

APPENDIX A. Multivariate methods for measuring invasive plant impacts.

TABLE A1. Suite of ecological impact metrics (EIMs) measured within each treatment (invaded, uninvaded, removed), their categorization, and methodological details.

Measured EIM	EIM Categorization	Additional Details	Reference
Diversity index (H')	Plant community	H' calculated on a percent area basis	(Spellerberg & Fedor 2003)
Diversity index w/o invader	Plant community	H' calculated on a percent area basis	
Richness	Plant community	USDA plants database used to determine nativity (USDA 2014)	(Flory 2010)
Native richness	Plant community	USDA plants database used to determine nativity	
Invasive richness	Plant community	USDA plants database used to determine nativity	
Bare ground (%)	Plant community		
Other invader cover (%)	Plant community		
Native cover (%)	Plant community		
Microbial biomass (mg kg ⁻¹)	Other biotic/abiotic	Chloroform fumigation	(Jenkinson & Powlson 1976)
Microbial activity (μg CO ₂ 10g soil ⁻¹ hr ⁻¹)	Other biotic/abiotic	Soil induced respiration	(Anderson & Domsch 1978)
Light penetration (%)	Other biotic/abiotic	$\frac{PAR_{above} - PAR_{below}}{PAR_{above}}$	(Machado & Reich 1999)
Litter abundance (g m ⁻²)	Other biotic/abiotic	Collected from 0.0625 m ² border	
Litter decomposition (%)	Other biotic/abiotic	0.0625 m ² area	(LIDET 1995)
Earthworms m ⁻²	Other biotic/abiotic	0.00785m ² area with 0.32L mustard solution (10g L ⁻¹)	(Eisenhauer & Scheu 2008)
Infiltration rate (cm min ⁻¹)	Soil physical property	0.1m diameter PVC ring driven 0.08m into soil	(SEMCOG 2008)
Soil moisture (%)	Soil physical property	Dynamax TH300	Dynamax Manual
pH	Soil physical property		Virginia Cooperative Extension
Organic matter (%)	Soil physical property		Virginia Cooperative Extension
TOC (ppm)	Soil physical property		Virginia Cooperative Extension
CEC (meq 100g ⁻¹)	Soil physical property		Virginia Cooperative Extension
N (%)	Soil nutrient		Virginia Cooperative Extension
P (ppm)	Soil nutrient		Virginia Cooperative Extension
K (ppm)	Soil nutrient		Virginia Cooperative Extension
Ca (ppm)	Soil nutrient		Virginia Cooperative Extension
Mg (ppm)	Soil nutrient		Virginia Cooperative Extension
Zn (ppm)	Soil nutrient		Virginia Cooperative Extension
Mn (ppm)	Soil nutrient		Virginia Cooperative Extension
Cu (ppm)	Soil nutrient		Virginia Cooperative Extension
Fe (ppm)	Soil nutrient		Virginia Cooperative Extension
B (ppm)	Soil nutrient		Virginia Cooperative Extension

TABLE A2. Principle component analysis (PCA) selected components. Flagship EIM values are bolded for each component.

	Component 1	Component 2	Component 3	Component 4	Component 5
Species of interest cover (%)	-0.0246	-0.7462	0.2128	0.2386	-0.2206
Diversity index (H')	0.0449	0.8892	-0.2227	-0.0518	0.1010
Diversity index w/o invader	0.1207	0.7651	-0.1656	0.1877	-0.0430
Richness	-0.0751	0.5961	-0.1210	0.2534	0.6548
Native richness	-0.1090	0.6319	-0.1524	-0.1443	0.6367
Invasive richness	0.0640	-0.0063	0.0533	0.8843	0.1163
Bare ground (%)	0.1088	0.8272	-0.2513	-0.3108	-0.1318
Other invader cover (%)	-0.0888	0.0311	-0.0298	0.6650	0.0259
Native cover (%)	-0.1496	-0.0981	0.0687	-0.0933	0.7792
Microbial biomass (mg kg ⁻¹)	0.7752	0.1206	0.3387	0.0136	0.1370
Microbial activity ($\mu\text{g CO}_2$ 10g soil ⁻¹ hr ⁻¹)	-0.6902	0.0468	-0.2035	-0.0083	-0.0986
Light penetration (%)	0.3193	0.6037	-0.2063	-0.2722	-0.3409
Litter abundance (g m ⁻²)	-0.1705	0.0764	-0.0027	-0.4472	-0.4700
Litter decomposition (%)	0.6052	-0.1822	0.0677	0.0118	0.3342
Earthworms m ⁻²	-0.1029	0.3877	0.0211	0.2130	-0.1210
Infiltration rate (cm min ⁻¹)	0.5887	0.0828	-0.1573	-0.2888	-0.0880
Soil moisture (%)	-0.2466	0.0688	-0.2553	0.5623	-0.4195
pH	0.3985	-0.2647	0.7311	-0.1106	0.2493
Organic matter (%)	0.9571	0.1204	-0.0005	0.0269	-0.0105
TOC (ppm)	0.8862	0.0736	0.1826	-0.0077	-0.0011
CEC (meq 100g ⁻¹)	-0.1080	0.0438	0.4694	-0.3396	-0.0991
N (%)	0.9174	0.1175	0.0580	0.1866	-0.0061
P (ppm)	0.6783	-0.0334	0.1227	-0.1908	-0.1780
K (ppm)	0.4387	-0.3274	0.2316	0.5045	-0.1086
Ca (ppm)	0.4687	-0.1911	0.8280	0.0419	0.1042
Mg (ppm)	0.5009	-0.1475	0.8084	-0.0201	0.1584
Zn (ppm)	0.0093	-0.4733	-0.1332	-0.0308	-0.1077
Mn (ppm)	-0.2850	-0.2649	0.8027	0.1703	-0.2259
Cu (ppm)	-0.5721	-0.0717	-0.0783	0.6074	-0.1708
Fe (ppm)	-0.2402	-0.1506	-0.0933	-0.0331	-0.4664
B (ppm)	0.4955	-0.1305	0.8115	0.0588	0.1230

TABLE A3. Unique resident plants within specific treatments. Same species are ordered by row.

