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ADDENDUM

to

SOIL SURVEY OF WILDCAT HILLS AREA
and

INTERPRETATION FOR RECREATIONAL USE

by
G. M. Greenlee, P. Ag.
Soils Division
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PREFACE

A standard explanatory format, beginning with the section entitled "Preface" and ending with the section entitled "Glossary" has been written. Since the same explanatory remarks will pertain to reports written for each of the Alberta Provincial Parks and other areas surveyed, the same standard format will be presented at the beginning of each report.

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INTRODUCTION

The growth in population and per capita income has and will continue to exert an unprecedented demand on the natural resources of Alberta. The nature of today's city living and working makes apparent the recreational value of Provincial Parks. Men and women often work in large factories and plants or in crowded offices, far removed from nature or a natural environment. The work week of forty hours or less, however, provides people with a relatively large amount of leisure time and prompts a constant search for off-time recreation to refresh the spirit. It is this trend in our civilization today that places high priority on comprehensive planning that will bring together the special interests in land use, watershed protection, wildlife, forestry, and parks and recreation based on carefully determined requirements.

Soil being one of the basic resources which man manipulates in his land use activities, requires prudent use, protection and proper management in order to realize its inherent potential on a sustained yield basis (8). Recognition of natural phenomena and physical limitations is no less important in campground construction or septic tank location than it is in crop production. The kind of soil dictates to a large degree the type and location of recreational facilities (8). Some soils are not desirable sites for campgrounds, play areas, picnic grounds, cabin sites or nature study areas; other soils are very desirable sites for recreational uses. Knowledge of the soils of an area provides fundamental information needed in recreation planning. The soil information contained in the reports to follow is designed to be of assistance in planning future development in various Provincial Parks within the Province of Alberta.

Detailed and semi-detailed soil surveys were conducted in the following Provincial Parks during the summer of 1974: Chain Lakes, Winagami Lake, Gregoire Lake, Long Lake and Cross Lake. Also included were areas in the vicinities of Lake Newell, the Wildcat Hills, and Pinehurst Lake. The total area surveyed was approximately 29,400 acres.

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of Lands and Forests provided the aerial photographs, as well as part of the funds and staff for the field work. Alberta Research published the report and compiled the soil map. The University of Alberta provided office and laboratory space.

Mrs. Pal Foster typed and assisted in compiling and proof reading the reports. Mr. Z. Widtman drafted the final soil map, while Mr. J. Beres determined the physical properties of the soils. The soil chemical analyses were determined by the Alberta Soil and Feed Testing Laboratory.

Able field assistance was given by Mr. E. Marchuk.

Special acknowledgment is given to the Park Wardens who co-operated by allowing soil investigations to be conducted throughout the parks and also invariably offered assistance.

METHODS

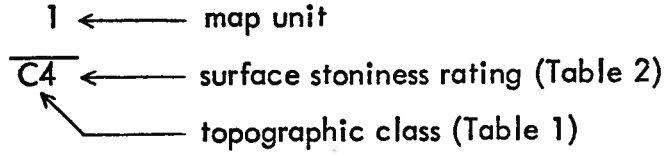
The areas surveyed were traversed by motor vehicle along all roads and negotiable trails, and on foot along cut-lines and non-negotiable trails. Soil pits were dug at frequent intervals to depths of 2 to 4 feet, to examine and describe soil horizons and classify the soils. Detailed field soil descriptions were made. Soil boundaries were drawn on aerial photographs with the aid of a pocket stereoscope.

Representative surface and shallow subsurface soil samples were collected for chemical analyses and subsurface samples were collected at depths of 4 to 6 feet for physical analyses.

GENERAL SOIL MAP

The soils were classified according to the System of Soil Classification for Canada (4). The areal extent of each different kind of soil is indicated on the soil map. An explanation of the map symbols follows:

Example:



The map units generally refer to single soil series or soil associations. A soil series is a grouping of all soils which are similar in the number, color, texture, structure,

relative arrangement, chemical composition, and thickness of horizons, as well as in the geology of the soil parent material (3). A soil association simply consists of a number of soil series occurring together in characteristic patterns.

Where a map unit consists of a single series, other soil series may be found in close association. However, the dominant series makes up to 80 to 90% of the map unit; the other series are present in such minor amounts that their presence is not considered significant enough to affect the use of a particular map unit for recreation.

Where a map unit consists of a soil association, it was not possible to outline each separate series in the time available to complete the soil survey. However, different series in an association generally possess very similar properties. The approximate percentage of each series comprising the association is indicated in the soil report. Minor insignificant amounts of other series may be present but are not mentioned in the definition of the association.

Other miscellaneous symbols appearing on the soil map are defined or explained in the soil report.

The topographic classes and stoniness ratings are defined in Tables 1 and 2, which follow:

Table 1. Topographic classes and symbols (3)

Simple topography Single slopes (regular surface)		Complex topography Multiple slopes (irregular surface)		Slope %
A	depressional to level	a	nearly level	0 to 0.5
B	very gently sloping	b	gently undulating	0.5 to 2
C	gently sloping	c	undulating	2 to 5
D	moderately sloping	d	gently rolling	5 to 9
E	strongly sloping	e	moderately rolling	9 to 15
F	steeply sloping	f	strongly rolling	15 to 30
G	very steeply sloping	g	hilly	30 to 60
H	extremely sloping	h	very hilly	60

Table 2. Stoniness ratings (5)

Stony 0 - (stone-free land)	too few stones to be of any hindrance to recreation
Stony 1 - (slightly stony land)	some stones, only slight to no hindrance to recreation
Stony 2 - (moderately stony land)	enough stones to cause some interference with recreation
Stony 3 - (very stony land)	enough stones to constitute a serious handicap to recreation - some clearing is required
Stony 4 - (exceedingly stony land)	enough stones to prevent recreational use unless considerable clearing is done
Stony 5 - (excessively stony land)	too stony to permit any recreational use (boulder or stone pavement)

SOIL CHARACTERISTICS AND INTERPRETATIONS FOR RECREATIONAL USE

Soil surveys provide for classifying, defining and delineating each kind of soil and making predictions of soil behaviour under specific management (8). The soils within an area are mapped and classified without regard for existing or expected land ownership boundaries, or types of use. Each delineated soil is defined so that the information is available for planning different kinds of land use.

