

Salt Marsh Restoration Framework



- Sara P. Grady, Ph.D., Senior Coastal Ecologist
- sgrady@massaudubon.org

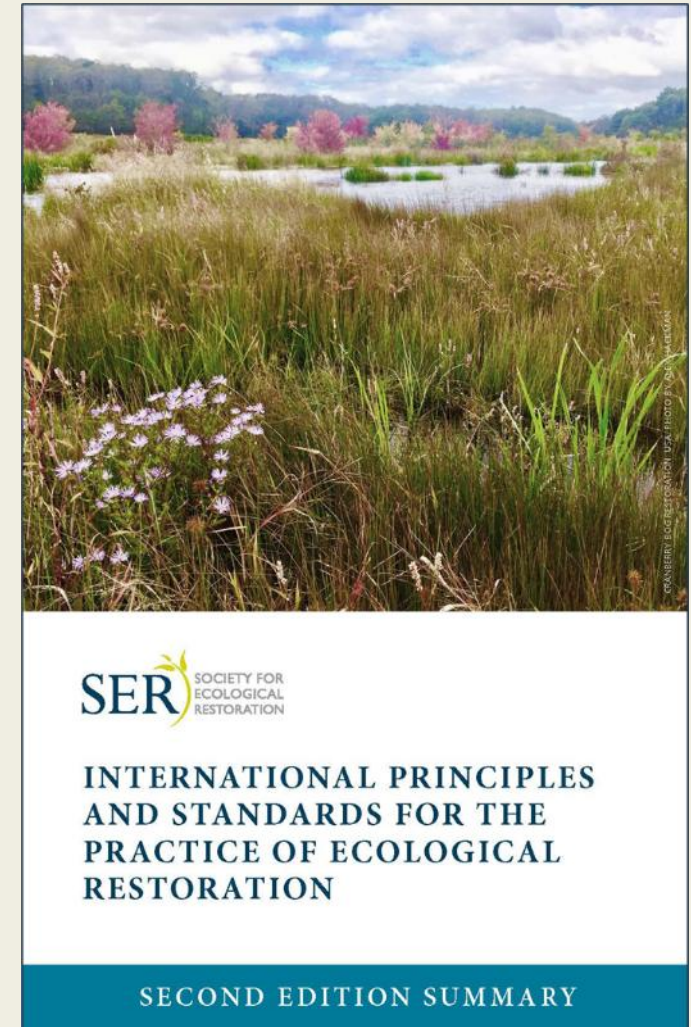




I work mostly in the salt marsh – it's a muddy and beautiful place

Ecological Restoration

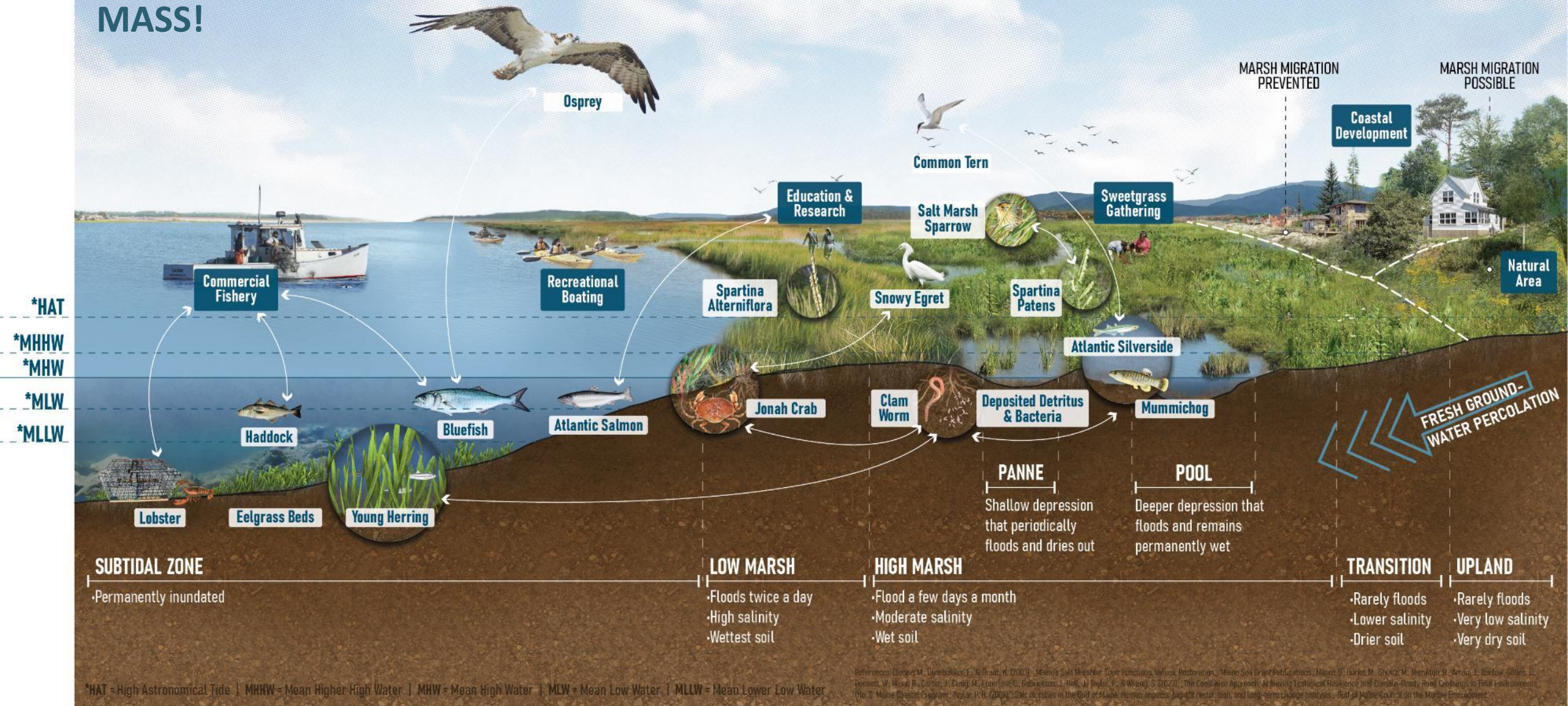
The **process** of assisting the recovery of an ecosystem that has been damaged, degraded, or destroyed



