Definition of Cutans

A hydrocarbon polymer, of uncertain structure but thought to be similar to kerogen, found in some plants.

An oriented deposit which can be composed of any of the component substances of the soil material.

According to Guidelines for soil description (FAO 2006)

Classification of the form of coatings	
C	Continuous
CI	Continuous irregular (non-uniform, heterogeneous)
DI	Discontinuous irregular
DE	Dendroidal
DC	Discontinuous circular
O	Other

Classification of the location of coatings and clay accumulation

P	Pedfaces
PV	Vertical pedfaces
PH	Horizontal pedfaces
CF	Coarse fragments
LA	Lamellae (clay bands)
VO	Voids
BR	Bridges between sand grains
NS	No specific location

Classification of abundance of coatings

		%
N	None	0
V	Very few	0–2
F	Few	2–5
C	Common	5–15
M	Many	15–40
A	Abundant	40–80
D	Dominant	> 80

Classification of the contrast of coatings

F	Faint	Surface of coating shows only little contrast in colour, smoothness or any other property to the adjacent surface. Fine sand grains are readily apparent in the cutan. Lamellae are less than 2 mm thick.
D	Distinct	Surface of coating is distinctly smoother or different in colour from the adjacent surface. Fine sand grains are enveloped in the coating but their outlines are still visible. Lamellae are 2–5 mm thick.
P	Prominent	Surface of coatings contrasts strongly in smoothness or colour with the adjacent surfaces. Outlines of fine sand grains are not visible. Lamellae are more than 5 mm thick.

Pictures:

Concretions – Cutanic Features

- features of clay iluviation (e.g.: clay coatings on the structure elements – peds)

Soil Stress – Visco Elastic Coating Failing

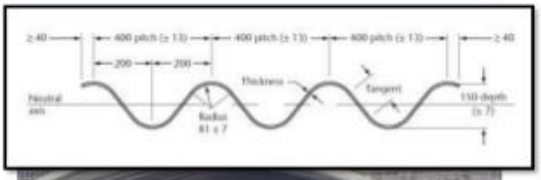
COATED PARTICLE

NON-COATED PARTICLE

PROFILES, APPLICATIONS AND COATINGS

Bridge Plate

- 400 mm x 150 mm Corrugation
- 4.3 mm – 8 mm Thickness
- 4 - 18 m Standard Spans
- Variety of Standard Shapes and Sizes
- Custom Applications
- Modular Lengths, 1200 mm Increments
- Galvanized or Polymer-Coated



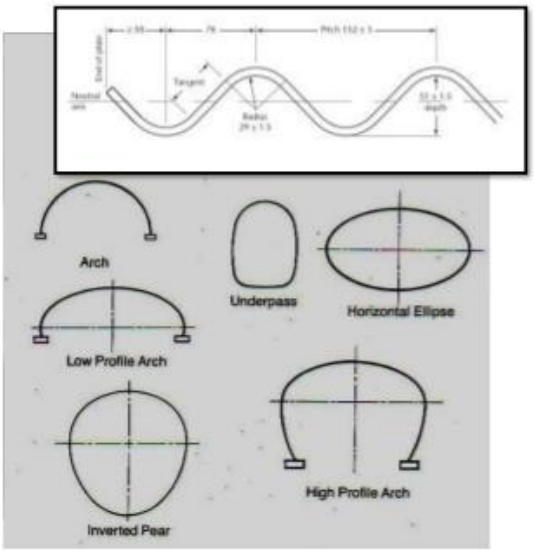
Applications:

- Bridges
- Culverts
- Pedestrian Tunnels
- Mine Portals
- Stockpile Tunnels

PROFILES, APPLICATIONS AND COATINGS

Multi Plate

- 152 mm x 51 mm Corrugation
- 3 mm – 7 mm thickness
- Galvanized or Polymer-coated
- Variety of Shapes & Sizes
- Modular Lengths, 610 mm Increments
- Stackable, Nestable Plates



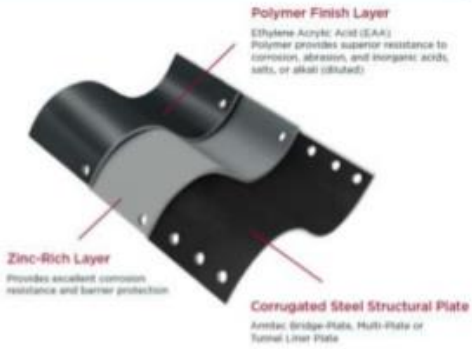
Applications:

- Culverts
- Underpasses
- Conveyor Tunnels
- Bridges
- Caissons
- Mine Portals

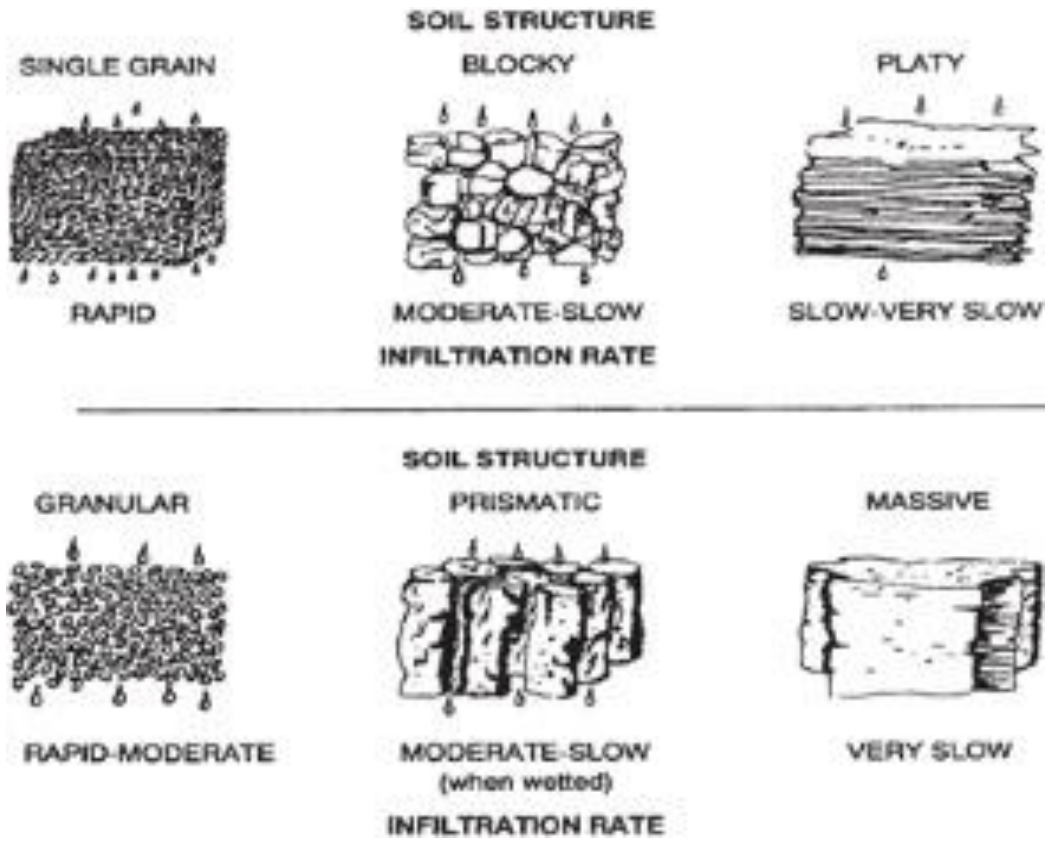
DESIGNING FOR DURABILITY

Multiple Plate / Coating Types:

