raw material for the application of stage transformation analysis.

The 1882 Land Use Map shows the preponderance of range land, the relatively narrow ribbon of cultivated bottomland (irrigated and non-irrigated) and a few population clusters. This year was selected because of 1883 there were a series of new changes manifest with the introduction of a railroad and a number of new settlements. In many ways 1882 symbolizes the last pre-development year.

The next period mapped was a 1938-1940 composite which was reconstructed from several sources. By this time most of the land irrigated by Boise river water was already being culitvated and the new settlements established, but suburban sprawl had not yet begun. The high areas above existing canals remained rangeland and pump well irrigation was not yet common to these areas. As in earlier period there is an assumption that the data provided was accurate.

The 1973 Land Use Map shows several significant changes; notably the rapid and extensive suburban sprawl through leap frogging westward from Boise. There are also a few suburban developments in Canyon county. Other specific items that should be noted are the continued shrinkage of parcels of rangeland as more areas have gone into irrigated farmland. This map differentiates between irrigated and non-irrigated land in cultivation and consequently the dry land farm operations in the southern portion of Ada county are delineated.

ATTITUDES AND IMPACTS

In developing this study it was intended to identify and segregate those impacts into three periods (1) those operative prior to the federal expenditure, (2) those associated with construction and (3) those related to the post construction period. As overlapping data was uncovered, expected delineations became more diffuse.

Though private irrigation in the area was well established in the 1860's, expansion by the private sector took a significant spurt in the 1880's and the 1890 to 1900 witnessed a tripling of the irrigation acreage. One 1883 irrigation survey was made to solicit funding from private interests and an 1889 additional survey hinted at the possibility of a future water storage facility. Discussion of a future possible federal project in the area proceeded final action on it by some twenty years and this may well have helped stimulate some of the regional activity. In 1890 there was 20,000 acreas of irrigated land and by 1900 nearly 100,000 acres were claimed (though not all were under irrigation) and farms had access to 465 miles of canals that were built at a cost of $1.8 million dollars.

When the Reclamation Service was created and the first Boise Project authorized in 1904, the federal funds were used for the construction of federal dams and new distribution as well as to complete and to expand numerous ventures started earlier with private funding. Even at a later date the Boise Project added to it a number of other privately developed facilities. Thus, establishing the

breaking time point of impact between the period of wholly private activity and the start of federal activity is not clear and concise. Probably the period prior to 1890 was exclusively private and those developments after 1906 were overwhelmingly federal. Some of the private developments in the critical 1890-1906 period were inspired by or related to some anticipated federal expenditures.

Placing a finite time period on the construction era also produces problems as construction of this multi-unit complex extended virtually over a fifty year span of time essentially from 1905 to 1955. As is common with large public works efforts, the appropriations are doled out for selected aspects of each segment and these extend over a long period of time. The normal time extending factors were compounded by the impact of two world wars, a major national depression, and a major project area in-migration pattern associated with Dust Bowl conditions in the dry farm belt of the Great Plains. Probably the post-construction period would most accurately date from 1955.

Each unit had a different time and scale of impact. The Arrowrock and Anderson Ranch dam units had local impact associated with their construction and discontiguous downstream impact expressed both by flood control or irrigation or contributions. Their direct regional impact is best associated with power and recreational activities to gain time frame perspective, it should be noted that water started moving from the official Boise Project in 1908 but that Lake Lowell, an integral unit thereof was not completed until 1911. Similarly though, Arrowrock was started in 1911 and it provided some storage by 1914, it did not reach capacity storage until 1915.

There was alos a question of scale. The Reclamation Service, in its second annual report, estimated that 600,000 acres in Southern Idaho could be added for irrigation and that this would generate some 500,000 new residents in the area. For the Boise and Payette units it translated to 20,000 new people with an immediate benefit while homes for many times that number would have to be provided in the Boise and Payette valleys.

The anticipated river storage, according to the Second Annual Report of the Reclamation Service, could supply enough early water for an additional 180,000 acres and a late supply of water for an additional 100,000 acres. Though the crops at that time were 15% in grain and 75% in hay, there was considerable interest in expanding the grain acreage which uses the greater supply of earlier water. This section was added to show that the relationship between the crops selected and the periods of available water. In the early period grain was preferred because it produced a reliable cash crop.

The Deer Flat Reservoir provides a valuable case study of impact. Developed to provide storage for late water on the Pioneer District and for the lands downstream on the south side of the Boise river. Initially, it drowned some of the deer browse existing in this depressed site as nearly 10,200 acres were taken out of

agricultural production, and placed under water for irrigation, swimming, and boating. Concurrent with its irrigation function, President T. Roosevelt issued Executive Order #1032 dated February 25, 1909 which designated part of the reservoir area and its adjacent shore lands as the Deer Flat Reservation for the Protection of Native Birds. The name has been changed but the bird protection function remains the same in this refuge area. From an overall land use perspective, probably the Lake Lowell change has been most significant.

To gather insight on attitudes concerning the early federal expenditures on the Boise Project, a survey was run of the regional newspapers at the critical time when the Reclamation Service was about to make its decision regarding the authorization of the Boise Diversion dam. Our findings indicate that almost all editional comment was highly favorable. Part of this support may have been attributable to a recent series of severe drought years, expansion of acreage in excess of reliable water supplies and subsequent water shortages, and the questionable practices of private ditch and canal owners.

Also coming from the editionals was a feeling of great hope for and confidence in the federal venture. Some recognized that federal regulations would probably follow in its wake but they also expressed a feeling that there would be equity in its administration.

The only reported objections seemed to come from individuals with good water rights who feared that the new project might jeopardize their existing rights or create new financial obligations for them far in excess of any additional benefits they might receive. There was some fear in the Boise area that the pending Minidoka project in the Twin Falls area might take precedence over and forestall activation of the Boise Project. This might have been a factor in generating so much pro-project sentiment.

A 1905 letter from J. H. Lowell, president of the Payette-Boise Water Users Association, written while awaiting a Reclamation Service report, expresses his conviction that the federal role in the project will mean fewer large land holdings, fewer absentee landowners, more small farms, more homes and more intensive cultivation. Lowell felt that the greatest economic and land use change would come from the federal rules, regulations and guidelines and only indirectly from the federal expenditure. Lowell's hypothesis of 1905 has yet to be clearly tested.

To gain insight into current regional attitudes regarding the regional federal expenditures, it was decided to contact a representative group of business firms called from the "yellow pages" of the Boise valley phone book. A prior screening was made to insure that these were all agriculturally based businesses. The report continues:

BOISE PROJECT RELATIONSHIP STUDY

Of the 178 questionnaires sent to agriculturally associated businesses identified in the yellow pages of the Boise phone book, 58 were at least partially completed and returned for a 30% sample.

Replying to a question on the year that their businesses started, 70% said since 1940, and only 28% were founded between 1900 and 1940. This suggests considerable expansion in the same time frame with the major dams.

In response to a question attempting to find out what share of their business volume was related to irrigation agriculture in the Boise Project area, the largest number, 17 out of 59, said 100%. The median reply was 75% and only 9 indicated under 30%.

A related question asked for the percentage of their business done outside of the Boise Valley. This was an attempt to cross check the earlier question. Of 48 validated, 22 indicated 10% or less of their business being done outside of the Boise valley. The largest single category was 0% and the median value was 20%. Several indicated a Boise address but business operations elsewhere in the state. Where clearly detected, these responses were culled from the total, which accounts for the disparity of total numbers used for different questions.

In response to a question trying to identify what percentage of their business was primarily with private homes, personal gardens, etc., 46 out of the 52 replies (86%) indicated less than 10% and 37 of these said under 2%. This it appears that our respondent group was overwhelmingly agri-business.

A rather complex question followed which was designed to identify what the businessmen would have expected to develop in the Boise Project lands without the major federal expenditures. Seven specific choices were listed for their multiple checking and 1 open ended question was included to solicit any additional comments on this topic. This is the order of the most frequent responses checked:

1. Private irrigation projects on a smaller scale - 39.
2. Less industry, fewer people - 33.
3. More emphasis on groundwater as a source of irrigation with less than 1/2 of the total irrigated acreage of today from groundwater sources - 22.
4. More emphasis on groundwater as a source of irrigation with more than 1/2 of the total irrigated acreage from groundwater sources - 20.

Private irrigation projects on the same scale - 7.

The two possible changes that did not get any more than 2 checks each were:

"Less emphasis on groundwater" and "more industrial development." In the question soliciting comments the following parallel observations were made "the area would be less developed" and "private irrigation would be on a larger scale."

In summary, over 50 business firm respondents perceived that without the major federal expenditure in the form of the dams and extensive lateral and canal systems, there would be less irrigation acreage, greater dependence on groundwater less industrial development, a smaller population and smaller scale irrigation projects. The respondents were almost equally divided on the question as to whether groundwater sources would have constituted over or under 50% of the resultant irrigated acreage.

In an attempt to provoke a response, the following question was inserted midway in the questionnaire "One of our researchers feels that many agribusinesses in the Boise Valley simply take the existing project for granted and do not relate their present business volume directly to the massive federal expenditures. How do you feel about this statement?"

In analyzing the 57 responses it seems that the largest number of replies (34) missed the perceptual purpose of the question. This was a conclusion reached from so many responses that were tangantial to the question. Of the 23 responses that seemed to address themselves to the question, fifteen indicated that they felt other businesses took the project for granted and eight indicated a belief that the full significance and value of the project was understood and appreciated. It appears that this question was no successful and that conclusions drawn from it may be of dubious value.

The final question sought to elicit a response from business men as to their perception of the effect of increased subdivision activity between Boise-Caldwell that is removing productive agricultural land. The responses were all written and those quoted or paraphrased were deemed to span the comments.

1. "Need the Guffy project to develop more land between Boise and Mountain Home."
2. "It will harm the agriculture but will probably benefit our business at least in the short run."
3. "Very little."
4. "The subdividing has taken lots of good agricultural ground out of production and has cut production greatly."
5. "It could mean that some of the farmers will be selling their places for building lots and will no longer need my services."
6. "Why not build on land other than existing and producing farm land?"
7. "It will increase my residential and commercial pump work quite a bit, but will cause my agricultural business to fall off."

8. "The 3000+ acres annually removed from agricultural production during the past four years has reduced our beet acreage in that area. Our only hope is that private development of new land will offset our losses."
9. "As a commercial feedlot, housing development in hearby areas will cause several problems including the question of relocation."
10. "Subdivisions are not significant in the total Boise valley agricultural picture."
11. "It will help my business greatly and not affect the agricultural production too much."
12. "More garden supply business and less feed and seed business."
13. "I don't think it will effect our business as much as others. We don't like to see all of this good farm land being lost."
14. "It will force farmers to develop more of the outlying areas."
15. "Here in Kuna on newly developed land the bulk of our business will continue to be with farmers."
16. "It will be damaging to my agricultural oriented business."
17. "It should be stopped."
18. "It will increase my commercial work and decrease my agricutlural work.
19. "In the short range, it will mean about the same volume for pump and water systems as we have in agricultural production. It would increase our sales of more specialized equipment such as softeners, iron and sand filters and chlorinators. However, in the long run we fear contamination of aquifer from proliferation of septic tanks and the lack of enforcement of our present standards unless there is an area wide sewer and water system required."

20. "I don't like it - we need the fertile land for food."
21. "Our business will decrease as the subdivisions increase unless there are new irrigation developments."
22. "Effect on my business will be minimal as there is quite a bit of new land in the Kuna-Swan Falls area."
23. "It will not affect our business directly, but it will decrease dairy and cattle raising."
24. "If they keep building like they have on our good land, soon we'll have none to farm."
25. "Increased land values forces farmers to lands in other areas such as Orovada, Nevada, and pumping projects along the Snake and Columbia Rivers."
26. "It is taking large acreages of prime agricultural land which cannot be replaced by new land projects in the building because of costs involved and cropping patterns that will be changing in the Boise Valley."
27. "It will be detrimental to agriculture as farmers sell out to industry, dairying will remove to other areas - eastern Oregon, or central Idaho, Payette, etc."
28. "We are also in the industrial equipment business so it won't hurt."

29. "This means more government regulation."
30. "More agricultural land going to large project type (pumping-sprinkler) operations."
31. "Custom butchering will decline and feedlots will increase. It is a terrible oversight to allow good farmland for houses when we have a desert within commuting distance of the cities that would be used for subdivisions."
32. "It will obviously help our business. The foothills shoudl be used for residential housing, leaving the good farm land for farmers."
33. "I feel the agricultural situation is suffering greatly in this area and will continue to degenerate as subdivisions encroach on prime farm land. The hillsides and rocky ground should be used for subdivisions."
34. "Our business will decrease if new agricultural areas are not increased to offset the loss to subdivisions."
35. "At present it is increasing our business, but over a five-year period it will reduce our sales."

WATER PROBLEMS

The pertinent portion of the Boise River floodplain begins four and nine-tenths (4.9) miles east of Boise City below Barber Dam. The flood plain narrows as it passes through Boise City as the channel is contained by natural and man-made embankments and levees. As the river moves west the flood plain widens and forms Eagle Island where the river forks into two channels. Approximately three and one-half (3.5) miles southwest of the town of Eagle, Idaho the river channels rejoin and continue in a westward direction. The northern boundary of the flood plain of Boise River is marked by foothills of the Boise Front and to the south by bench lands. The width of the flood plain varies from less than one (1) mile to approximately three (3) miles. The gradient of Boise River in the flood plain averages a vertical drop of eleven and one-half (11.5) feet per horizontal mile from Lucky Peak to the confluence with the Snake River. Extremes in the gradient are figured at six (6) and seventeen (17) feet per horizontal mile. Gradients in the upper drainage basin are steeper running 125 to 150 feet per horizontal mile.

The original flood plain is physically the same but the liklihood of possible inundation under flood water conditions has diminished with each phase of the federal expenditure. (See map V Flood Prone Zones.) It is recognized that the Geologic Survey labeled Flood-Prone area on the map is not to be used interchangeable with the flood plain for they are not synonymous; the flood prone area is that lower elevation area within the flood plain that is subject to periodic flooding. Excessive river sediment loads, aggrading of the stream and reduced channel carrying capacity may actually produce more floods then was forecast.

Flood plain development began with gold discoveries, trail crossings and agricultural development. The first areas settled were adjacent to the river where water could be easily and cheaply diverted. As agriculture demands and profits increased, the entire flood plain area was devoted to irrigated agricultural production. Further agricultural expansion spread to the bench lands, but real estate developers still favored the flat flood plain for residential and industrial construction because of the flat land, relatively low cost, access to a water supply and for industry--a nearby disposal area for liquid effluent. Consequently, with each successive flood, the potential dollar damage increased because of the flood plain acquiring more valuable structures.

Construction of the storage dams particularly the most recent flood control unit at Lucky Peak has greatly narrowed the zone of damage (flood prone zone) along the river. Flood waters surging down the Boise River have their destructive energies siphoned away by the network of reservoirs. The debris carried by the flood waters are dumped into the reservoirs. About 43% of the sediment dumped into Arrowrock, chiefly sand and gravel, is permanently trapped in the reservoir. Finer sands and silts are sluiced from the reservoir periodically. Sediment trapped at Arrowrock reduces storage capacity with an estimated replacement value of $44.71 per acre foot.

The additional silt load appears as bank erosion and each year cleaning silt from the ditches has become a labor task on the 8,680 farms. From three days to three weeks of hand and team labor is required annually on each farm for silt removal. Of the total ditch maintenance cost, most of it is for silt removal and some 90% of this silt is attributed to man's role.

The major flooding problems along the Boise River in recent years have come about on the foothill lands north of Boise. The problem intensifies from the nature of man's occupance pattern but these intermittent streams have been flood problems since geologic time. The problem has intensified with overgrazing, logging, fires, local summer floods and in more recent times with man's insistence upon moving onto the foothills with residences and roads. Each new subdivision onto the foothills intensified both the liklihood of a flood and the value of the resultant damage.

The first settlers located close to the river irrigate with minimal outlays of time, energy and capital. Because of the 11.5 foot gradient of the Boise River, farmers were able to construct temporary diversion structures made of cheap and easily available timber and rubble at upstream points making gravity irrigation possible on downstream land. The gradient of the canals supplying water was less than the river's gradient, and averaged two to four vertical feet per horizontal mile. That water not being consumed by crops, evaporation and seepage into the groundwater system returned to the river below the farmer's property by natural drainage.

As new land went into production further away from the river, more water was required during the growing season and without storage this had the overall effect of producing water shortages during dry years. However, increased irrigation produced a different type of problems for the low flood plain farmer--a rising groundwater level and the associated problem of alkalinity. Reports indicate local damage from an excess of water and alkaline salts as early as 1911. Some farmers used the water allocated for their entire tract of land on only a portion of their acreage. This was frequently more water than the land and crops could absorb. There was also a continual water return flow from the leakage of unlined canals. Boggy soils and local accumulations of alkaline salts also became common along the flood plain. One 1911 report advocating drainage programs noted that in 1901 the groundwater levels in the Caldwell-Nampa ranged from 15 to 100 feet below the surface but that ten years later the groundwater level was only a few feet below the land in any portion of that area. Problems varied in each section of the Boise Valley.

Expansion of irrigation and the overuse of water had the effect of raising groundwater levels significantly and reducing the capacity for additional groundwater storage. In the 1930's the effects of new drainage systems began to counteract the situation and groundwater levels were lowered in some areas.

The problem of alkalinity is closely associated with drainage and rising groundwater levels. Black alkali (carbonate) is the deposit which renders soil sterile. Normally, it is confined to the areas of sloughs and some portions of the flood plain immediately adjacent to the river, but it may exist anywhere the conditions for its deposit exist.

In 1940 it was estimated that 35,000 acres of alkaline lands existed in Boise Valley which represented 10% of the entire irrigated area. Reclamation efforts on some of these acres has since been completed. Seepage from adjacent bench lands provided a continual influx source of groundwater into the area.

Early seepage problems were common in the private canals but the big early case was the 1910 seepage problem in the Main canal leading from the Boise Diversion project which subsequently required concrete lining on the canal. Another seepage problem developed by the Deer Flat Reservoir and this was offset by a drainage canal built in 1913.

Seepage from and return flow to canals on the Boise Project lands were a continuing concern, as early canals were not line except where their flow was greatest. As construction proceeded more miles of canals were lined, and seepage losses declined from an estimated 20% to about 5%.

In addition to canal and lateral leakage, percolating irrigation water and waste from numerous septic tanks and drains upward leakage from the deep aquifer (Glenns Ferry Formation), and precipitation all entered in the shallow groundwater

recharge process. Groundwater is discharged from the shallow aquifer by several means, including: springs and artesian wells, flows to surface drainage (including pumping from wells) evaporation and evapotranspiration.

The number of users served by municipal sewer and water systems also changes the groundwater situation. Between 1953 and 1970, there was a 32% increase in the total number of users of municipal water systems, and a 98% increase for users of municipal sewer systems. All municipal water systems in the Boise area presently utilize the deep aquifer as a domestic water source for their customers. Increasing dependence on municipal water systems has resulted in more water being pumped from the deep aquifer. Expansion of municipal sewer systems has reduced seepage frpm septic tanks in some areas but suburban sprawl creates the problems in other areas because of the high reliance on septic tanks in new developments. Many septic tanks do not work efficiently or are located in soil types not favorable to septic systems which results in an increasing liklihood of contamination of groundwater.

The combined hydrologic effects of water use changes in irrigation, domestic use, other agricultural uses and industry progressively increased withdrawals from the deep aquifer in the 1953-1970 period while increasing the recharge of the shallow aquifer. (Table 12)

Recharge to the shallow aquifer is expected to stabilize, and then possibly drop in some areas such as the Boise-Meridian corridor when suburbanization replaces irrigated agrculture as the primary land use. Without the major federal expenditures, it can be assumed that there would have been greater reliance on groundwater sources for irrigation and more concern with conservation in fear of exhausting the available supply. This was discussed earlier as findings in the Boise Project Relationship Study.

Table 12. Summary of Use and Disposition of Water in the Boise-Nampa Area

		Year	Irrigation Use (acre-feet)	Domestic and Stock Use (acre-feet)	Industrial Use[1] (acre-feet)	Totals (acre-feet)
Diverted from Surface Stream		1953	712,000	0	0	712,000
		1970	732,000	0	0	732,000
Groundwater Pumpage	Deep Aquifer	1953	21,000	20,300	13,800	55,100
		1970	93,000	26,800	15,100	135,000
	Shallow Aquifers	1953	0	7,100	0	7,100
		1970	0	10,700	0	10,700
Consumed[2]		1953	288,000	6,800	3,300	298,000
		1970	323,000	9,400	2,800	340,000
Transferred from Project Area by Sewers, etc.[2]		1953	0	7,400	10,500	17,900
		1970	0	14,600	12,300	26,900
Gross Recharge to Shallow Aquifers		1953	445,000	13,200	0	458,000
		1970	497,000	13,500	0	511,000
Net Recharge to (+) or Withdrawl from (-)	Deep Aquifer	1953	-21,000	-20,300	-13,800	-55,100
		1970	-93,000	-26,800	-15,100	-135,000
	Shallow Aquifers	1953	+445,000	+6,100	0	+451,000
		1970	+497,000	+2,800	0	+500,000

[1]Estimates made by plant operators. [2]Unavailable for recharge.

From: Some Effects of Land Use Changes on the Shallow G.W. System in the B-N area. Dept. of W. Administration, #26, June 1972, p. 16.

WATER QUALITY

The main source of the Boise River is within the Idaho Batholith comprised of generally coarse-textured, shallow soils underlain by granitic bedrock. Where mountain glaciation was active, the loose rock materials have long since been removed. Where deeply weathered rock materials are present, these areas are subject to high sediment generation once the fragile soil surface is disturbed. Construction of roads and dams placed great sediment loads in the Boise River though many of the coarser fragments settled to the bottom of the reservoir pools. Prior to the dams, farmers in the area valued what they called "muddy water". Foote (1884) mentions that silt acts as a fertilizer and that it would be a serious if not fatal drawback to irrigation in the valley if this situation did not exist or if it were changed. Another benefit claimed for "muddy water" was that it prevented seepage through the sides of small diversion canals after a few days use. Since the development of Boise River the "nutritional" benefit of the "muddy water" had to be replaced by chemical fertilizers.

Increased sediment yields produced by logging, road building and construction are environmentally degradational factors. In the Batholith the most serious erosion comes from the construction of logging roads. About 85% of the erosion occurs during the first year after construction and is generally the result of erosion on fill slopes. As the logging generally takes place upstream, a major impact is on fish spawning areas and in the increased sediment load behind Arrowrock and Anderson Ranch Dams. Sediment at Lake Lowell comes mainly from runoff of the adjacent slopes and farm land.

Water leaving Lucky Peak Dam is of good quality in that it will support all forms of water based recreation activities and fishing. It has a high oxygen content and low bacterial and nutrient levels. Boise River water quality degenerates downstream with distance from Lucky Peak.

The first major assault area comes from surface runoff and then from the effluent from the Boise and Garden City waste treatment plants. In addition, there are several industrial discharges periodic discharges from storm drains and during periods of high use, the Idaho Fairgrounds.

There are thirty different diversion canals on the river. During the peak of irrigation, these canals withdraw as much as 7000 cu. fit./sec. from the river. This use with accompanying reservoir discharge control causes considerable fluctuation in the main stream depth. Maximum drawdowns and maximum summer temperatures often coincide, thus creating a hostile environment for resident fauna. Fluctuation in river levels is also caused by flow regulation at Lucky Peak Dam. Occasionally the entire flow is cut off to repair outflow tunnels at the dam. Such extreme fluctuations in the water level creates a dangerous concentration of poisonous substances and heating of the water with subsequent loss of oxygen needed for resident fish and it also may leave spawned eggs high and dry along the

the stream banks. Efforts are underway to establish minimum flow of the river for the protection of the fishery and the Fish and Game Department has rights to 50,000 acre feet of Lucky Peak water to be used as needed.

The Boise River flows nearly 60 miles through the populated valley and only in about half this distance does it provide suitable habitat for many game fish. Water quality deteriorates below the Ada-Canyon line. The Fish and Game Department has made plantings of rainbow and brown trout in the river down to Middleton. From Caldwell to its confluence with the Snake, the Boise River supports chiefly warm water rough fish (i.e. carp, sucker, squawfish, chisel mouth, and others). In some higher quality stretches of the river, largemouth bass, brown catfish, channel catfish, and white fish occur.

