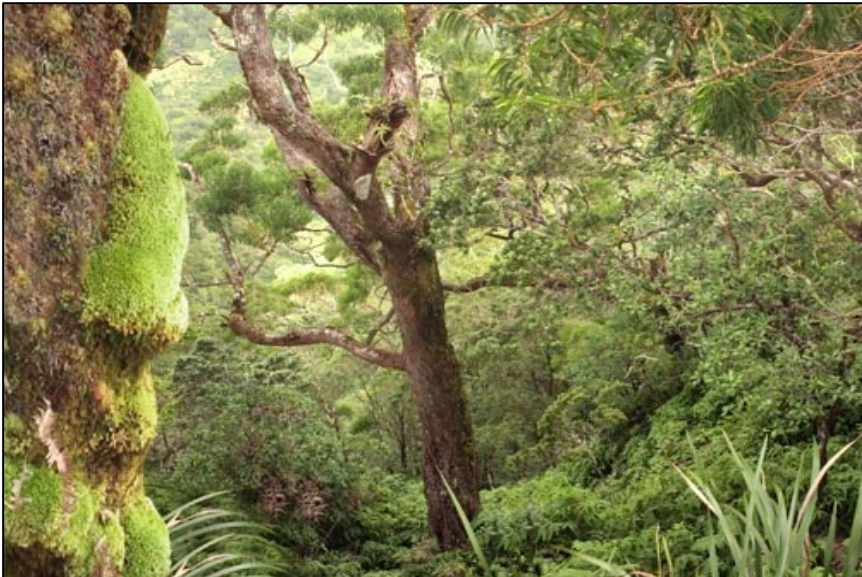


Soils: An Introduction



Soils: Where does soil come from?

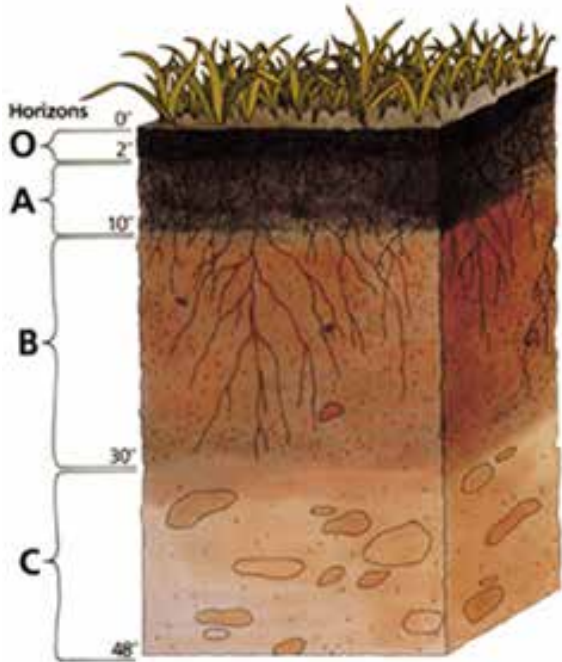


<http://imagecache.artistrising.com/artwork/xlg//1/160/KOVG000A.jpg>

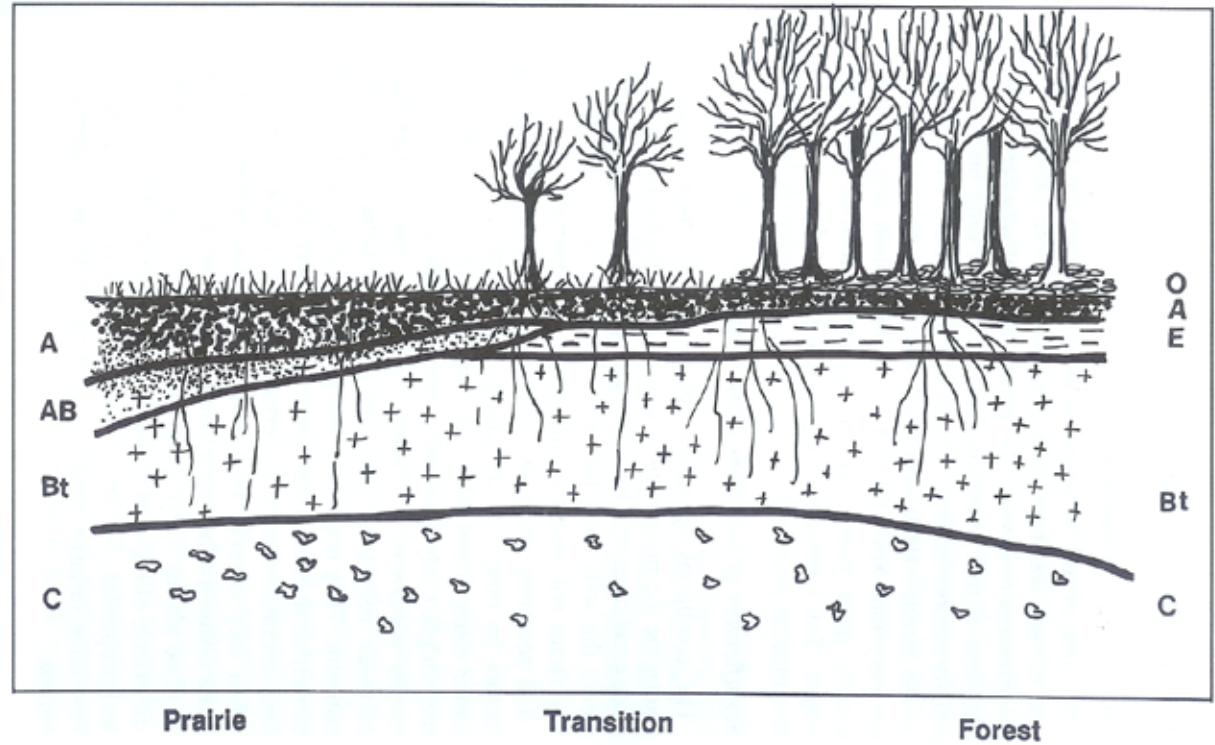
Soils: Where does soil come from?



