Salt in the Wound:

Remediating and Reclaiming Salt-Affected Soils

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Today

- Defining saline and sodic soils
- Considering range of issues for saline, sodic and saline-sodic soil rehabilitation
- Case studies and strategies

If your site is saline, sodic or both, you may see…

Soil surface changes – hard pan crust or eroding dust

If your site is saline, sodic or both, you will see…

Soil appearance changes – black organic crust, crystallized salt

If your site is saline, sodic or both, you will see…

Soil structure changes – shedding water or holding it just below the surface

If your site is saline, sodic or both, you will see…

Groundwater or surface water contamination from moving salts or eroding sediment

Erosion of sodic soils. Photo: Tim Overhue

If your site is saline, sodic or both, you will see…

Poor vegetation growth or death

Defining saline and sodic soils

The Alberta Soil Quality Guidelines state:

- A poor to unsuitable ***saline*** soil is one in which the electrical conductivity (EC) is >4 dS/m in the topsoil and >5 dS/m in the subsoil

In the field, that means:

- Soil is non-alkaline
- Salt crystals appear in patches or a crust
- Death or poor health of vegetation
- Trouble getting planted or seeded material to germinate and grow
- Impermeability issues – soil sheds precipitation and irrigation water

Defining saline and sodic soils

The Alberta Soil Quality Guidelines state:

- A poor to unsuitable ***sodic*** soil is one in which the sodium adsorption ratio (SAR) is greater than 8
- Or, the exchangeable sodium percentage is greater than 15%

In the field, that means:

- Soil pH higher than 8
- A soil surface that is hard and cloddy, or hard-panned
- Plants grow poorly, fail to germinate, or show toxicity issues
- Black crust formed by organic matter dispersing out of the soil
- Soil may shed water off the hard-panned surface, or hold it just under the surface

Defining saline and sodic soils

The Alberta Soil Quality Guidelines state:

- A ***saline-sodic soil*** combines the issues of an EC >4 dS/m with an SAR >8

In the field, that means:

- Soil pH higher than 8
- A soil surface that is hard and cloddy, or hard-panned
- Death or poor health of vegetation
- Black crust formed by organic matter dispersing out of the soil
- Water shed off the surface, or held just beneath it

Addressing soil and site problems

- Symptoms and causes of salinity, high pH, specific ion toxicity, and sodicity are frequently confused, and frequently additive

- Saline and/or sodic soil reclamation requires as a minimum
  - assessment of the problem
  - removal or isolation of ongoing sources (if applicable)
  - enhanced drainage
  - a relatively (but not completely!) salt free water supply

  AND…
  - a clear understanding of the site objectives
    - Geotechnical stability?
    - Erosion control?
    - Water discharge criteria?
    - Revegetated surface?

