

EROSION SURVEY No. 19

*Erosion* and RELATED  
LAND USE CONDITIONS

*on the*  
Presque Isle  
Demonstration Project  
*Maine*

By W. B. OLIVER  
Senior Soil Scientist  
and C. W. FRUTCHEY  
Associate Agronomist

Soil Conservation Service

UNITED STATES DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE • WASHINGTON • 1940

# EROSION and RELATED LAND USE CONDITIONS

*on the*  
**Presque Isle**  
**Demonstration Project, *Maine***

by **W. B. OLIVER**  
Senior Soil Scientist  
and **C. W. FRUTCHEY**  
Associate Agronomist  
Soil Conservation Service

Field survey by **W. B. Oliver, C. H. Atkinson, R. L. Carter, and W. L. Simmons**

*issued April 1941*

## CONTENTS

	<i>Page</i>
Introduction .....	1
Using the land in the Presque Isle area.....	2
<i>Classes of land according to use capability.....</i>	2
<i>Choosing practices to fit the land.....</i>	4
<i>Results and significance of the land inventory.....</i>	11
Description of the area.....	14
Agriculture .....	18
The conservation survey.....	19
<i>Methods and definitions.....</i>	19
<i>Soils.....</i>	20
<i>Erosion.....</i>	25
<i>Land use.....</i>	28
<i>Slope.....</i>	29
<i>Summary of the relation of erosion to other factors.....</i>	30
Summary .....	31
Appendix.....	31
<i>Soils of the Presque Isle area.....</i>	31

UNITED STATES DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE • WASHINGTON, D. C.

For sale by the Superintendent of Documents, Washington, D. C. - Price 20 cents

## Introduction

EVERY POTATO FARMER in northern Maine has noticed tiny rills or channel washes between the long potato rows in his fields. Frequently, heavy rains in the early summer have washed out potatoes planted in the lower ends of rows running up and down the slope. Some fields that formerly produced high-grade potatoes are now producing scabby potatoes of inferior quality. Farmers in this section have also known for some time that in order to maintain crop yields, it is necessary to use increasing amounts of highly concentrated fertilizers, to incorporate more organic matter in the soils, and to use intensive methods of cultivation. These observations have drawn the attention of the growers to the fact that their crops and the productivity of their soils are being threatened by soil erosion.

Potatoes grown in Aroostook County, Maine, have long been recognized as of superior quality for table use and seed stock. The county also supplies most of the potato starch made in the United States. Because of the high values attached to such a crop and the corresponding high cost of production, any threatened loss or reduction of crop yield and any change in the quality of the potatoes becomes of paramount interest to the growers.

A project for the demonstration of methods to control soil erosion was established in Aroostook County by the United States Department of Agriculture in the fall of 1935. The project, which comprises 30,912 acres just northeast of Presque Isle (fig. 1), is in the most highly concentrated potato-growing section in the county. Little or no livestock is raised and very few other cash crops are grown.

One of the first steps undertaken on the demonstration project was the making of a soil conservation survey. This is an inventory of the soil types occurring in the area, the slope of the land, and the type and degree of existing erosion in relation to the present land use. This survey was begun in April 1936 and completed in October 1937. The physical factors were mapped on aerial photographs which showed the

additional features of farm and field boundaries, streams and drainageways, and buildings.

On the basis of the physical features on the farms and in accordance with the principles of good farm management, soil conservation plans were developed cooperatively by the farmers and soil conservation technicians. Each farm plan that was made gave consideration not only to the physical features but also to crop and other economic

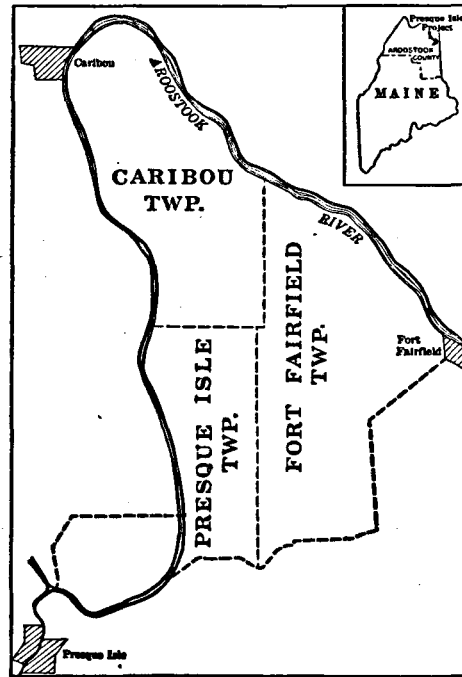


Figure 1.—Map showing the location of the Presque Isle project.

requirements. The farm plans involved the adoption of such soil- and moisture-conservation measures as contour cultivation, strip cropping, and terracing, and also actual changes in land use such as the retiring of steep or eroded fields from potatoes to permanent hay, pasture, or woodland. On this basis 111 cooperative agreements were made with the farmers of the area. A little over half of the total acreage of the area, or 15,636 acres, was included in this cooperative work.

The capability of the land in the Presque Isle area for agricultural use and the significance of the physical features in developing a sound land use program are reported in this bulletin. Included also are a brief description of the area, a short summary of the agriculture, and a technical discussion of the soil conservation survey and the facts it revealed. The maps in the envelope at the back of this bulletin show land-capability classes and the physical features of the land in detail. Nine maps were needed to cover the entire project, and one sample map is distributed with each copy of the report. Complete sets may be consulted at offices of the Soil Conservation Service or in libraries. These maps, printed on a scale of 4 inches to the mile, are very much generalized from the original field sheets that were prepared on the scale of 10.5 inches to the mile. Capability of the land for use is shown in colors; the base-map features in black; drainage in blue; soil-type, erosion, and slope symbols in brown; and the present land use in gray.

## Using the Land in the Presque Isle Area

### *Classes of Land According to Use Capability*

IN MAKING the soil conservation survey of the area, the physical factors of soil type, slope, and the kind and degree of erosion were mapped in relation to the present land use. Each of these factors is significant in careful studies of soils, erosion processes, and erosion-control methods. However, to work out the more general relationships of erosion-control practices and good land use in the project as a whole and to some extent on individual farms, these factors can be grouped into a simple classification that expresses the capability of the land for use. This classification gives full recognition to each of the physical factors wherever it is significant.

Seventy percent of the Presque Isle area is under cultivation at the present time. About one-fifth of the area is in woodland, and only small areas are in permanent pasture or are idle. The re-

sults of the survey indicate that not all the land now in cultivation is suitable for permanent cultivation under the farming practices now employed in the area. Over 60 percent of the soils have been moderately eroded, showing definitely that they are subject to erosion under cultivation. Only 11.6 percent of the land is on slopes of less than 2 percent, which do not require protection from erosion. Some of the soils are extremely shallow over limestone or calcareous material, others are too stony for cultivation, and still others are too wet for use as cropland. Land already affected by severe or very severe erosion is unfit for cultivation and is suitable only for permanent hay, pasture, or woodland. All of these conditions help determine the capability of the land for further and permanent use.

The classification according to use capability distinguishes land suitable for cropping from that suitable only for less intensive uses such as permanent hay, pasture, or woodland. It further distinguishes land on which soil-saving and soil-managing practices of varying intensity must be used from land on which only the usual good farming practices suitable to the region are needed. The kind and intensity of the practices necessary for any particular area may be determined by using this classification in connection with the specific information on physical factors supplied by the conservation survey. Soil-group characteristics will determine to a large extent the nature of the practices; slope and erosion conditions will determine their specific application.

Five classes of land according to use capability have been recognized in the Presque Isle area. Three are suitable for continued cultivation with varying kinds and intensities of land management and conservation practices. One class is suitable only for very limited cultivation and is therefore recommended chiefly for permanent hay or pasture. A fifth class is not suitable for any form of cultivation.

Class I land is defined as suitable for cultivation without special practices. It is shown in green on the map. Such land meets all the following requirements: It is nearly level and therefore

not subject to erosion under any method of cultivation; it is sufficiently productive to make cropping of some kind feasible; and it is physically suitable for cultivation, not needing unusual drainage measures nor the removal of excessive amounts of stone. It may have a cover of grass, trees, or brush at present or it may be in crops, since the classification is based on physical characteristics and not on present use. Although land of this class requires no special measures for its management or conservation when cropped, numerous accepted practices such as rotation of crops, the use of lime and fertilizers to replace plant nutrients removed by crops or leaching, the addition of organic matter through the plowing under of green-manure crops, practices to control plant diseases and insect pests, and practices for the improvement of soil structure may be desirable or even necessary for the production of satisfactory yields of crops. On class I land potatoes or some other crop may be grown without any significant loss of soil by using only these generally accepted farming practices.

Only 2.2 percent of the Presque Isle area falls within class I. It is restricted to part of the first and second bottoms and a few nearly flat areas on the uplands.

Class II land (shown in yellow on the map) is suitable for cropping but requires one or more simple protective practices in order to be cultivated safely and permanently. Nearly all the class II land in the Presque Isle area requires the use of soil conservation practices such as strip cropping, contour cultivation, sodded waterways, and broad-base terraces. Areas of poorly drained soils require artificial drainage.

Class III (shown in red on the map) consists of land that can be used regularly for crops without permanent damage if intensive and careful conservation practices are employed. All such land in the Presque Isle area is at least moderately sloping. The practices required are the same as those for class II, frequently more intensively applied, with the addition of diversion terraces. Class III includes the limit of land that can be recommended for

cultivation; that is, the steepest slopes, and the most severe degrees of present erosion that are suitable for regular and permanent use for crops.

Land that falls in class IV is not suitable for regular permanent cultivation, using the customary rotations, but may be used for permanent hay or pasture under conditions that require plowing and reseeding with grain as a nurse crop as often as every 4 or 5 years. In this area class IV (blue on the map) consists of slopes slightly too steep for cropland, severely eroded moderate slopes, shallow soils on moderate slopes, and some poorly drained soils on level areas or gentle slopes that are difficult to drain and that produce low-quality potatoes even after drainage. Any one of these factors or a combination places land in this class.

Class V land (shown in orange on the map) is too steep, too stony, too severely eroded, or otherwise unsuitable for any cultivation. It is therefore suitable only for permanent vegetation, and in the Presque Isle area may be utilized for permanent pasture, woodland, or wildlife areas.

#### RELATION OF SOIL, SLOPE, AND EROSION TO CAPABILITY OF LAND

Classes of land according to use capability furnish a guide to the intensity and the probable difficulty of application of the conservation or land-management practices that must be employed. Further selection of practices, crops to be grown, or of cropping systems must frequently be made within each class according to the nature of the soil and the slope and erosion conditions occurring in each class. A brief discussion of each of these factors that determine the land-capability classification is presented here. Further discussion of the factors and their significance is given on pages 19-31.

Twenty-six soil types, classified in six groups, were mapped in the area. Discussions of each of the groups are presented on pages 21-24, and a description of each soil type is given in the appendix. The six groups are as follows:

1. *Well-drained upland soils on calcareous glacial till.*—This is by far the most extensive group in the area, representing two-thirds of the entire acreage. Slopes range from gentle to very steep. All the soils have at least a few shale or limestone fragments throughout the profile and some of them are gravelly or sandy. They are the most intensively cultivated in the area. These soils and those of group 3 are considered the best potato soils in this section.

2. *Shallow, well-drained soils on glacial till.*—Slopes in this group range from moderate to very steep. Their shallowness over the underlying limestone or parent till makes these soils very susceptible to erosion. Shallowness of Houlton silt loam, a member of this group, over the underlying limestone and the frequent outcrops of limestone ledges make it ill-adapted to the production of potatoes. This group occupies 6.5 percent of the area.

3. *Deep, well-drained soils on outwash terraces and bottom lands.*—These soils occur in relatively level positions with a few sharp breaks on the second bottoms toward the streams. They are well adapted to cultivation, and land in potatoes is not subject to much erosion because of the gentle slope. They comprise 4.5 percent of the area.

4. *Imperfectly drained soils.*—This group is composed of the imperfectly drained soils of the uplands, terraces, and first bottoms. For the most part they occupy level areas or gentle to moderate slopes. These soils are not well adapted to the production of potatoes because of their imperfect drainage and their neutral to alkaline reaction. Grains and hay do better than potatoes on these soil types. This group covers 4.9 percent of the area.

5. *Poorly drained soils.*—The soils included in this group are all upland soils with extremely poor drainage. They occur in level or depressed positions or on gentle to moderate slopes. In wet years they remain cold and wet, which makes cultivation difficult. They are not suited to the production of potatoes and their use should be restricted to grain, hay, or pasture, if possible. They occupy 11 percent of the total area.

6. *Miscellaneous soils not suitable for cultivation.*—These nonagricultural soils occupy 7.3 percent of the area. The Caribou stony loam is too stony and too steep for cultivation, and the muck and the undifferentiated alluvial soils are too wet and variable.

Slope groups afford an expression of the slope factor as it affects land capability. Other factors such as stoniness of soils, poor drainage, or advanced erosion, however, may limit the use of any land, even very gentle slopes. Slopes are designated on the maps by the letters A, B, BB, C, and D. On this survey, A slopes are less than 2 percent and as a rule require little special effort for protection from erosion. B slopes, 2 to 8 percent, and BB slopes, 8 to 15 percent, may be used regularly for crops but require protection from erosion. C slopes, 15 to 25 percent, are too steep for row crops but may be used for hay or pasture with grain reseeded as a nurse crop. D slopes, 25 percent or more, may be used only for permanent vegetation in pasture or woodland.

The degree to which soil erosion has advanced greatly affects the capability of land. In this survey the present degree of erosion was mapped in detail and 15 different classes of erosion were recognized. These classes were also grouped, as shown on page 25, into no apparent, slight, moderate, severe, and very severe erosion.

Table 1 shows how these physical factors in the Presque Isle area were grouped to express by a simple classification the capability of the land for use.

### *Choosing Practices to Fit the Land*

The physical inventory supplies a definite physical basis for the selection and application of practices and measures that will not only conserve soil and moisture but also make better use of the land. The farming and conservation practices recommended for the Presque Isle area are summarized for the different land-capability classes in table 2.

The areas of class I land occur on the well-drained soils of the uplands, terraces, and first bottoms, or the soils of

TABLE 1.—Soil types, slope classes, and erosion classes making up each class of land according to use capability

Soil group and type	Slope <sup>1</sup> and erosion <sup>2</sup> characterizing class—				
	I (green) <sup>3</sup>	II (yellow) <sup>3</sup>	III (red) <sup>3</sup>	IV (blue) <sup>3</sup>	V (orange) <sup>3</sup>
1. Well-drained, upland soils on calcareous, glacial till: Caribou fine sandy loam. Caribou gravelly loam. Caribou loam. Presque Isle fine sandy loam. Presque Isle gravelly loam. Presque Isle loam.	A: +, 1, 2, 27, ⊕	A: 3 B: +, 1, 2, 27, 2⊕, 28, 3, 37, ⊕	B: 4, 47 BB: +, 1, 2, 3, 37, ⊕	BB: 4, 47, 4⊕, 48. C: +, 1, 2, 3, 37.	C: 38, 4, 47, 48, 5, 58. All D slopes.
2. Shallow, well-drained soils on glacial till: Houlton silt loam		B: 1, 3	BB: 8	BB: 4 C: 3 BB: 8	C: 5. All D slopes. BB: 37, 4, 47, 5. All C and D slopes. All D slopes.
Mapleton loam		B: 1, 2, 3	BB: 1, 2		
3. Deep, well-drained soils on outwash terraces and bottom lands: Aroostook fine sandy loam. Aroostook silt loam. Doyle gravelly sandy loam. Parkhurst gravelly sandy loam. Van Buren fine sandy loam. Van Buren silt loam.	A: 1, 2, ⊕	B: +, 2, 3, ⊕	BB: 2, 3, 37, ⊕	BB: 47 C: 1, 3	
4. Imperfectly drained soils: Caribou-Conant complex. Conant silt loam. Keegan silt loam. Maysville silt loam. Van Buren fine sandy loam, imperfectly drained phase.		A: +, 1, 2, 3 B: 1	B: 2, 27, 3, 37 BB: 2, 3, 37	C: 1	
5. Poorly drained soils: Caribou-Easton complex. Caribou-Washburn complex. Easton silt loam. Washburn silt loam.			B: +, 1, 2, 27, ⊕	A: +, 1, 2, 27, 3, 37. B: 3, 37. BB: 1, 2, 3, 37.	
6. Miscellaneous soils not suitable for cultivation: Alluvial soils, undifferentiated. Caribou stony loam. Muck.					All classifica- tions.

<sup>1</sup> Slope symbols: A, less than 2 percent; B, 2-8; BB, 8-15; C, 15-25; and D, 25 and over.

<sup>2</sup> Erosion symbols are explained in detail on p. 20 and in the legend on the maps accompanying this bulletin. 2, 3, and 4 indicate progressive degrees of sheet erosion; 7, ⊕, and 8, occasional shallow, occasional deep, and frequent shallow gullies, respectively; 1, no apparent erosion; ⊕, undifferentiated erosion; +, recent deposit; and 8, landslides.

<sup>3</sup> Color distinguishing class area on maps accompanying this bulletin.

groups 1 and 3, on A slopes that have either not been affected by erosion or been affected to no more severe a degree than a loss of less than one-fourth of the topsoil. Only 659 acres, or 2.2 percent of the entire area, can be included in this class. On this land potatoes may be grown continuously if high-grade fertilizers are used and a green-manure crop, such as crimson clover, is grown on the land every 2 or 3 years. No supplementary practices or measures are required, although potatoes are, of course, fertilized heavily on all classes of land.

Class II land lies mainly on the well-drained soils of the uplands, terraces, and first bottoms in soil groups 1, 2, and 3, with slopes no steeper than 8

percent that have been eroded only slightly or moderately. Some areas of imperfectly drained soils of group 4 on A and B slopes with slight to moderate erosion may be treated as class II land if suitable drainage measures are employed. The total area of class II land is 15,262 acres, which represents 49.9 percent of the area.

Potatoes may be grown on class II land if simple precautions are observed to maintain the soil. Rotations should include either a green-manure crop that is turned under to increase the organic-matter content of the soil or some grain and hay. Fertilizer is needed, especially for potatoes. Crops other than potatoes may require moderate applications of lime.

