1

FORMATION OF [illegible] PARENT MATERIAL

It is a poem of existence . . . not a lyric but a slow-moving epic whose beat has been set by eons of the world's experience. . . .

—JAMES MICHENER, CENTENNIAL

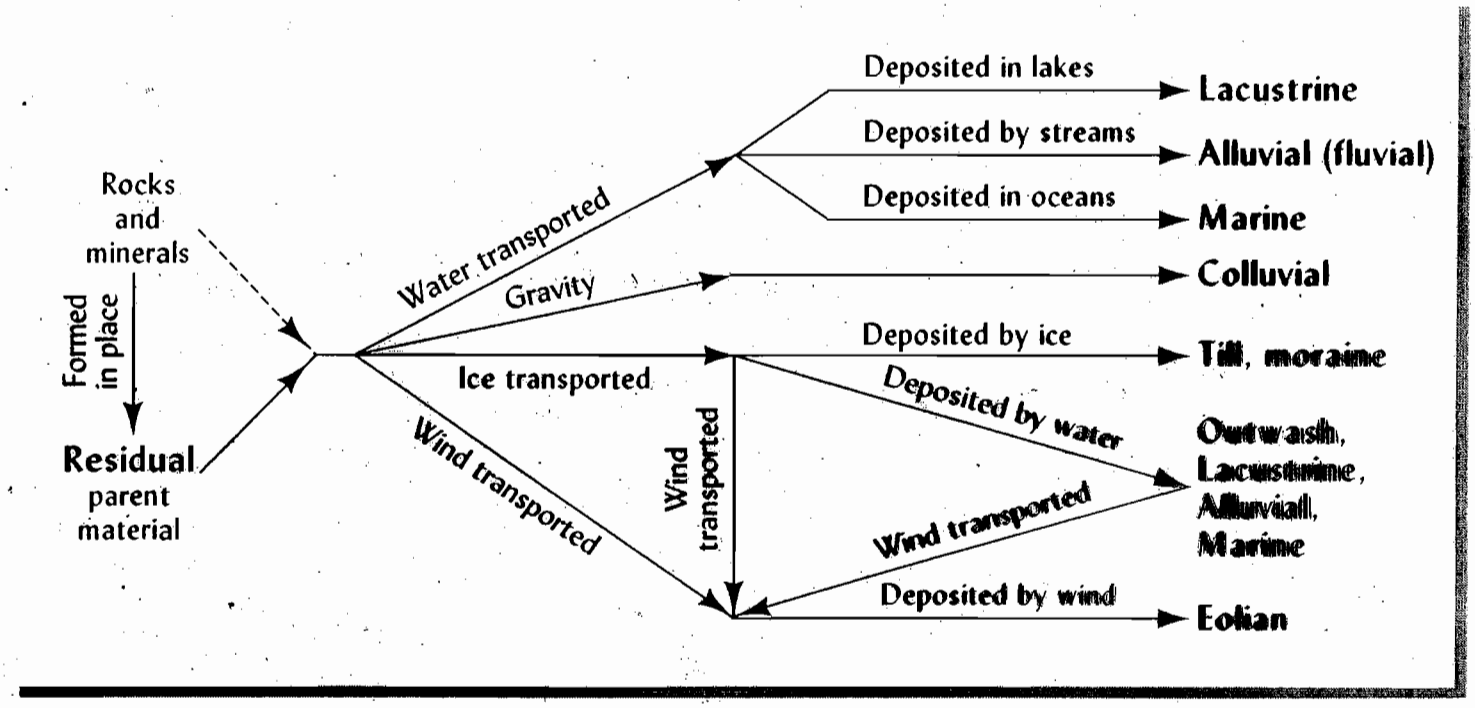


FIGURE 2.10 How various kinds of parent material are formed, transported, and deposited.

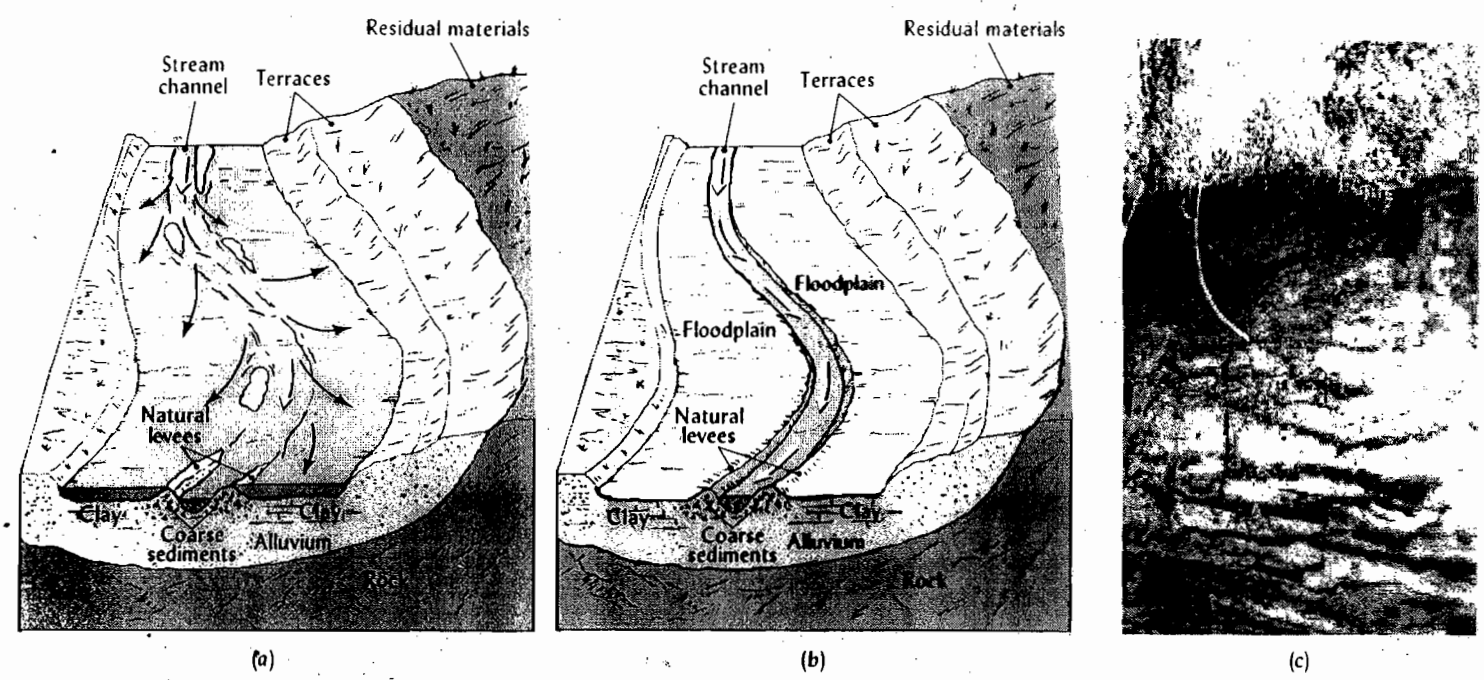


FIGURE 2.13 Illustration of floodplain development. (*a*) A stream is at flood stage, has overflowed its banks, and is depositing sediment in the floodplain. The coarser particles are being deposited near the stream channel where water is moving most rapidly, while the finer clay particles are being deposited where water movement is slower. (*b*) After the flood the sediments are in place and vegetation is growing. (c) Contrasting layers of sand, silt, and clay characterize the alluvial floodplain. Each layer resulted from separate flooding episodes. (Redrawn from *Physical Geology*, 2d ed., by F. R. Flint and B. J. Skinner, copyright © 1977 John Wiley & Sons, Inc. Reprinted by permission of John Wiley & Sons, Inc.) (Photo courtesy of R. Weil)