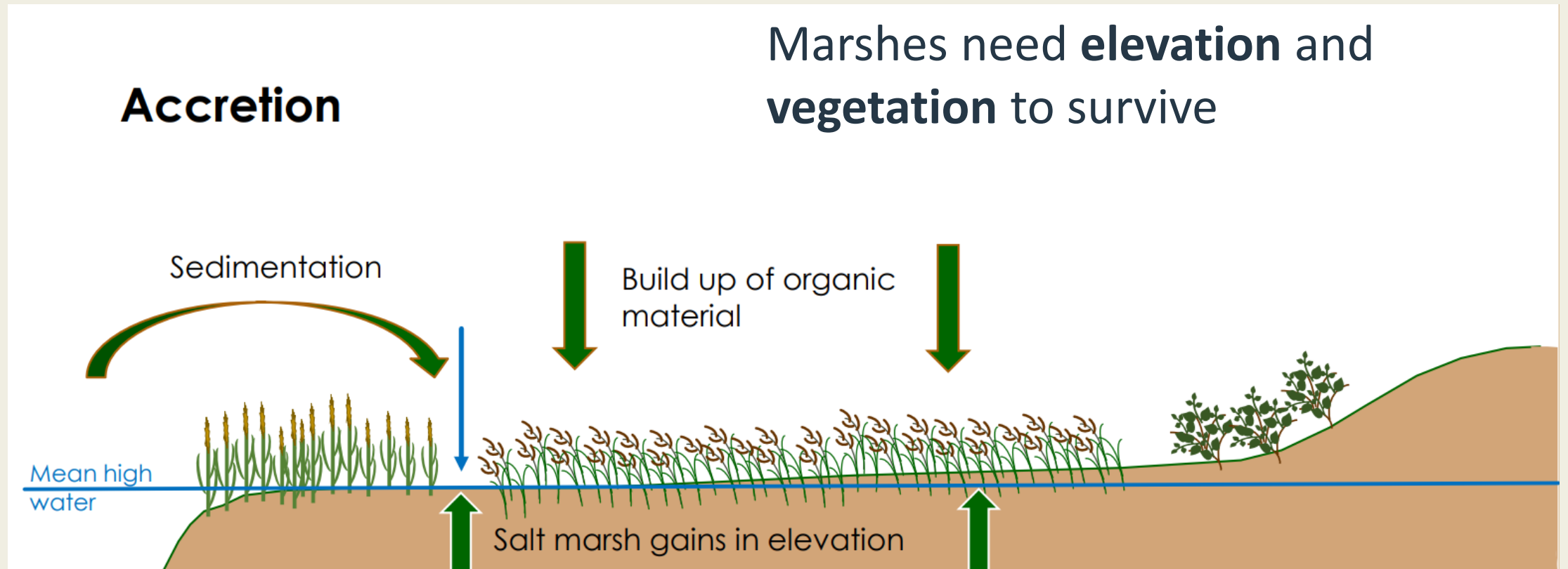
Salt marshes are in decline

- Massachusetts: 41% loss of salt marsh since ~1800
- Land use changes, altered sediment and nutrient regimes
- New England rates of sea level rise are 3-4x higher than global average

MAINE SALT MARSH and its Ecological, Social, and Cultural Connections AND MASS!



