

Toward a New Mitigation Emphasis in the Suisun Marsh

Suisun Marsh Science Workshop
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DWR

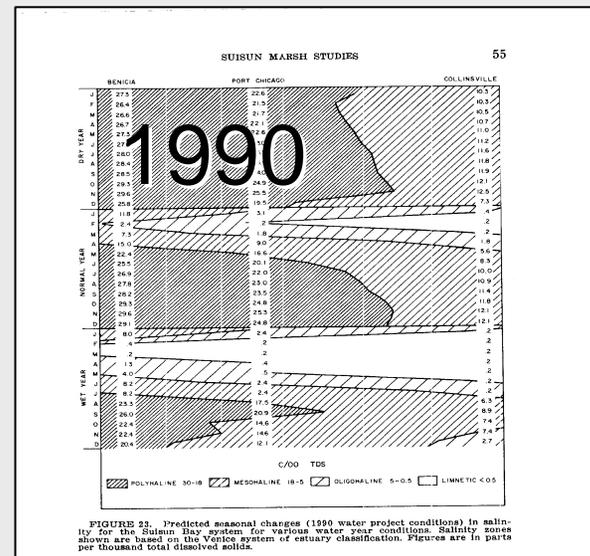
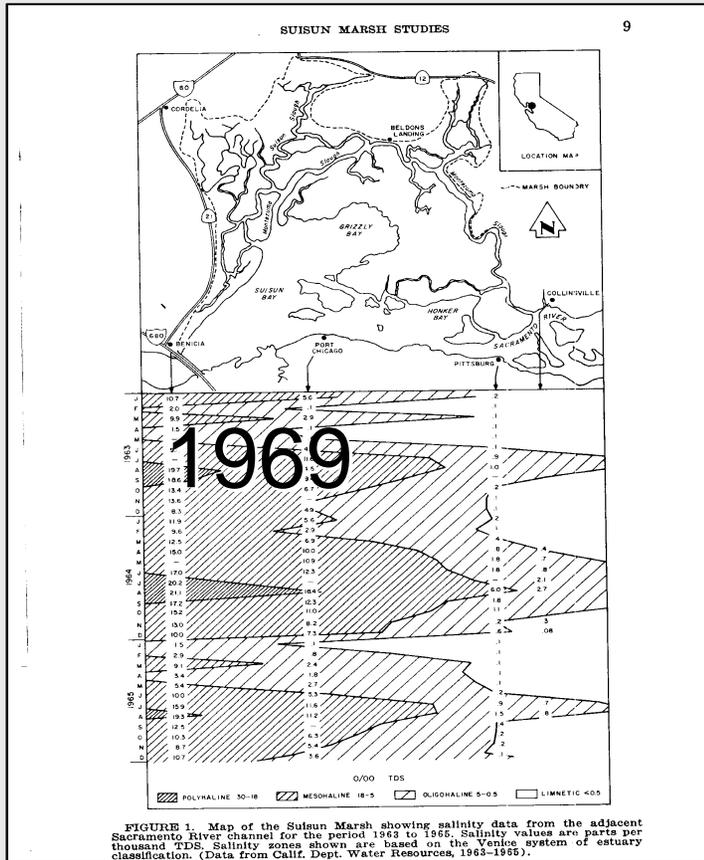
Two conceptual models

1. The current conceptual model of water project impacts in the Suisun Marsh
 2. Toward a new emphasis: Long-term protection of *all* Suisun Marsh resources depends on
 - Subsidence reversal
 - Levee integrity with habitat value
- Research science questions

1. Premise of Water Project Involvement in the Suisun Marsh

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- Suisun Marsh salinity will *~triple* with water project “build out” (Mall 1969):



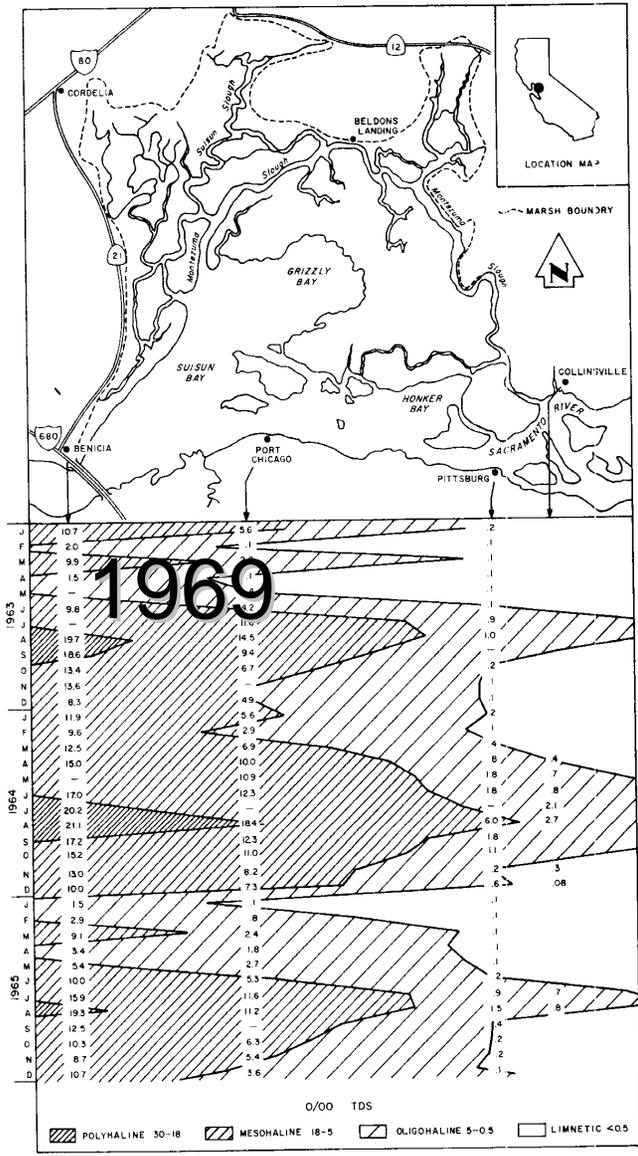


FIGURE 1. Map of the Suisun Marsh showing salinity data from the adjacent Sacramento River channel for the period 1963 to 1965. Salinity values are parts per thousand TDS. Salinity zones shown are based on the Venice system of estuary classification. (Data from Calif. Dept. Water Resources, 1963-1965).

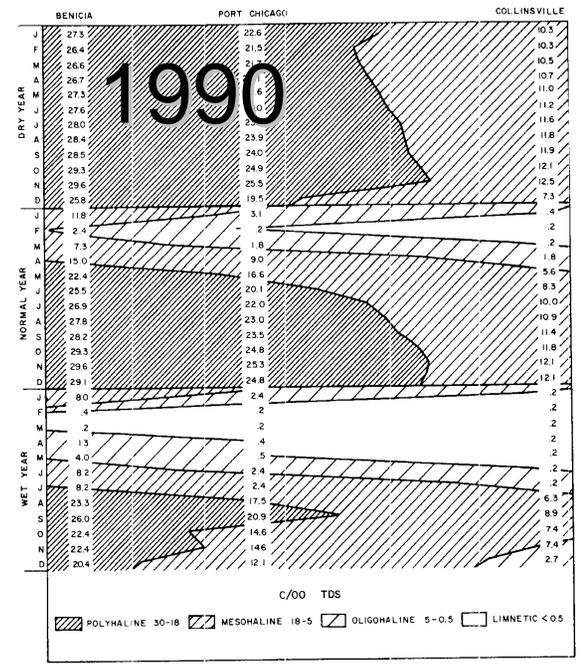


FIGURE 23. Predicted seasonal changes (1990 water project conditions) in salinity for the Suisun Bay system for various water year conditions. Salinity zones shown are based on the Venice system of estuary classification. Figures are in parts per thousand total dissolved solids.

Water project status

- Between 60-70% “built out.”
- Expect future increases in project export
- Expect future outflow timing change
- Expect geometry of the Delta to change
- *All will affect the mean and variability of SF Estuary salinity.*

Mitigation of what?