- Standard Galvanized (915 g/m^2)
- Heavy Galvanized (1220 g/m^2)
- Aluminum
- Strata-CAT Polymer Coating



Product	Galvanized (50+ Years)	Aluminum (75+ Years)	Strata-CAT (100+ Years)
Multi-Plate	✓		✓
Bridge-Plate	✓		✓
Tunnel Liner Plate	✓	✓	✓

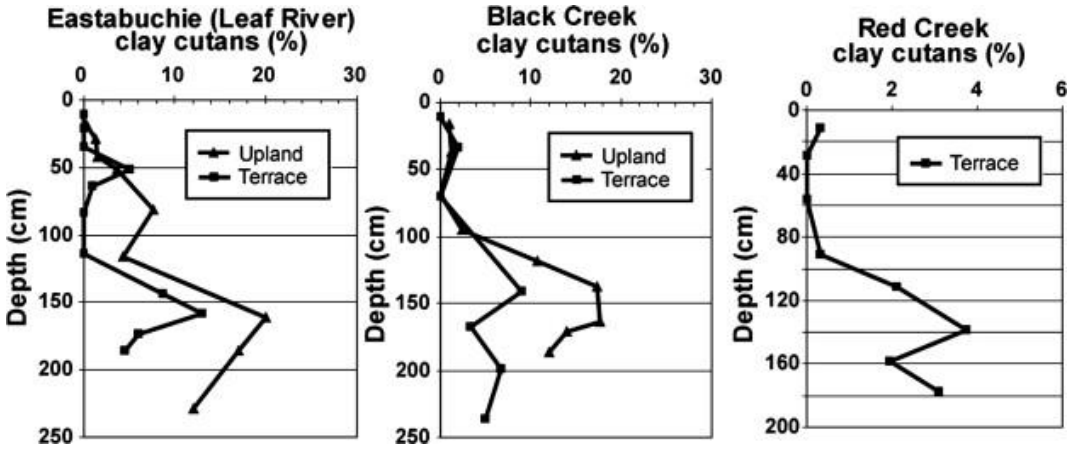


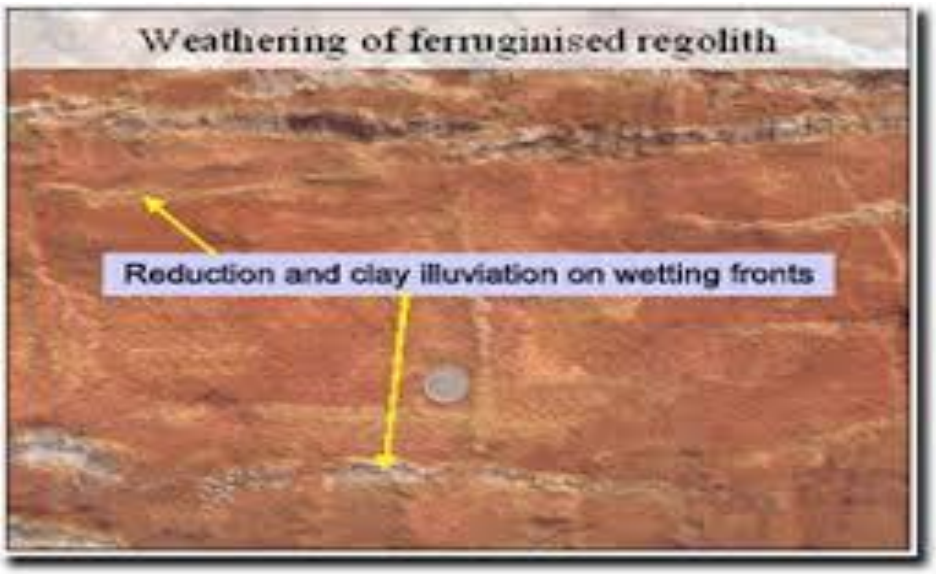
Structural Plate Coatings

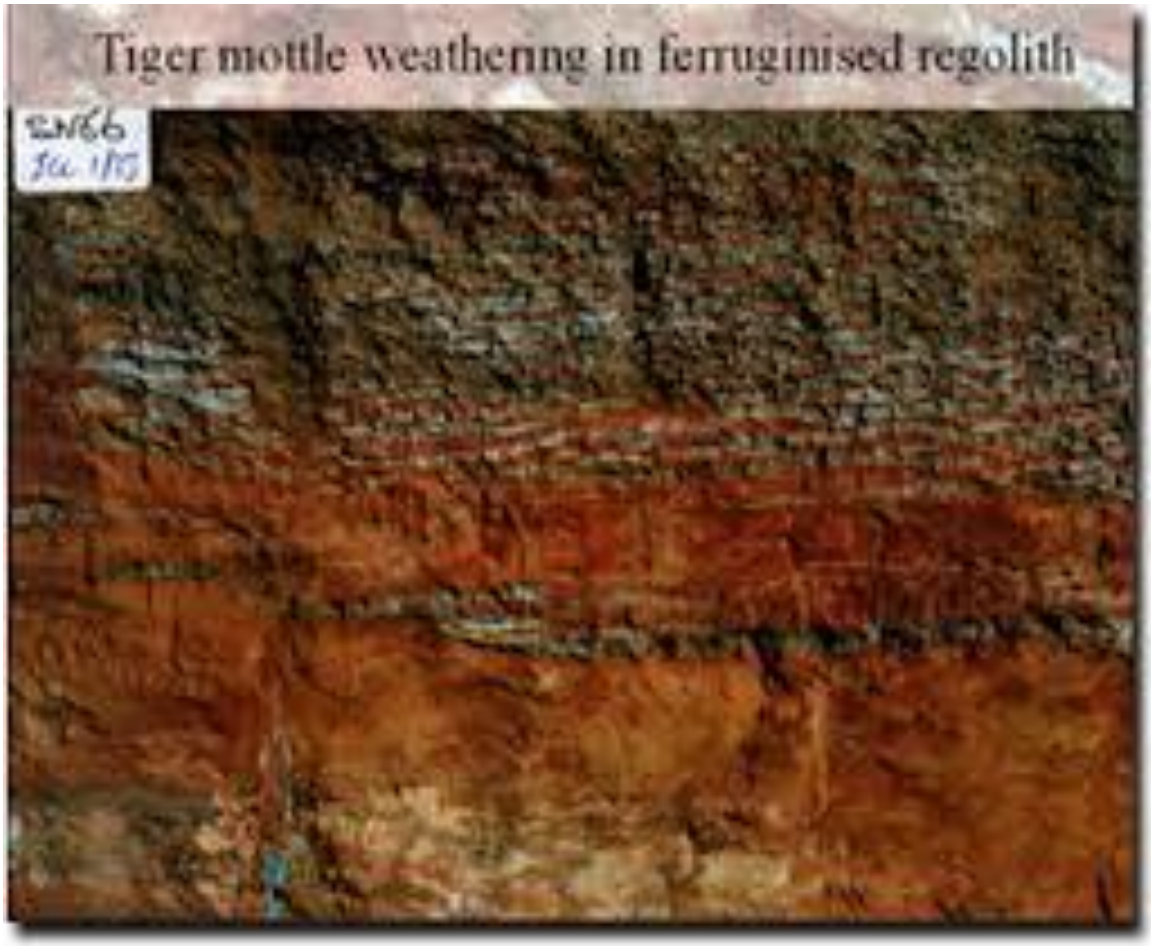
Table 2[1]
Environmental Limits For Galvanized Steel and Polymer Coated Steel

