Online Appendix 1

Oligonucleotide sequences for primers of 16 microsatellite loci scored in this study. Of these, 13 loci were polymophic in the Colorado populations and 10 were polymorphic in the Idaho populations.

Marker name	**Forward Primer**	**Reverse Primer**	Polymorphic in Colorado populations?	Polymorphic in Idaho populations?
BF-11	TCCTCCATTGTAGAGCAGAGC	CCATTGCTTAAACCCTAAACC	yes	yes
BF-20	TTCTCGGGAAAGTAATGAGGAG	GCAAATCTGACCAATGCAAG	yes	yes
BF-3	TTTTTAGACAGTAGTGGCTGTGAG	ACTTCGTTCCAGGCTCGTC	yes	yes
ca72	CACGACGTTGTAAAACGACAATCCCAGTAACCAAACACACA	CCCAGTCTAACCACGACCAC	yes	yes
BF-19	CACGACGTTGTAAAACGACACCGCATTGGTGTTGTGTC	ATAACGGACGCGACCAAAG	yes	yes
e9	CACGACGTTGTAAAACGACAGGAAAGGACAAAAGACATG	GCTTCCATGGAAGGAGACCC	yes	yes
ICE3	CACGACGTTGTAAAACGACGACTAATCATCACCGACTCAGCCAC	ATTCTTCTTCACTTTTCTTGATCCCG	yes	no
Bdru-878	CACGACGTTGTAAAACGACGGGAACCTTCATGTCCAAAG	TGCCTTTTCCGTTTTTCTAATC	yes	yes
ICE14	CACGACGTTGTAAAACGACTCGAGGTGCTTTCTGAGGTT	TACCTCACCCTTTTGACCCA	no	yes
Bdru-1220	CACGACGTTGTAAAACGACTCTATGCAAACAGCAAATCG	TTCTTCTACGAAACATTCCTTGC	yes	yes
Bdru-266	CACGACGTTGTAAAACGACTTTAATTTGTGCGTTTGATCC	CAAAATCGCAGAATGAGAGG	yes	yes
a3	CAACACATGGATGAGATTTTCG	GATCTTGGTTTCCGGTGAG	no	no
BF-15	CAGCATCTCCTTTGGGTTTG	ACTTGCTCCTTTGCATGACC	yes	no
BF-9	AAACACATTCCCGTCAGCTC	TTGATTGAATCCTGCGTTTG	yes	no
c8	TTCCGGGTATCATTCCTAG	GTTGTAAGTTCTTTCTCAG	yes	no
ICE11	CACGACGTTGTAAAACGACTTTCAAGTTGAGAAGTGGAGTG	AAGAATTAGGCAAGAGTTTAGTGG	no	no

Thermocycler conditions:
1) 94°C for 3 minutes
2) 40 cycles of: 94°C for 20 seconds, 50°C for 30 seconds, then 72°C for 30 seconds
3) 72°C for 6 minutes
4) 4°C hold

Online Appendix 2

Coordinates of accessions genotyped to quantify genetic similarity.

Accession	Latitude	Longitude	Region
GV1_5	38.9812333	-106.9983333	Colorado
GV46_8	38.98035	-106.9960333	Colorado
GV47_5	38.9800333	-106.9996333	Colorado
GV49_2	38.9842	-107.0038667	Colorado
GV50_4	38.9795	-107.0005	Colorado
GV51_1	38.9783667	-107.0012	Colorado
GV104_6	38.9773333	-106.9946667	Colorado
GV52_3	38.9776333	-107.0040667	Colorado
GV54_3	38.9732	-106.9997333	Colorado
GV66_3	38.9796333	-107.00405	Colorado
GV55_2	38.9945	-107.0088	Colorado
GV153_1	38.99295	-107.0130167	Colorado
GV154_7	38.9942333	-107.0146833	Colorado
GV156_3	38.99665	-107.01495	Colorado
GV56_2	39.0023833	-107.00235	Colorado
GV58_3	39.0076667	-106.99885	Colorado
GV180_5	39.0038333	-107.0072167	Colorado
GV181_2	39.005	-107.013	Colorado
GV182_1	39.00495	-107.0178333	Colorado
GV183_2	39.0063667	-107.0222	Colorado
GV184_1	39.01055	-107.0297	Colorado
GV185_2	39.0113833	-107.03395	Colorado
GV186_1	39.01505	-107.0352	Colorado
GV60_3	38.9879833	-107.0120167	Colorado
GV63_9	38.9880833	-107.0079667	Colorado
GV151_4	38.9891667	-107.0123	Colorado
GV152_5	38.9901333	-107.0115833	Colorado
GV61_2	38.9849833	-107.0095667	Colorado
GV64_4	38.9836167	-107.0080667	Colorado
GV68_1	38.9609	-106.9926833	Colorado
GV69_2	38.9630167	-106.9952	Colorado
GV70_4	38.9636833	-106.9947667	Colorado
GV74_1	38.94345	-106.9816333	Colorado
GV75_2	38.9484167	-106.9773333	Colorado
GV77_4	38.9524667	-106.9754833	Colorado
GV78_2	38.95255	-106.9729667	Colorado
GV80_2	38.9545333	-106.9703667	Colorado

GV81_3	38.9553167	-106.9722833	Colorado
GV83_3	38.9548	-106.9787333	Colorado
GV84_2	38.9563667	-106.9798	Colorado
GV86_2	38.9554833	-106.9884667	Colorado
GV88_2	38.951	-106.98965	Colorado
GV89_1	38.9498667	-106.9901333	Colorado
GV90_6	38.9507333	-106.9923333	Colorado
GV91_4	38.9535167	-106.9924167	Colorado
GV92_7	38.9541667	-106.9935333	Colorado
GV94_4	38.9618333	-106.9891667	Colorado
GV95_10	38.9621667	-106.9883333	Colorado
GV97_4	38.9655	-106.9883333	Colorado
GV98_3	38.9668333	-106.9896667	Colorado
GV99_3	38.9671667	-106.9903333	Colorado
GV100_5	38.9708333	-106.9901667	Colorado
GV101_4	38.9748333	-106.9911667	Colorado
GV102_7	38.9761667	-106.9895	Colorado
GV103_2	38.9795	-106.99	Colorado
GV107_3	39.0025	-107.0215	Colorado
GV161_4	38.9992667	-107.0210833	Colorado
GV162_1	39.0003667	-107.0231	Colorado
GV163_3	39.0014333	-107.0238333	Colorado
GV164_2	39.0021	-107.023	Colorado
GV157_4	38.9969833	-107.0168167	Colorado
GV158_1	38.9961833	-107.0186667	Colorado
GV159_4	38.9975	-107.0188333	Colorado
GV160_1	38.99795	-107.0208167	Colorado
GV177_3	38.9973667	-107.0221833	Colorado
GV178_4	38.9988	-107.0246	Colorado
GV165_1	39.0031833	-107.0268167	Colorado
GV167_5	39.0044833	-107.02795	Colorado
GV168_1	39.00415	-107.0292	Colorado
GV169_4	39.0054333	-107.0299333	Colorado
GV170_3	39.0054833	-107.0344833	Colorado
GV171_6	39.0120667	-107.0438333	Colorado
GV172_4	39.0138167	-107.0447667	Colorado
GV174_2	39.0141833	-107.0454167	Colorado
GV175_1	39.0140167	-107.0445833	Colorado
GV176_5	39.01185	-107.04165	Colorado
GV187_2	38.9955	-107.0223333	Colorado
GV188_2	38.9944167	-107.0242667	Colorado

