

SET #7

- Soils in *arid and semi-arid regions*. Redistribution of calcium carbonate and gypsum is an important mechanism of horizon differentiation in soils in the dry zone.
- Soluble salts may accumulate at some depth or, in areas with shallow ground-water, near the soil surface.
 - **SOLOCHAKS** with a high content of *soluble salts*,
 - **SOLONETZ** with a high percentage of *adsorbed sodium ions*,
 - **GYPSISOLS** with a horizon of *secondary gypsum enrichment*,
 - **DURISOLS** with a layer or nodules of soil material that is *cemented by silica*, and
 - **CALCISOLS** with *secondary carbonate enrichment*.

Solonchaks (SC)



Solonchaks (SC)

from R. sol, salt, and R. chak, salty area

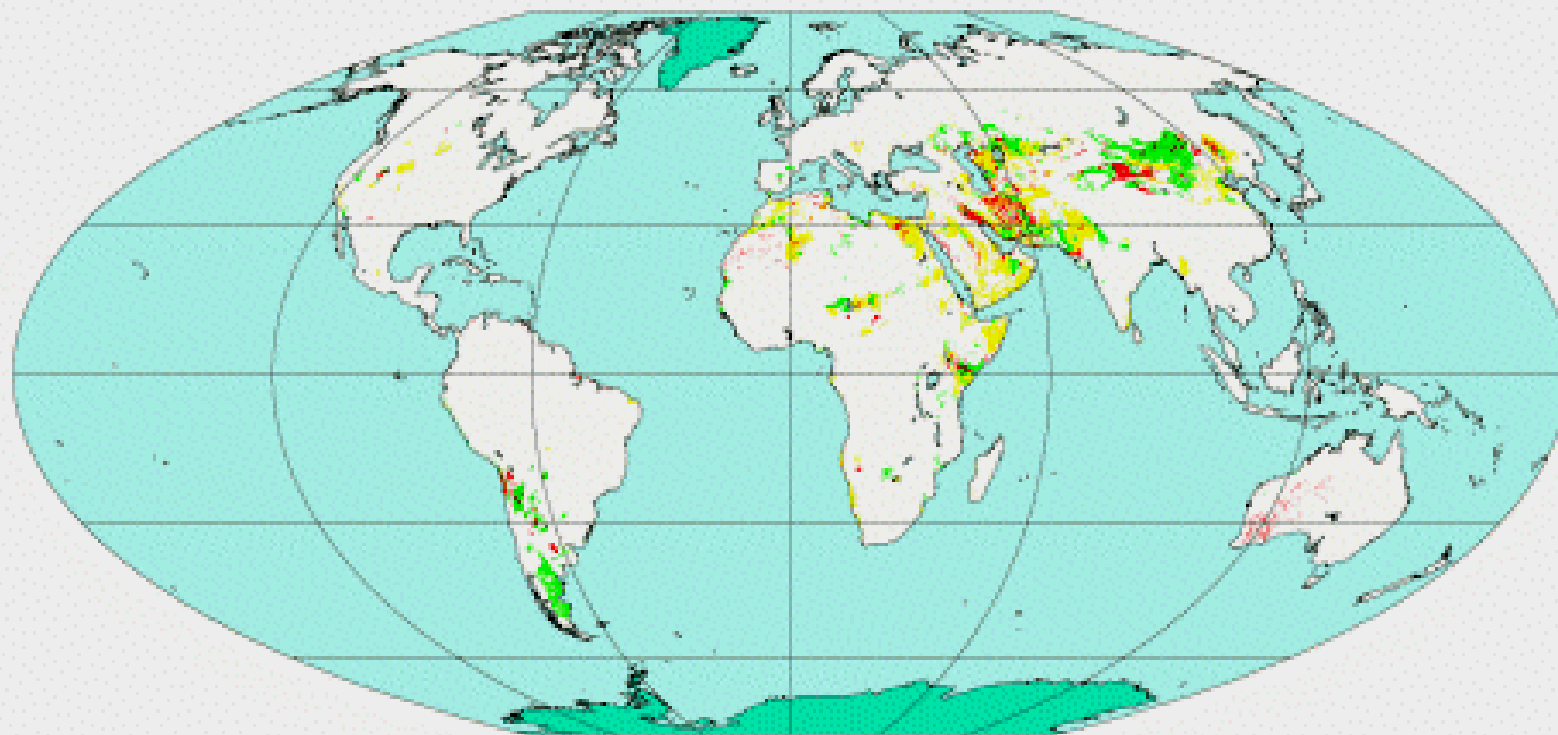
Soils that have a **high concentration of `soluble salts`** at some time in the year. Solonchaks occur mainly in arid and semi-arid climatic zones and to coastal regions in all climates.

