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The observed changes in geomorphology and ecosystem processes in our experimental creeks are attributable to the nutrient enrichment treatment because other potential factors did not differ among the experimental marsh systems. Low-marsh sediment deposition rates are high in Plum Island Estuary[48] (up to 8 mm yr^{-1}, Plum Island LTER database; http://ecosystems.mbl.edu/PIE/) and elsewhere in New England[1] while relative sea-level rise in the region is ~ 3 mm yr^{-1} (http://tidesandcurrents.noaa.gov/). Short-term process studies (total suspended solids, accumulation on sediment pads in different habitats, etc., within a tidal cycle or within one year) in the first 4 years of the experiment indicated that sediment deposition in different habitats did not differ across reference and experimental creeks[2]. Mesotidal marsh systems, such as Plum Island, are considered more resilient to sea-level rise than marshes in low tidal ranges[3]. At Plum Island, creek-bank *S. alterniflora* occupies a vertical elevation range of *ca.* 1.4 m while the local sea level increase from 2003 to 2009 was 0.01 m/yr at Portland, ME. The hydroperiod increase from such a small change in sea level during the experiment would not have a negative impact on the highly flood tolerant *S. alterniflora* [4]. Furthermore, the changes in our experimental marshes are not driven by higher-level consumers[5,6] because creek-bank fauna are little changed in terms of species composition, abundance or body size (including *Neries diversicolor*)[7], *Spartina* shows little evidence of herbivore cropping[8], and none of the grazing or burrowing species associated with marsh loss in other US locations [marsh crab (*Sesarma reticulatum)*, marsh periwinkle (*Littoraria irrorata),* nutria (*Myocaster coypus*) etc.] are present in Plum Island Estuary.

Supplemental References

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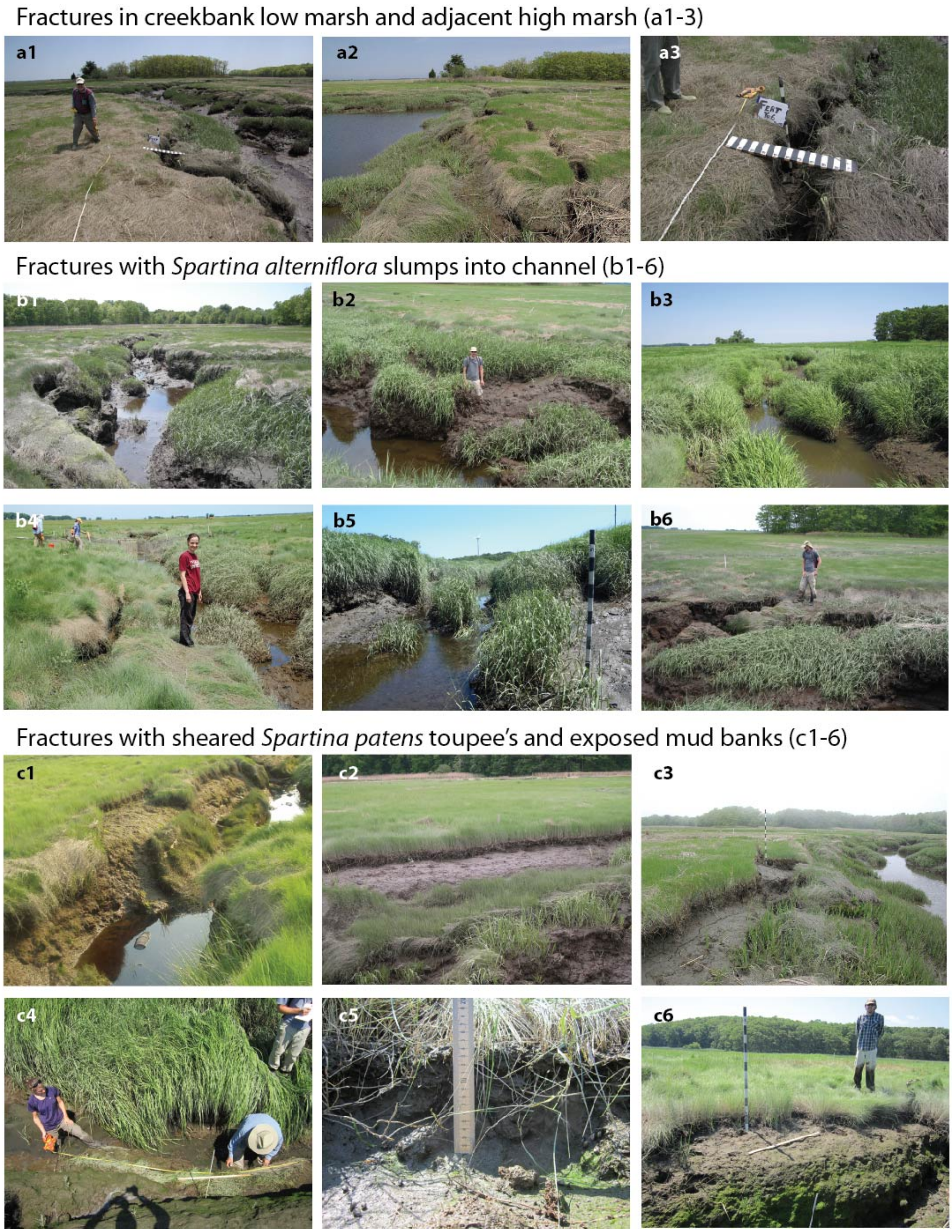

Figure S1. Photos of detailed marsh features. A) Examples of fractures in *Spartina alterniflora* low marsh and *Spartina patens* high marsh adjacent to creek banks. B) Creekbanks with fractures and *Spartina alterniflora* slumps in creek channel. C) Examples of active layer displacement where the *Spartina patens* turf sheared off at the active rooting layer and was displaced down slope into the creek channel. Years of photos: 2005: c1, c2; 2009: a1-b6, c3; 2010: c4-c6. Photo credits: Linda A. Deegan, R. Scott Warren, David S. Johnson, Konner Lockfield, and Erik Yando.