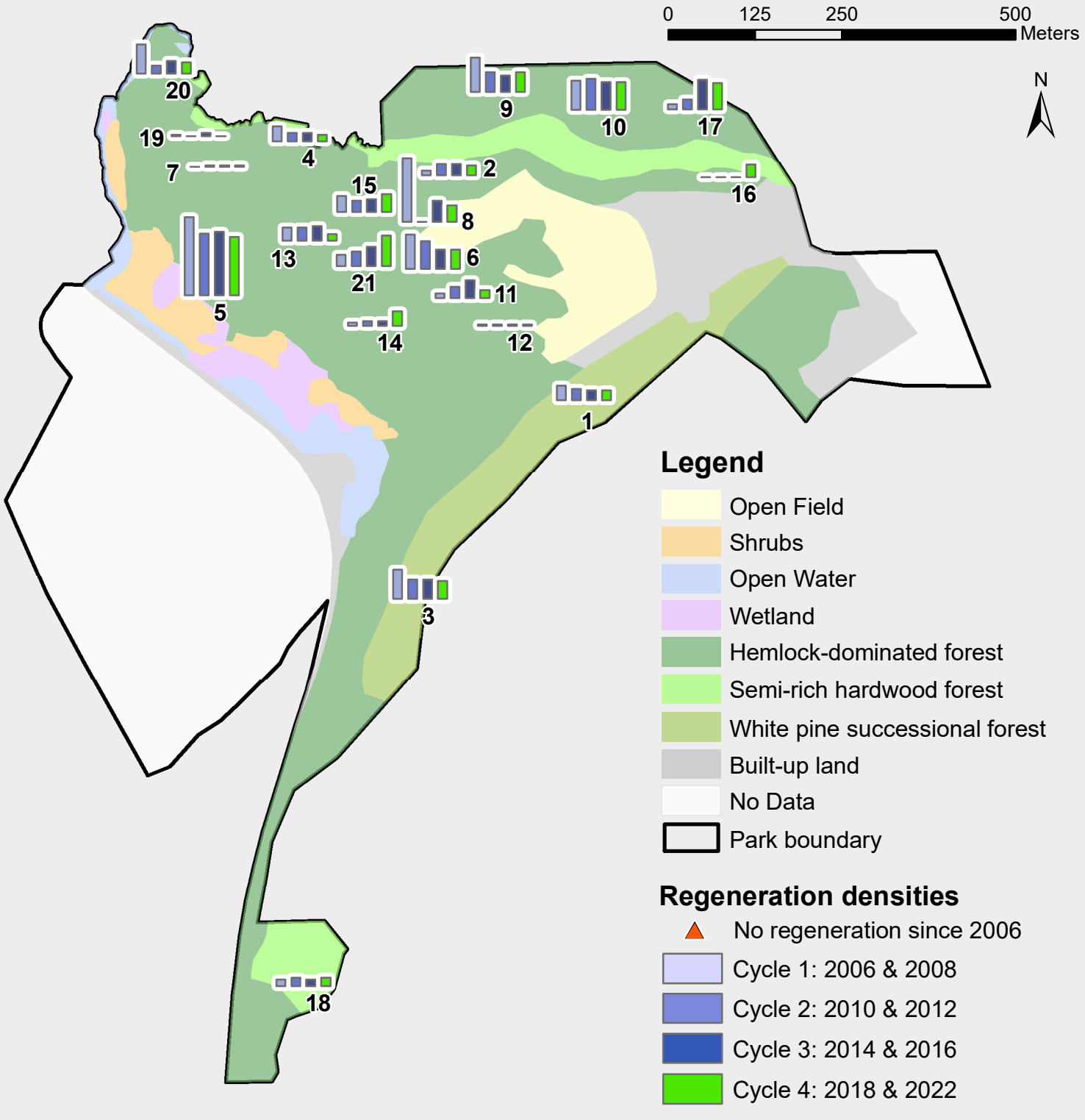
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Map 1. Tree Regeneration by Cycle

Trends in tree regeneration, including seedlings and saplings, observed in forest plots sampled from 2006-2022. Plots are sampled in an alternating panel, with plots 1-10 sampled in 2006, 2010, 2014, and 2018, and plots 11-21 sampled in 2008, 2012, 2016, and 2022. Densities range from 0 to 1.3 stems/m^2 and only include canopy-forming species. Densities are lower than the 2018 report because ash (Fraxinus spp.) are no longer considered canopy-forming. Note the unit change from the 2018 report to match manuscript in review. Plot 8 data are missing in 2010. See Table 1 for more details. Date: 8/19/2022.



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Map 2. Tree Regeneration by Size Class

Trends in tree regeneration by size class in forest plots from the most recent survey cycle (2018 and 2022). Plots are sampled in an alternating panel, with plots 1-10 sampled in 2018, and plots 11-21 sampled in 2022. Pie size is proportional to plot-level regeneration and location may be shifted to prevent overlap. Total densities range from 0 to to 6.8 stems/m^2 and only include native canopy-forming species. Note the unit change from 2018 report to match manuscript in review. Date: 8/19/2022.