GV192_1	38.9947333	-107.02265	Colorado
GV189_3	38.9941167	-107.0298833	Colorado
GV190_2	38.9917833	-107.0309167	Colorado
GV191_2	38.9929333	-107.0265167	Colorado
GV194_2	38.9906	-107.0196667	Colorado
GV195_1	38.9898333	-107.0230333	Colorado
GV196_4	38.9782	-106.9750167	Colorado
GV197_4	38.9859	-106.97045	Colorado
GV198_1	39.0129167	-106.94635	Colorado
GV199_2	39.0068667	-106.9452	Colorado
GV200_1	38.9981167	-106.9812	Colorado
GV201_3	38.9699167	-107.0267333	Colorado
GV202_1	38.9688167	-107.0276667	Colorado
GV203_1	38.9694333	-107.0294833	Colorado
GV204_3	38.9723833	-107.0350833	Colorado
GV205_1	38.9738833	-107.03655	Colorado
GV71_2	38.9657333	-106.9950833	Colorado
GV105_2	38.9713333	-106.9961667	Colorado
GV106_7	38.9651667	-106.9934167	Colorado
MV001	44.18248	-113.74462	Idaho
MV006	44.17648	-113.77137	Idaho
MV007	44.17270	-113.77018	Idaho
MV008	44.17818	-113.77217	Idaho
MV009	44.18213	-113.76773	Idaho
MV010	44.18283	-113.76680	Idaho
MV011	44.1817167	-113.7607167	Idaho
MV012	44.18083	-113.75820	Idaho
MV014	44.18667	-113.73593	Idaho
MV015	44.19278	-113.72825	Idaho
MV016	44.18378	-113.72662	Idaho
MV017	44.20133	-113.72123	Idaho
MV018	44.20078	-113.74647	Idaho
MV019	44.19867	-113.74543	Idaho
MV020	44.19493	-113.75003	Idaho
MV021	44.19182	-113.75658	Idaho
MV022	44.18950	-113.76073	Idaho
MV023	44.18795	-113.75770	Idaho
MV024	44.19165	-113.74755	Idaho
MV073	44.18867	-113.76283	Idaho
MV074	44.18517	-113.76600	Idaho
MV076	44.18017	-113.77217	Idaho

MV078	44.17867	-113.77617	Idaho
MV079	44.18750	-113.76883	Idaho
MV080	44.18583	-113.77017	Idaho
MV081	44.18283	-113.76950	Idaho
MV082	44.18067	-113.77383	Idaho
MV083	44.17933	-113.78000	Idaho
MV084	44.18050	-113.78583	Idaho
MV085	44.17567	-113.78117	Idaho
MV086	44.17367	-113.77967	Idaho
MV087	44.17033	-113.77883	Idaho
MV088	44.1658333	-113.7808333	Idaho
MV089	44.163	-113.7778333	Idaho
MV090	44.16767	-113.77567	Idaho
MV091	44.17117	-113.77500	Idaho
MV092	44.17467	-113.77550	Idaho
MV093	44.17700	-113.77450	Idaho
MV094	44.17983	-113.77517	Idaho
MV095	44.18367	-113.77333	Idaho
MV096	44.18833	-113.76067	Idaho
MV097	44.18667	-113.75950	Idaho
MV099	44.18600	-113.75800	Idaho
MV100	44.18667	-113.75683	Idaho
MV102	44.18767	-113.75333	Idaho
MV105	44.18933	-113.75633	Idaho
MV106	44.18917	-113.75900	Idaho
MV125	44.18957	-113.76357	Idaho
MV126	44.19098	-113.73765	Idaho
MV127	44.19170	-113.75370	Idaho
MV128	44.19137	-113.75410	Idaho
MV129	44.18602	-113.76412	Idaho
MV130	44.18520	-113.76428	Idaho
MV131	44.19032	-113.76012	Idaho
MV132	44.18735	-113.76433	Idaho
MV133	44.18855	-113.76573	Idaho
MV134	44.18790	-113.76570	Idaho
MV135	44.19090	-113.75585	Idaho
MV137	44.18488	-113.76557	Idaho
MV139	44.18445	-113.76625	Idaho
MV140	44.18955	-113.74343	Idaho
MV141	44.19027	-113.74197	Idaho
MV142	44.19122	-113.75490	Idaho

MV143	44.18547	-113.76343	Idaho
MV144	44.19035	-113.74072	Idaho
MV145	44.18813	-113.76403	Idaho
MV151	44.18373	-113.76770	Idaho
MV152	44.18317	-113.76830	Idaho
MV156	44.17973	-113.76505	Idaho
MV157	44.18052	-113.76392	Idaho
MV158	44.17977	-113.76683	Idaho
MV159	44.18080	-113.76233	Idaho
MV160	44.18327	-113.75730	Idaho
MV161	44.1832667	-113.7573	Idaho
MV162	44.18423	-113.76732	Idaho
MV163	44.18350	-113.75605	Idaho
MV167	44.18247	-113.75857	Idaho
MV168	44.18075	-113.7625333	Idaho
MV170	44.18760	-113.74370	Idaho
MV172	44.18302	-113.75827	Idaho
MV174	44.1844333	-113.7549167	Idaho
MV179	44.18135	-113.76135	Idaho
MV180	44.18953	-113.73708	Idaho
MV183	44.18663	-113.74890	Idaho
MV138	44.19087	-113.73635	Idaho
MV147	44.19062	-113.73953	Idaho
MV150A	44.1884167	-113.74665	Idaho
MV150B	44.1884167	-113.74665	Idaho
MV154	44.18155	-113.76868	Idaho
MV165A	44.1819667	-113.7604333	Idaho
MV165B	44.1819667	-113.7604333	Idaho
MV173A	44.1866	-113.7457667	Idaho
MV173B	44.1866	-113.7457667	Idaho
MV177A	44.1808	-113.76895	Idaho
MV177B	44.1808	-113.76895	Idaho
MV178A	44.1844333	-113.7549167	Idaho
MV178B	44.1844333	-113.7549167	Idaho
MV181A	44.1802667	-113.7661333	Idaho
MV181B	44.1802667	-113.7661333	Idaho
MV184A	44.1865667	-113.7495167	Idaho
MV184B	44.1865667	-113.7495167	Idaho
MV050A	44.19465	-113.74127	Idaho
MV050B	44.18253	-113.74615	Idaho
MV051A	44.18710	-113.74450	Idaho