- Agreements and regulatory standards are intended to mitigate impacts on **seasonal waterfowl values**.
- Other beneficial uses are not codified as numerical standards yet.

So, the premise for Suisun Marsh mitigation is:

● Reduced outflow, and/or modified seasonal pattern of outflow

→ reduces waterfowl productivity

The premise implies a conceptual model of influences:

Reduced outflow: ← *Water Projects*

- Estuary salinity
 - Applied water salinity
 - Soil water salinity/soil biochemistry
 - Plant productivity and assemblage
 - Waterfowl abundance

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➤ *Estuary salinity*

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➤ Applied water salinity

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Mitigation emphasis on salinity

- Salinity is an important physical/chemical factor...
- ...one factor among many for Marsh geochemistry and food web biology.
- Lesson of SEW
- We need to adjust our mitigation emphasis

The emphasis has evolved to water control

- Emphasis on seasonal water control
- But, here's the kicker:
- In general, seasonal water control strategies lead to decomposition of organic soil– subsidence.

The Big Elephant

- All long-term resource values in the Suisun Marsh are diminished by subsidence.

Subsidence: slow but sure

Ongoing land subsidence progressively:

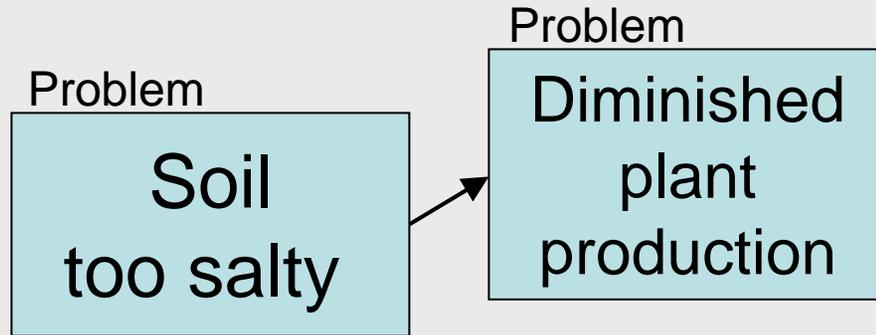
- increases levee cost
- precludes gravity drainage
- lowers land value
- reduces opportunities for retrieving tidal marsh function.
- threatens all resource protection initiatives.

