Supplementary Material

The post-fire assembly processes of tree communities based on spatial analysis of a Sierra Nevada mixed-conifer forest

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Appendix A – Supplemental Figures

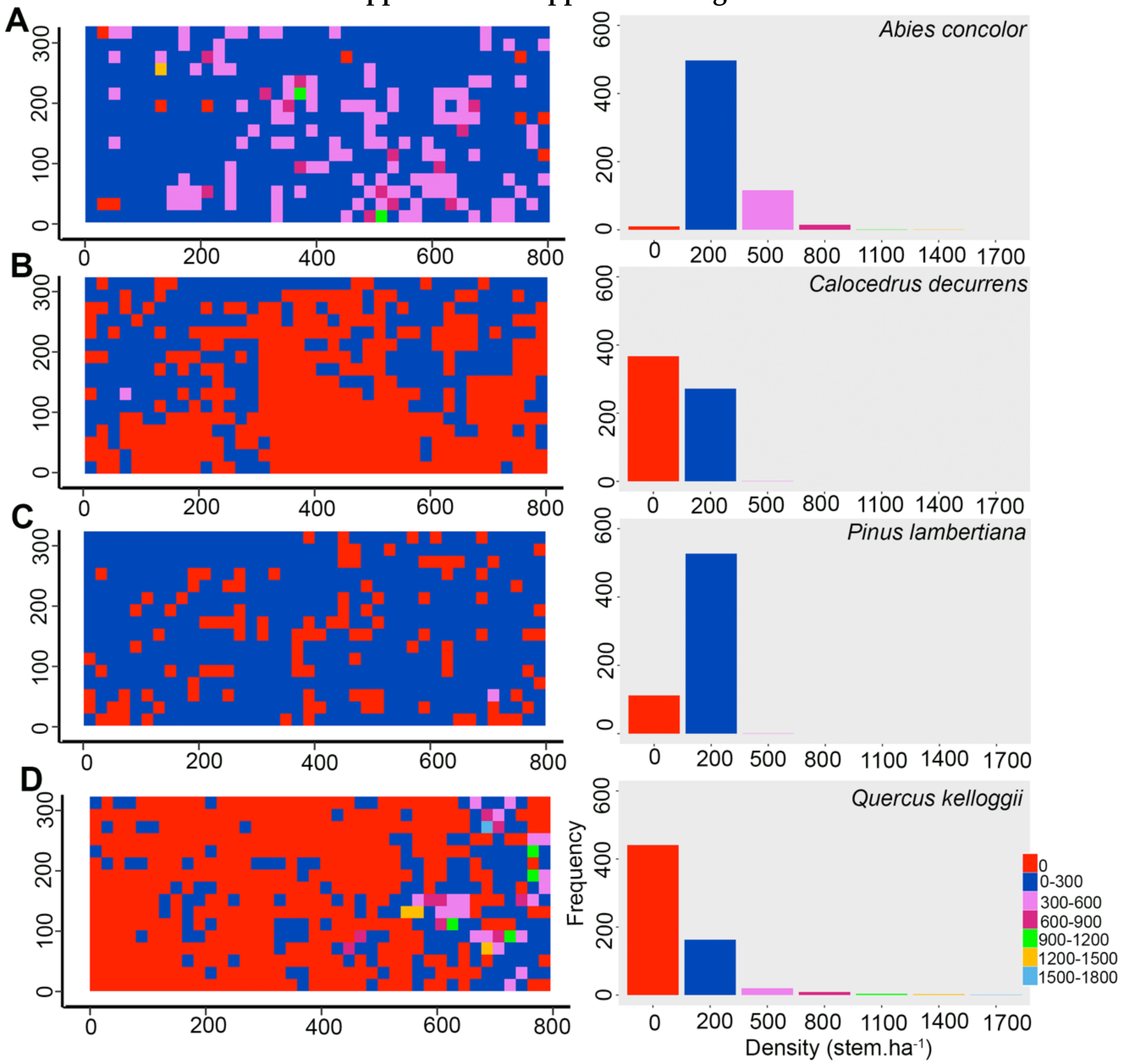

Figure S1. Distribution and density of the four most abundant species in the Yosemite Forest Dynamic Plot in 2019, including *Abies concolor* (A), *Pinus lambertiana* (B), *Calocedrus decurrens* (C), and *Quercus kelloggii* (D).