TABLE 2.—Farming and conservation practices recommended according to classes of land according to use capability

Land-capability class	Soil group	Practices for—				
		Cropland			Pasture or long-term hay	Woodland
		Rotations <sup>1</sup>	Fertilizers or amendments	Supporting practices		
I (green) <sup>2</sup>	1 and 3	1. R-R-GM	Fertilizer		Liming, fertilization, controlled grazing, mowing.	Protection from fire and grazing. Utilization of poor trees for firewood and rough products. Selective and regulated cutting. Maintenance of dense woodland border.
II (yellow) <sup>2</sup>	1, 2, 3, 4 <sup>3</sup>	1. R-G-H 2. R-R-G-H 3. R-GM	Fertilizer. Lime for crops other than potatoes.	Strip cropping; contour cultivation; sod waterways; winter cover. Terracing where rotation 2 or 3 used. Gully control where necessary. Drainage of soils of group 4 necessary.	do	Same as class I. Hauling of forest products on contour or when ground frozen or snow covered. Reforestation: Trees and shrubs suited to site at rate of not less than 1,000 per acre to be planted along contour furrows if practicable.
III (red) <sup>2</sup>	1, 2, 3, 4, 5 <sup>3</sup>	1. R-G-H (H) 2. R-R-G-H-H	do	Strip cropping, width and frequency adjusted to slope; contour cultivation; sod waterways; diversion terraces; winter cover. Gully control where necessary. Drainage of soils of groups 4 and 5 necessary.	do	Do.
IV (blue) <sup>2</sup>	1, 2, 3, 4, 5	1. G-H-H-H-H 2. Permanent pasture.	Fertilizer. Lime	Contour cultivation, reseeding in narrow strips. Gully control where necessary. Drainage of soils of groups 4 and 5.	do	Do.
V (orange) <sup>2</sup>	1, 2, 3, 6	None	None	None	Same as class I (less steep areas only should be in pasture).	Do.

<sup>1</sup> R—Row crops, generally potatoes; GM—Green-manure crop, usually clover; G—Small grain; H—Hay; (H)—1 or more additional years of hay optional.

<sup>2</sup> Color distinguishing class area on maps accompanying this bulletin.

<sup>3</sup> Soils of groups 4 and 5 are not well adapted to potatoes. Unless absolutely required for potato production, only grain-timothy hay rotation recommended for these soils.

Potato rows should be laid out as nearly as possible on the contour. Figure 2 shows a contour-planted field. Ridges, formed by the hilling of the potatoes 6 to 8 inches high, will have the effect of small terraces occurring every 36 inches. This practice will check nearly all the erosion that might occur on the gentle slopes during the growing season. On most slopes strip cropping should be combined with contour cultivation to provide some check

for the erosion that is likely to occur after the spring thaw when large volumes of water must be carried off the land. On the gentle slopes strips may be comparatively wide, but their width and frequency should be adjusted to the slope. Waterways should be sodded to prevent the formation of gullies. Leaving waterways and low places in sod will also remove the possibility of sharply curving crop rows, which are difficult to work (fig. 3).





Me-175

**Figure 2.**—Digging potatoes on a contour-planted field.

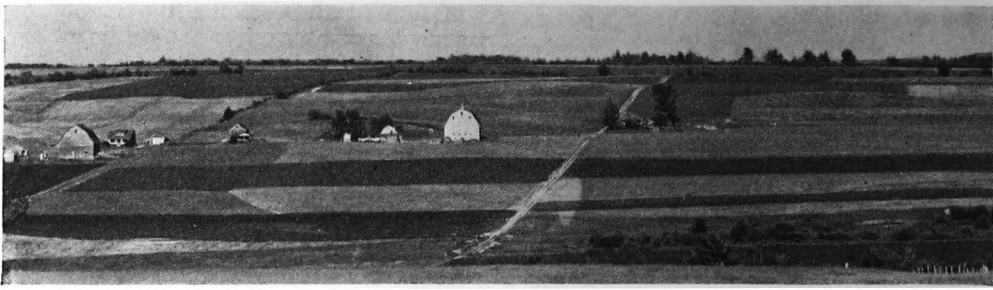
Where at all possible after the potato harvest, a winter cover should be established. This is difficult as a rule because of the late harvest and the early winter. However, it is generally possible to seed winter rye after the early varieties are harvested, and a good growth can be established before the first killing frost.

Broad-base terraces can be used effectively on the slopes of class II land and should be used if the rotation consists of 2 years of potatoes, followed by grain and hay or 1 year of potatoes followed by a green-manure crop. To facilitate the use of machinery employed in the growing of potatoes a very broad-base type of terrace should be used. Combinations of terracing and strip cropping will provide almost complete control of erosion on slopes up to 8 percent. The necessity for constructing outlets for terraces will be eliminated if the terraces can be made to discharge into a natural drainageway



Me-136

**Figure 3.**—Sod waterways in conjunction with contour cultivation.



Me-194

Figure 4.—Strip cropping on a Maine farm.

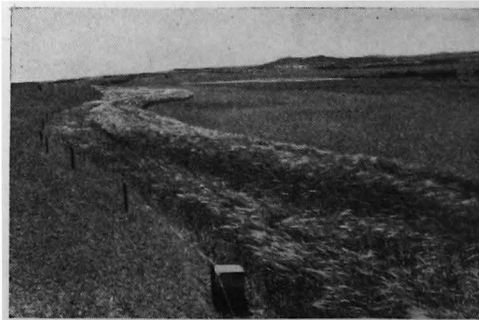
or grass-protected area. Where there is no natural outlet, however, an outlet should be constructed before the terrace is built in order that a good grass or clover sod may be established.

In choosing practices for class II land, considerable attention should be paid to soil type. For example, Houlton silt loam in soil group 2 is not a good potato soil because of its shallow depth to limestone and its neutral to alkaline reaction. Neutral or alkaline soils are favorable to the development of potato scab. Therefore, it is not recommended that any of this soil be put into potatoes, but rather that a grain-timothy hay rotation be used on it. The imperfectly drained soils of group 4 are not well adapted to potatoes and tend to produce low yields in wet years or scabby potatoes. Unless they are absolutely required for potato production, these soils would be better placed in a grain-timothy hay rotation.

Class III lands require the adoption of careful cultivation practices and the use of supporting measures to permit their continued safe use for the growing of cultivated crops. These lands form the upper limit that may be safely cultivated. This class includes all areas of well-drained soils that occur on BB slopes with no erosion to moderate erosion, accompanied in a few areas by infrequent shallow gullies. Well-drained soils on B slopes that are severely eroded are included here. Those areas of imperfectly drained soils on B and BB slopes slightly or moderately eroded and areas of poorly drained soils on B slopes with slight erosion may be treated as class III land if suitable drainage measures are employed.

Class III land occupies 7,403 acres, or 24.2 percent of the Presque Isle area.

Contour cultivation and strip cropping (fig. 4) with the width and frequency of the strips adjusted to the slope of the land should be used on class III land. Strips should be placed at more frequent intervals and should be less wide than for class II. All waterways should be sodded. If gullies have formed, they should be controlled by the use of diversion ditches, which will intercept water and permit natural revegetation, or, if necessary, by structures. The broad-base cropland terrace recommended for class II lands should not be employed on these steeper slopes or on any slope above 8 percent. However, diversion terraces (fig. 5) maintained in permanent sod should be used to carry off excess water. These should be located in pasture or permanent hay land wherever possible. Filter strips of permanent vegetation should be maintained above the terraces to prevent the accumulation of debris in the channels. Diversion terraces will divide large drainage areas



Me-241.

Figure 5.—Diversion ditch in a Maine field

into smaller units, making possible the use of contour cultivation and strip cropping. A winter cover should be established on class III land wherever possible. In wet years, it will be necessary to drain areas of the imperfectly or poorly drained soils.

As in class II, selection of crops and rotations should be determined, wherever possible, according to the nature of the soil. Unless the imperfectly and poorly drained soils are absolutely required for potatoes, they should be utilized for other crops. If livestock are kept on the farm, these soils may be well utilized for grain and hay.

Class IV land includes all well-drained soils on BB slopes that have been severely eroded and on C slopes that are slightly or moderately eroded. One exception to this general classification of the well-drained soils is the Mapleton loam of group 2 in which the class IV land occurs on the moderately eroded BB slopes that are not gullied. On the imperfectly drained soils (group 4), the C slopes that are slightly or moderately eroded, and on the poorly drained soils (group 5), all A slopes, B slopes with moderate erosion, and all BB slopes are in class IV. In these imperfectly and poorly drained soils, drainage is a major factor affecting use capability. There are 3,035 acres of class IV land in the Presque Isle area.

Land in class IV should be left either in permanent hay with grain grown occasionally as a nurse crop, or in permanent pasture. Gullies occurring in any of this land should be controlled with structures or sod. Although some land of class IV is now used for potatoes, such use is not recommended because of the erosion hazard.

Class V includes all D slopes, the very steep slopes, in the area, all C slopes with severe or very severe erosion, and all BB slopes on Mapleton loam with severe or very severe erosion. All areas of soil group 5 are included in this class, which occupies 4,218 acres, or 13.8 percent of the area. At the present time, 1,100 acres of class V are used as cropland.

Class V land should not be cultivated at any time. The less steep areas may be used for permanent pasture where

additional pasture is required. In this area, however, there is enough class IV land to meet the pasture requirements of the farmers. Class V should be utilized for woodland or wildlife purposes.

Recommendations for pasture treatment for the different land-capability classes do not vary much. Most of the pastures are not heavily grazed and only a few are severely eroded. Liming, fertilization, mowing, and controlled grazing will maintain most pastures in excellent condition.

Woodlands in all classes should be protected from fire and grazing. Poor species and diseased trees should be removed and utilized for firewood and other rough products. Selective and regulated cutting should be practiced. Dense woodland borders should be maintained wherever possible. Land that falls in classes II to V requires all of these woodland practices and also additional care in hauling out the forest products that are to be removed. They should be hauled out either when the ground is frozen or covered with snow or as nearly on the contour as possible. Trees and shrubs used in reforestation should be planted at a rate of not less than 1,000 per acre and along the contour, if possible.

Wildlife cover should be provided and maintained wherever there are suitable locations. Trees and shrubs that furnish food and shelter for wildlife should be used in reforestation.

The use of the physical survey in determining the capability of the land on an individual farm and its use in the determination of the soil conservation practices to be applied and the land use changes to be made can be illustrated with maps of a 160-acre cooperating farm in the Presque Isle area. Figure 6 presents the results of the survey and the land-capability classes.

There is no class I land on this farm. There are 59 acres of class II land, which consists mainly of Caribou loam and small areas of Caribou gravelly loam and Presque Isle gravelly loam on B slopes with moderate erosion. Class III land, which occupies 45.1 acres, is made up mainly of Caribou loam and Caribou gravelly loam on BB slopes with moderate erosion. A few areas

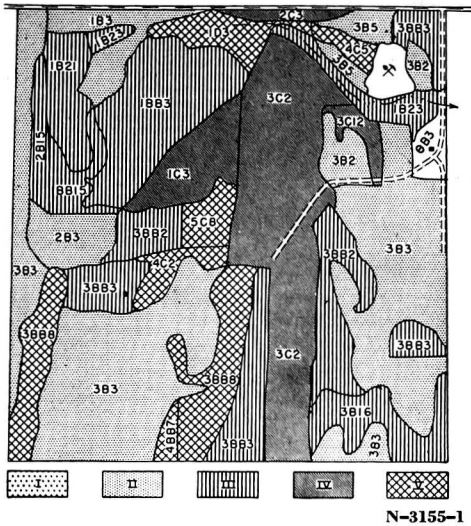


Figure 6.—Physical survey of a farm of 160 acres, showing the classification of land according to use capability. The composite symbols show erosion, slope, and soil type. Erosion legend: 1, No apparent erosion; 2, less than 25 percent of topsoil lost; 3, 25 to 75 percent of topsoil lost; 4, more than 75 percent of topsoil lost; 5, less than 6 inches of soil remaining over rock. Slope legend: B, 2 to 8 percent; BB, 8 to 15; C, 15 to 25; D, 25 percent and over. Soil legend: 3, Caribou loam; 2, Caribou gravelly loam; 5, Presque Isle gravelly loam; 7, Houlton silt loam; 8, Mapleton loam; 23, Washburn silt loam; 16, Conant silt loam; 21, Caribou-Washburn complex; 15, Caribou-Conant complex; 12, Parkhurst gravelly sandy loam. Soils 2, 3, and 5 are in soil group 1; 7 and 8 in group 2; 12 in group 3; 15 and 16 in group 4; and 21 and 23 in group 5.

of imperfectly and poorly drained soils on B slopes with either no erosion or only slight erosion are included in this class. Class IV lands, which occupy 34 acres of the farm, are steep and moderately eroded, whereas the 18.9 acres of class V land are steep or very stony with moderate and severe erosion. The farmyard occupies 1.5 acres and the gravel pit, 1.5 acres.

Figure 7 shows the land use on the farm at the time it was surveyed. Cropland occupied 108.1 acres, pasture 11.3, woodland 31.6, and idle land 6.0. A study of table 3, which shows the capability of the former land use classes, reveals that 35.6 acres formerly cropped should be eventually taken out of con-

tinuous cultivation. However there are 31.6 acres in other uses that could be put into cropland.

TABLE 3.—Use capability of the land on a 160-acre farm in the Presque Isle area by former land use classes

Land use	Area in land-capability class—				Total
	II	III	IV	V	
Cropland	48.7	23.8	19.8	15.8	108.1
Woodland	3.9	18.4	6.2	3.1	31.6
Pasture	2.9	.4	8.0		11.3
Idle land	3.5	2.5			6.0
Total <sup>1</sup>	59.0	45.1	34.0	18.9	157.0

<sup>1</sup> Farmyard occupies 1.5 acres; gravel pit, 1.5 acres.

Figure 8 shows the suggested land use plan for the farm and the conservation practices recommended for the various fields. Fields 1, 4, 6, and 8a and 8b are to be farmed in a general rotation of 2 years of potatoes, 1 year of grain, and 1 year of hay. One year of green manure is to be introduced in the rotation in parts of fields 1, 4, and 8b. The eastern part of field 1 is to be cleared and put into crops as above. Field 10, with the exception of strip 10g, and fields 12 and 14 are to be

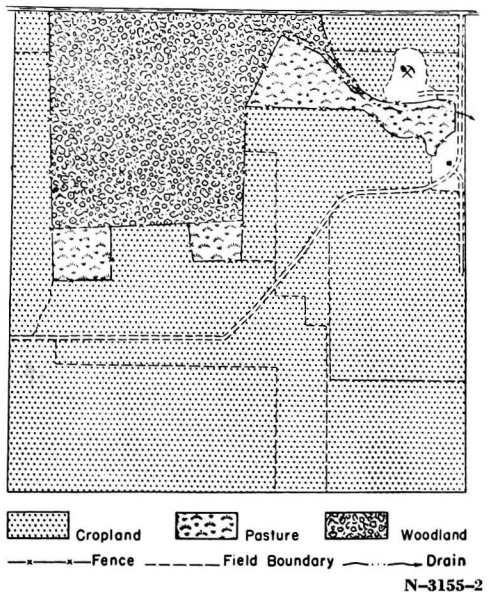


Figure 7.—Land use map of farm shown in figure 6 at the time the survey was made.

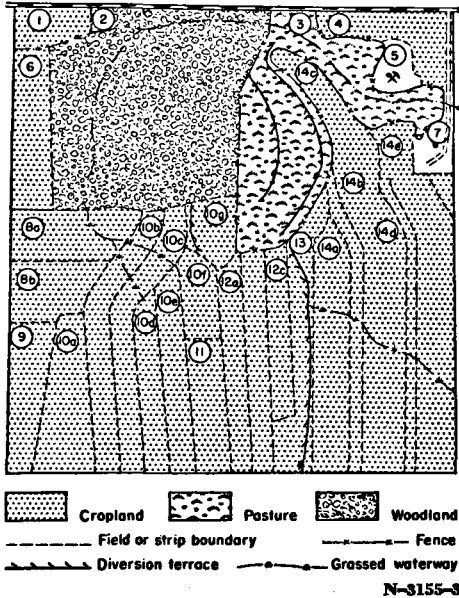


Figure 8.—Land use on the farm shown in figures 6 and 7 as revised in the cooperative agreement.

farmed on the contour and strip-cropped. The rotations used in the strips in these fields are to be either 2 years of potatoes, 1 year of grain, and 1 year of hay or 2 years of potatoes, and 1 year of green manure. Two sod waterways are to be constructed in field 10, as shown on the revised land use map, and treated with fertilizer and lime to establish a good sod. Another sod waterway, to be similarly treated is to be constructed in field 14. When the hay land adjacent to the potato land is plowed in the fall, a strip of sod not less than 25 feet wide is to be left next to the potato land for spring plowing. This strip will aid in the control of erosion in the late fall and early spring. In addition, if two adjacent strips are to be in potatoes in any one year, a strip of sod not less than 25 feet wide is to be left between them.

Field 3, part of which had previously been in cultivation, is to be retired to permanent pasture. Two diversion ditches are to be constructed as shown on the land use map. A top dressing of lime and pasture mixture is to be applied on the part of the field to be

retired from crops, and the part previously in potatoes is to be seeded to a grain nurse crop. Fields 10g and 13 are to be retired to permanent hay. Farm manure is to be applied to field 10g. A diversion ditch is to be constructed in field 10g and ground limestone and fertilizer are to be applied to secure a good sod in the ditch. Ground limestone and complete fertilizer are to be applied to field 13. Any land retired to permanent hay and used for temporary pasture is to be used for pasture not more than 1 year at a time. Electric fence is to be used to protect the other areas when this is done.

Field 2 is to remain in woods with the possibility of subsequent clearing of suitable parts of it to make up for some of the land removed from cultivation. The cutting will be in accordance with good woodland management. Fields 9 and 11 are to be retired to trees, planted at the rate of 1,200 per acre. These fields are to be protected from fire and grazing.

As the farm is rearranged, the operator will have 92 acres of cropland, 39 of woodland, 17.5 of pasture, and 8.5 of permanent hay.