Often in seasonally or permanently **waterlogged** areas with grasses and/or halophytic herbs, and in poorly managed irrigation areas.

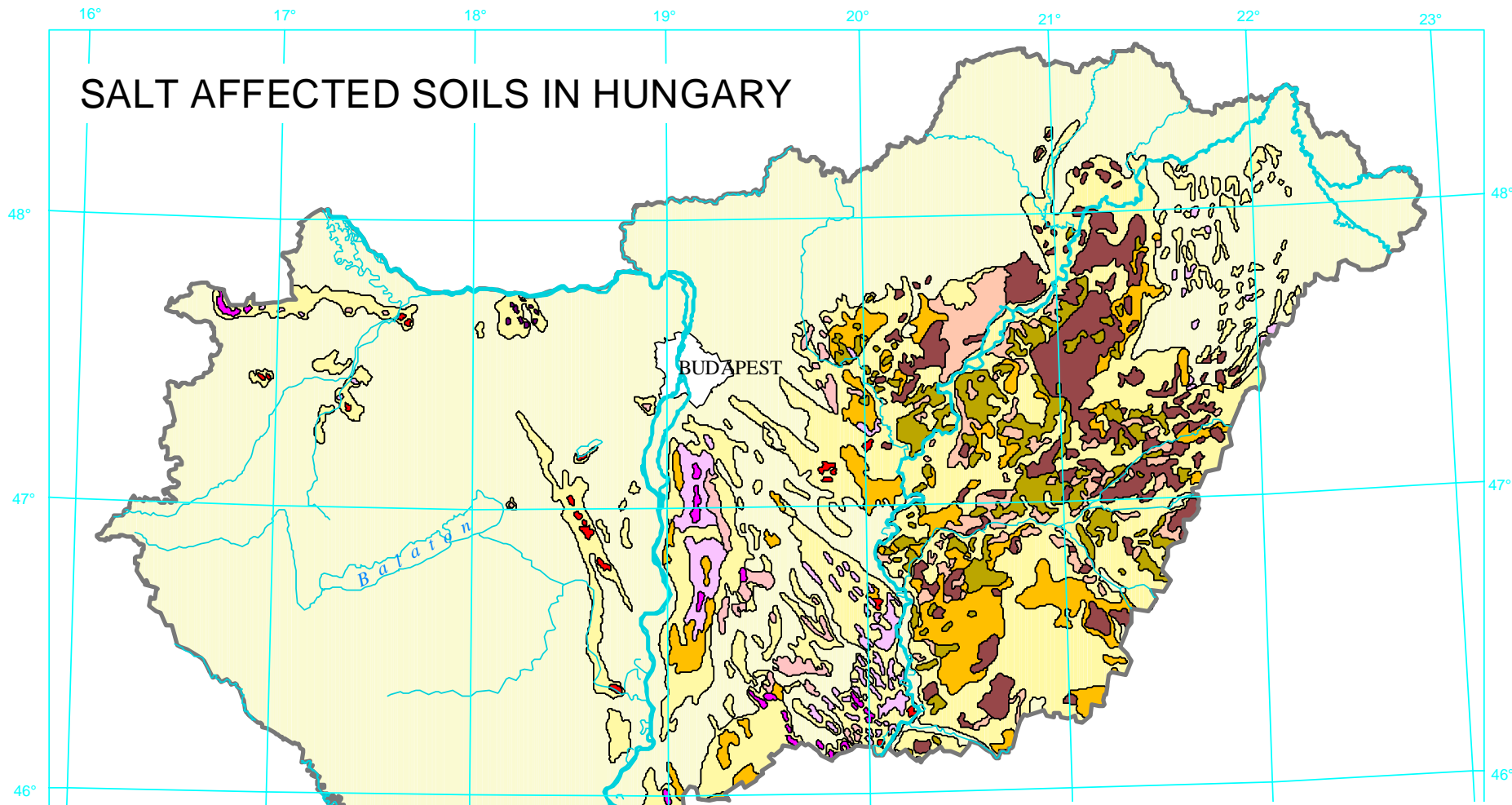
Common international names:

`saline soils' and `salt-affected soils'.

Solonchaks



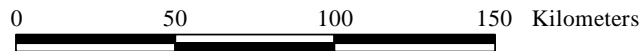
SALT AFFECTED SOILS IN HUNGARY



- Chloride and/or sulphate solonchak
- Sodic solonchak
- Calcareous meadow solonetz
- Calcareous meadow solonetz turning into steppe formation
- Calcareous solonetzic meadow soil
- Meadow solonetz
- Meadow solonetz turning into steppe formation
- Solonetzic meadow soil
- Chernozem and meadow chernozem salty in deeper layers
- Potential salt affected soils



Compiled in RISSAC GIS Lab
in 1996 based on Szabolcs,
Várallyay and Mélyvölgyi (1974)



Hungarian Unified Map Projection System

Definition of Solonchaks

Soils

1. having a **salic horizon** starting **within 50 cm** from the soil surface; and
2. lacking diagnostic horizons other than a histic, mollic, ochric, takyric, yermic, calcic, cambic, duric, gypsic or vertic horizon.

Salic horizon

must, throughout its depth:

- Have an **Electrical Conductivity (EC_e)** of the saturation extract of **more than 15 dS m⁻¹** at 25°C at some time of the year; **or** an EC_e of more than **8 dS m⁻¹** at 25°C if the **pH(H₂O)** of the saturation extract exceeds **8.5**
- have a **product of thickness (in cm) times salt percentage of 60 or more; and**
- have a **thickness of 15 cm or more.**



Genesis of Solonchaks

The most extensive occurrences of Solonchaks are in inland areas where **evapotranspiration is considerably greater than precipitation**, at least during a greater part of the year.

Salts dissolved in the soil moisture remain behind after evaporation / transpiration of the water and **accumulate**

- **at the surface** of the soil ('external Solonchaks'), or
- **at some depth** ('internal Solonchaks').



