

SUPPLEMENTARY DATA

Table S1 Main characteristics of the source populations and their sites, especially soil conditions

		Site		Distance to closest population		Population			Soil conditions ⁴										
		Latitude/Longitude	Altitude (m)	Overall (km)	Within habitat (km)	Plant height ¹ (cm)	Seed mass ² (mg)	Germination ³ (%)	pH _{H₂O}	Moisture ⁵	N (%)	C (%)	C/N	Ammonium (mg/kg)	Nitrate (mg/kg)	Phosphate (mg/kg)	Potassium (mg/kg)	Magnesium (mg/kg)	Calcium (mg/kg)
Deciduous forest	1	48.423/11.878	425	2.3	2.5	185	13	72	7.5	15.7	0.4	7.7	28	38.8	366	20	59.7	47.1	888
	2	48.402/11.760	493	2.1	2.2	125	14	72	7.5	12.6	0.3	7.3	38	23.6	112	29	63.4	38.9	722
	3	48.403/11.791	493	2.3	2.3	148	14	92	6.5	12.6	0.2	4.1	32	*	129	19	37.8	24.4	137
	4	48.385/11.744	493	2.2	2.2	96	13	57	7.6	10.6	0.2	6.9	72	29.9	84	19	62.0	25.0	616
	5 ⁶	48.413/11.848	426	0.9	2.5	n.a.	15	73	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
<i>Mean ± s.d.</i>			466 ± 33	1.9 ± 0.5	2.3 ± 0.2	138 ± 32	14 ± 1	73 ± 11	7.3 ± 0.4	12.9 ± 1.8	0.2 ± 0.1	6.5 ± 1.4	42 ± 18	30.8 ± 6.2	172 ± 133	22 ± 4	55.7 ± 10.5	33.8 ± 9.6	591 ± 280
Fallow meadow	1	48.440/11.625	366	2.6	2.6	n.a.	14	94	6.8	11.3	0.6	6.3	14	48.9	558	148	549.0	67.2	693
	2	48.443/11.660	438	2.6	2.6	193	13	86	7.3	19.7	0.3	2.8	12	0.0	134	14	7.1	31.9	77
	3	48.451/11.706	429	2.5	3.5	146	13	97	6.4	30.2	0.3	3.7	17	28.5	288	23	102.0	39.6	576
	4	48.403/11.711	452	0.9	0.9 ⁷	180	11	96	7.2	18.5	0.2	2.1	12	10.2	241	76	131.9	27.7	256
	5	48.395/11.713	461	0.9	0.9 ⁷	128	13	93	6.7	25.4	0.4	3.7	10	7.6	301	22	21.2	44.3	376
<i>Mean ± s.d.</i>			429 ± 33	1.9 ± 0.8	2.1 ± 1.1	162 ± 26	13 ± 1	93 ± 4	6.9 ± 0.3	21.0 ± 6.4	0.4 ± 0.1	3.7 ± 1.5	13 ± 2	19.0 ± 17.6	305 ± 140	57 ± 51	162.2 ± 199.0	42.1 ± 13.8	396 ± 220
Coniferous forest	1	48.429/11.700	477	2.5	2.5	156	11	84	6.9	10.2	0.5	7.6	22	38.8	391	27	57.7	70.9	1127
	2	48.411/11.679	469	2.5	2.5	155	12	83	4.2	32.2	0.3	5.6	17	32.1	n.a.	n.a.	63.9	37.1	79
	3	48.414/11.640	504	2.9	2.9	91	11	77	4.1	4.5	0.8	13.8	20	65.4	200	93	128.7	26.0	243
	4	48.421/11.847	479	0.9	6.6	149	14	93	4.7	6.2	0.5	6.4	16	35.0	83	21	105.1	22.6	176
	5	48.420/11.758	489	2.1	4.4	139	11	58	5.7	14.8	0.3	4.9	18	20.1	85	*	35.1	32.6	254
<i>Mean ± s.d.</i>			484 ± 12	2.2 ± 0.7	3.8 ± 1.6	138 ± 24	12 ± 1	79 ± 12	5.1 ± 1.1	13.6 ± 10.0	0.5 ± 0.2	7.7 ± 3.2	19 ± 2	38.3 ± 14.9	190 ± 125	47 ± 32	78.1 ± 33.9	37.8 ± 17.3	376 ± 381

n.a. = not available

¹ *Impatiens glandulifera*, mean plant height of four measurements per population at full development (August 2012)