### Results and Significance of the Land Inventory

The acreage and percentage of land in the entire project in each class of capability, by soil groups, is shown in table 4. From this table it is seen that 76.3 percent of the area may be used for cultivation. However, only 2.2 percent of the entire area, or 659 acres, is capable, on the basis of physical features, of being cultivated without special precautions to prevent erosion. The remaining 74.1 percent may be cultivated provided some precautions are used to maintain the productivity of the land and to prevent soil loss. This land may be used for row crops if such measures as strip cropping, contour cultivation, fertilization, the growing and turning under of green-manure crops, the use of winter cover, and terracing are employed either singly or in combinations.

TABLE 4.—Capability of land by soil groups

ENTIRE PROJECT<sup>1</sup>

Soil group	Area and proportion in land-capability class—										Total
	I (green) <sup>2</sup>		II (yellow) <sup>2</sup>		III (red) <sup>2</sup>		IV (blue) <sup>2</sup>		V (orange) <sup>2</sup>		
1. Well-drained, upland soils on calcareous, glacial till	73	0.4	14,191	70.7	3,757	18.7	1,243	6.2	793	4.0	20,057
2. Shallow, well-drained soils on glacial till	0	-----	330	16.4	219	10.9	428	21.2	1,038	51.5	2,015
3. Deep, well-drained soils on outwash terraces and bottom lands	586	42.8	462	33.8	128	9.3	57	4.2	136	9.9	1,369
4. Imperfectly drained soils	0	-----	279	18.9	1,190	80.6	7	5	0	-----	1,476
5. Poorly drained soils	0	-----	0	-----	2,109	61.9	1,300	38.1	0	-----	3,409
6. Miscellaneous soils not suitable for cultivation	0	-----	0	-----	0	-----	0	-----	2,251	100.0	2,251
Entire project <sup>1</sup>	659	2.2	15,262	49.9	7,403	24.2	3,035	9.9	4,218	13.8	30,577

CROPLAND

1. Well-drained, upland soils on calcareous, glacial till	71	0.4	12,698	73.4	3,078	17.8	983	5.7	462	2.7	17,292
2. Shallow, well-drained soils on glacial till	0	-----	257	20.3	8	.6	419	33.1	582	46.0	1,266
3. Deep, well-drained soils on outwash terraces and bottom lands	397	41.8	384	40.4	111	11.7	36	3.8	22	2.3	950
4. Imperfectly drained soils	0	-----	67	5.7	1,102	94.3	0	-----	0	-----	1,169
5. Poorly drained soils	0	-----	0	-----	634	60.4	415	39.6	0	-----	1,049
6. Miscellaneous soils not suitable for cultivation	0	-----	0	-----	0	-----	0	-----	34	100.0	34
All cropland	468	2.1	13,406	61.6	4,933	22.7	1,853	8.5	1,100	5.1	21,760

IDLE LAND

1. Well-drained, upland soils on calcareous, glacial till	2	0.6	179	51.9	50	14.5	44	12.7	70	20.3	345
2. Shallow, well-drained soils on glacial till	0	-----	23	26.4	8	9.2	6	6.9	50	57.5	87
3. Deep, well-drained soils on outwash terraces and bottom lands	89	63.1	21	14.9	1	.7	0	-----	30	21.3	141
4. Imperfectly drained soils	0	-----	34	66.7	17	33.3	0	-----	0	-----	51
5. Poorly drained soils	0	-----	0	-----	258	72.5	98	27.6	0	-----	356
6. Miscellaneous soils not suitable for cultivation	0	-----	0	-----	0	-----	0	-----	158	100.0	158
All idle land	91	8.0	257	22.6	334	29.3	148	13.0	308	27.1	1,138

PASTURE

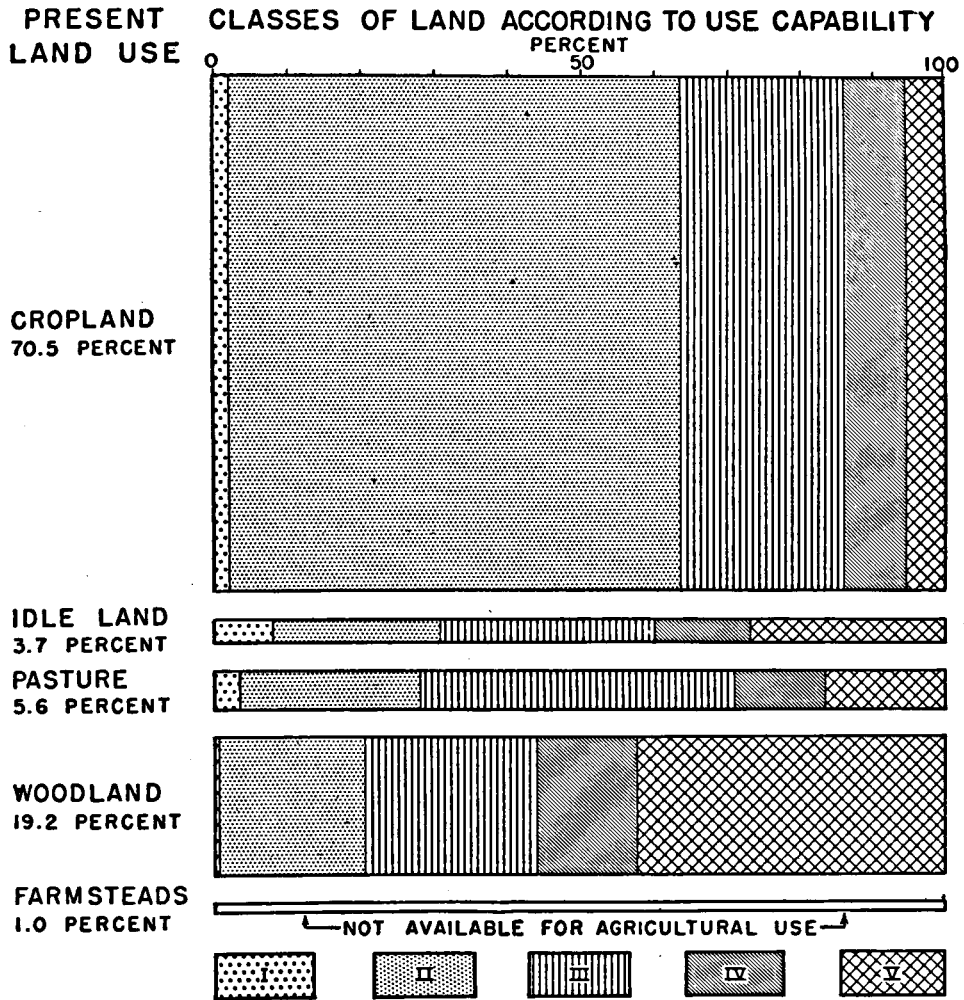
1. Well-drained, upland soils on calcareous, glacial till	0	-----	305	44.0	230	33.1	70	10.1	89	12.8	694
2. Shallow, well-drained soils on glacial till	0	-----	6	9.7	26	41.9	2	3.2	28	45.2	62
3. Deep, well-drained soils on outwash terraces and bottom lands	59	43.7	52	38.5	13	9.6	7	5.2	4	3.0	135
4. Imperfectly drained soils	0	-----	58	46.4	67	53.6	0	-----	0	-----	125
5. Poorly drained soils	0	-----	0	-----	416	75.1	138	24.9	0	-----	554
6. Miscellaneous soils not suitable for cultivation	0	-----	0	-----	0	-----	0	-----	173	100.0	173
All pasture	59	3.4	421	24.2	752	43.1	217	12.4	294	16.9	1,743

WOODLAND

1. Well-drained, upland soils on calcareous, glacial till	0	-----	1,009	58.4	399	23.1	146	8.5	172	10.0	1,726
2. Shallow, well-drained soils on glacial till	0	-----	44	7.3	177	29.5	1	.2	378	63.0	600
3. Deep, well-drained soils on outwash terraces and bottom lands	41	28.7	5	3.5	3	2.1	14	9.8	80	55.9	143
4. Imperfectly drained soils	0	-----	120	91.6	4	3.1	7	5.3	0	-----	131
5. Poorly drained soils	0	-----	0	-----	801	55.2	649	44.8	0	-----	1,450
6. Miscellaneous soils not suitable for cultivation	0	-----	0	-----	0	-----	0	-----	1,886	100.0	1,886
All woodland	41	.7	1,178	19.8	1,384	23.3	817	13.8	2,516	42.4	5,936

<sup>1</sup> Does not include farmyards and urban areas (309 acres) and quarries (26 acres).

<sup>2</sup> Color distinguishing class area on the maps accompanying this bulletin.



N-3155-4

**Figure 9.**—Present land use and use capability of land. Classes I, II, and III are suitable for cultivation, class I without special practices, class II with simple practices, and class III with complex or intensive practices; class IV is suitable only for occasional or limited cultivation; and class V is not suitable for cultivation.

Table 4 also presents data on the capability of the present land use classes. Part of this information is summarized in graphic form in figure 9. Cropland at present occupies 21,760 acres, or 70.5 percent of the area; 1,138 acres are idle; 1,743 are pastured; and 5,936 are in woodland.

Class IV land is now cultivated to the extent of 1,853 acres. This land should not bear row crops more than once in every 5 or 6 years at the most,

and is better if cropped only to grain and hay. Eleven hundred acres of class V land, which is not suited for cultivation at any time, is now cultivated. Thus, 2,953 acres of the present cropland should be removed from continuous cultivation. Furthermore, 22.7 percent of the present cropland, or 4,933 acres, is class III land on which the most careful conservation measures to prevent further damage must be employed. Of this acreage, 1,736 acres,

or 35.2 percent of the class III cropland, fall within soil groups 4 and 5, which are imperfectly and poorly drained soils, not particularly well suited to potato culture. In wet years poor yields are produced on these soils and potato scab is prevalent on them. They are well adapted to grains and hay or pasture, however, and could be devoted to one of these uses.

There are 682 acres now idle and 1,232 now in pasture that can be used for cultivation if suitable precautions are taken. In addition, 2,603 acres that have not been cleared of trees could be used for cultivation if cleared. Of this woodland area, however, 925 acres are imperfectly or poorly drained and would be better left in woodland or, if cleared, used only for grain, hay, or pasture. As 309 acres of the idle land and 541 of the pasture in classes I, II, and III also are in soil groups 4 and 5, only 2,742 acres of the land not now cultivated are suitable for potato culture.

Thus, the margin of land within which adjustments according to use capability can be made in the area is rather limited. However, with the proper precautions and the gradual substitution of class I, II, and III lands now idle, pastured, or in woodland for areas of classes IV and V now bearing row crops, some readjustments can be made. The inclusion of more livestock in the farming system and the substitution of grain, hay, and pasture for potatoes on some of the farms would assist in making the necessary changes.

## Description of the Area

THE PRESQUE ISLE area lies almost entirely within a loop formed by the Aroostook River as it flows northeast from the town of Presque Isle to Fort Fairfield in Aroostook County, Maine. The total area is 30,912 acres, or 48.3 square miles. The demonstration area (fig. 1, p. 1.) comprises parts of three townships, Presque Isle, Caribou, and Fort Fairfield, in Aroostook County, which is bounded on all sides except the south by Canada. The most eastern point of the entire area, Fort Fairfield,

is only 2½ miles west of the international boundary. Aroostook County is the largest county in Maine and has a total land area of 6,453 square miles.

For the most part the area consists of a succession of broad ridges and long swells that have level to undulating tops and that slope gently to the streams. Figure 10 illustrates the general appearance of the area. In the northeastern part of the area, however, the slopes break sharply toward the Aroostook River. In a few places abrupt slopes or rock outcrops, which are either hillside outcrops or bedrock hummocks covered with a thin layer of soil, give the otherwise gently sloping land a rippled appearance. Depressions or sinks occur at intervals throughout the uplands.

Altitudes range from 370 feet above sea level at Fort Fairfield to 1,085 feet on the ridge about 1½ miles east of Jordan school. The average altitude is 600 feet.

The project area is not a complete watershed, although all the land, except for a very small area in the southern part, drains into the Aroostook River, which is a tributary of the large St. John River. The area is cut by numerous small streams and brooks that flow into the Aroostook River before attaining much volume of flow.

The original forest cover constituted a part of what was one of the finest timber stands in the eastern United States. The most plentiful timber tree was the white pine, which provided excellent lumber and was particularly suited for shipbuilding. Today there are no important timber stands. Woodland of all types occupies 5,936 acres, or 19.2 percent of the area.

Associated with the white pine on the better, well-drained uplands is the hemlock that formerly was plentiful but that has been widely cut to secure the bark for the manufacture of tannic acid. Other coniferous trees on the uplands are the white spruce, which occupies well to imperfectly drained uplands, and the Canada balsam, which grows on muck swamps or imperfectly drained soils. Both of these trees are still fairly abundant and are cut for



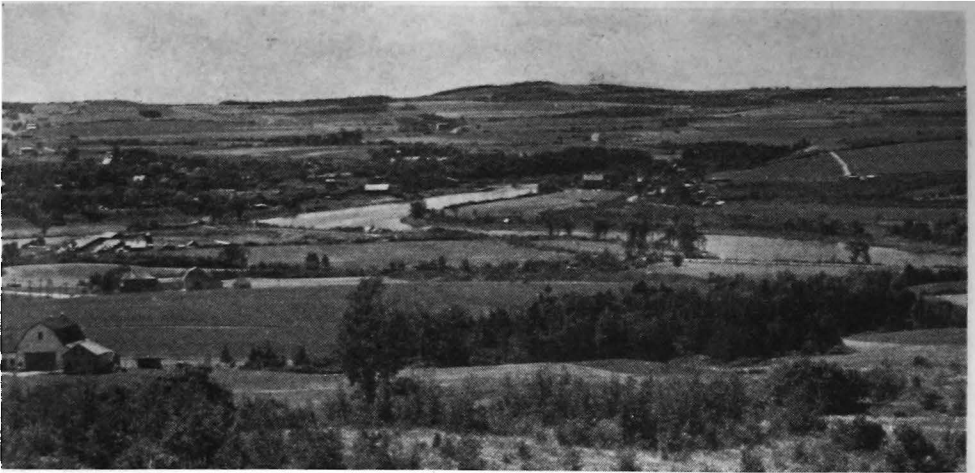


Figure 10.—Panorama view of part of the Presque Isle area.

Me-244

lumber and pulpwood. The black spruce is native in the swamps and bogs of the area but is of no commercial value. Other conifers are the eastern larch and the northern white-cedar, both of which grow in muck or swamp areas.

The principal hardwood trees of the uplands are the sugar maple and the yellow birch, which occupy high ridges and rolling uplands where drainage is well established. These trees are the source of practically all the hardwood lumber, and the sugar maple is used to a small extent as a source of maple sirup. Trees of lesser importance that grow on the well to imperfectly drained soils are the American beech, which comes in quickly in the cut-over areas; ironwood used in the manufacture of farm tool handles; white ash; quaking aspen; and the largetooth aspen.

The trees growing on stream banks, along lakes, and in wet areas are of little commercial value. Red maple, growing in swamps and along stream banks, is used mainly for fuel. Black willow, brown ash, black cherry, chokecherry, mountain-ash, alder, boxelder, and American elm are the most abundant of other species.

After the forests were cleared, shrubs and bushes became more plentiful. The most important of these that grow in cut-over areas, along fence rows, along streams, and in burned-over

areas, are the highbush cranberry, serviceberry, blue cornel, red-osier, beaked hazelnut, black huckleberry, witch-hazel, pasture gooseberry, low wild gooseberry, the Canada blueberry, and the nannyberry. These are all excellent sources of food for wildlife.

The climate of the area is continental in nature and is characterized by long, cold winters. Temperatures are very low during the winter months, but the cold is less noticeable in this part of the State than in areas nearer the coast where the humidity is much higher. Winter temperatures of  $-40^{\circ}$  F. have been recorded and there are periods when the thermometer hovers continually around zero. Despite these low temperatures, the ground does not freeze to any great depth because of the heavy snow that covers it the greater part of the winter. Snow may fall in late September and October but soon disappears. The heavy snows that begin about the middle of November, however, usually remain on the ground until the following spring. Subsequent snowfall adds to this cover, which reaches its maximum depth in March or early April. The average snowfall for the year at Presque Isle is 86 inches. Once the snow melts in the spring the ground is soon ready for cultivation. The enormous flow of water resulting from the rapid melting of this heavy snow



Me-98

*Figure 11.—Gully caused by melting snow.*

cover is an important factor in soil erosion (fig. 11).

The summers are usually mild and pleasant, although maximum temperatures of 97° and 99° F. are recorded occasionally.

Frost may occur during any month in the year although July and August are usually frost-free. The average growing season is 108 days, but the length ranges from 75 to 127 days. The average dates of the first killing frost in the fall and the last in the spring are September 15 and May 30. The date of the latest killing frost in the spring has ranged from May 3 to June 28, and the first killing frost in the fall from August 28 to October 7. The growing season, however, is sufficiently long to mature early and late varieties of potatoes, oats, hay, and certain vegetables and fruits.

The average annual precipitation at Presque Isle is 33.8 inches and is fairly well distributed throughout the year, although it is somewhat heavier in the summer months. The early-spring and late-fall rains are usually gentle and of several days duration, whereas those that fall in the middle of the summer are in the form of localized, heavy, dashing

thundershowers, which cause considerable sheet and gully erosion. Drought severe enough to injure crops seriously is virtually unknown, although during July and August there is an occasional period of dry weather that may reduce crop yields.

Significant climatic data from Presque Isle, Maine, are summarized in table 5.

