Anisfeld Lab Marsh Nitrogen Studies

Tidal Wetland Loss Workshop, Oct 22, 2014

PI: Shimon Anisfeld (shimon.anisfeld@yale.edu)
PhD student: Troy Hill

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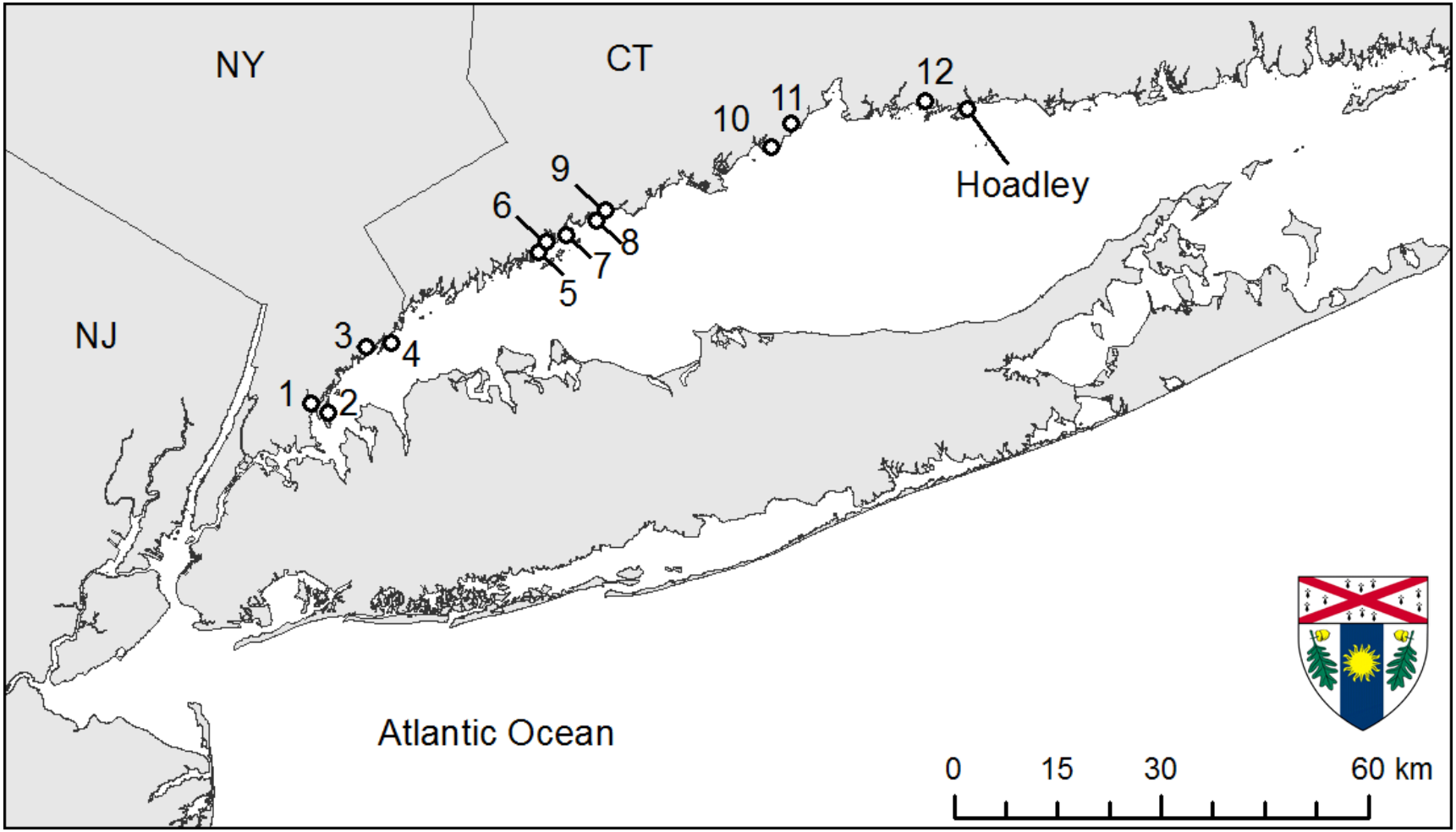


Hypothesis:

Excessive N and/or P inputs will decrease net elevation gain by decreasing belowground NPP or increasing decomposition.