Salt Marshes Naturally Adjust to Sea Level Rise



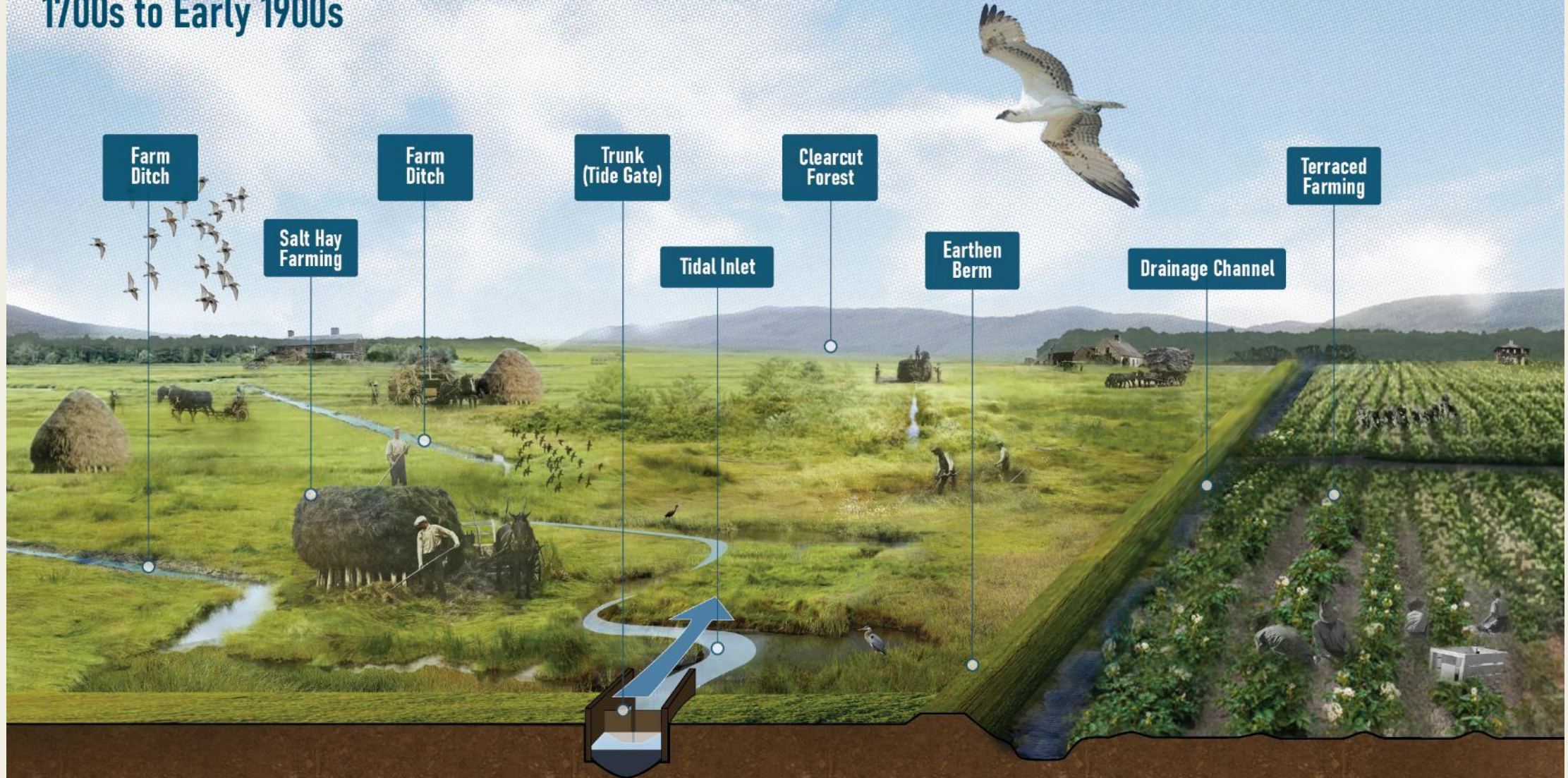
Wetlands need to be...wet!

- Low oxygen in wetland soil (especially peat) reduces decomposition
- Carbon is accumulated and stored



FARMING IN THE MARSH

1700s to Early 1900s



References: Adamowicz, S., Wilson, B., Bondick, B., Ferguson, W., & Hopping, R. (2020). Farmers in the Marsh: Lessons from History and Case Studies for the Future by Megan C. Adamowicz and others. *Wetland Science & Practice*, 21(3), 183-195. <https://doi.org/10.1623/UCR1063-224>; Bondick, B. M., Moore, G. E., Adamowicz, S. C., Wilson, G. M., & Peter, C. R. (2019). Mitigating the Legacy Effects of Ditching in a New England Salt Marsh: Estuaries and Coasts, 43(7), 1072-1079; Peck, E. K., Walker, J. E., Ackerman, R. V., Carr, P., Carroll, M. B., Dine, Z., Dragan, L. A., Eaton, M. J., Gajda, R. A., Hartley, M., Johnson, C., Meyer, J., Boskin, K. J., Woodruff, J. D., & Yollen, B. (2023). Distribution and disturbances of ditches across salt marshes of the Northeast U.S. with implications for management and restoration. *Journal of Environmental Management*, 376, 124444; Smith, D. C., & Bridges, A. E. (1982). Salt Marsh Dykes (Dikes) as a Factor in Eastern Maine Agriculture. *Maine History*, 21(4), 219-224; James, D. J. (2013). Impacts from ditching salt marshes in the mid-Atlantic and northeastern United States. *Environmental Reviews*, 21(2), 116-126.