Climatic factors greatly influence the agricultural practices. The heavy accumulation of snow does not usually melt until after the middle of April and the land cannot be worked much before the first of May. This means that the land must be fitted and crops planted within a very short period of time. Because of the early occurrence of the first killing frost in the fall, varieties of potatoes that mature after the middle of September must be harvested within a very few weeks to escape damage by freezing. Winter cover crops may be successfully grown after the early varieties of potatoes have been harvested, but the harvest of the late varieties invariably comes too late to permit establishment of a winter cover. As most of the plowing for the next year's potato crop must be done before the late varieties are dug, much

TABLE 5.—Monthly, seasonal, and annual temperature and precipitation at Presque Isle, Aroostook County, Maine

[Elevation, 606 feet]

Month	Temperature <sup>1</sup>			Precipitation <sup>2</sup>			
	Mean	Absolute maximum	Absolute minimum	Mean	Greatest on record	Least on record	Snowfall <sup>3</sup>
	° F.	° F.	° F.	Inches	Inches	Inches	Inches
December.....	16.5	58	-35	2.30	5.90	0.73	19.3
January.....	10.8	51	-41	2.40	4.27	1.15	18.4
February.....	10.9	51	-36	1.90	4.10	.75	18.4
Winter.....	12.7	58	-41	6.60	12.10	3.58	56.1
March.....	24.2	63	-26	2.25	4.94	.92	10.5
April.....	38.2	85	-2	2.51	5.31	.97	6.7
May.....	50.9	94	21	2.90	6.36	.34	1.1
Spring.....	37.8	94	-26	7.66	13.02	3.18	18.3
June.....	59.6	94	25	3.61	11.10	.76	.0
July.....	65.8	97	37	3.56	6.38	1.50	.0
August.....	63.6	99	31	3.04	5.43	.93	.0
Summer.....	63.0	99	25	10.21	16.48	5.92	.0
September.....	54.7	90	21	3.37	5.33	1.05	.2
October.....	44.3	84	8	3.44	6.13	.78	2.3
November.....	30.1	69	-15	2.53	4.61	.71	9.1
Fall.....	43.0	90	-15	9.34	13.10	5.89	11.6
Year.....	39.1	9	-41	33.81	43.56	24.62	86.0

<sup>1</sup> 25-year record.

<sup>2</sup> 26-year record.

<sup>3</sup> 16-year record.

of the land remains unprotected in the winter months and during the spring melting of the snows.

Immigrants from New Brunswick made the first settlement in the area at Fort Fairfield in 1816. The town of Presque Isle was settled a few years later. About 1836 to 1837, with the opening of the military road to Presque Isle, people from the southern part of the State were attracted to the region and settled near Presque Isle and Caribou. Aroostook County was organized in 1839 at which time the population was approximately 9,000. The county was enlarged to its present dimensions in 1843 and the population continued to grow until it reached a total of 93,804 in 1940. Although the population of the county is rather varied in nature, that of the project area is more or less uniform, being composed of native-born whites of English, Scotch, and Irish descent. There are a few foreign-born whites who have come in from New Brunswick, Quebec, and the St. John River Valley in Canada.

Lumbering was formerly the principal industry of the area and is still carried on to a limited extent. The

wood cut now is used more for the production of wood pulp and veneer than for lumber. Growing of potatoes and manufacture of potato starch are now the chief industries. The first starch factory, opened in 1874, was quickly followed by others. Each of the principal towns of the area has at least one starch factory and Presque Isle, Caribou, and Fort Fairfield have two factories each. Ninety percent of the potato starch made in the United States comes from Maine, most of it from Aroostook County.

Markets for any cash crop are at a considerable distance. The nearest market of any importance is Boston, Mass., which is 426 miles by rail from Presque Isle. Maine potatoes, nevertheless, are shipped to all parts of the country. Most of the potatoes are shipped by rail, although a large number are shipped to seaboard points and transported by boat to other markets. Important markets for Aroostook County potatoes are New York, Baltimore, Boston, Cleveland, Philadelphia, and Pittsburgh.

The area is well served by the Canadian Pacific Railroad, which was ex-

tended through the area between 1875 and 1881, and the Bangor and Aroostook Railroad, which was built from Bangor to Caribou and Fort Fairfield in 1893-94.

The main roads of the area are hard-surfaced and the secondary roads are mostly of gravel. They are all maintained in good condition. During the winter months, most of the main roads are kept open by snow plows, but many of the secondary roads are blocked by snow for long periods of time.

## Agriculture

THE AGRICULTURAL development of the Presque Isle area centers around the growth of the potato industry; 85 percent of the acreage of potatoes in Maine is in Aroostook County and the most concentrated area of potato growing lies within the boundaries of this project. Early agricultural development was slow as the early settlers were interested primarily in harvesting the native timber stands. The first farms taken up were only partly cleared and the crops grown were those that could be used either directly on the farm or sold to the lumber companies for food or feed for the stock. Many farmers derived some additional income from work in the lumber camps. Hay, oats, rye, wheat, and buckwheat were the principal crops grown. Potatoes, which were introduced at a comparatively early date, were found to thrive on the soils and in the cool, moist climate of the area, and the remarkable yields of the first crops caused many of the farmers to turn to potatoes and to devote less of their farms to other crops. For a long time transportation facilities for this bulky crop were very limited and available markets were few so that, after the local demand was satisfied, there was little that could be done with any surplus supply.

The building of the railroads through and beyond the area and the establishment of starch factories in the principal towns opened new markets for potatoes and the acreage devoted to them increased rapidly. In 1880 there were

14,009 acres in Aroostook County in potatoes with an average yield of 57 barrels per acre. The 1935 agricultural census shows 133,531 acres of the county in potatoes with a total yield of 46,484,548 bushels, an average of 126.6 barrels per acre. As the acreage in potatoes has increased, that in other crops has declined. Little livestock is raised in this section of the county.

Recent years have brought about a change in the type of market for potatoes as farmers from other sections of the country, particularly in the South, soon realized the desirability of these northern-grown potatoes for seed stock. At the present time about one-third of the potatoes grown are shipped into other sections for seed. The remainder are either shipped to various markets to be used as table potatoes or sold to the local starch factories. Only inferior grades or culls are now used in starch manufacture.

Potato yields in Maine have always been high in comparison with those of other sections of the United States. Yields have continued to increase through the years with the use of improved and treated seed and the employment of better methods of planting, fertilizing, spraying, and harvesting.

The farmers in the area use the most modern machinery in the growing of potatoes. Almost every potato grower has a tractor and the other equipment is up to date and well adapted to efficient production. Two-row diggers, 2- and 4-row planters, and 8-, 12-, and 16-row dusters are all used extensively. Fields are fertilized heavily with double-strength fertilizer, such as 8-16-14<sup>1</sup> applied at the rate of 900 to 1,000 pounds per acre, or single strength applied at about twice this rate. In the past few years, magnesium has been added to the fertilizer and subsequent yields have shown considerable increase. Many farmers prefer to add magnesium by using dolomite limestone rather than a pure calcium lime when liming soils for the clover used in the potato rotations.

Rotations are very short, generally consisting of 1 year of potatoes and 1 year of crimson clover. Where it is

<sup>1</sup> Percentages respectively of nitrogen, phosphoric acid, and potash.

desired to have grain in the rotation, as on small farms where horse-drawn machinery is used, potatoes are grown 2 years out of 4, with grain and hay in the other years, or a 3-year rotation of potatoes, grain, and hay is followed. Some farmers are growing potatoes 2 years and green manure, usually crimson clover, only 1 year.

The short growing season has determined to a considerable extent some of the farming practices employed in the area. Since seed must be planted as soon as possible after the snows have melted in the spring, land that has been in early potatoes or in other crops must be fall-plowed. Late potatoes are harvested only a short time before freezing weather in the fall, and plowing must therefore be done earlier in order to have labor and power available for digging potatoes at the proper time. The late potato lands lie bare from the time of the harvest until the heavy snows of late November cover them. In the spring the lands are bare from the time of the melting snow until about the first of July when the grain or clover crop is well established or the potato vines and roots afford some protective cover.

Farms in the area range in size from 35 acres to 600 acres. The average size of farms in the three townships, parts of which are included in the limits of the project area, is 135 acres. A one-man unit or small farm is usually 50 to 60 acres with about 20 to 25 acres in potatoes. Other larger farms have larger acreages in potatoes and employ modern power machinery in their production.

Land ownership has shifted much in the last 10 years because of prevailing unsettled economic conditions. Many farmers are struggling to pay off mortgages, assumed during boom times, that are equal to or greater than the present land values. Attempts to pay off these mortgages have increased the acreage of potatoes and have caused potatoes to be grown more often in the rotation than should be done if a good soil-conserving and soil-building program is maintained.

Only 6.9 percent of the farms in Aroostook County are operated by

tenants. Many men are farming land that their forefathers broke out of the virgin forest. Some farmers rent additional land on a yearly basis to grow a crop of potatoes. This is either a cash transaction or an agreement in which the owner receives a share of the crop.

## The Conservation Survey

### *Methods and Definitions*

SOIL TYPES, slopes, and the type and degree of erosion were mapped in the field in relation to the existing land use. Aerial photographs on the scale of 1 inch to 500 feet, or approximately 10.5 inches to the mile, were used as base maps for field work.

Capability of the land, according to the classes defined on pages 2-3, is shown in colors on the maps that accompany this bulletin. Soil type, slope, and the type and degree of erosion are shown by brown boundary lines and symbols. Present land use is shown by gray symbols.

Slope classes were established on the basis of the effect of slope on permanent use of the land. Five classes were mapped in the Presque Isle area. A slopes are those less than 2 percent (2 percent slope is a rise of 2 feet in a horizontal distance of 100 feet). B slopes are from 2 to 8 percent; BB slopes, from 8 to 15 percent; C slopes, from 15 to 25 percent; and D slopes, 25 percent and over.

The dominant type of erosion occurring in the area is sheet erosion, which is the removal of a more or less uniform layer of soil from an area. Included in the sheet-erosion classes mapped in this area are small areas of what is known as rill erosion (fig. 12) or the downward washing of soil in minute channels or rills, which are generally eliminated in ordinary farming operations. Gully erosion, or erosion that produces definite channel washes larger than those that would be obliterated by normal tillage operations, was mapped to a small extent. The most prevalent type of gully erosion mapped was shallow gullying caused by spring thaws.



Figure 12.—Rill erosion in a field prepared for potatoes.

Mc-104

Erosion was designated by the following symbols:

Sheet erosion:

2. Less than 25 percent of the topsoil removed.
3. 25 to 75 percent of the topsoil removed.
4. Over 75 percent of the topsoil removed.
5. Less than 6 inches of soil left over the underlying rock.

Gully erosion:

7. Occasional shallow gullies that can be crossed by tillage implements.
8. Frequent shallow gullies that can be crossed by tillage implements.
- Gullies too deep to be crossed by tillage implements, as ⑦ and ⑧.

Miscellaneous:

1. No apparent erosion.
- + . Recent alluvial or colluvial deposits.
- ⊖ . Undifferentiated erosion: Used on urban areas and farmsteads.
6. Landslides.

Sheet erosion symbols, miscellaneous symbols, or combinations of sheet- and gully-erosion symbols were used to designate erosion classes. Fifteen classes of erosion were mapped in the project area. These classes and also the manner in which they have been grouped to indicate severity of erosion, are listed in table 7, page 25.

Five classes of present land use were mapped. Cropland as mapped in-

cludes all land on which crops were growing at the time of the survey, and all land showing evidence that a crop had been harvested the preceding year or that preparation for a crop was in progress. This includes all land in tilled crops and all areas cut for hay. Pasture includes all land that is grazed regularly. Woodland includes all areas on which 40 percent or more of the surface is covered by the spread of good forest species. Idle land consists of areas covered by brush or weeds, grassland not cut or pastured, and some abandoned areas that have little or no cover. A fifth class, designated as farmsteads and urban areas, includes land occupied by houses and other buildings.

Soil types were mapped in accordance with the standards of the Division of Soil Survey of the Bureau of Plant Industry and were correlated by that Division. Twenty-six separations were mapped and are shown on the accompanying maps.

### Soils

For the most part, the soils of the area are loose, mellow, and of open structure. They are easily cultivated

and well suited to the use of the power machinery employed in potato culture. Although 26 soil types were mapped in the survey, these may be combined from the standpoint of general adaptability for growing potatoes or other crops into 6 groups. Physical characteristics of the soils and their position have determined to a large extent this grouping. Detailed descriptions of each of the 26 soils mapped are included in the appendix of this report. A general discussion of the groups follows. Table 6 presents the acreage and percentage of the area in each soil type and group.

## GROUP 1

### WELL-DRAINED UPLAND SOILS ON CALCAREOUS GLACIAL TILL

Group 1, which comprises 65.8 percent of the area, or 20,320 acres, includes Caribou loam, Caribou gravelly loam, Caribou fine sandy loam, Presque Isle loam, Presque Isle gravelly loam, and Presque Isle fine sandy loam. Of these types, Caribou loam is the most widespread as it occupies 12,877 acres, or 41.7 percent of the entire project area. Under cultivation, the Caribou soils consist of about 12 to 14 inches of a yellowish-brown to brown, loose, mellow soil underlain by a yellowish-gray, friable, calcareous till. The entire profile contains numerous limestone and shale fragments and is well drained throughout. The reaction of the surface layer is acid whereas that of the parent till is neutral to alkaline. The Presque Isle soils are similar in color and texture but differ from the Caribou soils in that the surface layers are somewhat deeper than those of the Caribou and that more foreign material of granite and igneous matter is incorporated in the profile. The parent glacial till on which the Presque Isle soils have been developed is much thicker than the parent till of the Caribou. Because of the greater depth of till, the Presque Isle soils have a relief different from that of the underlying parent rock and are characteristically drumloid in appearance. As in the Caribou soils the soil layers are acid until the lower C horizon or parent material is reached where the reaction is neutral or alkaline.

Soils of group 1 occupy the broad, level to undulating ridges that extend for miles between the drainageways and the ridge slopes that descend very gradually to the streams. More than 70 percent of this group occupies B slopes, ranging from 2 to 8 percent, and most of the remainder is on BB slopes, from 8 to 15 percent. Because of their position and general characteristics these soils are well drained throughout the year.

These soils are the most intensively cultivated of the entire area. They are

TABLE 6.—Acreage and percentage of each soil group and type

Soil group and type	Area	
	Acrea	Percent
<b>1. Well-drained upland soils on calcareous glacial till:</b>		
Caribou fine sandy loam.....	55	0.2
Caribou gravelly loam.....	3,040	9.8
Caribou loam.....	12,877	41.7
Presque Isle fine sandy loam.....	116	.4
Presque Isle gravelly loam.....	2,379	7.7
Presque Isle loam.....	1,853	6.0
<b>Total.....</b>	<b>20,320</b>	<b>65.8</b>
<b>2. Shallow well-drained soils on glacial till:</b>		
Houlton silt loam.....	73	.2
Mapleton loam.....	1,942	6.3
<b>Total.....</b>	<b>2,015</b>	<b>6.5</b>
<b>3. Deep well-drained soils on outwash terraces and bottom lands:</b>		
Aroostook fine sandy loam.....	94	.3
Aroostook silt loam.....	299	1.0
Doyle gravelly sandy loam.....	362	1.2
Parkhurst gravelly sandy loam.....	165	.5
Van Buren fine sandy loam.....	471	1.5
Van Buren silt loam.....	18	( <sup>1</sup> )
<b>Total.....</b>	<b>1,409</b>	<b>4.5</b>
<b>4. Imperfectly drained soils:</b>		
Caribou-Conant complex.....	430	1.4
Conant silt loam.....	731	2.4
Keegan silt loam.....	212	.7
Maysville silt loam.....	51	.2
Van Buren fine sandy loam, imperfectly drained phase.....	53	.2
<b>Total.....</b>	<b>1,477</b>	<b>4.9</b>
<b>5. Poorly drained soils:</b>		
Caribou-Easton complex.....	399	1.3
Caribou-Washburn complex.....	490	1.6
Easton silt loam.....	384	1.2
Washburn silt loam.....	2,141	6.9
<b>Total.....</b>	<b>3,414</b>	<b>11.0</b>
<b>6. Miscellaneous soils not suitable for cultivation:</b>		
Alluvial soils, undifferentiated.....	547	1.8
Caribou stony loam.....	431	1.4
Muck.....	1,273	4.1
<b>Total.....</b>	<b>2,251</b>	<b>7.3</b>
<b>Total<sup>2</sup>.....</b>	<b>30,886</b>	<b>100.0</b>

<sup>1</sup> Less than 0.1 percent.

<sup>2</sup> Quarries not included.

ideal potato soils, being well drained, loose and mellow, and are extremely productive. With good farm management, exceptionally high yields of potatoes are produced on them. They respond well to fertilization, and their acidity makes them resistant to potato scab. If they are sufficiently limed, grains, clovers, and grasses do well.

They are subject mainly to sheet erosion, occurring as they do on undulating ridge tops or on long gentle slopes where water accumulates. Since they are cultivated generally in large fields with the potato rows running up and down the slopes, large volumes of water accumulate and carry soil for great distances. Moderate erosion has occurred on 80.4 percent of their area, severe on 6.2 percent, and slight erosion on 5.2 percent.

More than 70 percent of this group is in land-capability class II and 18.7 percent is in class III.

#### GROUP 2

##### SHALLOW, WELL-DRAINED SOILS ON GLACIAL TILL

Houlton silt loam and Mapleton loam, the soil types in group 2, occupy 2,015 acres, or 6.5 percent of the area. They are not considered good potato soils, being very shallow and susceptible to erosion. Houlton silt loam is underlain, at depths that seldom exceed 24 inches, by limestone bedrock that imparts to the surface layers an alkaline reaction, making potatoes grown on this soil very susceptible to scab. The surface layer of Houlton silt loam is a brown, mellow silt loam, which is underlain by a yellowish-brown to reddish-brown silt loam to silty clay loam that rests on limestone. Mapleton loam is acid throughout and consists of 8 to 12 inches of a yellowish-brown to grayish-yellow, mellow loam underlain by gray, slightly weathered till. Depth to the bedrock of gray, calcareous shale varies but seldom exceeds 24 inches.

Depth to bedrock in these soils is so shallow that the loss of a few inches of soil by erosion makes them very unproductive for potatoes. In addition,

Houlton silt loam becomes more alkaline as soil is lost and bedrock approached, and the eroded areas produce extremely scabby potatoes. These soils occur on relatively steep slopes as 41.9 percent of their area is on slopes ranging from 8 to 15 percent and 41.7 percent on slopes even more steep. No soil in this group was mapped on A slopes. More than 66 percent of their area has been moderately, severely, or very severely eroded. Mapleton loam is the more extensive of the two soils; Houlton silt loam occupies only 73 acres in the entire area.

Both these soils may be used for grain and hay crops where the proper erosion-control methods are employed and if properly fertilized and limed. The steeper slopes on the Mapleton should probably be left in woods or used for pasture.