Subsidence spiral

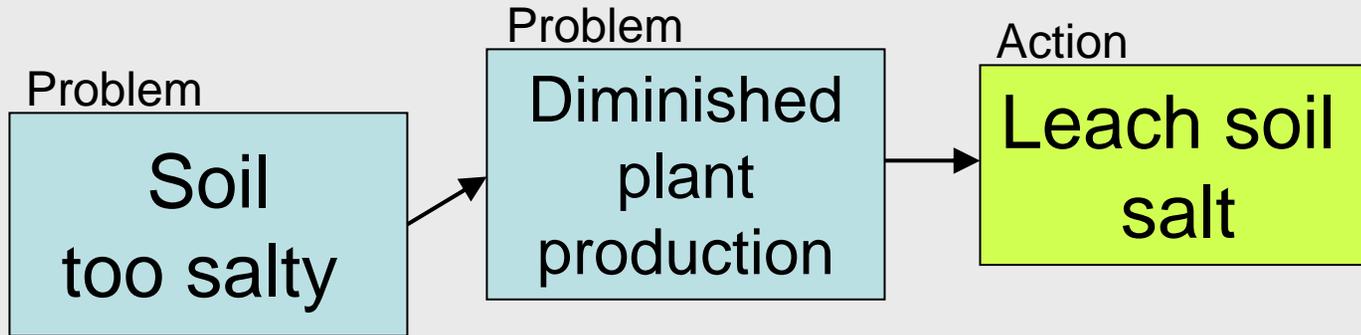
Problem

Soil
too salty

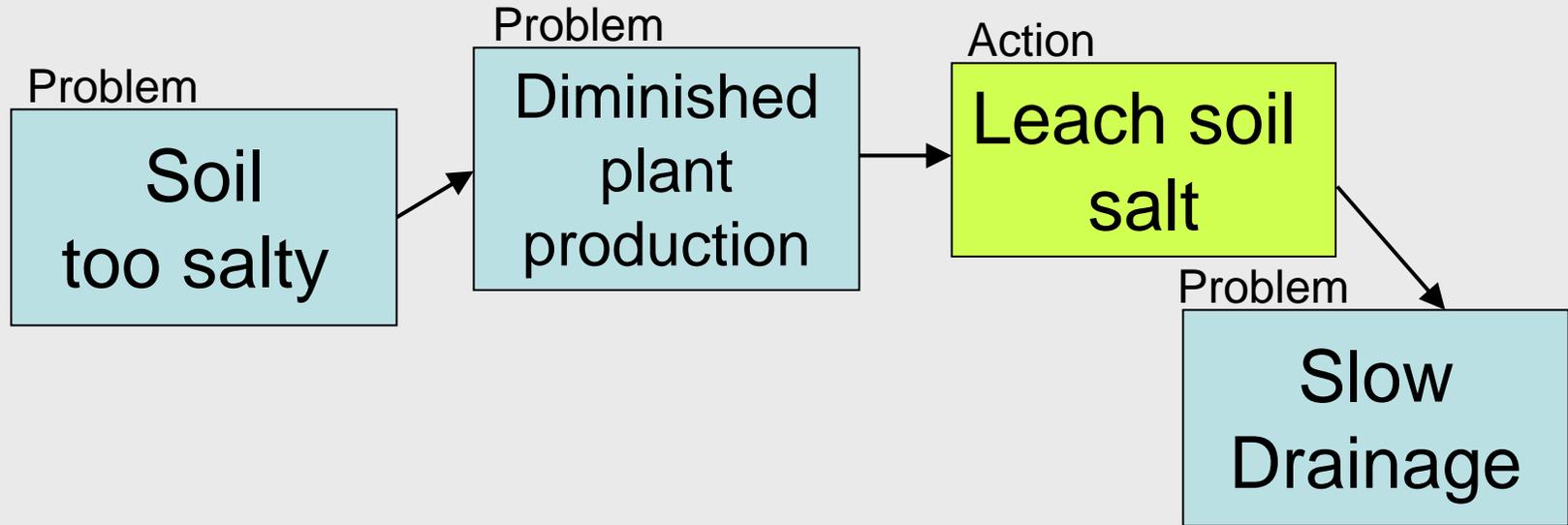
Subsidence spiral



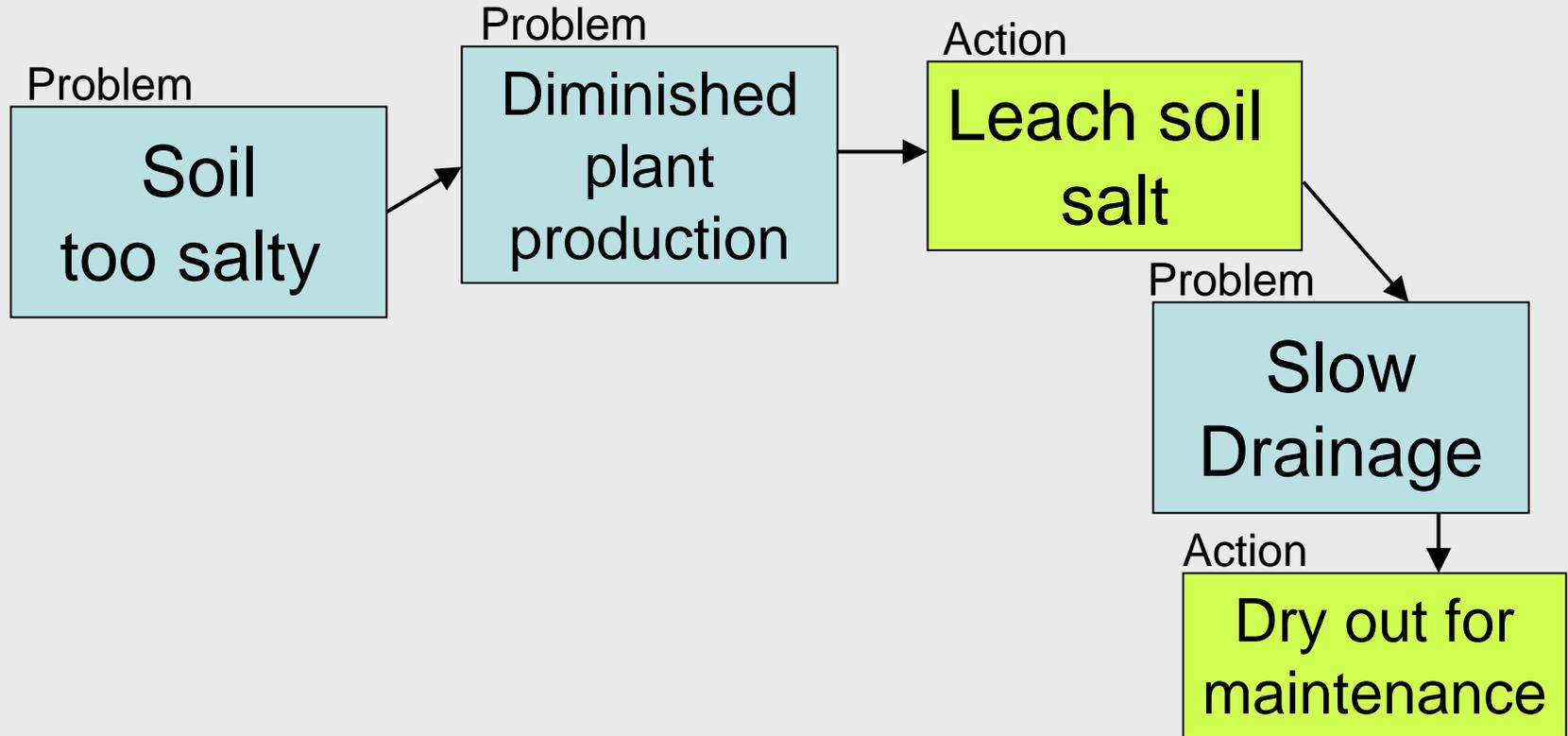
Subsidence spiral



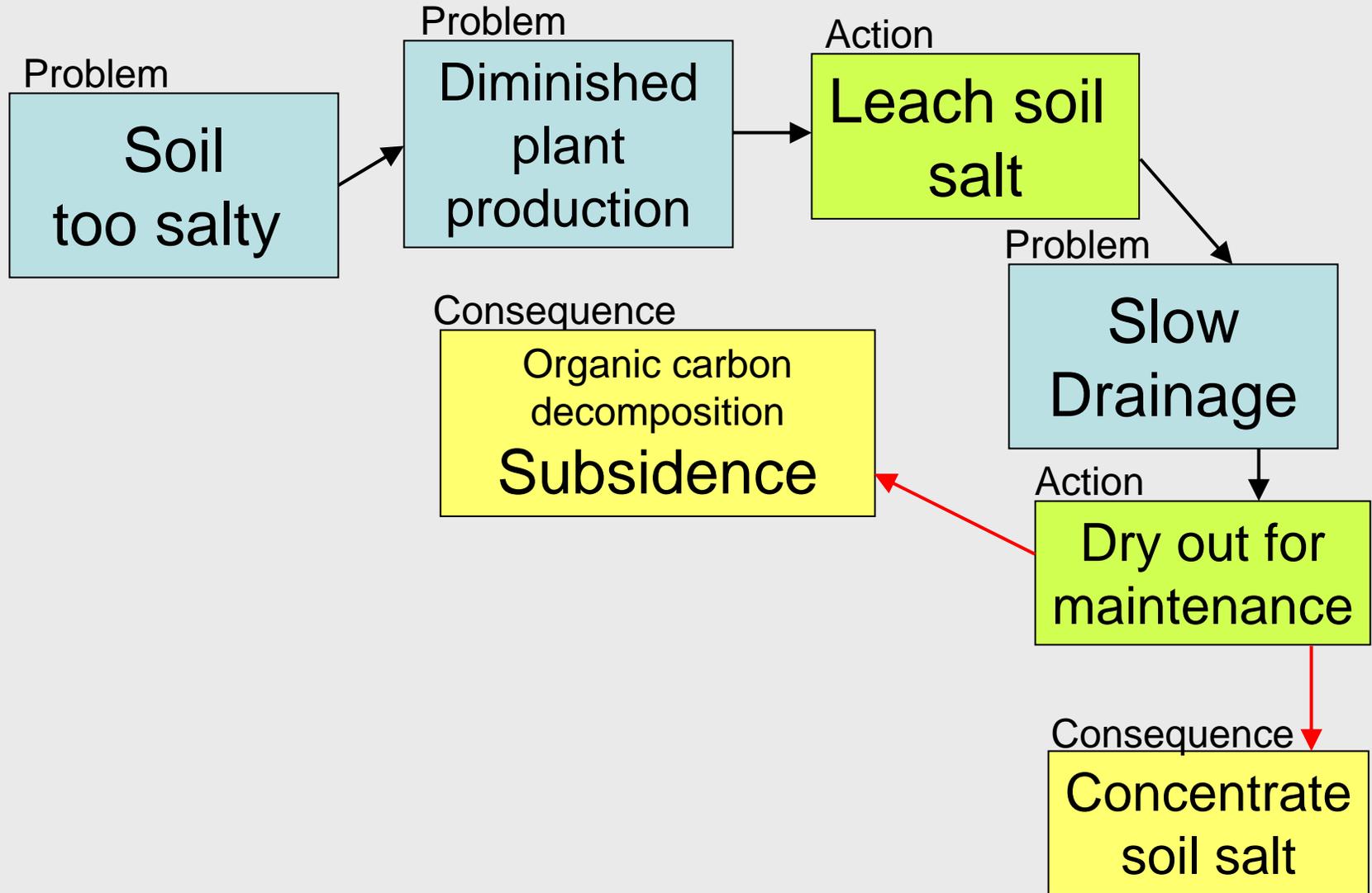
Subsidence spiral



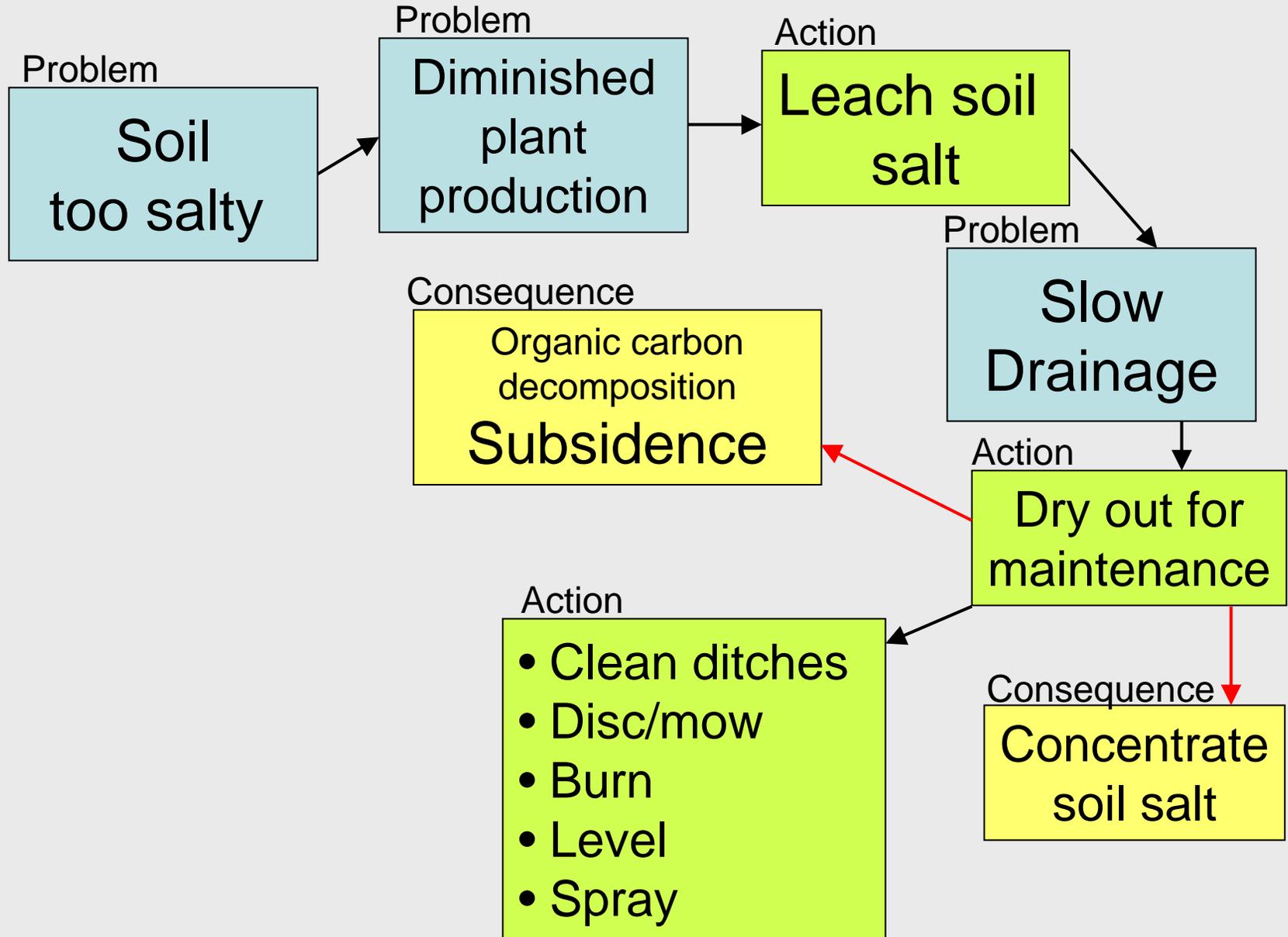
Subsidence spiral



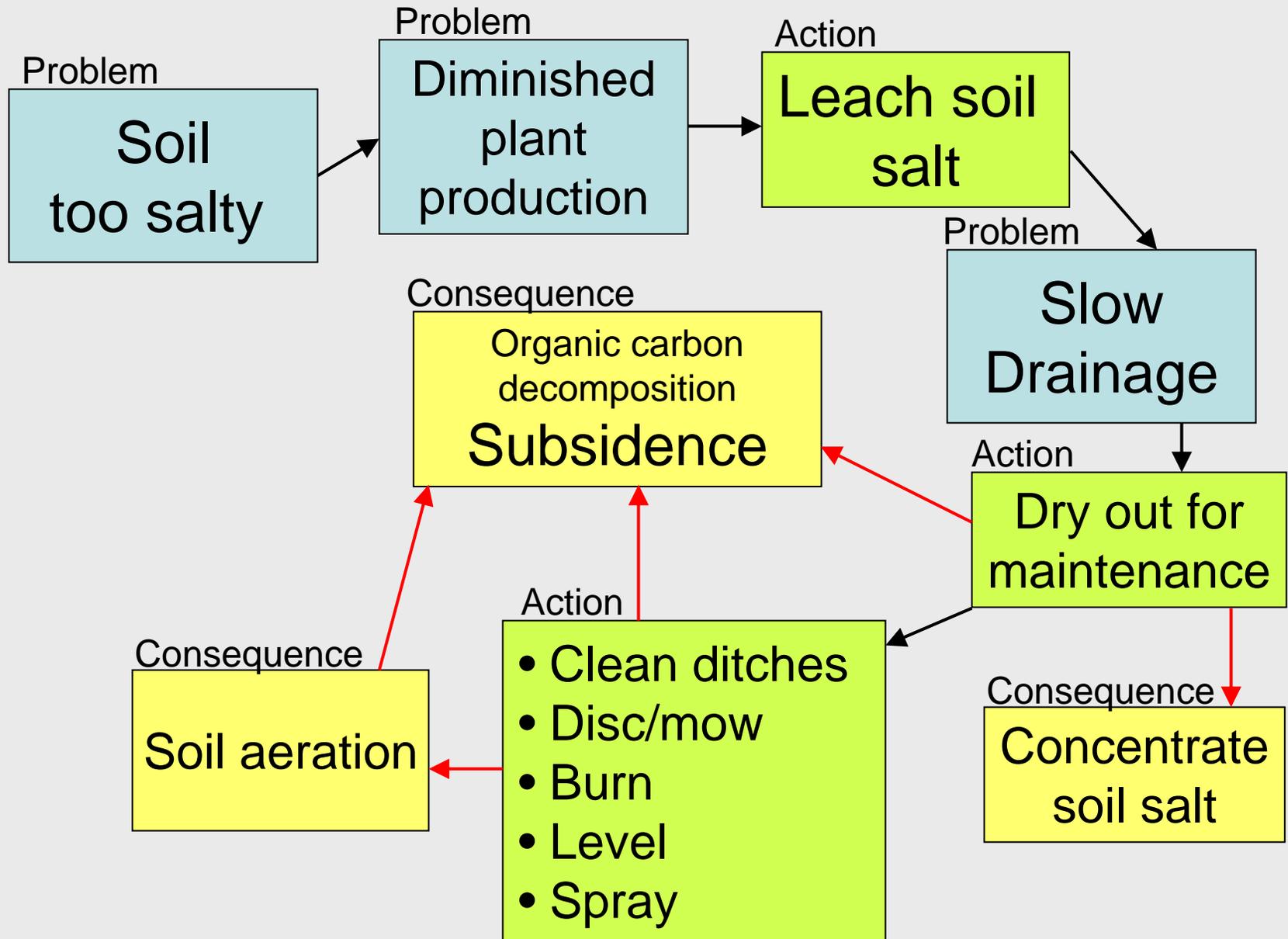
