Bioecology
Module: Soil Science

Lecture 12.
Types of Soils

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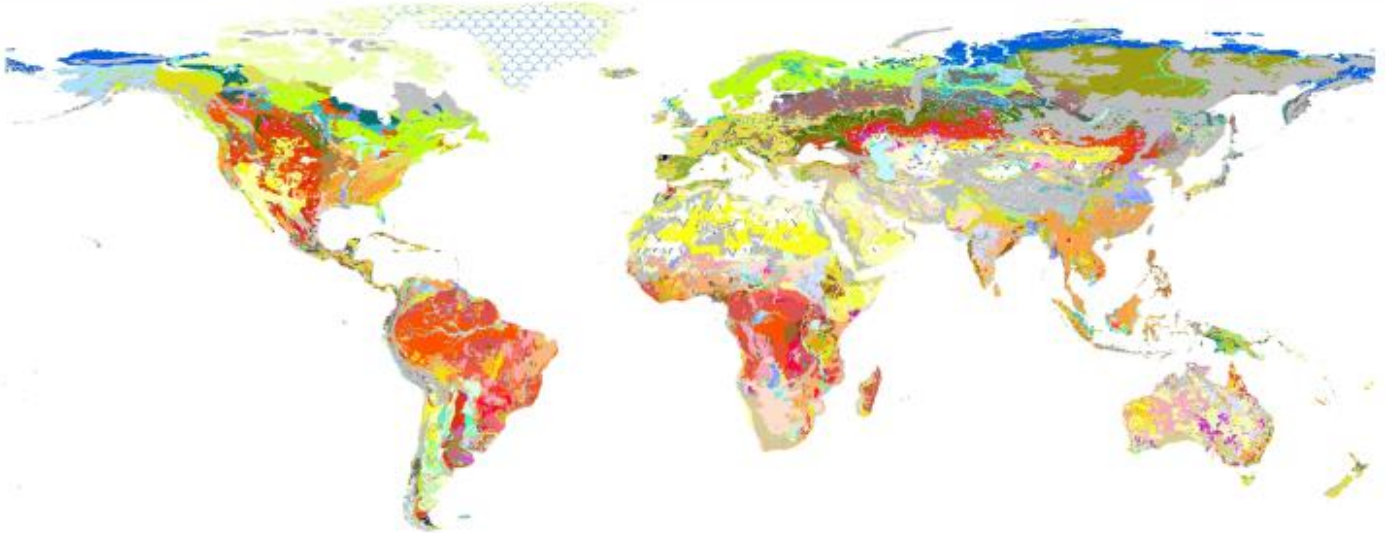
Digital Soil Map of the World