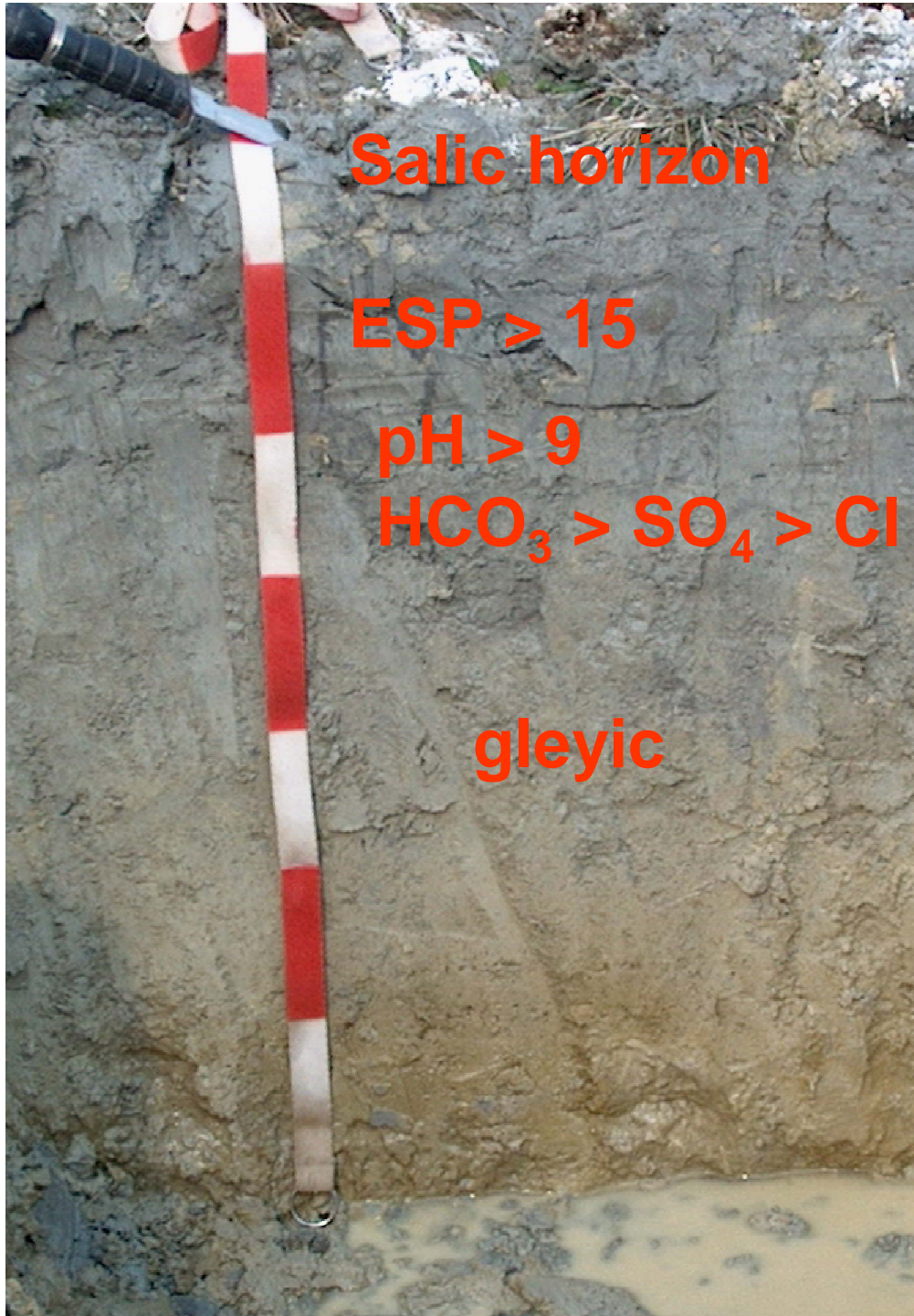
Composition of accumulated salts

Having in a 1:1 aqueous solution:

a soil-pH > 8.5 *and* $\text{HCO}_3 > \text{SO}_4 > \text{Cl}$: **Carbonatic**

$\text{SO}_4 > \text{HCO}_3 > \text{Cl}$: **Sulphatic**

$\text{Cl} > \text{SO}_4 > \text{HCO}_3$: **Chloridic**



SOLONCHAKS
Histic
Gelic
Vertic
Gleyic
Mollic
Gypsic
Duric
Calcic
Petrosalic
Hypersalic
Stagnic
Takyric
Yermic
Aridic
Hyperochric
Aceric
Chloridic
Sulphatic
Carbonatic
Sodic
Haplic



Carbonati-gleyic Solonchak (Sodic)

SOLONCHAKS

- Histic
- Gelic
- Vertic
- Gleyic
- Mollic
- Gypsic
- Duric
- Calcic
- Petrosalic
- Hypersalic
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- Aceric
- Chloridic
- Sulphatic
- Carbonatic
- Sodic
- Haplic



`Puffed Solonchak

Solonchak with fluctuations in the morphology of salts

High concentration of Sodium sulphate

At night: temperature at the soil surface is low
air humidity is high

needle-shaped mirabilite crystals

$(\text{Na}_2\text{SO}_4) \cdot 10\text{H}_2\text{O}$

The push fine soil aggregates apart



At day time: dry, hot
mirabilite convert to water-free **thenardite**

(Na_2SO_4)

Soft and fluffy surface





End of Solonchaks