Green Infrastructure Solutions

evaluating habitat's protective functions to guide community infrastructure investments

Roger Fuller The Nature Conservancy
Eric Grossman US Geological Survey

The Nature Conservancy. Protecting nature. Preserving life.

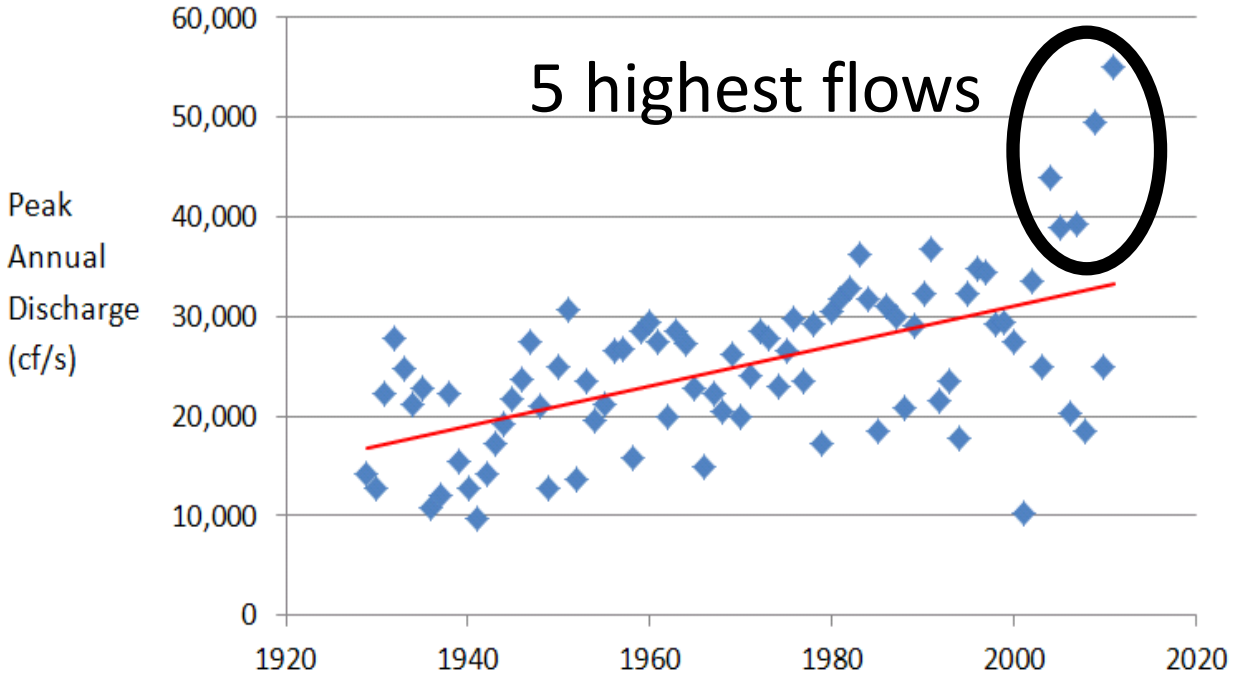
USGS science for a changing world

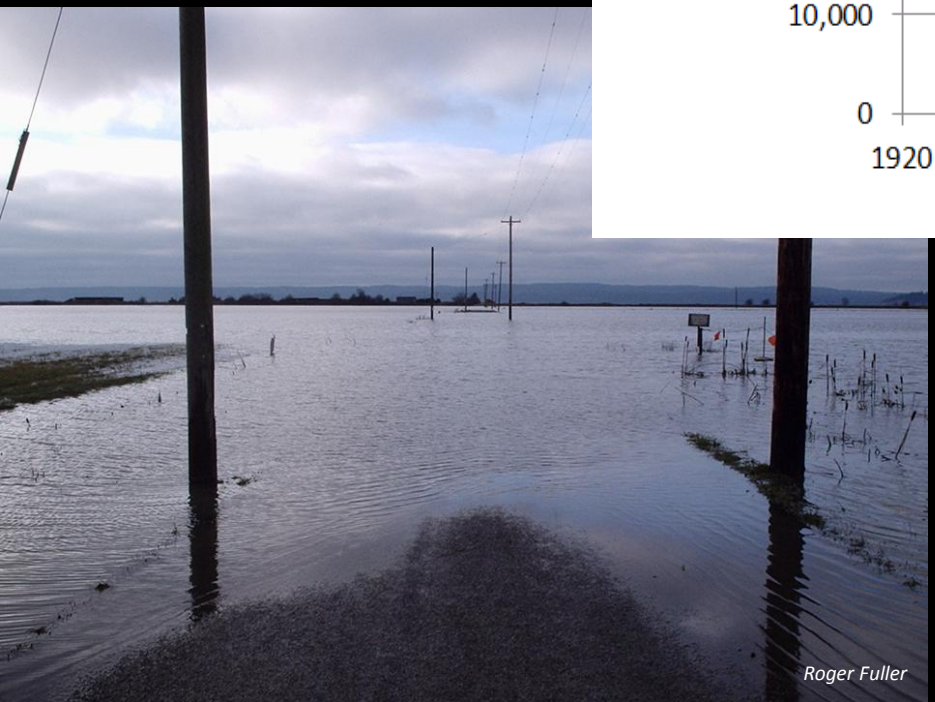
Jen Moslemi

The Salish Sea

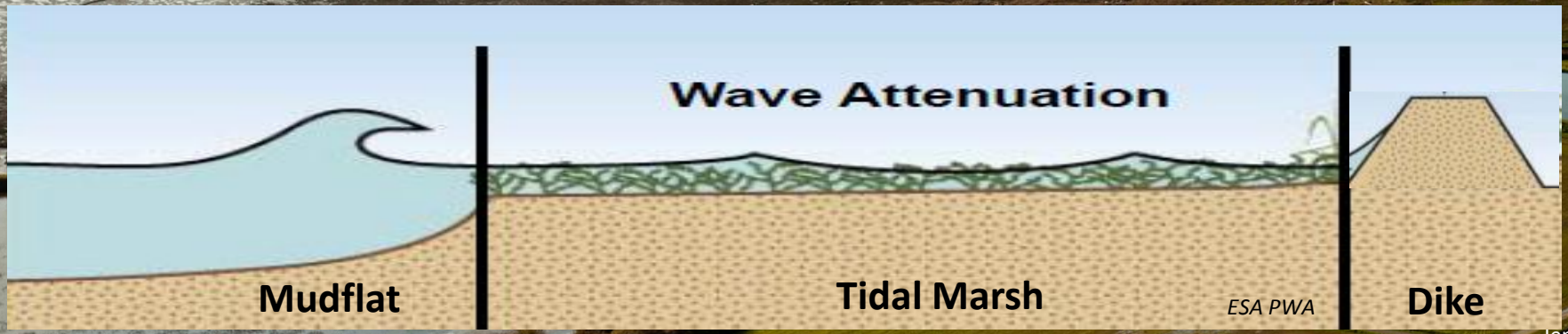
December 17, 2012

Stillaguamish Annual Peak Flows





green infrastructure protects grey



Jen Moslemi

