A N N U A L R E P O R T

1951

NORTHWESTERN MONTANA BRANCH STATION

Creston, Montana

C. W. Heath, Superintendent

This report is in 6 parts: 1. Development of the Station. 2. Agronomy. 3. Horticulture. 4. Activities. 5. Livestock. 6. Weather. Together they constitute a fairly comprehensive report on the activities and accomplishments of the Station in 1951.

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DEVELOPMENT OF THE NORTHWESTERN BRANCH STATION

Continuing a program initiated at the time the Station was established, labor and funds not absolutely essential in operation have been utilized in Station development.

Chief among such projects for 1951 has been the remodeling of "Residence No. 2" to provide comfortable modern quarters for an Assistant in Agronomy. The former Somers Barbershop purchased in 1950 has been partitioned, rewired, and otherwise remodeled into a two bed-room home. Cupboards and closets have been , a modern automatic oil furnace ordered, plumbing installed. Exterior painting, and interior wall decorating to the intended occupants specifications, insulation and storm windows are needed for completion of the new home.

Sidewalks were laid leading from the driveway to Residence No. 1, and a start made toward landscaping by setting fifty trees and shrubs.

A flag pole was erected and National and State flags flown during working hours.

Additional work has been done on roads and fences. An additional tract of grass land has been broken. Experimental pastures have been fenced with woven wire.

Authorized material expenditures for development projects during the year has been $2469.10. Labor in addition to that regularly employed has cost some $800.00, making the annual cost $3269.10, to which might be added some $700.00 worth of time by regularly employed personnel.

Plate I - Floor plan of Residence No. 2.

1951 AGRONOMY WORK

Forage Crop Improvement

Irrigated Plantings

- 10 pasture mixtures
- 13 hay mixtures
- Spacing influence on grass hay yields
- 15 grasses for seed
- 7 legumes for seed
- 14 Bromegrass strains
- 9 Orchardgrass strains
- Lawngrass seed production
- Adaptation nurseries
- Foundations Seed Production (Kenland)

Dryland Plantings

- 13 hay mixtures
- 15 grasses for seed
- Annual hay mixtures
- Adaptation nurseries
- Registered Seed Production (Alta Fescue)
- Spacing influence on grass hay yields

Irrigation Studies

Effect of irrigation rates and frequencies on crop yields.

Direct dryland- irrigated yield comparisons.

Spring Grain Improvement

Irrigated nurseries

Dryland nurseries

Winter Grain Improvement

Winter wheat nurseries

Winter barley nurseries

Soils research

Fertilizer trials

Weed Control

2-4-D tolerance of legumes

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Spring Grain Improvement

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Dryland Nurseries

Winter Grain Improvement

Winter wheat nurseries

Winter Barley nurseries

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Soils Research

Fertilizer Trials

Weed Control

2-4-D tolerance of legumes

Pasture	% Legume	CWT.
Blue-landino	40	1762
Blue-Trefoil	70	2068
Brome-alfalfa	50	3004
Brome-ladino	9	2802
Orchard-ladino	7	3026
Alta ladino	9	2862
Huntley	10	2690
Huntley A	13	2694
Huntley B	8	2533
Huntley C	9	2924

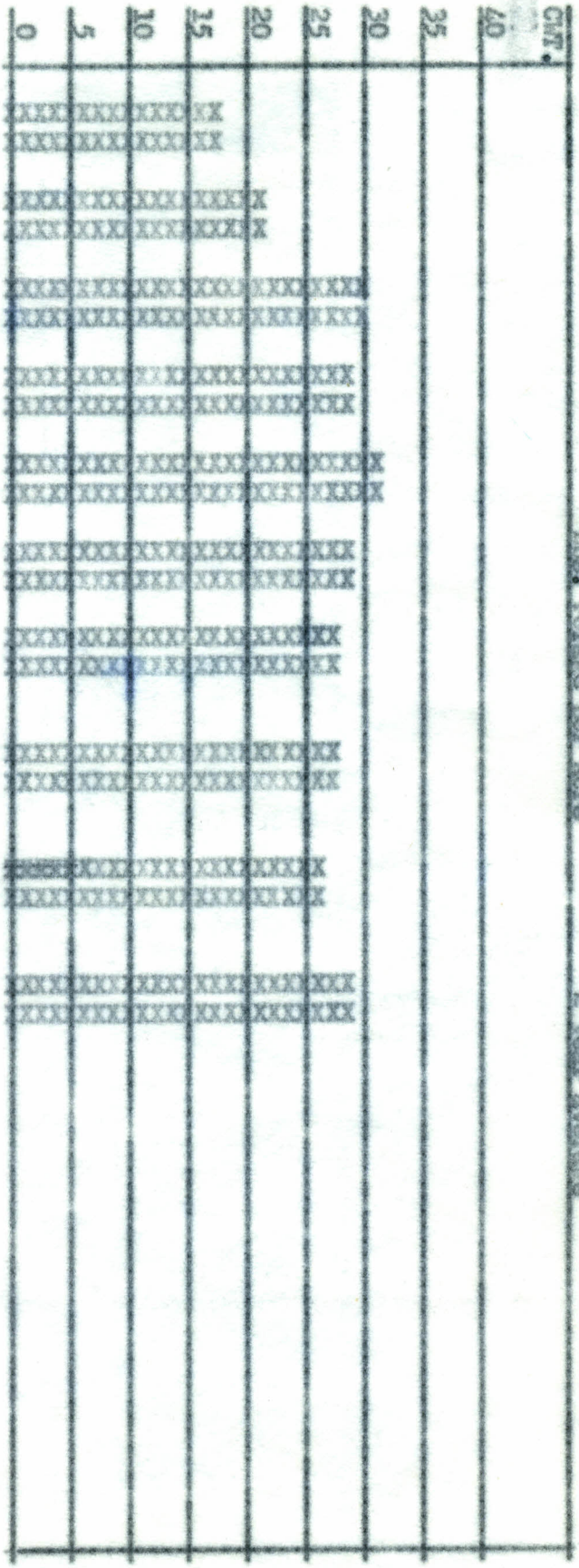


PLATE III

IRRIGATED PASTURES CHESTER

Lbs. Forage per Acre — 2 year average

10 Pastures Mixtures - Irrigated

Ten irrigated pasture mixtures were seeded in the spring of 1949 in 5 x 24 foot plots, 4 replications, rows spaced 6 inches. Yields are determined by frequent clippings. 3 x 20 foot plot centers are harvested and saved until dry for weighing. The percentage of legume is estimated at the time of clipping.

Growth in 1951 has been slow even though irrigation has been applied by sprinkler as often as deemed necessary. Possibly fertilizers might stimulate more satisfactory growth.

Table I shows dry weight of forage from 60 sqft. of plot centers and estimated legume percentages for each clipping in 1951. Table II shows 4 plot average seasons yield in pounds per acre and average legume percentages for 1950 and 1951 and 2 year average yields and legume percentages.

Careful scrutiny of these tables, plus some quick calculations, shows that the forage harvest on the May 31st clipping varies from 200 lbs. per acre for the bluegrass-ladino mixture to 700 for the Brome-ladino mixture. Comparing legumes in the mixtures at the early clipping date, it will be seen that the Tall Blue Trefoil mixture yield was 50% greater than the Tall Blue Ladino mixture and that the Brome-Alfalfa mixture yield was slightly better than the Brome-Ladino mixture. The Tall Blue-Trefoil mixture is the only one producing more forage in 1951 than in 1950. The Alta-Ladino mixture was high in season yield in 1951, a position held by Orchard-Ladino mixture in 1950. The percentage of legume in the mixtures is 1/3 to ½ as much as in 1950 in the mixtures containing alsike, white dutch and ladino, while in those with alfalfa and trefoil, the legume percentage is greater than in 1950.

TABLE I 1951 PLOT YIELDS OF 10 IRRIGATED PASTURES

Air dry weights in ounces and estimated legume percentages for 3 clippings.
Four replications 3 x 20 ft. plot centers.

		A		B		C		D	
Mixture	Date	Ozs.	%	Ozs.	%	Ozs.	%	Ozs.	%
Huntly	5/31	6½	2	10	2	16¼	2	13¼	2
	7/5	19-3/4	10	18	10	18	10	18-3/4	10
	8/14	24½	5	14½	5	17-3/4	10	20½	5
Huntly A	5/31	6½	2	8-3/4	2	14-3/4	2	16-3/4	2
	7/5	18-3/4	10	19½	10	20	10	19-3/4	10
	8/14	21½	5	21½	10	17½	5	17½	5
Huntly B	5/31	8-3/4	2	8½	2	10½	2	14-3/4	2
	7/5	18½	10	16½	10	17½	10	15-3/4	10
	8/14	24½	5	19	5	14	5	16	5
Huntly C	5/31	8-3/4	2	12½	2	14	2	11	2
	7/5	20½	10	19	10	17	10	19	10
	8/14	23-3/4	5	23	5	15	5%	19½	5
Orchard Ladino	5/31	6-3/4	2	10-3/4	2	15	2	16½	2
	7/5	18-3/4	10	22	10	22-3/4	10	19½	10
	8/14	23-3/4	5	22½	10	20	5	16½	5
Brome Ladino	5/31	13½	2	12½	2	15	2	21	2
	7/5	17½	10	11	10	13	10	14	10
	8/14	21½	5	16½	10	15	10	19½	10
Alta-Ladino	5/31	8	2	12	2	14½	2	18-3/4	2
	7/5	20½	10	17½	10	25	10	24½	10
	8/14	29-3/4	5	20½	5	22-3/4	10	25½	5

TABLE I Continued

		A		B		C		D	
Mixture	Date	Ozs.	%	Ozs.	%	Ozs.	%	Ozs.	%
Tall	5/31	½	5	6½	10	3	10	9¼	10
Blue-	7/5	11-3/4	40	19½	40	16½	40	14	40
ladino	8/14	15	30	13½	30	16¼	30	13	30
Brome-	5/31	10½	10	15	15	19	20	21	15
Alf.	7/5	14 1/2	40	14¼	40	18 3/4	40	15oz	40
	8/14	20½	25	14-3/4	25	28½	50	22½	40
Tall	5/31	1	70	7-3/4	60	11	70	8	65
Blue-	7/5	20-3/4	80	22½	80	7½	80	21¼	80
Trefoil	8/14	16½	80	20	80	27½	80	26-3/4	80

TABLE II 1950 and 1951 PASTURE YIELDS

Pounds per acre, 4 plot average, average legume percentage and two year average

Mixture	Season Yield, lbs. per acre			Legume %			
	1950	1951	2 yr. av.	1950	1951	52	2 yr. av.
Huntly	3145	2235	2690	15	6	3½	10.5
Huntly A	3097	2291	2694	20	6	3	13
Huntly B	2980	2087	2533	10	6	3½	8
Huntly C	3545	2303	2924	11	4	3	7.5
Orchard-Ladino	3624	2428	3026	8½	6	3	7.25
Brome-Ladino	3460	2144	2802	12	7	4	9.5
Alta-Ladino	3025	2700	2862	12	6	2½	9.0
Tall Blue-Ladino	1948	1577	1762	55	25	11	40
Brome-Alfalfa	3582	2427	3004	25	30	17½	27.5
Tall Blue-Trefoil	1982	2155	2068	68	75	73	71.5

13 IRRIGATED HAY MIXTURES

Six grasses were seeded alone and each with alfalfa in 5 x 24 foot plots, 4 replications in the spring of 1949; drilled in 6 inch rows. Yields are obtained by harvesting 3 x 20 ft. plot centers. 2 cuttings are made each season. Forage is raked shortly after cutting and hung in a dry place in burlap bags until dry for weighing.

Alfalfa growth in 1951 has been slow and quite unsatisfactory when compared with that in the dryland planting, which are located on deeper lighter, warmer soil with better drainage.

Table III gives plot yields and Table IV gives pounds per acre based on 4 plot averages for 1950 and 1951.

Study of the tables shows second cutting for timothy and crested wheat grass to be very light while in the case of alta fescue particularly, second cutting yields approach those of the first cutting. Alta leads all species and mixtures in seasons yield for the second year, producing more seeded alone than with alfalfa. All other grasses produced some more in mixtures with alfalfa, and hay yields were increased by seeding brome, orchard or alta fescue, with alfalfa by approximately 1 ton per acre over pure alfalfa seeding.

Comparison of 1951 yields with those for 1950 shows, that with the single exception of alta fescue, all grass hay yields are down more in pure stands than in mixtures with alfalfa.

SPACING INFLUENCE ON GRASS HAY YIELDS

Noting the difference in growth of grass in rows spaced 6 inches and spaced 3 feet in seed plantings, 20 ft. of a 3 ft. row of 5 species was cut and the dry forage weight compared with that of the same species grown 60 M sqft. when spaced 6 inches. The comparatives weights are shown in Table V based on the average weight of four replicates in each case for one cutting made July 5, 1951. Study of this table shows that the influence of spacing, greatly with species. Even though the per acre yield is greater for the wide spacing in all cases the difference varies from 233 pounds per acre for the Orchardgrass to 3415 pounds per acre for Redd Canary grass.

TABLE III IRRIGATED HAYS 1951

Lbs. and Ozs., air dry forage from 13 x 20 ft. plot centers. Four replications.
First cutting July 5, 1951

Species	A	B	C	D
Alfalfa	2-0	1-9	2-5	1-15
Smooth Brome	3-11	4-7	4-12	3-14
Brome-Alfalfa	4-0	3-6	3-9	4-10
Orchard	2-11	3-7	3-3	3-0
Orchard-Alfalfa	3-0	4-0	3-3	2-13
Alta	3-15	3-12	5-8	3-2
Alta-Alfalfa	3-9	3-13	4-2	2-11
Crested	3-14	3-6	3-3	2-5
Crsted-Alfalfa	2-14	3-8	2-11	3-9
Canary	2-4	2-10	4-3	2-2
Canary-Alfalfa	3-0	3-8	3-3	3-10
Timothy	4-13	4-5	3-9½	3-9
Timothy-Alfalfa	4-4	3-6	3-11	3-4

TABLE III Continued:

Species	Second cutting Sept. 18, 1951 A	B	C	D
Alfalfa	1-10	1-73/4	2-8	1-9
Smooth Brome	1-6-3/4	0-13½	0-15½	1-15
Brome Alfalfa	2-1½	1-7-3/4	2-7½	3-4
Orchard	2-5½	1-10	1-15½	1-9½
Orchared-Alfalfa	2-8	2-11½	2-14-3/4	2-8½
Alta	3-5½	3-3	4-4	1-6½
Alta-Alfalfa	2-15½	2-12	4-0	1-13½
Crested	0-15¼	0-9	0-13	0-11-3/4
Crested-Alfalfa	1-13-3/4	1-14-3/4	2-2	3-½
Canary	2-10-3/4	2-3	1-8½	1-7½
Canary-Alfalfa	2-7	2-7½	2-11½	3-8
Timothy	0-12	1-0	0-10	0-5½
Timothy-Alfalfa	2-4¼	1-11½	2-0	1-11-3/4

TABLE IV IRRIGATED HAY MIXTURES

SEASONS YIELDS 1950 - 1951

Species or Mixture	1950	1951	2 yr. av.
Alfalfa	3604	2720	3162
Smooth Brome	6506	3979	5243
Brome-Alfalfa	5936	4510	5223
Orchardgrass	5984	3596	4790
Orchard-Alfalfa	5975	4294	5135
Alta Fescue	6562	5173	5868
Alta-Alfalfa	6032	4674	5353
Crested	4336	2870	3603
Crested-Alfalfa	4557	3913	4235
Reed Canary	4849	3456	4153
Canary-Alfalfa	5031	4430	4731
Hopkins Timothy	6395	3449	4922
Timothy-Alfalfa	5536	4041	4789