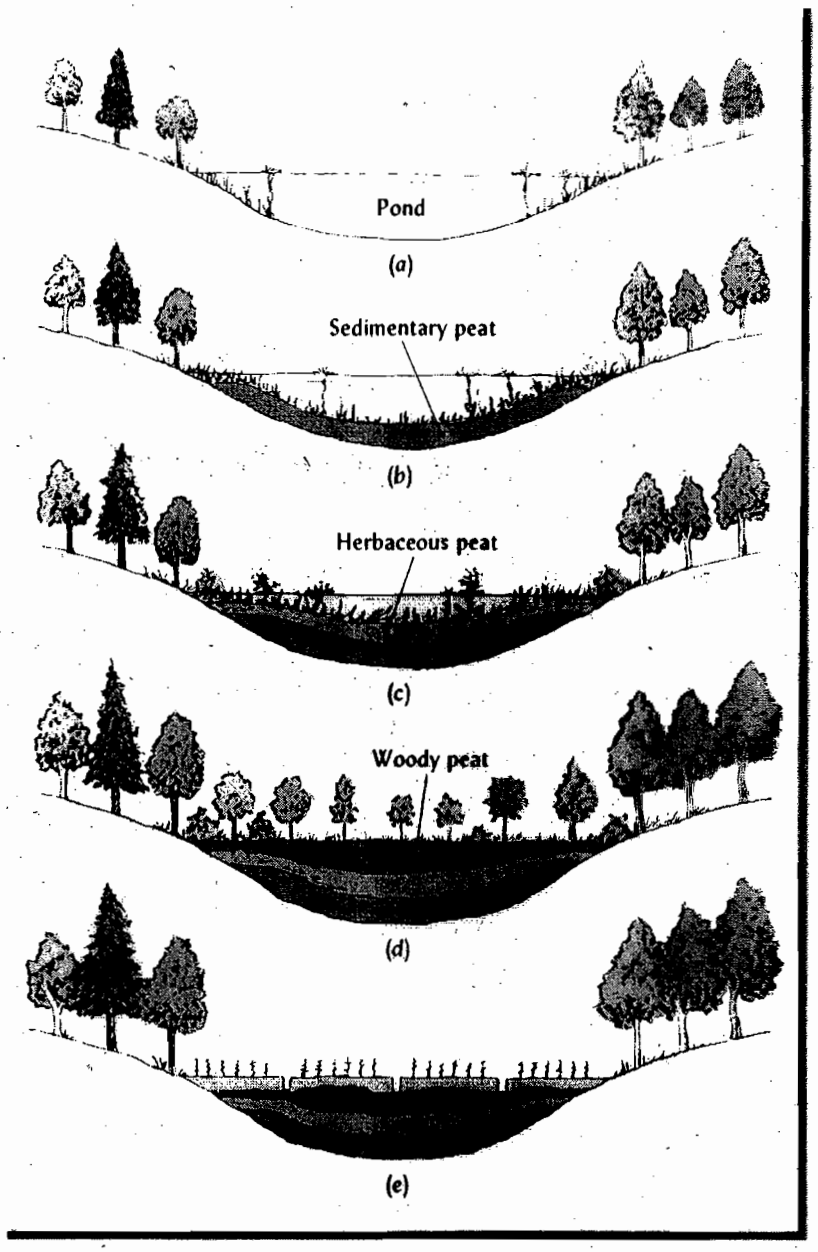
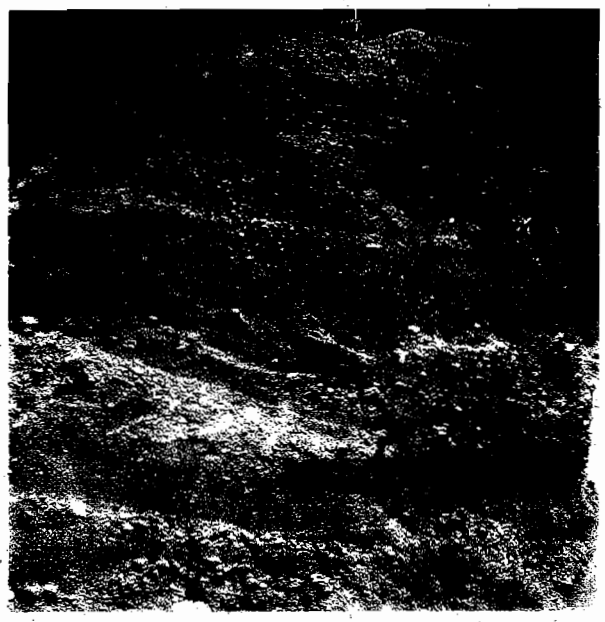


FIGURE 2.23 Stages in the development of a typical woody peat bog and the area after clearing and draining. (*a*) Nutrient runoff from the surrounding uplands encourages aquatic plant growth, especially around the pond edges. (*b*, *c*) Organic debris fills in the bottom of the pond. (*d*) Eventually trees cover the entire area. (*e*) If the land is cleared and a drainage system installed, the area becomes a most productive muck soil.



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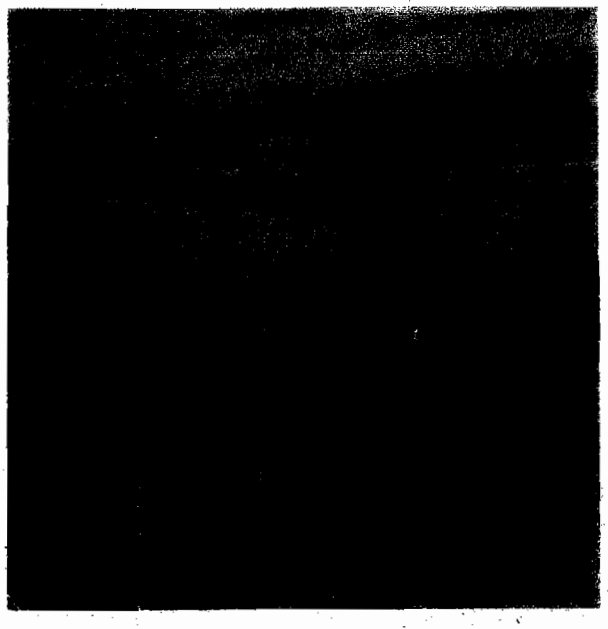

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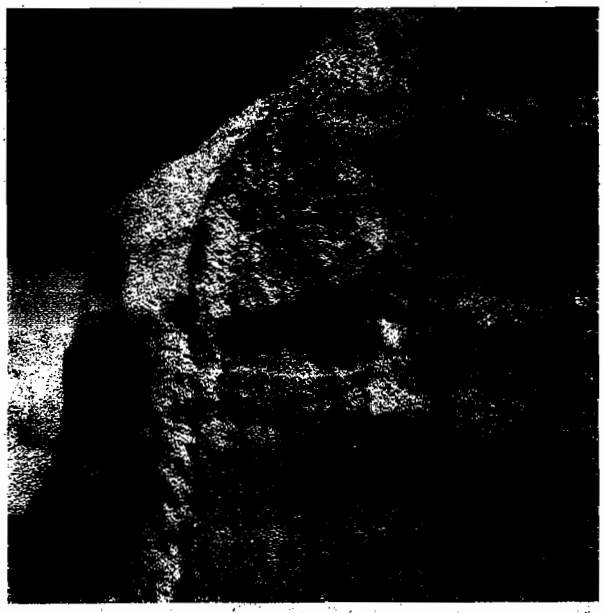

