An aerial photograph of a river delta system. A large, rectangular reservoir is visible in the upper right quadrant. The river channels branch out from the reservoir, creating a complex network of waterways. The surrounding land is a mix of green and brown, indicating different types of vegetation and possibly some agricultural or developed areas. The sky is overcast with grey clouds.

NSMRG Meeting
Restoration Design Considerations
Draft Materials by PWA
November 27, 2001

Key Questions

- Timeframe for evolution of tidal wetlands
- Design implications
 - Rate of habitat replacement versus loss
 - Timing and location of breaches
 - Consider means of speeding rate of restored site evolution?

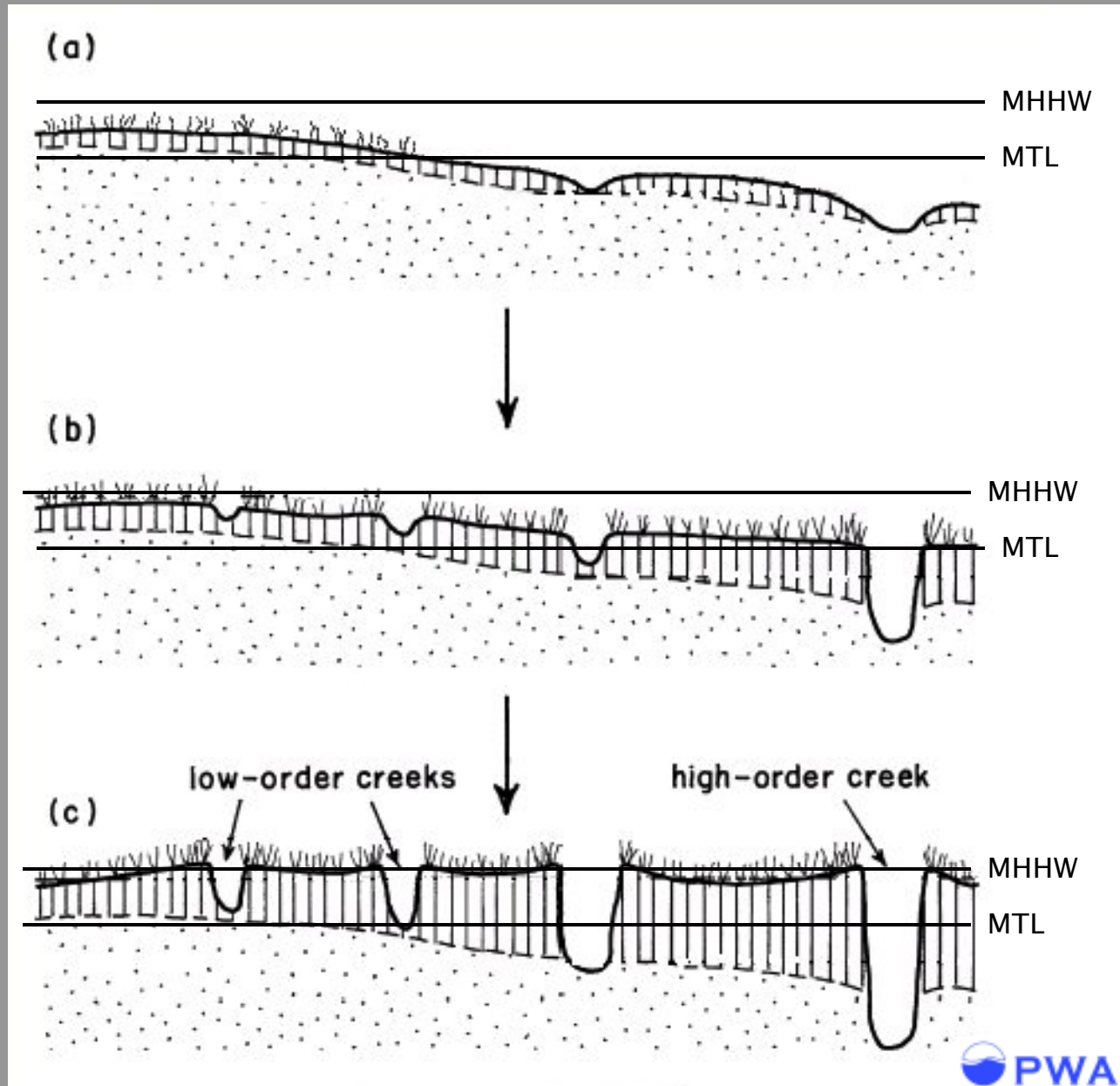
Evolution of Restored Sites

Young marsh,
Emergent vegetation
& intertidal mudflat

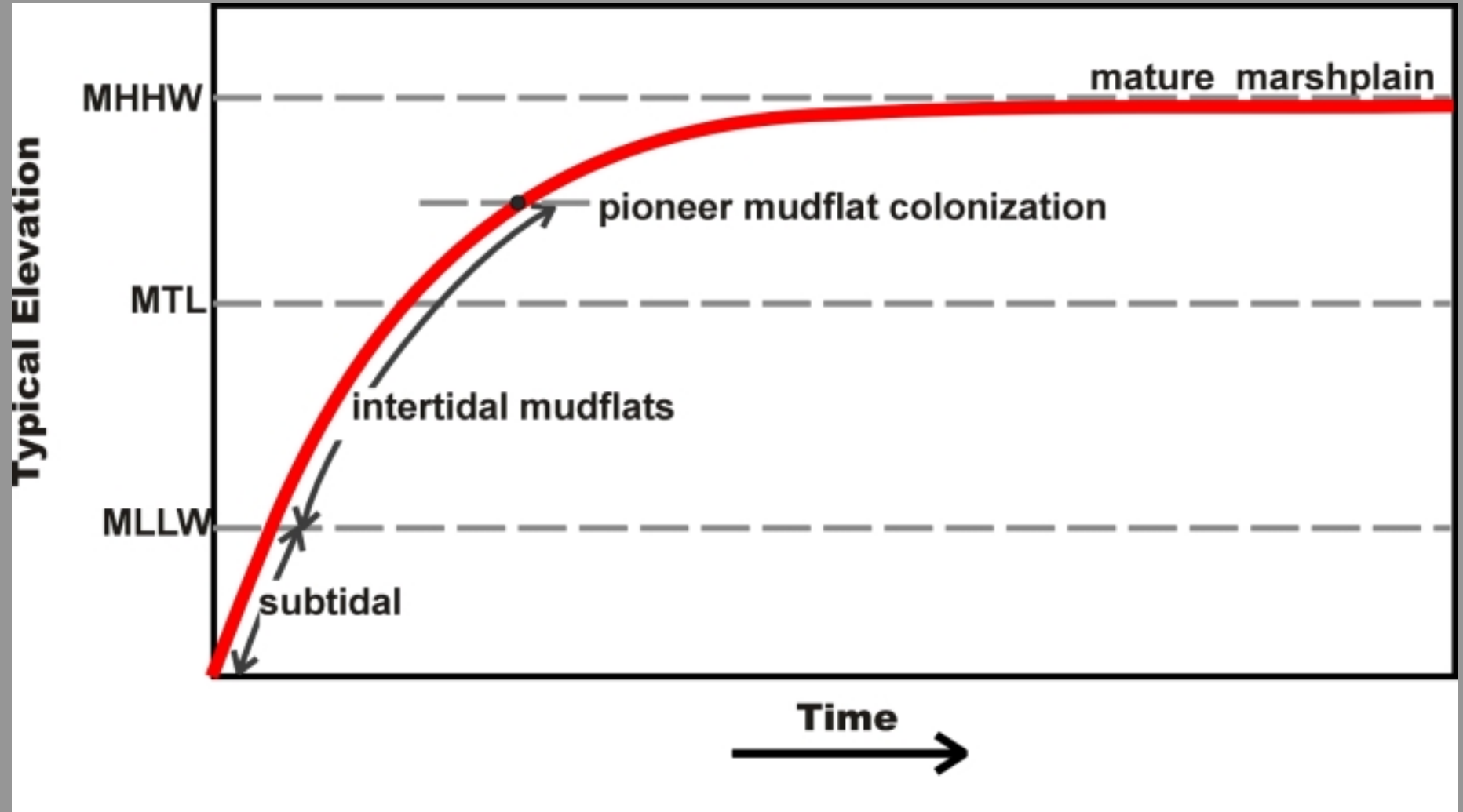
Developing marsh,
vegetation colonization
& channel formation