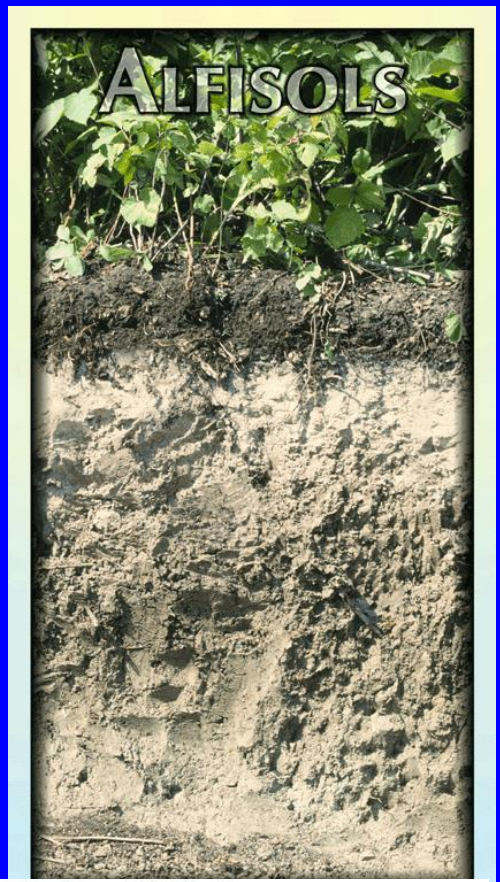
Legend

- A -ACRISOLS
- Af-Ferric Acrisols
- Ag-Gleyic Acrisols
- Ah-Humic Acrisols
- Ao- Orthic Acrisols
- Ap-Plinthis Acrisols
- B- CAMBISOLS
- Bc- Chromic Cambisols
- Bd- Dystric Cambisols
- Be- Eutric Cambisols
- Bf- Ferralic Cambisols
- Bg- Gleyic Cambisols
- Bh- Humic Cambisols
- Bk- Calcic Cambisols
- Bv- Vertic Cambisols
- Bx- Gelic Cambisols
- E- RENDZINAS
- C- CHERNOZEMS
- Cg- Glossic Chernozems
- Ch- Haplic Chernozems
- Ck- Calcic Chernozems
- Cl- Luvic Chernozems
- D- PODZOLUVISOLS
- Dd - Dystric Podzoluvisols
- De- Eutric Podzoluvisols
- Dg- Gleyic Podzoluvisols
- F-FERRALSOLS
- Fa- Acric Ferrlsols
- Fh-Humic Ferralsols
- Fo-Orthic Ferralsols
- Fp - Plinthic Ferralsols
- Fr-Rhodic Ferralsols
- Fx- Xanthic Ferralsols
- G-GLEYSOLS
- Gc- Calcaric Gleysols
- Gd- Dystric Gleysols
- Ge- Eutric Gleysols
- Gh- Humic Gleysols
- Gm- Mollic Gleysols
- Gp- Plinthic Gleysols
- Gx- Gelic Gleysols
- H- PHAEOZEMS
- Hc- Calcaric Phaeozems
- Hg- Gleyic Phaeozems
- Hh- Haplic Phaeozems
- Hl- Luvic Phaeozems
- I- Lithosols
- J- FLUVISOLS
- Jc- Calcaric Fluvisols
- Jd- Dystric Fluvisols
- Je - Eutric Fluvisols
- Jt- Thionic Fluvisols
- K- KASTAZNOZEMS
- Kh- Haplic Kastanozems
- Kk- Calcic Kastanozems
- Kl- Luvic Kastanozems
- L- LUVISOLS
- La- Albic Luvisols
- Lc- Chromic Luvisols
- Lf- Ferric Luvisols
- Lg- Gleyic Luvisols
- Lk- Calcic Luvisols
- Lo- Orthic Luvisols
- Lp- Plinthic Luvisols
- Lv - Vertic Luvisols
- M- GREYZEMS
- Mg- Gleyic Greyzems
- Mo- Orthic Greyzems
- N- NITOSOLS
- Nd- Distric Nitosols
- Ne- Eutric Nitosols
- Nh- Humic Nitosols
- O- HISTOSOLS
- Od- Dystric Histosols
- Oe- Eutric Histosols
- Ox- Gelic Histosols
- P- PODZOLS
- Pf- Ferric Podzols
- Pg- Gleyic Podzols
- Ph- Humic Podzols
- Pl- Leptic Podzols
- Po- Orthic Podzols
- Pp- Placic Podzols
- Q- ARENOSOLS
- Qa- Albic Arenosols
- Qc-Cambic Arenosols
- Qf- Ferralic Arenosols
- Ql- Luvic Arenosols
- R- REGOSOLS
- Rc- Calcaric Regosols
- Rd- Dystric Regosols
- Re- Eutric Regosols
- Rx- Gelic Regosols
- S- SOLONETZ
- Sg- Gleyic Solonetz
- Sm- Mollic Solonetz
- So- Orthic Solonetz
- T-ANDOSOLS
- Th- Humic Andosols
- Tm- Mollic Andosols
- To-Ochric Andosols
- Tv- Vitric Andosols
- U- RANKERS
- V- VERTSOLS
- Vc- Chromic Vertisols
- Vp- Pellic Vertisols
- W- PLANOSOLS
- Wd- Dystric Planosols
- We- Eutric Planosols
- Wh-Humic Planosols
- Wm- Mollic Planosols
- Ws- Solodic Planosols
- Wx- Gelic Planosols
- X- XEROSOLS
- Xh- Haplic Xerosols
- Xk- Calcic Xerosols
- Xl- Luvic Xerosols
- Xy- Gypsic Xerosols
- Y-YERMOSOLS
- Yh- Haplic Yermosols
- Yk- Calcic Yermosols
- Yl- Luvic Yermosols
- Yt- Takyric Yermosols
- Yy- Gypsic Yermosols
- Z- SOLONCHAKS
- Zg- Gleyic Solonchaks
- Zm- Mollic Solonchaks
- Zo- Orthic Solonchaks
- Zt- Takyric Solonchaks
- Water Bodies (WA)
- Water bodies (WA)
- Glaciers (GL)
- Salt flats (ST)
- Rock debris (RK)
- Dunes/Shifting sand (DS)
- No data (ND)

