

Appendix B.

Descriptive Terrain Symbols

Description:

The accompanying PDF provides a complete summary of terrain symbols with description utilized in this research.

Textural Terms and Symbols

<i>Specific Clastic Terms</i>		<i>Common Clastic Terms</i>		<i>Organic Terms</i>	
Name	Map Symbol	Name	Map Symbol	Name	Map Symbol
blocks	a	mixed fragments	d	fibric	e
boulders	b	angular fragments	x	mesic	u
cobbles	k	gravel	g	humic	h
pebbles	p	rubble	r		
sand	s	mud	m		
silt ¹	z	shells	y		
clay	c				

Figure B 1. Textural names with terrain map symbols (modified after Howes and Kenk, 1997).

size mm		roundness				
		256	64	2	.062	.002
s p e c i f i c	rounded	boulder b	cobble k	pebble p		
	rounded/ angular				sand s	silt z
	angular	block a				
c o m m o n	rounded	gravel g				
	rounded/ angular	mixed fragments d				mud m
	angular		rubble r			
		angular fragments x				

Figure B 2. Description of the specific and common textural terms, with relation of size and roundness (Howes and Kenk, 1997).

A) Specific Clastic Terms	
<i>Name</i>	<i>Definition</i>
blocks	Angular particles greater than 256 mm in size.
boulders	Rounded particles greater than 256 mm in size.
cobbles	Rounded particles between 64 and 256 mm in size.
pebbles	Rounded particles between 2 and 64 mm in size.
sand	Particles between .0625 and 2 mm in size.
silt	Particles between 2 μ m and .0625 mm in size.
clay	Particles less than 2 μ m in size.

B) Common Clastic Terms	
<i>Name</i>	<i>Definition</i>
mixed fragments	A mixture of rounded and angular particles greater than 2 mm in size.
angular fragments	A mixture of angular fragments greater than 2 mm in size (i.e., a mixture of blocks and rubble).
gravels	A mixture of two or more size ranges of rounded particles greater than 2 mm in size (e.g., a mixture of boulders, cobbles and pebbles); may include interstitial sand.
rubble	Angular particles between 2 and 256 mm; may include interstitial sand. Note: In general, little or no fine material will be visible on a rubble surface. At depth, sand and smaller particles may occupy the interstices between the coarser particles.
mud	A mixture of silt and clay; may also contain a minor fraction of fine sand.
shells	A sediment consisting dominantly of shells and/or shell fragments.

Figure B 3. A) Specific clastic textures that have narrow size range and implication of clast shape (rounded vs. angular) for particles >2 mm. B) Common clastic textures referring to groups of specific clastic size ranges (modified after Howes and Kenk, 1997).

Surficial Material Terms and Symbols

Surficial material defined as non-lithified, unconsolidated sediments derived of relatively young geological age and constitute the parent material of soils (Howes and Kenk, 1997). For detailed description of each material name, refer to Howes and Kenk (1997), pages 10 to 25.

<i>Material Name</i>	<i>Map Symbol³</i>	<i>Assumed Status of Formative Process</i>
Anthropogenic Material	A	active
Colluvium	C	active
Weathered Bedrock (in situ)	D	active
Eolian Material	E	inactive
Fluvial Material	F	inactive
Glaciofluvial Material	F^G	inactive
Ice	I	active
Lacustrine Material	L	inactive
Glaciolacustrine Material	L^G	inactive
Morainal Material (Till)	M	inactive
Organic Material	O	active
Bedrock	R	–
Undifferentiated Materials	U	–
Volcanic Material	V	inactive
Marine Material	W	inactive
Glaciomarine Material	W^G	inactive

Figure B 4. Surficial material name, map symbol and status of activity (Howes and Kenk, 1997).

Surface Expressions Terms and Symbols

Surface expression refers to the form (slope) and pattern expressed by surficial material at the ground surface, with three-dimensional shape of material equivalent to “landform” used as non-genetic sense (e.g. ridges, plains) (Howes and Kenk, 1997). The surface expression is classified according to slope, geometric shape and spatial pattern with no genetic implication, for detailed description, refer to Howes and Kenk (1997), pages 26 to 41.