Present in RE not IN
<i>Acalypha virginica</i>
<i>Actaea racemosa</i>
<i>Arisaema triphyllum</i>
<i>Athyrium filix-femina</i>
Unknown grass 1
<i>Carex swanii</i>
Unknown forb
Unknown tree
<i>Dioscorea villosa</i>
<i>Fatoua villosa</i>
<i>Galium circaezans</i>
<i>Geranium carolinianum</i>
<i>Hypericum canadense</i>
<i>Ligustrum sinensis</i>
Unknown rosette
Unknown grass 2
<i>Stellaria pubera</i>
<i>Osmunda claytoniana</i>
<i>Pinus strobus</i>
<i>Polygonum convolvulus</i>
<i>Prunella vulgaris</i>
Unknown rush
<i>Celastrus orbiculatus</i>
<i>Solidago</i> spp.
<i>Solidago curtisii</i>
Unknown grass 3
<i>Stellaria media</i>
<i>Viola</i> spp.
Unknown grass 4
<i>Uvularia grandiflora</i>
<i>Vaccinium angustifolium</i>
<i>Veronica officinalis</i>
<i>Viola hirsutula</i>
<i>Vitis</i> spp.

TABLE A4. Magnitude and direction of differences between invaded and reference site (Δk) of individual EIMs without absolute values and separated by site.

Measured EIMs	Removed Reference			Uninvaded Reference		
	BBS	PAN	POT	BBS	PAN	POT
Diversity index (H')	-0.598	-0.655	-0.616	-0.559	-0.694	-0.643
Diversity index w/o invader	-0.182	-0.145	-0.155	-0.142	-0.260	-0.300
Richness	-0.205	-0.322	1.754	-0.151	-0.208	-0.101
Native richness	-0.236	-0.373	-0.375	-0.236	-0.400	-0.035
Bare ground (%)	-0.902	-0.966	-0.805	-0.900	-0.978	-0.919
Other invader cover (%)	0.000	-0.631	-0.712	0.000	1.375	-0.917
Native cover (%)	-0.183	-0.583	-0.474	-0.256	-0.140	0.914
Microbial biomass (mg kg ⁻¹)	-0.268	0.099	-0.305	-0.269	-0.118	-0.614
Microbial activity ($\mu\text{g CO}_2$ 10g soil ⁻¹ hr ⁻¹)	-0.209	-0.005	1.594	0.114	-0.069	0.807
Light penetration (%)	-0.478	-0.331	-0.636	-0.532	-0.564	-0.657
Litter abundance (g m ⁻²)	-0.108	0.013	0.266	-0.237	-0.046	-0.109
Litter decomposition (%)	0.919	0.110	-0.467	-0.084	0.198	-0.448
Earthworms m ⁻²	0.000	-1.000	-0.977	-1.000	-1.000	-1.000
Infiltration rate (cm min ⁻¹)	1.033	0.526	-0.425	-0.527	5.677	-0.797
Soil moisture (%)	0.013	-0.058	0.047	0.352	-0.007	0.228
pH	-0.006	0.006	-0.197	0.103	0.054	0.092
Organic matter (%)	0.033	0.024	-0.618	-0.061	-0.074	-0.758
TOC (ppm)	-0.203	-0.027	-0.571	0.138	-0.120	-0.693
CEC (meq 100g ⁻¹)	0.158	-0.153	0.196	-0.104	0.054	0.430
N (%)	-0.217	-0.025	-0.782	0.091	0.011	-0.800
P (ppm)	0.000	0.000	-0.204	0.000	0.000	-0.368
K (ppm)	0.063	0.203	-0.710	0.052	0.944	-0.670
Ca (ppm)	-0.006	-0.045	-0.723	0.267	0.938	0.023
Mg (ppm)	0.050	-0.023	-0.352	0.590	0.443	-0.314
Zn (ppm)	0.024	6.786	1.617	0.753	8.083	1.394
Mn (ppm)	0.041	0.221	0.834	0.010	0.314	1.894
Cu (ppm)	0.000	0.053	1.045	0.091	0.404	1.000
Fe (ppm)	0.196	0.009	3.700	1.769	-0.145	2.267
B (ppm)	0.000	0.000	-0.747	0.000	0.053	-0.400

Supplemental TABLE A5A. Quadratic discriminant analysis correlation structure for IN plots.

