Table S1. Additional descriptions of experimental plots.

Plot	Hight (m)	Diameter (cm)	Total Basal Area (m^2/m^2)	Distance From Natural Forest (m)
Gap5	2.36 ± 0.60	11.8 ± 4.9	0.022 ± 0.007	210
Gap10	2.40 ± 1.04	12.5 ± 7.3	0.031 ± 0.008	20
Gap20	3.10 ± 1.43	18.7 ± 4.2	0.129 ± 0.045	270
Gap30	2.57 ± 1.05	15.0 ± 9.6	0.088 ± 0.057	160

Table S2. List of dispersed species and each dispersal type, growth form, species group, number of dispersed seeds, and proportion of number of seeds.

Species name	Dispersal Type	Growth Form	Species Group	Number of Seeds	Proportion (%)
Callicarpa spp.	Bird	Shrub	Secondary forest	2136	32.86
Eurya japonica	Bird	Shrub	Forest	1222	18.80
Broussonetia kazinoki × Broussonetia papyrifera	Bird	Shrub	Secondary forest	1172	18.03
Rubus spp.	Bird	Shrub	Pioneer	744	11.44
Acer mono var. marmoratum f.dissectum	Wind	Tree	Forest	247	3.80
Pinus densiflora	Wind	Tree	Secondary forest	214	3.29
Carpinus tschonoskii	Wind	Tree	Forest	157	2.42
Stachyurus praecox	Bird	Shrub	Pioneer	120	1.85
Zanthoxylum piperitum	Bird	Shrub	Secondary forest	90	1.38
Alnus hirsuta var. sibirica	Wind	Tree	Secondary forest	56	0.86
Diplomorpha sikokiana	Gravity	Shrub	Pioneer	47	0.72
Quercus acuta	Caching	Tree	Forest	27	0.42
Aralia elata	Bird	Shrub	Pioneer	27	0.42
Mallotus japonicus	Bird	Tree	Pioneer	26	0.40
Prunus jamasakura	Bird	Tree	Forest	26	0.40
Cocculus trilobus	Bird	Vine	Secondary forest	22	0.34
Hydrangea hirta	Gravity	Shrub	Pioneer	18	0.28
Vitis coignetiae	Bird	Vine	Secondary forest	13	0.20
Ilex macropoda	Bird	Tree	Forest	12	0.18
Zanthoxylum ailanthoides	Bird	Tree	Pioneer	11	0.17
Lindera umbellata	Bird	Shrub	Secondary forest	9	0.14
Trachelospermum asiaticum	Wind	Vine	Secondary forest	9	0.14
Rhus trichocarpa	Bird	Shrub	Pioneer	9	0.14
Abies firma	Wind	Tree	Forest	7	0.11
Zanthoxylum schinifolium	Bird	Shrub	Secondary forest	6	0.09
Swida macrophylla	Bird	Tree	Secondary forest	6	0.09
Celtis sinensis var. japonica	Bird	Tree	Secondary forest	5	0.08
Pinus thunbergii	Wind	Tree	Secondary forest	5	0.08
Vaccinium bracteatum	Bird	Shrub	Secondary forest	5	0.08
Sambucus racemosa ssp. sieboldiana	Bird	Shrub	Secondary forest	5	0.08
Rhus javanica var. roxburghii	Bird	Shrub	Pioneer	5	0.08
Styrax japonica	Caching	Tree	Secondary forest	4	0.06
Ficus erecta	Bird	Shrub	Secondary forest	3	0.05
Lonicera japonica	Bird	Shrub	Secondary forest	3	0.05
Tsuga sieboldii	Wind	Tree	Forest	3	0.05
Betula grossa	Wind	Tree	Forest	3	0.05
Lindera glauca	Bird	Shrub	Secondary forest	3	0.05
Carpinus laxiflora	Wind	Tree	Forest	2	0.03
Akebia quinata	Bird	Vine	Secondary forest	2	0.03
Berchemia racemosa	Bird	Vine	Secondary forest	2	0.03
Cleyera japonica	Bird	Tree	Forest	2	0.03

