

BADGER POCKET -- WASH-3

ANNUAL REPORT

1938 - 1939

The Badger Pocket Project consists of 40,000 acres of irrigated land, located seven miles southeast of Ellensburg in central Washington, and lies at an elevation ranging from 1600 to 2100 feet. Seventy-six percent, or 46 square miles of the area receives its water from the north branch of the High Line Canal, which is a part of the Kittitas Division of the Yakima Irrigation Project. Canal construction was completed in 1932. This canal irrigates the steeper and more rolling lands that lie above the older irrigation systems in the valley. In all cases 4 acre feet are allotted to the irrigable lands of the individual farm units and must be paid for whether utilized or not. Additional water may be purchased if desired. In some cases, lands as steep as 65 percent are actually being irrigated in this division. Because water is plentiful under this district, and because of the low financial returns from crops produced, sufficient labor has not been utilized to properly irrigate and to handle the water without serious loss through erosion and leaching of soil nutrients. Economic conditions, in a large number of cases, have made it impossible for the individual farmer to place in operation

proper water regulating devices even though he realizes that the productivity of his farm was being seriously impaired by the misuse of irrigation water.

must
Fourteen square miles, or 24 percent of the project area lies on relatively flat gradient and is irrigated from the old Cascade Canal, and, in part, by the Town Ditch which were constructed in 1912. ^{1903, 1885 respectively} The irrigation of the steeper lands above these old systems has aggravated the drainage problem in the lowlands under the old ditch systems. There is an apparent increase in the alkali areas on the older lands.

There are approximately 435 farm units located within the area and 40 percent are at the present time operated by tenant farmers. The average size of an irrigated unit is 92 acres. Balanced farming through livestock has been largely limited because approximately 50 percent of the farms have available stock water only while the irrigation canals are actually in operation. Ground water levels are, in general, at a considerable depth and the average cost of the deep wells runs from \$1200 to \$1500 for each complete installation. On the area as a whole, approximately half the farm units have a winter supply of stock water made available through the use of cisterns, wells or streams. To date, no crops of high acreage returns have been found that are suitable to the soil and climate of the valley.

On the Kittitas Division, consisting of 70,186 irrigable acres, 56,709 acres, or 81 percent of the District, comprising 779 farm units, is now being irrigated. The principal crops raised and their value in 1938 are shown in order of importance in the following table obtained from the Reclamation Service office at Yakima:

<u>Crops</u>	<u>Total ⁴/_{Field}</u>	<u>Value per Acre</u>	<u>Total Value</u>
Potatoes	1,591,499	\$ 83.66	\$ 413,790
Alfalfa hay	26,031	16.87	195,233
Cereals	1,418,628	15.82	193,604
Seed	38,109	19.62	80,845
Vegetables	91,651	39.45	41,489
Sugar Beets	8,119	37.92	34,506
Fruit(mostly berries)	92,340	33.70	1,212
			<u>962,400</u> 439

The average gross acre income for 1936, 1937 and 1938 has been \$33.12, \$28.63 and \$22.03^{23.08} respectively. At the end of the 1938 irrigation season, 45 percent of the water users under the High Line Canal were delinquent in their water assessments.

I. Effectiveness of the Program

(a). During the past year requests for information, technical assistance and demonstrations have been made by several different agencies and by numerous private individuals. In brief, these requests include the following:

1. Requests for information, cooperation and field trips by:

County Agent, Benton County, Washington; U. S. Indian Service, Toppenish, Washington; Roza Irrigation District; Sunnyside Irrigation District.

2. Requests for information on irrigation problems and demonstrations of methods:

New Agriculture, published in San Francisco - article on use of cotton in erosion control.

Washington Farmer - two articles on erosion problems and control measures.

Washington Irrigation Institute - paper on erosion problems under irrigation.

Commissioner of Agriculture of Northern Pacific Railroad - erosion control on irrigated land.

Director of Agriculture of the Chicago-Milwaukee-St. Paul and Pacific Railroad - erosion control on irrigated projects.

Community of Vera, Washington - demonstration of over-head sprinkler system.

County Agent, Spokane County, Washington - talk on irrigation by sprinkler method.

3. Information requested by individuals:

"Big 4 Ranch" at Stratford, Washington - request for assistance in planning an irrigation system on a 1,000 acre ranch.

Snohomish County - letter requesting information on sprinkler irrigation.

Burrows at Yakima - information on sprinkler irrigation or possibility of other methods.

Numerous requests from farmers off the local Project area - technical assistance in laying

out proper irrigation systems.

4. Technical assistance and information requested
by other areas, projects and camps in the Region:

Emmett, Idaho, Project Office - (two trips)

White Bluffs, Washington, Water Facility Area.

Weiser, Idaho, Camp Area.

Pocatello, Idaho, Project Office, Sublet Water
Facility Area and Preston Camp Area.

Stratford, Washington, Individual Irrigation Plant.

Bellingham, Washington, Nursery.

Pullman, Washington, Nursery.

Snohomish, Washington, Flood Control Area.

(b). A much more favorable attitude has been noted in this community. Increasing numbers of requests for technical information have been made by those outside of the project area, but within the immediate vicinity of the project office. The most striking fact, however, is the interest that has been aroused by the demonstrations at Ellensburg and the various irrigated sections in the Yakima and Wenatchee Valleys. This is best illustrated by the foregoing list, which shows a large majority of the requests came from areas at a considerable distance from Ellensburg.