Approaches

1. Fertilization study
   - one site (Hoadley Creek, Guilford)
   - five years
   - C_{ontrol}, N, P, NP
   - n = 6 plots (1.7 m^2) each

2. Cross-site comparison
   - 12 sites in NY and CT
   - Aerial photo analysis: 1974, 1995, 2010
   - Nitrogen measures:
     - Present-day snapshot: Creekwater NO_3^-, leaf N
     - Sediment cores (C:N ratios)

N-fertilized plots had higher aboveground production but identical belowground production.

Table 2 Net aboveground primary production and belowground net primary production, in grams of carbon per square meter per year (mean and SE)

	C	N	NP	P
NAPP—2005	249 (29)	549 (32)*	481 (76)**	332 (64)
NAPP—2007	222 (24)	344 (50)	397 (58)**	239 (15)
NAPP—2008	179 (15)	411 (50)*	394 (50)*	225 (30)
NAPP—2009	153 (16)	355 (29)*	452 (63)***	136 (18)
BNPP—2007	670 (120)	537 (60)	660 (120)	540 (120)
BNPP—2009	384 (25)	463 (42)	394 (30)	383 (27)

Within a row, treatments that are significantly different from controls are indicated

*$p<0.01$; **$p<0.05$; ***$p<0.001$

Higher respiration in N-fertilized plots . . .

Table 7 Annual CO_2 flux rates, by year and treatment, in grams of carbon per square meter per year (mean and SE)

	C	N	NP	P
2008	146 (14)	224 (7)**	208 (14)**	181 (3)
2009	218 (23)	292 (19)	302 (25)*	210 (15)

Treatments that are significantly different from controls are indicated by asterisks

*$p<0.05$; **$p<0.01$

No effect on net elevation change . . .