Each kind of soil has its own peculiar set of characteristics and qualities which are described in terms that can be observed (8). These include soil texture; color; structure; consistence; depth (to rock, hardpan, water table, etc.); kind and amount of coarse fragments; kind, thickness and sequence of soil layers; organic matter content; reaction; and slope. When accurately defined a specific soil can be distinguished from all other kinds of soil.

Most soils can be used for recreational activities of some kind. Some have no soil limitations for specific kinds of recreational uses; others have moderate to severe limitations for certain uses. Many soil properties affect the use limitations of soils for recreation, and the effects of a given soil property often vary with different uses (2).

The soil properties affecting most recreational uses include susceptibility to flooding, wetness, slope, and surface stoniness (2). Other soil properties also having an effect include: depth to sand and gravel, an impeding horizon and surface soil texture, as they affect permeability and erodibility; texture and plasticity, as they

affect shrink-swell potential, and susceptibility to frost heaving; soluble sulphate content, as it affects concrete corrosion hazard; and salinity of the topsoil.

Soils that are subject to flooding during the season of use are considered to have severe limitations for recreation facilities such as camping areas, building sites, and roads. Such areas require permanent design considerations (2,8). These soils should not be developed for campsites or building sites unless they are protected by dikes, levees or other flood prevention structures, which may be uneconomical. These soils may be better suited for hiking or nature study areas, or for greenbelt open space, if the flooding is not too frequent (8). Montgomery and Edminster (8) suggest one or two floodings during the season of use consitiutes only a moderate limitation for picnic areas, playground areas and hiking trails. These are the less permanent facilities that can be moved with relative ease. Thus, the soils can be managed to a high level without maintenance costs rising beyond the financial capacity of the administration (2).

Soils that are wet all year, even if not flooded, have severe limitations for campsites, roads, hiking trails, playgrounds and picnic areas (8). The economic feasibility of installing subsurface drainage in these soils is questionable (2). Soils that are wet only part of the year or those with a water table that fluctuates without actually reaching the surface are not easily detected. These soils are considered to have moderate to severe limitations for most recreational uses, and if possible should be avoided for the more permanent facilities such as camping areas and building sites. With careful planning, design, and management, however, these soils can be used for most recreational facilities. Soils that dry out slowly after rains also present problems where intensive use is contemplated. The soils that are dry during the season of use and have a water table greater than 3 feet from the surface are considered to have slight to no limitations for most recreational uses (2).

Droughty or very rapidly drained soils also have limitations for many recreational uses. On such sites grass cover needed for playing fields is difficult to establish and maintain. Access roads may be excessively dusty. Vehicles are easily mired down in sandy soils and soil blowing is common. Knowledge of these soil problems enables planners to use corrective conservation practices, such as irrigation, or to choose alternative locations (8).

The ability of a soil to support a load is important in many kinds of recreational activities. Some soils when wet fail to support structures such as access roads, trails and buildings (8).

Slope affects the use of soils for recreation (2,8). Generally, slopes of less than 2% offer no limitations for use as playgrounds, campsites, sites for recreation buildings, roads and trails. Slopes greater than 9% constitute a severe limitation for playground areas, since levelling costs would become prohibitive. Slopes of more than 15% constitute a severe limitation for camping areas, picnic areas and some building sites for the same reason. The smaller areas required for these facilities as compared to playground areas, account for the greater tolerance. On the other hand, steeply sloping soils are essential for ski runs and are desirable for hiking areas and scenic values. Hiking trails are not limited unless slopes are greater than 30%. Of course steep, gently sloping and moderately sloping soils can be levelled for campsites, playgrounds and building sites, where the cost is justified (8). Where this is done it is especially urgent that effective soil conservation practices be applied and maintained, based on the specific conditions at hand.

Permeability is an important property affecting the recreational use of soils (2). Since no permeability measurements were made, it has been estimated from a consideration of texture, structure and depth to an impeding horizon in the profile (9). Soils with very rapid to moderately rapid permeability have no limitations, and soils with slow and very slow permeability have severe limitations(8). The same classes apply to suitability for road subgrade material but are reversed when considering suitability for reservoir sites. Soils are rated for this purpose on their capacity to hold water without allowing seepage. It should be noted that the degree of limitation due to permeability will vary with climate. In high rainfall areas permeability is much more important than in low rainfall areas (2).

Surface stoniness limits the use of some soils for recreational facilities (2). Generally the non-stony (class 0) to slightly stony (class 1) land offers no limitation for recreational facilities. Very stony (class 3) to excessively stony (class 5) land offers severe limitations for camping areas, playground areas and building sites. The expense of removing the stone hazard is considered prohibitive (2). The very stony (class 3) land is considered to constitute only a moderate limitation for picnic areas and hiking

trails because of the lesser areal intensity of use associated with these facilities. In some instances it is feasible to remove the stones, thus eliminating the hazard (8). Rounded gravels and stones present hazards on steeply sloping soils used for foot trails.

Surface texture is an important soil property to consider (2,8). High clay or sand content in the surface horizon constitutes a severe limitation for playgrounds, campsites or other uses that involve heavy foot traffic by people or horses. Soils high in clay become sticky and slippery when wet and dry out slowly after rains. On the other hand loose sandy soils are undesirable as they are unstable when dry, making it difficult to establish sod grasses capable of withstanding concentrated foot traffic. Generally, sandy loam and loam surface soil textures are the most desirable for recreational uses involving heavy use by people.