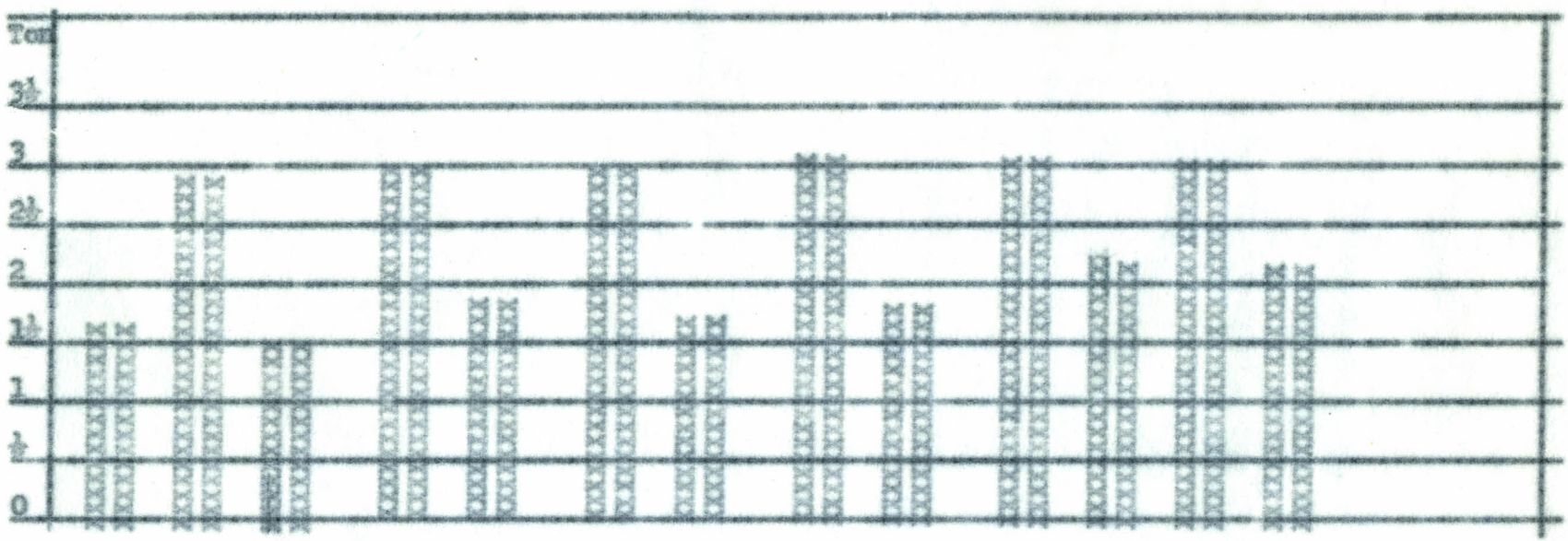
TABLE V INFLUENCE OF SPACING ON IRRIGATED GRASS HAY

Dry forage from 60 sqft., cut 7/5/51
4 replication average, lbs. per acre.

Species	6 in. spacing	36 in. spacing
Smooth Brome	3040	3412
Crested Wheat	2314	2977
Alta Fescue	2961	3340
Orchard	2235	2468
Reed Canary	2030	5445

PLATE IV

2 Year Average Hay Yield



Hays	Crested	Crested & Alfalfa	Canny	Canny & Alfalfa	Orchard	Orchard & Alfalfa	Timothy	Timothy & Alfalfa	Brome	Brome & Alfalfa	Alta	Alta & Alfalfa	Alfalfa
Tons	1.6	2.9	1.5	3	1.8	3.0	1.7	3.1	1.8	3.1	2.2	3.1	2.2

Note: Based on both dry and irrigated studies 1950 & 1951.

15 GRASSES FOR SEED - IRRIGATED

Fifteen grass species were seeded in 3 row plots, 24 ft. long, rows spaced 3ft., 4 replications in the spring of 1949, for the purpose of determining seed yields.

Fair to very good stands of 14 species were secured and in 1950 seed was harvested from all 15. Due to rapid infiltration of native blue grasses into the rows of some species in spite of cultivation and hand weeding, only 11 species were harvested this year. 20 feet of the center row was harvested, threshed, cleaned and weighed for plot yields. Plot yields and stand percentage are shown in Table VI. Yields per acre for 1950 and 1951, not corrected for perfect stands, based on 4 plot averages are given in Table VII.

Table VII shows 2 year average yields to be fair for several grasses, but show 1951 yields to be from 30 to 70% of 1950 yields. Apparently a fertilizer program will be needed to maintain grass seed yields at profitable levels.

TABLE VI IRRIGATED GRASS SEED PRODUCTION — 1951

Ounces of seed from 20 ft. of 3 ft. row, stand percentages and percentages of clean seed.

Grass	A		B		C		D		% cl.
	Ozs.	Stand %	Ozs.	Stand %	Ozs.	Stand %	Ozs.	Stand%	seed
Standard Crested	8½	90%	7-3/4	90%	11	70%	14¼	80%	70%
R. W. Rye	0-3/4	80	0-3/4	75	2	70	2½	85	70
Int. Wheat	7	100	6	95	5¼	95	5½	100	70
Alta fescue	11-3/4	95	12	85	12-3/4	95	18½	90	84
Manchar Sm. Brome	5¼	100	5½	100	8½	100	8	100	70
Tall Oat	8-3/4	95	7½	90	12	100	11½	100	87
Erect Brome	12-3/4	95	12-3/4	95	4¼*	90	11½	100	80
Blue wheat	4¼	90	1	60	4-3/4	75	4¼	70	64
Orchard	3-3/4	100	6½	100	5	85	5-3/4	90	70
Red fescue							7 60	60	86
Big Blue	6¼	75	6-3/4	75	6½	60	5¼	50	79
Reed Canary	1-3/4	100	4¼	100	5¼	100	8	100	80

* Badly shattered

TABLE VII IRRIGATED GRASS SEEDS

Lbs. per avre, 4 plot average, 1950 and 1951

Species	1950	1951	2 year av.
Standard Crested	1036	329.5	683
Russian Wild Rye	79	49.6	64
Intermediate Wheat	668	188.6	428
Altai Fescue	910	524	717
Smooth Brome	617	216.4	417
Tall Oat	628	392.3	510
Erect Brome	1160	374.3	767
Bluebranch Wheat	207	103.4	155
Orchard	500	166.7	333
Big Blue	313	219.5	266

SEVEN LEGUMES FOR SEED - IRRIGATED

Seven legumes for seed production were seeded in 5 x 24 foot plots, 4 replications, rows spaced 1 foot in the spring of 1949. Good stands were obtained.

Growth for the season was unsatisfactory in 1951, more so than in 1950. Irrigated alfalfa for hay in plots near this planting produced 1.36 tons per acre in 2 cuttings (Table IV). Forage growth for Birdsfoot trefoil in this planting was nearly equal to alfalfa. Ladino made only 8 inches growth in height during the season. Hop clover disappeared entirely during the winter and strawberry clover, in spiterof cultivation and hand weeding has been very largely taken over by bluegrass.

Plot yields and 4 plot average yields per acre for the legumes harvested are shown in Table VIII. 1951 seed yields were very low except for Birdsfoot Trefoil and Alfalfa, with trefoil producing the more satisfactory yields.

TABLE VIII LEGUME SEED PRODUCTION — 1951

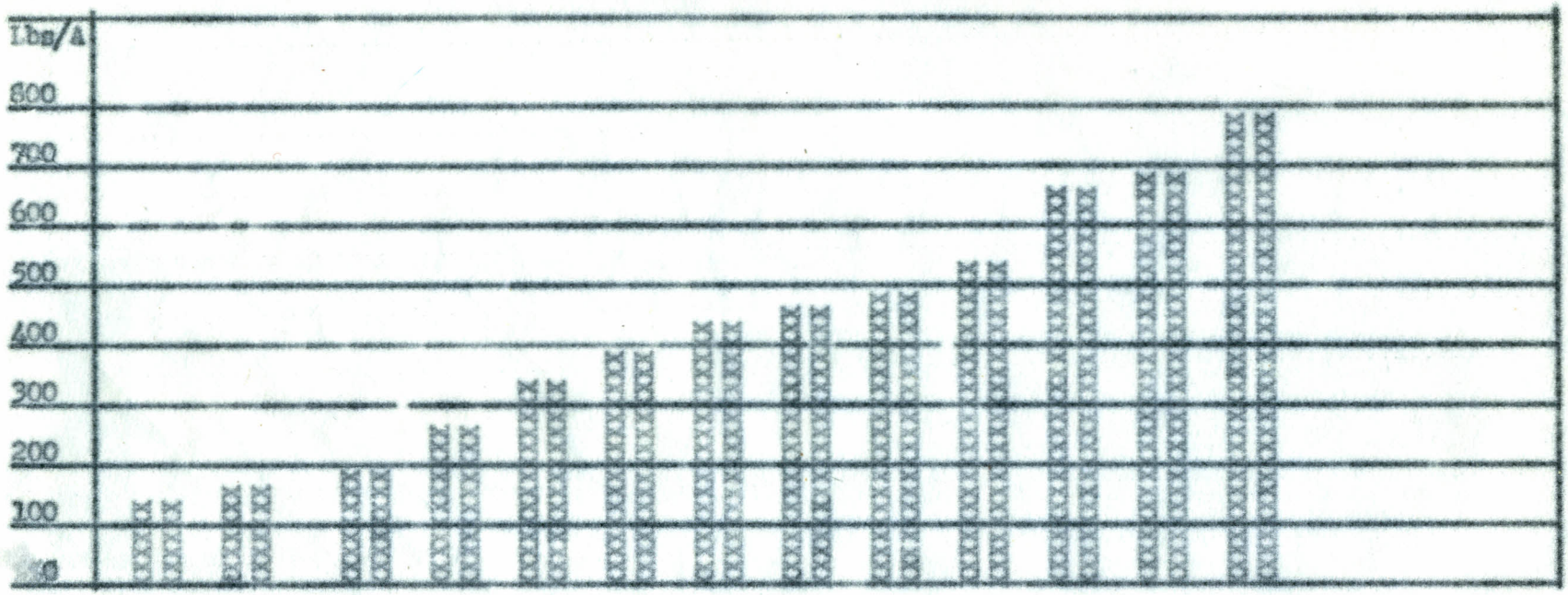
Clean seed ounces from 60 sqft.

Species	A	B	C	D	Total	Ave.	4 plot Av. lbs/A
Birdsfoot trefoil	7¼	7⅛	5-3/4	7⅛	28	7	317.6
Alfalfa	2	1-3/4	3	2¼	9	2¼	102.1
Breeders Ladino	⅛	1⅛	1⅛	3/4	3-3/4	15/16	42.5
Foundation Ladino	3/4	1	⅛	3/4	3	3/4	34.0
Kenland	1	1	1	1¼	4⅛	1-1/16	48.2

Note: Hop clover all gone, Strawberry clover about 90% bluegrass.

PLATE V

Lbs. per Acre Grass Seed 2 Years



Grass	Lbs/A
Russian Wildrye	113
Reed Canary	133
Blue branch Wheatgrass	178
Orchard	262
BIG blue	326
Mt. Brome	395
Intermediate wheatgrass	423
Creeping Red fescue	431
Tall Oatgrass	466
Smooth Brome	509
Erect brome	674
Alta fescue	689
Crested Wheatgrass	786

Note: Based of both dry and irrigated studies 1950 & 1951.

FOURTEEN BROMEGRASS STRAINS

Fourteen strains of bromegrass were seeded in 1950 in three row plots 20 feet long, rows spaced 3 feet, plots replicated 3 times. Stands secured were variable. 1951 stand percentage estimates show that for 11 of the 14 strains at least two replicates have stands of 70% or above.

Table IX shows the plot yields in ounces, the % stand, and the percent of weights given are clean seed. Table X shows the 3 plot average actual seed yield per acre without correction for perfect stands and height of forage growth.

1951 results show Fisher and Neb. 44 heavier producers of seed than Lincoln.

TABLE IX 14 BROMEGRASS STRAINS — 1951

Ounce of seed from 20 ft. of 3 ft. row, stand percentages and percentages of clean seed.

Stain	A Ozs.	A Stand%	B Ozs.	B Stand %	C Ozs.	C Stand %	% Clean seed
Elsberry	8	50	17½	90	20½	85	69
Achenbach	5-3/4	40	20-3/4	95	26-3/4	85	65
Lincoln	16	90	18	80	17½	75	71
Fisher	23½	75	—	—	28-3/4	80	71
Neb. 36	15-3/4	65	19	95	16-3/4	70	71
Neb. 44	26½	95	21	95	22½	75	69
Bin 12 (Utah)	20½	95	20½	95	9½	55	68
Martin	20½	85	17-3/4	90	26½	85	63
Manchar	14	95	18	90	26	95	70
Mandan 404	9	50	8½	45	21½	75	61
Can. Com.	14-3/4	60	19	90	3½	25	61
S. Dak.	14	90	23½	90	8-3/4	60	63
Parkland (Mont.)	18½	100	21	90	25-3/4	90	67
Meadow	Trace	5	17	45	24½	90	71

TABLE X YIELD OF CLEAN SEED PER ACRE AND FORAGE HEIGHT
14 BROMEGRASS STRAINS 1951

Strain	Lbs./A.	Ft. height
Elsberry	480	4
Achenbach	521	3½
Lincoln	553	4
Fisher	838*	4
Neb.36	553	4
Neb. 44	728	4
Bin 12 (Utah)	512	4½
Martin	617	4
Manchar	614	4
Mandan 404	357	3½
Can. Comp. [illegible]*	468*	4
S. Dak.	438	3½
Parkland (Mont.)	659	4
Meadow	651*	3

3 plot average except 2 where indicated *.

NINE ORCHARDGRASS STRAINS

Nine strains of orchardgrass were seeded April 26, 1951. Plots are 5 x 20 feet with rows spaced 6 inches. Each strain is replicated four times, 6 foot borders between sections, 1 foot between plots. A section is north with plots numbered east to west. The planting is located in Plot C-8. Good stands were secured so comparable forage yields in 1952 should be possible. The planting plan is as follows:

PLANTING PLAN - ORCHARD GRASS STRAIN NURSERY 1951

Replications: 4
Plots: 5 feet by 20 feet with rows 6 inches apart.

Strain Number	Plot Numbers I	II	III	IV
Wisconsin 51	A 1	B 8	C 3	D 6
Beltsville strain	A 2	B 3	C 9	D 4
Virginia grown	A 3	B 7	C 1	D 8
New Zealand	A 4	B 1	C 6	D 2
Trogdon	A 5	B 9	C 5	D 7
Akaroa	A6	B 4	C 2	D 1
Aber. S-37 (Wales)	A 7	B 2	C 4	D 9
Aber. S-143 (Wales)	A 8	B6	C 7	D 5
S-143 (Montana)	A 9	B 5	C 8	D 3

Seeding rates: 20 lbs. per acre = 2.08 grams per row.

40 envelopes of each strain (10 per plot).

LAWNGRASS SEED PRODUCTION

Two lawngrass, B 27 (Merion) Blue Grass and F 74 Red Fescue were seeded June 9, 1951 in four row plots, 1 foot spacing, 20 foot long, four replications, near the orchardgrass strain test in C-8.

Fair to good stands were obtained. The fescue was noticeably the easier to establish and made greater growth the first season, coming through with better stands.

The planting plan is as follows:

North

Sec. A	2	1	
Sec. B	1	2	East
Sec. C	2	1	
Sec. D	2	1	

Strain 1 - B 27 Blue Grass

Strain 2 - F 74 Red Fescue

GRASS ADAPTATION TRIALS

Grass nurseries of 42 species were seeded in the spring of 1951 in five locations; on the Floyd Johnson farm, 4 miles north of Kalispell in Flathead County, on the John Evans farm 1½ miles northeast of Eureka, in Lincoln County, on the Charles Stahl place, 2.8 miles west of Missoula in Missoula County, on the Ed Bartell farm 3½ miles north and 1 mile west of St. Ignatius in Lake County, and on the Wayne Balch farm adjoining Plains on the west in Sanders County.