	Japanese stiltgrass % cover	Diversity index (<i>H'</i>)	Diversity index w/o invader	Richness	Native richness	Invasive richness	Bare ground (%)	Other invader cover (%)	Native cover (%)	Microbial biomass (mg kg^{-1})	Microbial activity ($\mu g CO_2$ $10g soil^{-1} hr^{-1}$)	Light penetration (%)	Litter abundance ($g m^{-2}$)	Litter decomposition (%)	Earthworms m^{-2}	Infiltration rate (cm min^{-1})	Soil moisture (%)	pH	Organic matter (%)	TOC (ppm)	CEC (meq $100g^{-1}$)	N (%)	P (ppm)	K (ppm)	Ca (ppm)	Mg (ppm)	Zn (ppm)	Mn (ppm)	Cu (ppm)	Fe (ppm)	B (ppm)
Japanese stiltgrass % cover	1.0	-0.9	0.0	-0.5	-0.5	-0.1	-0.8	-0.1	-0.8	-0.4	0.5	-0.3	0.1	-0.3	-0.3	0.1	0.6	-0.4	-0.5	-0.3	0.0	-0.3	-0.2	0.1	-0.3	-0.4	0.2	0.1	0.4	0.3	-0.4
Diversity index (<i>H'</i>)	-0.9	1.0	0.3	0.8	0.8	0.3	0.6	0.3	0.8	0.4	-0.2	0.3	-0.1	0.2	0.2	-0.1	-0.5	0.2	0.3	0.2	0.0	0.2	0.1	-0.1	0.1	0.2	-0.1	-0.2	-0.3	-0.5	0.2
Diversity index w/o invader	0.0	0.3	1.0	0.8	0.7	0.4	0.2	0.4	-0.3	0.3	-0.1	0.1	-0.5	-0.1	0.3	0.1	0.0	-0.1	0.2	0.1	0.0	0.2	0.1	-0.3	-0.1	0.0	-0.6	-0.3	0.0	-0.5	-0.1
Richness	-0.5	0.8	0.8	1.0	0.9	0.5	0.4	0.5	0.3	0.3	0.0	0.2	-0.3	0.0	0.2	0.0	-0.3	0.0	0.1	0.1	0.0	0.2	0.0	-0.3	-0.1	0.0	-0.4	-0.3	-0.1	-0.5	0.0
Native richness	-0.5	0.8	0.7	0.9	1.0	0.2	0.4	0.2	0.3	0.2	-0.1	0.2	-0.2	-0.1	0.2	0.0	-0.4	0.1	0.1	0.0	0.1	0.1	0.0	-0.4	-0.1	0.0	-0.4	-0.4	-0.3	-0.4	0.0
Invasive richness	-0.1	0.3	0.4	0.5	0.2	1.0	0.0	1.0	0.1	0.3	0.1	0.2	-0.3	0.0	0.1	-0.3	0.1	-0.2	0.2	0.1	-0.4	0.4	-0.1	0.4	0.0	0.0	-0.1	0.0	0.4	-0.3	0.1
Bare ground (%)	-0.8	0.6	0.2	0.4	0.4	0.0	1.0	0.0	0.3	0.4	-0.6	0.4	-0.4	0.2	0.4	0.0	-0.3	0.2	0.5	0.4	-0.1	0.4	0.2	-0.3	0.2	0.2	-0.5	-0.2	-0.4	-0.1	0.2
Other invader cover (%)	-0.1	0.3	0.4	0.5	0.2	1.0	0.0	1.0	0.1	0.3	0.1	0.2	-0.3	0.0	0.1	-0.3	0.1	-0.2	0.2	0.1	-0.4	0.4	-0.1	0.4	0.0	0.0	-0.1	0.0	0.4	-0.3	0.1
Native cover (%)	-0.8	0.8	-0.3	0.3	0.3	0.1	0.3	0.1	1.0	0.2	-0.2	0.0	0.2	0.3	-0.1	-0.1	-0.7	0.4	0.2	0.1	0.1	0.1	0.2	0.2	0.3	0.4	0.3	0.1	-0.3	-0.3	0.4
Microbial biomass	-0.4	0.4	0.3	0.3	0.2	0.3	0.4	0.3	0.2	1.0	-0.6	0.4	-0.2	0.5	0.4	0.4	-0.3	0.7	0.9	0.9	0.0	0.9	0.6	0.3	0.7	0.7	-0.1	0.3	-0.6	-0.3	0.7
Microbial activity	0.5	-0.2	-0.1	0.0	-0.1	0.1	-0.6	0.1	-0.2	-0.6	1.0	-0.2	0.2	-0.6	-0.3	-0.4	0.2	-0.7	-0.8	-0.6	-0.3	-0.6	-0.6	-0.1	-0.6	-0.6	0.2	-0.1	0.4	0.2	-0.6
Light penetration (%)	-0.3	0.3	0.1	0.2	0.2	0.2	0.4	0.2	0.0	0.4	-0.2	1.0	0.2	0.2	0.3	0.1	0.1	0.1	0.3	0.2	0.0	0.3	0.0	0.2	0.0	0.0	0.0	-0.4	-0.3	-0.2	0.0
Litter abundance	0.1	-0.1	-0.5	-0.3	-0.2	-0.3	-0.4	-0.3	0.2	-0.2	0.2	0.2	1.0	0.1	-0.3	0.1	-0.1	0.0	-0.3	-0.3	0.3	-0.3	-0.1	0.3	0.0	-0.1	0.6	0.1	0.0	-0.1	-0.1
Litter decomposition (%)	-0.3	0.2	-0.1	0.0	-0.1	0.0	0.2	0.0	0.3	0.5	-0.6	0.2	0.1	1.0	-0.2	0.0	-0.3	0.5	0.5	0.5	0.4	0.5	0.4	0.2	0.6	0.7	0.1	0.4	-0.2	-0.3	0.6
Earthworms m^{-2}	-0.3	0.2	0.3	0.2	0.2	0.1	0.4	0.1	-0.1	0.4	-0.3	0.3	-0.3	-0.2	1.0	0.1	0.1	0.0	0.4	0.4	-0.1	0.5	-0.1	-0.1	-0.1	-0.1	-0.1	-0.4	-0.3	-0.1	-0.1
Infiltration rate	0.1	-0.1	0.1	0.0	0.0	-0.3	0.0	-0.3	-0.1	0.4	-0.4	0.1	0.1	0.0	0.1	1.0	-0.1	0.6	0.4	0.2	0.2	0.2	0.7	0.2	0.4	0.3	0.1	0.1	-0.4	-0.2	0.3
Soil moisture (%)	0.6	-0.5	0.0	-0.3	-0.4	0.1	-0.3	0.1	-0.7	-0.3	0.2	0.1	-0.1	-0.3	0.1	-0.1	1.0	-0.6	-0.2	-0.2	-0.4	-0.2	-0.4	0.0	-0.5	-0.6	0.1	-0.4	0.4	0.5	-0.6
pH	-0.4	0.2	-0.1	0.0	0.1	-0.2	0.2	-0.2	0.4	0.7	-0.7	0.1	0.0	0.5	0.0	0.6	-0.6	1.0	0.7	0.6	0.4	0.5	0.9	0.3	0.9	0.9	0.0	0.6	-0.6	-0.2	0.9
Organic matter (%)	-0.5	0.3	0.2	0.1	0.1	0.2	0.5	0.2	0.2	0.9	-0.8	0.3	-0.3	0.5	0.4	0.4	-0.2	0.7	1.0	0.9	0.0	0.9	0.7	0.4	0.7	0.7	-0.1	0.2	-0.6	-0.2	0.7
TOC (ppm)	-0.3	0.2	0.1	0.1	0.0	0.1	0.4	0.1	0.1	0.9	-0.6	0.2	-0.3	0.5	0.4	0.2	-0.2	0.6	0.9	1.0	0.0	0.9	0.5	0.1	0.7	0.8	-0.2	0.4	-0.5	0.0	0.7
CEC (meq $100g^{-1}$)	0.0	0.0	0.0	0.0	0.1	-0.4	-0.1	-0.4	0.1	0.0	-0.3	0.0	0.3	0.4	-0.1	0.2	-0.4	0.4	0.0	0.0	1.0	-0.1	0.2	-0.2	0.2	0.2	-0.1	0.0	-0.3	-0.1	0.2
N (%)	-0.3	0.2	0.2	0.2	0.1	0.4	0.4	0.4	0.1	0.9	-0.6	0.3	-0.3	0.5	0.5	0.2	-0.2	0.5	0.9	0.9	-0.1	1.0	0.5	0.3	0.7	0.7	-0.1	0.3	-0.4	-0.2	0.7
P (ppm)	-0.2	0.1	0.1	0.0	0.0	-0.1	0.2	-0.1	0.2	0.6	-0.6	0.0	-0.1	0.4	-0.1	0.7	-0.4	0.9	0.7	0.5	0.2	0.5	1.0	0.3	0.9	0.8	-0.1	0.5	-0.5	-0.2	0.8
K (ppm)	0.1	-0.1	-0.3	-0.3	-0.4	0.4	-0.3	0.4	0.2	0.3	-0.1	0.2	0.3	0.2	-0.1	0.2	0.0	0.3	0.4	0.1	-0.2	0.3	0.3	1.0	0.4	0.2	0.5	0.3	0.2	-0.3	0.4
Ca (ppm)	-0.3	0.1	-0.1	-0.1	-0.1	0.0	0.2	0.0	0.3	0.7	-0.6	0.0	0.0	0.6	-0.1	0.4	-0.5	0.9	0.7	0.7	0.2	0.7	0.9	0.4	1.0	1.0	0.0	0.7	-0.5	-0.2	1.0
Mg (ppm)	-0.4	0.2	0.0	0.0	0.0	0.0	0.2	0.0	0.4	0.7	-0.6	0.0	-0.1	0.7	-0.1	0.3	-0.6	0.9	0.7	0.8	0.2	0.7	0.8	0.2	1.0	1.0	-0.1	0.7	-0.5	-0.2	1.0
Zn (ppm)	0.2	-0.1	-0.6	-0.4	-0.4	-0.1	-0.5	-0.1	0.3	-0.1	0.2	0.0	0.6	0.1	-0.1	0.1	0.1	0.0	-0.1	-0.2	-0.1	-0.1	-0.1	0.5	0.0	-0.1	1.0	0.0	0.1	0.0	0.0
Mn (ppm)	0.1	-0.2	-0.3	-0.3	-0.4	0.0	-0.2	0.0	0.1	0.3	-0.1	-0.4	0.1	0.4	-0.4	0.1	-0.4	0.6	0.2	0.4	0.0	0.3	0.5	0.3	0.7	0.7	0.0	1.0	0.0	0.1	0.7
Cu (ppm)	0.4	-0.3	0.0	-0.1	-0.3	0.4	-0.4	0.4	-0.3	-0.6	0.4	-0.3	0.0	-0.2	-0.3	-0.4	0.4	-0.6	-0.6	-0.5	-0.3	-0.4	-0.5	0.2	-0.5	-0.5	0.1	0.0	1.0	0.0	-0.4
Fe (ppm)	0.3	-0.5	-0.5	-0.5	-0.4	-0.3	-0.1	-0.3	-0.3	-0.3	0.2	-0.2	-0.1	-0.3	-0.1	-0.2	0.5	-0.2	-0.2	0.0	-0.1	-0.2	-0.2	-0.3	-0.2	-0.2	0.0	0.1	0.0	1.0	-0.3
B (ppm)	-0.4	0.2	-0.1	0.0	0.0	0.1	0.2	0.1	0.4	0.7	-0.6	0.0	-0.1	0.6	-0.1	0.3	-0.6	0.9	0.7	0.7	0.2	0.7	0.8	0.4	1.0	1.0	0.0	0.7	-0.4	-0.3	1.0