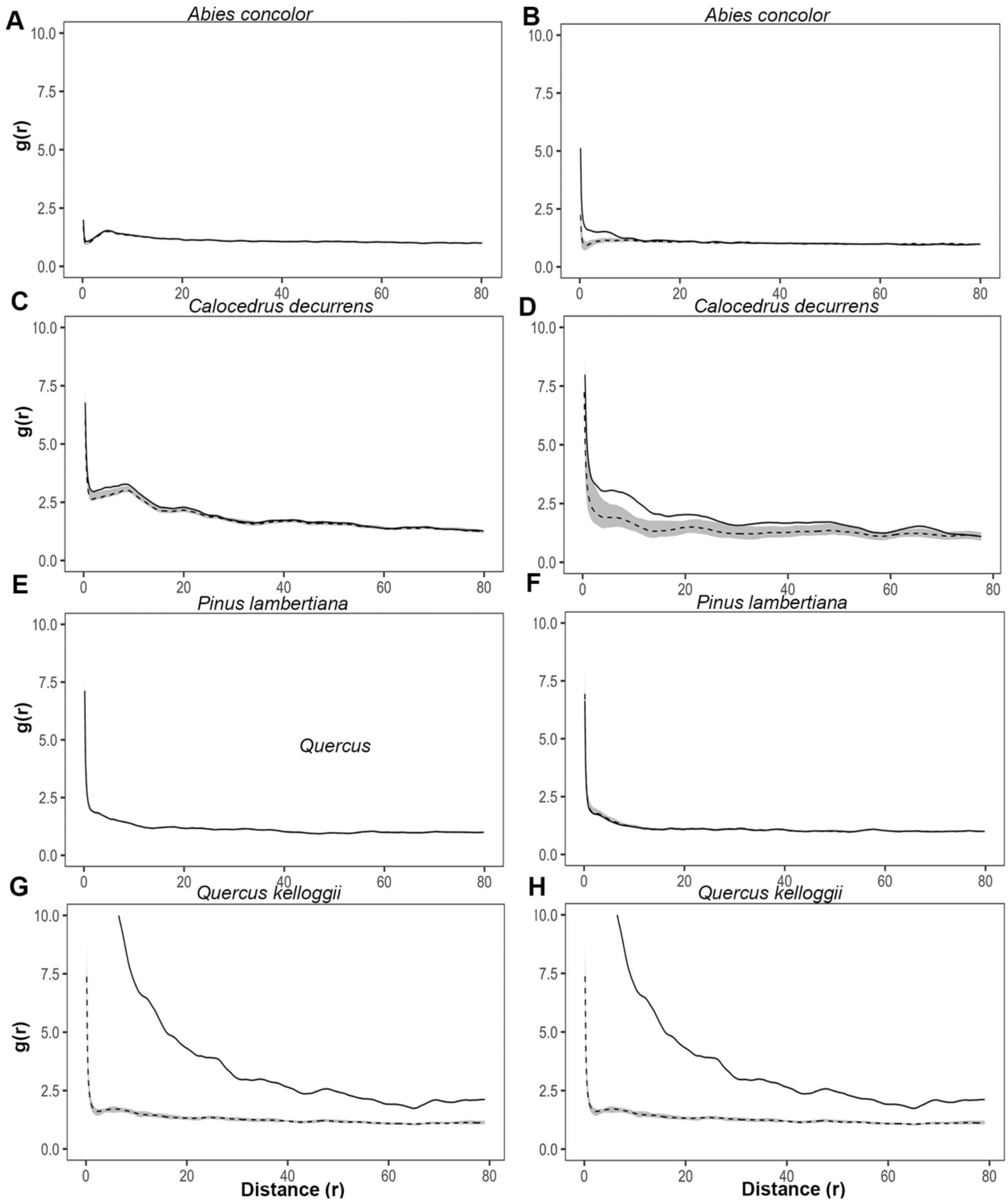

Figure S2. Results of the sensitivity analysis for diameter cutoff values chosen for the grouping of adult and juvenile stems in 2019 in the Yosemite Forest Dynamic Plot. Bivariate null model between juveniles and adults was generated for a ±50% range of diameter thresholds (<5 cm and ≥20 cm). The values were changed from 2.5 cm and ≥10 cm diameter at breast height (dbh) for juveniles and adults, respectively (A, C, E, G) to 7.5 cm and ≥30 cm for juveniles and adults (B, D, F, H). Black lines show the observed g function and gray areas indicate the simulation envelopes generated from 999 Monte Carlo simulations.

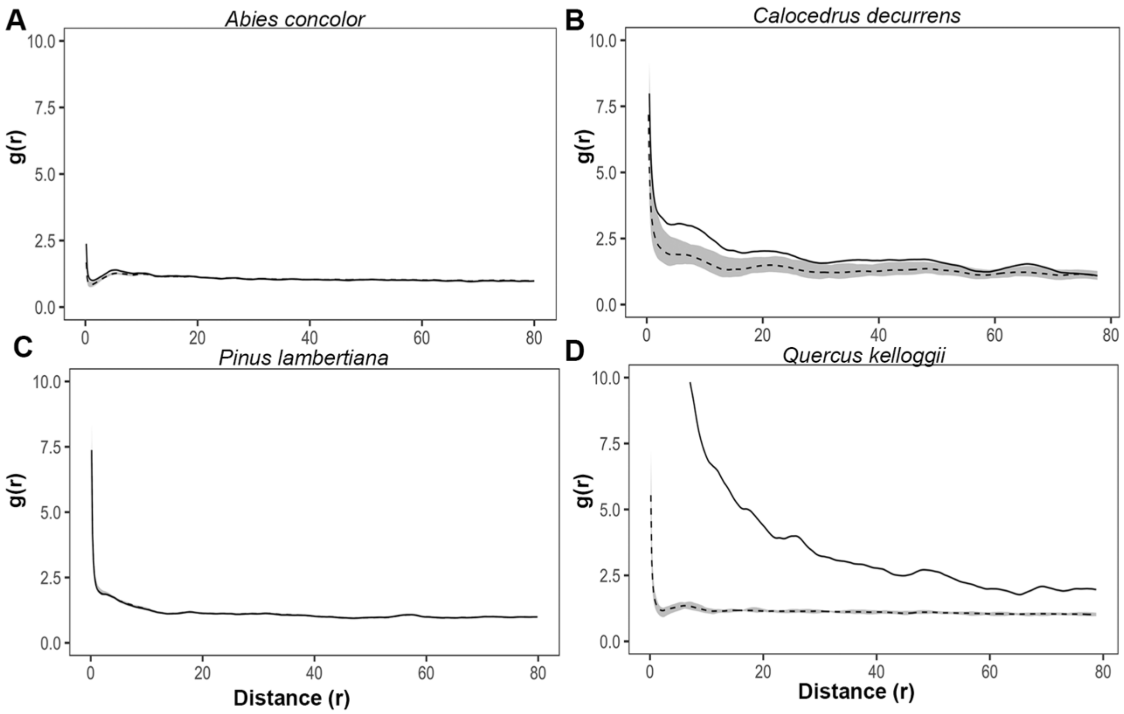

Figure S3. Results of the sensitivity analysis for diameter cutoff values were chosen for grouping the adult and juvenile stems in 2019 in the Yosemite Forest Dynamic Plot. A bivariate null model between juveniles and adults was generated for 5 cm and ≥20 cm dbh for juveniles and adults, respectively. Black lines show the observed g function and gray areas indicate the simulation envelopes generated from 999 Monte Carlo simulations.