Lack of funds has been the greatest single controlling factor in curtailing private expenditures for the proper control of irrigation water. In some instances, farmers have borrowed quite heavily, realizing that these improvements would, in a

short time, repay their cost in increased crop production and curtailment of labor necessary during the irrigation season. The seriousness of the situation can be readily recognized when we realize that only 55 percent of the farmers in the area have been able to meet their water assessments for the current year. Several farmers in the area, who were extremely critical of the program two years ago, have either signed cooperative agreements or have requested them for the fall of 1939. In addition to this, we have furnished technical advice, which has been followed, to several farmers who were our most outspoken critics a year ago. A striking increase is noted in the voluntary applications received for service in connection with our farm planning program. This is particularly significant in view of the fact that we have drawn up all new agreements on a strictly operations basis and no materials, other than trees or seed, have been furnished.

(c). Tree plantings in any form, have been difficult to secure because the areas on which they should be planted, to afford the maximum protection from wind erosion to the farm, are often the most valuable lands which the farmer possesses. (See photo pagell). The low crop income makes it mandatory that cash returns be sufficient to at least bear the cost of operations. Another serious handicap in this work is that under the press of the early season's operations, annual

crops are given the first consideration and the tree plantings quite often suffer severely from lack of proper irrigation, particularly in the opening weeks of the irrigation season. Established windbreaks consist, in the main part, of one row of willow plantings or, in some cases, single rows of cottonwood or elm. These provide only a minimum of protection and are poor returns to the farmer for the time and money spent in installing them and caring for them through to maturity. The large number of tenants makes a long-time program of woodland management difficult where the returns must be computed over a period of several years. Many objections are being overcome by our Service such as fear of sprouting in adjacent fields and damage to canals and other irrigation structures. The objection to affording these plantings the necessary protection has been largely overcome by fencing to prevent stock damage and possible damage through harvesting of crops on adjacent areas.

The entire project is heavily infested by noxious weeds and the woodland plantings, in their early stages, afford an excellent place for weed growth and spread. To overcome this, some of these areas have been interplanted with grass to provide competition and elimination, insofar as possible, of the weed problem until the trees themselves can effectively shade out the undergrowth. It is hoped that this will tend to eliminate, in a large measure, the necessity of excessive labor that is now necessary to control the weeds on planting areas.

Woodland plantings of one variety or another have been successfully established on all of our cooperative agreements. In this way we have been able to retire to trees, areas that have been severely eroded or those which would have been critical areas had they been utilized for any of the present crops. The Woodland Section, in cooperation with the Nursery Division is working on the details of providing species that will allow a greater return and one commensurate with the land values and the care involved in bringing these plantings through to maturity.

The most serious remaining problem in the Woodland and Wildlife Program is that of convincing the individual Cooperator that the future values involved are sufficient to allow for expenditure of considerable time and money prior to the actual harvesting of the timber crop, and before the direct benefits of windbreak and wildlife plantings can be fully appreciated. Cooperators, on whose land plantings were made two years ago, are already beginning to appreciate the value of woodland plantings and a marked improvement in their care has been noted.

In the agronomic field some difficulty has been encountered in securing acceptance of grass-alfalfa mixtures for improved erosion control on steep lands, because the west coast markets do not recognize mixed hay as a number one feed. This is partly because grasses formerly found in alfalfa were mostly

High winds in the spring have filled a 4
to 6 foot deep, roadside ditch with soil,
blown from the grain field in the back-
ground, before the irrigation of crops has
been started.

Wm-

April 19, 1939

T. R. Horning

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cheat grass, and partly because grass pastures used to furnish carbohydrates, are available on the coast and require only straight alfalfa to balance the roughage feed.

Prejudices against certain methods of water distribution and irrigation have been counteracted by demonstrations of improved methods on Cooperators' farms. Among these demonstrations, the following are included:

1. Many irrigators believed that reducing the width between corrugations would increase the time and labor required to irrigate in direct proportion to the increase in the number of corrugations. The difficulties encountered when large heads of water are run for long distances are strikingly shown on the several fields illustrated by Aerial Photo No. A-Wn-45004 on the next page. Systems of pipe lines, flumes, Browne spreaders and cloth-lined ditches have been installed on several fields as permanent and temporary installations to reduce the length of corrugations.
2. In the past it was considered an unnecessary expense and a great inconvenience in performing farming operations, to install flumes across the middle of fields planted to row crops. This Service has made use of these pipe lines, Browne spreaders, temporary flumes and cloth-lined ditches,

Aerial photo showing late season irrigation of fallow land seeded to rye for a green manure crop next spring. Irrigation of these long corrugations, using large heads of water, on steep and irregularly sloping lands cause poor water distribution, heavy soil and water losses, as well as increasing the cost of water application. This view is in a southeasterly direction up the Badger Wasteway. Sec. 36, T17N, R20W, four and one-half miles south of Kittitas, Kittitas County, Washington.

A-Wn-45004

September 14, 1938

J. C. James (photographer)

D. L. Swartz (pilot)

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A-WN-45004

as well as installations of surface pipe to demonstrate control measures that will overcome the objections common to flume installations. Overhead sprinklers were demonstrated throughout the last irrigation season, and again this season under slightly different conditions, to test their adaptability to local crops and soils and also to overcome the objections of permanent installations that interfere with harvesting and cultivation. These installations are shown in Photo No. A-Wn-45006 on page 15. This photo also indicates a contrast in uniform distribution and control of water as compared with the Photo No. A-Wn-45004.

Previous to the establishment of the Badger Pocket demonstration area, contour irrigation was reported to have been tried and found to be a failure.