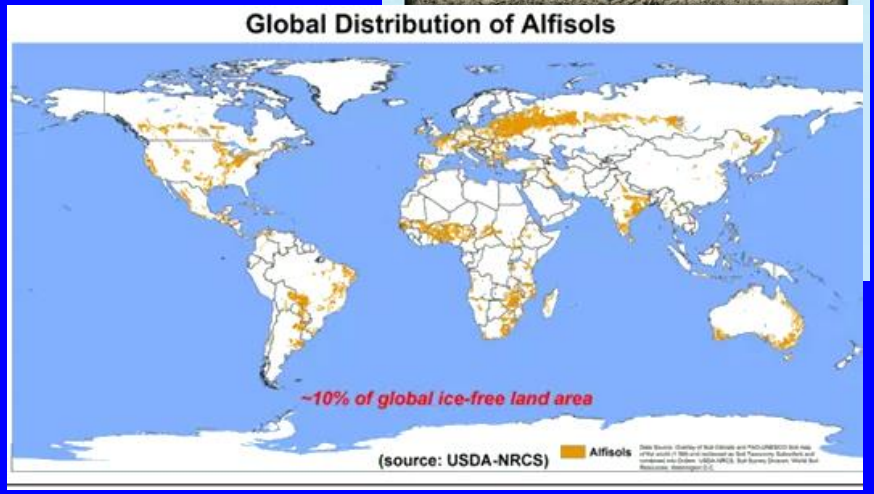
Soils: Alfisols

Alfisols (USDA soil taxonomy) or Luvisols, Lixisols (World Reference Base for Soil Resources (WRB)) or Retisols or Nitisols form in semiarid to humid areas, typically under a hardwood forest cover. They have a clay-enriched subsoil and relatively high native fertility. "Alf" refers to aluminium (Al) and iron (Fe). Because of their productivity and abundance, the Alfisols represent one of the more important soil orders for food and fiber production.

Aqualfs are mainly Stagnosols or Planosols. Alfisols with a natric horizon are mainly Solonetz.



Alfisols occupy around 10% of the Earth's ice-free land surface. They are dominant in many areas, such as the Ohio River basin in the United States, southern and unglaciated Western Europe, the Baltic region and central European Russia, the drier parts of Peninsular India, Sudan in Africa, and many parts of South America.



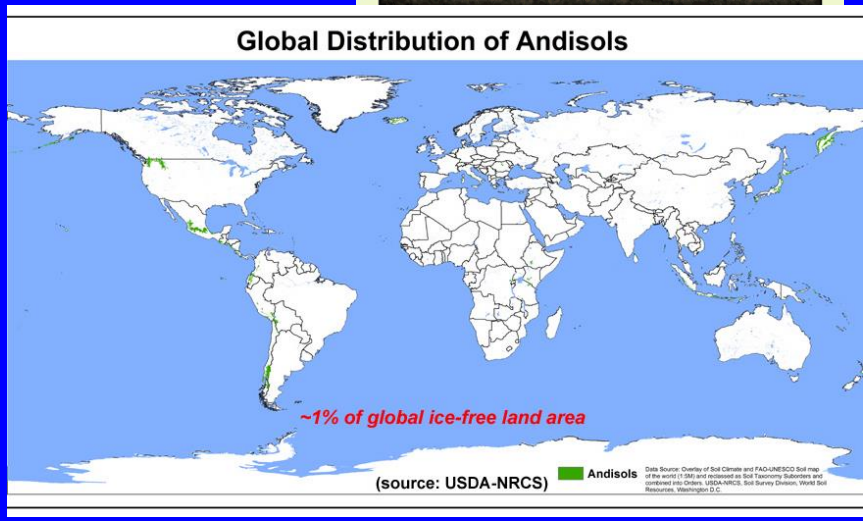
Soils: Andisols

Andisols (USDA soil taxonomy) or ***Andosols*** (World Reference Base for Soil Resources, WRB) are soils formed in volcanic ash and defined as soils containing high proportions of glass and amorphous colloidal materials, including allophane, imogolite and ferrihydrite.

Andisols typically are very fertile except in cases where phosphorus is easily fixed (this sometimes occurs in the tropics). They can usually support intensive cropping.