Soils: Where does soil come from?



<http://soils.usda.gov/education/resources/lessons/profile/profile.jpg>




(Kohnke & Franzmeier 1995)

Soils: Where does soil come from?

THE TWELVE ORDERS OF SOIL TAXONOMY


ALFISOLS



Alfisols are developed in moist areas. These soils result from weathering processes that build the mineral soil while maintaining most of the surface layer and the subsoil, where they can hold and tightly retain soil nutrients against their lateral growth under forest or other vegetation cover and/or protection by their capricious water table.

AVERAGE MADE UP ABOUT 10% OF THE WORLD'S EXTENDED LAND SURFACE.


ANDISOLS



Andisols have formed from weathering processes that generate intense volcanic ash and volcanic tephra. These materials are usually light weight and contain highly reactive, highly porous volcanic ash and volcanic tephra. They are usually developed in volcanic ash and volcanic tephra, and are usually developed in high precipitation, especially those areas associated with volcanic materials.

AVERAGE MADE UP ABOUT 1% OF THE WORLD'S EXTENDED LAND SURFACE.


ARIDISOLS



Aridisols are soils that are too dry for the growth of mesophytic plants. The lack of moisture greatly restricts the amounts of weathering processes and forest cover and decomposition. These soils are usually developed in arid and semiarid areas where erosion or deposition rates are faster than the soil's soil development, such as dunes, river terraces, and flood plains. They occur in many environments.

AVERAGE MADE UP ABOUT 16% OF THE WORLD'S EXTENDED LAND SURFACE.


ENTISOLS



Entisols are soils that show little or no evidence of pedogenic horizon development. Pedogenic horizons are poorly developed, pedogenic horizons are absent where erosion or deposition rates are faster than the soil's soil development, such as dunes, river terraces, and flood plains. They occur in many environments.

AVERAGE MADE UP ABOUT 16% OF THE WORLD'S EXTENDED LAND SURFACE.


GELISOLS



Gelisols are soils that have permafrost near the soil surface and/or have evidence of discontinuity from changes in soil temperature. Gelisols are common in the higher latitudes or in high altitudes.

GELISOLS MADE UP ABOUT 9% OF THE WORLD'S EXTENDED LAND SURFACE.


HISTOSOLS



Histosols have a high content of organic matter and low mineral content. They are developed in wetlands, swamps, and other areas where water is present for much of the year. They are usually developed in high precipitation, especially those areas associated with volcanic materials.

HISTOSOLS MADE UP ABOUT 1% OF THE WORLD'S EXTENDED LAND SURFACE.


INCEPTISOLS



Inceptisols are soils of incipient horizon development that generally exhibit only rudimentary degrees of soil weathering. Inceptisols have a weak profile to the horizon and are usually developed in high precipitation, especially those areas associated with volcanic materials.

INCEPTISOLS MADE UP ABOUT 17% OF THE WORLD'S EXTENDED LAND SURFACE.


MOLLISOLS



Mollisols are soils that have a dark colored surface horizon composed of clay particles. They are developed in moist areas where erosion or deposition rates are faster than the soil's soil development, such as dunes, river terraces, and flood plains. They occur in many environments.

MOLLISOLS MADE UP ABOUT 8% OF THE WORLD'S EXTENDED LAND SURFACE.


OXISOLS



Oxisols are highly weathered soils of tropical or subtropical regions. They are developed in high precipitation, especially those areas associated with volcanic materials.

OXISOLS MADE UP ABOUT 8% OF THE WORLD'S EXTENDED LAND SURFACE.


SPODOSOLS



Spodosols formed from weathering processes that strip organic matter combined with aluminum, iron, and other trace elements from the surface and deposit them in the subsoil. Inceptisols are usually developed in high precipitation, especially those areas associated with volcanic materials.

SPODOSOLS MADE UP ABOUT 8% OF THE WORLD'S EXTENDED LAND SURFACE.


ULTISOLS



Ultisols are soils that are highly weathered and have a high content of clay. They are developed in high precipitation, especially those areas associated with volcanic materials.

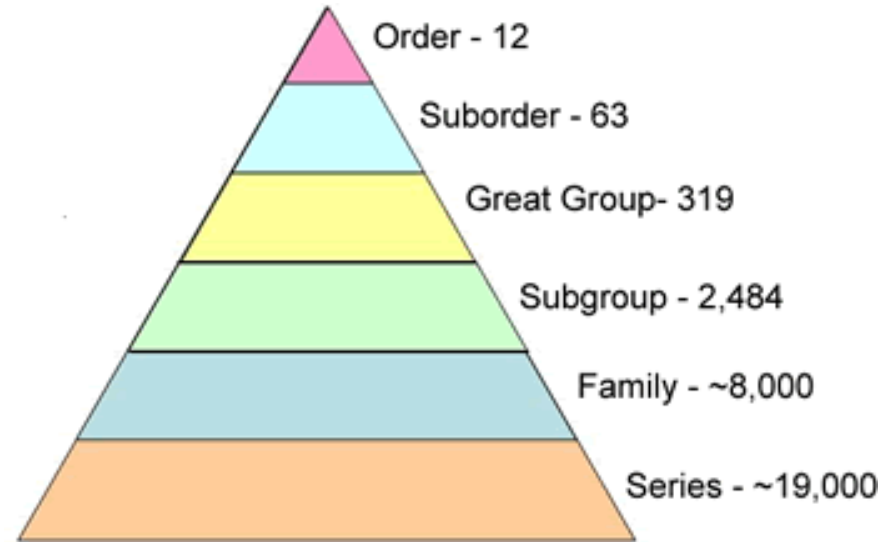
ULTISOLS MADE UP ABOUT 8% OF THE WORLD'S EXTENDED LAND SURFACE.