Conditions governing these trials are not known.

During the past irrigation season, three contour demonstrations were carried out on two different farms. In these demonstrations, a decrease in labor and water requirements was coincidental with an increase in yeild or quality of crops on the areas. On the strength of these demonstrations, all the potatoes on one farm, or 15 acres, are being planted on the countour this year. On the other farm three different crops are being irrigated by the contour method on four different fields. This is an increase of from 4 to 16 acres over that of last year. In addition to row crops, one small field of Ladine clover is being irrigated on the contour. Sugar beets are being irrigated on the contour (Photo No. A-Wn-45005 on page 17),

Aerial photo showing controlled irrigation from concrete pipe lines to corrugations on a fallow field. Irrigation water is controlled through and by California type pots, by orchard type valves with individual row control gates, and by the Browne spreader unit system. The pipeline midway of the slope allows for continuous crop rows and decreases the length of run in each corrugation or row, and permits more even distribution of water. View down-slope taken on the George J. and Don G. McKenzie's farm. Sec. 5, T16N, R20E. Twelve miles southeast of Ellensburg, Kittitas County, Washington.

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in the lower left foreground, as compared with a similar crop irrigated in short and long runs on the field just above. Water used and wasted on these fields, as well as several others on the project, was measured by means of water stage recorders in conjunction with weirs or Parshall flumes. Portable surface pipe installations may be seen on two of the fields on this farm, where they are used to shorten the length of corrugations.

Some irrigators believed that silt content being carried by the main irrigation laterals was so heavy that if settling basins were constructed, they would have to be cleaned out every day to take care of the silt load. Two settling basins were constructed on the farm shown in the picture on page 17. Cleaning was necessary only twice during the irrigation season. Altogether, over 100 cubic yards of silt were removed from the two basins. Besides removing silt that is troublesome wherever the gradient of ditches or corrugations is decreased, these basins removed weeds, roots and other debris which ordinarily made it extremely difficult to maintain uniform distribution of water from flumes and surface pipes.

(d). The past year has shown a marked increase in flume construction on non-cooperators' lands. It has been observed that a large amount of new construction work has been done immediately adjacent to cooperating farms on which this type of control device has been installed by our Service. The numerous inquiries received by this office concerning construction details and installation

Aerial view of the Dodge and McCune farms shows land topographies, general field and crop boundaries, irregular shaped fields, water distribution features and control demonstrations. Cross-slope planting of sugar beets as compared with down-slope, gate-equipped flumes down steep slopes, surface pipe with distribution gates dividing long runs, uniform gradient in head ditches, flow control recording stations, land retirement and rotational seedings are also shown in this view. Sections 3 and 4, T16N, R19E. Nine miles south-east of Ellensburg, Kittitas County, Washington.

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J. G. James (photographer)

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A- WNW - 45005

information on demonstrational practices indicates a rapidly increasing interest in better control and distribution of irrigation water. A general survey of non-cooperators has shown a sharp increase in the installation of water measuring and controlling devices. Construction methods, coupled with the manner of installation, indicate in practically all cases, that the demonstrational construction features were closely followed.

II. Advances in Technique.

The past three years, covering the period of time which the project has been in operation, have seen a steady decline in the gross returns to the individual farmers, as shown by the annual report issued by the Reclamation Service. This condition has presented a serious difficulty to the Service in securing cooperators who are in a financial condition to fulfill the terms of a satisfactory cooperative agreement. We have found that the success of many of our demonstrations has made it easier for us to obtain the proper cooperation even though our program this year was carried on a strictly operations basis, which provided only for labor and technical assistance. In several cases, cooperation was possible on the part of the farmers only because outside sources of revenue were available to them for the purchase of materials. In the case of farmers with limited means, a more flexible program was designed which would reduce the

initial expenditures and spread the complete control program over a period of several years. In this way we expect a more strict compliance with the terms of the agreement because of the reduced financial burden to the individual farmer in any one calendar year.

Project equipment has been revised and developed to improve the efficiency of the operations, especially on fields that are prepared for irrigation by the border method. It was determined through our experience that land prepared for this method of irrigation should be planted to annual crops the first year to allow re-leveling where necessary before permanent hay is seeded. New equipment has been secured that will increase the efficiency of the operations as compared to similar operations conducted last year. Other equipment has been found necessary for proper cultivation and harvesting of crops on slopes above 3 percent, when irrigated by the contour method. Some implements have been devised and others are needed to care for the new problems created by change in tillage operations and new methods of irrigation.

The elimination of erosion in temporary earth head and waste ditches on steep slopes has been accomplished by the use of a ditch lining made of cheap, unbleached, 80 mesh cotton cloth. (See photos No. Wn-45075 and No. Wn- on page 20). Five-mesh cotton cloth, used last season, proved entirely unsatisfactory, and its use has been discontinued.

This irrigation head ditch lies on a gradient of 3 to 12%. To prevent severe erosion, the ditch has been lined with 80-mesh cotton cloth, held in place with rocks and wire loops. Don G. McKenzie's farm 16 miles southeast of Ellensburg, Kittitas County, Washington. Sec. 5, T16N, R20E.