Smilax china	Bird	Vine	Pioneer	2	0.03
Rosa multiflora	Bird	Shrub	Secondary forest	2	0.03
Fraxinus sieboldiana	Wind	Tree	Forest	2	0.03
Sorbus alnifolia	Bird	Tree	Forest	1	0.02
Litsea coreana	Bird	Tree	Forest	1	0.02
Lindera erythrocarpa	Bird	Tree	Secondary forest	1	0.02
Diplomorpha ganpi	Gravity	Shrub	Pioneer	1	0.02
Quercus serrata	Caching	Tree	Secondary forest	1	0.02
Helwingia japonica	Bird	Shrub	Secondary forest	1	0.02
Kalopanax pictus	Bird	Tree	Forest	1	0.02
Skimmia japonica	Bird	Shrub	Secondary forest	1	0.02
Morus australis	Bird	Shrub	Secondary forest	1	0.02
Myrica rubra	Bird	Tree	Forest	1	0.02

Table S3. Bird-dispersed seed existence in each plot and measuring year. The plus denotes seed existence in seed traps.

Species No.	Growth Form	Species Group	2006		2007				2008				2009				2014				2018			
			5	30	5	10	20	30	5	10	20	30	5	10	20	30	5	10	20	30	5	10	20	30
Eurya japonica	Shrub	Forest	+	+	+			+	+		+	+			+	+	+	+	+	+	+	+	+	+
Callicarpa spp.	Shrub	Secondary forest			+			+	+		+	+	+		+	+	+	+	+	+	+	+	+	+
Rubus spp.	Shrub	Pioneer					+	+	+	+	+	+	+		+	+	+	+	+	+	+	+	+	+
Broussonetia kazinoki x B. papyrifera	Shrub	Secondary forest		+				+								+	+		+	+	+		+	+
Zanthoxylum piperitum	Shrub	Secondary forest			+		+							+	+	+	+			+	+	+	+	+
Prunus jamasakura	Tree	Forest	+	+				+	+				+	+		+				+	+		+	+
Litsea coreana	Tree	Forest				+																		
Lindera erythrocarpa	Tree	Secondary forest		+																				
Morus australis	Shrub	Secondary forest		+																				
Lindera glauca	Shrub	Secondary forest			+																			
Berchemia racemosa	Vine	Secondary forest									+		+											
Smilax china	Vine	Pioneer							+															+
Rosa multiflora	Shrub	Secondary forest									+	+												
Vitis coignetiae	Vine	Secondary forest										+												+
Kalopanax pictus	Tree	Forest																					+	
Sorbus alnifolia	Tree	Forest																			+			
Zanthoxylum schinifolium	Shrub	Secondary forest																		+				
Skimmia japonica	Shrub	Secondary forest																	+					
Myrica rubra	Tree	Forest														+								
Aralia elata	Shrub	Pioneer	+																		+		+	+
Mallotus japonicus	Tree	Pioneer																			+	+		+
Stachyurus praecox	Shrub	Pioneer																			+		+	+
Ilex macropoda	Tree	Forest											+									+	+	+
Celtis sinensis var. japonica	Tree	Secondary forest			+			+															+	+
Lindera umbellata	Shrub	Secondary forest						+						+								+		+
Cocculus trilobus	Vine	Secondary forest																					+	+
Rhus trichocarpa	Shrub	Pioneer																					+	+
Rhus javanica var. roxburghii	Shrub	Pioneer																	+	+				+
Cleyera japonica	Tree	Forest																				+		+
Swida macrophylla	Tree	Secondary forest			+										+									+
Akebia quinata	Vine	Secondary forest									+	+												
Ficus erecta	Shrub	Secondary forest																	+					+
Zanthoxylum ailanthoides	Tree	Pioneer											+											+
Vaccinium bracteatum	Shrub	Secondary forest														+								+
Lonicera japonica	Shrub	Secondary forest																						+
Sambucus racemosa ssp. sieboldiana	Shrub	Secondary forest																						+
Helwingia japonica	Shrub	Secondary forest																						+

Eurya japonica	Shrub	Forest	+

Table S4. GLM results as an example. Response variable is proportion of seed traps with dispersed seeds at each collection and explanatory variable is gap mosaic.