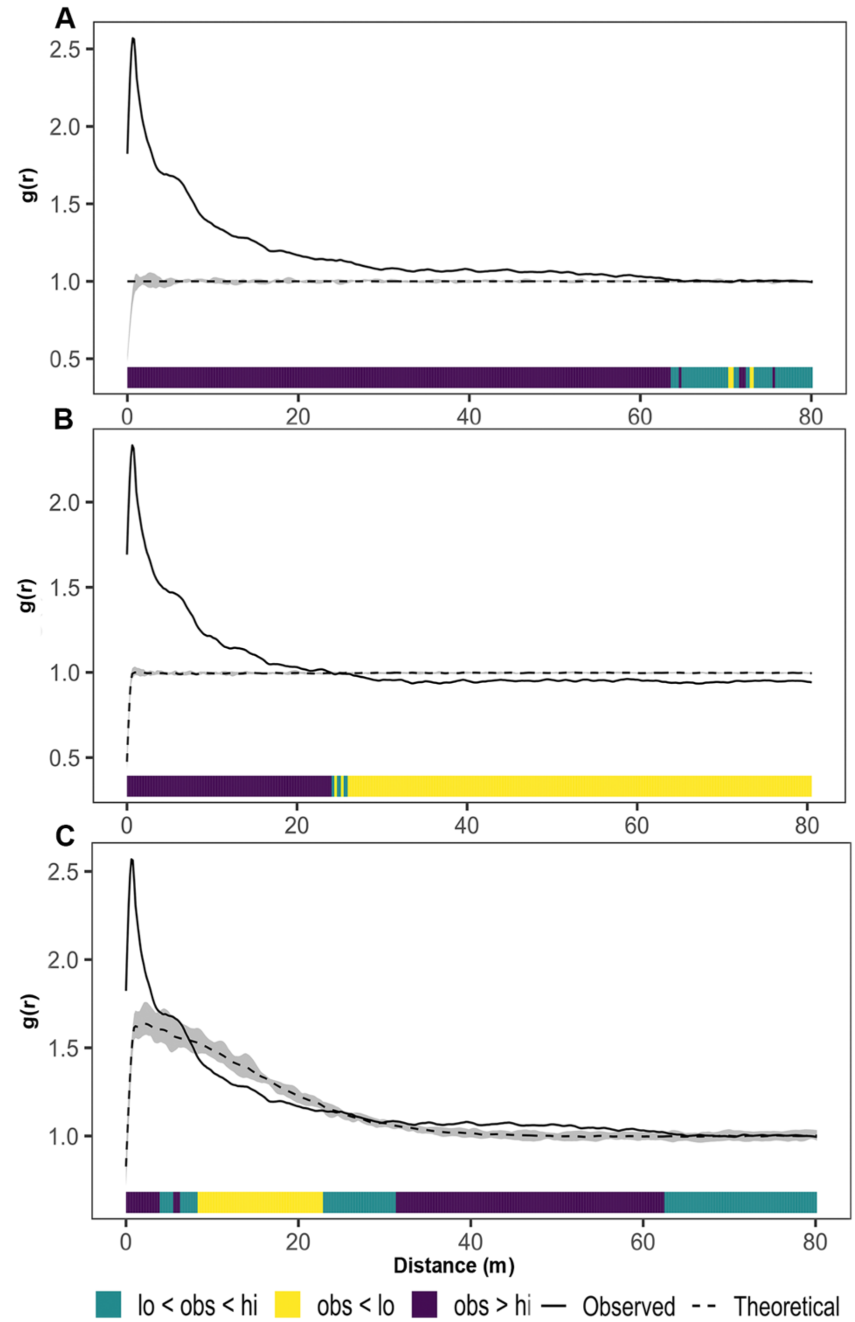

Figure S4. Panels display the relationship between the univariate pair-correlation function g(r) and distances for *Abies concolor* in 2019 in the Yosemite Forest Dynamic Plot. The gray regions indicate the boundaries of the 999 Monte Carlo simulations under the null hypothesis of homogeneous Poisson process (complete spatial randomness) (A), heterogeneous Poisson process (habitat heterogeneity) (B), and homogeneous Thomas process (dispersal limitation) (C). The bold black lines show the calculated g function from observed data and the black dashed lines indicate the mean of simulated values. Green, yellow, and violet colors show randomness, segregation, and clustering patterns, respectively.

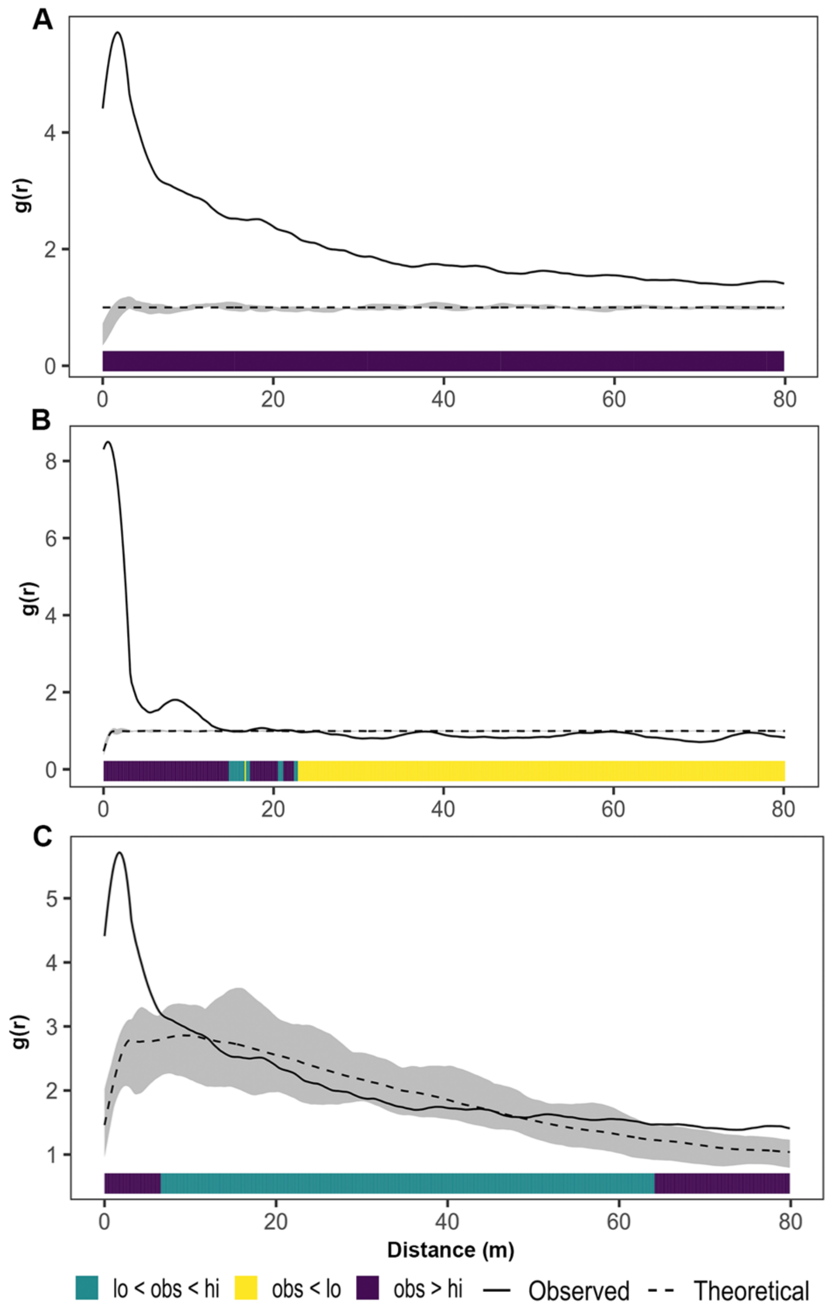

Figure S5. Panels display the relationship between the univariate pair-correlation function g(r) and distances for *Calocedrus decurrens* in 2019 in the Yosemite Forest Dynamic Plot. The gray regions indicate the boundaries of the 999 Monte Carlo simulation envelopes under the null hypothesis of homogeneous Poisson process (complete spatial randomness) (A), heterogeneous Poisson process (habitat heterogeneity) (B), and homogeneous Thomas process (dispersal limitation) (C). The bold black lines show the calculated g function from observed data and the black dashed lines indicate the mean of simulated values. Green, yellow, and violet colors show randomness, segregation, and clustering patterns, respectively.