KEY TO THE SELECTION OF SURFACE EXPRESSION SYMBOLS

1a. Topography of a surficial material is either bedrock-controlled or it reflects the surface configuration of the underlying surficial material; i.e., in either case, the surface material is draped over and owes its landform to the topography of an underlying substrate 2

2a. Thickness of the surficial material is relatively uniform over bedrock or surficial material 3

3a. Thickness of the surface material is less than about 1 m See VENEER (v) and THIN VENEER (x)

3b. Thickness of surface material is greater than 1 m See BLANKET (b)

2b. Thickness of surface material is variable, ranging from 0 to a few metres; surface material fills or partly fills depressions in an irregular substrate that may be either bedrock or surficial material See MANTLE OF VARIABLE THICKNESS (w)

1b. There is no apparent relation between the topography of the surficial material and that of underlying bedrock or older surficial material; depositional or erosional landforms are present 4

4a. Simple, constructional or erosional landforms are present, consisting primarily of planar surfaces 5

5a. Slopes are between 0 and 3° (0-5%) See PLAIN (p)

5b. Slopes are between 4 and 15° (6-26%) See GENTLE SLOPE (j)

5c. Slopes are between 16 and 26° (27-49%) See MODERATE SLOPE (a)

5d. Slopes are between 27 and 35° (50-70%) See MODERATELY STEEP SLOPE (k)

5e. Slopes are steeper than 35° (70%) See STEEP SLOPE (s)

4b. More complex depositional or erosional landforms are present, consisting mainly of multi-directional, non-planar surfaces 6

6a. Non-linear rises and hollows with slopes generally less than 15° (26%) See UNDULATING TOPOGRAPHY (u)

6b. Elongate rises and hollows with slopes generally less than 15° (26%) See ROLLING TOPOGRAPHY (m)

6c. Non-linear rises and hollows with many slopes steeper than 15° (26%) See HUMMOCKS (h)

6d. Elongate rises with many slopes steeper than 15° (26%) See RIDGES (r)

6e. Hollows, separated from an adjacent gentler surface by a marked break of slope See DEPRESSIONS (d)

6f. A fan shaped landform that is a sector of a cone; longitudinal gradient less than 15° (26%) See FAN (f)

6g. A fan shaped landform that is a sector of a cone; longitudinal gradient more than 15° (26%) See CONE (c)

6h. Level areas and scarps adjacent downslope; stepped topography See TERRACES (t)

<i>Surface Expression Name</i>	<i>Map Symbol</i>
moderate slope	a
blanket	b
cone(s)	c
depression(s)	d
fan(s)	f
hummock(s)	h
gentle slope	j
moderately steep slope	k
rolling	m
plain	p
ridge(s)	r
steep slope	s
terrace(s)	t
undulating	u
veneer	v
mantle of variable thickness ⁶	w
thin veneer ⁷	x

B)

A)

Figure B 5. A) Surface expression symbol description and B) term and map symbol (modified after Howes and Kenk, 1997).

Geomorphological Process Terms and Symbols

Geomorphological processes refer to natural mechanisms of weathering, erosion and deposition that modify the surficial material and landforms and are summed to be active unless otherwise stated (Howes and Kenk, 1997). For detailed description, refer to Howes and Kenk (1997), pages 42 to 62.

<i>Group</i>	<i>Geological Process Name</i>	<i>Map Symbol</i>	<i>Assumed Status of Geological Process</i>
Erosional Processes	Deflation	D	active
	Karst processes	K	active
	Piping	P	active
	Gully erosion	V	active
	Washing	W	active
Fluvial Processes	Braiding channel	B	active
	Irregularly sinuous channel	I	active
	Anastomosing channel	J	active
	Meandering channel	M	active
Mass Movement Processes	Snow avalanches	A	active
	Slow mass movements	F	active
	Rapid mass movements	R	active
Periglacial Processes	Cryoturbation	C	active
	Nivation	N	active
	Solifluction	S	active
	General periglacial processes	Z	active
	Permafrost processes	X	active
Deglacial Processes	Channeled by meltwater	E	inactive
	Kettled	H	inactive
Hydrologic Processes	Inundation	U	active
	Surface seepage ¹²	L	active

Figure B 6. Geomorphological process terms, map symbols, and summed status of geological process (Howes and Kenk, 1997).

Terrain Symbol Subclasses and Subtypes

Subclasses and subtypes can be incorporated in terrain symbols to provide additional information on the surficial material and/or geomorphological process, for detailed description, refer to Howes and Kenk (1997), pages 66 to 74.