WN-45075

T. R. Horning

July 20, 1938

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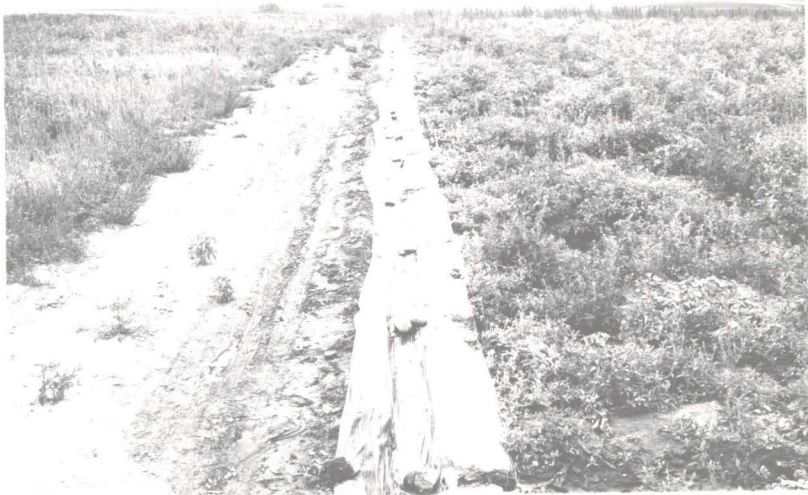
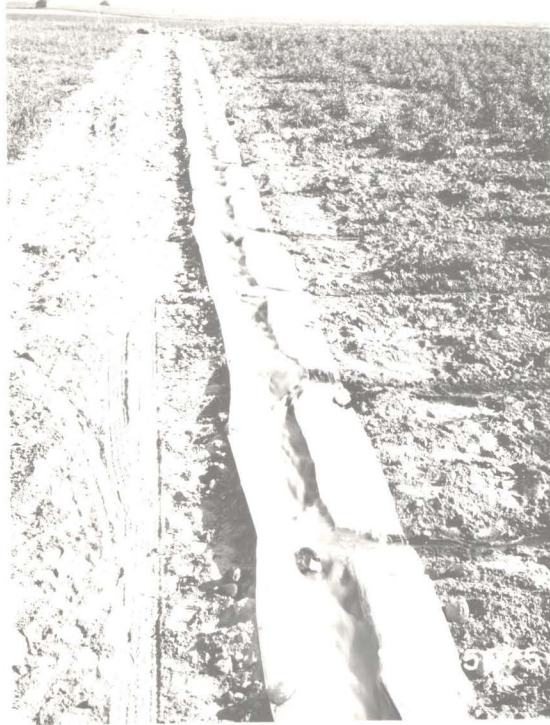
A 36 inch strip of 80-mesh, cotton fabric was installed in this head ditch, lying on a gradient of from 3 to 12%, before irrigation of the potatoes on the right was started in July. After 3 months use, this fabric lining has been satisfactory in providing control of water and erosion in this head ditch, although it has rotted beyond a point where it can be used again. Don G. McKenzie's farm 16 miles southeast of Ellensburg, Kittitas County, Washington. Sec. 5, T16N, R20E.

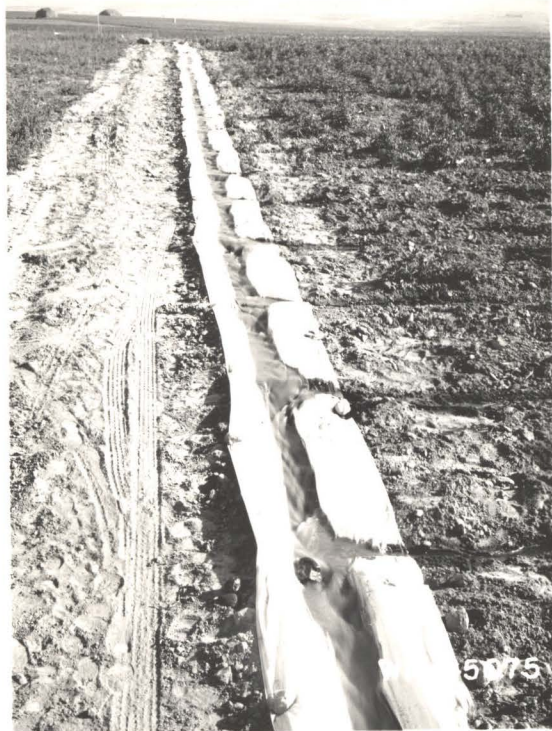
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T. R. Horning

September 6, 1938

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Cleats placed diagonally across the bottom of flumes used on steep slopes were found necessary to provide uniform flow of water through the individual flume gates. Considerable difficulty was encountered by the collection of trash and silt behind these gates which obstructed the flow of irrigation water and destroyed the effectiveness of the control. This season, the diagonal cleats have a small gap between the cleat and the outlet gate which provides a getaway channel for trash and silt and has greatly facilitated the proper control of water from these devices.

Structural design of the various irrigation devices has been altered considerably as a result of the accumulated experience of the past two years. Slope gradient and the location of the individual structures relative to the field have been found, in many cases, to be limiting factors as to the most desirable type. The practice of leveling land in the spring will be discontinued where grain or hay crops are to be planted. Potato land can be spring leveled, providing it is irrigated before the farm work is started. Corrugations have been successfully constructed by utilizing the packed tracks made by the cleated rubber tires of the tractors used in cultivating. It has been found that this method of irrigating increases the lateral penetration of the irrigation water and apparently reduces the erosion in the individual corrugations to a minimum. (Photo No. Wn- on page 22).

A field, on which the sugar beets were crowded out by

This crop of sugar beets is being irrigated using the conventional type of corrugations on the left and a track made by a rubber tired tractor on the right. The speed of the water, and soil erosion are reduced considerably and lateral seepage is more than doubled in the tire track as compared with the usual type of corrugation. Snowden E. Ross farm, 9 miles southeast of Ellensburg, Kittitas County, Washington. Sec. 34, T17N, R19E.