Over half of the area of these soils falls in land-capability class V and 21.2 percent in class IV.

#### GROUP 3

##### DEEP, WELL-DRAINED SOILS ON OUTWASH TERRACES AND BOTTOM LANDS

The soil types included in group 3 are Aroostook fine sandy loam, Aroostook silt loam, Doyle gravelly sandy loam, Parkhurst gravelly sandy loam, Van Buren fine sandy loam, and Van Buren silt loam. Only 4.5 percent of the area, or 1,409 acres, is included in this group. For the most part they are medium to good potato soils and fair grain and hay soils. The Doyle and Van Buren soils occur on terraces and the Parkhurst on kames. The Aroostook soils are on first bottoms along the Aroostook River and the larger streams.

The Aroostook soils are well drained throughout although inclined to be wet late in the spring, thus delaying planting. The surface soil is a dark-brown, mellow silt loam or fine sandy loam, underlain by a brown silt loam or sandy loam that rests on bedded sand and gravel. Because of their position on the level flood plains of the area, the Aroostook soils are not subject to much erosion. They will produce good yields of potatoes if heavily fertilized. With



proper management and fertilization, good crops of hay and grain may be produced, although grains are likely to lodge during wet seasons.

The Doyle and Parkhurst soils are somewhat alike in texture, structure, and erodibility, but differ in the type of relief on which they occur. Both soils are well drained and during periods of dry weather crops may be affected by a lack of moisture. Both of them are subject to erosion when under cultivation and have been moderately eroded. Doyle gravelly sandy loam is a terrace soil occurring in relatively level positions separated from the flood plain along the river by an escarpment or bluff. Parkhurst gravelly sandy loam occurs on kames and has a hummocky relief. It is not extensive in the area and is used mainly for cultivation and as a source of gravel for road construction. The surface soils are yellowish-brown or brown sandy loams underlain by grayish or yellowish-brown sandy loam or gravelly loam that rests on interbedded coarse sands and gravel. These soils are acid throughout the profile.

The Van Buren soils, which are the best potato-growing soils on the terraces, have less well-developed profiles than the Doyle soil, which is on old glacial outwash terraces. The silt loam is not extensive. The surface soil of both Van Buren silt loam and fine sandy loam is yellowish-brown to brown. It is underlain by yellowish to olive-brown sandy loam that rests on olive-green to gray interbedded sands and gravel. The solum is generally stone and gravel free and is well drained and acid throughout. These soils occur in relatively level positions and are not subject to much erosion by virtue of their position.

The largest part of this group is in land-capability classes I and II, 42.8 percent being in class I and 33.8 percent in class II.

#### GROUP 4

##### IMPERFECTLY DRAINED SOILS

Group 4 is composed of Conant silt loam, and the Caribou-Conant complex

on the uplands; Van Buren fine sandy loam, imperfectly drained phase, and Keegan silt loam on the terraces; and Maysville silt loam on the first bottoms. These soils are all imperfectly drained and are nearly neutral to alkaline in reaction. They are not good potato soils, although in dry seasons fair crops may be produced, and are better suited for grain and hay. They are likely to be wet late in the spring. Scab is prevalent on potatoes grown on these soils because of the neutral to alkaline reaction. This group comprises 1,477 acres, or 4.9 percent of the area.

Conant silt loam has a dark-brown silt loam surface soil, underlain by a grayish-brown to grayish-yellow mottled subsoil, which rests upon a grayish-yellow till that has developed a definite hardpan. Gravel and shale fragments are frequent throughout the profile. The Caribou-Conant complex represents a mixture of small areas of the well-drained Caribou soils and the imperfectly drained Conant soil occurring so close together that they cannot be shown separately on the map. These soils lie on relatively smooth to gently sloping uplands and are usually not subject to severe erosion, although they have been eroded more than the other soils in the group. The Caribou-Conant complex is characterized by a hummocky surface.

Keegan silt loam consists of a dark-gray, heavy silt loam surface soil, underlain by a gray, mottled silt loam or silty clay loam subsoil, which rests upon a gray, medium to fine sand. The imperfectly drained phase of the Van Buren resembles the typical Van Buren except that the subsoil is mottled. Both the Keegan and the imperfectly drained Van Buren occupy nearly level or depressed areas adjoining the better drained terrace soils and are not subject to much erosion. They are better suited for hay and pasture than for any other crops.

The Maysville silt loam is closely associated with the better drained Aroostook soils. The surface soil is a dark-brown silt loam underlain by a lighter brown to gray, mottled silt loam or

sandy loam that rests on bedded fine sand, silt, and gravel. It occupies flat to depressed areas and is subject to flooding late in the spring. The soil is best adapted to hay and pasture. Because of its position, it is not subject to erosion. It occupies only 51 acres in the area.

The greater part of group 4 is in land-capability classes II and III, 80.6 percent being in class III and 18.9 percent in class II.

#### GROUP 5

##### POORLY DRAINED SOILS

The soils in group 5 are Easton silt loam, Washburn silt loam, Caribou-Easton complex, and the Caribou-Washburn complex. They occupy 11 percent of the area, or 3,414 acres. They are not well adapted to potatoes because of their extremely poor drainage and the susceptibility of potatoes grown on them to scab, although the Easton soil is fairly acid. During dry years fair yields of potatoes may be grown, but these soils are much better suited to the production of grain and hay. In wet years, they remain cold and wet for a considerable length of time, which makes their cultivation difficult.

Washburn silt loam has been developed in depressions in the Caribou uplands where a layer of muck or organic matter has accumulated over the surface. The surface is a dark-brown to black, mucky, silty clay loam that becomes granular rather than mucky under cultivation, underlain by an olive-gray, mottled loam that rests on a gray, calcareous till. Washburn silt loam is the most extensive of the poorly drained soils in the area. Grain and hay do especially well and high yields are produced. It is also an excellent pasture soil. In depressions and on smooth slopes where the soil ordinarily occurs erosion is not a serious problem, but on the steeper slopes sheet erosion may become rather serious and occasionally there is some gully erosion.

Easton silt loam differs from Washburn silt loam mainly in having a white to gray surface soil and a lower

content of organic matter. The surface soil is usually mottled and streaked and is underlain by dull gray silty loam that rests on gray till. Potatoes are likely to be drowned out on this soil, which is cold and wet in the spring. Easton silt loam is much in need of organic matter and drainage if good yields of any crop are to be expected. It responds to fertilization only fairly well. The soil is best adapted to grains and hay crops. It usually occupies swales and depressions in the uplands where erosion is not serious.

The Caribou-Easton and the Caribou-Washburn complexes are associations of the better drained upland soils with the Easton and Washburn soils in generally depressed areas. They are extremely variable in their nature and are better left out of potato cultivation, being used mainly for grain and hay.

This group occupies land-capability classes III and IV, 61.9 percent being in class III and 38.1 percent in class IV.

#### GROUP 6

##### MISCELLANEOUS SOILS NOT SUITABLE FOR CULTIVATION

Rough or very poorly drained land comprises 7.3 percent of the area, or 2,251 acres. These soils and land types have been grouped together not because of any similarity of texture or structure but because none of them is suitable for cultivation. All areas of these land types are in class V according to use capability. Muck forms the largest part of group 6, as it occupies 1,273 acres, or 4.1 percent of the entire area. Muck is a highly organic soil, poorly drained, and wet during considerable periods. It occurs in depressions and on flat surfaces. If drained properly, it could be used for the cultivation of crops, but this has not been done. Caribou stony loam is too steep and stony for cultivation, and most of the stones or limestone ledges that outcrop in this soil would be difficult to remove. The undifferentiated alluvial soils are extremely variable in their nature and wet through long periods in the year.

## Erosion

The different types and degrees of erosion mapped in the Presque Isle area have been defined in detail on page 20. The acreage and percentage of each erosion group and class are shown in table 7. Sheet erosion is the dominant type. Gullies were mapped in conjunction with sheet erosion on only 2.8 percent of the area. Figure 13, A, shows a gully and an alluvial fan formed in the Caribou loam.

TABLE 7.—Acreage and percentage of each erosion group and class

Erosion group and class <sup>1</sup>	Area	
	Acres	Percent
Recent alluvial and colluvial deposits: +.....	644	2.1
No apparent erosion: 1.....	5,962	19.3
Slight erosion: 2.....	3,285	10.7
27.....	69	.2
6.....	276	.9
Total.....	3,630	11.8
Moderate erosion: 28.....	5	(?)
3.....	18,215	59.0
37.....	590	1.9
Total.....	18,810	60.9
Severe erosion: 38.....	2	(?)
4.....	1,602	5.2
47.....	187	.6
6.....	2	(?)
Total.....	1,793	5.8
Very severe erosion: 48.....	33	.1
5.....	11	(?)
58.....	3	(?)
Total.....	47	.1
Total <sup>2</sup> .....	30,886	100.0

<sup>1</sup> For explanation of erosion symbols, see p. 20 or the legend on the back of map accompanying this bulletin.

<sup>2</sup> Less than 0.1 percent.

<sup>3</sup> Quarries not included.

Recent alluvial and colluvial deposits were mapped on only 644 acres, or 2.1 percent of the area. These deposits consist of materials from upland sources carried by running water and deposited to varying depths with some sorting of material into coarse, medium, and fine particles. They are present chiefly along the Aroostook River and the flood plains of the smaller streams. Some deposition was mapped in potato

fields where soil was deposited at the lower ends of the potato rows (fig. 13, B).

No apparent erosion was mapped on 5,962 acres, or 19.3 percent of the area. This figure alone would tend to indicate that the area is in a fairly good position as far as erosion is concerned. Table 8, which shows the relation of erosion to present land use, brings out the fact, however, that 4,976 acres of this uneroded land is in woodland, which, when protected from grazing, affords the best known natural protection against erosion. In other words, most of the land not affected by erosion has never been cleared. Of the cultivated land, only 187 acres have not been affected by erosion, nearly all of which is on slopes of less than 2 percent. About half of the area of the soils in group 5 and three-fourths of the area in group 6 show no apparent erosion. These soils lie on level or depressed areas and have to a large extent been left in woodland. Table 9 shows the distribution of the erosion groups in each of the soil groups.

Slight erosion includes all areas from which less than 25 percent of the topsoil has been removed, including 69 acres on which occasional shallow gullies, no more frequent than 3 per acre, have been formed. It was mapped on 3,630 acres, or 11.8 percent of the area. The greatest acreage of slight erosion, or 2,145 acres, is on slopes ranging from 2 to 8 percent, as shown in table 10, and almost half of the total acreage of slight erosion is on cropland. Land in pasture has contributed a fifth of the slightly eroded land and the remainder is divided between woodland, idle land, and farmyards and urban areas. Slight erosion was mapped most widely on the soils of groups 3, 4, and 5, although a large acreage was mapped on the soils of group 1.

Moderate erosion includes chiefly land that has lost from 25 to 75 percent of the topsoil. It was mapped on 18,810 acres, or 60.9 percent of the area and, therefore, represents the generally prevailing condition in the area. Of this total acreage of moderately eroded land, 18,083 acres, or 96.1 percent of the erosion group, is on cropland.



Me-33, Me-14

**Figure 13.—A, Gullying and an alluvial fan formed in Caribou loam; B, erosion and deposition in potato field.**

TABLE 8.—Distribution of the erosion groups in each land use class

Erosion group	Cropland		Idle land		Pasture		Woodland		Farmyards and urban areas		Entire project <sup>1</sup>	
	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
Recent alluvial and colluvial deposits.....	43	0.2	62	5.4	76	4.4	463	7.8	0	-----	644	2.1
No apparent erosion.....	187	.9	448	39.4	351	20.1	4,976	83.8	0	-----	5,962	19.3
Slight erosion.....	1,714	7.8	416	36.6	728	41.8	474	8.0	298	96.4	3,630	11.8
Moderate erosion.....	18,083	83.1	149	13.1	544	31.2	23	.4	11	3.6	18,810	60.9
Severe erosion.....	1,893	7.8	56	4.9	44	2.5	0	-----	0	-----	1,793	5.8
Very severe erosion.....	40	.2	7	.6	0	-----	0	-----	0	-----	47	.1
<b>Total.....</b>	<b>21,760</b>	<b>100.0</b>	<b>1,138</b>	<b>100.0</b>	<b>1,743</b>	<b>100.0</b>	<b>5,936</b>	<b>100.0</b>	<b>309</b>	<b>100.0</b>	<b>130,886</b>	<b>100.0</b>

<sup>1</sup> Quarries not included.

TABLE 9.—Distribution of the erosion groups in each soil group

Soil group	Recent alluvial and colluvial deposits		No apparent erosion		Slight erosion		Moderate erosion		Severe erosion		Very severe erosion		Total
	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	
1. Well-drained upland soils on calcareous glacial till.....	13	0.1	1,647	8.1	1,065	5.2	16,330	80.4	1,265	6.2	0	-----	20,320
2. Shallow well-drained soils on glacial till.....	0	-----	474	23.5	209	10.4	762	37.8	523	26.0	47	2.3	2,015
3. Deep well-drained soils on outwash terraces and bottomlands.....	13	.9	395	28.0	562	39.9	434	30.8	5	.4	0	-----	1,409
4. Imperfectly drained soils.....	15	1.0	180	12.2	327	22.1	955	64.7	0	-----	0	-----	1,477
5. Poorly drained soils.....	124	3.6	1,629	47.7	1,247	39.5	314	9.2	0	-----	0	-----	3,414
6. Miscellaneous soils not suitable for cultivation.....	479	21.3	1,637	72.7	120	5.3	15	.7	0	-----	0	-----	2,251
<b>Entire project <sup>1</sup>.....</b>	<b>644</b>	<b>2.1</b>	<b>5,962</b>	<b>19.3</b>	<b>3,630</b>	<b>11.8</b>	<b>18,810</b>	<b>60.9</b>	<b>1,793</b>	<b>5.8</b>	<b>47</b>	<b>.1</b>	<b>30,886</b>

<sup>1</sup> Quarries not included.

TABLE 10.—Distribution of the erosion groups in each slope class

Erosion group	A slopes (less than 2 percent)		B slopes (2-8 percent)		BB slopes (8-15 percent)		C slopes (15-25 percent)		D slopes (25 percent and over)		Entire project <sup>1</sup>	
	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
Recent alluvial and colluvial deposits.....	595	16.6	44	0.2	3	0.1	2	0.1	0	-----	644	2.1
No apparent erosion.....	2,322	64.8	2,245	11.9	522	9.1	633	32.8	240	32.4	5,962	19.3
Slight erosion.....	661	18.4	2,145	11.3	402	7.0	164	8.5	258	34.9	3,630	11.8
Moderate erosion.....	7	.2	14,455	76.5	3,810	66.4	373	19.3	165	22.3	18,810	60.9
Severe erosion.....	0	-----	9	.1	992	17.3	715	37.1	77	10.4	1,793	5.8
Very severe erosion.....	0	-----	0	-----	5	.1	42	2.2	0	-----	47	.1
<b>Total.....</b>	<b>2,585</b>	<b>100.0</b>	<b>18,898</b>	<b>100.0</b>	<b>5,734</b>	<b>100.0</b>	<b>1,929</b>	<b>100.0</b>	<b>740</b>	<b>100.0</b>	<b>30,886</b>	<b>100.0</b>

<sup>1</sup> Quarries not included.

Most of this erosion group occurs on slopes ranging from 2 to 15 percent, or the B and BB slopes. Moderate erosion occurs most extensively on the soils that have been cropped most heavily for potatoes and the largest part of the soils of groups 1, 2, and 4 have been moderately eroded.

Severely eroded areas have lost 75 percent or more of their topsoil. Severe erosion was mapped on 1,793 acres, or 5.8 percent of the area. It is

largely restricted to slopes over 8 percent, none being mapped on the A slopes and only 9 acres on B slopes. Almost the entire acreage severely eroded is cultivated. Soils of groups 1 and 2 contribute the largest acreages in this erosion group. None was mapped on the soils of groups 4, 5, and 6.

Very severe erosion was mapped on land that has lost over 75 percent of the topsoil and is severely gullied and on

TABLE 11.—Distribution of the land use classes in each soil group

Soil group	Cropland		Idle land		Pasture		Woodland		Farmyards and urban areas		Total
	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	
1. Well-drained upland soils on calcareous glacial till.....	17,292	85.1	345	1.7	694	3.4	1,726	8.5	263	1.3	20,320
2. Shallow well-drained soils on glacial till.....	1,266	62.8	87	4.3	62	3.1	600	29.8	0	-----	2,015
3. Deep well-drained soils on outwash terraces and bottomlands.....	950	67.4	141	10.0	135	9.6	143	10.2	40	2.8	1,409
4. Imperfectly drained soils.....	1,169	79.1	51	3.4	125	8.5	131	8.9	1	.1	1,477
5. Poorly drained soils.....	1,049	30.8	356	10.4	554	16.2	1,450	42.5	5	.1	3,414
6. Miscellaneous soils not suitable for cultivation.....	34	1.5	158	7.0	173	7.7	1,886	83.8	0	-----	2,251
Entire project <sup>1</sup> .....	21,760	70.5	1,138	3.7	1,743	5.6	5,936	19.2	309	1.0	30,886

<sup>1</sup> Quarries not included.

areas on which only 6 inches of subsoil remain. Very severe erosion occurs on only 47 acres, 40 of which were still being cultivated at the time of the survey. The remainder was idle. Forty-two acres of this group are on C slopes, ranging from 15 to 25 percent, the remainder being on BB slopes. Very severe erosion is restricted entirely to the soils in group 2, which lie on the steeper slopes of the area and are extremely shallow.

**Land Use**

More than 70 percent of the Presque Isle area, or 21,760 acres, was cultivated at the time of the survey. It is estimated that between 40 and 50 percent of the cropland is in potatoes. Table 11, which shows the distribution of land use in each soil group, shows that the soils in groups 1, 2, 3, and 4 are largely in cropland; whereas group 5 is less intensively cultivated and only 1.5 percent of soil group 6 is cultivated. The largest acreage in cropland is in soil group 1, since these soils occupy 65.8 percent of the area and are the

soils best suited to potato culture. Of the total cropland, 15,262 acres, or 70.1 percent, is on B slopes, and most of the remainder on BB slopes. Of all the cropland 83.1 percent has been moderately eroded, and 8.0 percent, or 1,733 acres, has been severely or very severely eroded. This would indicate that although most of the cultivated land occurs on slopes that may be cultivated with safety, control measures must be adopted soon to keep them from being seriously damaged by erosion. Table 12 indicates the distribution of land use in each of the slope classes.