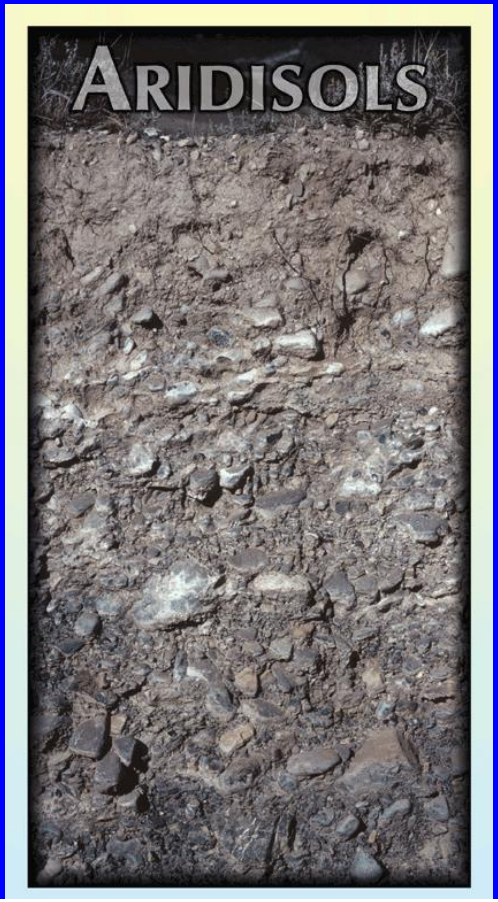
Suborders: Aquands, Gelands, Cryands, Torrands, Ustands, Udands, Xerands, Vitrands.

Andisols occupy about 1% of the global ice-free land area. Most occur around the Pacific Ring of Fire, with the largest areas found in central Chile, Ecuador, Colombia, Mexico, the Pacific Northwest USA, Japan, Java and New Zealand's North Island. Other areas occur in the Great Rift Valley, Kenya, Italy, Iceland and Hawai‘i.



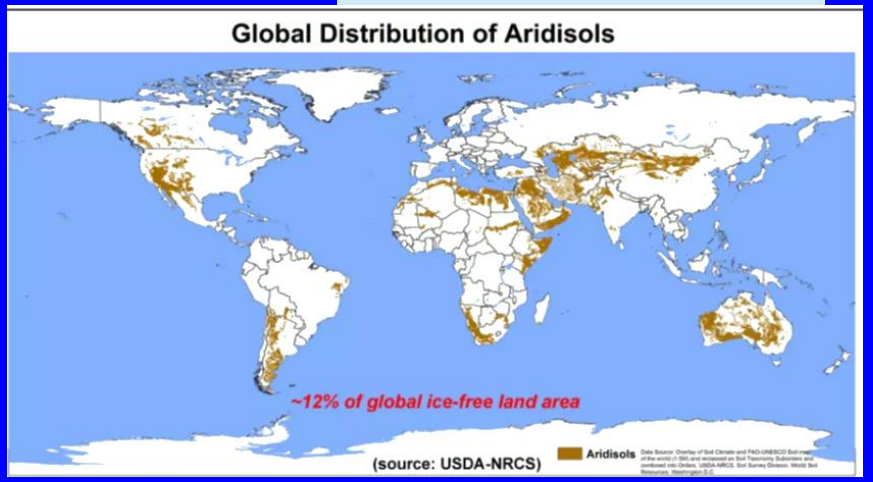
Soils: Aridisols

Aridisols (USA soil taxonomy) or desert soils form in an arid or semi-arid climate. Aridisols dominate the deserts and xeric shrublands, which occupy about one third of the Earth's land surface. Aridisols have a very low concentration of organic matter, reflecting the paucity of vegetative production on these dry soils. Water deficiency is the major defining characteristic of Aridisols. Limited leaching in aridisols often results in one or more subsurface soil horizons in which suspended or dissolved minerals have been deposited: silicate clays, sodium, calcium carbonate, gypsum or soluble salts. These subsoil horizons can also be cemented by carbonates, gypsum or silica. Accumulation of salts on the surface can result in salinization.



In the WRB, most Aridisols belong to the Calcisols, Gypsisols, Durisols and Solonchaks.

Aridisols occupy around 12% of the Earth's ice-free land surface.



Soils: Entisols

Entisols (USDA soil taxonomy) are defined as soils that do not show any profile development other than an A horizon. An entisol has no diagnostic horizons, and most are basically unaltered from their parent material, which can be unconsolidated sediment or rock. Entisols are the second most abundant soil order, occupying about 16% of the global ice-free land area.

In WRB, because of the diversity of their properties, suborders of Entisols form individual Reference Soil Groups: Psamments correlate with Arenosols and Fluvents with Fluvisols. Many Orthents belong to Regosols or Leptosols. Most Wassents and aquic subgroups of other suborders belong to the Gleysols. Suborders: Aquents, Fluvents, Orthents, Psamments, Wassents.