Soil depth affects many uses (8). Soils underlain by bedrock or sand and gravel at shallow depths cannot be levelled for playgrounds except at high cost. Roads, trails, basements and reservoirs are very difficult to construct on soils with shallow bedrock, and soils with shallow sand and gravel are undesirable sites for reservoirs. It is difficult to establish vegetation on shallow soils overlying impervious soil layers, rock or sand and gravel, thus making them poor locations for playing fields and other intensive use areas.

Sewage disposal is also an important consideration in designing recreation areas (2). Some soils absorb septic effluent rapidly and other soils absorb it very slowly (8). Soils that are slowly or rapidly permeable, poorly drained, subject to flooding, shallow to rock, or steeply sloping all have severe limitations for septic tank filter fields. These include soils of high clay content, sandy soils and Gleysolic soils. The most desirable soils for sewage disposal have a moderate permeability, are well drained and are situated in nearly level areas (2). The most desirable soils for sewage disposal are also the most desirable soils for sanitary land fills. In some cases where soils cannot handle the volume of waste involved, sewage lagoons can be used (8). These also are feasible only in soils that meet the special requirements for sewage lagoons.

Shrink-swell potential is inferred from Atterberg limits (2). Soils with low to medium shrink-swell potential are considered to have no to slight limitations for recreational facilities. Soils with a very high shrink-swell potential are considered to constitute severe limitations for building sites and road subgrade material as these soils tend to be unstable with changing moisture conditions. Soils with a high shrink-swell

potential offer moderate limitations for use and thus should be avoided if possible.

The suitability of the underlying soil material for road subgrade depends upon the additional property of susceptibility to frost action(2). Generally soils high in silt content are highly susceptible to frost action. Other factors, such as the availability of water, also affect this parameter. The availability of water is dependent upon climatic conditions and depth to water table. Thus, soils high in silt content may not necessarily undergo appreciable frost heaving unless they are imperfectly or poorly drained, or subject to high rainfall shortly before freezing. This is especially true in Alberta.

The soluble sulphate content of the underlying soil material is an important factor for buildings with concrete foundations, as well as for underground conduits (2). The U. S. Bureau of Reclamation (14) has established classes for sulphate attack on concrete. Soils with 0 to 0.1 % soluble sulphate content are considered to have no limitations for standard concrete foundations, and soils with 0.1 to 0.2% are considered to have slight limitations. Soils with 0.2 to 0.5% soluble sulphate content are considered to have moderate limitations, and foundations may require sulphate resistant concrete. Soils with greater than 0.5% soluble sulphate are considered to have severe limitations and should be avoided (2).

Salinity and depth of topsoil affect soil suitabilities for lawns and landscaping, and sources of topsoil. An electrical conductivity of less than 1 (mmhos./cm.) and a depth of topsoil of more than 6 inches offer no limitations. An electrical conductivity of more than 3 (mmhos./cm.) and a depth of topsoil of less than 3 inches render severe limitations.

Productive capacity of soils for vegetation of different kinds is closely related to the feasibility of many recreational enterprises (8). The ability of soils to grow sods that can take concentrated human traffic has already been noted as a factor in such areas as playgrounds and campsites. The development of such vegetative conservation practices as shade tree plantings, living fences, plant screens, and barriers to trespass is guided by soil conditions. The capacity of an area to produce economically harvestable crops of game is dependent in part upon the productive ability of its soils (8).

Thus we find that basic soil qualities and characteristics are closely associated with the various types of outdoor recreational activities (8). By knowing the characteristics and qualities of the different kinds of soils and their behaviours, and with the aid

of a soil map, soil scientists and other specialists can develop soil interpretations for recreational uses. Interpretations for recreation can best be made locally by those familiar with the soils and conditions in the area (8).

EXPLANATION OF SOIL INTERPRETATIONS

Soil limitation or suitability ratings are for evaluating each soil for a particular use (9). Interpretations are based on evaluation of the soil to a depth of about 40 inches; however, some interpretations can be made below the 5 foot depth. These interpretations are made largely from detailed soil descriptions obtained during the field soil mapping program. The limited time, resources and trained personnel available did not permit such determinations as bulk density and percolation rate. Only surface and shallow subsurface soil samples were collected for routine chemical analyses, while only limited numbers of deeper subsurface samples were collected for engineering tests. Engineering properties of some map units sampled were extrapolated to other map units not sampled, where soils of the different map units were developed on the same or very similar parent materials.

It is important that the proper perspective be placed on the use of soil interpretations in recreation planning (8). The interpretations are for soils in the natural state only and not for disturbed areas. Nor do they include other factors, such as location, aesthetic values, and nearness to population centres. A soil survey properly interpreted is a useful guide for general recreation planning and in site selection. However, all soil differences which occur in the field cannot be shown on a general soil map. Thus for design and construction of specific recreational facilities, an "on-site" investigation is often needed.

The soils are grouped into 3 categories according to their limitations or suitabilities for specific uses. They are evaluated by considering the interaction of the various properties to give an overall degree of limitation or suitability to each map symbol. The 3 categories of limitations are as follows:

(1) S - None to slight soil limitations - Soils relatively free of limitations that affect the intended use, or the limitations are easy to overcome.

(2) M - Moderate soil limitations - Soils having limitations that need to be recognized but can be overcome with correct planning, careful design and good management.

(3) V - Severe soil limitations - Soils with limitations severe enough to make the proposed use questionable. It does not mean the soil cannot be used for a specific use but it does mean that careful planning and design, and very good management are needed. This often includes major soil reclamation work. In many cases the limitations will not be economically feasible to correct.

The soils are rated as good (G), fair (F), or poor (P) as sources of topsoil, or sand and gravel. These suitability ratings correspond to the limitations of none to slight (S), moderate (M), and severe (V) respectively and the definitions are essentially the same. The soils may also be rated "unsuitable" as sources of topsoil, or sand and gravel.

