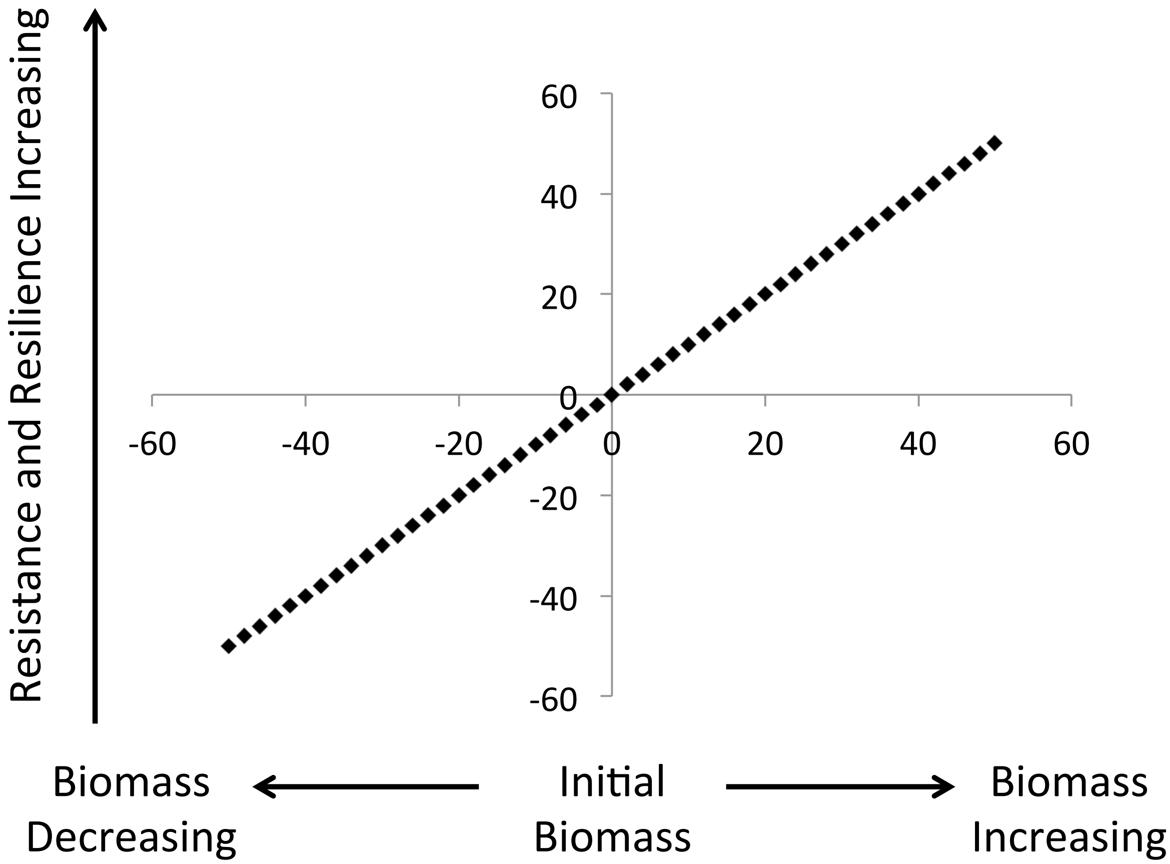
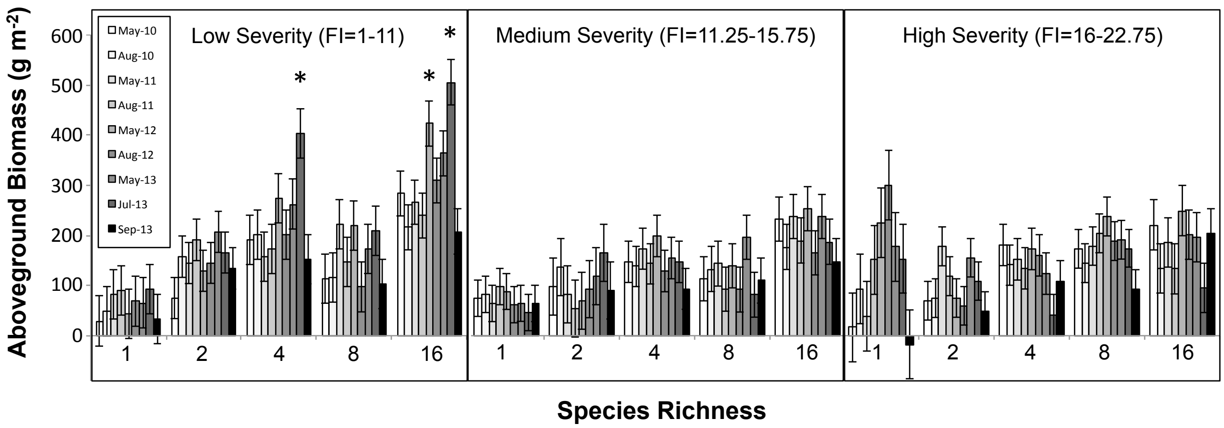
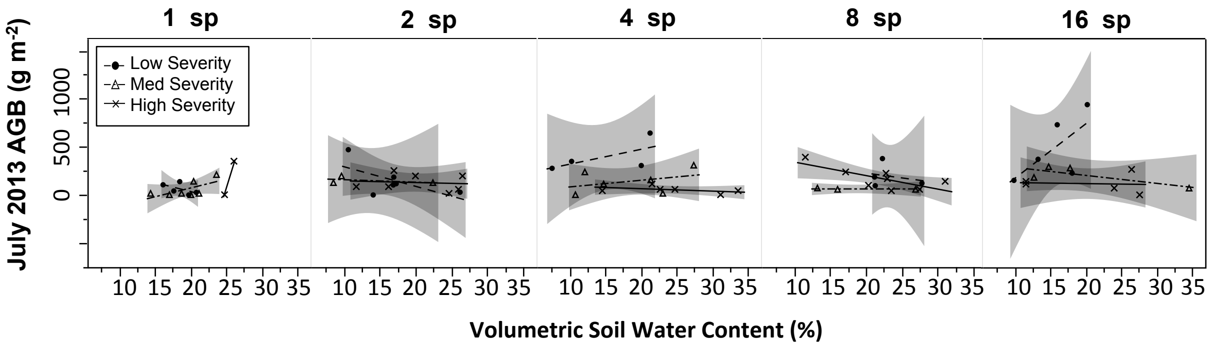


