

CHANGES IN DESCHUTES COUNTY IRRIGATION AGRICULTURE

SINCE 1950

by

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A RESEARCH PAPER

submitted to

THE DEPARTMENT OF GEOGRAPHY

in partial fulfillment of  
the requirements for the  
degree of

MASTER OF SCIENCE

June 1975

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## CHANGES IN DESCHUTES COUNTY IRRIGATION AGRICULTURE SINCE 1950

ABSTRACT: Since the early 1950's, irrigation agriculture in Deschutes County has evolved from a general diversified commercial farming structure, to one almost completely dominated by part-time hobby farms. Interrelated physical, economic, and social forces have been catalyst to change in the local agricultural systems. The resultant patterns may jeopardize the future quality, quantity, and availability of resources being used for agriculture of all types within the area.

### OVERVIEW OF PROBLEM

Since the completion of the irrigation project era, during the early 1950's, readjustments in patterns of land and water use have occurred throughout Central Oregon. The readjustments have been most dramatic in the Deschutes County area, primarily because of the physical limitations, and changes in the economic and social environment of the area.

Basic issues of land and water resources allocation and use, at the present time and for the future, are involved in the changes in agricultural patterns because agriculture is the primary user of those resources within the study area. With increasing scarcity of quality land and water in the Western States, and with new demands constantly being made for their use, it is necessary to know the trends, needs, and structures of local agricultural systems, to facilitate comprehensive planning for future resource allocation, for all uses.

It is this writer's purpose, in this paper, to analyze the trends and changes in irrigation agriculture in Deschutes County since 1950. I will discuss the present agricultural patterns in the study area that have evolved as a result of the interactions of the physical limitations with dynamic economic and social elements that have affected land and water use. I will also assess the problems and potentials for conservation of water and soil that have emerged as consequences to the evolutionary processes.

#### Study Methodology

Four types of research, each basic to the Geographer's method and point of view, have been incorporated in this study of the evolution and unique patterns of irrigation agriculture in Deschutes County. The Geographic Systems concept, emphasizing relatedness of environmental elements, was the unifying and guiding principle throughout the various phases of the study.

Collection, review, and plotting of relevant agricultural-, and rural-related data were undertaken, using four primary data sources. Each source reported for different data bases, or time periods, resulting in varying degrees of reliability, but sufficient trends resulted to warrant use of the method. The four sources are: (1) U. S. Bureau of Census, Census of Population, 1950, 1960, 1970 for Deschutes County; (2) U. S. Bureau of Census, Census of Agriculture, 1950, 1954, 1959, 1964, 1969 for Deschutes County; (3) U. S. Bureau of Reclamation, Federal Reclamation Projects, Annual Crop Report and Related Data, 1955-1973, for Central Oregon Irrigation District, Arnold Irrigation District, and Crescent Lake

Dam Project (Tumalo Irrigation District); and (4) Cooperative Extension Service, Oregon State University, Annual Revised Crop Report Estimates, 1959-1973, for Deschutes County.

Collection, review, and graphic representation of spatial and spatial-temporal phenomena were then completed, using as primary sources: (1) Oregon State Water Resources Board, Oregon's Long-Range Requirements for Water, General Soil Map Report with Irrigable Areas, Deschutes Drainage Basin, 1969; (2) U. S. Bureau of Reclamation, Deschutes Project, Potentials for Expansion and Improvement of Water Supplies, July, 1972; (3) Metsker's Atlas of Deschutes County, 1944 and 1972 editions; and (4) Deschutes County Zoning Ordinance, No. PL-5, December, 1971.

I attempted to map the extent and distribution of irrigated lands within the study area, using high-flight infrared imagery (U-2), but was unable to complete this stage, due to incomplete photographic coverage of the area.

I also carried out unstructured personal interviews with public officials and residents during several trips to the study area. The unstructured nature of the interviews produced very satisfactory results, by allowing more openness and frankness between myself and the people I interviewed. The method did, however, consume more time than would perhaps a questionnaire or a structured question-answer direct survey. I also observed patterns of land use and agricultural enterprise, and their resultant landscapes while travelling throughout the area. My own experience in agriculture, and in the study area from time to time, where I have seen many of the changes actually take place, have given me

an added, valuable perspective on agricultural dynamics and problems in the Central Oregon region.

The fourth research method was an ongoing literature review, whereby I explored the history, and the physical and economic environments of the study area. Most prominent of the sources are: Sheldon Erickson's "Occupance in the Upper Deschutes Basin" (Research Paper No. 32, University of Chicago, Department of Geography, 1953), which gives a good description of the geographic nature of the area in the early 1950's, and which I used as a base-line for comparison in this study; and Isiah Bowman's The Pioneer Fringe (American Geographical Society, Special Publication No. 13, 1931), which exemplifies geographic insight and perception of the interrelated physical and human elements involved in "pioneering" in the larger region, within which the study area is located. Raymond Hatton's Bend Country Weather and Climate (1973), and Watts', et. al., Consumptive Use and Net Irrigation Requirements for Oregon (Corvallis: Agricultural Experiment Station, Oregon State University, 1968), together give a good representation of the climatic environment in which agriculture is being practiced. Powers, et. al., Land Capability and Conservation Farming, Deschutes Area Central Oregon (November, 1947), and Irrigation of Agricultural Lands, edited by R. M. Hagan, et. al., (American Society of Agronomy, 1967), form a base for studying the physical nature and mechanics of irrigation and conservation farming.

#### Location of Study Area

The irrigated portion of Deschutes County encompasses approximately the northeast one-third of the county, and is situated in Central Oregon

between the foothills of the Cascade Mountains and Blue Mountains. The study area lies wholly within the High Lava Plains physiographic province, which is characterized as a gently rolling basaltic plain, relatively unbroken in relief, except for a few recent volcanic buttes which vary in height from about 300 feet (91.4m) to 1,400 feet (426.7m) above the surrounding plain.<sup>1</sup> Besides these buttes, the relief is broken locally by ridges of basaltic outcrops throughout the study area, and by the entrenched canyons of the Deschutes and Crooked Rivers.

The Deschutes River Canyon, only about 50 feet (15.2m) deep at the southwest margin of the study area, is cut to a depth of approximately 800 feet (243.8m) below the plain at the Deschutes-Jefferson County line. The Crooked River enters its deep gorge at the eastern edge of the study area, the northern Deschutes-Crook County line, and its depth is little changed where the river enters Jefferson County, approximately 5 river-miles (8.0km) downstream. Other canyons, containing largely nonexistent or intermittent streams, join the canyons of the Deschutes and Crooked Rivers, forming a dendritic pattern of ancient and active drainage channels, and with their various erosional terraces, have formed physical landscapes in the central core and northern expanses of the study area quite dissimilar to those of the surrounding plain.

General elevation of the plain, in the study area, is highest in the south and southeast, and lowest in the north. The agricultural area northwest of Bend, and west of the Deschutes River, is most uniform in elevation, averaging about 3,300 feet (1,006m). The agricultural area highest in elevation is south of Bend, and is about 3,700 feet (1,128m).

Local elevations decrease gradually to the north, to the Crooked River, where the elevation of the plain is about 2,800 feet (853m).

The study area is isolated by distance, by time, and by the natural barrier imposed by the Cascade Mountains, from the populous Willamette Valley Region of Western Oregon, where the majority of the State's population lives. To the east, broad expanses of high desert sagebrush and mountain ranges separate the study area from the relatively populous Snake River Valley. One hundred thirth miles (209km) to the south, the Klamath Basin, with the town of Klamath Falls, is the nearest contact to an agricultural community and population center in that direction. The Madras, Metolius, Culver Irrigated Area, of the North Unit Irrigation District, is situated just north of the study area, separated from it by the Crooked River Gorge and a range of low hills.

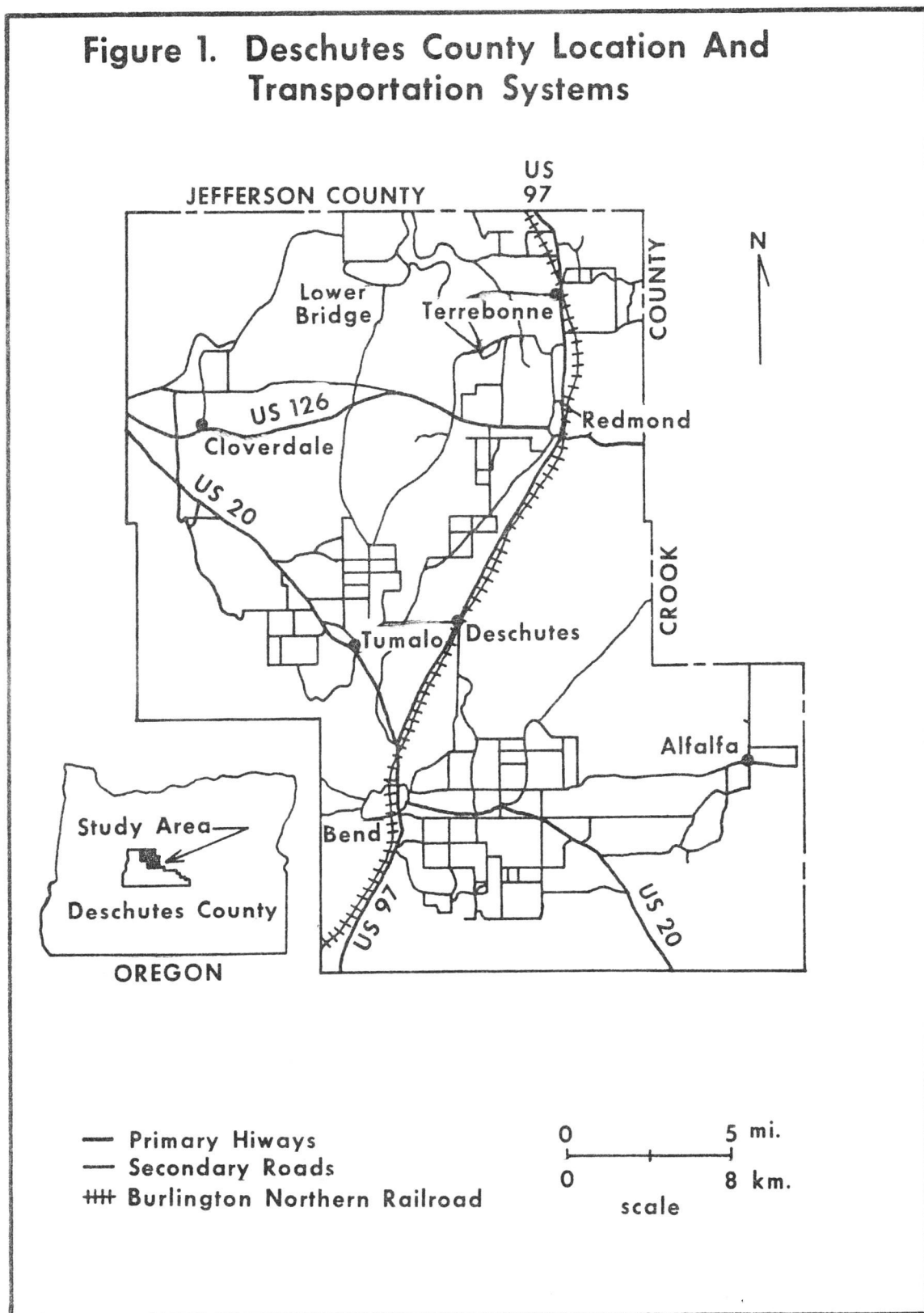
Rail transport from Bend became a reality in 1911, when a spur was completed from the main lines in the Columbia River Gorge. The line was later completed southward as far as Klamath Falls, reducing the effect of isolation in the Central Oregon Region. Isolation was further reduced when, with Federal assistance, a major statewide road network was completed. Four U. S. Highways now serve the region: U. S. 97, running north and south through the area, connecting Bend, Redmond, and Terrebonne with other communities located on the east side of the Cascades; U. S. 20, connecting Bend with Southeast Oregon and Western Idaho, and through Sisters, to the Willamette Valley; U. S. 126, connecting Redmond with Prineville in neighboring Crook County and other points east, and through Sisters, to the Willamette Valley; and U. S. 26, leaving U. S. 97 at

Madras, north of the study area, to Portland, giving the Central Oregon Region a more direct access route to the State's major population center.

Similarly, a local transportation network has evolved in the study area. Most of the present local roads were constructed during the irrigation project era, to serve as market roads connecting the communities with their respective agricultural hinterlands (Figure 1).

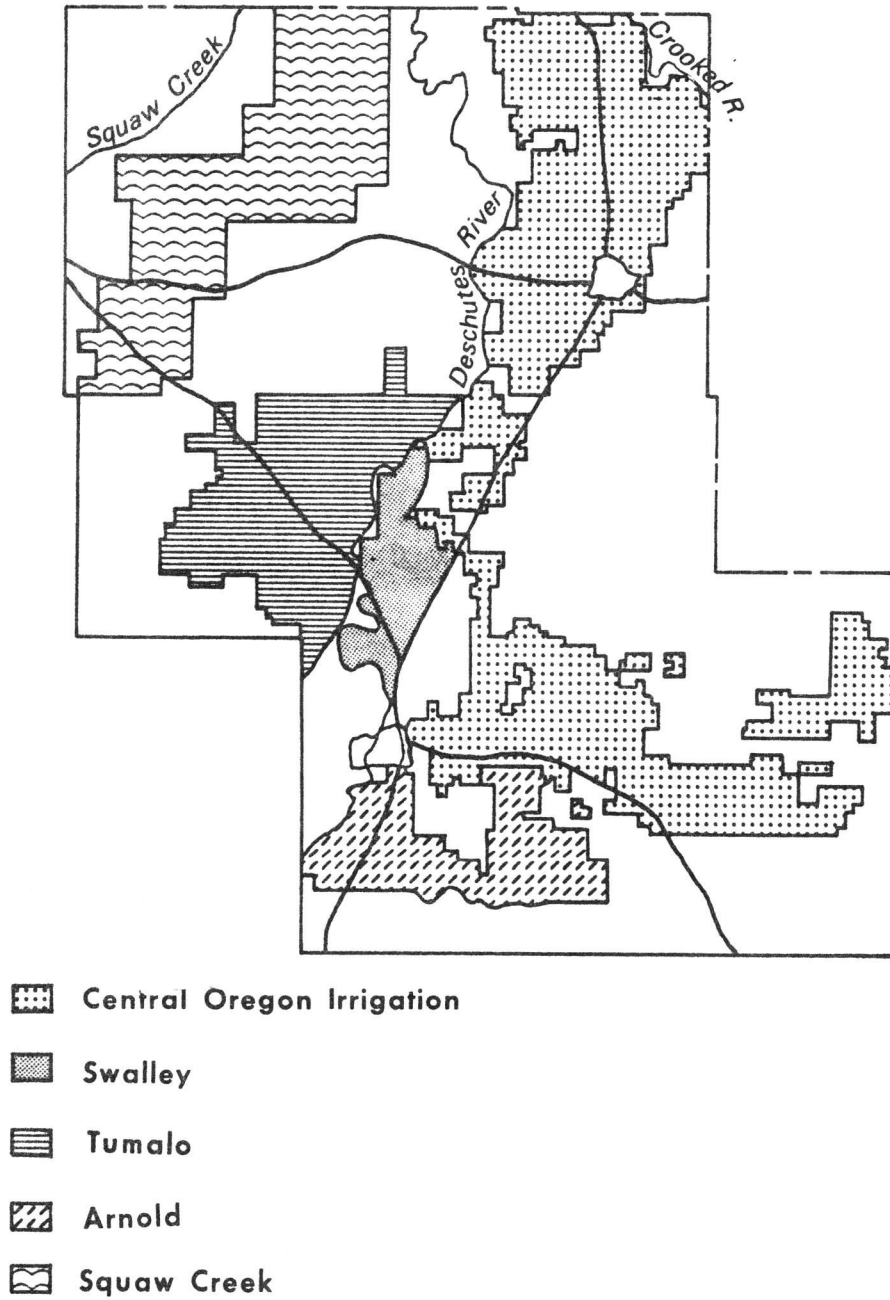
The boundaries of the study area do not correlate with any specific physical, economic, or political boundaries, except where Deschutes County adjoins Crook and Jefferson Counties. The southern and western edges of the study area were chosen to effectively encompass the five irrigation districts that lie wholly, or in part, in Deschutes County. These districts are: (1) Deschutes Reclamation and Irrigation Company ("Swalley", throughout this study), 4,500 arable acres (1,822ha) north of Bend; (2) Squaw Creek Irrigation District, 10,600 arable acres (4,592ha) north and east of Sisters; (3) Arnold Irrigation District, 4,400 arable acres (1,781ha) south of Bend; (4) Tumalo Irrigation District, 13,200 arable acres (5,344ha) northwest of Bend; and (5) Central Oregon Irrigation District, approximately 40,000 arable acres (16,194ha) north of Bend, including the Alfalfa area and a small portion adjoining the Arnold District east of Bend (Figure 2).<sup>2</sup>

**Figure 1. Deschutes County Location And Transportation Systems**





**Figure 2. Deschutes County Irrigation Districts**



SOURCE: U.S. Bureau of Reclamation, *op. cit.*, footnote 2

## CHANGES IN IRRIGATION AGRICULTURE SINCE 1950

Since the beginning of settlement in Central Oregon, and especially since the early 1950's, agriculture in Deschutes County has been dynamic, adjusting and readjusting to local physical conditions, and to local, regional, and national economic and social trends. The irrigated area of northern Deschutes County has undergone the greatest change, compared to the rest of the Central Oregon Region. The changes are most evident in: (1) cropping patterns and trends, (2) land use, (3) the total rural landscape.

### Historical Antecedents to Deschutes County Agriculture

The history of settlement and agricultural development in northern Deschutes County was not unlike the histories of other marginal agricultural areas in the Intermontane West. The first permanent settlers were cattlemen, who were pushed out of the Willamette Valley of Western Oregon, generally because of increased settlement pressure there. After them came a small wave of homesteaders, a backwash from the rapidly-filling western valleys. They found settlement and farming in Central Oregon to be difficult, and those who were not dissuaded by the hardships, began to adjust to the local environments and to plan for growth and future stability. The farmers formed several cooperative irrigation districts, and after constructing crude delivery systems, began to apply water from the Deschutes River on their farm lands.

New farmers were drawn to the area by promises of good, cheap land, a good life in a developing pioneer area, and cheap transportation, after the railroad came to Bend in 1911. In reality, the new settlers found

that the good, irrigated land had already been claimed, but that it could be bought from speculators at highly inflated prices. They settled in less favorable areas, organizing their own cooperative irrigation districts after finding that dryland farming was impossible, and began to adjust and adapt cropping and land use practices that would ensure longevity in their agricultural enterprises. At various times since the beginning of irrigation in Deschutes County, the irrigation districts used the Bureau of Reclamation's expertise and funding to improve and maintain the water delivery systems. In many cases they found improvement impossible, with some reservoirs and ditches incapable of holding or carrying water. Then, over time, the local farmers began to adjust their land and water use patterns, to develop new enterprises, and, in general, to adopt soil and water conservation practices, at the urging of Federal soil scientists and other conservationists. Agriculture in the area then slipped into a relatively static period, spurred by the general stability of high crop prices and high demand during World War II.<sup>3</sup>

#### Characteristics of Farming in the Early 1950's

In 1953, Erickson completed a study of the occupance patterns of the Upper Deschutes Basin, of which this study area is a part. His description of the region's agriculture was a typology, in which there were three main farming types: (1) Part-time farms; (2) Crop and livestock farms; and (3) Specialty-crop farms. Part-time farms were small, primarily subsistence farms, owned by employees of the lumber mills in Bend, and consequently were concentrated around that community. Crop and livestock farms averaged about 160 acres (64.8ha), and were scattered throughout the study area.

