

Soil Environments and Agriculture

Soils = products weathering + stability

- Mechanical , chemical , biological
- Cl, O, R, P, T
 - Climate, Organics, Relief, Parent material, Time
- Sustain life as we know it / a bridge between the geologic and biologic sciences

Official State Soil: Houston Black

What's in it?



Official State Soil: Tama

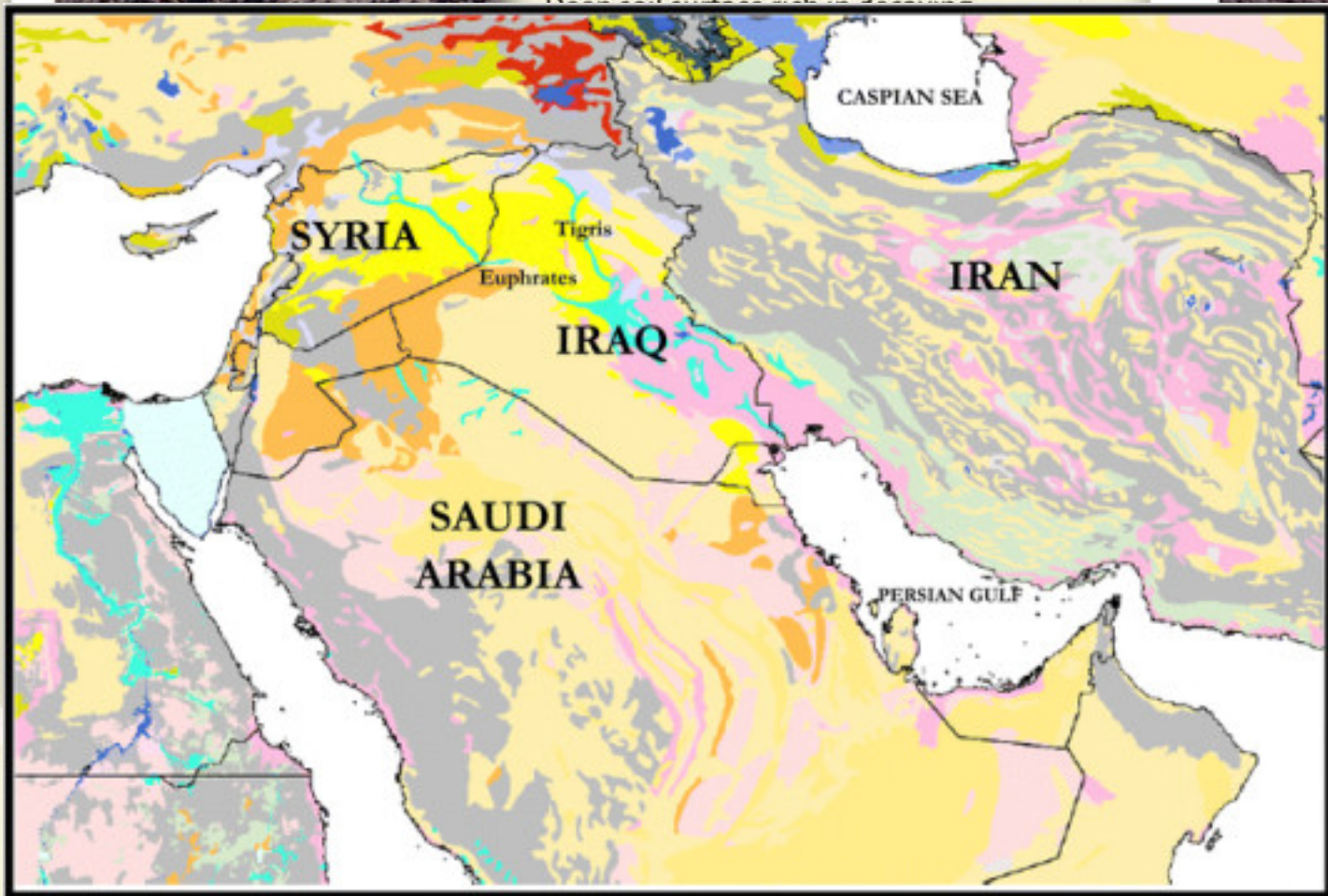
What's in it?



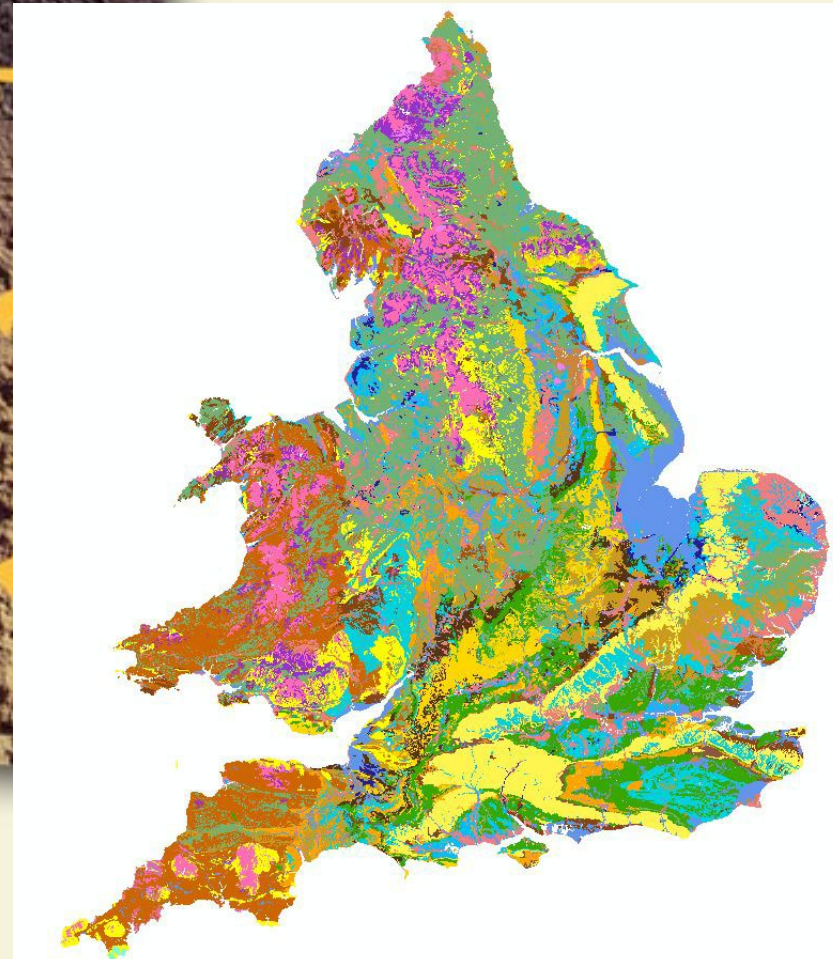
HOUSTON BLACK
Shrinking and Swelling Soils

