Materials and Methods: Characterization of the elevational gradient

We measured volumetric soil moisture (Fig. S3A) using a hand-held ECH_20 EC5 soil moisture sensor (Decagon Devices, Pullman, Washington).

We measured percent canopy openness (Fig. S3B) by taking hemispheric photos using a Nikon Coolpix5000 camera with a Nikon Fisheye Converter FC-E8 0.21x, and analyzing the resulting images with Gap Light Analyzer (GLA) Version 2.0 (Simon Fraser University, Burnaby, British Columbia, and the Institute of Ecosystem Studies, Millbrook, New York).

We monitored near-surface air temperature in each experimental block using Maxim iButton (San Jose, California) temperature sensors (positioned ~10cm above the soil surface (i.e., seedling height) over the 2012 field season. We calculated the field-season growing degree days (GDD; Fig. S3C) for each site as the sum of degrees per daily mean temperature over 5°C, representing the biologically active period for most vegetation in the region. iButtons were deployed from June-November, thus GDD comparisons should only be made relative to other sites within the present study as the entire growing season was not captured.

Three soil samples of ~2L volume were collected from each experimental block, mixed, and brought back to the lab for the following analyses (Figs. S3D-R):

- A sub-sample of fresh soil from each block was extracted in 50 mL 1 N aqueous KCl on a reciprocating shaker for one hour. The resulting suspension was gravity-filtered through Watman No. 5 filter paper. Filtered extractions were subject to colorimetric determination of ammonium- and nitrate-nitrogen concentrations on a continuous-flow Technicon Autoanalyser II system using the indophenols blue (alkaline salicylate-nitroprusside-hypochlorite) and Griess-Ilosvay (Cd reduction-NED-sulphanilamide) reactions, respectively. Sample absorbances were compared against standard curves calculated for NH_4SO_4 and KNO_3. Extractable inorganic-N concentrations (mg/L) were then corrected to an oven-dry soil mass-basis (60°C for 48 hours).

The remaining soils were air-dried and passed through a 5 mm mesh sieve to remove rocks, root fragments, and other large particles and subsequently analyzed for the following variables:

- We measured the pH of a sub-sample of air-dried soil from each block (SI Analytics GmbH, Haan, Germany).
- A sub-sample of sieved soil was weighed and then dry-ashed at 400°C for 12 hours to determine loss-on-ignition (LOI) and thus the percent soil organic matter content. Organic matter mass was calculated as the difference between pre- and post-ash mass, with percent soil matter content being the difference divided by the pre-ashed mass.
- A sub-sample of sieved soil was ground with a mortar and pestle, 100-150 mg of which was weighed to the nearest 0.1 mg prior to flash combustion at 960°C under medical-grade O_2 in a Vario Macro multi-element analyzer (Elementar analysensysteme GmbH, Haan, Germany). The dried and reduced (830°C) combustion gases were passed through a thermo-conductivity detector for sequential determination of total N (mg N/g) and total C (mg C/g). The remaining ground soil (about 3 g) was subject to extraction in 30 mL of Mehlich 3 reagent. The resulting suspensions (10:1) were agitated on a reciprocating shaker for five minutes and filtered through Whatman No. 5 papers. Phosphate-P

concentrations of the filtered extracts were determined by manual colorimetry using Murphy-Riley reagent (ammonium molybdate-potassium antimony tartrate-ascorbic acid) immediately following filtration. Sample absorbances (882 nm) were read after 10 minutes of color development and compared against those of standard solutions (0, 2, 4, 6, 8, 10 ppm phosphorus as KH_2PO_4). Available base cation (Ca, Mg, K, Na) concentrations were determined from Mehlich 3 extracts of the soils (Mehlich 1984), using inductively coupled plasma-atomic emission spectroscopy (ICP-AES).

References:

1. Mehlich, A. 1984 Mehlich 3 soil test extractant: a modification of Mehlich 2 extractant. *Commun. in Soil Sci. Plant Anal*. **15**, 1409-1416.