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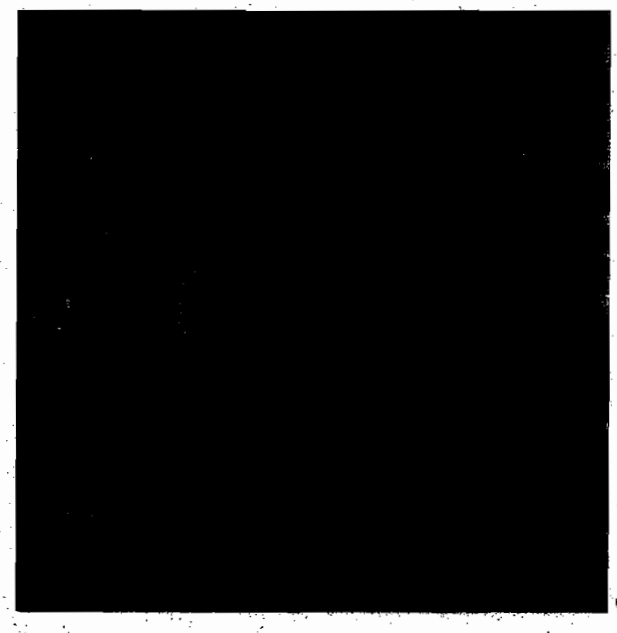
Figs. 39–44. Examples of unconsolidated materials.

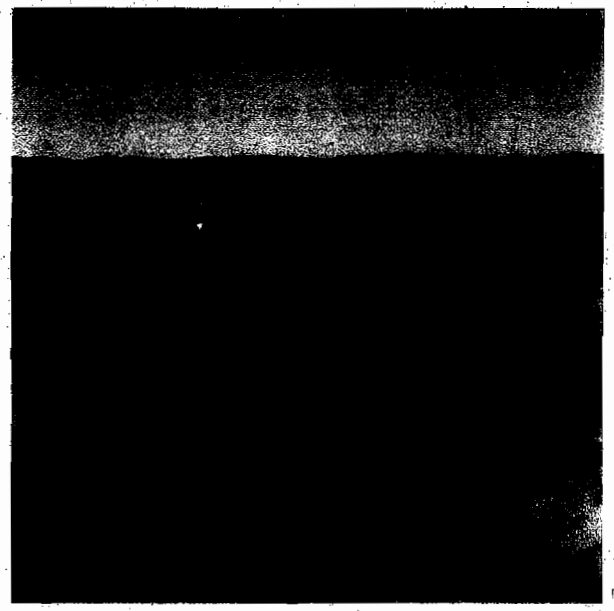
Fig. 39. Colluvial material.

Fig. 40. Eolian material.

Fig. 41. Fluvial material.

Fig. 42. Lacustrine material.





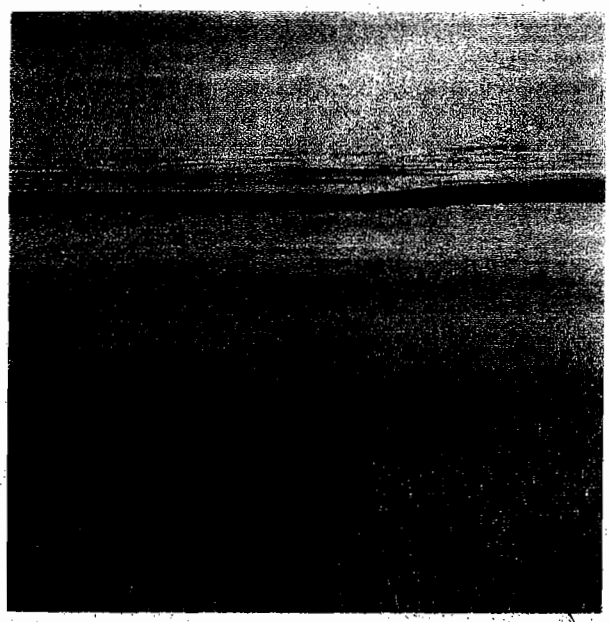
Figs. 51–56. Surface expressions of morainal materials.

Fig. 51. Morainal blanket over undulating bedrock, eastern Quebec.

Fig. 52. Hummocky and ridged morainal material in the midground and background, Kamloops, B.C.

Fig. 53. Ridged morainal material. The lines of trees mark the swales between parallel ridges, southern Ontario.

Fig. 54. Rolling morainal material, southeastern Alberta.



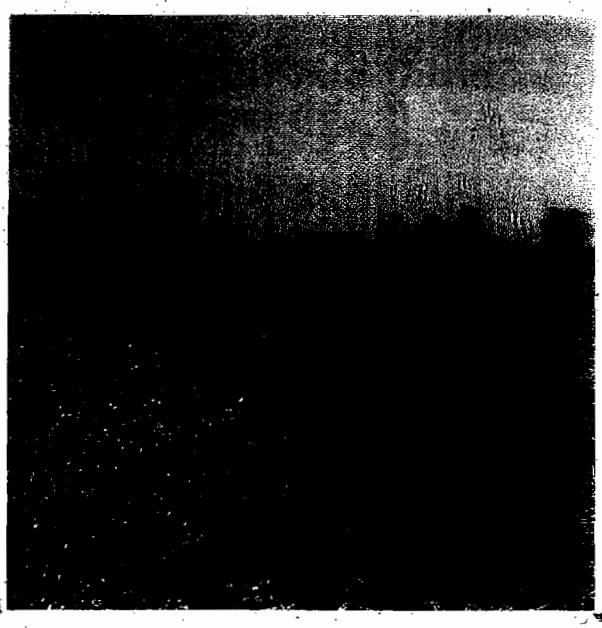


Fig. 55. Undulating morainal material, southern Saskatchewan.

Fig. 56. Morainal veneer over rolling bedrock, Vancouver Island, B.C.

Figs. 57–62. Surface expressions of lacustrine and marine materials.

Fig. 57. Hummocky glaciolacustrine material, Biggar, Sask.

Fig. 58. Level lacustrine material, southwestern Ontario.

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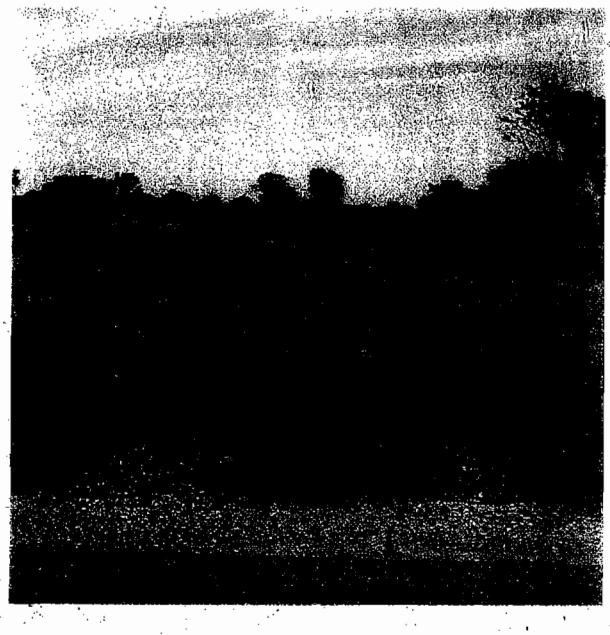