² Weighted as $n = 5 \times 500$ seeds per population

³ $N = 5 \times 50$ stratified seeds germinated on wet filter paper in Petri dishes at 5/15 °C, 12:12 h, without light, for 3 weeks

⁴ Mixed soil sample from five cores, diameter 1.5 cm, 0–14 cm depth (for all soil characteristics but moisture)

⁵ Mean of five measurements per population in August 2012

⁶ Site became disturbed after seed collection in autumn 2011

⁷ Distance between fallow meadows 4 and 5 below 2 km was considered not to cause problems because sites are separated by a ridge and belong to different watersheds.

* Below detection limit

Table S2 Main characteristics of the plot sites in the reciprocal transplant experiment and their soil conditions

		Site				Soil conditions ²										
		Latitude/ Longitude	Distance to source pop. (m)	Altitude (m)	PAR ¹ (%)	pH _{H₂O}	Moisture ³	N (%)	C (%)	C/N	Ammonium (mg/kg)	Nitrate (mg/kg)	Phosphate (mg/kg)	Potassium (mg/kg)	Magnesium (mg/kg)	Calcium (mg/kg)
Deciduous forest	1	48.423/11.878	48	432	0.8	7.5	22.6	0.4	8.4	31	32.3	407	*	76.3	50.3	915
	2	48.404/11.762	314	448	2.7	7.5	11.7	0.3	7.9	41	27.9	161	15	88.3	42.4	784
	3	48.403/11.791	35	445	5.9	7.5	20.0	0.3	8.5	36	2.3	194	27	42.1	15.5	128
	4	48.385/11.744	36	460	2.2	7.6	9.3	0.1	6.8	142	20.1	50	*	53.6	24.1	621
	5	48.410/11.836	962	437	0.9	7.6	16.2	0.3	8.3	36	32.5	406	19	87.9	53.8	834
<i>Mean ± s.d.</i>			279 ± 358	444 ± 10	2.5 ± 1.9	7.5 ± 0.0	16 ± 4.9	0.3 ± 0.1	8.0 ± 0.6	57 ± 43	23.0 ± 11.3	244 ± 141	20 ± 5	69.6 ± 18.7	37.2 ± 15.0	656 ± 281
Fallow meadow	1	48.441/11.626	118	438	88.0	6.6	12.4	0.2	3.0	18	11.7	156	11	20.5	27.7	616
	2	48.443/11.660	37	450	3.2	6.0	10.7	0.3	3.2	12	15.2	33	16	26.0	18.1	37
	3	48.451/11.706	42	439	42.5	6.0	17.4	0.3	3.4	18	34.4	136	42	65.6	31.0	789
	4	48.403/11.709	116	465	47.1	5.8	24.2	0.3	2.6	10	10.3	232	33	28.4	21.6	235
	5	48.395/11.713	34	450	85.5	6.3	37.9	0.3	2.8	10	13.8	360	17	23.3	31.9	293
<i>Mean ± s.d.</i>			69 ± 39	448 ± 10	53.2 ± 31.3	6.1 ± 0.3	20.5 ± 9.9	0.3 ± 0.0	3.0 ± 0.3	14 ± 4	17.1 ± 8.8	183 ± 107	24 ± 12	32.8 ± 16.6	26.1 ± 5.4	394 ± 271
Coniferous forest	1	48.431/11.689	792	487	6.7	4.0	10.6	0.4	7.1	20	44.1	55	25	65.3	15.6	86
	2	48.408/11.679	407	481	16.8	4.1	18.4	0.4	7.5	19	15.0	53	59	24.9	8.6	20
	3	48.414/11.641	119	506	3.4	4.0	11.0	0.3	7.1	24	42.9	76	*	48.2	13.5	84
	4	48.420/11.844	310	492	11.5	3.9	6.9	0.3	5.1	18	36.9	16	*	61.4	7.9	54
	5	48.418/11.760	269	493	5.0	3.8	18.4	0.2	4.0	18	30.9	69	*	37.0	14.5	74
<i>Mean ± s.d.</i>			379 ± 226	492 ± 8	8.7 ± 4.9	4.0 ± 0.1	13.1 ± 4.6	0.3 ± 0.1	6.2 ± 1.4	20 ± 2	33.9 ± 10.6	54 ± 21	n.a.	47.4 ± 15.0	12.0 ± 3.2	64 ± 25

n.a. = not available

¹ Photosynthetically active radiation above *Impatiens glandulifera* canopy in the control treatment, *n* = four measurements per plot (August 2012)