They had evolved from an earlier pure livestock type of farm and were developed largely to help offset fluctuations in livestock prices. Hay and pasture were the principal crops, but grain, potatoes, and clover raised for seed were planted in rotation with the forages. Crops other than forages were more predominant where local physical conditions would allow the crops to grow to maturity. Dairying and poultry-raising were the dominant livestock types on those farms near the communities of Bend and Redmond, while beef cattle and sheep were more important away from the population centers. Extensive turkey production was the major poultry enterprise near Bend, while chickens raised for egg production were more dominant near Redmond.<sup>4</sup>

Specialty-crop farming became important in Deschutes County after experimentation during the 1930's and 1940's showed that potato and clover seed production were economically and physically feasible. This type of farming supplanted the existing crop-livestock type, although not completely replacing it. The specialty crops only became more important in the cropping pattern, and were generally adopted in areas where better soils and less frost hazard existed. The farm size remained about the same as the crop-livestock type, but the type was concentrated in the lower, northern portion of the study area.<sup>5</sup> New handling and marketing facilities were constructed in Redmond at the southern limit of the specialty-crop farming area, and a favorable market for Deschutes baking potatoes and alsike clover natural vegetable dyes promised a good future and growth for Deschutes County's specialty-crop farmers.<sup>6</sup>

### Cropping Trends Since 1950

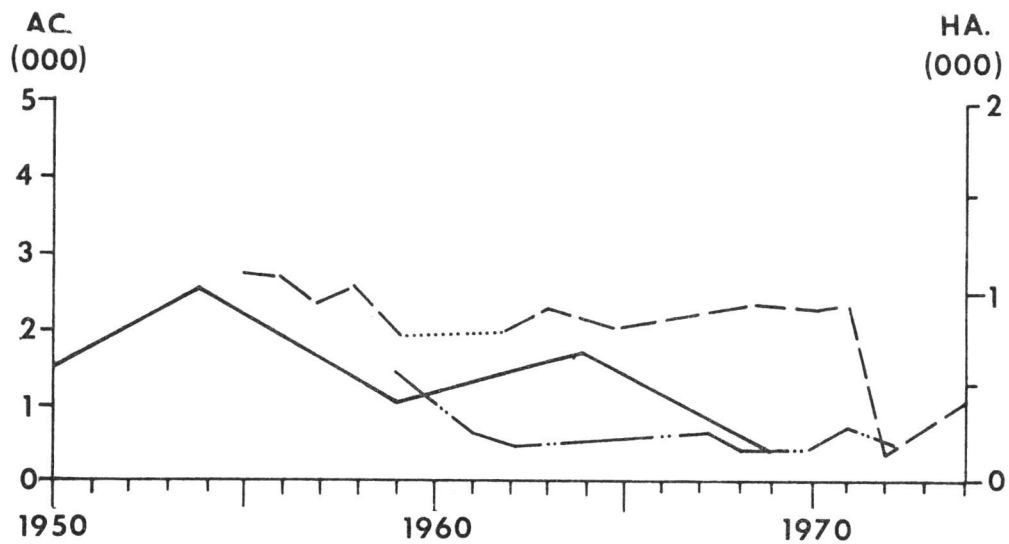
Research data showed three major crop types in Deschutes County, considered on an acreage-harvested basis. Although the data bases do not fit the study area boundaries exactly, sufficient correlation exists, to at least show cropping trends, to warrant the use of the method (Appendix I). The three crop types are: (1) small grains; (2) specialty crops; and (3) forage crops.

#### Trends in Small Grains Harvested

Small grains were the major pioneer crops in newly settled areas, wheat being most important. Bowman suggested a possible correlation between high prices received for wheat, especially during periods of war, and waves of agricultural settlement to new agricultural lands.<sup>7</sup> Settlers in Deschutes County found, as did Bowman, that the southern limit of dryland wheat production was on the northern slopes of Gray's Butte, about 5 miles (8km) north of the Deschutes-Jefferson County line.<sup>8</sup> After experimentation with dryland grain production proved that practice to be futile, the major production of grain crops was concentrated within the irrigated areas, where they were raised primarily as cash-crops, but also as livestock-feed supplements.<sup>9</sup>

Since 1950, the three principal small grains grown in the area, wheat, barley, and oats, have shown a decrease in acreage harvested, to a low in the early 1960's. Since 1963, the acreage has been somewhat constant for all three, with wheat and barley showing a small increase since 1972, and oats declining more sharply since then (Figures 3, 4, and 5).

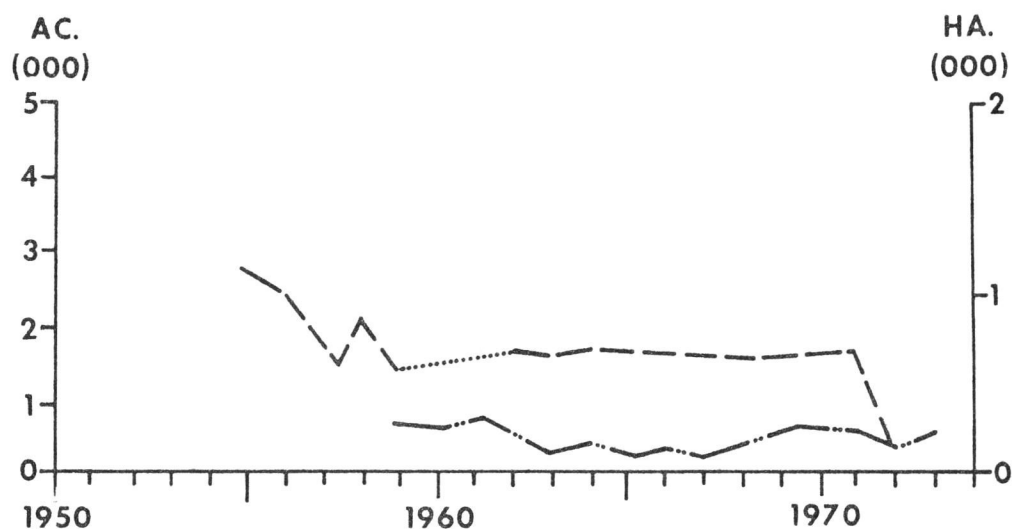
**Figure 3. Trend In Deschutes County Wheat Acreage Harvested, 1950 – 1973**



**SOURCES:**

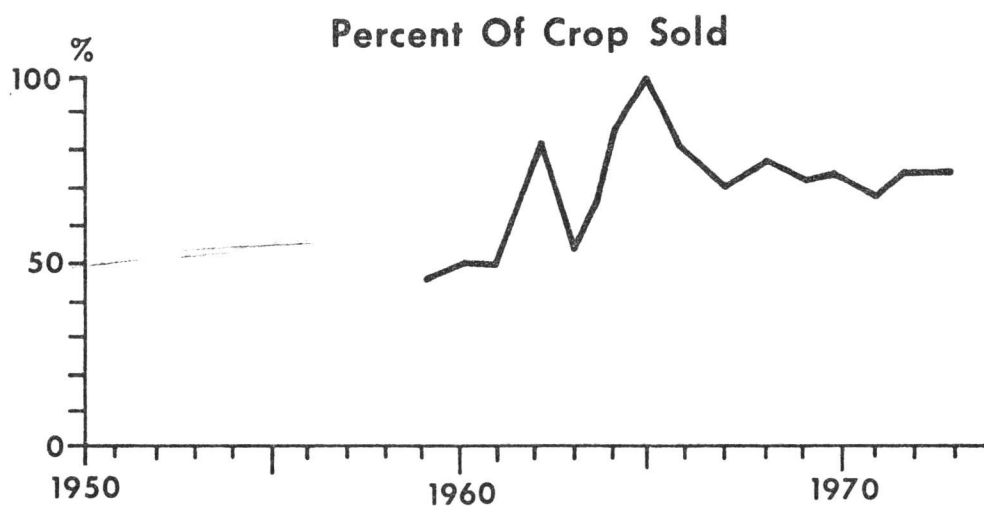
- U.S. Bureau of Reclamation
- U.S. Bureau of Census
- - - Cooperative Extension Service
- ..... No report for these years

**Figure 4. Trend In Deschutes County Barley Acreage Harvested, 1950 - 1973**



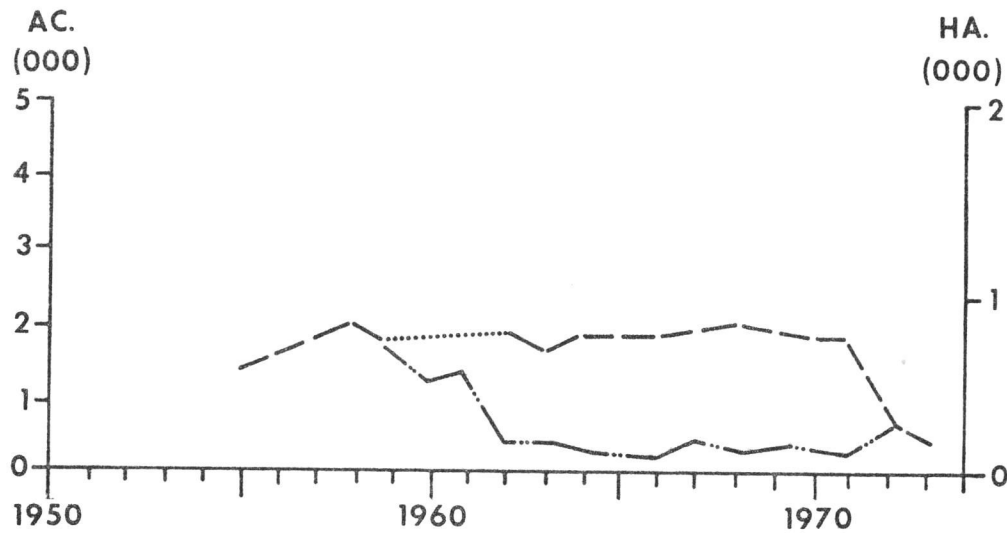
**SOURCES:**

- U.S. Bureau of Reclamation
- Cooperative Extension Service
- ..... No report for these years



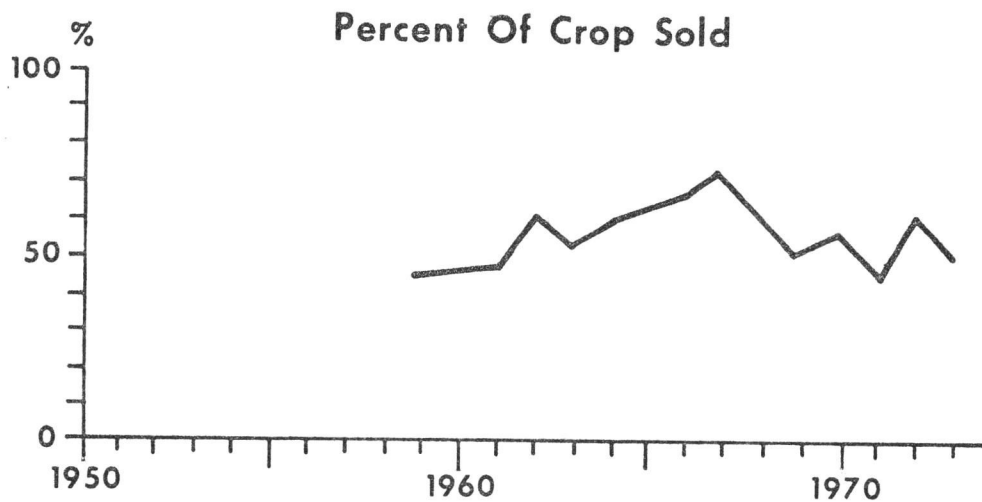
SOURCE: Cooperative Extension Service, Oregon State University, Annual Crop Reports, 1950 - 1973

**Figure 5. Trend In Deschutes County Oats Acreage Harvested, 1950 - 1973**



**SOURCES:**

- U.S. Bureau of Reclamation
- Cooperative Extension Service
- ..... No report for these years



SOURCE: Cooperative Extension Service, Oregon State University, Annual Crop Reports, 1950 - 1973



Of the three grains, wheat is the primary cash crop, with about 95 percent being sold annually, through the Cooperative Marketing Service in Redmond, the remainder being kept for seed.<sup>10</sup> Barley is becoming relatively more important as a cash crop in the study area, showing a change in percentage of the harvested crop being sold, from 45 to 72 percent, in 1959 and 1973, respectively.<sup>11</sup> Oats, on the other hand, showed an increase in percentage of the crop being sold from 1959 until 1967, after there has been a decline to about the 1959 level.<sup>12</sup>

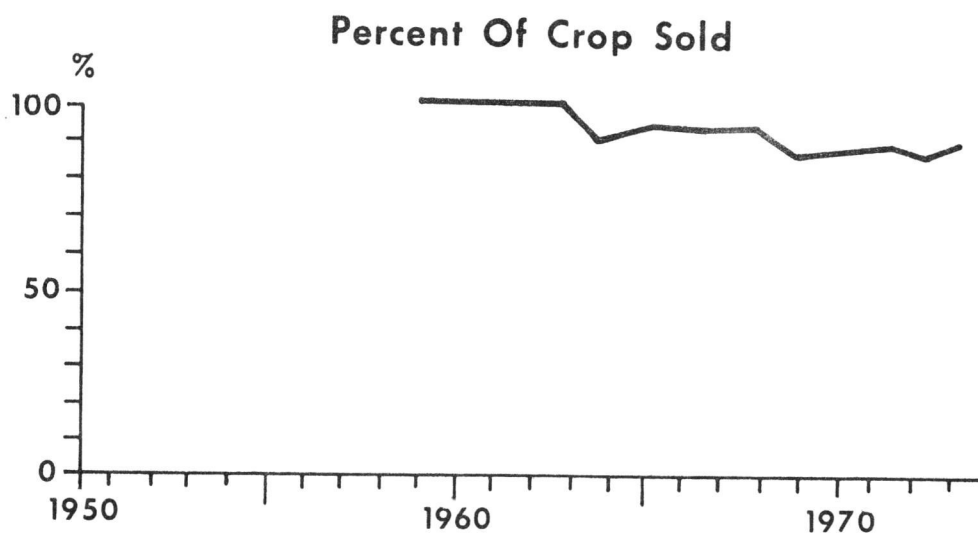
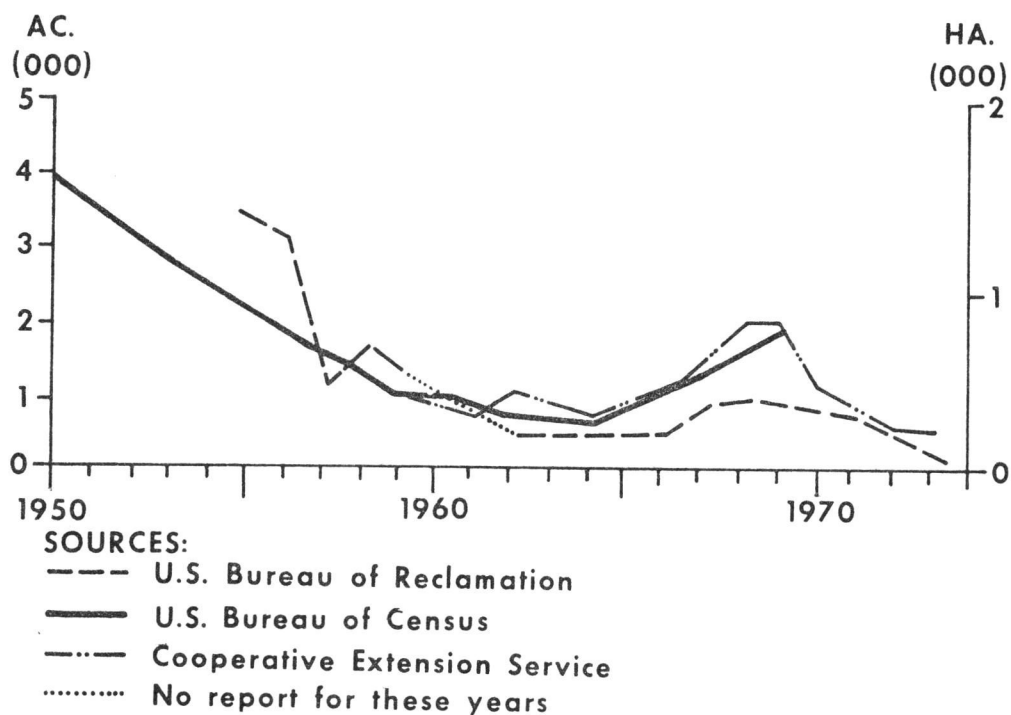
#### Trends in Specialty Crops Harvested

The two specialty crops, potatoes and alsike clover, became important in irrigation farming enterprises after experimentation showed that they could be produced profitably by farmers in environmentally favorable sites. Indicating their relative increase in importance in Deschutes County agriculture, potatoes increased from 3.5 to 10.8 percent of the total cropland harvested between 1929 and 1944; alsike clover increased from 3 to 8.8 percent, over the same period.<sup>13</sup>

Since 1950, however, the potato acreage harvested each year has declined to about one-quarter of the 1950 level. The downward trend tended to level off in the early 1960's, and showed an increase in the 1960's, only to decline again, until 1973 (Figure 6). Until 1963, the percentage of the annual potato crop being sold was 100 percent, after then declining to a low of 88 percent in 1972.<sup>14</sup>

Deschutes potatoes have traditionally been exported to Willamette Valley markets, with a few being sold locally. Recently, however, about

**Figure 6. Trend In Deschutes County Potato Acreage Harvested, 1950 - 1973**



SOURCE: Cooperative Extension Service, Oregon State University,  
Annual Crop Reports, 1950 - 1973

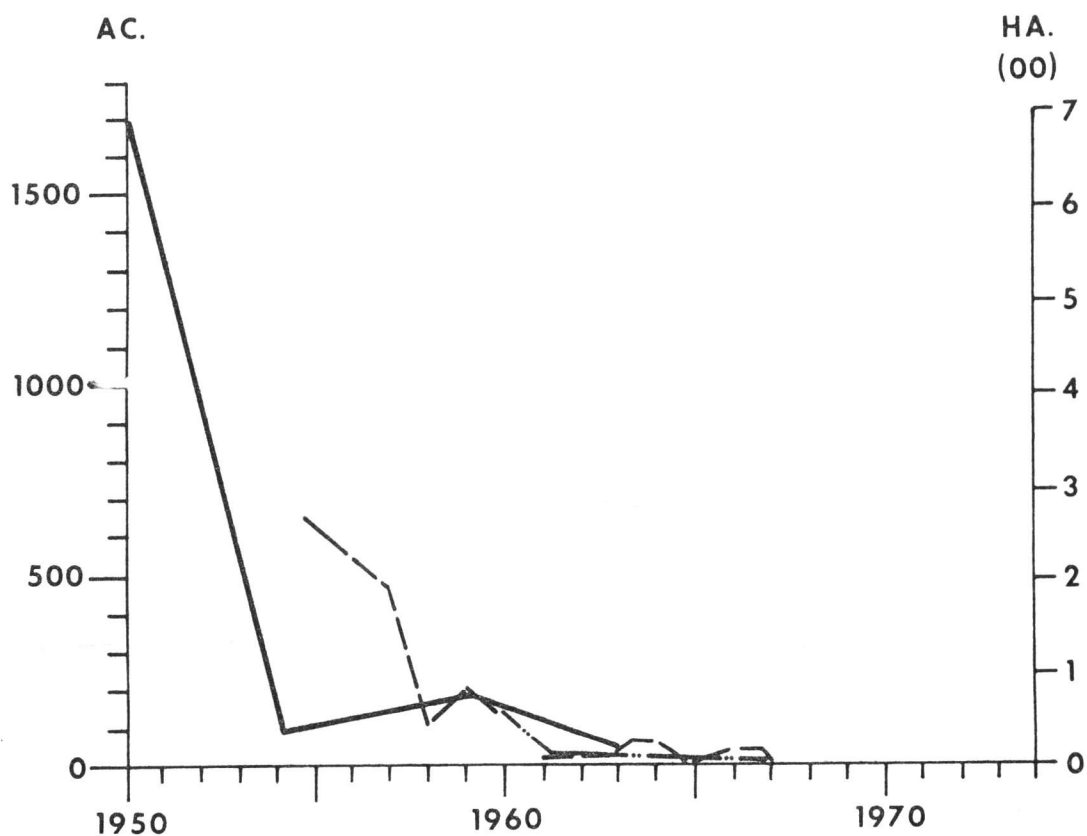
one-third of the annual crop has been sold outside Central Oregon, in other potato-producing areas, as seed. Some potatoes from the extreme northern portion of the study area are being trucked to Metolius in Jefferson County, where they are processed into various frozen convenience-type potato foods at the Gourmet Food plant.<sup>15</sup>

The trend in clover seed acreage harvested is more pronounced, the crop has essentially disappeared from the study area's agricultural system. From 1950, there was a sharp decline in harvested acreage until 1962, when a small increase was shown; since 1967 the crop has disappeared from the production pattern (Figure 7). The cash crop nature of clover seed production is evidenced by the fact that as long as the crop was being raised, 100 percent of the harvest was being sold annually, all outside the region where it was being processed as a source of vegetable-based, meat-stamping ink.<sup>16</sup> Ladino clover has likewise disappeared from the cash-crop system in Deschutes County, its acreage trends aggregated with those of alsike clover in Figure 7.