DITCHING THE MARSH

1920s to 1930s



Mosquito Control Ditch

Parallel Ditching

Old Farm Ditch

Deteriorated Tide Gate

Vegetation Die-off from Ditching

Mosquito Control Ditch

Mechanized Farming

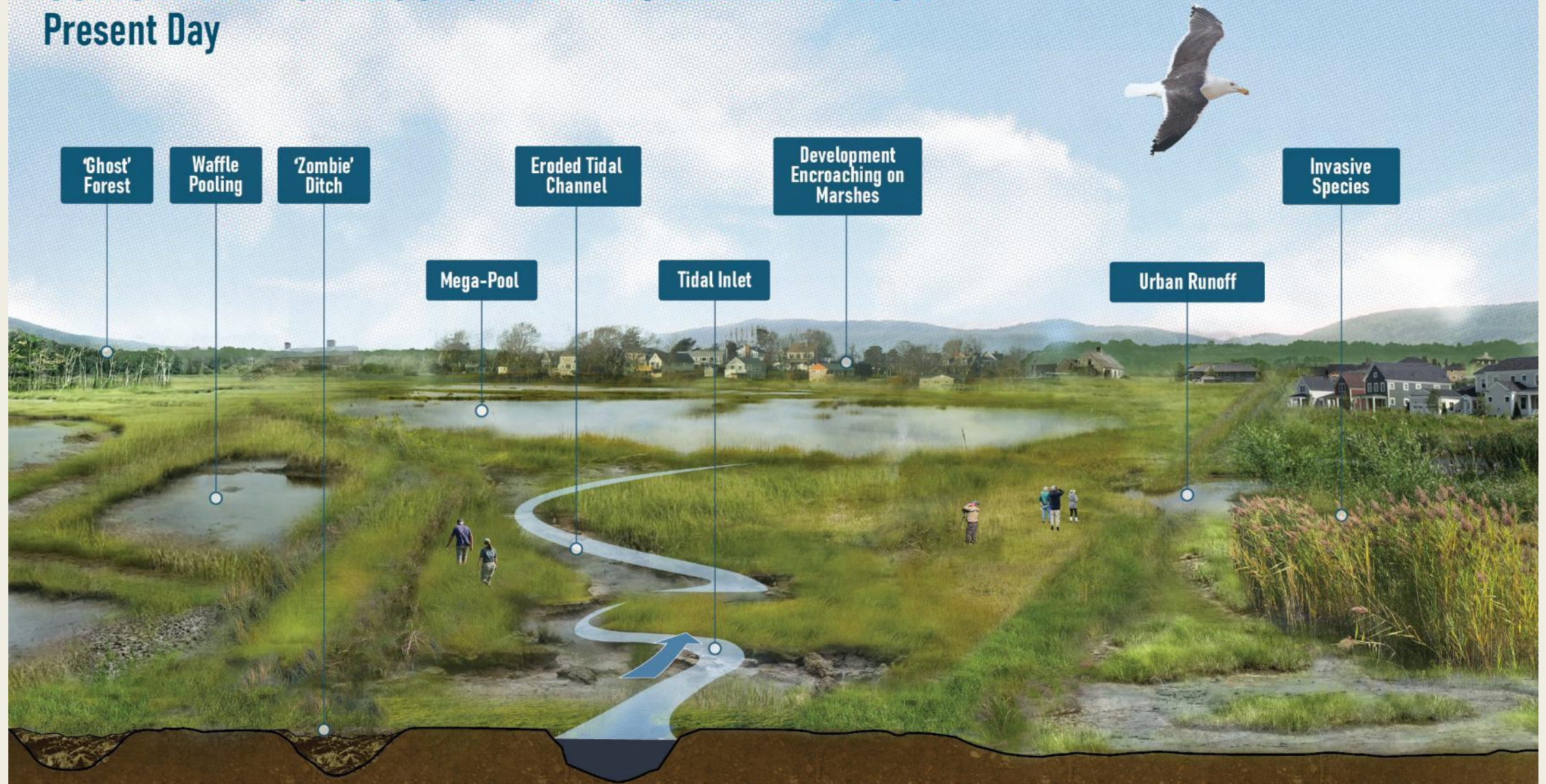
Tidal Inlet

Drainage Channel

References: Adamowicz, S., Wilson, B., Burdick, D., Ferguson, W., & Hoppling, R. (2020). Farmers in the Marsh: Lessons from History and Case Studies for the Future. In Susan C. Adamowicz and others, *Wetland Science & Practice*, 77(3), 183–195.