Environmental Parameter	Suggested Limits Galvanized Steel	Suggested Limits for Polymer Coated Steel		
		50 year EMSL	75 year EMSL	100 year EMSL
pH preferred range	5 – 9	3 – 12	4 – 9	5 – 9
Resistivity	2,000 – 8,000 ohm-cm	>100 ohm cm	>750 ohm cm	>1,500 ohm cm
Chlorides	< 250 ppm	NA	NA	NA
Sulfates	< 600 ppm	NA	NA	NA
Hardness	> 80 ppm $CaCO_3$	NA	NA	NA

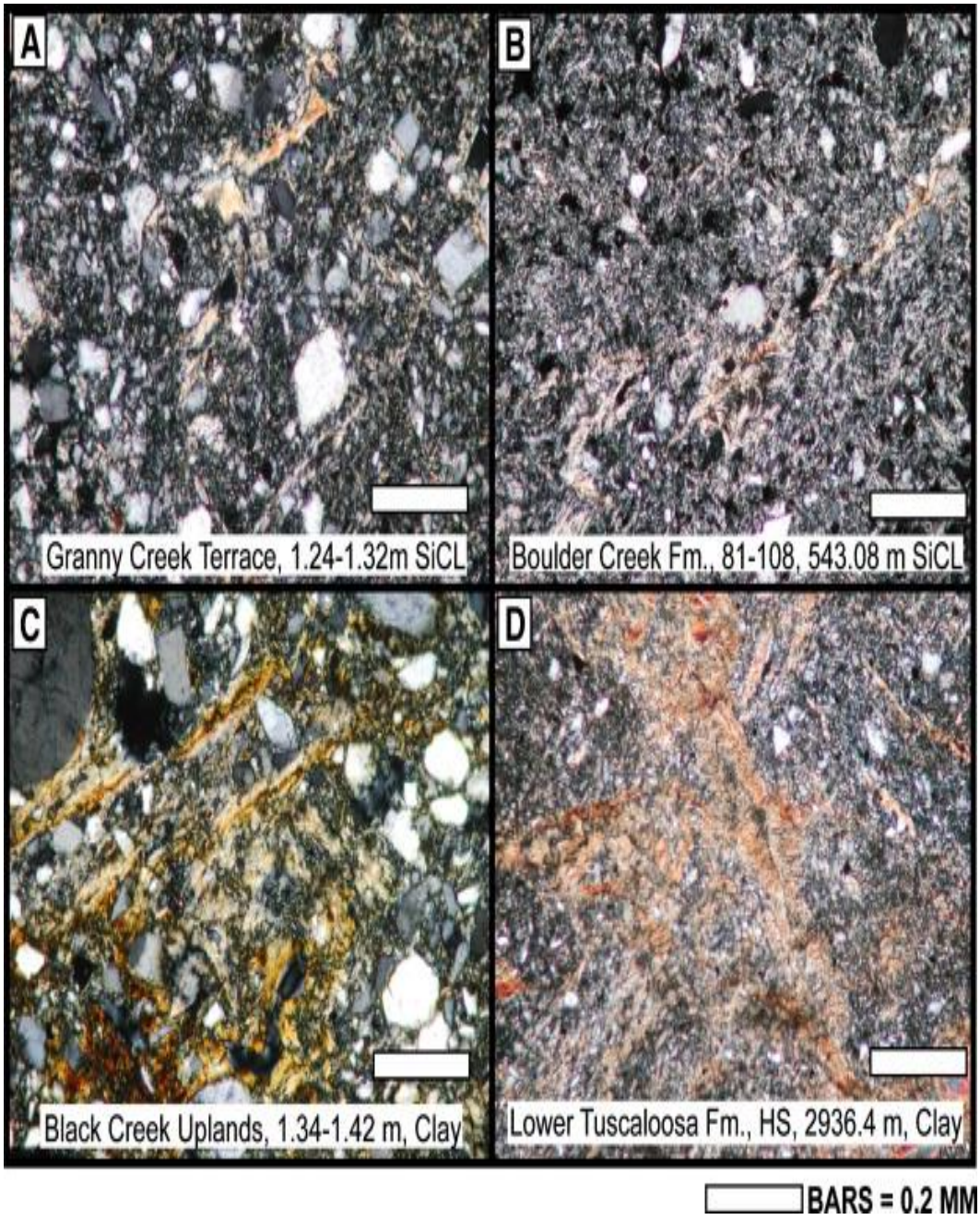
[1] Performance Guideline For Buried Steel Structures – Tech. Bulletin 13, CSPI Feb 2012



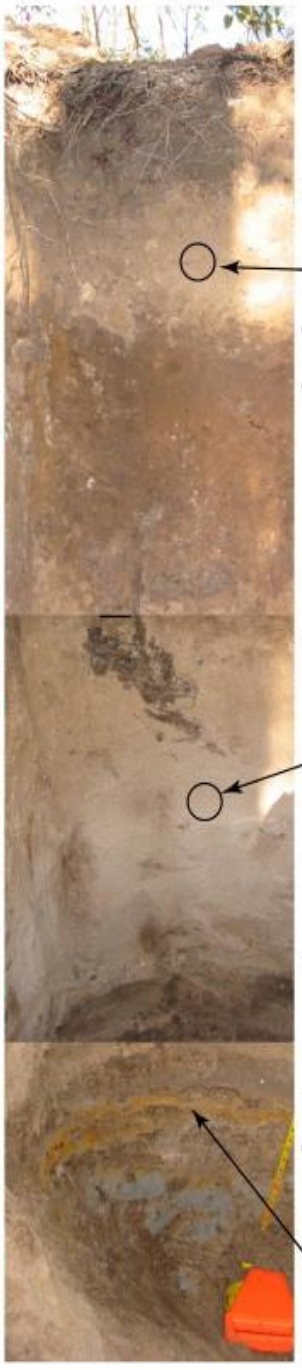

Weathering of ferruginised regolith
Reduction and clay illuviation on wetting fronts


Tiger mottle weathering in ferruginised regolith

Clay Cutans


A
Granny Creek Terrace, 1.24-1.32m SiCL
B
Boulder Creek Fm., 81-108, 543.08 m SiCL
C
Black Creek Uplands, 1.34-1.42 m, Clay
D
Lower Tuscaloosa Fm., HS, 2936.4 m, Clay
BARS = 0.2 MM

Quaternary Terrace *31° 26' 02" N*
Eastabuchie (Shady Grove Ch) *89° 18' 45" W*



Ap — Sandy loam; granular structure; 2.5Y 3/2; irregular basal contact w/ root burrow structures piping more organic rich material into underlying horizon.

4,070 ± 500 years

C — **OSL Sample 1'2"** — Sand; single grain to weak granular; 2.5Y 6/2; wavy basal contact w/ irregular burrow/root mottles.

Ab — Sandy loam; granular; 2.5Y 3/3; wavy-diffuse lower boundary; organic rich.

Bt — Sandy loam; weak subangular blocky; 10YR 3/4; contains 2-5% gravel; few distinct clay films in voids; wavy basal contact; contains large organic/clay rich root trace.