Mature marsh,
vegetated marsh plain
& channel drainage
system

Adapted from Allen 2000



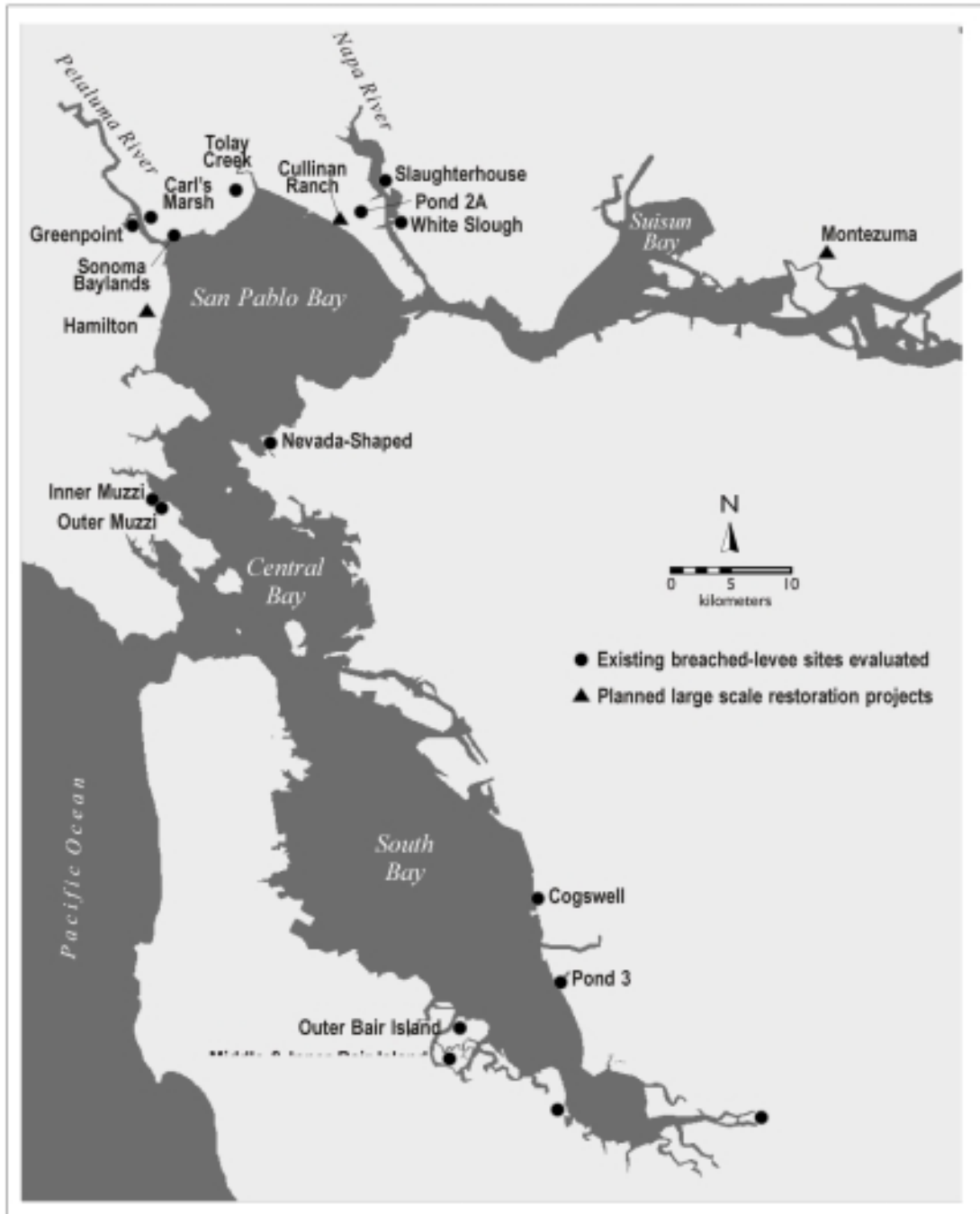