The slow moving shallow water at Lake Lowell is warm, turbid and eutrophic. Indian Creek has become little more than an open sewer as a result of agricultural by-products such as silty irrigation runoff, food processing and slaughterhouse wastes. An analysis of these stream reveals: 1) high bacterial concentrations (coliform and occasionally pathogenic forms), 2) low levels of dissolved oxygen and high levels of other gases (methane etc), 3) large quantities of dissolved and suspended materials (i.e., silt, waste liquids and chemicals), 4) reduced aesthetic value, unsightly appearance and undesirable odors). The lower 24 mile stretch of the Boise River has often resembled a muddy, sluggish drainage canal generally unsuitable as a wildlife habitat or human recreational activites. In this section of the river, the bottom has often been heavily silted and devoid of invertebrate fauna, with beds of partially decomposed sludge lining the shores. The general health of the Snake River where it borders Ada and Canyon counties is better than the Boise River although it too carries a considerable load of dissolved and suspended materials.

Although much recent effort has been directed towards mitigation of such conditions, the waters still receive some products which create a high Biological Oxygen Demand (B.O.D.) as well as high counts of bacteria. A high B.O.D. tends to deprive resident river organisms of a needed oxygen supply.

Development in Boise Valley has resulted in by-products additions to the river such as agricultural run-off, and plant and animal food processing wastes which have degraded the lower Boise River. Part of the problem results from using excessive irrigation water percolation into the groundwater system, raising of the groundwater level, or the downriver return of water carrying herbcide, pesticides, industrial and feed lot effluent.

With increased irrigation activities, a network of drainage canals are dug, which may discharge silt and nutrient-laden (phosphate and nitrate) runoff into the Snake and Boise Rivers, or directly into a reservoir (as in the case of Lake Lowell). Some of the dissolved nutrients provide the fertility necessary for widespread eutrophication such as may be found in Lake Lowell during the summer. There is

some evidence to suggest that Boise River nutrients play a role in the development of algae blooms downstream on the Snake River behind the Brownlee Dam.

Wastes from food processing operations figure heavily in water quality problems whether they are discharged directly into streams or by overloading domestic waste treatment plants. An Environmental Protection Agency report identifies six major polluters on Indian Creek, which flows into the Boise River near Caldwell. Listed were: Idaho Animal Products, Amalgamated Sugar Co., Western Farmers Inc., World Wide Foods, Bird's Eye Foods, and J.R. Simplot Poultry. Although some of the companies utilize pre-treatment before their wastes are placed into the Nampa Waste Treatment Plant, the resulting overload at the plant is still serious.

By the time the river reaches Caldwell there has been significant agricultural water return as many drains have emptied into the river. Caldwell's Waste Treatment Plant is also a contributor to the problem, as in Nampa's which flows into Boise River via Indian Creek. Nampa's treatment plant is possibly the most heavily overloaded in the area. A 1973 joint report by the Ada Council of Governments, Canyon Development Council and the U.S. Crops of Engineers indicates that "the several industries that discharge into the Nampa treatment plant do so in such a manner as to have a loading equivalent of a population of approximately 300,000 persons."

From this point to Boise River's mouth, more degradation occurs as additional drains, industry, and domestic wastes enter the river. We may assume that many of the industrial polluters, especially food processors and meat packers, were attracted to the area by the agricultural productivity, and thus exhibit an indirect effect of the Federal expenditure.

A more direct impact of the Federal Expenditure upon the river's quality relates to the volume of its flow. Because water must be stored during the winter months for the following season's irrigation, flows during winter months are lower than they would be normally. In a similar manner, the storage facilities prevent spring "washouts" and floods. It might be expected that quality would be worst in the winter when the flows are lowest, preventing dilution of any pollutants present. This is partially invalid because some pollutants also follow a seasonal pattern. Agricultural return flows only occur in summer when flows are greatest. Perhaps the worst problem occurs when food processing is at a peak in the fall and continues into the winter as flows are reduced.

Other degrading influences are the scattered residential developments that take over agricultural lands or more up the hillsides. Discontinuous developments make utilization of central water and sewer systems difficult in most suburban areas and impossible (economically) in others. In these situations population densities are low, population dispersion rates are high and to serve such an area high capital expenditures are required. An alternative to central municipal water and

sewer systems is an on-site system such as the septic and well systems. When the density of these systems is high, there is a potential for water quality degradation in the upper reaches of the groundwater table which is the source of well water. According to a study prepared by the Ada Council of Governments: "Present pollution represents a health hazard or is otherwise detrimental to irrigation, recreation, and fish and wildlife uses. It represents a potential serious health hazard for those Boise Valley residents who water supply comes from shallow wells. Of a test group of sixty wells in the Northwest Boise area, 15% were found to be contaminated by bacteria of the coliform group. The Boise River, safe for swimming above Boise, becomes so polluted as it passes through the city that swimmers are warned to stay out of the river below the Broadway bridge.

In summer, water quality in Boise River has been deteriorating adversely since the first agricultural, logging and mining booms. More intensive agricultural, residential, construction and urban development made their respective pollutant and sediment contributions, all related, at least indirectly to the Federal expenditures. The Federal expenditure is not responsible for contaminating the river but, it is responsible for agriculture, industry and settlement of a large portion of the society which lives there today, and which is responsible for the degradation of the river.

RECREATION

At the time of the 1902 Reclamation Act's passage and subsequent signing into law, the nation's economic base was firmly agrarian with almost 40% of the labor force engaged in primary agricultural pursuits. The agricultural orientation was even more pronounced in southern Idaho. There is no evidence that recreation was initially considered in regard to the Boise River Diversion Dam (1908), Deer Flat Reservoir (1911) or Arrowrock (1915).

Despite numerous legislative amendments and acts dealing with Reclamation, none mentioned recreation as a potential project benefit until 1946, and even then it only alludes to recreation under the idea that project justification should include values of the preservation and propagation of fish and wildlife. This was aimed to gain popular urban support and to improve the cost benefit ratio. The idea acknowledged project potentials for outdoor recreation. The Fish and Wildlife Coordination Act of 1958 strengthened the 1946 Act by placing wildlife conservation on an equal basis with other project purposes.

The Federal Water Project Recreation Act of 1965 requires concern for outdoor recreation and it provides funds for the acquisition of land and the development of recreation facilities. This served as an impetus for change at both newly planned and existing reservoirs.

For existing reservoirs, it provides for limited development on a 50/50 cost

sharing basis with a $100,000 ceiling on the Federal contribution. For new projects, the Federal government is obliged to bear one-half the cost of recreation facilities and a non-federal public agency in the area of the recreation facility will the other half and assume full operational and maintenance costs.

In Boise Valley there are many popular recreation facilities that have become associated with federal projects. As they were built before 1965, none can qualify for inclusion under the 1965 law.

The Boise River Diversion Dam (1908) provides some opportunity for fishing an some recent intense use of tubing. Tubing consists of using large tire tubes that float downstream with youthful occupants, and each summer thousands of people can be observed tubing through the city limits of Boise.

Deer Flat Reservoir (1911) has a variable water surface area ranging from 9165 to 9835 acres. The Bureau of Reclamation indicates an average of 9445 acres of water of which 9165 acres are classified for recreation. The lake with a twenty-eight mile shoreline and thirty-five foot maximum depth provides: sightseeing, picnicking, camping, swimming, boating, fishing, and hunting. Based on the Bureau's 1972 data, Lake Lowell accommodated 287,000 annual visitor days for the year, second highest figure in Boise Valley (next to Lucky Peak) and the highest for a Bureau of Reclamation facility.

Lake Lowell is well suited for hunting because the perimeter of marshes, grasses and trees provides a well balanced migratory waterfowl habitat and the lake lies astride a flyway. It provides a winter nesting area for some 750,000 ducks and 10,000 geese on the 11,583 acre Deer Flat National Wildlife Refuge in this area. Some 788 shoreline acres are devoted to three boat launching ramps, three hundred parking spaces, two swim beaches, and picnic facilities. The reservoir attracts thousands of persons each summer for water based recreational activities and thousands more during the hunting seasons.

During 1970, a total 160,800 sport fish were taken from Lake Lowell and 28,457 ducks were harvested from the surrounding 3,875 acres of public hunting lands.

The recreation at Arrowrock Dam is sightseeing, picnicking, camping, swimming, waterskiing, boating, fishing, and hunting. With a reservoir shoreline of about sixty miles and an average surface area of 3100 acres. In addition, there are 5527 acres of land open to hunting included in this facility's recreation plan. The Bureau estimates that 12,100 visitor days were accommodates in 1970. Arrowrock's recreation facilities are administered by the Forest Service.

Anderson Ranch Dam and Reservoir recreaton attractions include sightseeing, camping, picnicking, fishing, hunting, swimming, waterskiing, and boating. The reservoir has a shoreline of approximately fifty miles and an average

water surface area of 4740 acres. The Bureau estimates that the facility accommodated 25,100 annual visitor days during 1970. Planted kokenee have adapted well and now comprise the main fishing catch. Recreation facilities at Anderson Ranch are administered by the Forest Service and the State of Idaho. Some 4647 acres of land are included in the recreation plan.

Lucky Peak Dam and Reservoir, on the main channel of Boise River, ten miles east of Boise City was constructed by the U.S. Army Corps of Engineers in 1955. The reservoir has a shoreline of twenty-five miles and a range of 1239 to 2850 acres of surface area. Recreation attractions at this site include fishing, swimming, boating, waterskiing, sightseeing, and picnicking. Lucky Peak's proximity to the large urban center of Boise city plus the attractiveness of Discovery State Park (adjacent to Lucky Peak) make it extremely popular. Estimations of between 1.2 to 1.5 million visitor days use annually make it the prime Boise Valley desination for water based recreation.

Fishing in Boise Valley is varied. Lucky Peak Reservoir yields coho salmon and rainbow trout. Anderson Ranch dam produces kokenee. Lake Lowell features crappie and bass. Some rainbow trout have been caught from the river within the city limits of Boise. The reservoirs attract the greatest number of fishermen in the valley.

Resident game fish were seriously affected by the increased water temperatures behind dams and decreased stream flows below dam sites. Prior to 1955, the section of river between the present site of Lucky Peak State Park and Arrowrock Dam was an excellent trout fishery. Lucky Peak inundated another seven or eight miles of trout stream, backing water to the base of Arrowrock Dam.

The initial positive impact of the projects were to "rough fish" population as higher temperatures favored these species and they were increasingly competitive with game fish and replaced them in some areas. Subsequent restocking and new introductions have improved game fish populations upstream.

The irrigated farming sections of southwestern Idaho provide fine pheasant hunting. Some of the best hunting is in the Weiser-Payette-Parma sections, but there is some hunting right outside the city limits of Boise. Added to this species are chukkar, Hungarian partridges, bobwhite, valley and mountain quail, blue ruffed grouse and mourning doves which are also hunted. During summer, food for upland game and migrating waterfowl is abundant, and the stubble and unharvested portions of land provide a good source for food and habitat protection in the winter.

Of the wildlife forms, bird populations especially waterfowl have derived some benefits. Chukar, pheasant, and grouse habitats have improved with some aspects of irrigation and a new waterfowl habitat has developed on the reservoirs, especially at Lake Lowell where the Deer Flat National Wildlife Refuge has been

established. Mallard ducks and Canadian geese are the main migratory waterfowl found in the area.

Though there is some trapping for fur bearing animals in the wet lands, there is no big game hunting in the lower section of the Boise valley. The upper basin has good deer and some elk hunting.

This irrigation based prosperity and the increased population and its discretionary time and affluence has begun to strain the recreation system because of the growing demand. The same forces that provided the recreation opportunity are beginning to destroy the resource.

Recreation demand and population have been increasing faster than new recreation facilities, resulting in a more intensive use of existing facilities. The reservoirs appear to be carrying the bulk of the demand as more and more people are able to afford motor boats. It is virtually assured water quality will necessarily be degraded as the number of boats increase. Thus, a type of tradeoff situation occurs. If one trend continues, boating could eventually replace fishing, swimming, and tubing as water contact would be less desirable as the water quality deteriorates. On the other hand increased pressures for higher environmental standards are attempting to slow contamination of the reservoir waters upstream.

There is a growing problem on the Boise River where tubing has become quite popular. There is increasing conflict between private land owners along the river and the increased number of "tubers."

Meeting the demand for water based recreation is different in the Boise valley. The Columbia-North Pacific Region Comprehensive Framework Study indicates that a deficit of 1.7 million user-days of outdoor recreation existed in 1970 within a 50 mile radius of Boise and that to satisfy this need would require nearly 19,000 additional acres of water. This can be partially offset by providing more access points for use on the upstream reservoirs.

Table 13. Comparative Recreation Data-1972

Facility	Average Size in Acres Water	Land	Total	Shoreline Miles	Visitor Days	Date completed
Anderson Ranch	4740	4647	9387	50	25,100	1950
Arrowrock	3100	5527	8627	60	12,100	1915
Lake Lowell	9165	12,371	21,536	28	287,000	1911
Lucky Peak	2000 (1239 to 2850)	5285 est.	8135	25	1,500,000	1955
Diversion	-	-	-	-	-	1908

EARLY URBANIZATION AND TRANSPORTATION

The first urban settlement west of the Boise area was at Middleton, a stage stop midpoint on the journey between Boise and the mouth of the Boise River. It was a trade center for the early irrigated section north of the Boise River. When the Oregon Short Line entered the valley in 1883, Middleton, which was not on the line, was subordinated to other railroad based towns and declined in importance. Later when the Idaho Northern Railroad passed through Middleton enroute to the lumbering areas further north, the town had a slight rejuvenation, but it never regained its earlier prominence.

When the Oregon Short Line (an outlet for the Union Pacific through Snake River valley to Portland) reached Boise valley, it skirted the towns. Caldwell, Parma, Nampa, and Notus had railroad origins and they all functioned first as railroad construction camps. They later served as local freight and express stations. Caldwell's townsite was owned by the Idaho Oregon Land Improvement Company which owned several other townsites along the railroad.

Leading citizens of Boise, who then spent fifteen years trying to get a railroad to their community, decided that the Union Pacific had decided upon a bypass route in order to develop a new, competing town of their own. When the surveyors who established the route reached Indian creek they had a choice of following that stream on a level route to Boise River in the center of the valley, or of climbing and descending some steep, expensive grades to go over a longer, more difficult route through Boise. They opted for the cheaper more direct route.

An old stage station at the Indian creek crossing of the Boise-Silver City road suddenly became prominent at Boise's rail depot late in 1883. From Kuna station to Boise, an awkward fifteen mile stage trip gave Idaho's capital city access to rail service. But that was only a temporary expedient. Boise investors arranged with the Union Pacific to construct a branch line to Boise from Indian creek. Known as the Boise Central, this route promised to save their community from economic ruin. Promoters of the Boise Central, to ensure that no competing town would develop at the junction of their line with the Oregon Short Line, got control of the land and held it to insure that no new town was built.

The Idaho Oregon Land Improvement Company, associated with but not part of the Union Pacific and managed by Robert E. Strahorn, undertook to develop a string of new cities along the new transportation route. Hailey, Mountain Home, and a new Weiser (located at the Oregon Short Line station not far from original bypassed Weiser) were among Strahorn's projects. In Boise valley, he decided upon a townsite on Alkali Flat, on lower Indian creek fairly close to the Boise Central junction. The Alkali Flat townsite was intended to become the major city of Idaho and it was named for the company president, Alexander Caldwell.

Strahorn showed imagination in his promotion of Caldwell. But a national financial panic in February 1884 delayed the Boise Central and Boise valley canal construction--particularly the gigantic New York canal project for which Caldwell might serve as an important community center. Then, after the Boise Central finally commenced construction, the Union Pacific abruptly decided to abandon the project. Work halted on April 16, 1885, and the Union Pacific offered to return the right-of-way, valued at fifty to sixty thousand dollars to the donors.

After the collapse of the Boise Central, the Union Pacific finally decided upon a shorter route. Alexander Duffes' ranch, nine miles up Indian creek above Caldwell, offered a superior terminal. About half way between Caldwell and Kuna, this terminal made an acceptable compromise between the shortest distance (at Kuna, from which a direct route would entail some hills and grades) and the easiest, though, longest grade from Caldwell. Incorporation of the Idaho Central Railway, June 26, 1886, followed by incorporation of a Nampa townsite company, November 8, led to construction of the line finally selected. By December, Nampa had a store and two houses, and final arrangements between the Boise Central promoters and the Union Pacific were concluded the next spring to substitute the Idaho Central for the original project. Construction started at the beginning of June, with an experienced Mormon contractor and crew from Montpelier handling the grading. Work went on all summer and the new line was completed in time for a train to reach Boise September 5, 1887. The original Boise depot stood on the bench close to the present passenger station, but a new line down Front street (still used for freight service) began operation August 17, 1893.

It took another thirty-six years before Boise arranged to obtain main line passenger service from the Union Pacific. When the agreed-upon line from Orchard (on Indian creek) to Boise finally was opened to traffic, April 24, 1925, Idaho's capital city, at last, had good rail service east and west. By then, the Idaho Central had served its purpose. Freight continued to come through Nampa. As long as the Union Pacific hauled passengers, the Idaho Central route carried the only traffic to and from the west. That arrangement, however, lasted only about a decade longer than the passenger branch from Nampa. But the Idaho Central freight pattern continues to operate, with branch line service still available from Nampa.

This lengthy narrative was included to show the close interrelations between urban beginnings and transportation systems in the Boise valley.

ANNEXATION AND POPULATION GROWTH

The urban clusters in Boise valley occupy an ever increasing amount of land because of annexation, urban sprawl, land use changes and corridor developments which show best in the areas between Nampa and Caldwell and between Boise city and Meridian. Much of the change is reflected in the annexation patterns

motivated by a city's desire to grow areally and numerically and capture the greatest tax base possible.

The overall prosperity of agriculture in the valley has been influenced by the availablility of large quantities of low cost irrigation water and good, flat land. Boise city has grown from a local center to a regional governmental center, and a major regional center for distribution and marketing services. This growth was started by agriculture and later boosted by associated diversified economic developments. Federal provision of water storage facilities has greatly reduced the annual risks of drought and flood.

With regard to the physical (land use) aspects of annexations, Boise's growth occurred in four basic stages (map 6 on Boise annexation):

1. City Core Acquisition (1866-1905) parallel to river followed by expansion to Northwest.
2. Peripheral areas of City Core Acquisition, north and south, (1906-1945).
3. Pre-Annexation Law Revision Expansion (1946-1960).
4. Post Annexation Law Revision (Spetember 1, 1961) (1960-1973).

Previous to 1900, there were three actions by the authority of the State Legislature which formed the core of Boise city. All three were of considerable size forming a city core of approximately 1407 acres on which lived 5,957 persons. This original town site occupied land on the north bank of Boise River and remains the central business district, including the Capitol. The State Legislature added 541 acres to Boise east of the original townsite on the north bank of the river.

In the ten year period following 1905 the city's holdings increased to 3176.96 acres with the addition of two large tracts of land. One formed a westward extension of the city core and the other constituted the first tract of land on the south side of the river. This tract incorporated an earlier existing South Boise.

In the following decade only 370 acres were added to the city. By 1930 Boise city had grown to 3546.24 acres with a population of 21,544 persons.

Between 1947 and 1950, there were 21 parcels (958 acres) of land annexed. By 1950 Boise city has grown to 4507.52 acres with a population of 34,393.

The period between 1950 and 1960 saw the greatest growth to date with 49 parcels of land being annexed. These parcels tended to be rather small and, with the exception of the airport (1798 acres), averaged less than 10 acres; many were less than one acre. There were 2379 acres added in this decade though the population showed a gain of less than 100 to a 1960 figure of 34,481. Company growth within the city limits (Table 14) with county population growth (Table 17) shows both

the responses to urban sprawl and the difficulty on the part of charter city Boise to alter its annexation laws.

On September 1, 1961 Boise city achieved First Class City Status, and annexation laws were greatly relaxed. Between 1960 and 1973, approximately 85 annexation actions involving 10,721 acres were added for a total of 17,607.68 acres as of January 3, 1973. Each annexation, including the date, authorization citation, size and population is shown in Appendix 3. The action in this time period can only be described as an "Annexation explosion" which continue to the time of this report. In 1974 the population in the city limits rose to 98,199.

The pattern of annexation since 1966 has been one of "filling in", and rounding off the boundaries though there has also been some expansion since 1970 to the north and northwest along the Boise River.

Population density is another index of urbanization. It correlates population growth with spatial growth and it also reflects the exodus pattern associated with sprawl and the cost of providing services. Higher densities mean shared costs: lower densities are more costly to install and maintain urban services.

An examination of Plate 5 shows densities with a multimodal pattern, peaking in 1880, 1910, and 1950. Following each of these peaks, the trend has been to reduced population density which correlates with significant annexations of less densely or even undeveloped land. Annexation of the airport area into Boise city in 1953, reflects a major population density decline.

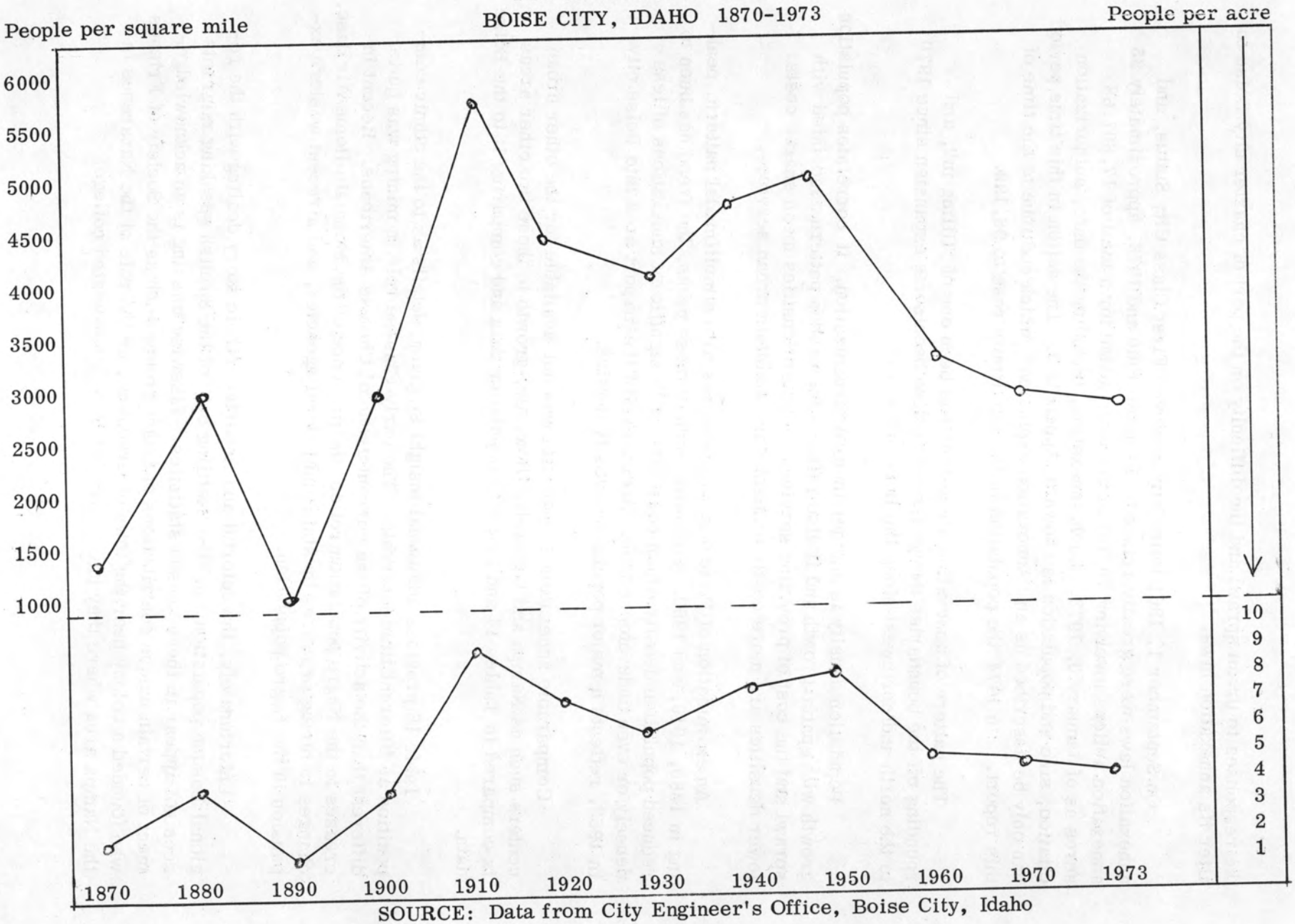
Comparable annexation growth data was not available for the other urban centers such as Nampa and Caldwell. However, growth in these two other areas is compared in Tables 14 and 15 using population data and comparing it to the Boise data.