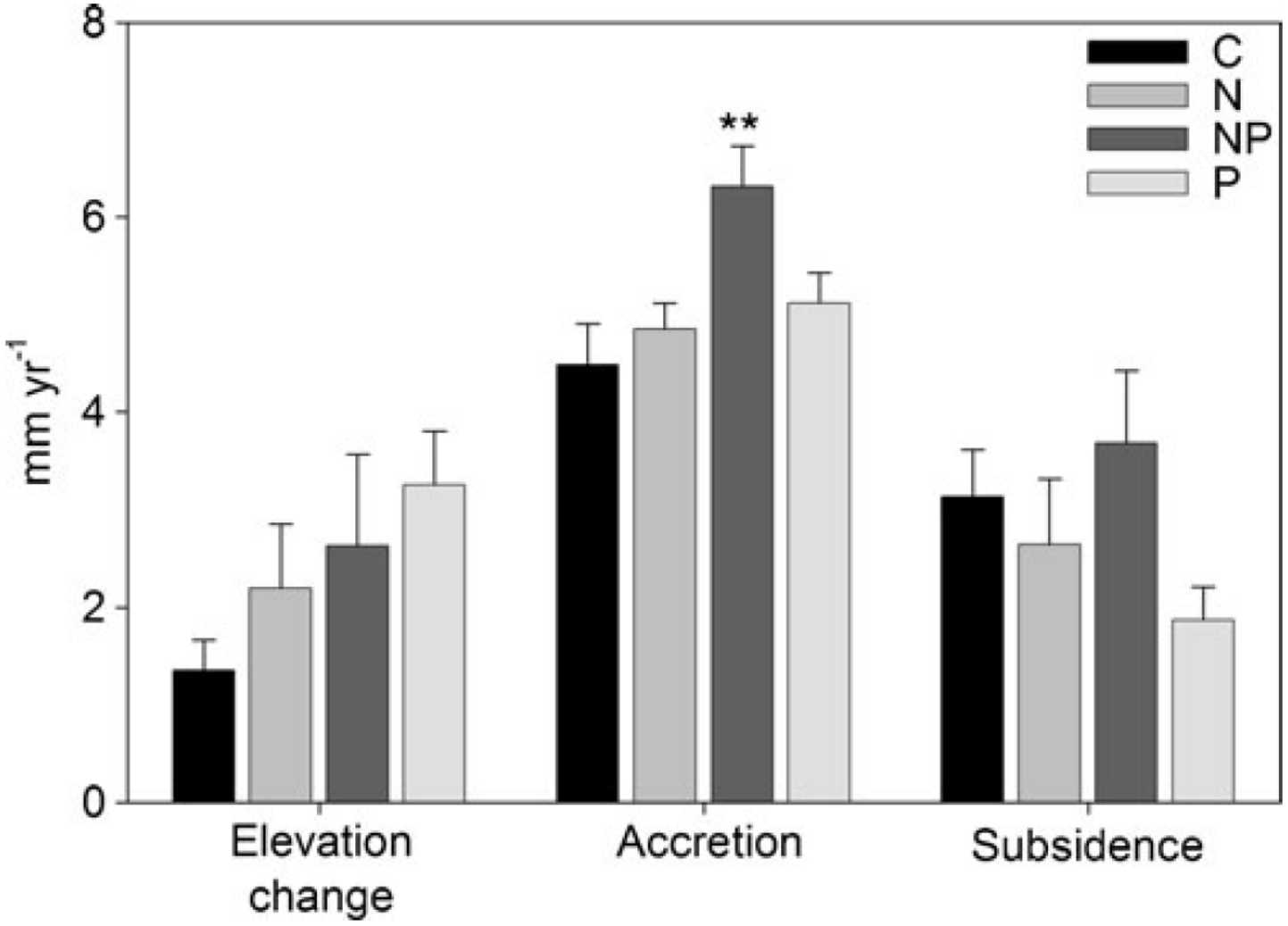
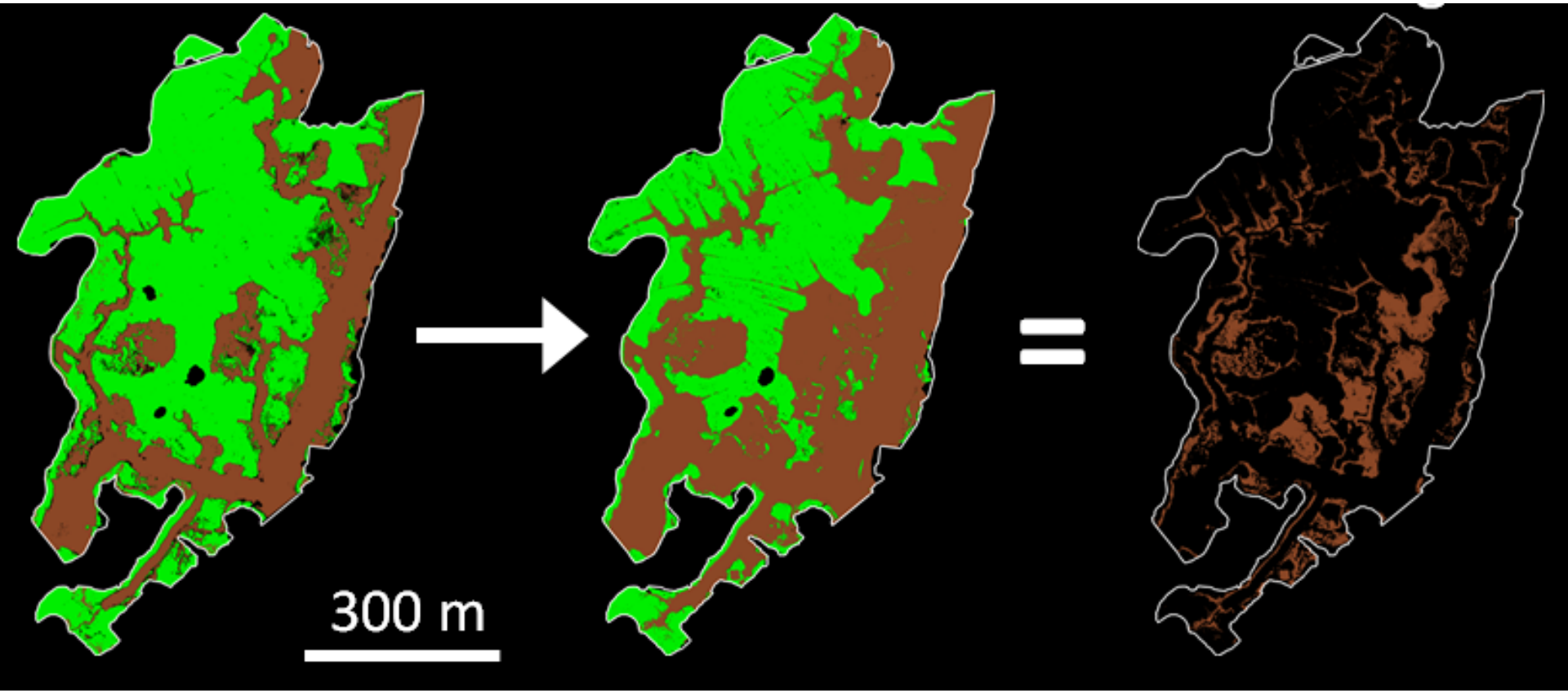