Interpretations are not included for wildlife use. However, it is recognized that all soils are suited for some form of wildlife and that this is an important use which is compatible with certain other uses.

DEFINITION OF SELECTED USES

(1) Camp Areas are considered to be used intensively for tents, truck campers and small camp trailers with the accompanying activities of outdoor living (9). It is assumed that little site preparation will be done other than shaping and levelling for tent and parking areas. The soils should be suitable for heavy foot traffic and for limited vehicular traffic. Flooding hazard, depth to water table, slope, permeability, stoniness and surface texture affect suitability for this use. Soil suitability for growing and maintaining vegetation is not rated but is an item to consider in final evaluation of the site (see ratings for lawns and landscaping).

(2) Foundations for Low Buildings (with or without basements)- Interpretations indicate limitations for construction and maintenance of homes and small buildings (9). They are affected by soil characteristics such as flooding hazard, wetness, slope, stoniness, depth to bedrock, shrink-swell potential, sulphate content, and depth to sand and gravel. (Limitations for on-site sewage disposal is rated separately.)

(3) Play Areas for recreation apply to soils that are to be used intensively for organized games such as football, baseball, volleyball, horseshoes and other similar organized games (9). They are subject to heavy foot traffic. A level surface, good drainage, and a surface soil texture and consistence that gives a firm surface which is not slippery and sticky when wet is generally required. Soils that are sloping, very stony, very shallow, subject to blowing, subject to flooding, or have seasonally high water tables or slow permeability are rated as having severe limitations.

(4) Paths and Trails - Uses are local and crosscrountry footpaths, and bridle paths. It is assumed that these areas will be used as they occur in nature and that little or no soil will be moved (excavated or filled)(9). Soil features, such as surface texture and structure, that affect trafficability, dust, and design and maintenance of trafficways should be given special emphasis. Soils that flood frequently, are poorly drained or very stony, or have clay or sand surface textures or steep slopes are rated as having severe limitations.

(5) Picnic Areas are considered to be extensively used as park-type picnic grounds and are subject to heavy foot traffic (9). It is assumed that most vehicular traffic will be confined to access roads and parking areas. Flood hazard, wetness, slope, permeability, surface stoniness and surface texture affect suitability for this use. Soil suitability for growing vegetation is not rated but is an item to consider in final evaluation of the site. (See ratings for lawns and landscaping.)

(6) Septic Tank Filter Fields - Successful operation of the system depends upon the ability of the soil to absorb and filter the liquid or effluent passed through the tile field (9). Filter fields are influenced by the ease of downward movement of effluent through the soil. Soils with slow permeability are rated severe. Other soil properties that affect septic tank filter fields are flooding hazard, seasonal high groundwater, slope, depth to bedrock, and depth to sand and gravel. Clean sands and gravels with rapid permeability may constitute a hazard for groundwater contamination.

(7) Road and Parking Location and Suitability for Subgrade Material - These uses are based on features that affect performance for the location of roads, streets and parking areas (9). The main factors considered are flooding hazard, shrink-swell potential, depth to bedrock and susceptibility to frost heave.

(8) Lawns and Landscaping - The soil is rated on the assumption that it will be used for lawn turf, shrubs and trees without need for adding topsoil for good establishment, and also that irrigation is provided (9). Soil characteristics affecting this use are flooding hazard, depth to seasonal high water table, slope, stoniness, surface soil texture, depth of topsoil, salinity and depth to bedrock or sand and gravel.

(9) Sanitary Land Fills are disposal areas for trash and garbage. A good sanitary land fill should be usable all year and should operate without contaminating water supplies or causing a health hazard (9). Soil factors considered in rating the limitations for use are flood hazard, seasonal high water table, slope, permeability, depth to bedrock and depth to sand and gravel.

(10) Reservoir Sites are rated on the adequacy of the soil material to prevent seepage from the reservoir (9). Soil properties most important are slope, permeability, depth to bedrock and depth to sand and gravel. Depth to

water table influences the depth of water in dugouts, pits, etc. in all kinds of soil materials so is not rated for this use.

(11) Suitability as a Source of Topsoil - Topsoil is considered to be used for establishing lawns (9). A rating of "good" means the soil provides a good source of topsoil for removal and transfer to another place, or it can be used in place. Soils are rated on flooding hazard, wetness of the surface layer of undisturbed soils, slope, stoniness, surface texture, depth of topsoil and salinity.

(12) Suitability as a Source of Sand and Gravel - A particular area outlined on the soil map can be identified as predominantly sand or predominantly gravel by consulting the soil report for a description of the map unit under consideration. Only the suitability as a source for sand and gravel is rated (9). No attempt is made to rate the quality of the sand and gravel for specific uses such as road base, concrete, etc. Quality determinations should be made at the site of the source, since both grain sizes and shapes of sand and gravel determine suitability for specific uses (9). Soil limitations considered at the site of the source are flooding hazard, wetness, depth to bedrock (influences thickness of sand and gravel deposit), and depth to sand and gravel (determines thickness of overburden that must be removed to reach sand and gravel deposit).

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GLOSSARY

Atterberg limits - Various moisture contents of a soil at which it changes from one major physical condition to another. The Atterberg limits which are most useful for engineering purposes are liquid limit and plastic limit.

The liquid limit is the moisture content at which a soil passes from a plastic to a liquid state.

The plastic limit is the moisture content at which a soil changes from a semi-solid to a plastic state.