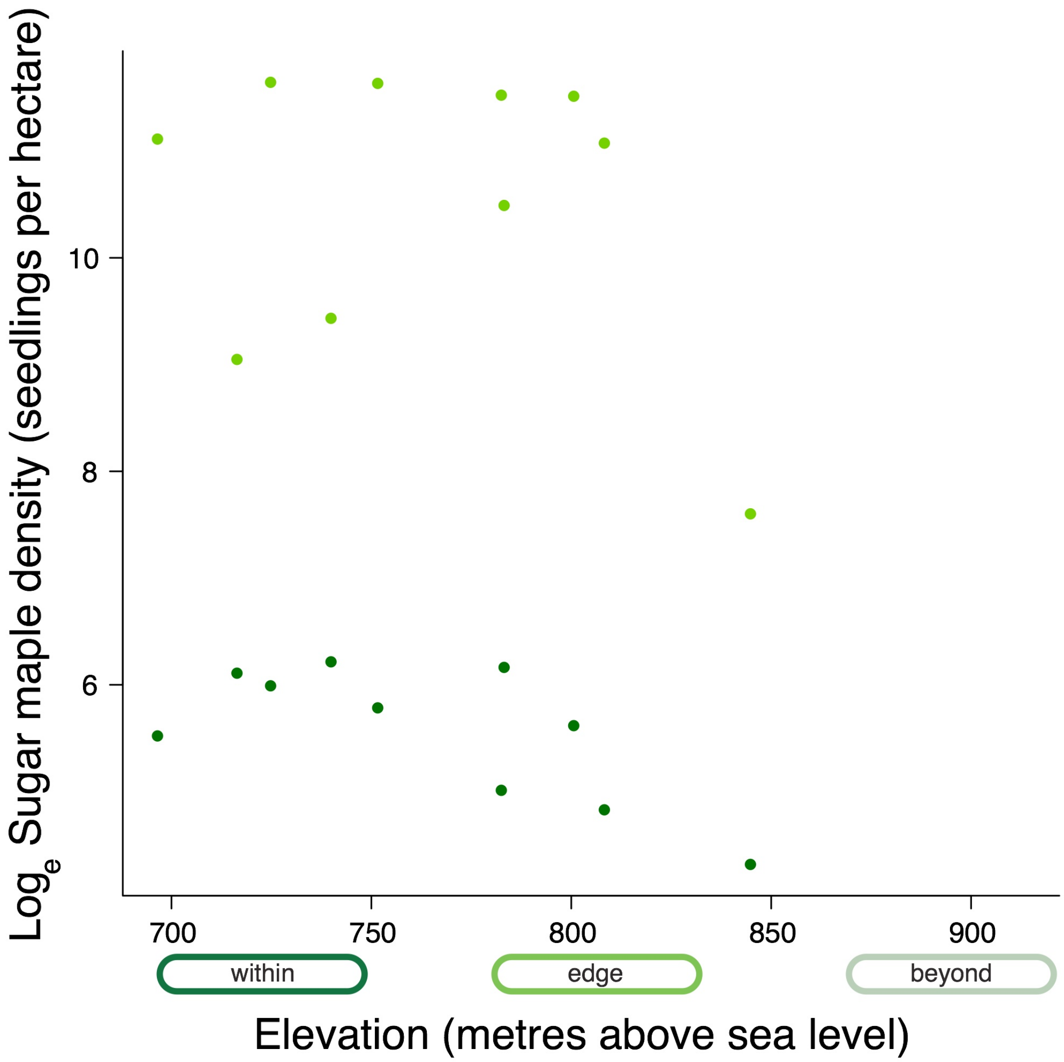

Figure S1: Natural distribution of sugar maple across the studied elevational gradient, quantified using 14 fixed-area plots located along two transects (seven per transect). Adults (height>1.4 m) were counted in a single 20x20 m plot at each of the 14 sampling points. Seedlings and saplings (height<1.4 m) were counted in 20-1x1 m plots positioned along two perpendicular transects within the larger adult plot, beginning and ending at the center point of each side of the adult plot. Trees (dark green) and seedling/saplings (light green) were measured as number of individuals per hectare on a $\log_{10}$ scale. No sugar maples were found in the sampling plots above 850 m ASL. Experimental site names are placed at their approximate elevational locations along the x-axis.

