

Ecological Archives E095-155-A1

B. M. Connolly, D. E. Pearson, and R. N. Mack. 2014. Granivory of invasive, naturalized, and native plants in communities differentially susceptible to invasion. *Ecology* 95:1759–1769. <http://dx.doi.org/10.1890/13-1774.1>

APPENDIX A. Study sites with UTM coordinates.

TABLE A1. Sites listed by habitat with corresponding UTM locations and elevations.

Habitat	Site Name	UTM Coordinates	Elevation (m)
<i>Festuca idahoensis</i> / <i>Symphoricarpos albus</i>	Smoot Hill – Summit	11T - 481679 m E, 5184841 m N	919
	Smoot Hill – Slope	11T - 481947 m E, 5185318 m N	808
	Kramer	11T - 483588 m E, 5158799 m N	839
	Steptoe Butte	11T - 476818 m E, 5208474 m N	905
<i>Pinus ponderosa</i> / <i>Symphoricarpos albus</i>	Smoot Hill – East	11T - 483545 m E, 5186086 m N	708
	Smoot Hill – West	11T - 483000 m E, 5186070 m N	733
	Turnbull – East	11T - 456595 m E, 5256244 m N	703
	Turnbull – West	11T - 453067 m E, 5252148 m N	706

[\[Back to E095-155\]](#)

Ecological Archives E095-155-A2

B. M. Connolly, D. E. Pearson, and R. N. Mack. 2014. Granivory of invasive, naturalized, and native plants in communities differentially susceptible to invasion. *Ecology* 95:1759–1769. <http://dx.doi.org/10.1890/13-1774.1>

APPENDIX B. A table summarizing nonnative plant coverage and frequency by community.

TABLE B1. Frequency and canopy coverage (sensu Daubenmire 1959) for non-native flora in stands in *Festuca idahoensis*/*Symphoricarpos albus* and *Pinus ponderosa*/*Symphoricarpos albus* habitat types. *N*, the number of sites at which species were recorded; Freq (%), average frequency \pm SE; Canopy coverage (%) \pm SE; +, presence at site, but not recorded in sample plots.

Introduced Species	<i>Festuca idahoensis</i> / <i>Symphoricarpos albus</i> h.t.			<i>Pinus ponderosa</i> / <i>Symphoricarpos albus</i> h.t.		
	<i>N</i>	Freq (%)	Canopy coverage (%)	<i>N</i>	Freq (%)	Canopy coverage (%)
<i>Bromus arvensis</i>	2	+	+	1	+	+
<i>Bromus tectorum</i>	4	86.00 \pm 5.72	12.94 \pm 3.40	4	22.00 \pm 9.70	1.54 \pm 0.82
<i>Centaurea cyanus</i>	1	+	+	1	+	+
<i>Centaurea solstitialis</i>	1	+	+	0	-	-
<i>Cirsium arvense</i>	1	+	+	1	+	+
<i>Dipsacus fullonum</i>	1	+	+	0	-	-
<i>Draba verna</i>	3	42.67 \pm 13.48	2.72 \pm 0.62	0	-	-
<i>Holosteum umbellatum</i>	1	0.02	0.05	0	-	-
<i>Hypernicum perforatum</i>	2	+	+	0	-	-

<i>Lactuca serriola</i>	4	9.50 ± 3.86	0.80 ± 0.45	2	19.00 ± 7.78	1.48 ± 0.55
<i>Plantago major</i>	0	-	-	1	6.00	0.15
<i>Secale cereale</i>	1	+	+	0	-	-
<i>Taeniatherum caput-medusae</i>	2	+	+	0	-	-
<i>Tragopogon dubius</i>	3*	10.00	0.75	1	6.00	0.40
<i>Verbascum thapsus</i>	1	+	+	0	-	-
<i>Vicia villosa</i>	0	-	-	3	6.67 ± 3.21	0.75 ± 0.48
Average introduced richness	7.00 ± 1.00			3.75 ± 0.25		
Proportion total richness introduced (%)	23.98 ± 2.58			11.99 ± 1.26		

* - *T. dubius* was detected (+) at two sites; occurred within one sampling plot at one site.

[\[Back to E095-155\]](#)

Ecological Archives E095-155-A3

B. M. Connolly, D. E. Pearson, and R. N. Mack. 2014. Granivory of invasive, naturalized, and native plants in communities differentially susceptible to invasion. *Ecology* 95:1759–1769. <http://dx.doi.org/10.1890/13-1774.1>

APPENDIX C. A table summarizing test-seed source and storage conditions.