25,730 ± 1,760 years

OSL Sample 4'0"

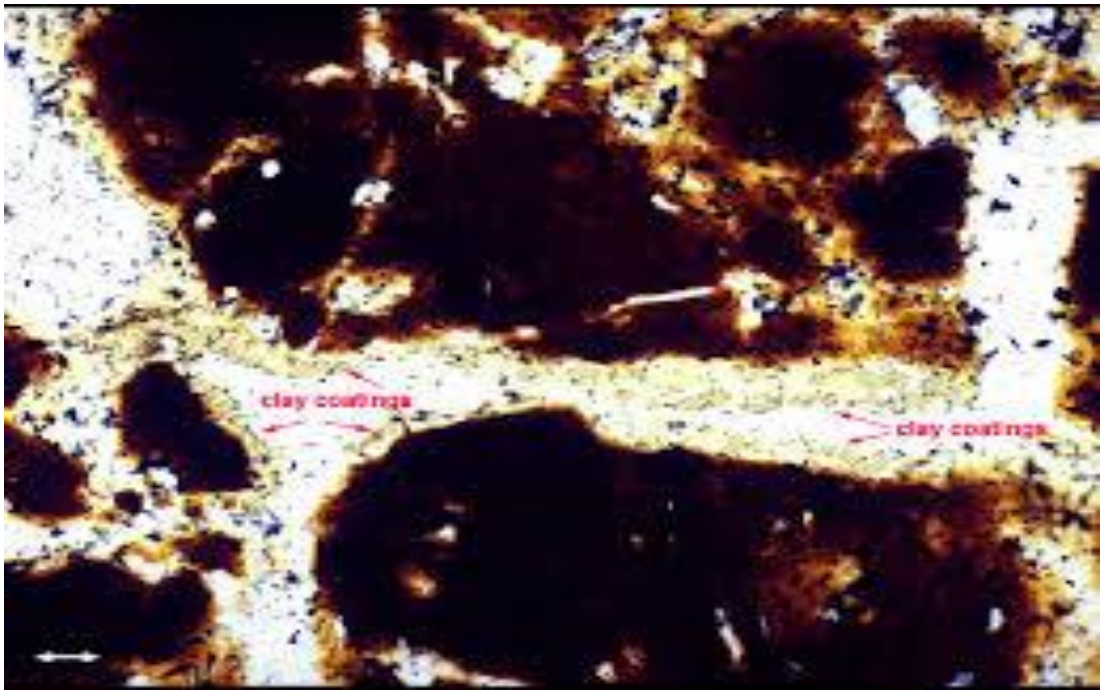
C_2 — Sand; single grain; 2.5Y 7/2 subtle change in color; upper portions of this horizon (6") may be slightly darker -not a whole number change in hue/chroma; 1-2% gravel.

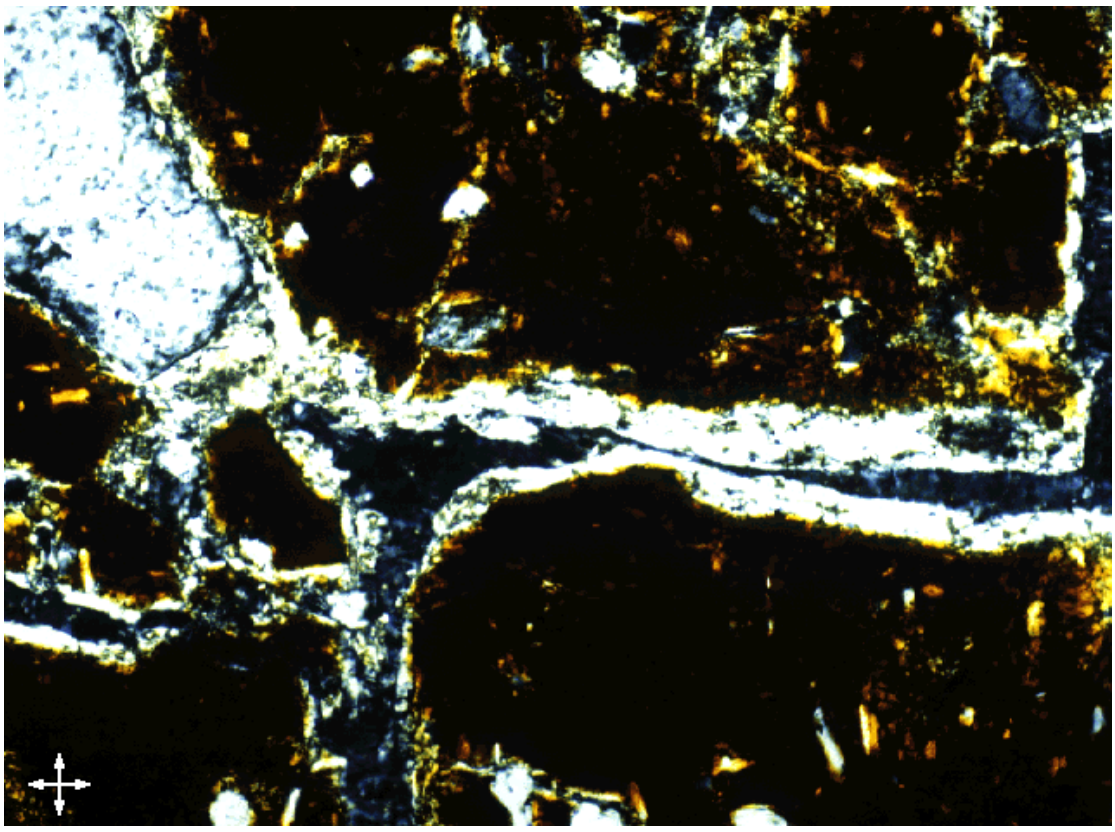
$2C_3$ — Gravelly sand; weak subangular blocky; 2.5Y 4/2 (dark), 2.5Y 6/3 (light mottles); distinctly mottled light and darker gray with few distinct root-trace mottles 7.5YR 4/6; 10-15% gravel.

$3C_4$ — Gravelly silty-clay; bright orange 5YR 5/8; mixture of gravel (up to 2.5 cm long axis)and a silty-clay matrix. Saturated, gravel content up to 25%.

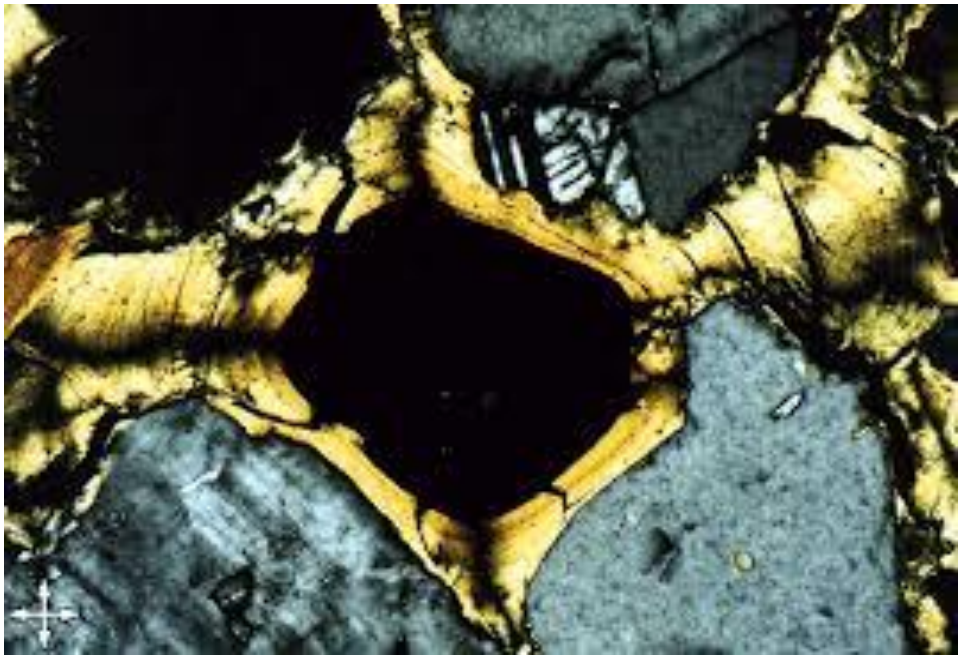
$3C_5$ — Silty clay; 2.5Y 6/1; coarse blocky; gleyed; few distinct 7.5YR 4/6 mottles along root traces; minor gravel in upper 5-10 cm.