Subsidence spiral



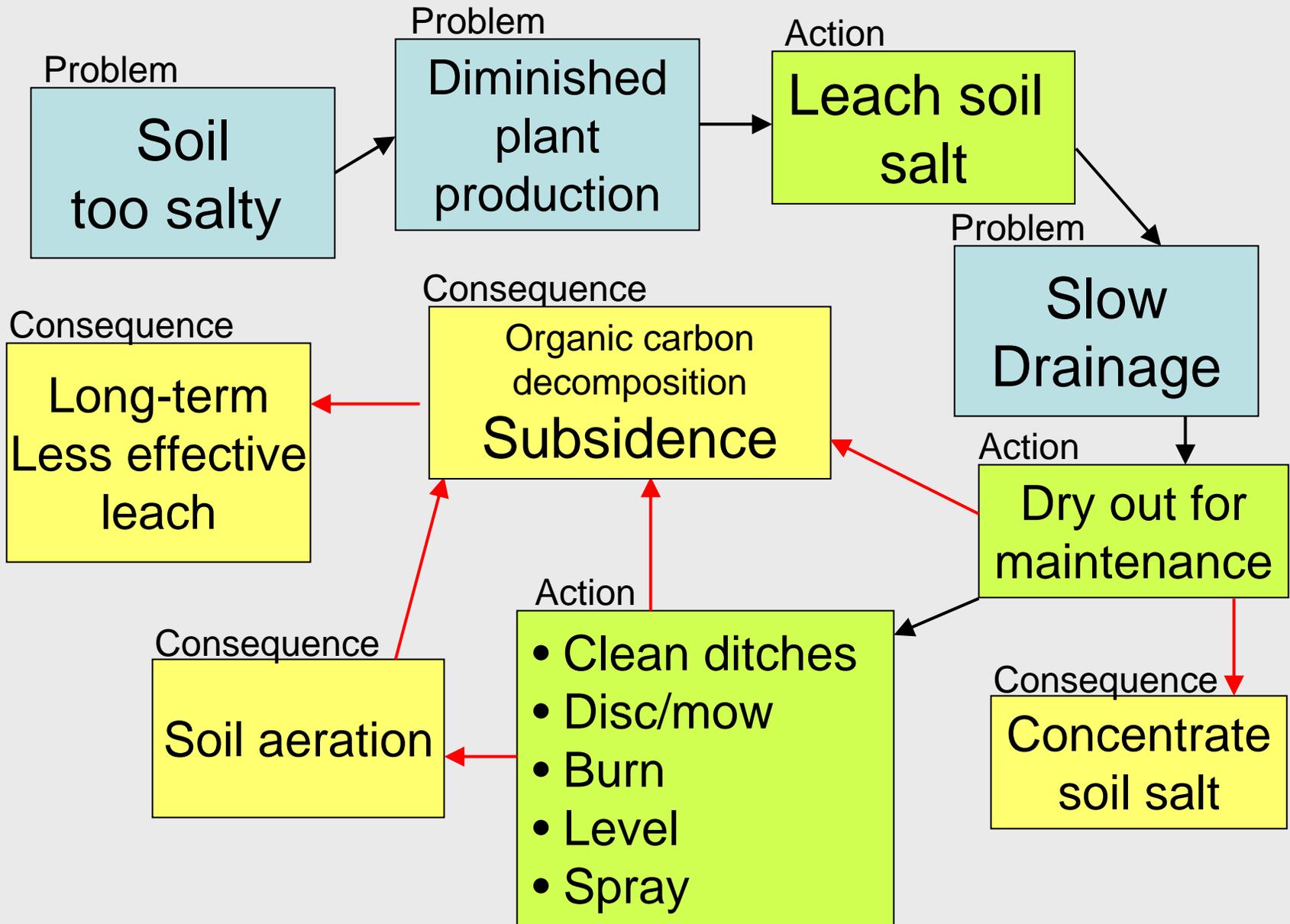
Subsidence spiral



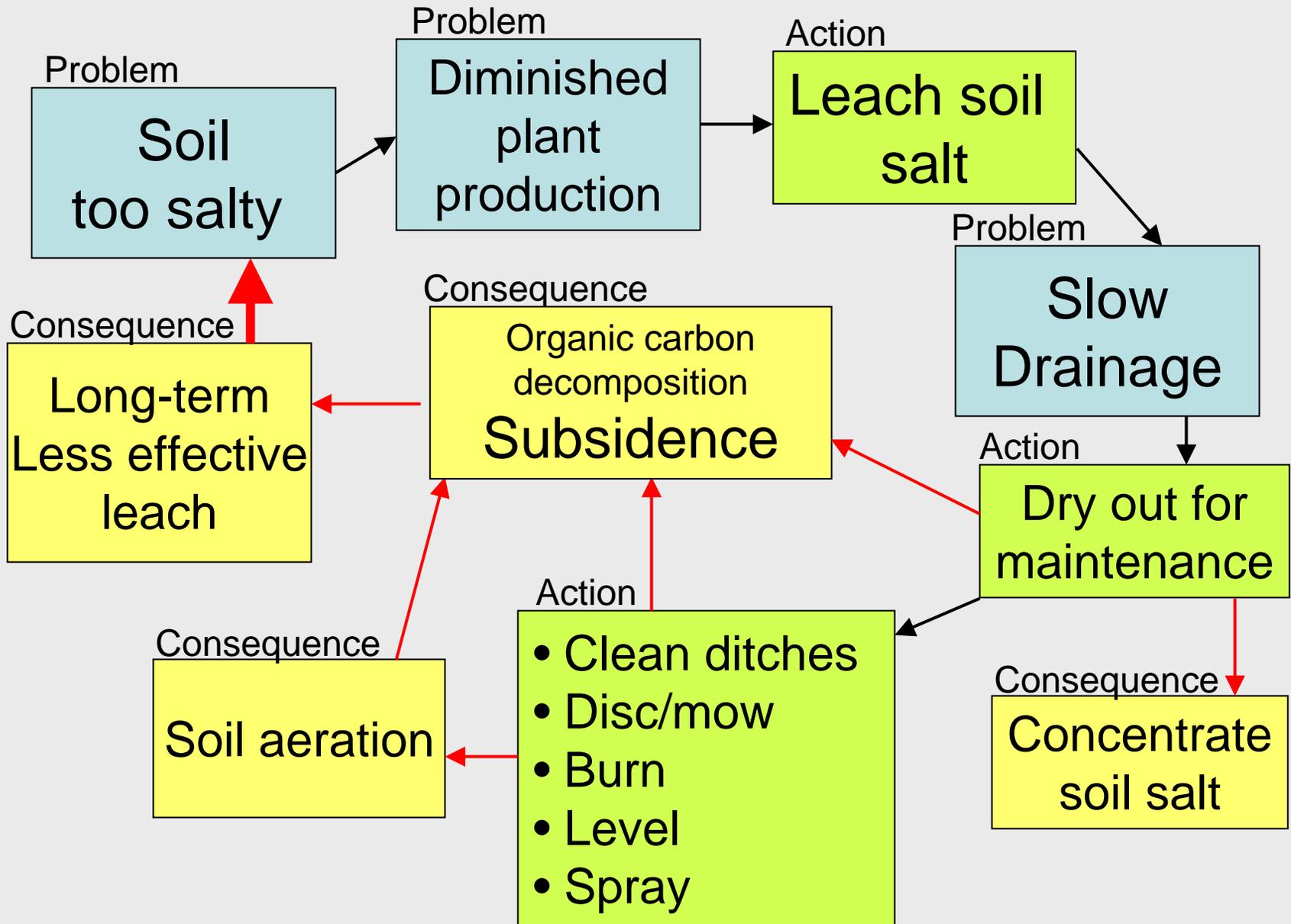
Subsidence spiral



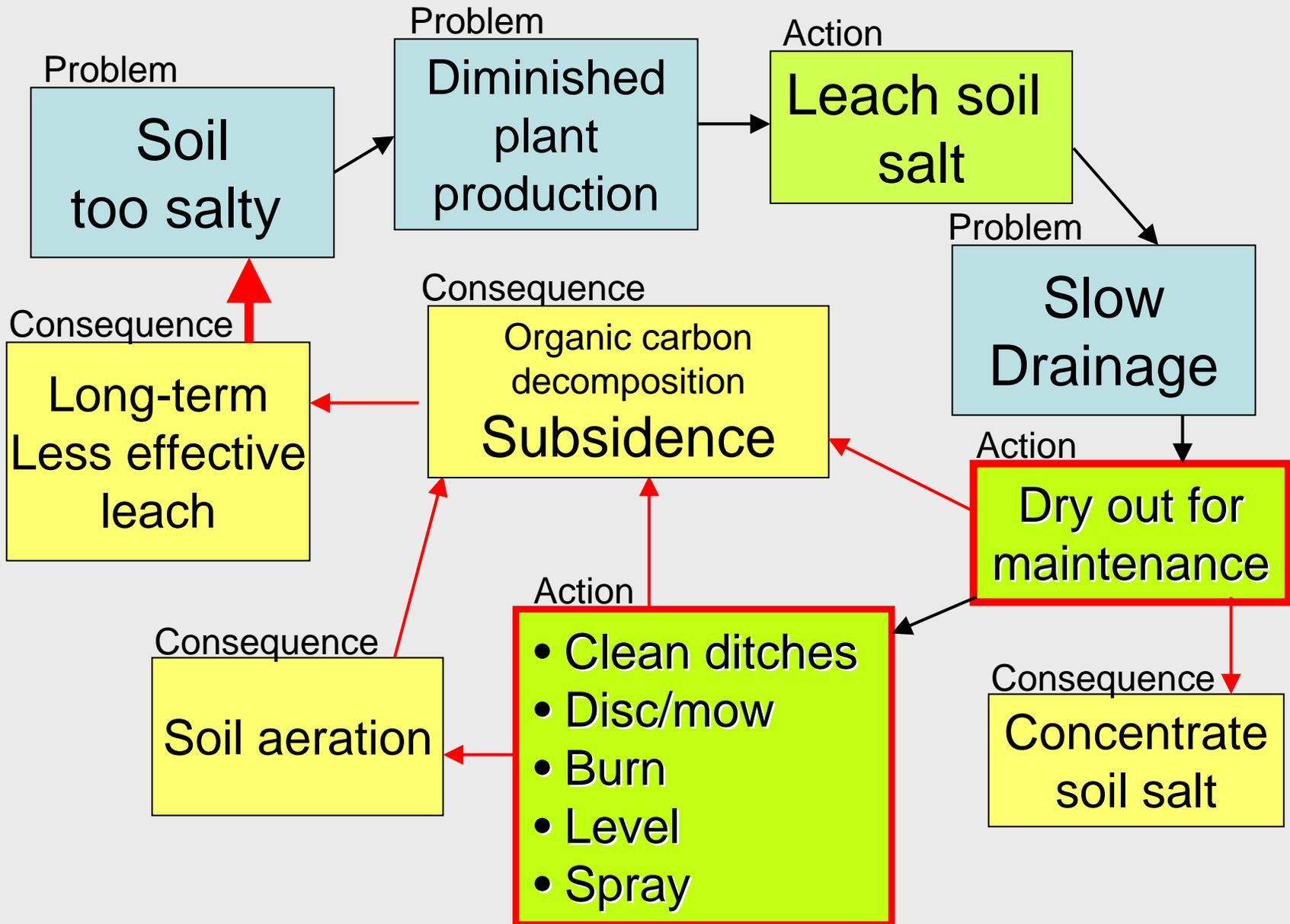
Subsidence spiral



Subsidence spiral



Subsidence spiral



If you've been to the Marsh at high tide,
you know this view.



Van Sickle Island, December 2003