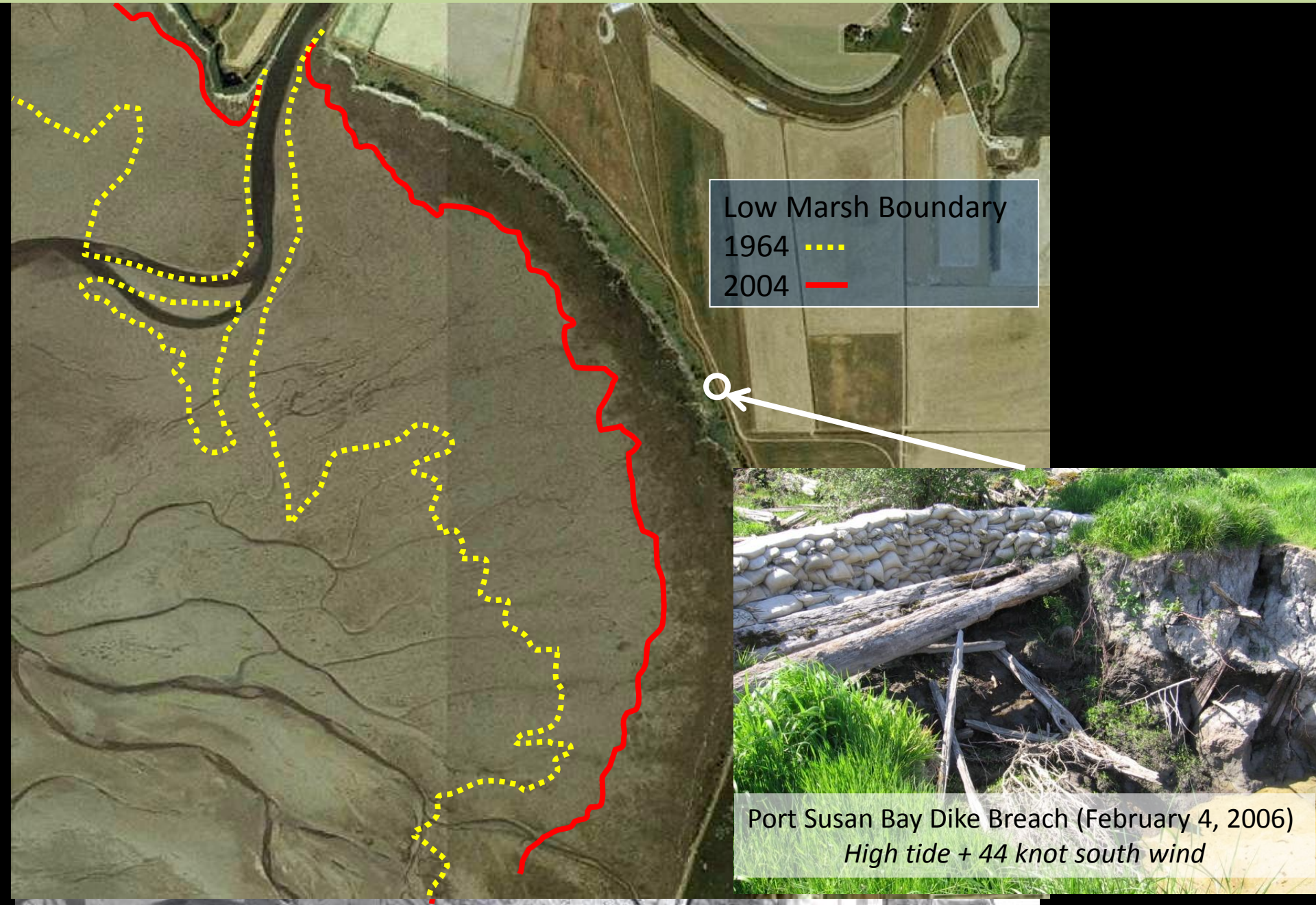
green

no waves!

grey

waves!

a vulnerable estuary? a vulnerable community?



Port Susan Bay Dike Breach (February 4, 2006)
High tide + 44 knot south wind

floodplain green and grey infrastructure

floodplain green and grey infrastructure

floodplain green and grey infrastructure

green infrastructure restoration – economic values

50 acres
20yr low estimate

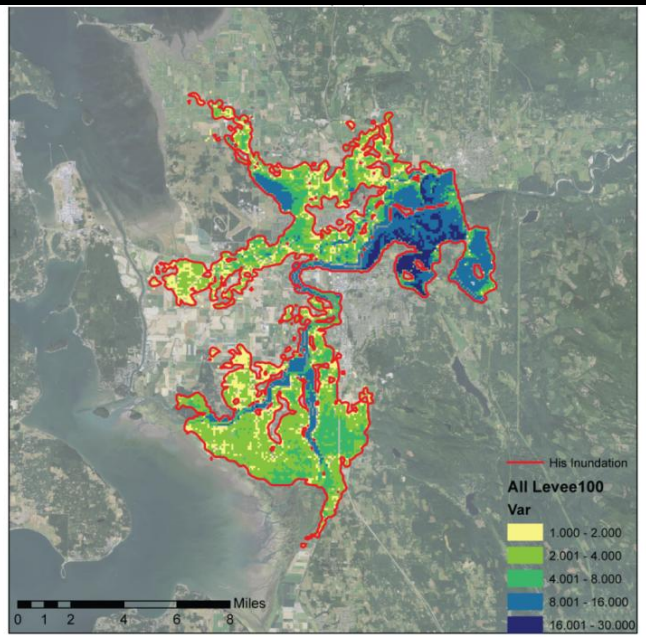
$8.5 m

Table 1. Net Present Value[1] of the Quantifiable Socioeconomic Benefits of the Fisher Slough Restoration Project (2011$)

