

Recommended Practices  
For  
Soil Erosion Control

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# RECOMMENDED PRACTICES FOR SOIL EROSION CONTROL

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## INTRODUCTION

Serious soil erosion occurs in Montana. It is important that this fact be recognized and suitable precautions taken to prevent, control, or at least minimize the activities of this destructive agency. With continued cultivation the organic matter and fibre of the older soils is being depleted and the erosion hazard is increasing.

Since 1940, over 2,000,000 acres of sod land have been broken up and prepared for cropping in Montana. Much of this newly plowed land is in areas where the risks of crop failure due to drought, soil erosion, and other hazards associated with dry farming in the Plains, are above the average for the region.

It is the purpose of this publication to summarize existing information on erosion control and to indicate how it applies to the dry land sections of Montana.

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### IMPORTANCE OF SUMMER FALLOW

Available soil moisture is the principal limiting factor in dry land crop production in Montana. The amount and seasonal distribution of local precipitation varies somewhat throughout the dry land area as may be seen from the data presented in table 1 from Huntley, Moccasin, and Havre. These stations, located in southern, central, and northern Montana, respectively, have climatic conditions typical of the regions they represent.

TABLE 1.—PRECIPITATION RECORDED IN INCHES AT THE BRANCH STATIONS AT HUNTLEY, MOCCASIN, AND HAVRE.

	Annual	Precipitation Received During the Fallow Period for Spring Grain				Precipitation Received During the Fallow Period for Fall Grain		
		Season April to Sept.	Stubble Interval	Tilled Interval	Total (20 Mo.)	Stubble Interval	Tilled Interval	Total (13 Mo.)
			August to June (10 Mo.)	June to April (10 Mo.)		August to June (10 Mo.)	June to Sept. (3 Mo.)	
<b>Huntley</b>								
(Elev. 3,000 ft.)	13.21	8.75	9.66	10.18	19.84	9.66	4.41	14.07
<b>Moccasin</b>								
(Elev. 4,300 ft.)	15.16	11.17	10.33	11.89	22.20	10.33	6.33	16.66
<b>Havre</b>								
(Elev. 2,600 ft.)	11.70	9.03	7.46	9.31	16.77	7.46	5.42	12.88

Huntley record 1913-1946 (34 years).

Moccasin record 1909-1946 (38 years).

Havre record 1917-1946 (30 years).

Seasonal 66.2% of annual.

Seasonal 73.7% of annual.

Seasonal 77.2% of annual.

Since soil moisture plays such an important part in dry land agriculture, suitable summer fallowing, for the purpose of collecting in the soil and retaining for crop use as much precipitation as possible, continues to be an essential requirement in good dry farming practice. In some sections of Montana corn may be used successfully to replace part or all of the summer fallow acreage as a preparatory treatment for small grains. Although small grains following corn usually yield less than when grown on fallow, the corn, small grain rotation is applicable where corn may be expected to produce a profitable and dependable amount of pasturage, dry fodder, or grain for local feeding. This rotation, where applicable, usually increases the total annual return per acre above that of any other cropping system.

The results of growing winter wheat and spring wheat under different methods of seedbed preparation at the three stations are compared in table 2 and illustrate the response of small grains to different methods of preparation.

The yields shown in table 2 illustrate the importance of summer fallow as a soil treatment preparatory to seeding wheat. Winter wheat continuously cropped at Havre, Moccasin, and Huntley has returned respectively 58%, 55%, and 40% of the fallow yield. Somewhat the same yield reductions have been obtained with spring wheat. Yields of winter wheat grown on disked cornland have ranged from 62% of the yields obtained from fallow at Havre to 91% at Moccasin.

TABLE 2.—AVERAGE YIELDS OF WINTER WHEAT AND SPRING WHEAT AFTER FALLOW, CORN, AND WHEAT—AT HUNTLEY, HAVRE, AND MOCCASIN BRANCH STATIONS.

Crop	Ordinary Fallow	Disked Cornland		Plowed and Cropped to Wheat Every Year		
	Acre Yield Bu.	Acre Yield Bu.	Percent of Fallow Yield	Acre Yield Bu.	Percent of Fallow Yield	
Huntley 1913-1946						
(34 years)	Winter Wheat	22.4	17.6	78	10.0	40
	Spring Wheat	16.4	13.1	80	8.0	49
Havre 1917-1946						
(30 years)	Winter Wheat	15.4	9.7	62	5.9	38
	Spring Wheat	15.5	11.5	74	7.6	49
Moccasin 1909-1946						
(38 years)	Winter Wheat	17.8	16.2	91	9.7	55
	Spring Wheat	16.4	15.0	92	11.2	70

### TIMELINESS OF FALLOW PREPARATION

Early spring tillage for fallow is a factor of major importance in good dry farming practice. In general, early preparation means having the fallow tilled ahead of the normal period of greatest precipitation, which in the plains region of Montana, is usually late in May and in June. There is no advantage in extremely early tillage, but operations should be started in time to be completed before the start of the rainy season.

Longtime experiments at the branch stations have shown that wheat grown on fallow prepared in early spring has consistently outyielded, by a substantial amount, wheat grown on fallow prepared in July. Disking of stubble in the fall previous to spring fallow preparation has not increased yields of grain grown on fallow.

## METHODS OF FALLOW PREPARATION FOR THE CONTROL OF WIND EROSION

Studies of the properties of soils and of wind movements which influence soil erosion have shown that protection from soil drifting is based upon two principal factors: (1) retarding of wind velocity at the surface of the soil; and (2) maintenance of a soil condition resistant to wind action. Experimental work and farm practice have demonstrated that these objectives can be attained by suitable soil management practices in most of the Montana dry farming areas. Fortunately tillage operations for reaching each of these basic objectives are often identical.