Addressing soil and site problems

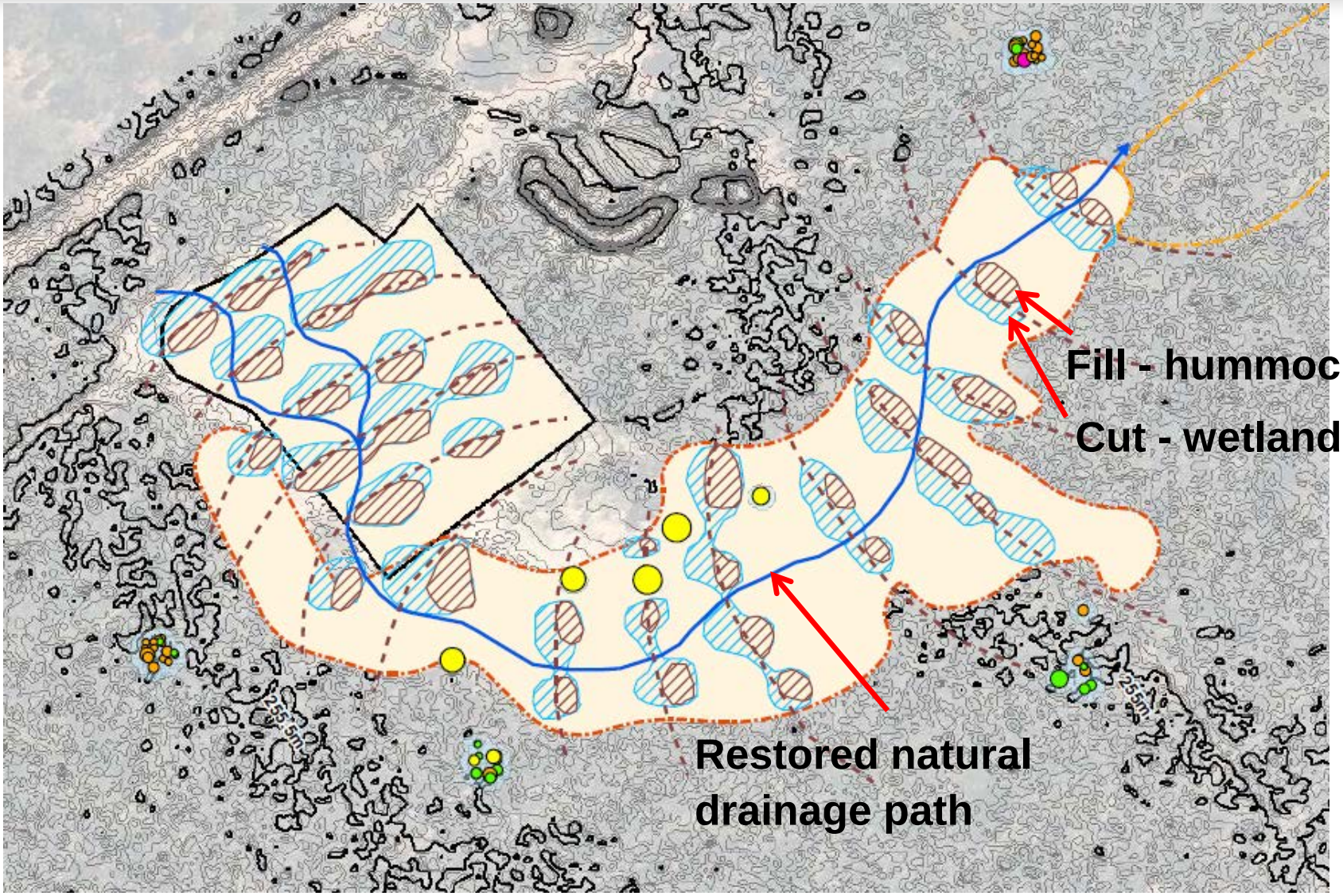
- Correctly diagnosing soil problems is the key to determining effective management strategies for the soil:
  - Chemical amendments (gypsum, lime, calcium chloride, sulphur)
  - Mechanical amendment (tilling, ripping, soil mixing, *ex situ* soil washing)
  - Irrigation

- And for the entire site:
  - Organic material incorporation
  - Site contouring
  - Drainage