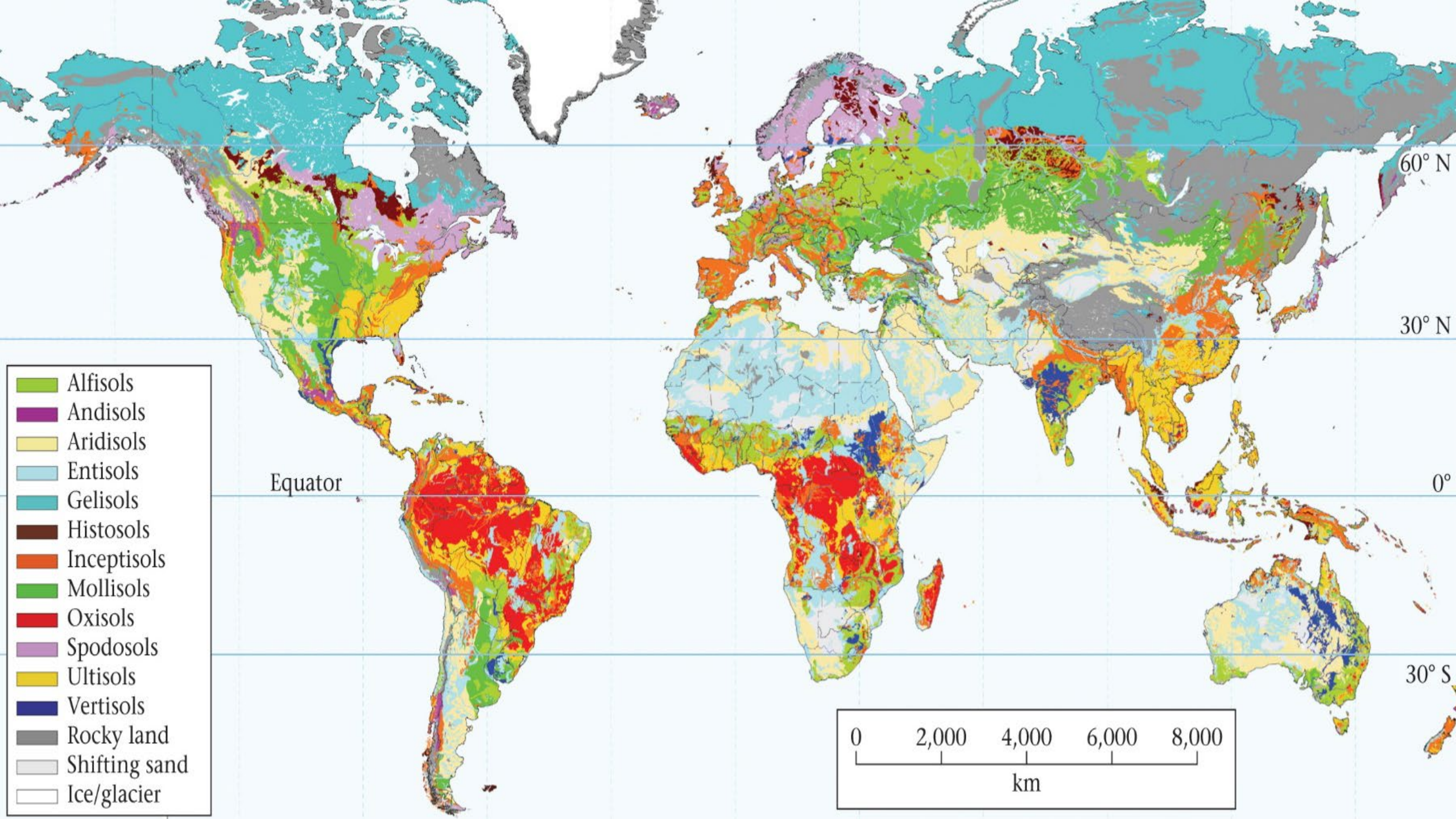


TAMA
Grassland Soils



- HWSD Soil Groups
- Acrisol - AC
 - Alisol - AL
 - Andosol - AN
 - Arenosol - AR
 - Anthosol - AT
 - Chernozem - C
 - Calcisol - CL
 - Cambisol - CM
 - Fluvisol - FL
 - Ferralsol - FR
 - Gleysol - GL
 - Greyzem - GR
 - Gypsisol - GY
 - Histosol - HS
 - Kastanozem - K
 - Leptosol - LP
 - Luvisol - LV
 - Lixisol - LX
 - Nitisol - NT
 - Podzoluvisol - F
 - Phaeozem - PH
 - Planosol - PL
 - Plinthosol - PT
 - Podzol - PZ
 - Regosol - RG
 - Solonchak - SC
 - Solonetz - SN
 - Vertisol - VR
 - Rock Outcrops
 - Sand Dunes - C
 - Water bodies - A
 - Urban, mining -
 - Salt flats - ST
 - No Data - NI
 - Glaciers - GG
 - Island - IS





Natural Resources Conservation Service (NRCS)



ALFISOLS

Alfisols are found in moist areas. These soils result from weathering processes that leach the cations and other constituents out of the surface layer and into the subsoil, where they can hold and supply nutrients and moisture to plants. They formed primarily under forest or mixed vegetation cover and are productive for most crops.

ALFISOLS MAKE UP ABOUT 18% OF THE WORLD'S 82,000 LAND SURFACES.



ANDISOLS

Andisols form from weathering processes that generate minerals with little visible structure. These minerals can result in an extremely high water and nutrient holding capacity. As a group, Andisols tend to be highly productive soils. They include readily 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 82,000 LAND SURFACES.

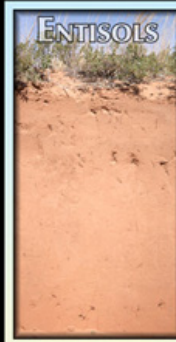


ARIDISOLS

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 root and development processes in the upper part of the soil. Andisols 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 82,000 LAND SURFACES.



ENTISOLS

Entisols are soils that show little or no evidence of pedogenic horizon development. Entisols occur in areas of recently deposited parent materials or in areas where erosion or deposition rates are faster than the rate of soil development, such as dunes, steep slopes, and flood plains. They occur in many environments.

ENTISOLS MAKE UP ABOUT 14% OF THE WORLD'S 82,000 LAND SURFACES.



GELISOLS

Gelisols are soils that have formed near the soil surface and/or have evidence of cryoturbation (frost churning and/or segregation).

GELISOLS ARE COMMON IN THE HIGHER LATITUDE or at high altitudes.

GELISOLS MAKE UP ABOUT 9% OF THE WORLD'S 82,000 LAND SURFACES.



HISTOSOLS

Histosols have a high content of organic matter and no permafrost. They are saturated year-round, but a thin ice layer (permafrost) is commonly called bogs, meadows, peats, or mucks. Histosols form in decomposed plant remains that accumulate in water-saturated or more water than they drain. 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 82,000 LAND SURFACES.



INCEPTISOLS

Inceptisols are soils of wetland 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 82,000 LAND SURFACES.



MOLLISOLS

Mollisols are soils that have a dark colored surface horizon relatively high in content of organic matter. The soils are bare or have a thin grass cover and are highly fertile.

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

MOLLISOLS MAKE UP ABOUT 7% OF THE WORLD'S 82,000 LAND SURFACES.