Site Evolution



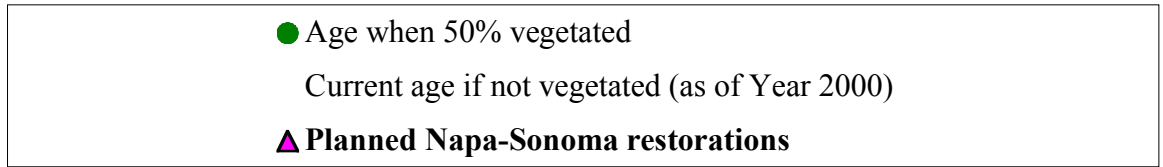
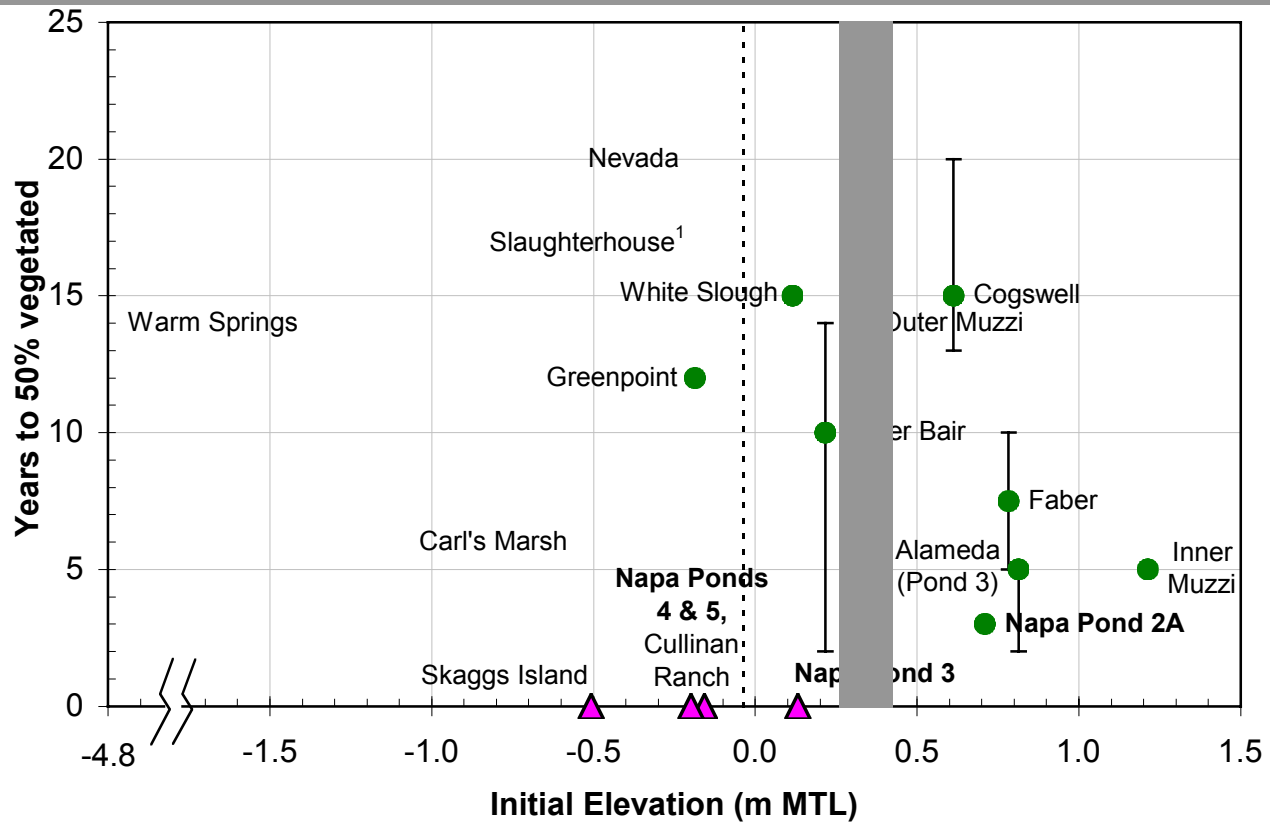
Evolution of Restored Sites