VERTISOLS



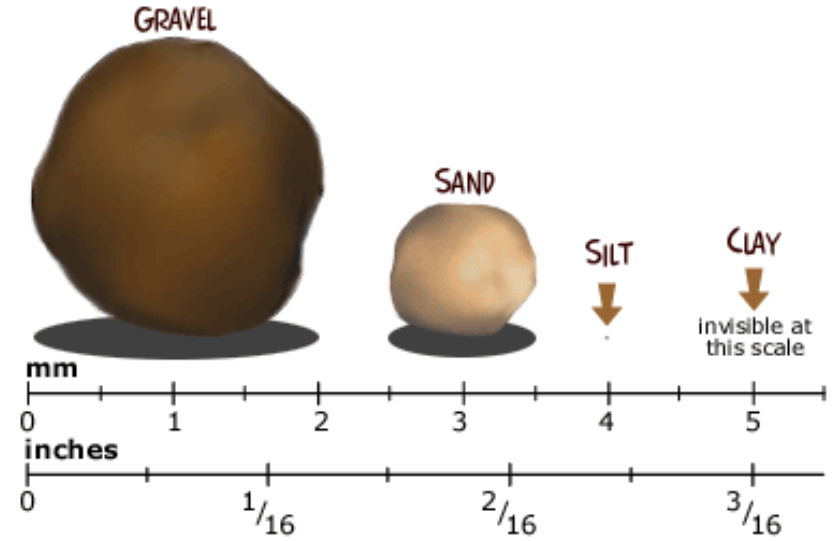
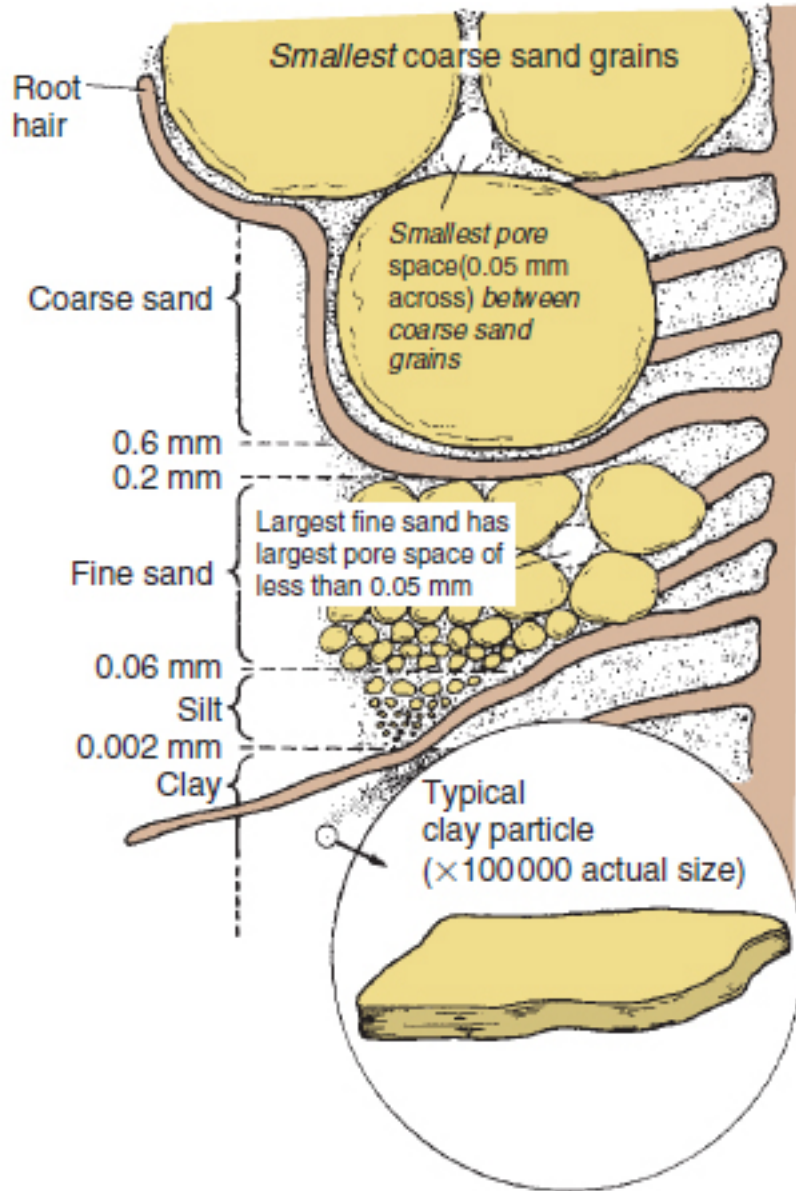
Vertisols have a high content of expanding clay minerals. They are developed in high precipitation, especially those areas associated with volcanic materials.

VERTISOLS MADE UP ABOUT 2% OF THE WORLD'S EXTENDED LAND SURFACE.



The screenshot shows the Web Soil Survey (WSS) website. The header includes the USDA logo and the text "Natural Resources Conservation Service" and "Web Soil Survey". The main content area features a search bar, a "START WSS" button, and a "Welcome to Web Soil Survey (WSS)" section. The "Welcome" section provides information about the WSS, including that it is operated by the USDA Natural Resources Conservation Service (NRCS) and provides access to the largest natural resource information system in the world. It also mentions that the site is updated and maintained online as the single authoritative source of soil survey information. The "Four Basic Steps" section is visible, with the first step being "Define" and the second being "Use the Area of Interest tab to define your area of interest." The right sidebar contains sections for "I Want To..." (Start Web Soil Survey, Know the requirements, etc.), "Announcements/Events" (Web Soil Survey 2.3 has been released), and "I Want Help With..." (How to use Web Soil Survey, etc.).