#### Trends in Forage Production

Forage crops have been important in local livestock enterprises since the first ranchers settled in the area, and especially since the extremely harsh winter of 1880-1881. As the crop-livestock enterprise developed over the years, the production of irrigated pasture and hay became more important, both as livestock forage, and as soil-building crops in rotation with other, predominately cash crops. On an acreage-harvested basis, alfalfa has been the most important hay crop, followed

**Figure 7. Trend In Deschutes County Clover Seed Acreage Harvested, 1950 – 1973**



**SOURCES:**

- U.S. Bureau of Reclamation
- U.S. Bureau of Census
- .- Cooperative Extension Service

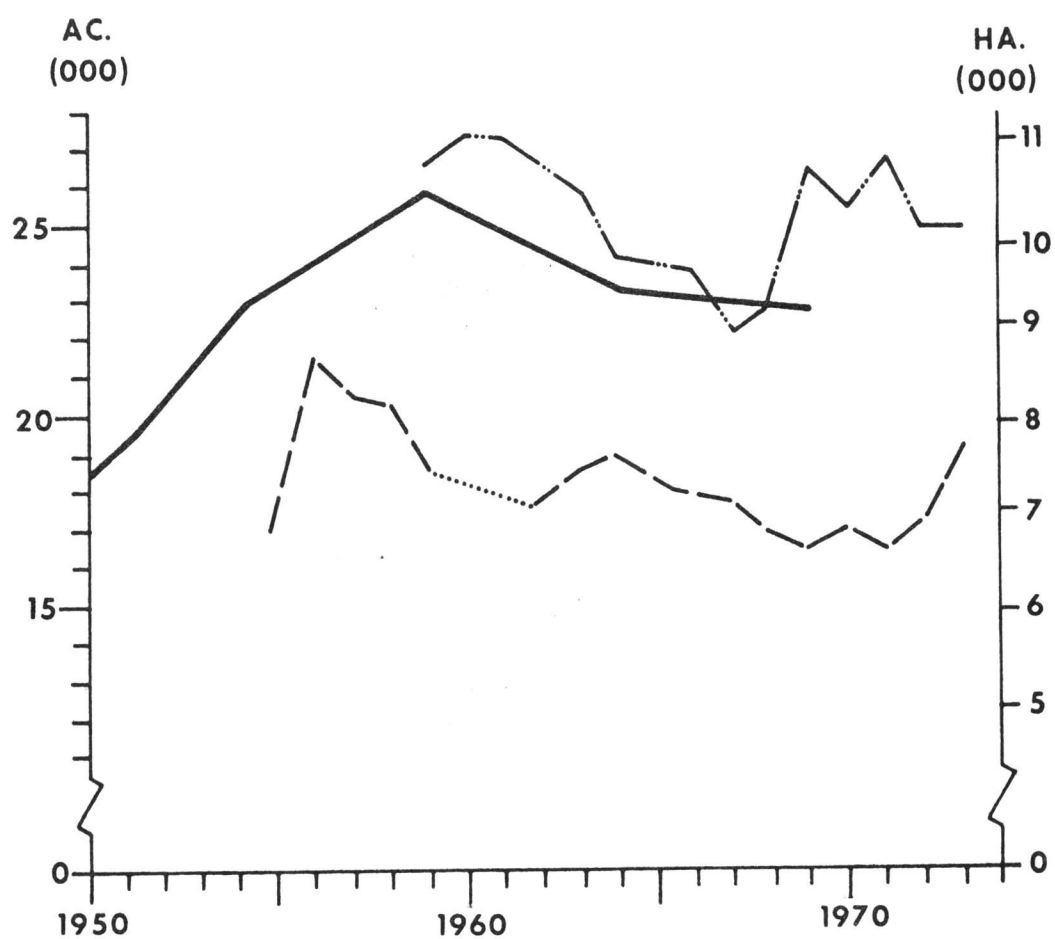
100 Percent of crop sold throughout

by a clover-timothy mix, and finally by small grain-hay combinations.

The nature of forage crops is such that they are dual-purpose, depending on perceived needs, with the same piece of agricultural land producing either hay or irrigated pasture. Since 1950, the total acreage of hayland harvested has shown an increase, to a high in 1960, after which acreage harvested declined slowly until 1965, increasing again to its previous 1960 high (Figure 8). These increases show that haylands have generally replaced the other, declining crops in the study area. Hay has been relatively unimportant as a cash crop in Deschutes County, because farmers and ranchers produce forages for their own livestock, occasionally selling their surplus on the open market to other local livestock producers. The amount of the total hay crop sold seldom exceeds 40 percent of the total annual crop (Figure 9). Besides the local market, a small Willamette Valley market has developed for Deschutes County alfalfa in the past five years, the hay eventually being fed to dairy stock there.<sup>17</sup>

Irrigated pastureland is complementary to haylands harvested; while hayland harvested increased until 1958, irrigated pastureland decreased in extent. From 1959 to 1963, irrigated pasture increased, while hayland generally decreased. There was then a leveling-out of irrigated pasture acreage, with a sharp increase since 1969, again leveling since 1972 (Figure 10). There are no data reported on the value of irrigated pastureland, but currently, leasing pasture in the area costs about ten dollars per animal unit, per month. The pasture is leased to local

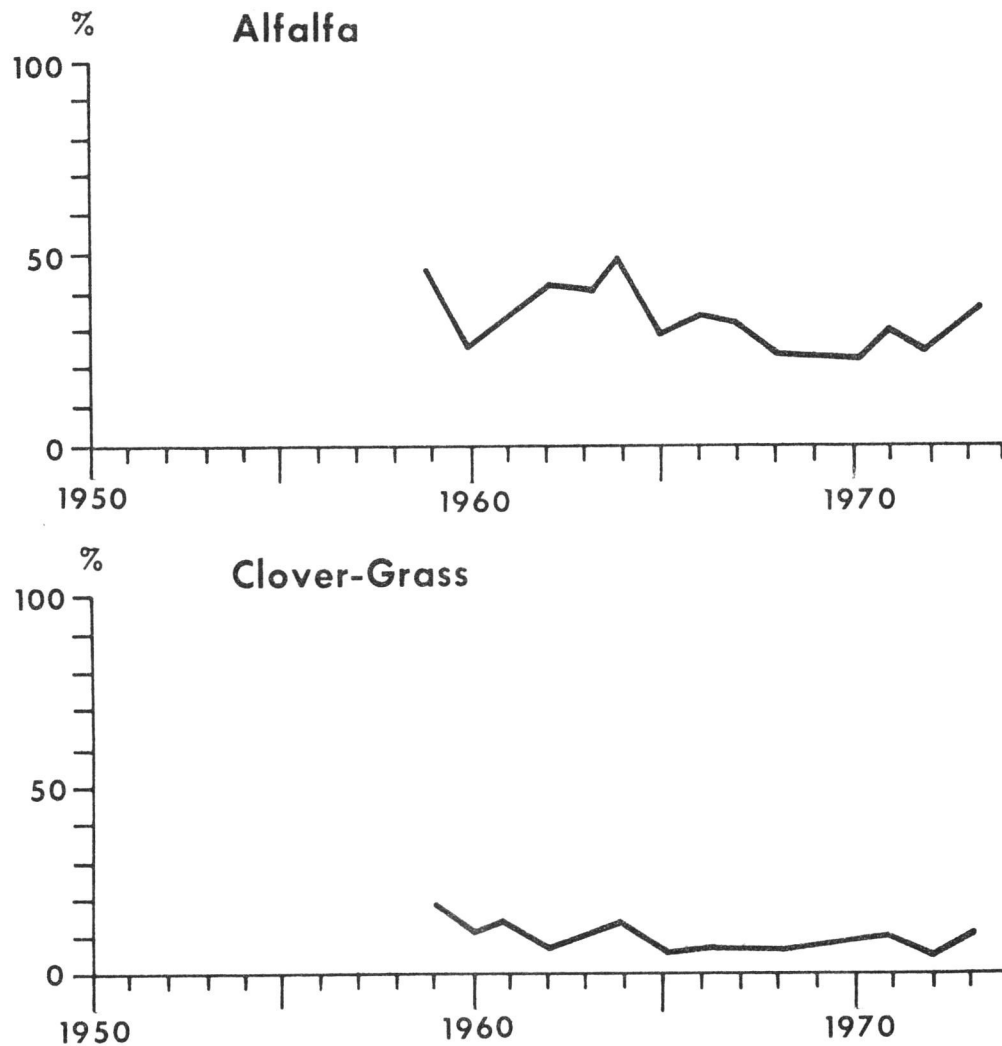
**Figure 8. Trend In Deschutes County Hayland Acreage Harvested, 1950 – 1973**



**SOURCES:**

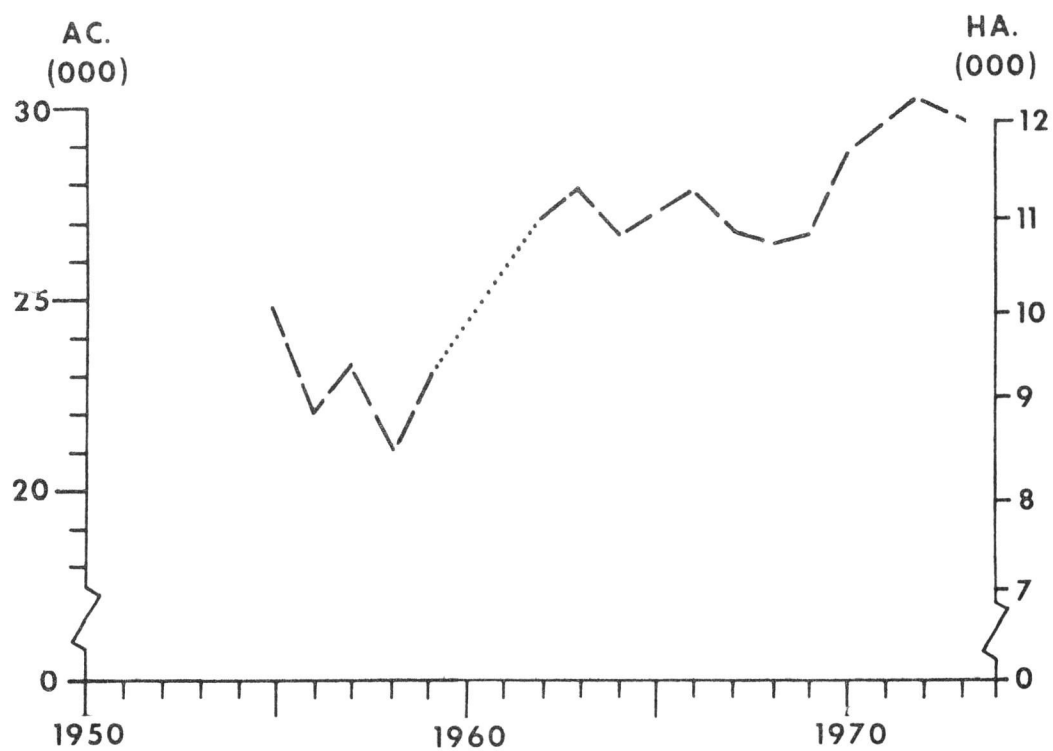
- U.S. Bureau of Reclamation
- U.S. Bureau of Census
- - - Cooperative Extension Service
- ..... No report for these years

**Figure 9. Percentage Of Hay Crops Sold Annually**



SOURCE: Cooperative Extension Service, Oregon State University,  
Annual Crop Reports, 1959 - 1973

**Figure 10. Trend In Deschutes County Irrigated Pastureland**



SOURCE:

- U.S. Bureau of Reclamation
- ..... No report for these years



stockmen, with no evidence of rental to stockmen with their operating units located outside the study area.

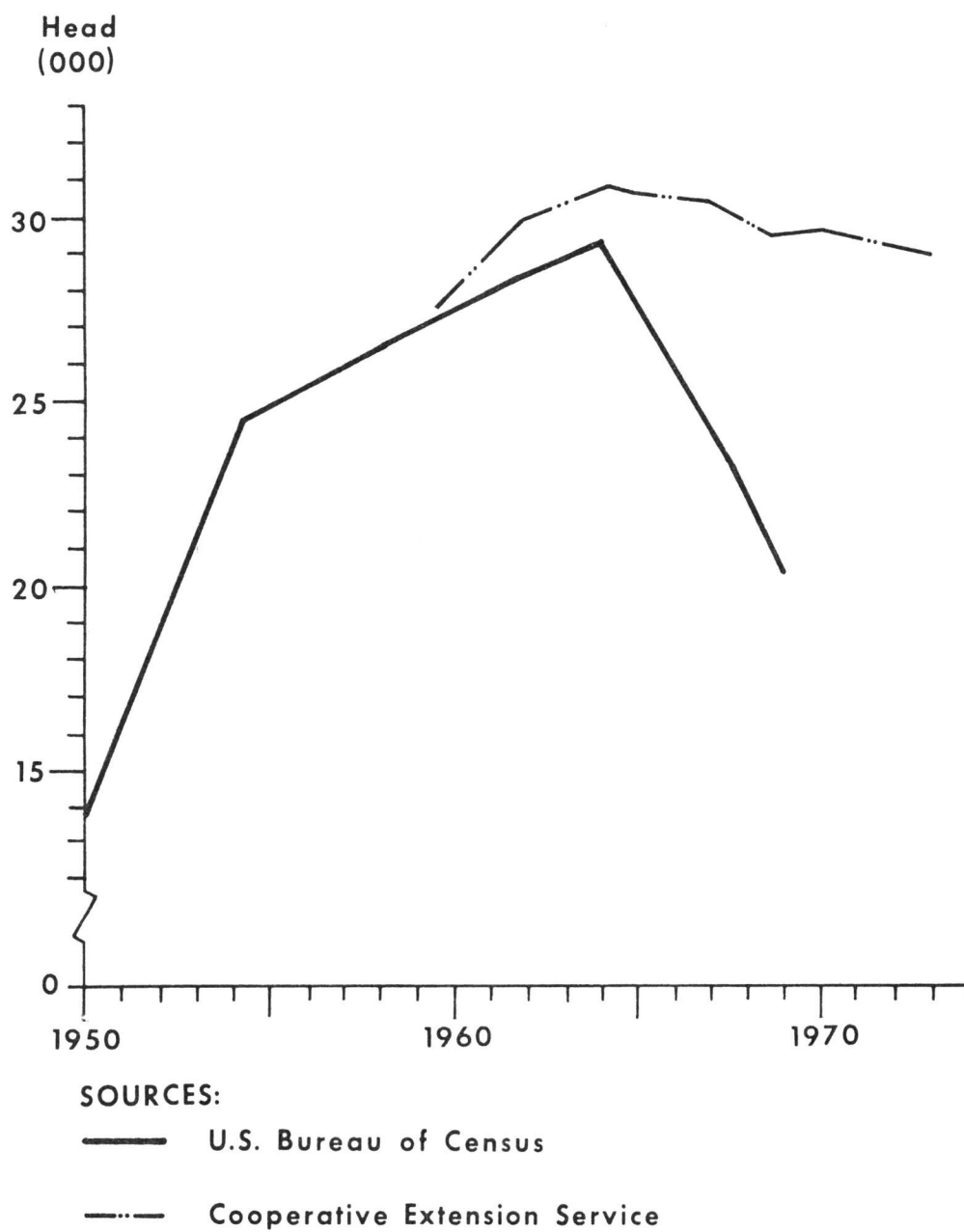
#### Trends in Livestock Numbers Since 1950

Extensive livestock production has been a major constituent of the Deschutes County agricultural economy since the first settlers arrived in the late 19th century. Beef cattle have been the primary livestock enterprise, but with the evolution of the crop-livestock farming type on irrigated lands, other livestock types have increased in importance, primarily dairying and poultry production, as Erickson described them in the early 1950's.<sup>18</sup>

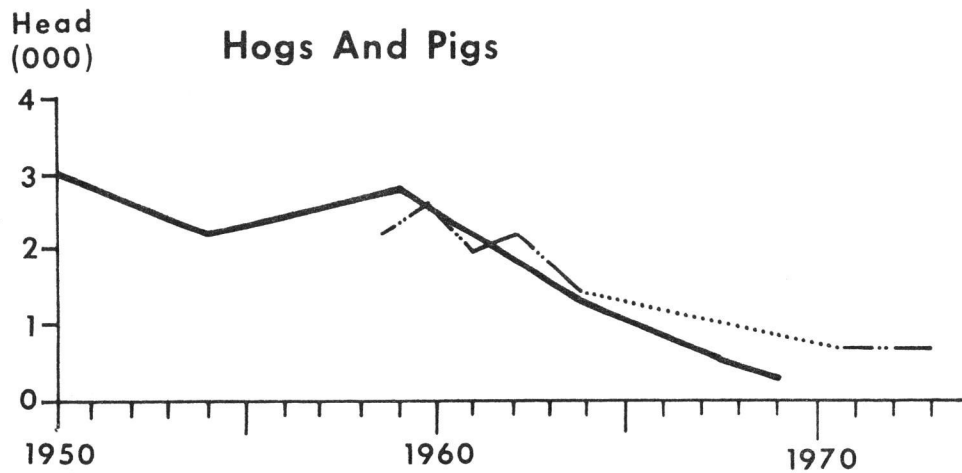
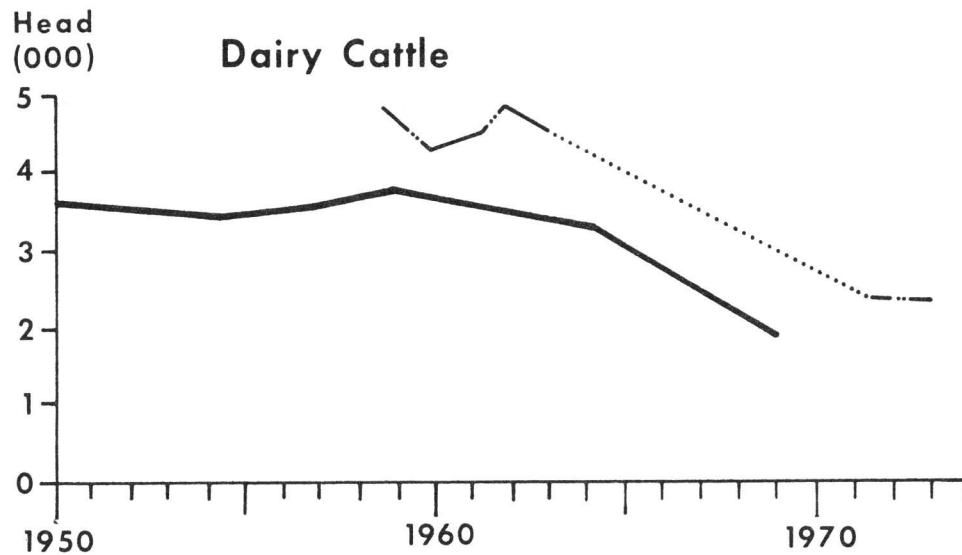
Primarily because they are the dominant livestock type in the area, the trends in numbers of cattle and calves have been most dramatic of all the livestock types since 1950. The total number of animals increased between 1950 and 1964, with a gradual decline since then (Figure 11). Cattle and calves, like hayland and pasture with which they are related, have largely become the dominant farm enterprise in areas where the specialty crops have declined in importance. The decline in total number of animals is an aggregate response to the declines in both types of cattle: dairy, and beef.

Dairying, on the small scale, has all but disappeared from the area's livestock economy, with even some large dairy farms changing to other uses. Since 1950, numbers of dairy stock had remained relatively static, until the early 1960's, after which there has been a gradual decline in numbers (Figure 12). Related to this declining trend, the Deschutes area

**Figure 11. Trend In Deschutes County Cattle And Calves**



**Figure 12. Trend In Deschutes County Dairy Cattle And Hogs And Pigs**



**SOURCES:**

- U.S. Bureau of Census
- - - Cooperative Extension Service
- ..... No report for these years

has always been a milk surplus area, shipping milk to the Willamette Valley, the remainder going to the declining number of local milk processing plants. Since 1973 however, milk has been imported from outside the region, for processing in the area's two remaining milk plant.<sup>19</sup>

The area's hog and pig production has similarly declined since 1950, with the number of animals remaining somewhat static until the early 1960's. Since then, however, there has been a steady decline in numbers (Figure 12). Hogs and pigs have not been very important, commercially, within the study area, with most being slaughtered locally for either on-farm consumption, or for sale to local individuals.

The trend in numbers of sheep and lambs has been similar to that of total numbers of cattle and calves, but with a much sharper decline since 1965 (Figure 13). Sheep and lamb production in the Deschutes area is of the farm-flock type, with small numbers of animals on each farm. Local production is primarily of grass-fattened lambs, which are eventually marketed in the Midwest, Eastern United States, or in California.<sup>20</sup>

The number of horses in the study area has shown the only sustained increasing trend since 1950 (Figure 14). They are primarily hobby-type riding horses with one to three per farm unit being the most common pattern. However, local horse breeders raise Arabians, Quarterhorses, and Appaloosas, with some Arabians being shown competitively throughout the United States and Canada.