Table 16 provides additional insight by giving details as to the ethnic composition at different time intervals. The early Chinese role in mining was quite different than the activity of the current group of Chinese Americans. Recent increases in the Negro population reflect the presence of the Mountain Home Air Base, changes in hiring practices by state and federal agencies, and a recent western expansion in the Negro population.

Unfortunately, the colorful and important ethnic story dealing with the regional Basque population, and the "settling out" of the Spanish speaking migrants does not appear in these census statistics. Likewise missing is an acknowledgement of certain unique contributions of intact groups such as the Society of Friends who founded a colony near the town of Greenleaf, or the role of the Nazarenes in the Nampa area where they have a private church associated college.

PLATE 5

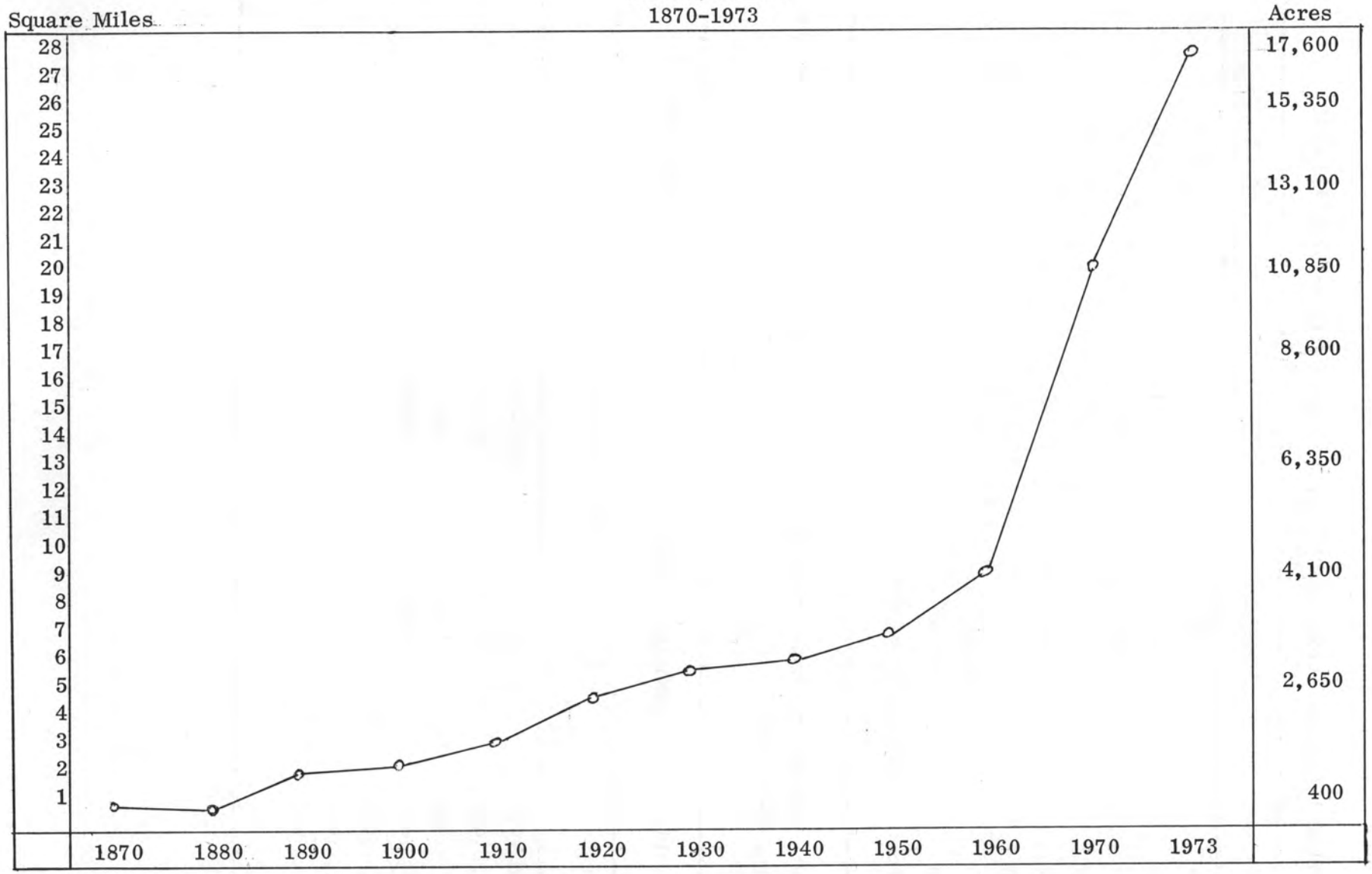
POPULATION DENSITIES
BOISE CITY, IDAHO 1870-1973



SOURCE: Data from City Engineer's Office, Boise City, Idaho

PLATE 6

AREAL GROWTH
BOISE, IDAHO
1870-1973



SOURCE: Data from City Engineer's Office, Boise City, Idaho

Table 14: Population Growth: Nampa, Caldwell, Boise (1900-1970)

Year	Nampa	Caldwell	Boise
1900	799	997	5,957
1910	4,205	3,543	17,358
1920	7,621	5,106	21,393
1930	8,206	4,974	21,544
1940	12,149	7,272	26,130
1950	16,185	10,487	34,393
1960	18,013	12,230	34,481
1970	20,768	14,219	74,990

Source: U. S. Bureau of Census

Growth figures are computed from these raw population data from one decade to the following.

Table 15: Percentage Growth: Nampa, Caldwell, Boise (1900-1970)

Year	Nampa	Caldwell	Boise
1900-1910	426.2%	255.3%	191.3%
1911-1920	81.2%	44.1%	23.2%
1921-1930	7.6%	-2.5%	0.7%
1931-1940	48.0%	46.2%	21.2%
1941-1950	33.2%	44.2%	31.6%
1951-1960	11.2%	16.6%	0.2%
1916-1970	15.2%	16.2%	117.4%

Table 16: Population Composition

Year	White	%	Negro	%	Indian	%	Chinese	Japanese	Other	%
Ada County										
1900	11,023	95.36	48	.41	3	.02	225	260	0	4.19
1910	28,610	98.35	168	.57	3	.01	255	52	0	1.05
1920	34,883	99.06	82	.23	0	-	209	35	0	.07
1930	37,583	99.09	101	.26	9	.02	129	38	65	.61
1940	50,091	99.38	117	.23	4	.01	93	17	79	.55
1950	70,234	99.41	206	.29	27	.03	68	105	9	.25
1960	92,795	99.28	246	.26	178	.19	71	82	0	.16
1970	111,079	98.97	303	.26	284	.25	116	184	0	.26
Canyon County										
1900	7,397	98.90	42	.56	1	.01	45	30	0	1.00
1910	25,090	99.07	33	.13	1	.01	40	159	0	.78
1920	26,787	99.46	36	.13	3	.01	18	88	0	.39
1930	30,725	99.33	16	.05	25	.08	11	141	12	.53
1940	40,805	99.55	15	.03	6	.01	4	148	0	.37
1950	52,987	98.86	55	.10	25	.04	25	413	92	.98
1960	56,738	98.39	123	.26	198	.34	23	457	0	.83
1970	60,283	98.36	91	.14	190	.31	50	399	0	.73

Source: U. S. Bureau of the Census

Table 17: Population Growth - Ada and Canyon Counties

Year	Ada	% Change	Canyon	% Change
1900	11,559	-	7,479	-
1910	29,088	+151.6	25,323	+237.7
1920	35,213	+ 21.0	26,932	+ 6.3
1930	37,925	+ 7.7	30,930	+ 14.8
1940	50,401	+ 32.8	40,987	+ 32.4
1950	70,649	+ 40.1	53,597	+ 30.7
1960	93,460	+ 32.2	57,662	+ 7.5
1970	112,230	+ 20.0	61,288	+ 6.2

Source: U. S. Bureau of the Census

EMPLOYMENT

One approach considered to approximate the impact of the federal expenditure was employment categories and employment change using county employment statistics. As detailed and seemingly reliable information starts with 1930, there still is a need for better pre-1930 data.

In dealing with large scale land questions, agriculture dominates the Project and most of this is located in Canyon and Ada counties. When necessary to include upper reaches of the Boise Basin where some of the dams are located as well as timber cutting, grazing, mountain roadbuilding, and the mining ventures, the scope of this section was expanded to include Elmore and Boise counties. In dealing with employment patterns of highly mobile man and his regional pattern of commuting, attention should be given to data for Gem and Payette counties and the region around Nyssa, Vale and Ontario in Oregon.

In this overview study there was more emphasis in exploring alternative methodologies rather than in establishing a definitive technique and reaching specific quantitative conclusions.

The categories used here to group employment are: Agriculture; Logging and Mining; Construction; Transportation, Communications and Utilities; Government; Manufacturing; and Other.

AGRICULTURE: owner and tenant farmers, farm managers and foremen, farm laborers.

LOGGING and MINING: logging, forestry, fisheries, extractive enterprises, sawmilling, lumber and wood products (semi-finished).

TRANSPORTATION, COMMUNICATIONS, and UTILITIES: telegraph, telephone, rail, motor and air freight, rail, motor and air passenger service, public utilities including sanitary services, warehousing.

GOVERNMENT: public service and administration, postal service, public educational service.

CONSTRUCTION: all types of building construction.

MANUFACTURING: metal fabricating industries, machinery enterprises, motor vehicle and equipment fabrication, food processing, apparel fabrication, printing and publishing, chemical manufacture.

OTHER: wholesale and retail trade, food stores, eating and drinking establishments, motor vehicle sales, motor vehicle repair, service stations, insurance, real estate, finance, personal and domestic

services, medical and health services including hospitals, hotels, motels, and lodging places, private education, engineering and professional services, all repair and business services, entertainment and recreation, independent trades and services.

The Boise Project most closely coincides with Ada and Canyon counties but there is a conspicuous employment difference between them reflecting the influence of state and federal employees in Ada county and the gravitation of people to the largest city. Though Canyon county is more agricultural, the differences are not as great as one would normally expect because of their adjacency and easy access between them. Additionally many individuals who work in Ada county sleep in Canyon county.

From 1930 to 1970 the number of employees in Ada county increased from 15,248 to 44,821 (290%). The Canyon county counterpart statistics are 11,185 and 23,475, a 110% increase. (See Tables 18 and 19.) From 1930 to 1940 during the depression, both counties showed their smallest increase, 11.6% and both counties showed their greatest employment increase from 1940-1950 with 56.5% for Ada and 46.8% for Canyon county. World War II was probably directly or indirectly in the changes of that decade.

Unemployment rates for both counties show high figures for 1940 (Ada - 8.9%, Canyon - 9.8%) and extremely low figures by 1970 (Ada - 3.4%, Canyon 3.2%). Part of this is attributable to general national and regional prosperity and in a shift in employment. Employees working in agriculture in 1930 were 23% for Ada and 45.2% for Canyon county. The corresponding statistics for 1970 are 4% and 14.3%. While Canyon county showed twice the percentage figure for Ada county in 1930, it was over three times the corresponding figures for 1970. Using raw numbers instead of percentages shows a decrease in Ada county from 3,556 persons to 17,775 engaged in agricultural pursuits and for Canyon county, the corresponding numbers are 5,055 in 1930 and 3,354 in 1970. The decline in numbers is smaller than the percentage changes which indicates a significant increase in non-agriculture sectors especially in secondary and tertiary economic activities.

Boise's nodal location in regard to air and highway routes, its role as a state capital and as a distribution, trade, regional federal center explain much concerning its employment pattern. In 1930, there were 746 government employees in Ada county representing approximately 5% of the total number of employees. By 1970, this figure had risen to 6,482, representing 15% of the total. According to Idaho State Department of Employment figures (for the first quarter of 1973) there were a total of 8,083 government jobs in Ada county. Of these, 5,105, or 63.1% were State jobs, 2,935, or 36.3% were Federal jobs, and 43, or 5% were local government jobs.

From 7,234 employees (47%) in the "other" category for Ada county in 1930, to 24,654 or 55% by 1970 this represents a 240% increase. Most of these are broad

spectrum tertiary sales and service activities that reflect a maturing of an economy that shifts away from its primary agricultural labor demands.

Ada county employment has undergone a drop and then stabilization in the logging and mining categories, a rise and then drop in the construction and transportation, communications, and utilities category; and a drop and then rise in the manufacturing category in the 1930-1970 period.

The location of a major Federal Center, the regional headquarters for the U.S. Bureau of Reclamation and a Veterans Administration facility in Boise and an Air Force Base at Mountain Home have affected overall employment. Boise Project employment associations include construction people, farmers, agribusiness goods and services, well drillers, diverse governmental agency personnel and all of the support and service functionaries including administrators, inspectors, supervisors, office help and the corresponding state and county employees.

Government employment figures for Canyon county are lower and accounted for 1.8% of the total in 1930 and 7.9% by 1970.

Manufacturing employment in Canyon county went from 937 in 1930 to 4,044 in 1970 for a 331.% increase. Food processing has contributed heavily to this gain with an increased demand for pre-processed and packaged food, and thereby is indirectly related to the Federal expenditures in the Boise Project.

The manufacture of mobile homes, pick-up tops, camper trailers and other recreational vehicles is also an important factor with over twenty-seven such plants in the Boise valley. These industries, scattered throughout Ada, Canyon, and Payette counties are not directly related to the Project, though many of the employees were formerly engaged in agriculture or were part of the migrant farm labor supply that "settled" out of the migrant stream for more permanent employment.

The "other" category for Canyon county increased 181.% from 3,954 employees in 1930 to 11,118 in 1970. This increase, not as great as in Ada county, is also mainly in tertiary activities.

Construction employment for Canyon county grew during the war period, between 1940 and 1950, but then experienced a decline between 1950 and 1960. Since 1960, it has recovered and, in 1970, accounted for 5.3% of the total employment.

Logging and mining, never, important, have remained at about 1.6% for the forty year interval. Transportation, communication, and utilities employment peaked in the 1950's because of major construction. In 1970, this category accounted for 6.4% of the employment in Canyon county.

Table 18: Employment Data for Counties, 1930.

	Ada	%	Boise	%	Canyon	%	Elmore	%	Gem	%	Payette	%
Agriculture	3556	23.3	288	33.2	5055	45.2	644	39.2	1250	48.3	1415	51.5
Government	746	4.9	19	2.2	199	1.8	42	2.5	37	1.4	67	2.4
Logging and Mining	587	3.8	382	44.1	79	.7	79	4.7	530	20.5	21	.8
Transportation, Comm., and Utilities	731	4.8	44	5.1	573	5.1	313	8.5	60	2.3	105	3.8
Manufacturing	1523	10.0	32	3.7	937	8.4	71	4.2	60	2.3	193	7.0
Construction	870	5.7	14	1.6	388	3.5	40	2.4	74	2.9	87	3.2
Other	7235	47.4	88	10.1	3954	35.4	487	28.7	578	22.3	857	31.2
Total	15248		867		11185		1696		2589		2745	

U. S. Bureau of Census

Table 19: Employment Data for Counties, 1970

	Ada	%	Boise	%	Canyon	%	Elmore	%	Gem	%	Payette	%
Agriculture	1766	3.9	119	20.8	3354	14.3	557	14.9	844	26.6	822	17.4
Government	6482	14.5	81	14.1	1836	7.8	801	21.4	289	9.1	389	8.2
Logging and Mining	782	1.7	181	31.6	380	1.6	63	1.7	605	19.1	74	.6
Transportation, Comm., & Utilities	3353	7.5	16	2.8	1502	6.4	320	8.6	129	4.1	287	6.1
Manufacturing	3943	8.8	23	4.0	4044	17.2	86	2.3	131	4.1	1004	21.2
Construction	3841	8.6	26	4.5	1241	5.3	237	6.3	200	6.3	276	5.8
Other	24654	55.0	127	22.2	11118	47.4	1677	44.8	978	30.8	1874	39.7
Total	44821		573		23475		3741		3176		4726	

U. S. Bureau of Census

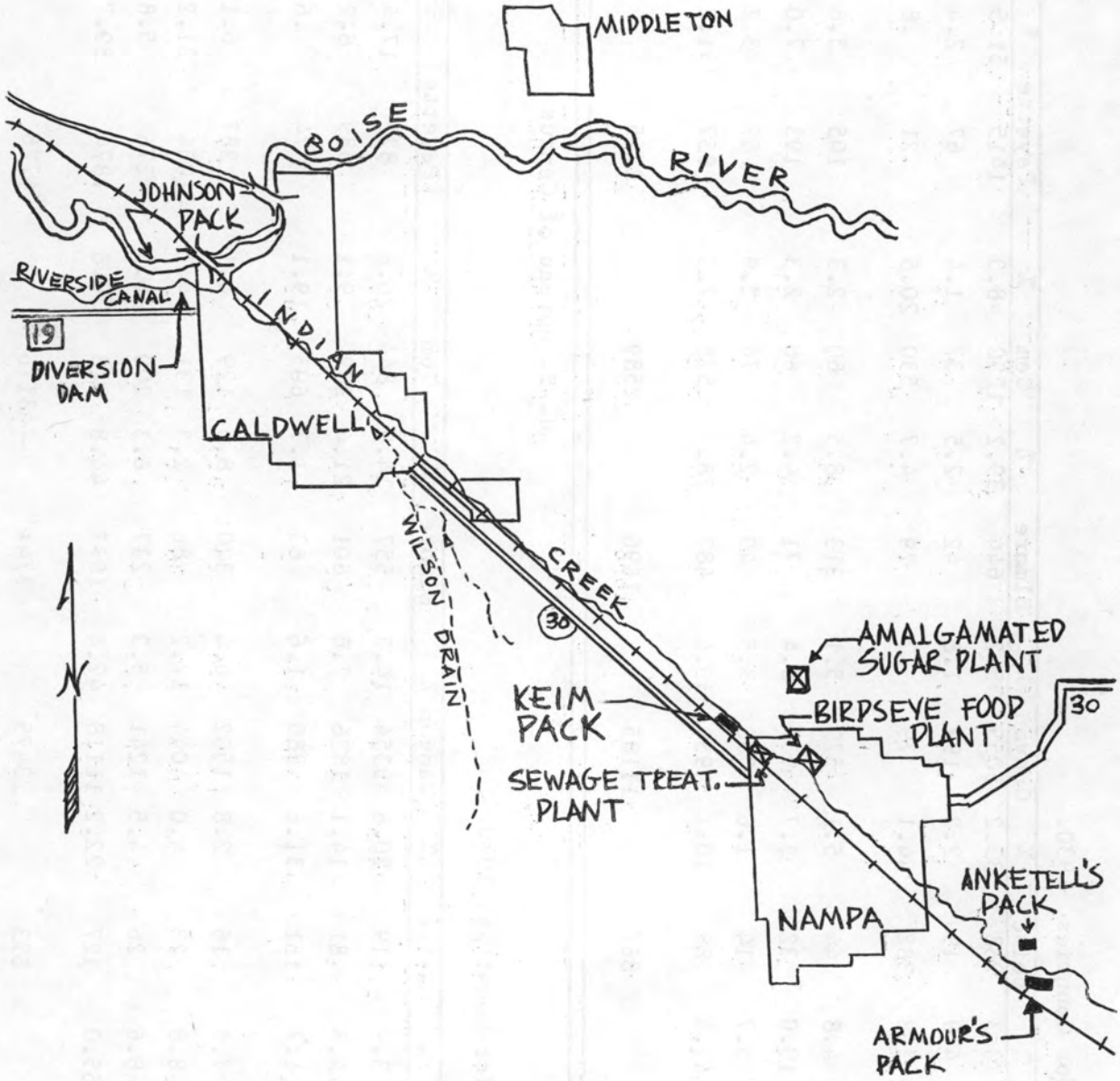


Plate 7

Selected Processing Industries on Indian Creek

Canyon County, Idaho

Table 20: 1972 Plants, Boise Valley

Name and Product	Area	Cost	Emp.	Location	Status
Missouri Beef Packers	160 acres 70,000 sq. ft.	3 million	175	9 m. S.W.	Operational
Armour Food Co. Beef Processor			75	Nampa	Operational
Control Developments Inc. Manorwood Corp. Rec. Trailers & Veh.	expansion		15	Caldwell	Completed
Swiss Village Cheese	20,000 sq. ft.	250,000	20	W. Meridian	Under Const.
Frontier Paint Manuf.			10	Boise	Operational
Grostim Corp. Chemical Frost Retardant			10	Meridan	Operational
Morrison-Knudson Co. Locomotive Rebuilding			75-200	Boise	Operational
Kaufman & Broad Home Systems Mobile Homes	68,000 sq. ft.		75	Boise	Under const.
General Aluminum Corp.	30,000 sq. ft.		100	Boise	Operational
Fireball Industries Inc. Rec. Vehicles	33,000 sq. ft.		70-150	Boise	Under const.

Source: Letter from the Idaho Department of Commerce and Development (Kenneth W. Stearns dated August 23, 1973.)

All employment categories relate to the federal impact either directly as in construction, transportation and utilities or indirectly such as agricultural employment and the assoicated food processing plants as those along Indian creek (Plate 7) which have been in the Project area since the 1950's. Even many of the newer industries (Table 20) show strong project associations. Locomotive rebuilding at the Morrison-Knudson shops and even more recent valley ventures at the Hewlett Packard Company are not project assoicated.

Specific Industrial Employment

Additional insight into the employment perspective is the allocating of certain number of employees of a company as being directly or indirectly related to the federal expenditure. This creates a model of relationship and dependence. This approach could produce information not readily available from other sources but it has numerous inherent problems. It could be applied to the heavy concentration of food processing plants with a high dependence on irrigation show on Plate 7 and on Table 20. Were employee allocation technique applied backwood in time to each of the same companies, it might indicate an increasing or decreasing relationship to the federal expenditure.

The businesses most directly associated with federal expenditures are those associated with agriculture such as agricultural chemical and fertilizer suppliers, farm implement and equipment and parts dealers, crop dusters, concrete ditch liners construction, farm management and agricultural consultant services, feed and seed dealers, meat packers, well water drillers, irrigation equipment and frost protection dealers, and suppliers of food processing machinery and containers. A telephone book tally of these categories identified and individual enterprises shown in Table 21.

Table 21: Business Survey, Boise Valley

Category	Individual Businesses (approx)
Agricultural chemicals and fertilizer suppliers	32
Farm tractors, equipment and parts dealers	40
Crop dusters	9
Concrete ditch liners	3
Farm management and agricultural consultant services (not incl. SCS or Dept. of Ag)	3
Feed and seed dealers	33
Meat packers	22
Well water drillers	17
Irrigation and frost protection equipment suppliers	14
Food processing machinery and containers	15
	188

It is possible to identify most industries influenced by the federal expenditure but it is also recognized that many of the same industries would have evolved in the same location even without major federal expenditures for dams. Probably there would have been less flood irrigation acreage, and more dependence on wells and sprinkler systems. Conversely, there might not have developed as many concerns dealing with irrigation canal construction and repair.

The increased number of companies in food processing, machinery, and containers since 1950 reflect increased production, yield, technology and a growing distant market. Much of the current food processing permits transformation of once perishable foods into non-perishable or less perishable forms. The demand for these processed foods (frozen or dehydrated) has expanded and the main market has shifted from individual purchasers to institutional high volume buyers.