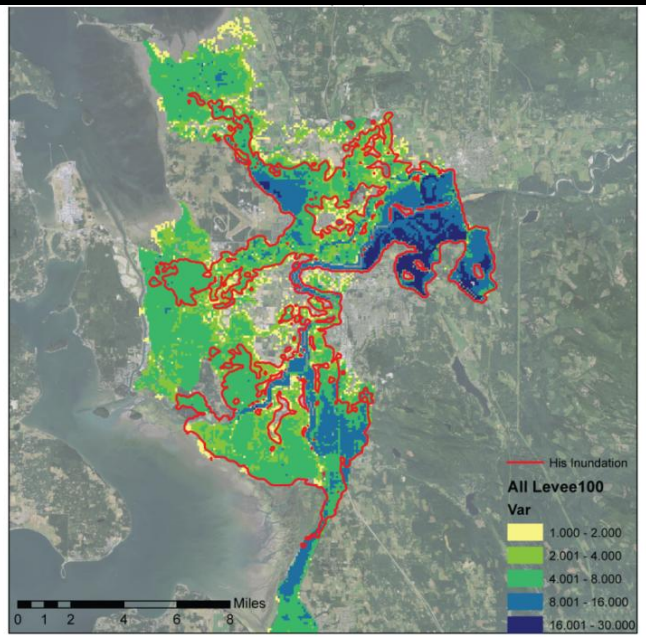
Benefit Category	Low Estimate[2]		High Estimate[2]	
	20-year total	50-year total	20-year total	50-year total
Human-built Capital				
Reduced O&M costs	At least $4,000	At least $7,000	At least $7,000	At least $13,000
Abated Cost of New Infrastructure[3]	At least $1,925,000	At least $1,925,000	At least $1,925,000	At least $1,925,000
Reduced risk of catastrophic failure of old infrastructure	Unquantified, but potentially substantial. Includes the avoided costs of emergency repairs and damage to downstream property and habitat.[4]			
Natural Capital				
Reduced cost of flood damage	$106,000	$198,000	$2,594,000	$4,852,000
Reduced habitat restoration obligations to districts under TFI agreement[4]	$5,775,000	$5,775,000	$9,333,000	$9,333,000
Reduced dredging costs	$198,000	$367,000	$417,000	$775,000
Increased crop value	$369,000	$729,000	$1,846,000	$3,646,000
Reduced crop production costs	Unquantified. Includes lower costs associated with reduced risk of disease and reduced planting costs. Data are unavailable to estimate these costs.[5]			
Social Capital				
Reduced costs of future projects from investments in stakeholder relationships	$121,000	$121,000	$121,000	$121,000
Human Capital				
Reduced costs of future projects from investments in skills and knowledge of estuary restoration	Unquantified. Planning and implementing estuary restoration with multiple benefits increases skills and improves efficiency for future projects.[6]			
Total Net Present Value of the Quantified Benefits	**$8,498,000**	**$9,122,000**	**$16,243,000**	**$20,665,000**

Understanding vulnerability in order to find solutions

Current 100-year Flood



2040's 100-year Flood + Sea Level Rise



Changes from "current"

Inundation, acres
42,266 to 71,236 (69% increase)

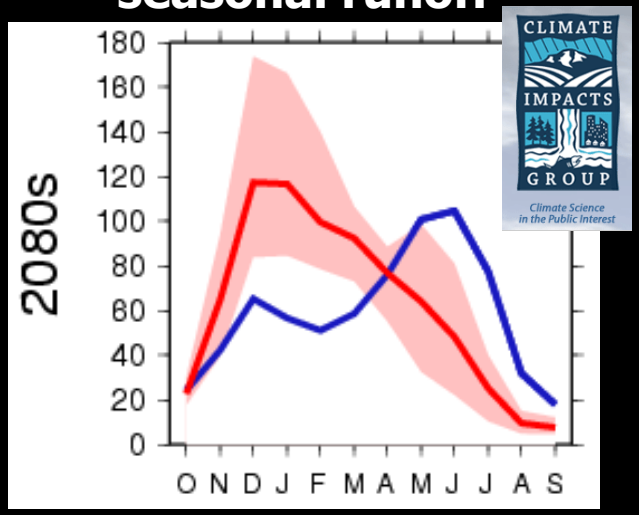
Mt. Vernon Depth, ft
0.0 to 0.45

Burlington Depth, ft
0.77 to 2.40

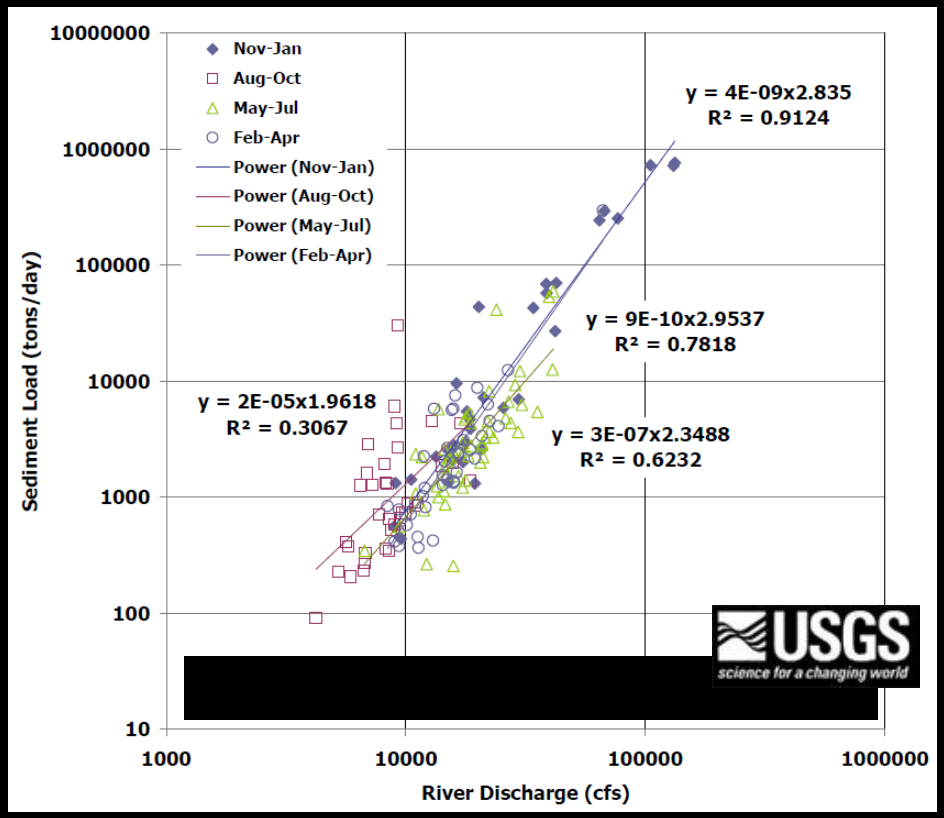
University of Washington Climate Impacts Group