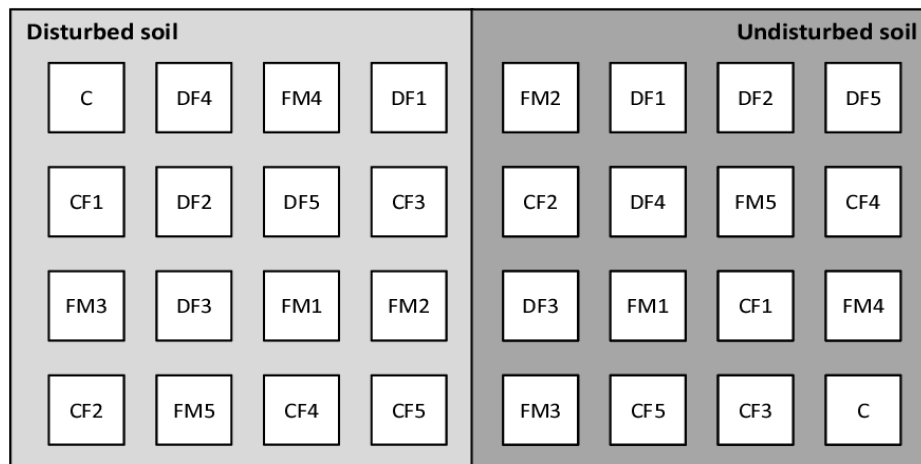
² Mixed soil sample from five cores, diameter 1.5 cm, 0–14 cm depth (for all soil characteristics but moisture)

³ Mean of five measurements per population in August 2012

* Below detection limit

Fig. S1 Experimental design. The transplant experiment (A) included 15 plots (one is shown), five in each of three habitat types. In one half of each plot (0.8 m x 0.8 m) the soil remained untreated ('undisturbed soil'); in the other half all aboveground litter and vegetation were removed and the soil was disturbed with a rake ('disturbed soil'). Each half of the plot contained 16 subplots (0.2 m x 0.2 m). One remained as a control (C) and seeds of each source populations were sown into the other subplots (DF = deciduous alluvial forest; FM = fallow meadow; CF = coniferous upland forest). The greenhouse experiment (B) included five replicated rows of eight blocks (one row is shown). Half of each row was exposed to high shade (5% PAR), the other half to low shade (10% PAR). Each block contained one plant from each for the source populations, leading to 15 pots per block.

A



B

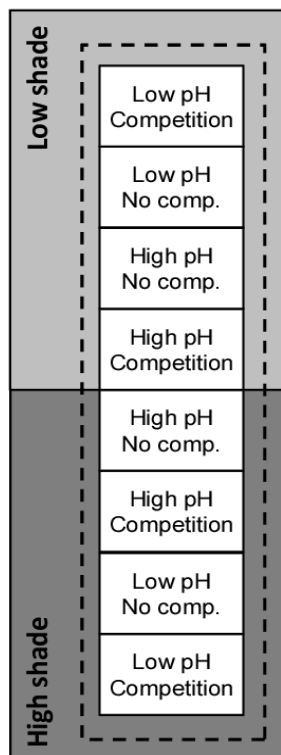


Fig. S2 Plant height (A, B) and relative growth rate (C, D) of the invasive alien *Impatiens glandulifera* when reciprocally transplanted between deciduous forests (df/DF), fallow meadows (fm/FM) and coniferous upland forest (cf/CF) in the invaded range. Seed origins are indicated with capital letters, plot habitats with small letters. Soil remained either undisturbed (A, C) or was experimentally disturbed before planting (B, D). The number of plant individuals in each group is given in small italic numbers above the boxplots.