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T. R. Horning

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A green manure crop of winter rye on irrigated land is being plowed under before planting the field to late potatoes. Noxious weeds crowded out the sugar beets on this field in 1938, which was then summer fallowed and rye seeded in the fall. Wires are being used on the plow to completely cover the heavy crop of rye which was lodged considerably by wind. Don G. McKenzie farm, 16 miles southeast of Ellensburg, Kittitas County, Washington. Sec. 5, T16N, R20E.

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T.R. Horning,

May 19, 1939

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noxious weeds in 1938, was summer fallowed and seeded to winter rye last fall. The rye was plowed under as a green-manure crop in June 1939 (Photo No. Wn- on page 22). It was feared that the dense stand of rye would cause a serious heat condition, through the rapid decomposition of the organic matter, and injure the viability of the potato crop which was to follow this spring. The green-manure crop was irrigated before being turned under and investigations were conducted to determine any temperature rise that might occur. Only a slight rise in temperature was noted on a two-week test and it was thought that, in this case, chemical action may have been retarded by the mature condition of the green rye when plowed under. Information is lacking as to the heat conditions that might have been expected in a less mature stand. This planting will be checked closely to determine whether quality and production are affected.

Seeding of permanent hay, in retiring the steeper slopes, has been restricted by the extremely narrow margin of profit and because this crop cannot be utilized on the farms, due to the limited extent to which stock water is available throughout the winter months. It is hoped that a continuation of the Water Facilities Program, initiated this year, will increase the available supply of stock water and give a correspondingly greater utilization of hay products. Tall meadow oat grass, when seeded as one of the grasses in a mixture with

alfalfa, (Photo on page 25), matured several weeks in advance of the alfalfa. Orchard grass tends to produce a rank growth in pasture mixtures unless clipped or closely grazed. Further study is needed on grass to find more suitable hay and pasture mixtures for use on irrigated lands. Many observations have been made on cultural practices carried out in the valley and in trying to determine which of these is the most successful in production of crops under weedy, alkaline or shallow soil conditions on irrigated land.

Little information is available on the water requirements of various species of trees and the proper method of irrigating them on slopes which are too steep for cultivated crops. Several different methods of irrigation have been installed and are being studied to determine their relative value from such points as rate of moisture penetration, ease of irrigation, cost of installing the system, and amount of maintenance necessary. Other investigations are being carried out so as to provide information on the amount of weed control necessary and whether this is accomplished better by cutting or by cultivation of the entire planting.

III. Physical Progress

(a) General

Seven new cooperative agreements have been prepared during the past year covering an area of 728 acres, which gives

This stand of alfalfa, tall meadow oat grass, smooth brome-grass and slender wheatgrass was seeded in the spring of 1937. At haying time the tall oatgrass was in the late dough stage and 12 to 18 inches above the alfalfa. The other grasses matured at about the same time as the alfalfa, indicating that tall oatgrass should be replaced by some slower maturing variety of grass. N. D. Richardson farm, 14 miles southeast of Ellensburg, Kittitas County, Washington. Sec. 6, T16N, R20E.

WN-

June 3, 1939

T. R. Horning

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a total area under agreement of 1,580.07 acres. Treatment has been completed on 60 percent of this area and the rest will be completed within the next two years.

(b). Technical

Woodland plantings and replantings have been made on 52.6 acres during the past spring. Altogether 30,165 trees and shrubs were planted. Wildlife plantings were made on 8.3 acres, which involved 8,439 shrubs and trees; woodlots were planted on 17.2 acres, utilizing 10,339 trees and shrubs; windbreaks occupied 4.7 acres with a total of 4,620 trees and shrubs. In the case of windbreaks, these were planted on the north and west field boundaries so as to provide maximum protection from the prevailing winds. Maintenance work on farm plantings required 6,767 trees and shrubs which were distributed over 22.4 acres.

In the fall of 1938, yields were taken on fields of potatoes and sugar beets and computed in tons per acre by regular plot analysis. Comparisons were worked out between the down slope and contour methods of irrigation, and comparisons were made on long and short runs. One year's results in general, indicate that better yields were secured and were of a higher quality on both the contoured fields and on the fields in which short runs were utilized.

Fertilizer plots were laid out on two farms. The object being to determine whether or not fertilizers can be profitably used to more quickly obtain adequate protection from soil losses

by means of more rapid vegetative growth. In these trials, fertilizers were applied to one set of plots in the fall of 1838 and the other in the spring of 1939. To date no comparisons are available.

During the spring of 1939, field trials were carried out on seven farms by spreading crop residue, (Photo No. Wh- on page 28), with a commercial straw spreader. Four-hundred tons of legume and grain straw were spread at the rate of two to four tons per acre and then plowed or disked under. Farmers doing this work are of the opinion that their fields showed less erosion, irrigation water was more easily distributed, and the soil held the moisture longer where the straw was applied. Observations showed that in most cases, miniature dams were formed in the corrugations which soon filled with silt. This straw spreader was also used for mulching trials. A light application of from one to one and a half tons of red clover straw was spread on alfalfa and pasture fields immediately after seeding. An absence of crusting on the soil surface and greater retention of surface moisture was noted on the fields so treated when compared with adjacent check plots.

It has been felt that it would be desirable to acquaint the farmer with a practical method of determining the depth of penetration obtained by the various irrigation methods and to show a practical means of determining distribution of moisture.