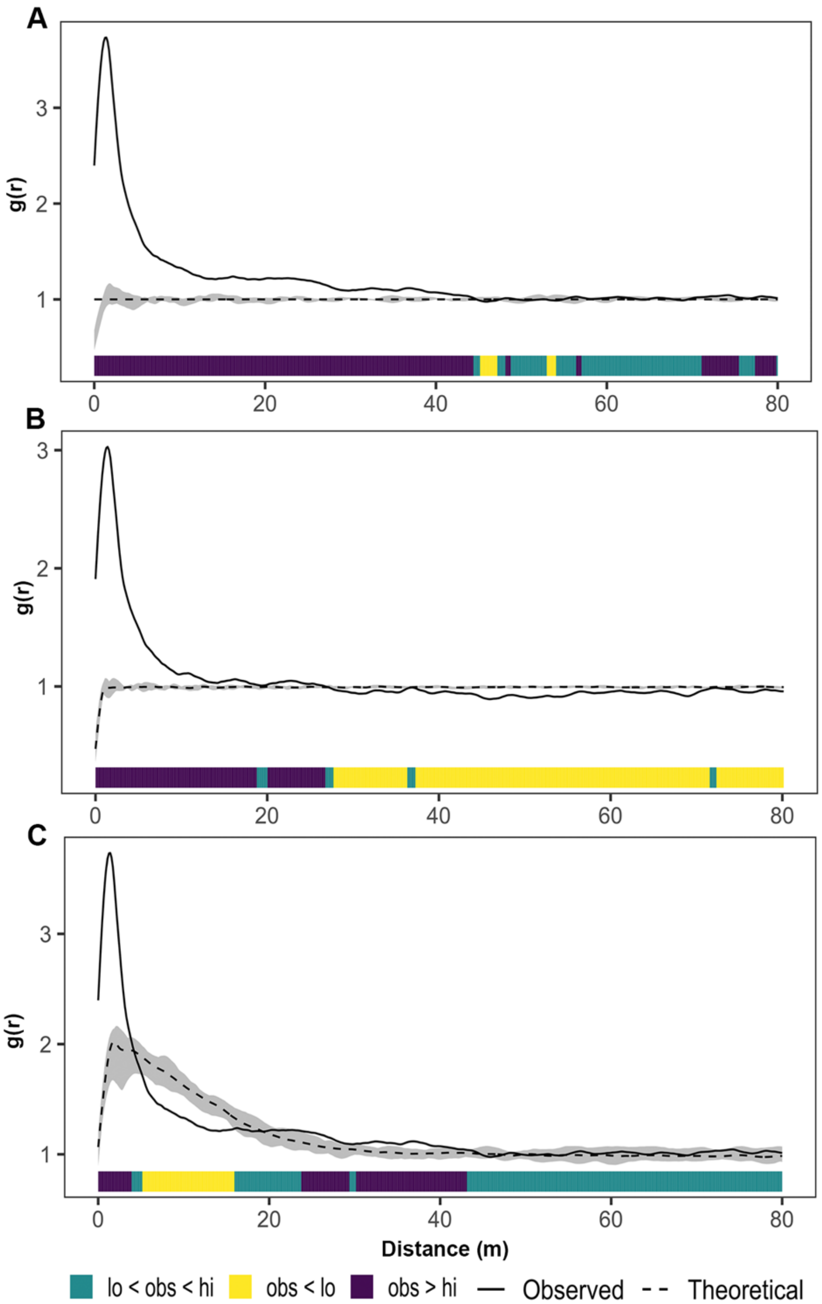

Figure S6. Panels display the relationship between the univariate pair-correlation function g(r) and distances for *Pinus lambertiana* in 2019 in the Yosemite Forest Dynamic Plot. The gray regions indicate the boundaries of the 999 Monte Carlo simulation envelopes under the null hypothesis of homogeneous Poisson process (complete spatial randomness) (A), heterogeneous Poisson process (habitat heterogeneity) (B), and homogeneous Thomas process (dispersal limitation) (C). The bold black lines show the calculated g function from observed data and the black dashed lines indicate the mean of simulated values. Green, yellow, and violet colors show randomness, segregation, and clustering, respectively.

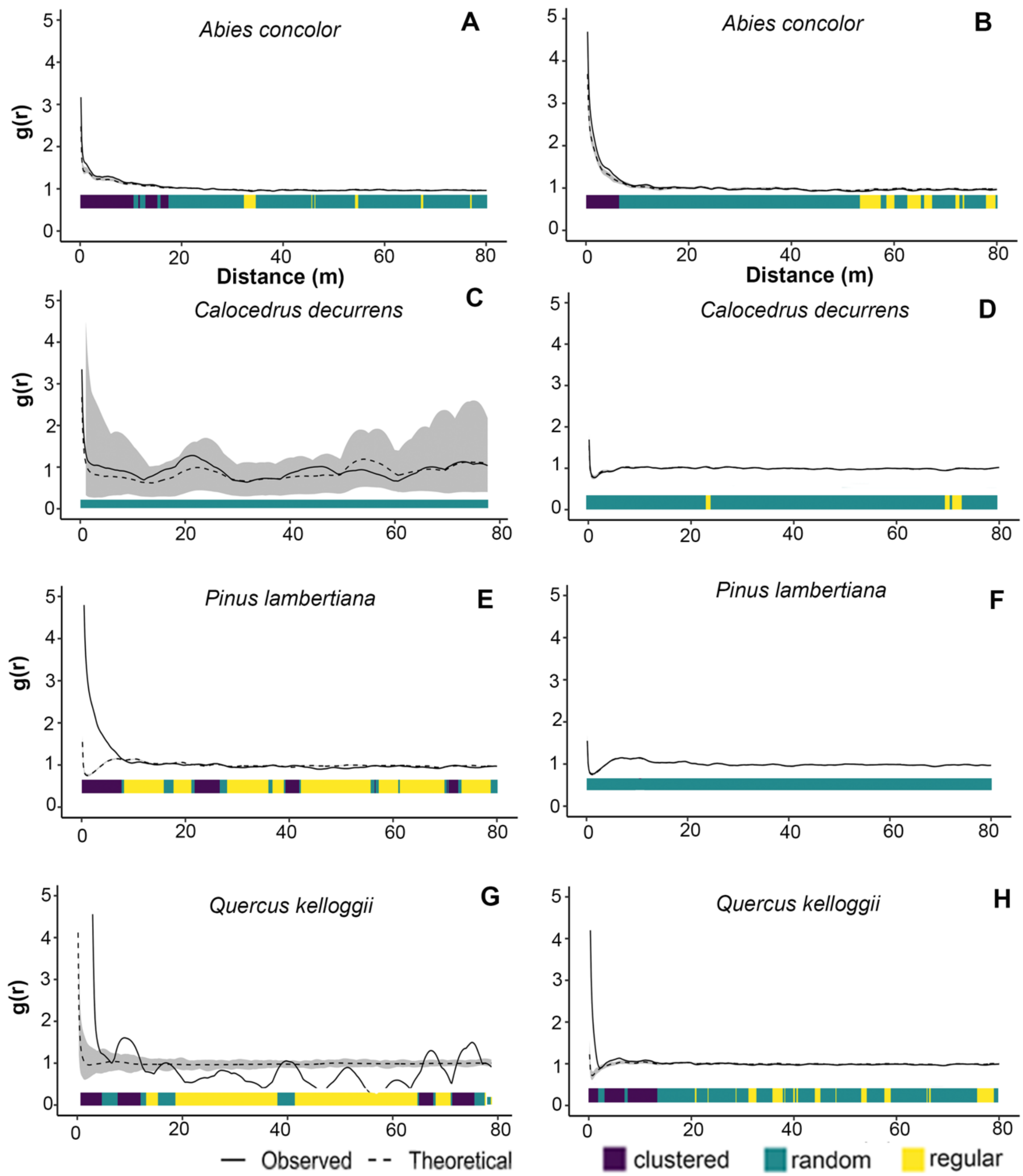

Figure S7. Left panels show the relationship between the pair-correlation function g(r) and scales for the *Abies concolor* (A), *Calocedrus decurrens* (C), *Pinus lambertiana* (E), *Quercus kelloggii* (G), to assess the interaction between juveniles (1 cm ≤ dbh < 5 cm dbh) and conspecific adults (individuals ≥ 20 cm dbh) in 2019 in the Yosemite Forest Dynamic Plot. The right panels display the relationship between the pair-correlation function g(r) and distances for the *Abies concolor* (B), *Calocedrus decurrens* (D), *Pinus lambertiana* (F), *Quercus kelloggii* (H), to estimate the interaction between juveniles (1 cm ≤ stems dbh < 5 cm) and other species adult trees (individuals ≥ 20 cm dbh) in 2019. The gray areas represent the 999 Monte Carlo simulation envelopes under the antecedent condition null model and the black lines indicate the calculated g function from observed data. Green, yellow, and violet colors show randomness, segregation, and clustering patterns, respectively.