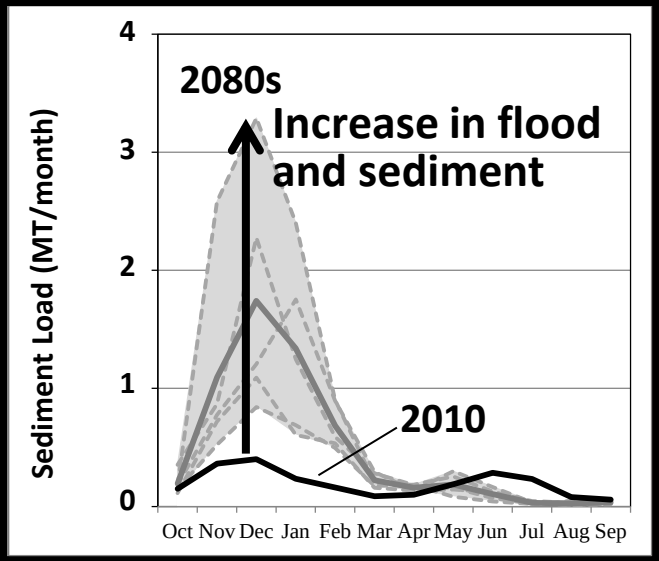
Projected Climate Impacts to Sediment Delivery

Increase and earlier seasonal runoff



Seasonal sediment transport model

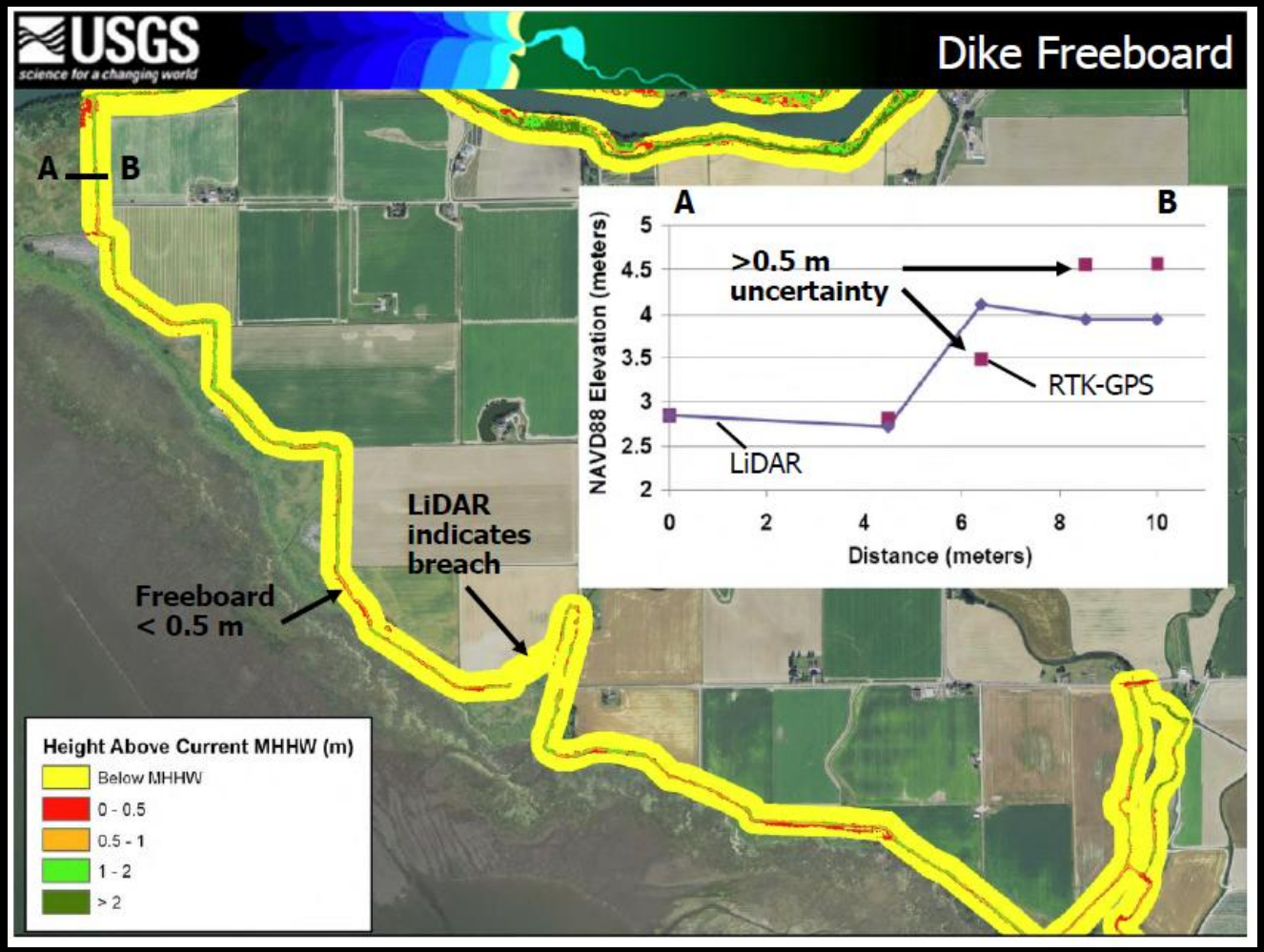




Hamlet and Grossman (in prep)