Plasticity index (P.I.) is defined as the numerical difference between liquid limit and plastic limit.

bedrock - The solid rock underlying the regolith in depths ranging from zero (where exposed by erosion) to several hundred feet.

bulk density, soil - The mass of dry soil per unit bulk volume.

coarse fragments - Rock or mineral particles greater than 2.0 mm. in diameter.

consistence - (a) The resistance of a material to deformation or rupture. (b) The degree of cohesion or adhesion of the soil mass.

droughty soil - Sandy or very rapidly drained soil.

electrical conductivity, soil - Measurement on a saturated soil paste or a water extract of the soil, made to estimate the salt content of the soil.

engineering tests - Laboratory tests made to determine the physical properties of soils that affect their uses for various types of engineering construction.

erodibility - Susceptibility to erosion.

erosion - The wearing away of the land surface by running water, wind, ice, or other geological agents, including such processes as gravitational creep.

fertile soil - A soil with an abundant supply of available elements necessary for plant growth.

fertilizer - Any organic or inorganic material of natural or synthetic origin that is added to a soil to supply certain elements essential to the growth of plants.

field capacity (field moisture capacity) - The percentage of water remaining in a soil 2 or 3 days after having been saturated and after free drainage has practically ceased.

frost heave, in soil - The raising of a surface caused by ice formation in the underlying soil.

Gleysolic soil - soil developed under wet conditions resulting in reduction of iron and other elements and in gray colors and mottles.

grain size - The effective diameter of a particle measured by sedimentation, sieving, or micrometric methods.

ground water - That portion of the total precipitation which at any particular time is either passing through or standing in the soil and the underlying strata and is free to move under the influence of gravity.

hardpan - A hardened soil layer, in the lower A or in the B horizon, caused by cementation of soil particles with organic matter or with materials such as silica, sesquioxides, or calcium carbonate.

impeding horizon - A horizon which hinders the movement of water through soils under the influence of gravity.

irrigation - The artificial application of water to the soil for the benefit of growing crops.

parent material - The unconsolidated and more or less chemically weathered mineral or organic matter from which the solum of a soil has developed by pedogenic processes.

pedogenic - Pertaining to the origin, morphology, genesis, distribution, and classification of soils.

permeability, soil - The ease with which gases, liquids, or plant roots penetrate or pass through a bulk mass of soil or a layer of soil.

productive capacity, soil - The capacity of a soil, in its normal environment, for producing a specified plant or sequence of plants under a specified system of management. The "specified" limitations are necessary since no soil can produce all crops with equal success nor can a single system of management produce the same effect on all soils.

regolith - The unconsolidated mantle of weathered rock and soil material overlying solid rock.

seepage, soil - (a) The escape of water downward and laterally through the soil. (b) The emergence of water from the soil along an extensive line of surface in contrast to a spring where the water emerges from a local spot.

shrink-swell potential - Tendency of soils to undergo volume changes with changes in water content.

soil blowing - Soil erosion by wind.

soil conservation - (a) Protection of the soil against physical loss by erosion or against chemical deterioration; that is, excessive loss of fertility by either natural or artificial means. (b) A combination of all management and land use methods which safeguard the soil against depletion or deterioration by natural or by man-induced factors.

soil drainage classes - The soil drainage classes are defined in terms of (a) actual moisture content in excess of field moisture capacity, and (b) the extent of the period during which such excess water is present in the plant-root zone. The soil drainage classes are defined as follows:

1. Rapidly drained - The soil moisture content seldom exceeds field capacity in any horizon except immediately after water additions.

2. Well drained - The soil moisture content does not normally exceed field capacity in any horizon (except possibly the C) for a significant part of the year.

3. Moderately well drained - The soil moisture in excess of field capacity remains for a small but significant period of the year.

4. Imperfectly drained - The soil moisture in excess of field capacity remains in subsurface horizons for moderately long periods during the year.

5. Poorly drained - The soil moisture in excess of field capacity remains in all horizons for a large part of the year.

6. Very poorly drained - Free water remains at or within 12 inches of the surface most of the year.

soil horizon - A layer of soil or soil material approximately parallel to the land surface; it differs from adjacent genetically related layers in properties such as colour, structure, texture, consistence, and chemical, biological and mineralogical composition.

soil organic matter - The organic fraction of the soil; includes plant and animal residues at various stages of decomposition, cells and tissues of soil organisms, and substances synthesized by the soil population.

soil reaction - The degree of acidity or alkalinity of a soil, usually expressed as a pH value. Descriptive terms commonly associated with certain ranges in pH are: extremely acid, 4.5; very strongly acid, 4.5 - 5.0; strongly acid, 5.1 - 5.5; moderately acid, 5.6 - 6.0; slightly acid, 6.1 - 6.5; neutral, 6.6 - 7.3; slightly alkaline, 7.4 - 7.8; moderately alkaline, 7.9 - 8.4; strongly alkaline, 8.5 - 9.0; and very strongly alkaline, 9.0.

soil salinity - The amount of soluble salts in a soil, expressed in terms of percentage, parts per million, or other convenient ratios.

soil structure - The combination or arrangement of primary soil particles into secondary particles, units, or peds. The secondary units are characterized and classified on the basis of size, shape, and degree of distinctness into classes, types, and grades.

soil texture - The relative proportions of the various soil separates (sand, silt and clay) in a soil as described by textural classes. The textural classes may be modified by adding suitable adjectives when coarse fragments are present in substantial amounts; for example, "stony silt loam", or "silt loam, stony phase". The sand, loamy sand, and sandy loam classes are further subdivided on the basis of the proportions of the various sand separates present (fine, medium, coarse). The various classes and subclasses and abbreviations are listed in order from coarse to fine as follows: coarse sand (CS), sand (S), fine sand (FS), very fine sand (VFS), loamy coarse sand (LCS), loamy sand (LS), loamy fine sand (LFS), loamy very fine sand (LVFS), coarse sandy loam (CSL), sandy loam (SL), fine sandy loam (FSL), very fine sandy loam (VFSL), loam (L), silt loam (SiL), silt (Si), sandy clay loam (SCL), clay loam (CL), silty clay loam (SiCL), sandy clay (SC), silty clay (SiC), clay (C), heavy clay (HC). The textural classes can also be grouped as follows:

(a) Coarse-textured group
1) Very coarse textured: CS, S, FS, VFS, LCS, LS, LFS, LVFS.
2) Moderately coarse textured: CSL, SL, FSL, VFSL.
(b) Medium-textured group
1) Medium textured: L, SiL, Si.
2) Moderately fine textured: SCL, CL, SiCL.
(c) Fine-textured group.
1) Fine textured: SC, SiC, C.
2) Very fine textured: HC (more than 60% clay).

soluble sulphate - Water-soluble sulphate found in soil.

solum - The upper horizons of a soil in which the parent material has been modified and in which most plant roots are contained. It usually consists of A and B horizons.

subsurface drainage - Removal by artificial means of excess water below the soil surface.

topsoil - (i) The layer of soil moved in cultivation. (ii) The A-horizon. (iii) The Ah-horizon. (iv) Presumably fertile soil material used to topdress roadbanks, gardens, and lawns.

trafficability - The capacity of a soil to withstand traffic by people, horses, or vehicles.

watershed - A drainage area containing a few thousand acres, from which water drains toward a single channel.

water table - The upper surface of ground water or that level below which the soil is saturated with water.

CONTENTS

LIST OF TABLES

INTRODUCTION

This report is an addendum to the original report written for the Wildcat Hills area mapped in 1973 (2). The reader is referred to that report for a discussion of the standard explanatory format usually included at the beginning of the Alberta Provincial Park and proposed park area soil survey reports.

ACKNOWLEDGMENTS

Alberta Research supplied the funds and staff for the laboratory and drafting work, and for the writing of the report. The Parks Planning Branch of Alberta Lands and Forests provided the aerial photographs, as well as part of the funds and staff for the field work. Alberta Research published the report and compiled the soil map. The University of Alberta provided office and laboratory space.

Mrs. Pal Foster typed and assisted in compiling and proof reading the reports. Mr. Z. Widtman drafted the final soil map, and able field assistance was given by Mr. E. Marchuk.

LOCATION AND SIZE

The area discussed in this report is section 34, township 26, range 5, west of the fifth meridian; and is 640 acres in size. This area was mapped during 1974, and adjoins the area mapped to the south during 1973 (2).

PHYSIOGRAPHY AND SURFICIAL DEPOSITS

The high ridge extending through the middle of the 1973 mapped area (2) continues through the southwest quarter of section 34, and sandstone outcrops occur along the crest. The highest elevation in section 34 is about 4500 feet above sea level, and occurs on top of the ridge. The lowest elevation of about 4100 feet occurs near the northeast corner of section 34. The mapped area is drained by the

Grand Valley Creek and the Beaupré Creek (2).

The surficial deposit covering all of section 34 is till.

CLIMATE AND VEGETATION

The climate and vegetation of the Wildcat Hills area have been discussed in the report written for the 1973 mapped area (2).

SOILS

Twelve Map Units were recognized in the total mapped area. Ten of these were recognized in the 1973 mapped area and described in the report written for that area (2). Of the two additional Map Units recognized in 1974, one belongs to the Chernozemic Order and the other to the Gleysolic Order in the Canadian System of Soil Classification (1).

The two additional Map Units are described herein. Horizon thicknesses quoted represent averages. Thicknesses of comparative horizons in identical profiles often vary by as much as ten to 40% from the norm at different points in the landscape. Common names are used to list the dominant plant species observed growing on different soils (2). These are very general lists, and are not attempts at complete or exhaustive species lists.

Map Unit 12

Classification: Lithic Orthic Dark Gray Chernozem.

Parent Material: medium textured till similar to that of Map Units 1,2,4 and 5 (2), overlying sandstone.

Slope: strongly rolling (15+ to 30%).

Stoniness: slightly stony (1).

Drainage: well drained.

Vegetation: aspen.

Profile Description: 2 inches L-H; 4 to 5 inches Ah silt loam, very friable consistence when moist; 6 inches Bm silt loam, friable consistence when moist; Cca is silt

loam, very friable consistence when moist; hard sandstone found about 2 to 3 feet below soil surface.

Limitations: moderate for paths and trails; severe for all other uses. Specific limitations are excessive slope, slippery or sticky when wet (water erosion hazard), moderate permeability, susceptibility to frost heave, shallow depth to bedrock, thin Ah horizon and moderate shrink-swell potential.

Map Unit 13

Classification: Rego Gleysol.

Parent Material: fine textured till similar to that of Map Units 8,9,10 and 11 (2).

Slope: gently undulating to gently rolling (0.5+ to 9%).

Stoniness: slightly stony (1).

Drainage: poorly drained.

Vegetation: grass, sedge.

Profile Description: profile consists of Ccag horizon, silty clay loam to silty clay, firm to very firm consistence when moist; areas of Map Unit 13 soils appear to be groundwater discharge areas.

Limitations: severe for all uses. Specific limitations are seasonally high groundwater table, slippery or sticky when wet (water erosion hazard), high clay content, slow permeability, high shrink-swell potential, susceptibility to frost heave, high lime content (soil nutrient imbalance), and lack of Ah horizon.

MISCELLANEOUS LAND TYPES

1) S. This symbol indicates the location of a spring. The ground surface is generally wet in the immediate vicinity of the spring. Three springs were found in the 1973 mapped area, and four were found in the 1974 mapped area.

2) R. This symbol indicates the location of a reservoir.

3)  This symbol indicates the location of a bedrock outcrop, either sandstone or shale.

SOIL INTERPRETATIONS

Soil interpretations are predictions of soil performance under different uses, not recommendations for land use (2). They do not eliminate the need for land use planning; rather they are valuable tools that can be used to assist the planner. They indicate limitations and suitabilities of the various kinds of soil for any particular use. The planner can then predict the type and degree of problem likely to be encountered, and plan the kind and amount of on site investigation needed to determine corrective measures. However the actual number of on site investigations can be reduced considerably by the use of a detailed soil survey map.

Using the basic soil survey data of an area, it is possible to make soil performance predictions, based on soil morphology and the associated soil physical and chemical properties. Soils in the provincial parks are used mainly for recreational pursuits, and as construction materials.