Year	Variables	Estimate
2006	Intercept	−3.871
	Gap5	0.278
2007	Intercept	−5.043
	Gap5	1.269
	Gap20	0.7
	Gap30	1.318
2008	Intercept	−4.077
	Gap5	1.369
	Gap20	0.71
	Gap30	1.111
2009	Intercept	−3.555
	Gap5	1.095
	Gap20	1.023
	Gap30	1.543
2014	Intercept	−2.344
	Gap5	0.193
	Gap20	0.658
	Gap30	0.765
2018	Intercept	−1.713
	Gap5	0.262
	Gap20	1.338
	Gap30	1.218

Table S5. GLM results as an example. Response variable is proportion of seed traps with dispersed seeds at each collection and explanatory variable is measuring year.

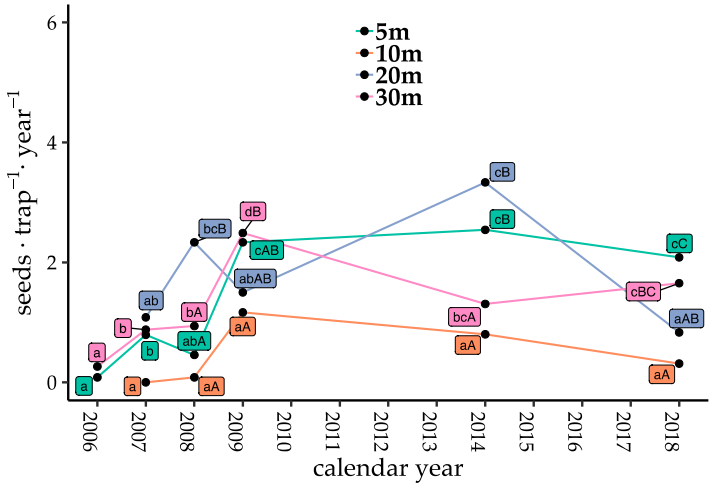
Gap	Variables	Estimate
Gap5	Intercept	−3.593
	2007	−0.182
	2008	0.885
	2009	1.133
	2014	1.441
	2018	2.141
Gap10	Intercept	−5.043
	2008	0.966
	2009	1.488
	2014	2.699
	2018	3.33
Gap20	Intercept	−4.344
	2008	0.977
	2009	1.818
	2014	2.657
	2018	3.969
Gap30	Intercept	−3.871
	2007	0.146
	2008	0.905
	2009	1.86
	2014	2.292

2018	3.376	

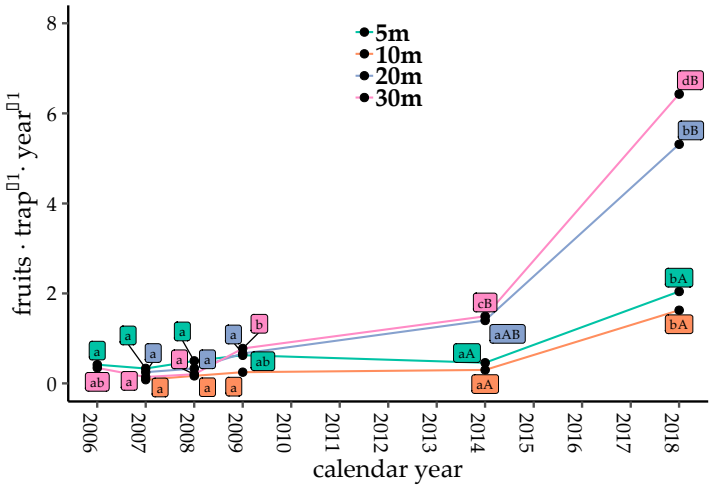
Table S6. Result of Bayesian analysis. (1)–(5) denote the month from August to December. (,1) and (,2) denote no fruit and fruit, respectively.