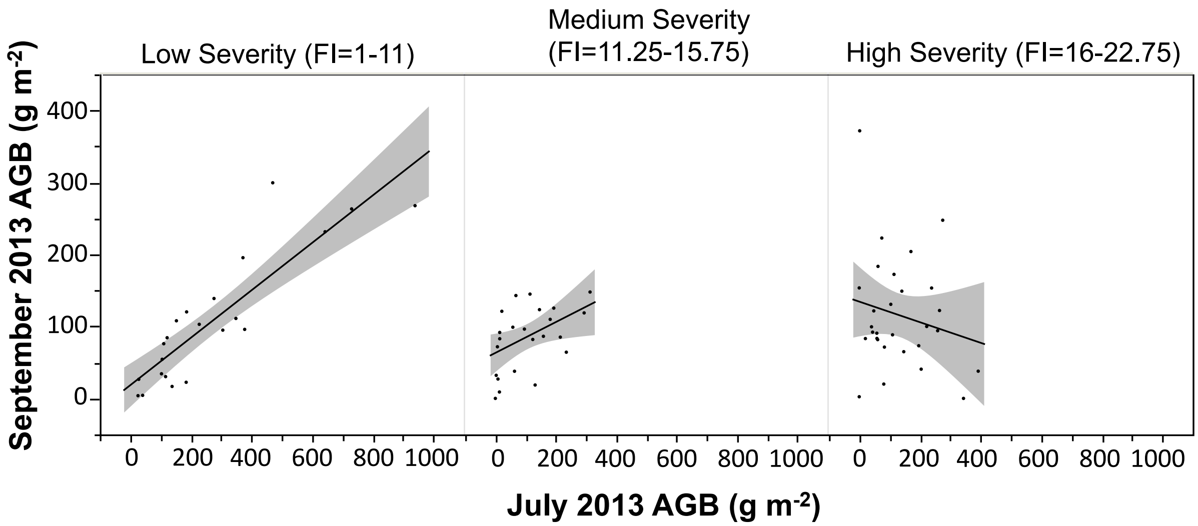
Supplementary Fig. 1 Resistance and resilience measurements. The calculation of stability is varied in the literature. Here we report absolute change in biomass over time, which is often reported as resistance (postflood – preflood biomass) or recovery (biomass after a longer period of time – postflood biomass). Unfortunately, these terms can be misleading whenever biomass is increasing in response to a disturbance (upper right hand quadrant of the graph below). An increase in biomass with respect to the initial biomass would be interpreted as a further increase in resistance (according to the y-axis), though if resistance is meant to describe resistance to change, moving to the right on the graph shows biomass moving farther away from the baseline which should be described as decreasing resistance. We thus use the same calculation, but call it "change from baseline".