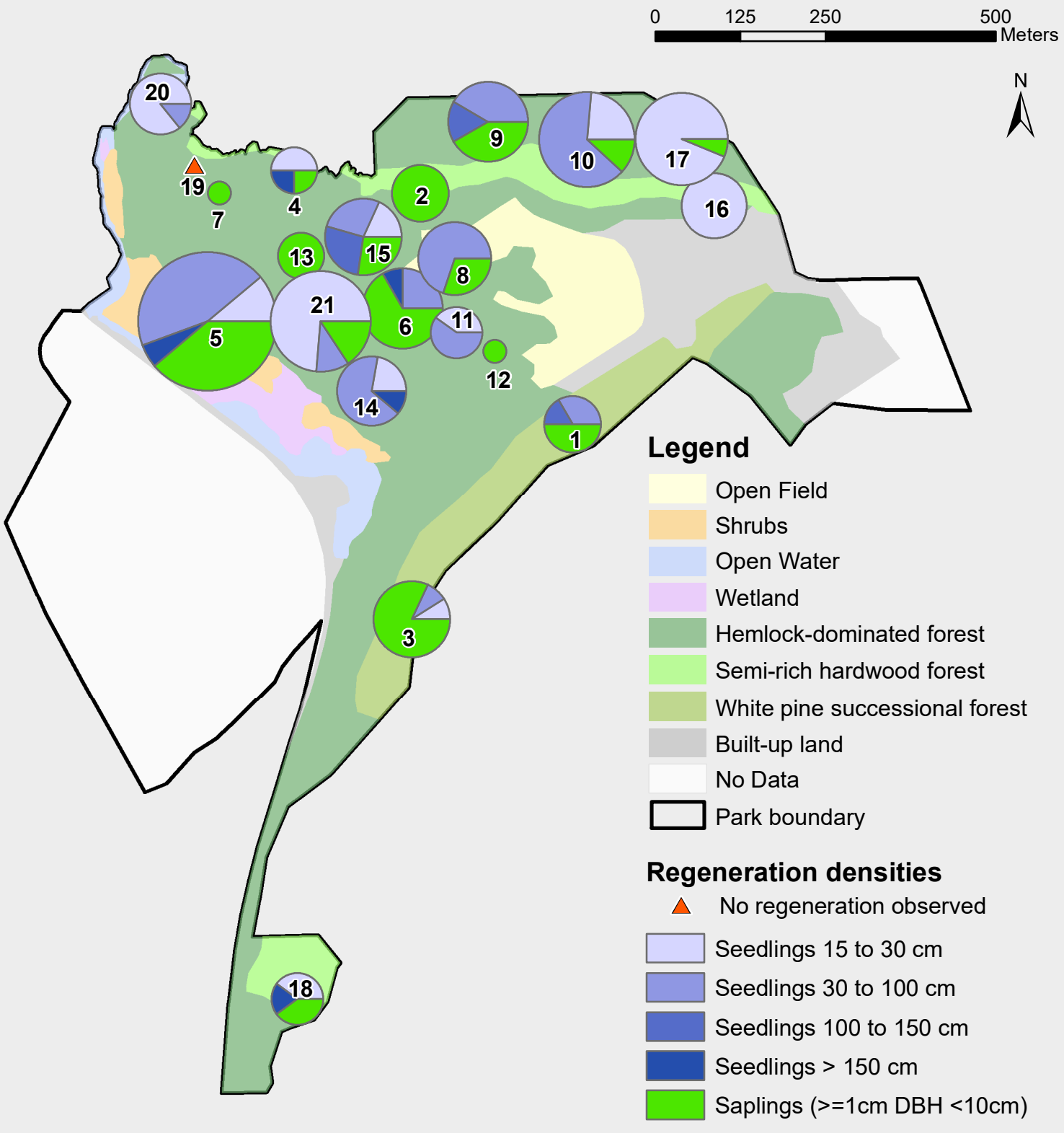


Table 1. Average plot-level seedling and sapling stem densities, converted to stems per m^2, and stocking index by cycle. Only native, canopy-forming species are included. Note that *Fraxinus* spp. (ash species) are no longer considered canopy-forming species, which differs from the 2018 summary. Cycle 1= 2006 & 2008; Cycle 2= 2010 & 2012; Cycle 3= 2014 & 2016, Cycle 4= 2018 & 2022. Plots are sampled in alternating years, with Panel 1 sampled the first year, and Panel 2 sampled the second year. The stocking index quantifies whether current regeneration densities are sufficient to restock a forest canopy. The index is a weighted sum of seedling and sapling densities where larger seedling size classes get higher weights. Cells highlighted in green are plots that meet the minimum management target of 0.25 seedlings/m^2 and 0.14 saplings/m^2 or have a stocking index >100.

Plot	Panel	Seedlings per m^2				Saplings per m^2				Stocking Index			
		Cycle 1	Cycle 2	Cycle 3	Cycle 4	Cycle 1	Cycle 2	Cycle 3	Cycle 4	Cycle 1	Cycle 2	Cycle 3	Cycle 4
1	1	0.00	0.11	0.08	0.08	**0.24**	0.08	0.08	0.08	50.00	8.00	8.00	8.00
2	1	0.08	0.05	0.00	0.00	0.00	0.13	**0.19**	**0.16**	2.00	63.33	50.00	16.67
3	1	0.16	0.05	0.03	0.05	**0.32**	**0.27**	**0.29**	**0.24**	**154.00**	**101.00**	67.33	51.00
4	1	0.08	0.08	0.11	0.08	**0.16**	0.05	0.03	0.03	**100.00**	13.67	40.33	17.33
5	1	**0.64**	**0.61**	**0.66**	**0.58**	**0.64**	**0.40**	**0.37**	**0.37**	**408.00**	**200.67**	**154.33**	**145.33**
6	1	**0.32**	0.21	0.13	0.11	**0.24**	**0.24**	**0.19**	**0.21**	**158.00**	**139.33**	**134.67**	85.33
7	1	0.00	0.03	0.00	0.00	0.00	0.00	0.03	0.03	0.00	0.33	0.00	0.00
8	1	**0.72**	0.00	0.24	0.19	**0.32**	0.00	0.11	0.08	63.00	0.00	22.00	4.67
9	1	**0.32**	0.19	0.13	0.19	**0.24**	0.13	0.13	0.13	7.00	43.33	36.33	50.00
10	1	**0.48**	**0.45**	**0.40**	**0.40**	0.00	0.05	0.05	0.05	11.00	59.00	42.33	25.33
11	2	0.05	0.13	**0.29**	0.13	0.03	0.05	0.00	0.00	0.67	2.33	4.67	2.67
12	2	0.00	0.00	0.00	0.00	0.03	0.03	0.03	0.03	0.00	0.00	0.00	0.00
13	2	0.00	0.00	0.05	0.00	**0.21**	**0.21**	**0.19**	0.11	66.67	50.00	34.00	16.67
14	2	0.05	0.08	0.08	0.24	0.00	0.00	0.00	0.00	1.00	1.33	1.67	21.33
15	2	0.19	0.11	0.13	0.21	0.08	0.08	0.08	0.08	75.67	52.67	59.00	56.00
16	2	0.00	0.00	0.00	0.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.67
17	2	0.03	0.13	**0.45**	**0.40**	0.05	0.03	0.03	0.03	0.33	1.67	5.67	5.00
18	2	0.03	0.05	0.05	0.08	0.08	0.08	0.05	0.05	6.67	7.00	7.00	17.33
19	2	0.03	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.33	0.00	0.67	0.00
20	2	**0.48**	0.13	0.21	0.19	0.00	0.00	0.00	0.00	6.67	2.33	9.33	2.67
21	2	0.13	0.16	0.24	**0.42**	0.05	0.08	0.08	0.08	35.00	19.67	19.67	22.67