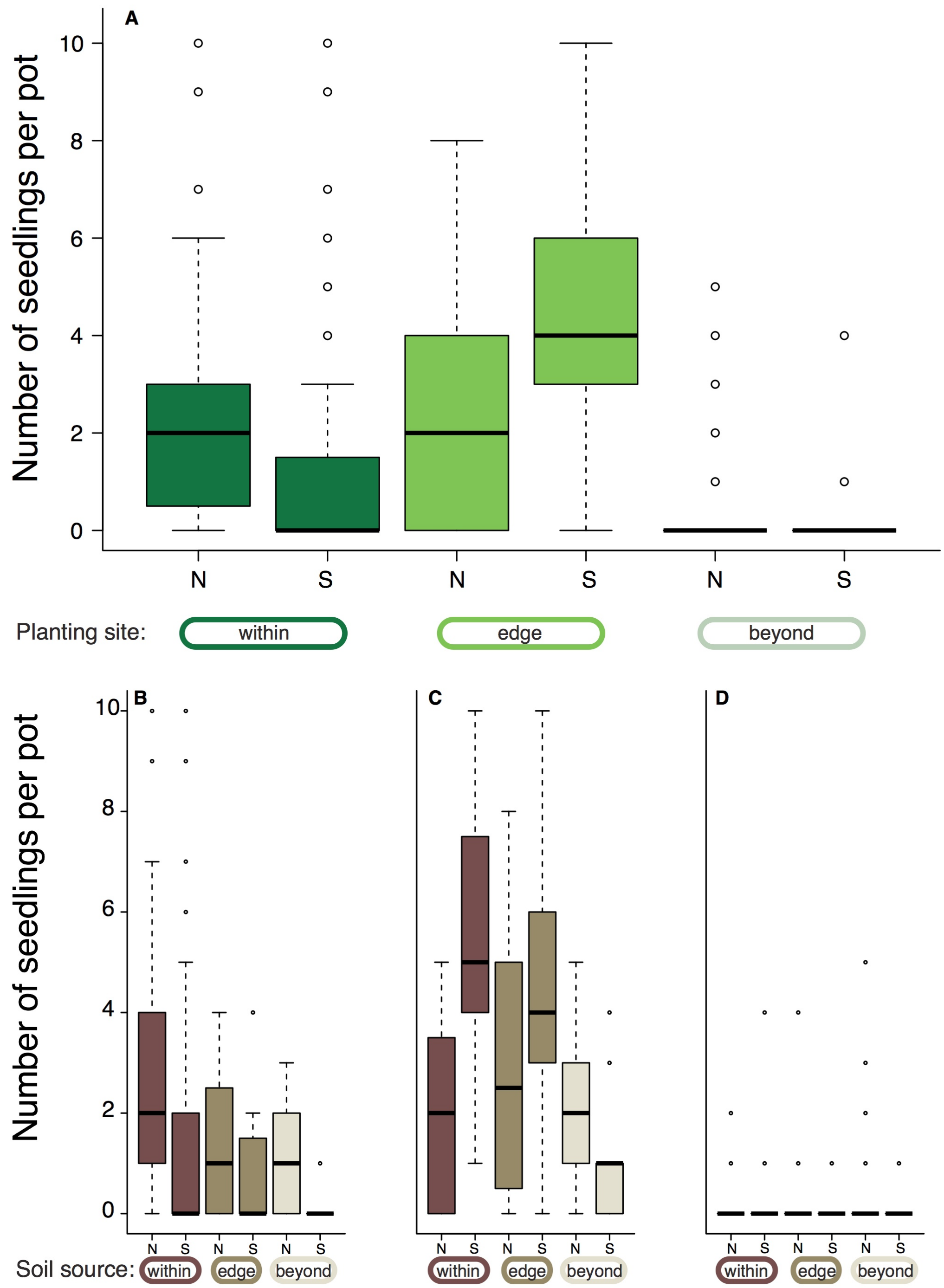

Figure S2: Seedling regeneration response to elevation, transect, and soil source. Number of seedlings per pot by (a) planting site, regardless of soil source, and planted at sites (b) within, (c) at the edge, and (d) beyond sugar maple's natural distribution along the north (N) and south (S) transects to show between-transect variation, and separated by soil source. The number of seedlings represents those individuals that survived beyond initial germination and persisted into late July during the first year of recruitment.