At the time of the survey woodland occupied 5,936 acres, or 19.2 percent of the area, most of it on soils that had never been cultivated, because they either were poorly drained or too steep or were in areas remote from farming operations. Nearly one-half of the land remaining in woodland was suitable for cultivation with control measures. Some of this land that is on suitable soil types and slopes has been brought into cultivation in the last few years. Over 70 percent of the

TABLE 12.—Distribution of the land use classes in each slope class

Land use class	A slopes (less than 2 percent)		B slopes (2-8 percent)		BB slopes (8-15 percent)		C slopes (15-25 percent)		D slopes (25 percent and over)		Entire project <sup>1</sup>	
	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
Cropland.....	720	20.1	15,262	80.7	4,630	80.7	1,033	53.5	115	15.5	21,760	70.5
Idle land.....	300	8.4	548	2.9	91	1.6	88	4.6	111	15.0	1,138	3.7
Pasture.....	285	7.9	908	4.8	324	5.7	108	5.6	118	15.9	1,743	5.6
Woodland.....	2,262	63.1	1,956	10.3	622	10.8	700	36.3	396	53.6	5,936	19.2
Farmyards and urban areas.....	18	.5	224	1.3	67	1.2	0	-----	0	-----	309	1.0
Total.....	3,585	100.0	18,898	100.0	5,734	100.0	1,929	100.0	740	100.0	30,886	100.0

<sup>1</sup> Quarries not included.

woodland was on A and B slopes. The remainder was distributed in the other slope classes. Only 6.7 percent of the woodland was on D slopes, but woodland occupied more than half of the D slopes in the entire area.

Pasture was mapped on 1,743 acres, or 5.6 percent of the area. It is fairly well distributed among the different soils in the area. The greatest percentage on any soil group, although not the largest acreage, is on the poorly drained soils of group 5, which are not well suited to cultivation. Of the pasture area, 52.1 percent of the pasture is on B slopes, 16.4 percent on A slopes, and 18.6 percent on BB slopes. One-fifth of the pasture shows no apparent erosion, which indicates that a good growth of pasture grasses not subjected to overgrazing has been maintained in these areas. Slight erosion has occurred on 41.8 percent of the land in pasture and moderate erosion on 31.2 percent. As a rule, the pastures are insufficiently grazed and little interest is shown in pasture improvement. There is, however, a growing interest in the production of beef in the area and more land is gradually being used for pasture.

The large areas of both woodland and pasture on the A and B slopes are due chiefly to soil conditions. The soils in many of these level or depressed areas are too poorly drained to be suitable for cultivation.

The conservation survey shows only 3.7 percent of the area, or 1,138 acres, as idle land. About one-third of this land was temporarily idle because of

financial conditions and will be put back in cultivation as soon as the farmers are financially able to do so. Much of the remainder is unsuited to cultivation and is not now needed for pasture. Most of the idle land is on slopes of less than 8 percent. Nearly half of it is on soil groups 4, 5, and 6, and is idle because of soil conditions rather than slope.

### Slope

A slopes, less than 2 percent, occur on 3,585 acres, or 11.6 percent of the area. Table 13 presents the distribution of slopes in the various soil groups. About one-half of the A slopes are on soils of group 6 and about one-fourth are on the poorly drained soils of group 5. No A slopes were mapped on the soils of group 2. A large part of the A slopes are in woodland because poor drainage makes them unsuitable for cultivation. Crops occupy 20.1 percent and woodland 63.1 percent of these slopes. A slopes for the most part are not eroded, or only slightly so. Considerable deposition, some of it harmful, has occurred on the bottom lands.

B slopes, from 2 to 8 percent, were mapped on 18,898 acres, or 61.2 percent of the area. These slopes make up 70 percent of the total cropland and 80.7 percent of their area is occupied by crops. The largest acreage of B slopes naturally falls within the soils of group 1, and the greatest part of the soils of groups 4 and 5 is also on these slopes. Three-fourths of the B slopes are moderately eroded.

TABLE 13.—Distribution of the slope classes in each soil group

Soil group	A slopes (less than 2 percent)		B slopes (2-8 percent)		BB slopes (8-15 percent)		C slopes (15-25 percent)		D slopes (25 percent and over)		Total  Acres
	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	
1. Well-drained upland soils on calcareous glacial till.....	73	0.8	14,400	70.9	4,587	22.6	903	4.4	357	1.8	20,320
2. Shallow well-drained soils on glacial till.....	0	-----	330	16.4	844	41.9	645	32.0	196	9.7	2,015
3. Deep well-drained soils on outwash terraces and bottom lands.....	604	42.9	490	34.1	137	9.7	52	3.7	136	9.6	1,409
4. Imperfectly drained soils.....	210	14.2	1,191	80.6	69	4.7	7	.5	0	-----	1,477
5. Poorly drained soils.....	964	28.2	2,406	70.5	44	1.3	0	-----	0	-----	3,414
6. Miscellaneous soils not suitable for cultivation.....	1,734	77.0	91	4.0	53	2.4	322	14.8	51	2.3	2,251
Entire project <sup>1</sup> .....	3,585	11.6	18,898	61.2	5,734	18.6	1,929	6.2	740	2.4	30,866

<sup>1</sup> Quarries not included.

BB slopes, from 8 to 15 percent, occupy 5,734 acres, or 18.6 percent of the area. As in all except the A slopes, the largest acreage is in the soils of group 1. About two-fifths of the shallow soils (group 2) are on these slopes. Most of these slopes have been moderately or severely eroded and require careful erosion-control practices for permanent use as cropland. Cropland occupies 80.7 percent of this group and 10.8 percent is in woodland.

C slopes, from 15 to 25 percent, occupy 1,929 acres, or 6.2 percent of the total area. These slopes are too steep for cultivation and should be put under some permanent cover of grasses or woody vegetation. At the time of the survey 53.5 percent of their total area was cropped. This acreage should be retired to some permanent cover. Woodland occupies 36.3 percent of these slopes. No apparent erosion was mapped on 32.8 percent of the C slopes, which was all in woodland or permanent pasture. Severe erosion has occurred on 37.1 percent of these slopes, indicating the immediate need of retiring this land from cultivation. C slopes occur mainly in the soils of groups 1, 2, and 6.

D slopes, those over 25 percent, were mapped on only 740 acres, or 2.4 percent of the area. These slopes should all be retired to a permanent cover, preferably woodland. There were no D slopes mapped in the soils of groups 4 and 5. Woodland occupied 53.6 percent of these steep slopes. Although 32.4 percent of the D slopes was mapped as having no apparent erosion, the remainder shows considerable erosion, indicating that some land may have been retired to woodland because of erosion. Cultivation was being carried on on 15.5 percent of these slopes. This land should be taken out of the rotations.

### *Summary of the Relation of Erosion to Other Factors*

Erosion in this area has not yet become serious enough to be the direct cause of land abandonment. Its effect on potato yields has been masked by the heavy applications of improved and

concentrated fertilizers and by the use of improved methods of cultivation and spraying. Although these improved methods have increased yields, they have also contributed to further erosion. The introduction of power machinery has encouraged the farming of larger fields and led to the removal of stone walls and fence rows that acted as soil-saving structures. Shortened rotations, which provide little or no protective cover for the land for any length of time, have speeded up erosion processes. The planting and ridging of potatoes in long rows that run up and down the long, gentle slopes of the large fields have provided run-off channels of considerable depth.

The effect of climatic conditions on erosion is well evidenced in this area, as the short growing season has determined somewhat the farming practices employed. The huge volume of water resulting from the spring thaws has caused tremendous soil losses.

Soil types have influenced the kind and degree of erosion. Soil group 2 has been the most severely eroded. Soil groups 1 and 4 are largely moderately eroded, and soil groups 3 and 5, for the most part, are only slightly or not at all eroded. The greater part of soil group 6 shows no erosion. This is primarily the result of land use as very little of this group has ever been cultivated.

Increase in the steepness of slope increases enormously the amount of soil lost. Furthermore, length of slope determines the amount of water that will accumulate on any slope before being carried off. The long slopes in this area permit the accumulation of a considerable volume of water, which causes much sheet erosion over large areas. No apparent erosion is dominant on the A slopes of this area, as would be expected; moderate erosion is the dominating erosion group on the B and BB slopes. The BB slopes are also severely eroded to the extent of 17.3 percent of their area. C slopes are, for the most part, at least moderately eroded, although 32.8 percent of their area shows no apparent erosion. Here, land use has influenced erosion as 36.3 percent of the C slopes is in woodland.



Land use has also affected the erosion of the D slopes as over half of the acreage of the D slopes is in woodland.

The influence of land use on erosion is well known and further evidence of soil loss on land in continuous cultivation to row crops is shown by this survey. Moderate and severe erosion prevail on the cropland in the area. The greatest part of the woodland shows no erosion. No apparent and slight erosion are about equally distributed on the idle land of the area, although 18 percent is moderately or severely eroded. The pastures in the area have been slightly to moderately eroded with a small acreage severely eroded.

## Summary

THE PRESQUE ISLE Demonstration Project covers an area of 30,912 acres in the heart of the concentrated potato-growing section of Aroostook County, Maine. This bulletin reports the results and findings of the physical survey made of the area, on which basis the land was classified according to use capability.

Five classes of land according to use capability were established and described for the area. Only 2.2 percent of the land is shown to be class I land, or land that may be farmed safely and permanently without special conservation practices. Half of the area may be cultivated with the use of simple practices and is classed as class II land. Land of class III, which may be used for row crops only if special intensive practices are employed to conserve and maintain the soil, occupies 24.2 percent of the area. Class IV, suitable only for very limited cultivation, and class V, not suitable for any cultivation, make up 9.9 percent and 13.8 percent, respectively, of the project area. Of the land now in cultivation 13.6 percent should be retired to permanent hay, pasture, or woodland.

Recommendations as to the cropping practices and special conservation measures needed for each class of land are made according to the use capability of the land and the nature of the soil. These include the use of fertilizers,

lime, and green-manure crops for the maintenance of soil productivity and suitable reaction, and the application of such special conservation measures as contour cultivation, strip cropping, and terracing. The use of winter cover crops and the sodding of waterways are also recommended. Proper management of pastures, woodlands, and the establishment of food and cover for wildlife should be included in the conservation program.

The survey of soils, slopes, and erosion also furnished the basis on which individual farm plans for soil conservation and land use changes were made for 111 farms comprising an area of 15,636 acres, in the area.

These great soil losses have occurred mostly within the past 40 to 50 years of intensive farming. Today not much land has been abandoned or is lying idle because of destruction by erosion, but if soil losses continue at the present rate, crop yields are bound to decline in spite of heavy fertilization, and in places all of the tillable soil will be lost. The result will be abandoned and idle land. The problem today is to conserve the land which is the foundation of the rich agriculture in the Aroostook area.

## Appendix

### *Soils of the Presque Isle Area*

THE UPLAND soils of the Presque Isle area have been developed on glacial till. They belong to the great soil group known as Podsoils, which occurs in the northern parts of Maine, New Hampshire, Vermont, New York, Michigan, Wisconsin, Minnesota, and in small areas in Pennsylvania, New Jersey, Long Island, and West Virginia. These soils have been developed in a cool, moist climate under a mixed coniferous and deciduous tree cover. The Podsoils, where undisturbed by cultivation, are characterized by a gray-to-white mineral layer 1 to 3 inches thick, which lies beneath a layer of organic material of forest duff. The gray-to-white layer has been leached of most of its iron and aluminum and is low in organic matter. Underlying this layer is a horizon of loose, rich-brown or coffee-brown soil that becomes lighter in color with depth, grading from the coffee brown to a light brown or yellowish brown. This lower horizon, or subsoil, is much richer in iron, aluminum, and organic-matter content than the surface horizons. These horizons rest on parent material of glacial till,

which in turn rests on shaly Aroostook limestone. Where the soils have been cultivated, the true surface soil has been mixed with the subsoil layer so that the characteristic cultivated, well-drained upland soil of the area is composed of two horizons, or a layer of loose, yellowish-brown or rich-brown topsoil 10 inches or more thick, underlain by the parent glacial till. The surface soils of the poorly drained upland soils are either gray because of poor drainage or black because of the accumulation of organic matter.

Table 6 on page 21 of the text gives the extent of each soil type mapped in the Presque Isle area. Since the soil survey of the Aroostook area was made in 1917,<sup>2</sup> the Conant, Doyle, Houlton, Maysville, Parkhurst, and Presque Isle soils have been recognized, and definitions of the other soils have been somewhat revised. A description of each soil type mapped in the project is therefore given here for reference.

#### CARIBOU LOAM

Caribou loam is the most extensive soil type mapped in the project area and is considered its best potato soil. As mapped in a forested area, the soil profile consists of about 2 inches of a black organic layer or duff (A<sub>0</sub> horizon), matted by roots, underlain by approximately 2 inches (A<sub>1</sub> horizon) of a light-gray silty loam of floury consistency. These two layers make up the true surface soil. The upper part of the subsoil is a coffee-brown loam, light textured and mellow, to a depth of 5 inches. From 5 to 10 inches the subsoil is a yellowish-brown heavy loam, firm but friable, structureless, which changes to a pale yellowish-brown loam extending from 10 to 18 inches. At a depth of approximately 18 inches a pale yellowish-gray friable till, the upper C horizon, which contains numerous shale fragments is present. At 24 inches this grades into a very slightly compact gray till containing numerous bluish-gray fragments. Both surface soil and subsoil are strongly acid in reaction. The reaction of the parent material, which is derived from calcareous shales and limestone, is neutral to alkaline, usually about pH 7.0. Shale fragments and gravel of quartzite, granite, and limestone are present throughout the entire profile. The depth of the till over bedrock ranges from 3 to 6 feet, whereas the depth of the soil profile ranges from 15 to 24 inches. The thickness of each of the layers of the soil profile varies from place to place.

When cultivated as most of this soil is, the surface and subsoil layers are mixed in varying degrees, giving rise to a layer about 12 to 14 inches thick, which is brown, loose, and mellow, underlain by a slightly weathered yellowish-gray till that becomes more compact at 24 inches.

Both surface and subsoil drainage are good. The loamy texture and open structure make

<sup>2</sup> HURST, LEWIS A., KNOBEL, E. W., HENDRICKSON, B. H. SOIL SURVEY OF THE AROOSTOOK AREA, MAINE. U. S. Dept. Agr., Bur. Soils Field Oper. 1917, 44 pp., illus.

the soil responsive to fertilizers and excellent for potatoes. The acidity of the surface layers is sufficient to prevent potato scab.

Caribou loam is well distributed over the gently sloping to gently rolling uplands. Although it occurs occasionally on some of the steeper slopes in the area, it was mapped mainly on B and BB slopes. The native vegetation on the areas that have not been cleared is beech, hard maple, and yellow birch mixed with some spruce and fir.

Under cultivation Caribou loam is subject to serious erosion when in clean tilled crops. Of the 12,877 acres of this type mapped in the project, 10,877 acres have been moderately eroded, or have lost on the average one-half of the original topsoil. An additional 243 acres have lost 75 percent or more of the original topsoil.

At the time of the survey 10,625 acres were in cropland, 368 in pasture, 1,485 in woodland, and 252 acres were idle.

#### CARIBOU FINE SANDY LOAM

Caribou fine sandy loam varies from Caribou loam in that under cultivation the texture of the surface soil and the upper part of the subsoil is a fine sandy loam, which is brown in color. It is of soft-crumb structure. The lower subsoil is an unconsolidated olive-green sand that grades into a compact, dull-gray clay loam that contains numerous gravel and stone fragments. Surface drainage is very good and the internal drainage is good. It is considered a good potato soil.

This soil occurs on smooth to undulating areas and was mapped entirely on B and BB slopes in this area. The principal areas occur along U. S. Highway No. 1, approximately 4 miles north of Presque Isle and on State Highway No. 161, approximately one-half mile east of Caribou.

Only 55 acres of the type were mapped in the area of which 47 were in cropland, 3 in pasture, and 5 in farmyards and urban areas. It is subject to serious erosion if cultivated, as 43 acres of the 55 mapped have lost from 25 to 75 percent of the topsoil.

#### CARIBOU GRAVELLY LOAM

The surface soil of Caribou gravelly loam is somewhat darker than that of the loam and has a gravelly silty loam texture. A large part of both surface and subsoil is gravel and fragmentary stone, which are rounded and waterworn and are mainly of quartz, granite, and quartzite. This soil type is considered a good potato soil, being well drained and yet not droughty.

The gravelly loam occurs on somewhat steeper slopes than the loam, being mapped mainly on B, BB, and C slopes in the area. It is subject to serious erosion if cultivated; over two-thirds of the acreage mapped has lost from 25 to 75 percent of the topsoil and about one-fourth has lost over 75 percent of the topsoil.

Of the 3,040 acres of Caribou gravelly loam mapped in the area, 2,885 acres were in cropland, 25 were idle, 91 in pasture, 32 in woodland, and 7 in farmyards and urban areas.

#### PRESQUE ISLE LOAM

The Presque Isle series differs from the Caribou series with which it is closely associated in the somewhat thicker surface soil and subsoil layers and in the considerable amount of foreign material of granite and igneous matter incorporated in the parent till. The till deposits, derived from calcareous shale, limestone, and erratics, on which the Presque Isle soils are developed are considerably deeper than those on which the Caribou are developed. They range from 15 to 25 feet or deeper, whereas those from which the Caribou are developed range from 3 to 6 feet. Because of the thickness of these deposits, the Presque Isle has developed a relief somewhat different from that of the underlying rock and is typically drumloid. In other respects the Presque Isle and the Caribou soils are similar.