The poultry production reported by Erickson in the early 1950's has

Figure 13. Trend In Deschutes County Sheep And Lambs

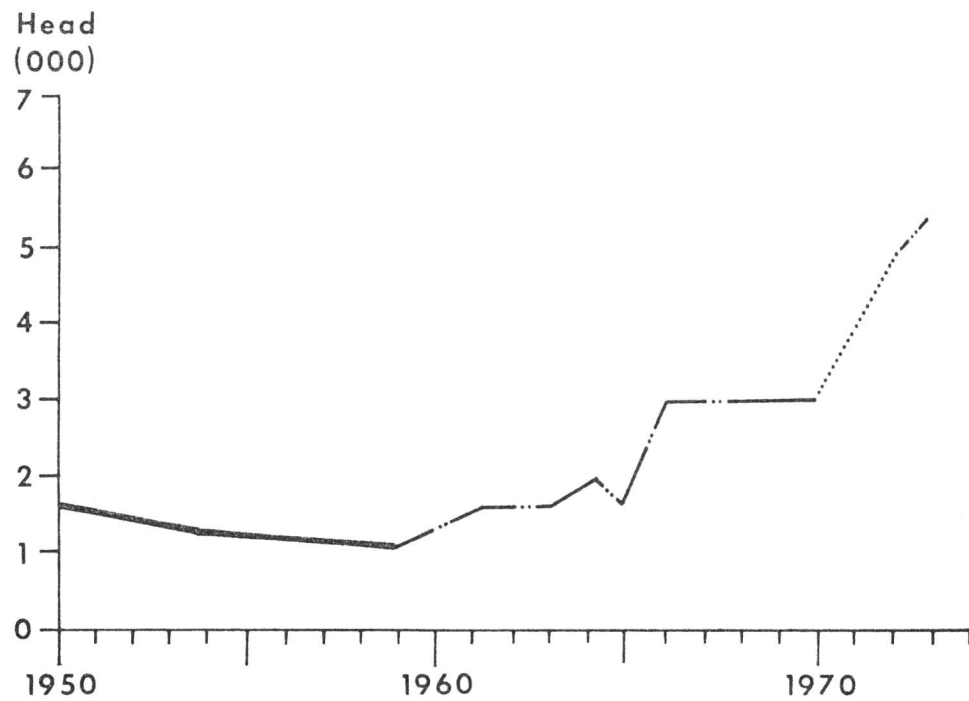


SOURCES:

— U.S. Bureau of Census

-.- Cooperative Extension Service

Figure 14. Trend In Deschutes County Horses



SOURCES:

- U.S. Bureau of Census
- · - Cooperative Extension Service
- No report for these years

virtually disappeared from the area's agricultural system. There are no sustained data in any of the sources I surveyed substantiating the trend, but turkey and chicken egg production are now represented only as relatively small farm flocks, with surplus chicken eggs being sold directly to local consumers by individual farmers.

Goats, on the other hand, have increased in numbers within the study area, primarily during the last five years. Goats are kept for home milk production on many of the smaller suburban farmsteads.

#### Changes in Agricultural Production Value

As another indication of the changing farm enterprises in the study area, the relative value of income derived from crops and from livestock has changed. In Deschutes County in 1947, income received for livestock, and livestock products was approximately one-third the total income received for crops.<sup>21</sup> In contrast in 1959, crops generated one-third as much income as did livestock and livestock products; in 1969 the difference had narrowed, primarily because of the decline in commercial livestock enterprise, with livestock producing just under three times as much income as did all crops.<sup>22</sup>

#### Parcelization of Land-Ownership Units

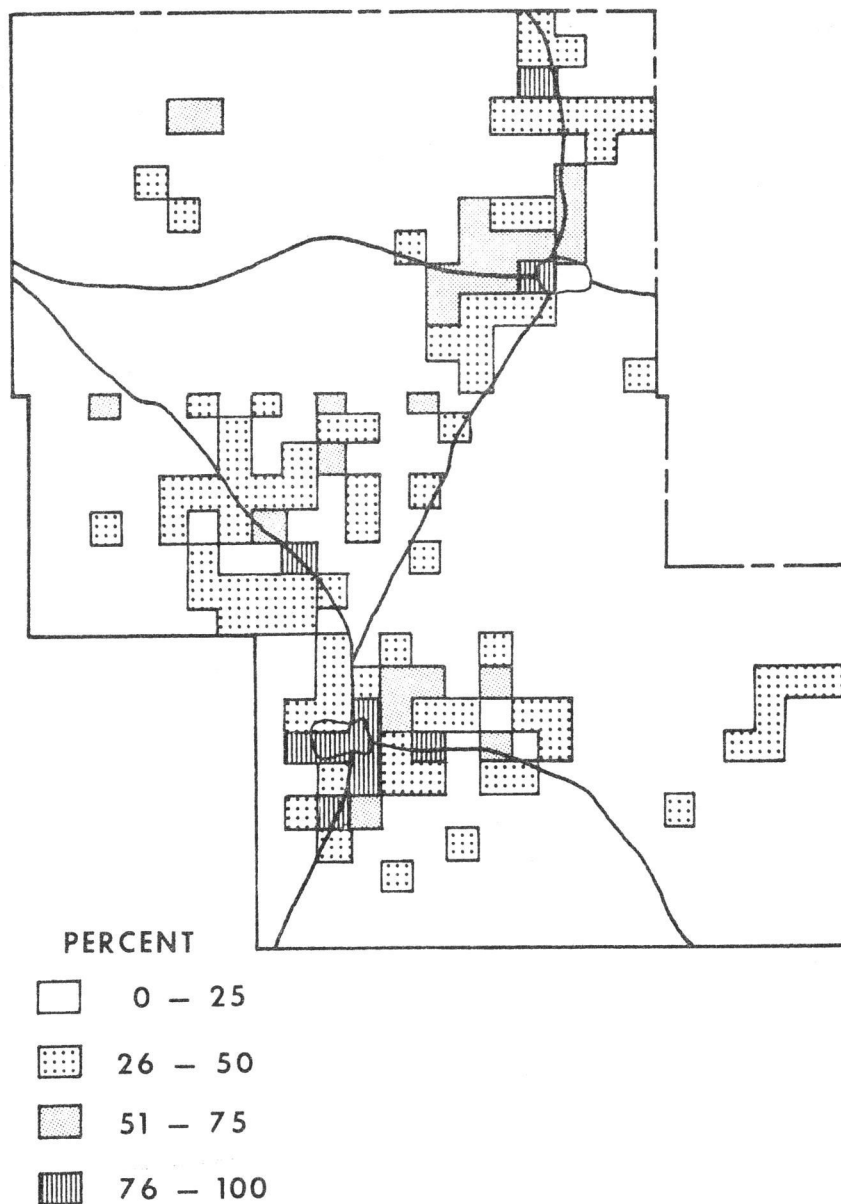
In 1944, the distribution of individual holdings, with large percentages of 40 acre-or-less (16.6ha) land-ownership parcels showed concentration around Bend and Redmond, and, to a lesser degree, near Alfalfa, Terrebonne, and Tumalo. From these communities, the parcelized sections decreased in number outward, with only a few islands of more

intense parcelization interrupting the pattern (Figure 15). The pattern in 1944 indicates the location of the subsistence farms and small dairy and poultry farms that Erickson described.<sup>23</sup> The parcelization patterns in 1972 show a great change in the irrigated portion of Deschutes County, the remainder of the county being relatively static, except for the recreation area South of Bend.

There has been a filling on land near Bend and Redmond, with the larger parcels there in 1944 being further subdivided into one-to-five acre (.3-2.1ha) ownership units, and filling along the major highways which serve as growth corridors (Figure 16). There was an increase in parcelization in the vicinity of the Deschutes community, and westward from U. S. Highway 97. The same subdivision phenomenon has also grown in the vicinity of Tumalo, and westward through the eastern portions of the Tumalo Irrigation District. The increase in parcelization along U. S. Highways 20 and 126 is along growth corridors from the Sisters community, located just west of the western margin of the study area. There has also been a great deal of parcelization since 1944, in isolated areas away from the regular growth corridors. The extent of subdivision throughout the study area indicates a perceived commuter maximum trip realm, as most subdivisions are within a distance circle that can be travelled in about 15 minutes, to and from the major communities of Bend and Redmond. Terrebonne, and Tumalo, especially, are becoming bedroom communities for Bend and Redmond, and are not expanding their functions as working-living towns. It is interesting to note that the subdivision has occurred within, or at the margins of the five irrigation districts, primarily because of water availability.

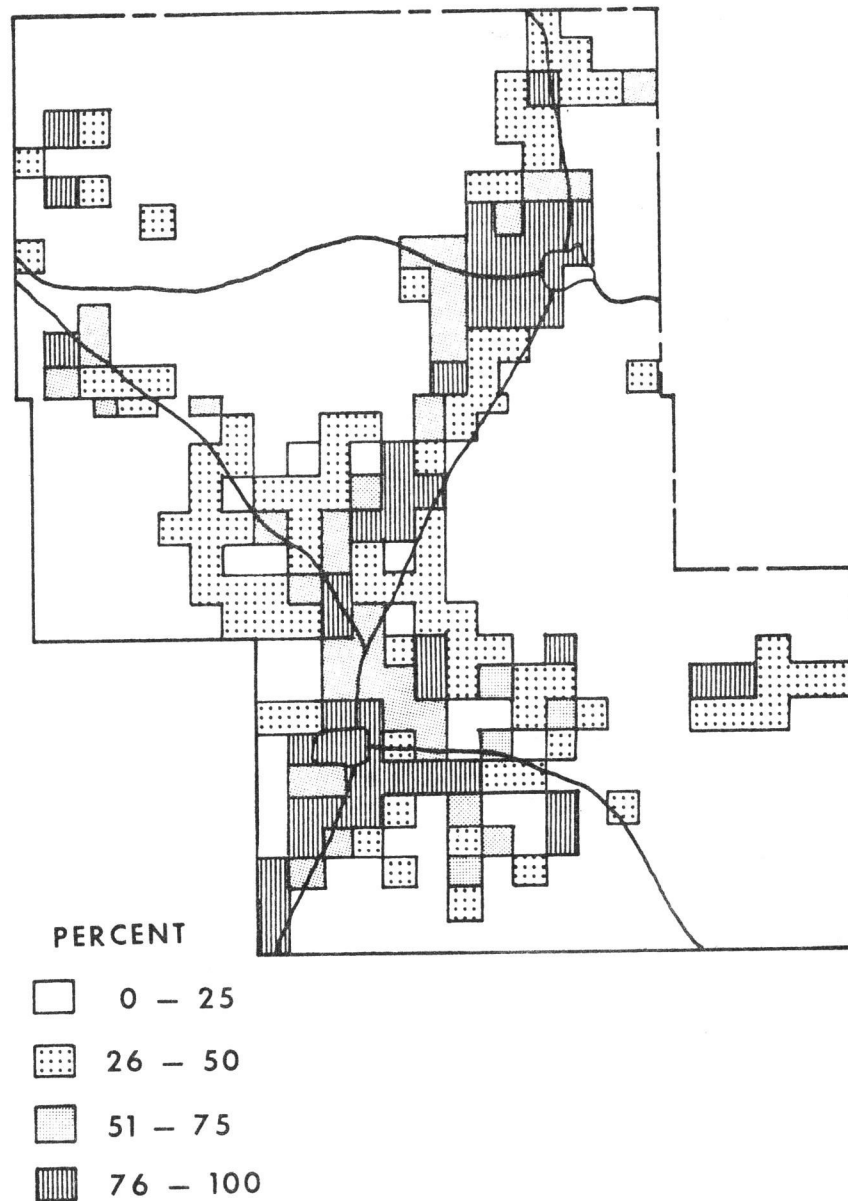


Figure 15 . Percentage Of Parcelization By Section,  
40 Acre Or Less Ownership Units, 1944



SOURCE: Metsker's Atlas of Deschutes County, 1944

**Figure 16. Percentage Of Parcelization By Section,  
40 Acre Or Less Ownership Units, 1972**



SOURCE: Metsker's Atlas of Deschutes County, 1972

Since 1944, there has also been some consolidation of ownership units within the study area. This has occurred in isolated areas, scattered throughout the irrigation districts, and generally associated with individual farms. Consolidation was most marked in an area near Terrebonne, east of U. S. Highway 97, and at the western fringe of the Tumalo Irrigation District.

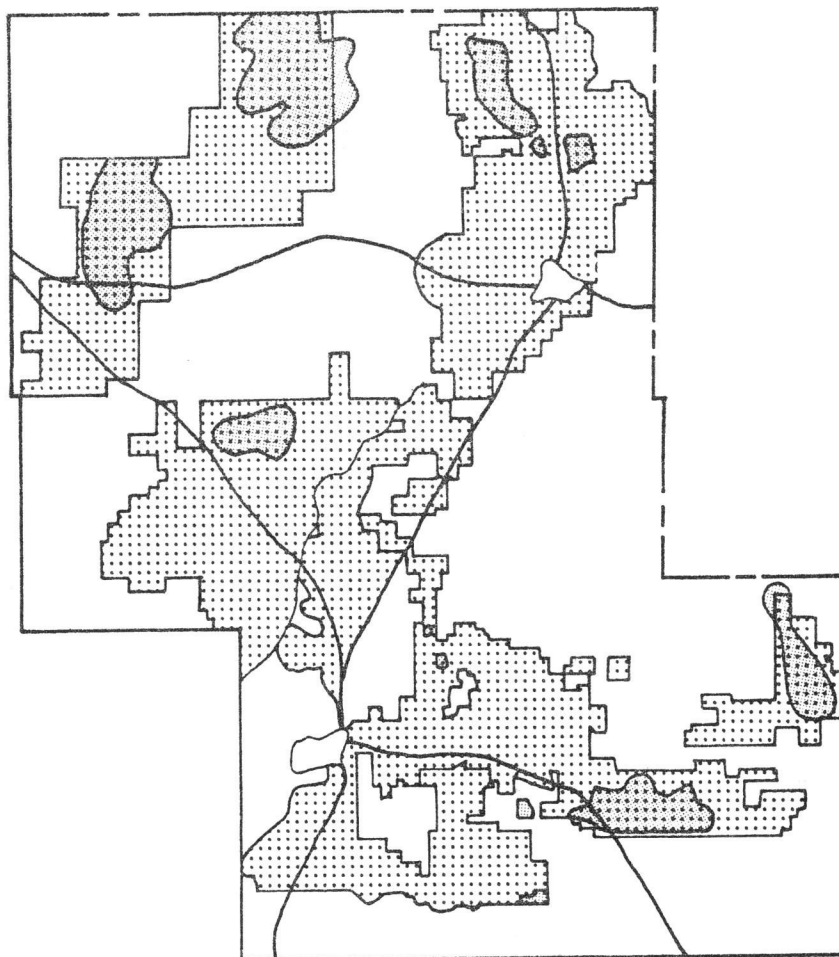
As an index of parcelization in Deschutes County, in 1966 there were approximately 25,000 tax plots in the county. In 1974, there were over 43,000 and in 1975, there were approximately 50,000 individual land-ownership units.<sup>24</sup>

#### Present Farm Type Distribution

Hobby farms, of varying sizes, are now the major farm type within the study area. Full-time commercial farming is still represented in different forms than found by Erickson in the early 1950's in, at most, six areas within the study area. They are generally located outside the margin of the commuter shed mentioned above, except where tenacity and hard work by the farmers has allowed them to exist inside that margin (Figure 17).

As might be imagined, by looking at the trends in acreage of potatoes and clover seed harvested, there are few specialty-crop farms remaining within the study area. The crop-livestock type studied by Erickson has prevailed since 1950, although the numbers are diminishing and they are changing in structure. There is now a great deal of specialization within the type, especially in the dairy enterprises. Most full-time farmers

**Figure 17. Full Time Farming Areas In Northern Deschutes County**



-  Irrigation Districts
-  Full-time Farming

SOURCE: Personal observations and interviews

have changed to a beef cattle-crop mix, with potatoes and small grains being planted occasionally in rotation where the local physical environment will allow. Alfalfa hay, and irrigated pasture are now the dominant crop types, producing the necessary forage to maintain the animals through the winter, and to pasture them throughout the remainder of the year. One large 3,000 acre (1,147ha) corporation farm produces hay for export to the dairy farms in the Willamette Valley, but also raises a substantial acreage of wheat, barley, and potatoes in a rotation crop mix, with acreages and crop largely determined by market prices and contracts.<sup>25</sup>

Hobby farms within the study area generally raise beef cattle, and have hayland and irrigated pasture as the dominant crop types. Most exhibit varying degrees of self-sufficiency, having dairy stock for home milk consumption, chickens for egg and fryer production, pigs for a pork supply, and various other animals for home meat production or for pets. Some hobby farms have a small number of sheep to produce lamb for export. One dominant animal, though not represented on all hobby farms, is the horse, varying in number from farm-to-farm, and according to size of the individual ownership unit.

The smaller hobby farms generally do not produce their own hay, using their land for irrigated pasture, for a few head of cows, or horses. The smallest hobby farms generally feed hay throughout the year, because they do not have any pasture at all.

### Present Landuse and Landscapes

Present landuse and landscapes tend to be dependent primarily on the size of individual land-ownership parcels, especially on the small land parcels, and more on the physical capability of the area on larger ownerships units, especially on the full-time commercial farms.

### Small Land Parcels

Small land-ownership parcels are those generally having an ownership area base between one and twenty acres (.3-8.2ha) in extent. They are located throughout the study area, though primarily close to communities, or near the major highways. From the highways and other roads, it is easy to determine the nearby presence of small parcels, due to the proliferation of long lines of mailboxes on racks where a subdivision service road meets the mail route road.

Landuse and landscapes on small parcels are generally manifestations of the individual owner's whim. In at least two cases, in my road survey of the area, I saw racetracks for horses that had recently been scraped out of the pasture. Nearby were expensive-looking starting gates, for one or two horses. Pastures are generally fenced, with different types of materials, ranging from poles, to finished lumber, to woven wire. Almost all of these parcels have small outbuildings, at least a shed and small barn, of various designs, to give livestock and feed shelter during winter months. The pastures are poorly maintained, and are not cultivated and reseeded when necessary, primarily because they are stocked beyond

their carrying capacity. On-farm irrigation delivery systems are poorly planned, and poorly maintained, resulting in dry areas in some places, and marshy areas in others.

Mobile homes are the dominant dwelling type, new suburban ranch homes second in dominance, and older farm dwellings, of many styles and ages being least in number and extent. The latter were the farmsteads for the many small farms that have been subdivided over the years. The structures that were being used on those farms, in their enterprise systems, generally remain today, leaving evidence of past farm activity on the present landscape (Figures 18, 19, and 20).

Many parcels shown on County cadastral maps do not have any improvements on them. These are generally owned by local residents, and are being held for speculative purposes; or, they are owned by people presently living outside the region, who are planning on building retirement-recreation homesteads on their parcels at sometime in the future.

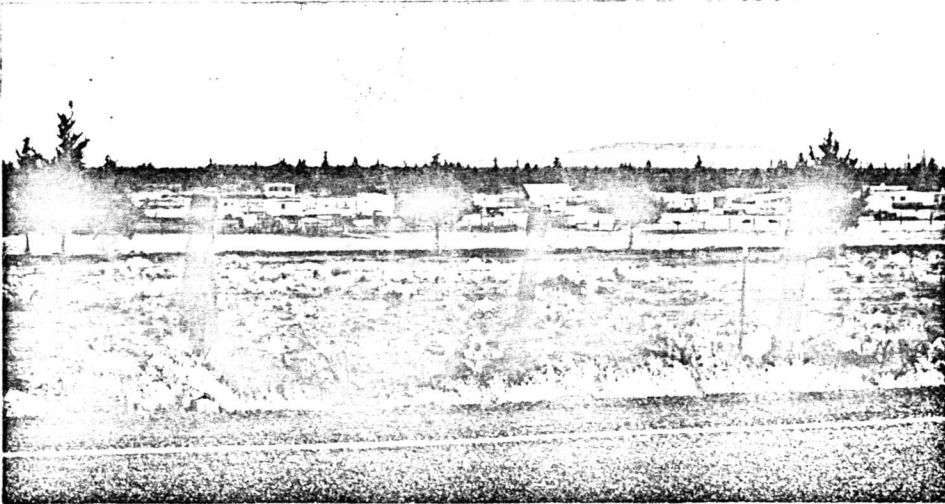
#### Medium-Sized Parcels

Medium-sized ownership parcels are those generally between twenty-one, and ninety-nine acres (8.3-41ha) in extent. They are scattered throughout the irrigated portions of the study area, and are the dominant type of land-ownership within northern Deschutes County. Both hobby farms and small, full-time farms are represented within this class, the full-time farms are generally in the larger acreage ranges.