Parameter	Mean	Confidence Interval					n_eff	Rhat
		2.5%	25.0%	50.0%	75.0%	95.7%		
a (1)	0.913 ± 0.008	0.256	0.673	0.893	1.131	1.714	1783	0.999
a (2)	0.545 ± 0.006	0.066	0.363	0.534	0.710	1.092	1700	1.002
a (3)	1.314±0.009	0.665	1.042	1.280	1.555	2.180	1803	0.999
a (4)	0.567 ± 0.006	0.104	0.416	0.568	0.716	1.034	1388	1.000
a (5)	1.020 ± 0.01	0.371	0.748	0.985	1.259	1.840	1630	1.001
b (1,1)	−1.037 ± 0.008	−1.746	−1.274	−1.039	−0.803	−0.349	1758	1.001
b (1,2)	0.327 ± 0.018	−0.868	−0.161	0.258	0.723	1.967	1528	0.999
b (2,1)	-0.556 ± 0.008	−1.159	−0.768	−0.563	−0.353	0.072	1434	0.999
b (2,2)	−0.225 ± 0.011	−1.099	−0.537	−0.228	0.091	0.695	1718	1.001
b (3,1)	−0.660 ± 0.009	−1.372	−0.894	−0.666	−0.440	0.079	1630	1.001
b (3,2)	0.190 ± 0.014	−0.783	−0.170	0.146	0.506	1.354	1531	0.999
b (4,1)	−0.213 ± 0.011	−1.041	−0.527	−0.230	0.080	0.725	1742	0.999
b (4,2)	0.156 ± 0.006	−0.326	−0.020	0.150	0.329	0.649	1698	1.000
b (5,1)	0.447 ± 0.01	−0.221	0.176	0.417	0.687	1.294	1584	1.002
b (5,2)	0.602 ± 0.011	−0.209	0.299	0.581	0.877	1.512	1723	1.001
c (1)	−0.376 ± 0.048	−4.711	−1.266	−0.102	0.759	2.917	1702	1.002
c (2)	1.458 ± 0.055	0.076	0.608	1.121	1.892	4.866	555	1.003
c (3)	1.117 ± 0.02	0.203	0.623	0.953	1.415	3.066	1322	1.003
c (4)	0.167 ± 0.001	0.044	0.124	0.166	0.207	0.288	1837	1.000
c (5)	−3.870 ± 0.056	−7.659	−4.713	−3.602	−2.710	−1.438	850	1.002
d (1,1)	−6.051 ± 0.204	−19.448	−7.220	−4.816	−3.297	−1.618	512	1.001
d (1,2)	−5.358 ± 0.201	−17.974	−6.484	−4.101	−2.610	−1.007	528	1.002
d (2,1)	−4.345 ± 0.208	−16.287	−5.361	−3.073	−1.657	−0.401	480	1.006
d (2,2)	−2.820 ± 0.112	−10.017	−3.656	−2.065	−1.070	−0.250	562	1.004
d (3,1)	−2.272 ± 0.042	−6.263	−2.906	−1.894	−1.206	−0.413	1326	1.002
d (3,2)	−3.832 ± 0.144	−12.794	−4.406	−2.934	−2.044	−0.977	564	1.001
d (4,1)	−2.972 ± 0.197	−16.549	−3.372	−1.339	−0.759	−0.222	467	1.006
d (4,2)	0.137 ± 0.002	−0.074	0.081	0.146	0.202	0.304	1732	1.000
d (5,1)	−7.495 ± 0.233	−19.777	−8.783	−6.381	−4.769	−2.829	396	1.003
d (5,2)	−2.623 ± 0.05	−5.963	−3.360	−2.393	−1.604	−0.530	848	1.002
abase	0.851 ± 0.02	−0.063	0.599	0.858	1.111	1.813	814	1.001
bbase	−0.091 ± 0.008	−0.684	−0.296	−0.110	0.096	0.596	1724	1.000
cbase	−0.232 ± 0.07	−4.369	−1.155	−0.208	0.677	3.799	1090	1.001
dbase	−3.747 ± 0.126	−10.976	−4.565	−3.058	−2.162	−0.857	435	1.004
pf (1)	0.835 ± 0.007	0.339	0.637	0.825	1.014	1.394	1715	1.001
pf (2)	0.591 ± 0.005	0.199	0.445	0.586	0.726	1.028	1833	1.000
pf (3)	0.330 ± 0.004	−0.015	0.217	0.328	0.454	0.676	1700	1.003
pf (4)	0.067 ± 0.005	−0.330	−0.068	0.074	0.209	0.443	1883	0.999