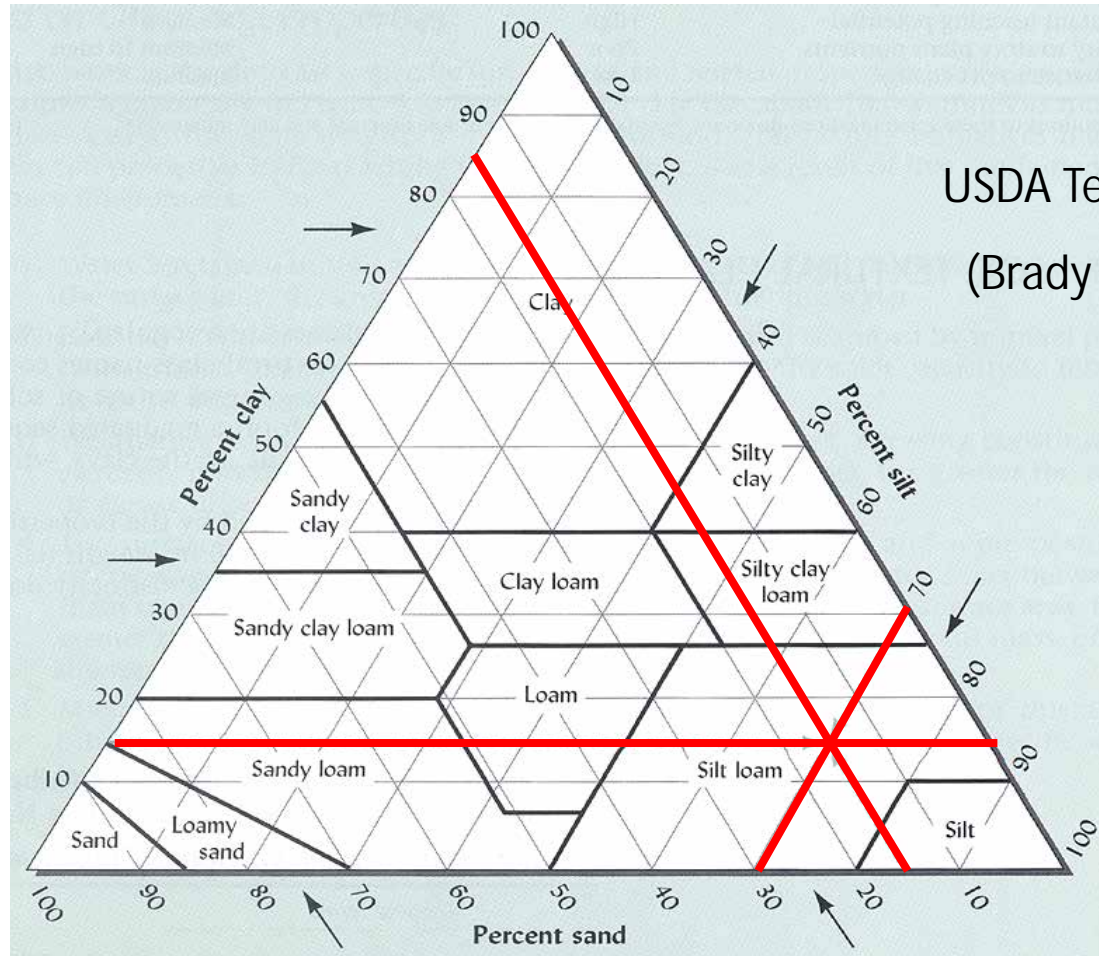
Soils: Where does soil come from?



www.water.me.vccs.edu

Soils: Where does soil come from?

Classify a soil with 15% clay, 70% silt, 15% sand:



USDA Textural Triangle
(Brady & Wiel 2002)

Determining texture by hand



Soils: Where does soil come from?