Most of the hobby farms are easily distinguishable from the full-time farms because of the presence of new, expensive houses, relatively

FIGURE 18 . . . SMALL HOBBY FARMS

MOBILE-HOME SUBDIVISION IN DESCHUTES COMMUNITY



SMALL HOBBY-FARMS ON U.S. 126, EAST OF SISTERS

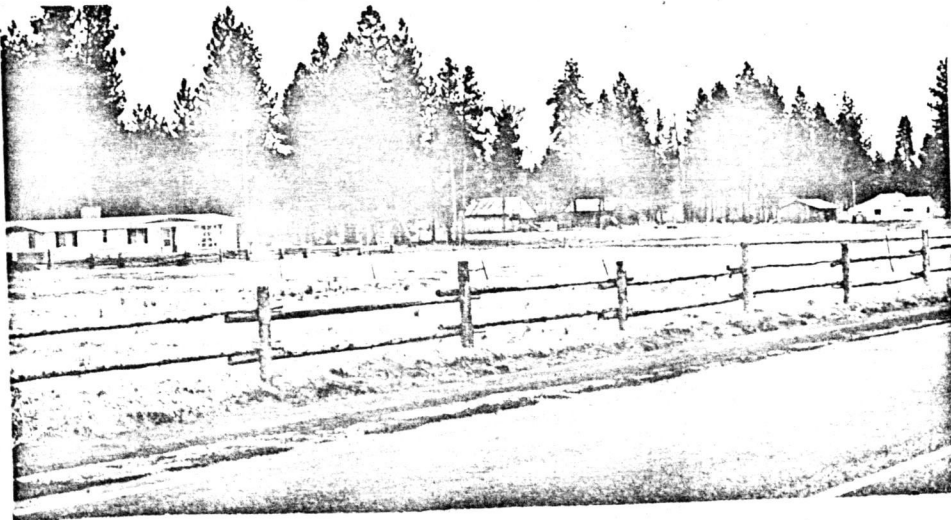




FIGURE 19 . . . SMALL HOBBY FARMS

HORSES ON POOR CONDITION PASTURE, SMALL HOBBY FARM



TYPICAL SMALL HOBBY FARM

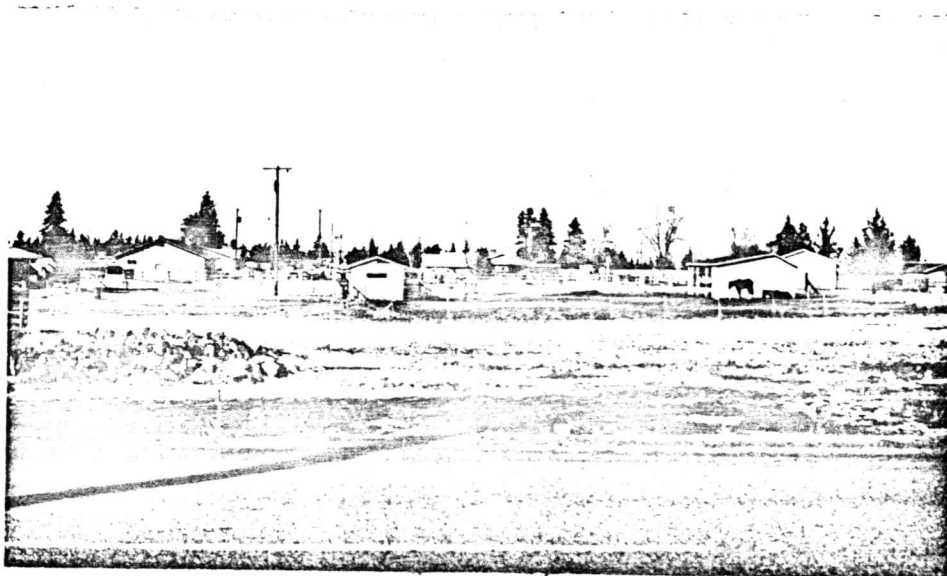
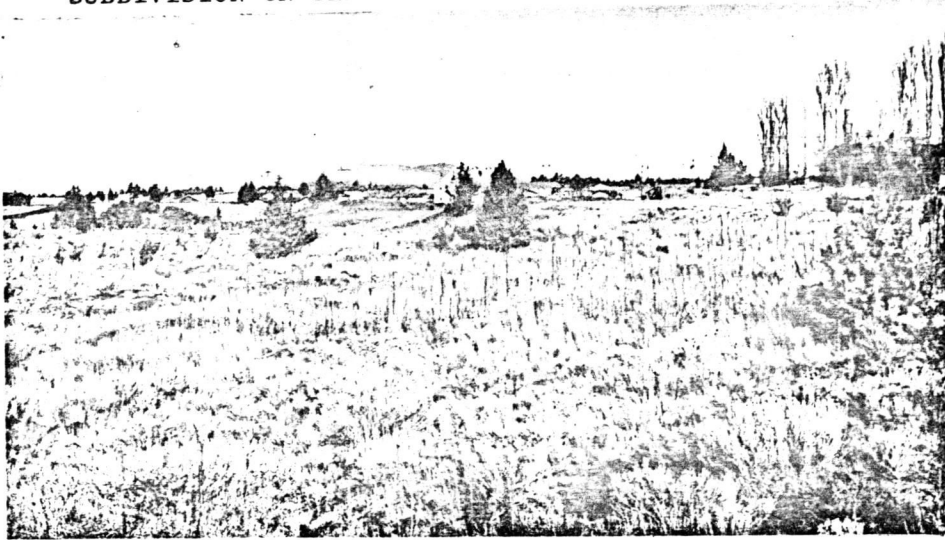
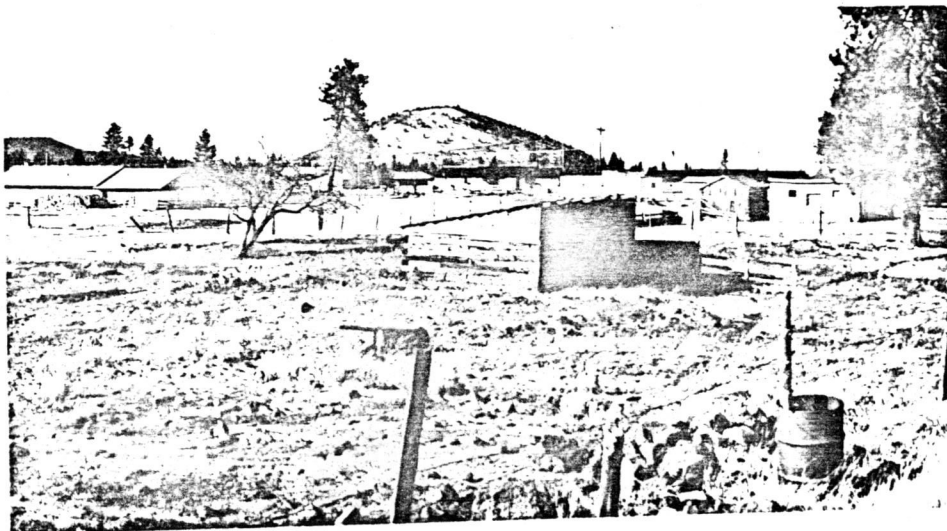


FIGURE 20 . . . SMALL HOBBY FARMS

SUBDIVISION ON OLD DAIRY FARM



TYPICAL SMALL HOBBY FARMS



good fencing, new farm equipment, and generally newer, relatively expensive capital equipment and fixtures. Another distinguishing feature of the hobby farms is the dominance of a beef-cattle, or horse-raising enterprise, with the related hay-pasture type of cropping.

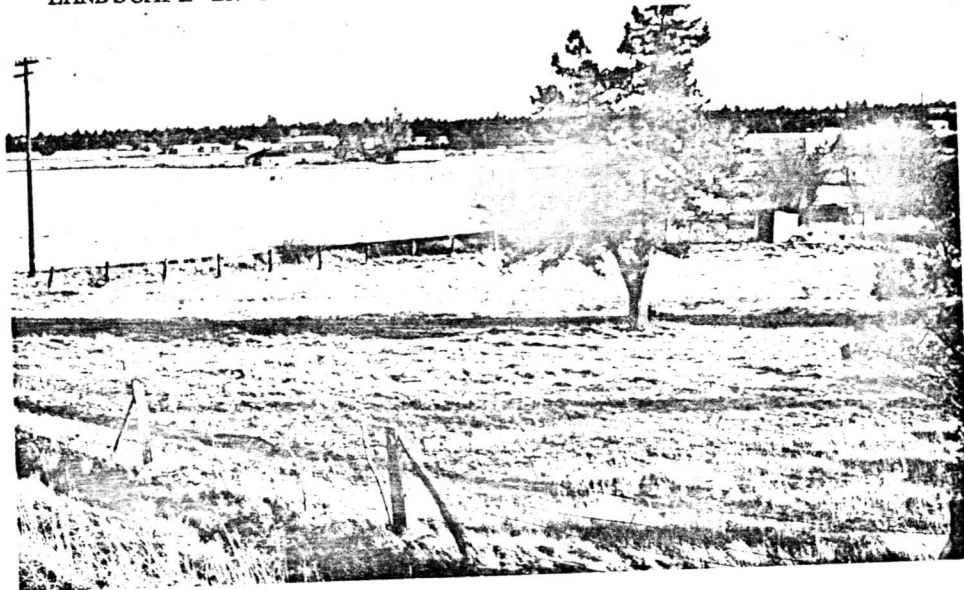
Full-time farms have relatively older dwellings and outbuildings, and old, but functional capital fixtures and machinery. Most of those farmers raise potatoes, small grains, alfalfa, and pasture, in rotation, where local physical conditions allow. Livestock are also present, but are considered to be a part of the total enterprise. These full-time farms are residuals of the small crop-livestock type described by Erickson.<sup>26</sup>

Many of the hobby farms in this size category are poorly planned and laid out. Junipers are encroaching on many of the pastures, and rocks are generally not removed, after frostheaving processes have moved them to the surface. Hobby farms in this size class generally exhibit the same lack of operational ability and care for the land as do the smaller hobby farms(Figure 21).

Irrigation ditches are generally in various stages of disrepair on hobby farms. They are often choked with grass and weeds, and ditch sides are collapsing, due primarily to trampling and poor irrigation practices. Ditch condition is generally not a problem on farms that have sprinkler irrigation systems. Sprinkler systems are, however, generally limited to farms on which the owners have more money with

FIGURE 21 . . . MEDIUM HOBBY FARMS

LANDSCAPE IN SMALL-MEDIUM SIZED HOBBY FARM AREA



JUNIPERS ENCROACHING, POORLY-MAINTAINED IRRIGATION DITCH



which they can operate their enterprise.

#### Large Land Parcels

Large land-ownership parcels in the study area are those operating units of over one-hundred acres (41.2ha). They are limited in number, except on the fringes of the commuter shed, and in the full-time farming areas, owing to the spatial and numerical extent of the medium-sized units throughout the study area. There are a few representations of the hobby farm in the large ownership units, but they are generally a further expression of the monied types found in the medium size range. They are generally indistinguishable from the full-time commercial farms in the same size category, except for the presence of new, very expensive houses, and new, expensive capital fixtures.

The hobby farms in this group still raise livestock, and irrigated pasture and hay. They are generally irrigated by sprinkler, many getting water from deep wells drilled on the ownership unit. The large hobby farms often appear to be only recently established, evidenced by new stands of alfalfa and pasture grasses, and new fencing where only a few years ago sagebrush, rabbitbrush, and junipers were dominant.

Full-time commercial farms in this category generally have older dwellings and capital improvements. Due to the cultural practice of rotation farming, the fields are in very good condition, and they are well maintained. Many have only recently adopted sprinkler irrigation, predominately the side-roll type, for labor-savings. In general, the full-time farms seem to exhibit an aura of permanence in the areas where they exist, in contrast to the ephemeral appearances of the hobby farms in all size classes (Figures 22, 23, and 24).

FIGURE 22 . . . LARGE FULL-TIME FARMS

HAYLAND-PASTURE ON FULL-TIME FARM



DRYLAND LOT, AND FARMSTEAD, DAIRY FARM

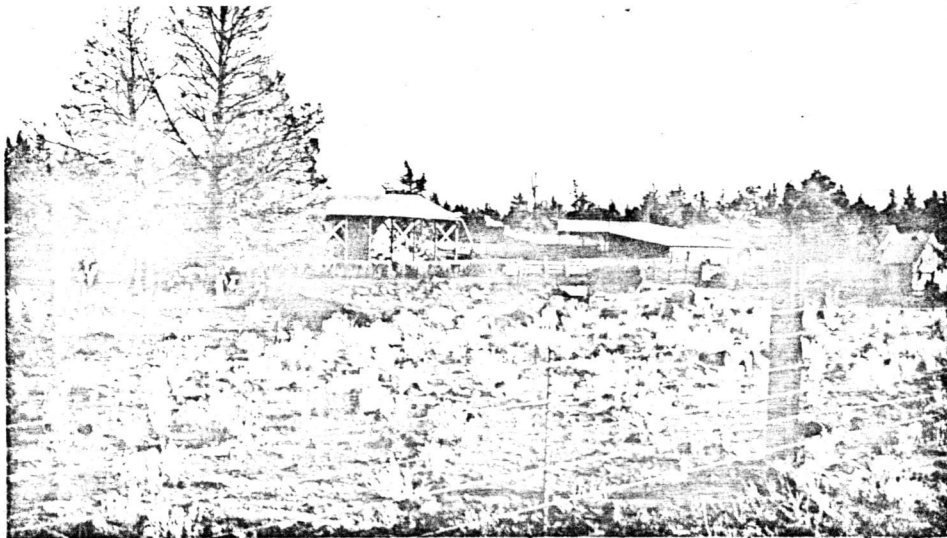
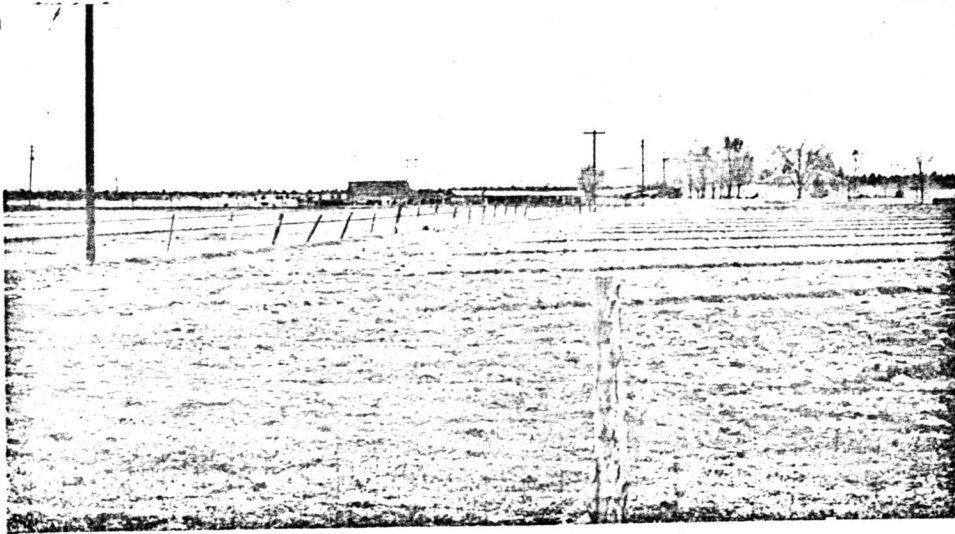


FIGURE 23 . . . . LARGE FULL-TIME FARMS

CROP-LIVESTOCK TYPE FARM, TERREBONNE AREA



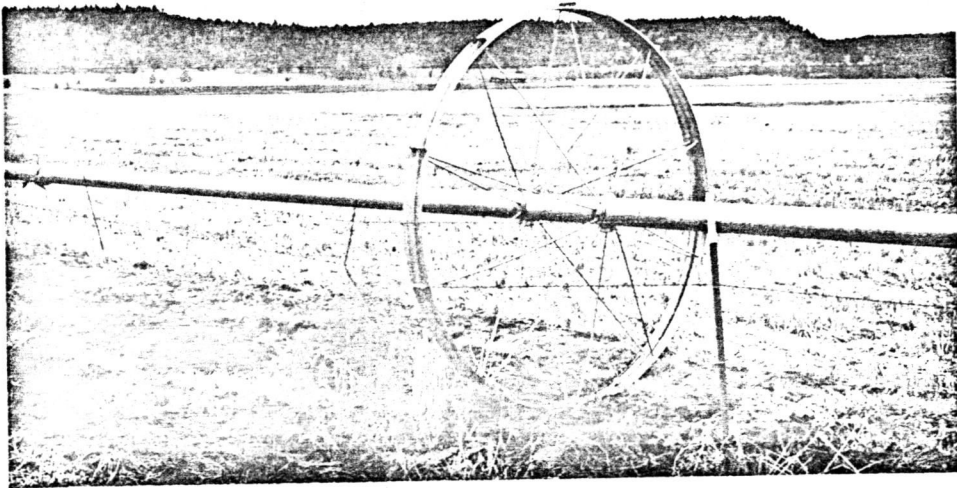
CROP-LIVESTOCK TYPE FARM, CLOVERDALE AREA



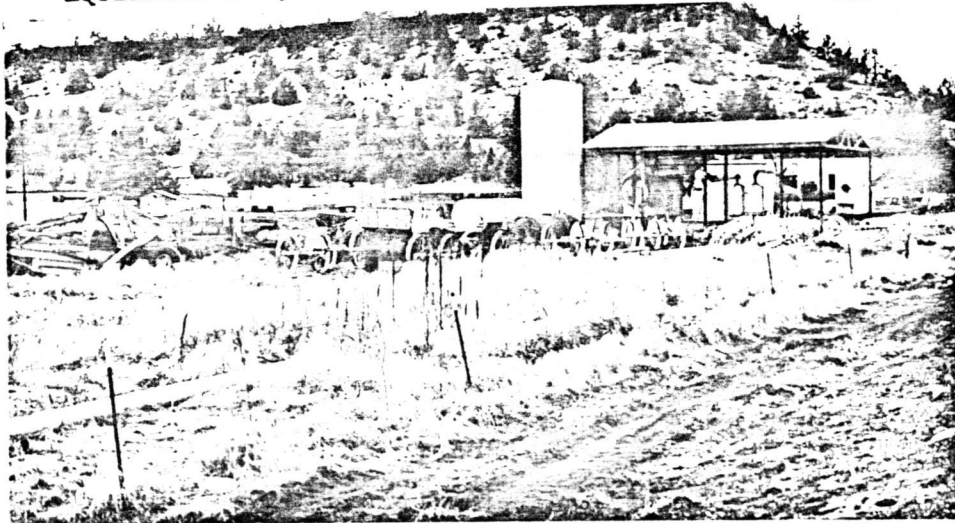


FIGURE 24 . . . LARGE FULL-TIME FARMS

CROP-LIVESTOCK TYPE FARM, LOWER BRIDGE AREA



EQUIPMENT LOT, FULL-TIME FARM, LOWER BRIDGE AREA





#### CAUSES OF CHANGE IN AGRICULTURAL PATTERNS

There has been no single direct cause of change in irrigation agriculture within Deschutes County. Physical, economic, and social forces, acting in concert, have been the agents of dynamism throughout the settlement history of the area, and continue to mold the spatial, geographic patterns of human occupation, land use, and the resultant landscapes. Until the early 1950's, most agricultural enterprises were responses to the limitations imposed by the physical environment of the study area, with economic and social forces playing relatively minor roles. But, since then, economic and social changes and considerations have had larger roles in causing change. The physical environment of the study area is relatively static, but the perception of utility has changed because human society and economies are always dynamic.

#### Physical Limitations to Agricultural Enterprise

Interaction of limitations imposed by climate and soils have historically been cause for experimentation, adjustments, and readjustment within the study area's agricultural systems. Neither the climate, nor the soils of Northern Deschutes County are particularly amenable to intensive agriculture, as it is known in other, more favorably endowed regions. The resultant agricultural enterprises and landscapes are then, in part, a unique response to the physical base of the study area.