Subsidence rate

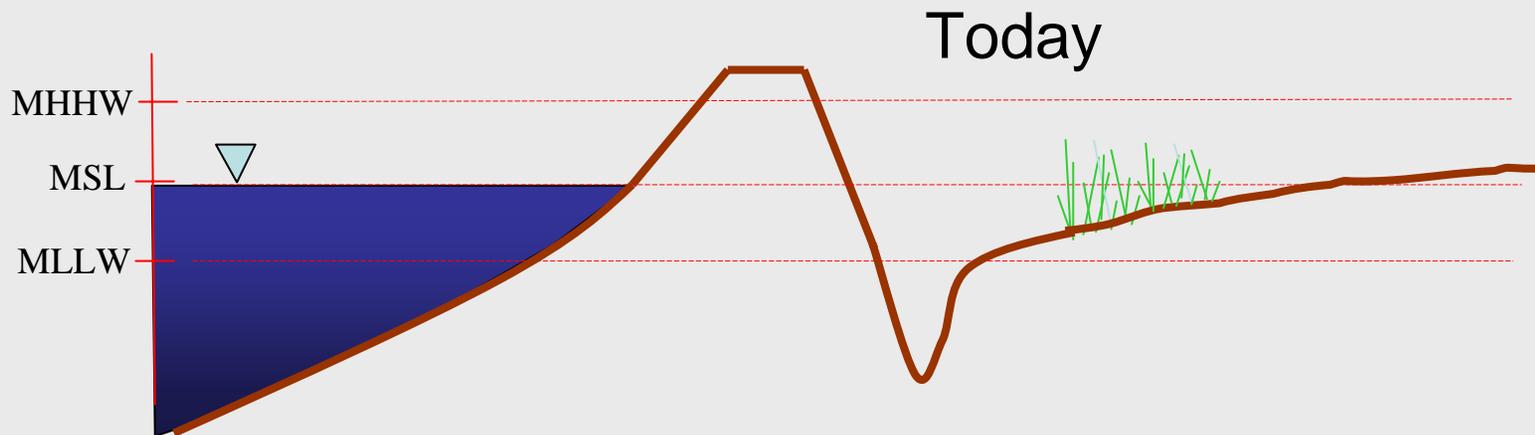
- Unknown
- Differential depending on organic content, seasonal hydroperiod, and disturbance.
- Delta subsidence is 3-8 cm/year
- Subsidence at 1 cm/year makes gravity drainage impossible in 20-30 years.

Marsh in transition

- Sea level rise = 2mm/yr... accelerating
- Mineral sediment sources are decreasing