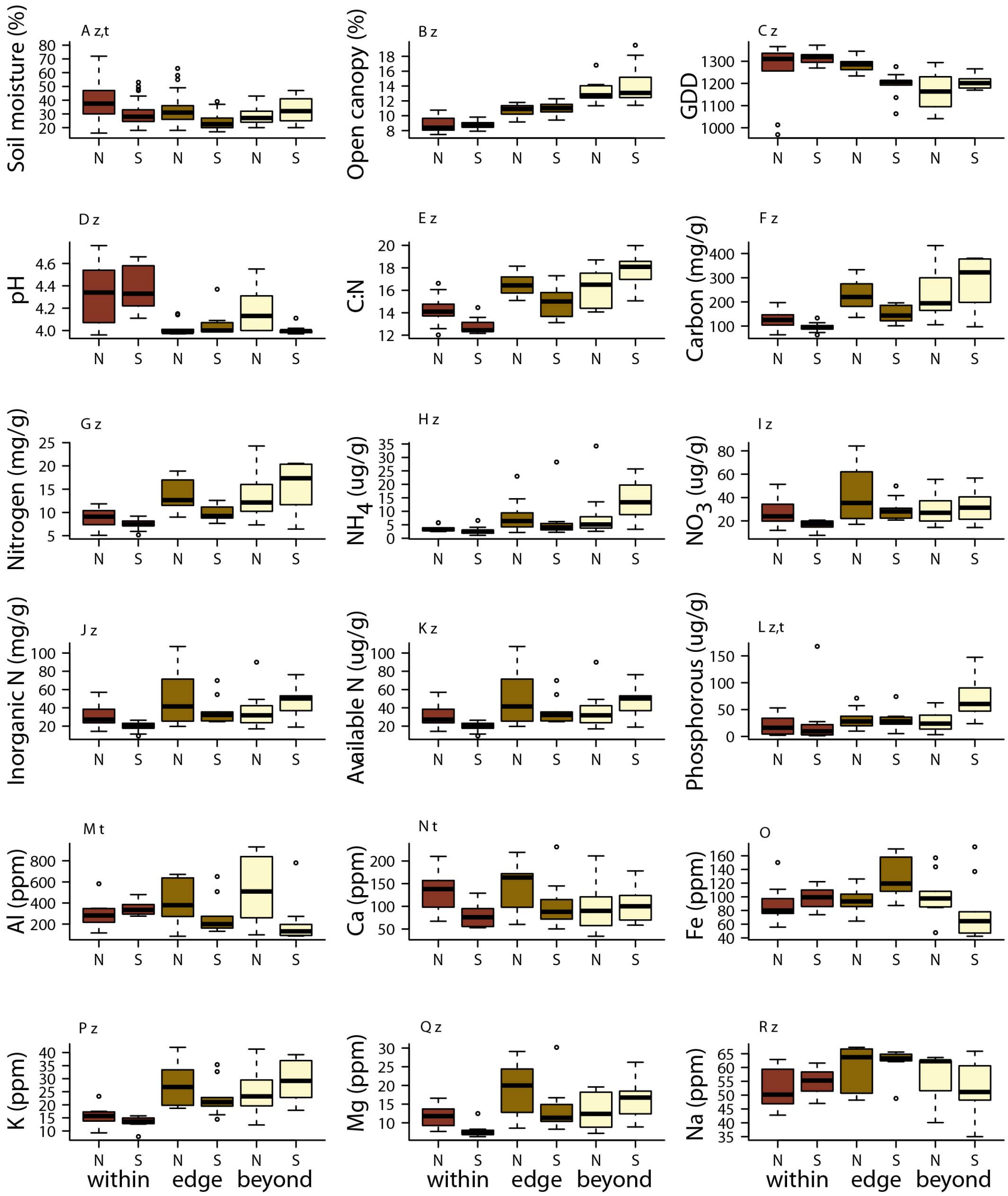

Figure S3: Characteristics of the elevational gradient and soil sampled at the planting sites (within, edge, and beyond). Measured characteristics were (a) percent soil moisture, (b) percent canopy openness, (c) number of growing degree days, (d) soil pH, (e) carbon nitrogen ratio, (f) total carbon, (g) total nitrogen, (h) ammonia (NH4), (i) nitrate (NO3), (j) inorganic nitrogen, (k) available nitrogen (ammonia + nitrate), (l) phosphorous content, and cation concentration of (m) aluminum, (n) calcium, (o) iron, (p) potassium, (q) magnesium, and (r) sodium. Soil characteristics are measured in milligrams per gram (mg/g), micrograms per gram (ug/g), or parts per million (ppm). Letters following the alphabetical panel designation indicate statistically significant differences ($p<0.05$) between elevational zones (z) or transects (t) tested with analysis of variance.