#### Climatic Limitations

The climate of the study area is typical of the Mid-Latitude, Semi-Arid type with meager precipitation and short growing seasons, primarily because of location on the leeward side of the Cascade Mountains.<sup>27</sup>

Precipitation Characteristics. The Cascade Mountains, west of the study area, act as an orographic barrier to the moisture-laden Pacific storm fronts, giving the area a characteristic semi-arid, to arid, climate. Approximately two-thirds of the total annual precipitation falls in the form of snow during the winter months, with a minor secondary precipitation maximum in May and June, primarily due to convective thunderstorms moving through the area.<sup>28</sup> The average annual precipitation, calculated for Bend over a 58 year recording period, is 12.54 inches (317.5mm.); at Redmond, 16 miles north (25.6km.) for a 29 year recording period, it is 8.49 inches (215.6mm.).<sup>29</sup> There is, however, a great deal of variability in annual precipitation. Bend has recorded a minimum of 6.04 inches (153.4mm.), in 1949, and a maximum of 25.75 inches (664mm.), in 1907. Redmond has received 4.39 inches (111.5mm.), as a minimum in 1949, and 14.19 inches (360.4mm.), as a maximum in 1948.<sup>30</sup>

Watts, et. al., have computed the water budgets for specific crop needs at both Bend and Redmond, based on average monthly rainfall at the reporting stations (Table 1). Their calculated net irrigation requirements for pasture grass, alfalfa, spring grains, and potatoes were determined by subtracting the total average monthly precipitation

Table 1.--CONSUMPTIVE USE AND NET IRRIGATION REQUIREMENT  
FOR SELECTED CROPS: BEND AND REDMOND

	<u>Pasture Grass</u>		<u>Alfalfa</u>		<u>Spring Grains</u>		<u>Potatoes</u>	
	CU*	IR**	CU*	IR**	CU*	IR**	CU*	IR**
<u>Bend:</u>								
April	1.41	0.72	1.07	0.73	0.40	0.06	--	--
May	2.42	1.39	2.93	1.90	2.44	1.41	0.16	0.02
June	3.40	2.40	4.17	3.17	4.50	3.50	1.85	0.85
July	4.64	4.18	5.61	4.15	4.34	3.88	6.06	5.60
August	3.95	3.61	4.59	4.25	0.61	0.39	5.81	5.47
September	2.40	1.89	2.74	2.23	--	--	--	--
SEASON	18.22	14.19	21.11	16.43	12.24	9.24	13.38	11.94
<u>Redmond:</u>								
April	1.81	1.23	1.35	1.06	0.51	0.22	--	--
May	3.02	2.04	3.66	2.68	3.05	2.07	--	--
June	4.08	3.11	5.01	4.04	5.41	4.44	0.20	0.07
July	5.53	5.23	6.67	6.37	5.17	4.87	2.22	1.25
August	4.70	4.45	5.47	5.22	0.73	0.57	7.21	6.91
September	2.97	2.45	3.38	2.86	--	--	6.92	6.67
SEASON	22.11	18.51	25.54	22.23	14.87	12.17	16.55	14.90

\* Computed average consumptive use.

\*\* Net irrigation requirement.

SOURCE: Watts, D. G., et. al., Op. cit., Footnote 30.

from the average monthly consumptive uses for the specific crops.<sup>31</sup>

The calculated net irrigation requirements vary with annual and monthly fluctuations in precipitation, but it is evident that irrigation is necessary for raising the area's major crops.

Growing Seasons The average frost-free period at the Bend weather station is 90 days, although variations occur from year to year. The longest recorded period between frosts has been 110 days, in 1958, but frosts have occurred during every night of the year.<sup>32</sup> Bend averages 962 growing degree days in a year, whereas Redmond, at a lower elevation averages 1,124.<sup>33</sup> Although there is no weather station in the vicinity, a farmer in the Lower Bridge area, west of Terrebonne, told me that the growing season in that area averages about 90 days longer each year, than is experienced in Bend.<sup>34</sup> Local microclimates exist throughout the study area, resulting in either longer or shorter growing seasons, depending on location.<sup>35</sup>

Even with availability of water for irrigation, only the hardiest of crops can be raised successfully in the southern, or higher parts of the study area, due to frost hazard. Potatoes are feasible during some years, but the frost potential throughout the growing season makes raising them a risky enterprise. Longer frost-free periods are experienced in the northern and lower parts, but crop choice is still somewhat limited.

#### Limitations Due to Soil Nature

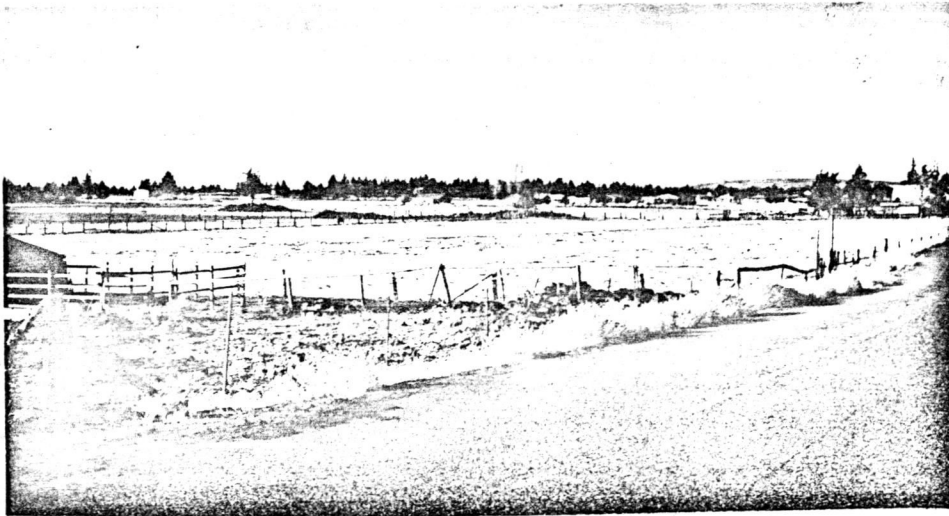
The agricultural soils of northern Deschutes County have developed

from pumiceous and other volcanic materials of Recent or Pleistocene Age that were wind-deposited or slope-washed into natural basins, covering the volcanic baserock in the basins. Slope-wash has occurred over time, moving thin soil veneers from the basaltic ridges into the basins. The soils range from loamy sand to sandy loam, are relatively low in organic content, and range in color from light brown to brown. The soils in the basins range from very shallow to moderately deep (0-40 inches; 0-102cm). Root zones are limited by the occurrence of solid basalt, or particles of basalt rock, at about 20 inches (50cm), in the deeper soils in the northern portions of the study area.<sup>36</sup> Between the individual soil basins, and grading into them at their margins, large areas of basaltic scabland exist, with either no soil present, or with very shallow veneers developed directly from the basalt, or from wind-deposited material.

The shallow soils within the study area present an added problem to agricultural practices. Frost-heaving processes constantly move various-sized particles of basalt to the soil surface, so that, with the cultural practice of annual rock-clearing, many rock piles have been developed on sites with shallower soils, or on rock outcrops within individual fields (Figure 25).

The Oregon State Water Resources Board has developed a generalized soil map, covering the entirety of the study area.<sup>37</sup> Correlated with an irrigation suitability map compiled by the Soil Conservation Service, I compiled a general soil type, irrigation suitability map (Figure 26).<sup>28</sup>

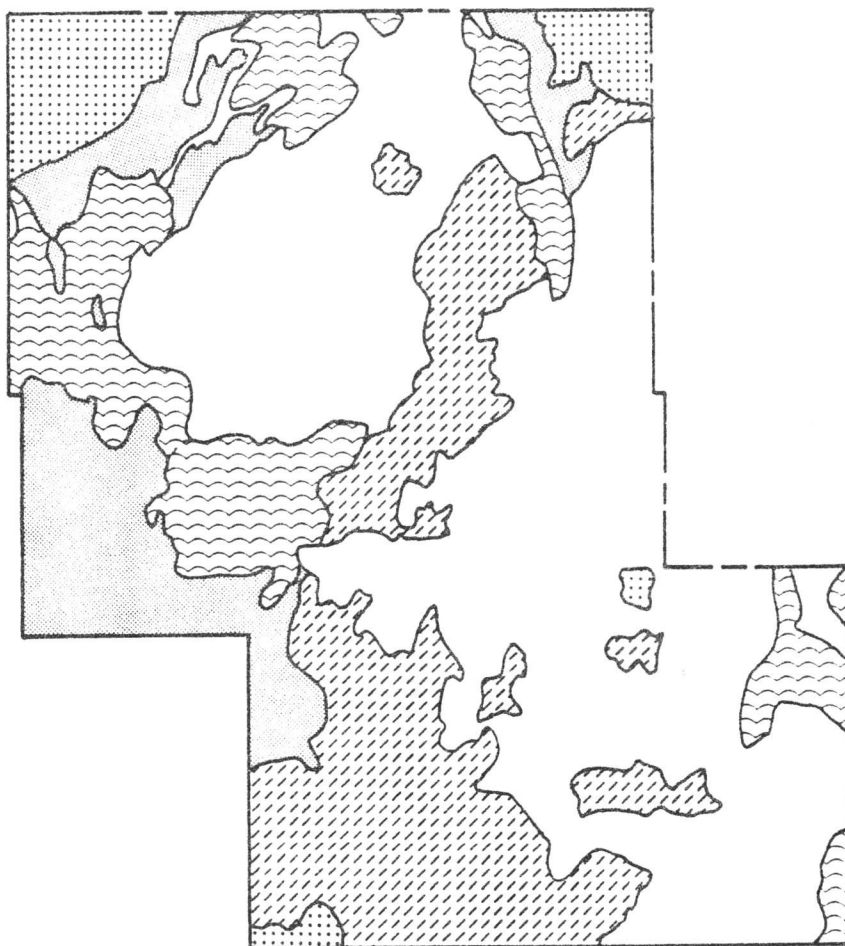
FIGURE 25 . . . TYPICAL SOIL CHARACTERISTICS  
ROCK MOUNDS IN IRRIGATED FIELDS



MEDIUM-SIZED SOIL BASIN



**Figure 26. Generalized Irrigation Suitability For Area Soils**



□ Predominant Scab Lands

▤ Very Poor

■ Poor

▨ Fair

▧ Good

SOURCE: State Water Resources Board, *op. cit.*, footnote 37  
Soil Conservation Service, *op. cit.*, footnote 38

Although there are no excellent, or very good soils within the study area, some soils considered to have good adaptability for irrigation do exist. They are limited to two portions of the Squaw Creek Irrigation District, in the vicinities of Cloverdale and Lower Bridge; in the Tumalo Irrigation District, on the plain west of Tumalo; in the Central Oregon Irrigation District, in a narrow strip north of Redmond, including an area north and west of Terrebonne, and in the vicinity of Alfalfa, east of Bend. Fair irrigation suitability is attributed to the remainder of the Central Oregon Irrigation District, to the Arnold Irrigation District, and to the Swalley District. Poor and very poor soils are generally not represented on the map, within the irrigation districts, except in isolated instances. However, by looking at a more detailed soil map that regrettably does not cover all of the study area, it is evident that soil distributions are not uniform in any of the above categories, which have generalized out many of the scablands, and do not show the presence of the small and medium soil basins.<sup>39</sup> Irrigation suitability, in this case, is limited by local conditions of soil depth, stoniness or rockiness, slope, and water-holding capacity.<sup>40</sup>

#### Economic Considerations of Change in Agriculture

Bowman in 1931, and Erickson in 1953, both classed farming enterprise within the study area as "marginal".<sup>41</sup> The Deschutes area is still, today, more isolated from markets for its farm produce than are other competing areas, and the physical nature of the study area limits



yields per acre to levels much lower than in the other competing agricultural areas. Increasing production costs with, in some cases, declines in productivity, have caused many of the agricultural lands to move into different uses. Also, the lack of homogeneity of the resource base has hampered the adoption of the practice of increasing farm size.

#### Isolation from Markets

Potato production trend within the study area is an example of the effect of relative isolation from markets. Erickson noted that the Deschutes area was competing with the Klamath Basin agricultural area for potato markets in the Willamette Valley, California, and the Middle West. He found that Klamath potatoes had a transportation cost advantage for the California and Lower Willamette Valley markets, while the Deschutes potatoes held an advantage for the Portland market. Both Central Oregon areas were, however, disadvantaged by the intermediate location of the Snake River Valley agricultural areas for midwestern and eastern markets.<sup>42</sup>

Today, the Klamath Basin area supplies a large part of the Willamette Valley and California fresh potato markets. The northern Willamette Valley and Puget Sound Trough markets have been taken over by other potato producing areas, predominantly by producers in the North Unit Irrigation District, in Jefferson County, and by farmers in the Columbia Basin Project area. As a measure of comparative advantage dynamics, the beginning of the downward trends in specialty

crops in Deschutes County occurred at about the same time the two other areas began to receive irrigation water.<sup>43</sup>

#### Differences in Productivity

Primarily because of the physical environment of the study area, yields per acre in Deschutes County are lower than are yields for the same crops in other agricultural areas. In 1953, in the Columbia Basin Project, the average yield of potatoes per acre was approximately one-third greater than current potato yields within the study area. Columbia Basin yields have increased from about 260 cwt/acre (4,728kg/ha), in 1953, to about 360 cwt/acre (6,546kg/ha), in 1963; current yields within the study area have declined to about 175 cwt/acre (3,200kg/ha).<sup>44</sup> Potato yields in the Agency Plains - Metolius-Culver area of Jefferson County, are similar to those in the Columbia Basin Project, about 360 cwt/acre (6,546kg/ha).<sup>45</sup>

The Jefferson County agricultural area has adapted grass, and cloverseed production in cash-crop enterprise, further undermining the market potential for similar crops within the study area. Seed production there is carried on in larger scale, and on generally larger farms than were characteristic within the study area before the decline began.<sup>46</sup> The Deschutes area has also lost its competitive edge to California and Canadian clover-seed producers, primarily because they experience greater yields per acre.<sup>47</sup>

#### Changes in Consumer Tastes and Preference

Per capita potato consumption in the United States has increased

gradually since 1962, but fresh potato consumption has actually declined. Processed potatoes, in many forms, have made up the difference by increasing in importance at a greater rate.<sup>48</sup> Increasing importance of processed foods in the American diet has caused industrial location theory to become proportionately as important for locating food processing plants. The Deschutes area is disadvantaged in site location by its relative isolation from major markets, and by lack of scale and homogeneity in the raw material supply area. The Jefferson County, Columbia Basin, and Snake River Valley areas have these economic advantages, and consequently, potato processing plants are located in and throughout these areas.

Alsike clover production has likewise suffered from changes in taste and preferences, but in a different manner. The seed was primarily processed into natural vegetable dyes, but have since largely been replaced by artificial dyes.<sup>49</sup>

It would seem that alfalfa hay would be subject to the same demand considerations from place to place, but with development of the hay marketing business, Deschutes County was, at first, passed over. The area's soils are inherently low in the trace element selenium, and deficiencies are transmitted through the quality of the forages produced. Therefore, the dairymen in the Willamette Valley prefer hay produced in other areas, most notably from western Idaho, northern California, and the Klamath Basin or Oregon. They will buy hay produced within the study area only if the regular sources are low in supply, or to gain a cost-of-transportation advantage.

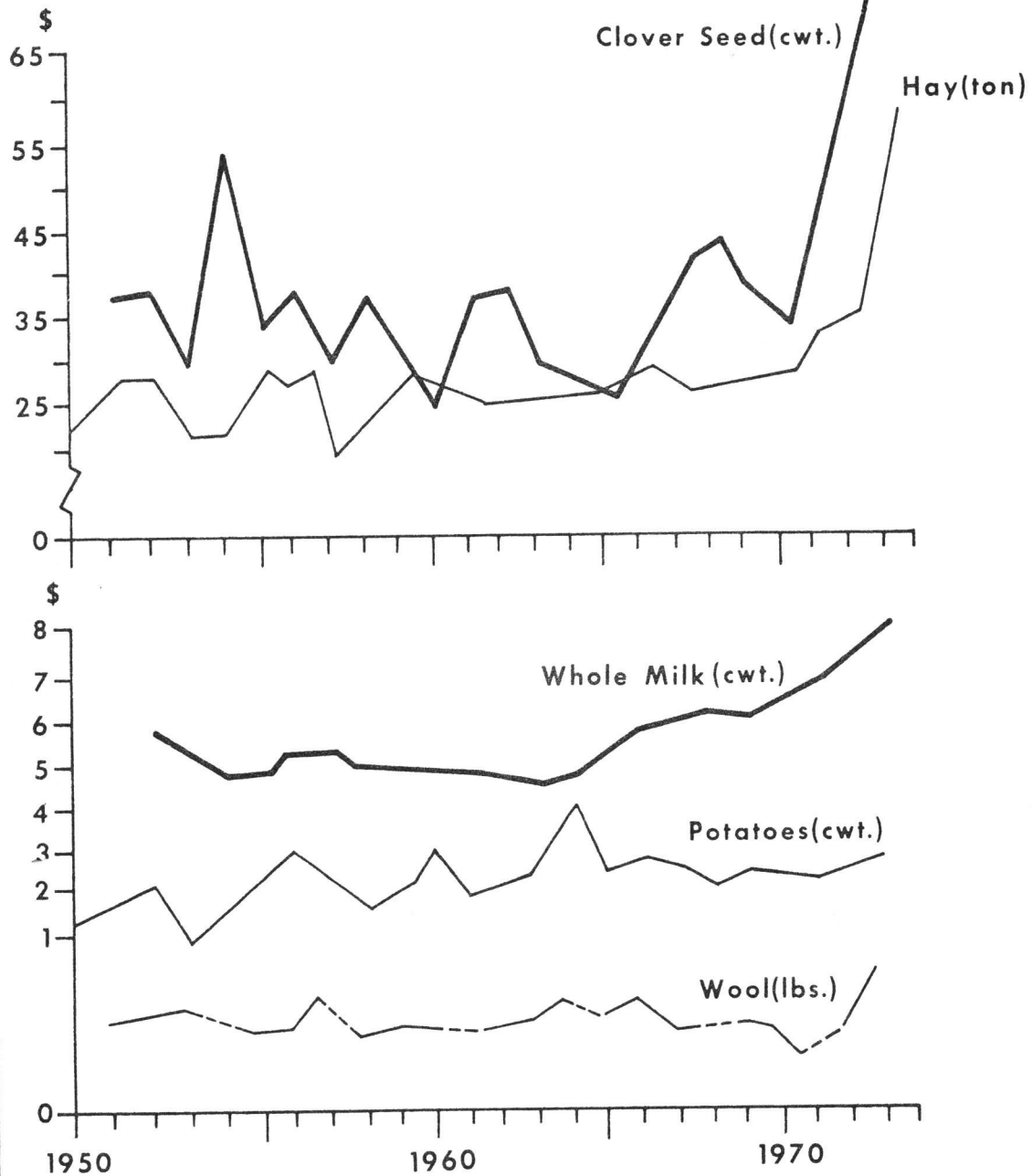
### Profit-Cost Margins

The costs for farm labor, real estate and taxes, farm machinery, fertilizers, and the other inputs necessary for modern farming enterprise have gradually increased over the years, adding accumulatively to total production costs.<sup>50</sup> Costs have increased gradually since 1950, with the increase being sharper since the early 1960's.<sup>51</sup> The prices received for farm products produced in the study area have, however, remained relatively constant, over the same time period (Figures 27 and 28). This situation would suggest the necessity of increases in productivity, which generally have not occurred, except on some of the larger dairy farms, and large full-time farms.<sup>52</sup>

There are definite advantages to economies of scale in farm enterprise, for those crops raised within the study area, because larger farms reduce operating costs per acre, to a limit, by becoming more efficient users of inputs. Larger farms, with modern equipment and managerial practices, often experience higher yields, as is the case of the larger dairy farms within the study area.