MV051B	44.18233	-113.75002	Idaho
MV052A	44.18780	-113.74290	Idaho
MV052B	44.18177	-113.75175	Idaho
MV054A	44.18890	-113.73900	Idaho
MV055A	44.18980	-113.73660	Idaho
MV055B	44.17990	-113.75883	Idaho
MV056B	44.17922	-113.76428	Idaho
MV058B	44.18292	-113.75065	Idaho
MV059A	44.19370	-113.72790	Idaho
MV062A	44.18810	-113.73340	Idaho
MV063A	44.18720	-113.73460	Idaho
MV066C	44.19510	-113.74283	Idaho
MV067A	44.19270	-113.74560	Idaho
MV067B	44.19322	-113.74723	Idaho
MV067C	44.19300	-113.74533	Idaho
MV067F	44.19283	-113.74333	Idaho
MV070C	44.19570	-113.74490	Idaho
MV071A	44.19545	-113.74923	Idaho
MV071B	44.19515	-113.74840	Idaho
MV071C	44.19478	-113.74950	Idaho
MV072A	44.19633	-113.74983	Idaho
MV072B	44.19867	-113.75133	Idaho
MV072C	44.19950	-113.75383	Idaho
MV072D	44.19720	-113.75680	Idaho

Online Appendix 3

Coordinates for gardens and maternal families in the Colorado and Idaho common garden experiments. We transplanted full siblings of one family per population.

Region	Family	Latitude	Longitude	Elevation (m)	Geographic distance from low elevation CO garden (m)	Geographic distance from high elevation CO garden (m)	Geographic distance from Idaho garden (m)	2011 cohort	2012 cohort
CO	low elevation garden	38°57.086	-106°59.465	2891	0				
CO	high elevation garden	39°02.346	-107°03.818	3133		0			
CO	GV048	38° 58.929	-107°00.078	2949	3512.3	8277.9	NA	CO low elevation garden	both CO gardens
CO	GV049	38° 59.052	-107°00.232	2940	3790.5	7962.0	NA	CO low elevation garden	both CO gardens
CO	GV050	38° 58.770	-107°00.030	2934	3210.0	8548.2	NA	CO low elevation garden	both CO gardens
CO	GV066	38° 58.778	-107°00.243	2929	3312.6	8347.3	NA	CO low elevation garden	both CO gardens
CO	GV068	38° 57.654	-106°59.561	2910	1050.4	10601.8	NA	CO low elevation garden	both CO gardens
CO	GV072	38° 58.070	-106°59.799	2933	1872.3	9777.1	NA	CO low elevation garden	both CO gardens
CO	GV086	38° 57.329	-106°59.308	2880	499.1	11302.2	NA	CO low elevation garden	both CO gardens
CO	GV089	38° 56.992	-106°59.408	2869	204.9	11743.3	NA	CO low elevation garden	both CO gardens
CO	GV092	38° 57.250	-106°59.612	2925	355.9	11183.7	NA	CO low elevation garden	both CO gardens
CO	GV095	38° 57.730	-106°59.300	2966	1208.6	10707.2	NA	CO low elevation garden	both CO gardens

CO	GV096	38° 57.750	-106°59.140	2994	1309.3	10817.2	NA	CO low elevation garden	both CO gardens
CO	GV101	38° 58.490	-106°59.470	3050	2590.9	9460.3	NA	CO low elevation garden	both CO gardens
CO	GV105	38° 58.280	-106°59.770	2929	2242.8	9490.2	NA	CO low elevation garden	both CO gardens
CO	GV161	38° 59.956	-107°01.265	3055	5891.4	5731.5	NA	CO low elevation garden	both CO gardens
CO	GV175	39 00.841	-107°02.675	3251	8315.9	3226.8	NA	CO low elevation garden	both CO gardens
CO	GV185	39 00.683	-107°02.037	3411	7594.1	3991.4	NA	CO low elevation garden	both CO gardens
CO	GV187	38° 59.730	-107°01.340	3067	5568.0	5996.5	NA	CO low elevation garden	both CO gardens
CO	GV188	38° 59.665	-107°01.456	3126	5545.4	5999.4	NA	CO low elevation garden	both CO gardens
CO	GV194	38° 59.436	-107°01.180	3108	4981.0	6572.3	NA	CO low elevation garden	both CO gardens
CO	GV197	38° 59.154	-106°58.227	3682	4214.1	9932.1	NA	CO low elevation garden	both CO gardens
CO	GV198	39 00.775	-106°56.781	3623	7830.5	10460.5	NA	CO low elevation garden	both CO gardens
CO	GV200	38° 59.887	-106°58.872	3448	5248.6	8401.8	NA	CO low elevation garden	both CO gardens
CO	GV202	38° 58.129	-107°01.660	3368	3668.5	8392.4	NA	CO low elevation garden	both CO gardens
CO	GV205	38° 58.433	-107°02.193	3463	4612.5	7605.8	NA	CO low elevation garden	both CO gardens
ID	Idaho garden	44°10.906”	-113°44.363	2535			0		
ID	MV050B	44° 10.952	-113°44.769	2545.1	NA	NA	550	Idaho garden	Idaho garden