The soils of Map Units 12 and 13 have severe limitations for nearly all uses. The soils of Map Unit 13 should be left undisturbed, while those of Map Unit 12 can be used if the limitations are recognized and procedures followed to alleviate them during construction. The limitations of these two Map Units have already been listed in this report.

As stated in the report written for the 1973 mapped area, an adequate supply of topsoil can easily be found in the mapped area (2). However, a source of gravel was not found in either of the 1973 or 1974 mapped areas.

The limitations and suitabilities of the various soils for selected uses are shown in Table 2. The ratings were determined on the basis of soil morphological, physical, and chemical properties, as well as steepness of slope. The principal limiting properties are indicated by numerals which correspond to those listed in Table 1. The limiting properties are generally listed in decreasing order of importance in Table 2.

TABLE 1. LIMITING SOIL PROPERTIES AND HAZARDS

2. Seasonally high groundwater table or ponding.
3. Excessive slope.
4. Surface stoniness.
6. Slippery or sticky when wet (water erosion hazard).
7. High clay content.

10. Moderate permeability.
11. Slow permeability.
13. High shrink-swell potential.
14. Susceptibility to frost heave.. *
15. Surface soil salinity.
16. High lime content (soil nutrient imbalance).
17. Shallow depth to bedrock.
18. Thin Ah horizon.
22. Moderate shrink-swell potential.
23. Moderate concrete corrosion hazard (soluble sulphate).
26. Solonetzic soil. **

* Contingent upon an abundant supply of moisture. Frost heaving is not generally considered to be a serious problem for roads in Alberta except in poorly drained locations where the water table is near the soil surface (2). In well drained locations, the water table is normally deep enough so that frost heaving rarely takes place. Consequently the hazard "susceptibility of soils to frost heaving" has been given only minor consideration in determining a soils' overall limitation for a particular use. Exceptions are soils having high or fluctuating water tables. These soils may be highly susceptible to frost heaving, depending upon texture.

** These soils have undesirable structure and/or low permeability (2). The soils are difficult to cultivate, absorb water slowly and/or the depth of the plant rooting zone is restricted. Care should be exercised not to over-irrigate these soils, and adequate drainage should be provided. Otherwise adverse soil moisture conditions such as a high groundwater table may cause salt to be concentrated in the soil profile and on the surface to an extent that is detrimental to plant growth. (2).

In Table 2, the soil limitations for various uses have been designated as slight (S), moderate (M), and severe (V). As a source of topsoil or as a source of sand and gravel the soils are simply rated as good (G), fair (F), poor (P), and unsuitable (U).

REFERENCES

1. Canada Department of Agriculture. 1974. The System of Soil Classification for Canada. Information Canada, Ottawa, 255 pp

2. Greenlee, G. M. 1974. Soil Survey of the Wildcat Hills area and Interpretation for Recreational Use. Alberta Institute of Pedology Number M-74-4. Alberta Research, Edmonton. 55 pp.

APPENDIX AND GLOSSARY.

The appendix and glossary appear in the report written for the 1973 mapped area, (2), and will not be repeated herein.

TABLE 2. SOIL LIMITATIONS AND SUITABILITIES FOR SELECTED USES

Map Symbol	Soil Limitations For:											Suitability as a Source of	
	Camp Areas	Picnic Areas	Play Areas	Paths and Trails	Lawns & Land-scaping	Buildings		Septic Tank Filter Fields	Sanitary Land Fills	Reservoir Sites	Roads, Parking, Subgrade Material	Topsoil*	Sand and/or gravel
						with basement	without basement						
5/f2	V3,6,4	V3,6	V3,17,6,4	M3,6	V3,4,17	V3,17,4,22	V3,4,22	V3,17	V17	V3,17,10	V3,17,22,14	P3,4,18	U
8/c1	M6	M6	M3,6	M6	S	M22	S	V7,11	S	M3	V7,13,14	G	U
8/d1	M6	M6	V3,6	M6	S	M22	S	V7,11	S	M3	V7,13,14	F3	U
8/e1	M3,6	M3,6	V3,6	M6	M3	M22,3	M3	V7,11,3	S	V3	V7,13,14	P3	U
8/G2	V3,4,6	V3,6	V3,4,6	V3,6	V3,4	V3,22,4	V3,4	V3,7,11	V3	V3	V3,7,13,14	U	U
9/b1	M2,6	M2,6	M2,6	M6	M2,16	V2,22	M2	V7,11,2	M2	S	V7,13,2,14	F16,2	U
9/c1	M2,6	M2,6	M2,3,6	M6	M2,16	V2,22	M2	V7,11,2	M2	M3	V7,13,2 14	F16,2	U
9/d1	M2,6	M2,6	V3,2,6	M6	M2,16	V2,22	M2	V7,11,2	M2	M3	V7,13,2 14	F16,2,3	U
9/d2	M2,4,6	M2,6	V3,2,4,6	M6	M4,2,16	V2,22,4	M2,4	V7,11,2	M2	M3	V7,13,2,14	F4,16,2,3	U
11/b1	V7,11,6	M7,11,6	V7,11,6	M6	V26,15,18,16	V7,13,23	S	V7,11	S	M3	V7,13,14	F18,15,16	U

Legend: S - none to slight, M - moderate, V - severe, G - good, F- fair, P - poor, U - unsuitable

* Topsoil being considered here is Ah - horizon or its equivalent (see glossary)