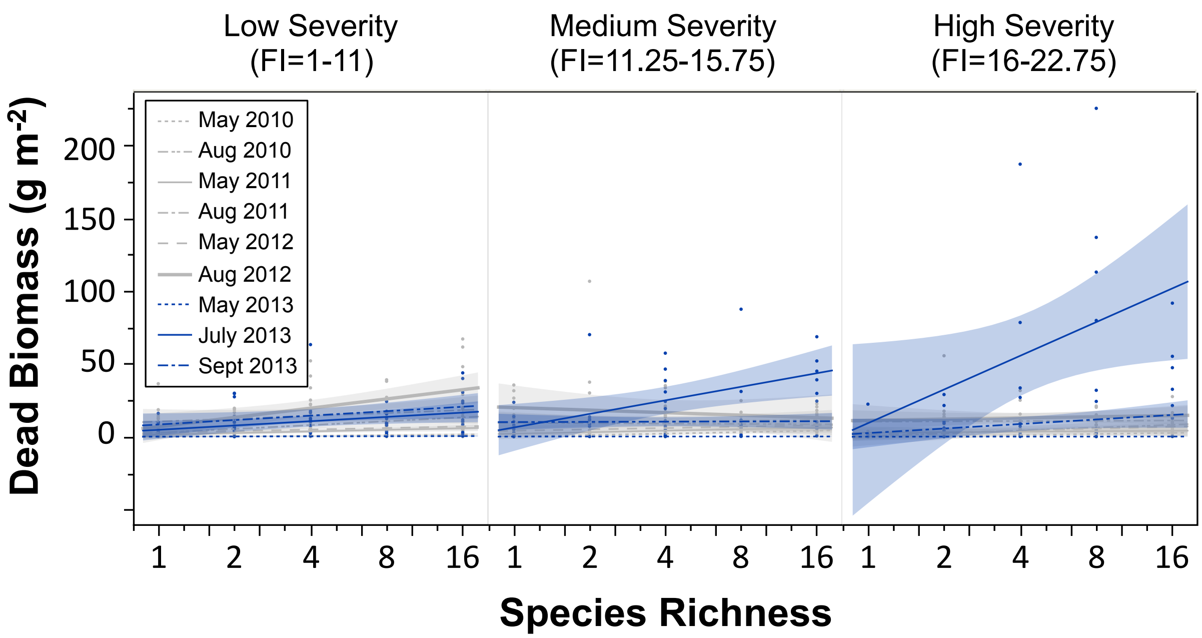
Supplementary Fig. 2 Multiple comparisons of aboveground biomass over time. To understand when productivity was highest over the course of the study, we assessed the differences in aboveground biomass (live tissue) between discrete values for all sampling dates, species richness levels, and flooding index (FI) classes (equally divided groups are the same as throughout the rest of the paper, n_{low}=25, n_{med}=25, n_{high}=26). We then compared all values using a Student's t-test. Aboveground biomass production in the highest diversity plots in the lowest flooding severity levels in July 2013 (immediately after the flood) was the highest it had been since 2010. Aboveground biomass in 4-species plots in July 2013 and 16-species plots in May 2012 were lower though not significantly different from this number. Asterisks represent values with significantly greater aboveground biomass than all other groups. Error bars represent 95% confidence intervals.