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 82,000 LAND SURFACES.

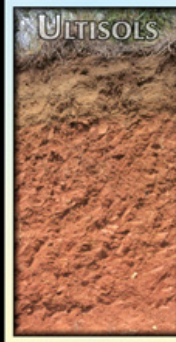


SPODOSOLS

Spodosols formed from weathering processes that strip organic matter combined with aluminum (oxides or sulfates) from the surface layer and deposit them in the subsoil. In established areas, a gray eluvial horizon that has the color of uncolored quartz underlies a reddish horizon or thick subsoil.

Spodosols commonly occur in areas of coarse-textured deposits under continuous forests of humid regions. They tend to be acid and infertile.

SPODOSOLS MAKE UP ABOUT 6% OF THE WORLD'S 82,000 LAND SURFACES.



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 moderate to low capacity to retain additions of lime and fertilizer.

ULTISOLS MAKE UP ABOUT 8% OF THE WORLD'S 82,000 LAND SURFACES.



VERTISOLS

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 suboptimal tiller fertility. They tend to be fairly high in natural fertility.

VERTISOLS MAKE UP ABOUT 2% OF THE WORLD'S 82,000 LAND SURFACES.

THE TWELVE ORDERS OF SOIL TAXONOMY

Soil development variables

Landscape Stability

Hans Jenny (1941)

Cl, o, r, p, t

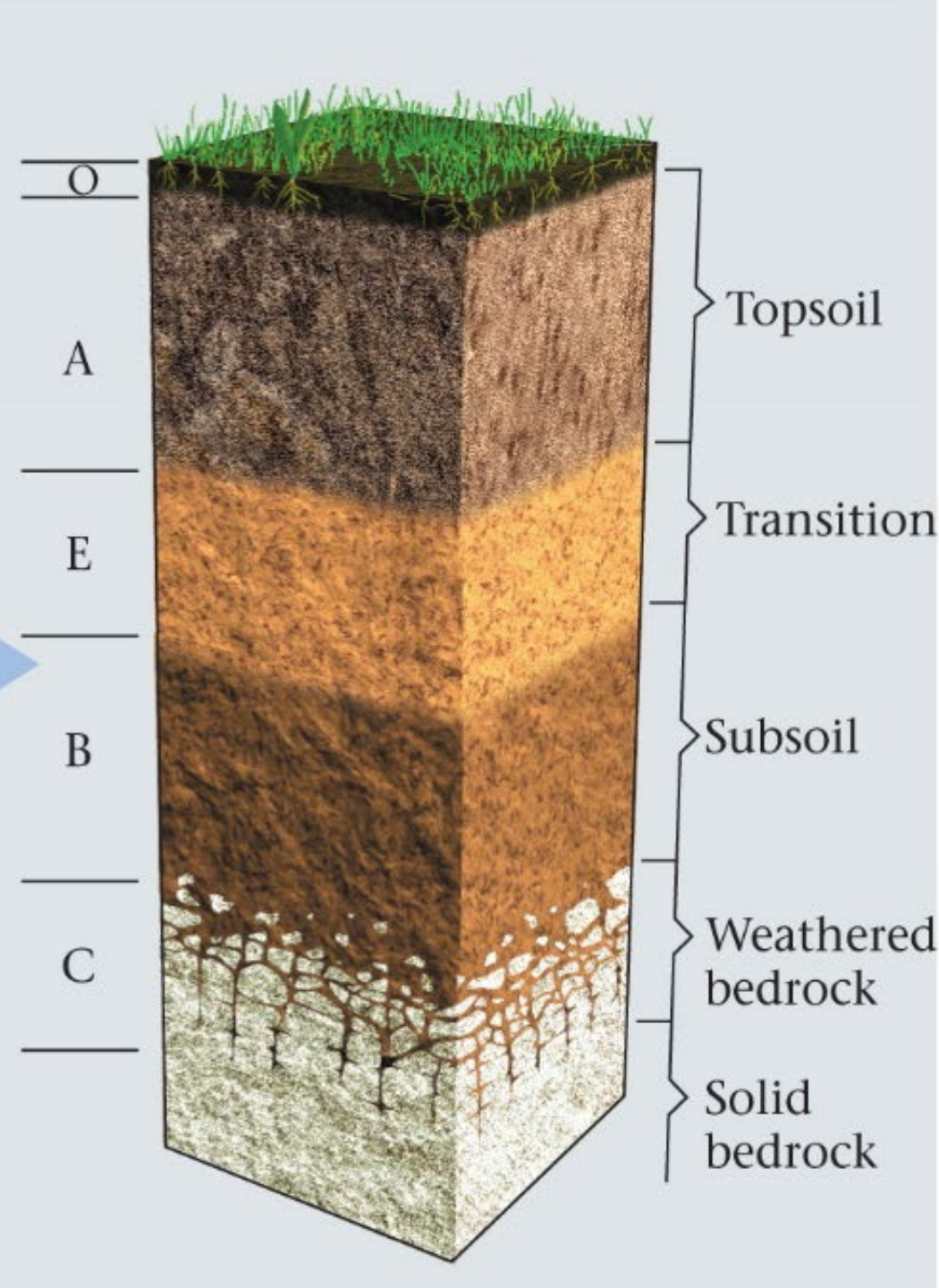
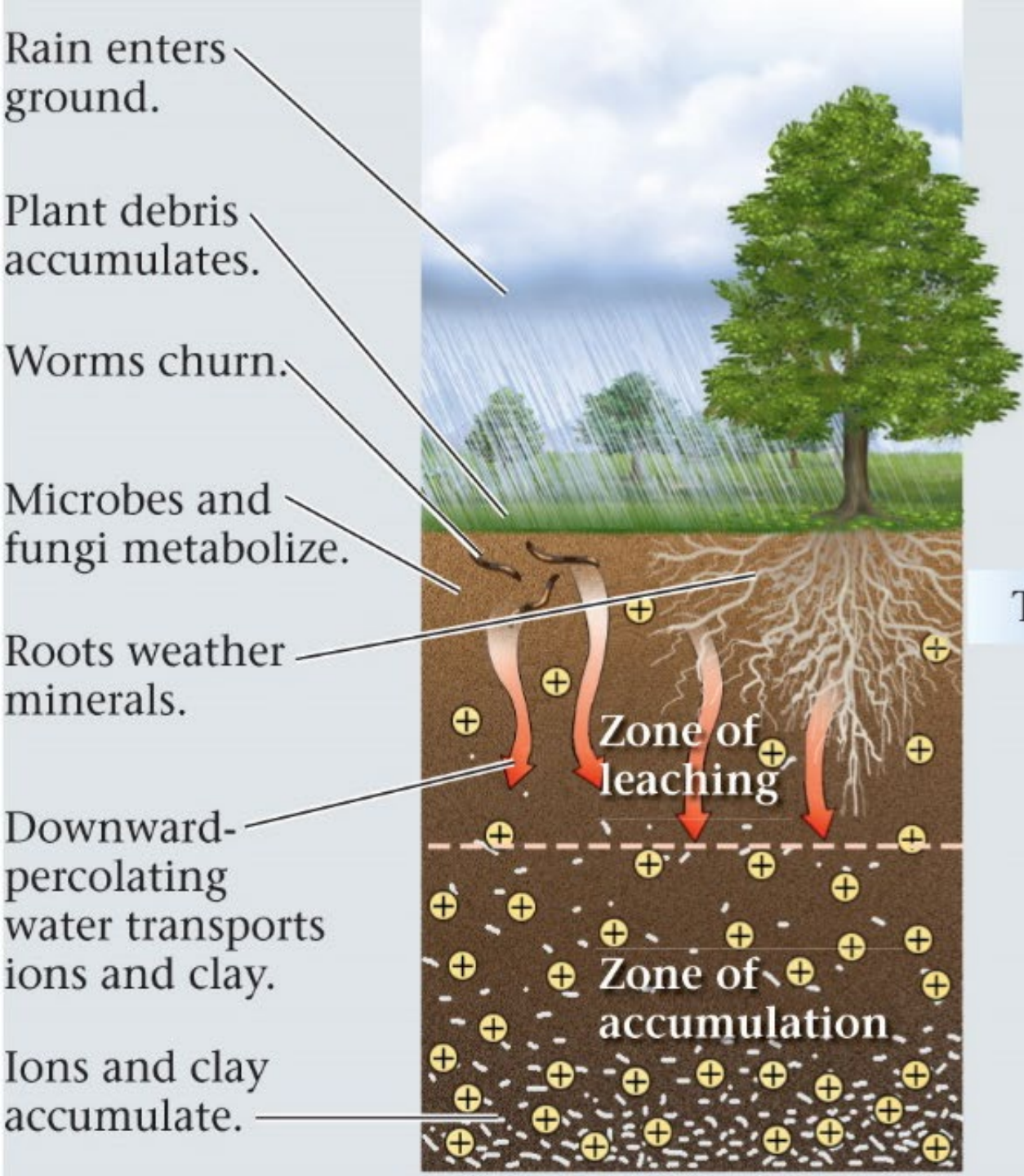
- cl, climate
- o, biology
- r, topography
- p, parent material
- t, time