- Rate of evolution is a function of
 - Initial site elevation
 - Vegetation colonization elevations
 - Suspended sediment supply
 - Wind-wave re-suspension

Map of Restored Sites



Initial Elevation

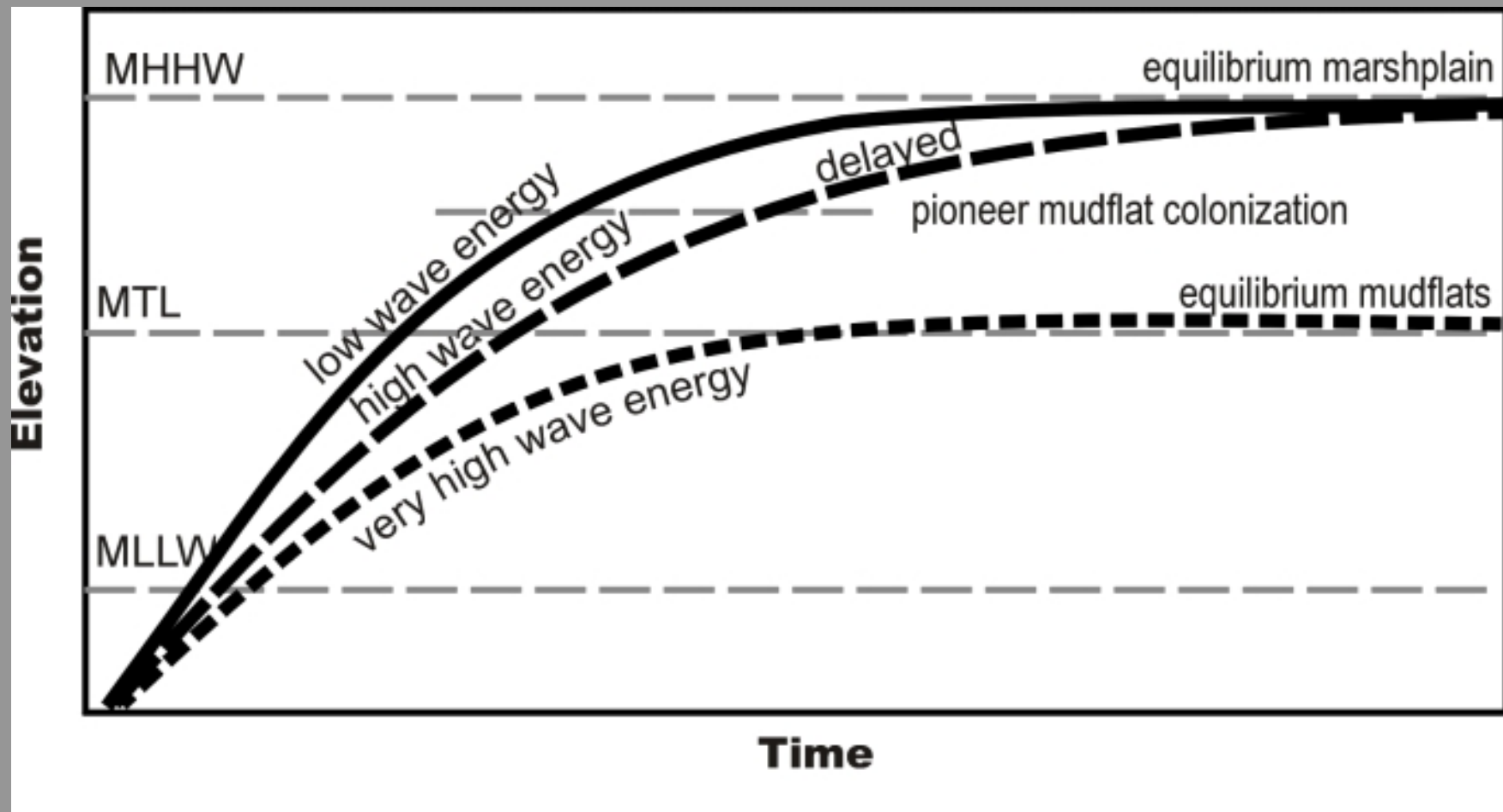


Notes: Shaded bar identifies the approximate *Spartina foliosa* colonization elevation. Dashed vertical line indicates the minimum