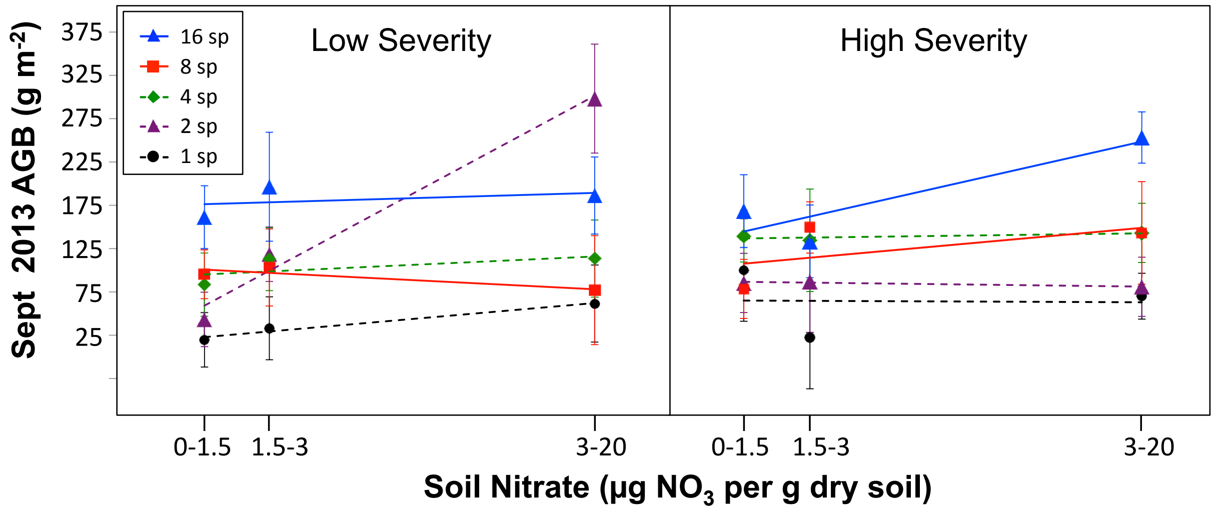
Supplementary Fig. 3. Soil water and aboveground biomass in July 2013. We measured volumetric soil water content at 20 cm depth (%) at the time of the July 2013 biomass harvest and found that increasing biomass in the 16-species plots in July 2013 was related to increasing availability of soil moisture, but this was only true in plots where flooding severity was low. A similar pattern was present in the 4-species plots and reflected in the greater biomass of 4-species plots in July 2013. We assessed differences using a mixed effects model framework (n=76). Flooding severity (FI) groups were set at the same levels as throughout the rest of the paper (FI_{low}= 1-11, FI_{med} = 11.25-15.75, FI_{high} = 16-22.75). Shaded areas represent 95% confidence intervals.