Prior to 1950 the main shipment of potatoes was in the fresh whole form. In 1958 only 36% were processed and by 1968, this figure jumped to 59%. Total potato production increased 30% in the decade. During 1970, processors in Southern Idaho and adjacent Malheur county in Oregon produced one billion pounds of frozen potato products, equivalent to 43% of the 2.4 billion pounds produced nationally. In 1970, 33% of the Idaho potatoes were shipped out frozen and 26% shipped in dehydrated form totaling almost 60% of the total crop grown. Sugar beets and corn are also grown and processed in large quantities in the region.

The multiplier effect in processing, packaging, and handling functions increase the value of the raw product by a ratio of about three to one. For example, in 1969, fresh potatoes valued at 49 million dollars were converted to frozen French fries and other frozen by-products conservatively valued at 150 million dollars f.o.b. processing plants.

Potato production and processing largely is basic economic activity, i.e., it brings new money into the state from other states and flows into the total state economy. In addition, these dollars pass through regional businesses several times supporting services and products associated with food products; such as repair, shipping, packaging materials and advertising.

A 1967 input-output analysis indicated that each dollar invested in potato production earned $4.18 at the farm level. By the time the product was processed, the return was $11.68 or $7.50 increment over farm level.

The processing "revolution" did not come from the federal expenditure. The federal expenditures helped make the Boise valley prosperous and in combination with the processing revolution favored the locating of food processing operations in the valley.

EPILOGUE

In designing this overview study it was assumed that one could determine a series of pre-existing conditions and relationships and then measure the impact of each of the major federal expenditures associated with the Boise Project. The assumptions were based on the premise that the major dams became operative on specific dates and that these would provide convenient time frames to gauge the economic, ecologic and land use changes that followed. This may be a valid approach where raw land is converted to irrigation with the creation of a network of major dams and irrigation canals. However the Boise valley had a pre-existing and thriving irrigation operation that sought to open new lands and to extend its canal network with private capital.

The federal expenditures in this area were designed primarily to provide storage, ensure a supply of water throughout the growing season and to reduce the flood dangers on the farms, residences and communities in the flood plain.

The concept of specific interval periods to identify impacts proved wanting. Entrepreneurs, farmers and speculators anticipated many of the changes that would result from the major federal expenditures long before the construction was completed and they took actions designed to maximize their personal gains when specific projects were completed. The projects were frequently discussed for several years prior to their authorization and actual construction was extended over a number of years. Thus Boise project changes were part of a continuum of environmental, ecologic, land use, economic, social and political changes not conveniently segmented into time fragments to coincide with specific dams.

Without the federal expenditures, the Boise valley would have developed as a major irrigated area but progress would probably been slower and greater emphasis placed on ground water sources. Developments in this area were complicated because of the role of Boise as a state capital, and its model crossroads function that helped make it a regional center for diverse government activities.

Some of the outstanding changes directly attributable to the federal expenditures are those relating to the control of the waters of the Boise river and many of the subsequent land use changes in the formerly flood prone lower elevations. The continuing changes are related to current federal water management priorities and alternatives.

APPENDIX I

APPENDIX 1

Boise valley vegetation, fish, birds, mammals, reptiles, and amphibians.

TABLE 1

Partial checklist of native vegetation on the Big Sagebrush-Bluebunch Wheat grass areas of the Lower Boise Valley.

Equisetaceae

Equisetum lavigatum - Horsetail

Gramineae

Agropyron spicatum - Wheatgrass

Aristida longiseat - Aristida

Elymus cinereus - Giant wildrye

Festuca octoflora - Fescue-grass

Muhlenbergia asperifolia - Muhlenbergia

Oryzopsis hymenoides - Mountain rice

Poa sandbergii - Blue grass

Sitanion hystrix - Squirreltail

Stipa comata - Needlegrass

Stipa thurberiana - Needlegrass

Cyperaceae

Cyperus rivularis - Flatsedge

Juncaceae

Juncus orthophyllus - Rush

Liliaceae

Allium acuminatum - Wild onion

Brodiaea douglasii - Brodiaea

Calochortus machrocarpus - Green-banded star-tulip

Fritillaria pudica - Fritillaria

Zygadenus venenosus - Death camas

Iridacead

Sisyrinchiuminflatum - Blue-eyed grass

Santalaceae

Comandra pallida - Comandra

Polygonaceae

Eriogonum heracleoides- Buckwheat

Eriogonum ovalifolium- Buckwheat

Eriogonum strictum - Buckwheat

Eriogonum vimineum - Buckwheat

Polygonum douglasii - Knotweed

Chenopodiaceae

Grayia spinosa - Spiny hop sage

Nyctaginaceae

Abronia fragrans - Abronia

Portulacaceae

Montia perfoliata - Miner's lettuce

Caryophyllaceae

Arenaria aculeata - Needleleaf Sandwort

Paeoniaceae

Paeonia brownii - Peony

Ranunculaceae

Delphinium nuttallianum- Larkspur

Myosurus aristatus - Mouse-tail

Ranunculus glaberrimus- Buttercup

Cruciterae

Arabis divericarpa - Rockcress

Arabis holboelli - Holboellii

Descurainia pinnata - Tansymustard

Draba verna - Whitlow - wort

Erysimum occidentale - Wallflower

Idahoa scapigera - Scalepod

Lepidium montanum - Peppergrass

Saxifragaceae

Lithophragma bulbifera- Rocketstar

Lithophragma parviflora - Lithophratma

Saxifraga integrifolia- Saxifrage

Ribes cereum - Squaw current

Rosaceae

Purshia tridentata - Bitterbrush

Rosa woodsii - Wood Rose

Leguminosae

Astragalus aremiticus- Locoweed

Astragalus Loutiginosus- Locoweed

Astragalus Mulfordiae - Locoweed

Astragalus purshii - Locoweed

Astragalus reventus - Locoweed

Astragalus stenophyllus- Locoweed

Lupinus caudatus - Locoweed

Lupinus laxiflorus - Lupine

Lupinus leucophyllus - Lupine

Malvaceae

Sphaeralcea munroana - Globe mallow

Cactaceae

Opuntia polyacantha - Prickly-pear cactus

Onagraceae

Clarkia pulchella - Elkhorns

Epilobium paniculatum - Willow-weed

Gayophytum diffusum - Groundsmoke

Oenothera andina - Evening-primrose

Oenothera caespitosa - Evening-primrose

Oenothera contorta - Evening-primrose

Oenothera pallida - Evening-primrose

Umbelliferae

Lomatium canbyi - Desert-parsley

Lomatium dissectum - Desert-parsley

Lomatium foeniculaceum- Desert-parsley

Lomatium grayi - Desert-parsley

Lomatium macrocarpum - Desert-parsley

Lomatium nudicaule - Desert-parsley

Lomatium triternatum - Desert-parsley

Orogenia linearifolia- Orogenia

Perideridia gairdneri- Yampah

Primulaceae

Primula cusickiana - Primrose

Apocynaceae

Apocynum cannabinum - Dogbane

Polemoniaceae

Collomia grandiflora - Collomia

Collomia linearis - Collomia

Gilia aggregata - Gilia

Gilia minutiflora - Gilia

Gilia sinuata - Gilia

Gymnosteris nudicaulis- Gymnosteris

Microsteris gracilis - Microsteris

Phlox aculeata - Phlox

Phlox longifolia - Fphlox

Polemonium micranthum- Jacob's ladder

Hydrophyllaceae

Phacelia hastata - Placelia

Phacelia linearis - Placelia

Boraginaceae

Amsinckia tessallata - Fiddleneck

Cryptantha sp. - Forget-me-not

Cryptantha flaccida - Cryptantha

Cryptantha pterocarpya- Cryptantha

Lappula redowskii - Stickseed

Lithospermum ruderale- Gromwell

Mertensia longiflora - Bluebells

Myosotis micrantha - Forget-me-not

Plagiobothrys tenellus- Popcorn flower

Scrophulariaceae

Collinsia parviflora - Blue-eyed Mary

Penstemon acuminatus - Penstemon

Penstemon speciosus - Penstemon

Orobanchaceae

Orobanche fasciculata- Broomrape

Plantaginaceae

Plantago patagonica - Plantain

Valerianaceae

Plectritis macrocera - Valerian

Compositae

Achillea millefolium - Yarrow

Agoseris grandiflora - False-dandelion

Agoseris heterophylla- False-dandelion

Ambrosia acanthicarpa- Ragweed

Antennaria dimorpha - Everlasting

Artemisia dracunculus - Dragon sagewort

Artemisia tridentata - Big sage brush

Aster canescens - Aster

Balsamorhiza sagitatta- Balsamroot

Blepharipappus scaber - Blepharipappus

Chaenactis douglasii - Chaenactis

Chrysothamnus nauseosus- Rabbit brush

Chrysothamnus viscidiflorus - Rabbit brush

Cirsium canovirens - Thistle

Cirsium magnificum - Thistle

Crepis acuminata - Hawksbeard

Crepis occidentalis - Hawksbeard

Erigeron bloomeri - Daisy

Erigeron pumilus - Daisy

Eriophyllum lanatum - Eriophyllum

Gnaphalium palustre - Everlasting

Grindelia squarrosa - Gumweed

Haplopappus carthamoides - Goldenweed

Helianthus annuus - Sunflower

Hieracium cynoglossoides - Hawkweed

Iva xanthifolia - Poverty weed

Lagophylla ramosissima - Rabbitleaf

Layia glandulosa - Layia

Microseris linearifolia - Microseris

Microseris troximoides - Microseris

Solidago occidentalis - Goldenrod

Stephanomeria paniculata - Wire lettuce

Tatradymia canescens - Horsebrush

Townsendia florifer - Townsendia

TABLE 2

A partial checklist of vegetation for the Shadscale (Atriplex confertifolia) community along the southern edge of the Boise drainage.

Granimeae

Elymus cinereus - Giant wildrye

Festuca octoflora - Fescue grass

Oryzopsis hymendoides - Indian rice-grass

Poa sandbergii - Bluegrass

Stipa comata - Needlegrass

Liliaceae

Allium nevadense - Wild onion

Calochortus buneaunis - Mariposa lily

Fritillaria pudica - Fritillaria

Santalaceae

Comandra pallida - Comandra

Polygonaceae

Eriogonum deflexum - Buckwheat

Eriogonum maculatum - Buckwheat

Eriogonum ovalifolium - Buckwheat

Chemopodiaceae

Atriptex canescens - Shadscale

Atriptex confertifolia - Wingscale

Atriptex nuttallii - Moundscale

Eurotia lanata - Winterfat

Grayia spinosa - Spiny hopsage

Sarcobatus vermiculatus - Black greasewood

Ranunculaceae

Delphinium andersonii - Larkspur

Cruciferae

Caulanthus Pilosus - Wild cabbage

Erysimum repandum - Wallflower

Leguminasae

Astragalus beckwithii - Locoweed

Astragalus nudisiliquus - Locoweed

Astragalus pursii - Locoweed

Lupinus pusillus - Rusty lupine

Malvaceae

Sphaeralcea munroana - Globe mallow

Loasaceae

Mentzelia albicaulis - Mentzelia

Mentzelia laevicaulis- Blazing star

Caetaceae

Opuntia polycantha - Prickley-pear

Onagraceae

Oenothera scapoidea - Evening primrose

Oenothera alyssoides - Evening primrose

Umbelliferae

Cymopterus acaulis - Cymopteris

Lomatium cambyi - Desert-parsley

Lomatium dissectum - Desert-parsley

Lomatium foeniculaceum - Desert-parsley

Polemoniaceae

Gila leptomeria - Gilia

Gila sinuata - Gilia

Leptodactylon pungens- Prickly Phlox

Phlox aculeata - Phlox

Hydrophyllaceae

Nama aretioides - Nama

Phacelia glandulifera- Phacelia

Boraginaceae

Amsinckia tesselata - Fiddleneck

Coldenia nuttallii - Coldenia

Cryptantha circumscissa - Cryptantha

Cryptantha pterocarya- Cryptantha

Cryptantha Watsonii - Cryptantha

Labiatae

Salvia dorrii - Sage

Solanaeeae

Solanum triflorum - Nightshade

Scrophillariaceae

Castelleja chromosa - Indian Paintbrush

Mimulus cusickii - Monkey flower

Penstemon acuminatus - Penstemon

Orobancaeeae

Orobanche fasciculata- Broomrape

Compositae

Artemisia arbuscula - Sage

Artemisia tridentata- Big Sagebrush

Aster canescans - Aster

Balsamorhiza sagittata - Balsamroot

Chaenactis douglasii- Chaenactis

Chrysothamnus nauseosus - Rabbit brush

Gutierrezia sarothrae - Matchweed

Malacothix torreyi - Malacothrix

Tetradymia canescens- Horse-brush

Tetradymia glabrata - Horse-brush

Tetradvmia spinosa - Horse-brush

Townsendia florifer - Townsendia

TABLE 3

Partial list of Native Vegetation for the Sandberg bluegrass (Poa sandbergii) short grass community.

Equisetaceae

Equisetum laevigatum - Horsetail

Gramineae

Aristida longiseta - Aristida

Poa sandbergii - Blue grass

Hordeum Sp. - Barley

Muhlenbergia Sp. - Muhleubergia

Cyperaeeae

Cryperus rivularis - Flatsedge

Juncaceae

Juncus orthophyllus - Rush

Liliaceae

Fritillaria pudica - Fritillaria

Salicaceae

Salix exigua - Willow

Chenopodiaceae

Atriplex spinosa - Spiny hopsage

Ramunculaceae

Myosurus aristatus - Mouse-tail

Ranunculus glaberrimus- Buttercup

Saxifragaceae

Lithophragma bulbifera- Lithophragma

Leguminosae

Astragalus purshii - Locoweed

Malvaceae

Sphaeralcea munroana - Globe Mallow

Cactaceae

Opuntia Sp. - Prickly-pear

Onagraceae

Epilobium paniculatum - Fireweed

Umbelliferae

Lomatium sp. - Desert-parsley

Polemoniaceae

Microsteris gracilis - Microsteris

Phlox aculeata - Phlox

Boraginaceae

Amsinckia sp. - Fiddleneck

Compositae

Achillea millefolium - Yarrow

Ambrosia acanthocarpa- Ragweed

Antennaria dimorpha - Sage

Artemisia tridentata - Big sagebrush

Aster canescens - Aster

Balsamorhiza sagittata - Balsamroot

Chaenactis douglasii - Chaenactis

Chrysothamnus nauseosus - Rabbit brush

Chrysothamnus viscidiflorus - Rabbit brush

Crepis acuminata - Hawksbeard

Gnaphalium palustre - Everlasting

Grindelia squarrosa - Gumweed

Helianthus annuus - Sunflower

Solidago occidentalis - Goldenrod

TABLE 4

Partial list of native vegetation for the river edge and sloughs of Boise River bottomlands.

Marsileaceae

Marsilea vestita - Pepperwort

Salviniaceae

Azolla mexicana - Water fern

Equisataceae

Equisetum arvense - Horsetail

Equisetum hyemale - Horsetail

Equisetum variegatum - Horsetail

Typhaceae

Typha latifolia

Potamogetaceae

Potamogeton berchtoldii - Pondweed

Zannichelliaceae

Zannichella paulustris - Horned Pondweed

Alismataceae

Sagittaria cuneata - Water Plantain

Graminae

Agropyron sp. - Goatgrass

Distichlis stricta - Saltgrass

Echinochloa crusgalli - Cockspur

Muhlenbergia asperifolia - Muhlenbergia

Panicum capillare - Panic grass

Sporobolus cryptandrus - Dropseed

Cyperaceae

Carex lanuginosa - Sedge

Cyperus rivularis - Flatsedge

Cyperus erythrorhizos - Flatsedge

Scirpus acutus - Bulrush

Scirpus microcarpus - Bulrush

Scirpus validus - Bulrush

Lemnaceae

Lemna minor - Duckweed

Juncaceae

Juncusalpinus - Rush

Juncusalpinus balticus - Rush

Juncusalpinus torreyi - Rush

J. tenius - Rush

J. effusus - Rush

Salicaceae

Populus trichocarpa - Poplar

Salix exigua - Willow

Salix lasiandra - Willow

Betulaceae

Alnus incana - Alder

Chenopodiaceae

Kochia scoparia - Red belvedere

Monolepsis spathulata - Poverty weed

Amaranthaceae

Amaranthus retroflexus - Pigweed

Ranunculaceae

Ranunculus aquatilis - Buttercup

Ranunculus cymbalaria - Buttercup

River edges - Flora

Cruciferae

Rorippa islandica - Cress

Rorippa oblusa - Cress

Grossulariaceae

Ribes aureum - Golden current

Rosaceae

Amelanchier alnifolia - Serviceberry

Potentilla biennis - Cinquefoil

Rosa woodsii - Woods rose

Prunus emarginata - Cherry

Prunus virginiana - Chokecherry

Leguminosae

Glycyrrhiza lepidota - Licorice

Onagraceae

Epilobium glandolosum - Fireweed

Epilobium watsonii - Fireweed

Gaura parviflora - Gaura

Oenothera biennis - Evening primrose

Umbelliferae

Berula erecta - Berula

Apocynaceae

Apocynum cannabinum - Dogbane

Asclepiadaceae

Asclepias speciosa - Milkweed

Boraginaceae

Myosotis Laxa - Forget-me-not

Verbenaceae

Verbena bractaeta - Vervain

Verbena hastata - Vervain

Labiatae

Lycopus americanus - Water horehound

Lycopus asper - Water horehound

Menta arvensis - Mint

Scrophulariaceae

Bacopa rotundifolia - Water hyssop

Limosella acquatica - Mudwort

Lindernia anagallidea - Falsepimpernel

Lindernia dubia - Falsepimpernel

Mimulus guttatus - Monkey-flower

Veronica americana - Speedwell

Cucurbitaceae

Echinocystis lobata - Wild cucumber

Compositae

Achillea millefolium - Yarrow

Artemisia dracunculus - Dragon sagewort

Artemisia ludoviciana - Prairie sage

Artemisia tridentata - Big sagebrush

Aster occidentalis - Aster

Bideus cernua - Sticklight

Bideus frondosa - Sticklight

Chrysothamnus nauseosus - Rabbit brush

Circium magnificum - Thistle

Conyza canadensis - Conyza

Grindelia squarrosa - Gumweed

Helianthus annuus - Sunflower

Helianthus nuttallii - Sunflower

Iva axillaris - Poverty weed

TABLE 5

Partial checklist of introduced plants in the middle Snake drainage:

Potamogetonaceae

Potamogeton crispus - Pondweed

Graminae

Agropyron cristatum - Wheat grass

Agrostis alba - Bentgrass

Bromus commutatus - Bromegrass

Bromus mollis - Bromegrass

Bromus tectorum - Cheat grass

Dactylis glomerata - Orchard grass

Digitaria sauguinalis--Crabgrass

Eragrotis cilianensis -Love Grass

H. glaucum - Barley

Hordeum murinum - Fox tail

Phleum pratense - Timothy

Poa bulbosa - Bluegrass

Poa palustris - Meadow-grass

Poa pratensis - Lawn grass

Polypogon monspeliensis - Beardgrass

Setaria lutesceus - Fox tail

Setaria verticillata - Fox tail

Setaria viridis - Fox tail

Liliaceae

Asparagus officinalis- Asparagus

Polygonaceae

Polygonum aviculare - Doorweed

Polygonum convolvulus- Birdweed

Polygonum hydropiper - Marshpepper

Polygonum lapathifolium - Curltop ladysthumb

Polygonum persicaria - Spotted ladysthumb

Rumex acetosella - Sourweed

Rumex crispus - Dock

Chenopodiaceae

Atripliex rosea - Redrache

Bassia hyssopifolia - Bassia

Chenopodium album - Lambsquarter

Chenopodium botrys - Feather geranium

Halogeton glomeratus - Haolgeton

Kochia scoparia - Red belevedere

Salsola kali - Russian thistle

Corispermum hyssopifolium - Bugseed

Aizoaceae

Mollugo verticillata - Carpetweed

Portulacaceae

Portulace oleracea - Common purslane

Caryophyllaceae

Cerastium vulgatum - Chickweed

Holosteum umbellatum - Jagged chickweed

Lychnis coronaria - Rose colmpiou

Saponaria officinalis - Bouncing Betty

Spergularia marina - Sandspurry

Spergularia rubra - Sandspurry

Stellaria media - Chickweed

Vaccaria segetalis - Cowcockle

Ranunculaceae

Ranunculus testiculatus - Hornseed buttercup

Cruciferae

Alyssum alyssoides - Allyssum

Brassica campestris - Mustard

Brassica nigra - Mustard

Capsella bursapastoris - Shepard's purse

Cardaria drabe - Hoary pepperwort

Cardaria pubescens - Hoary cress

Chorispora tenella - Blue Mustard

Conringia orientalis - Hare's ear

Descurainia Sophia - Tansymustard

Lepidium campestre - Peppergrass

Lepidium perfoliatum - Peppergrass

Malcolmia africana - Malcolmia

Rorippa nasturtium - Aquaticum-cress

Sisymbrium altissimum - Tumble-mustard

Thalaspi arvense - Fanweed

Leguminosae

Medicago lupulina - Hopclover

Medicago sativa - Alfalfa

Melilotus alba - Sweet-clover

Mililotus officinalis - Common Yellow sweet-clover

Robinia pseudo-acacia - Black locust

Trifolium fragiferum - Strawberry clover

Trifolium hybridum - Alsike clover

Trifolium repens - Dutch clover

Vicia cracca - Tine grass

Vicia sativa - Common vetch

Geraniaceae

Erodium cicutarium - Filaree

Geranium dissectum - Cut-leaf geranium

Oxalidaceae

Oxalis dillenii - Dillen's woodsorrel

Oxalis stricta - Yellow Woodsorrel

Zygophyllaceae

Tribulus terrestris - Puncture vine

Ephorbiaceae

Euphorbia esula - Esula spurge

Euphorbia supina - Milk spurge

Aceraceae

Acer negundo - Box-elder

Malvaceae

Malva neglecta - Mallow

Elatinacerae

Bergia texana - Bergia

Tamaricaceae

Tamarix pentandra - Tamarisk

Tamarix tetrandra - Tamarisk

Lythraceae

Lythrum hyssopifolia - Hyssop

Umbelliferae

Conium maculatum - Poison Hemlock

Convolvulaceae

Convolunlus arvensis- Morning glory

Boraginaceae

Myosotis micrantha - Blue scorpion grass

Labiatae

Lycopus americanus - Water Horehound

Marrubium vulgare - Horehound

Mentha spicata - Mint

Nepeta cataria - Catnip

Solanaceae

Solanum dulcamara - Blue blindweed

Solanum sarrachoides- Hairy nightshade

Solanum nostratum - Buffalo bur

Scrophulariaceae

Linaria - Dalmatian

Linaria vulgaris - Butter and Eggs

Verbascum blattaria - Mullein

Verbascum thapsus - Mullein

Veronica anagallis-aquatica - Pimpernell

Veronica arvensis - Common speedwell

Plantaginaceae

Plantago lanceolata - Ribgrass

Plantago major - Nippleseed

Dipsacaceae

Dipsacus sylvestris - Gypsy combs

Compositae

Arctium lappa - Burdock

Arctium minus - Burdock

Cichorium intybus - Chicory

Cirsium arvense - Creeping thistle

Cirsium vulgare - Spear thistle

Coreopsis tinctoria - calliopsis

Lactuca serriola - Prickly lettuce

Matricaria matricarioides - Pineapple weed

Sonchus asper - Prickly sowthistle

Sonchus oleaceus - Common sowthistle

Taraxacum officinale - Common dandelion

Tragopogon dubius - Yellow Salsify

*List prepared for Dr. Patricia Packard, College of Idaho.