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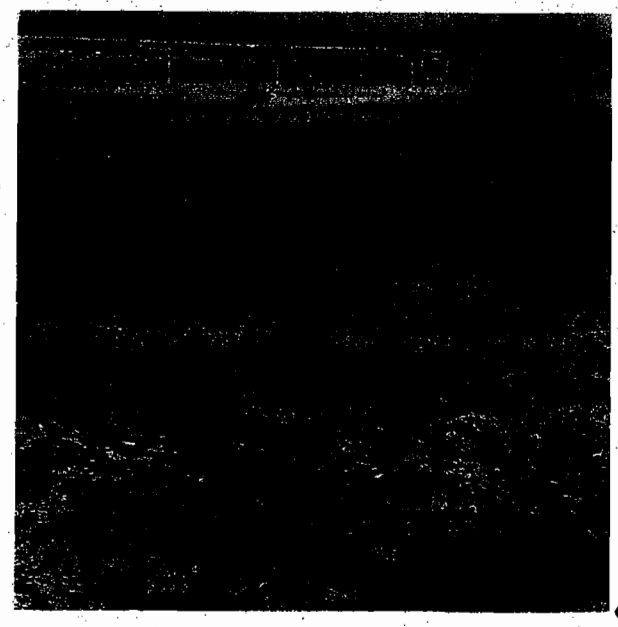

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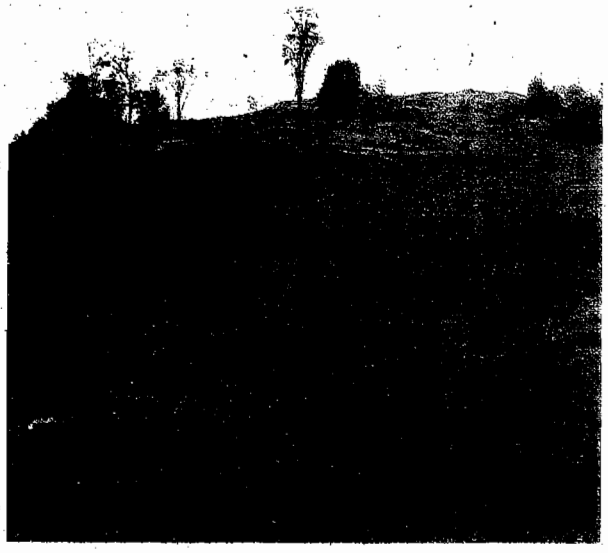

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Fig. 59. A lacustrine terrace dissected by streams, between a river and hills, Kamloops, B.C.

Fig. 60. Undulating marine landform marks the remnants of ancient clay flow slides, Pontiac County, Que.

Fig. 61. Thin marine veneer over level bedrock, Grande-Anse, N.B.

Fig. 62. Marine veneer and blanket over hummocky bedrock, Montmagny, Que.

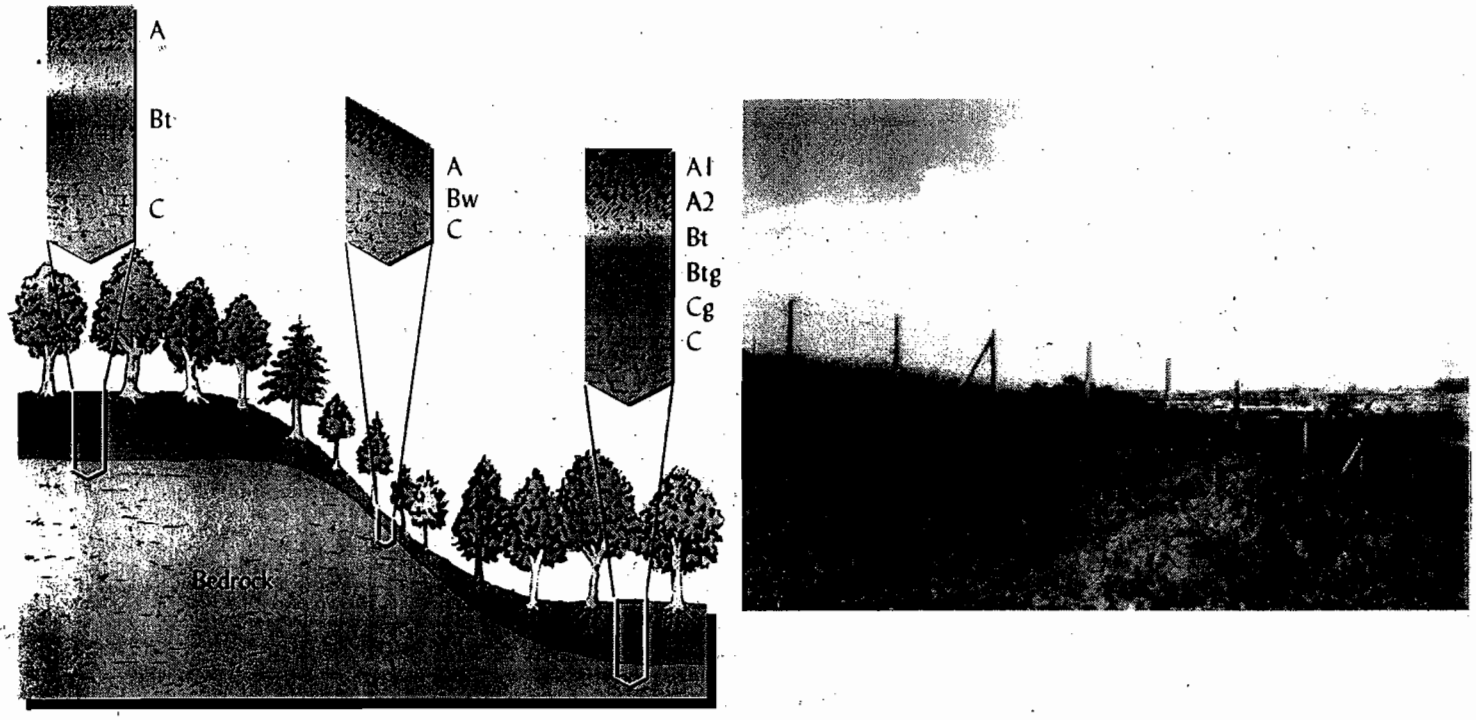


FIGURE 2.30 Topography influences soil properties, including soil depth. The diagram on the left shows the effect of slope on the profile characteristics and the depth of a soil on which forest trees are the natural vegetation. The photo on the right illustrates the same principle under grassland vegetation. Often a relatively small change in slope can have a great effect on soil development. See Section 2.18 for explanation of horizon symbols. (Photo courtesy of R. Weil)