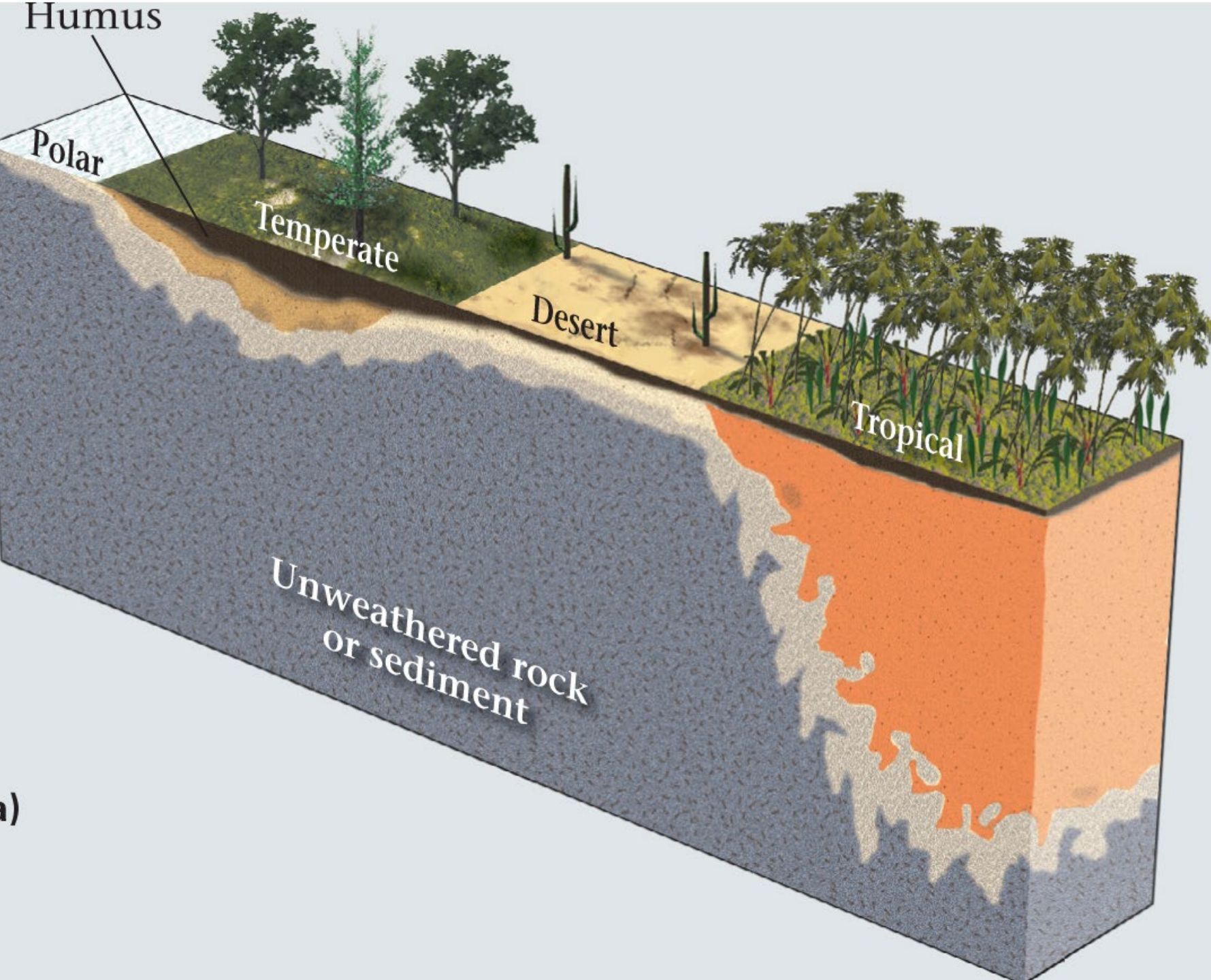
- Soils
 - Are a product of weathering
 - Texture – sand, silt and clay
 - Amazing interface