Under forest cover, the profile of the Presque Isle loam consists of approximately 2 inches of dark-brown forest duff ( $A_0$  horizon) underlain by 2 inches of gray loam ( $A_1$  horizon). The upper subsoil is a rich yellowish-brown mellow loam of soft-crumb structure underlain at a depth of 5 inches by a yellowish-brown loam that fades into pale yellowish-brown to gray and is of firm but friable crumb structure. The subsoil ranges from 12 to 16 inches thick and is underlain by a gray, heavy, faintly compact till that contains a considerable number of gravel and shale fragments ( $C_1$  horizon). This till or parent material changes after 20 to 24 inches into a compact heavy bluish-gray calcareous till that contains many gravel and shale fragments and boulders of limestone and erratics ( $C_2$  horizon). The entire solum is acid, the pH ranging from 4.5 to 5.0 until the lower C horizon is reached where the reaction is neutral to alkaline, the pH being generally about 7.5. Under cultivation, the surface and subsoil layers have been mixed so that the usual surface layer is a yellowish-brown loam 8 to 10 inches in depth. Both surface and internal drainage are good.

Presque Isle loam occurs on the uplands along the Aroostook River immediately above the river bottom or terrace soils. It usually occurs on undulating to rolling relief. In this area it was mapped mainly on B slopes, from 2 to 8 percent. The native vegetation on areas not cleared consists of maple, beech, birch, and poplar.

Of the 1,853 acres of Presque Isle loam mapped in the area, 1,638 acres have lost from 25 to 75 percent of the topsoil. Nine acres were idle at the time of the survey, 1,590 were in cropland, 97 in pasture, 127 in woodland, and 30 in farmyards and urban areas. The soil is used extensively for potatoes, oats, and hay.

#### PRESQUE ISLE FINE SANDY LOAM

Presque Isle fine sandy loam differs from the loam in that, under cultivation, the surface soil is of a fine sandy loam texture, brown in color, and of soft-crumb structure. This layer about 8 inches thick is underlain by a brighter coffee-brown fine sandy loam that grades into brown with depth. From 12 to 36 inches occurs an olive-green fine sand that is underlain by an olive-gray gravelly sandy till. The solum is acid throughout, and the underlying till is calcareous.

The fine sandy loam occurs on much the same relief as the loam and has very good surface and internal drainage. It is of very small extent in the area, only 116 acres being mapped. It is closely associated with the Presque Isle loam and the Presque Isle gravelly loam. Most of it is cultivated or in pasture. It is considered a good potato soil and is also good for grain, clover, and grasses.

This soil is subject to severe erosion if cultivated and of the 116 acres mapped in this area, 105 have lost from 25 to 75 percent of the topsoil. Shallow gullying has also affected this type.

#### PRESQUE ISLE GRAVELLY LOAM

Presque Isle gravelly loam is more widely distributed in the area than is either the loam or fine sandy loam types of the Presque Isle series. Under cultivation, the surface soil is a brown gravelly loam 6 to 8 inches deep, underlain by a yellowish-brown heavy gravelly loam upper subsoil that grades into a mixed yellow and yellowish-gray heavy gravelly loam. At 18 inches the subsoil is underlain by a gray compact gravelly till that is neutral to alkaline in reaction. At 36 inches lies a very compact gravelly calcareous till. The gravel consists of limestone, quartz, and igneous erratics. The surface soil and subsoil are acid, the pH ranging from 4.5 to 6.0. Surface and internal drainage are very good.

The gravelly loam occurs on smooth to undulating relief on the uplands along the Aroostook River, usually between the terrace soils and the Caribou soils.

The Presque Isle gravelly loam is subject to serious erosion if cultivated and is more affected by shallow gullying than are the Caribou soils. Nearly all of it has been cleared for cropland and pasture land. Of the 2,379 acres mapped in the area, 1,802 acres have lost from 25 to 75 percent of the topsoil but are not noticeably affected by gullying; an additional 99 acres have lost 75 percent or more of the topsoil, and 230 acres have lost not only 25 percent or more of the topsoil but also been affected by gullying.

#### HOULTON SILT LOAM

Houlton silt loam is an upland soil consisting of shallow till over limestone. It is closely associated with the Caribou soils and although nearly all of it is in cropland, it is not used extensively for potatoes because of the ten-

dency to scab. This is due to the alkaline reaction of the surface soil. The A horizon or surface soil is a light-brown to brown mellow silt loam with a crumb structure, about 6 to 10 inches deep. This is underlain by a yellowish-brown to reddish-brown silt loam to silty clay loam with irregular angular to lumpy breakage. This layer from 6 to 12 inches thick rests on limestone. The profile is neutral to alkaline throughout, the pH of the A horizon where sampled being 7.3 and that of the subsoil or B horizon 7.5. The surface and internal drainage is good. Depth to limestone varies from place to place, although it is ordinarily not more than 24 inches. Outcrops of limestone are numerous in places.

Native vegetation consists of hardwoods, maple, beech, aspen, and birch. Only 73 acres were mapped, which occur in scattered small areas throughout the project, the largest area being in Fort Fairfield township near the Aroostook River.

Houlton silt loam is subject to severe sheet erosion when cropped. Over one-half of the total acreage mapped has lost 25 to 75 percent of the original shallow topsoil, and an additional one-third has lost 75 percent or more. Almost the entire acreage of the soil in the project is in cropland, with a few scattered areas in woodland.

#### MAPLETON LOAM

Mapleton loam consists of shallow till, similar to the Caribou, laid down in shallow deposits over calcareous shale. It is faintly podsolized under forested conditions, but in most areas a gray, leached mineral layer has not developed under the forest duff. The surface soil, or A horizon, is a dark-brown loam of granular structure that contains considerable partially disintegrated organic matter and some finely divided organic matter incorporated with the soil. This layer, 1 to 3 inches thick, is underlain by a yellowish-brown upper subsoil, the B<sub>1</sub> horizon, that is a mellow, firm but friable loam with a soft-crumb structure, grading into a grayish-yellow loam, the B<sub>2</sub> horizon. The subsoil, which ranges from 8 to 10 inches thick, is underlain by the parent material or C horizon of grayish-yellow to gray, firm but friable loam that contains numerous gravel and shale fragments. This 15- to 20-inch layer rests on bedrock of gray calcareous shale. Depth to bedrock ranges from 12 to 36 inches but is usually about 24 inches. Surface and internal drainage are good. The profile is acid throughout, the pH of samples of the various horizons being as follows: A, 4.5; B, and B<sub>2</sub>, 5.0; C, 6.0.

Mapleton loam occurs mainly on the ridge tops scattered over the gently sloping areas occupied by the Caribou soils. The relief ranges from almost flat to steeply sloping, although the soil generally occurs on the steeper slopes. It is extremely subject to both sheet and gully erosion and is soon rendered useless for cultivated crops. Two-thirds of the acreage mapped in the project

area has lost 25 percent or more of the original shallow topsoil and much of it is gullied.

Mapleton loam, which occupies 1,942 acres in the project, is largely in cropland or woodland. About two-thirds of it is cropped for potatoes or timothy and clover hay. With the exception of a few scattered areas in pasture or idle, the remainder is in woodland.

#### AROOSTOOK SILT LOAM

Aroostook silt loam and the associated Aroostook fine sandy loam are well-drained alluvial soils that occur along the Aroostook River and the larger streams of the area. They receive material washed from the upland soils that are developed on calcareous glacial till. The surface soil of the Aroostook silt loam is a dark-brown, mellow silt loam that, below 4 inches and extending to a depth of 14 inches, becomes brown and somewhat platy in structure. This surface soil, which is neutral in reaction, is underlain by an alkaline, brown silt loam to very fine sandy loam that is friable and extends to a depth of approximately 30 inches. Below this to a depth of about 42 inches is a layer of brown, fine sandy loam or sandy loam of single-grain structure, which is underlain by bedded coarse sand and gravel. The surface and subsoil layers are free from stone and gravel as a rule. Surface drainage in this soil is good and the internal drainage is very good. The depth to the better drained sandy layer may vary from the 30 inches described above, being anywhere from 15 to 48 inches, whereas the depth to the interbedded sand and gravel may vary from 30 to 60 inches. It averages, however, around 42 inches.

Birch, ash, elm, and willow constitute the native vegetation on this soil, which was mapped on 299 acres in the project. It occurs generally on flat surfaces although it was mapped on slopes as steep as 8 to 15 percent. It is usually subject to annual spring flooding, which makes it a late soil for cultivation. About half of the acreage in the area is in cropland, being used for potatoes, grain, and hay with good yields. It is subject to very little erosion, mainly because of its position.

#### AROOSTOOK FINE SANDY LOAM

Aroostook fine sandy loam varies from the silt loam not only in the texture of the surface and lower horizons but also in that the lower horizons are lighter in color than those of the silt loam and the profile is more acid. The surface soil, a dark-brown, fine sandy loam that is very strongly acid, is underlain at a depth of approximately 10 inches by a grayish-brown, fine sandy loam, single-grained which, where sampled, has a pH of 6.0. Interbedded layers of sand, fine sand, and silt occur at depths of 20 to 36 inches. These in turn are underlain by beds of coarse sand and gravel at depths of 42 to 72 inches. The fine sandy loam layers range in depth from 15 to 40 inches. Surface drainage is very good and internal drainage is excessive.

Only 94 acres of Aroostook fine sandy loam were mapped so it is not an important soil type although over two-thirds of it is in cropland. It is a good to medium potato soil and will also produce good grain and hay crops. It is not subject to much erosion.

#### DOYLE GRAVELLY SANDY LOAM

The Doyle series belongs to the true podsol group and is developed on glacial outwash terraces derived from gray calcareous shales and limestone. Only the gravelly sandy loam occurs in the project area, but the sandy loam and fine sandy loam should be expected throughout northeastern Maine. The surface soil is a brown to grayish-brown sandy loam of soft-crum structure, 8 to 10 inches thick. Some large gravel, mainly quartz and quartzite, is strewn over the surface. The pH of the surface layer that was sampled is 5.2. The upper part of the subsoil is a yellowish-brown, firm but friable sandy loam of soft-crum structure, and contains some gravel. This layer, which is 10 to 12 inches thick, is underlain by a lower horizon of pale yellowish-brown gravelly sandy loam of single-grain structure. The pH of these subsoil layers or B horizon ranges from 5.3 to 5.7. At a depth of about 36 inches is a layer, 8 to 10 inches thick, of pale yellowish-brown gravel and sand, which is loose and open in structure and is underlain by gray bedded sand and gravel, consisting of quartz and shale. The loose, open gravel and sand layer has a slightly acid reaction, whereas that of the bedded gravel and sand is strongly alkaline. These layers rest in turn upon calcareous, gray, coarse, glacial gravel and quartz, loose and open in structure. The thickness of all the layers in the profile varies considerably as does the amount of gravel in the surface horizons. Owing to the porous nature of the gravelly substratum both surface and under-drainage are good, making the Doyle a somewhat droughty soil.

The Doyle gravelly sandy loam occurs on level to gently sloping areas with a sharp break to the river. It occurs in relatively narrow intermittent strips between the lower stream terraces, occupied by the Van Buren soils, and the bottom lands of the Aroostook River. The principal areas of the soil were mapped along the river between Caribou and Fort Fairfield.

Three hundred and sixty-two acres of this soil were mapped. Over two-thirds of it is cultivated as this stone-free soil is easily cultivated and is very desirable for farming and home sites.

This soil is subject to rather severe erosion where it occurs on the steeper slopes. Of the 362 acres mapped, 215 have already lost 25 to 75 percent of the topsoil.

#### VAN BUREN FINE SANDY LOAM

The Van Buren soils are podsoles developed on stream terraces on materials derived from calcareous shale and limestone glacial till.

The uplands from which the parent material is derived are mainly occupied by the Caribou soils. The Van Buren soils are younger and have less well developed profiles than the Doyle soil, which is an old glacial outwash terrace.

Under forested conditions where podsolization has progressed sufficiently the profile consists of 2 inches of a lightweight, black, fluffy organic layer containing matted plant roots, underlain by a light gray fine sand to fine sandy loam, fluffy and 2 inches deep. The pH of these two layers which constitute the A horizon is 4.5 to 5.0. The subsoil is a bright yellowish-brown, fine sandy loam, light textured, and underlain by a yellowish to olive-brown fine sand. These layers have a pH of about 5.0 and extend to a depth of 12 inches. From 12 to 20 inches is a layer of olive-green fine sand, which is also strongly acid and is underlain to a depth of 27 to 36 inches by an olive-green sand mixed with some coarse and fine sand and a little gravel. This layer in turn rests on dull-gray, stratified coarse sand and gravel, which is neutral in reaction. Where the soil has been cultivated, as most of it has, the surface and subsoil layers have been mixed to a depth of 6 to 8 inches. Surface drainage is good and the internal drainage is extremely good.

Van Buren fine sandy loam occurs along the Aroostook River, the principal areas being between Caribou and Fort Fairfield, and smaller areas between Caribou and Presque Isle. It is closely associated with the Doyle gravelly sandy loam. It occurs mainly on level or flat areas, although occasionally on undulating gentle slopes. The native vegetation is spruce, beech, poplar, and white birch.

There were 471 acres of the Van Buren fine sandy loam mapped in the project area. With the exception of a few scattered areas in pasture, and woodland, most of it is cropland. Most of the soil has been slightly eroded, but not seriously. Shallow gullying has occurred on a few areas of the soil.

#### VAN BUREN SILT LOAM

Van Buren silt loam is very limited in extent in this area, only 18 acres having been mapped in the entire project. It consists of about 8 inches of a brown mellow, medium acid silt loam, underlain by 8 inches of olive-brown, firm, friable, sandy loam that is neutral in reaction. From 16 to 36 inches is a layer of olive-yellow sandy loam, of single-grain structure, which contains some gravel. This layer, also neutral, rests on bedded calcareous sand and gravel. The soil occurs on level to slightly undulating areas, being mapped in this area almost entirely on slopes of less than 8 percent. Surface and internal drainage are good.

The silt loam is associated with the Van Buren fine sandy loam and occurs in relatively the same positions. Almost the entire acreage mapped is in cropland, being utilized for the growing of potatoes, hay, and oats. Since

it is easily tilled and is free from stone and gravel, it is considered a desirable soil.

#### PARKHURST GRAVELLY SANDY LOAM

Parkhurst gravelly sandy loam is developed on kame terraces derived from more or less calcareous shales and limestones. In forested areas, the soil is usually a sandy loam but under cultivation, it becomes a gravelly sandy loam. The soil is not extensive in the area and is not well suited to cultivation largely because of its broken and hummocky relief. Under forest cover, the profile consists of a dark-brown duff layer, 1 to 3 inches thick, very strongly acid, underlain by a gray sandy loam, which is structureless and contains some quartz gravel. The pH of a sample of this layer, which is 2 to 4 inches thick, is 4.0. Directly below the gray sandy loam is an extremely thin layer, less than one-fourth inch thick, of coffee-brown sandy loam. The upper subsoil is a structureless, yellowish-brown, firm but friable sandy loam, 8 to 12 inches thick, that contains some quartz gravel. The lower subsoil consists of a pale yellowish-brown to grayish-yellow sandy loam, 8 to 12 inches thick, which grades into an olive-gray to grayish-yellow loamy coarse sand and gravel. Thin beds of sand and silt are contained in the lower layer, which is loose and open and is from 12 to 18 inches thick. The pH of the lower subsoil is 5 to 5.5. Shale fragments occur throughout the subsoil. At a depth of about 42 inches and extending 6 to 12 inches is a layer of gray to olive-gray, bedded gravel, coarse sand, and fine sand, also strongly acid, which is loose and open in structure and which rests on gray bedded gravel and coarse sand partly cemented by carbonates. The gravel is quartz, quartzite, shale, sandstone, limestone, granite, and schist. Surface drainage is good and the internal drainage is excessive.

The Parkhurst soil occurs on kames and eskers along the Aroostook River Valley. The native vegetation consists of mixed hardwoods, beech, maples, poplar, and some scattered spruce and fir.

Only 165 acres of this soil were mapped. Most of the area was in cropland, although some of it has been used for gravel pits. If cultivated, it is subject to serious erosion, and three-fourths of the area mapped has already lost 25 percent or more of the original topsoil.

#### MAYSVILLE SILT LOAM

Maysville silt loam is an imperfectly drained alluvial soil closely associated with the Aroostook soils. The associated uplands are mainly Caribou. The surface soil is a very dark-brown silt loam of crumb to granular structure, which extends to a depth of 6 to 10 inches and is neutral in reaction. The upper subsoil is a brown, friable silt loam that is streaked with rusty brown and has a crumb to granular structure. This layer, which extends for 6 to 8 inches, is underlain by a brown, fine sandy loam, mottled with gray and rusty brown, 6 to 10 inches thick. Di-

rectly beneath is a layer of gray sandy loam to loamy sand that contains some gravel and is loose and open in structure. It extends for 10 to 12 inches where it rests on dark-gray to greenish-gray bedded fine sand, silt, and gravel. The lower strata show a considerable variation in the amounts of fine and coarse sand, or even silt, and the clay or gravel that may be incorporated in them. The surface drainage of the soil is fair, whereas the internal drainage is imperfect.

Maysville silt loam occurs along the river bottoms of the Aroostook River, closely associated with the better drained Aroostook soils. It usually occurs on flat surfaces or in depressed areas of the Aroostook soils. The soil is subject to overflow from the river.

The native vegetation consists of willow, alder, ash, and birch. Only 51 acres were mapped in the project, of which 10 were idle, 15 were in woodland, 14 in pasture. Only 12 acres were cultivated for hay or grain. The sod is usually not subject to much erosion.

#### VAN BUREN FINE SANDY LOAM, IMPERFECTLY DRAINED PHASE

A very limited acreage of an imperfectly drained phase of Van Buren fine sandy loam was mapped on smooth slopes along the Aroostook River terraces. A little more than half of the 53 acres mapped was in cultivation, mainly in hay crops, and the rest was in pasture. It is not a good potato soil because of its imperfect drainage and its nearly neutral reaction, which is favorable to the development of potato scab.

The surface soil, to a depth of 5 inches, is a grayish-brown fine sandy loam containing many grass roots. This is underlain by about 4 inches of light grayish-brown, fine sandy loam, which contains some gravel. Both these horizons are neutral or only slightly acid. At 9 inches and extending to 36 inches is a greenish-olive sandy loam, which is mottled with rust brown and contains some gravel. The surface drainage is fair and the internal drainage is imperfect.

Most of the imperfectly drained phase of the Van Buren has been only slightly eroded.