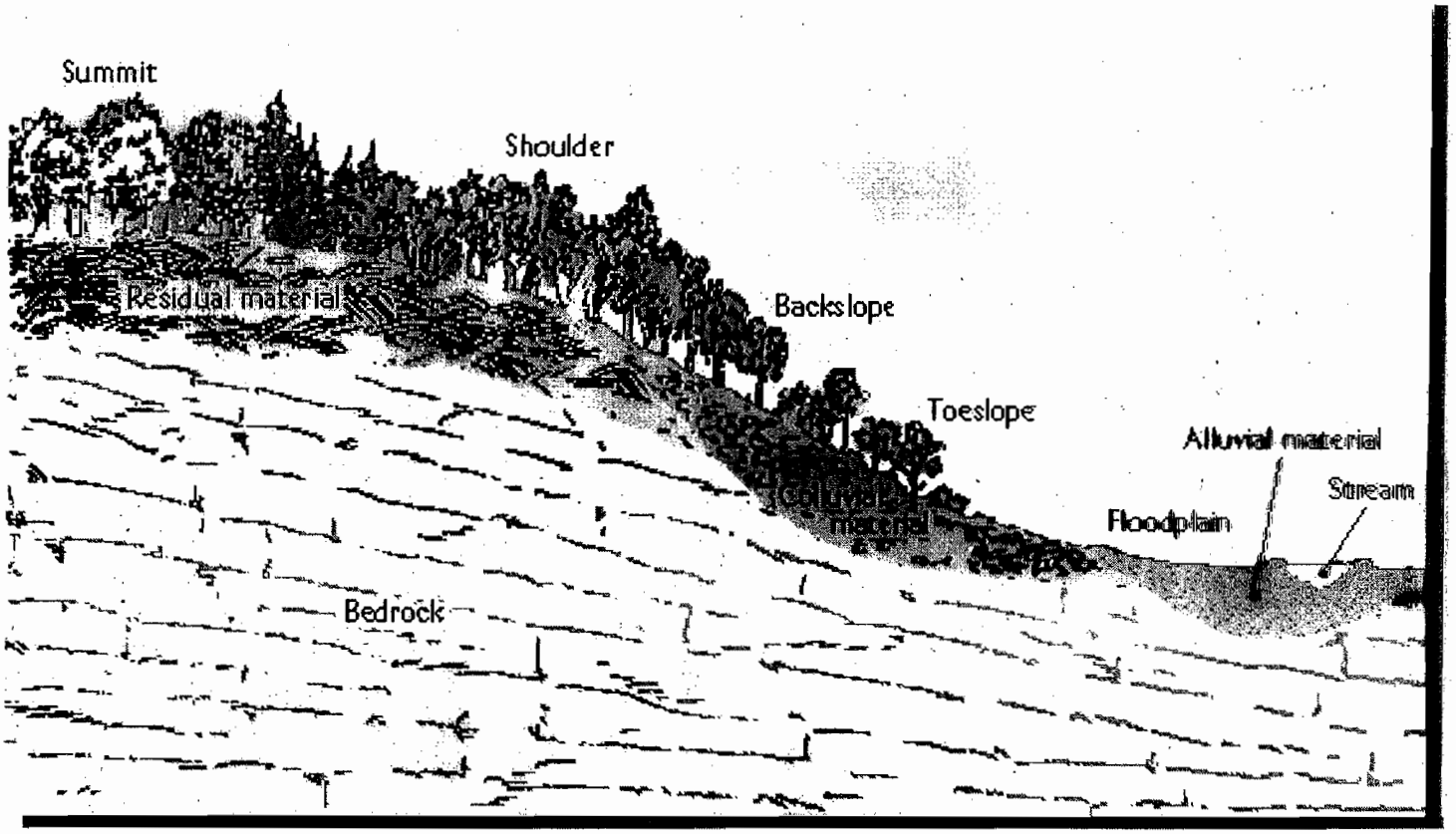


FIGURE 2.31 An interaction of topography and parent material as factors of soil formation. The soils on the summit, toe-slope, and floodplain in this idealized landscape have formed from residual, colluvial, and alluvial parent materials, respectively.

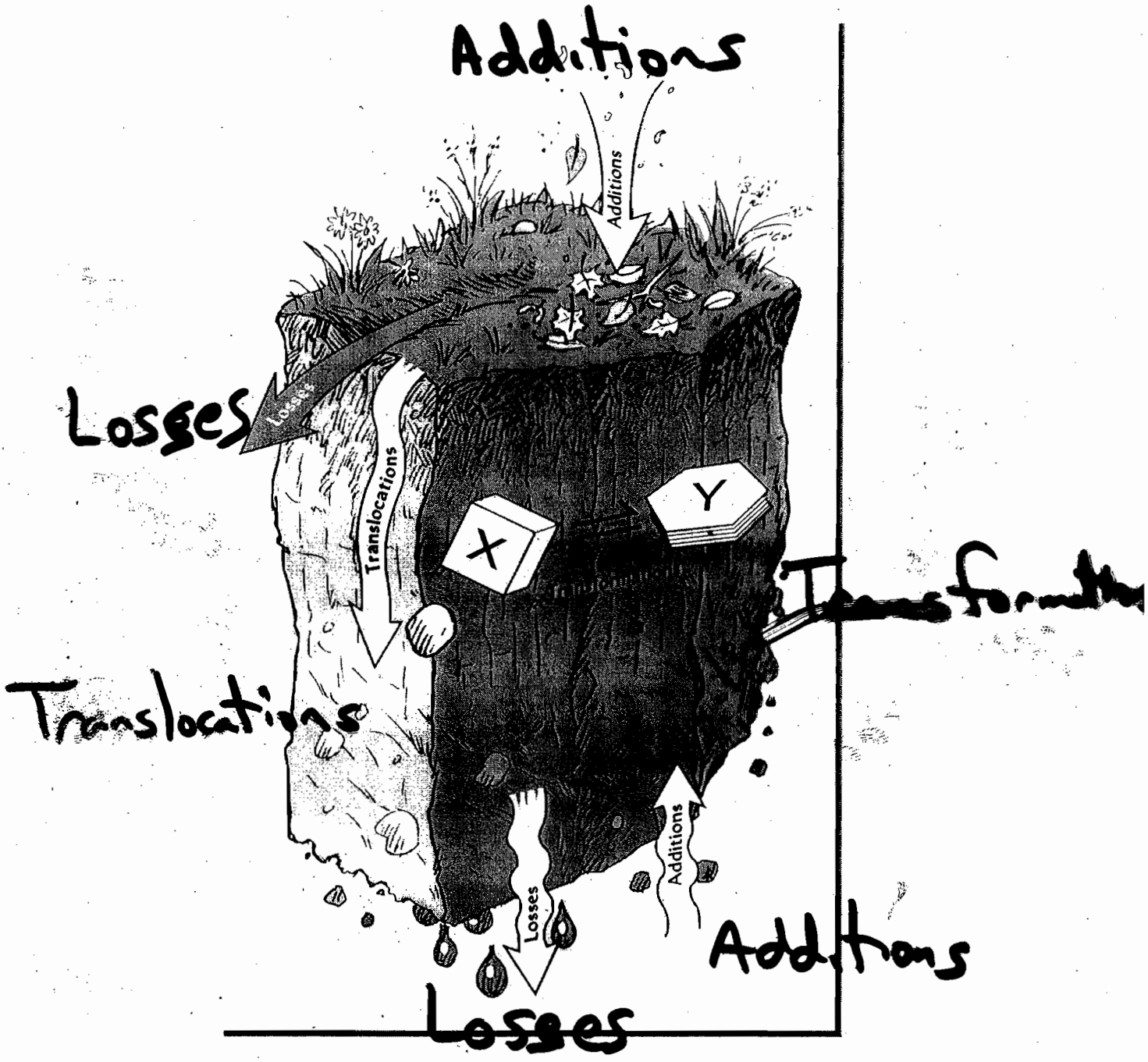


FIGURE 2.32 A schematic illustration of additions, losses, translocations, and transformations as the fundamental processes driving soil-profile development.