TABLE C1. Seed source and storage conditions may influence granivore preference. In the table below we summarize the seed source for each test species. All seeds were harvest 1 to 12 months before use in field trials. All seeds were stored in large paper bags in a dark, cool (~19–22° C) room.

Species	Seed Source
<i>Ph. canariensis</i>	Ordered from Bird Supply of New Hampshire, LLC. (http://www.birdsupplynh.com/) to ensure adequate seed supply
<i>Ps. spicata</i>	Ordered from local seed vendor Rainier Seed, Inc. (www.rainierseed.com ; Davenport, WA) to ensure adequate seed supply
<i>Ba. sagittata</i>	Ordered from local seed vendor Rainier Seed, Inc. (see above) to ensure adequate seedsupply
<i>S. cereale</i>	Ordered from local seed vendor Rainier Seed, Inc. (see above) to ensure adequate seed supply
<i>Ce. cyanus</i>	Hand-collected from mature individuals in mesic steppe sites and bulked
<i>Br. tectorum</i>	Hand-collected from mature individuals in mesic steppe sites and bulked annually
<i>Ci. arvensis</i>	Hand-collected from mature individuals in mesic steppe sites and bulked

[\[Back to E095-155\]](#)

Ecological Archives E095-155-A4

B. M. Connolly, D. E. Pearson, and R. N. Mack. 2014. Granivory of invasive, naturalized, and native plants in communities differentially susceptible to invasion. *Ecology* 95:1759–1769.

<http://dx.doi.org/10.1890/13-1774.1>

APPENDIX D. A table summarizing results from generalized linear mixed model analysis of seed predator identification study.

TABLE D1. Generalized linear mixed model analysis for beta-transformed percent seed removal of two seed types (SP, *P. canariensis* vs. *P. spicata*) from four enclosure types (EX, complete enclosure vs. insect access vs. small mammal access vs. bird/small mammal access) in two plant community types (CT, steppe vs. forest) during June and September (MO) and all possible interactions. Values in bold indicate significant differences at Type I Error = 0.05.

Factor	<i>F</i>	df	<i>P</i>
Community Type (CT)	4.72	1, 6	0.073
Species (SP)	57.97	1, 170	<0.001
Enclosure Type (EX)	80.28	3, 170	<0.001
CT × SP	14.22	1, 170	<0.001
CT × EX	13.21	3, 170	<0.001
SP × EX	29.05	3, 170	<0.001
CT × EX × SP	2.52	3, 170	0.059
Month (MO)	3.74	1, 176	0.055
CT × MO	20.21	1, 176	<0.001

SP × MO	22.05	1, 176	<0.001
EX × MO	2.07	3, 176	0.107
CT × SP × MO	0.08	1, 176	0.772
CT × EX × MO	5.26	3, 176	0.002
EX × SD × MO	1.73	3, 176	0.163
CT × MO × SP × EX	2.05	3, 176	0.108

[\[Back to E095-155\]](#)

Ecological Archives E095-155-A5

B. M. Connolly, D. E. Pearson, and R. N. Mack. 2014. Granivory of invasive, naturalized, and native plants in communities differentially susceptible to invasion. *Ecology* 95:1759–1769. <http://dx.doi.org/10.1890/13-1774.1>

APPENDIX E. A graph summarizing total seed predator abundance (TSPA), 2010–2012.