Good stands of most species were secured in Flathead, Lake, and Missoula Counties and poor to good stands in Lincoln County. Grasses germinated and then died in the Sanders County planting from failure to irrigate the sandy soil on which the planting was made. An earlier irrigation would have helped stands in Lincoln County, where the planting was made on gravelley loam soil.

This work is part of a Montana Grass program and is being done in cooperation with farmers and the Extension Service.

The Standard Planting Plan was adhered to except in the Flathead County planting, where workers became confused as to which were plot numbers and which strain numbers and planted A and B sections in the same order and simply reversed the order in the C section.

Each species occupies a three row plots 20 feet long, rows spaced 1foot, and three replications.

Grasses making the best showing under unfavorable conditions at Eureka as shown by observations on Sept. 5 were: Standard Crested, Slender wheatgrass, Bearded wheatgrass, Lincoln Brome, Erect Brome, Mountain Brome, Meadow Fescue, Alta Fescue, Tall oatgrass, Reed Canary, Orchardgrass, and Switchgrass. These 12 came through with fair to good stands and made a growth of 6 or more inches in height. Tall oatgrass was outstanding throughout this first season.

The Standard planting plan showing species and locations in the plantings is given on page 22.

PLANTING PLAN
1951 Grass Nurseries

Entry No.	Species	A	B	C
1	Standard crested wheatgrass	1	25	5
2	Fairway crested wheatgrass	2	7	10
3	Slender wheatgrass	3	33	1
4	Intermediate wheatgrass	4	27	6
5	Pubescent wheatgrass	5	39	17
6	Beardless wheatgrass	6	21	25
7	Bearded wheatgrass	7	32	4
8	Bluebunch wheatgrass	8	11	23
9	Siberian wheatgrass	9	1	26
10	Western wheatgrass	10	35	39
11	P24-3 crested wheatgrass	11	19	15
12	Tall wheatgrass	12	4	2
13	Lincoln brome	13	20	33
14	Erect brome	14	31	37
15	Mountain Brome	15	24	28
16	Russian wildrye	16	30	20
17	Canada wildrye	17	26	29
18	Blue wildrye	18	5	30
19	Beardless wildrye	19	34	14
20	Meadow fescue	20	38	12
21	Red fescue	21	29	24
22	Hard fescue	22	41	31
23	Sherman big bluegrass	23	14	36
24	Robust big bluegrass	24	23	16
25	Kentucky bluegrass	25	16	35
26	Canada bluegrass	26	6	13
27	Bulbous bluegrass	27	3	8
28	Tall oatgrass	28	36	22
29	Meadow foxtail	29	22	3
30	Green Stipagrass	30	17	42
31	Astoria bent	31	10	21
32	Reed canarygrass	32	28	41
33	Orchardgrass	33	9	40
34	Bluegrama grass	34	13	19
35	Side oats grama	35	40	32
36	Elrena side oats grama	36	42	18
37	Timothy (commercial)	37	2	38
38	Hopkins timothy	38	8	27
39	Indian ricegrass	39	18	34
40	Switchgrass	40	37	7
41	Redtop	41	15	9
42	Alta fescue	42	12	11

FOUNDATION SEED PRODUCTION
(Kenland)

Eight acres of Kenland Medium Red Clover (Breeder's Seed) was planted in the spring of 1949 for the production of Foundation seed. One pound per acre was seeded in rows spaced 3 feet.

The 1950 crop grossed approximately $270.00 per acre for seed and straw. No exact estimate can be made of the value of the 1951 crop at this time. The stand was considerably thinner this season than last, growth was less, and possibly one fourth of the seed germinated in the field before the crop dried sufficiently to stack. About half the crop was stacked in the barn and appears to be in good condition, even though quite wet when hauled. The other half was stacked outside and heating sufficiently to thaw snow that falls on the stack. (See Weather Report.)

THIRTEEN HAY MIXTURES - DRYLAND

Six grass each seeded alone and with alfalfa and alfalfa seeded alone comprise the species and mixtures in this study. These were seeded in the spring of 1949 on 5 x 24 foot plots, rows spaced 1 foot, 4 replications.

Alfalfa is making more satisfactory growth in this dryland planting than in the irrigated trial (Page 10), probably due to satisfactory moisture on a deeper, better drained lighter soil.

Plot yields are shown in Table XI and yields per acre for 1950 and 1951 shown in Table XII. Grasses seeded in pure stands made insufficient regrowth to justify making a second cutting.

More uniformity of plot yields would be desirable within species or mixtures.

It is interesting to note in Table XII that grass in pure stands produces from 40 to 85 percent of 1950 yields, while alfalfa and grass alfalfa mixtures exceed 1950 yields in all cases. No grass species is producing as much as 40% as much dry forage as alfalfa in this planting.

TABLE XI DRY LAND HAYS 1951

Pounds and ounces, air dry forage from 3 x 20 ft. plot centers. Four replications.
First cutting June 26, 1951

Species or mixture	A	B	C	D
Alfalfa	5-3	5-2	5-14	5-5
Smooth Brome	2-4	1-13	1-10	3-9
Brome-Alfalfa	5-5	5-6	4-11	5-5-3/4
Orchard	2-1	2-6	1-13	1-5
Orchard-Alfalfa	5-11	4-13	4-15	4-12
Alta	3-3	2-1	3-3	6-3
Alta-Alfalfa	5-13	6-1	5-1	5-8
Crested	5-0	2-13	2-10½	2-9
Crested-Alfalfa	5-6	6-0	6-10	5-4
Canary	1-2	1-12	3-14	2-5
Canary-Alfalfa	5-10	4-13	4-10	4-15
Timothy	1-14	1-2	1-7	1-14
Timothy-Alfalfa	5-10	5-9	4-15	5-3

TABLE XI Continued.

Second cutting Sept. 14th.
Only plots containg alfalfa made sufficient growth for second cutting.

Species or mixtures	A	B	C	D
Alfalfa	4-13	5-1½	5-6	5-6
Brome-Alfalfa	5-6½	4-4½	4-11-3/4	4-6½
Orchard-Alfalfa	4-11½	4-9	4-7½	3-13
Alta-Alfalfa	5-5	5-4½	4-4-3/4	3-15½
Crested-Alfalfa	5-8½	5-0½	4-11	5-3
Canary-Alfalfa	4-15½	5-1	5-8½	5-5-3/4
Timothy-Alfalfa	6-0½	5-8	5-3-3/4	4-10½

TABLE XII THIRTEEN HAY MIXTURES — DRYLAND

Dry Forage per Acre 1950 and 1951

Species or Mixture	1950	1951	2 yr. av.
Ladak Alfalfa	7354	7467	7410
Smooth Brome	2592	1679	2135
Brome-Alfalfa	6974	7180	7077
Orchardgrass	3346	1373	2360
Orchard-Alfalfa	6367	6853	6610
Alta Fescue	3100	2654	2877
Alta-Alfalfa	6432	7492	6962
Crested	3457	2365	2861
Crested-Alfalfa	6962	7929	7496
Reed Canary	2538	1645	2092
Canary-Alfalfa	7189	7430	7310
Hopkins Timothy	3015	1202	2109
Timothy-Alfalfa	7115	7753	7434
Mean	5110.8 2.55	4847.8 2.42	

FIFTEEN GRASSES FOR SEED - DRYLAND

Fifteen grass species were planted in the spring of 1949 in 3 row plots, rows spaced 3 feet, 24 feet long for seed production. Twelve of these survived in stands adequate for seed production.

Plot yields are shown in Table XIII together with stand percentages and the percent of clean seed in the threshed samples reported for plot yields. Table XIV shows the cleaned seed per acre for 1950 and 1951.

Grasses that produced heavily in 1950 are down noticeably in 1951 with the exception of Alta Fescue which shows a nearly 30% increase. Reed Canary is up considerably from 1950.

TABLE XIII DRYLAND GRASS SEED PRODUCTION — 1951

Ounces of seed from 20 ft. of 3 ft. row, stand percentages and percentage of clean seed.

Grass	A		B		C		D		% Clean seed
	Ozs.	Stand %	Ozs.	Stand %	Ozs.	Stand %	Ozs.	Stand %	
Standard Crested	9-3/4	90	20½	90	17½	85	13-3/4	80	70
R. W. Rye	1½	90	3½	60	3-3/4	75	7-3/4	75	70
Int. Wheat	10-3/4	100	11½	100	9-3/4	100	12	90	80
Mt. Brome	5½	70	6½	70	10	75	6-3/4	60	80
Alta Fescue	14½	90	18-3/4	95	17½	70	17½	85	84
Sm. Brome	10½	100	9½	90	18½	90	12-3/4	90	70
Tall Oat	8½	95	9-3/4	90	11½	80	8½	85	87
Erect Brome	8-3/4	90	16½	95	12	85	5½	95	80
Blue Wheat	2½	80	6½	75	4½	65	2-3/4	50	64
Orchard	2-3/4	95	4-3/4	95	4½	85	3½	80	70
Red Fescue	4½	40	7	70	7	50	5½	50	86
Reed Canary	2½	100	2½	80	4	95	4-3/4	90	80

TABLE XIV GRASS SEED PRODUCTION —DRYLAND

Clean seed per acre 1950 and 1951, weight in pounds.

Species	1950	1951	2 yr. av.
Crested	1135	486	810
R. W. Rye	138	131	135
Int. Wheat	469	399	434
Mt. Brome	418	256	337
Alta Fescue	498	643	570
Smooth Brome	765	407	586
Tall Oat	408	370	389
Erect Brome	712	383	548
Bluebranch Wheat	203	113	158
Orchard	236	121	179
Cr. Red Fescue	200	229	215
Reed Canary	36	93	65

ANNUAL HAY MIXTURES - DRYLAND

Oats was seeded alone and in mixtures with field peas and vetch for hay in three replications, 21 by 150 feet. Samples taken were 4½ by 100 feet from each plot. The samples were weighed green and 10 pound green samples dried to determine shrinks.

Plot yields and percentage dry weights of harvested forage are as follows:

Kind or Mixture	Lbs. green from 450 sqft. Sec. 1	Sec. 2	Sec. 3	%
Oats (Mission)	74	80	86	58
Oats & Vetch	71	77	83	47
Oats & Peas	55	65	83	52

3 plot yields per acre for 1950 and 1951 are as follows:

Kind	Tons per acre 1950	1951	2 yr. av.
Oats	1.97	2.24	2.1
Oats & Vetch	1.74	1.78	1.76
Oats & Peas	1.79	1.70	1.74

3560
1.87

ADAPTATION NURSERIES - DRYLAND

As part of a State-wide grass program grass nurseries of 42 species were seeded on dryland at three locations in the fall of 1950, in 3 row plots, rows 20 feet long spaced 1foot, plots replicated 3 times. Locations were: Pickett Bros. ranch, Lake County, Jim Murry ranch, Sanders County, Wm. Lucier place, Missoula County.

At the end of the 1951 cropping season it appeared that fall seeding of grass species in the area is a questionable practice, for in no case were the nurseries sufficiently well established to provide comparable data on the value of the species. Scattered stands of some species are present in the Sanders and Missoula County nurseries. The Lake County nursery is, so far, a complete failure.

REGISTERED SEED PRODUCTION (ALTA FESCUE)

Seven and one-half acres of Alta Fescue was seeded on dryland with some seeped areas in the spring of 1949. Good stand were secured from seeding in 3 ft. rows at 2 lbs. per acre. Cultivation and hand rogueing has kept the stands pure.

Growth and seed production has been quite satisfactory for two seasons without application of fertilizers.

Approximately 300 lbs. of clean seed per acre was produced in 1950. The 1951 crop consists of 2680 lbs. of seed delivered to the cleaning plant, plus one and a half tons per acre of fair quality hay, cut after the seed was combined. Growth habits of alta fescue make combine harvest of ripe seed, followed by harvest of the green basal leaves for hay an acceptable and apparently efficient method of harvest. Fall grazing of the forage, if livestock was available would be even better because of the difficulty of haying row planted cultivated crops.

EFFECT OF SPACING ON FORAGE YIELD - DRYLAND

Because of the marked difference in growth of forage of the same species when grown in 1 foot and 3 feet spaced rows, samples from from 20 feet of 3 feet row of certain species was harvested for comparison with 3 rows 20 feet long spaced 1 foot.

Plot yields are shown for the four replications for 4 species in Table XV. These compare directly with the same species spaced 1 foot reported under Dryland Hay Mixtures (Table XI) Page 38.

Comparative yields of dry forage per acre are shown in Table XVI. From this data it appears that up to 90% more forage will result from the wider spacing.

TABLE XV Lbs. Dry Grasses From 20 ft. of 3 ft. row.

Species	Rep. 1	Rep. 2	Rep. 3	Rep.4	Total
Smooth Brome	9#	11#	18#	12#	50
Crested	14	16	13	10	53
Alta Fescue	14	16	12	14	56
Orchard	7	10	9	8	34

TABLE XVI DRY FORAGE PER ACRE FROM 1 and 3 ft. SPACINGS

Species	1 ft. spacing	3 ft. spacing
Smooth Brome	1679 lbs.	3267 lbs.
Crested Wheat	2362	3848
Alta Fescue	2654	3153
Orchard grass	1373	2033
	4)8068	4)12361
	2017	3075

SPRING GRAIN IMPROVEMENT - IRRIGATED

Irrigated spring grain nurseries planted on the Staion in 1951 contained 20 - 30 varieties each of wheats, oats, and barley. These were planted in 3 row plots spaced 1 foot, rows 18 feet long, with 3 replications. 16 feet of the center row was harvested for yield.

Off-Station nurseries of 9 varieties each of wheat, oats, and barley were seeded in four replictions, two in Lake County and one in Sanders and Lincoln Counties. These nurseries were seeded in one row plots with four replications. The Sanders County nursery was not harvested because of poor stands. The oats were damaged in one Lake County nursery and the Lincoln County nursery by livestock to the extent that comparable yields could not be obtained.

Nine variety nurseries were grown on the Horticultural Brandh Station in Ravalli County and delivered to Creston for threshing. The barleys were harvested in four sacks with no plot identification so 3 plot averages are all the data that can be obtained.

1951 yield data for the irrigated spring wheat is shown in Tables XVIIa to XVIIe, for oats in Tables XVIIIa to XVIIIc, and for barley in Tables XIXa to XIXe. Other data for wheat, oats, and barley is shown in Tables XVIIA, XVIIIA, and XIXA.

An attempt is made in Tables XVIIA, XVIIIA, and XIXA to show at a glance how the other varieties being studied comapare with one of the better approved varietes.

Table XVIIA compares spring wheat varieties with Pilot. None of the hard red wheats that have been grown in 10 or more nurseries have produced 100% of Pilot. Ceres, andapproved variety for dryland, comes very close with 97.7%. Soft feed wheats grown in 10 or more nurseries have produced from 5 to 8 percent more than Pilot.

Three hard red spring wheats grown in limited trials have satisfactory yield and test weight and are early enough and have sufficient resistance to lodging, as compared to Pilot, to justify further study. Protein percentages have not been secured for these from locally produced samples.

TablesXVIIIA shows how oats varieties compare with Bridger. None of the varieties tested extensively has produces as well on the average as Bridger, and few in limited trials have exceeded its yield. However, there is demand for and earlie oat with shorter straw that will approach the yield of Bridger, and some varieties in limited trials have met these requirements better than Gopher.

Table XIXA shows barley varietes in comparison to Titan. Titan is not the leader in yield that Pilot is in wheat or that Bridger is in oats. In fact ofthe 8 varieties grown in 7 or more nurseries only 2 have produced less than Titan. A variety not now recommended has demonstrated leadership in yield in extensive tests and should be recommended to occupy this position. Other factors including early maturity, resistance to lodging, and high test weight will doubtless insure popularity for Titan for any extended period.

Table _____. Off-Station spring wheat, irrigated nursery, Corvallis, Montana, 1951.