<i>Subclass Name</i>	<i>Map Symbol</i>	<i>Definitions</i>	<i>Subclass Name</i>	<i>Map Symbol</i>	<i>Definitions*</i>
<i>Initiation Zone</i>	"	polygon includes sites or zones of instability, such as the headscaps of debris slides or earthflows and source areas for rockfall and debris flows; use with -F and -R to distinguish initiation zones from runoff zones; (see example on previous page).	<i>Slow or Rapid Mass Movement: use the following symbols with -F or -R</i>		
<i>Slow Mass Movement: use the following symbols with -F</i>			earthflow	e	slow viscous flow of material containing a high proportion of silt and clay.
soil creep	c	slow movement of soil.	slump –in bedrock	m	sliding of internally cohesive masses of bedrock or surficial material along a slip plane that is concave upward or planar.
rock creep	g	slow movement of angular debris under periglacial conditions (e.g., rock glaciers)	–in surficial material	u	
tension cracks	k	open fissures, commonly near crest of slope.	slump–earthflow	x	combined slump (upper part) and earthflow (lower part).
lateral spread			debris slide	s	sliding of disintegrating mass of surficial material.
–in bedrock	p	lateral extension of a fractured mass of bedrock or surficial material; movement is predominantly horizontal.	rockslide	r	descent of large masses of disintegrating bedrock by sliding.
–in surficial material	j		<i>Snow Avalanches: use the following symbols with -A</i>		
<i>Rapid Mass Movement: use the following symbols with -R</i>			major avalanche tracks; active	f	in zones of coniferous forest: broad avalanche track(s) occupied by predominantly shrubby, deciduous vegetation; conifers are largely absent.
debris fall	f	descent of a mass of surficial material by falling, bouncing and rolling.	minor avalanche tracks; active	m	similar to above, but relatively narrow; generally narrower than the height of adjacent trees.
rockfall	b	descent of masses of bedrock by falling, bouncing and rolling.	mixed major and minor tracks; active	w	polygon includes both major and minor avalanche tracks.
debris flow	d	rapid flow of saturated debris.	old avalanche tracks	o	tracks are clearly visible on air photos but are less well defined than active avalanche tracks because they are partly or completely occupied by young conifers.
debris torrent	t	rapid flow of a mixture of water, earth and vegetation debris down a steep, well-defined stream channel.	* Mass movement definitions after Fairbridge, 1968; Swanston, 1974; Swanston and Swanson, 1976; Vames, 1978; White, 1981.		

Figure B 7. Subclasses for mass movements including: slow mass movement (F), rapid mass movement (R), and snow avalanche (A) (Howes and Kenk, 1997).

<i>Subclass Name</i>	<i>Map Symbol</i>	<i>Definitions</i>
progressive bank erosion	u	persistent bank erosion indicated by the presence of undercut banks, overhanging and fallen trees, and much timber in the channel; old air photos and historical information can also be used as evidence. Example: sF ^A p-Mu
abrupt channel diversion; avulsion	a	the present channel has recently shifted abruptly to a previously vegetated area; the former channel can be identified on air photos or on the ground. Examples: gF ^A p-Ja gF ^A f-Ba
backchannels (undivided)	b	small channels which may or may not be connected to the main channel. Example: sgF ^A p-Ib
permanent river-fed backchannels	p	backchannels joined to the main channel at the upstream end, allowing flowing or standing water all year. Example: sgF ^A p-Jp
ephemeral river-fed backchannels	e	backchannels joined to the main channel at the upstream end, but dry during late summer. Examples: sgF ^A p-Je sgF ^A p-Jpe gF ^A f-Be
spring-fed backchannels	s	backchannels in which water is maintained during the late summer by the emergence of floodplain groundwater. Examples: sF ^A p-Ms sF ^A p-Msu
permanent tributary-fed backchannels	t	either flowing or standing water from tributaries is present in the backchannel all year. Example: sgF ^A p-Jt
ephemeral tributary-fed backchannels	d	backchannels normally fed by tributaries, but dry during late summer. Example: sgF ^A p-Jtr

Figure B 8. Subclasses for fluvial processes including: braided channel (B); irregularly sinuous channel (I), anastomosing channel (J); and meandering channel (M) (Howes and Kenk, 1997).