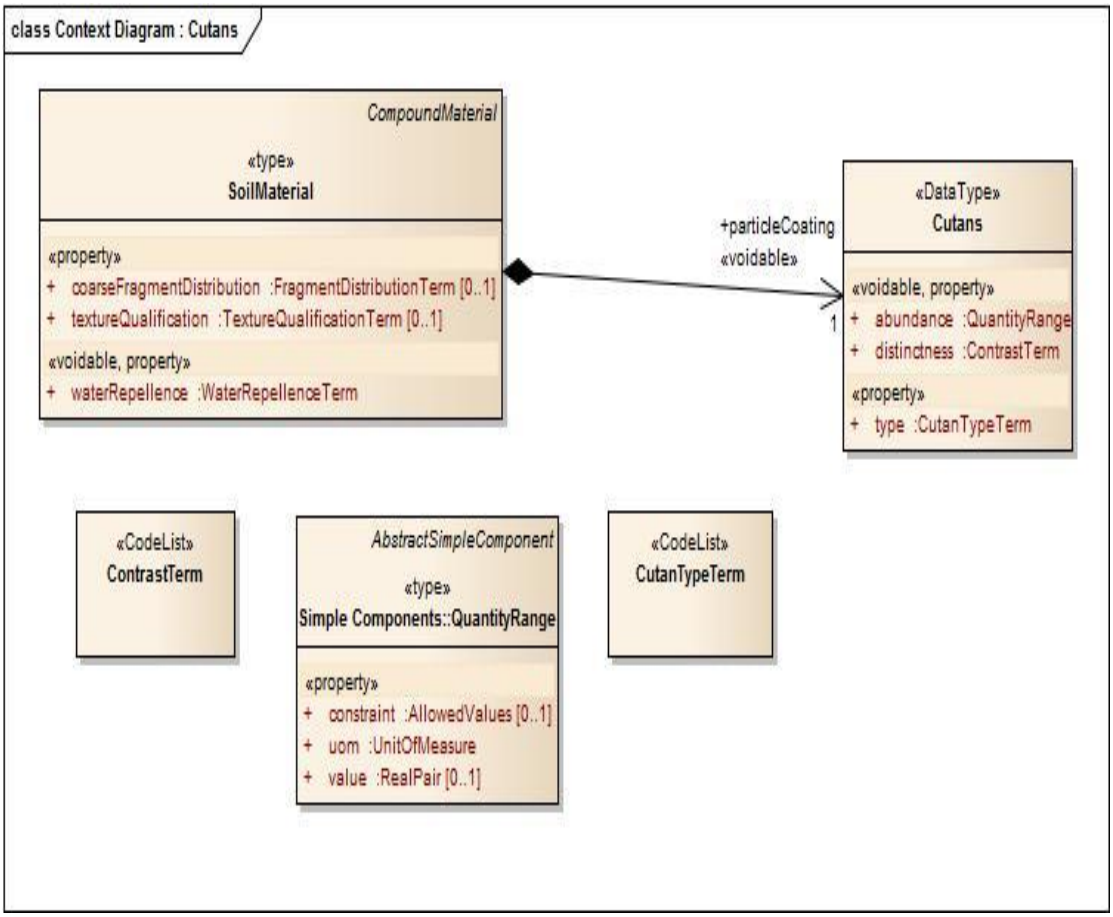
Top Hattiesburg Fm.