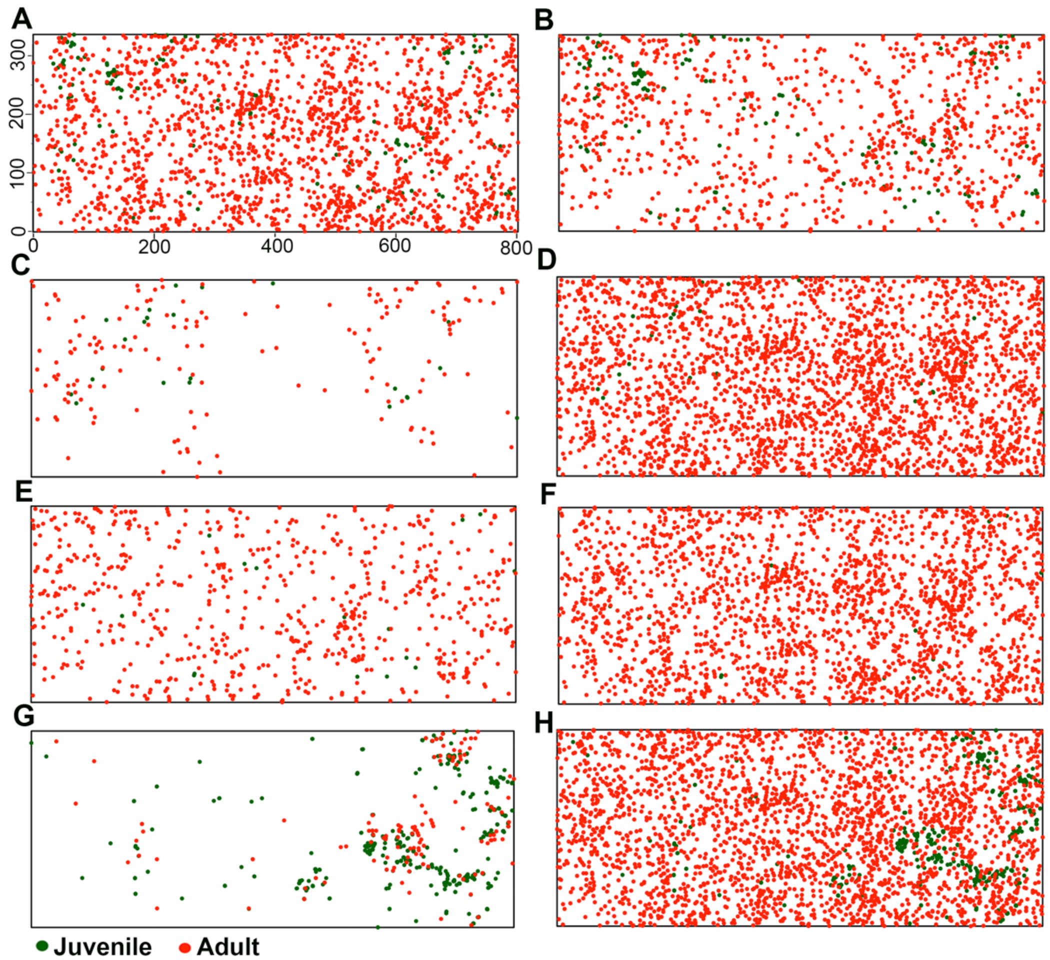

Figure S8. Left panels display the distributions of juveniles (1 cm ≤ dbh < 5 cm dbh) and conspecific adults (dbh ≥ 20 cm) in *Abies concolor* (A), *Calocedrus decurrens* (C), *Pinus lambertiana* (E), and *Quercus kelloggii* (F), in 2019 in the Yosemite Forest Dynamic Plot. The right panels show the distributions for juveniles of *Abies concolor* (B), *Calocedrus decurrens* (D), *Pinus lambertiana* (F), and *Quercus kelloggii* (H), and adults of other species in 2019 in the Yosemite Forest Dynamic Plot.