Supplemental TABLE A5B. Quadratic discriminant analysis correlation structure for RE plots.

	Japanese stiltgrass % cover	Diversity index (<i>H'</i>)	Diversity index w/o invader	Richness	Native richness	Invasive richness	Bare ground (%)	Other invader cover (%)	Native cover (%)	Microbial biomass (mg kg ⁻¹)	Microbial activity ($\mu\text{g CO}_2$ 10g soil ⁻¹ hr ⁻¹)	Light penetration (%)	Litter abundance (g m ⁻²)	Litter decomposition (%)	Earthworms m ⁻²	Infiltration rate (cm min ⁻¹)	Soil moisture (%)	pH	Organic matter (%)	TOC (ppm)	CEC (meq 100g ⁻¹)	N (%)	P (ppm)	K (ppm)	Ca (ppm)	Mg (ppm)	Zn (ppm)	Mn (ppm)	Cu (ppm)	Fe (ppm)	B (ppm)
Japanese stiltgrass % cover	1.0	0.1	0.1	0.3	-0.2	0.9	-0.3	0.5	-0.1	-0.4	0.2	-0.3	0.1	-0.4	0.2	-0.1	0.3	-0.3	-0.3	-0.4	0.0	-0.3	-0.1	0.1	0.0	-0.2	0.2	0.4	0.6	0.0	-0.1
Diversity index (<i>H'</i>)	0.1	1.0	1.0	0.5	0.4	0.1	0.7	-0.1	-0.8	-0.1	0.0	0.6	0.1	-0.2	-0.1	0.3	0.3	-0.4	0.0	0.0	0.3	0.1	0.2	-0.1	-0.3	-0.4	0.0	-0.1	0.2	0.1	-0.3
Diversity index w/o invader	0.1	1.0	1.0	0.5	0.5	0.1	0.7	-0.1	-0.8	0.0	0.0	0.6	0.1	-0.2	0.0	0.3	0.3	-0.4	0.0	0.0	0.3	0.1	0.2	-0.1	-0.3	-0.3	0.1	-0.1	0.2	0.0	-0.3
Richness	0.3	0.5	0.5	1.0	0.8	0.3	0.0	-0.1	0.0	0.0	0.0	0.0	-0.4	0.1	-0.2	0.0	0.0	-0.3	-0.1	-0.1	0.2	0.0	0.0	-0.1	-0.3	-0.2	0.0	-0.3	0.2	-0.4	-0.3
Native richness	-0.2	0.4	0.5	0.8	1.0	-0.3	0.2	-0.5	0.0	0.1	-0.1	0.2	-0.4	0.1	-0.4	0.1	-0.3	-0.1	0.0	0.0	0.2	0.1	0.0	-0.3	-0.3	-0.1	-0.1	-0.4	-0.1	-0.3	-0.2
Invasive richness	0.9	0.1	0.1	0.3	-0.3	1.0	-0.4	0.7	0.0	-0.2	0.2	-0.4	0.1	-0.1	0.4	-0.1	0.4	-0.3	-0.1	-0.2	-0.1	-0.1	0.0	0.4	0.0	-0.2	0.1	0.2	0.6	-0.2	0.0
Bare ground (%)	-0.3	0.7	0.7	0.0	0.2	-0.4	1.0	-0.4	-0.9	0.1	-0.1	0.7	0.2	-0.3	-0.1	0.4	0.1	-0.1	0.2	0.2	0.2	0.1	0.2	-0.4	-0.2	-0.1	-0.1	-0.1	-0.2	0.4	-0.1
Other invader cover (%)	0.5	-0.1	-0.1	-0.1	-0.5	0.7	-0.4	1.0	-0.1	-0.3	0.4	-0.4	0.1	0.1	0.3	-0.2	0.2	-0.3	-0.3	-0.3	-0.2	-0.2	-0.1	0.2	-0.1	-0.3	-0.1	0.1	0.5	-0.1	-0.2
Native cover (%)	-0.1	-0.8	-0.8	0.0	0.0	0.0	-0.9	-0.1	1.0	0.1	-0.1	-0.6	-0.3	0.3	0.0	-0.3	-0.2	0.2	0.0	0.0	-0.2	0.0	-0.2	0.4	0.3	0.2	0.1	0.0	-0.1	-0.4	0.2
Microbial biomass	-0.4	-0.1	0.0	0.0	0.1	-0.2	0.1	-0.3	0.1	1.0	-0.7	0.5	-0.4	0.5	-0.2	0.6	-0.4	0.6	0.9	0.9	0.1	0.9	0.4	0.4	0.6	0.7	-0.4	-0.6	-0.7	-0.5	0.7
Microbial activity	0.2	0.0	0.0	0.0	-0.1	0.2	-0.1	0.4	-0.1	-0.7	1.0	-0.5	0.5	-0.3	0.3	-0.6	0.3	-0.7	-0.8	-0.8	0.0	-0.7	-0.3	-0.2	-0.6	-0.7	0.3	0.2	0.5	0.1	-0.6
Light penetration (%)	-0.3	0.6	0.6	0.0	0.2	-0.4	0.7	-0.4	-0.6	0.5	-0.5	1.0	-0.2	-0.1	-0.2	0.7	-0.1	0.3	0.4	0.5	0.1	0.5	0.2	-0.1	0.3	0.3	-0.3	-0.2	-0.3	0.1	0.3
Litter abundance	0.1	0.1	0.1	-0.4	-0.4	0.1	0.2	0.1	-0.3	-0.4	0.5	-0.2	1.0	-0.3	0.4	-0.4	0.6	-0.5	-0.3	-0.3	0.2	-0.3	-0.1	0.1	-0.3	-0.5	0.4	0.4	0.2	0.5	-0.4