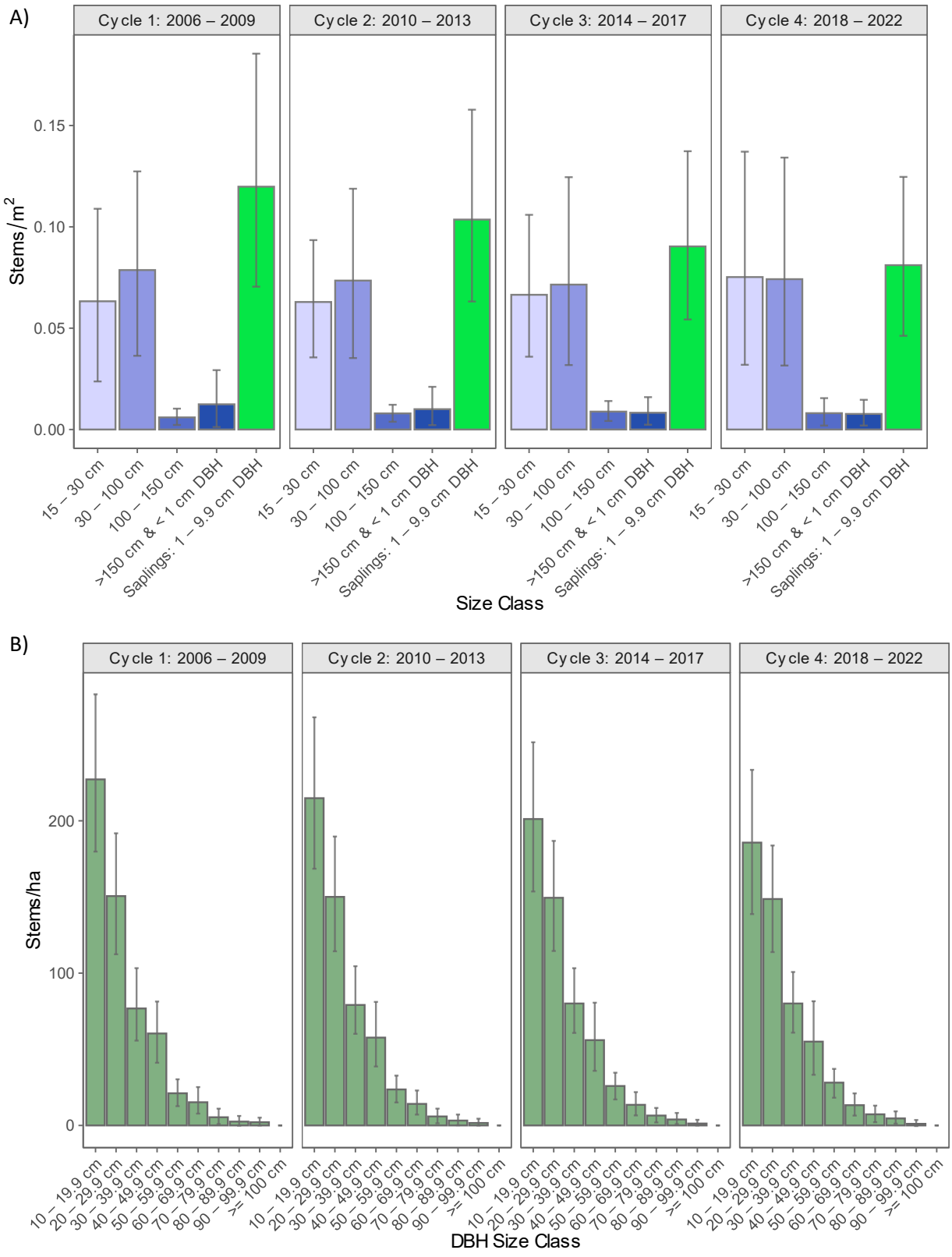


Figure 1. Stem density distributions by survey cycle in Saint-Gaudens National Historical Park. Cycle 1 is 2006-2009; Cycle 2 is 2010-2013; Cycle 3 is 2014-2017; Cycle 4 is 2018-2022. Figure A shows regeneration densities by size class. Figure B shows tree density by diameter at breast height (DBH) increments. Error bars are 95% bootstrapped confidence intervals. An asterisk denotes a linear DBH distribution that is indicative of long-term recruitment failure.

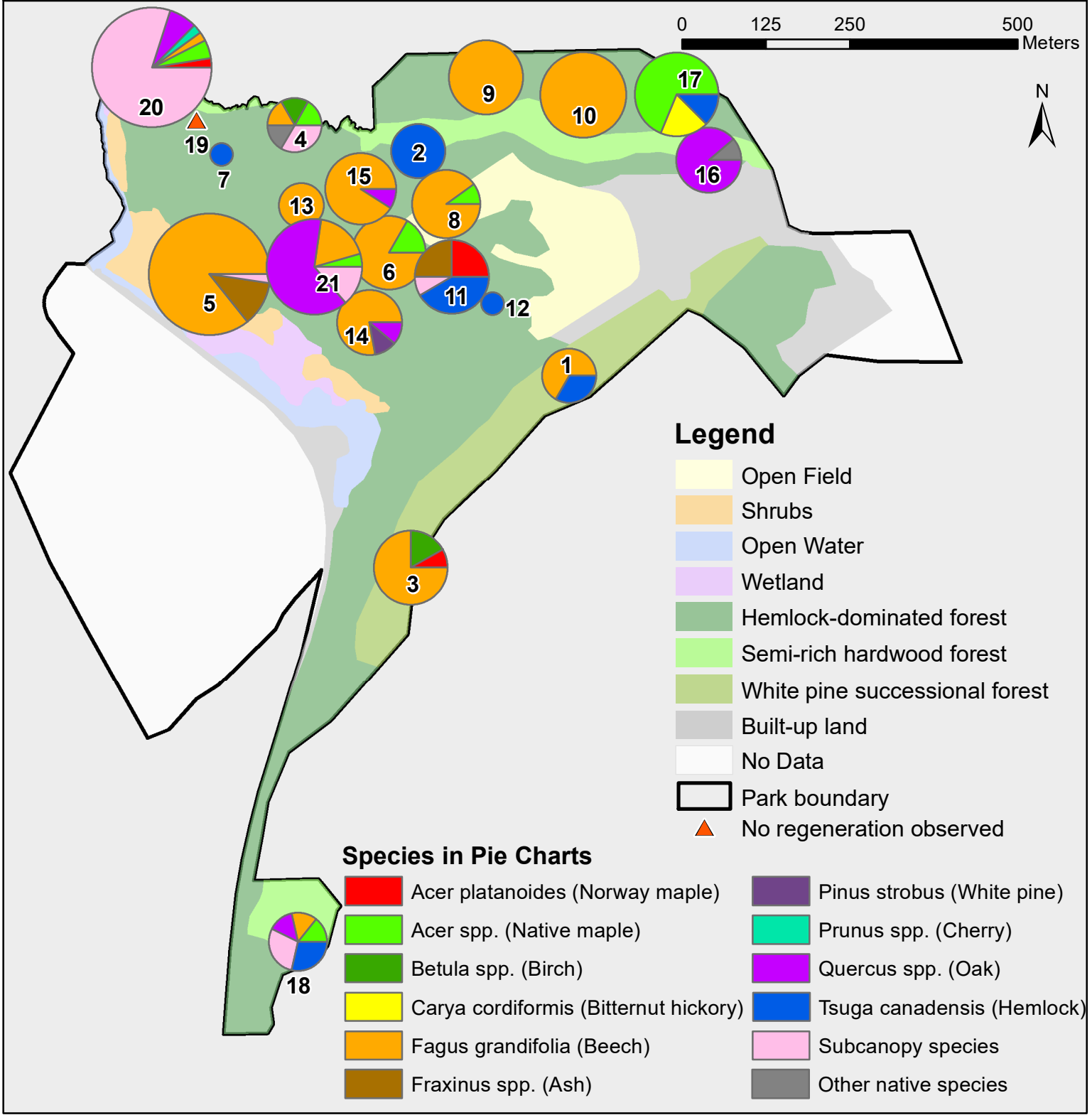
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Map 3. Tree Regeneration Composition

Trends in tree regeneration, including seedlings and saplings, by species group observed in forest plots in the most recent survey cycle (2018 and 2022). Plots are sampled in an alternating panel, with plots 1-10 sampled in 2018, and plots 11-21 sampled in 2022. Pie size is proportional to the total plot-level regeneration (plot-level density range: 0 to 1.1 stems/m^2.). Note the unit change from the 2018 report to match manuscript in review. Pies may be shifted from actual plot location to prevent overlap. Note that striped maple (A. pensylvanicum) is included in the subcanopy group. Date: 8/19/2022.



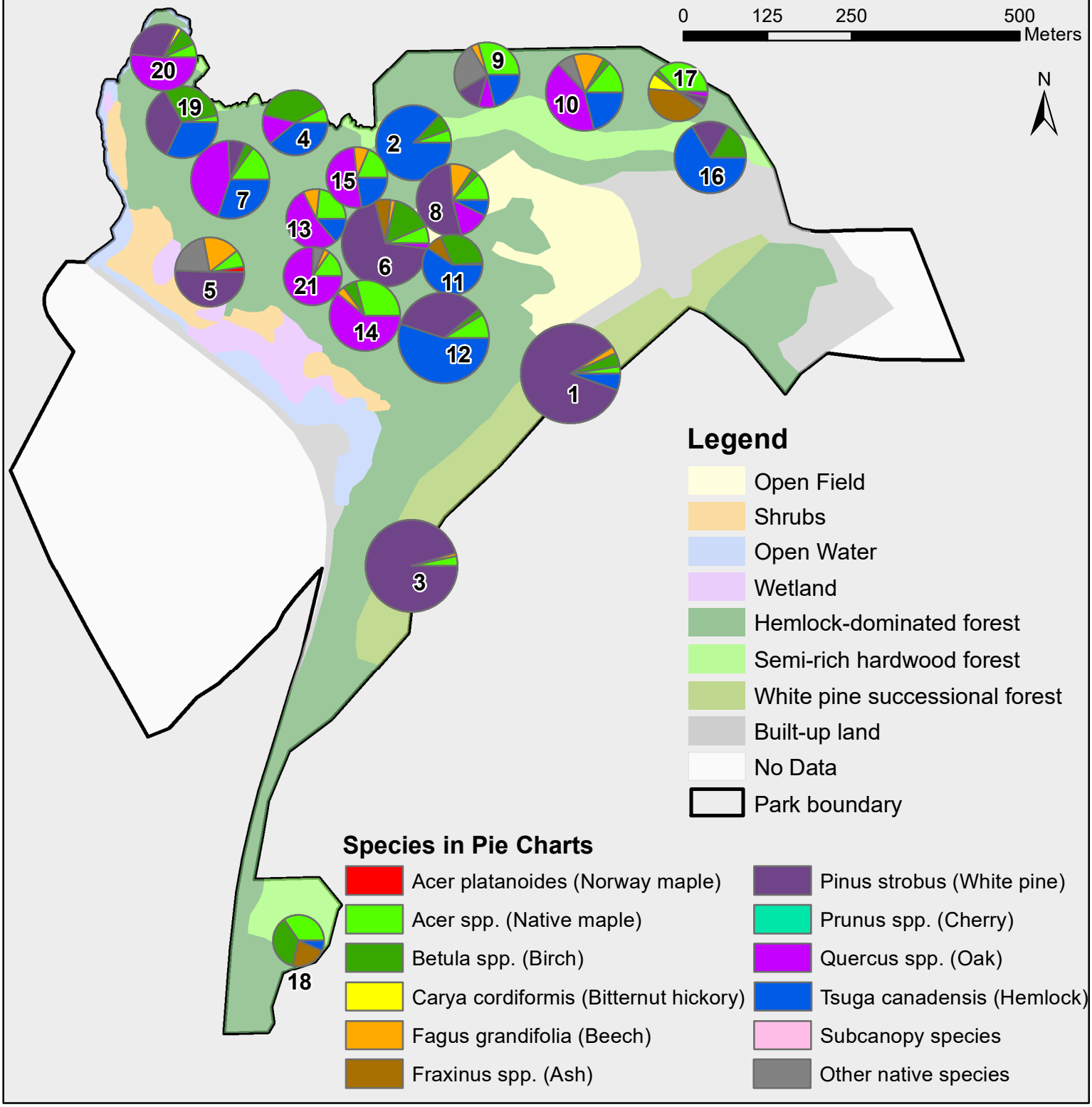
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Map 4. Tree Canopy Composition