- Levees are weak— not amenable to raising.

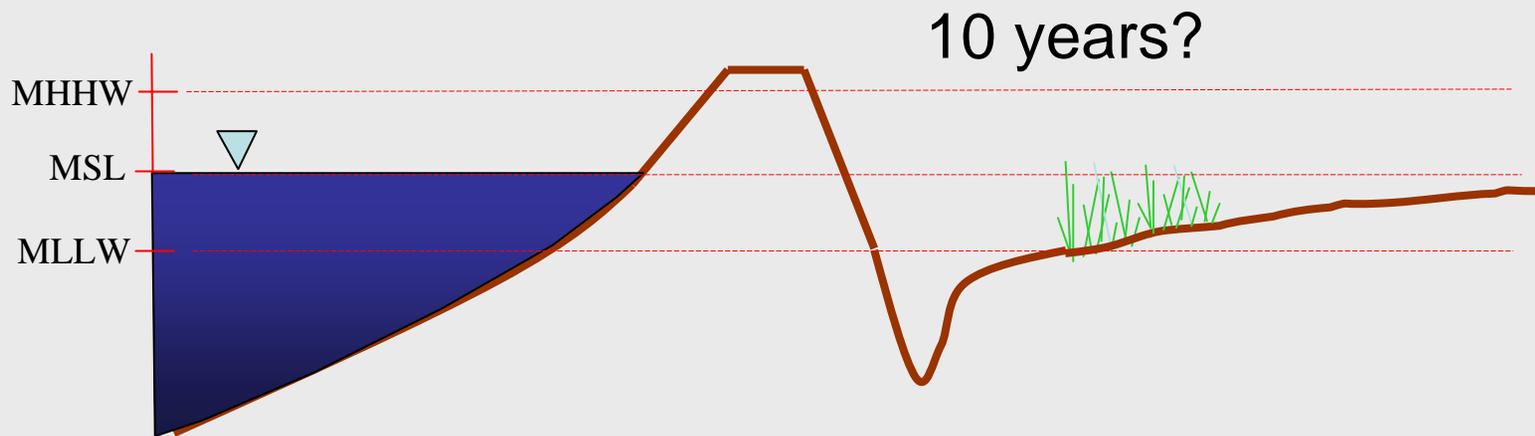
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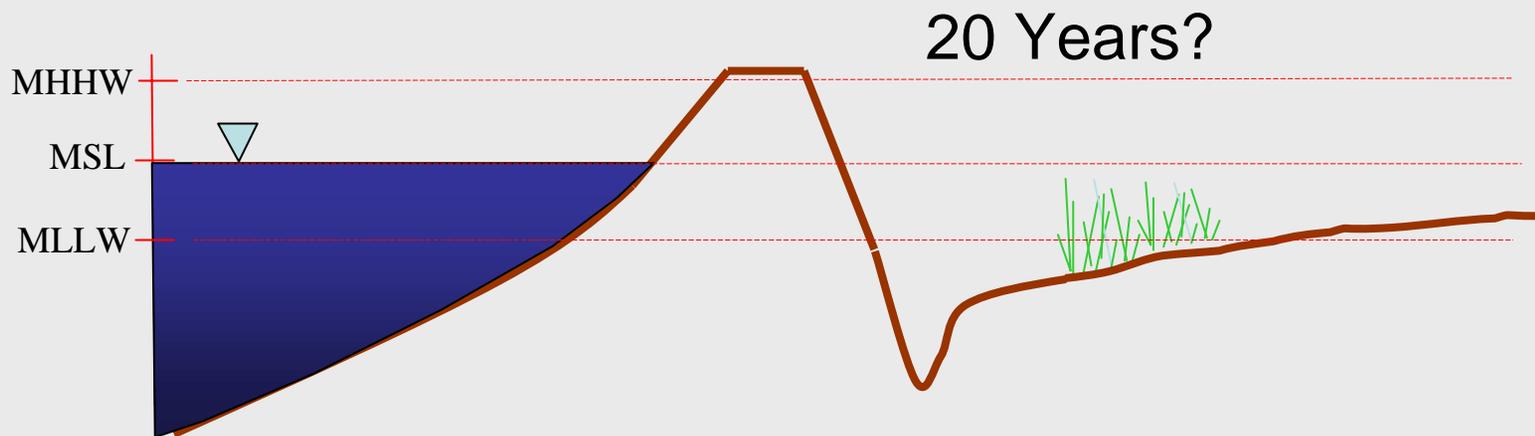
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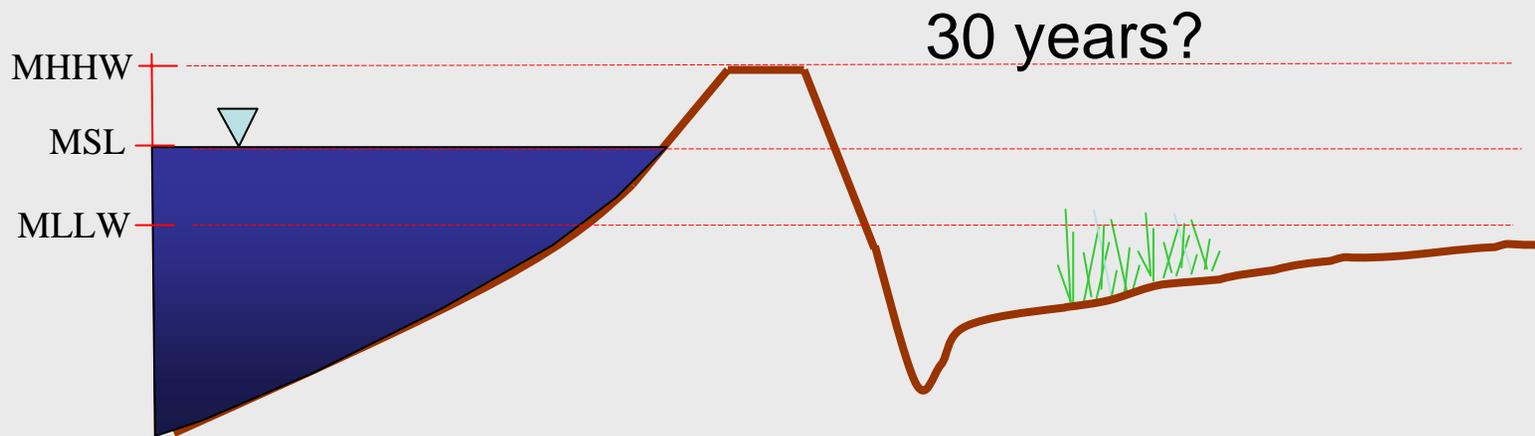
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Marsh in transition