TABLE 6

Partial checklist of Native Fishes for Boise Valley waters:

Petromyzonidae

Entosphenus tridentalus - Pacific lamprey A

Lampetra ayresi - River lamprey A

Acipenseridae

Asipenser transmontanus- White sturgeon B

Salmonidae

Oncorhynclus nerka - Sockeye salmon A

Oncorhynclus tschawytscha - Chinook salmon A

Salmo clarki - Cutthroat trout C

Salmo gairdneri - Rainbow trout C

Salvelinus malma - Dolly Varden C

Prosopium williamsoni - Mountain whitefish C

Thymallus montanus - Mountain grayling C

Cypinidae

Acrocheilus alutaceus - Chiselmouth D

Gila bicolor - Tui chub D

Gila copei - Leatherside chub D

Ptychocheilus oregonense - Northern squawfish D

Richardsonius balteatus - Redside shiner D

Rhinichthys falcatus - Leopard dace

Rhinichthys cataractae - Longnose dace D

Catostomidae

Pantosteus jordani - Jordan Sucker D

Catostomas Spp. - suckers D

Cottidae

Cottus Spp. - sculpins C

Introduced fishes:

Salmonidae

Salmo trutta - Brown trout C

Salvelinus fontinalis - Brook trout C

Cyprinidae

Cyprinus carpio - Carp D

Carassius auratus - Gold fish D

Centrarchidae

Micropterus dolomieui - Smallmouth bass D

Micropterus salmoides - Largemouth bass D

Lepomis gibbosus - Pumpkinseed D

Lepomis macrochirus - Bluegill D

Pomoxis nigromaculatus - Black crappie D

Pomoxis annularis - White crappie D

Percidae

Perca flavescens - Yellow perch D

Ictaluridae

Pylodictis olivaris - Flathead cat fish D

Ictalurus nebulosus - Brown bullhead D

Ictalurus melas - Black bullhead D

Ictalurus punctatus - Channel catfish D

Schilbeodes sp. - Madtom D

Code:

A. Has apparently disappeared from Boise - Snake.

B. Present - but landlocked.

C. Present - only in clear upper reaches of streams.

D. Present - throughout Boise - Snake River drainage of the Boise Valley.

TABLE 7

Partial checklist of native amphibians for the Boise Valley:

Ambystomatidae

Ambystoma macrodactylum - Long-toed Salamander D

Pelobatidae

Scaphiopus intermontanus - Great Basin Spadefoot D

Bufonidae

Bufo boreas - Western toad A

Bufo woodhousii - Woodhouse's toad A

Hylidae

Hyla regilla - Pacific treefrog D

Pseudacris triseriata - Northern Chorus frog D

Ranidae

Rana pipiens - Leopard frog A

Rana pretiosa - Spotted frog D

Code: Same as for reptiles.

TABLE 8

Partial checklist of reptiles for the Boise Valley:

Iguanidae

Phrynosoma platyrhinos - Desert Horned Lizard B

Phrynosoma douglassi - Short-horned Lizard B

Crotaphytus collaris - Collared Lizard B

Crotaphytus wislizeni - Leopard Lizard B

Sceloporus occidentalis - Western Fence Lizard B

Sceloporus graciosus - Sagebrush Lizard B

Uta stansburiana - Side blotched Lizard B

Teidae

Cnemidophorus tigris - Western Whiptail B

Scincidae

Eumeces skiltonianus - Western skink B

Colubridae

Thamnophis sirtalis - Common Garter snake A

Thamnophis elegans - Western Garter snake A

Diadophis punctatus - Eastern Ring-necked snake B

Diadophis amabilis - Western Ringnecked snake B

Columber constrictor - Western Yellow-bellied racer B

Pituophis melanoleucus - Pine Snake B

Sonora semiannulata - Western Ground snake B

Hypsiglena torquata - Desert Night snake B

Boidae

Charina bottae - Rubber boa B

Introduced:

Rana catesbeiana - Bull frog A,C

Code:

A. Common in Boise Valley area today.

B. Presently, only found in sagebrush desert.

C. Introduced.

D. Limited numbers present today.

TABLE 9

Partial checklist of birds native to the big sagebrush-bluebunch-wheatgrass (Artemisia tritentata-Agropyron Spicatum) and related upland communities of the Boise Valley:

Vulturidae

Cathartes aura - Turkey vulture D

Accipitradae

Buteo jamaicensis - Red-tailed hawk A,B

Buteo lagopus - Rough-legged hawk F

Buteo regalis - Ferruginous hawk D

Aquila chrysaetos - Golden eagle D

Circus cyaneus - Marshhawk A

Falconidae

Falco mexicanus - Prairie falcon E

Phasianidae

Pedioecetes phasianellus - Sharp-tailed grouse D

Centrocercus urophasiaus - Sage grouse D

Lophortyx californica- California Quail B

Columbidae

Zenaidura macroura - Mourning dove C

Strigidae

Asio flammeus - Short-eared owl D

Speotyto cunicularia - Burrowing Owl D

Caprimulgidae

Phalaenoptilus nuttallii - Poor-will F

Chordeiles minor - Common nighthawk F

Tyrannidae

Tyrannus tyrannus - Eastern kingbird F

Myiarchus cinerascens- Ash-throated flycatcher F

Sayornis sayus - Say's phoebe F

Hirundinidae

Petrochelidon pyrrhonota - Cliff swallow F

Alaudidae

Eremophila alpestris - Horned lark F

Corvidae

Pica pica - Black-billed magpie C

Coruus corax - Common raven F

Corus brachyrhynchos - Common crow C

Troglodytidae

Salpinctes obsoletus - Rock wren F

Salpinctes mexicanus - Canyon wren F

Mimidae

Oreoscoptes montanus - Sage thrasher D

Lanidae

Lanius ludovicianus - Loggerhead shrike F

Icteridae

Euphagus cyanocephalus - Brewer's blackbird C

Sturnella neglecta - Western meadowlark F

Fringillidae

Plectrophenzx nivalis- Snow bunting F

Calamospiza melanocorys - Lark bunting F

Chlorura chlorura - Green-tailed towhee F

Ammodramus savannarum- Grasshopper sparrow F

Spizella breweri - Brewer's sparrow F

Amphispiza bilineata - Black-throated sparrow F

Pooecetes gramineus - Vesper sparrow F

Chondestes grammacus - Lark sparrow F

Introduced Species

Phasianidae

Colinus virginianus - Bobwhite D

Phasianus colchicus - Ring-necked pheasant D

Perdix perdix - Hungarian partridge D

Alectoris graeca - Chukar C

Columbidae

Columba livia - Rock dove C

Sturnidae

Sturnus vulgaris - Starling C

Fringillidae

Passer domesticus - House sparrow C

Code:

A. Common today in upland agricultural areas.

B. Common today in native vegetation within agricultural lands.

C. More abundant today than previously.

D. Present in reduced numbers.

E. Irregular occurance.

F. No appreciable change in status with change in time.

TABLE 10

Partial checklist of native birds for Boise Valley bottomlands:

Gaviidae

Gavia immer - Common loon E

Podicipedidae

Podiceps caspicus - Eared greb E

Aechmophorus occidentalis - Western greb E

Podilymbus podiceps - Pied-billed greb E

Pelecanidae

Pelecanus erythrorhynchos - White pelican

Areidae

Ardea herodias - Great blue heron

Egretta alba - Common egret

Egretta thula - Snowy egret G

Nycticorax nycticorax - Black-crowned night heron B

Botaurus leutiginosus - American bittern E

Anatidae

Olor columbianus - Whistling swan E

Branta canadensis - Canada goose E

Anas platyrhnchos - Mallard E

Anas acuta - Pintail E

Anas discors - Blue-winged teal E

Anas cyanoptera - Cinnamon teal E

Anas crecca - Green-winged teal E

Anas streptera - Gadwall E

Mareca americana - American pidgeon E

Spatula clypeata - Shoveler E

Aix sponsa - Wood duck E

Aythya affinis - Lesser scaup E

Aythya marila - Greater scaup E

Aythya collaris - Ring-necked duck E

Aythya americana - Redhead E

Aythya valisineria - Canvas back D

Bucephala claugula - Common goldeneye E

Bucephala albeola - Bufflehead E

Mergus merganser - Common mergaser E

Oxyura jamiacensis - Ruddy duck E

Vulturidae

Cathartes aura - Turkey vulture D

Accipitridae

Accipiter gentillis - Goshawk D

Accipiter cooperii - Cooper's Hawk D

Accipiter striatus - Sharp-shinned hawk D

Beteo jamiacensis - Red-tailed hawk A

Buteo lagopus - Rough-legged hawk E

Buteo regalis - Rerruginous hawk D

Aquila chrysaetos - Golden eagle E

Haliaeetus leucocephalus - Bald eagle E

Circus cyaneus - Marsh hawk A

Pandion haliaetus - Osprey F

Falconidae

Falco mexicanus - Prairie falcon F

Falco columbaius - Pigeon hawk F

Falco sparverius - Sparrow hawk A

Phasianidae

Pedioecetes phasianellus - Sharp-tailed grouse D

Ceutrocercus urophasianus - Sage grouse D

Gruidae

Grus canadensis - Sandhill crane F

Rallidae

Rallus limicola - Virginia rail F

Rallus carolina - Sora F

Fulica americana - American coot A

Charadrilidae

Charadrius vociferus - Killdeer A

Scolopacidae

Actitis macularia - Spotted sandpiper E

Catoptrophorus semipalmatus - Willet

Numenius americanus - Long-billed curlew G

Ereunetes mauri - Western sandpiper E

Erolia minutilla - Least sandpiper E

Capella gallinago - Common snipe A

Totanus melanoleucus - Greater Yellowlegs E

Recurvirostridae

Recurvirostra americana - Avocet D

Himatopus mexicanus - Black-necked stilt D

Phalaropodidae

Steganopus tricolor - Wilson's phalarope D

Laridae

Larus californicus - California gull D

Larus delawarensis - Ring-billed gull G

Hydroprogne caspia - Caspian tern D

Chlidonias niger - Black tern D

Columbidae

Zenaidura macroura - Mourning dove G

Tytonidae

Tyto alba - Barn owl G

Strigidae

Aegolius acadicus - Saw-whet owl

Bubo virginianus - Great horned owl E

Speotyto cunicularia - Burrowing owl D

Asio otus - Long-eared owl D

Asio flammeus - Short-eared owl D

Caprimulgidae

Phalaenoptilus nuttalli - Poor-will E

Chordeiles minor - Nighthawk E

Trochilidae

Selasphorus platycerus - Broad-tailed hummingbird E

Stellula calliope - Calliope hummingbird E

Alcedinidae

Megaceryle alcyon - Belted kingfisher E

Picidae

Colaptes auratus - Flicker E

Asyndesmus lewis - Lewis's woodpecker E

Dendrocopos villosus - Hairy woodpecker E

Dendrocopos pubescens - Downy woodpecker E

Tyrannidae

Tyrannus tyrannus - Eastern kingbird E

Tyrannus verticalis - Western kingbird E

Sayornis sayus - Say's phoebe E

Alaudidae

Eremophila alpestris - Horned lark D

Hirundinidae

Petrochelidon pyrrhonota - Cliff swallow E

Stelgidopteryx ruficollis - Rough-winged swallow E

Riparia riparia - Bank swallow E

Tachycineta bicolor - Tree swallow E

Trachycineta thalassina - Violet-green swallow E

Hirundo rustica - Barn swallow E

Corvidae

Coreus brachyryhnchos - Common crow G

Nucifraga columbiana - Clark's nutcracker F

Pica pica - Black-billed magpie G

Cyanocitta stelleri - Steller's jay F

Paridae

Parus atricapillus - Black-capped chickadee E

Sittidae

Sitta carolineansis - White-breasted nuthatch E

Certhiidae

Certhia familiaris - Brown creeper E

Troglodytidae

Troglodytes aedon - House wren E

Salpinctes obsoletus - Rock wren E

Turdidae

Turdus migratorius - Robin

Myadestes townsendi - Townsend's solitaire E

Sylviidae

Regulus satrapa - Golden-crowned kinglet F

Regulus calendula - Ruby-drowned kinglet E

Motacillidae

Anthus spinoletta - Water pipit E

Bombycillidae

Bombycilla garrulus - Bohemian waxwing E

Bombycilla codrorum - Cedar waxwing G

Laniidae

Lanius excubitor - Northern shrike E

Lanius ludovicianus - Loggerhead shrike E

Parulidae

Deudroica petechia - Yellow warbler G

Deudroica auduboni - Audubon's warbler G

Geothlypis trichas - Yellow throat G

Icteridae

Molothrus ater - Brown-headed cowbird G

Xanthocephalus xanthocephalus - Yellow-headed blackbird E

Abelaius phoeniceus - Red-winged blackbird E

Euphagus cyanocephalus - Brewer's blackbird G

Icterus bullockii - Bullock's oriole G

Sturnella neglecta - Western meadow-lark E

Fringillidae

Passerina amoena - Lazuli Bunting E

Spinus tristis - Common Goldfinch E

Oberholseria chlorura - Green-tailed towhee E

Pipilo erythrophthalmus - Rufous-sided towhee E

Junco oreganus - Oregon Junco E

Junco hyemalis hyemalis - Slate-colored junco E

Melospiza melodia - Song sparrow E

Passerella iliaca - Fox sparrow E

Spicella passerina arizonae - Chipping sparrow E

Neotoma lepida Desert packrat	- G	
Microtus montanus Mountain vole	- G	
Reithrodontomys megalotis Desert harvest mouse	- G	
Onychomys lencogaster Grasshopper mouse	- G	
Lagurus curtatus Sagebrush vole	- G	
Canidae		
Canus latrans Coyote	- ADF	
Canus lupus Gray wolf	- E	
Vulpes fulva Red fox	- ADF	
Mustelidae		
Mustela erminea Short-tailed weasel	- AG	
Taxidea taxus Badger	- FG	
Spilogale gracilis Western spotted skunk	- G	
Felidae		
Lynx rufus Bobcat	- C	
Bovidae		
Odocoileus hemionus Mule deer	- C	
Antilocapridae		
Antilocapra americana Pronghorn	- DF	
Introduced species		
Sciuridae		
Sciurus niger Eastern fox squirrel	- BD	
Mividae		
Rattus norvegicus Norway rat	- BD	
Mus musculus House mouse	- BD	

Code:

A. May be present today in agricultural areas.

B. May be present today in urban areas.

C. Very limited today, along rivers and around reservoirs.

D. More abundant today than previously.

E. Formerly more abundant.

F. Confined to sage deserts.

G. No appreciable change in status with change in time.

APPENDIX II

Introduced Species

Ardeidae

Ardeola ibis - Cattle egret G

Phasianidae

Colinus virginianus - Bobwhite

Phasianus colchicus - Ring-necked pheasant D

Perdix perdix - Hungarian partridge D

Alectoris graeca - Chukar partridge G

Columbidae

Columba livia - Rock dove G

Sturnidae

Sturnus vulgaris - Starling G

Fringillidae

Passer domesticus - House sparrow G

Code:

A. Common today in bottomland agricultural areas.

B. Common along the streams today.

C. Present today in reduced numbers.

D. Once more abundant.

E. No appreciable change in status with change in time.

F. Irregular occurance.

G. Increased numbers in recent years.

TABLE 11

Partial checklist of native mammals for the Boise River bottomlands:

Soricidae

Sorex vagrans - Vagrant shrew G

Leporidae

Sylvilagus nuttalli - Nutall's cottontail EA

Sciuridae

Eutamias minimus - Least chipmunk CE

Citellus townsendi - Townsend's ground squirrel AD

Geomyidae

Thomomys talpoides - Northern pocket gopher AD

Thomomys townsendi - Townsend's pocket gopher AD

Castoridae

Castor canadensis - Beaver

Cricetidae

Reithrodontomys megalotis - Desert harvest mouse G

Peromyscus maniculatus - Deer mouse G

Microtus montanus - Montane meadow mouse G

M. longicaudus - Long-tailed meadow mouse G

Ondatra zibethieus - Muscrat AD

Zapus princeps - Western jumping mouse G

Erethizontidae

Erethizon dorsatum - Porcupine AD

Canidae

Canus latrans - Coyote ADF

Canus lupus - Gray wolf E

Vulpes fulva Red fox	- ADF	
Ursidae		
Ursus americanus Black bear	- E	
Procyonidae		
Procyon otor Raccoon	- E	
Mustelidae		
Mustela erminea Short-tailed weasel	- AG	
Mephitis mephitis Striped skunk	- G	
Spilogale gracilis Western spotted skunk	- G	
Taxidea taxus Badger	- FG	
Felidae		
Lynx rufus Bobcat	- EF	
Bovidae		
Odocoileus hemionus Mule deer	- C	
Cervus canadensis Elk (Wapiti)	- E	
Antilocapridae		
Antilocapra americana Antelope (Pronghorn)	- EF	
Introduced species		
Sciuridae		
Scuirus niger Eastern fox squirrel	- BD	
Muridae		
Rattus norvegicuns Norway rat	- BD	
Mus musculus House mouse	- BD	
Capromyidae		
Myocaster coypus Nutria	- AD	
Code:		
(Same as for sage lands.)		

TABLE 12

Partial checklist of native mammals for Boise Valley sagebrush areas and related upland communities:

Soricidae		
Sorex vagrans Vagrant shrew	- G	
Leporidae		
Lepus californicus Black-tailed jack	- F	
Sylvilagus idahoensis- Pygmy rabbit	DF	
Sylvilagus nuttalli Nuttall's cotton-tail	- EA	
Sciuridae		
Marmota flaviventris Yellow-bellied marmot	- AB	
Citellus townsendi Townsend's ground squirrel	- AD	
Citellus lencurcus White-tailed ante-lope squirrel	- EF	
Eutamias minimus Least chipmunk	- CE	
Geomyidae		
Thomomys talpoides Northern pocket gopher	- AD	
Thomomys townsendi Townsend's pocket gopher	- AD	
Heteramyidae		
Dipodomys ordi Ord kangaroo rat	- AE	
Cricetidae		
Peromyscus mamiculatus- Deer mouse	G	

APPENDIX 2
BOISE VALLEY CANALS

JACOBS CANAL COMPANY, LTD.

The Jacobs canal begins about 1½ miles easterly of the original townsite of Boise in the NE corner NE¼ NW¼ Section 24 T3N R2E. It ran northwest to Boise and through a portion of Front Street. The ditch was constructed in 1863 by Thomas Davis. He built his headgate nearly 8 feet high and 4 feet deep. The ditch would carry 2000 inches but at first only diverted 700 inches. Davis carried out enlargements of the ditch in 1864 and 1865. He originally owned 300 acres under the system but by 1900 had sold all but about 75 acres. He leased this remaining acreage to the Chinese who utilized the land for raising garden produce. Since 1864, 40 out of the above 75 acres had been under cultivation, with the remainder used for pasture. In 1864 Davis planted and raised 40 acres of potatoes, cabbage, onions and a little grain. His 300 acre tract lay south of Front Street, a little east of the Cottonwood Flume and ran west to 9th street and thence south to the river. He estimated that he lost 50 acres out of the 300 due to the changing of the river channel.

On May 17, 1872, Davis sold his ditch and water rights to Cyrus Jacobs. However, in this deed of transfer he had a clause inserted which guaranteed him a perpetual water right, free of charge, for his remaining lands. Cyrus Jacobs maintained ownership of the canal until 1890 when he sold out to the Boise Rapid Transit Company. This company utilized the canal water to irrigate agricultural lands and various sub-divisions in Boise. In addition they supplied water to the city of Boise for watering streets and flushing the sewers. After 1904, though, water was no longer furnished for flushing the sewers.

In 1903, the canal maintained a carrying capacity of 50 second feet and extended 3 miles in length with 7 miles of laterals. On February 25, 1904, Judge Olden and J. L. Niday incorporated and formed the Jacobs Canal Company, Ltd. At this time, they purchased the canal and water rights of the Boise Rapid Transit Co. The canal still originated at the same point. It followed the railroad for about 200 feet from its diversion point, went under the railroad, and kept on the northside of the railroad down to Front Street. It then divided at 8th Street. One section went into the city park and Riverside additions and the other ran into the Boise City canal at the junction of Grove Street and 8th Street, from whence it was carried to 13th Street where it divided and went on down to near the head of Farmers Union Canal through an old slough, after passing through the Fairview addition.

The headgate in 1904 measured 7 feet wide, 12 feet in length and 5 feet in depth and was capable of admitting over 3000 inches into the canal. Besides furnishing water to the city of Boise for various services, it also irrigated 716.35 acres. At the request of the city, the canal ran dry through Boise during the summer of 1905, as they were laying asphalt paving on the streets. In 1906, the Jacobs canal received water rights (1 & 2) of 1110 inches.

MIDDLETON MILL DITCH COMPANY CANAL

The Middleton Mill Ditch Company canal begins on the north bank of the Boise river in T4N R1W Section 13. It runs a general westerly course through Middleton and 5 miles beyond for a total distance of about 27 miles. Throughout its course, the canal utilizes natural sloughs when practicable. The canal services a strip of land 12 miles long and about 2 miles wide. This land lies north of the Boise river and south of the canal.

The first four miles of the canal were built in 1864 by M. V. Palmer, F. O. Palmer, David Allison, and Alex Allison. These men diverted 1000 inches through the canal. In 1871 the canal and water rights were acquired by J. C. Isaac, H. P. Isaac, and J. M. Steavenson. These men enlarged and extended the canal 14 miles from the mill slough to Middleton in that year and they divereted 8000 inches under a 4 inch pressure through the canal. At this time, 6000 acres were covered by the canal. They further extended the canal one mile in 1872, 1½ miles in 1878, and 4 miles in 1885. The extensions built below and west of Middleton were known as the Canyon Hill estensions and covered 2000 acres.

Around 1877, S. S. Foote and a Mr. Packard bought the Middleton mill and ditch. By 1884, Foote was the sole owner. On April 27, 1889, the Middleton Mill Ditch Company was organized and stock distributed to the land owners in proportion to water utilized. A share of stock equaling 1/500 part of water. In 1889, the company books reveal 4,341 acres under irrigation. However, according to the company's secretary at the time, an additional 2700 acres were irrigated without owners of these lands paying any fees. Consequently in 1889, over 7000 acres were watered from the canal. With incorporation of the company in 1889, the mill at Middleton was shut down and the 8000 inches diverted was utilized entirely for irrigation. In 1903, the State Engineer listed the canal's capacity at 282 second feet with 33 miles of lateral ditches. In 1906, the canal received water rights (3, 53, & 120) of 3175 inches.

ANDREWS CANAL

The Andrews Canal begins in SE¼ Section 25 T5N R5W. This canal and conduits connect with a chain of natural sloughs running in a northwesterly direction for 6 miles to and across the lands of T. W. Boone, Thomas Andrews, J. N. Tucker, and Prior Burnett. These men owned 1535 acres, most of which were irrigated.

This canal was constructed in July 1864, and at this time water was first divereted to the above lands. These lands lie in SE¼, SE¼, SW¼, NW¼ Section 25 T5N R5W; E½, SE¼ NW¼, SE¼, NE¼, SW¼, E½, NW¼ and lots 1 and 2, Section 22 T5N R5W. In 1906 the canal received water rights (4, 29, 50, 104, and 121) of 750 inches.

EAGLE ISLAND DITCHES

1. Mace Catlin Ditch. Begins on south bank of Boise River in Lot 5, Section 17, T4N, R1E and runs through Sections 13, 17, 18, 19, and 24 in T4N R1E for a distrance of 3.5 miles. The ditch was constructed in 1864

by T. C. Catlin, J. E. Wood, J. C. Wilson, G. W. Paul, C. R. Barnes, John Johnson, and M. M. Johnson. As originally built, the ditch measured 2½' to 3' in width and 18 inches in depth. In 1864, 150 inches of water were diverted through the ditch. The ditch was enlarged annually until 1872. From 1872 to 1905, the size of the ditch remained at 6 feet on the bottom, 10 feet on the top, and 2 feet deep. Also during this time, 500 inches were appropriated and diverted. Two headgates serve this ditch, one being 3 feet wide and 18 inches deep and the other 2½ feet wide and 18 inches deep. Polette Mace and T. C. Catlin each irrigated about 350 acres from this ditch. Catlin, in 1864, first utilized water to raise 12 acres of barley, 2 acres of potatoes, 4 acres of grain, garden produce, and about 40 acres of hay. In 1906, the ditch received water rights (4 & 51) of 536 inches.

2. Davis and Hart Ditch. Received water from a slough that connected with the Boise River. The headgate for the ditch is located in NE¼ Section 18 T4N R1E. The ditch extends westerly through lands originally belonging to E. N. Hart, Mary G. Davis, and T. C. Catlin. These lands were located in the center of NE¼ Section 18 T4N R1E, SW corner Section 13 T4N R1W, lots 9, 10, 11, and 12 and E½ SE¼ Section 14 T4N R1W.