Trends in tree composition, by species group, observed in forest plots in the most recent survey cycle (2018 and 2022). Plots are sampled in an alternating panel, with plots 1-10 sampled in 2018, and plots 11-21 sampled in 2022. Pie size is proportional to the total plot-level basal area (range: 22.0 to 82.6 m^2/hectare). Pies may be shifted from actual plot location to prevent overlap. Date: 8/19/2022.



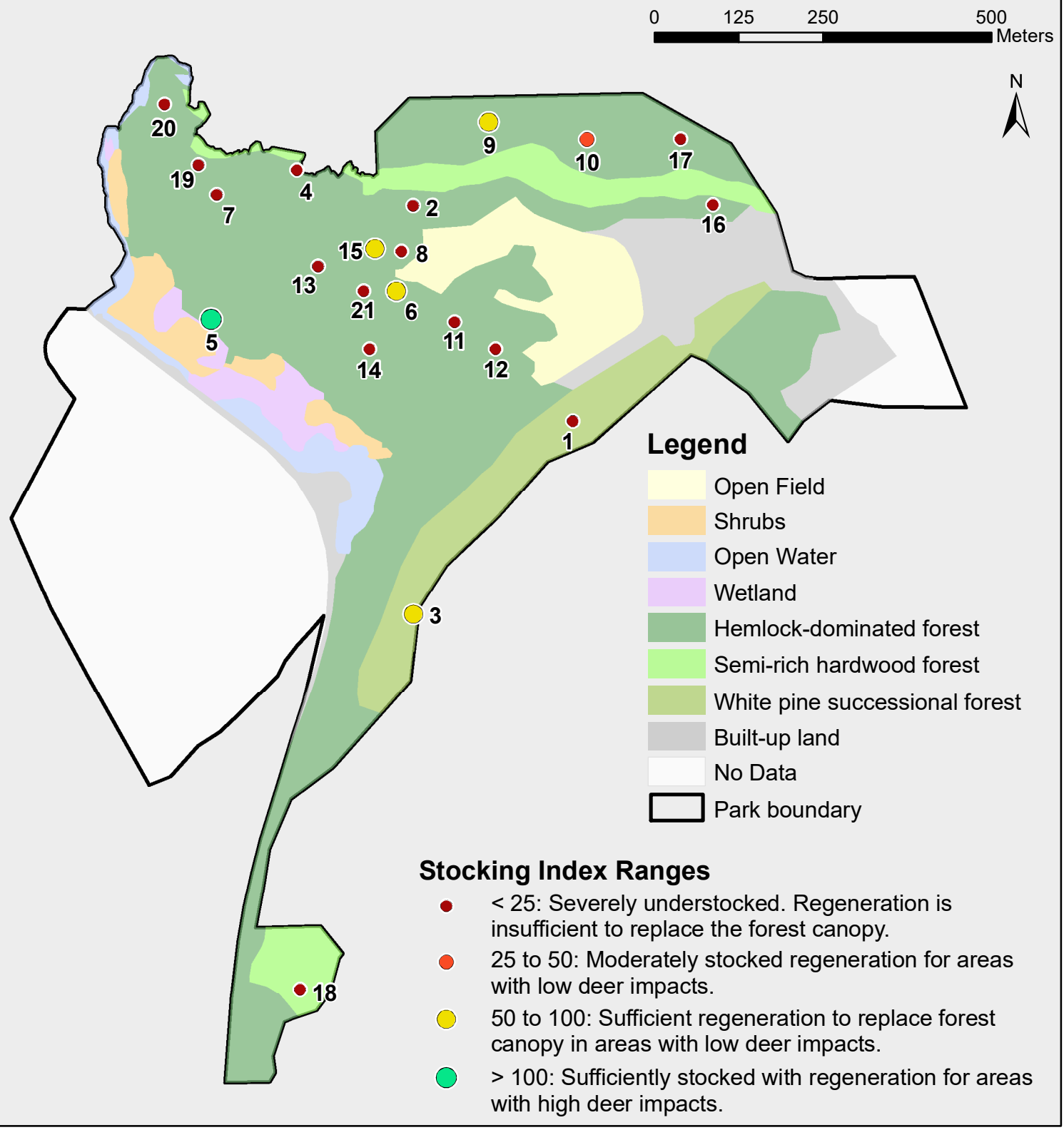
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Map 5. Tree Regeneration Stocking Index

Trends the regeneration stocking index for the most recent survey cycle (2018 and 2022). This index is a weighted sum of seedling and sapling densities where larger seedling size classes get higher weights and quantifies whether current regen. densities are sufficient to restock a forest canopy. The stocking index is averaged over three 2-m radius microplots per forest plot and only includes native canopy-forming species (range 0-145). See Table 1 for stocking index values. Date: 8/19/2022.