Red clover straw, from which the seed has been removed, is being spread back on the field to increase the amount of organic matter in the soil. A two-wheel, traction powered, straw spreader than can be operated behind either a truck or hayrack is being used. Edwin N. Storms farm, 1 $\frac{1}{4}$ miles southeast of Ellensburg, Kittitas County, Washington. Sec. 8, T16N, R20E.

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T. R. Horning

January 10, 1939

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With the start of the current irrigation season, moisture determinations were made by means of soil augers and the attention of the cooperators was drawn to the fact that they could control their moisture much more accurately by use of this instrument. By reducing the water applied to conform with the needs of the plants, erosion will be reduced, deep percolation decreased and a saving of water effected.

Fifty-one fields, totaling 405.5 acres were seeded in 1939 on cooperators' farms. Of this number, 91 acres of hay and pasture fields were reseeded. Acreages of legumes seeded were as follows: Red clover, 112 acres; alfalfa, 86 acres; sweet clover, 24 acres; Alsike clover, 16 acres; Ladine clover, 6 acres; strawberry clover, 2 acres, and 26.5 acres of alfalfa and grass for hay, 32 acres of mixed grasses for pasture, and 10 acres of winter rye for green manure were also seeded.

Improvements were made in both the design and construction of several types of distribution systems used by our Service last year.

In the case of wooden flumes, cracks, seams and joints were filled with boat pitch which provided satisfactory water-tight construction at a very small additional cost. A number of flume sections were treated with creosote which was brushed on to determine whether or not this treatment would provide sufficient increased life to the structure to justify its cost. Closer

spacing in nailing flume sections indicates that a more substantial flume has been secured that will not require additional maintenance to render it water-tight if reasonable care is given it. Flume lumber, kiln dried or air dried, decreased the length of time required to construct the individual flume sections and eliminated shrinkage, which formerly called for maintenance with the first season's operation. Rapidity of construction was increased and better flume resulted in the use of lumber surfaced on both edges.

Surging in connection with the use of the California type of overflow pots was considerably reduced by installing a small gate through the partitions on the floor level of the pipe.

Small nozzles were secured for use on the overhead sprinkler unit (Photo No. Wn- on page 31), the purpose being to eliminate waste water and reduce erosion to a minimum. A reduction in labor cost would follow as one man would be able to operate the sprinkler, except for periodic moves that would be made at six to eight hour intervals. Previously moves at three hour intervals were necessary due to slow penetration.

Five fields on four cooperating farms have been leveled and prepared for border irrigation.

Four earth head and waste ditches have been lined with a total of 500 yards of 80-mesh cotton cloth furnished by the Surplus Commodities Corporation during the past year.

Rock linings were installed in two ditches which totaled 335 feet in length, to demonstrate the use of native materials in controlling erosion.

This pasture has been seeded to a mixture of grasses, and is being irrigated the first year with an overhead sprinkler system. After the first year, the field will be irrigated by the controlled flooding method, taking water from 3 head ditches spaced equally down the slope. The water will be confined within definite limits by the ridges running with the slope. Don G. McKenzie farm, 16 miles southeast of Ellensburg, Kittitas County, Washington. Sec. 5, T16N, R20E.

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May 19, 1939

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Rock drops were constructed in a gully which had been washed by excess waste water and spring run-off. Gravel backings were used in preference to coarse unbacked rock in constructing these drops, and this material has proven satisfactory.

Sugar beets, potatoes and clover are being irrigated on the contour on seven fields, which total 34.6 acres.

A deep tillage tool holder with five shanks has been found to work very satisfactorily to take the place of a plow for fall cultivation of areas that have been leveled to prevent erosion during the winter. The press type Knapp corrugator that was utilized throughout the last irrigation season proved to be too rigid and uniform corrugation could not be obtained on uneven ground surfaces. To effect this disadvantage, the corrugator frame was cut in two and independent articulation provided for the two halves. This compensated for the uneven terrain and in addition allowed the corrugator to be used as two independent units or as a single unit for tractor or horse operation.

Cooperative agreements have been simplified by treating each operation, such as seeding, leveling, flume construction, etc., on one field as independent work units. Individual unit operations are thus delineated and a better understanding is achieved. This is a material assistance to the cooperator. The supervising foreman is also provided with a closer control in construction details.

The current season's field operations have been carried out under the supervision of a qualified foreman attached to this office. The carrying out of individual technical construction details has been coordinated in the foreman's position. By this means, greater efficiency has been obtained in field operations and many useless duplications have been avoided with the corresponding lowering of the per unit cost of field operations.

IV. CCC

Camp area SCS W-7 is located near Cashmere, Washington, on the Mission Creek Drainage. This camp area lies approximately 70 miles north of the project by road. The main portion of the area is made up of rough, mountainous topography which has been seriously overgrazed, and contains large blocks upon which destructive logging practices have been followed. The lower valley is highly productive and is made up almost exclusively of orchard plantings. These lands have a high valuation and in normal times demand a price between \$800.00 and \$1200.00 per acre. Pending the completion of a program in the upper watershed, log structures and rock-wire revetments were constructed in the lower stream channel to give protection to these lands that have been seriously damaged by recurring floods. The upper drainage contains several forest plantings, established in cooperation with the United States Forest Service, and a large side drainage has been successfully controlled by

the use of water spreading devices. A drift fence has closed this area to grazing and the United States Forest Service is cooperating in re-establishing the vegetation on this area. Reseeding of range land within this area has been of material assistance in re-establishing a permanent ground cover. This camp was placed on a maintenance basis September 30, 1937. A spike camp, which was established from W-6, Wiley City, Washington, on October 26, 1937 and discontinued on December 15, 1937, was used to complete unfinished work on cooperative agreements.