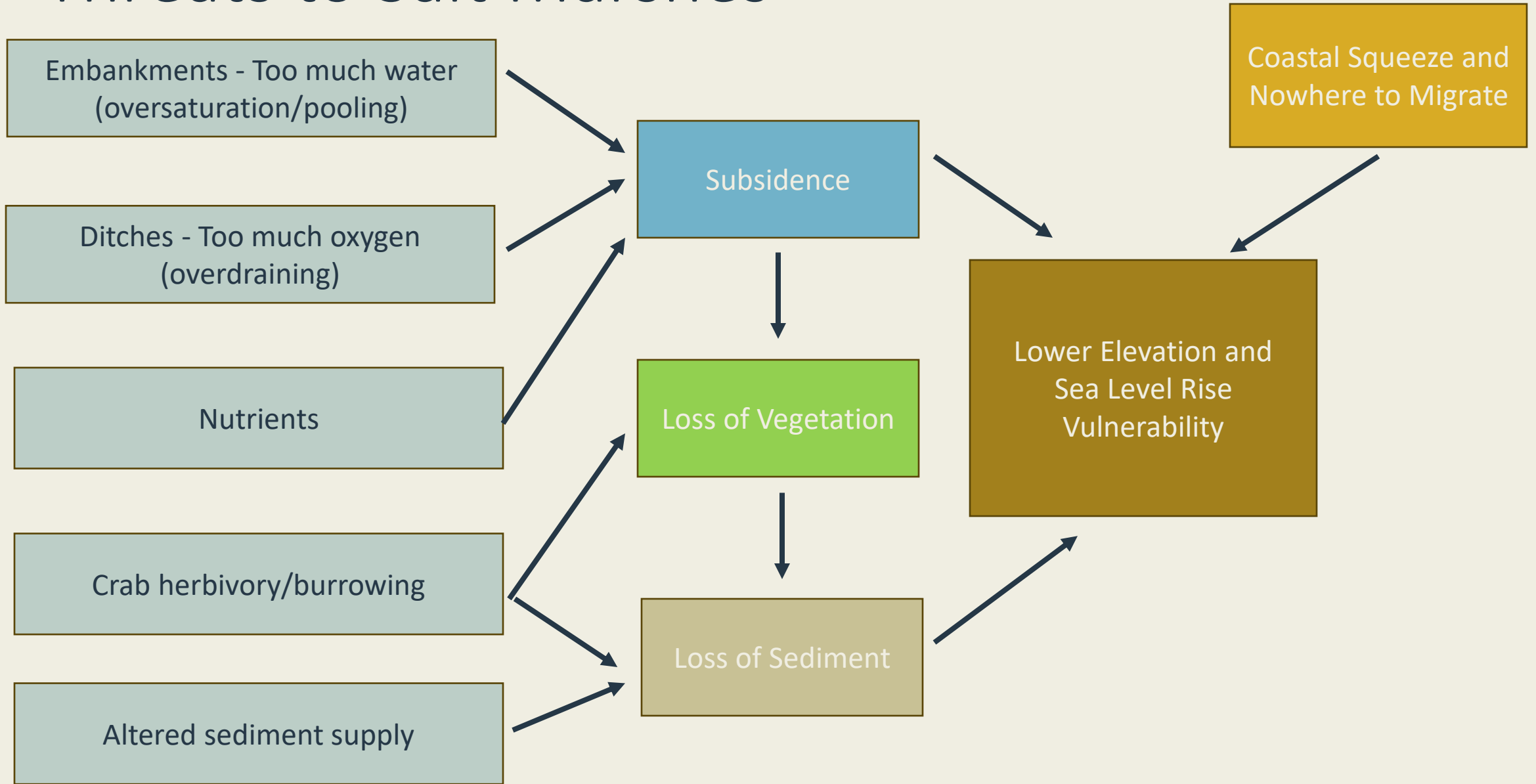
CUMULATIVE STRESSES IN A DEGRADED MARSH

Present Day



References: Adamowicz, S., Wilson, B., Burdick, D., Ferguson, W., & Hopflon, R. (2020). Farmers in the Marsh: Lessons from History and Case Studies for the Future. In Susan C. Adamowicz and others, *Wetland Science & Practice*, 7(3), 184-195. <https://doi.org/10.1622/UCR7083-224>. Burdick, B. M., Moore, G. E., Adamowicz, S. C., Wilson, E. M., & Peter, C. B. (2019). Mitigating the Legacy Effects of Ditching in a New England Salt Marsh. *Estuaries and Coasts*, 42(5), 1422-1474. Peng, B. X., Walker, J. E., Ackerman, R. V., Carr, A., Correll, M. D., Jones, Z., Grogan, L. A., Eaton, M. J., Bonni, R., Hartley, M., Johnson, L., Meyer, J., Harkin, K. J., Woodruff, S. M., & Tolson, B. (2025). Distribution and disturbances of ditches across salt marshes of the Northeast U.S. with implications for management and restoration. *Journal of Environmental Management*, 376, 124444. Smith, D. L., & Bridges, A. C. (1982). Salt Marsh Dykes (Dikes) as a Factor in Eastern Maine Agriculture. *Maine History*, 21(4), 219-226. Hayes, D. J. (2015). Impacts from ditching salt marshes in the mid-Atlantic and northeastern United States. *Environmental Reviews*, 21(2), 116-126.

Threats to Salt Marshes



Salt Marsh Restoration Toolbox

Salt marshes need **salinity** and **sediments** from tidal flooding - BUT too much flooding can drown them!

Threat - formation of marsh pools

Solution - runneling



Salt marshes need to drain - BUT overdraining leads to **oxidation & subsidence**

Threat - agricultural ditches in the marsh

Solution - ditch remediation



Salt marshes need **sediment** to keep up with sea level rise

Threat - elevation loss or slow gain

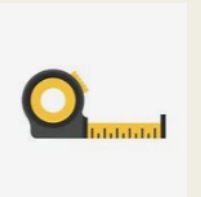
Solution - marsh nourishment



Salt marshes are getting squeezed

Threat - sea level rise and coastal development

Solution (in some locations) - Marsh migration corridors



~42,000 acres of salt
marsh in Massachusetts
need restoration today.



Great, but how do I get there?



Come
with me!
Let's GO!





The Salt Marsh Framework uses geospatial data to score salt marshes statewide by their current *Condition*, future *Trajectory*, and *Migration* potential.

☑ Right *Places* 🧭 ☑ Right *Time* ⌚



Condition, Trajectory and Migration scores are used to suggest *Management Guidances*.