<http://www.jaimetreadwell.com/munsell-soil-tree.jpg>

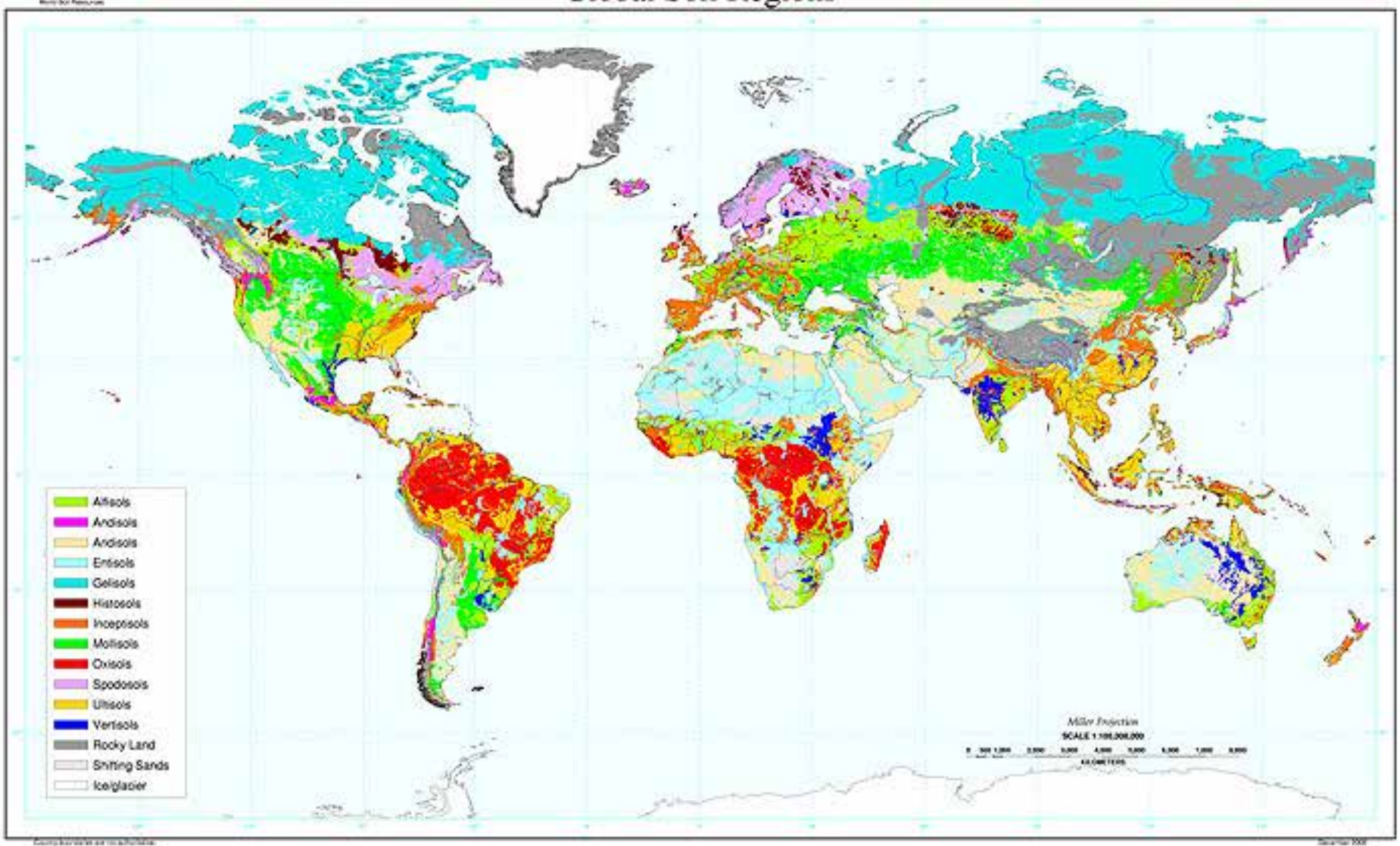


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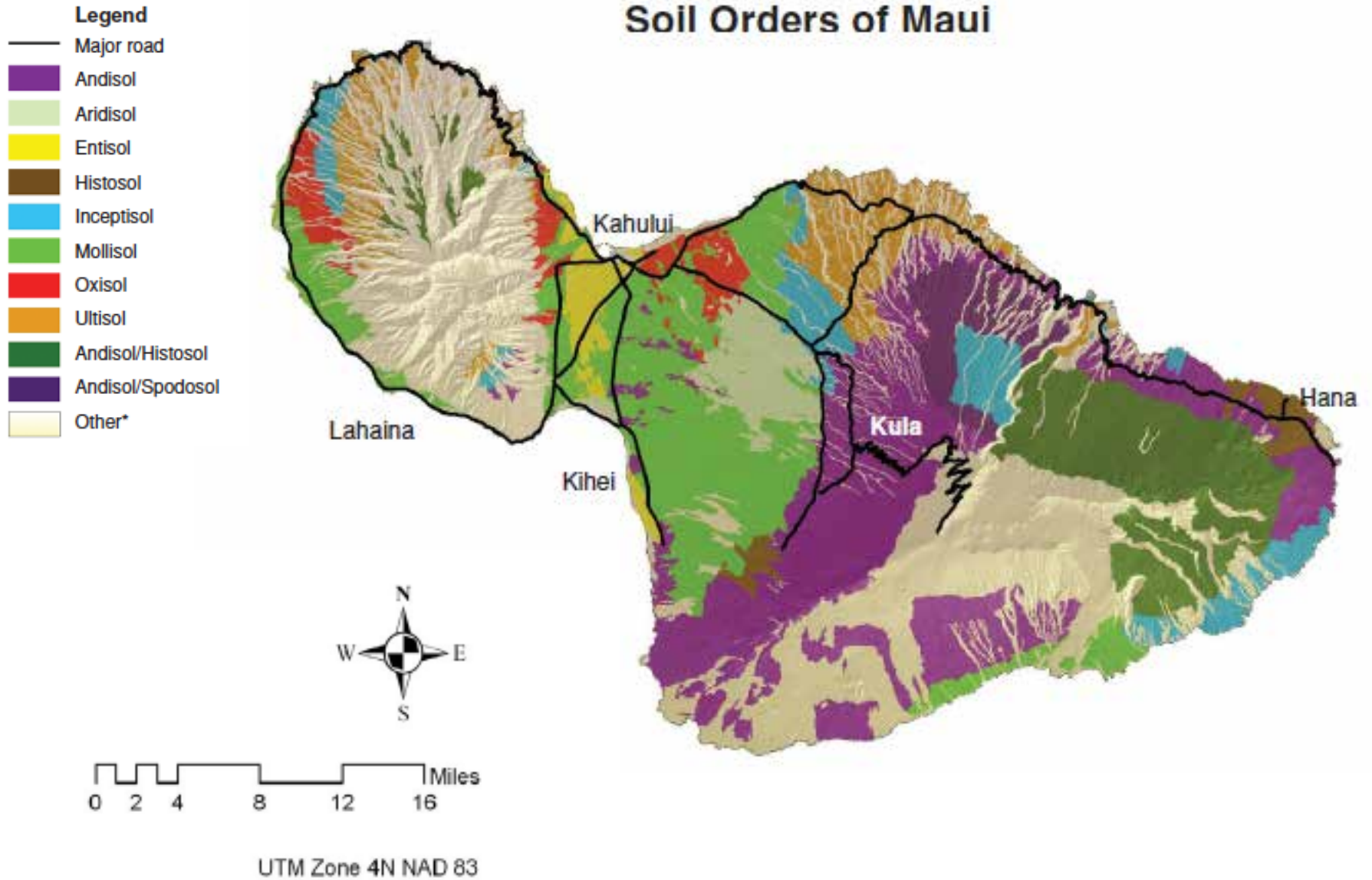


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Soils: Where does soil come from?