The recommended soil management practice for wind erosion control is to create and maintain a rough trashy surface on the fallow land. This is accomplished by tillage practices which leave stubble and trash at the top of the ground. A clod mulch is effective so long as the clods persist. It is seldom that a cloddy condition can be maintained through the fallow season.

**Stubble Mulch.**—Stubble mulch is an aid in the control of both wind and water erosion. The effectiveness of this practice is dependent on the amount of vegetative material present on the surface. A stubble or trashy cover retards surface wind velocity and, to some degree, traps soil moving along the surface of the field. Tillage for fallow which leaves the stubble anchored on the surface of the soil is more desirable than an operation which cuts up and covers the stubble. Cultivation of the fallow land during the growing season for the destruction of weeds may greatly reduce the stubble cover by breaking up the material and facilitating natural decomposition. Summer tillage should be conducted with a view to preserving intact as much of the surface residue as possible.

Implements commonly used in the stubble mulch operation are various types of wide blades or sweeps, the one-way disk, rotary rod weeder, and duckfoot cultivator. The choice of tools with which to obtain the desired results is largely governed by local conditions such as the type of soil, the amount of moisture in the soil, and the amount and condition of the crop residue to be handled.

Uniform seeding of grain in trash-covered fallow has sometimes been difficult. The use of a treader behind the stubble mulch tillage

implement not only anchors the trash but also tends to establish a firmer seedbed which frequently simplifies the drilling operation. The furrow drill usually operates more satisfactorily than a standard drill when the seedbed is too loose for best results.

Cropping studies have been made comparing trashy fallow with plowed fallow at the Moccasin, Havre, and Froid stations in Montana, as well as at many other places in the Great Plains and the Prairie Provinces of Canada. These studies have shown no differences in grain yields obtained from the two types of fallow.

**Clod Mulch.**—The use of the clod mulch on fallow land as a protection against wind erosion is still a common practice in some areas of Montana. Tests have shown that a cloddy field cover is not as effective in retarding surface wind velocity or in trapping drifting soil as is a well maintained mulch of heavy stubble. When a stubble cover is not available the clod mulch is the only substitute. However, results over any length of time can be expected only in the medium textured soils. A clod mulch can be obtained only by cultivating when the soils are wet.

**Strip Fallow.**—It is apparent that many fields now handled as block fallow should be changed over to a strip fallow arrangement as a soil saving measure. Strip fallow has been used in Montana for many years and has proved to be one of the most successful means of controlling wind erosion. Strips should be laid out at right angles to prevailing or storm winds. They should never exceed 16 rods in width. On soils easily moved by wind the width of the strips must be reduced accordingly, but it is generally conceded that strips less than 5 rods in width cannot be farmed economically. Fields requiring such extreme measures should be returned to a permanent grass. In certain areas it is desirable to place the strips on the contour to aid in water erosion control, as well as to reduce wind erosion.

**Emergency Measures.**—With the extreme climatic conditions prevailing in Montana, there are times when the practices listed above will not control wind erosion. Such conditions call for emergency measures. The most effective measure is ridging the surface at right angles to the wind. The effectiveness of this measure depends on the height of the ridge and the number of clods it contains. Consequently the lister is the implement best adapted to this practice. Any implement which throws up a cloddy ridge is helpful.

## METHODS OF FALLOW PREPARATION FOR THE CONTROL OF WATER EROSION

Observers are impressed by the damage to Montana fields caused by the runoff of water resulting from torrential rains or rapidly melting snow. Such damage may range from moderate sheet erosion to severe gullies. The potential hazard of water erosion increases with the percent and length of slope. Under average conditions slopes of 8% to 12% are considered the maximum upon which cultivation should be attempted. From the standpoint of water erosion, most slopes above 12% should be maintained in grass.

**Stubble Mulch.**—Water erosion control depends on maintaining a cover on the soil. Bare unprotected fallow is most susceptible to movement by water. Every effort should be made to maintain as much cover as possible on the land at all seasons of the year. The stubble mulch practice reduces water erosion in at least three ways: (1) by leaving surface open for water infiltration by preventing puddling and consequent sealing of the surface layer; (2) by reducing the abrasive action of rain drops by intercepting their fall; (3) by slowing the movement of water over the surface.

**Fallow Layouts for Water Erosion Control.**—The practice of contour strip fallow has proved to be effective in reducing water erosion in many parts of Montana. The area of adaptation has not been defined. It is usually most effective on long and uniform slopes. Contour strip cropping should not be undertaken without the use of grass buffer strips at least 1 rod wide. These in turn need to be supported by grassed waterways at any point where water accumulation is sufficient to start gullies.

**Grassed Waterways.**—Gully erosion is always a hazard where water accumulates. The only satisfactory method of control is the seeding of grass in all major waterways. This practice is applicable to any tillage system used on the field. Its use will usually prevent the development of gullies which seriously interfere with field operations.

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Despite the care given to tillage and land arrangement for the reduction of wind and water erosion, instances will occur where the careful use of the best known control methods will fail to hold the soil in place. Such instances, however, should not be cited to discredit the use of approved practices, but rather should be utilized in a constructive way to determine, if possible, a more positive method of preventing the recurrence of such situations.

### SUMMARY

Summer fallow is essential to a successful agriculture in the plains area. Paradoxically it is our greatest erosion hazard.

The essential features of a wind erosion control program are (1) maintenance of crop residues on the surface (stubble mulch); and (2) strip cropping.

Stubble mulch is also the most effective means available for water erosion control. Contour strip cropping with grassed buffer strips is effective in many parts of the State. Grassed waterways should be established where running water tends to concentrate.