elevation for the lateral colonization of bullrush. Error bars represent the range of uncertainty based on the data available to bracket the timeframe. MTL elevations are approximate. 1- Damped tides for many years has slowed site evolution at the Slaughterhouse site.

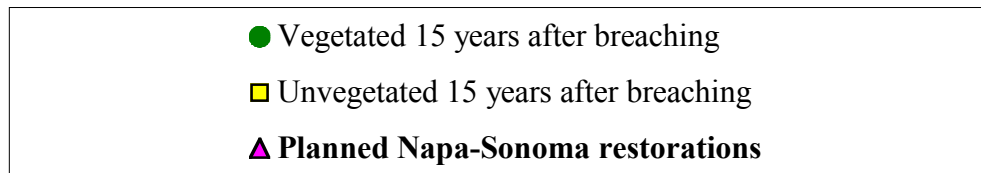
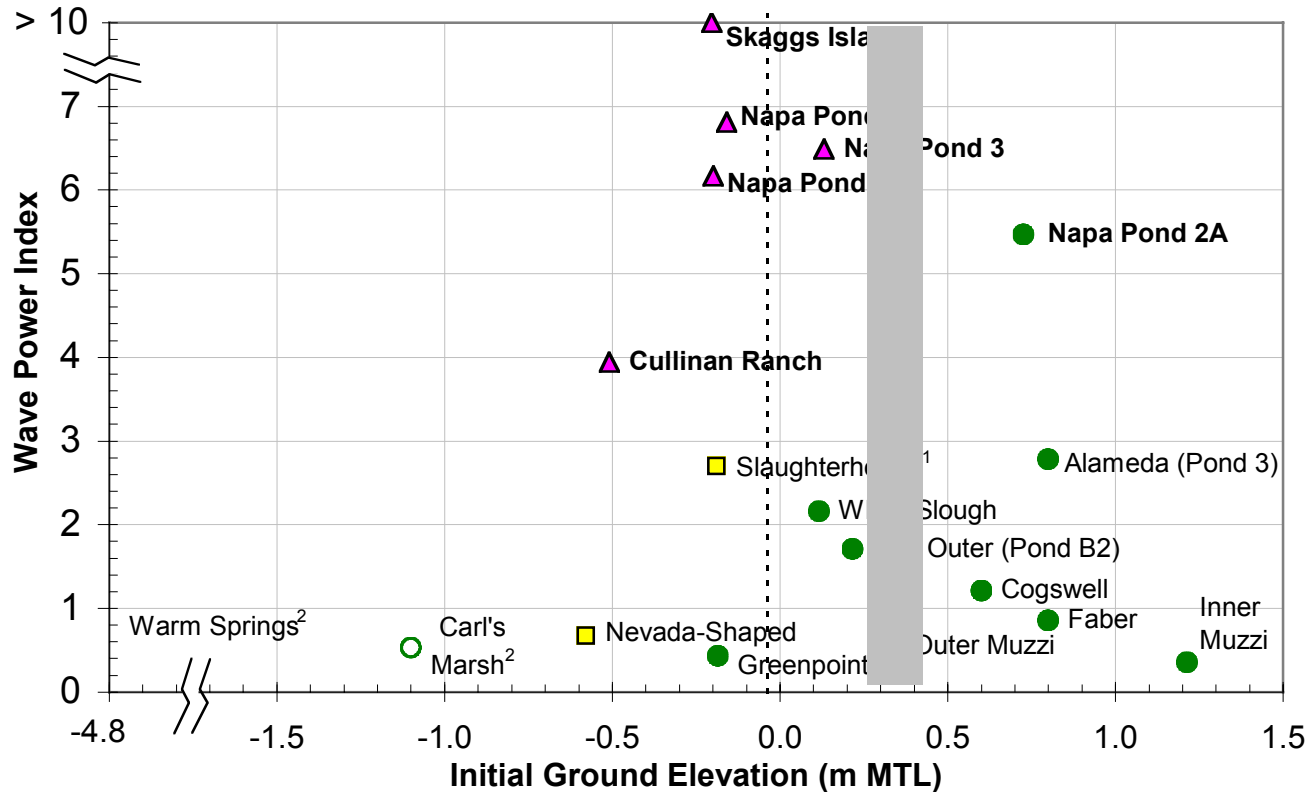
Sediment supply