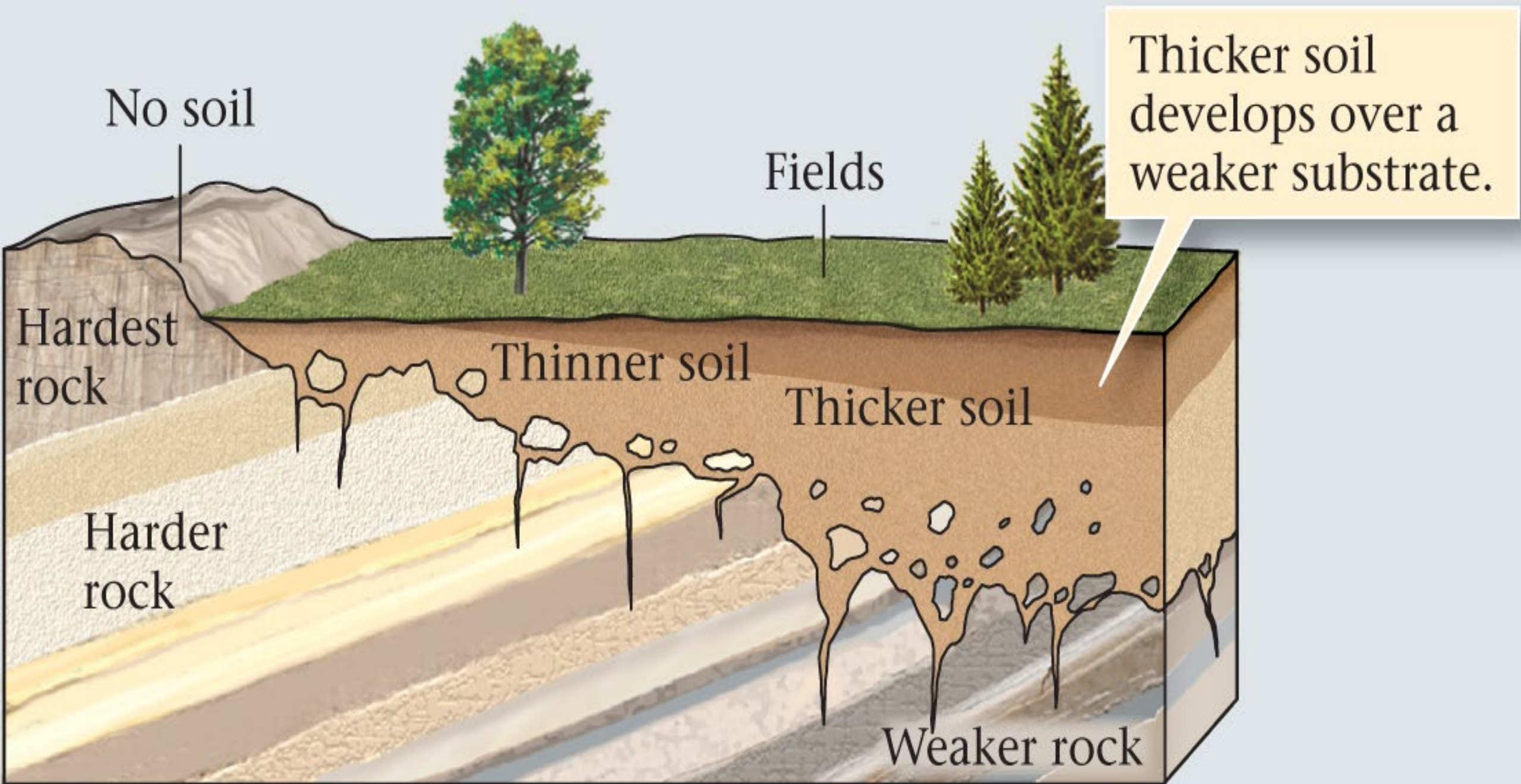
Biology

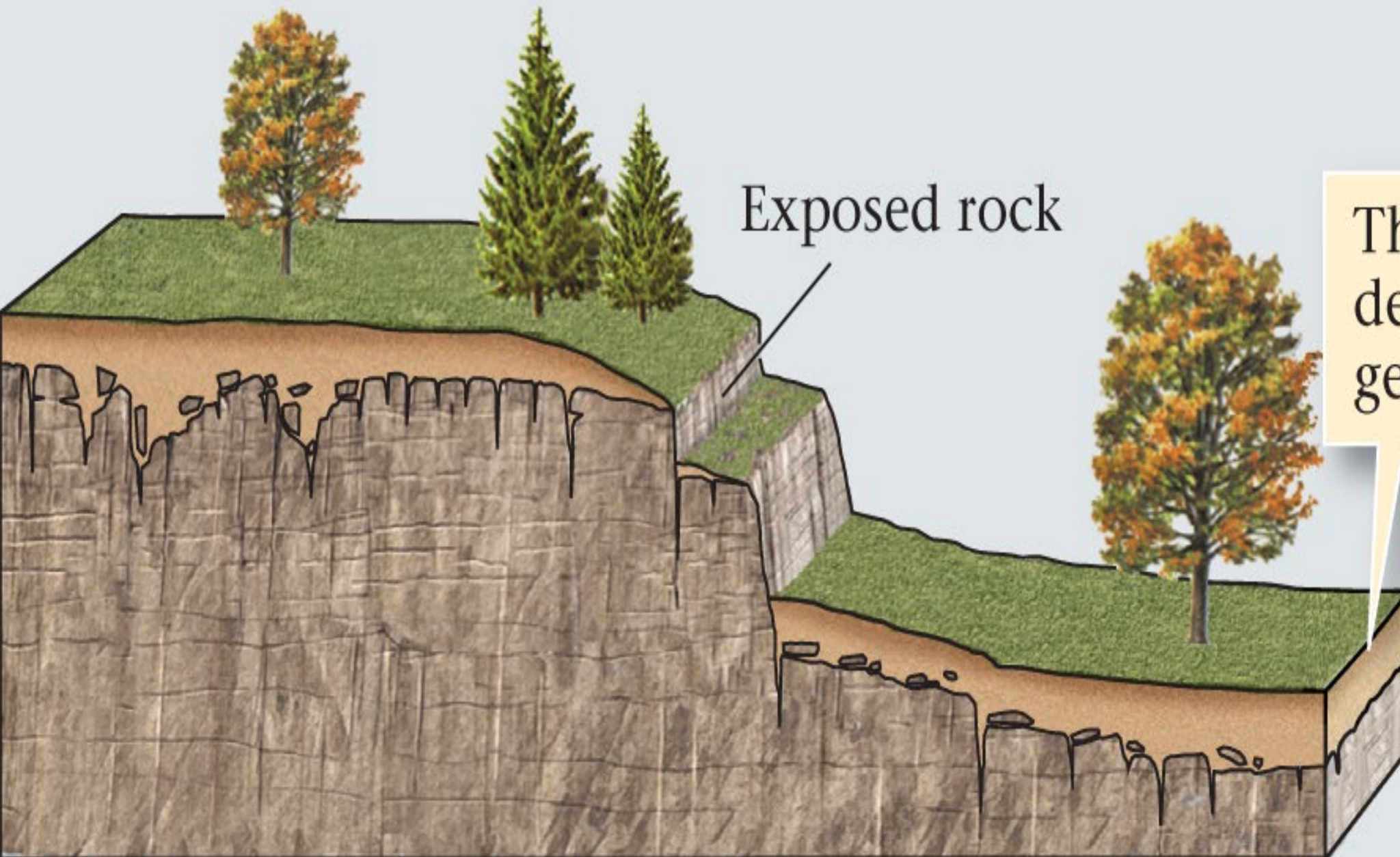
Geology











Exposed rock

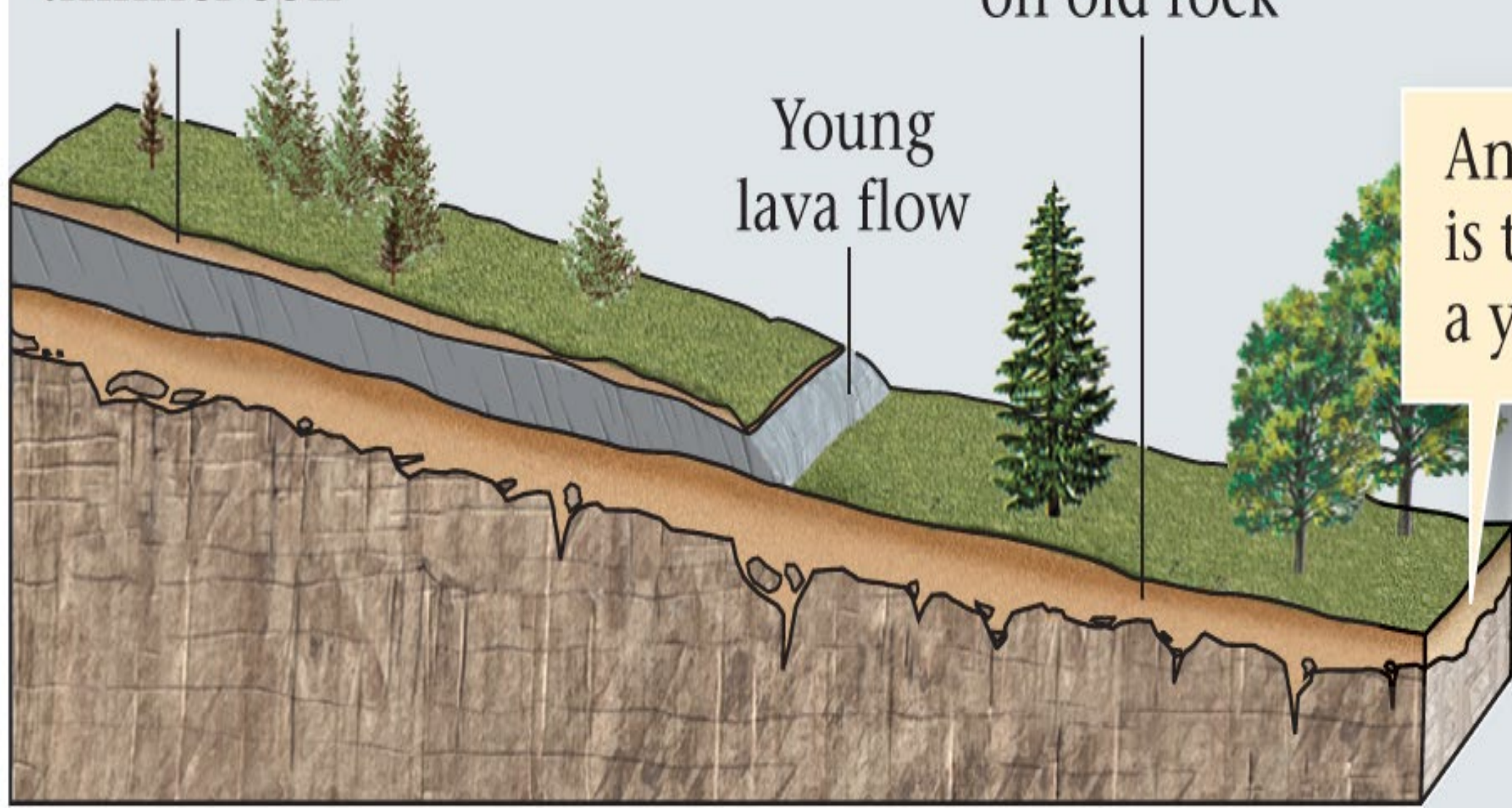