The ditch was constructed in 1863 by Edward N. Hart. It was enlarged in 1864 and 1865. In 1865, it measured 6 feet on top and 4 feet on the bottom. Hart at this time appropriated and diverted 12 cubic feet of water under a four-inch pressure. The ditch covered 575 acres. In 1906, the ditch received water rights (6, 57, & 58) of 165 inches.

3. Thomas Aiken ditch begins in Section 16 T4N R1E about 60 rods from west line of said Section 16 and near its southern line. In 1876, Thomas Aiken filed on 250 acres in Section 17 T4N R1E. The same year he built the ditch and appropriated 500 inches of water. The ditch extended through a portion of William H. Conway's land and Aiken's land for a distance of 1¼ miles. Conway used some of the water but the majority went toward irrigating the 250 acres of Aiken. In 1876, Aiken had 40 acres in cultivation. He cut 60 tons of hay and raised some grain. In 1906, the ditch received water right (63) for 260 inches.

4. Conway-Hamming ditch originated on land of W. J. Hamming which was situated in Section 21 T4N R1E. This land was originally owned by Lewis and Goff, who occupied it in 1864. They built a ditch, but it remained vacant when property was sold to Gabe Newman in 1870. Newman, the same year, built a new ditch. In 1877, Thomas Aiken extended and enlarged the ditch to run through his land and Conway's property. In 1885, D. O. Stevenson surveyed for an enlargement of the ditch. In the spring of 1885, the ditch was enlarged by a Mr. Cobb and Lewis McShane. After this work was finished, the ditch was 4 feet on the bottom and a foot deep and would carry 200 inches of water. When Gabe Newman died in 1891, T. C. Catlin bought up his land. Catlin in turn sold the 180 acres to Frank Short, who in 1904 relinquished his title to W. J. Hamming. Luther McShane and Thomas Aiken were the original owners of the 148 48/100 acres owned by William Conway. Conway purchased his property on October 1, 1891, from Jack Vincent, who had bought out McShane and Aiken on January 1, 1891. However, Aiken kept a portion of his water right, which in 1900 he sold to Conway. By 1905, the ditch measured 4 feet on the bottom, six feet on the top, 2 feet in depth and about one mile in length. In 1906, the ditch received water rights (48, 64, & 118) of 285 inches.

THURMAN MILL SLOUGH AND CANAL

When the Thurman Mill Slough and Canal was constructed in March 1866, 6000 inches of water under a 4 inch pressure was appropriated and diverted. The canal begins on the south side of Boise River at a point opposite Governor's Island in the SE¼ NE¼ section 5 T3N R2E. From its diversion point, the canal extends westerly for about 7 miles. In addition to the main canal, a few landowners constructed small ditches which originate from the Thurman Mill Slough. By 1903, 6 miles of laterals were in operation. By 1905, the canal had been enlarged to more than twice its original size. Major improvements and extensions of the canal had been made in 1885 and 1890.

Mrs. Martha E. McCarthy, owner of the largest property under the canal, irrigated 500 acres. She had purchased her land from William M. Thurman, who had himself bought land from Peter L. More on May 20, 1872. More was the first user of the Thurman Mill Slough water. When Thurman purchased this property from More, the transfer included More's mill site and the water ditch. The water at first was utilized to run the mill and provide limited irrigation for adjacent lands. But as additional settlers moved into the area, the water came to be used exclusively for irrigation. By 1905 the canal irrigated over 2000 acres of land located in T4N R1E.

In 1906, the Thurman Mill Slough and Ditch received water rights (7, 10, 11, 36, 37, 41, 54, 55, 61, 62, 75, 76, 78, 79, 80, 81, 82, 83, 84, 87, 115, 116 and 128) of 2288 inches.

PIONEER-DIXIE DITCH COMPANY

The Pioneer-Dixie (Keller, Kelly) ditch begins on the south bank of the Boise River near the center of the NE¼ NW¼ Section 20 T4N R3W. It runs in a general westerly course through Sections 20, 19 & 18, T4N R3W, Sections 24, 23, 13, 14 and 15, T4N R4W. It terminates in Section 10 T4N R4W. When built in 1864 by John Anderson, James Sims, John Levanter and others, the ditch was known as the Keller or Kelly ditch. It later became known as the Pioneer-Dixie ditch when landowners of the area formed the Pioneer-Dixie ditch when landowners of the area formed the Pioneer-Dixie Ditch Co. After completion of the ditch in September 1864, water was diverted into a slough by constructing brush dams across the river channel. The use of this method made a headgate unnecessary but after more settlers moved into the area one was added. Over 3000 acres under the system were susceptible to irrigation. Between 1864 and 1878 about 1000 acres received water. By 1906 an additional 1000 acres was under cultivation and using waters of the ditch. At first, the ditch diverted 1000 inches. However, after an enlargement of the system in 1869, a notice of intent to divert a greater quantity was filed.

In 1903, the ditch maintained a capacity of 22 second feet and extended nearly 10 miles in length with 5 miles of laterals. In 1906, the ditch received water rights (8, 44) of 2772 inches.

1. Young Ditch begins on the south bank of the Boise River near SE¼ SW¼ Section 16 T4W R3W. It extends in a general westerly direction through Section 15 and terminates in Section 21 T4N R3W. The ditch was built in January 1887 by William C. Young and Benjamin F. Young. At the time of construction, the builders appropriated and diverted 1000 inches. On March

25, 1895, they filed an additional notice claiming the right to divert 30 second feet. Benjamin Young's heirs took charge of his water rights upon his death September 21, 1898. In 1903 the Young ditch measured 2 miles in length and irrigated over 500 acres.

2. The American Canal begins on the south side of the Boise River near the SE corner SW¼ section 16 T4N R3W. It extends on a general westerly course through Sections 21, 20, 17 and 18 in T4N R3W, Sections 12, 11, 10, 9, 8, 5 and 6, T4N R4W and terminated in Section 1 T4N R5W. Construction of the canal began September 1, 1887. It was completed by December 29, 1887. The promoters and builders of the system included David L. Williams, J. R. Beck and George Froman. On July 9, 1887, the president and secretary of the American Ditch Association, J. R. Beck and David L. Williams, filed a notice to divert and appropriate 4000 inches under a 4 inch pressure.

The headgate for the system measured 10 feet 4 inches. The canal was 10 feet across the bottom with a fall of 1/8 inch to the rod. A survey in 1887 revealed that 4000 acres under the system were susceptible to irrigation. In 1888, 965 acres received water. The succeeding year brought an increase of 200 irrigated acres. By 1900, over 2500 acres were under cultivation and receiving irrigation water.

The association had a capital stock of $20,000 and $14,050 in subscribed stock. One inch of water equaled one share.

In 1903, the canal maintained a capacity of 50 second feet, extended 10 miles in length with 16 miles of laterals, and irrigated over 2000 acres. In 1906, the canal received water right (96) of 2390 inches.

3. The Riverside (Methodist, Dixie, Roswell) ditch originates on the south bank of the Boise River near the centerline of Section 20 T4N R3W. It extends on a general westerly course through T4N R3W, T4N R4W, T4N R5W, and T4N R6W. It also runs into T21S R46E and T22S R46E in Oregon. The canal terminates in Section 18 T4N R6W.

The Dixie Ditch Co., the originator of the canal, was formed in 1882. Its membership consisted of interested farmers, including J. B. Wright, J. M. Bowman, G. W. Grannis, R. A. Dell, M. F. Fowler, and J. M. McKean. After forming the above company, the stockholders filed notice, in July 1882, to appropriate and divert 6000 inches under a 4-inch pressure. In May 1883, the Dixie Ditch Co. and L. W. Stillwell became the contracting parties for construction of the canal. The contract called for the building of a canal 10 miles in length. Of this total, 3 miles consisted of hillside work. The main portion of the canal was ready during the summer of 1883, but it was not completed until the spring of 1884, when work on the difficult sidehill section was finished. To divert the water, a 12 foot wide headgate was erected. The canal, following completion, measured 8 feet on the bottom, 10 feet on the top, and 1 foot in depth and utilized a grade of 1/2 inch to the rod.

During the initial phase of construction, rich and valuable placer mines were reportedly discovered along the Dixie Slough lying parallel and adjacent to the canal. Mining lots, in 20-acre tracts, were filed on and all thought the area would become a lively mining district. Observers reported that some of the bars should pay $8 to $10 per day to persons using a rocker. Apparently the mining boom never materialized, as following the initial excitment no further references are found to the placers.

The company annually enlarged and lengthened the canal until 1891, when they sold the system and water rights to Judson Spofford and the Boise

Land and Water Co. By this time, the Dixie Ditch Co. had expended over $8,000 for the building of the canal. Prior to the irrigating season of 1893, the Boise Land and Water Company enlarged and extended the ditch 5 miles further on the Roswell Bench. In addition, they built a new headgate and 4 waste gates. They then filed a notice to appropriate and divert an additional 150 second feet of water.

In the fall of 1893, the canal was sold to C. W. Sterry, C. B. Hart, and E. M. Kirkpatrick. These men formed the Riverside Irrigation District, Ltd., as equal partners. C. W. Sterry died shortly after the foundation of the company and his stock became the property of the 2 remaining owners. These two men, in turn, sold stock to farmers utilizing the system. One share of stock equaled 10 acres and each stockholder paid 75¢ per acre for maintenance. Out of the 1500 shares held by the company, 550 were sold. The remaining nonappurtenant shares remained in the possession of Kirkpatrick and Hart. This stock was available for purchase by the settlers or utilized to meet deficiency assessments levied against the stock. The nonappurtenant stock when transferred to new settlers became appurtenant stock attached to the land and not transferable.

In 1895, the company acquired a right of way through the Young land. This made possible the construction of a new diversion point--Section 20 T4N R3W. At this point, a new headgate was erected and the ditch extended to just below the original headgate, a distance of about 2 miles, where it united with the old ditch.

In 1898 further improvements took place at the diversion point. These included building a dam across the river and the addition of new headworks. An enlargement and lengthening of the canal was also begun in the fall of 1898 and completed by the spring of 1899. The improvements of 1898 and 1899 cost the company $10,731.14. At this time, estimates revealed the headgate capable of carrying 2,500 inches and 2500 acres receiving irrigation water. During the fall of 1901 and spring of 1902 the company initiated more improvements for the system. They expended $11,273.30 on improvements for the Young Ditch, $9,618.72 for general improvements, and about $5000 for deficiency assessments due to extra work caused by leaks in the canal. They also let out a contract for $8,568 to R. W. Faris for work on the system. Faris enlarged the canal to a uniform bottom width of 16 feet, finished the banks to 6 feet above the grade, set the sideslopes at 1½ to 1, and leveled the ditch to a general fall of 2.65 feet per mile. The ditch, when Faris completed his contract, was capable of a 5 foot depth and carrying capacity of 358½ cubic feet per second.

During this time the ditch underwent an extension from where it struck the Roswell Bench to Black Point, a distance of 17 miles. In 1901, the company diverted 6000 inches; 1902, 7000 inches; 1903, 8000 inches; and 9500 inches in 1904.

By 1903, the canal extended 30 miles in length with 40 miles of laterals, and over 15,000 acres under the system were susceptible of irrigation. Of this total, 4000 acres received the water. By 1908 this acreage increased to 6000 acres. In 1906, the canal received water rights (91, 124, 130, 133) of 9500 inches.

SIEBENBERG CO-OPERATIVE DITCH COMPANY

The diversion point is located on the north side of the Boise River near the center of NW¼ Section 15 T4N R3W. The canal extends from this point in a general westerly course through Sections 15, 16, 17, 18, 8 and ends in Section 7, all located in T4N R3W. The ditch was built in 1865 by William Siebenberg and other interested property owners. At this time, the ditch carried 300 inches of water and measured 4 feet on the bottom and 1½ feet in depth. Before the building of a headgate, water was diverted from the river by the piling of brush across the river channel. This damming consequently funneled the water into a slough. Water for the ditch was then received from the slough. By 1903, the ditch maintained a capacity of 20 second feet and irrigated nearly 800 acres. Also by this time, the ditch was near 5 miles in length. All irrigation was accomplished from the main ditch as no laterals were built. In 1906, the Siebenberg ditch received water right (9) of 671 inches.

GRAHAM GILBERT DITCH

Begins in SE corner NW¼ NE¼ Section 21 T4N R1E on the north bank of meandered south bank of the Boise River. It runs from this point in a westerly direction through NW¼ NE¼ Section 21 and lots 3 and 4 of Section 21, lots 1, 2, and 3 of Section 21, lots 1, 2, and 3 of Section 20, all in T4N R1E. The ditch terminated in Section 20 T4N R1E. The ditch was constructed in 1865 by J. M. Stewart and others who at the time appropriated and diverted 400 inches of water under a 4-inch pressure. By 1905, the water rights and ditch were acquired by James L. Graham, Frank L. Graham, and William Gilbert. These men utilized the ditch to irrigate their property, which consisted of 188.81 acres. In 1906, the Graham-Gilbert ditch received water right (12) of 220 inches.

EUREKA CANAL NO. 1

Begins on the south side of the Boise River in Section 23 T4N R1W and runs in a westerly direction for about 6 miles. The canal was constructed in the winter of 1863 by George Leggett, Frank Fulton, and Hugh Allen when they appropriated and diverted 5000 inches under a 4-inch pressure. In 1864, these men were mainly raising garden produce and using water to irrigate same. The canal was enlarged each year as more settlers moved into the area. The system of irrigation under the canal was mostly sub-irrigation.

The Eureka Water Company was incorporated on April 26, 1881. Eleven shares in the new company were issued to William Simpson (2 shares), William Frost (2 shares), Elijah Frost (2 shares), Houston Frost, George Goodrich, William Lewis, R. M. Brannan, and Adam Schindler (one share each). The company also claimed 10,000 inches of water.

The headgate measured just under 12 feet with a depth of 4 feet. The canal was 12 feet across the bottom.

In 1903 the canal had a capacity of 289.5 second feet and was 6 miles long with 9 miles of laterals. At this time, the canal was watering 1,386

acres. In 1906, the canal received water right (13) to 1666 inches.

NEW UNION DITCH COMPANY CANAL

Commences on the north bank of the Boise River in lot 2 Section 23 T4N R1E and extends in a northwesterly direction through Sections 23, 14, and 15 and terminates in Section 16 T4N R1E. The canal was built in the fall of 1864 and spring of 1865 by Seth Bixby, John Carpenter, John Patterson, and others. When constructed, 1000 inches of water under a 4-inch pressure was appropriated and diverted. Since its enlargement in 1866, the canal has remained the same size. In 1903, the canal maintained a capacity of 81.8 second feet and measured 2 miles in length with 5 miles of laterals. By 1905, there were 8 owners and stockholders under the canal. These persons owned 949.85 acres of which 689 acres were irrigated. In 1906, the canal received water right (14) of 688 inches.

BOISE VALLEY IRRIGATION DITCH COMPANY CANAL & FARMERS UNION DITCH COMPANY CANAL

The Boise Valley Irrigation Ditch Company Canal originates on the north bank of the Boise river in the NE¼ SE¼ of Section 32 T4N R2E and runs northwesterly through Sections 32, 29, and 30 of T4N R2E and Sections 24, 23, and 14 in T4N R1E. This canal was constructed in the fall of 1865 and spring of 1866 by Seth Bixby, William A. C. Fite, and others. When built, 3000 inches of water under a 4-inch pressure was appropriated and diverted. On October 2, 1894, the Boise Valley Irrigation Ditch Co. transferred to the Farmers Union Ditch Co., Ltd., the right to enlarge, use and maintain the canal, but they retained their 3000 inches which the latter company was to deliver to stockholders. This was accomplished by inserting a perpetual right clause into the transfer deed. Representatives of Farmers Union had earlier, April, 1894, filed a water notice to appropriate and divert 15,000 inches of water under a 4-inch pressure for their own use.

The Farmers Union Ditch Company began the enlargement of a portion of the old ditch and construction of a new one. In the fall of 1894 they followed the old ditch for 1½ miles. At this point, the Boise Valley Irrigation Ditch company built a new headgate for delivery of water to their stockholder's lands. Also, at this junction, the new canal began.

A new headgate at the Boise River diversion point was started in the fall of 1894 and completed on March 23, 1895. When finished, it was 48 feet long, 24 feet wide, 20 feet in the clear and 14 feet high. The canal at first measured 10 feet in width on the bottom, 16 feet surface width and 3 feet in depth. It was later enlarged to 12 feet on the bottom, 16 feet surface width and 3 feet in depth. It was later enlarged to 12 feet on the bottom and 18 feet on the top. The original grade of 24 inches to the mile was later reduced to 20 inches. In the spring of 1895, water was diverted through the completed 6 miles of the canal. In the spring of 1898, the canal was completed to Big Gulch, north of Star. By 1899, it was completed to its entire length of 24 miles.

A partial breakdown of the costs expended on construction of the canal shows: $4,320.80 in 1894, $6,273.31 in 1895, $15,979.58 in 1896, and $16,879.98 in 1897. By the completion of the canal, $77,858. had been spent on its construction. The canal was built by the farmers and 500 shares of stock were issued.

In 1903, the canal maintained a capacity of 130 second feet, extended 24 miles in length with 59 miles in laterals, and could service an estimated 10,000 acres. However, at this time, only 4,639 acres of this total were actually irrigated. In addition to this acreage, the Boise Valley Irrigation Company ditch serviced 3,233.23 acres of which 2,728.88 acres were irrigated by the 27 stockholders. In 1906 the Boise Valley Irrigation Ditch Company received water right (15) of 2729 inches. The Farmers Union Ditch Co. received water right (126) of 5500 inches.

RIDENBAUGH-ROSSI MILL DITCH

This ditch commences on the south side of the Boise River in Section 24 T3N R2E and extends in a northwesterly direction through the northeasterly corner of Section 23, southwesterly corner of Section 14, thence to and past Rossi and Ridenbough flour mill, thence in a northerly direction to the Boise River. The ditch was built in 1865 by H. P. and J. C. Isaac. The Isaac brothers appropriated and diverted 385 second feet of water for irrigation of a section and a half of land, power for flour and saw mills, operation of a distillary, and the flotation of logs and lumber. When built, the ditch was 8 feet wide on the bottom, 20 feet wide at the top and 5 feet deep, with a uniform grade of 62 inches to the mile. The headgate measured 10 feet in width. The mill ditch, sometime after its completion was sold to the Grangers. The Grangers sold the ditch in 1878 to William B. Morris and William H. Ridenbaugh. By 1900, the ditch was owned by Ridenbaugh and Alexander Rossi, who utilized the ditch water in running of a flour mill, the flotation of logs, and electric light power. The water that was consumed for milling purposes ran back into the river just above the 9th Street bridge. In 1903, the ditch maintained a capacity of 159.5 second feet, extended 2½ miles in length with 2½ miles of laterals, and irrigated over 300 acres. In 1906, the mill ditch received water rights (16, 17 and 18) of 13,790 inches.

1. The diversion point of Meeves No. 1 ditch is located on the south bank of the Boise River in NW¼ SE¼ Section 24 T3N R2E. The ditch was built in 1868 by Nelson M. Armstrong, who appropriated and diverted 250 inches of water under a 4-inch pressure. By 1905, the ditch was owned by Peter Meeves. Water was utilized in irrigation of lands situated in Sections 14 and 23 T3N R2E. In 1906, Meeves No. 1 ditch received water right (53) of 90 inches.

2. The Bubb canal, also known as the Payne canal, originates on the south bank of the Boise river near where such bank is intersected by the line betwwen T3N R2E and T3N R3E. It runs in a westerly direction along the south bank of the river to a point in Section 24, T3N R2E about 80 rods

north from the south line of said Section, from whence it continues in a westerly direction about 2 miles.

Construction on the canal began on March 1, 1889. When completed 2 months later, the headgate measured 7 feet and the ditch was 6 feet on the bottom and 2 feet deep. No enlargements were made until the spring of 1906. At this time, a new headgate also had to be built, as the river had washed out the original one. The builders of the canal, all interested landowners, were M. E. Payne, William Bubb, M. E. Pratt, Charles Rein, and Jacob Rein. In filing their water notice, they claimed the right to appropriate and divert 20 cubic feet of water per second.

In 1903, the canal maintained a capacity of 26.4 second feet, measured 3 miles in length with 3 miles of laterals, and irrigated over 700 acres. In 1906, the canal received water rights (107, 108, 109, 110, 111, 112, 113, and 114) of 580 inches.

3. The diversion point of the Rein and Keogh ditch is on the south side of the Boise River about 75 years below the Ridenbaugh main headgate. The ditch extends just over one mile westerly where it empties back into the river. The ditch was built in 1894 by Charles Rein and A. J. Lamberger, who appropriated and diverted one cubic second foot of water. The water was removed from the ditch at a point 100 yards from the diversion headgate by means of a water wheel which measured 29 feet in diameter and carried 44 gallon buckets. From the water wheel, the water was transmitted to the above persons lands by means of a 100 yard flume. On October 7, 1898, Lamberger sold his land, Lot 7 Section 30 T3N R3E, to Jane Keogh. The ditch irrigated about 55 acres. The water wheel was also utilized by Rein and Koegh for power. In 1903, the ditch maintained a capacity of 35.5 second feet and measured 1¼ miles in length. In 1906 the ditch received water right (127) of 50 inches.

4. The Ridenbaugh canal begins on the south side of the Boise river 6 miles above Boise in Lot 6 Section 29 T3N R3E. It extands in a westerly direction for about 7 miles with a uniform width of 26 feet on the bottom and 40 feet at the surface of the water. It maintains a water depth of 6 feet and a grade of 2 1/10 feet to the mile. From the seven-mile point, it extends southerly and westerly across Five Mile Creek and the Oregon Short Line Railroad through Ada County and into Canyon County, south and west of Nampa, for a total distance of 53 miles. Nearly 80,000 acres were susceptible of irrigation under the system.

William B. Morris began construction on the canal in 1877. On August 7, 1877, he filed a notice of intent to appropriate and divert 500 inches of water under a 4 inch pressure. Seven miles of the canal were finished in time for the 1878 irrigation season. After the death of Morris in 1878, capital to extend and enlarge the canal became difficult to find. Before his death, he had expended about $60,000 for construction of the first 7 miles. The canal, following the demise of Morris, became the property of his widow, Lavinia T. Morris, and nephew, William H. Ridenbaugh. Without the necessary capitol, these two could do little but oversee the completed section. The canal, besides supplying irrigation water, in 1886 began furnishing water to operate a power plant. This 300 watt plant was built by

R. W. Purdom. It utilized 100 inches of water and operated as a source of electrical power for Boise. Beginning in 1888, the power plant increased its water usage from 100 inches to 3000 inches.

Lacking funds did not deter Ridenbaugh from filing an additional notice of intent to divert and appropriate 30,000 inches under a four-inch pressure on August 20, 1888. He had hopes of raising enough money to extend the canal, but was never able to raise the necessary capital. Consequently, he sold the canal and water rights to the Central Canal and Land Company on October 1, 1888. This company immediately began the task of enlarging and extending the canal. They expended $67,000 on the project but became disappointed with its return and sold the canal to Morrill, Jones, and Simmons on May 28, 1890, for $95,000.

By 1891, the system contained 100 miles of main canals with 153 miles of lateral ditches, and a chain of 10 lakes and reservoirs for storage completely covering the bench and south of Boise.

On April 1, 1894, Morrill, Jones and Simmons sold the enterprise to the Boise City Irrigation Land and Lumber Company for $123,149. In 1894, 10,600 acres, including 294 farm customers and 47 town customers, received water. By 1896, 15,200 acres were under cultivation; in 1898, 16,494 acres; in 1901, 22,770 acres; in 1903, 26,204 acres; and in 1905, 27,042 acres, which included 714 farm users and 127 town customers.

During 1903, the canal maintained a capacity of 426 second feet and the headgate had the ability to divert 60,000 inches under a 4-inch pressure. The canal extended 53 miles in length with 271 miles of laterals. The system had in force 23 large gates, 109 checkgates, 296 lateral taps, 280 weirs, 33 culverts, 2 flumes, each 500 feet long, and a number of smaller flumes. Altogether, around ½ million feet of lumber went into the woodwork.