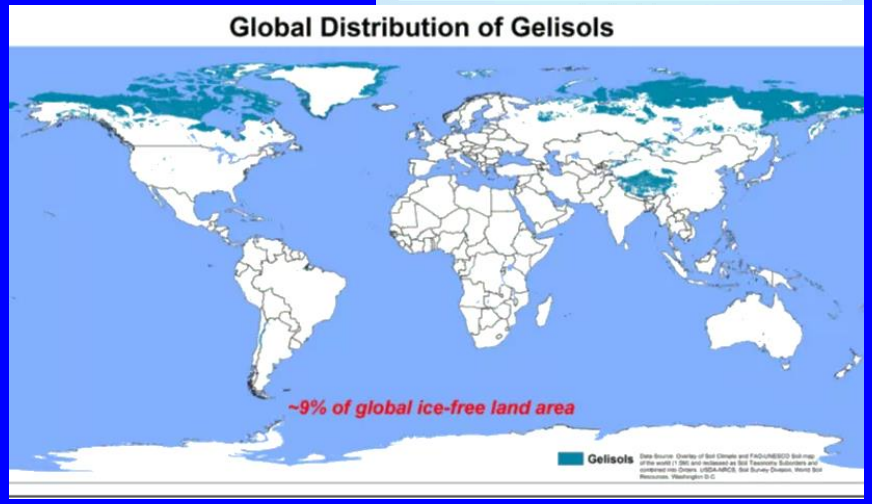
Soils: Gelisols

Gelisols (USDA soil taxonomy) or Cryosols (WRB) are soils of very cold climates which are defined as containing permafrost within two meters of the soil surface.

Structurally, Gelisols may have a B horizon and more commonly have an A horizon and/or O horizon resting on the permafrost. Because soil organic matter accumulates in the upper layer, most Gelisols are black or dark brown in soil color, followed by a shallow mineral layer. Despite the influence of glaciation in most areas where Gelisols occur, chemically they are not highly fertile because nutrients, especially calcium and potassium, are very easily leached above the permafrost.

Suborders: Histels, Turbels, Orthels

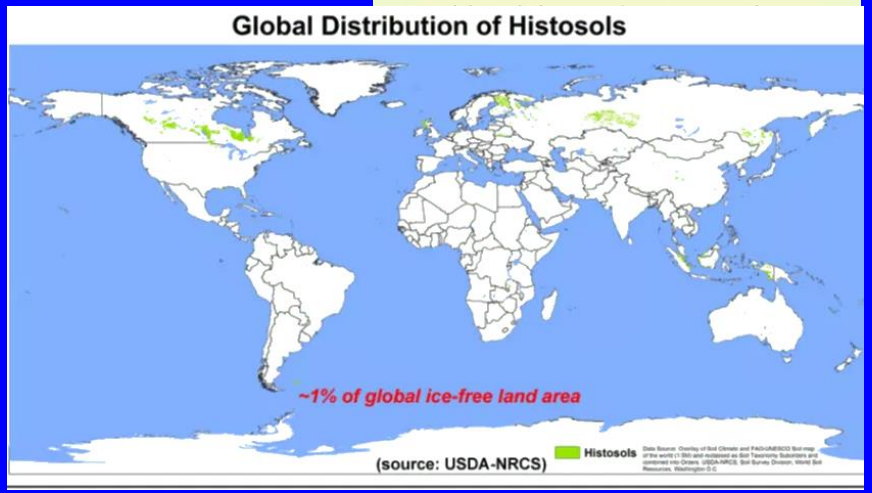
Gelisols are found chiefly in Siberia, Alaska and Canada. Smaller areas are found in the Andes (mainly near the intersection between Chile, Bolivia and Argentina), Tibet, northern Scandinavia and the ice-free parts of Greenland and Antarctica.



Soils: Histosols

Histosol (USDA soil taxonomy, WRB) or ***Organosols*** (Australian Soil Classification) is a soil consisting primarily of organic materials. They are defined as having 40 centimetres or more of organic soil material in the upper 80 centimetres. Organic soil material has an organic carbon content (by weight) of 12 to 18 %, or more, depending on the clay content of the soil. These materials include muck (sapric soil material), mucky peat (hemic soil material), or peat (fibric soil material). Aquic conditions or artificial drainage are required. Histosols are generally very difficult to cultivate because of the poor drainage and often low chemical fertility. Suborders: Folists, Fibrists, Hemists, Saprists

Most Histosols occur in Canada, Scandinavia, the West Siberian Plain, Sumatra, Borneo and New Guinea. Smaller areas are found in other parts of Europe, the Russian Far East (chiefly in Khabarovsk Krai and Amur Oblast), Florida and other areas of permanent swampland.