Members from the Badger Pocket staff, located at Ellensburg, Washington, representing the Engineering, Agronomy, Forestry and Conservation sections, have made periodic inspections of the area to determine the success of the program as well as the degree of cooperation being secured. An inspection of wildlife conditions was made by a member of the Regional Woodland Wildlife Section in June 1937. No technician was available for resident assistance at or near the camp area.

Inspections during the past few months revealed the following conditions on this camp area: The survival in the case of tree plantings on this area has been very low due to unfavorable climatic and soil conditions. Except for damage from deer and a small amount of sheep trailing, the water spreaders are in excellent shape and have proven very effective in spreading run-off water, much of which has been heavily laden with sand

accumulated from the sandstone areas that prevail on many of the hillsides. An agreement with the United States Forest Service has eliminated the Sheep Rock stock trail, which had contributed considerably to the damage caused by overgrazing in the lower watershed. The rerouting of this trail has provided additional protection to the vegetation in the lower portion of the drainage. Seedings of native and domestic grasses have established a fair cover. Several springs and streams that were dry are now flowing again. Native reproduction of yellow pine and shrubs is showing a very satisfactory recovery, especially on some areas that were previously overgrazed. All drift fences, gates and stock crossings have been kept in an excellent state of repair. No stock has been evident in the restricted area under agreement. This area, as stated, falls into two classifications. The high, mountainous portion carries a spotted stand of timber growth, which is interspersed by brush areas and barren rock slides. The lower valley with its orchards precludes the necessity for crop rotations or changes in land use, and construction details as called for by the cooperative agreements were carried out prior to the time this camp area was placed on a maintenance basis. It is felt that the Cooperators have followed the terms of the cooperative agreements to the best of their ability since the area went on maintenance.

V. Special Activities

Kittitas County was approved as a demonstration Water Facility

area in March 1939. A total of thirteen applications have been received but only three of this number have been approved for planning. The reason for the low percentage is largely because applications on homestead lands could not be acted upon favorably by the Farm Security Administration due to the lack of title to the land. Rehabilitation on many of these new lands is dependent on the creation of a year-round supply of stock water. This will provide for a balanced program of farming activities.

1939 WATER FACILITIES OPERATIONS

Operations	County Demon- strations	Estimated Amount (Direct)	Amount Approved (Direct)
Plans written involving loans	1	\$ 869.28	
Plans transmitted to FSA	1		
Applications Received	13		
Applications Rejected by SCS	3		
Applications Rejected by FSA	7		
Applications app- roved pending planning	2		

During the present fiscal year various regional and Washington inspections and tours were made of the Badger Pocket Project. Project personnel contributed heavily to a well balanced educational program in connection with the presentation of Showboat to some 1800 school children and CCC boys in the State of Washington. Various members of the project personnel presented talks, lectures, slides, film strips and movie films giving the various phases of the conservation work to approximately 700 members of civic organizations, special school classes, irrigation institutes and special meetings called to deal with erosion problems.

VI. Miscellaneous Activities

A program of field investigational work has been set up to obtain pertinent data needed for the construction of accurate erosion control plans on lands under irrigation. This work is a continuation of that carried on during the last two years. The purpose of field investigations is to determine the proper individual corrugation heads of water and lengths of run, which will result in a minimum soil loss when used on the various slope group classes suited for cultivation of row crops on the Badger Pocket Area.

Field investigations carried on in 1938 dealt with lengths of run, slope conditions, methods of distributing water, contour irrigation and other phases of irrigation work on steep lands. In continuing this work, it was felt necessary at this time to observe what rate of application will best

suit each slope class, the controlling factor being the resultant length of run giving the most uniform penetration and absorption of water with the least possible soil loss.

In order to provide areas to collect the information outlined above, three sites were selected on two of the cooperating farms. These investigations will be conducted on three slope classes: medium, 0 to 2 percent; average, 2 to 8 percent; steep, 8 to 14 percent. All areas are located on the same soil type. Irrigation of the individual plots will be controlled by distribution of water through a metal type flume where a constant head can be maintained above the outlet orifices. A control record of flume delivery will be maintained by the means of water stage recorders. These will provide an accurate record covering any fluctuations in head. Actual delivery to the individual corrugations will be rigidly maintained and checked by the volume stop watch system. The heads of water will be varied on each of the set-ups to obtain both the upper and lower limits that are required to maintain optimum moisture conditions. Measurement of the waste water at the end of the runs will be accomplished by means of N.S. measuring flumes constructed to accurately measure small heads of water. Soil moistures will be calculated from the plots before and after irrigation, using standard methods of sampling and calculating amounts. Soil losses will be measured annually in each of the furrows at uniform intervals down the slope.

Pages corresponding
to these were removed from the Copy of the Annual
Report set W O ³⁹ Passmore

VII. ADMINISTRATIVE DEVELOPMENTS

BADGER POCKET AREA - WASH-3

During the 1939 fiscal year there has been a tremendous turn-over of personnel in the project. However, on July 1, 1938 there was a project staff of 18 while on June 30, 1939 there is a personnel of 17, or a reduction of one in the total number during the year. There have been changes in both the technical and administrative personnel, with a resulting turnover loss that must be recognized as a handicap to progressive achievement.