ID	MV051A	44° 11.226	-113°44.67	2430. 8	NA	NA	717	Idaho garden	Idaho garden
ID	MV051B	44° 10.94	-113°45.001	2496.3	NA	NA	857	Idaho garden	Idaho garden
ID	MV052B	44° 10.906	-113°45.105	2499.4	NA	NA	994	Idaho garden	Idaho garden
ID	MV054A	44° 11.334	-113° 44.34	2423.2	NA	NA	787	Idaho garden	Not planted
ID	MV055A	44° 11.388	-113°44.196	2414	NA	NA	913	Idaho garden	Idaho garden
ID	MV055B	44° 10.794	-113°45.53	2529.8	NA	NA	1576	Idaho garden	Idaho garden
ID	MV058B	44° 10.975	-113°45.039	2487.2	NA	NA	914	Idaho garden	Idaho garden
ID	MV062A	44° 11.286	-113°44.004	2441.4	NA	NA	848	Idaho garden	Idaho garden
ID	MV063A	44° 11.232	-113°44.076	2465.8	NA	NA	712	Idaho garden	Idaho garden
ID	MV066A	44° 11.628	-113°44.581	2468.9	NA	NA	1358	Idaho garden	Not planted
ID	MV067A	44° 11.562	-113°44.736	2478.0	NA	NA	1304	Idaho garden	Idaho garden
ID	MV067B	44° 11.593	-113°44.834	2487.2	NA	NA	1411	Idaho garden	Idaho garden
ID	MV067F	44° 11.57	-113° 44.6	2466.1	NA	NA	1260	Idaho garden	Idaho garden
ID	MV70C	44° 11.742	-113°44.694	2479	NA	NA	1,598	Not planted	Idaho garden
ID	MV071C	44° 11.687	-113°44.97	2505.5	NA	NA	1649	Idaho garden	Idaho garden
ID	MV072A	44° 11.78	-113°44.99	2510	NA	NA	1812	Idaho garden	Idaho garden
ID	MV072C	44° 11.97	-113°45.23	2648.7	NA	NA	2273	Idaho garden	Idaho garden

ID	MV073	44° 11.32	-113°45.77	2598.4	NA	NA	2032	Idaho garden	Idaho garden
ID	MV080	44° 11.15	-113°46.21	2513	NA	NA	2,513	Not planted	Idaho garden
ID	MV085	44° 10.54	-113°46.87	2746	NA	NA	3,424	Not planted	Idaho garden
ID	MV090	44° 10.06	-113°46.54	2884.9	NA	NA	3303	Idaho garden	Idaho garden
ID	MV092	44° 10.48	-113°46.53	2723.4	NA	NA	3005	Idaho garden	Idaho garden
ID	MV094	44° 10.79	-113°46.51	2686.8	NA	NA	2883	Idaho garden	Idaho garden
ID	MV095	44° 11.02	-113°46.4	2726.4	NA	NA	2736	Idaho garden	Idaho garden
ID	MV100	44° 11.2	-113°45.41	2540.5	NA	NA	1502	Idaho garden	Idaho garden

Online Appendix 4

Lifetime fitness components (survival and fecundity) analyzed separately for each garden and cohort.

Table 4A: Length of study for the separate cohorts and sites. The cohort indicates the year of planting. All individuals from that cohort were transplanted as juvenile rosettes of 2-3 months old in September-October of that year, and monitored in subsequent growing seasons.

	Monitored in 2012?	**Monitored in 2013?**	**Monitored in 2014?**	**Total number of years of study**
Colorado 2011 cohort: Low elevation garden (2891m)	Yes	Yes	Yes	3
Colorado 2012 cohort: Low elevation garden (2891m)	No	Yes	Yes	2
Colorado 2012 cohort: High elevation garden (3133m)	No	Yes	Yes	2
Idaho 2011 cohort	Yes	Yes	No	2
Idaho 2012 cohort	No	Yes	No	1

Table 4B: Variation in foliar damage and fitness in the two cohorts planted into the Colorado low elevation garden. Family level lifetime fitness averages were estimated as LSMEANs from mixed model analyses (Proc Mixed, SAS, ver. 9.3) that included initial size at planting as a covariate. Plants that failed to produce fruits over the course of the experiment were given fitness values of 0. Family means excluded plants that died during the first winter for the Colorado 2011 cohort. We report raw p-values, but highlight in bold the p-values that are significant after controlling for the false discovery rate across multiple analyses (Garcia 2004).

	Foliar damage						Survival				Lifetime fitness			
	CO 2011 cohort: 2012 growing season		CO 2011 cohort: 2013 growing season		CO 2012 cohort: 2013 growing season		CO 2011 cohort		CO 2012 cohort		CO 2011 cohort		CO 2012 cohort	
	$F_{1,21}$	p-value	$F_{1,21}$	p-value	$F_{1,21}$	p-value	χ^2	p-value	χ^2	p-value	$F_{1,19}$	p-value	$F_{1,21}$	p-value
Source elevation	27.9	**<0.0001**	10.5	**0.004**	0.26	0.61	13.22	**0.0003**	25.3	**<0.0001**	8.31	**0.0095**	0	0.98
Geographic distance	0.36	0.56	0.6	0.45	1.19	0.29	0.019	0.89	18.2	**<0.0001**	3.57	0.074	0.02	0.9
(Source elevation)^2									23.9	**<0.0001**	8.24	**0.0098**		
(Distance)^2											4.4	0.0496		

Table 4C: Clinal variation in herbivore susceptibility and fitness components in the high elevation CO garden. Family means excluded plants that died because of gopher activity for the CO 2012 high elevation garden. We report raw p-values; we highlight in bold the p-values that are significant after controlling for the false discovery rate across multiple analyses

	Foliar damage		Survival		Lifetime fitness	
	$F_{1,21}$	p-value	χ^2	p-value	$F_{1,21}$	p-value
Source elevation	16.99	**0.0005**	0.77	0.38	1.84	0.19
Geographic distance	5.31	0.0315	3.12	0.077	0.94	0.34

\\

Table 4D: Clinal variation in the two cohorts planted into the Idaho garden. The 2012 Idaho cohort had minimal reproductive success: plants from only 8 families successfully flowered, precluding separate analysis of fecundity.

	Foliar damage						Survival				Lifetime fitness		Fitness in first growing season (2012)	
	ID 2011 cohort: 2012 growing season		ID 2011 cohort: 2013 growing season		ID 2012 cohort: 2013 growing season		ID 2011 cohort		ID 2012 cohort		ID 2011 cohort		ID 2011 cohort	
	$F_{1,20}$	p-value	$F_{1,20}$	p-value	$F_{1,21}$	p-value	χ^2	p-value	χ^2	p-value	$F_{1,20}$	p-value	$F_{1,20}$	p-value
Source elevation	0.96	0.34	0	0.99	1.61	0.22	0.006	0.94	6.14	**0.013**	4.02	*0.059*	6.96	**0.016**
Geographic distance	1.44	0.24	0.02	0.89	0.72	0.41	0.81	0.37	6.66	**0.0099**	3.8	*0.065*	7.59	**0.012**

Online appendix 5

Repeated measures analysis of fitness components in the three years of the study of the low elevation Colorado garden (2012, 2013, and 2014). Results indicate that fitness clines with elevation hold across years (no significant effect of year or year by elevation interaction). Furthermore, these patterns are similar to those reported for fitness components in the main text (Fig. 2), suggesting that survival and fecundity estimates from any of these years would have generated similar results as those presented for lifetime fitness (integrated across years). The quadratic effect of elevation is only apparent for the fitness fecundity component. Here, survival is calculated as the number of individuals of each genotype that survived the growing season over the number that were alive the previous fall (for growing season 2013 and 2014) or the number that overwintered (for growing season 2012). As described in the text, plants on the northern side of this garden experienced high mortality due to unusually high winter runoff in spring 2012; individuals that died between planting and first monitoring on June 1, 2012 were excluded from fitness analysis in the main text. Including those individuals does not fundamentally alter fitness clines, but introduces noise to the data (Online Appendix 6).