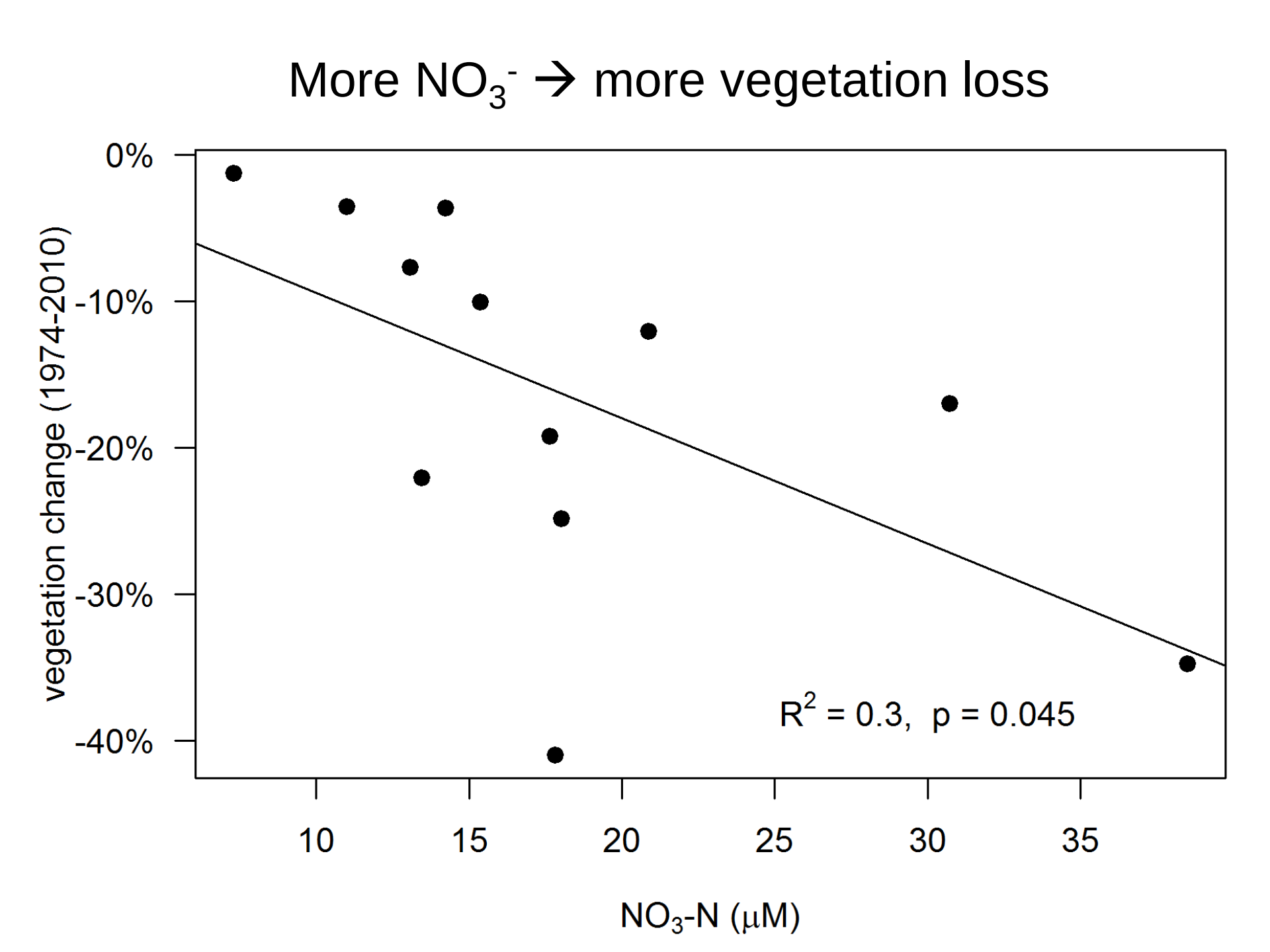