Thicker soil develops over gentler slopes.

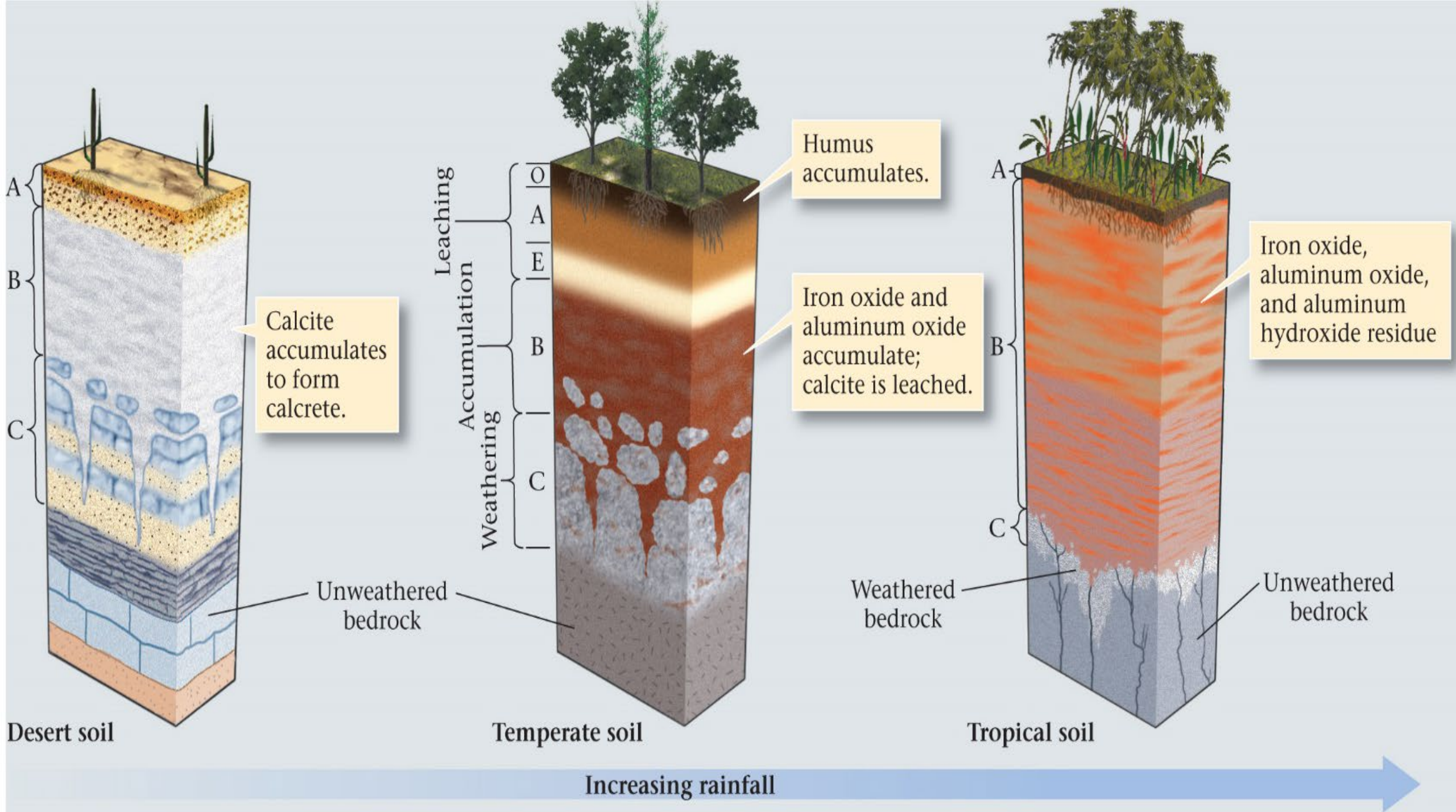
Younger,
thinner soil

Older, thicker soil,
on old rock

Young
lava flow

An older soil
is thicker than
a younger soil.