Litter decomposition (%)	-0.4	-0.2	-0.2	0.1	0.1	-0.1	-0.3	0.1	0.3	0.5	-0.3	-0.1	-0.3	1.0	-0.2	0.2	-0.1	0.2	0.5	0.5	0.0	0.5	0.1	0.3	0.1	0.3	-0.5	-0.6	-0.4	-0.4	0.2
Earthworms m ⁻²	0.2	-0.1	0.0	-0.2	-0.4	0.4	-0.1	0.3	0.0	-0.2	0.3	-0.2	0.4	-0.2	1.0	-0.2	0.3	-0.2	-0.2	-0.1	-0.2	0.0	-0.1	0.4	0.0	-0.2	0.2	0.1	0.2	-0.2	0.0
Infiltration rate	-0.1	0.3	0.3	0.0	0.1	-0.1	0.4	-0.2	-0.3	0.6	-0.6	0.7	-0.4	0.2	-0.2	1.0	-0.2	0.6	0.5	0.5	0.1	0.5	0.2	0.1	0.6	0.6	-0.2	-0.1	-0.3	-0.2	0.6
Soil moisture (%)	0.3	0.3	0.3	0.0	-0.3	0.4	0.1	0.2	-0.2	-0.4	0.3	-0.1	0.6	-0.1	0.3	-0.2	1.0	-0.7	-0.3	-0.2	0.0	-0.1	-0.2	0.2	-0.5	-0.6	0.1	0.3	0.5	0.4	-0.5
pH	-0.3	-0.4	-0.4	-0.3	-0.1	-0.3	-0.1	-0.3	0.2	0.6	-0.7	0.3	-0.5	0.2	-0.2	0.6	-0.7	1.0	0.5	0.5	0.1	0.4	0.0	0.1	0.9	0.9	-0.2	-0.1	-0.6	-0.2	0.9
Organic matter (%)	-0.3	0.0	0.0	-0.1	0.0	-0.1	0.2	-0.3	0.0	0.9	-0.8	0.4	-0.3	0.5	-0.2	0.5	-0.3	0.5	1.0	1.0	0.1	0.9	0.6	0.4	0.5	0.6	-0.4	-0.5	-0.7	-0.3	0.6
TOC (ppm)	-0.4	0.0	0.0	-0.1	0.0	-0.2	0.2	-0.3	0.0	0.9	-0.8	0.5	-0.3	0.5	-0.1	0.5	-0.2	0.5	1.0	1.0	0.0	1.0	0.4	0.4	0.5	0.6	-0.5	-0.6	-0.7	-0.3	0.6
CEC (meq 100g ⁻¹)	0.0	0.3	0.3	0.2	0.2	-0.1	0.2	-0.2	-0.2	0.1	0.0	0.1	0.2	0.0	-0.2	0.1	0.0	0.1	0.1	0.0	1.0	0.1	0.0	0.2	0.2	0.2	-0.2	0.3	0.0	0.0	0.2
N (%)	-0.3	0.1	0.1	0.0	0.1	-0.1	0.1	-0.2	0.0	0.9	-0.7	0.5	-0.3	0.5	0.0	0.5	-0.1	0.4	0.9	1.0	0.1	1.0	0.4	0.5	0.4	0.5	-0.5	-0.6	-0.5	-0.4	0.5
P (ppm)	-0.1	0.2	0.2	0.0	0.0	0.0	0.2	-0.1	-0.2	0.4	-0.3	0.2	-0.1	0.1	-0.1	0.2	-0.2	0.0	0.6	0.4	0.0	0.4	1.0	0.1	0.0	0.1	0.1	-0.3	-0.3	-0.1	0.1
K (ppm)	0.1	-0.1	-0.1	-0.1	-0.3	0.4	-0.4	0.2	0.4	0.4	-0.2	-0.1	0.1	0.3	0.4	0.1	0.2	0.1	0.4	0.4	0.2	0.5	0.1	1.0	0.5	0.3	-0.1	0.1	0.1	-0.4	0.5
Ca (ppm)	0.0	-0.3	-0.3	-0.3	-0.3	0.0	-0.2	-0.1	0.3	0.6	-0.6	0.3	-0.3	0.1	0.0	0.6	-0.5	0.9	0.5	0.5	0.2	0.4	0.0	0.5	1.0	0.9	-0.2	0.1	-0.4	-0.3	1.0
Mg (ppm)	-0.2	-0.4	-0.3	-0.2	-0.1	-0.2	-0.1	-0.3	0.2	0.7	-0.7	0.3	-0.5	0.3	-0.2	0.6	-0.6	0.9	0.6	0.6	0.2	0.5	0.1	0.3	0.9	1.0	-0.4	-0.1	-0.6	-0.3	1.0
Zn (ppm)	0.2	0.0	0.1	0.0	-0.1	0.1	-0.1	-0.1	0.1	-0.4	0.3	-0.3	0.4	-0.5	0.2	-0.2	0.1	-0.2	-0.4	-0.5	-0.2	-0.5	0.1	-0.1	-0.2	-0.4	1.0	0.4	0.2	0.1	-0.3
Mn (ppm)	0.4	-0.1	-0.1	-0.3	-0.4	0.2	-0.1	0.1	0.0	-0.6	0.2	-0.2	0.4	-0.6	0.1	-0.1	0.3	-0.1	-0.5	-0.6	0.3	-0.6	-0.3	0.1	0.1	-0.1	0.4	1.0	0.5	0.5	0.0
Cu (ppm)	0.6	0.2	0.2	0.2	-0.1	0.6	-0.2	0.5	-0.1	-0.7	0.5	-0.3	0.2	-0.4	0.2	-0.3	0.5	-0.6	-0.7	-0.7	0.0	-0.5	-0.3	0.1	-0.4	-0.6	0.2	0.5	1.0	0.1	-0.4
Fe (ppm)	0.0	0.1	0.0	-0.4	-0.3	-0.2	0.4	-0.1	-0.4	-0.5	0.1	0.1	0.5	-0.4	-0.2	-0.2	0.4	-0.2	-0.3	-0.3	0.0	-0.4	-0.1	-0.4	-0.3	-0.3	0.1	0.5	0.1	1.0	-0.3
B (ppm)	-0.1	-0.3	-0.3	-0.3	-0.2	0.0	-0.1	-0.2	0.2	0.7	-0.6	0.3	-0.4	0.2	0.0	0.6	-0.5	0.9	0.6	0.6	0.2	0.5	0.1	0.5	1.0	1.0	-0.3	0.0	-0.4	-0.3	1.0