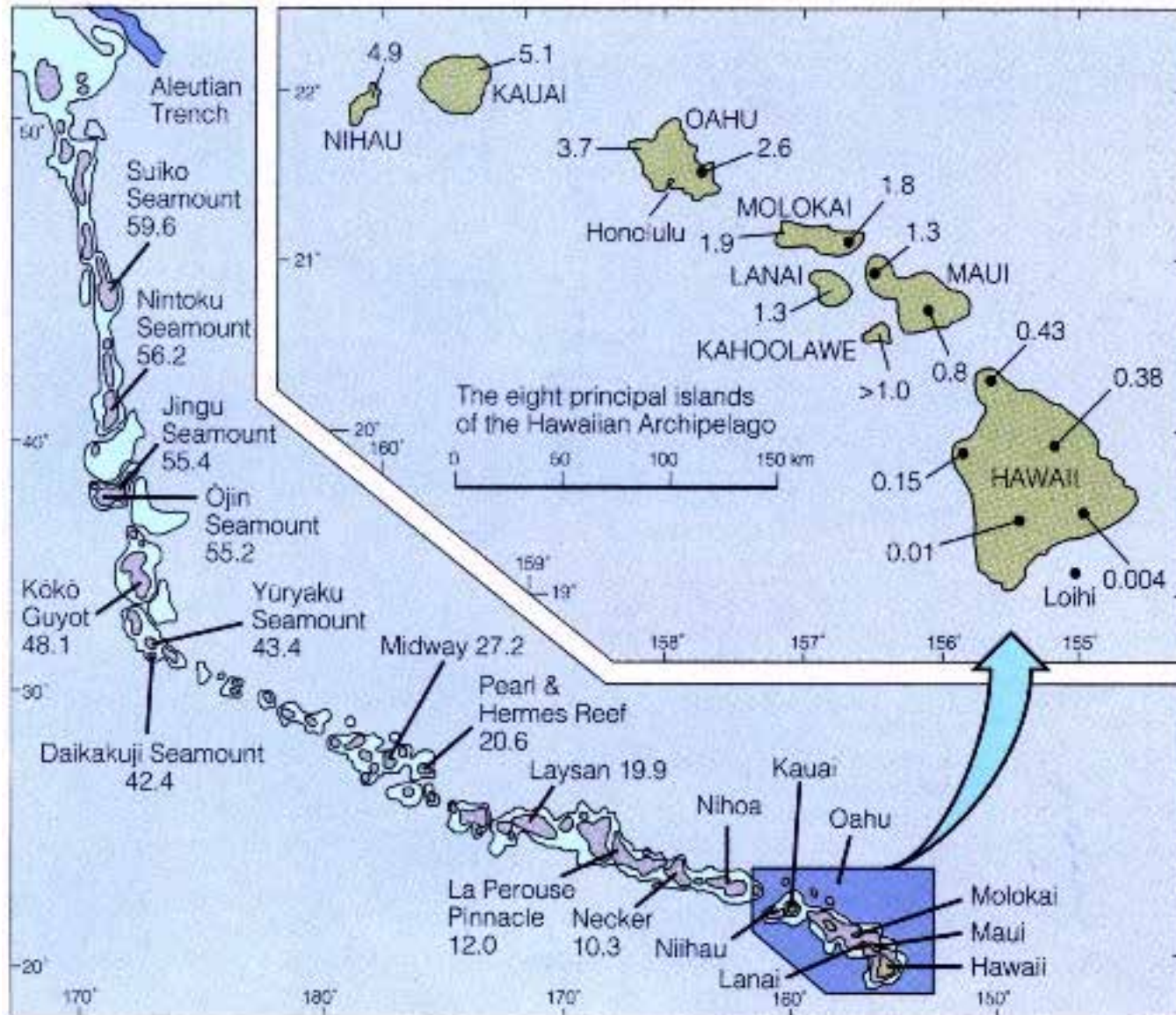


Soils: Where does soil come from?