The elevation of this garden is 2891m.

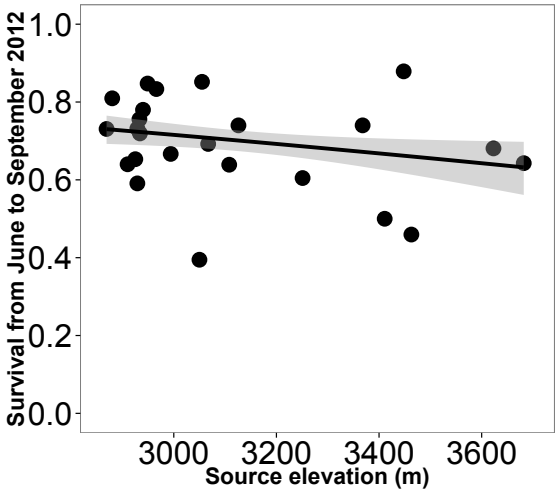
Table 5A: Lifetime fitness results for this low elevation garden (replicated from Appendix 4B):

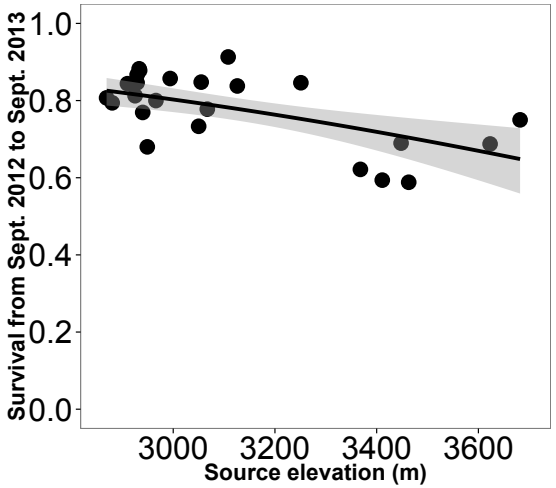
	Survival		Lifetime fitness	
	χ^2	p-value	$F_{1,19}$	p-value
Source elevation	13.22	**0.0003**	8.31	**0.0095**
Geographic distance	0.019	0.89	3.57	0.074
$(\text{Source elevation})^2$			8.24	**0.0098**
$(\text{Distance})^2$			4.4	0.0496

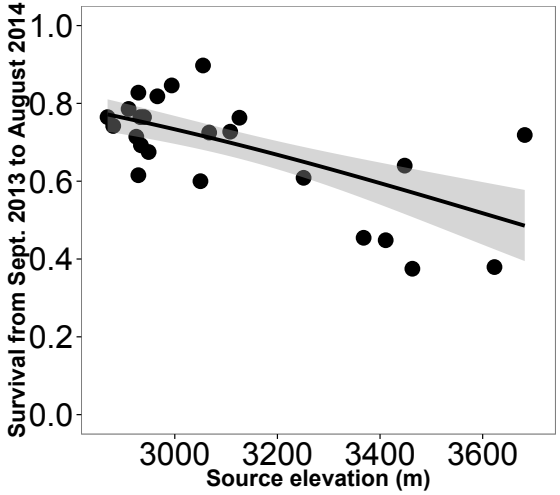
Table 5B: Results of repeated measures analyses of annual fitness over the course of three growing seasons (2012, 2013, and 2014). We found no evidence for nonlinear fitness functions for the probability of survival, so we excluded quadratic effects of source elevation and distance. For fecundity, we retained those quadratic effects because the slope of the non-linear relationship between number of fruits and elevation, and for symmetry with the lifetime analyses replicated above. An alternative model excluding quadratic effects of distance for fecundity results in qualitatively similar patterns (not shown).

	Probability of survival		Fecundity	
	$F_{1,21}$	p-value	$F_{1,19}$	p-value
Source elevation	8.28	**0.009**	5.43	**0.031**
$(\text{Source elevation})^2$			8.97	**0.0074**
Year	$F_{2,42}$=1.29	0.29	$F_{2,35}$=2.52	0.095
Year ×Source elevation	$F_{2,42}$=0.98	0.39	$F_{2,35}$=2.41	0.10
Year × $(\text{Source elevation})^2$			$F_{2,35}$=2.41	0.10
Geographic distance	0.00	0.99	0.24	0.63
$(\text{Geographic distance})^2$			0.01	0.92
Year × Geographic distance	$F_{2,42}$=0.13	0.88	$F_{2,35}$=0.32	0.73
Year × $(\text{Geographic distance})^2$			$F_{2,35}$=0.39	0.68

Survival clines from the three separate years:

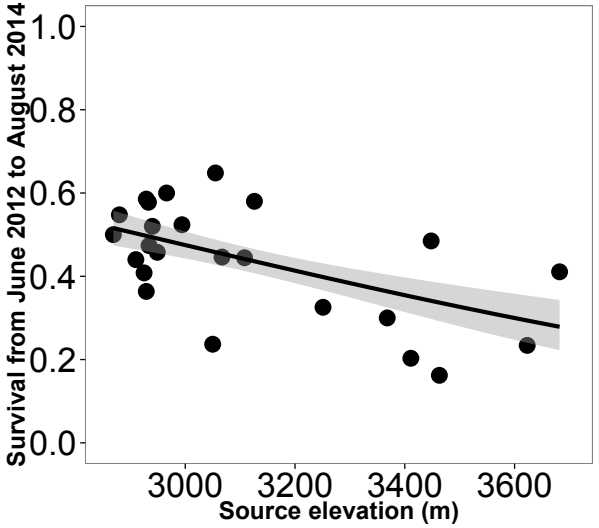




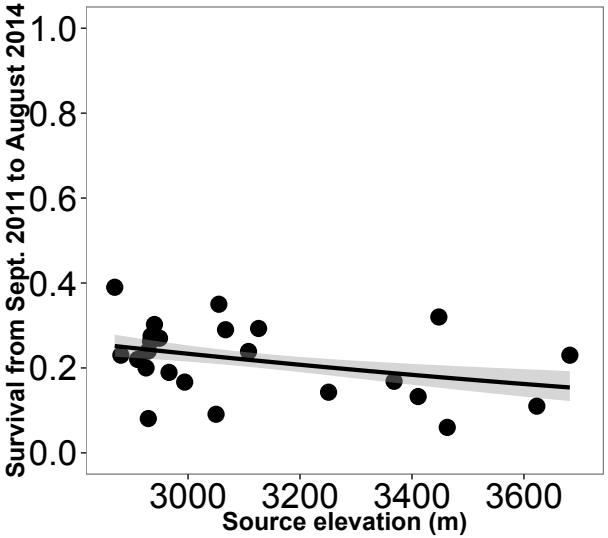


As a point of comparison, below are the survival curves from across the entire experiment (excluding initial overwinter mortality on the left, and including all plants on the right). Both of these clines are statistically significant (see main text and Appendix 6):