TABLE A5C. Quadratic discriminant analysis correlation structure for UN plots.

	Japanese stiltgrass % cover	Diversity index (<i>H'</i>)	Diversity index w/o invader	Richness	Native richness	Invasive richness	Bare ground (%)	Other invader cover (%)	Native cover (%)	Microbial biomass (mg kg^{-1})	Microbial activity (μg CO_2 $10\text{g soil}^{-1} \text{hr}^{-1}$)	Light penetration (%)	Litter abundance (g m^{-2})	Litter decomposition (%)	Earthworms m^{-2}	Infiltration rate (cm min^{-1})	Soil moisture (%)	pH	Organic matter (%)	TOC (ppm)	CEC (meq 100g^{-1})	N (%)	P (ppm)	K (ppm)	Ca (ppm)	Mg (ppm)	Zn (ppm)	Mn (ppm)	Cu (ppm)	Fe (ppm)	B (ppm)
Japanese stiltgrass % cover	1.0	0.2	0.1	0.1	-0.1	0.5	0.0	0.5	-0.1	-0.1	0.0	0.2	-0.2	-0.3	0.2	-0.3	0.2	0.0	-0.1	-0.2	-0.1	-0.1	-0.1	0.2	0.3	0.1	0.0	0.2	0.3	0.4	0.3
Diversity index (<i>H'</i>)	0.2	1.0	1.0	0.5	0.3	0.7	0.3	0.5	-0.3	0.2	0.2	-0.1	-0.3	0.2	0.3	-0.2	0.6	0.0	0.1	0.1	-0.2	0.2	-0.3	0.3	0.5	0.4	-0.1	0.1	0.1	-0.3	0.6
Diversity index w/o invader	0.1	1.0	1.0	0.5	0.3	0.6	0.3	0.4	-0.3	0.3	0.2	-0.1	-0.3	0.2	0.2	-0.2	0.5	0.0	0.1	0.1	-0.2	0.2	-0.3	0.3	0.5	0.4	-0.1	0.1	0.1	-0.3	0.6
Richness	0.1	0.5	0.5	1.0	0.9	0.4	-0.6	0.3	0.5	0.0	0.0	-0.5	-0.5	0.1	0.1	-0.1	0.0	0.4	-0.2	-0.3	-0.3	-0.2	-0.4	-0.2	0.2	0.2	-0.1	0.1	0.2	-0.1	0.2
Native richness	-0.1	0.3	0.3	0.9	1.0	0.0	-0.7	0.0	0.7	-0.1	0.1	-0.5	-0.3	0.0	0.1	-0.2	-0.1	0.3	-0.4	-0.5	-0.3	-0.4	-0.5	-0.5	-0.1	-0.1	0.0	0.2	0.2	0.0	0.0
Invasive richness	0.5	0.7	0.6	0.4	0.0	1.0	0.1	0.9	-0.3	0.1	-0.1	0.0	-0.4	0.3	0.0	0.0	0.3	0.4	0.4	0.3	-0.2	0.3	0.1	0.6	0.7	0.8	-0.3	-0.2	-0.1	-0.2	0.6
Bare ground (%)	0.0	0.3	0.3	-0.6	-0.7	0.1	1.0	0.1	-1.0	0.2	0.1	0.5	0.2	0.1	0.1	0.2	0.3	-0.4	0.4	0.4	0.2	0.4	0.3	0.5	0.3	0.2	0.0	-0.1	-0.2	-0.3	0.2
Other invader cover (%)	0.5	0.5	0.4	0.3	0.0	0.9	0.1	1.0	-0.2	0.1	-0.2	0.0	-0.4	0.1	-0.1	0.0	0.2	0.3	0.3	0.3	-0.2	0.3	0.0	0.5	0.5	0.5	-0.3	-0.1	0.0	0.0	0.5
Native cover (%)	-0.1	-0.3	-0.3	0.5	0.7	-0.3	-1.0	-0.2	1.0	-0.2	-0.1	-0.5	-0.1	-0.1	-0.1	-0.1	-0.3	0.3	-0.4	-0.4	-0.2	-0.4	-0.3	-0.6	-0.3	-0.3	0.1	0.1	0.2	0.2	-0.3
Microbial biomass	-0.1	0.2	0.3	0.0	-0.1	0.1	0.2	0.1	-0.2	1.0	-0.5	-0.1	0.0	0.4	0.3	0.3	0.3	-0.2	0.6	0.6	0.2	0.6	0.3	0.3	0.2	0.3	0.1	-0.3	-0.3	-0.1	0.2
Microbial activity	0.0	0.2	0.2	0.0	0.1	-0.1	0.1	-0.2	-0.1	-0.5	1.0	-0.1	0.0	-0.5	0.2	-0.5	0.3	-0.2	-0.6	-0.5	-0.1	-0.4	-0.5	-0.3	-0.2	-0.5	0.1	0.5	0.5	0.1	0.3
Light penetration (%)	0.2	-0.1	-0.1	-0.5	-0.5	0.0	0.5	0.0	-0.5	-0.1	-0.1	1.0	0.5	-0.1	0.0	0.0	0.2	-0.3	0.1	0.1	0.3	0.0	0.5	0.3	0.2	0.0	-0.1	0.1	0.0	0.0	-0.2
Litter abundance	-0.2	-0.3	-0.3	-0.5	-0.3	-0.4	0.2	-0.4	-0.1	0.0	0.0	0.5	1.0	-0.1	-0.2	0.1	0.1	-0.4	-0.1	-0.1	0.7	-0.2	0.2	-0.3	0.1	-0.2	0.5	0.2	-0.2	-0.1	-0.6