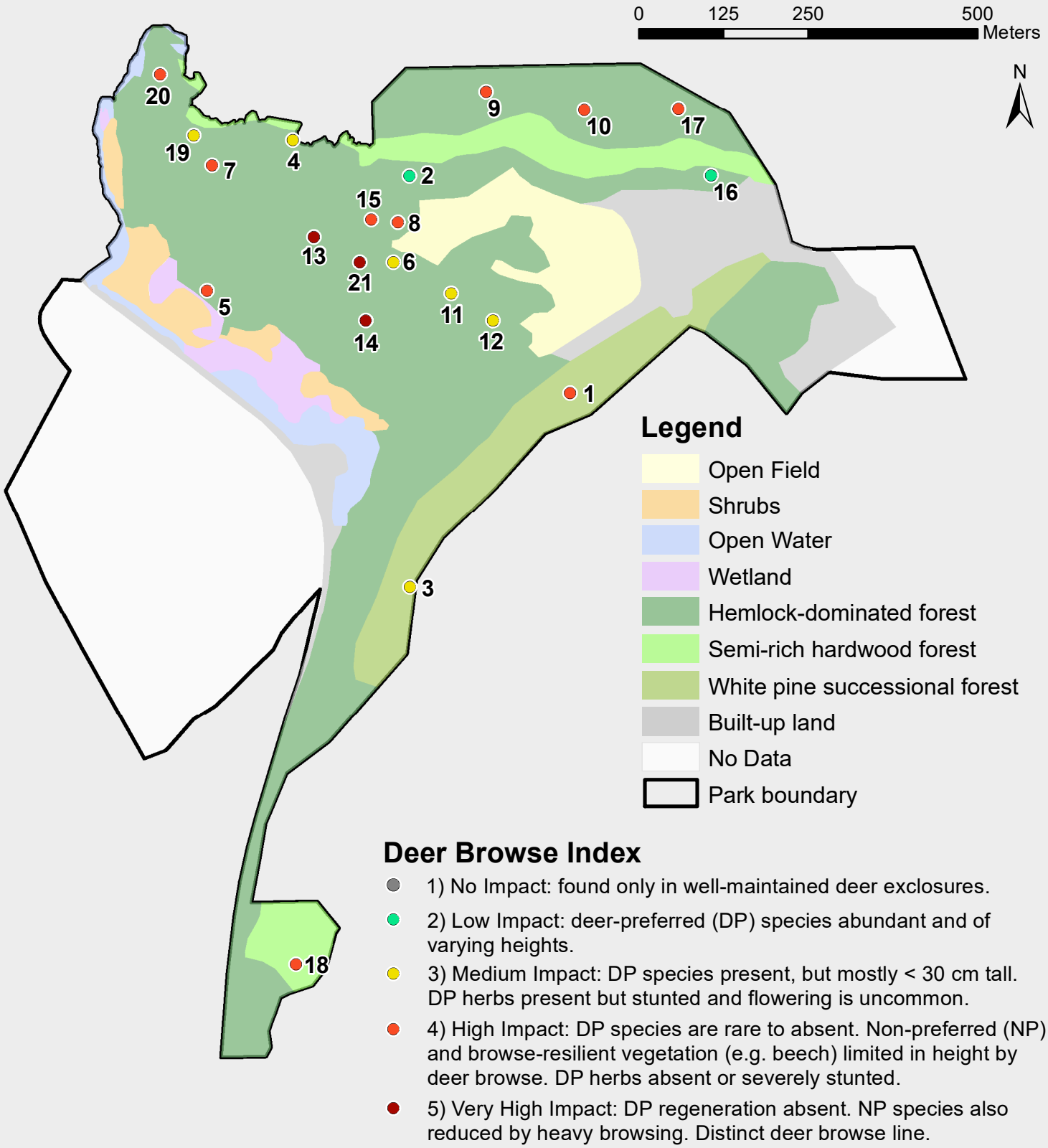
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Map 6. Index of Deer Browse Impacts

Index of deer browse impacts observed in forest plots in the most recent 4 years of sampling (2018 & 2022). Plots are sampled in an alternating panel, with plots 1-10 sampled in 2018 and plots 11-21 sampled in 2022. Deer browse impacts are assessed on a scale of 1-5, with 1 representing no impact and 5 representing severe impacts. Date: 8/19/2022.



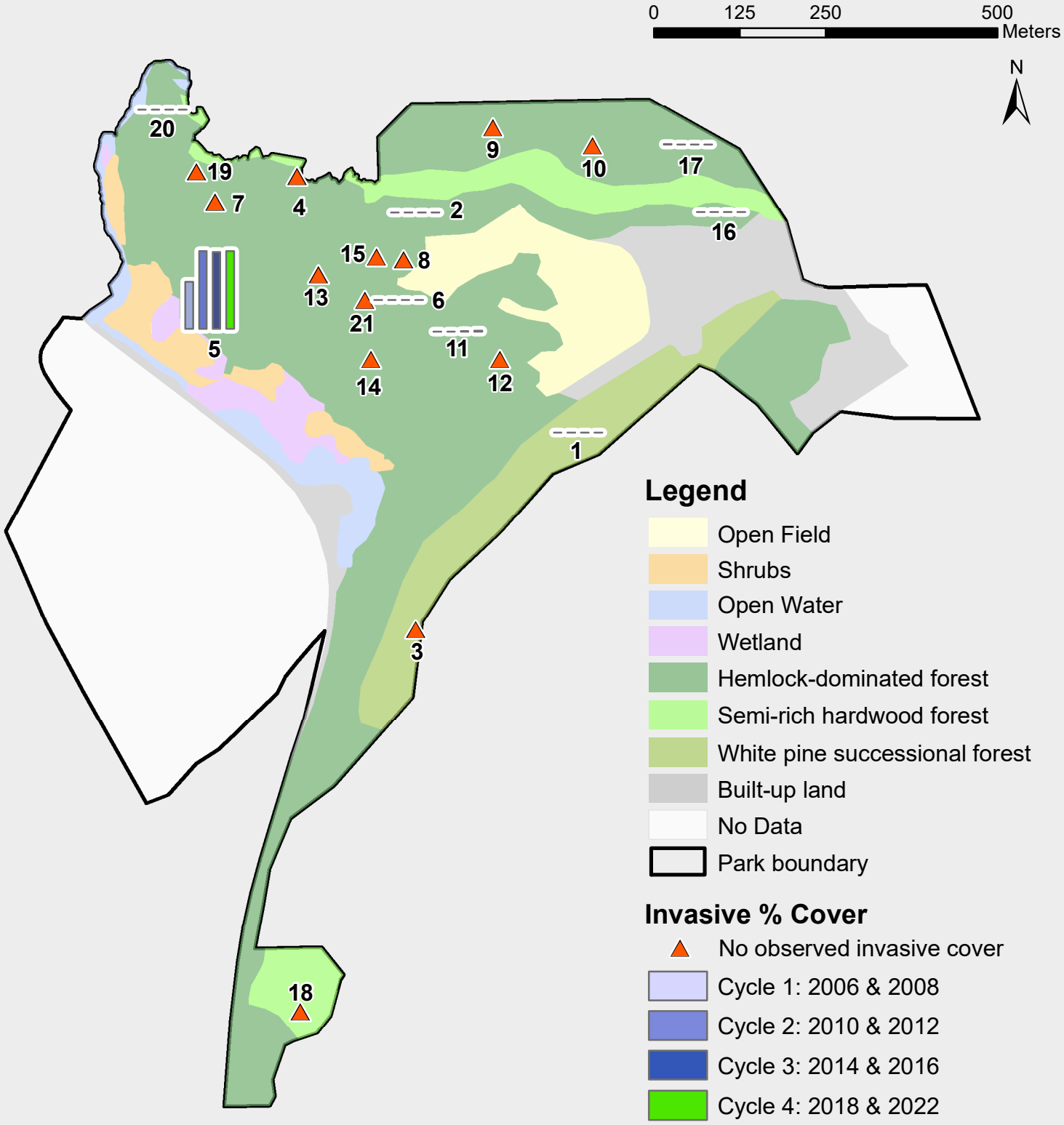
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Map 7. Invasive % Cover by Cycle

Trends in percent cover of invasive species observed in plots sampled from 2006-2022. Plots are sampled in an alternating panel, with plots 1-10 sampled in 2006, 2010, 2014, and 2018, and plots 11-21 sampled in 2008, 2012, 2016, and 2022. Average invasive cover ranges from 0 to 22.2%. See Table 2 for % cover values. Date: 8/19/2022.



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U.S. Department of the Interior

Saint-Gaudens National Historical Park

Map 8. Invasive % Cover by Species

Trends in % invasive cover by species observed in quadrats for plots in the most recent survey cycle (2018 & 2022). Plots are sampled in an alternating panel, with plots 1-10 sampled in 2018 and plots 11-21 sampled in 2022. Pie size is proportional to total invasive cover (range: 0 to 22.2%), and location may be shifted to prevent overlap. See Table 2 for more information. Date: 8/19/2022.