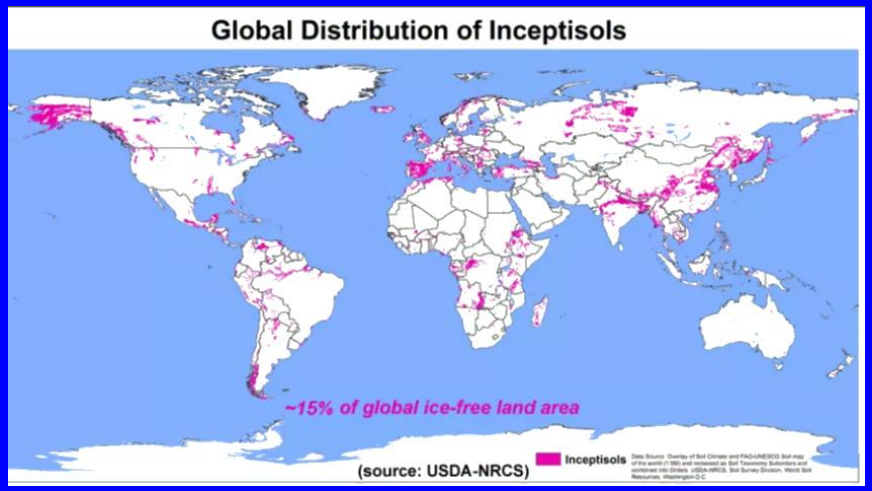


Soils: Histosols

Inceptisols (USDA soil taxonomy), Cambisols or Umbrisols (WRB) form quickly through alteration of parent material. They have no accumulation of clays, iron oxide, aluminium oxide or organic matter. They have an ochric or umbric horizon and a cambic subsurface horizon.

Suborders: Aquepts, Gelepts, Cryepts, Udepts, Ustepts, Xerepts

Inceptisols occupy around 15% of the Earth's ice-free land surface.

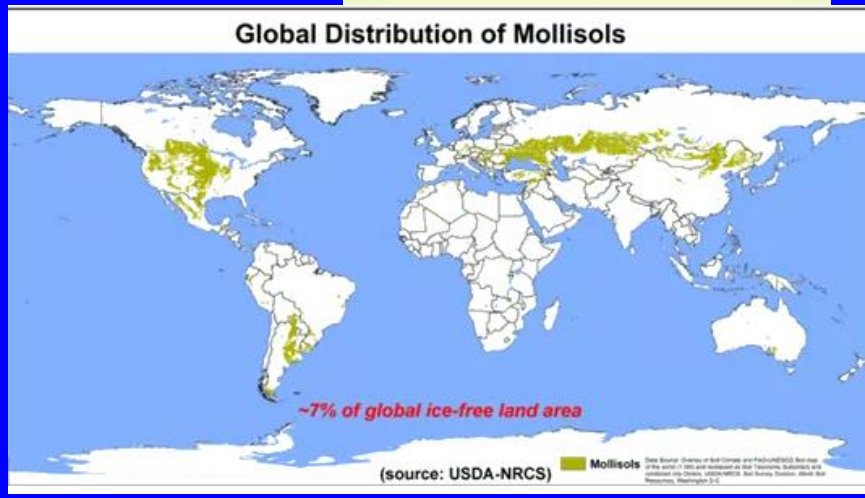


Soils: Mollisols

Mollisols (USDA soil taxonomy) form in semi-arid to semi-humid areas under a grassland cover. Their parent material is base-rich and calcareous and include limestone, loess, or wind-blown sand. Mollisols have deep, high organic matter, nutrient-enriched surface soil (A horizon), between 60 and 80 cm in depth. This fertile surface horizon, known as a mollic epipedon, is the defining diagnostic feature of Mollisols. Suborders: Albolls, Aquolls, Cryolls, Gelolls, Rendolls, Udolls, Ustolls, Xerolls.

In WRB, Mollisols are split up into Chernozems, Kastanozems and Phaeozems. Shallow or gravelly Mollisols may belong to the Leptosols. Many Aquolls are Gleysols, Stagnosols or Planosols. Mollisols with a natric horizon belong to the Solonetz.

They represent ~7% of ice-free land area. They are the world's most agriculturally productive soil order. They are most commonly found in the mid-latitudes, namely in North America, mostly east of the Rocky Mountains, in South America in Argentina (Pampas) and Brazil, and in Asia in Mongolia and the Russian Steppes.