Litter decomposition (%)	-0.3	0.2	0.2	0.1	0.0	0.3	0.1	0.1	-0.1	0.4	-0.5	-0.1	-0.1	1.0	-0.1	0.4	-0.1	0.4	0.6	0.6	-0.1	0.6	0.6	0.6	0.4	0.8	-0.4	-0.6	-0.6	-0.5	0.1
Earthworms m^{-2}	0.2	0.3	0.2	0.1	0.1	0.0	0.1	-0.1	-0.1	0.3	0.2	0.0	-0.2	-0.1	1.0	-0.2	0.3	-0.2	-0.2	-0.2	0.0	-0.1	-0.2	0.0	-0.1	-0.2	0.1	0.1	0.4	0.1	0.2
Infiltration rate	-0.3	-0.2	-0.2	-0.1	-0.2	0.0	0.2	0.0	-0.1	0.3	-0.5	0.0	0.1	0.4	-0.2	1.0	-0.5	0.5	0.5	0.4	-0.1	0.4	0.5	0.2	0.1	0.3	-0.3	-0.5	-0.6	-0.4	-0.3
Soil moisture (%)	0.2	0.6	0.5	0.0	-0.1	0.3	0.3	0.2	-0.3	0.3	0.3	0.2	0.1	-0.1	0.3	-0.5	1.0	-0.6	0.0	-0.1	0.3	0.0	-0.2	0.2	0.5	0.1	0.3	0.5	0.4	0.1	0.5
pH	0.0	0.0	0.0	0.4	0.3	0.4	-0.4	0.3	0.3	-0.2	-0.2	-0.3	-0.4	0.4	-0.2	0.5	-0.6	1.0	0.2	0.2	-0.7	0.2	0.2	0.3	0.0	0.4	-0.6	-0.6	-0.3	-0.2	0.0
Organic matter (%)	-0.1	0.1	0.1	-0.2	-0.4	0.4	0.4	0.3	-0.4	0.6	-0.6	0.1	-0.1	0.6	-0.2	0.5	0.0	0.2	1.0	0.9	0.0	0.9	0.7	0.8	0.4	0.8	-0.3	-0.7	-0.7	-0.4	0.2
TOC (ppm)	-0.2	0.1	0.1	-0.3	-0.5	0.3	0.4	0.3	-0.4	0.6	-0.5	0.1	-0.1	0.6	-0.2	0.4	-0.1	0.2	0.9	1.0	-0.1	1.0	0.6	0.7	0.3	0.7	-0.3	-0.7	-0.6	-0.2	0.1
CEC (meq 100g^{-1})	-0.1	-0.2	-0.2	-0.3	-0.3	-0.2	0.2	-0.2	-0.2	0.2	-0.1	0.3	0.7	-0.1	0.0	-0.1	0.3	-0.7	0.0	-0.1	1.0	-0.3	-0.1	-0.3	0.3	-0.1	0.8	0.4	-0.2	-0.2	-0.2
N (%)	-0.1	0.2	0.2	-0.2	-0.4	0.3	0.4	0.3	-0.4	0.6	-0.4	0.0	-0.2	0.6	-0.1	0.4	0.0	0.2	0.9	1.0	-0.3	1.0	0.6	0.8	0.2	0.6	-0.4	-0.7	-0.5	-0.2	0.2
P (ppm)	-0.1	-0.3	-0.3	-0.4	-0.5	0.1	0.3	0.0	-0.3	0.3	-0.5	0.5	0.2	0.6	-0.2	0.5	-0.2	0.2	0.7	0.6	-0.1	0.6	1.0	0.6	0.2	0.5	-0.5	-0.6	-0.5	-0.2	-0.1
K (ppm)	0.2	0.3	0.3	-0.2	-0.5	0.6	0.5	0.5	-0.6	0.3	-0.3	0.3	-0.3	0.6	0.0	0.2	0.2	0.3	0.8	0.7	-0.3	0.8	0.6	1.0	0.4	0.7	-0.6	-0.5	-0.3	-0.2	0.5
Ca (ppm)	0.3	0.5	0.5	0.2	-0.1	0.7	0.3	0.5	-0.3	0.2	-0.2	0.2	0.1	0.4	-0.1	0.1	0.5	0.0	0.4	0.3	0.3	0.2	0.2	0.4	1.0	0.7	0.2	0.1	-0.3	-0.5	0.4
Mg (ppm)	0.1	0.4	0.4	0.2	-0.1	0.8	0.2	0.5	-0.3	0.3	-0.5	0.0	-0.2	0.8	-0.2	0.3	0.1	0.4	0.8	0.7	-0.1	0.6	0.5	0.7	1.0	1.0	-0.3	-0.5	-0.6	-0.5	0.4
Zn (ppm)	0.0	-0.1	-0.1	-0.1	0.0	-0.3	0.0	-0.3	0.1	0.1	0.1	-0.1	0.5	-0.4	0.1	-0.3	0.3	-0.6	-0.3	-0.3	0.8	-0.4	-0.5	-0.6	0.2	-0.3	1.0	0.7	0.0	-0.1	-0.2
Mn (ppm)	0.2	0.1	0.1	0.1	0.2	-0.2	-0.1	-0.1	0.1	-0.3	0.5	0.1	0.2	-0.6	0.1	-0.5	0.5	-0.6	-0.7	-0.7	0.4	-0.7	-0.6	-0.5	0.1	-0.5	0.7	1.0	0.5	0.1	0.2
Cu (ppm)	0.3	0.1	0.1	0.2	0.2	-0.1	-0.2	0.0	0.2	-0.3	0.5	0.0	-0.2	-0.6	0.4	-0.6	0.4	-0.3	-0.7	-0.6	-0.2	-0.5	-0.5	-0.3	-0.3	-0.6	0.0	0.5	1.0	0.8	0.1
Fe (ppm)	0.4	-0.3	-0.3	-0.1	0.0	-0.2	-0.3	0.0	0.2	-0.1	0.1	0.0	-0.1	-0.5	0.1	-0.4	0.1	-0.2	-0.4	-0.2	-0.2	-0.2	-0.2	-0.2	-0.5	-0.5	-0.1	0.1	0.8	1.0	-0.2
B (ppm)	0.3	0.6	0.6	0.2	0.0	0.6	0.2	0.5	-0.3	0.2	0.3	-0.2	-0.6	0.1	0.2	-0.3	0.5	0.0	0.2	0.1	-0.2	0.2	-0.1	0.5	0.4	0.4	-0.2	0.2	0.1	-0.2	1.0