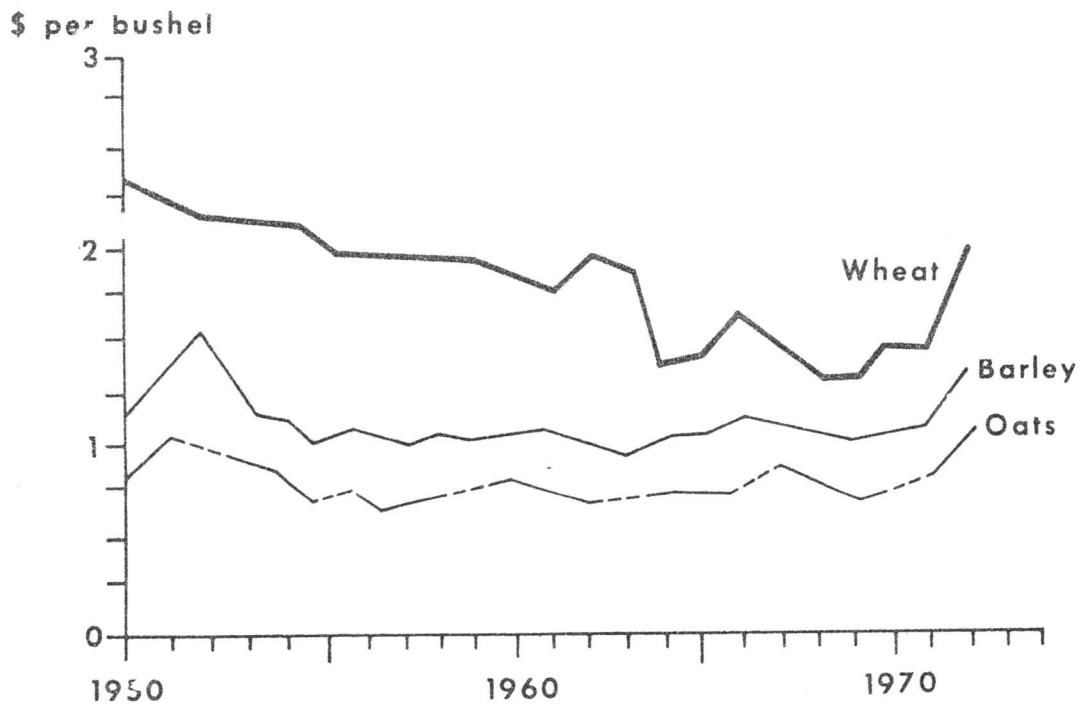
Hay and cattle production also gain advantages from scale of enterprise. Hay purveyors generally consider purchasing in large lots from one supplier to be beneficial, because of better guarantees of uniformity of quality and because large lots from a single supplier require less transportation and handling costs. Large cattle ranchers, of the cow-calf type found in the study area, find similar advantage because cattle buyers are willing to come directly to the ranch to buy

**Figure 27. Average Prices Received By Oregon Farmers For Hay, Specialty Crops, And Livestock Products**



SOURCE: Agricultural Statistics, U.S.D.A., 1950 - 1974

**Figure 28. Average Prices Received By Oregon Farmers For Wheat, Barley, And Oats**



SOURCE: Agricultural Statistics, U.S.D.A., 1950 - 1974

feeder or slaughter steers. Cattlemen in the area, with small herds, generally market their calves in small lots at the auction yard in Redmond, where part of the price they receive is taken in the form of a sales commission.

#### Detriments to Farm Enlargement

Madden stated that there are three factors that may limit consolidation of farm-operating units. These are: (1) lack of uniformity of resources; i.e., areas not having identical soil types throughout, so that they require different management practices; (2) spatial dispersion, so that a very large farm, even with homogeneous resources, requires more time spent in observing and managing all parts of the farm; and (3) lack of predictability, especially in enterprises where market conditions or weather are highly erratic.<sup>53</sup>

These limiting factors are prevalent within the study area, especially (1) and (3). In the early 1950's, farmers had lessened the effects of market fluctuations by adopting diversified farming practices to spread the risk over a wider range of crops and livestock. With the advent of specialized farms, however, market fluctuations are again becoming a problem for the area's farmers.

One factor not discussed by Madden, which is very important as a limit to farm enlargement in the study area, is the cost of acquiring more land or more water. Competition from uses other than full-time farming has forced the price for these resources to levels much higher than could be returned by agriculture.

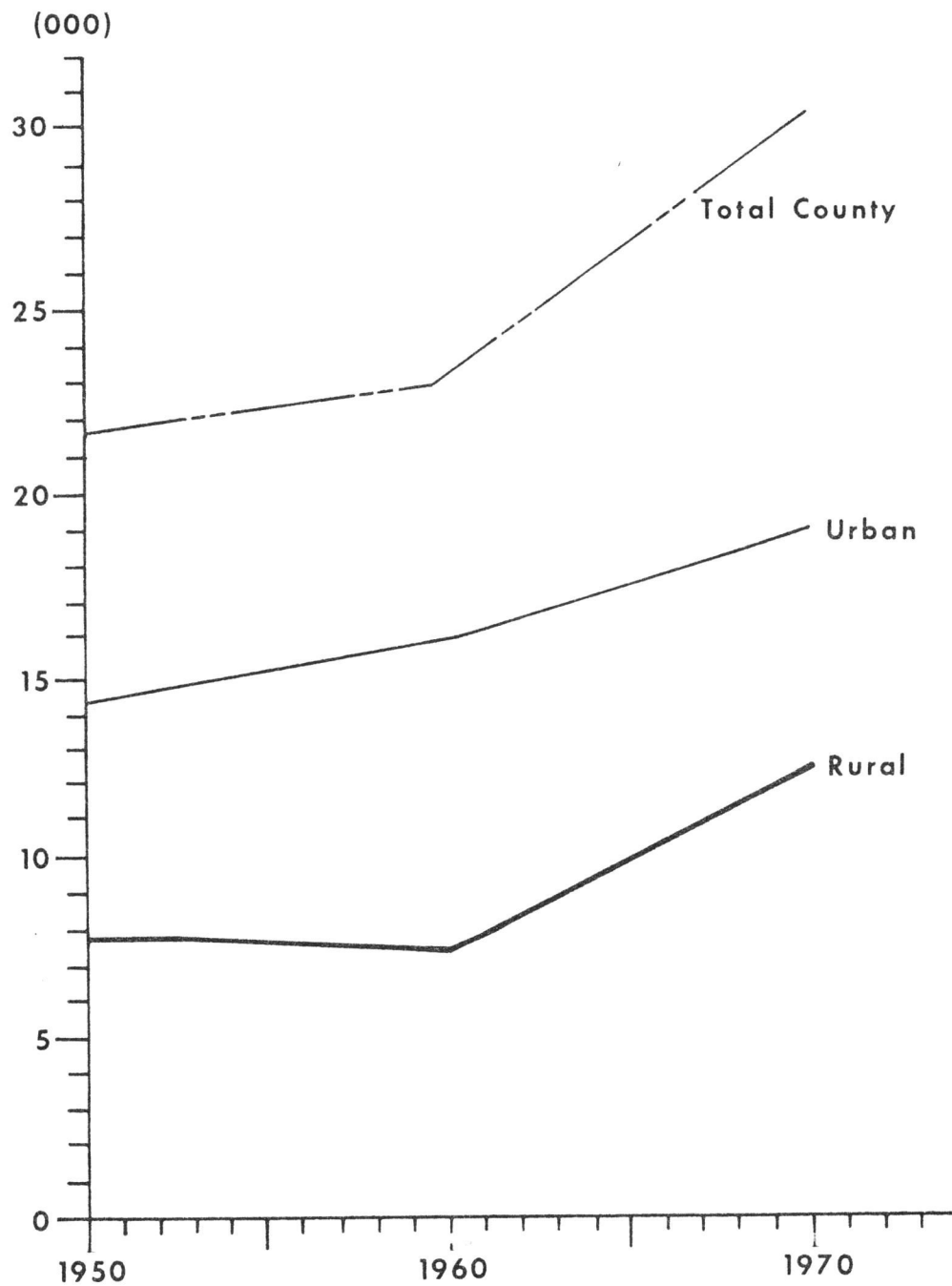
### Changes in Rural Society

During the early 1950's, the economic and social character of the study area were responses to the two major industries, forestry and agriculture, and a retail community serving the two major sectors. Tourism and recreation were minor, but growing sectors in the total regional economy.<sup>54</sup> Since Erickson wrote about the area, year round recreation has become the second most important industry in the region, surpassed only by lumbering in income generated.<sup>55</sup>

The study area has become increasingly more attractive over time for recreation, and recreation-retirement activities, especially since the early 1960's. At that time, a major winter sports facility was constructed at Mount Bachelor, located 20 miles (32km) southwest of Bend. The area has always been popular for summer and fall recreational activities, such as fishing, hunting, boating, and hiking, but development of intensity and popularity of winter sports has caused the phenomenal growth in recreational sectors of the local economy.

Year-round recreational opportunities have drawn many people to the area to settle permanently, either to live and work in Central Oregon or to retire there. As a consequence, population growth has increased gradually from 1950 to 1960, and more rapidly since then (Figure 29). An interesting aspect of the population growth rate, is the fact that rural areas are increasing in population at a faster rate than are the urban communities of Bend, Redmond, and Sisters. This growth in rural population is reflected partially in



**Figure 29. Trend In Deschutes County Population**

SOURCE: U.S. Bureau of Census, Census of Population, 1950, 1960, 1970, for Oregon

the increasing demand for amenity services (Figure 30).<sup>56</sup>

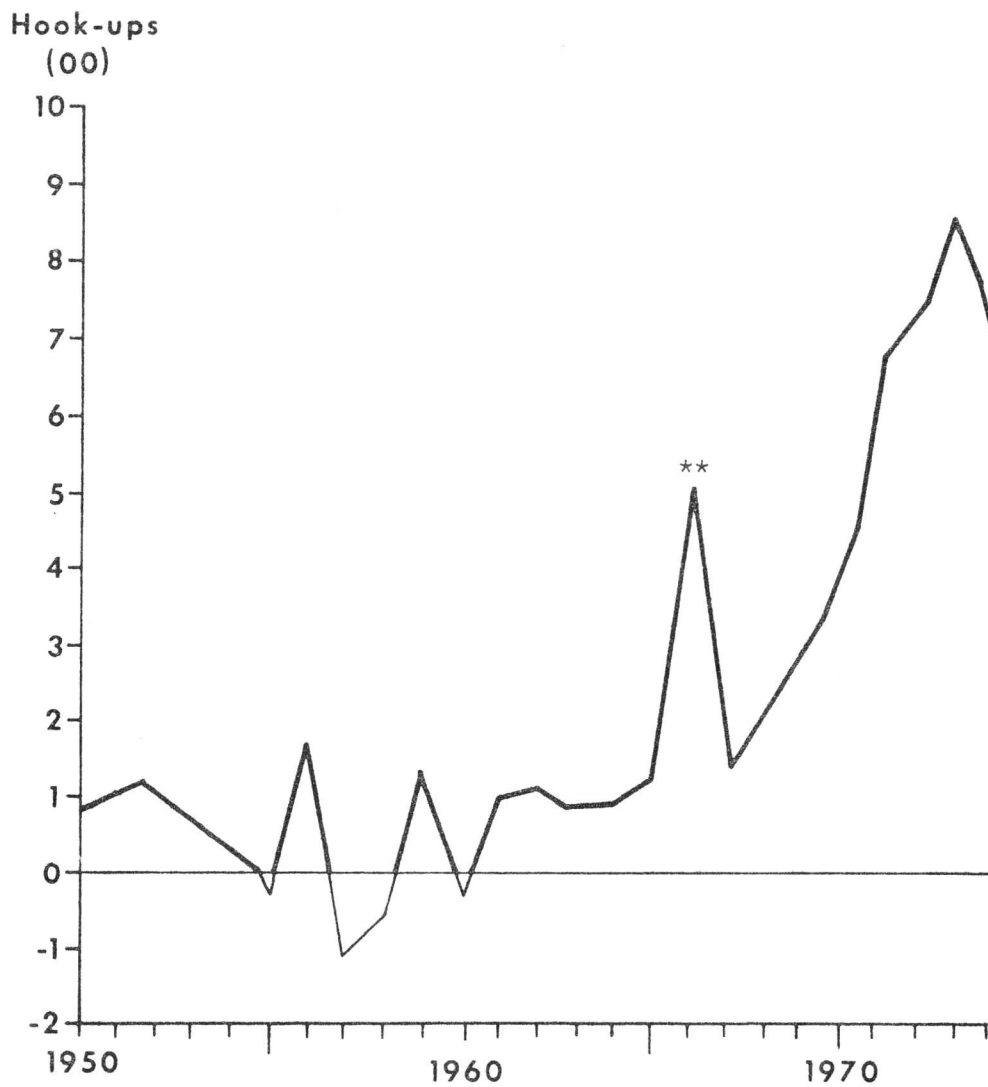
Consequent to population growth in the rural areas of Deschutes County, a change in employment categories of the residents is also taking place (Figure 31). The number of people whose primary source of income is derived from agriculture, has decreased steadily from just over 10,000 in 1950, to about 3,800 in 1970. The greatest change in rural employment structure has occurred in the higher income, or white collar professional fields. Low-income employment categories are second in rate of growth of population, followed by a slight increase in blue-collar categories: clerical, operatives, craftsmen, and foremen.

It is this writer's opinion that the relatively high income people can generally be associated with the medium-sized, to large hobby farms in the study area. People with relatively low, seasonal, or unstable incomes, can be identified with the smaller hobby farms, primarily on those with mobile homes as the dwelling type.

Changes in landuse are also inherently associated with changes in population structure, although not necessarily caused by them. Those land-owners with off-farm employment do not have time for intensive agricultural labor, except on weekends, when they have the choice of either working on their farms, or of taking advantage of the region's varied recreational resources.

Of the full time farmers I interviewed, none seemed to begrudge the burgeoning hobby farmer, because they seemed to realize that the

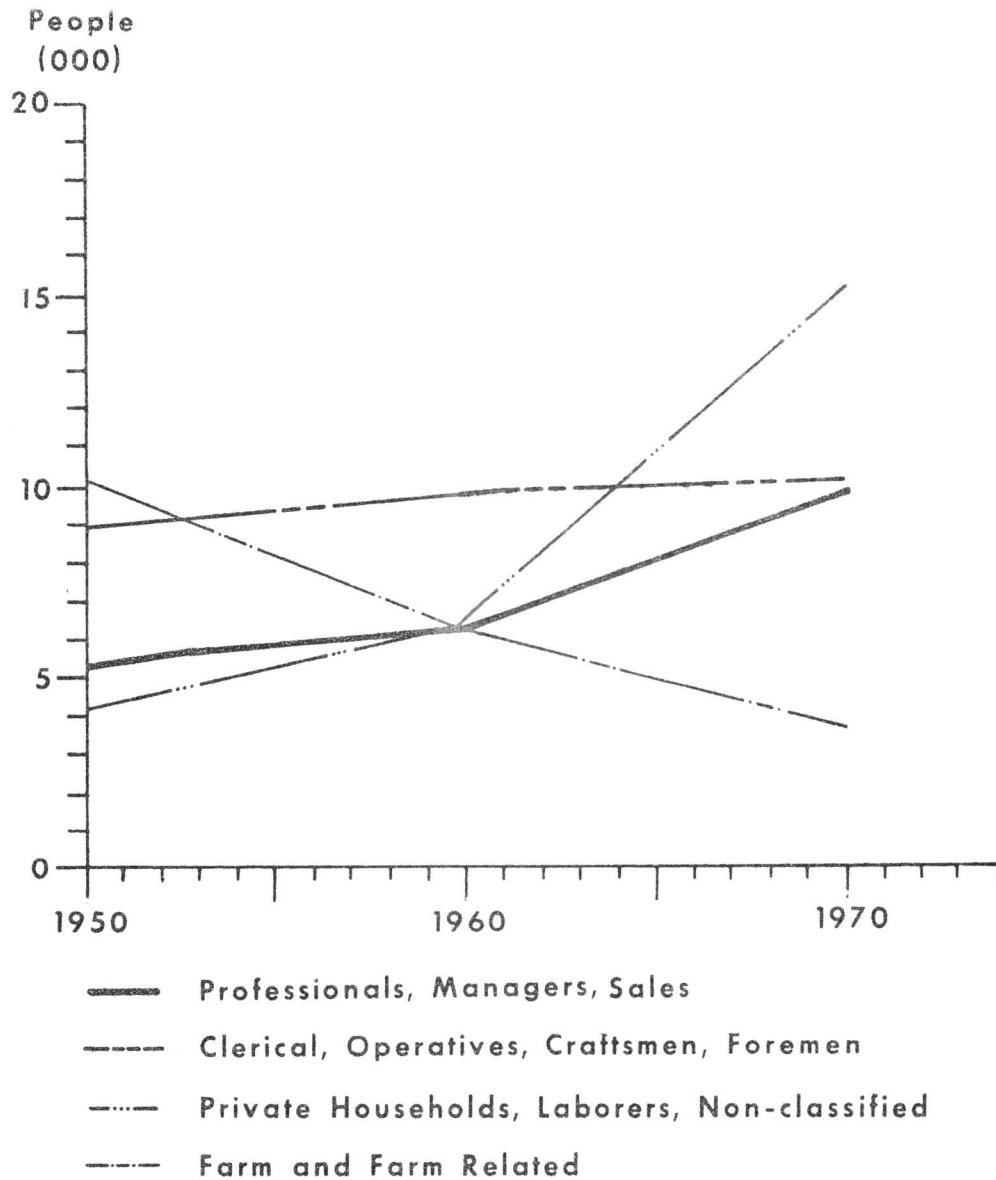
**Figure 30. Net Power Hookups, Central Electric Cooperative, Inc.**



SOURCE: Files of Central Electric Cooperative, Inc.

\*\* Picked up new service area

**Figure 31. Trend In Deschutes County Rural Employment Structure, 1950 – 1970**



SOURCE: U.S. Bureau of Census, Census of Population, 1950, 1960, 1970, for Oregon

hobby farmer is escaping the drudgeries of urban life for a quality "rural" environment. Those who were closer to the influences of the subdivisions and their residents were more critical, concerned with the visible misuse of land, increased traffic, and a rising crime rate in the vicinity.

One farmer was very critical of his past neighbors, who had gone out of business and sold their land to subdividers. He said that the main reason they "went broke" was because they were unwilling to tolerate the hard work and long hours associated with farming in the area. This ideology seems to mirror the thought that Bowman expressed in 1931, that those who "pioneer" in an area are those who are willing to live without many of the amenities that are available to them, and who are willing to receive fewer benefits at the present time with expectations of future benefits.<sup>57</sup> Those hobby farmers in the study area today, who are giving up many of the things that are available to them, are furthering the pioneer spirit, building for their future retirement, or attempting to realize a long held dream of being a "farmer".

## PROBLEMS AND PROSPECTS FOR FUTURE DEVELOPMENT

Experience and evolution have shown that a hayland-pasture, live-stock farm type is best suited to the natural limitations in the study area, but local conditions also limit the types of forages that can be grown efficiently. Deep-rooting alfalfa can be grown relatively well in the deeper soils, but root-zone limitations of shallower soils seem to suit them best for producing clover-grass mixtures. Where frost hazard is not too serious, as in the lower, northern portions of the study area, potatoes can be grown relatively well.<sup>58</sup> Notwithstanding current economic conditions, a dairy-crop enterprise mix is best suited for the study area.

The type of farming in an area is directly responsible for the degree of soil and water conservation. Powers emphasized the necessity of constant crop rotation, incorporating forage and other crop residues into the soil, to improve the water-holding capacity of the naturally fast-draining soils characteristic of the area. To ensure soil granulation, healthy, vigorous stands also have to be maintained. Pasturing livestock directly on the pasture, and aftermath grazing on harvested haylands also improves the level of organic content in the soil, by incorporating animal manures.<sup>59</sup>

Generally, these soil conservation measures are not practiced on the hobby farms in the study area. Most forage stands are not cultivated and reseeded as often as they should be, if at all. Overstocking on stands of desired forages quickly debilitates pastures, allowing less desirable weedy species to advance and dominate.<sup>60</sup>

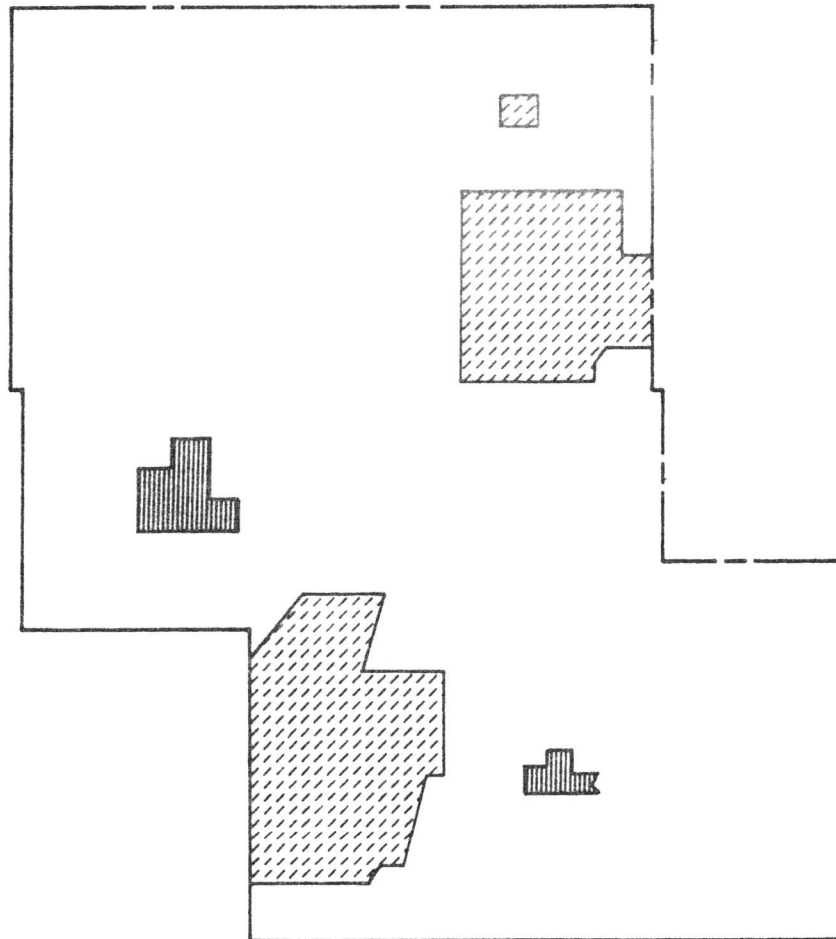
Land-use zoning in Deschutes County seems to be ensuring that such practices will continue to be carried on. Although the area outside the special consideration zones around Bend, Redmond, and Terrebonne are zoned for exclusive agriculture, or agriculture with transitional standards, section 3.220 of the Deschutes County Zoning Ordinance No. PL-5 states:

1. The minimum lot area shall be five acres unless the lot is located in a Class II Rural subdivision as approved by the Planning Commission . . . (Figure 32).<sup>61</sup>

From this, it is evident that Deschutes County is not zoning according to agricultural capability, nor for any commercial agriculture. The planners are ensuring the future proliferation of small hobby farms of the type that are most characteristic of improper land use and cropping practices.