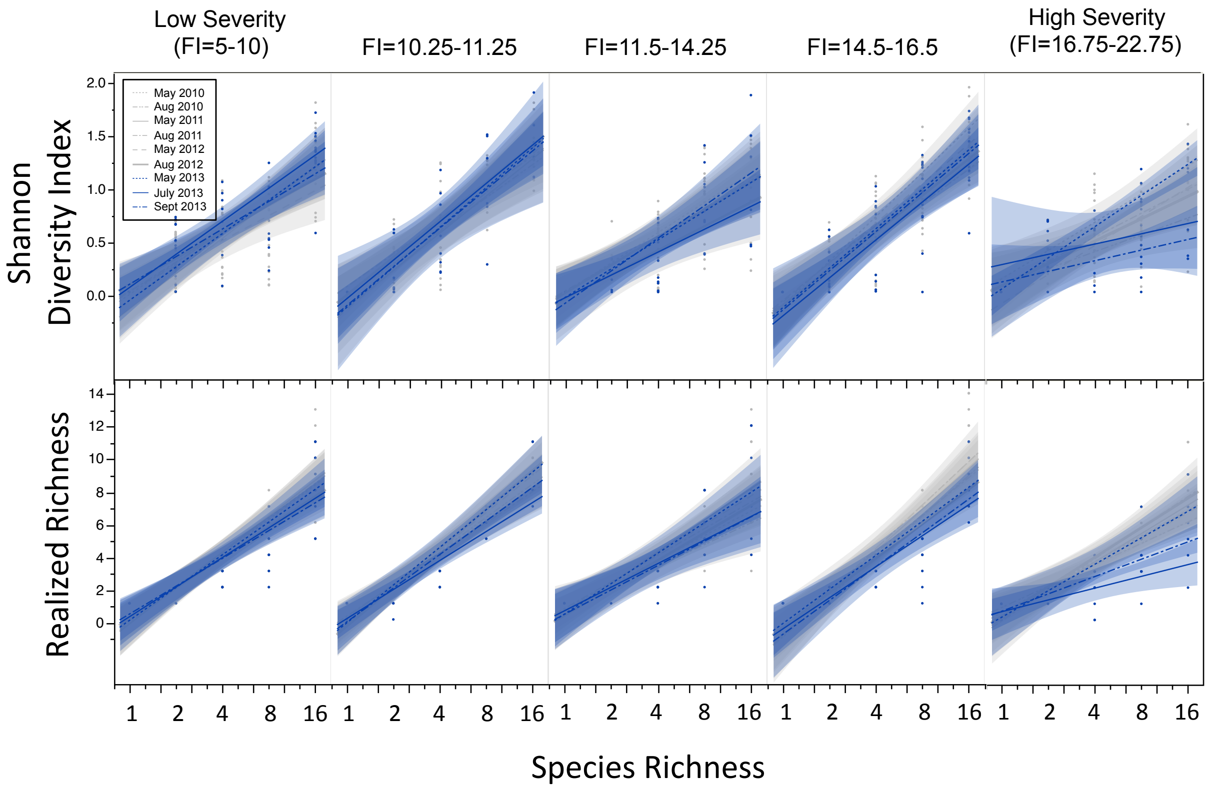
Supplementary Fig. 4 Legacy aboveground biomass (AGB) between July 2013 and September 2013. We measured AGB in September 2013 and July 2013 and found that growth by September was largely a reflection of growth that had occurred in the previous July, but this was only true when flooding index (FI) was low (significant interaction between the effect of July 2013 AGB and flooding on September 2013 AGB, $F_{1,69}$=19.4, P<0.0001). We assessed differences using a mixed effects model framework (n=76). Shaded areas represent 95% confidence intervals.



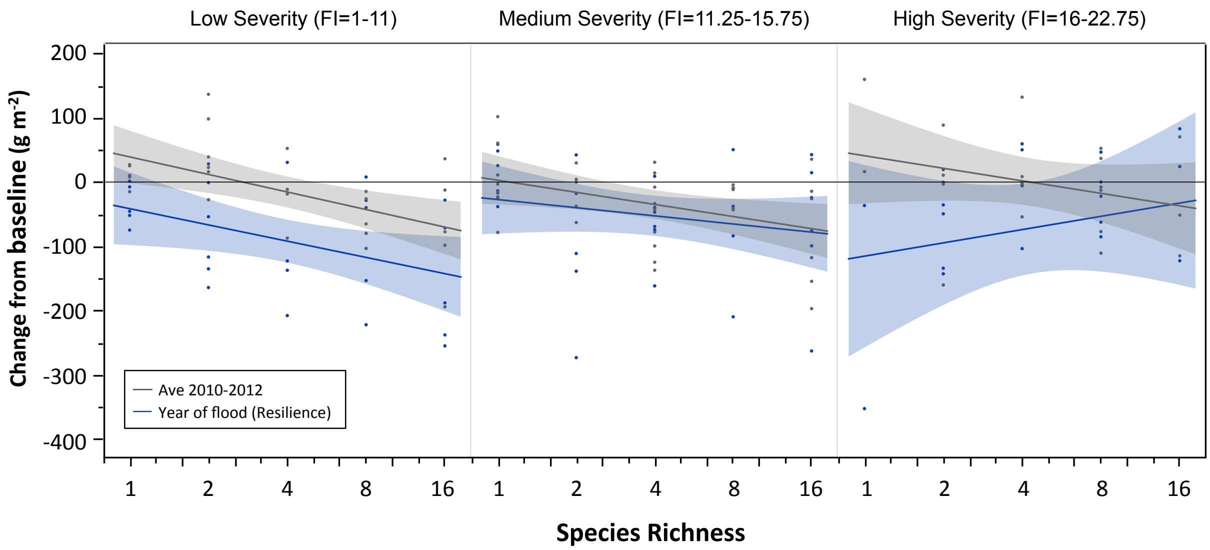
Supplementary Fig. 5 Dead biomass measured over time. Dead biomass was separated and measured in May 2013, early July 2013, and September 2013 and compared to dead biomass in previous years (since 2010) using a mixed effects statistical framework (n=76). Dead biomass was highest in higher diversity/high flood index (FI) plots in July 2013. Shaded areas represent 95% confidence intervals.