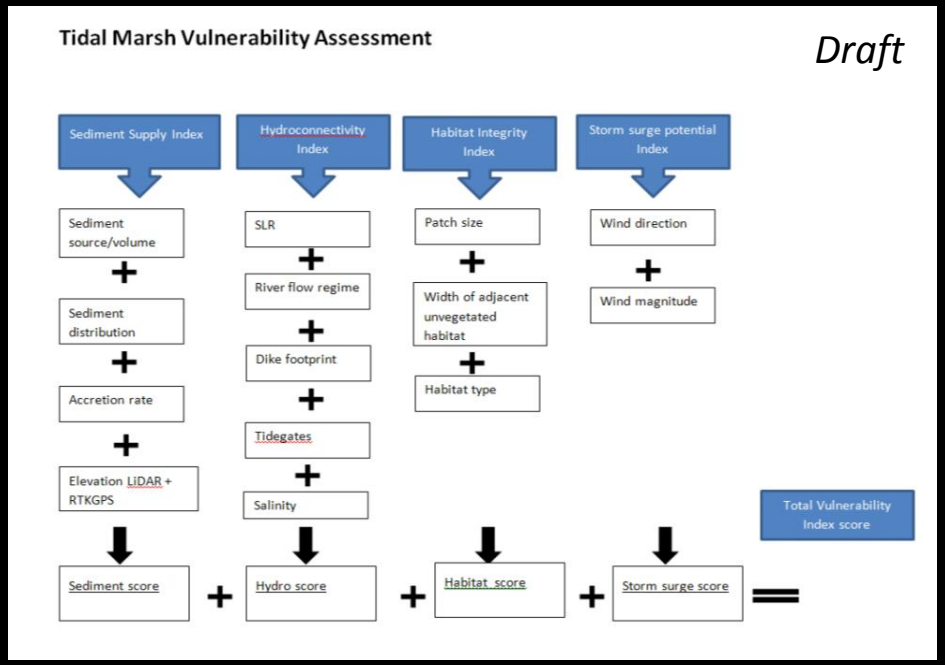
Understanding vulnerability in order to find solutions

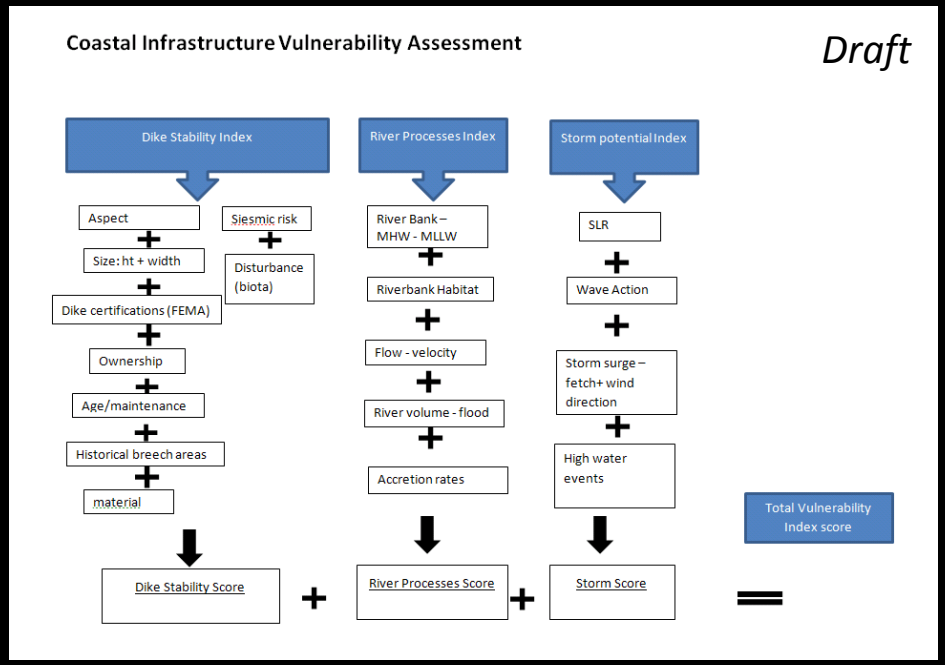
Infrastructure Vulnerability



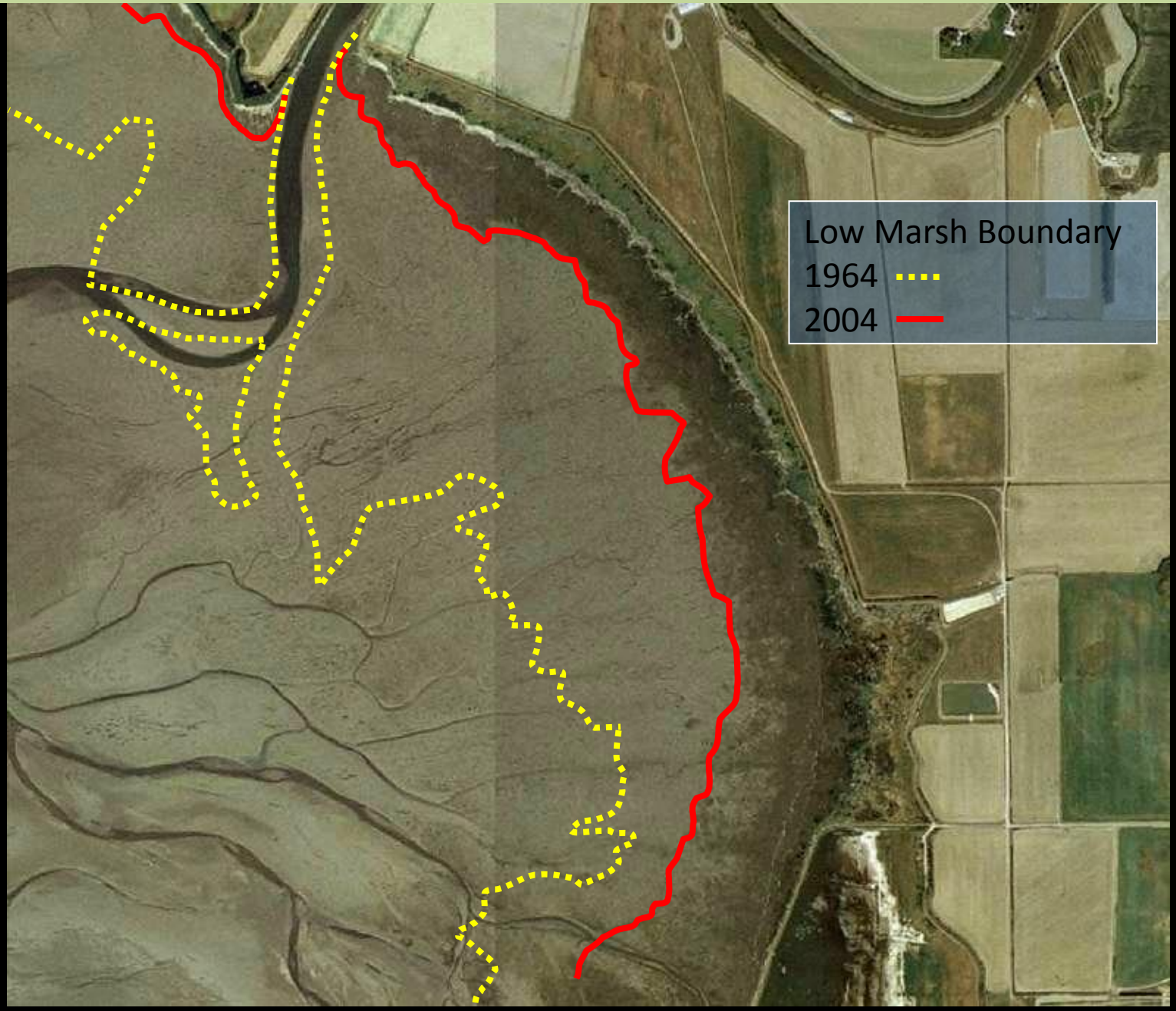
Understanding vulnerability in order to find solutions