Conservation of water is another serious problem in the study area, which has been present since the earliest irrigation development was completed. Except for a few deep wells, drilled at great expense through hundreds of feet of solid basalt, all of the water used for irrigation and domestic uses comes from irrigation district delivery systems. A very low irrigation efficiency is present throughout the study area, due to losses of large amounts of water from the point of diversion to the fields where it is eventually applied (Figure 33). There have been no exact studies of the extent of water loss in the study area, but the Bureau of Reclamation estimates a 50 percent loss in

**Figure 32. Deschutes County Zoning In The Study Area**

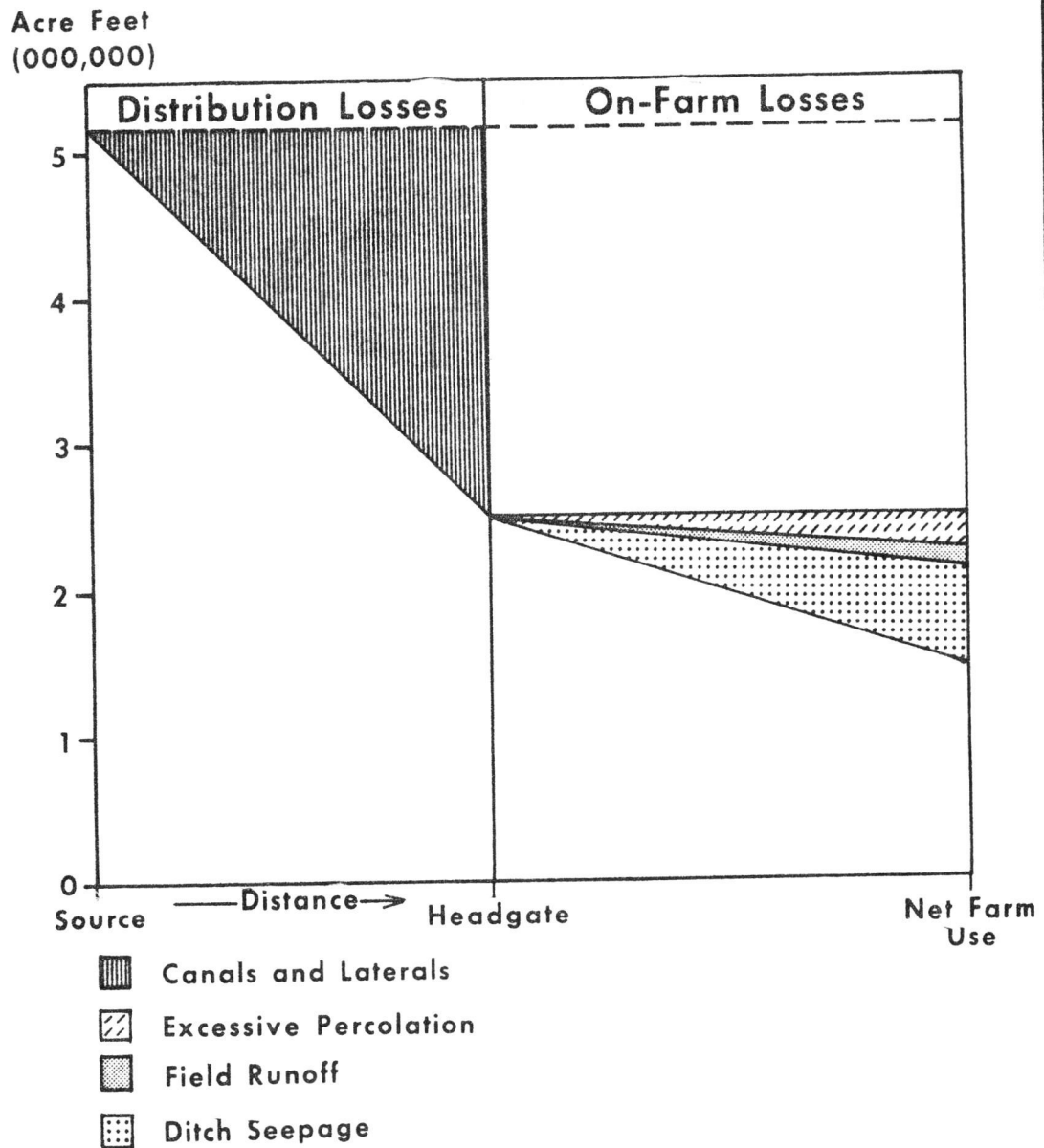


- ☐ Exclusive Agriculture
- ☒ Area for Special Zoning Considerations
- ☒ Exclusive Agriculture with Transitional Standards

SOURCE: Deschutes County Zoning Ordinance, No. PL-5,  
op. cit., footnote 61



**Figure 33. Water Losses In Deschutes Irrigation Systems**



SOURCE: Compiled from information in: U.S. Bureau of Reclamation, op. cit., footnote 2, pp. 40-41

the distribution system alone.<sup>62</sup> Farm efficiencies range from about 40 percent for gravity systems to about 58 percent for sprinkler systems.<sup>63</sup> Due to these losses, an overly large amount of water is diverted from the Deschutes River during the irrigation season, leaving the in-channel flow of the river depleted almost to the point of disappearance during the summer.<sup>64</sup>

To help solve water-savings problems, the Bureau has proposed a massive canal-lining project, at a cost of about \$67,009,000 (April, 1971 prices).<sup>65</sup> To finance the project, the Bureau has proposed that more irrigation development within the study area be undertaken. Although there are isolated areas where additional water could be beneficial to agricultural enterprises, it is this writer's opinion that such a development would further improve lands for their subdivision value.

Although any program to save water, or to decrease the waste of any resource is a move toward "true" development,<sup>66</sup> it is apparent through the results of this study, that commercial, full-time agriculture cannot repay all of the construction costs. These costs could be repaid more readily by the hobby farmers, because they generally do not seek to repay all of their production costs purely from agricultural enterprise. Indeed, more subdivision within the existing systems may be necessary to repay construction costs, to spread the repayment over smaller ownership units.

An alternative repayment scheme would assess at least part of the cost of construction to instream-downstream beneficiaries, of which the

State of Oregon and Portland General Electric would be most benefitted. The State could improve fish habitat with increased summer flows, and P.G.E. would benefit from increased flows to their electricity generating plants at Round Butte and Pelton Dams on the Deschutes River.

Excess water might also be sold to other agricultural areas, where relatively higher value crops can be grown in more amenable physical environments, rather than be retained in Deschutes County, where water has a relatively low agricultural productivity value. Areas possibly feasible for transfer of water rights from the Deschutes area include the North Unit Irrigation District in Jefferson County and the valley lands of Crook County near Prineville.

On-farm water savings could be generated by two cultural practices: sprinkler irrigation and humus-building through more frequent crop rotation. Sprinkler irrigation is not widely practiced within the study area primarily because of prohibitive installation costs, but the total costs vary with the size of farm. Doran, et. al. found that there are scale efficiencies for sprinkler system installation and maintenance, with lower costs being found where the method had been adopted on larger farms.<sup>67</sup> It is possible, with a change in tax law, that tax credits could be given to farmers who adopt sprinkler irrigation for conservation measures, instead of taxing them as capital inputs as is current practice.

Powers and others, suggest that on-farm water savings could also be

generated by conservation farming practices, whereby humus-building by frequent crop rotation would improve water-retention abilities of highly permeable soils.<sup>68</sup> Secondary benefits from adoption of conservation farming would be: improved soil tilth; lower fertilizer requirements, because increased organic material in the soil would reduce the amounts of commercial fertilizer needed as well as reducing rapid solution and percolation of fertilizers outside the reach of root systems; and increased crop yields.<sup>69</sup> The practices may also aid in increasing soil temperatures, thereby improving local microclimatic soil conditions for crop physiology.

Another water-related problem requiring urgent attention in the study area is the deterioration of water quality. The majority of domestic water is taken from irrigation deliveries and stored in cisterns for a constant supply. Subdivision and use of septic tank waste-disposal systems in very permeable soils along the Deschutes riverbank upstream has the potential of further polluting the river, especially if those soils are charged beyond their capacity. Clearly, more restrictive zoning controls are needed, to lessen the probability of stream pollution, or of water-borne microbial diseases.

## CONCLUSIONS

Early irrigation developments in Deschutes County were planned and constructed for immediate perceived needs with no, or little consideration for problems that may have come up in the future. They were constructed at a time when agriculture was the "way of life" for a large segment of the national population. It was draft powered and more labor intense. At the same time, water had little perceived value for uses other than agriculture and consequently water-wasting was not critical so long as the agricultural lands received their duty of water. Essentially the same comments could be made concerning the value and use of land.

Experience and experimentation through time proves that northern Deschutes County was a marginal agricultural area even in the strictest economic sense. After relatively high crop prices had fostered a feeling of stability to commercial farming in the area during and following World War II, domestic over-production of the crops being raised in Deschutes County drove prices below the level required for farmers in the area to recoup their production costs. Further irrigation development in more favorable agricultural environments, along with general nationwide gains in efficiency, out-put, and transport caused by vast improvements in resource-converting and space-adjusting technology removed the competitive advantages enjoyed by Deschutes County farmers after the late 1940's and early 1950's.

Growth of a new industry in the region and its economic and social consequences, developed a market for land and water to those farmers who were willing to sell. Consequently, current patterns of landuse and landscape began to manifest themselves, eventually replacing a relatively sound conservation farming system. This new agricultural structure may, however poor the soil and water conservation practices associated with it are, be the answer to two major problems in the area: Reoccupance of the land - a new pioneer movement - and financing major reconstruction of water distribution systems, the latter not being feasibly financed by commercial agriculture in Deschutes County.

## FOOTNOTES

- 1 Dicken, S. N., Oregon Geography, Fourth Edition (Eugene, Oregon: University of Oregon Cooperative Bookstore, 1965), p. 16.
  
- 2 Arable Lands in This Study are Those Considered to be within the Land Capability Classes I-III by the U. S. Bureau of Reclamation. Deschutes Project, Potentials for Expansion and Improvement of Water Supplies (Washington: U. S. Department of Interior, 1972), pp. 14-15.
  
- 3 This brief account of Deschutes County's agricultural history just touches on some highlights of the evolutionary process. Many works cover the history of the area in more depth, some of which are: Bowman, Isaiah, The Pioneer Fringe (New York: American Geographical Society, Special Publication No. 13, 1931); Brogan, Phil F., East of the Cascades (Portland: Binfords and Mort, 1964); Erickson, Sheldon D. "Occupance in the Upper Deschutes Basin," Research Paper No. 32 (Chicago: University of Chicago Department of Geography, December, 1953); Oliphant, J. Orin, On the Cattle Ranges of the Oregon Country (Seattle: University of Washington Press, 1968).
  
- 4 Erickson, op. cit., Footnote 3, pp. 83-84.
  
- 5 Erickson, op. cit., Footnote 3, p. 85.
  
- 6 Erickson, op. cit., Footnote 3, pp. 85-86.
  
- 7 Bowman, op. cit., Footnote 3, p. 94, pp. 111-112.
  
- 8 Bowman, op. cit., Footnote 3, p. 95.

- 9 Erickson, op. cit., Footnote 3, pp. 85-86.
- 10 Cooperative Extension Service, Revised Annual Crop Report Estimates (Oregon State University, 1959-1973), and interview with Mr. John McGrew, farmer, 19 March, 1975.
- 11 Cooperative Extension Service, op. cit., Footnote 10.
- 12 Cooperative Extension Service, op. cit., Footnote 10.
- 13 Oregon State Agricultural College Extension Service, "County Agricultural Data: Crook, Deschutes, and Jefferson Counties, Oregon" (Corvallis: Oregon State College), in Erickson, op. cit., Footnote 3, pp. 86-87.
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- 15 Interview with Mr. Marvin Young, Deschutes County Extension Agent, 15 April, 1975, and Sterling, Robert H., "Deschutes County", Agriculture in Oregon Counties: Farm Sales and General Characteristics (Corvallis: Oregon State University, June, 1971) pp. 80-81.
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- 17 Young, op. cit., Footnote 15.
- 18 Erickson, op. cit., Footnote 3, pp. 38-50.
- 19 Interviews with Mr. Beril Nelson, Dairyman, Mrs. Wally Crawford, Dairyman, and Young, op. cit., Footnote 18.



- 20 Interview with Dr. John Landers, Extension Animal Scientist,  
Oregon State University, Corvallis.
- 21 Stricklin, C. E., "Oregon Irrigation", Oregon Blue Book, 1949-50  
(Salem: State Printing Office), p. 205. Found in: Erickson,  
op. cit., Footnote 3, p. 84.
- 22 Sterling, op. cit., Footnote 15, p. 81.
- 23 Erickson, op. cit., Footnote 3, pp. 83-84.
- 24 Interview with Mr. Bill Kurtz, Deschutes County Farm Land Tax  
Assessor, 20 March, 1975.
- 25 McGrew, op. cit., Footnote 10.
- 26 Erickson, op. cit., Footnote 3, p. 84.
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(Englewood Cliffs: Prentice-Hall, Inc., 1966), pp. 192-198.
- 28 Hatton, Raymond R., Bend Country Weather and Climate (Redmond:  
R. R. Hatton, 1973), p. 9.
- 29 Watts, A. G., et. al., Consumptive Use and Net Irrigation Require-  
ments for Oregon (Corvallis: Agricultural Experiment Station,  
Oregon State University, 1968), pp. 13-14, p. 17.
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University, 1967), p. 9.

- 31 Watts, A. G., op. cit., Footnote 29, p. 5, pp. 28-29.
- 32 Hatton, R. R., op. cit., Footnote 28, p. 31, p. 33.
- 33 A growing degree day is the accumulated number of degrees, for consecutive days with the average daily temperature exceeding 50°F. (27.5°C). Hatton, R. R., op. cit., Footnote 28, p. 7.
- 34 McGrew, op. cit., Footnote 10.
- 35 The area west of the Deschutes River, within the Tumalo Irrigation District, experiences more mountain-wind influence than does the rest of the study area, giving a generally lower wind-chill factor during critical periods of low temperatures; and Erickson, op. cit., Footnote 3, p. 91.
- 36 Resource Development Section, op. cit., Footnote 30, pp. 11-12; and Erickson, op. cit., Footnote 3, pp. 20-22.
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- 40 State Water Resources Board, op. cit., Footnote 37, pp. 34-36.
- 41 Bowman, op. cit., Footnote 3, p. 11, p. 112; Erickson, op. cit., Footnote 3, p. 47, p. 88.
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- 46 Kimball, op. cit., Footnote 43, p. 1-6.
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- 48 U. S. Department of Agriculture, 1974 Handbook of Agricultural Charts (Washington: USDA, 1974), p. 147.
- 49 Young, op. cit., Footnote 15.

- 50 Farm land value is increasing annually at about a 7-10 percent rate within the study area. Kurtz, op. cit., Footnote 24.
- 51 U.S. Department of Agriculture, op. cit., Footnote 48, p. 13.
- 52 The 1959 Census of Agriculture noted that just under 25.5 million pounds of milk were sold in Deschutes County. In 1964 this had increased to well over 26.25 million pounds, from fewer cows. And, interview with Young, op. cit., Footnote 15.
- 53 Madden, J. P., Economies of Size in Farming (Washington: Economic Research Service, USDA, 1967), pp. 11-12.
- 54 Erickson, op. cit., Footnote 3, pp. 31-32.
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- 56 Central Electric Cooperative in Redmond is the only service agency that serves only the rural areas. However, its service area covers other areas that are not included in this study. A spokesman for the Co-op estimates that approximately 90 percent of the increase in net hookups annually is generated within the study area. Interview and files of Central Electric Cooperative, Redmond, Oregon, 20 March, 1975.
- 57 Bowman, op. cit., Footnote 3, pp. 1-20.
- 58 Powers, W. L., et. al., Land Capabilities and Conservation Farming; Deschutes Area, Central Oregon (Corvallis: Oregon Agricultural Experiment Station, 1947), p. 40.

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- 60 Powers, op. cit., Footnote 58, pp. 48-49.
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- 62 U. S. Bureau of Reclamation, op. cit., Footnote 2, pp. 40-41.
- 63 U. S. Bureau of Reclamation, op. cit., Footnote 2, p. 48.
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## APPENDIX I

## DATA RELIABILITY AND BIAS

The data bases for my three primary data sources: (1) U.S. Bureau of Census, Census of Agriculture, 1950, 1954, 1964, 1969; (2) Cooperative Extension Service, Annual Revised Crop Report Estimates, 1959-1973; and (3) U.S. Bureau of Reclamation, Federal Reclamation Projects, Annual Crop Report and Related Data, 1955-1973, do not fit the boundaries of the study area exactly, nor do they represent the same reporting years in all cases. The Census of Agriculture and Annual Crop Report Estimates report for all of Deschutes County; the Bureau of Reclamation reports for only three of the five irrigation districts that are located within the study area.

The use of county-wide data is justified as representing the study area's crop and livestock trends, because approximately 95 percent of all farms, and cropland are located within the five irrigation districts (Census of Agriculture, 1950-1969). The only deviance from the 95 percent reliability is in the categories of small grains cut for hay and numbers of cattle and calves which are the predominant crop and livestock types on dryland farms and cattle ranches outside the study area, in Deschutes County. Although the Bureau's data do not represent all of the irrigated lands within the study area, they do include the Powell Butte agricultural area, located just east of the study area boundary, in Crook County. The agricultural types there are similar to those in the study area, but it is less affected by the subdivision and hobby-farming phenomena. The Powell Butte agricultural area more than makes up

for the acreages not reported for the other low irrigation districts, accounting in part for the high acreages and numbers of animals, compared to the other reporting sources in the trend graphs. During the process of field research, I attempted to disaggregate the reports for Central Oregon Irrigation District, by utilizing ditch rider reports. I found that the data could not be disaggregated by the method, primarily because the District did not collect its own data during the period 1959-1972. Mr. Bob Anderson, manager for the District, informed me that during that time period, the Bureau of Reclamation estimated the acreages. The Bureau tended to overestimate the acreages, as is evidence by the sharp drop in their reported acreages after 1972, when the District again began its own crop reporting.

Over-, or under-estimates may be present in the data reported in the other two sources. It is my opinion that the most accurate source is the Cooperative Extension Service, but problems occur within its reports. Discontinuity of reporting for specific livestock types is the most serious problem, but the other major problem for trend studies is the fact that the reports began relatively late. By 1959, many of the trends in Deschutes County agriculture had already suffered the sharp declines represented in this study, and anyone relying solely on that data source could not visualize the dynamics in Deschutes County agriculture.

## LIST OF INDIVIDUALS AND ORGANIZATIONS INTERVIEWED

Bob Anderson, Manager, Central Oregon Irrigation District, Redmond

Bend Chamber of Commerce, Bend

Central Electric Cooperative, Redmond

Mrs. Wally Crawford, Dairy Farmer, Bend

James Fleming, Farmer, Manager, Miller Lumber Company, Bend

Dale Heidy, Farmer, Terrebonne

Bill Kurtz, Farm Tax Assessor, Deschutes County, Bend

John Landers, Extension Animal Scientist, Oregon State University, Corvallis

John McGrew, Farmer, Lower Bridge

Bertil Nelson, Dairy Farmer, Bend

Bill Sanowski, Student, Oregon State University (former farm resident)

Corvallis

Laura Wonser, Secretary, Swalley Irrigation District, Deschutes County

Pioneer Association, Bend

Marvin Young, Deschutes County Extension Agent, Redmond



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