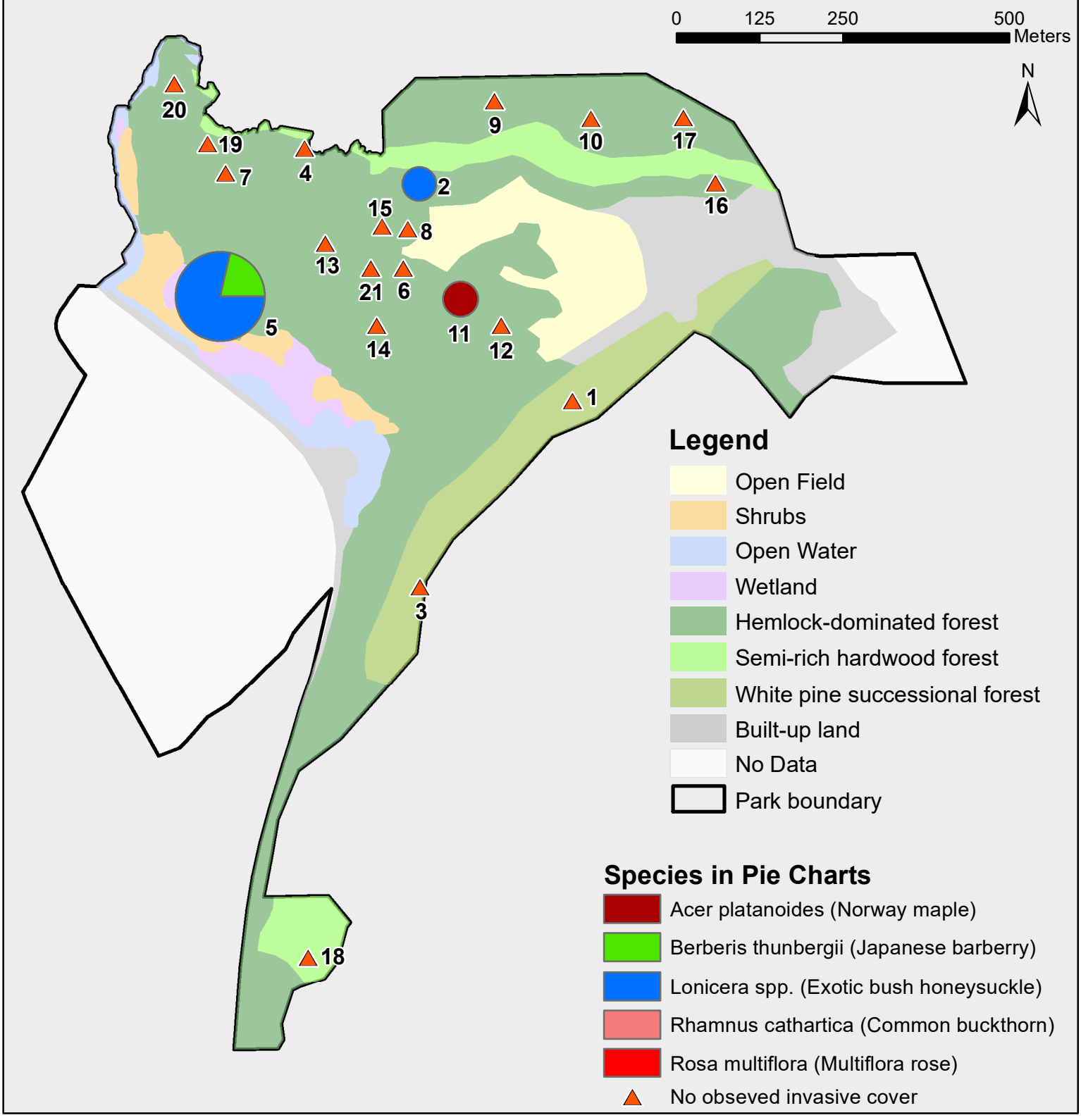


Table 2. Average % cover and number of invasive species detected in each plot by cycle. Cycle 1= 2006 & 2008; Cycle 2= 2010 & 2012; Cycle 3= 2014 & 2016, Cycle 4= 2018 & 2022. Plots are sampled in alternating years, with Panel 1 sampled the first year, and Panel 2 sampled the second year.

Plot	Panel	Average % Cover				Number of Species per Plot			
		Cycle 1	Cycle 2	Cycle 3	Cycle 4	Cycle 1	Cycle 2	Cycle 3	Cycle 4
1	1	0.00	0.00	0.04	0.00	0	1	2	2
2	1	0.00	0.00	0.00	0.01	0	0	0	1
3	1	0.00	0.00	0.00	0.00	1	1	2	2
4	1	0.00	0.00	0.00	0.00	0	1	0	0
5	1	13.45	22.20	21.91	22.16	3	4	4	6
6	1	0.00	0.00	0.01	0.00	0	0	1	0
7	1	0.00	0.00	0.00	0.00	0	0	0	0
8	1	0.00	0.00	0.00	0.00	0	2	0	0
9	1	0.00	0.00	0.00	0.00	0	0	0	0
10	1	0.00	0.00	0.00	0.00	0	0	0	0
11	2	0.00	0.00	0.04	0.19	1	0	2	2
12	2	0.00	0.00	0.00	0.00	0	0	0	0
13	2	0.00	0.00	0.00	0.00	0	0	0	0
14	2	0.00	0.00	0.00	0.00	1	1	0	2
15	2	0.00	0.00	0.00	0.00	0	0	0	0
16	2	0.00	0.00	0.03	0.00	1	0	2	1
17	2	0.20	0.01	0.00	0.00	1	1	3	5
18	2	0.00	0.00	0.00	0.00	0	1	0	1
19	2	0.00	0.00	0.00	0.00	0	0	0	0
20	2	0.03	0.03	0.01	0.00	3	4	1	3
21	2	0.00	0.00	0.00	0.00	0	0	0	0

Table 3. Number of plots out of 21 where priority invasive species were detected by cycle. Cycle 1= 2006 & 2008; Cycle 2= 2010 & 2012; Cycle 3= 2014 & 2016; Cycle 4= 2018 & 2022. This list includes all exotic vascular plant species that are capable of dominating Northeastern US forest habitats, but does not include all exotic species detected in SAGA forest plots.

Latin Name	Common Name	Cycle 1	Cycle 2	Cycle 3	Cycle 4
Acer platanoides	Norway maple	1	1	5	6
Berberis thunbergii	Japanese barberry	4	2	2	2
Celastrus orbiculatus	Asian bittersweet	0	2	1	3
Euonymus alatus	burningbush	0	1	1	3
Ligustrum spp.	privet	0	1	0	0
Lonicera spp.	exotic bush honeysuckle	5	6	5	7
Rhamnus cathartica	common buckthorn	0	1	1	2
Rhamnus frangula	glossy buckthorn	0	0	1	0
Rosa multiflora	multiflora rose	0	0	1	2