TABLE 2. SOIL LIMITATIONS AND SUITABILITIES FOR SELECTED USES

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						with basement	without basement						
11 / c1	V7,11 6	M7,11, 6	V7,11, 6,3	M6	V26,15, 18,16	V7,13,23	S	V7,11	S	M3	V7,13, 14	F18,15, 16	U
11 / d1	V7,11,6	M7,11, 6	V7,11, 3,6	M6	V26,15, 18,16	V7,13, 23	S	V7,11	S	M3	V7,13, 14	F18,15, 16,3	U
12 / f1	V3,6	V3,6	V3,6, 17	M3,6	V3,17	V3,17, 22	V3	V3,17	V17,3	V3,17, 10	V3,17, 22,14	P3,18	U
13 / b1	V2,7, 11,6	V2,7, 11,6	V2,7, 11,6	V2,6	V2,18, 16,7,6	V2,7, 13	V2	V2,7,11	V2	V2	V2,7, 13,14	U	U
13 / d1	V2,7, 11,6	V2,7, 11,6	V2,3,7, 11,6	V2,6	V2,18, 16,7,6	V2,7, 13	V2	V2,7,11	V2	V2	V2,7, 13,14	U	U

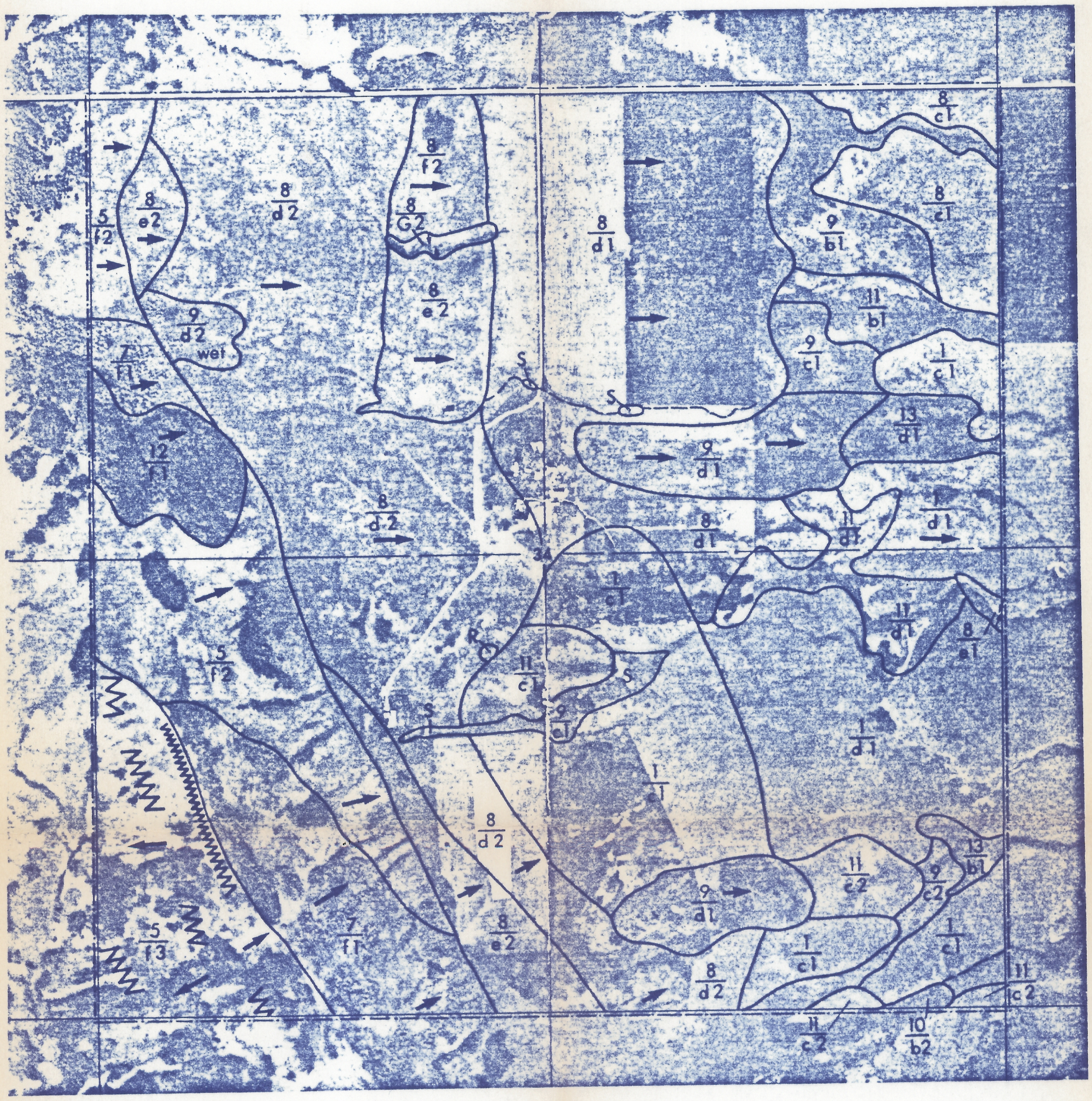
(29)

Legend: S - none to slight, M - moderate, V - severe, G - good, F- fair, P - poor, U - unsuitable

* Topsoil being considered here is Ah - horizon or its equivalent (see glossary)

SOILS MAP OF ADDITIONAL PORTION OF WILDCAT HILLS AREA

Tp.26, R.5, W-5th



Soil Classification:

MAP UNIT	SOIL ORDER	SOIL SUBGROUP	SOIL PARENT MATERIAL
12	Chernozemic	Lithic Orthic Dark Gray	medium textured till overlying sandstone
13	Gleysolic	Rego Gleysol	fine textured till
Note: For classification of Map Units 1 to 11, see legend for 1973 mapped area.			

Legend:

Map Symbol

1/c1 ← map unit; surface stoniness rating; topographic class

S. – Spring

R. – Reservoir

WWWW – bedrock outcrop (sandstone or shale)

~ – soil line

—·—·— – boundary of mapped area

↙ – direction of slope

APPROXIMATE SCALE:

660 0 660 1320 1980 2640 3300

FEET

Compiled from uncontrolled mosaic.

Mapped and Compiled by: G.M. Greenlee
Soils Division

Alberta
RESEARCH COUNCIL
1975

1974-4