The spring months were unusually busy ones inasmuch as a 24 man spike camp was established to assist in the planting of trees and other work called for under Cooperative Agreements. Additional work necessitated the hiring of unskilled laborers and Letter of Authority employees, which usually numbered about 15. The 24 man spike camp and hiring of other labor was necessary in order to complete the work under Cooperative Agreement before the start of the irrigation season.

<u>Personnel at beginning</u>	<u>of</u>	
<u>Personnel at beginning</u>	<u>year</u>	18
<u>Personnel at end of year</u>		17

Major Personnel Changes

Otto F. Schnellhardt, Junior Agronomist, transferred from CCC, SCS W-4, Walla Walla, Washington to SCS, Wash-3, Ellensburg, Washington, July 5, 1938.

Hugh C. McKay, Junior Agronomist, transferred from Wash-3, Ellensburg, Washington to Research R-1, Moscow, Idaho, July 16, 1938.

John K. Anderson, Senior Foreman of Laborers, transferred from CCC, Camp SCS O-7, Warrenton, Oregon to SCS, Wash-3, Ellensburg, Washington, July 7, 1938.

August W. Engelking, Assistant Clerk, transferred from Wash-3, Ellensburg, Washington to Bonneville Project, U. S. D. I., Portland, Oregon, August 1, 1938.

Xenia P. Petkovits, Under Clerk-Typist, resigned and approved by Secretary of Agriculture, August 28, 1938.

Forrest E. Bernath, Junior Forester, transferred from Wash-1, Moscow, Idaho to Wash-3, Ellensburg, Washington, September 16, 1938.

Marjorie Jean Cozine, Junior Clerk-Stenographer, resigned and approved by Secretary of Agriculture, August 26, 1938.

K. Verner Kalenius, Assistant Storekeeper, furloughed without pay and approved by Secretary of Agriculture, effective October 27, 1938.

Earl J. Tibbetts, Senior Clerk, transferred from Wash-O, Spokane, Washington to Wash-3, Ellensburg, Washington, January 25, 1939.

Ben A. Guderian, Principal Clerk, transferred from Wash-3, Ellensburg, Washington to Wash-2, Dayton, Washington, February 9, 1939.

Forrest E. Bernath, Junior Forester, transferred from Wash-3, Ellensburg, Washington to Pocatello, Idaho, February 1, 1939.

Roland O. Severson, Assistant Clerk-Stenographer, transferred from War Department, U. S. E. O., Fort Peck, Montana, to U. S. D. A., Soil Conservation Service, Wash-3, Ellensburg, Washington, February 9, 1939.

Ruth E. Woodruff, Junior Clerk-Stenographer, appointment Secretary of Agriculture, February 20, 1939, effective March 1, 1939.

Irving E. Pringle, Bulldozer Operator, transferred from Ida-2, Emmett, Idaho to Wash-3, Ellensburg, Washington, March 16, 1939.

Walter M. Fergerson, Junior Forester, transferred from Forest Service, CCC, Ely, Minnesota to SCS, Wash-3, Ellensburg, Washington, appointment Secretary of Agriculture, March 10, 1939 EOD March 29, 1939.

Warren A. Starr, Assistant Soil Technologist, transfer of payroll headquarters from Wash-3, Ellensburg, Washington to Regional Office, Spokane, Washington Flood Control payroll, May 16, 1939.

Clyde C. Bowsby, Junior Soil Surveyor, transferred from Regional Mobile Survey to Wash-3, Ellensburg, Washington, May 16, 1939.

Irving E. Pringle, Bulldozer Operator, transferred from Wash-3, Ellensburg, Washington to Ida-2, Emmett, Idaho, June 1, 1939.

Mary R. Cutler, Assistant Clerk-Stenographer, resigned to be married. Final action has not been received from the Secretary of Agriculture.

Student Assistants: Each summer season for a period of approximately three months three student assistants are added to the regular project staff and are paid \$85.00 a month salary.

Funds Allotted

& expended during the fiscal year

Regular SCS funds(1,291,000.030)	\$69,220.00	38,700
Regular Water Facilities(1291003(10).002)	1,000.00	
ERA Water Facilities(901182)	500.00	

Total of Allotments

70,720.00

Funds Expended During the Year

	<u>Regular SCS</u>	<u>Regular Water Facilities</u>
Personal services	49,694.15	800.16
Supplies & materials	2,686.62	
Communication service	534.79	3.00
Travel expenses	1,250.00	15.00
<i>Irano</i> Freight	1,736.04	
Heat, light & water	1,105.00	
Rent	3,340.29	
Repairs	1,392.34	
Special & misc. expenses	40.00	
Equipment	5,855.04	
Special Expenditures for Regional Office(Draft- man, partial salary; ware- house, rent & telephone)	1,506.71	
	<u>69,140.98</u>	<u>818.16</u>

CCC Spike Camp

On March 23, 1939 a Spike Camp was established on the
Kittitas County Fairgrounds.

Freight charge	\$421.80
Fuel	75.00
Light	19.69
Water	11.08
Locker rent	1.68
Light wiring & fixtures	35.25
Plumbing installation	74.01
Garbage removal	6.17
Telephone	19.42

Total 664.10

When the Spike Camp was assembled a great deal of
necessary equipment was lacking. The necessary articles
(lumber, stove boards, stove pipe, veneer, galvanized
screen, hinges, hasps, etc.) were purchased from regular
SCS project funds and an adjustment made at a later date.
The expenditure of project funds amount to \$128.35 and the
Regional Office reimbursed the project by increasing our allot-
ment by \$125.00.