Table S1: Comparisons of pot versus no-pot treatments. Generalized linear models were used to test for differences of potted versus non-potted experimental plantings within each site. As no-pot treatments were only used on soil and seed from the planting site, they were compared to potted treatments with the same soil source and seed combination; i.e., three separate models are summarized below. Degrees of freedom for the pot treatment and residuals are shown in subscript following the t-value.

	Estimate	t-value	Probability
Planting site			
Within	-1.2	$3.2_{1,78}$	0.08
Edge	0.86	$2.4_{1,76}$	0.1
Beyond	-0.25	$1.8_{1,78}$	0.2

Table S2: Model summary of reciprocal seed-soil transplant experiment. Results from a generalized linear mixed model (assuming a Poisson distribution of residuals) of the effects of planting site, soil source, and seed source on sugar maple recruitment along an elevational gradient. Planting block and transect were included as random effects. Probabilities in bold indicate p≤0.05. Random effects had a variance=0.094 (block) and 2.97×10^{-11} (transect) and standard deviation=0.31 (block) and 5.45×10^{-6} (transect).

	Estimate	Standard error	z-value	Probability
Intercept	0.65	0.12	5.50	**<0.0001**
Planting site				
Edge	0.65	0.11	5.98	**<0.0001**
Beyond	-1.68	0.36	-4.64	**<0.0001**
Soil source				
Edge	-0.71	0.17	-4.10	**<0.0001**
Beyond	-1.36	0.31	-4.38	**<0.0001**
Seed source	0.063	0.082	0.77	0.44
Interactions				
Edge site*edge soil	0.66	0.20	3.36	**0.0008**
Beyond site*edge soil	0.64	0.55	1.17	0.24
Edge site*beyond soil	0.52	0.37	1.40	0.16
Beyond site*beyond soil	1.014	0.52	1.95	0.051

Table S3: Model summary of soil effects of elevational gradient within favourable climate. Results from a generalized linear mixed model (assuming a Poisson distribution of residuals) of the effects of soil source and seed source on sugar maple recruitment planted within sugar maple's natural distribution; i.e., within a zone of favourable climate. Planting block was included as a random effect. Probabilities in bold indicate $p \leq 0.05$. Random effects had a variance=0.12 and standard deviation=0.35.

	Estimate	Standard error	z-value	Probability
Intercept	0.62	0.18	3.40	**0.00068**
Soil source				
Edge	-0.71	0.18	-3.96	**<0.0001**
Beyond	-1.36	0.31	-4.38	**<0.0001**
Seed source	0.091	0.15	0.59	0.56

Table S4: Model summary of predator exclosure experiment. Results from a generalized linear mixed model (assuming a Poisson distribution of residuals) of the effects of seed predator exclosure cages on sugar maple seed survival along an elevational gradient. Planting block was included as a random effect. Probabilities in bold indicate p≤0.05.

	Estimate	Standard error	z-value	Probability
Intercept	0.99	0.14	7.30	**<0.0001**
Exclosure treatment				
Cage control	-0.15	0.20	-0.75	0.45
Cage	0.60	0.17	3.52	**<0.0001**
Planting site				
Edge	0.12	0.19	0.65	0.51
Beyond	-1.74	0.35	-4.94	**<0.0001**
Interactions				
Cage control*edge	0.27	0.27	1.00	0.32
Cage*edge	-0.14	0.24	-0.58	0.56
Cage control*beyond	-0.85	0.66	-1.29	0.20
Cage*beyond	1.68	0.38	4.42	**<0.0001**

Table S5: Model summary of sugar maple seedling growth. Results from a generalized linear mixed model of the effects of planting site, soil source, and seed source on sugar maple growth (measured as height) along an elevational gradient. Planting block and transect were included as a random effects. Probabilities in bold indicate p≤0.05. Random effects had standard deviations of 0.54 (transect) and 0.32 (block).

	Estimate	Standard error	t-value	Probability
Intercept	7.17	0.49	14.73	**<0.0001**
Planting site				
Edge	0.27	0.28	-0.96	0.34
Beyond	0.34	0.38	0.89	0.37
Soil source				
Edge	-0.19	0.17	-1.11	0.27
Beyond	-0.54	0.28	-1.94	0.054
Seed source	0.35	0.18	1.98	**0.049**