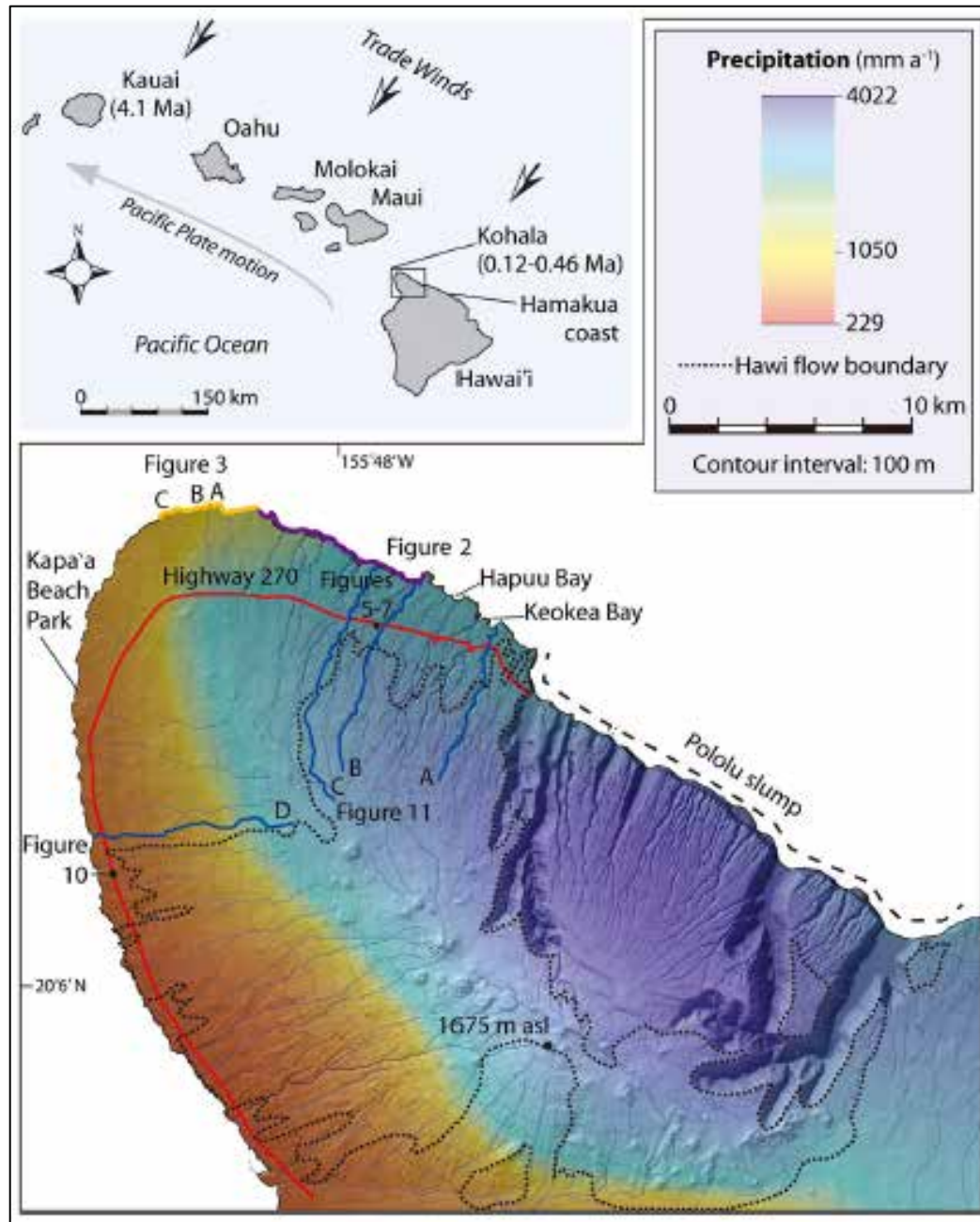


From Deenik and McClellan 2007

Soils: Where does soil come from?



Soils: Where does soil come from?



From Goodfellow et al. 2013

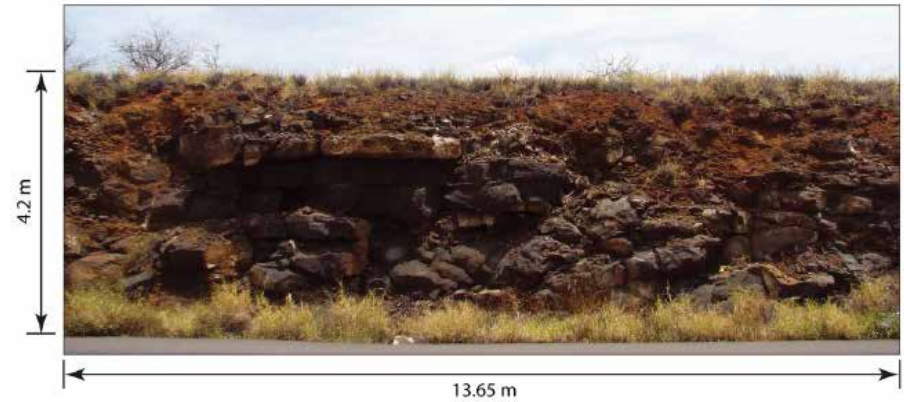
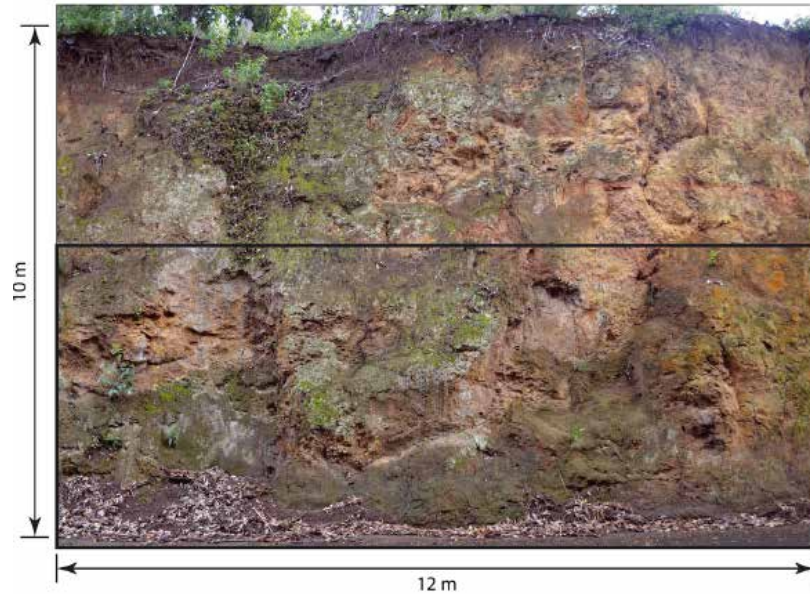
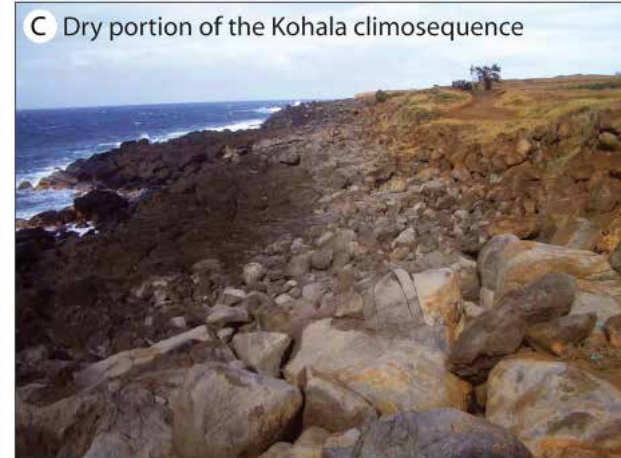
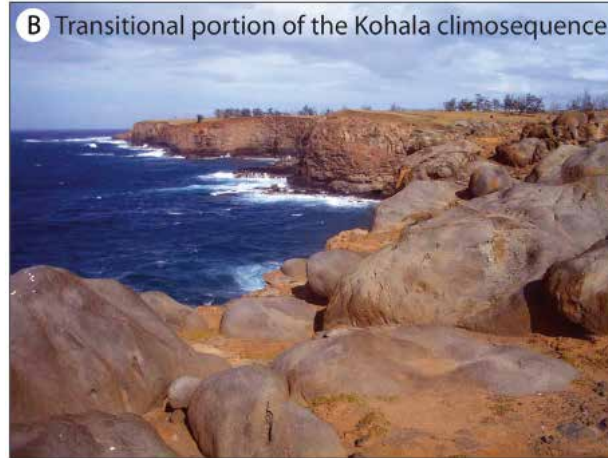
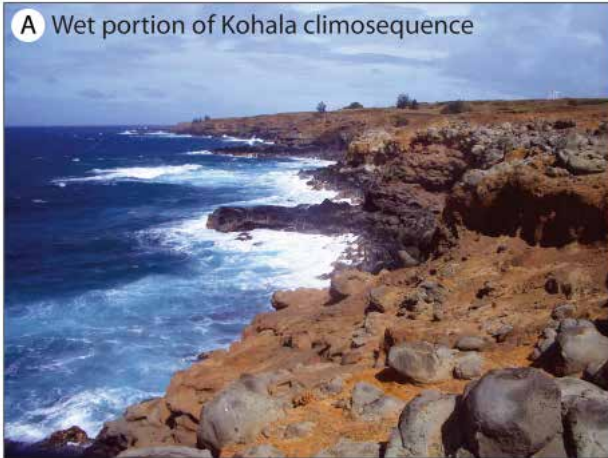
Soils: Where does soil come from?