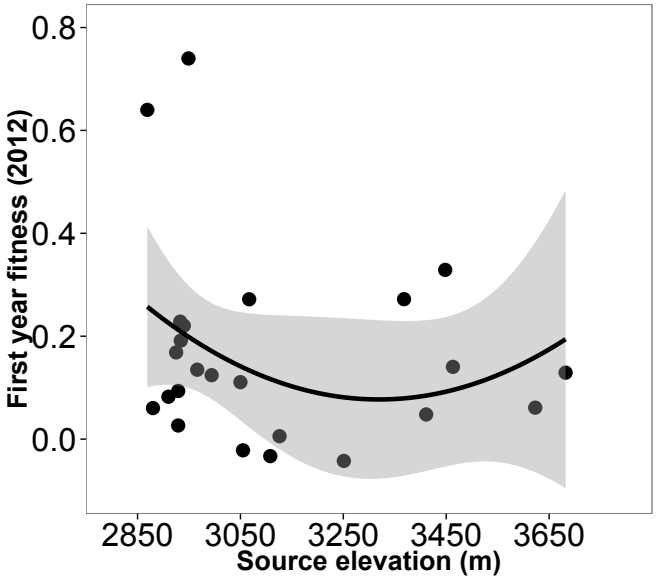
Excluding plants that died over the first winter (2011-2012)

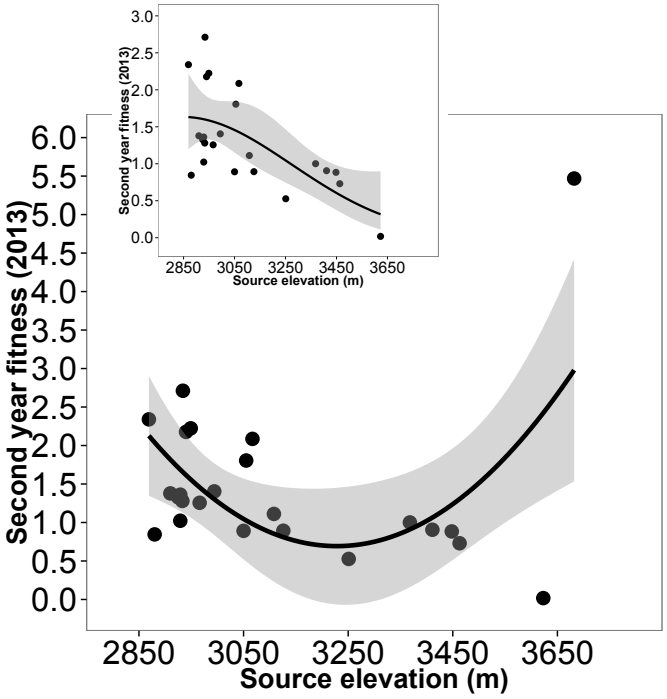


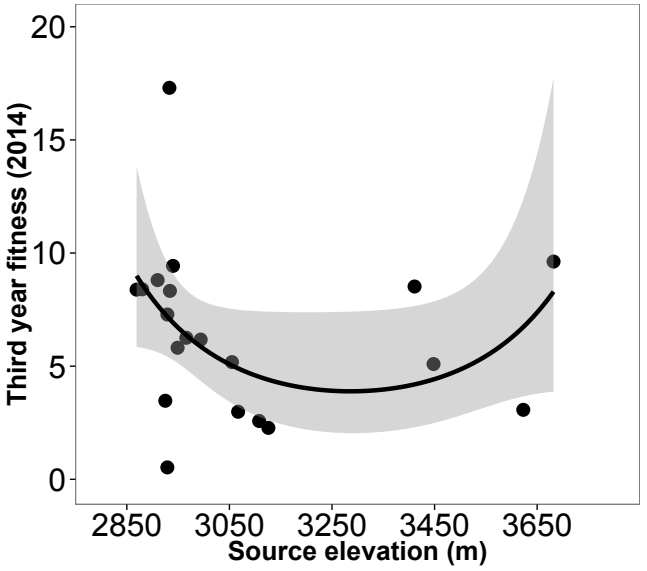
Including all individuals, even first-year overwinter mortality



Fecundity clines: Repeated measures ANOVA indicates that there are significant linear and quadratic effects of source elevation, but no significant effect of geographic distance on fecundity. In addition, repeated measures ANOVA found no significant effect of year or year by elevation interactions. In the second year (2013), the non-linear aspect of the clinal relationship is driven by one high elevation family with very high fecundity. For that year, we show an inset plot of the relation ship between fecundity and source elevation excluding that outlier. The inset plot does not obscure any data points.