Are we at the elevation fulcrum point between alternative futures?

- Intertidal land elevation is resilient:
biogeomorphology

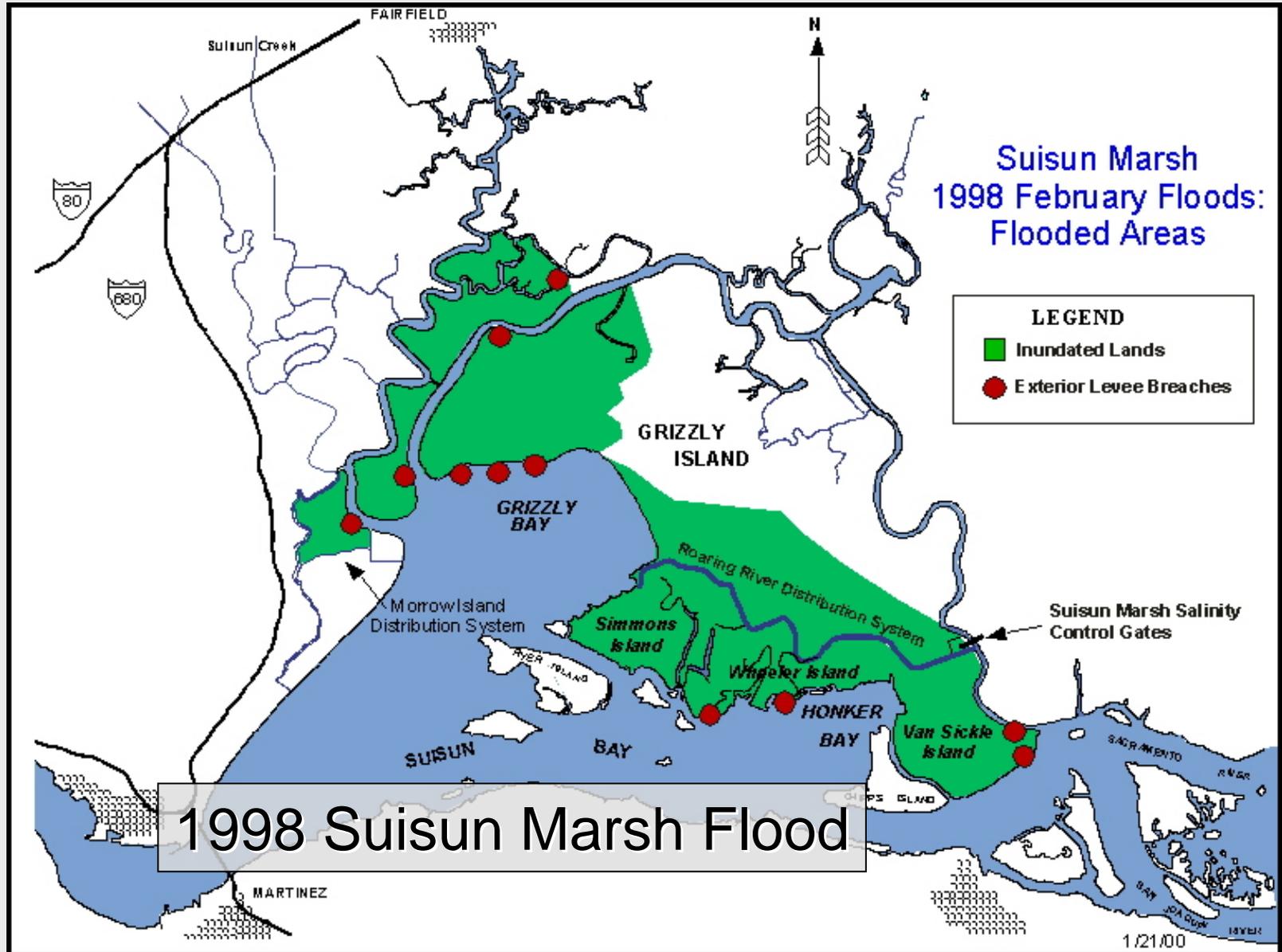
or,

- The Marsh goes Delta:
hydrogeomorphology
- Accretion processes depend on initial land elevation.