Variety	C. I. or N No.	Bushels Per Plot I	II	III	Total Bushel	Average Bushels Per Acre
Lemhi	11415	53.1	51.7	53.9	158.7	52.9**
Ceres	6900	56.7	51.0	48.2	155.9	52.0**
Onas	6221	56.7	52.4	46.1	155.2	51.7**
Idaed	11706	48.9	45.5	52.4	146.7	48.9**
Rescue	12435	51.7	39.7	51.0	142.4	47.3**
Pilot	11945	47.5	42.5	51.0	141.0	47.0**
Awned Onas	12235	48.2	40.4	48.2	136.8	45.6**
Hope x Lemhi^4	12685	43.2	41.1	51.7	136.0	45.3**
Thatcher	10003	36.9	31.2	33.3	101.4	33.8

Note: Thatcher is used as a check in this nursery.

**Yields significantly higher than Thatcher.

Mean Yield.....47.2
S. E. $\bar{x}$ 2.2
L.S.D (5%)..... 6.1
C. V. 4.66%

Table _____. Off Station Spring Wheat Irrigated Nursery, Ronan, Montana, 1951.

Date Planted, May 28, 1951. Date Harvested September 15, 1951.

Variety	C. I. or N No.	Bushels per Acre I	II	III	IV	Total Bushels	Average Bushels Per Acre
Pilot	11945	46.8	39.7	33.3	36.1	155.9	39.0*
Ceres	6900	31.2	36.9	34.7	34.0	136.8	34.2*
Pilot x Mida (N1756)	12303	31.9	30.5	39.0	35.4	136.8	34.2*
Onas	6221	26.2	33.3	32.6	31.9	124.0	31.0*
Awned Onas	12235	22.0	28.3	34.0	31.9	116.2	29.1
Mida x Cadet (N1831)	12363	33.3	26.9	27.6	26.2	114.0	28.5
Lemhi	11415	24.8	22.7	25.5	32.6	105.6	26.4
Thatcher	10003	26.2	22.7	22.0	28.3	99.2	24.8
Rescue	12435	22.7	17.7	26.2	16.2	82.8	20.7

*Varieties yielding significantly higher than Thatcher

Mean Yield.....29.8
S. E. %..... 2.1
L.S.D. (5%)..... 6.0
C. V. 7.05%

Table _____. Off-Station Spring wheat, Irrigated Nursery, Charlo, Montana, 1951.

Date Planted, May 28, 1951 Harvested, September 6, 1951

Variety or Cross	C. I. or N No.	Bushel Per Plot I	II	III	IV	Total Bushel	Average Bushels Per Acre
Pilot	11945	31.2	26.9	28.3	24.1	110.5	27.6
Ceres	6900	26.2	27.6	29.1	26.9	109.8	27.5
Rescue	12435	25.5	21.3	28.3	32.6	107.7	26.9
Pilot x Mida (N1756)	12303	22.7	26.9	31.2	24.1	104.9	26.2
Onas	6221	26.2	19.1	31.2	22.0	98.5	24.6
Awned Onas	12235	13.5	22.1	34.0	25.5	95.1	23.8
Lemhi	11415	24.1	21.3	29.1	19.8	94.3	23.6
Thatcher	10003	22.7	22.0	25.5	17.0	87.2	21.8
Mida x Cadet (N1831)	12363	19.1	19.8	19.8	24.1	82.8	20.7

Mean Yield.....24.7
S. E. $\bar{x}$..... 2.0
L.S.D.(5%).....N. S.
C. V. 8.10%

Table _____. Off-Station Spring Wheat Irrigated Nursery, Eureka, Montana- 1951.

Date Planted, May 11, 1951 Date Harvested, Sept. 5, 1951.

Variety	C. I. or N No.	Bushels Per Plot I	II	III	IV	Total Bushels	Average Bushels Per Acre
Lemhi	11415	44.7	26.9	54.6	41.8	168.0	42.0
Onas	6221	43.2	34.7	38.3	39.0	155.2	38.8
Awned Onas	12235	45.4	35.4	33.3	36.9	151.0	37.8
Pilot x Mida (N1756)	12303	36.9	33.3	34.7	33.3	138.2	34.6
Mida x Cadet (N1831)	12363	35.4	33.3	40.4	26.9	136.0	34.0
Thatcher	10003	31.9	24.8	48.2	26.9	131.8	33.0
Rescue	12435	31.2	31.2	39.0	29.8	131.2	32.8
Ceres	6900	39.0	28.3	31.9	31.9	131.1	32.8
Pilot	11945	33.3	31.9	27.6	32.6	125.4	31.4

Mean Yield.....35.2
S. E. M..... 2.8
L.S.D. (P .05).....N. S.
C. V. 7.95%

TABLE XVIIA COMPARISON OF SPRING WHEAT WITH PILOT

Variety Hard Red	Yield % of Pilot: Station dry No.	%	Off-sta dry No.	%	Station Irr. No.	%	Off-sta Irr. No.	%	All trials No.	%	Maturity Days More	Days less	1951 lbs/bu	1951 Ht. in.	1951 % lodging
Rescue	2	82	1	84	1	133	6	89	10	91.5	same		No inf.	-3	3
1996	1	100	-	-	1	96	-	-	2	98		2	same	same	4
Renard	2	81	-	-	2	91	-	-	4	86		2	1	3	-21
Thatcher	2	93	3	93	2	103	10	87	17	90.6	2		-1	2	27
H1552 x Mida	1	107	-	-	1	104	-	-	2	105.5	2		1	2	17
Lee	2	96	-	-	2	90	-	-	4	93	same		-3	3	4
(H2211)	1	112	-	-	1	100	-	-	2	106	3		-1	same	20
H1764 x Rescue	1	109	-	-	-	-	-	-	1	109	same		-1	2	13
Tin x Newth	1	109	-	-	1	101	-	-	2	105	2		-1	same	37
Mida	2	91	-	-	1	128	-	-	3	103	same		2	6	-2
Ceres	2	101	3	100	2	95	10	97	17	97.7	same		same	6	39
(H1831)	2	106	-	-	2	100	-	-	4	103	6		3	6	9
Rushmore	1	114	-	-	-	-	-	-	1	114	same		1	2	same
Red Thatcher	1	106	-	-	-	-	-	-	1	106	6		2	4	1

Saunders	1	92	-	-	-	-	-	-	1	92	same	-3	-4	same	
Marquis	2	93	3	86	1	126	5	78	11	87.3	3	1	same	-2	
(M1756)	2	97	-	-	2	124	3	97	7	104.7	2	1	2	-1	
Soft Wheats															
Aum. Onas	1	118	1	109	2	119	7	100	11	106	same	-3	-2	20	
Onas	1	131	3	104	2	103	10	108	16	108	same	-3	same	17	
Lenhi	1	121	2	105	2	106	10	104	16	105.5	7	-4	2	37	
Marfed	-	-	-	-	2	99	-	-	2	99	4	-1	-	2	
Bart	-	-	-	-	2	104	-	-	2	104	same	same	-	37	
Bart 46	-	-	-	-	2	101	-	-	2	101	4	2	-	7	
White Fed.	-	-	-	-	2	132	-	-	2	132	same	same	-	4	
Federation	-	-	-	-	2	95	-	-	2	95	1	-4	-	27	
Idaed	-	-	-	-	2	99	-	-	2	99	same	1	-	-20	
Hope x Lenhi	1	114	-	-	2	109	-	-	3	111	5	-2	same	-11	

TABLE XVIIIA COMPARISON OF OATS VARIETIES TO BRIDGER

Variety	Yield % of Bridger: Station Dry No.	%	Off-sta dry No.	%	Station Irr. No.	%	Off-sta Irr. No.	%	All trials No.	%	Maturity Days more	Days less	1951 lbs/bu	1951 Ht. in.	1951 % lodging
Mission	2	90	7	83	2	88	10	77	21	81		6	same	-6	5
Gopher	2	96	7	89	2	92	10	84	21	87.5		10	-2	-16	-10
4283	2	102	7	90	2	100	10	91	21	92.5		6	-1	-12	-10
5347	1	94	-	-	1	89	-	-	2	91.5		5	-2	-10	-4
Aberystuyth	-	-	-	-	1	88	-	-	1	88		2	same	-14	20
Bannock	-	-	7	86	2	106	10	97	19	94		3	-1	-2	33
Zephyr	2	104	7	90	2	85	10	80	21	86		4	-1	-8	-4
Can. Hybrid	2	106	-	-	1	95	2	106	4	103		5	same	-12	3
5983	1	102	7	92	2	102	10	94	20	94.5		5	-1	-12	5
5989	-	-	-	-	1	95	-	-	1	95		9	same	-14	3
6013	2	98	-	-	1	94	-	-	3	97		8	same	-12	3
6014	2	106	-	-	1	113	-	-	3	108		5	same	-14	3
6016	2	105	-	-	1	102	2	89	5	98		4	1	-10	-7
Cody	1	98	-	-	1	103	-	-	2	100		7	-5	-16	-4
Gold. Rain	-	-	-	-	1	100	-	-	1	100		3	1	-6	-5

Overland	2	105	7	86	2	104	10	82	21	88		4	-2	-16	-14
Res. Clinton	2	97	-	-	1	92	-	-	3	95		5	same	-8	-15
Mag. 044	-	-	-	-	1	98	-	-	1	98	same		2	-6	-10
Exeter	1	99	-	-	-	-	-	-	1	99		5	-1	-13	same
C x Clinton	1	87	-	-	-	-	-	-	1	87		10	-1	-16	-3
F x clinton	2	98	-	-	-	-	-	-	2	98		5	-2	-16	-3
Vicland	2	98	-	-	-	-	-	-	2	98		10	-3	-14	-2
M.R. x Mission	2	92	-	-	-	-	-	-	2	92		3	1	-13	4
5834	2	103	-	-	-	-	-	-	2	103		7	-1	-12	-2
5835	2	96	-	-	-	-	-	-	2	96		8	-2	-12	1

Table _____. Agronomic data from Irrigated barley nursery Creston, Montana, 1951.

Date Planted, May 17 & 18, 1951. Irrigated 3 times. Harvested, September

Variety or Cross	C. I. or N No.	Height (ins.)	Lodging %	Smut	Ripening Date	Plot Yield in Bushels Per Acre I	II	III	Total Bushels	Average Bushels Per Acre
Glacier	4976	36	13		9-5	100.9	74.3	76.1	251.3	83.77
Gem	7243	36	13		9-5	118.6	71.7	92.9	283.2	94.40
Bonneville	7248	33	32		9-10	104.4	70.8	68.2	243.4	81.13
B. C. 4-15	7558	36	70		9-10	123.0	102.6	70.8	296.4	98.80
Velvon 11	7088	36	80		9-5	96.5	106.2	79.7	282.4	94.13
Velvon 1-17	8058	32	75		9-7	114.2	97.4	78.8	290.3	96.77
Plush	6095	36	50		9-5	114.2	89.4	67.2	270.8	90.27
Canada Hybrid	3951-1356	40	32		9-10	108.7	72.6	104.4	285.7	95.23
W. S. 471	8055	33	20		9-5	105.3	58.4	70.8	234.5	80.83
Harlan	7008	33	27		9-5	136.3	82.3	62.8	281.4	93.80
Trebi	936	30	40		9-5	122.1	95.6	70.8	288.5	96.17
Frontier	7155	36	66		9-5	97.4	91.1	108.0	296.5	98.83
Compana	5438	30	80		9-5	78.8	76.1	69.0	223.9	74.63
Glacier x Compana	47-7405-I	33	13	x	9-5	85.8	54.0	62.9	202.7	67.57
Glacier x Compana	47-7405-V	30	17	x	9-1	80.6	65.5	64.6	210.7	70.23
Glacier x Compana	47-7405-X	33	7	x	9-1	77.9	44.3	57.5	179.7	59.90
Glacier x Compana	47-7415-V	40	10	x	9-5	69.9	38.1	65.5	173.5	57.83
Titan	7055	40	13		9-5	92.0	72.6	92.0	256.6	85.53
Moore	7251	38	22	x	9-7	86.7	66.4	80.5	233.6	77.87
Lico I	7544	30	8		9-1	73.5	72.6	68.2	214.3	71.43

Note: Average of Titan and Compana is the check (80.08).

Mean Yield.....83.37
S. E. $\bar{x}$..... 7.78
L.S.D. 5%.....22.19
L.S.D. 1%.....29.70
C. V. 8.95%

Table _____. Yield data from irrigated barley nursery at Corvallis, 1951. Yields are given in bushels per acre with the average of 3 plots.

Variety or Cross	C. I. or N No.	Average for three plots In bushels per Acre
Compana	5438	69.9
Titan	7055	91.1
Frontier	7155	56.6
Plush	6095	81.4
Canada Hybrid	3951-1356	93.8
Velvon 11	7088	76.1
Gem	7243	76.1
Harlan	7008	74.3
B. C. 4-15	7558	72.6

Table _____. Yield data from irrigated barley nursery, Roman, Montana 1951.

Variety or Cross	C. I. or N No.	I	II	III	Total Bushels	Average Bushels per Acre
Compana	5438	24.8	27.4	30.1	82.3	27.43
Titan	7055	35.4	45.2	39.8	120.4	40.13
Frontier	7155	29.2	23.0	40.7	92.9	30.97
Plush	6095	28.3	40.7	39.8	108.8	36.27
Canada Hybrid	3951-1356	34.5	47.8	45.2	127.5	42.50
Velvon 11	7068	32.8	46.0	46.9	125.7	41.90
Gem	7243	37.2	40.7	39.8	117.7	39.23
Hadan	7008	24.8	48.7	40.7	114.2	38.07
B. C. 4-15	7558	38.9	33.6	31.9	104.4	34.80

Note: Average of Compana and Titan is the check (33.78)

Mean Yield.....36.81
S. E. %..... 2.99
L.S.D.5%..... 8.99
C. V. 8.12%

Table _____. Yield data from irrigated barley nursery in Lake County, Charlo, Montana, 1951.

Variety or Cross	C. I. or N No.	I	II	III	IV	Total Bushels	Average Bushels/A
Compana	5438	46.0	40.7	40.7	34.5	161.9	40.48
Titan	7055	49.6	46.0	53.1	35.4	184.1	46.03
Frontier	7155	54.9	52.2	62.0	54.9	224.0	56.00**
Plush	6095	54.9	66.4	65.5	50.5	237.3	59.33**
Canada Hybrid	3951-1356	66.4	66.4	62.0	46.0	240.8	60.20**
Velvon 11	7088	63.7	58.4	63.7	37.2	223.0	55.75
Gem	7243	50.5	56.6	55.8	37.2	200.1	50.03
Harlan	7008	38.9	53.1	57.5	31.9	181.4	45.35
B. C. 4-15	7558	77.9	67.2	62.0	44.3	251.4	62.85**

Note: Average of Titan and Compana used as a check (43.26).

**Varieties yielding significantly more than the check (1%).

Mean Yield.....59.93
S. E. $\bar{x}$..... 3.23
L.S.D. (5%)..... 9.66
L.S.D. (1%).....13.17
C. V. 6.28%

Table _____. Yield data from barley nursery under irrigation, Eureka, Montana.

Variety or Cross	C. I. or N No.	I	II	III	IV	Total Bushels	Average Bushels/A
Compana	5438	38.1	35.4	36.3	35.4	145.2	36.30
Titan	7055	47.8	43.4	46.9	44.3	182.4	45.60
Frontier	7155	53.1	49.6	54.9	60.2	217.8	54.45**
Plush	6095	43.4	52.2	51.3	51.3	198.2	49.55**
Canada Hybrid	3951-1356	50.5	56.6	53.1	45.2	205.4	51.35**
Velvon 11	7088	49.6	59.3	54.9	54.0	217.8	54.45**
Gem	7243	48.7	48.7	44.3	44.3	186.0	46.50*
Harlan	7008	45.2	42.5	44.3	39.8	171.8	42.95
B. C. 4-15	7558	55.8	53.1	61.1	54.5	224.5	56.12**

Note: Average of Compana and Titan is the check (40.9%).