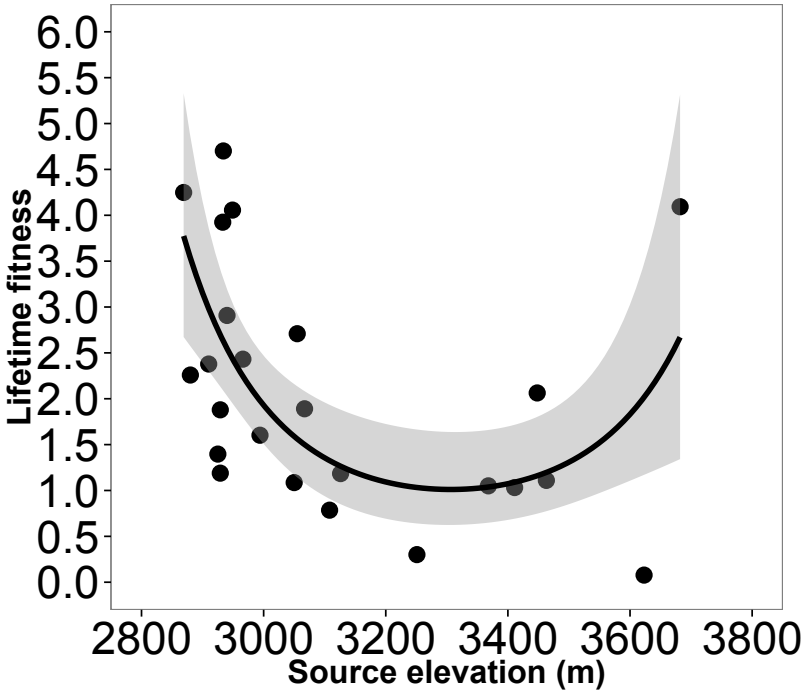




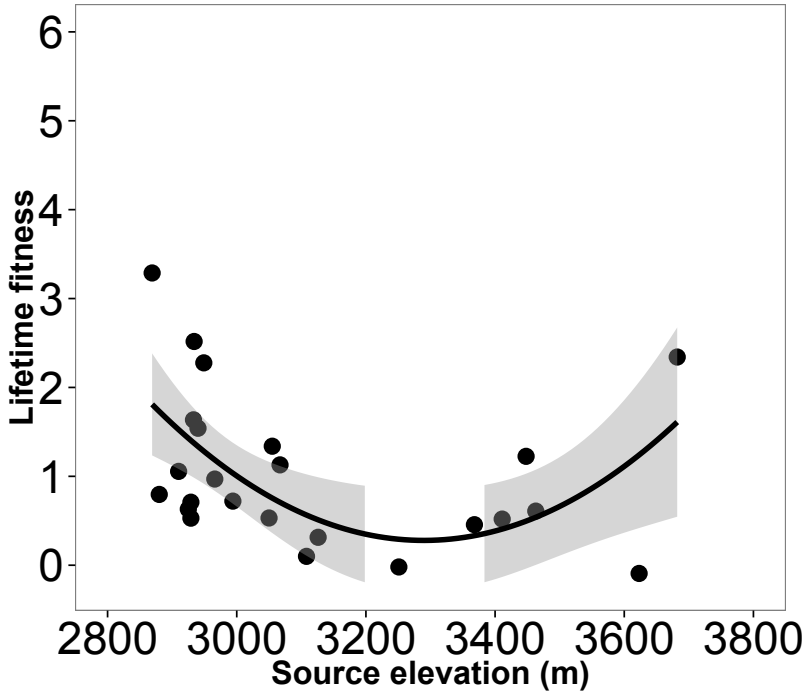


As a point of comparison, below we have replicated the fecundity clines from across all three years. As for survival, we show both the cline with family averages excluding the plants that died over the first winter (Fig 3 in text) and the cline of family averages including all plants (Appendix 6). In both cases, we find significant linear and quadratic effects of source elevation, but no significant effect of geographic distance:

Excluding plants that died over the first winter (2011-2012)



Including all individuals, even first-year overwinter



Online Appendix 6

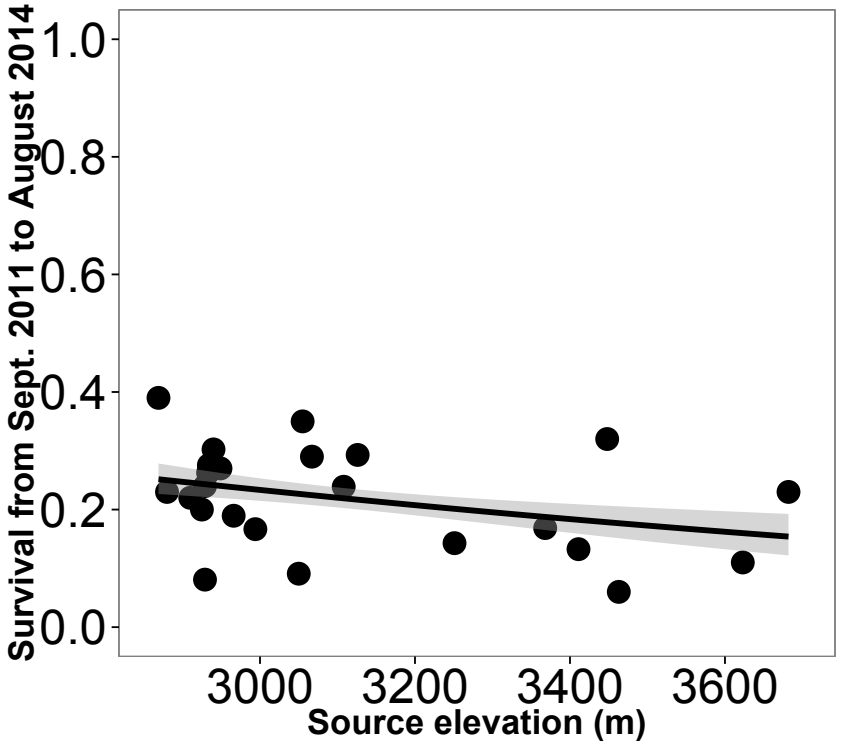
Fitness analyses including plants that died over the first winter for the Colorado 2011 low elevation cohort. This cohort suffered 49.8% mortality the first winter after planting (winter 2011-2012), leaving 1150 individuals alive on the first census date of 1 June 2012. We excluded those plants from the analyses presented in the main text. Here, we show results of analyses including those plants:

(6A) Initial overwinter survivorship (fall 2011 to June 2012): There was no evidence for clinal variation in fitness during this time frame (Proc Logistic)