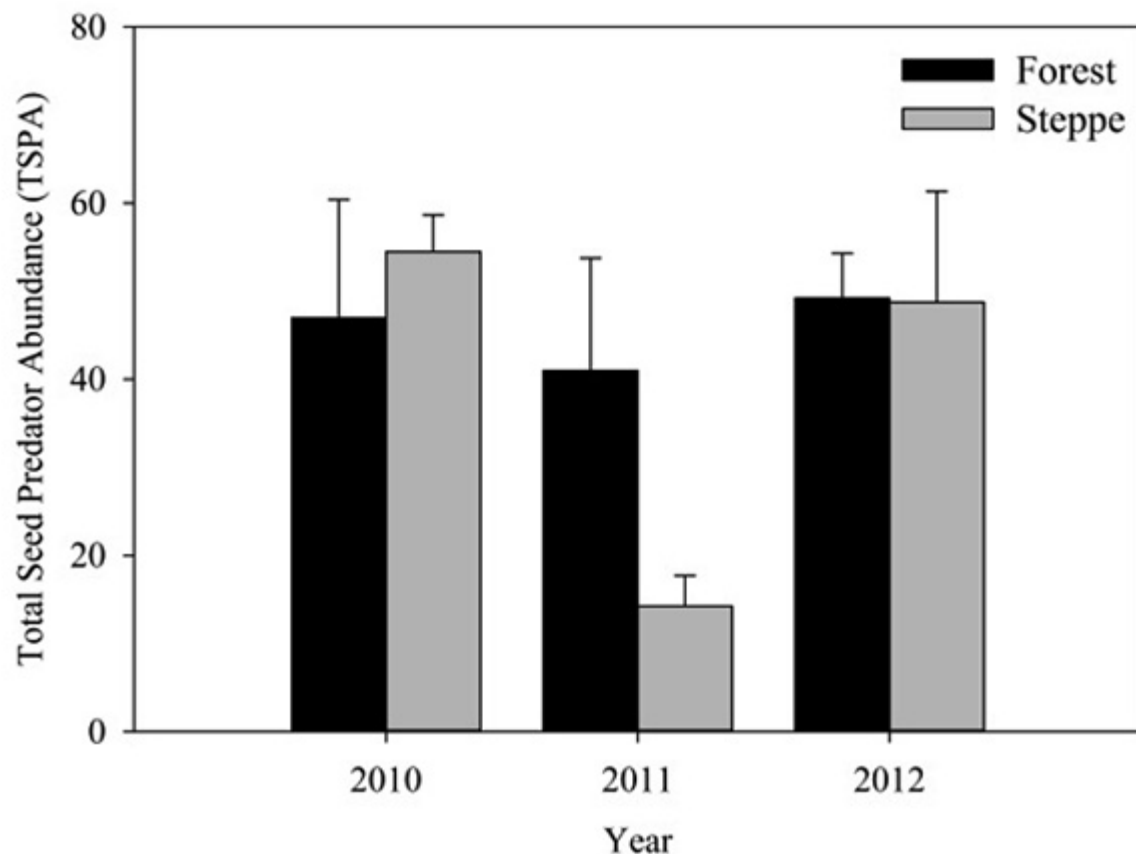


FIG. E1. Average total small mammal abundance (TSPA) \pm standard error in mature stands in *Pinus ponderosa*/*Symphoricarpos albus* h.t. [$n = 4$] and *Festuca idahoensis*/*Symphoricarpos albus* h.t. [$n = 4$], 2010–2012. Histograms are summed averages of the three most abundant small mammal seed predators within steppe (*P. maniculatus*, *R. megalotis*, and *Microtus* spp.) and forest (*P. maniculatus*, *T. amoenus*, and *Microtus* spp.).

[\[Back to E095-155\]](#)

Ecological Archives E095-155-A6

B. M. Connolly, D. E. Pearson, and R. N. Mack. 2014. Granivory of invasive, naturalized, and native plants in communities differentially susceptible to invasion. *Ecology* 95:1759–1769. <http://dx.doi.org/10.1890/13-1774.1>

APPENDIX F. A table summarizing results from generalized linear mixed model analysis of seed recruitment study.

TABLE F1. Results of generalized linear mixed model analysis for emergence, establishment, and viable seed number within the seed bank based on small mammal access (SMA, access vs. enclosure), plant community type (CT, steppe vs. forest), species (SP, *P. spicata* vs. *S. cereale* vs. *B. tectorum*), and all possible factor interactions.

	Emergence			Establishment			Viable Seedbank Density		
	<i>F</i>	df	<i>P</i>	<i>F</i>	df	<i>P</i>	<i>F</i>	df	<i>P</i>
<i>2010–2011</i>									
Small Mammal Access (SMA)	62.73	1, 173	<0.001	120.96	1, 173	<0.001	---	---	---
Community Type (CT)	9.47	1, 6	0.022	0.001	1, 6	0.994	---	---	---
Species (SP)	13.03	2, 173	<0.001	7.80	2, 173	0.001	---	---	---
SMA × CT	1.75	1, 173	0.188	0.001	1, 173	0.945	---	---	---
CT × SP	9.84	2, 173	<0.001	2.03	2, 173	0.134	---	---	---
SMA × SP	1.63	2, 173	0.199	3.67	2, 173	0.027	---	---	---
SMA × CT × SP	0.14	2, 173	0.872	4.48	2, 173	0.013	---	---	---
<i>2011–2012</i>									