Case Study 1 – Santos Coal Seam Gas Field

Before rehabilitation

Integrating Microtopography and Drainage



Removal of source, and amendment of soil

After soil rehabilitation activities are complete

…Recontoured

Regrowing…

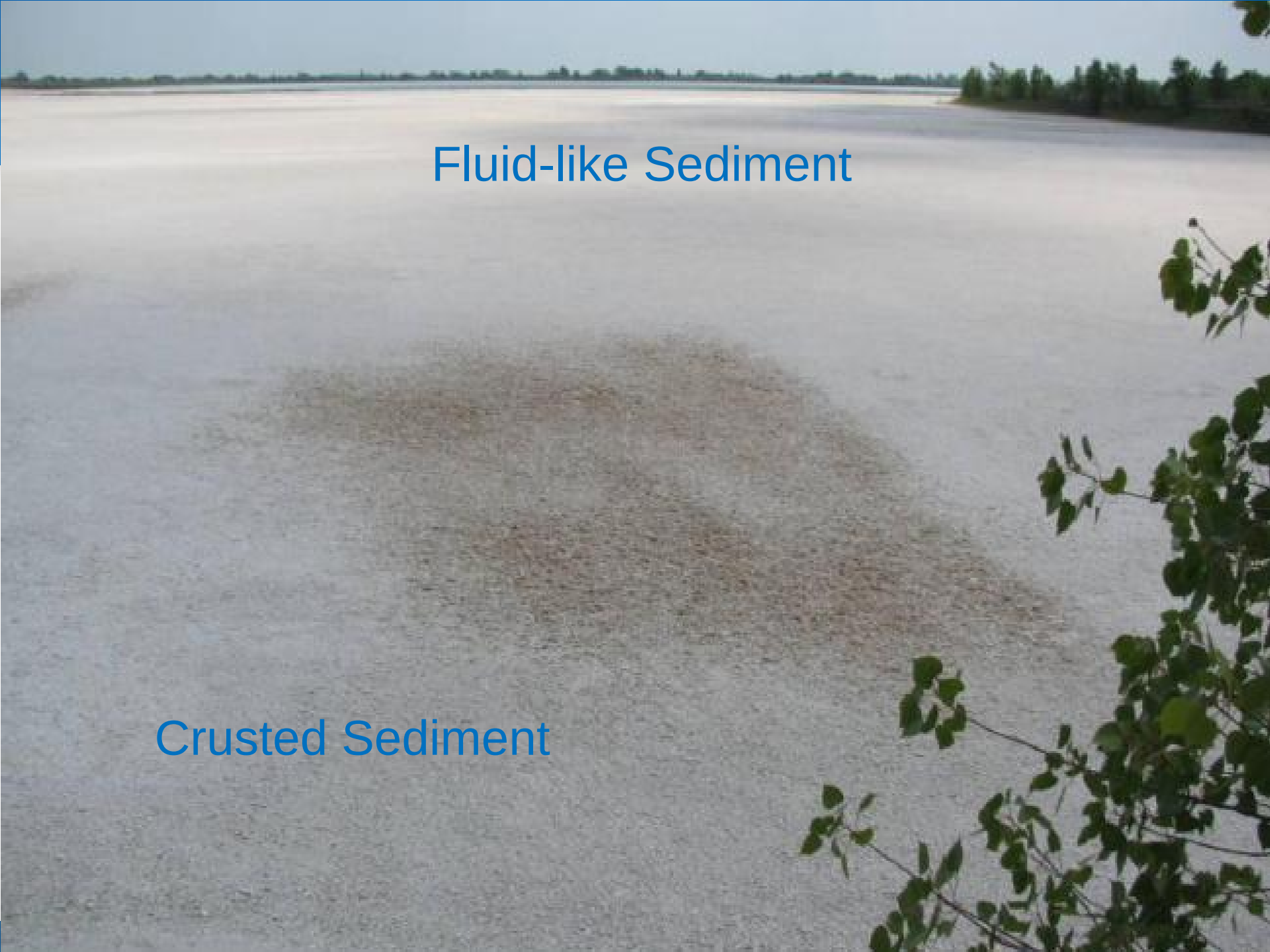
Case Study 2 – Owens Lake, California

Owens Lake, California (Pre-2002)
Largest PM_{10} Source in U.S.

Tilling and furrowing, planting saltgrass

Owens Lake, California – Native Vegetation (*Distichlis spicata*) to Stabilize Blowing Dust

Case Study 3: Soda-Ash Settling Basin, Ontario


Fluid-like Sediment
Crusted Sediment

Plot trials on settling basin surface

Questions?

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