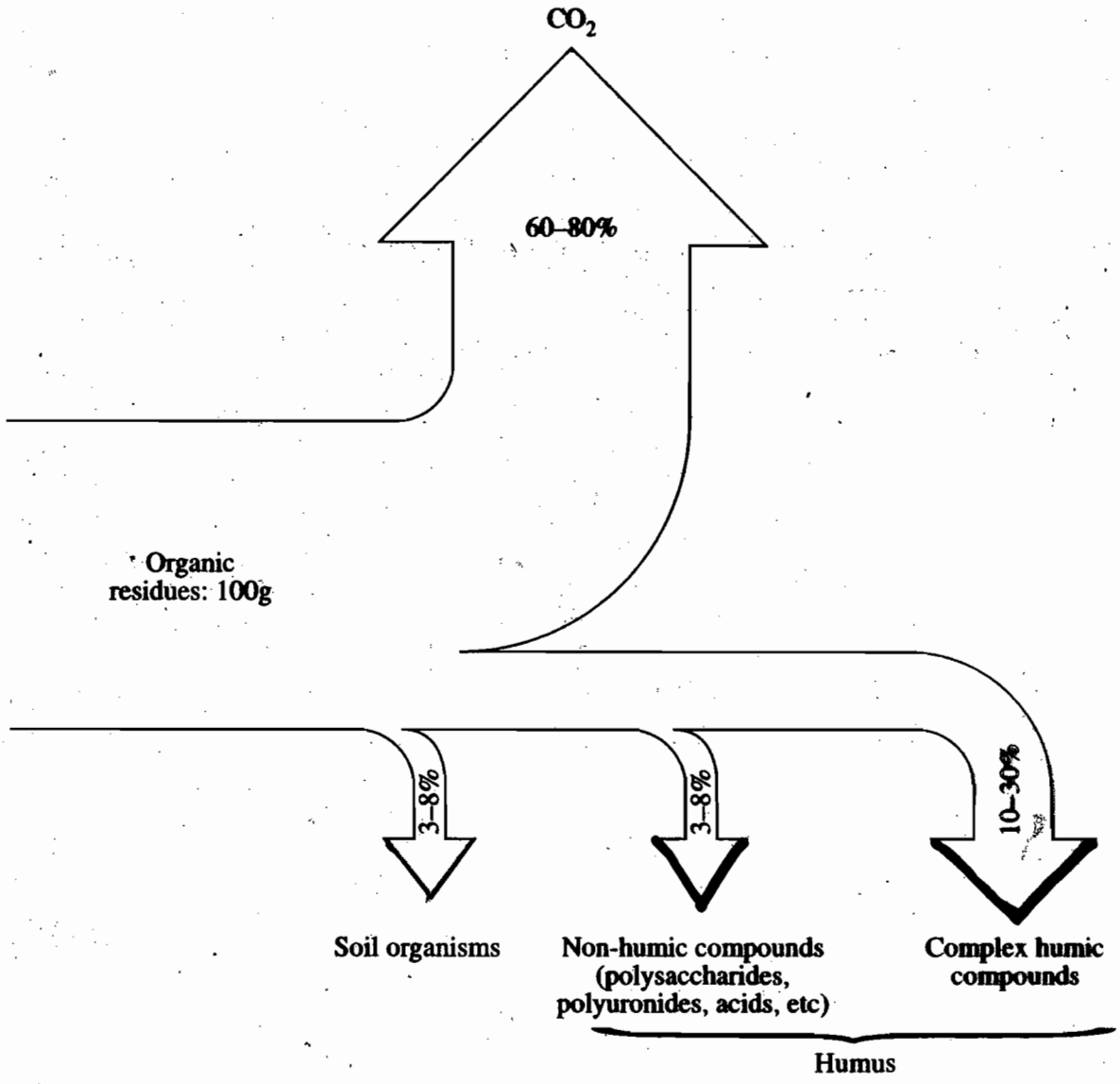


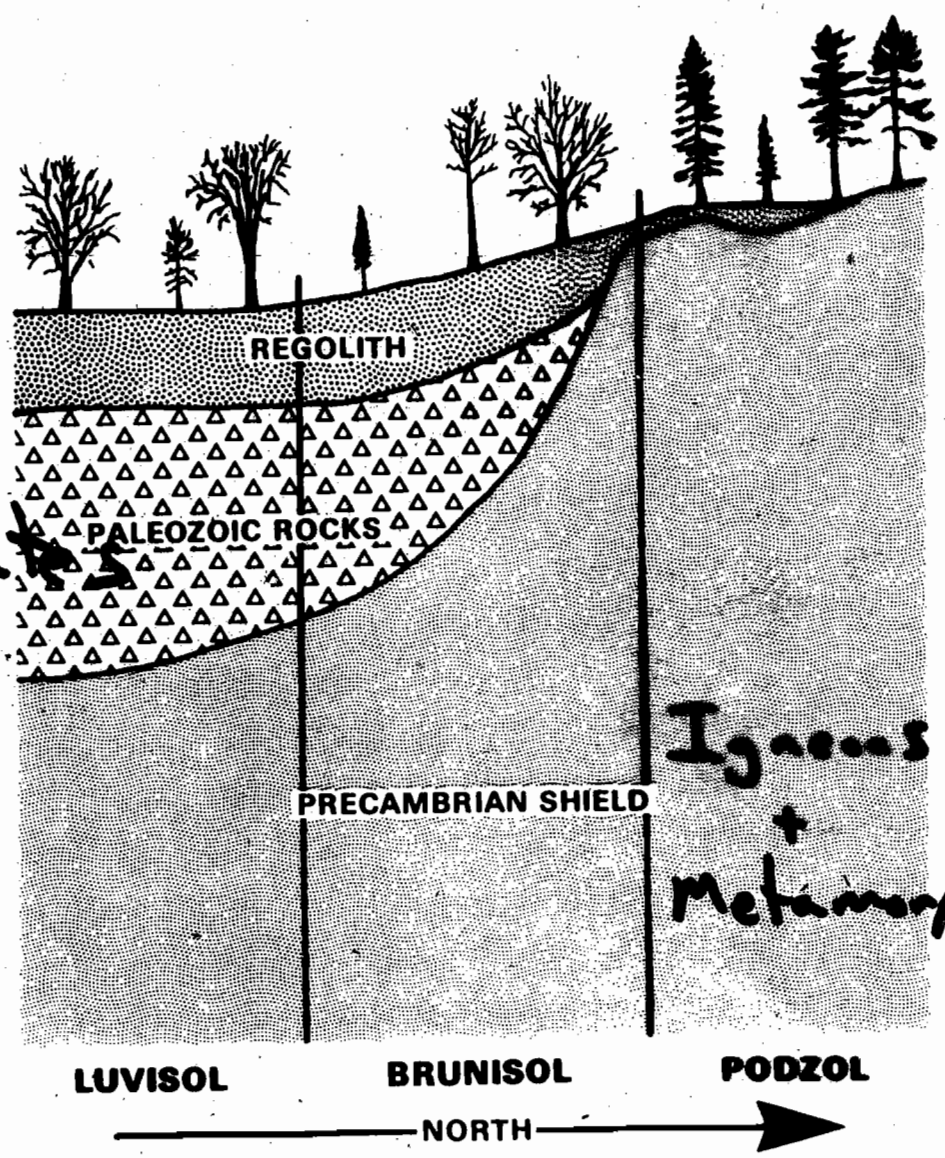
Figure 3.1 The fate of 100 g of organic residues 1 year after incorporation into the soil (from Brady 1990)

Soil formation is a complex process that takes place over decades or centuries. The soil pedon is an open, dynamic system that allows additions, removals, transfers and transformations of energy and matter.

Horizons develop as a result of numerous processes in the soil. These processes are be classified into the following categories:

1. additions,
2. removal,
3. mixing,
4. translocations
5. and transformations.