From Goodfellow et al. 2013

Soils: Where does soil come from?

From Goodfellow et al. 2013



ANDISOLS



Andisols form from weathering processes that generate minerals with little orderly crystalline structure. These minerals can result in an unusually high water- and nutrient-holding capacity.

As a group, Andisols tend to be highly productive soils. They include weakly weathered soils with much volcanic glass as well as more strongly weathered soils. They are common in cool areas with moderate to high precipitation, especially those areas associated with volcanic materials.

**ANDISOLS MAKE UP ABOUT 1% OF THE WORLD'S
ICE-FREE LAND SURFACE.**

Extent in Hawaii: 39%

All images and text courtesy of USDA-NRCS

HISTOSOLS



Histosols have a high content of organic matter and no permafrost. Most are saturated year round, but a few are freely drained.

Histosols are commonly called bogs, moors, peats, or mucks.

Histosols form in decomposed plant remains that accumulate in water, forest litter, or moss faster than they decay. If these soils are drained and exposed to air, microbial decomposition is accelerated and the soils may subside dramatically.

**HISTOSOLS MAKE UP ABOUT 1% OF THE WORLD'S
ICE-FREE LAND SURFACE.**

Extent in Hawaii: 26%

All images and text courtesy of USDA-NRCS

Oxisols



Oxisols are highly weathered soils of tropical and subtropical regions. They are dominated by low activity minerals, such as quartz, kaolinite, and iron oxides. They tend to have indistinct horizons.

Oxisols characteristically occur on land surfaces that have been stable for a long time. They have low natural fertility as well as a low capacity to retain additions of lime and fertilizer.

Oxisols make up about 8% of the world's ice-free land surface.

Extent in Hawaii: 10%

All images and text courtesy of USDA-NRCS

MOLLISOLS



Mollisols are soils that have a dark colored surface horizon relatively high in content of organic matter. The soils are base rich throughout and therefore are quite fertile.

Mollisols characteristically form under grass in climates that have a moderate to pronounced seasonal moisture deficit. They are extensive soils on the steppes of Europe, Asia, North America, and South America.

**MOLLISOLS MAKE UP ABOUT 7% OF THE WORLD'S
ICE-FREE LAND SURFACE.**

Extent in Hawaii: 8%

All images and text courtesy of USDA-NRCS

INCEPTISOLS



Inceptisols are soils of semiarid to humid environments that generally exhibit only moderate degrees of soil weathering and development.

Inceptisols have a wide range in characteristics and occur in a wide variety of climates.

INCEPTISOLS MAKE UP ABOUT 17% OF THE WORLD'S ICE-FREE LAND SURFACE.

Extent in Hawaii: 6%

All images and text courtesy of USDA-NRCS

ULTISOLS



Ultisols are soils in humid areas. They formed from fairly intense weathering and leaching processes that result in a clay-enriched subsoil dominated by minerals, such as quartz, kaolinite, and iron oxides.

Ultisols are typically acid soils in which most nutrients are concentrated in the upper few inches. They have a moderately low capacity to retain additions of lime and fertilizer.

**ULTISOLS MAKE UP ABOUT 8% OF THE WORLD'S
ICE-FREE LAND SURFACE.**

Extent in Hawaii: 4%

All images and text courtesy of USDA-NRCS



Vertisols have a high content of expanding clay minerals. They undergo pronounced changes in volume with changes in moisture. They have cracks that open and close periodically, and that show evidence of soil movement in the profile.

Because they swell when wet, vertisols transmit water very slowly and have undergone little leaching. They tend to be fairly high in natural fertility.

**VERTISOLS MAKE UP ABOUT 2% OF THE WORLD'S
ICE-FREE LAND SURFACE.**

Extent in Hawaii: 2%

All images and text courtesy of USDA-NRCS

ARIDISOLS



Aridisols are soils that are too dry for the growth of mesophytic plants. The lack of moisture greatly restricts the intensity of weathering processes and limits most soil development processes to the upper part of the soils. Aridisols often accumulate gypsum, salt, calcium carbonate, and other materials that are easily leached from soils in more humid environments.

Aridisols are common in the deserts of the world.

**ARIDISOLS MAKE UP ABOUT 12% OF THE WORLD'S
ICE-FREE LAND SURFACE.**

Extent in Hawaii: 3%

All images and text courtesy of USDA-NRCS