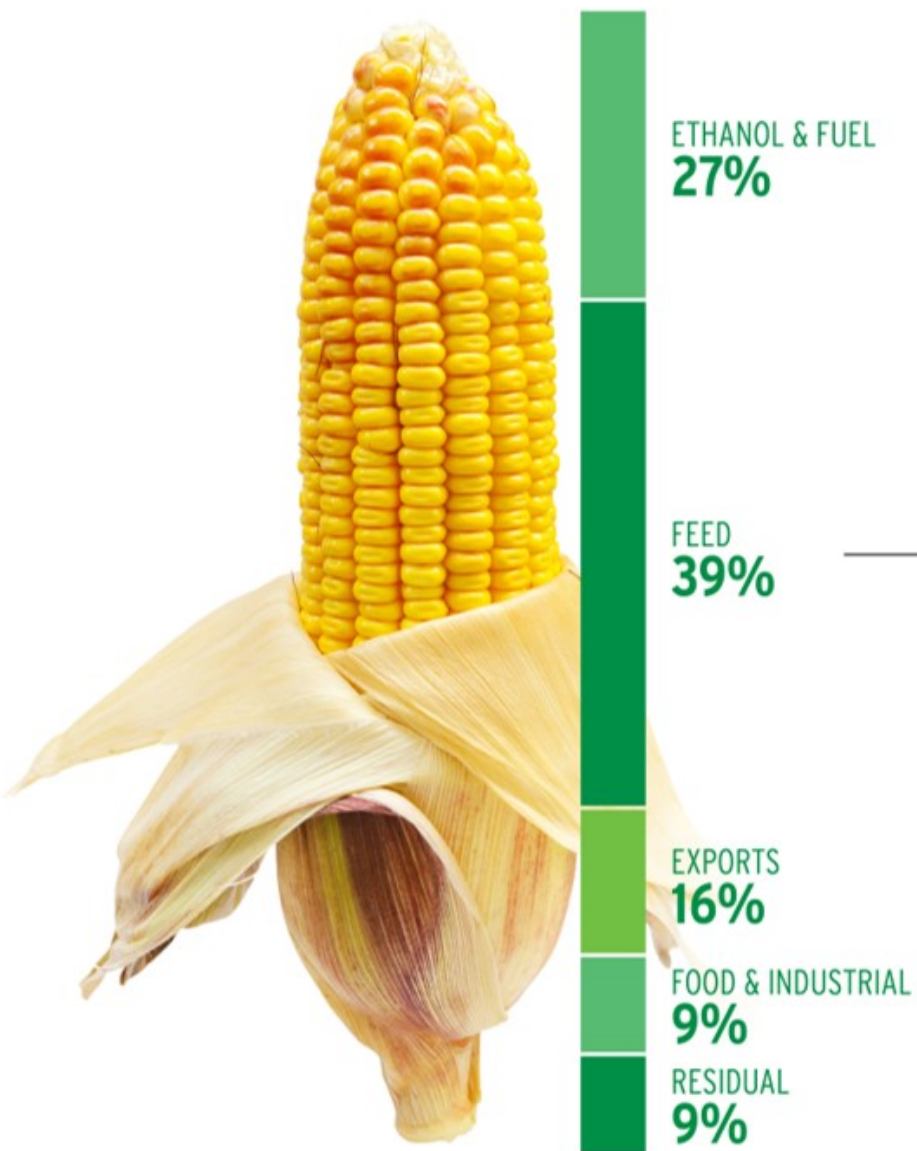




Soil's Purpose ?



U.S. CORN USAGE



80%

MEAL

The primary component of soybeans is meal.

20%

OIL

The other soybean component is oil.

97%

ANIMAL FEED



3%

FOOD PRODUCTS



68% FOOD



25% BIODIESEL

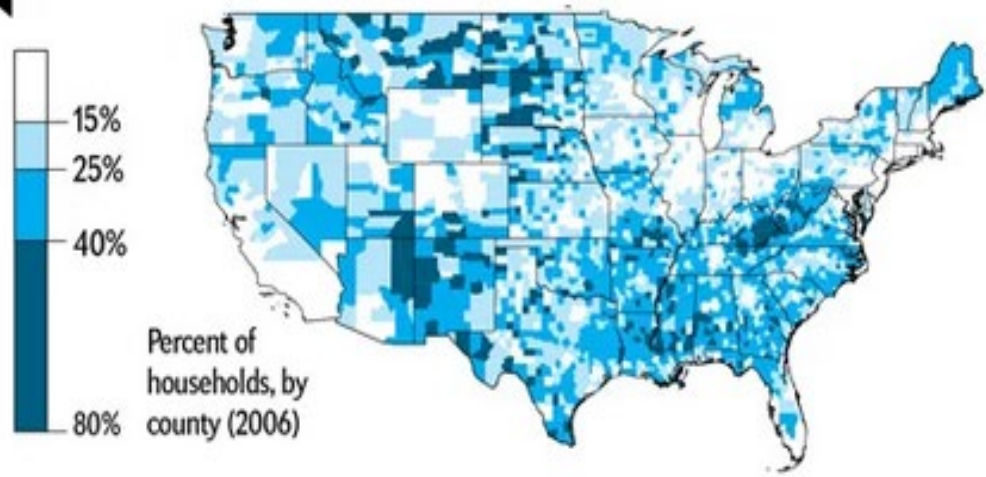
& BIOHEAT®



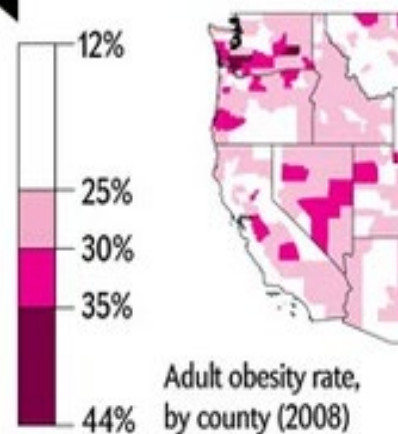
7% INDUSTRIAL USES



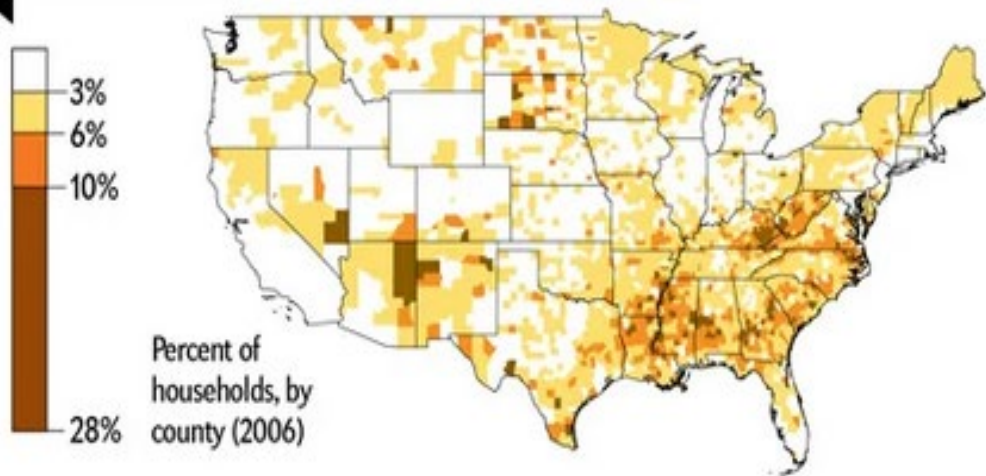
Low-Income Households (more than 1 mile from a grocery)