Supplementary Fig. 6 Soil nitrate and aboveground biomass production in September 2013. We measured soil nitrate in October 2013 and found that it was correlated with aboveground biomass in September, where higher diversity plots that experienced more flooding in July 2013, were more productive in Sept 2013, due to increasing soil nitrate (blue line in the panel on the right). Flooding severity was split into two equally sized groups (not three due to smaller sample sizes) for display purposes: low severity *FI* = 1-12 days full submergence (n=35), high severity *FI* = 12.25-22.75 (n=36). Values displayed are adjusted means and error bars demonstrate standard error measurements.



Supplementary Fig. 7 Shannon diversity and realized species richness over time. We assessed the importance of species richness and flooding intensity on Shannon diversity index and realized richness at every time period for the past 4 years (n=76 for each time interval). This analysis was done in the mixed effects model framework. We found that diversity was similar to previous years both in terms of Shannon Diversity Index (a) and realized species richness (b). However, at the very highest level of flooding severity, higher diversity plots lost an average of 3-4 species and this species loss was persistent through September 2013. The flooding index (FI) divisions in this figure comprise five equally sized groups, as three and four groups were not sufficient to determine the basis of the three-way interaction indicated in Table 1. In other words, species loss was only evident at very severe levels of flooding. Shaded areas represent 95% confidence intervals.



Supplementary Fig. 8. Resilience of communities in the year of the flood. We measured plot biomass before the flood (May 2013) and several months after the floodwaters had receded (September 2013). For comparison we also demonstrate the same average seasonal variation (May – Aug, 2010-2012) that was shown in Fig. 4. We assessed differences using a mixed-effects statistical model for the effects of species richness and flood intensity on community resilience (Sept 2013 – May 2013 biomass). We found a significant interaction between species richness and flooding intensity on longer term seasonal resilience ($F_{1,72}$=4.06, P=0.05). Higher diversity communities were more resilient in the most severely flooded plots. However, similar to the underlying seasonal pattern from previous years, higher diversity communities were less resilient than lower diversity communities in the least severely flooded plots.

Supplementary Table 1. Summary table of raw values and standard errors on all continuous and discrete factors and their interactions in our three-way mixed effects ANCOVA assessing the effects of time, species richness (SR), and flooding index (FI) on aboveground biomass. Asterisks and bolded items denote significance at the 0.05 level (n=76 for each time interval).