From September 1893, to December 31, 1902, the company spent $93,303 on construction. Including a bill of $93,800 for interest on bonds, the estimated cost of the canal by 1903 was $405,252. The company charged water users $75 per second foot with the water flowing continuously during the irrigating season. On or about January 1, 1906, the canal system was sold to the Nampa and Meridian Irrigation District. Prior to the sale, the Boise City Irrigation and Land Company had become insolvent, which caused much concern among the users and necessitated the transfer. In 1906, the canal received water rights (67,106) of 17,052 inches.

CENTER POINT DITCH

Beginning on the south bank of the Boise River in Section 12 T4N R4W, this ditch extends northwesterly through a chain of sloughs. Irrigation of lands under this ditch in T4N R4W and T5N R4W originated in 1864 with water being diverted from Center Point Slough. Most farmers in the area initiated serious cultivation of lands in 1868. At this time they were raising oats, wheat, hay, and various varieties of grain. In 1870, the neighboring farmers organized among themselves. In 1873 they built brush dams across the Boise River to divert more water into the slough. A small headgate was first installed in 1877. In 1879 the headgate received an enlargement and a 200 yard ditch was built to run water from the diversion point to the slough in a more accomodating manner. Also in 1879 the first filing of a

water notice took place. The farmers then claimed the right to appropriate and divert 10,000 inches of water. A further enlargement of the ditch transpired in 1881. In effect, the Center Point ditch was actually a chain of connected sloughs that received supplemental river water. The chain of sloughs or ditchs produced available water for over 2000 acres. By 1903, Center Point ditch maintained a capacity of 18.7 second feet and extended 7 miles in length with 7 miles of laterals. In 1906, the ditch received water rights (19, 20, 21, 22, 23, 24, 25, 26, 27, 38, 43 and 73) of 1945 inches.

JOSEPH PERRAULT AND R. Z. JOHNSON

The Perrault ditch (Walling Ditch, Boise Valley Water Ditch) begins on the north bank of the Boise River at the west or lower side of Rocky Point in section 19 T3N R3E. It runs on the northeast side of the river to and through Boise and down the Boise valley.

In June 1864 Jerome B. Walling acquired the right to divert water under a 4 inch pressure and constructed a ditch to water his land. On December 21, 1864 William B. Hughes and Associates, Valisco Water Company, received a franchise from the territorial legislature to acquire and divert 5,000 inches under a four inch pressure. They planned to use the water for irrigation of agricultural lands, mining, milling, domestic, mechanical, fire, and sanitary purposes. Work on this project started around April 1, 1865, and was completed to Boise by May 1, 1966. Although the ditch was finished to Boise, it still needed a lot of work to insure a suitable carrying capacity. In the process of erecting this system, the Valisco Water Co., acquired the ditch and water rights of Walling. Following the initial phase of construction, work came to a standstill. Consequently, on October 22, 1868, Hughes and his associates reorganized as a joint stock company under the name of Boise Valley Water Company. The new company began with a capitalization of $10,000 divided into 400 shares, each having a par value of $25.00.

Considering the potential of the ditch and the good it could do for Boise, the company had difficulties in raising even $4,000 in subscriptions. Nevertheless, with promises of aid from Boise businessmen, the trustees let out $5,000 in contracts for work from the head of the canal to the cemetery. As the project progressed, the businessmen still seemed reluctant to purchase stock. Many stated they would buy when water was running in the ditch, but to the trustees such action would not mean much as they needed the funds sooner. Opposition lessened a great deal when the ditch reached the cemetery and water flowed through the ditch for the first time on March 27, 1869. The company annually enlarged and extended the ditch and in 1881 claimed, appropriated, and diverted 25,000 inches.

In July 1877, the canal began utilizing 10,000 inches for the operation of a sawmill and floatation of logs to the mill, which was located 2½ miles below the headgate.

On March 6, 1888, R. Z. Johnson became a 1/5 owner of the company. This purchase was followed by Joseph Perrault, who on June 6, 1888, bought the remaining 4/5 interest of the company from Jerome B. Walling.

By November 1888, the company filed notice to divert 50,000 inches. This application, however, was refused.

In 1890, Boise began utilizing 900 inches of water from the canal to flush the sewers of the town. Boise residents by then used more than 500 inches to water gardens and ornamental and shade trees. More than 2000 inches was appropriated for the domestic use of Boise homemakers.

In 1899, the ditch measured 6.3 miles in length with an average top of 10 feet and an average grade of 3 feet per mile. Two miles of the upper portion was used for flotation, log storage and power purposes in connection with the Goodwin Sawmill. From the sawmill to the end, a distance of 4.3 miles, the canal acted as a supply for irrigation, chiefly in Boise. It maintained a flow through the city of about 25 second feet. A few farms and gardens were watered below the city, but most of the water went toward the irrigation of town lots and flushing the city sewers. The water was furnished from April 1 to November 1 for the irrigation of lots, 50 x 120 feet, at the rate of $7.50 each, and for farm and garden lots at $4.00 an acre. In 1899, it irrigated a total of about 700 acres.

By 1903, the ditch maintained a capacity of 19.5 second feet and extended 7 miles in length with 30 miles of laterals.

In 1905 over 600 acres were utilizing the ditch and the company was processing the applications for an additional 300 acres. The company estimated that 3,500 town lots could be irrigated but of this total 800 actually received water. In addition, 900 inches were used to flush the 3 current sewers of Boise. The lateral that supplied Boise left the main ditch at the Goodwin Mill (Page and Mott Mill). It measured 10 feet on the bottom, 15 feet on top and carried 2,500 inches. The main ditch was 36½ feet wide, 4½ feet deep and carried 16,000 inches. The water from the ditch and sewers emptied into the river. In 1906, the canal received water rights (30, 66) of 12,500 inches.

DALBERG CANAL

The canal originates on the north bank of the Boise river in Section 17 T4N R1W and extends northwesterly. The canal was built in 1864. At that time, 150 inches of water under a 4 inch pressure was appropriated and diverted. In 1906, the canal received water right (31) of 130 inches.

BOISE CITY CANAL COMPANY

The Boise City Canal began on the north side of the Boise River in Section 24 T3N R2E. It ran in a northwesterly direction through Boise on Market Street (Grove St.) to the junction of said street with 9th Street and thence on down Boise Valley. The diversion point was located above the Walling Ranch at the Point of Rocks. The canal paralleled the Walling ditch for a short distance. It was situated between the Walling ditch and the river.

The Boise City Canal Co. received incorporation from the territorial legislature January 12, 1866. This act authorized the company to divert 6,000 inches. The franchise was to be in existence for 15 years.

Before authorization was granted by the legislature, the company had completed portions of the canal. In 1864 the canal ran to the site of the natatorium. In 1865 the ditch was built through Boise and watered the old

race track which afterwards became known as the Agricultural Park Association. In the spring of 1866 the ditch was extended on down Boise valley to Stuart's Gulch. The lower end underwent annual enlargements. The upper end measured 9 feet on the bottom and 3 to 4 feet in depth and maintained a grade of 1/4" to the rod.

On May 8, 1869, the company was re-incorporated.

In 1903, the canal maintained a capacity of 29.8 second feet, extended 6 miles in length with 8 miles of laterals, and irrigated over 1800 acres. In 1906, the company received water right (33) of 190 inches.

CALDWELL CANAL

The Caldwell (Highline, Strahorn, Franklin, Stapleton) canal begins on the south side of the Boise River in Section 18 T4N R1W.

The canal was originally constructed in the summer of 1865 by John Stapleton and Associates, when they acquired a water right to 3748 inches under a 4-inch pressure. The water originally serviced just a few of the area settlers who were mainly raising hay and grain. As first constructed, the canal carried 200-300 inches under a 4-inch pressure. The canal underwent yearly enlargements as more settlers moved into the area. On October 29, 1880, users of the system united and formed the Franklin Ditch Company. The 11 shareholders who formed this company had nearly 2,200 acres under cultivation. Following incorporation, the shareholders filed a water notice and set about to increase the dimensions of the canal. They enlarged the canal to 10 feet on the bottom and 3 feet in depth with a uniform grade of ¼ inch to the rod.

On June 24, 1884, the company transferred the canal and certain water rights to the Idaho and Oregon Land and Improvement Company. After closing of the deal, the latter company deeded back 1350 inches under a four-inch pressure to be delivered free of charge.

The Idaho and Oregon Land and Improvement Co., under the direction of Robert Strahorn, intended to utilize the canal water to service the recently founded town of Caldwell and surrounding area. This company, at the outset, filed a notice of intent to divert additional water and began the task of enlarging and extending the system. By March, 1887, the company had expended nearly $20,000 on improvements. The canal measured 20 miles in length, and was designed to service 12,000 acres. However, just over 2000 acres, at the time, were receiving water. The canal also supplied power and water to the town of Caldwell.

Unable to realize what they considered an adequate return for their investment, the Idaho and Oregon Land and Improvement Company sold the water rights and canal in the fall of 1890 to the Caldwell Real Estate and Water Company. The new company was guided by Howard Sebree, a prominent Caldwell businessman. Under the direction of Sebree, the canal underwent further improvements and revisions. Sebree hired W. D. Arnett, an experienced ditch builder, to supervise the new construction. Arnett abandoned the old headgate and located a new point of diversion one mile higher up the river in order to take water from the main channel. The new headgate was considered by many a marvel as it could measure out from 10 to 50,000 inches. In order to connect with the old works, one mile of new ditch had to be built. He thoroughly overhauled the old canal and installed an

upper levee across each fill which confined the water to one continuous channel with no dead water being left along the works. In all, the company expended about $10,000 on the project.

Mismanagement, oppressive water rates and the failure of the company to make further improvements which would have enabled the addition of new users, created a bad feeling toward the company by the settlers. The farmers responded by agitating for the creation of an irrigation district and the purchase of both the Caldwell and Phyllis canals. The Pioneer Irrigation District, an outgrowth of the farmer's desire to purchase the above water systems, was created in March of 1900. Problems arose over the purchase price and the district was unable to buy the canals until 1902. On June 23, 1902, they bough the Caldwell canal for $10,000. They had, previously, on April 13, 1902, purhcased the Phyllis canal for $75,000.

The new organization soon set out to make the operation of the canal more efficient. By 1903, the canal maintained a capacity of 75.5 second feet, measured 20 miles in length with 50 miles of laterals, and irrigated about 3000 acres. By the fall of 1903, the canal was 25 feet on the bottom, 35 feet on top, and 4 feet deep with a grade of 4/100 to the rod. In 1906, the canal received water rights (34, 77, 90) of 4805 inches.

CANYON COUNTY WATER COMPANY CANAL

The canal begins on the north bank of the Boise river at or near where the east line of Canyon County intersects said north bank. It extends on a northerly westerly course through sections 13, 12, 11, 10, 9, 8, 4, 5, 6 and 7 in T4N R2W and sections 12, 2 and 11 in T4N R3W. It terminates in section 11 T4N R3W.

The origin of the canal dates to 1866 when a Mr. Eaton constructed a small dam to divert water into the Canyon County irrigating slough. Most of the land along this slough was settled in 1866.

In 1903, the canal maintained a capacity of 125 second feet and measured about 12 miles in length with 17½ miles of laterals. It irrigated over 3000 acres. In 1906, the canal received water right (35) of 3790 inches.

HAAS CANAL

Begins on the south bank of the Boise River near the NE corner of Section 21 T5N R5W. It runs in a general westerly course through Sections 21, 20, 16, and 17, all in T5N R5W.

The canal was built around 1864 by a Mr. Haas and a Mr. Kane. In 1868, these men were raising grain and vegetables. J. M. Ross purchased the property of these men in 1874. He raised hay and grain. The canal had a capacity of 1000 inches, extended 2 miles in length, and irrigated 427 acres. By 1903, the property was owned by C. Ben Ross, the son of J. M. Ross and a future (1931-36) Governor of Idaho. In 1906, the canal received water right (39) of 427 inches.

THE MASON CREEK DITCH

Begins on the south bank of the Boise River near center NE¼ section 21 T4N R2W. It runs in a general westerly course through sections 21, 22, 18, and 19 T4N R2W and sections 24, 13, 14, and 11 T4N R3W. The headgate at the diversion point was 7 feet wide and 5 feet high. An additional headgate existed at the Ten Mile slough. The ditch was constructed in 1866 by Charley Potts and John Thomas. They diverted a quantity of water greater than 80 second feet. Lands in excess of 1850 acres received irrigation water from the ditch. In 1903, the ditch maintained a capacity of 37 second feet and extended 5 miles with 6 miles of laterals. The Mason Creek Ditch Company acted as a partnership company. In 1906, the ditch received water right (46) of 1860 inches.

PIONEER CANAL (DITCH)

Begins on the north bank of the Boise River near SE corner NE¼ NW¼ section 14 T4N R1W. It ran in a westerly direction through section 14, 15, 16, 17, and 8 and terminated in 18, all in T4N R1W. The construction of this ditch transpired in the fall of 1864 and spring of 1865. Its builders included B. F. Swalley, Loring A. Sevey, and John M. Ross. These men appropriated and diverted 2,000 inches of water under a 4 inch pressure. The stockholders of the Pioneer Canal Company owned 1,441.01 acres of which 1,285.95 acres received irrigation water. The ditch underwent an enlargement around 1869 and by 1870 the majority of land under the system was cultivated.

In 1903, the capacity of the ditch was 38.5 second feet and it measured 4 miles in length with 6 miles of laterals. In 1906, the ditch received water right (49) of 1286 inches.

COSTON DITCH

Begins on the south side of the Boise River in the SW¼ NW¼ section 33 T3N R3E. It was built in 1864 by I. N. Coston and F. C. Ghost to water their 270 acres. They appropriated and diverted 800 inches of water under a 4 inch pressure. The headgate measured 4 feet in width at the top, 4 feet on the bottom, 3½ feet in depth. The ditch had a fall of 2 inches to the rod. Annual enlargements took place until completion of the ditch in 1869. On September 20, 1869, Coston purchased the land and water rights of Ghost. In December 1903, Coston sold his property and water rights to the Barber Lumber Company. At the time of the sale, the ditch had a capacity of 18.3 second feet and extended one mile in length.

The Barber Lumber Company proposed to transfer the water rights to the north side of the river. To accomplish this they planned to build a headgate of 21 feet and divert the water by constructing a dam across the river 1½ miles below the diversion point of Coston ditch. They further envisioned the erection of a power house. They estimated the cost of the dam and power house at $80,000. To aid in diversion of the water, they placed an order for delivery of machinery, water wheels, and a pump. They estimated it would cost $25,000 to eventually divert the water. The water was to be utilized for irrigation and as a source of supply for the mill

workers and village at the dam site. These plans were initiated in 1904. In 1906 the ditch received water right (50) of 112 inches.

FARMERS CO-OPERATIVE DITCH CO. (SEBREE CANAL)

The Sebree Canal commences on the north side of the Boise River at the Caldwell Bridge in section 15 T4N R3W. It runs through sections 15, 16, 9, 8, and 6 T4N R3W, thence westerly through T5N R4W, thence westerly and northerly through T6N R6W.

In 1874, Peter Johnson acquired the right to divert and appropriate 1000 inches of water under a 4 inch pressure. The same year he built a ditch. On March 20, 1878, he filed notice of intent to divert 10,000 inches of water. With annual enlargements, the ditch by 1881 had the capacity to divert 5000 inches. On November 30, 1883, he filed another notice of intent, this time on 15,000 inches. He continued to enlarge the ditch until January 1, 1887, when he sold his water rights and ditch to Howard Sebree. At the time of the sale, Johnson's ditch was 5 feet wide or the bottom and 3 feet deep and irrigated about 600 acres. This irrigated acreage consisted mainly of pasture land. Before purchasing Johnson's water rights, Sebree had surveys done which showed the feasibility of recovering over 40,000 acres. With this in mind he bought the ditch and laid out plans for the construction of a canal 23 miles in length. With the exception of a small stretch at the beginning, the canal would basically be new. On January 12, 1887, he filed a notice of intent to divert 20,000 inches.

In February 1887, Sebree let out contracts for the construction of the first 4 miles. This work was to be finished by April 1, 1887, at a cost of $6,000. By March, 40 men and teams were at work. Initially, a wing dam was built to send water into the canal. At the diversion point, a finely structured headgate was installed. Guarded by immense masses of lava rock to make it floodproof, the headgate measured 22 x 22 feet with 4 gates. Each gate maintained a 4 x 5 foot opening.

Construction on the canal terminated on June 2, 1888, with the completion of the 20th mile. The canal at the beginning measured 30 feet wide on the bottom and 20 feet on top and the bottom of the headgate was 18 inches below the low water in the river. These dimensions did not vary until the 3rd mile. Between the 3rd and 12th mile, the bottom underwent a reduction to 15 feet. From the 13th to the 20th mile, the canal was further reduced to 12 feet on the bottom. Throughout, it averaged 6 feet in depth. By June of 1888, all the land along the canal had been taken up, and hourses and cultivated fields began appearing. The guarantee of water encouraged J. A. Goodhue to plant 5,000 fruit trees. Other property owners along the system started raising various varieties of grains and grasses.

In June 1887, Sebree took an active part in the organization of the Idaho Irrigating and Colonization Company. This company maintained its headquarters in Salt Lake City, Utah. Sebree became the first president and treasurer. The company listed a capital of $100,000 with 1000 shares valued at $100 each. The immediate purpose of this new organization was to purchase the then partly completed Sebree Canal. A working capital of 875 shares was to be held by the company for payments to Sebree and to W. L. Geary and Co. for the canal's completion.

Although organized in June, 1887, the Idaho Irrigating and Colonization Co. did not purchase the canal until January 16, 1889. The company rented water initially to the farmers at $1.00 per inch. This worked out to be the equivalent of 50¢ per acre. The farmers also had the option of paying $8.00 an inch for a perpetual water right, after which no costs would be incurred except a proportional share in the expense of keeping the canal in repair.

In 1893, the company ran into some difficulty when Z. S. Barnum sued them for damages. He based his complaint on the company's failure to deliver water onto his lands in 1890. Barnum won a judgment of nearly $600 and, for some unexplained reason, the company failed to comply. Consequently, on June 4, 1893, the canal was purchased by P. A. Devers for $1000 at a Sheriff's sale to satisfy the judgement. Obervers thought it unbelievable that the company failed to comply after spending $40,000 on its construction. The fact that the company enjoyed a good financial status with wealthy stockholders like Fred L. Eames of Boston and F. J. Keisel of Ogden, further mystified everyone. However, shortly thereafter, the company redeemed the canal through an arrangement with Devers.

After an enlargement in 1894, the canal was able to divert 12,000 inches under a four inch pressure. By 1900, the canal was 23 miles long with an average top width of 25 feet and an average grade of 1.6 feet per mile. It maintained a flow during the irrigating season of about 200 second feet and its cost was estimated at $75,000. In addition, 5,500 acres received water.

The farmers' growing dissatisfaction toward the operation and management of the canal resulted in the formation of the Farmers Cooperative Ditch Company in 1901. In the spring of 1902, this newly organized group purchased the canal and water rights from the Idaho Irrigation and Colonization Company. In 1903, the canal maintained a capacity of 347 second feet, extended 23 miles in length with 30 miles of laterals and irrigated over 8,500 acres. In 1906, the canal received water rights (60, 86, 105, and 126) of 8,175 inches.

MIDDLETON WATER COMPANY CANAL

Begins on the north bank of the Boise River in SW¼ SE¼ section 12 T4N R1W. It runs northwesterly through T4N R1W and across T4N R2W. On August 26, 1876, settlers of the area incorporated under the name of Middleton Canal Company. The purpose of the company centered on construction of a canal to supply water onto lands of stockholders. Initial work on the project began in the fall of 1877 and completion of the canal was achieved in the spring of 1878. In 1877, the company acquired the right to appropriate and divert 6,400 inches under a 4 inch pressure. On June 13, 1885, the company underwent a reorganization and became re-incorporated under the name of Middleton Water Company. Like its predecessor, the chief function of the company was the operation and distribution of the canal's water to the stockholders.

By 1900, the canal extended 15 miles in length and utilized an estimated flow during the irrigation season of 120 second feet. The cost of the works was placed at $20,000 with the ownership divided into shares. Each share entitled its holder to 10 inches of water to flow continuously during

the irrigating season and was measured to the user over a weir. The annual assessment amounted to 20 cents per acre and could be worked out at $2.00 a day per man and $4 a day per man and a team. The system at that time irrigated 3,300 acres.

In 1903, the canal maintained a capacity of 593 second feet and measured 15 miles in length with 12 miles of laterals. Waters of the company's ditches which united with the Middleton Mill Ditch were divided equally.

The stockholders of the company in 1905 owned 6963.52 acres under the system. Out of this total, 5,704.5 acres received irrigation water. In 1906, the canal received water right (65) of 5,704 inches.

PARMA CANAL

Begins on the north bank of the Boise River in SE¼ section 16 T5N R5W. Extends in a northwesterly direction through T5N R5W for about 1 mile.

The canal was built in 1877 by R. H. and Smith Stockton to water their lands. At time of construction, they appropriated and diverted 440 inches under a 4 inch pressure. In 1878, they were irrigating 440 acres. As more settlers moved into the vicinity, the ditch underwent enlargement and extensions and became known as the Parma Canal. In 1906, the canal received water rights (71, 74 and 125) of 396 inches.

NEW DRY CREEK DITCH COMPANY

The Dry Creek Canal begins on the north bank of the Boise River in SW¼ SE¼ section 24 T4N R1E. It extends in a northwesterly direction through sections 24, 23, 14, 15, 10, 9, 8, 7, 6 T4N R1E and thence across sections 1 & 2 T4N R1W.

The canal was surveyed in the spring of 1879 by Joe E. Wood, Alexander Rossi, and Mr. Maxon. Construction of the system began in March, 1879. The promoters and builders, John Hailey, Thomas Mann, John Jones Smith, and John Patterson, completed the canal by the 1st of June.

Articles of incorporation for the new Dry Creek Ditch Co. Ltd. were filed on March 8, 1879. At this time, the company filed notice of intent to appropriate and divert 2000 inches under a 4 inch pressure. When completed the canal was 10 feet wide, 2 feet deep, and 4 miles long and irrigated 1,425 acres. In 1886, the canal was enlarged to 12 feet on the bottom, 18 feet at the top and 3 feet in depth. It was also lengthened 8 miles. After enlargement, capacity of the canal became 2,337 inches. Another enlargement in 1888 increased the capacity to 3,546 inches. By 1900, the canal extended 13 miles in length with 11 miles of laterals and had cost an estimated $10,000. It maintained enough water to irrigate the 3000 acres which lay under the system. In 1902, the canal transmitted water to 2,433 cultivated acres. By 1905 2,720 acres were under cultivation. In 1906, the canal received water rights (72, 83 and 97) of 2720 inches.

EUREKA DITCH COMPANY

Eureka Canal #2 begins on the south bank of the Boise River in SW corner section 12 T4N R4W. It extends on a general westerly course through sections 12, 11, 10, 9, 3, 4, 5 and 6 T4N R4W and thence across sections 36, 35, 34, 33, 28, 29, 20, 19, and 18 T5N R5W. The canal was constructed in 1883 with a 10 foot bottom. The headgate measured 8 feet on the top, 8 feet on the bottom, and 6½ feet in depth. Construction of the canal was accomplished by individuals owning property serviced by it.

Some individuals, like John and Julia Mammon and Charles Allen, had, prior to 1883, built private ditches. These persons later became involved in the Eureka Ditch Company but retained their water rights.

By 1903, the canal maintained a capacity of 38.6 second feet, extended 9 miles in length with 10 miles of laterals, and irrigated over 1500 acres. In 1906, the canal received water rights (41, 68, 69, 70 and 89) of 1993 inches.