	χ^2	p-value
Elevation of origin	0.17	0.68
Geographic distance	1.63	0.20

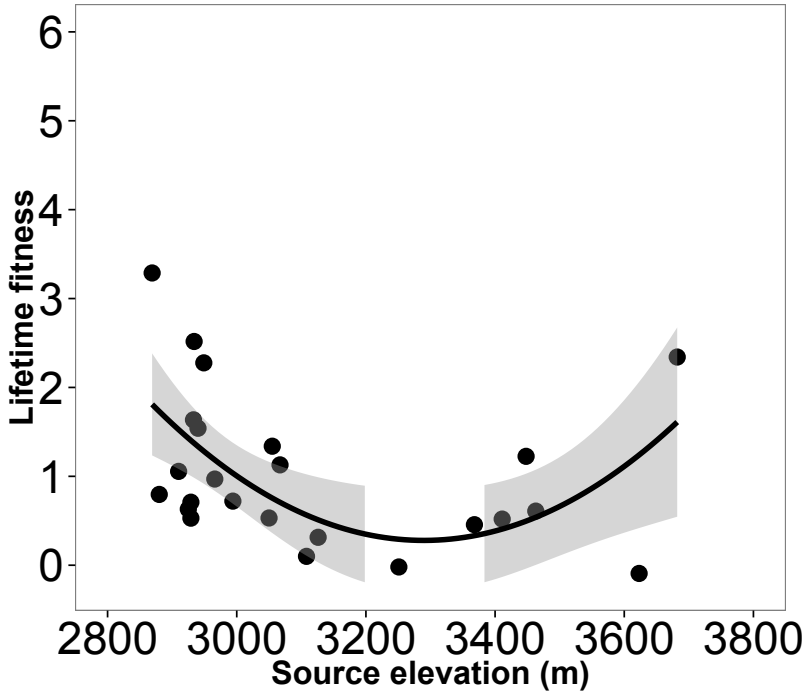
(6B) Survivorship over the course of the study (from planting to September 2014). We find similar results when we analyze survivorship from planting to the end of the experiment (here) compared with the models presented in the main paper (from initial overwinter survival to September 2014). The odds of survival decline by 8.5% for every 100m increase in source elevation (odds ratio: 0.915; 95% CI: 0.863, 0.970):

	χ^2	p-value
Elevation of origin	8.8	**0.0030**
Geographic distance	0.43	0.51



(6C) We analyzed lifetime fitness (numbers of fruits) on all plants, including those that died in the initial winter. The results are similar to those presented in the main text:

	Beta estimate	$F_{1,19}$	p-value
Elevation of origin	-0.063 ± 0.026	6.09	**0.0233**
Geographic distance		1.73	0.20
$(\text{Elevation of origin})^2$	9.62E-6 ± 3.90E-6	6.10	**0.0232**
$(\text{Geographic distance})^2$		2.20	0.15



(6D) Finally, we ran a zero-inflated negative binomial model using individual level data, including plants that died in the first winter (R package glmmADMB, ver. 0.8.0). These results are consistent with the dataset confined to the subset of plants that survived the first winter (see Appendix 7).

	Estimate	Std. Error	z value	Pr(>|z|)
Elevation of origin	-4.86E-02	1.18E-02	-4.13	**3.60E-05**
Geographic distance	4.59E-05	5.27E-05	0.87	0.3839
$(\text{Elevation of origin})^2$	7.41E-06	1.79E-06	4.15	**3.30E-05**
Initial plant size	1.16E-02	3.66E-03	3.16	**0.0016**
	χ^2	p-value		
genotype	0	1.00		
block	25.42	**<0.0001**		

Online Appendix 7

Clinal variation in fitness, modeled using individual level lifetime fitness data with a zero-inflated negative binomial distribution (R package glmmADMB ver. 0.8.0) with random effects for genotype and block. Lifetime fecundity was analyzed as a function of linear and quadratic effects of source elevation and geographic distance, and we included initial plant size as a covariate in these multivariate regressions. These individual level data were modeled separately for each garden and cohort. Table 7A shows results of two analyses from the CO 2011 cohort: (1) excluding the plants that died over the initial winter when there was heavy mortality from spring runoff, and (2) including all plants. Individuals that died, did not flower, or simply failed to set fruit were given fitness values of 0. Table 7B has results from the other gardens and cohorts.

Table 7A: 2011 cohort planted into the low elevation Colorado environment. Analyses revealed similar patterns whether the dataset excluded (left) or included (right) plants that died in the initial overwintering period between planting and the first census.

	Colorado 2011 cohort: Low elevation. Excluding plants that died during the first winter				Colorado 2011 cohort: Low elevation. Incuding all plants			
	Estimate	SE	z value	Pr(>|z|)	Estimate	SE	z value	Pr(>|z|)
Source elevation	-4.67E-02	1.16E-02	-4.01	**6.00E-05**	-4.80E-02	1.18E-02	-4.07	**4.70E-05**
Geographic distance	1.32E-04	9.60E-05	1.37	0.17	1.11E-04	9.63E-05	1.16	0.26
(Source elevation)^2	7.11E-06	1.76E-06	4.03	**5.50E-05**	7.32E-06	1.79E-06	4.09	**4.40E-05**
(Geographic distance)^2	-1.38E-08	1.21E-08	-1.14	0.25	-9.95E-09	1.22E-08	-0.82	0.41
Initial plant size	9.12E-03	3.47E-03	2.63	**0.0086**	1.10E-02	3.71E-03	2.95	**0.0031**
	χ^2	p-value			χ^2	p-value		
genotype	0	1			0	1		
block	29.06	**<0.0001**			26	**<0.0001**		

Table 7B: Results of zero-inflated negative binomial models for the remaining sites are consistent with family level models (see main text).

	Colorado 2012 cohort: Low elevation				Colorado 2012 cohort: High elevation				Idaho 2011 cohort				Idaho 2012 cohort			
	Estimate	SE	z value	Pr(>|z|)	Estimate	SE	z value	Pr(>|z|)	Estimate	SE	z value	Pr(>|z|)	Estimate	SE	z value	Pr(>|z|)
Source elevation	-3.7E-03	1.11E-02	-0.33	0.74	-1.7E-02	1.98E-02	-0.88	0.38	3.3E-02	1.70E-02	1.94	*0.053*	9.3E-03	1.05E-01	0.09	0.93
Geographic distance	9.6E-07	1.07E-04	0.01	0.99	4.6E-04	2.69E-04	1.71	0.087	-6.2E-04	3.70E-04	-1.67	0.094	3.8E-04	2.61E-03	0.15	0.88
(Source elevation)^2	5.1E-07	1.69E-06	0.3	0.76	2.7E-06	3.04E-06	0.89	0.37	-6.3E-06	3.32E-06	-1.89	*0.058*	-6.2E-07	2.09E-05	-0.03	0.98
(Geographic distance)^2	4.1E-10	1.12E-08	0.04	0.97	-3.2E-08	1.74E-08	-1.85	0.064	1.7E-07	1.25E-07	1.33	0.18	-3.6E-07	1.00E-06	-0.36	0.72
Initial plant size	2.1E-03	4.46E-03	0.46	0.64	4.2E-03	2.11E-03	1.98	**0.048**	1.6E-02	1.17E-03	13.9	**<0.0001**	7.2E-02	3.35E-02	2.14	**0.032**
	χ^2	p-value				χ^2	p-value			χ^2	p-value			χ^2	p-value	
genotype	2.08	0.15			genotype	92.88	**<0.0001**		genotype	49.34	**<0.0001**		genotype	0	1	
block	0.7	0.4			block	1.48	0.22		block	11.66	**0.0006**		block	0	1	