Levee paradox

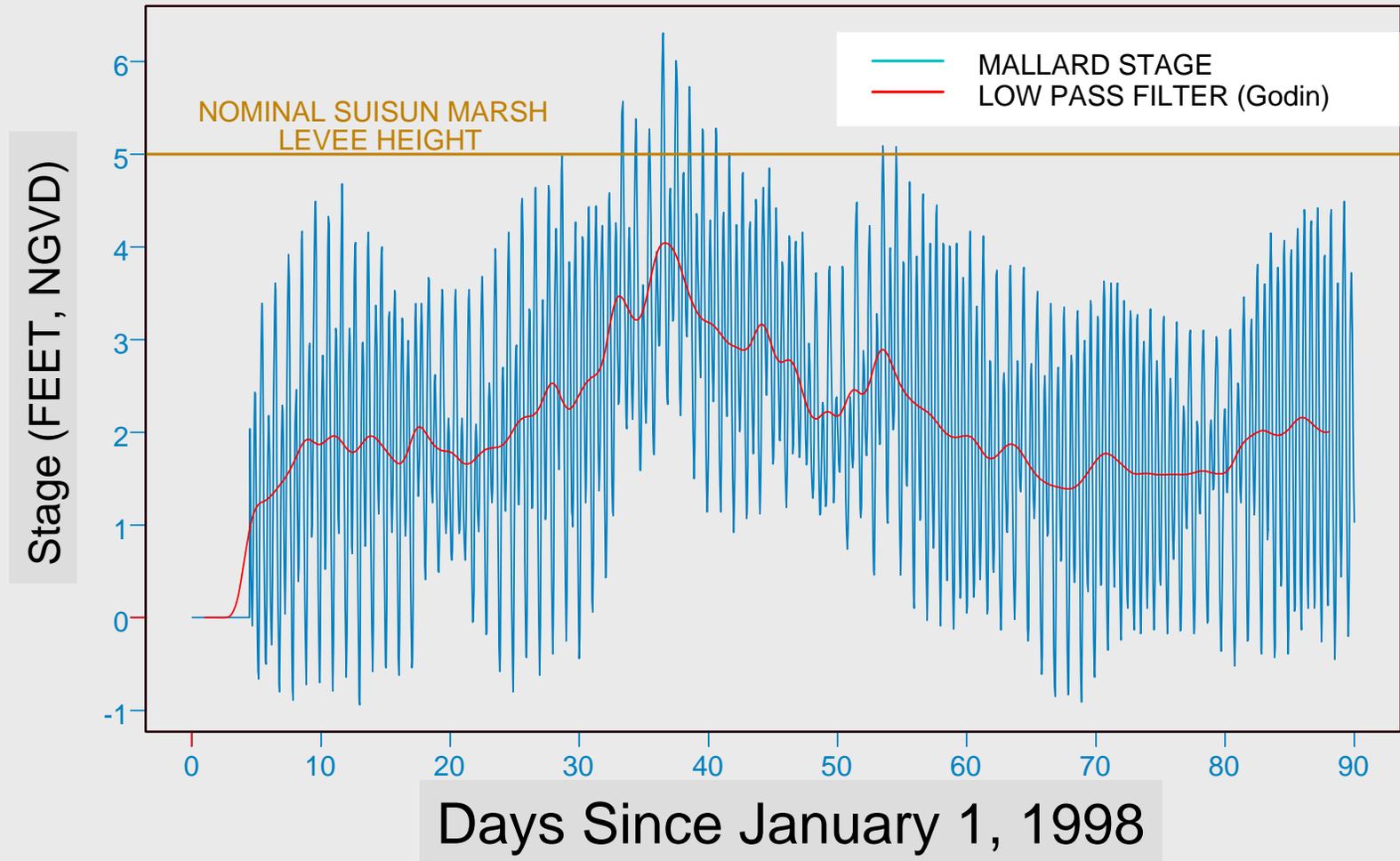
- Subsidence and levees are tied at the hip.
- Most resource values are degraded if levees fail, even though
- Levees caused or facilitated the problem in the first place.
- Levees are essential today.
- Mutual interest in levee integrity

Water project interest



1998 Suisun Marsh Flood

CHIPPS ISLAND Stage, January - March 1998

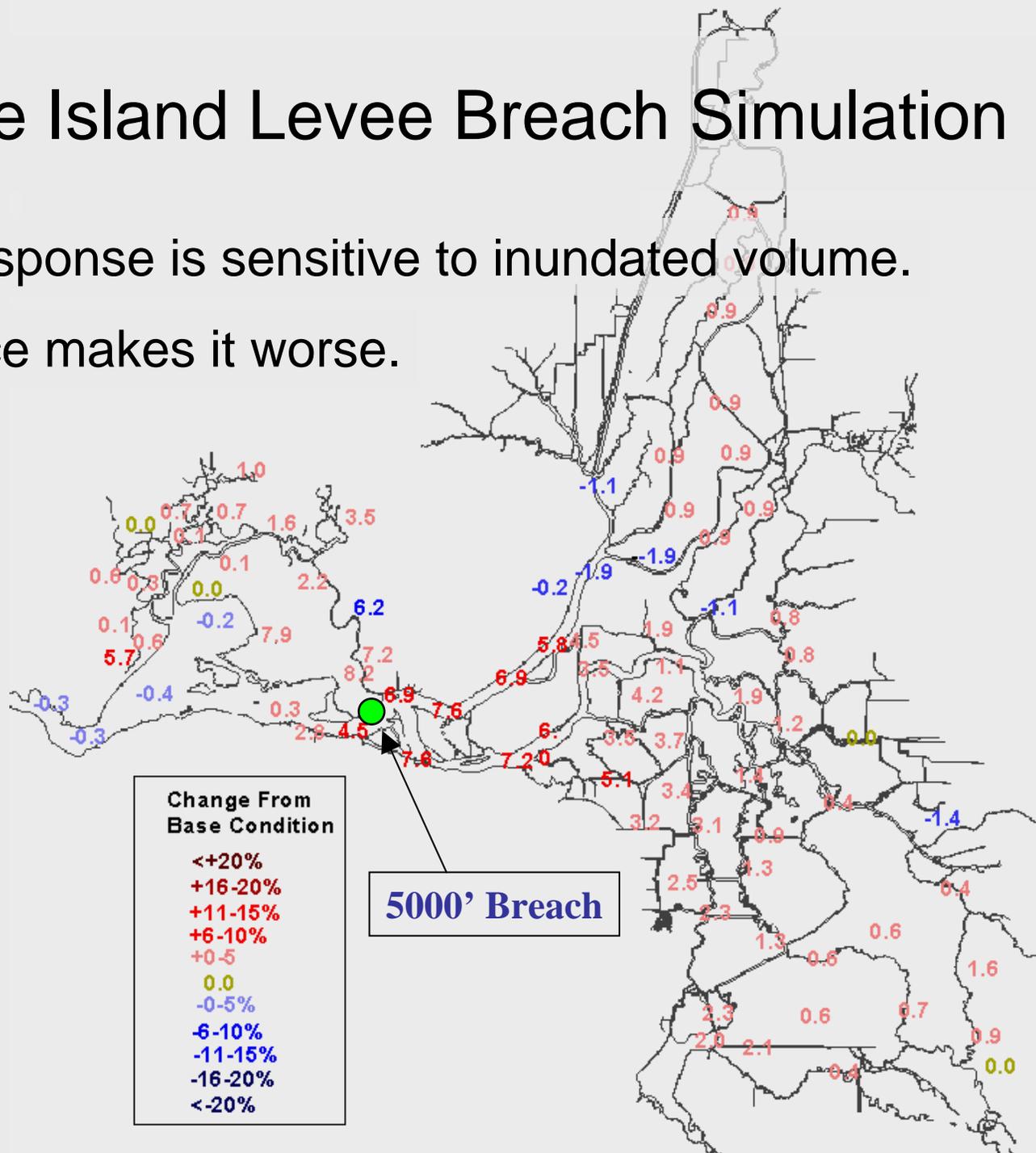




Van Sickle Island
February 1998
looking across to Pittsburg

Van Sickle Island Levee Breach Simulation

- Salinity response is sensitive to inundated volume.
- Subsidence makes it worse.



Research needs: Subsidence

- Determine the rates and mechanisms of land subsidence in the Suisun Marsh.
- Investigate alternative approaches to traditional diked wetland management that stops/reverses subsidence (e.g. moist soil management).
- Develop incentive based subsidence control programs that benefit both landowners and the water project agencies.
- Observe, analyze, write, review, publish....

Research needs: Levees

- Demonstrate alternative levee designs that accommodate overtopping during extreme sea level events and provide high marsh transition habitat (e.g. shallow sloped “habitat levees”).
- Observe, analyze, write, review, publish....

Thank you

- Victor Pacheco
- Frank Wernette
- Steve Chappell
- Kamyar Guivetchi
- Steve Culberson
- Cassandra Enos