Small Mammal Access (SMA)	96.53	1, 173	< 0.001	86.79	1, 173	< 0.001	69.36	1, 173	< 0.001
Community Type (CT)	1.66	1, 6	0.244	3.08	1, 6	0.129	14.21	1, 6	0.009
Species (SP)	30.91	2, 173	< 0.001	19.39	2, 173	< 0.001	35.15	2, 173	< 0.001
SMA × CT	0.25	1, 173	0.621	0.04	1, 173	0.835	2.10	1, 173	0.149
CT × SP	2.00	2, 173	0.138	2.36	2, 173	0.098	1.65	2, 173	0.195
SMA × SP	0.90	2, 173	0.410	4.47	2, 173	0.013	8.59	2, 173	< 0.001
SMA × CT × SP	0.93	2, 173	0.397	0.03	2, 173	0.969	0.07	2, 173	0.929
<i>2012–2013</i>									
Small Mammal Access (SMA)	126.07	1, 173	< 0.001	131.09	1, 173	< 0.001	49.17	1, 173	< 0.001
Community Type (CT)	0.07	1, 6	0.805	0.80	1, 6	0.407	1.31	1, 6	0.296
Species (SP)	60.80	2, 173	< 0.001	23.80	2, 173	< 0.001	49.17	2, 173	< 0.001
SMA × CT	0.54	1, 173	0.463	1.49	1, 173	0.225	0.24	1, 173	0.621
CT × SP	1.24	2, 173	0.291	3.41	2, 173	0.035	2.58	2, 173	0.079
SMA × SP	6.98	2, 173	0.001	5.33	2, 173	0.006	5.57	2, 173	0.005
SMA × CT × SP	0.81	2, 173	0.448	0.82	2, 173	0.441	3.07	2, 173	0.049

[\[Back to E095-155\]](#)

Ecological Archives E095-155-A7

B. M. Connolly, D. E. Pearson, and R. N. Mack. 2014. Granivory of invasive, naturalized, and native plants in communities differentially susceptible to invasion. *Ecology* 95:1759–1769. <http://dx.doi.org/10.1890/13-1774.1>

APPENDIX G. A graph showing the correlation between small mammal abundance and seed removal rates in the steppe in 2012.

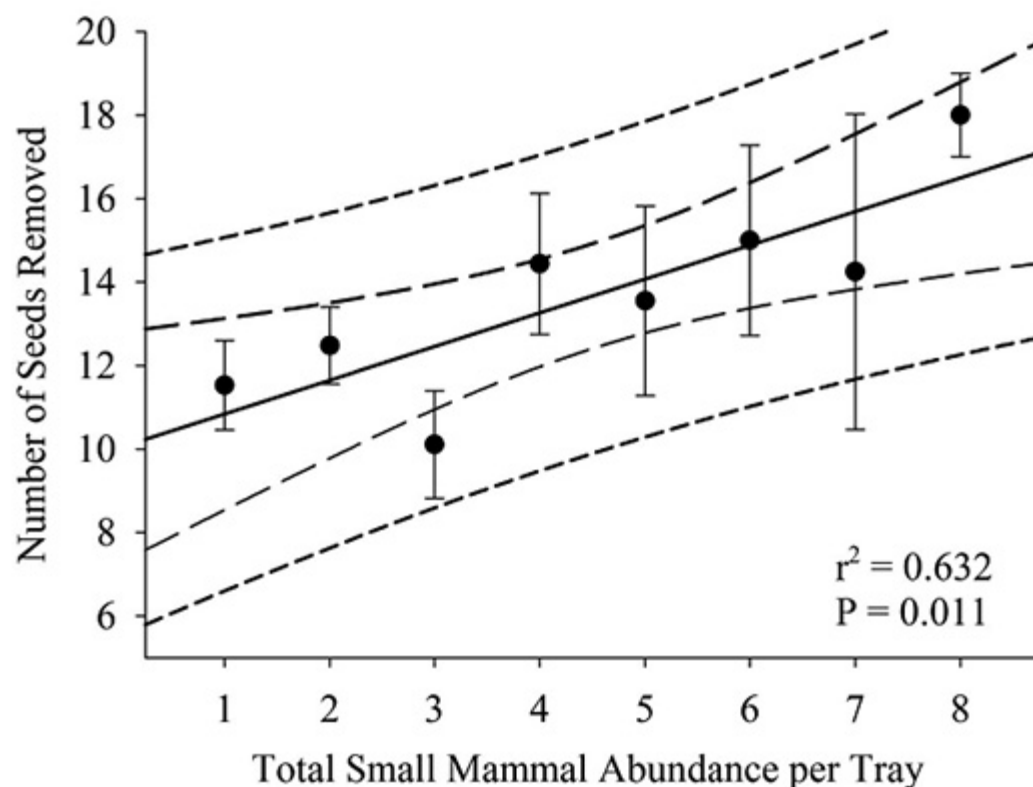


FIG. G1. Relationship between number of small mammals trapped near seed removal trays and the number of seeds removed per tray \pm standard error in the steppe, 2012. The solid line indicates the predicted linear regression fit. The long dash lines indicate the 95% confidence interval, and the short dash line predicts the 95% prediction interval. Inset values contains model fit (r^2) and regression model fit probability.

[\[Back to E095-155\]](#)