* Varieties yielding significantly more than the check (5%).

**Varieties yielding significantly more than the check (1%).

Mean Yield.....48.46
S. E.%..... 1.80
L.S.D..... 5.27
L.S.D..... 7.15
C. V. 3.73%

TABLE XIX4 SPRING BARLEY COMPARED WITH TITAN

Variety	Yield % of Titan										Maturity		1951	1951	1951
	Station Dry		Off-sta dry		Station Irr.		Off-sta Irr.		All trials		Days	Days	lbs/bu	Ht. in.	% lodging
	No.	%	No.	%	No.	%	No.	%	No.	%	More	less			
Gem	2	117	4	97	2	106	10	99	18	105.5	same		-4	same	same
Bonneville	2	114	-	-	2	102	-	-	4	108	8		-9	-2	19
B.C.4-15	1	103	-	-	2	129	4	97	7	107	8		-10	same	57
Velvon 11	2	99	2	98	2	119	6	99	12	101	1		-4	same	67
Velvon 17	2	116	-	-	2	118	-	-	4	117	4		-6	same	62
Moore	2	84	2	111	1	99	2	97	7	98	same		-4	4	9
W.S.471	2	106	-	-	1	91	-	-	3	101	1		-5	same	7
Harlan	2	109	-	-	2	114	4	87	8	104	2		-4	same	20
Atlas	2	109	-	-	-	-	-	-	2	109	same		-6	same	17
B.C.4-51	2	115	-	-	-	-	-	-	2	115		2	-3	same	47
Compana	2	89	4	94	2	96	10	87	18	90	same		1	-3	57
Otis	2	88	-	-	-	-	-	-	2	88		2	4	-6	37
Flush	2	91	4	104	2	108	10	107	18	105	1		-2	same	37
Can. Hybrid	2	119	4	110	2	123	10	119	18	117	3		-1	same	19
Trebi	-	-	-	-	2	116	-	-	2	116	same		-1	-6	27

Lico 1	-	-	-	-	2	104	-	-	2	104		5	-1	-3	-5
Frontier	-	-	4	99	2	113	10	105	16	105	same		same	same	53
GxC 7405-I	1	88	-	-	1	79	-	-	2	83	1		same	-	same
GxC 7405-V	1	94	-	-	1	82	-	-	2	88		1	-1	-	4
GxC 7405-X	1	81	-	-	1	70	-	-	2	75		2	1	-	-6
GxC 7415-V	1	80	-	-	1	67	-	-	2	73	3		same	-	-3

SPRING GRAIN IMPROVEMENT - DRYLAND

Dryland spring grain nurseries containing twenty of more varieties of wheat, oats, and barley, seeded in triplicate 3 row plots 18 feet long spaced 1 foot, produced well at Creston in 1951. Off-Station dryland nurseries did not fare as well. Two were seeded, one at Plains and one at Trout Creek, and neither was harvested because of livestock damage or variable stands.

Plot yields are shown in Tables XXa, XXb, and XXc. Comparisons with Pilot wheat, Bridger oats, and Titan barley are shown in Tables XVIIA, XVIIIA, and XIXA for dryland as well as irrigated nurseries. Generally varieties that have produced well on dryland have produced well when irrigated in the Northwestern Montana trials. This may be due to rather high summer precipitation during recent years. It has been noticed that not all varieties of barley that produce heavy grain, that is grain with a high weight per bushel, under irrigation do so on dryland.

PLATE VI

SPRING WHEAT IN % OF THATCHER
24 Northwestern Montana Trials

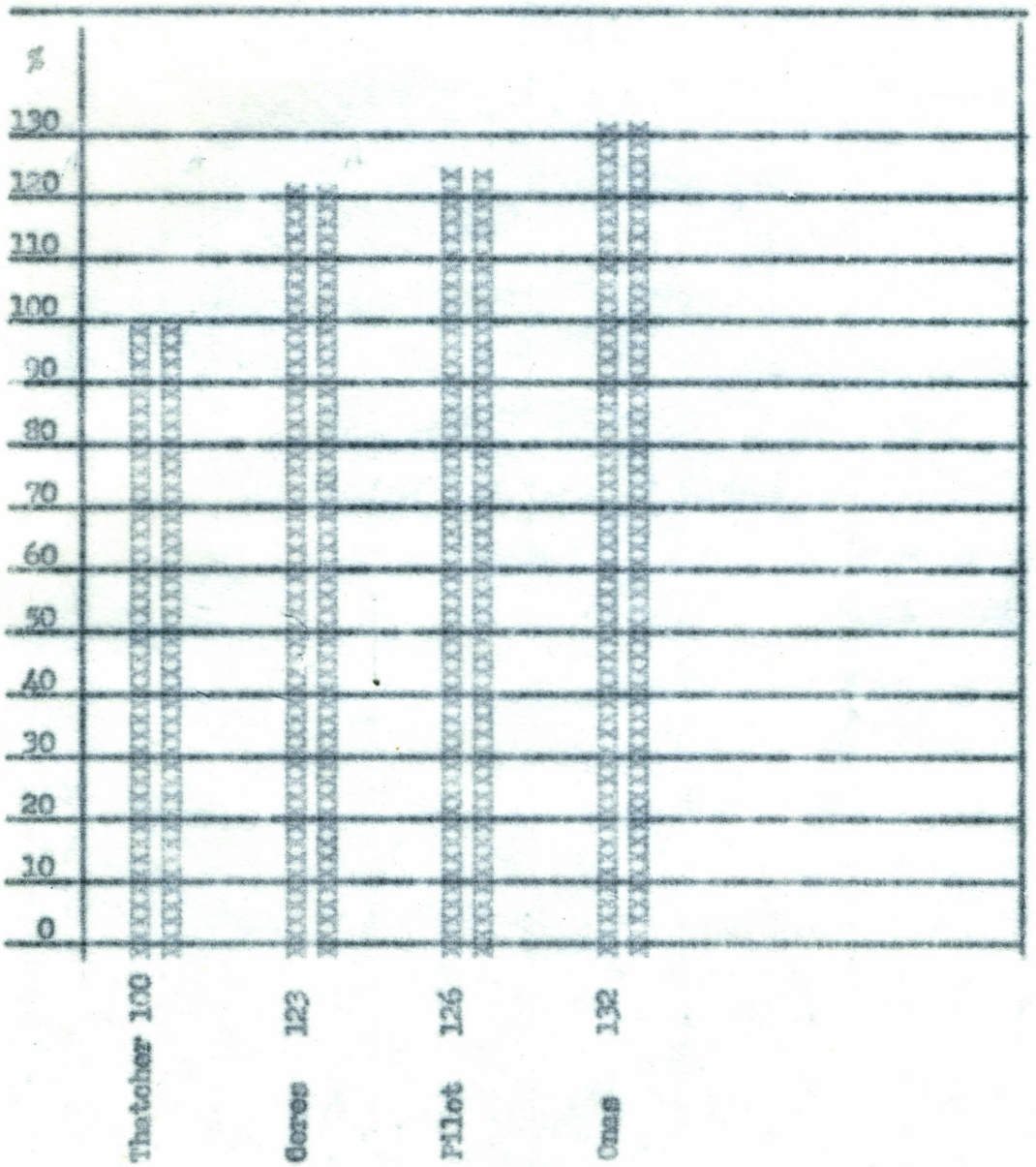


Table _____. Agronomic data from dryland spring barley, Creston, Montana 1951.

Date Planted, May 10, 1951. Harvested, August 25, 1951.

Variety or Cross	C. I. or N No.	Heading Height (Inches)	Smut	Lodging %	Ripeing Date	Wt/ Bu. Lbs.	Plot Yield In Bushels Per Acre I	II	III	Total Bushels	Average Bushels Per Acre
Glacier	4976	36		20	8-18	42	81.4	75.2	84.1	240.7	80.23**
Gem	7243	36		15	8-18	42	74.3	66.4	76.1	211.8	72.27**
Bonneville	7248	34	x	30	9-1	37	49.5	46.9	63.7	160.1	53.37
B. C. 4-15	7558	36		73	9-1	36	56.6	69.0	67.2	192.8	64.27
Velvon 11	7088	36	x	33	8-20	42	51.3	74.3	76.1	201.7	67.23*
Velvon 1-17	8058	36		47	8-25	40	70.8	69.9	69.9	210.6	70.20**
Moore	7251	40	x	17	8-16	42	53.1	67.2	56.6	176.9	58.97
Titan	7055	36		7	8-16	46	60.2	63.7	62.9	186.8	62.27
W. S. 471	8055	36		15	8-18	41	54.0	67.2	69.0	190.2	63.40
36 ab 6127	7008	36		23	8-20	42	59.3	76.1	82.3	217.7	72.57**
Atlas 46	7323	36		30	8-18	40	56.6	81.4	67.2	205.2	68.40**
B. C. 4-51	8053	36		60	8-16	43	61.1	67.2	65.5	193.8	64.60
Compana	5438	33		30	8-18	47	42.5	54.9	53.1	150.5	50.17
Glacier x Compana	47-7405-I	36	x	25	8-20	46	49.6	50.4	64.6	164.6	54.87
Glacier x Compana	47-7405-V	40	x	23	8-20	45	54.0	60.2	59.3	173.5	57.83
Glacier x Compana	47-7405-X	36	x	13	8-18	47	46.0	52.2	55.8	154.0	51.33
Glacier x Compana	47-7415-V	36	x	10	8-22	46	38.1	50.4	62.0	150.5	50.17
Otis	7557	30	x	50	8-16	50	51.3	55.8	62.9	170.0	56.67
Flush	6095	36		33	8-20	44	53.1	57.5	66.4	177.0	59.00
Canada Hybrid	3951-1356	36		12	8-20	45	54.9	57.5	74.3	186.7	62.23

Note: Average of Titan and Compana used as a check (56.22).

* Varieties yielding significantly more than the check (5%).

**Varieties yielding significantly more than the check (1%).

Mean Yield.....61.77
S. E. $\bar{x}$ 3.02
L.S.D.(5%)..... 8.64
L.S.D. (1%)..... 11.54
C. V. 4.89%