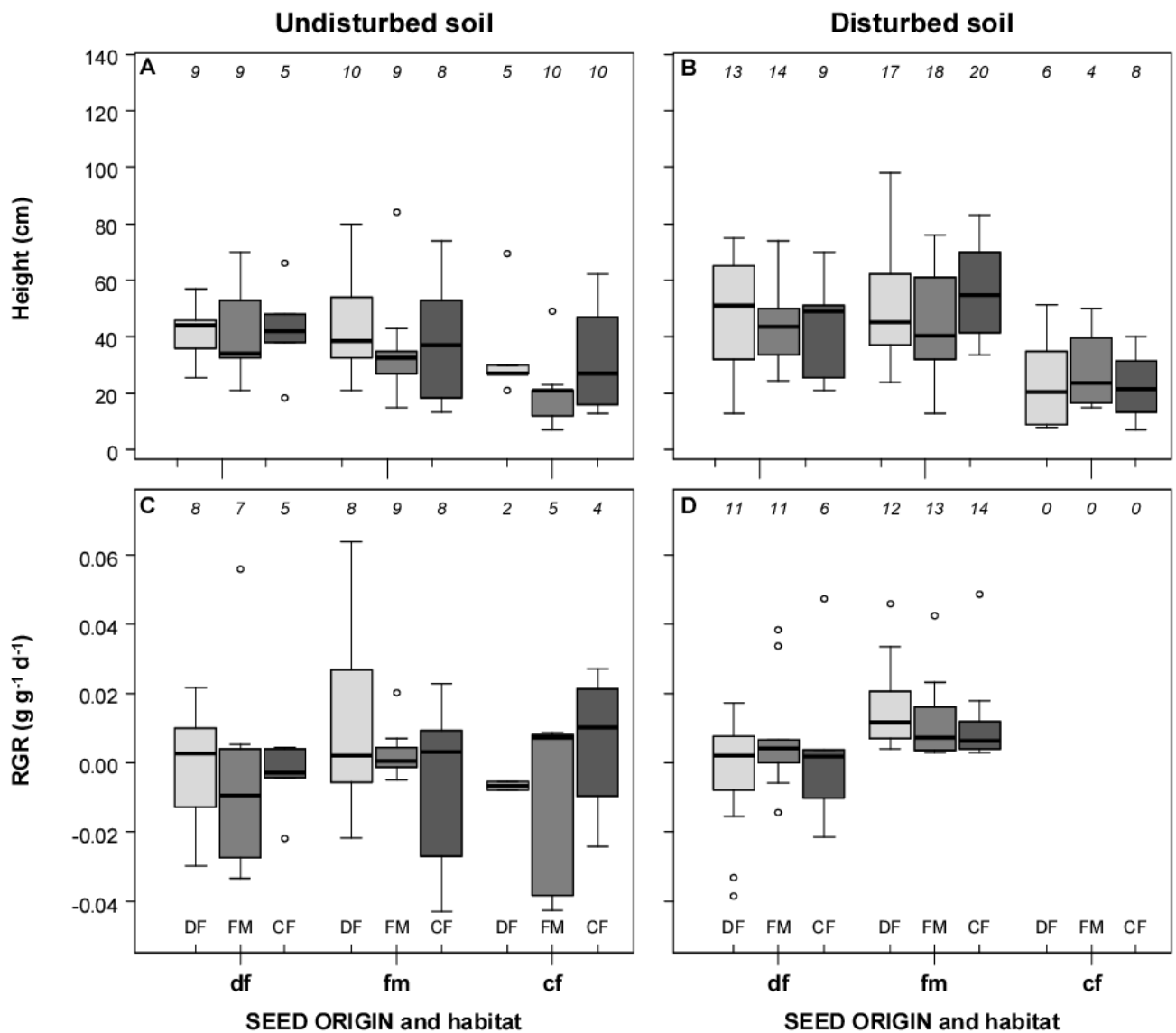


Fig. S3 Plant height (A, B) and relative growth rate (C, D) of invasive populations of *Impatiens glandulifera* in a greenhouse experiment. Plants were exposed to eight treatments in a full-factorial design, including high and low shade, competition by a common grass species (*Arrhenatherum elatius*) and no competition, as well as low and high soil acidity. Plant material originated from three habitat types, i.e. alluvial deciduous forests (DF), fallow meadows (FM) and coniferous upland forests (CF). Most groups represent 15 replicates, except five cases where only 14 replicates were available.