Spatial Infrastructure Vulnerability Maps





a vulnerable estuary? a vulnerable community?



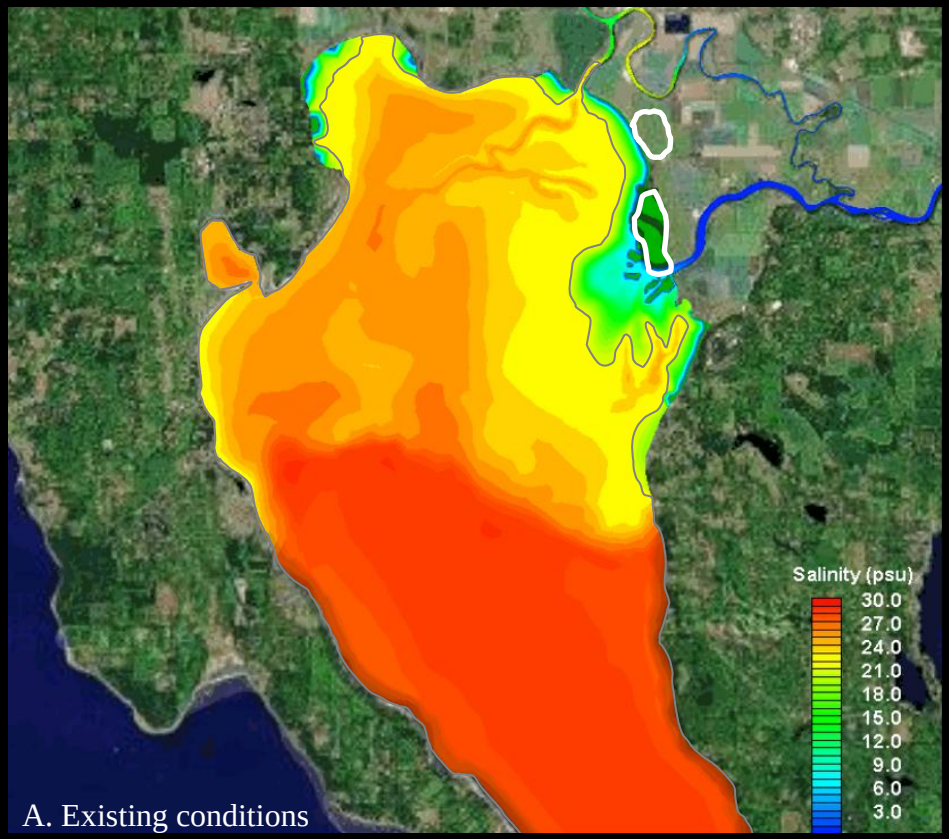
Can we improve both green and grey infrastructure?

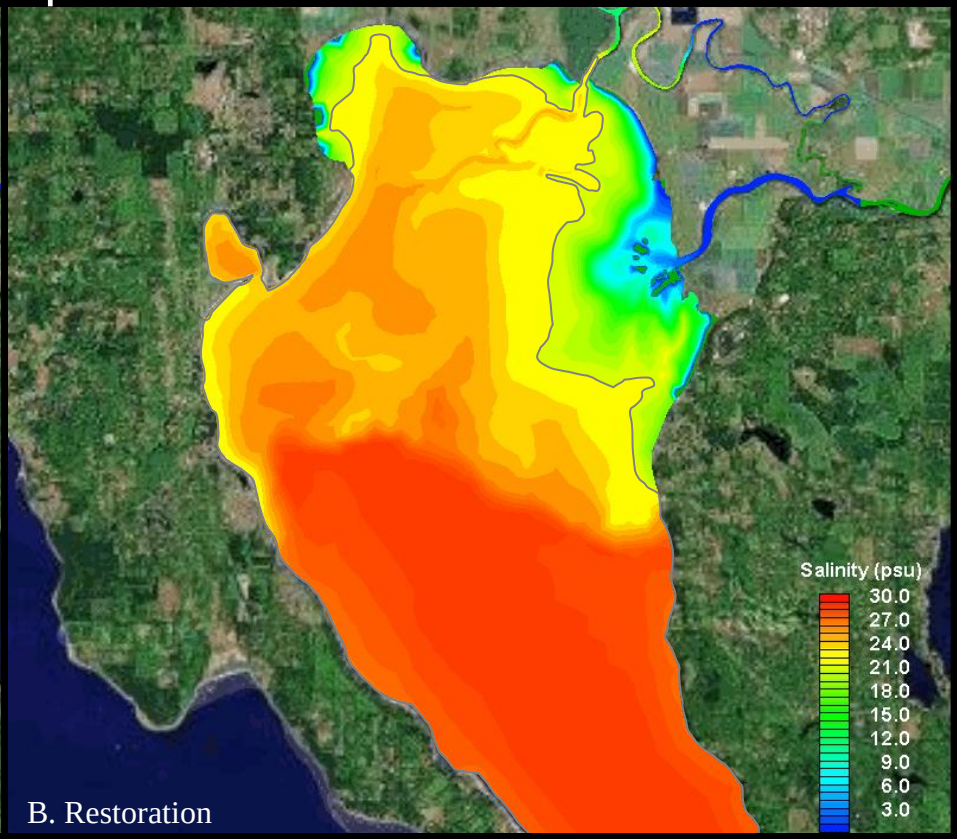
Understanding vulnerability in order to find solutions