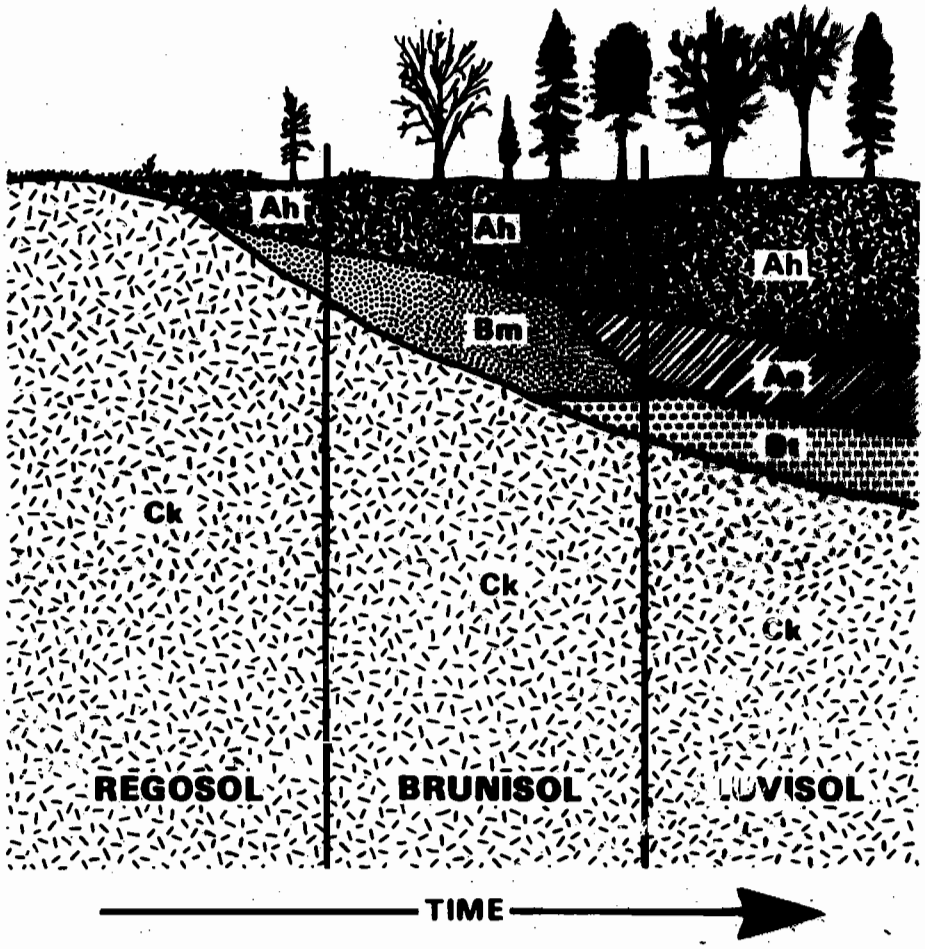
Organic and mineral master horizons are further divided into distinct horizons by added a suffix to master horizons. Soil pedons have distinct horizons and combinations.



Glacial

Carbonates

Igneous + Metamorphic

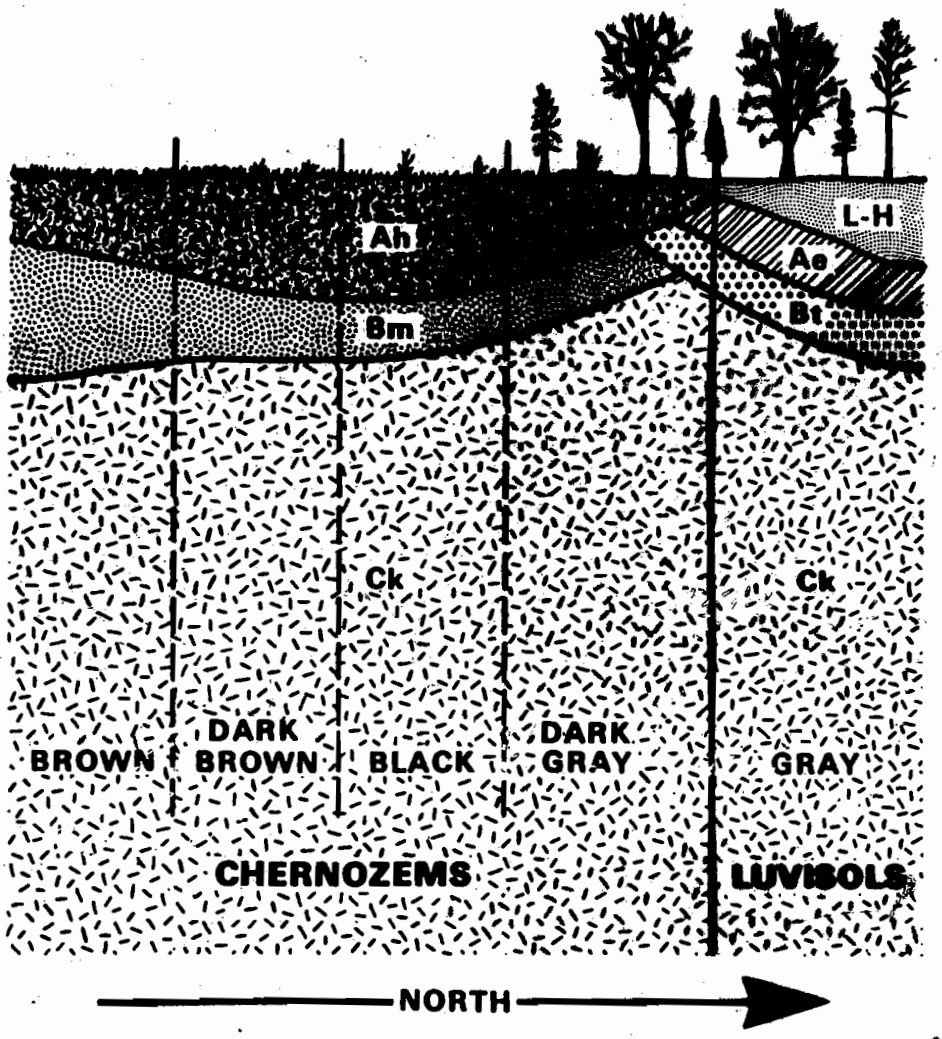


Southern Ontario

→ Bfj ?

→ Bm > 5cm ?