	Value	**Std.Error**	**t-value**	**P-value**
(Intercept)	47.28	60.19	0.79	0.43
Aug-10	40.93	63.30	0.65	0.52
May-11	70.07	63.30	1.11	0.27
Aug-11	94.05	63.30	1.49	0.14
May-12	-14.30	63.30	-0.23	0.82
Aug-12	18.78	63.30	0.30	0.77
May-13	70.97	63.30	1.12	0.26
July-13	34.78	63.30	0.55	0.58
Sep-13	69.84	63.30	1.10	0.27
SR	160.23	82.48	1.94	0.06
FI	-0.01	4.44	0.00	1.00
Aug-10 x SR	-14.16	93.51	-0.15	0.88
May-11 x SR	-22.56	93.51	-0.24	0.81
Aug-11 x SR	-93.58	93.51	-1.00	0.32
May-12 x SR	215.34	93.51	2.30	**0.02***
Aug-12 x SR	-13.95	93.51	-0.15	0.88
May-13 x SR	98.25	93.51	1.05	0.29
July-13 x SR	381.44	93.51	4.08	**0.0001***
Sept-13 x SR	-105.64	93.51	-1.13	0.26
Aug-10 x FI	-0.12	4.76	-0.02	0.98
May-11 x FI	-2.61	4.76	-0.55	0.58
Aug-11 x FI	-2.84	4.76	-0.60	0.55
May-12 x FI	3.03	4.76	0.64	0.53
Aug-12 x FI	1.39	4.76	0.29	0.77
May-13 x FI	-1.88	4.76	-0.39	0.69
July-13 x FI	-0.51	4.76	-0.11	0.91
Sept-13 x FI	-5.62	4.76	-1.18	0.24
SR x FI	-0.85	6.02	-0.14	0.89
Aug-10 x SR x FI	-4.45	6.82	-0.65	0.51
May-11 x SR x FI	-0.21	6.82	-0.03	0.97
Aug-11 x SR x FI	1.00	6.82	0.15	0.88
May-12 x SR x FI	-13.72	6.82	-2.01	**0.04***
Aug-12 x SR x FI	-2.85	6.82	-0.42	0.68
May-13 x SR x FI	-8.35	6.82	-1.22	0.22
July-13 x SR x FI	-28.92	6.82	-4.24	**<0.0001***
Sept-13 x SR x FI	4.45	6.82	0.65	0.51

Supplementary Table 2. Vol. soil water (%), flooding index (FI), and species richness (SR) helped explain differences in AG biomass production in July 2013. We analyzed the effects of volumetric soil water content (%) at 20 cm, species richness (continuous log-transformed), and flooding index (continuous) on July 2013 aboveground biomass. To assess the potential for non-linear responses at different levels of biodiversity and flooding severity, we also analyzed the July 2013 growth response in terms of species richness (discrete factor), flooding index (binned according to the three equal subdivisions of the data), and continuous soil water. Asterisks and bolded items denote significance at the 0.05 level (n=76).

	Continuous Effects			Discrete Effects		
Effects Tests	**d.f.**	**F-ratio**	**P-value**	**d.f.**	**F-ratio**	**P-value**
SR	1, 65	15.0	**0.0002***	4, 43	5.42	**<0.001***
FI	1, 65	22.2	**<0.0001***	2, 43	9.52	**0.0004***
Soil Water	1, 65	2.04	0.16	1, 43	4.14	0.05
SR x FI	1, 65	17.4	**0.0001***	8, 43	3.70	**0.002***
SR x Soil Water	1, 65	0.00	1.00	4, 43	0.35	0.85
FI x Soil Water	1, 65	6.92	**0.01***	2, 43	1.28	0.29
SR x FI x Soil Water	1, 65	0.02	0.88	8, 43	3.17	**0.007***

Supplementary Table 3. Soil nitrate, flooding index (FI), and species richness (SR) helped explain differences in AG biomass production in September 2013. We analyzed the effects of soil nitrate, species richness (continuous log-transformed), and flooding index (continuous) on September 2013 aboveground biomass. To assess the potential for non-linear responses at different levels of biodiversity and flooding severity, we also analyzed the September 2013 growth response in terms of species richness (discrete factor), flooding index (continuous factor as binning this factor led to too much overlap between random block effects and flooding severity so the model failed to converge), and continuous soil nitrate. Asterisks and bolded items denote significance at the 0.05 level (n=73).

	Continuous Effects			**Discrete Effects**		
	d.f.	**F-ratio**	**P-value**	**d.f.**	**F-ratio**	**P-value**
SR	1, 64	26.3	**<0.0001***	4, 52	11.0	**<0.0001***
FI	1, 64	0.07	0.80	1, 52	0.002	0.97
Oct Nitrate	1, 64	0.34	0.56	1, 52	0.29	0.59
SR x FI	1, 64	1.41	0.24	4, 52	0.90	0.47
SR x Nitrate	1, 64	0.02	0.89	4, 52	4.14	**0.006***
FI x Nitrate	1, 64	1.48	0.23	1, 52	0.66	0.42
SR x FI x Nitrate	1, 64	2.89	0.09	4, 52	3.48	**0.01***