PLATE VII

BARLEY IN % OF GLACIER
23 Northwestern Montana Trials

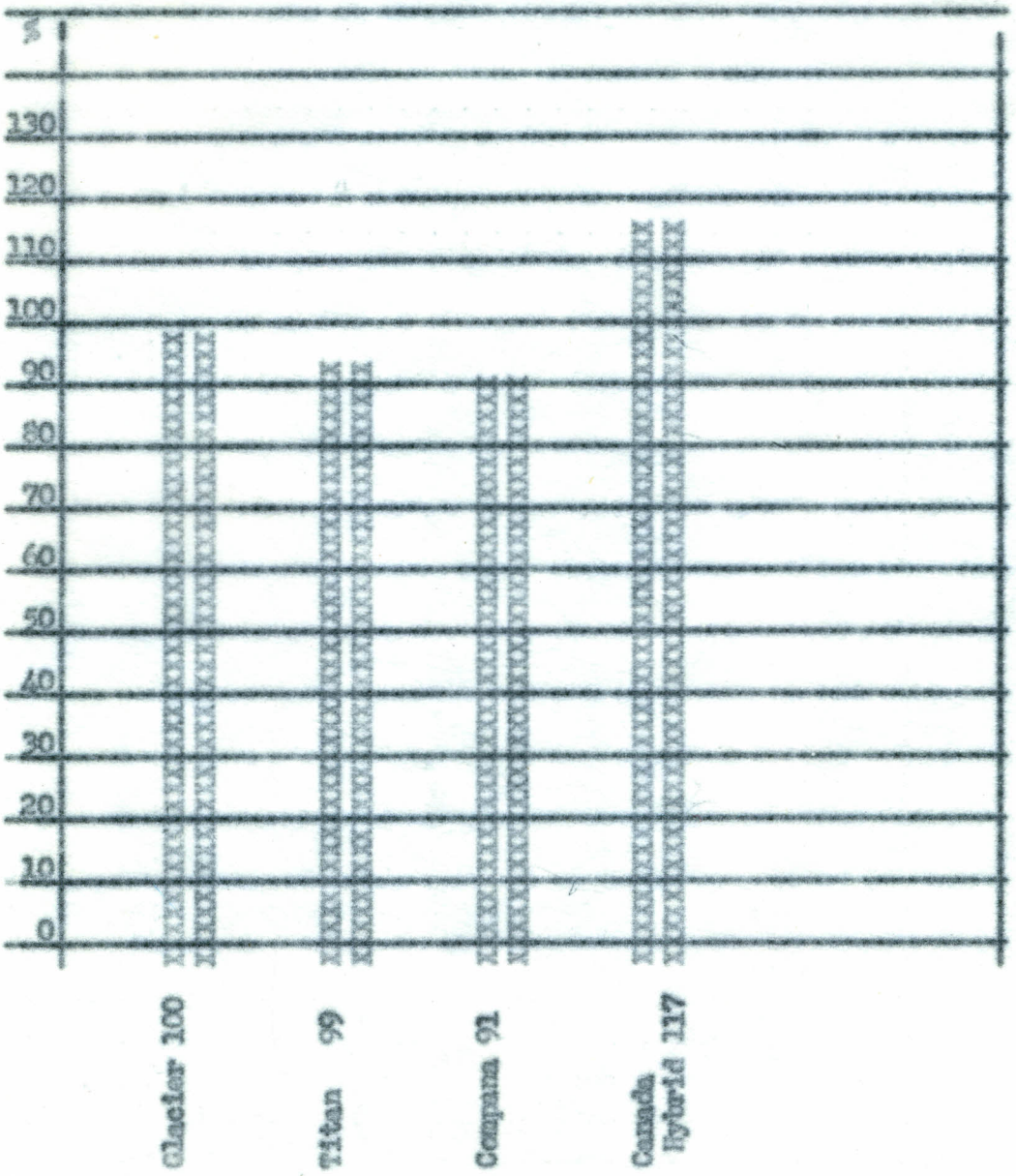


PLATE VIII

OATS IN % OF GOPHER
22 Northwestern Montana Trials

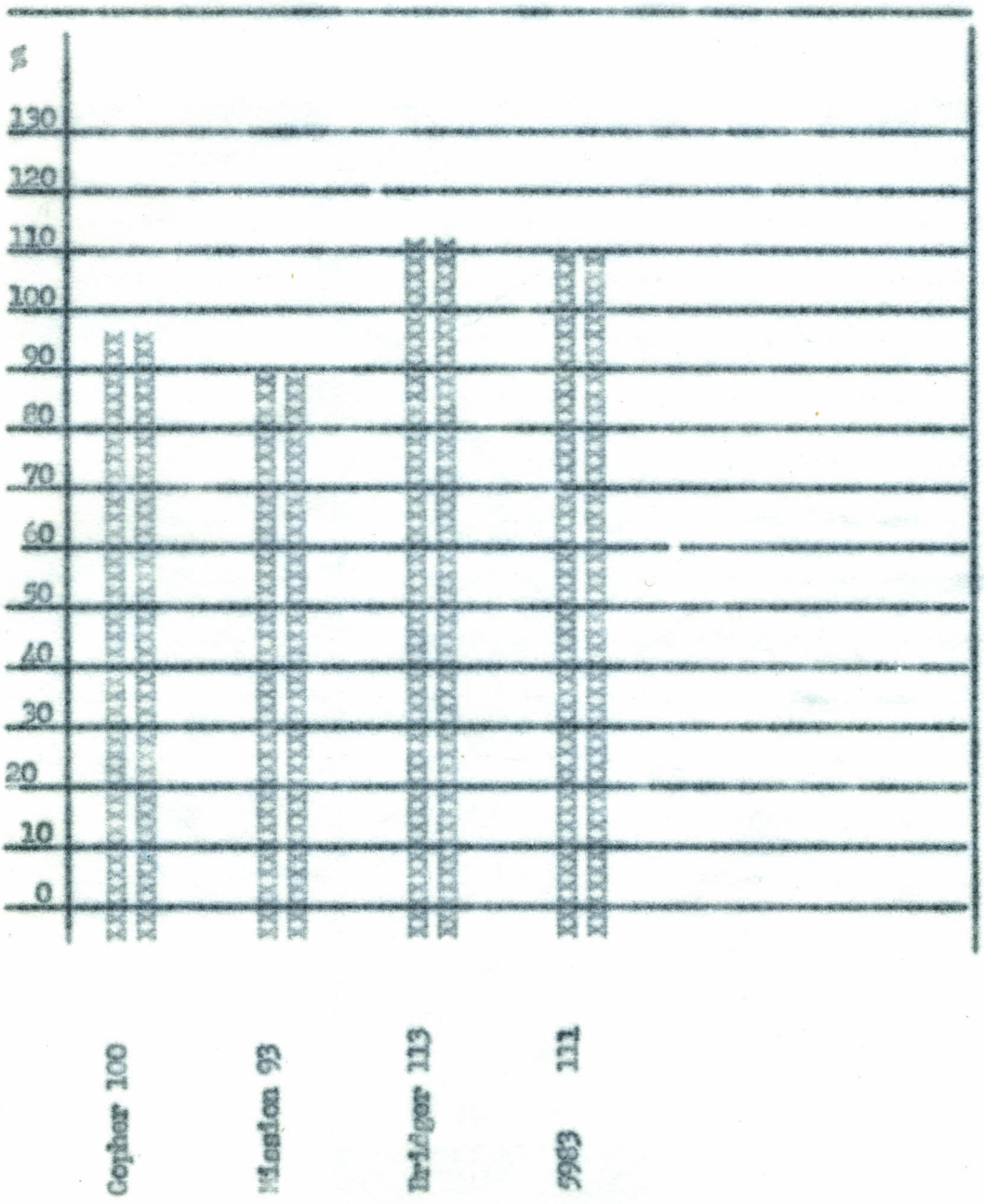
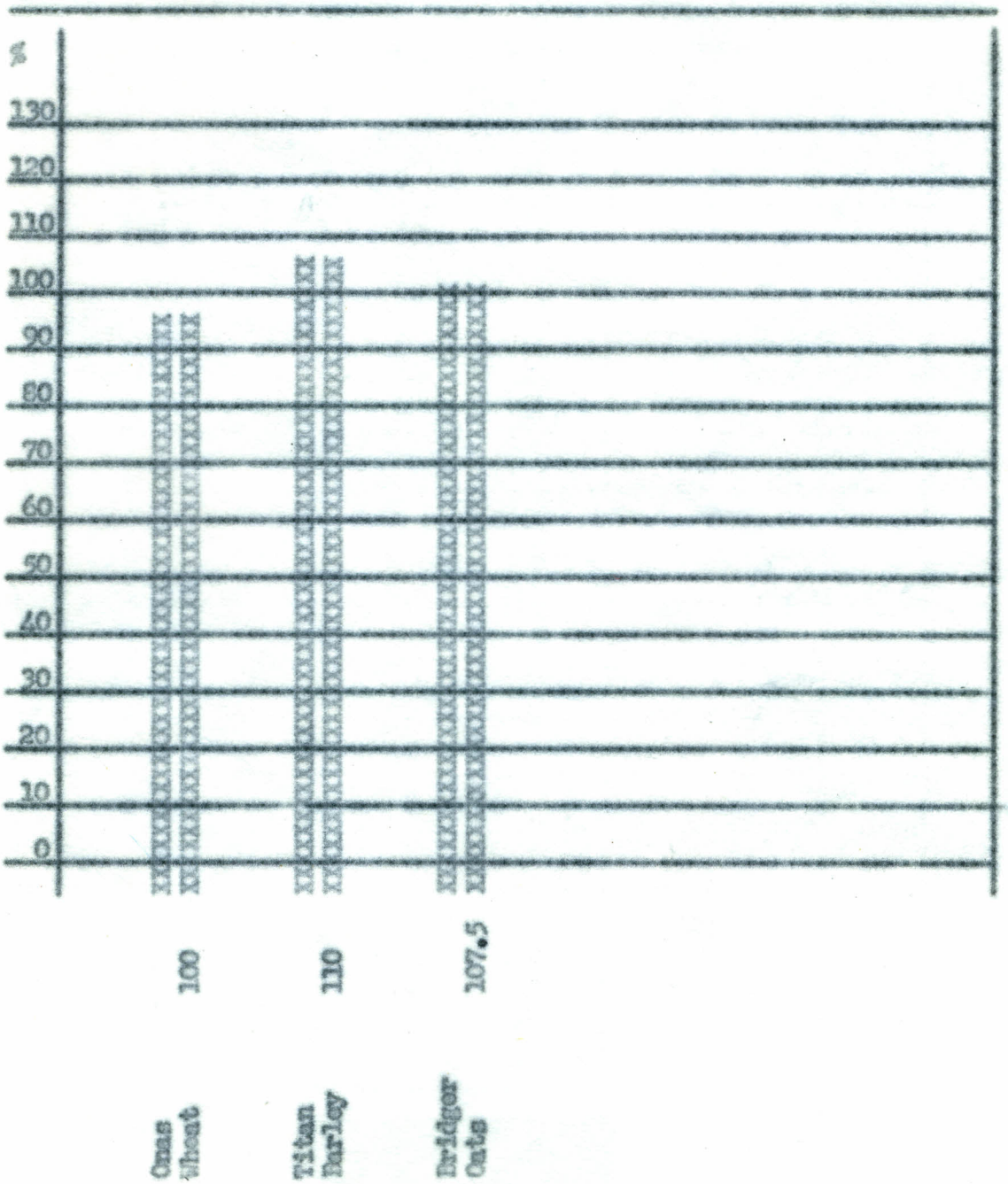


PLATE IX

T.D.N. OF FEED GRAINS IN % OF WHEAT
23 Northwestern Montana Nurseries



WINTER GRAIN IMPROVEMENT

Winter Wheat

Sixteen varieties of winter wheat were seeded Oct. 7, 1950 on dryland, in 3 row plots 18 feet long spaced 1 foot, with 3 replications. Good stands were secured, and even though some growers in the area complained of winter killing of winter wheat the nursery plots all came through with comparable stands.

Yield data for this nursery is shown in Table XXa. It will be noted that yields of Wasatch, the variety recommended for this area, are quite low compared to several other varieties. This was not true in a nursery of fewer varieties harvested in 1950. and may reflect the winter injury more accurately than does the stand. Other data, including maturity date, height, percent lodging, and weight per bushel is shown in Table XXa.

Winter Barley

Sixteen varieties or strains of winter barley were seeded near the winter wheat nursery, in three row plots replicated three times.

Stands were variable in the spring after severe temperatures with little or no snow cover during part of the winter. However several varieties came through with good stands and yields exceed those for the nearby winter wheat nursery in some cases.

Yield data is shown in Table XXIa. Other data including maturity date, percent of lodging, percent of survival, and pounds per bushel is shown in Table XXIa.

Maturity dated for the winter barleys were (in 1951) a week or more ahead of dryland spring barleys, and somethree weeks ahead of irrigated spring barleys which might be of some advantage in harvesting large acreages.

Yields for some of the better winter barleys compare favorably with spring barleys grown in another dryland location on the Station. (Table XXc)

Table _____. Agronomic data from dryland winter wheat nursery Creston, Montana 1951. Three row plots, three replications.

Date Planted, October 7, 1950. Date Harvested, Aug. 10 & 15, 1951.

Variety or Cross	Height in Inches	Lodging %	Date Ripend	Wt/ Bu. Lbs.	Yield Per Plot In Bushels Per Acre I	II	III	Total Bushels	Average Bushels Per Acre
Yogo	40	20	8-14	58	43.2	29.1	43.2	115.5	38.5
Karakof	40	25	8-15	59	36.9	45.4	50.3	132.6	44.2
Karmont	40	40	8-13	60	44.7	39.0	36.1	119.8	39.9
Newturk	40	80	8-12	57	39.7	19.1	44.7	103.5	34.5
Wasatch	38	15	8-13	57	36.1	22.7	28.3	87.1	29.0
Nebred	38	10	8-14	59	38.3	56.7	51.0	146.0	48.7
Comanche	40	30	8-14	59	54.6	27.6	39.0	121.2	40.4
Cheyenne	36	10	8-13	57	29.8	29.8	45.4	105.0	35.0
Tenmarq	38	20	8-12	59	26.2	26.9	35.4	88.5	29.5
Minter	40	10	8-12	56	27.6	32.6	23.4	83.6	27.9
Huntley 44	38	30	8-14	59	32.6	56.0	54.6	143.2	47.7
Turkey x Oro-221	40	10	8-13	59	32.6	24.8	44.7	102.1	34.0
Turkey x Oro-216	38	10	8-13	58	34.7	24.8	60.9	120.4	40.1
Turkey x Oro-205	40	10	8-13	56	31.2	36.1	29.8	97.1	32.4
Yogo x Wasatch-9	38	20	8-13	57	27.6	36.1	41.8	105.5	35.2
Yogo x Wasatch-11	38	20	8-13	59	25.5	27.6	43.9	97.0	32.3
Fourty fold[1]					39.0	32.6	45.4	117.0	39.0

Note: Wasatch is the check variety.

[1] Not included in the analysis.

Mean Yield.....36.28
S. E. M..... 5.11
L.S.D. (5%).....N. S.
C. V. 14.10%

Table VII Agronomic data obtained from Off-Station Winter Wheat Nursery (Stillwater) grown by the Northwestern Montana Branch Station, Creston in 1950-51

Entry	C.I. number	Yield of Grain
		bus./A.
Yogo	8033	33.1
Newturk	6935	28.8
Cache	11599	27.0
Karmont	6700	26.7
Wasatch	11925	25.5
Fortyfold (White)	4156	23.2
Turkey x Oro--221	12705	22.5
Mean		26.7
L.S.D. at 5% level		2.9

C.V.--7%

Variance Analysis for Yield

Source	Degrees of Freedom	Mean Square
Replications	2	4,491 **
Entries	6	3,867 **
Error	12	348
Total	20	

Table _____. Agronomic data from winter barley dryland condtions, Creston, Montana 1951.

Date Planted, October 7, 1950 Date Harvested, Aug. 20, 1951

Variety or Cross	C. I. or N No.	Ripening Date	Lodging %	Survival %	Wt/ bu. Lbs.	Plot yield in Bushels Per Acre I	II	III	Total Bushels	Average Bushels Per Acre
Ohio Winter 1	7072	8-10	80	83	44	43.4	30.1	57.5	131.0	43.67
Winter Club	592	8-15	25	70	43	53.1	39.8	51.3	144.2	48.07
Reno	6571	8-10	80	70	42	42.5	38.9	35.4	116.8	38.93
Comp. Cross X	6625	8-15	10	87	44	46.0	45.2	67.2	158.4	52.80
B 550 Kty 5 x M. E. B.	7531	8-10	5	80	43	32.8	46.0	47.8	126.6	42.20
Purdue 1101 Sel.	7523	8-10	10	87	46	72.6	58.4	83.2	214.2	71.40**
Brien	7157	8-10	25	80	45	72.6	50.5	86.7	209.8	64.97*
B 546 Kty 5 x M. E. B.	7568	8-12	25	53	40	49.6	35.4	50.5	135.5	45.17
W. Va. CC10-45-22	7582	8-12	80	70	40	28.3	41.6	54.9	124.8	41.60
Nebr. 412490	7580	8-10	80	90	48	38.9	34.5	30.1	103.5	34.50
Boz.CC10-220		8-12	75	80	44	55.8	44.3	63.7	163.8	54.60
Boz.CC10-242		8-15	80	73	46	38.1	56.6	72.6	167.3	55.77
Pueblo	8070	8-10	35	83	42	36.3	61.1	47.8	145.2	48.40
B699 Admive x M. E. B.	8064	8-2	25	73	41	36.3	42.5	72.6	151.4	50.47
Boz. CC10-284		8-10	30	80	44	61.1	46.9	54.0	162.0	54.00
Boz. CC10-272		8-10	80	87	47	47.8	42.5	63.7	154.0	51.43

Note: Average of Ohio Winter 1 & Winter Club is the check (45.87).

**Varieties yielding significantly more than the check (1%).

Mean Yield.....50.18
S. E. $\bar{x}$..... 5.678
L.S.D. (5%)..... 16.41
L.S.D. (1%).....22.12
C. V. 11.33%

IRRIGATION STUDIES

Six crops are being grown in a rotation designed to provide information as to irrigation rates and frequencies for best crop production in the Flathead County area below Hungry Horse Dam; prior to possible establishment of irrigation districts.

The schedule of rates and frequencies and the yield per acre of each crop is shown in Table XXII. The results need be considered in conjunction with weather data (See page 98). It appears to be entirely possible that all scheduled rates furnished too little water for some dry seasons, for grass hays needed more than was scheduled even this year which may have been wetter than normal. At the same time it will be noted that heavier rates of application appeared to be detrimental to alfalfa and potatoes.

TABLE XXIII EFFECT OF RATES AND FREQUENCIES OF IRRIGATION ON CROPS

2 Acre Plots

Crop	Irrigation Schddule No.	Amt.	Interval	Total in.	Yield per acre
Pasture	4	2 in.	3 wk	8 in.	397.5 lbs. lamb gain
Pasture	6	2 in.	2 wk	12	484.0 lbs. lamb gain
Pasture	4	3 in.	3 wk	12	465.5 lbs. lamb gain
Mixed hay	3*	2 in.	3 wk	6	5469 lbs.
Mixed hay	4	2 in.	3 wk	8	5082 lbs.
Mixed hay	3*	3 in.	3 wk	9	5469 lbs.
* Aug. 20 mixed hay was burning so all plots received 4 irrigation.					
Alfalfa	3	2 in.	3 wk	6 in.	4274 lbs.
Alfalfa	4	2 in.	3 wk	8	5300
Alfalfa	3	3in.	3wk	9	3559
Barley	2	2 in.	2 wk	4 in.	74.3 bu.
Barley	2	3 in.	2 wk	6 in.	73.5
Barley	3	2 in.	2 wk	6 in.	71.3
Potatoes	4	2 in.	2 wk	8	275.8 cwt.
Potatoes	5*	2 in.	2 wk	10	275.3
Potatoes	4	2½ in.	2 wk	10	211.5
* Fifth irrigation not given.					

Note: Peas, also included in the study. Through error all plots were raked together, making it impossible to get separate data for the 3 plots.

DIRECT IRRIGATED - DRYLAND COMPARISONS

It has been observed that the location on the Creston Station has more influence upon the yield of some crops than the application of irrigation water. Dryland grain and alfalfa grown near the north end of the farm have consistently produced better than irrigated grain and potatoes at the south end of the farm. For this reason irrigated - dryland comparisons must be located close together on similar soils to give a fair measure of the value of irrigation.

Direct comparison of similar crops on similar soils with comparable treatment are given in Table XXIII.

TABLE XXIII ---- PER ACRE YIELD DRY AND IRRIGATED CROPS
Otherwise similar treatment - 1951

Soil	Crop & Treatment		Dry (lbs.)	Irrigated (lbs.)
No.1	Potatoes	No fertilizer	12,858	16,815
No.1	"	200# 10-20-0	19,750	26,600
No.1	"	200# 6-30-0	19,028	24,510
No.1	"	200# T. S. P.	13,470	24,800
No.2	"	No fertilizer	11,946	21,033

SOILS RESEARCH
Fertilizer trials 1951

There is little to report in this catagory for the current year. Three fertilizer trials were put out off-station, none of which produced data of value.

Failure on the part of the cooperator to irrigate a replicated fertilizer trial on barley at Eureka on a gravelly loam soil resulted in yields from all plots too low to make fertiser application profitable.