Prairie Grasslands



Also, Dry wetter

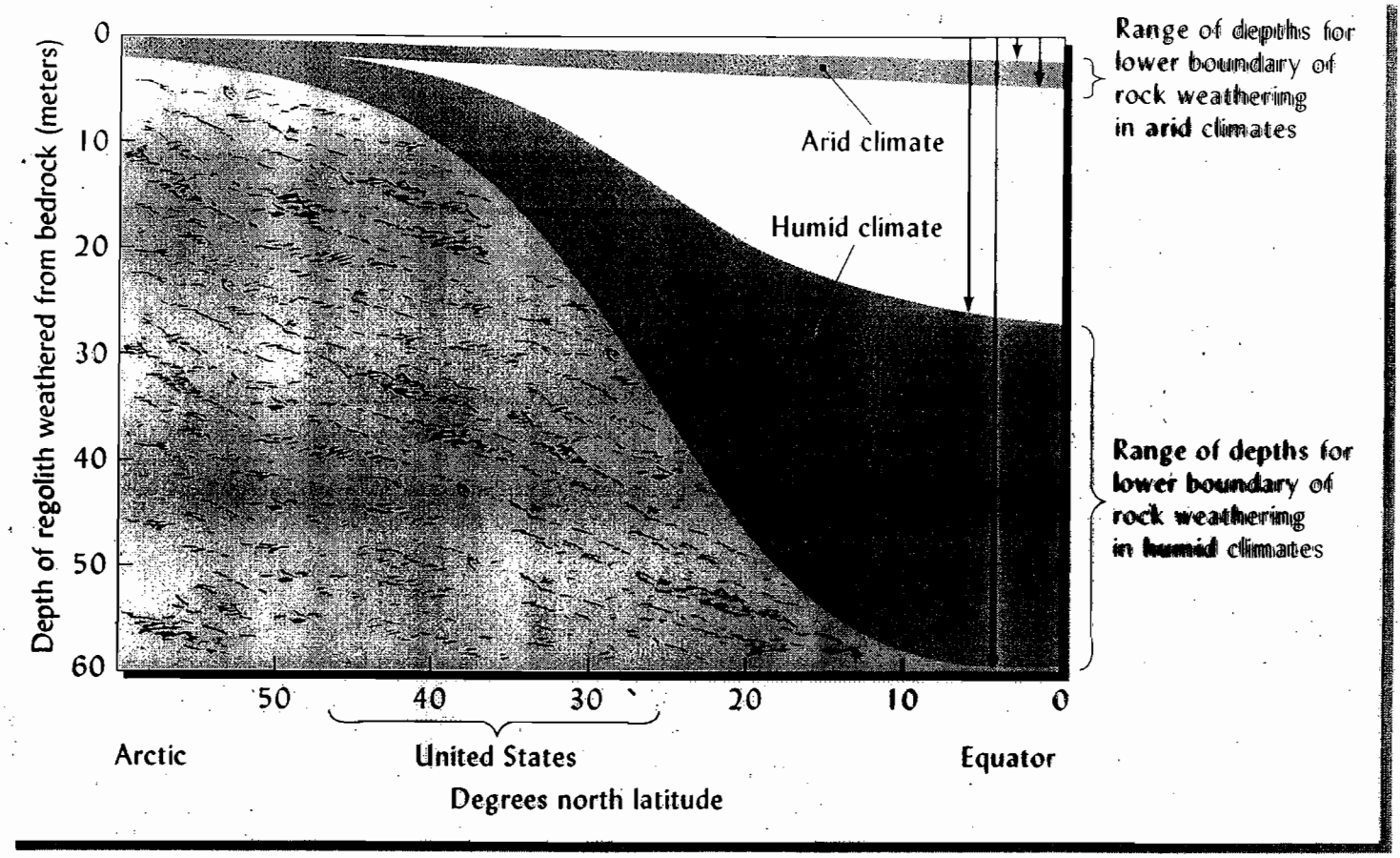
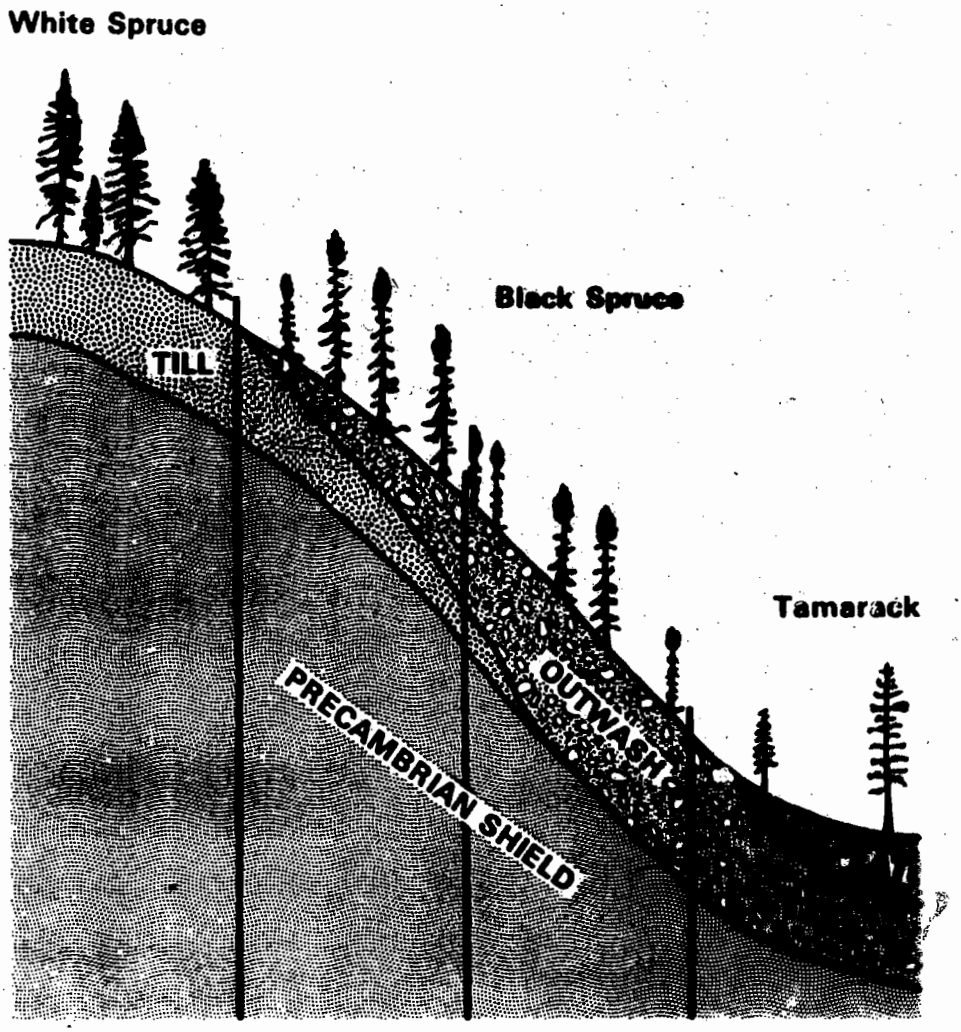


FIGURE 2.24 A generalized illustration of the effects of two climatic variables, temperature and precipitation, on the depths of regolith weathered in bedrock. The stippled areas represent the range of depths to which the regolith typically extends. In cold climates (arctic regions), the regolith is shallow under both humid and arid conditions. In the warmer climates of the lower latitudes, the depth of the residual regolith increases sharply in humid regions, but is little affected in arid regions. Under humid tropical conditions, the regolith may be 50 or more meters in depth. The vertical arrows represent depths of weathering near the Equator. Remember that soil depth may not be as great as regolith depth.



Topography → drainage effects

Soil Formation

http://129.128.49.169/Pedosphere/toc01.html

Soil Master Horizons

A horizon A mineral horizon formed at or near the surface in the zone of removal of materials in solution and suspension, or maximum in situ accumulation of organic carbon, or both.

B horizon A mineral horizon characterized by one or more of the following:

1. An enrichment in silicate clay, iron, aluminum, or humus.
2. A prismatic or columnar structure that exhibits pronounced coatings or staining associated with significant amounts of exchangeable sodium.
3. An alteration by hydrolysis, reduction, or oxidation to give a change in color or structure from the horizons above or below, or both.

C horizon A mineral horizon comparatively unaffected by the Pedogenic processes operative in A and B, except gleying, and the accumulation of carbonates and more soluble salts.

Summary of Soil Formation

The driving variables which control formation of soil or a soil property in undisturbed ecosystems are

1. climate,
2. vegetation,
3. parent material,
4. topography or relief
5. and soil organisms

over a period of time.