- Suspended sediment concentration in the water column
 - Sediment dynamics and budget
- Tidal inundation
 - Muted vs. full tidal range

Wind Wave Re-suspension



Wind Wave Re-suspension

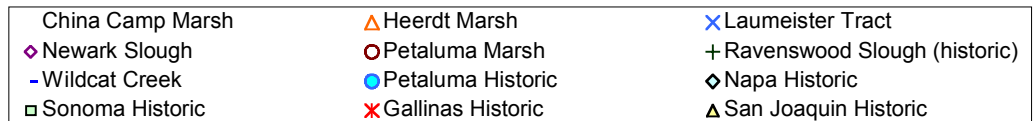
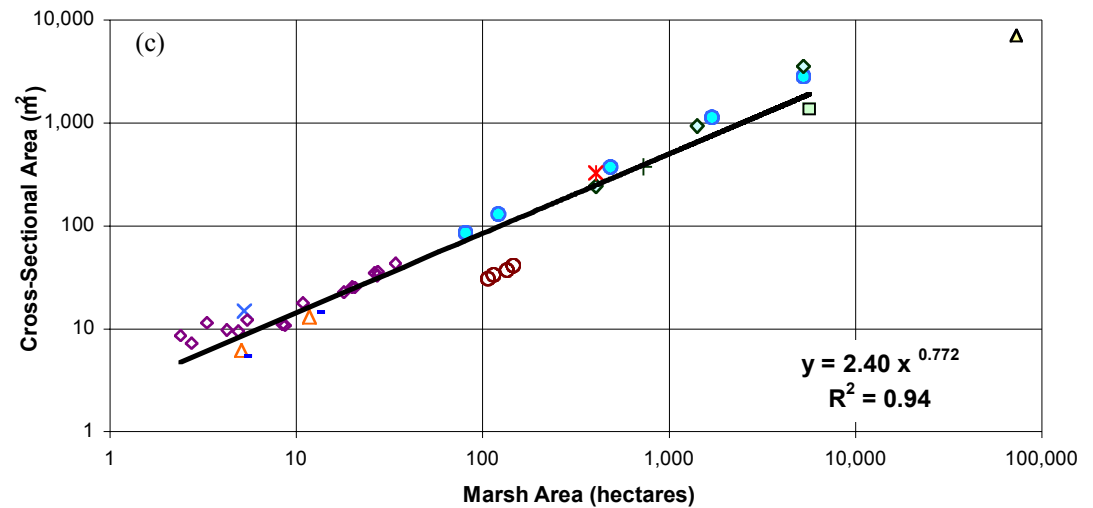
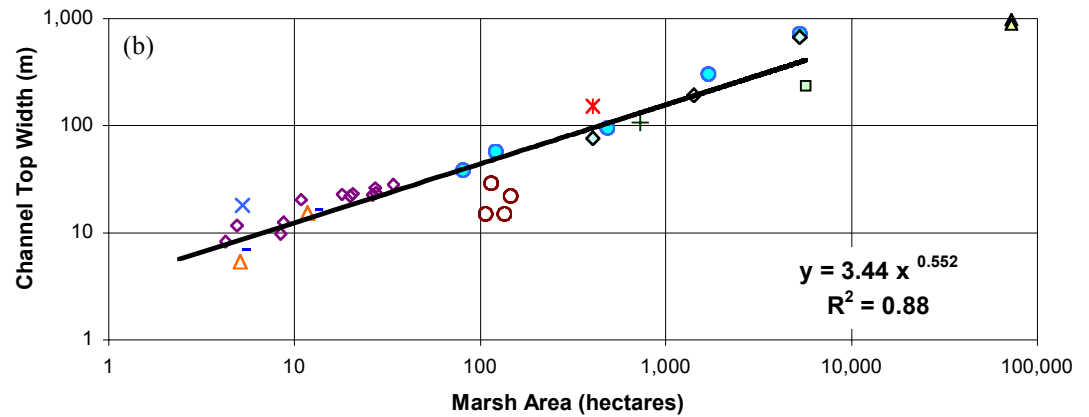
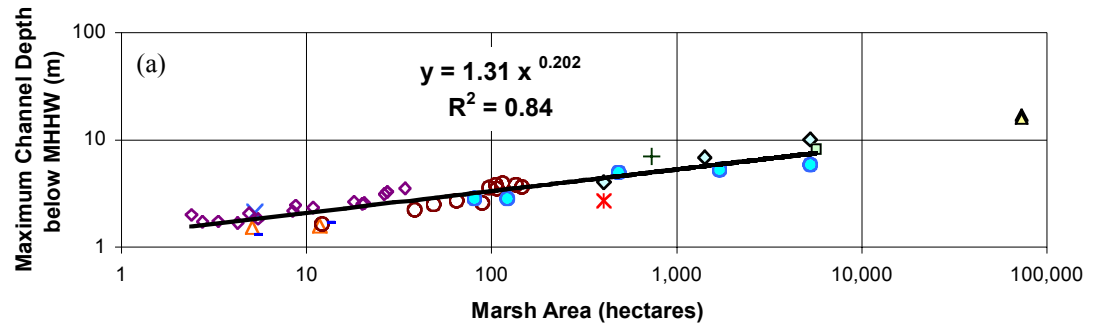