☑ Right *Approach* 🔧

The Massachusetts Salt Marsh Framework

A Salt Marsh Restoration and Management Planning Tool



Current condition

How is the marsh doing today?



Migration potential

Is there room and appropriate land nearby for the marsh to migrate toward?



Future trajectory

Will the marsh decline in the future, and how fast?

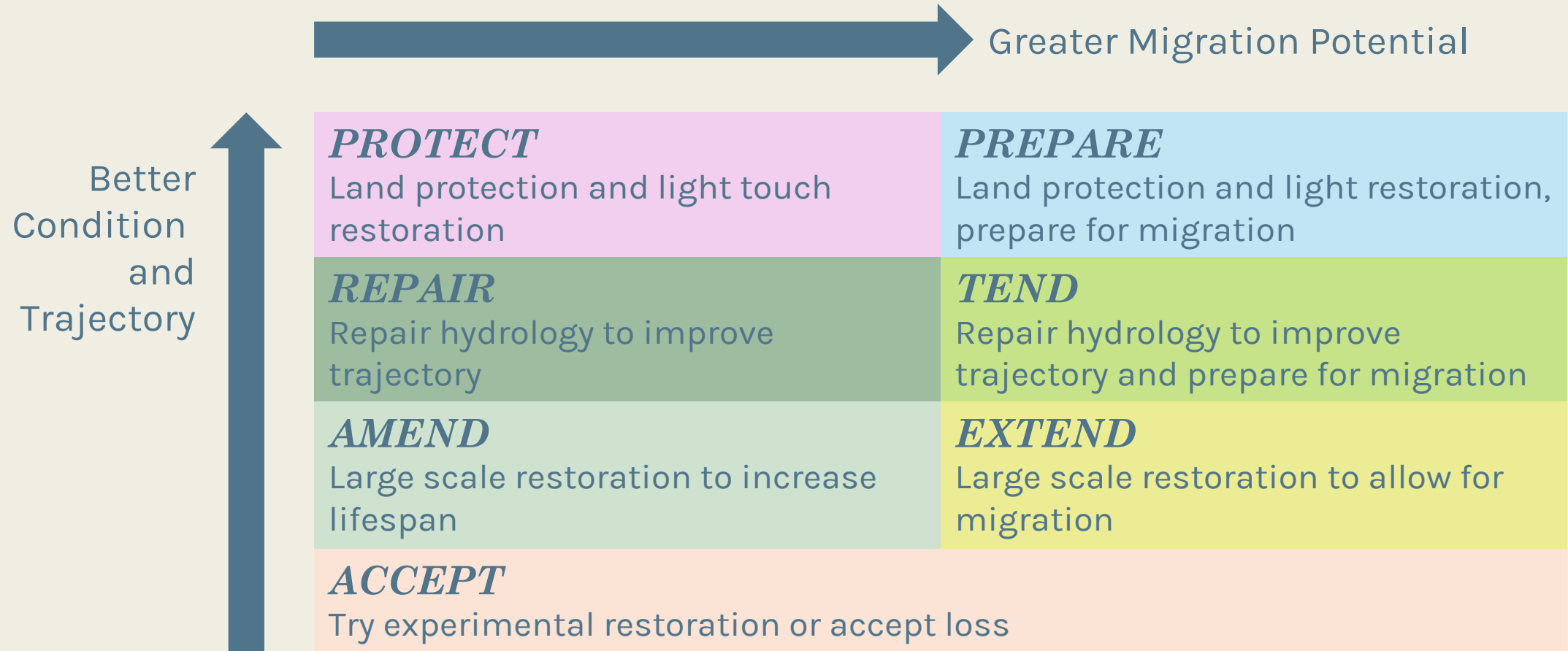


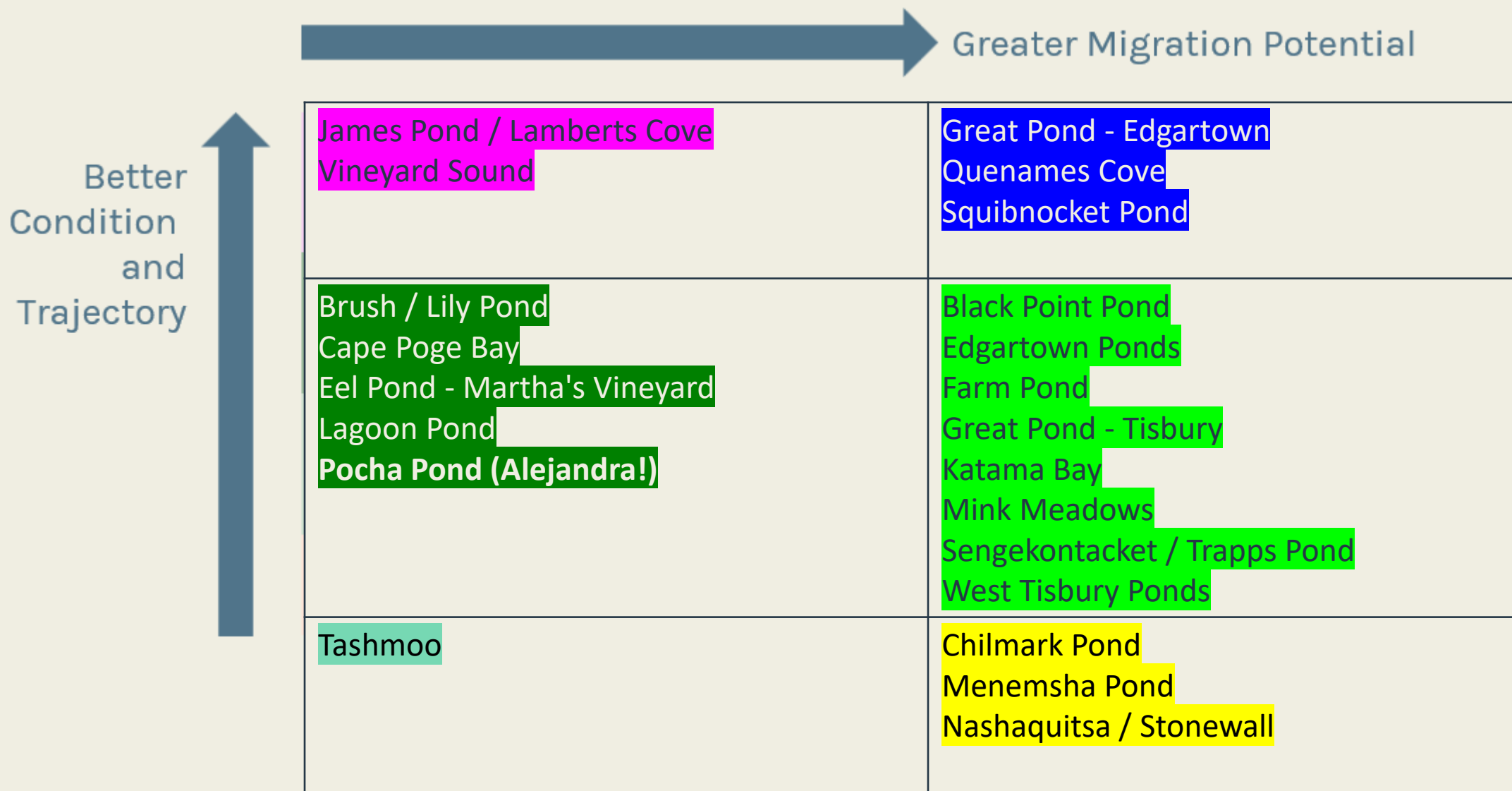
Combinations of scores provide guidance focused on PROTECTION, RESTORATION, & MIGRATION.



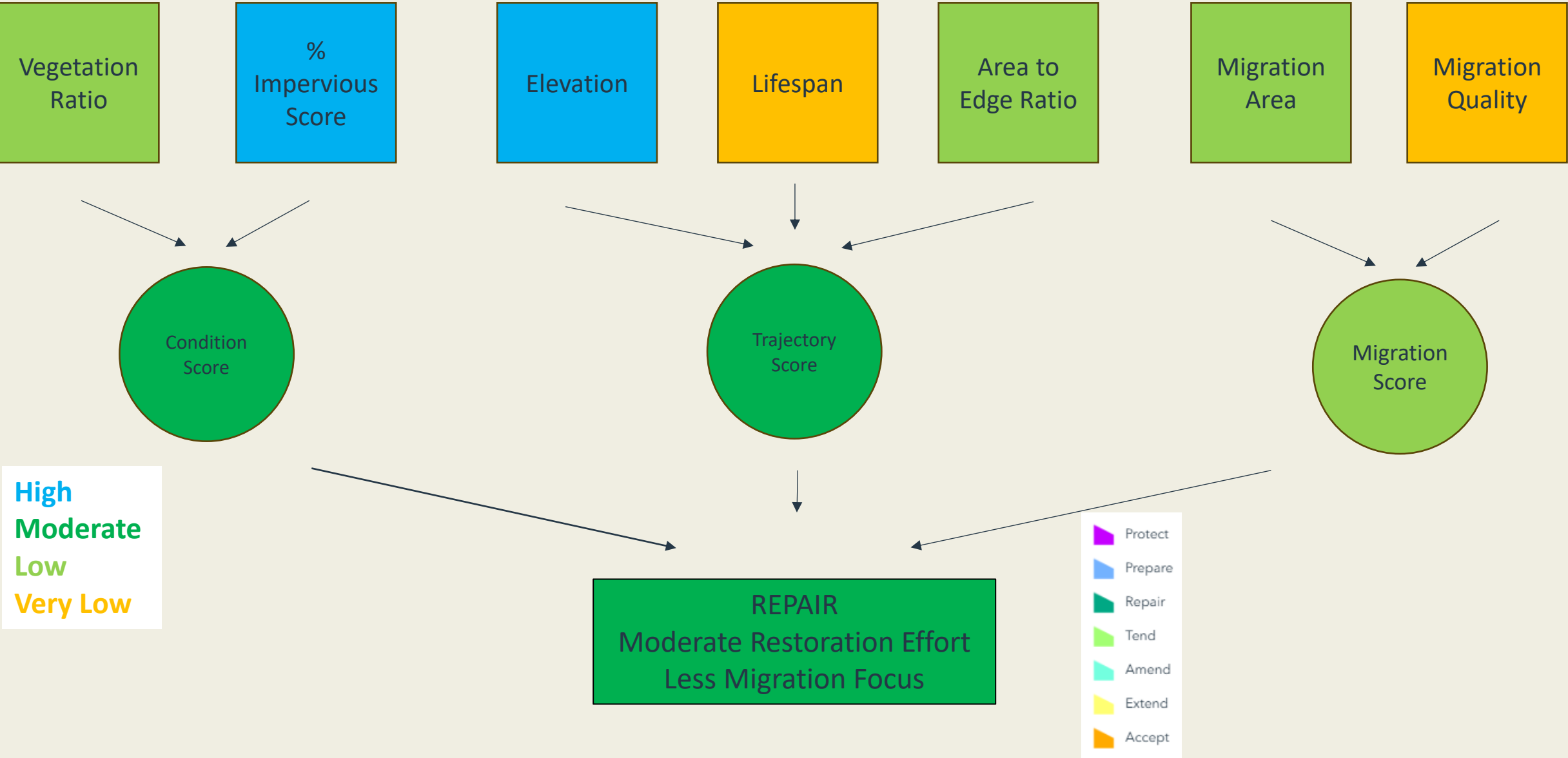
Condition, Trajectory and Migration inform *Management Guidances*