SETTLERS CANAL (LEMP CANAL)

The Settlers Canal begins on the southside of the Boise river at a point on the head of Government Hay Reservation in Section 9 T3N R2E. The original locators of this canal and water right were Christian R. Purdum, Aldolphus Purdum, and William H. Smith. They made their filing on October 17, 1884, and claimed 50,000 inches of water under a 4-inch pressure. The irrigation water applied for was to be utilized in the watering of lands in T3N R2E, T4N R2E, T4N R1E, T4N R1W, T4N R2W, T3N R1W, T3N R2W, and T3N R1E. Settlers of the area began construction of the canal in the fall of 1884. However, according to one observer, the farmers showed more interest in religious activities than in work. William H. Smith, one of the original promoters, was a Methodist minister who in 1885 joined the Seventh Day Adventist church. Apparently this church enjoyed great popularity at the time in its appeal to the farmers. With the farmers spending so much time on church activities, no work to speak of was done on the canal. In 1887, John Lemp, a Boise businessman, became interested in the proposed water system and took over the job of sseing it through. Lemp started work on the canal in 1887 and by 1891 water flowed through the canal. In 1899, the canal was 7 miles long with some laterals measuring 7 miles. It had a top width of 18 feet, a grade of 2 feet per mile, and an average flow of 95 second feet. By 1900 about 5,400 acres were irrigated.

The farmers under the canal in 1896 organized an irrigation district with a view toward acquiring and enlarging the water system. Purchase of the canal was accomplished in September 1901 when John Lemp sold to the Settlers Canal Co., Ltd. Lemp, by this time had expended over $100,000 on the construction of the canal and its laterals.

The new company enlarged and extended the canal in the winter of 1901 and spring of 1902 at a cost of about $45,000. In 1902, the canal carried 15,000 inches of water. A further enlargement took place in 1903 and in 1904 the canal was cleaned out to a width of 16 feet through to the cut at the Belfry school about 7 miles from the division point. In 1904, the company installed a concrete headgate and in 1905 further cleaned out the canal. By 1905, the canal measured 20 miles in length with 95½ miles

of laterals. Over 32,000 acres lay under the system as covered by original notice of location. Out of this total, 7,000 acres were irrigated in 1902, close to 11,000 acres in 1903, a little over 13,000 acres in 1904, and 14,072 acres in 1905. In 1903 the shareholders of the company had 5,722 acres under irrigation. In addition, 8,350 acres were watered on a rental basis. 8,617½ inches of water was delivered to these lands. Each share of stock in the company equaled 1/2 inch of water. In 1906, the canal received water rights (92 and 122) of 8,625 inches.

DAVIS CANAL

1. The Davis canal originated on the south side of the Boise River in the NW¼ Section 9 of T3N R2E and extended 52 miles in a westerly direction to and upon fractional parts of Sections 5 and 6 and 31 and 32 in T3N R2E. The canal was located and constructed by George R. Breidenstein in 1886. Breidenstein built the canal 10 feet wide on the bottom, 12 feet wide on top, and 2 feet deep with a uniform grade of about one inch to the rod. The headgate measured 22 feet in width and 18 feet in depth. Its capacity when built ran near 220 second feet. Beginning in 1888, Thomas Davis began buying the land under this canal. By 1905, he owned all the land serviced by this canal, a total of 650 acres. Of this, all but 50 acres were irrigated. In 1903, the State Engineer listed the canal's capacity at 136 second feet. Two miles of lateral ditches connected to the main canal. In 1906, the Davis canal received water right (94) of 670 inches.

2. The Davis private ditch utilizes the headgate of the Davis canal. Thomas Davis built the ditch in 1890 to irrigate 25 acres located on part of the old Government Hay Reserve. The ditch was 1/2 mile long. Nearly 700 feet of this distance utilized a flume to aid in the diversion. The remainder of the ditch measured 2 feet on the bottom and 18 inches in depth. The capacity of the ditch was 2 second feet. In 1906, the Davis private ditch received water right (119) of 27 inches.

BALLENTYNE CANAL

Begins on the north bank of the Boise River near center NW¼ SW¼ section 15 T4N R13. It extends in a westerly direction about 5½ miles. In 1887, James Ballentyne purchased around 800 acres of improved land. His plans called for the construction of a ditch to supply water onto this property and subdividing the land into smaller tracts for sale. During 1887 he acquired the necessary water rights. In the spring of 1888, he hired D. O. Stevenson to stake out and supervise construction of a canal. When completed in 1888, the canal was 6 feet on the bottom with a slope of one to one and carried about 600 inches. By 1900, the canal had been enlarged to 10 feet on the bottom and was estimated to have cost $8,000. Ballentyne had very little trouble in selling portions of land under the canal and soon had all of his original tract sold.

In 1903, the canal maintained a capacity of 30 second feet, extended 5½ miles in length with 4 miles of laterals, and irrigated over 600 acres. In 1906, the canal received water rights (98, 99, 100, 101, 102 and 103) of

538 inches.

PHYLLIS CANAL

The Phyllis Canal begins on the south bank of the Boise River about 12 miles below Boise opposite the lower part of Eagle Island in Section 24 T4N R1W. It runs in a generally westerly direction through T4N R1W, T3N R1W, T3N R2W, T3N R3W, T4N R3W, T4N R4W, T4N R5W, T5N R5W, T5N R6W and T4N R6W to Idaho's western boundary line.

In the fall of 1882, John H. Burns, a New York capitalist, arrived in Boise. On November 13, 1882, he filed 2 claims to appropriate and divert 150,000 inches for agricultural, mining, and milling purposes. He acted on behalf of the Idaho Mining and Irrigation Company. This company foresaw the building of two canals. These canals were to aid in the recovery of fine gold from the Snake river and at the same time furnish the company with capital by the rental of water to settlers along the routes of the canals. The main canal (New York) was to originate above Boise and the other (Phyllis) was to be a western distributing lateral. A. D. Foote and John Sherman arrived in Boise from New York in September, 1883, to oversee the project. On October 26, 1883, Foote filed on an additional 75,000 inches. Between 1883 and 1891 construction on the main canal was carried on intermittently. Concentrating mainly on problems associated with building the New York canal, the company shelved the western lateral until a later date. In the interim, J. M. Stewart and James A. McGee, agents of a Philadelphia Company, arrived in Boise in 1885. Their interest focused on the undeveloped western project. On November 6, 1885, they incorporated the Phyllis Canal Company for agricultural and mining purposes. The canal was named for the daughter of McGee. At first they encountered problems in securing a right of way, but newspaper and public resentment aided in obtaining the necessary easements. Work on the Phyllis canal began in the Spring of 1886. However, money for the project soon ran out and the canal was sold to the Idaho Mining and Irrigation Company on October 14, 1888. The new owners attempted to utilize local labor but work progressed so slowly that resorted in early 1890 to hiring an outside firm, W. C. Bradbury Company to complete the project. This Denver-based company began work in February of 1890. By September of 1890, water ran in the Phyllis canal as far as Nampa. In 1891, all 35 miles of the canal was completed. When finished, $135,000 had been expended on construction. Just prior to completion, the Idaho Mining and Irrigation Company failed, in March of 1891, due to a lack of funds. The Bradbury Company reacted by obtaining the legal services of W. E. Borah and in July of 1891 filed a mechanic's lien against the company for $208,000. On February 8, 1894, Bradbury purchased both the Phyllis and New York canals at an Ada County sheriff's sale for $184,000. Owning canals was not exactly Bradbury's forte, but he planned to retain the two systems and run them in as economical and profitable a manner as possible. Bradbury assigned John D. Bloomfield to act as a manager and water master for the Phyllis canal. Bloomfield retained this post until the canal was sold in 1902.

In 1895, the canal supplied water to 1,261 acres; 1896, 1,716 acres; 1897, 2,393 acres; 1898, 2,735.5 acres; 1899, 3,058.5 acres; 1900, 3,737 acres, and in 1901, 4,695 acres. The canal measured 12 feet on the

bottom, 22 feet at the top and 5 feet in depth.

The Bradbury Company levied a charge of $10 per acre for a water right and $1.50 an acre for water rental. To the water users these charges seemed unreasonably high. Even at these high rates, the canal did not return the profits expected by Bradbury.

The canal was designed to service in excess of 30,000 acres, but by 1901 only supplied water to just over 4,500 acres. Following the original construction, Bradbury appeared somewhat reluctant to improve the system and add new customers. This, coupled with the high rates, did not set too well with the settlers under the canal. The farmers retaliated against what they considered unfair management and formed the Pioneer Irrigation district. On April 13, 1902, this newly organized group purchased the canal from Bradbury for $75,000. The Pioneer Irrigation District began an immediate enlargement of the canal in an effort to bring more acres under cultivation. In 1903, the canal maintained a capacity of 550 second feet, extended 37 miles in length with 155 miles of laterals and irrigated 8,501.5 acres.

After completion of the enlargements in 1904, the canal measured 27 feet on the bottom, 40½ feet on the top, and 5 feet in depth and utilized a grade of 3/100 to 100 feet. In 1906, the canal received water rights (117, 135) of 12,817 inches.

CANYON DITCH COMPANY

The Campbell canal begins on the north side of the Boise River at NE corner NE¼ Section 16 T4N R3W, 110 feet below the Sebree canal headgate. It parallels the Sebree canal, extending in a westerly direction for 2 miles.

D. D. Campbell, along with Fred Sundman, Eric Falquist, and Ed and Douglas Campbell, began construction on the canal on October 26, 1901. They finished the project just before the end of the year. Their headgate measured 7 feet on the bottom and 8 feet on the top. The canal supplied water onto 390 acres in 1902.

The canal utilized the water rights of both D. D. Campbell and Fred Sundman. The latter, in 1900, constructed a private ditch for which he had appropriated and diverted 500 inches. The following year, Campbell filed a notice to appropriate and divert 277 inches. In 1901, Sundman abandoned his ditch and combined his water rights with those of Campbell. In the fall of 1902, William and Henry Baker and Ross Dement were given an interest in the canal provided they enlarge it to 7 feet on the bottom and build up the headgate. They met these stipulations with completion of the enlargement in the spring of 1903. In 1903, the canal maintained a capacity of 20 second feet, extended 3 miles in length and irrigated over 600 acres.

The Canyon Ditch Co., Ltd., was incorporated January 5, 1904. It began with a capital stock of $8500 divided into 850 shares with a par value of $10 per share. All the available stock was subscribed to by members of the company. D. D. Campbell, William E. Baker, William Messler, Fred Sundman, and Eric Fallquist were installed as the company's first directors. Initially, the company consisted of 8 shareholders. In 1906, the canal received water rights (132 and 134) of 777 inches.

APPENDIX III

APPENDIX 3

ANNEXATIONS, AREA, POPULATION

BOISE 1866-1973

REF #	DATE	AUTHORITY / M.R.	SQ. MI. ANNEX.	SQ. MI. TOT.	ACRES	POP.
1	Jan. 11, 1866	State Legis.	.676		432.64	
	Area Jan. 1, 1870			.676		955
	Area Jan. 1, 1880			.676		1,899
2	Jan. 30, 1885	State Legis.	1.472		942.08	
	Area Jan. 1, 1890			2.148	1374.72	2,311
	1899	State Legis.	.051		32.64	
	Area Jan. 1, 1900			2.199	1407.36	5,957
4	May 11, 1903	State Legis.	.846		541.44	
	Area Jan. 1, 1910			3.045	1948.80	17,358
5	March 13, 1912	State Legis.	.864		552.96	
6	April 17, 1913	Ord. 1065	1.055		675.20	
	Area Jan. 1, 1920			4.964	3176.96	21,393
	Jan. 2, 1920	Ord. 1282 (Corrected by Ord. 1381)				
7	Oct. 17, 1922	Ord. 1381	.496		317.44	
8	Dec. 18, 1923	Ord. 1400	.054		34.56	
	April 12, 1924	Ord. 1405 (Corrected by Ord. 1439)				
9	Nov. 24, 1925	Ord. 1439	.027		17.28	
	Area Jan. 1, 1930			5.541	3546.24	21,544
10	Oct. 19, 1936	Ord. 1701	.005		3.20	
	Area Jan. 1, 1940			5.546	3549.44	26,130
11	Feb. 10, 1947	Res. 916	.0282		18.05	
12	Oct. 20, 1947	Res. 929	.1594		102.02	
	Area Jan. 1, 1948			5.734	3669.76	
13	Feb. 28, 1848	Res. 938	.085		54.40	
14	Aug. 9, 1948	Res. 954 & 956	.0374		23.94	
15	Aug. 15, 1948	Res. 955 & 957	.0092		5.89	
16	Nov. 12, 1948	Res. 971	.6788		434.43	
	Area Jan. 1, 1949			6.544	4188.16	

Ch. 21 1949 Session Laws Lists City Boundary. (Charter City)

REF #	DATE	AUTHORITY / M.R.	SQ. MI. ANNEX.	SQ. MI. TOT.	ACRES	POP.
17	Jan. 3, 1949	Res. 974	.0262		16.77	
18	Jan. 10, 1949	Res. 975	.1472		94.21	
19	Jan. 10, 1949	Res. 976	.0017		1.09	
20	March 14, 1949	Ord. 2015	.0023		1.47	
21	April 11, 1949	Ord. 2019	.1704		109.06	
22	May 6, 1949	Ord. 2021	.0071		4.54	
23	May 6, 1949	Ord. 2022	.0053		3.34	
24	May 23, 1949	Ord. 2026	.0002		.13	
25	July 5, 1949	Ord. 2040	.0013		.83	
26	Sept. 19, 1949	Ord. 2050	.026		16.64	
27	Sept. 26, 1949	Ord. 2051	.0380		24.32	
28	Sept. 26, 1949	Ord. 2052	.0057		3.56	
29	Oct. 31, 1949	Ord. 2054	.0041		2.62	
30	Oct. 21, 1949	Ord. 2059	.0324		20.74	
31	Nov. 14, 1949	Ord. 2060	.0170		10.88	
	Area Jan. 1, 1950			7.043	4507.52	34,393 census
32	Feb. 14, 1950	Ord. 2067	.0051		3.26	
33	Feb. 14, 1950	Ord. 2068	.0084		5.38	
34	Feb. 14, 1950	Ord. 2069	.0016		1.02	
35	June 12, 1950	Ord. 2080	.0059		3.78	
36	June 26, 1950	Ord. 2083	.0005		.32	
37	July 5, 1950	Ord. 2086	.0846		54.14	
38	July 5, 1950	Ord. 2087	.0003		.19	
39	Oct. 2, 1950	Ord. 2097	.0009		.58	
40	Oct. 2, 1950	Ord. 2098	.0013		.83	
41	Oct. 9, 1950	Ord. 2102	.0037		2.37	
42	Oct. 9, 1950	Ord. 2104	.0019		1.22	
43	Dec. 11, 1950	Ord. 2112	.0055		3.52	
44	Dec. 11, 1950	Ord. 2113	.0055		3.52	
45	Dec. 26, 1950	Ord. 2116	.0014		.90	
46	Dec. 26, 1950	Ord. 2117	.0003		.19	
47	Dec. 26, 1950	Ord. 2118	.0037		2.37	

REF #	DATE	AUTHORITY / M.R.	SQ. MI. ANNEX.	SQ. MI. TOT.	ACRES	POP.
	Area Jan. 1, 1951			7.173	4590.72	
48	April 20, 1951	Ord. 2127	.0010		.64	
49	April 20, 1951	Ord. 2128	.0040		2.56	
50	April 14, 1951	Ord. 2131	.0098		6.27	
51	June 11, 1951	Ord. 2134	.0006		.38	
52	Sept. 10, 1951	Ord. 2149	.0008		.51	
53	Oct. 15, 1951	Ord. 2152	.0027		1.73	
54	Oct. 22, 1951	Ord. 2154	.0084		5.38	
	Area Jan. 1, 1952			7.201	4608.64	
55	May 21, 1952	Ord. 2168	.0027		1.73	
56	Nov. 3, 1952	Ord. 2185-A	.0169		10.82	
	Area Jan. 1, 1953			7.221	4621.44	
57	Feb. 6, 1953	Ord. 2186	.0002		.13	
58	Feb. 6, 1953	Ord. 2187	.0002		.13	
59	March 30, 1953	Ord. 2192	2.8100		1798.40	
60	Dec. 28, 1953	Ord. 2226	.0028		1.79	
	Area Jan. 1, 1954			10.034	6421.76	
61	May 10, 1954	Ord. 2236	.0423		27.07	
62	Nov. 15, 1954	Ord. 2248	.1221		78.14	
	Area Jan. 1, 1955			10.198	6526.72	
63	Jan. 17, 1955	Ord. 2250	.0298		19.07	
64	Feb. 28, 1955	Ord. 2253	.0014		.90	
65	April 18, 1955	Ord. 2256-A	.0020		1.28	
66	June 20, 1955	Ord. 2263	.0098		6.27	
67	Aug. 29, 1955	Ord. 2269	.0011		.70	
68	Sept. 26, 1955	Ord. 2270	.0004		.26	
69	Sept. 26, 1955	Ord. 2271	.0006		.38	
	Area Jan. 1, 1956			10.243	6555.52	
70	Sept. 10, 1956	Ord. 2306	.0002		.13	
71	Dec. 3, 1956	Ord. 2312	.0322		20.61	
	1957	None				
	Area Jan. 1, 1957			10.276	6576.64	34,450
	Area Jan. 1, 1958			10.276	6576.64	

REF #	DATE	AUTHORITY / M.R.	SQ. MI. ANNEX.	SQ. MI. TOT.	ACRES	POP.
72	Feb. 7, 1958	2360	.0002		.13	
73	Sept. 1, 1958	2378	.0009		.58	
74	Oct. 24, 1958	2386	.0334		21.38	
75	Oct. 31, 1958	2388	.0002		.13	
	Area Jan. 1, 1959			10.311	6599.04	
76	June 6, 1959	2407	.0096		6.14	
77	June 19, 1959	2409	.25		160.00	
78	Aug. 1959	2419	.187		119.68	
79	Oct. 1959	2425	.00058		.37	
80	Nov. 27, 1959	2430	.00181		1.16	
	Area Jan. 1, 1960			10.760	6886.40	34,481 census
81	Jan. 1, 1960	2436	.000642		.41	
82	July 1960	2457	.01560		9.98	
83	Aug. 1960	2466	.000673		.43	
	Area Jan. 1, 1961			10.777	6897.28	36,162
84	Mar. 1961	2484	.000838		.54	
85	May 25, 1961	2490	.000274		.18	
86	Oct. 1961	2511	.17		108.80	
87	Oct. 16, 1961	2512	.066		42.24	
88	Oct. 16, 1961	2514	.061		39.04	
89	Dec. 18, 1961	2530	.12		76.80	
	September 1, 1961, Boise went to City of first class and annexation laws were greatly eased.					
	Area Jan. 1, 1962			11.195	7164.80	50,985
90	March 12, 1962	2537	.004		2.56	
91	June 6, 1962	2554	.019		12.16	
92	Sept. 4, 1962	2563	.260		166.40	
93	Sept. 4, 1962	2564	.236		151.04	
94	Oct. 17, 1962	2573	.716		458.24	
95	Dec. 3, 1962	2584	2.74		1753.60	
96	Dec. 17, 1962	2592	.033		21.12	

REF#	DATE	AUTHORITY / M.R.	SQ. MI. ANNEX.	SQ. MI. TOT.	ACRES	POP.
	Area Jan. 1, 1963			15.203	9729.92	55,909 51,977 official
97	Dec. 24, 1963	2635				
98	Dec. 24, 1963	2636	1.625		1040.00	
99	Dec. 31, 1963	2637				
100	Dec. 31, 1963	2638				
	Area Jan. 1, 1964			16.828	10769.92	67,592 63,518 official
101	March 17, 1964	2647	.056		35.84	
102	June 10, 1964	2656	.045		28.80	
103	Dec. 23, 1964	2680	.03		19.20	
104	Dec. 30, 1964	2682	.49		313.60	
105	Dec. 30, 1964	2683	.12		76.80	
106	Dec. 30, 1964	2684	.52		332.80	
107	Dec. 30, 1964	2685	.85		544.00	
108	Dec. 30, 1964	2686	.83		531.20	
109	Dec. 30, 1964	2687	.51		326.40	
110	Dec. 30, 1964	2688	.37		236.80	
	Area Jan. 1, 1965			20.649	13215.36	69,820
111	July 23, 1965	2706	.125		80.00	
112	Dec. 6, 1965	2721	.009		5.76	
113	Dec. 20, 1965	2722	.01		6.40	
114	Dec. 20, 1965	2723	.029		18.56	
115	Dec. 20, 1965	2724	.08		51.20	
116	Dec. 20, 1965	2725	.04		25.60	
117	Dec. 20, 1965	2726	.05		32.00	
118	Dec. 20, 1965	2727	.003		1.92	
119	Dec. 20, 1965	2728	.086		55.04	
120	Dec. 20, 1965	2729	.218		139.52	
121	Dec. 20, 1965	2730	.16		102.40	
122	Dec. 20, 1965	2731	.008		5.12	
123	Dec. 27, 1965	2733	.886		567.04	

REF #	DATE	AUTHORITY / M.R.	SQ. MI. ANNEX.	SQ. MI. TOT.	ACRES	POP.
124	Dec. 27, 1965	2734	.004		2.56	
125	Dec. 27, 1965	2735	.094		60.16	
126	Dec. 27, 1965	2737	.39		249.60	
	Area Jan. 1, 1966			22.891	14650.24	72,090
127	Jan. 31, 1966	2741	.120		76.80	
128	April 27, 1966	2753	.125		80.00	
129	June 1, 1966	2755	+.000		00.00	
130	June 29, 1966	Court Order De-Annex	-.016		-10.24	
			-.009		- 5.76	
131	July 28, 1966	2762	+.084		53.76	
132	Dec. 19, 1966	2773	.036		23.04	
133	Dec. 19, 1966	2774	.011		7.04	
134	Dec. 19, 1966	2775	.008		5.12	
135	Dec. 19, 1966	2776	.004		2.56	
136	Dec. 19, 1966	2777	.001		.64	
137	Dec. 19, 1966	2778	.117		74.88	
138	Dec. 19, 1966	2779	.010		6.40	
139	Dec. 19, 1966	2780	.034		21.76	
140	Dec. 19, 1966	2781	.001		.64	
	Area Jan. 1, 1967			23.367	14954.88	72,212
141	May 22, 1967	2822	0		0	
142	Dec. 28, 1967	2851	0.010		6.40	
143	Dec. 28, 1967	2852	0.017		10.88	
	Area Jan. 1, 1968			23.394	14972.16	72,246
144	May 20, 1968	2872	+0.025		16.00	
145	Oct. 21, 1968	2904	-0.176		-112.64)	
146	Nov. 4, 1968	2909	- .058		- 37.12)	-149.76
	Area Jan. 1, 1969			23.185	14838.4	72,395
147	Jan. 20, 1969	2921	.006		3.84	
148	Aug. 18, 1969	2984	.013		8.32	
149	Oct. 6, 1969	2990	.468		299.52	
	Area Jan. 1, 1970			23.672	15150.00	74,990 census

REF #	DATE	AUTHORITY / M.R.	SQ. MI. ANNEX.	SQ. MI. TOT.	ACRES	POP.
150	April 6, 1970	3042	.017		10.88	
151	Nov. 23, 1970	3112	.003		1.92	
			.001		.64	
			.009		5.76	
	Area Jan. 1, 1971			23.702	15169.28	77,574
152	Dec. 13, 1971	3267	.504		322.56	
153	Dec. 13, 1971	3269	.130		83.20	
154	Dec. 13, 1971	3271	.047		30.08	
			.041		26.24	
			.080		51.20	
			.117		74.88	
155	Dec. 13, 1971	3273	.410		262.40	
156	Dec. 13, 1971	3275	.084		53.76	
	Area Jan. 1, 1972			25.115	16073.60	82,704
157	March 6, 1972	3300	.007		4.48	
158	March 27, 1972	3304	.245		156.80	
	Area verified by computation June 1, 1972					
			25.895		16572.80	
159	Oct. 16, 1972	3352	.115		73.60	
			.038		24.32	
160	Oct. 16, 1972	3354	.015		9.60	
161	Oct. 16, 1972	3356	.036		23.04	
		3358 Corrected by Ord. 3378				
162	Oct. 16, 1972	3364	.034		21.76	
163	Dec. 26, 1972	3376	.010		6.40	
164	Dec. 26, 1972	3378	.017		10.88	
			.477		305.28	
165	Dec. 26, 1972	3380	.642		410.88	
	Area Jan. 1, 1973			27.279	17458.56	84,300
166	Jan 2, 1973	3360	.233		149.12	
			27.512		17607.68	

APPENDIX IV

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