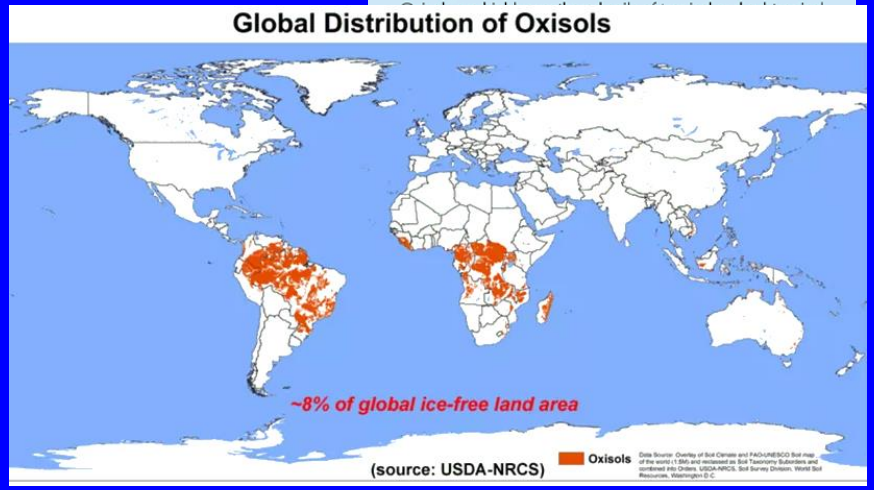
Soils: Oxisols

Oxisols (USDA soil taxonomy) or ***Ferralsols, Plinthosols, Nitisols*** (WRB), best known for their occurrence in tropical rain forest, 15–25 degrees north and south of the Equator. Some Oxisols have been previously classified as laterite soils.

They are defined as soils containing at all depths no more than 10 percent weatherable minerals, and low cation exchange capacity. Oxisols are always a red or yellowish color, due to the high concentration of iron (III) and aluminium oxides and hydroxides. They also contain quartz and kaolin, plus small amounts of other clay minerals and organic matter. Suborders: Aquox, Perox, Torrox, Ustox, Udox.

Oxisols are often used for tropical crops such as cocoa and rubber, rice

Oxisols represent ~8% of ice-free land area and are found almost exclusively in tropical areas, in South America and Africa, almost always on highly stable continental cratons.



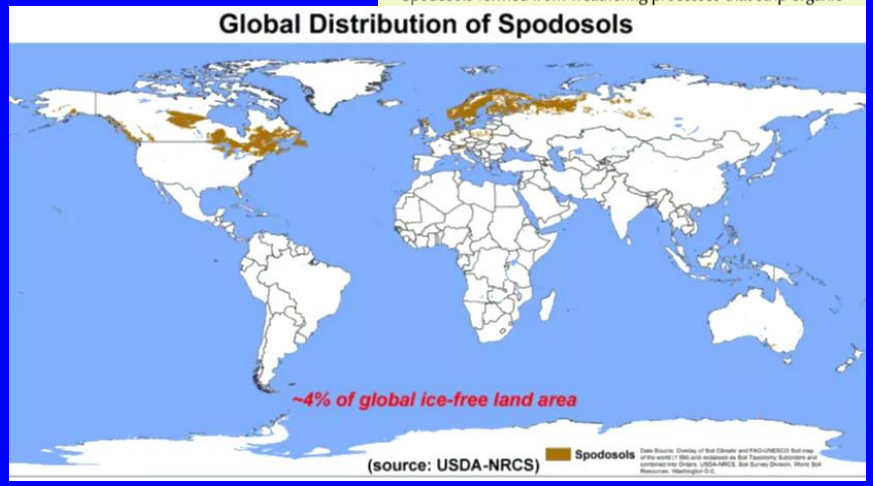
Soils: Spodosols

Spodosols (USDA soil taxonomy, Chinese soil taxonomy) or ***Podzols*** (WRB and in many national soil classification systems (in some of them, spelled ***Podsols***), or ***Podosols*** (Australian Soil Classification), or ***Espodossolos*** (the Brazilian Soil Classification System) are the typical soils of coniferous or boreal forests. They are also the typical soils of eucalypt forests and heathlands in southern Australia.

Podzols are able to occur on almost any parent material but generally derive from either quartz-rich sands and sandstones or sedimentary debris from magmatic rocks, provided there is high precipitation. Most Podzols are poor soils for agriculture due to the sandy portion, resulting in a low level of moisture and nutrients.The best agricultural use of Podzols is for grazing.