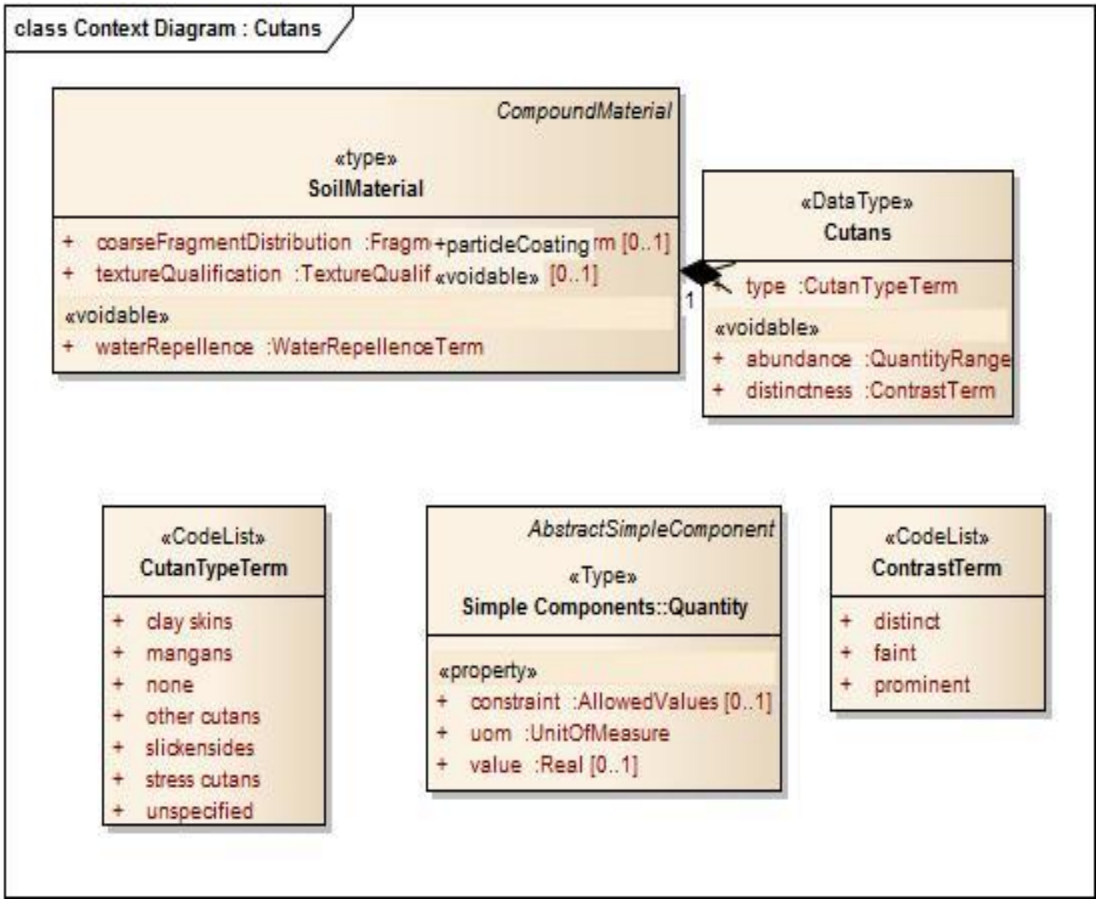

clay coatings
clay coatings



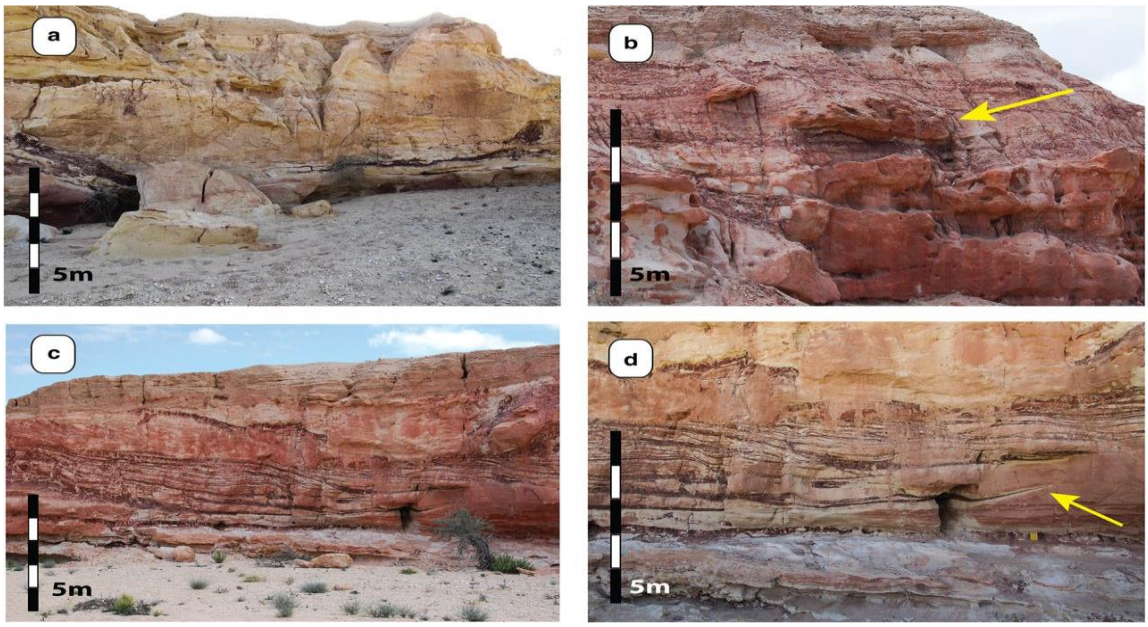
Morphological classification of coatings

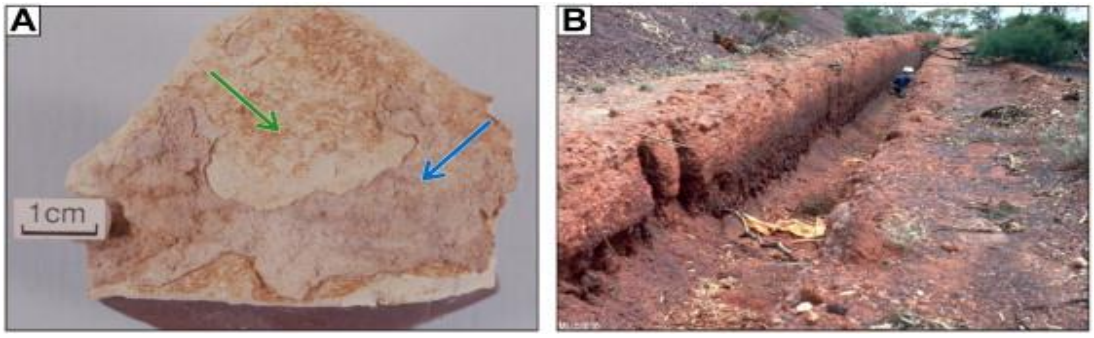


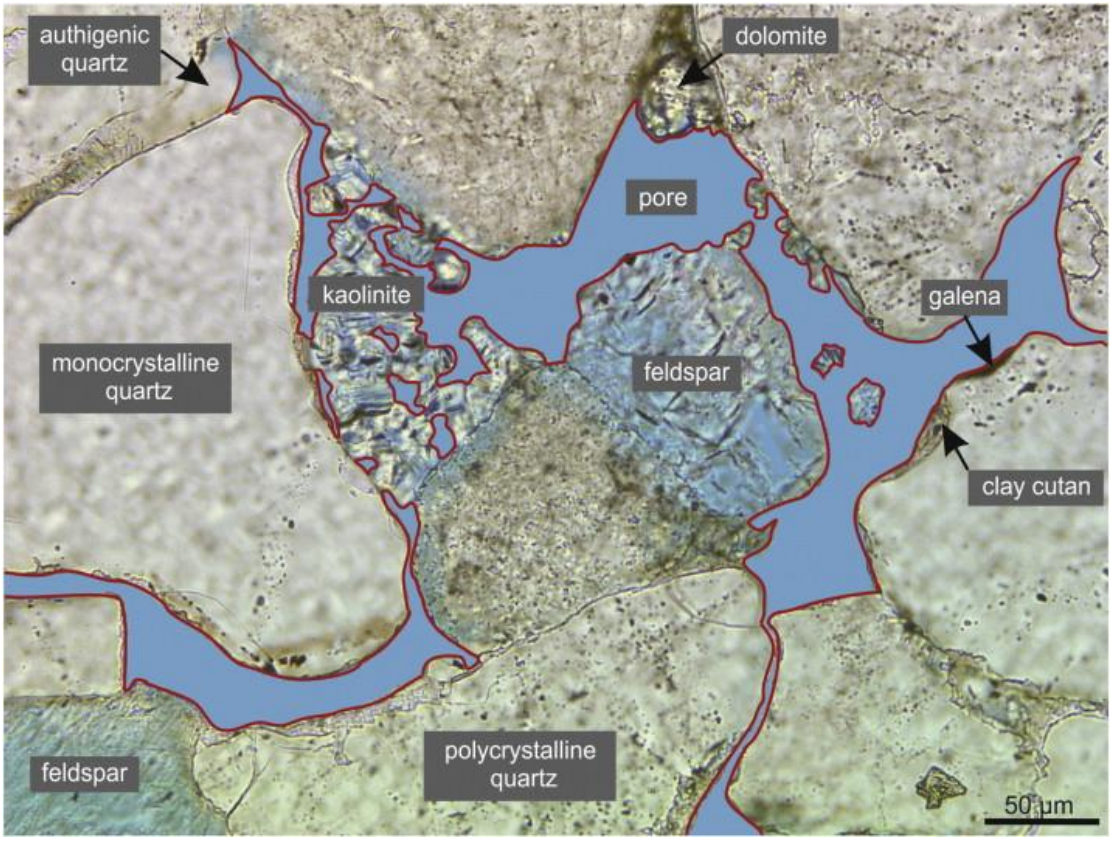


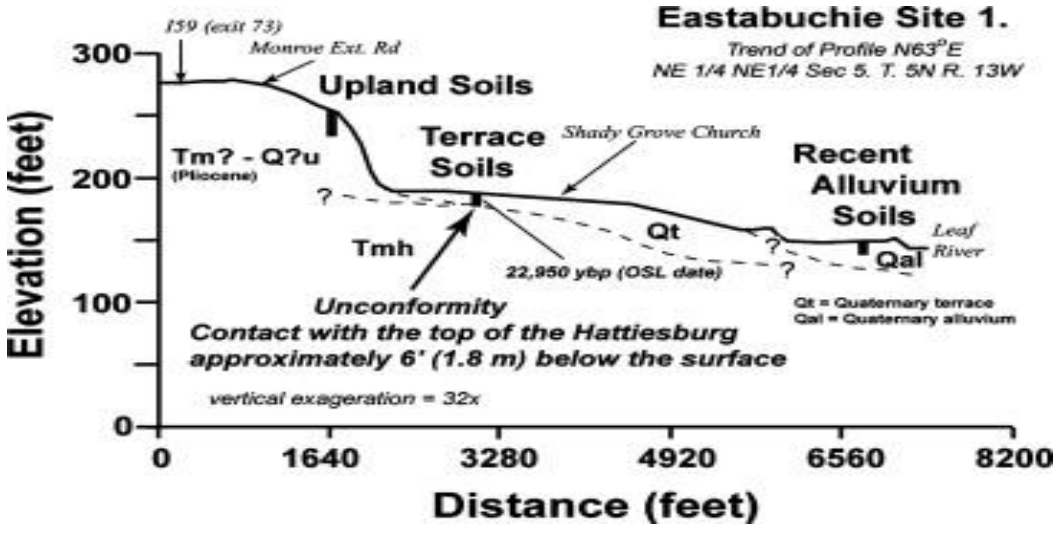


Cutan Geology




A
1cm
B


authigenic quartz
dolomite
pore
kaolinite
galena
monocrystalline quartz
feldspar
clay cutan
feldspar
polycrystalline quartz
50 µm