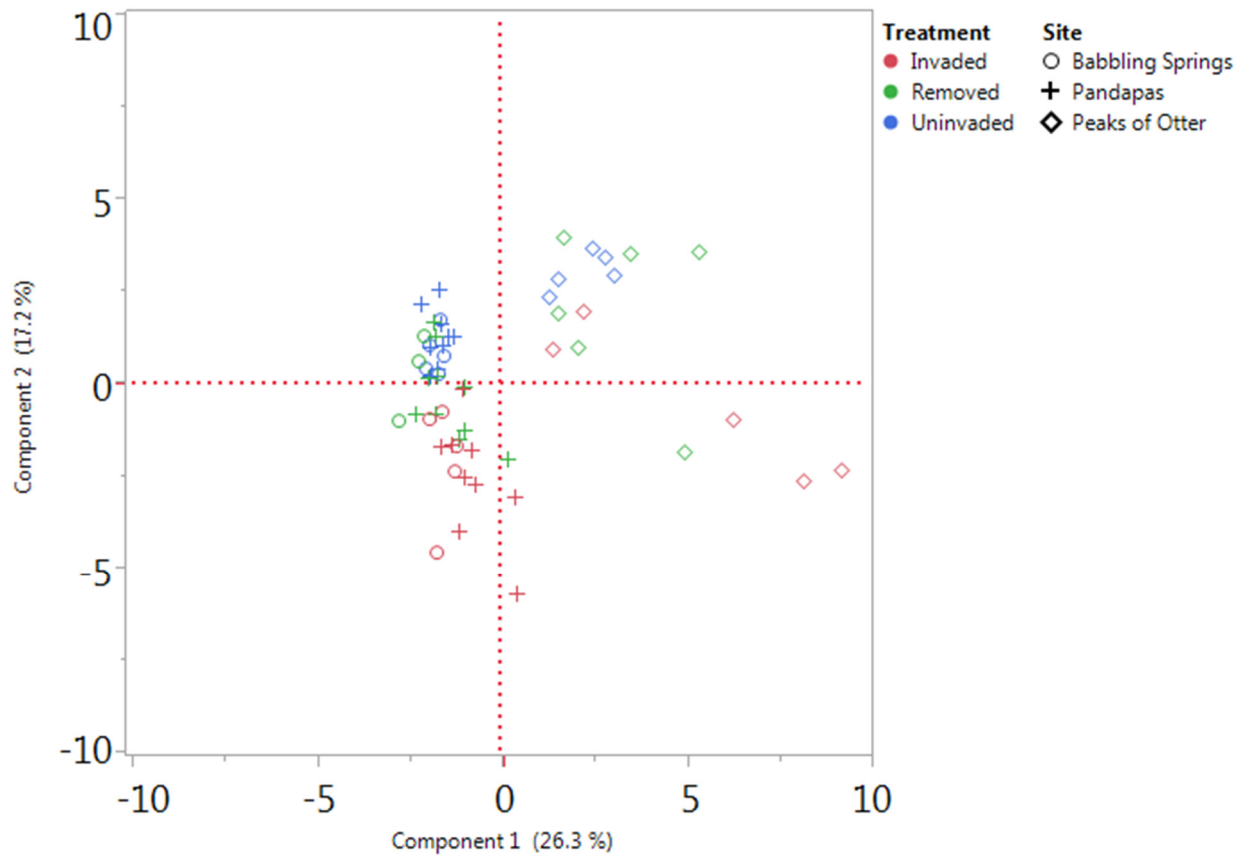


FIG. A1. PCA of invaded, removed, and uninvaded plots. IN plots are red, RE plots are green, and UN plots are blue. BBS plots are circles, PAN plots are crosses, and POT are diamonds.

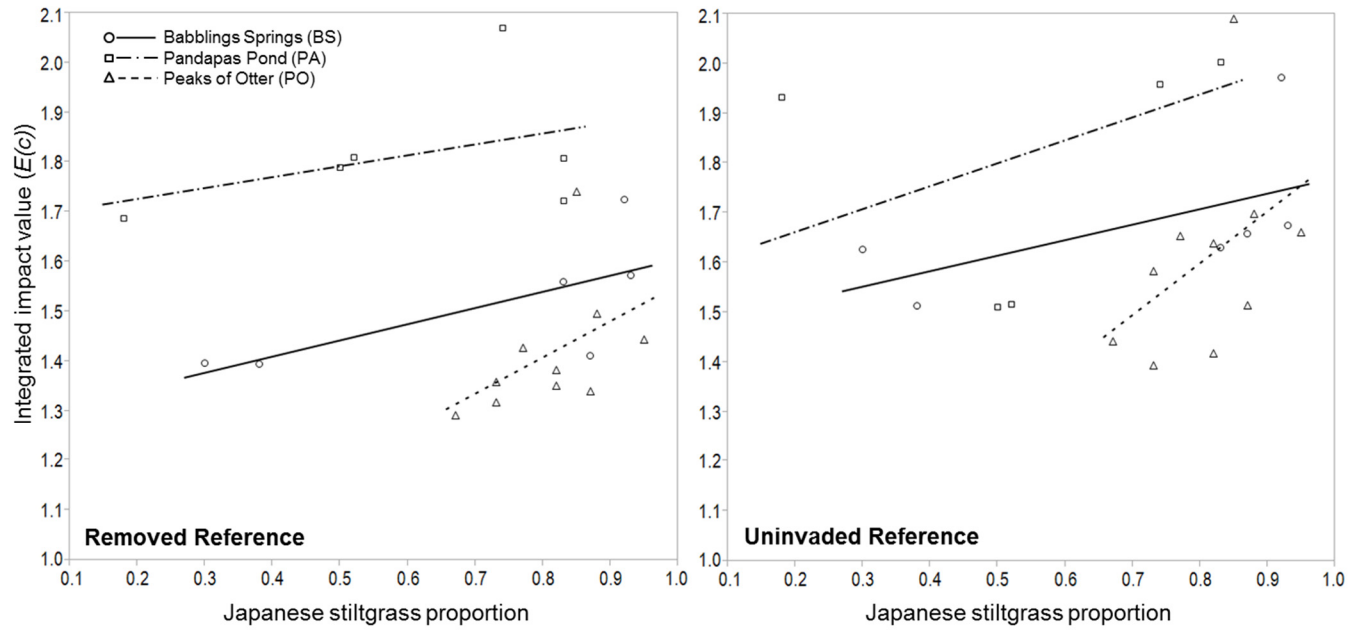


FIG. A2. ANCOVA of $E(c)$ values separated by site over the cover of Japanese stiltgrass.

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