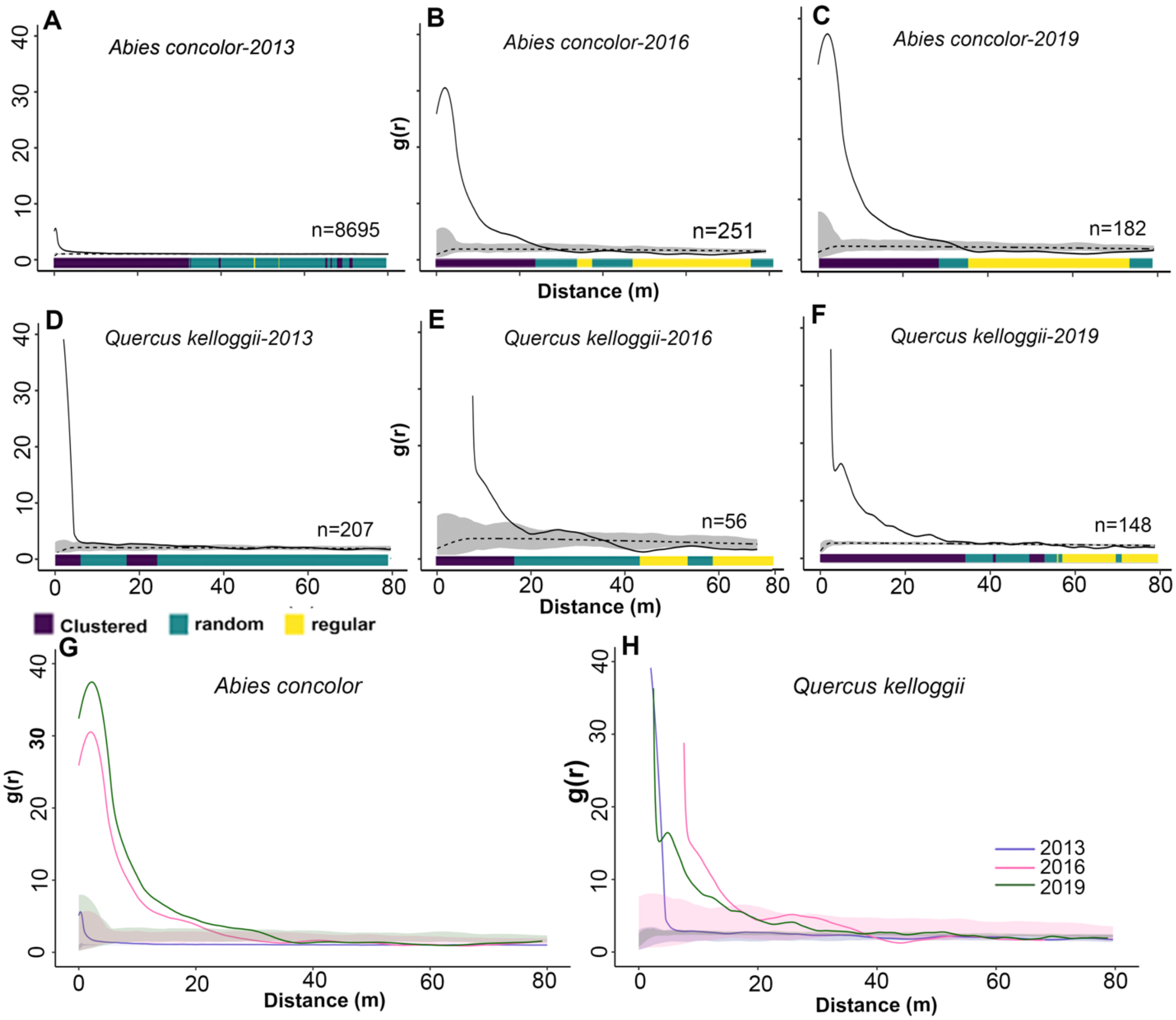

Figure S9. Comparison of juveniles regeneration spatial patterns (1 cm ≤ dbh < 5 cm) in seeder species (*Abies concolor)* and sprouting species (*Quercus kelloggii*) in 2013 (pre-fire), 2016 (post-fire), and 2019 (post-fire) in the Yosemite Forest Dynamic Plot. Black lines display the observed g(r), values above (below) simulation envelopes indicate aggregated (dispersed) pattern. The gray areas were obtained from the 25th highest and 25th lowest values from 999 Monte Carlo simulations. Green, yellow, and violet colors show randomness, segregation, and clustering patterns, respectively. The panels (G, H) show the overall changes in regeneration spatial patterns in 2013, 2016, and 2019 in the Yosemite Forest Dynamic Plot. Lines display the observed g(r), values above (below) simulation envelopes indicate aggregated (dispersed) pattern. The colorful areas were obtained from the 25th highest and 25th lowest values from 999 Monte Carlo simulations.

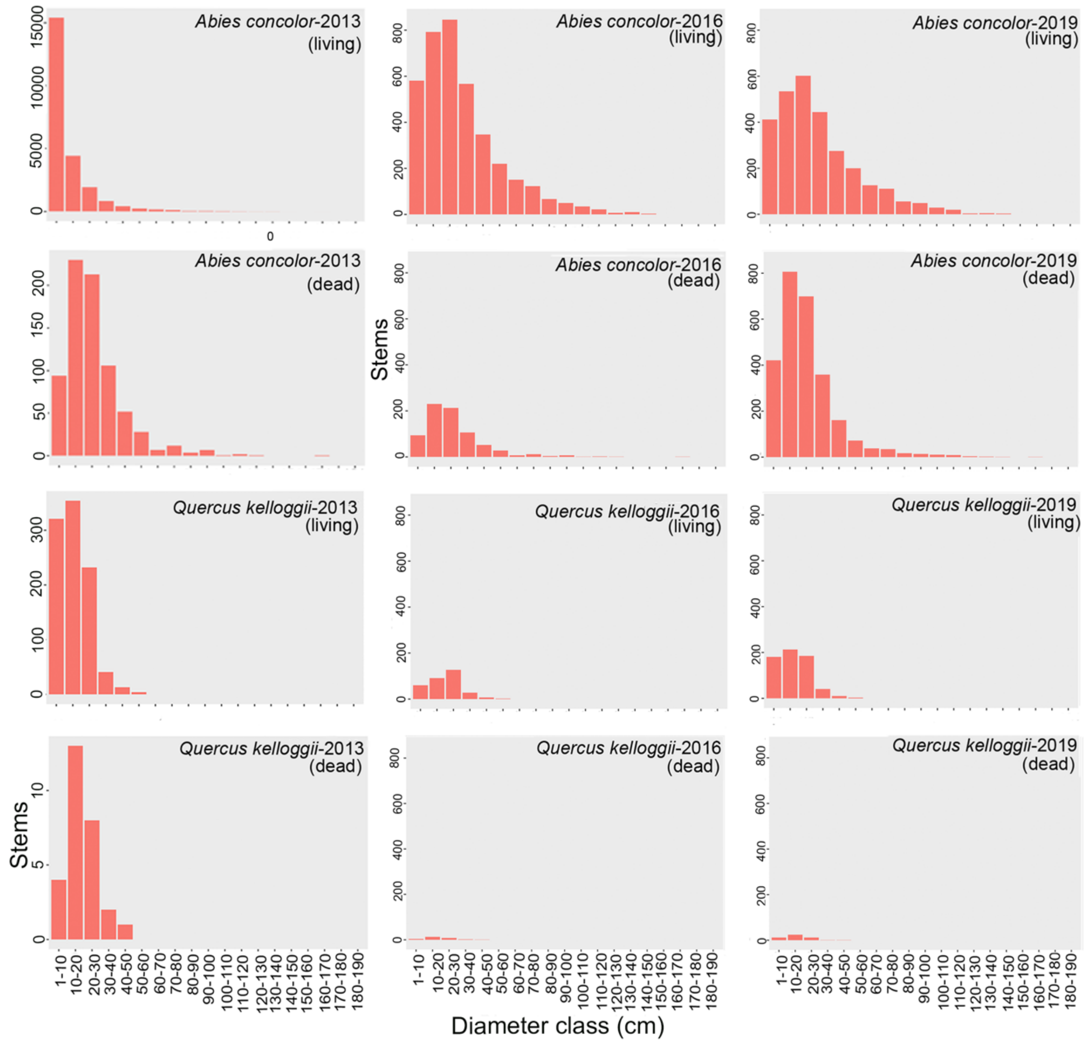

Figure S10. Diameter distributions of live stems (panels in first and third rows) and dead stems (panels in second and forth rows) for species in 2013, 2016, and 2019 in the 25.6 ha Yosemite Forest Dynamics Plot.