A replicated trial on a clover seed crop at Trout Creek produced no data for the reason that no seed was produced. Regrowth following clipping on the dryland area was too little to produce much seed and a wet fall made harvest impossible.

Unfavorable harvest weather prevented securing yield data from the third 1951 trial. This was to have been the one that proved and demonstrated that 400 to 600 pounds seed yield were still possible in the Flathead. Cooperating with Ed Turnbull at Charlo, phosphate alone and with nitrogen, potash, and and boron was applied to 2 acre fields of Kenland clover, June 19 following clipping and irrigation. Dr. Hunt, Corvallis, dusted the plots and by careful check determined that harmful insects had been controlled.

Growth on the plots was only fair, not good, seed set was only fair , and wet harvest weather prevented threshing. Actual threshed yields may yet be etained but are not expected to exceed 200 lbs. per acre in any case.

Fertilizer value on the Station is measured by the Gem seed potato crop and reported under Horticulture. See Page 81.

Sawdust at 10 ton and 20 ton rated was applied to plots 33 ft. wide by 200 ft. long in C-8 on April 23. From irrigated grass seed plots west to read the treatments are in the following order: 20 ton, check, 10 ton. Sawdust was put on with a manure spreader as a top dressing and disced in prior to seeding.

On June 9, Hopkins Timothy was drilled in 3 foot rows on all strips. Fair stands were secured. However the growth and color of the grass on the sawdust strips indicated nitrogen deficiency. Without question the first seasons effect can be said to be detrimental to the grass crop.

WEED CONTROL

2 4 D Tolerance of Legumes

A copy of a paper presented to the Western Section of the American Society of Agronomy meeting in Bozeman in 1951 is submitted in this connection.

Following the meeting, the dry weight of forage for the several plots, Replications 1 and 2, was determined at the stage of maximum seasons growth and some seed harvested from Replication 3 and sent to the seed laboratory for germination test and to be observed for abnormal sprouts.

Should analysis of the 1951 forage yield data or seed tests furnish additional information regarding the tolerance to 2 4 D or ability to produce normal seed following treatment this will be incorporated in the 1952 report.

EFFECT OF HERBICIDES ON SMALL SEEDED LEGUMES

In my discussion of the effect of herbicides on legume seedlings, I wish to present data pertinent to this question: Do legume seedlings have sufficient tolerance to amine 2,4-D to permint spraying for elimination of annual weeds and more susceptible legumes? Obviously, if such is the case, much hand labor needed in rogueing can be dispensed with.

At our Main Station here at Bozeman 7 species of legumes were seeded in the spring of 1949 in 3½ x 7 ft. plots, rows spaced 6 inches. The species were: Alsike, White, Red, Sweet, Alfalfa, Ladino, and Lotus. Lotus plots were not harvested because of uneven stands. Three replications of each were treated with five concentrations of amine 2,4-D; 0, .15, .30, 160, and 1.2 lbs. acid equivalent per acre on two dates, July 26 and September 8, 1949.

Samples from 3 ft. of row from each plot were taken May 25, 1950, and oven dried. The gram weights of these samples constitutes the data used for analysis, and was found to be significant.

This data indicates that alsike, white, and ladino have considerable tolerance as yields were not significantly reduced by either rate at either date.

Red clover yields were reduces by 1.2 lbs. on the late date.

Alfalfa yields were reduced by the 1.2 rate on the early date and all rates on the late date.

Sweet clover was reduced by all rates on all dates.

It was determined that in order of increasing tolerance the species rank as follows: Sweet, Alfalfa, Red, Ladino, White, and Alsike.

This is reported by David H. Leighty in "Effect of 2,4-D on Forage Yields of Small Seeded Legumes". He acknowledges assistance of Mr. Warden ans Mr. Eslick, Montana State College.

A similar planting was made at the Northwestern Branch Station at Creston in 1950. The seven species were seeded in single row, 10 ft. plots, and were given the same rates of 2,4-D application as the Bozeman plots on three dates, June 24, July 8, and September 6, 1950. *

Yield date at the stage of maximum growth will be compiled from the 315 plots in this planting this year, and analized in the same manner as the Bozeman plots.

Data available now is stand counts taken in 1950 following treatment.

* Treatments applied and stand counts taken by David H. Leighty.

Stands in % of untreated checks

For all species, all rates and all dates - 48% survival

For all species, all rates, Date 1 - 60% "

" " " " " , Date 2 - 46% "

" " " " " , Date 3 - 38% "

For all species, all dates, .15 rate -.80% "

" " " " " , .30 " -.53% "

" " " " " , .60 " -.46% "

" " " " " , 1.2 " -.17% "

These data indicate sufficient tolerance to 2,4-D in the amine form to permit its use on legume seedlings for the elimination of more susceptible plants.

From what is know of the rated of application required for many annual weeds and the tolerance shown by these studies, many interesting possibilities come to mind. I am encouraged to believe that for us in the Kenland seed area we can develop spray schedules that will save considerable rogueing.

Since stand reduction seems inevitable from spraying, probably the use of spray should be confined to seed crops where high plant populations are less important than pure stands.

1951 HORTICULTURE WORK

Fertilizers for Potatoes

Potato Variety Study

Observations of Hybrid Sweetcorns

Small Fruit Plantings

Landscape Plan Development

Ornamentals

FERTILIZERS FOR POTATOES

Fertilizer work with potatoes under irrigation was continued as outlined in 1949, the only changes being substitution of a Phosphate plus boron treatment for the center check plot, and return to barnyard manure as used in 1949 instead of green manure as in 1950.

Work was extended to include a dryland study of the lower rates of fertilizer application in comparable soils. This work provides fertilizer information for dryland growers and also provides direct dry-irrigated yield comparison for this crop, or a means of evaluating irrigation.

Response to fertilizer followed closely the pattern set in the previous two years with two exceptions. Plots receiving 100 lb. applications of 6-30-0 were abnormally high in yield, making it fairly obvious that some error must have been in applying fertilizer to these plots, and phosphate alone produced better relative results than in past years.

Pounds, field run, of potatoes from the center row of the 3 row plots, 132 ft. long, rows spaced 3½ ft. for the irrigated trial are shown in Table I, together with 3 plots average yield per acre.

This is the third year for this study on irrigated potatoes so per acre yields for each of the years and 3 year averages for the 200# applications are shown in Table II.

Fertilizers have influenced vine growth, and maturity, type and quality of tubers as well as yield. On July 20th vines in plots receiving nitrogen and phosphate were nearly double the size of vines in unfertilized check plots. Plots receiving phosphate and phosphate-nitrogen combinations were noticeably of better type and more mature at digging time than from nitrogen plots.

Response to fertilizer on dryland plots was similar to the response under irrigation, except that nitrogen alone actually retarded production of tubers on dryland and that 6-30-0 combinations were more nearly equal to 10-20-0 combinations on dryland than under irrigations.

Single plots 792 ft. long were used in 1951 instead of shorter replicated plots. Plot weights for 792 ft. of 42 inch row and Cwt. per acre are shown in Table III. For 1951 Dry-Irrigated yield comparison see Table IV above.

Seed from 1950 fertilizer plots was planted in 25 ft. row plots, 4 replicates in 1951 to determine what effect fertilizer levels had upon the crop produced. While some differences in early season vine growth were thought to be due to seed differences, at harvest time yield difference were not consistent and followed no treatment pattern.

Lbs. of field run potatoes from each 25 ft replicate, and yields per acre are shown in Table V.

TABLE I FERTILIZER ON POTATOES - 1951 With Manure

Row	Treatment	Sec.A	Sec.C	Sec.E	Total	Average	Cwt/Acre
2	Check	226	159	221	606	202	191.9
5	1-10-20	278	271	289	838	279	265
8	2-10-20	286	283	308	887	296	281.2
11	4-10-20	268	293	281	842	281	267
14	1-6-30	310	282	305	897	299	284
17	2-6-30	296	265	264	825	275	261.25
20	4-6-30	326	248	308	882	294	279.3
23	200TSP+6B	270	221	267	758	253	240.35
26	200 TSP	288	283	298	869	290	275.5
29	150 Amon. Nit.	221	211	273	705	235	223.25
32	Check	251	205	213	669	223	211.85

FERTILIZER ON POTATOES - 1951 Without Manure

Row	Treatment	Sec.B	Sec.D	Sec.F	Total	Average	Cwt/Acre
2	Check	192	177	161	530	177	168.15
5	1-10-20	258	263	192	713	238	226.1
8	2-10-20	295	311	233	839	280	266.0
11	4-10-20	311	303	270	884	295	280.25
14	1-6-30	300	268	256	825	275	261.25
17	2-6-30	276	242	256	774	258	245.10
20	4-6-30	304	264	252	820	273	259.35
23	200 TSP+6B	264	229	206	699	233	211.35
26	200 TSP	270	271	243	784	261	248
29	150 Amon. Nit.	189	223	174	586	195	185.25
32	Check	209	215	175	599	200	190.00

12,445.7 ft 3½ ft. /acre
95 x 132 = 12,440
Plot av. x 95 = Acre yield.

TABLE II IRRIGATED POTATOES NO MANURE

Treatment	1949	1950	1951	Total	3 yr. Av.
Check	136	194	168	498	166
200 Phos T.S.P.	158	216	248	622	207
200 N S.A.	151	208	185	544	181
200 - 10 - 20	249	279	266	794	265
200 - 6 -630	204	260	245	709	236
400 - 10 - 20	246	262	280	788	263
400 - 6 - 30	230	270	259	759	253

IRRIGATED POTATOES MANURED LAND

Treatment	1949	1951	Total	2 yr. Av.	Increased Manure over none
Check	183	192	375	187	21
200 T.S.P.	204	275	479	239	32
200 S A A	224	223	447	223	42
200 - 10 - 20	267	281	548	274	9
200 - 6 - 30	237	261	498	249	13
400 - 10 - 20	267	267	534	267	4
400 - 6 - 30	248	279	527	263	10

TABLE III DRYLAND FERTILIZER TRIAL ON POTATOES - 1951

ROW	Treatment	Plot Wt.	Acre Wt.
2	check	819	12,858
5	100-10-20	1206	18,934
8	200-10-20	1258	19,750
11	100-6-30	1173	18,416
14	200-6-30	1212	19,028
17	200 T.S.P.	858	13,470
20	150 Amm nit.	658	10,330
23	check	787	12,406

mean 15,649

Plot x 15.7

792 x 15.7 = 12,434

TABLE IV DRY & IRRIGATED - NO - MANURE 1951

Treatment	Dry	Irrigated	Water increase
Check	128	168	40
200 - T.S.P.	135	248	113
200 - S.A.	103	195	82
200 - 10 - 20	197	266	69
200 - 6 -30	190	245	55

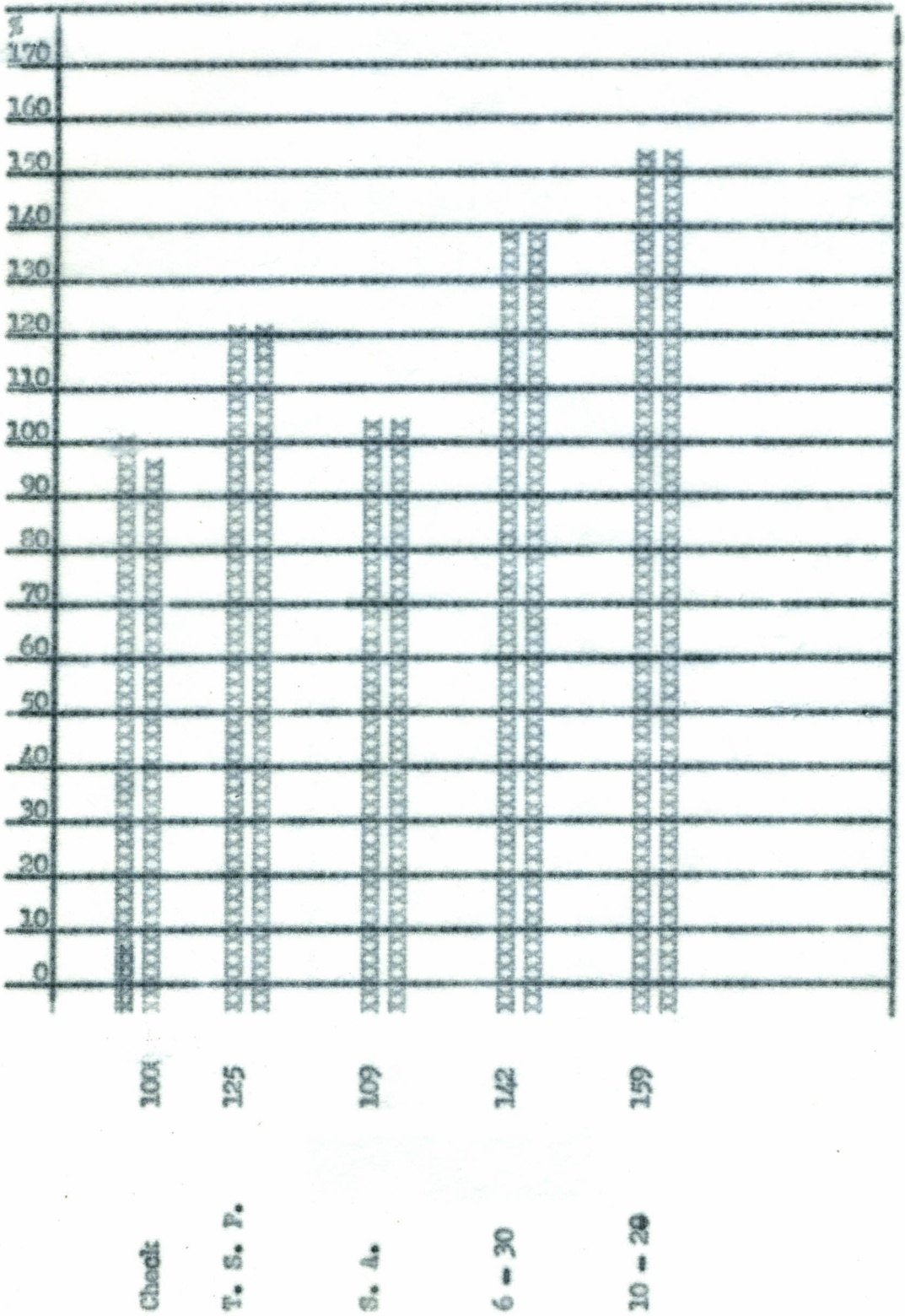
TABLE V POTATOES FROM 1950 FERTILIZER PLOTS SEEDED IN 1951 WITH LIME TREATMENT

Treatment	Rep. 1	Rep. 2	Rep. 3	Rep. 4	Total	Cwt/acre
1-10-20	32	40	50	36	158	197.5
2-10-20	38	39	46	39	162	202.5
check	35	43	44	40	162	202.5
1-6-30	33	44	38	40	155	193.75
2-6-30	34	43	44	34	155	193.75
4-6-30	33	39	47	37	156	195
200 T.S.P	34	39	48	40	161	201.25
150 Amon Nit.	37	37	45	33	152	190

Plot x 497.8

PLATE X

FERTILIZER EFFECT ON POTATO YIELDS
3 Year Average Irrigated Creston



To get some idea how set and tuber size are influenced by fertilizer, and why greater yields results from fertilizer application, 25 pound random samples from the B sections with no manure were taken. The tubers were counted, then sorted into size groups and the percentage in each size group determined.

Assuming 90% stands, and assuming that the samples represent the treatments; the number of gem potatoes produced under irrigation per acre, the set per hill, and the cwt. per acre, based on 3 year average, yields would be as shown in Table VI.

If the samples taken fairly represent the treatments, then the increases from fertilizers can be said to have resulted primarily from heavier set, or to the fact that more of these set developed into marketable tubers. Perhaps actual counts and size sorts should be made from plots in the future to establish accurately which treatment produces the largest number per hill and the greatedt quantity of each size group.