Notes: Vegetative status refers to >50% cover. The majority of sites are vegetated and either (1) near or above the *Spartina* colonization elevation (represented by the shaded bar) or (2) low energy sites. The few unvegetated sites are higher energy and/or initially low elevation. MTL elevations are approximate.

1- Slaughterhouse site evolution has been slowed due to initially muted tidal exchange.

2- Open symbols at Warm Springs and Carl's Marsh refer to expected vegetative condition at Year 15 (both sites are younger than 15 years old).

Hydraulic Geometry



Potential Ways to Speed Marsh Evolution

- Wide area fill placement
 - such as at Muzzi Marsh, Faber Tract, planned at Hamilton
 - Drawback for Napa salt ponds is loss of existing natural channel network
- Limited fill placement
 - To replace lost habitat and help speed initial vegetative colonization
- Wave-break peninsulas
 - (such as at Sonoma Baylands)
- Muted tides to enhance vegetative colonization

Tide Statistics

	Elevation			
	MLLW (meters)	NAVD88 (meters)	NGVD29 (meters) (feet)	
MHHW	1.748	1.835	1.020	3.346
MHW	1.578	1.665	0.850	2.789
MTL	0.931	1.018	0.203	0.666
NGVD29	0.728	0.815	0	0
MLW	0.284	0.371	-0.444	-1.457
MLLW	0	0.087	-0.728	-2.388
NAVD88	-0.087	0	-0.815	-2.674

NOTES

Tidal datums from NOAA tidal benchmark sheet for Mare Island Shipyard, Carquinez Strait

NAVD88 to NGVD29 conversion from VERTCON