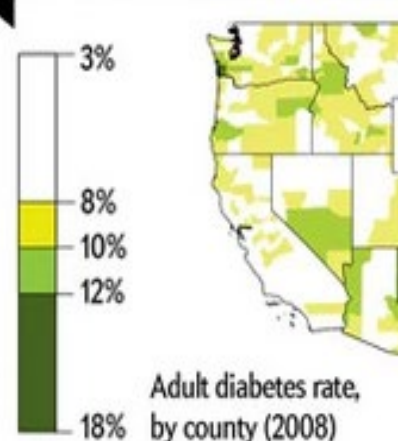
Health Indicator: Obesity



Car-Free Households (more than 1 mile from a grocery)



Health Indicator: Diabetes



FOOD DESERTS

Food Deserts are defined as...



Urban neighborhoods and rural towns without ready access to fresh, healthy, and affordable food.

Food deserts are most commonly found in communities of color and low-income areas, where many people don't have cars.



About 23.5 million people live in food deserts.

Studies have found that urban residents who purchase groceries at small neighborhood stores pay between **3** and **37** percent more than suburbanites buying the same products at supermarkets.

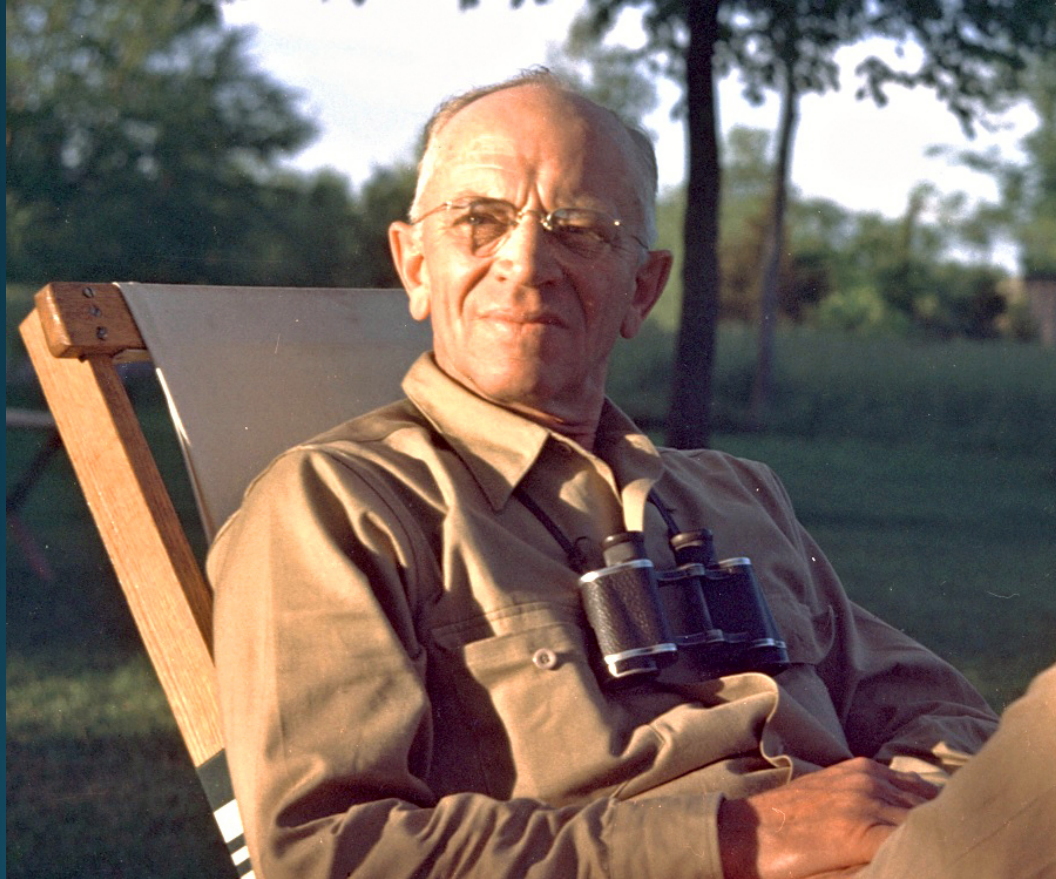
First Lady Michelle Obama has spearheaded the "Let's Move" campaign to combat childhood obesity, which includes a goal of eradicating food deserts by 2017 with a

\$400 million

investment from the government focused on providing tax breaks to supermarkets that open in food deserts.



Aldo Leopold



- "A land ethic ... Reflects the existence of an ecological conscience, and this in turn reflects a conviction of individual responsibility for the health of the land. Health is the capacity of the land for self-renewal. Conservation is our effort to understand and preserve this capacity."

Soil cannot be replaced in 'human-time'



- Destruction of the soil is the most fundamental kind of economic loss which the human race can suffer. With enough time and money, a neglected farm can be put back on its feet—if the soil is there. By expensive replanting and with a generation or two of waiting, a ruined forest can again be made productive – if the soil is there...But if the soil is gone, the loss is absolute and irrevocable.

SUSTAINABLE DEVELOPMENT GOALS

1 NO POVERTY



2 ZERO HUNGER



3 GOOD HEALTH AND WELL-BEING



4 QUALITY EDUCATION



5 GENDER EQUALITY



6 CLEAN WATER AND SANITATION



7 AFFORDABLE AND CLEAN ENERGY



8 DECENT WORK AND ECONOMIC GROWTH



9 INDUSTRY, INNOVATION AND INFRASTRUCTURE



10 REDUCED INEQUALITIES



11 SUSTAINABLE CITIES AND COMMUNITIES



12 RESPONSIBLE CONSUMPTION AND PRODUCTION



13 CLIMATE ACTION



14 LIFE BELOW WATER



15 LIFE ON LAND



16 PEACE, JUSTICE AND STRONG INSTITUTIONS



17 PARTNERSHIPS FOR THE GOALS



Security

Ensuring all people across the world have access to sufficient food to meet their dietary needs.

Food Security

Sovereignty

Empowering people to make their own choices about the food they eat, where it comes from and how it is produced.

Safety

Ensuring people have healthy, nutritious food that is free from contamination or degradation.