Eastabuchie Site 1.
Trend of Profile N63°E
NE 1/4 NE1/4 Sec 5. T. 5N R. 13W
I59 (exit 73)
Monroe Ext. Rd
Upland Soils
Terrace Soils
Shady Grove Church
Recent Alluvium Soils
Tm? - Q?u
(Pliocene)
Tmh
Qt
Qal
Leaf River
22,950 ybp (OSL date)
Unconformity
Contact with the top of the Hattiesburg approximately 6' (1.8 m) below the surface
Qt = Quaternary terrace
Qal = Quaternary alluvium
vertical exageration = 32x
Elevation (feet)
300
200
100
0
0
1640
3280
4920
6560
8200
Distance (feet)

What are the other Names for this Condition? (Also known as/Synonyms)

- CLM (Cutaneous Larva Migrans)
- Ground Itch
- Sandworm Eruption

What is Cutaneous Larva Migrans? (Definition/Background Information)

- Cutaneous Larva Migrans (CLM) is primarily a skin disease caused by a variety of larval nematode parasites. The signs and symptoms occur when a larval infection penetrates the skin. The skin manifestation of the larva is denoted as Cutaneous Larva Migrans
- The common larval infections causing Cutaneous Larva Migrans includes infections by Ancylostoma braziliense, Dracunculus medinensis, or Fasciola hepatica. Many nematode infections spreads to humans through the warm moist soil, contaminated feces, or through contaminated water bodies/pools
- The main risk factors for Cutaneous Larva Migrans are poor hygiene and sanitary conditions, engaging in outdoor activities without suitable protective clothing, and those travelling to the tropical and sub-tropical regions, where the parasites are endemic
- The signs and symptoms of the infection include skin inflammation, itchiness, and ulceration. Often, multiple skin lesions that migrate in the direction of movement of the larva under the skin, can be observed (termed migratory inflammatory lesions)
- Cutaneous Larva Migrans is treated through antiparasitic medications and removal of the larva from the body is generally not required. With proper diagnosis and treatment, the prognosis of CLM is excellent. However, systemic infections may occur that take longer to treat
- Individuals should adopt preventive methods (proper clothing) when travelling to high-risk regions; individuals who have untreated and open wounds should be particularly careful

Who gets Cutaneous Larva Migrans? (Age and Sex Distribution)

- Cutaneous Larva Migrans can affect any individual irrespective of their age, gender, race, or ethnicity
- Men are generally more prone to infection than women, mostly because of the nature of activities/occupation they are involved in
- CLM is also more common among people living in the tropical and subtropical parts of the world (in the endemic regions)

What are the Risk Factors for Cutaneous Larva Migrans? (Predisposing Factors)

Following are the risk Factors associated with Cutaneous Larva Migrans:

- Residing in or traveling to areas where the specific larva is endemic

- Engaging in activities that increases the risk of coming into contact with the larva
- Outdoor activities in endemic areas; farmers, gardeners, and animal handlers have a higher risk
- Swimming in contaminated ponds and lakes
- Walking barefoot in soils containing the parasite
- Poor hygiene and sanitation status
- Advanced age
- Individuals who are immunocompromised due to various factors
- Travelling to tropical and subtropical areas that include Asia, Central and South America, and the Caribbean islands
- Those with open and untreated wounds are at high risk for developing Cutaneous Larva Migrans in the endemic zones

It is important to note that having a risk factor does not mean that one will get the condition. A risk factor increases ones chances of getting a condition compared to an individual without the risk factors. Some risk factors are more important than others.

Also, not having a risk factor does not mean that an individual will not get the condition. It is always important to discuss the effect of risk factors with your healthcare provider.

What are the Causes of Cutaneous Larva Migrans? (Etiology)

Cutaneous Larva Migrans is an infection caused by a variety of larval nematode parasites (belonging to hookworm family) that are normally found in cats, dogs, and certain wild animals. Human beings are not natural hosts for these parasites, but may serve as an intermediate host.

Human transmission may occur through any of the following methods:

- Contact with warm moist soil, where the organism may thrive
- Contaminated feces
- Contaminated water bodies and pools

The skin manifestation of the larva leads to Cutaneous Larva Migrans. The common nematodes causing CLM include:

- Ancyclostoma braziliense (a hookworm primarily affecting cats and dogs) and A. carinum: These two form the most common causative agents found in pets
- Dracunculos medinensis (guinea worm)
- Fasciola hepatica (the common liver fluke or sheep liver fluke)

The larva can enter the body through open wounds and lesions, or even through unbroken skin. This may result in a local allergic reaction, which is followed by the signs and symptoms of CLM that develops slowly.

What are the Signs and Symptoms of Cutaneous Larva Migrans?

The signs and symptoms of Cutaneous Larva Migrans may include the following:

- When the larva penetrates the skin, it may cause an inflammatory or allergic reaction in the area
- The skin may itch, ulcerate, and bleed
- The skin condition can become nodular or may form vesicles
- There may be single or multiple lesions depending on the number larval penetrations on skin
- Common areas affected are the hands and legs; it can also affect the buttocks
- In many cases, depending on the type of larval infection, deep tissues and other organs in the body may also be affected
- Depending upon the type of worm, the signs and symptoms of systemic infection may vary
- In majority of cases, once the larva enters the bloodstream, the skin symptoms disappear

Generally, as the larva migrates under the skin, the skin symptoms also migrate, leaving a trail of irregular and random skin rashes. Hence, the condition is also known as Creeping Eruption to Larva. The larva tends to move a few millimeters each day.

How is Cutaneous Larva Migrans Diagnosed?

The diagnosis of Cutaneous Larva Migrans involves the following tests and exams:

- A complete evaluation of medical history and a thorough physical exam
- During the evaluation, the emphasize may be on:
    - Details of any recent visits to the tropical and sub-tropical areas
    - The individual's socioeconomic and hygiene status, including nature of work

The following tests may be performed:

- Blood tests, such as complete blood count, which may show increased white blood cells
- CBC with differential may show increased eosinophil, called peripheral eosinophilia

In many cases, a clinical diagnosis is sufficient and no skin biopsy is required.

- Ultrasound of the affected region to localize the larva and extent of involvement. This can help enable the surgeon to remove the larva without damaging other important parts, such as the facial nerve, if required
- Skin biopsy of the wound: A skin biopsy is performed and sent to a laboratory for a pathological examination. The pathologist examines the biopsy under a microscope. After putting together clinical findings, special studies on tissues (if needed) and with microscope findings, the pathologist arrives at a definitive diagnosis

Many clinical conditions may have similar signs and symptoms. Your healthcare provider may perform additional tests to rule out other clinical conditions to arrive at a definitive diagnosis.

What are the possible Complications of Cutaneous Larva Migrans?

The following are the complications associated with Cutaneous Larva Migrans:

- The individual can develop a severe allergic reaction
- Secondary infections due to bacteria or fungus
- Development of systemic infection: Infection in other parts of the body - depending on where the larva infects
- Systemic parasitemia, when blood is infected

How is Cutaneous Larva Migrans Treated?