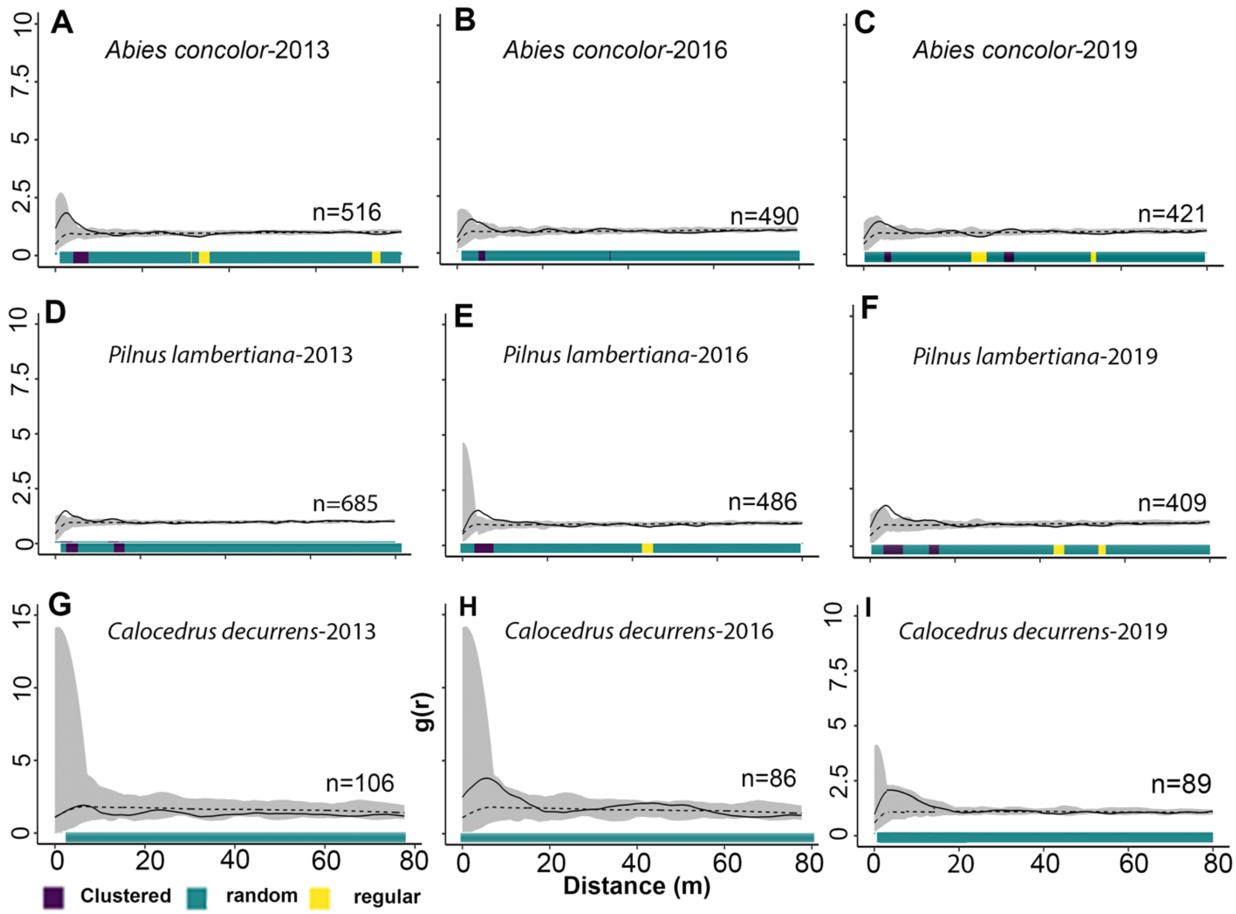

Figure S11. Spatial pattern of pre-fire (2013) and post-fire (2016 and 2019) for large-diameter trees (live and dbh ≥ 60 cm) within the Yosemite Forest Dynamic Plot. Black lines display the observed g(r), values above (below) simulation envelopes indicate aggregated (dispersed) pattern. The gray areas were obtained from the 25th highest and 25th lowest values from 999 Monte Carlo simulations. Green, yellow, and violet colors show randomness, segregation, and clustering, respectively.

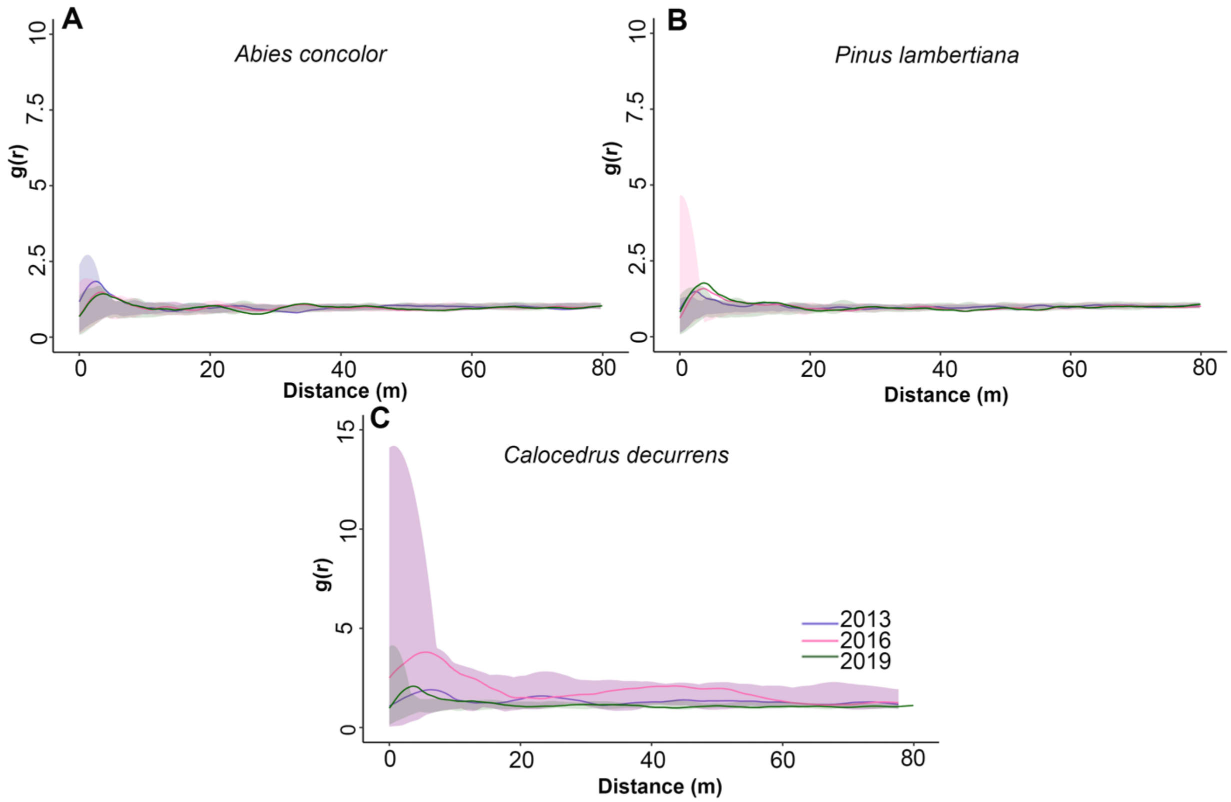

Figure S12. The panels (A, B, C) show the overall changes in live large-diameter trees spatial patterns (dbh ≥ 60 cm) in 2013, 2016, and 2019 in the Yosemite Forest Dynamic Plot. Lines display the observed g(r), values above (below) simulation envelopes indicate aggregated (dispersed) pattern. The colorful areas were obtained from the 25th highest and 25th lowest values from 999 Monte Carlo simulations.