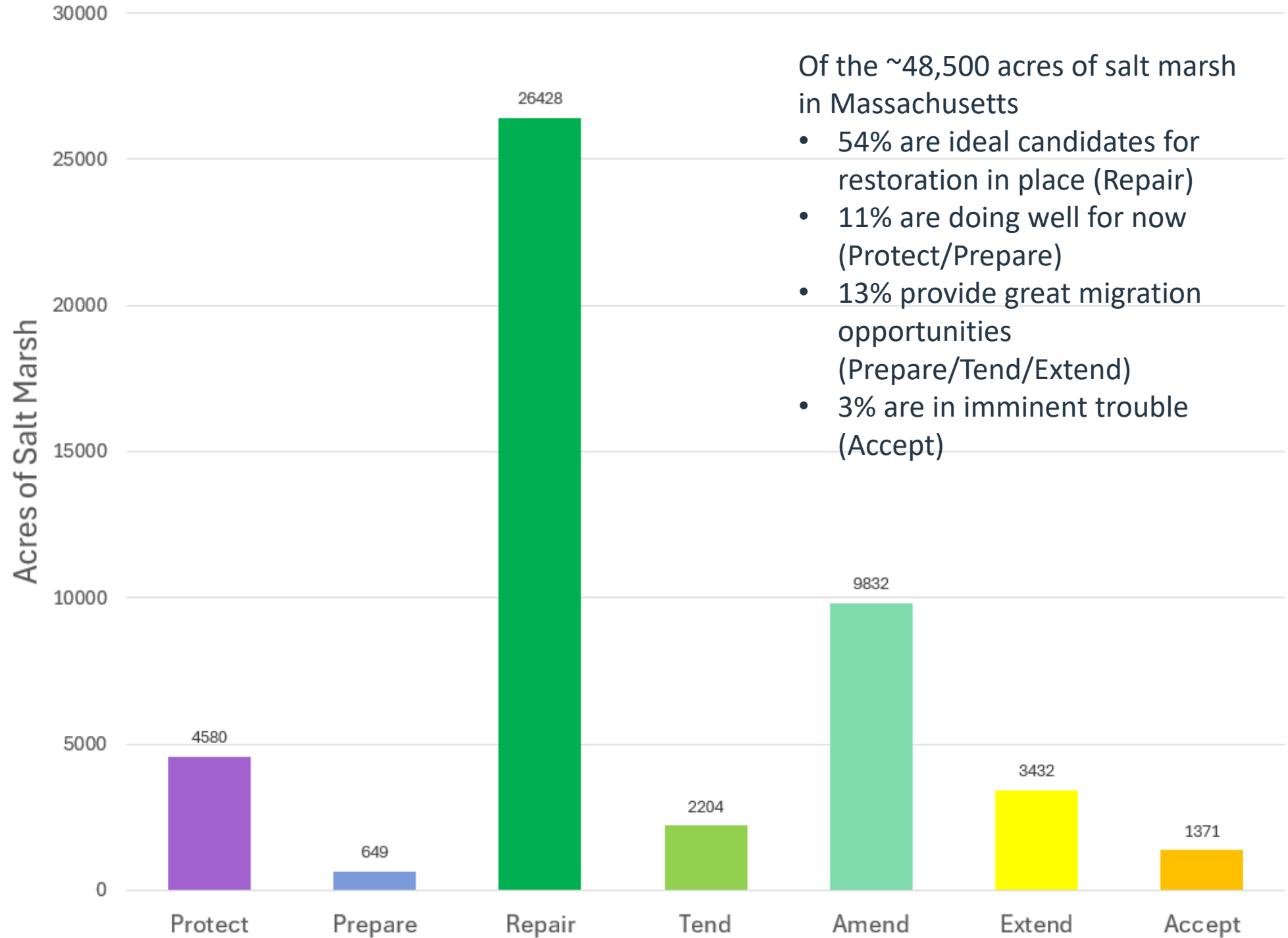
☑ Right *Approach* ✂





Pocha Pond - Salt Marsh Framework





Thank you!