Fig. 3 Elevation change, accretion, and subsidence (mean±SE) over 5 years. Treatments that are significantly different from controls are indicated by *asterisks* (**$p<0.01$)

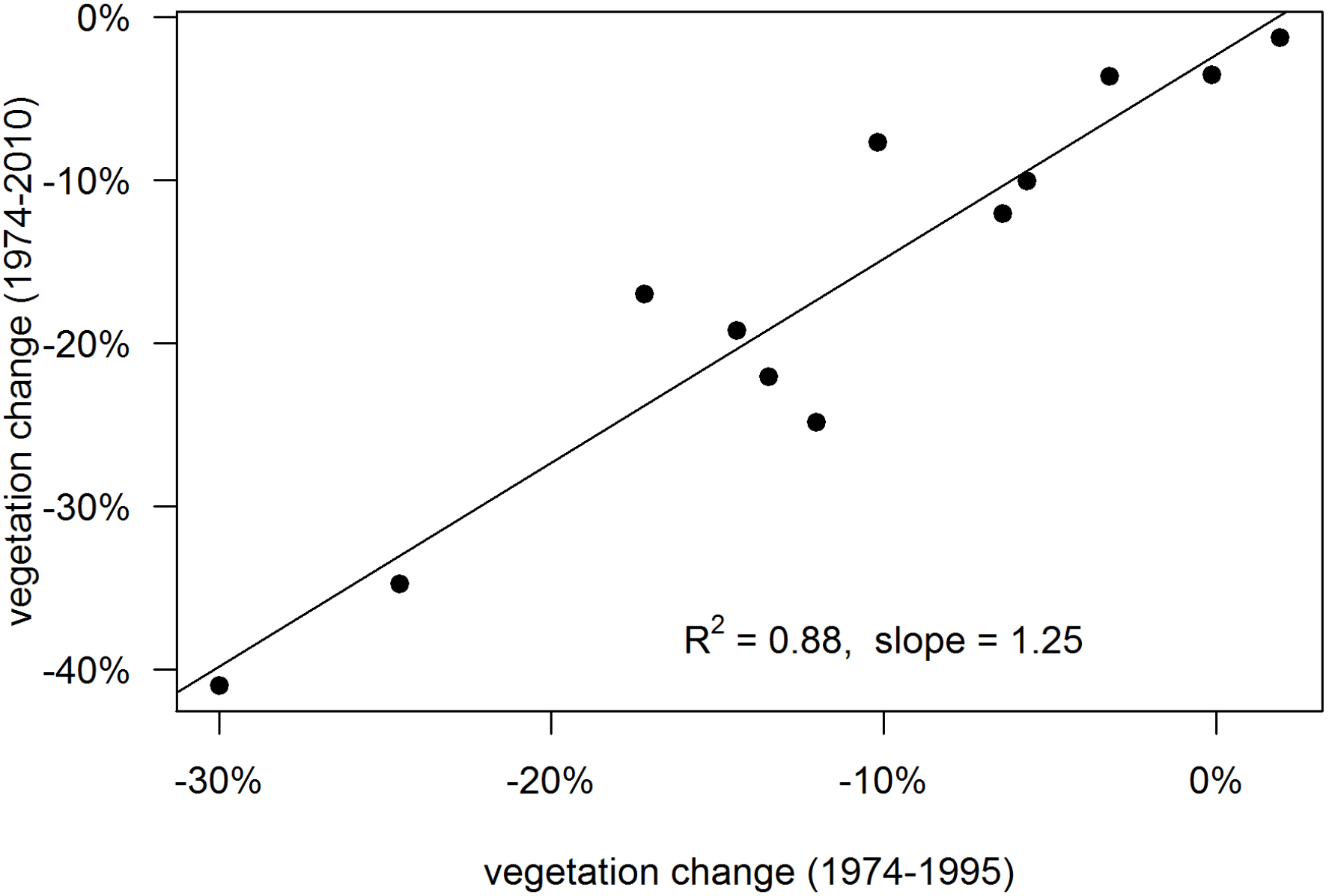
Multi-site analysis:

Does N correlate with vegetation loss?




More NO_3^- → more vegetation loss
0%
-10%
-20%
-30%
-40%
vegetation change (1974-2010)
10
15
20
25
30
35
NO_3-N (μM)
R^2 = 0.3, p = 0.045

But, most loss occurred during 1974-1995



Sediment C:N ratios in the 1970s: no relationship