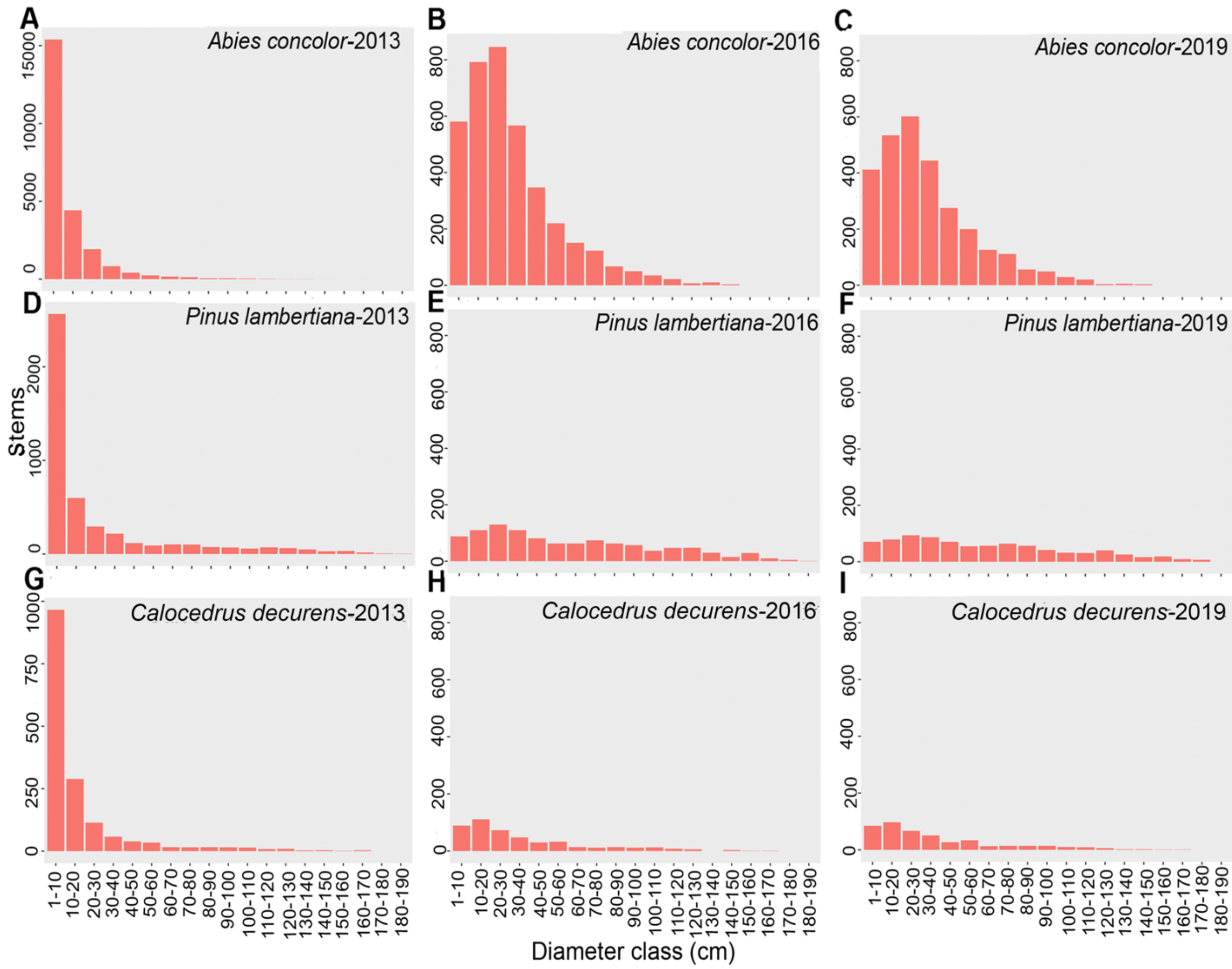

Figure S13. Diameter distributions for the three species (live stems) in 2013 (pre-fire), 2016 (little post-fire), and 2019 in the 25.6 ha Yosemite Forest Dynamics Plot.

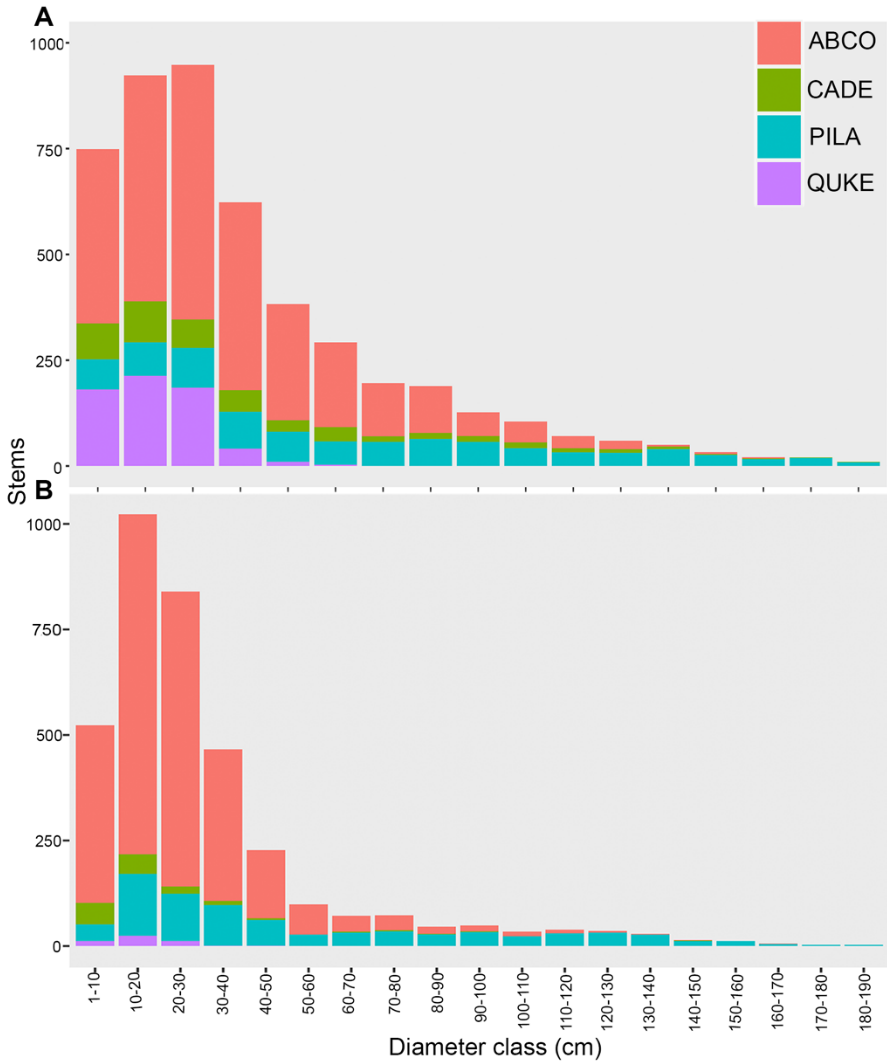

Figure S14. Diameter distributions of living (A) and dead (B) stems for the *Abies concolor* (ABCO), *Calocedrus decurrens* (CADE), *Pinus lambertiana* (PILA), and *Quercus kelloggii* (QUKE) in 2019 in the 25.6 ha Yosemite Forest Dynamic Plot.

Appendix B – Supplemental tables

Table S1. Stem numbers of juveniles and adults in species in 2019 in the Yosemite Forest Dynamic Plot.

Year	Species	Family	Stems <5 cm dbh	Stems ≥20 cm dbh
2019	*Abies concolor*	Pinaceae	284	3508
	Pinus lambertiana	Pinaceae	45	326
	Calocedrus decurrens	Cupressaceae	36	1306
	Quercus kelloggii	Fagaceae	1041	279

Table S2. Live juveniles (1 cm ≤ dbh < 5) of *Abies concolor* and *Quercus kelloggii* in 2013, 2016, and 2019 in the Yosemite Forest Dynamic Plot.

Year	Species	Family	Stems <5 cm dbh
2013	*Abies concolor*	Pinaceae	8695
	Quercus kelloggii	Fagaceae	271
2016	*Abies concolor*	Pinaceae	251
	Quercus kelloggii	Fagaceae	81
2019	*Abies concolor*	Pinaceae	182
	Quercus kelloggii	Fagaceae	1033