#### KEEGAN SILT LOAM

Keegan silt loam is developed on smooth imperfectly to poorly drained terraces where slack-water silts and clay derived from glacial till of shale and limestone origin have been deposited over sandy material. The surface soil to a depth of 10 inches is a dark-gray, firm, heavy silt loam that is rather compact when dry. The subsoil is a gray silt loam to silty clay loam, slightly compact but friable and mottled with rusty brown. At depths of 20 inches or more the silty clay loam rests on a gray, medium to fine sand that is loose in consistency. There is no stone or gravel in the profile. Depth of the sandy material varies from 18 to 24 inches. The surface soil and subsoil are neutral in reaction, whereas the parent material is alkaline. The soil is imperfectly to poorly drained throughout and

occurs on level or depressed areas. The native vegetation is spruce, poplar, and birch.

There were 212 acres of the Keegan silt loam mapped. Ninety-one acres were in woodland, 59 acres were cultivated mostly for hay crops, and 57 acres were in pasture. This soil is not suited to the growing of potatoes. Keegan silt loam is not subject to much erosion in the areas in which it occurs.

#### CONANT SILT LOAM

The Conant series consists of upland soils, associated with the Caribou series, that are developed on nearly level, imperfectly drained positions on till derived from calcareous shales and limestones in which there is a well-developed hardpan. The surface soil of the Conant is a dark-brown silt loam, 6 to 8 inches thick, neutral in reaction. The upper subsoil is a gray to light grayish-brown or tan, faintly mottled with gray, silt loam to silty clay loam that is firm but friable. This layer, which is 6 to 10 inches thick and is mildly alkaline, is underlain by a compact, grayish-yellow clay loam to clay that contains gray and rusty brown mottlings and whose breakage is irregular and angular. The lower subsoil, which is 12 to 18 inches thick, rests on a grayish-yellow till that is fairly compact and is mottled with gray and rusty brown. The calcareous till extends to a depth of 6 feet or more. The entire profile contains gravel and shale fragments, which increase in frequency with depth. The surface drainage is fair, but the internal drainage is imperfect or retarded. In places where the drainage is somewhat better, the subsoil may be more brown in color.

Conant silt loam occurs on almost level areas or very gentle slopes. In this area it was mapped mainly on B slopes, from 2 to 8 percent. The native vegetation is maple, beech, poplar, birch, spruce, and fir. The soil was mapped on 731 acres of which 695 were cultivated. Grain and hay are best suited to the soil although fairly good yields of potatoes may be obtained in dry years. It is not recommended as a good potato soil. Two-thirds of the total acreage mapped has lost 25 percent or more of the original topsoil.

#### CARIBOU-CONANT COMPLEX

The Caribou-Conant complex represents a condition where small patches of the well-drained Caribou and Presque Isle soils occur so closely intermingled with small patches of the imperfectly drained Conant in a patchwork pattern that they cannot be mapped separately. Grain and hay do well on this complex and potatoes may be grown in dry years with only fairly good results.

Areas of this complex vary in their adaptability to cultivation as the relative proportions of the imperfectly drained Conant determine whether or not crops may be grown with good yields. Four hundred and thirty acres were mapped in the project, of which 366 are cultivated. The remainder of the complex is distributed in pasture (29 acres),

woodland (14 acres), and idle land (21 acres). Over three-fourths of the acreage mapped has lost 25 percent or more of the original topsoil.

#### WASHBURN SILT LOAM

Washburn silt loam has been developed in depressions on the Caribou soils where the vegetation has been sufficiently heavy to allow the accumulation of muck on the surface. When forested, the surface layer is a mucky, black, silty clay loam to loam, neutral in reaction, which is underlain by 4 to 6 inches of an olive-gray, gritty, friable silty loam to loam whose pH is 8.0. Some gravel is contained in this layer. Under cultivation the black surface layer is granular rather than mucky and its depth may range from a few inches to a foot. The subsoil is an olive-gray loam, mottled with rusty brown that contains considerable gravel. The subsoil extends for 12 inches. At depths of 24 or more inches is the gray, slightly compact, raw calcareous till or parent material, which contains considerable bluish-gray shale and glacial gravel. The entire solum is poorly drained, although the drainage varies from place to place. The color of the lower surface varies from dull gray where very poorly drained to gray mottled with yellow where better drained.

The soil occurs on level to gently undulating areas and is widely distributed throughout the area. The native vegetation consists of a dense growth of white cedar, fir spruce, tamarack, and some aspen and white birch. Washburn silt loam is not a good potato soil but is considered very good for grasses.

Of the 2,144 acres of the soil, 799 were in woodland, whereas 641 were cultivated mainly for hay and grass. A few potatoes are grown on this soil where it occurs in small areas in large fields of better drained soils. The remainder of the soil is in pasture or idle. Washburn is not subject to much erosion.

#### EASTON SILT LOAM

Easton silt loam has been developed in depressions on the uplands from glacial till derived from calcareous shales and limestone. Under forested conditions the surface layer consists of 2 inches of a dark grayish-brown, well-decayed leaf mold, which is underlain by a very thin layer of dark-gray silt loam stained with organic matter. Usually, under cultivation, the surface soil consists of 8 inches of strongly acid gray silt loam streaked and mottled with rusty brown and underlain by a dull-gray silty loam streaked with brown and extending for 4 to 6 inches. The subsoil is a grayish-yellow or olive-gray loam to clay loam, with a neutral reaction, mottled with gray and rusty brown, and breaking into irregular and angular particles. At depths of 30 inches or more the solum rests on a gray, rather compact till having a pH value of 8.0 or more. The drainage of the entire profile is poor, although this varies from place to place, which results in differences in the depth and intensity of mottling.

Easton silt loam occurs mainly on flat or very gently sloping areas and is widely distributed throughout the area. The native vegetation on this soil is a scattered growth of spruce, fir, tamarack, alder, aspen, white cedar, and white birch with an underbrush of blueberries and mosses. Organic matter does not accumulate on the soil to any great extent because of the sparse plant growth.

Of the 384 acres mapped in the area, 254 were in woodland, 96 in pasture, 26 were idle, and only 8 acres were cultivated. Grain and hay grow well on the Easton soil but it is not well suited to potatoes, as it is extremely wet and poorly drained and low in organic matter.

Easton silt loam has not been seriously affected by erosion mainly because of the fact that so little of it has been cultivated and also because it occurs on very gentle slopes.

#### CARIBOU-EASTON COMPLEX

#### CARIBOU-WASHBURN COMPLEX

These complexes are intimate associations of the well-drained Caribou or Presque Isle soils and the poorly drained Easton and Washburn soils. Their productivity and adaptability to cultivation is determined largely by the amount of Easton and Washburn occurring in the association. Where large amounts of either of the poorly drained soils are present, they are likely to be wet late in the spring and nonproductive. The Caribou-Easton complex was mapped on 399 acres in the project, of which 209 were in woodland, 42 in pasture, 23 idle, and 125 acres cultivated mainly for grain and hay. The Caribou-Washburn complex was mapped on 490 acres, of which 188 were in woodland, 71 in pasture, 44 idle, and 187 cultivated mainly for grain and hay.

The erodibility of these complexes is dependent on the varying amounts of the different soils in them and on the slope of the land on which they occur.

#### CARIBOU STONY LOAM

Caribou stony loam is rough land that is too stony and steep for cultivation. The material between the stones in the surface layer, which is about 8 inches deep, is a brown loam, whereas the interstitial material of the subsoil is a yellowish-brown to yellowish-gray loam. Limestone ledges outcrop in many places on the surface. These would be difficult to remove for cultivation.

Caribou stony loam occurs mainly on the crests of the ridges in the south-central part of the project area and in other scattered areas.

There were 431 acres of the type mapped in the project, of which 325 were in woodland and 71 in pasture. There has not been much erosion on the stony loam as it has not been cultivated.

#### ALLUVIAL SOILS, UNDIFFERENTIATED

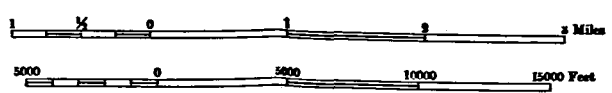
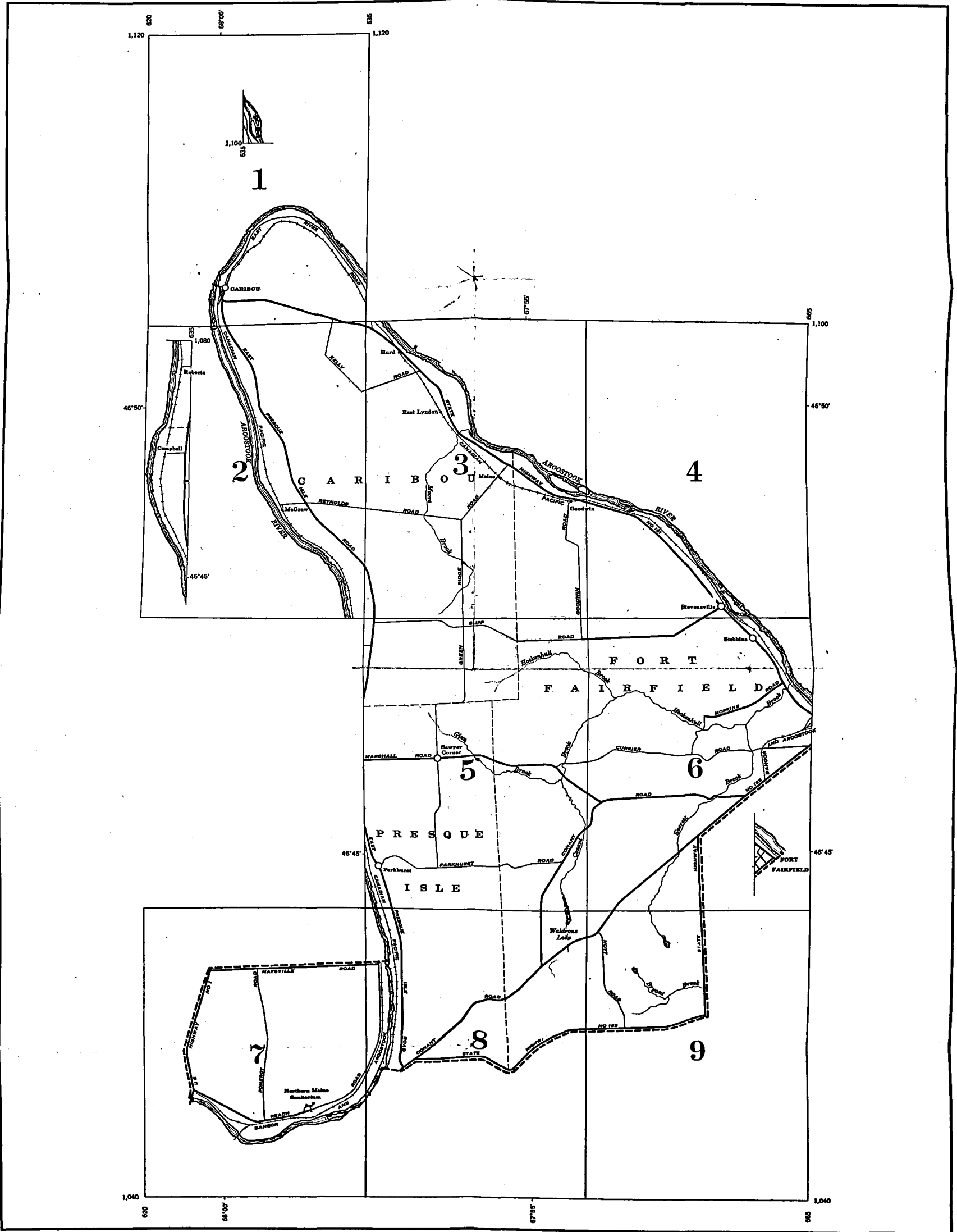
Undifferentiated alluvial soils were mapped along the bottoms of the small streams of the area. Most of these bottoms are cut by old stream channels. These soils are composed of mixed organic and mineral materials and stones, and are extremely variable in content and texture. There has been no profile development in these recently deposited materials; hence, it was impossible to separate them in mapping. Their extreme variability and wetness make them unsuitable for cultivation. Water stands on these soils for comparatively long periods of time. They are subject to continuous overflow of the streams and further deposition of materials. Most of the 547 acres mapped in the project were in brushy or worthless timber and other scattered areas were in pasture or were idle.

#### MUCK

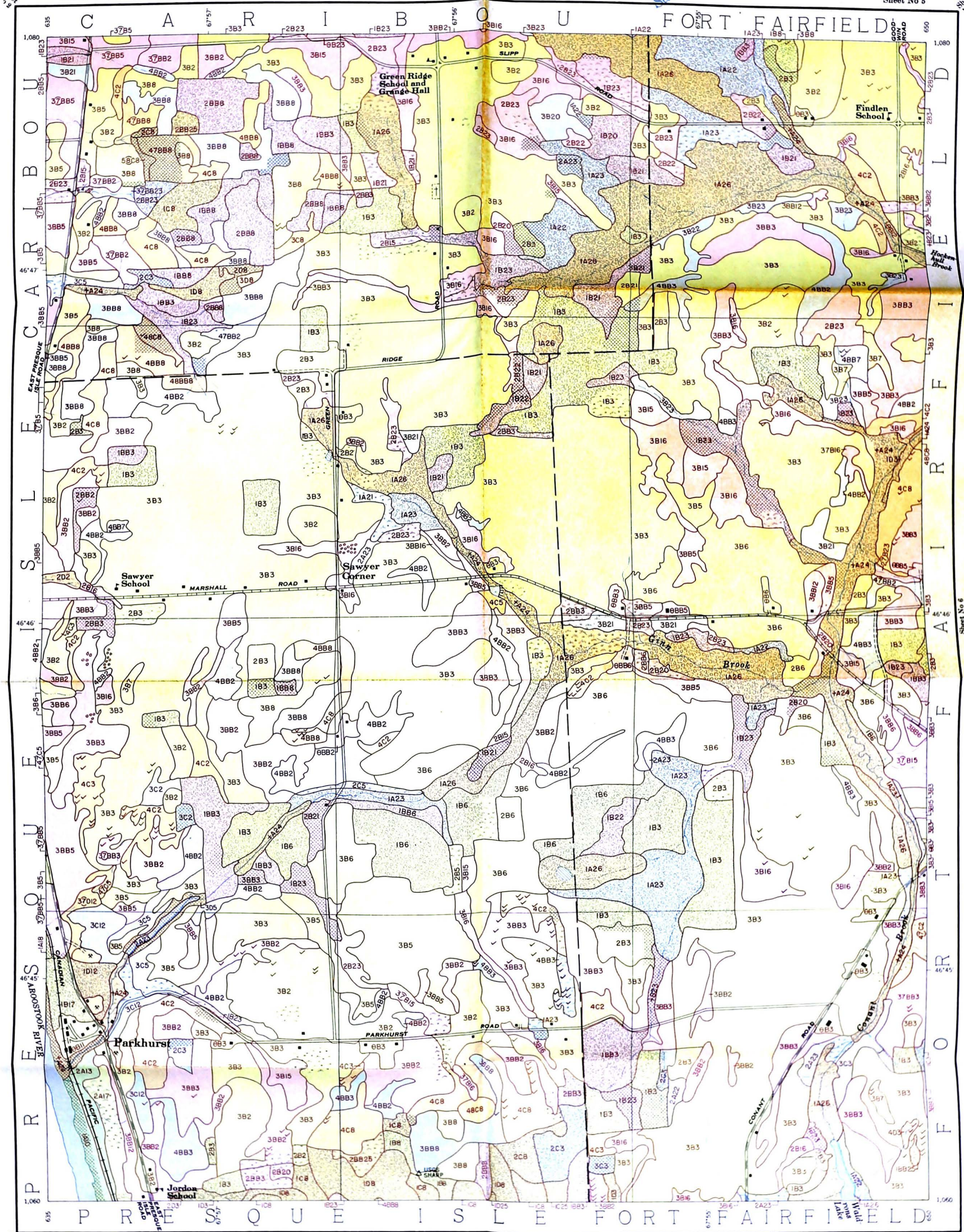
The surface layer of the muck mapped in this area consists of black organic matter in varying stages of decomposition, flecked with brown bits of wood and occasional pieces of roots and partly rotted tree trunks of cedar and spruce. The surface soil ranges in depth from a few inches to 2 feet. The reaction of this organic layer is neutral. Lying directly beneath the organic matter and about 6 to 8 inches thick is a layer of slate-gray clay, which is plastic with a faintly developed granular structure and which shows some horizontal cleavage. The lower part of this horizon is somewhat mottled with rust-brown and is underlain by a blue sandy loam streaked and spotted by rust-brown and olive-green, which extends for 30 to 34 inches and is alkaline in reaction. Both surface and internal drainage are very poor. During wet seasons water stands on this soil, which occurs in depressions having a flattish surface and classed as A slope. Native vegetation on the muck is cedar, black spruce, aspen, and tamarack. Muck occurs in scattered areas throughout the project. One area that is underlain by marl occurs in the northeastern part of Presque Isle township.

Of the 1,273 acres of muck mapped in the project, 1,179 were in woodland, 35 were idle, and 59 acres were in pasture. It is possible that some of the muck areas might be used for cultivation if they were adequately drained.

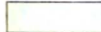








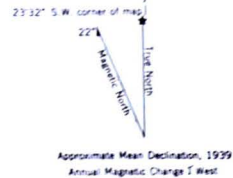
- Surface roads —————
- Dirt-good motor —————
- Roads with staves —————
- Township lines - - - - -
- Project boundary - - - - -



**CLASSES OF LAND ACCORDING TO USE CAPABILITY**

-   
**I - Suitable for cultivation without special practices**
-   
**II - Suitable for cultivation with simple practices**
-   
**III - Suitable for cultivation with complex or intensive practices**
-   
**IV - Not suitable for continuous cultivation**
-   
**V - Not suitable for cultivation**

Scale 1:15,840



Base map compiled from aerial photographs by Soil Conservation Service.  
Horizontal control by S.C.S., U.S.G.S., and U.S.C. & G.S.  
Transverse Mercator projection, 5000 foot grid based upon  
Maine system (East Zone) of plane coordinates with  
last three digits of grid numbers omitted.  
Polyconic projection, North American 1927 datum,  
indicated by marginal ticks.