The treatment of Cutaneous Larva Migrans includes the following procedures:

- Anti-microbial therapy depending upon the type of larva causing the infection
- Application of topical creams and lotions
- Prescriptive medications include the drug ivermectin, which has been found to be very effective in treating CLM

It is important not to make an attempt to remove the larva underneath the skin (self-removal), since it can do more harm than good.

How can Cutaneous Larva Migrans be Prevented?

The following precautionary measures need to be followed to prevent or reduce the incidence of Cutaneous Larva Migrans:

- Travellers should take extra care while travelling to tropical and sub-tropical endemic areas
- Wear protective clothing, such as long-sleeved shirts and full trousers
- Avoid walking barefoot on the soil, especially on beaches or gardens that contain the feces of pets (dogs and cats)
- While lying or sitting on the tropical beaches (where pets are allowed), it is always preferable to use a suitable mattress to protect bare skin from exposure to the parasite, through direct contact with the soil
- Wounds should always be covered to protect from superimposed infections
- Follow personal hygiene habits such as:
    - Washing hands before and after every meal
    - Proper sanitation methods
    - Washing clothes regularly
    - Drying the clothes under direct hot sun and in open spaces

What is the Prognosis of Cutaneous Larva Migrans? (Outcomes/Resolutions)

- 1-appropriate diagnosis and treatment
- However, the prognosis also depends upon the type of larva causing the infection and the associated systemic infection

Additional and Relevant Useful Information for Cutaneous Larva Migrans:

Cutaneous Larva Migrans is also known by a host of names, which include Ground Itch, Hookworm Cutaneous Vesicle (Disorder), Larval Duck Hunter's Itch, Larval Plumber's Itch, Sandworm Eruption, etc.

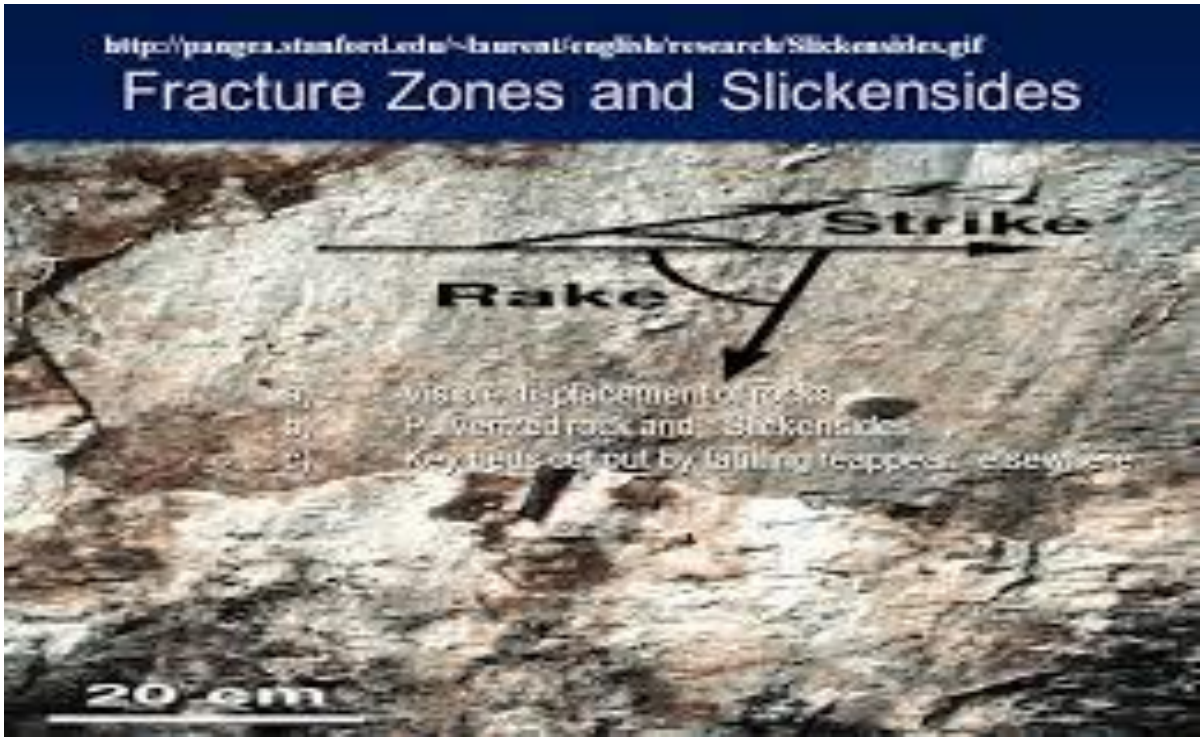
Types of Cutans

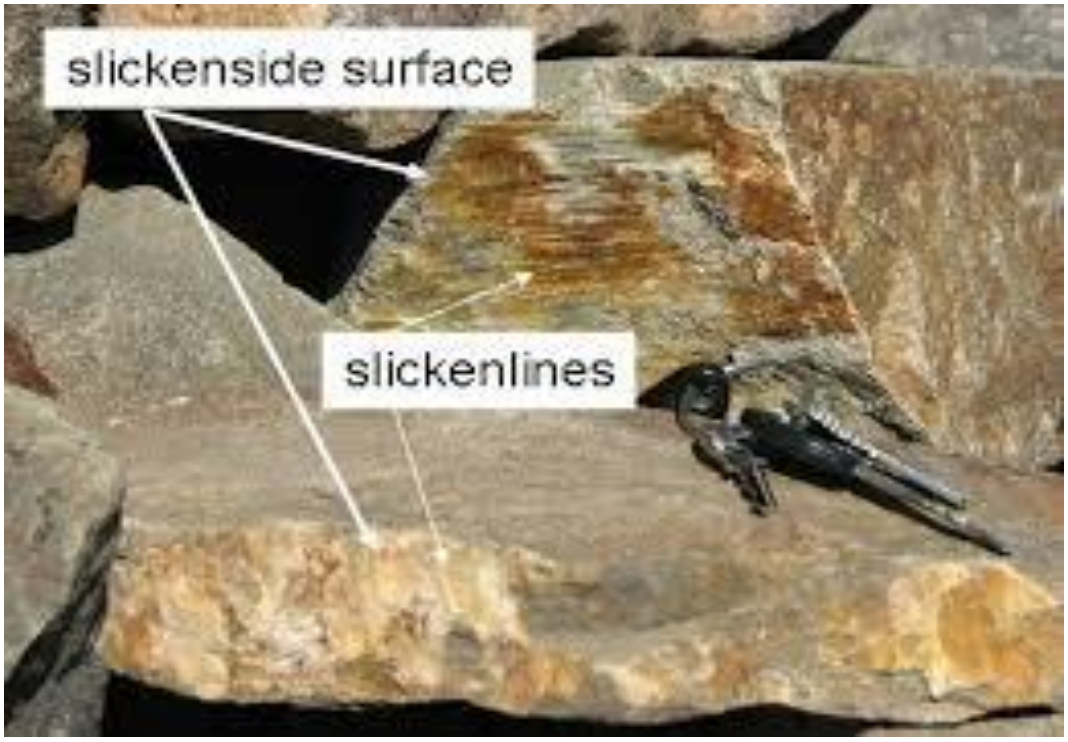
Clay skins (Argillan)


70
81
82

Clay bridge

Slickenside


http://pangea.stanford.edu/~laurent/english/research/Slickensides.gif
Fracture Zones and Slickensides
Strike
Rake
20 cm


slickenside surface
slickenlines