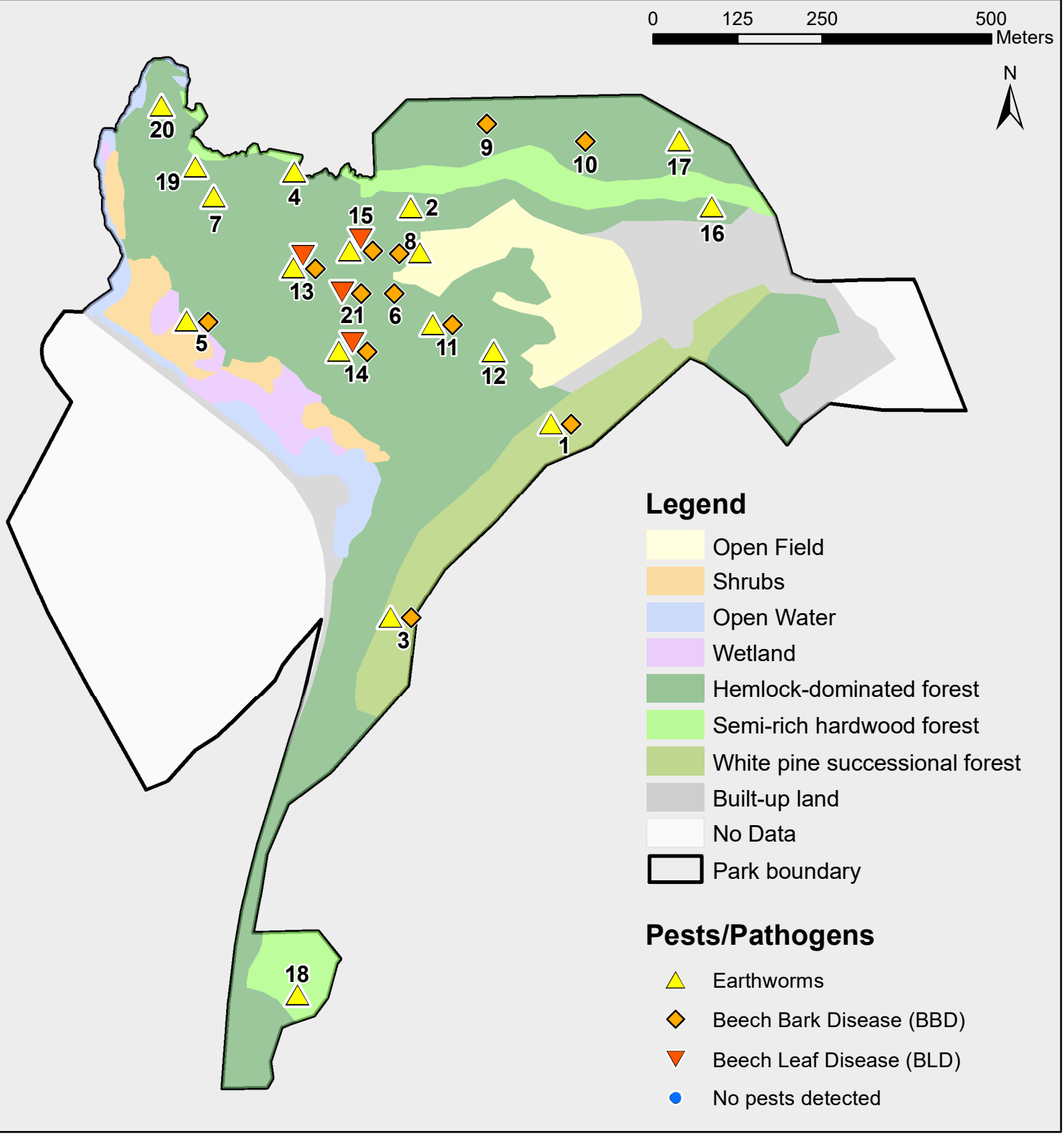
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Map 9. Forest Pest/Pathogen Detections

Priorirty pest and pathogen detections in forest plots sampled from 2018-2022. Plots are sampled in an alternating panel with plots 1-10 sampled in 2018 and plots 11-21 sampled in 2022. Plots with multiple pests present (1, 3, 8, etc.) have multiple symbols. Note that BLD may be more widespread than map indicates, as plots 1-10 were sampled prior to the first detection in 2022. Date: 8/22/2022.



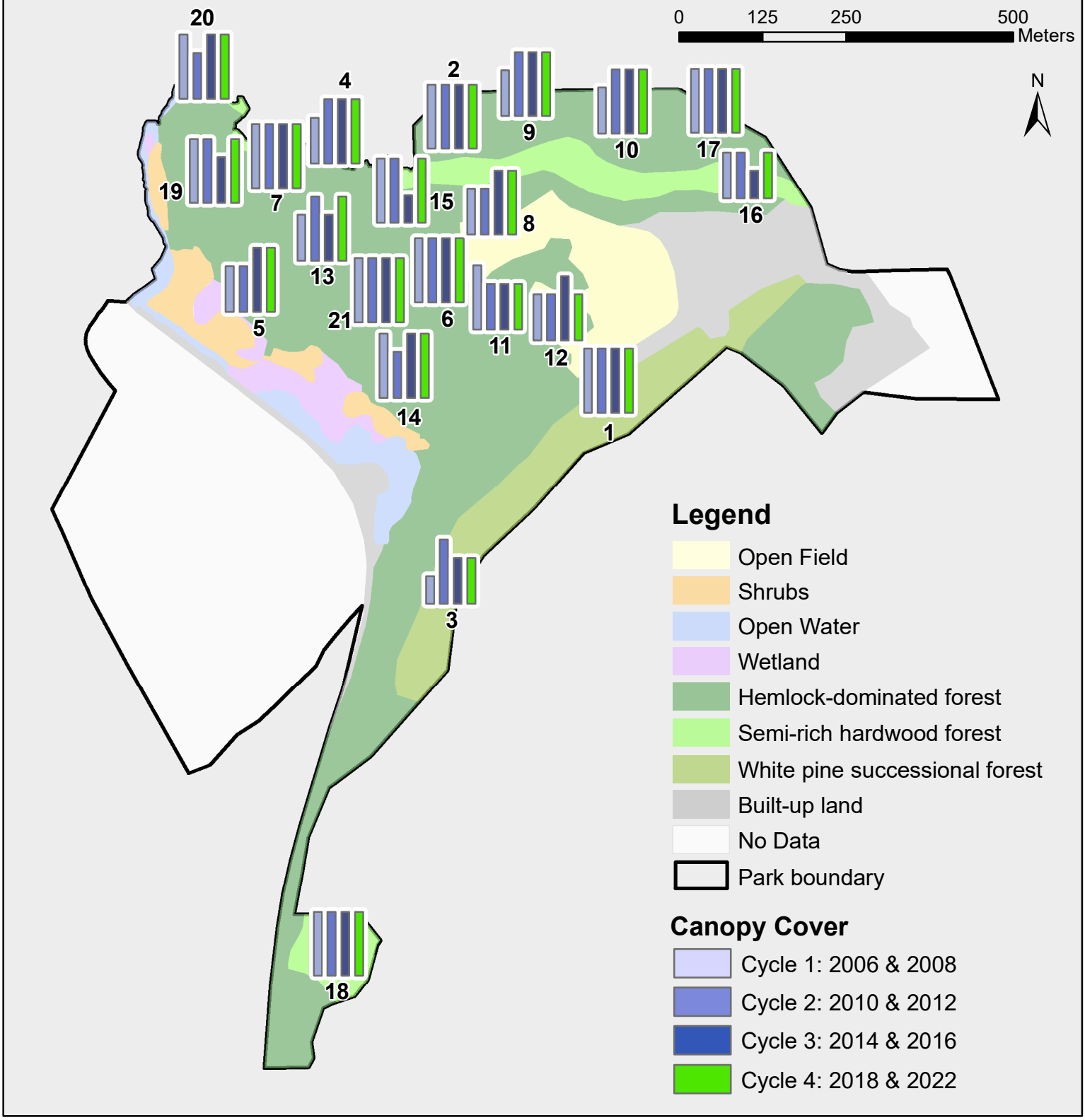
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Map 10. Canopy Cover by Cycle

Trends in tree canopy cover in forest plots sampled from 2006-2022. Plots are sampled in an alternating panel, with plots 1-10 sampled in 2006, 2010, 2014, 2018 and plots 11-21 sampled in 2008, 2012, 2016, and 2022. Canopy cover ranges from 25 - 50% to >75%. Date 8/22/2022.