pf (5)	0.145 ± 0.005	−0.244	0.016	0.149	0.272	0.508	1742	1.001
pic (1)	−1.973 ± 0.008	−2.640	−2.180	−1.962	−1.743	−1.364	1770	1.000
pic (2)	−1.177 ± 0.006	−1.661	−1.329	−1.175	−1.016	−0.735	1635	0.999
pic (3)	−0.762 ± 0.005	−1.175	−0.905	−0.762	−0.627	−0.348	1652	1.000
pic (4)	0.744 ± 0.005	0.334	0.597	0.736	0.897	1.153	1855	0.999
pic (5)	−0.627 ± 0.005	−1.037	−0.759	−0.622	−0.486	−0.223	1703	1.002



(**a**)



(**b**)

Figure S1. Temporal changes in seed dispersal in each plot. (**a**) Number of wind-dispersed seeds; (**b**) number of bird-dispersed fruits except *Callicarpa*. Different lowercase letters denote significant differences among measuring years, and uppercase letters denote significant differences among plots from multiple comparisons (GLM, $\alpha = 0.05$).

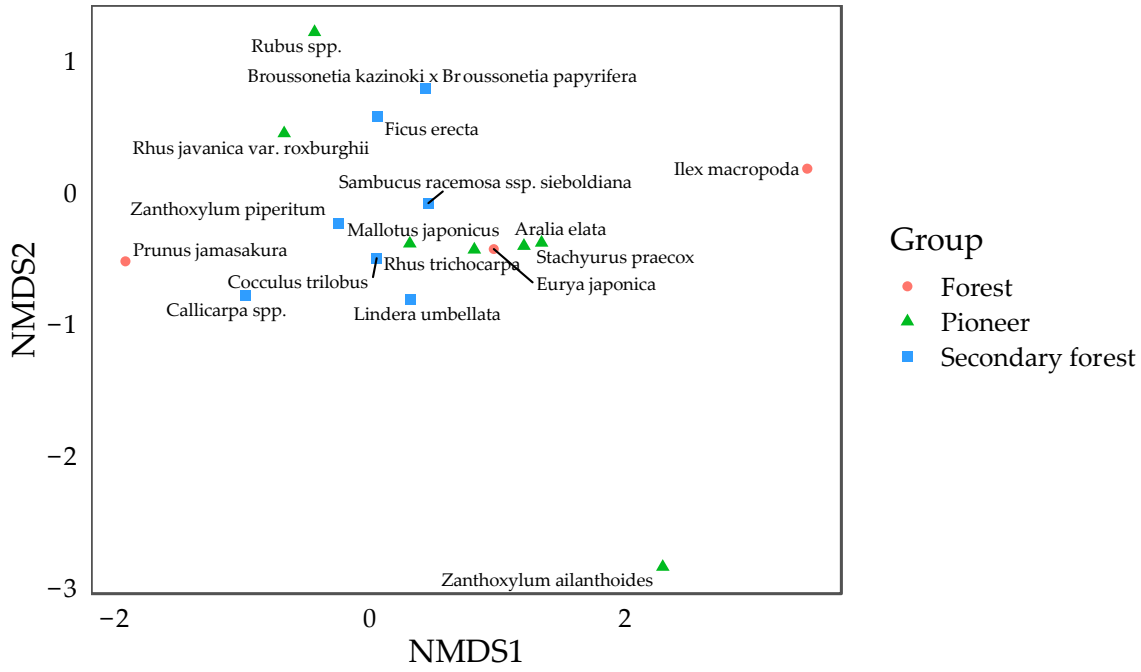


Figure S2. First two axes of a two-dimensional nonmetric multidimensional scaling fit based on Jaccard distances (k = 2, *stress* = 0.093). Each point denotes a dispersed species. Different shapes and colors denote each species group. We excluded from the analysis species which were dispersed only a few times.