Multi-benefit restoration: improving both green and grey infrastructure

pre-restoration

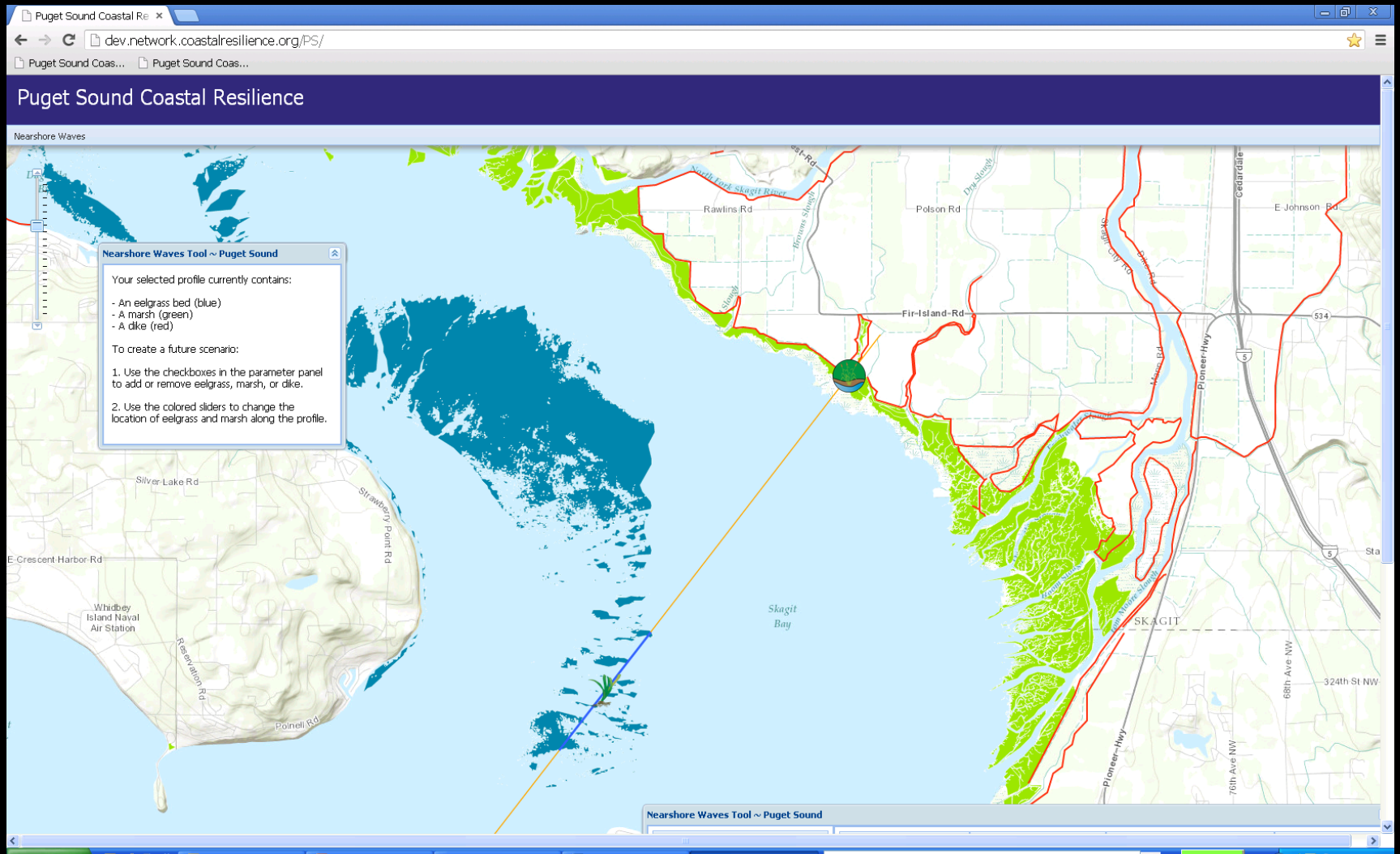
post-restoration



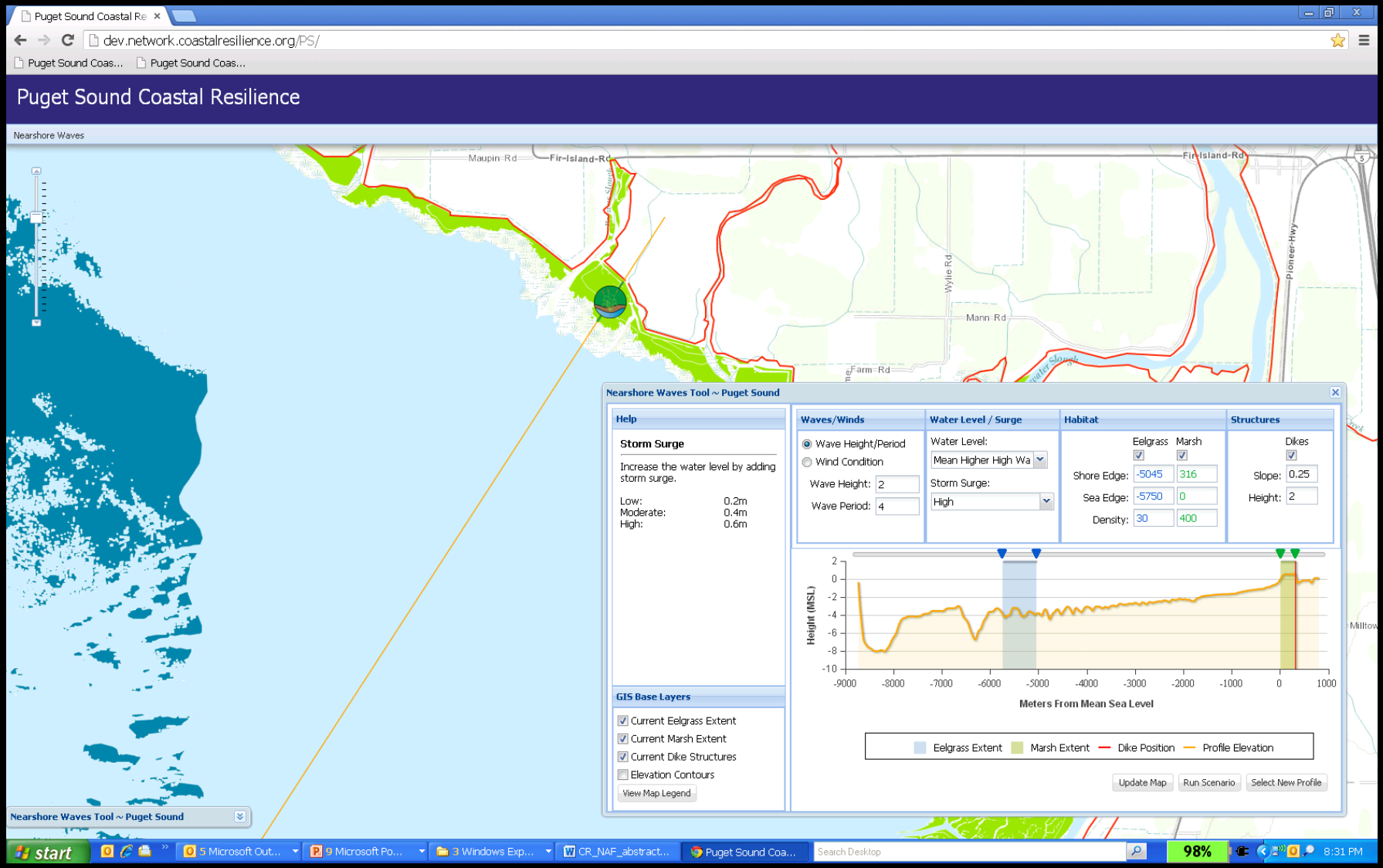


Understanding infrastructure assets to guide investments

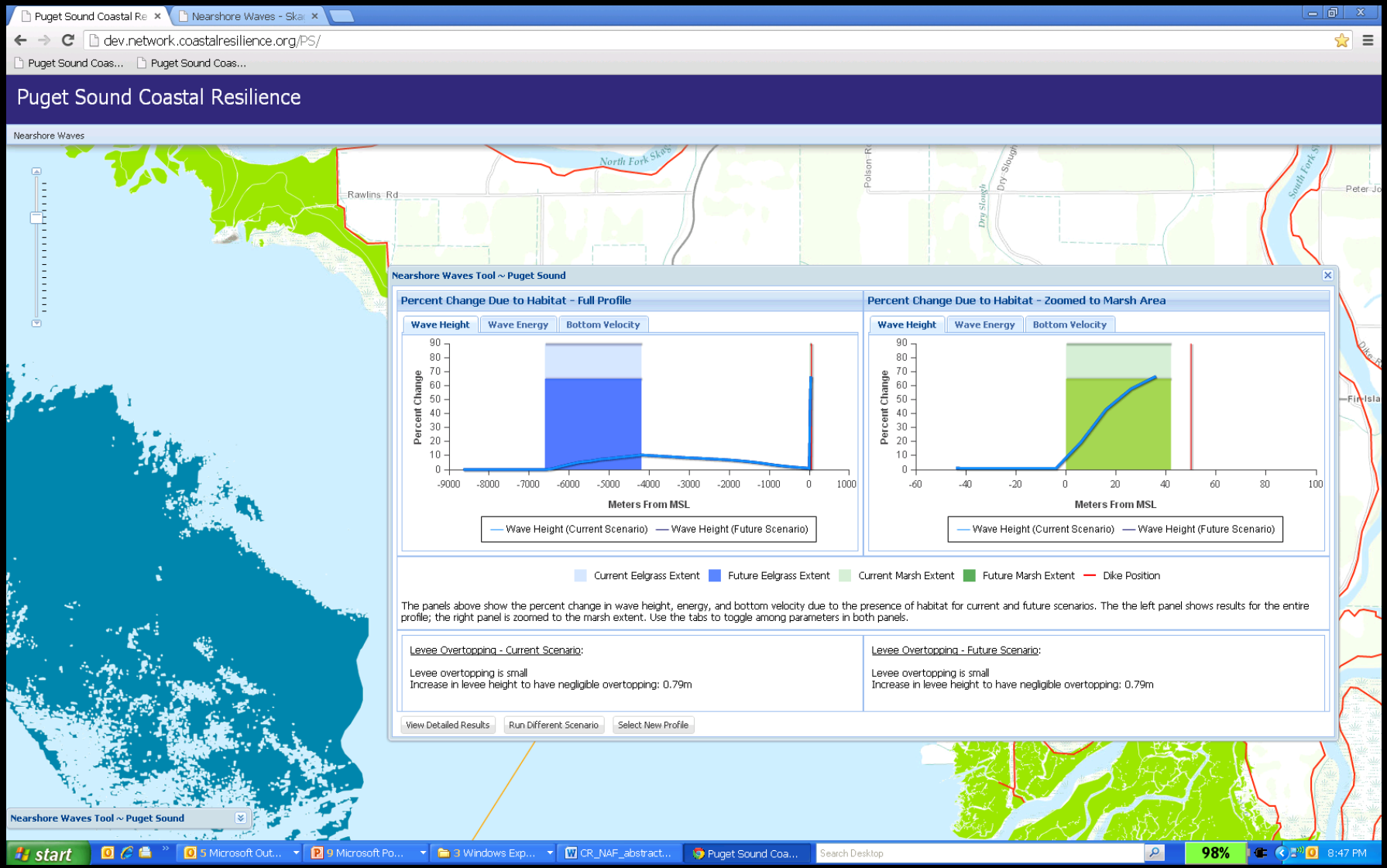
Modeling the performance of green infrastructure



Understanding infrastructure assets to guide investments



Understanding infrastructure assets to guide investments



…finding synergistic green-grey solutions

Thanks!

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