TABLE VI TUBER SET AND SIZE - FERTILIZER PLOTS 1951

Treatment	Number Per A*	Number per hill**	Cwt. in Size Group*** over 8 oz.	4 - 8 oz.	under 4 oz.	cull
check	34,528	3.1	93	59.8	6.6	6.6
200 T.S.P.	44,712	4	99.3	91.1	8.3	8.3
200 S.A.	40,544	3.6	72.4	43.5	21.7	43.4
200-10-20	62,540	5.6	116.6	116.1	26.5	5.3
200-6-30	58,528	5.2	94.4	113.3	18.9	9.4
400-6-30	63,756	5.6	101.2	112.6	20.6	5.1

*Number in sample x 3 year average yield.
** Number per acre divided by 11,200.
*** % in sample x 3 year average yield.

POTATOE VARIETY STUDY

Nineteen potato varieties, in themost cases the same varieties planted in 1950, were planted in 25 feet single row plots, plots replicated 4 times.

Yields were quite satisfactory for the planting and there was much less disease to influence production than in the 1950 plots.

Plot yields are shown in Table VII. Quality, maturity and scab readings are shown in Table VII. Several varieties equaled or exceeded gems in yield, but none were free of scab that were also of free of other serious objections such as air checks, roughness and hollowness. Cayuga, which was good in this regard in 1950 although low in yield, was rough in 1951 with 25% or more of the tubers hollow.

TABLE VII YIELD IN POUNDS PER PLOT, WITH CERTAIN OTHER DATA FOR POTATO VARIETY TRIAL

Variety	Replication 1	2	3	Total	Mean	Sacks per acre	Scab infection	Maturity	Tuber size	Grade Characteristics
Cayuga	32	61	37	130	43	215	none	good	small	checks & hollow
Cobbler	73	57	43	173	58	290	medium	good	medium	checks
Erie	60	45	62	167	56	280	medium	good	small	checks
Katahdin	70	65	35	170	57	285	medium	good	large	
Ashworth	50	57	50	157	52	260	Medium	fair	large	checks & hollow
Chenango	48	51	36	135	45	225	heavy	good	small	
Progress	52	53	36	141	47	235	light	good	medium	checks
Wasega	60	35	42	137	46	230	heavy	good	medium	
Kasota	74	69	50	193	64	320	medium	good	small	
Placid	70	78	45	193	64	320	heavy	fair	large	
Canus	59	60	57	176	59	295	heavy	good	small	
Early Rose	79	51	50	180	60	300	light	good	large	rough
Houma	83	50	62	195	65	325	heavy	good	small	
Netted gem	66	60	51	177	59	295	none	good	medium	rough
Triumph	60	65	60	185	62	310	heavy	good	small	checks
White cloud	45	71	50	166	55	275	heavy	good	small	
La Soda	66	53	60	179	60	300	heavy	good	large	
Yampa	79	73	73	225	75	375	light	good	medium	checks
Mohawk	44	42	38	124	41	205	medium	fair	large	hollow
Totals	1170	1096	937	3203	56	280				
Least difference for significance at the 5% point					14	72				

OBSERVATIONS OF HYBRID SWEETCORNS

Two sweetcorn plantings were made in 1951. These were designated by the horticulture Department at Bozeman as "Preliminary", and"Uniform".

The Preliminary nursery of 26 entries was planted in duplicate two row plots 16 feet long on May 22. The Uniform list of 19 entries wasplanted in two rou plots 16 feet long, 4 replications, on May 21. Both were drilled, and as the season progressed it was evident that there were far too many plants for best ear size, and normal development without irrigation.

The stage of development on Aug. 9th, the date first ears were ready and the seasons production for each variety are shown in Tables ~~VII~~ VIII & IX.

By adding this years data to that of 1949 and 1950 a list has been prepared of hybrids that have produced edible ears by Aug. 25, and between Aug. 25 and Sept. 10 for a 3 year period, and the seed source for each.

Alpine Bantum should receive credit for being the earliest corn in the nurseyy for three consecutive years.

TABLE VIII PRELIMINARY SWEETCORN TRIALS 1951

Dryland, drilled. Note: Too thick for best ear size. Planted May 22.
Two replications - two row plots, 16 ft.

Variety	Stage 8/9*	First Ears	Total Ears.	Ears/Plot
Earligold	T	8/31	3	1½
Alpine Pantum	S	8/15	10	5
Advance Guard	S	8/24	7½	3-3/4
Harvard	S	8/31	5	2½
Hyb. C. Hummer	T	8/31	1	½
Tender	T	—	—	—
North. Cross	T	9/7	1½	3/4
Sugar Prince	S	8/24	2½	1¼
Golden Sugar	T	9/7	—	—
Golden Honey	S	8/24	4	2
Gold Mine	S	8/19	7	3½
Madison	T	—	—	—
Belgold	T	—	—	—
Hybrid B2	T	—	—	—
Minneature	S	8/24	10½	5¼
Seneca Arrow	T	—	—	—
Katatadin Gold	T	—	—	—
Bunlite	T	8/31	4	2
Surprise	S	8/29	5	2½
Gold Rush	T	9/7	½	¼
Charter 50825	S	8/24	10	5
Ex. Early Pearl	T	—	—	—
Pearl Cross	T	—	—	—
Honey Cream	T	9/7	1	½
Luther Hill	T	9/7	1	½
Plymouth	S	8/24	6	3

* T - Tassel S - Silk

TABLE IX UNIFORM LIST HYBRID SWEETCORNS 1951

Planted May 21 on dryland following grain - 2 row plots 16 ft. 4 replications. Drilled Note: Too thick for best ear size.

Hybrid	Date Silking	First ears Date	Total ears dozen	Doz./plot
Extra Early				
Seneca 60	8/9	8/19	20	5
Patrick Henry	8/9	8/24	8	2
Seneca 60 x 613	8/9	8/20	12	3
Sun-up	8/9	8/19	15	3-3/4
Imp Spanc. C13.3	8/9	8/19	10	2½
Early				
Narcross	8/9	8/22	6	1½
Seneca Dawn	8/9	8/29	3	3/4
Golden Jewel	8/9	8/31	2	½
Priscella	8/9	8/24	10	2½
North Starr	8/9	8/24	10	2½
Our Choice	8/9	8/24	8	2
Earliest Pioneer	8/9	8/24	14	3½
Golden Rocket	8/9	8/24	9	2¼
Early Mids.				
Imp. Carmel C30.13	8/9	9/4	1	¼
Golden Rule	8/9	9/4	2	½
Seneca Golden	8/9	9/4	1	¼
Mids. A				
Grant C 22.27	8/9	—	0	0
Pilgrim M32.C27	8/9	—	0	0
Open Pol.				
G P G Bantum	8/9	9/4	2	½

CORNS PRODUCING EARS BY AUG. 25 , 3 CONSECUTIVE YEARS

Strain	Source	
Alpine Bantum	Michael Leonard	Ames, Ia.
Improved Spanocross	K.C. Livermore	Honey Falls, N. Y.
Advance Guard	P.H. Woodruff	Toledo, Ohio
North Star	Joseph Harris	Rochester 11, N. Y.

CORNS PRODUCING EARS BY SEPT. 10, 3 CONSECUTIVE YEARS

Harvard	Brecks Inc.	Boston 9, Mass.
Hyb. Golden Hummer	Michael Leonard	Ames, Ia.
Northern Cross	Joseph Harris	Rochester 11, N. Y.
Golden Rocket	Northrup King	Minneapolis, Minn.
Our Choice	Vaughan's Seed Store	Chicago 6, Ill.
Seneca Golden	Robson Seed Farm	Hall, N. Y.
Golden Rule	Eastern States Farmers Exc.	W. Springfield, Mass.
Carmel Cross C30.13	" " " " " "	"

Some sother strains might have qualified for this list had they been in the trials each of the three years.

SMALL FRUIT PLANTINGS

A small planting of Latham raspberries was made in 6 rows, 100 feet long, plants spaced 2½ feet in rows spaced 7 feet in the spring of 1951. Plants were furnished by the Horticulture Branch Station.

Survival was poor. More plants will be needed to make solid rows, or about 3 of the present 6 rows will be needed to fill in the other [illegible].

Once established the planting is designed to give information on mulching and fertilizers.

ORNAMENTALS

Croft lilly bulbs and chrysanthemum plants received from Montana State College were set in the spring of 1951. All survived in high percentage and produced flower the first season.

Lillies and Mums were covered in late fall with a 4 inch sawdust mulch in a attempt to insure good winter survival.

Seventeen lilly varieties were received for fall planting and the bulbs were set October 22.

Notes on survival and general adaptability will be taken by varieties.

LANDSCAPE PLAN DEVELOPMENT

Some trees and shrubs have been set in accordance with a landscape plan drawn by V. E. Iverson. Colorado Blue Spruce received from the Forestry School Nursery were set in designated locations in the spring on 1951. All survival and made good growth.

Shrub borders were outlined with lilac saved from clumps dug out before the lawn was planted, and further developed by transplanting stock received by the boys in "Conservation Nurseries". Native birch clumps secured in the woods near the station were also set out.

Cement sidewalks were put in according to plan. Lawn seeded in the spring of 1950 is fine and thick after 2 seasons growth. Some perennial flower beds have been established.

Still needed for plan development are evergreens for foundation plantings and some additional shrubs for beds and borders.

ACTIVITIES

Talks based on the work of the Northwestern Montana Branch Station have been given on 14 occasions, 4 Field Days held, two County Fairs Judged, Exhibits shown at 6 locations, and a Progress Report on color slides prepared for showing in 1952.

Newspapers in the Area have on several occasions used feature stories and pictures to present the Station Program.

County Agents, S. C. S. Personnel, Veterans Instructors, Vo-Ag. Instructors, Conservation District Supervisors, Farm Organization Leaders and interested individuals have been helpful in relaying information about and reports from the Station.

TALKS

Date	Occasion	Subject
Jan.	Swan River Farmers Union	Station Results
Jan.	County Farmers Union Convention	Station Results
Jan.	Kalispell Kiwanis	Conservation
Jan.	Grange at Libby	Station findings
Feb.	Irrigation Show at Kalispell	Fertilizer studies
Feb.	F.H.A. Farmers meeting, Polson	Work at Station
Feb.	Annual Seed Growers, Charlo	Seed Production trials
March	Conservation Day, Trout Creek	Station Program related to Cons.
March	" " Hot Springs	" " " " "
March	" " Eureka	" " " " "
March	" " Kalispell	" " " " "
May	Pamona Grange, Lake County	Work of Station
Aug.	Western Section, American Society of Agronomy, Bozeman	Effect of Herbicides on Legume Seedlings
Nov.	Western Division Assc. of Soil Conservation Districts, Mal.	Factors of Crop Production

FIELD DAYS

July 19	Agents Field Day, Creston	Tour of Experiment Plots
July 20	Annual Open House, Creston	Tour of Experiment Plots
Sept	Annual Potatoe Day, Creston	Fertilizer for Potatoes
Nov.	F.F.A. Chapter Visit, Creston	Experiment Work

Fairs Judged

Location	Classes
Sanders County	All field crops
Lake County Junior Fair	All crops

Exhibits Prepared & Shown

Exhibits	Where Shown
Grass legume seeds	Seed Show, Kalispell Seed Growers, Charlo F.H.A. Farmers Meet, Polson
Influence of fertilizers on Type quality and Yield	Seed Show, Kalispell Conservation Days, Sanders Co.

PICTURE REPORT

With County Agent Walt Mauritson as collaborator and photographer a picture report on various phases of the work at the Station has been prepared. Planned as a Progress Report the 38 color slides show comparative yields and responsed to fertilizer. A short script to accompany the pictures makes it possible to give a comprehensive report of the work of the Northwestern Montana Branch Station in about 45 minutes.

OTHER ACTIVITIES

The Superintendent has served on The County Mobilization Committee, the Agricultural Committee of the Kalispell Chamber of Commerce, and assisted the Irrigated Agriculture Committee in preparing their Rural Progress Report.

LIVESTOCK

Livestock entered the program at the Northwestern Montana Branch Station in May of 1951.

Ten yearling Columbia ewes with lambs were secured from Whites at Rollins on Contract, to become the property of the Station upon the return to Whites of 12 Columbia sheep of similar age and quality. Tentative plans call for the return of 4 each year for three years.

Seven ewe lambs and one wether lamb were raised in 1951. The small flock has been used to measure pasture yields under varied irrigation. See report page 68.

Since the end of the grazing season the sheep have been fed miscellaneous roughages produced on the farm, supplemented by corn silage produced in the 3 year rotation of potatoes, silage, and grain.

Eight of the ewes secured were grades and two registered.

WEATHER

Weather observations in 1951 emphasize what farmers in the area have observed, that both spring and fall work, especially harvest, was hindered by more than normal precipitation. During 1951 winter temperatures were not so severe as in 1949 and 1950. Spring seeding on many fields was delayed by heavy rain and wet field conditions. There were no summer frosts. 30 days in mid-summer were unusually dry and warm. Fall harvest was difficult for all crops, impossible for some. Potato harvest was delayed by lack of frost severe enough to kill the vines.

Precipitation:

April 29 to July 10	9.25
July 10 to Aug. 10	.87
Aug. 10 thru' October	10.05
Total Apr. 29 thru' Oct. 31	19.37

Yield of crops harvested was good except for legumes, most of which apparently suffered from low spring and early summer temperatures. Peas for seed were an exception and yields above 40 bushels per acre were reported.

1951 WEATHER RECORD

Month	Max.	Min.	Mean	Precip.	Snow	Critical frost dates
1	45	-25	2.2	.94	15.1	
2	55	-10	27.7	1.29	14.8	
3	56	-19	27.0	.62	7.8	
4	69	4	42.1	2.32	10.0	
5	80	27	50.0	3.77	T	
6	80	29	54.2	2.26		June 1
7	92	34	64.7	1.03		
8	95	37	60.4	2.86		
9	76	27	50.6	1.49		Sept. 15
10	64	14	40.8	5.62	5.5	
11	46	5	30.8	1.01	6.6	
12	50	-20	15.2	3.31	47.2	

1951 Summary

Max. 95 Min. -25 Mean 38.8

Precipitation 26.52 Growing Season precipitation (Sept. thru' Aug.) 21.55.

1951 Snowfall 105 inches

Frost free period 106 days

Days with rain or fog, May through September 58.

TABLE _____. Summary of climatic data by months for the 1950-1951 crop year (September to August) and averages for the period, 1950-1951, at the Northwestern Experiment Station, Creston, Montana.

	Months												Total or Ave.
	Sept. 1950	Oct. 1950	Nov. 1950	Dec. 1950	Jan. 1951	Feb. 1951	Mar. 1951	Apr. 1951	May 1951	June 1951	July 1951	Aug. 1951	
Precipitation (inches)													
Current year	.52	2.3	1.16	2.48	1.94	1.29	.62	2.32	3.77	2.26	1.03	2.86	21.55
1949-1950	1.03	1.05	1.67	.92	2.62	1.13	2.31	.64	.15	3.90	3.12	.75	19.29
Mean temperature (°F)													
Current year	53.8	45.9	31.5	29.8	2.2	27.7	27.0	42.1	50	54.2	64.3	60.4	40.8
1949-1950	54.1	41.5	39.5	25.0	4.2	25.6	31.2	41.9	49.7	57.0	64.0	62.5	47.3

Last killing frost in Springs*

1951 - June 1 29°

1949-1950 - June 10 32°

First killing frost in Fall*

1951 - Sept. 15 29°

1949-1950 - Sept. 11 29°

Frost free period

1951 - 106 days

1949-1950 - 93 days

Maximum summer temperature - 95° on Aug. 2

Minimum winter temperature - 25° below zero on Jan. 28

* In this summary 32° is considered a killing frost.
Averages not computed, since only 1 full year previous to 50-51 is available.

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