Spodosols formed from weathering processes that strip organic

Spodosols represent ~4% of ice-free land area

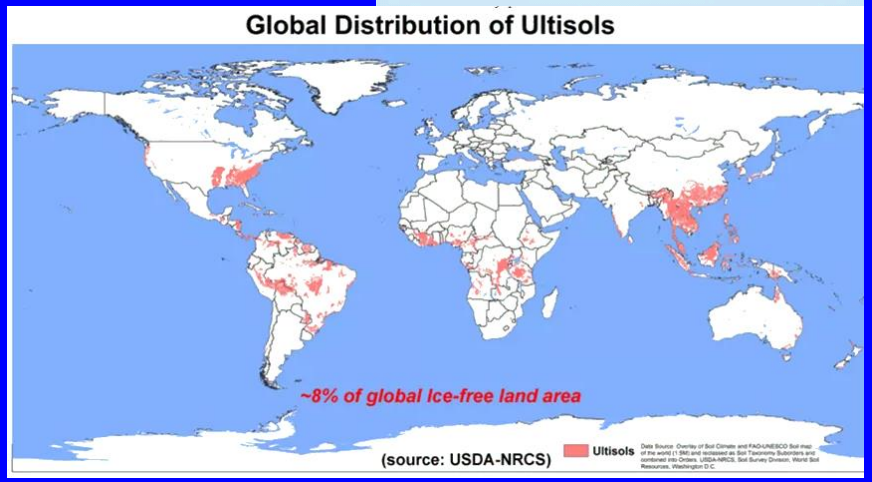


Soils: Ultisols

Ultisols (USDA soil taxonomy), or ***Acrisols*** and ***Alisols*** (WRB) commonly known as red clay soils. Ultisols were seen as the ultimate product of continuous weathering of minerals in a humid, temperate climate without new soil formation via glaciation. They are defined as mineral soils which contain no calcareous (calcium carbonate containing) material anywhere within the soil, have less than 10% weatherable minerals in the extreme top layer of soil, and have less than 35% base saturation throughout the soil.

Suborders: Aquults, Humults, Udults, Ustults, Xerults. Some belong to the Retisols or to the Nitisols. Aquults are typically Stagnosols or Planosols. Humults may be Umbrisols.

Ultisols represent ~8% of ice-free land area, and occur in humid temperate or tropical regions. While the term is usually applied to the red clay soils of the Southern United States, Ultisols are also found in regions of Africa, Asia, and South America.

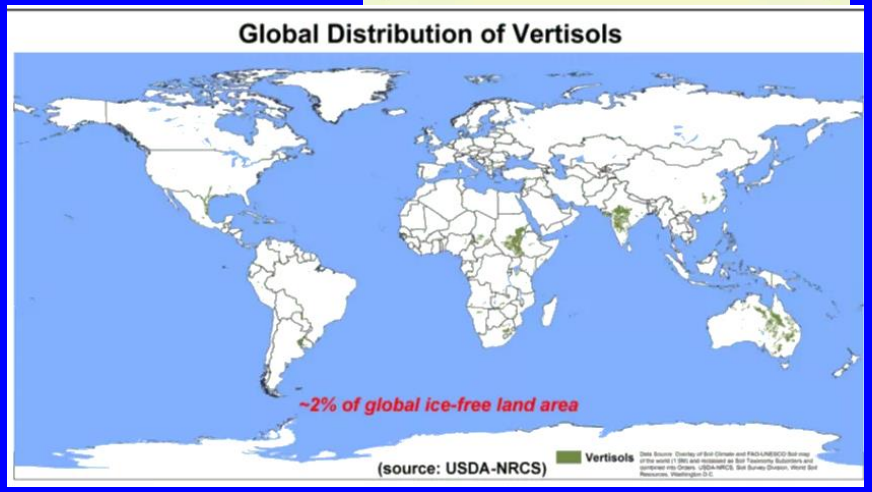


Soils: Vertisols

Vertisol (USDA soil taxonomy, WRB) or Vertosol (Australian Soil Classification) is a soil in which there is a high content of expansive clay minerals (montmorillonite), that form deep cracks in drier seasons or years.

Vertisols typically form from highly basic rocks, such as basalt, in climates that are seasonally humid or subject to erratic droughts and floods, or that impeded drainage. Depending on the parent material and the climate, they can range from grey or red to the more familiar deep black. The natural vegetation of Vertisols is grassland, savanna, or grassy woodland. The heavy texture and unstable behaviour of the soil makes it difficult for many tree species to grow, and forest is uncommon. Suborders: Aquerts, Cryerts, Xererts, Torrerts, Usterts, Uderts.

Vertisols represent ~2% of ice-free land area. Major areas where Vertisols are dominant are eastern Australia (especially inland Queensland and New South Wales), the Deccan Plateau of India, and parts of southern Sudan, Ethiopia, Kenya, and Chad (the Gezira), and the lower Paraná River in South America.



Thank you for attention!