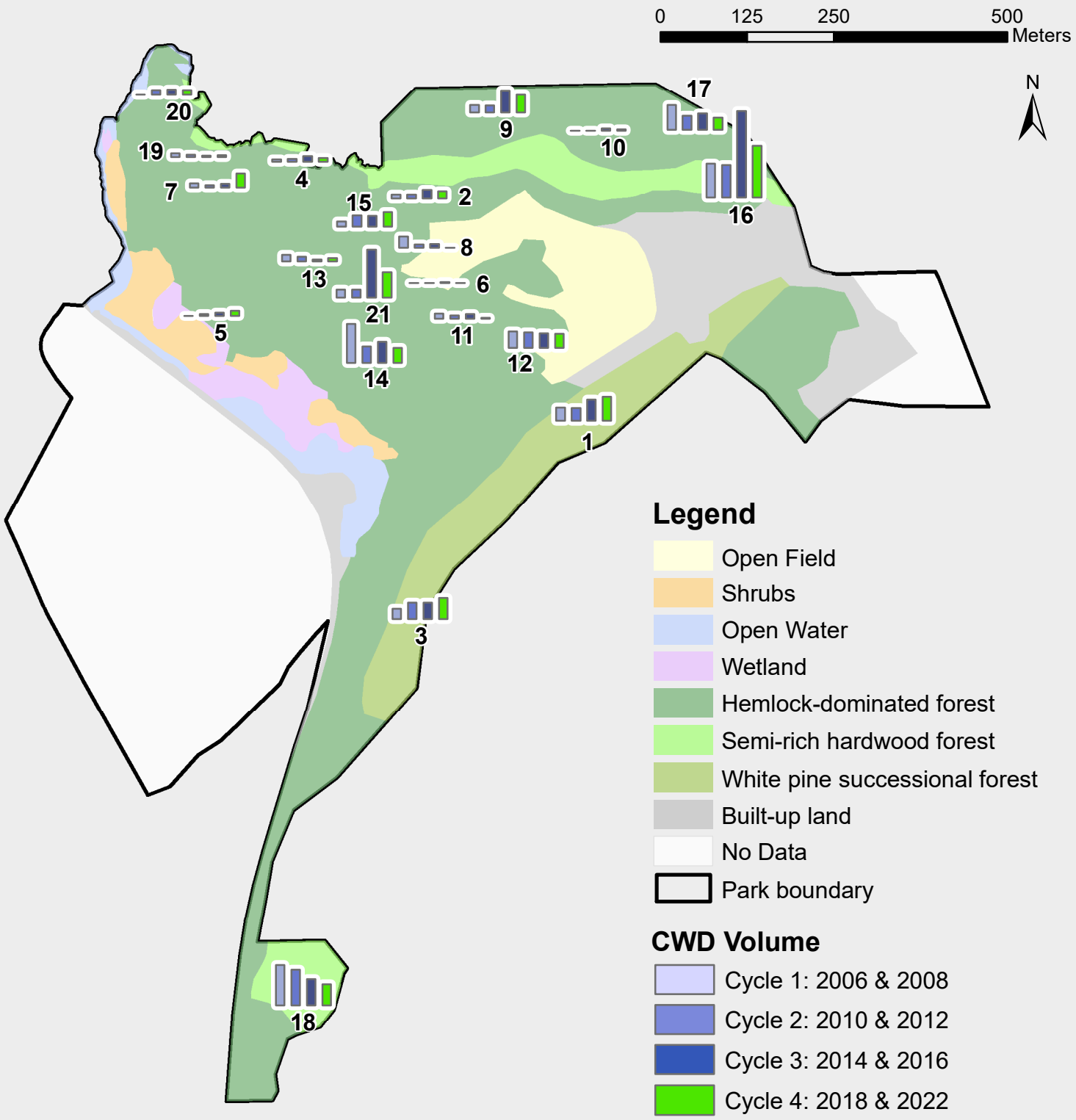
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Map 11. Coarse Woody Debris by Cycle

Trends in Coarse Woody Debris (CWD) volume observed in plots sampled from 2006-2022. Plots are sampled in an alternating panel, with plots 1-10 sampled in 2006, 2010, 2014, and 2018, and plots 11-21 sampled in 2008, 2012, 2016, and 2022. CWD volume ranges from 0 to 288.7 m^3/ha (4,126.6ft^3/ac). Date: 8/22/2022.



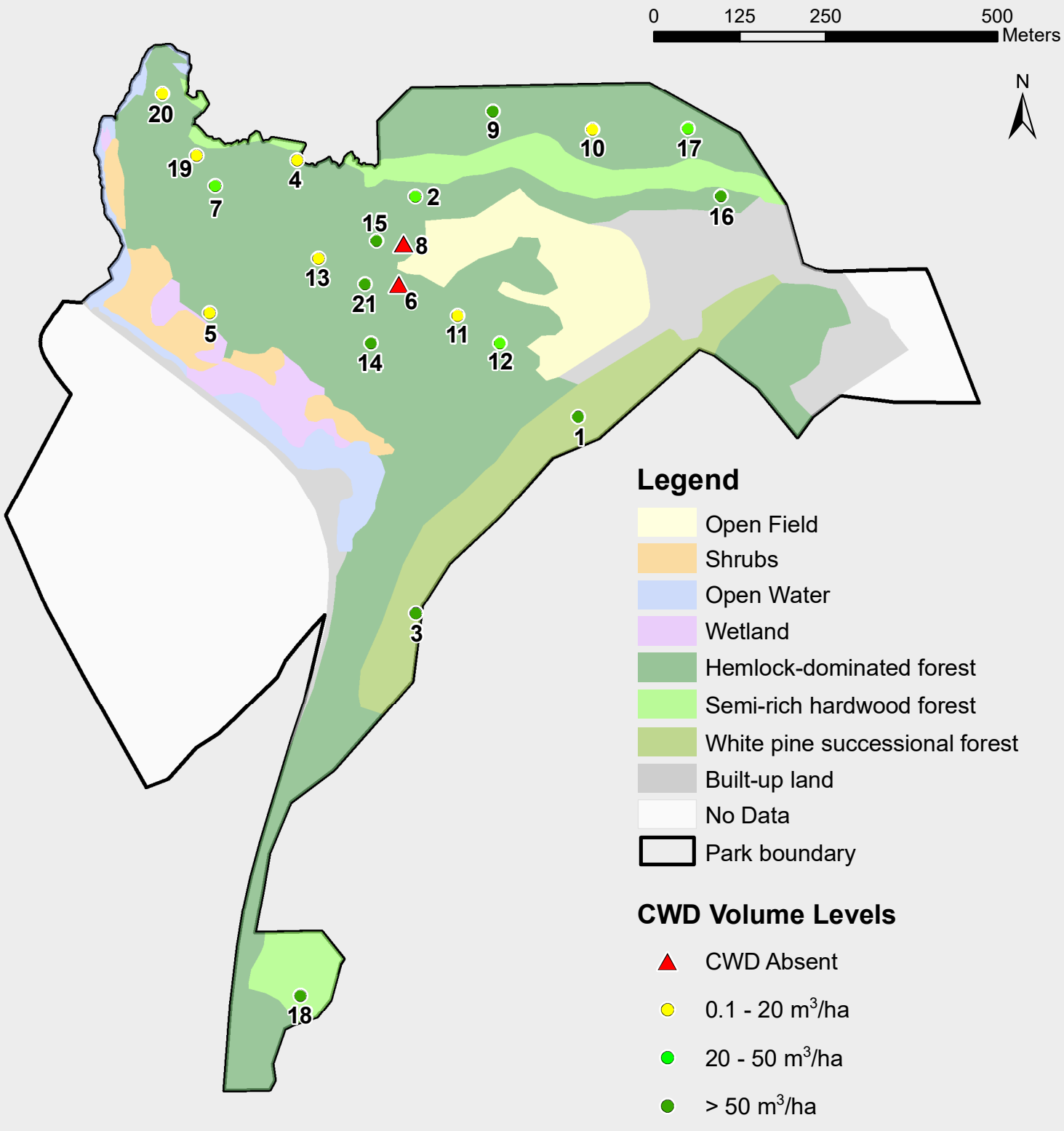
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Map 12. Coarse Woody Debris Ratings

Coarse woody debris volume (m^3/ha) for the most recent survey cycle (2018 and 2022). Plots 1-10 were sampled in 2018 and plots 11-21 were sampled in 2022. Volumes range from 0 to 289 m^3/hectare (4,127 ft^3/ac). Plots are color coded by volume to indicate whether they meet the 20-50 m^3/ha (285.8-714.6 ft^3/ac) threshold in Müller and Bütler (2010). Date: 8/22/2022.



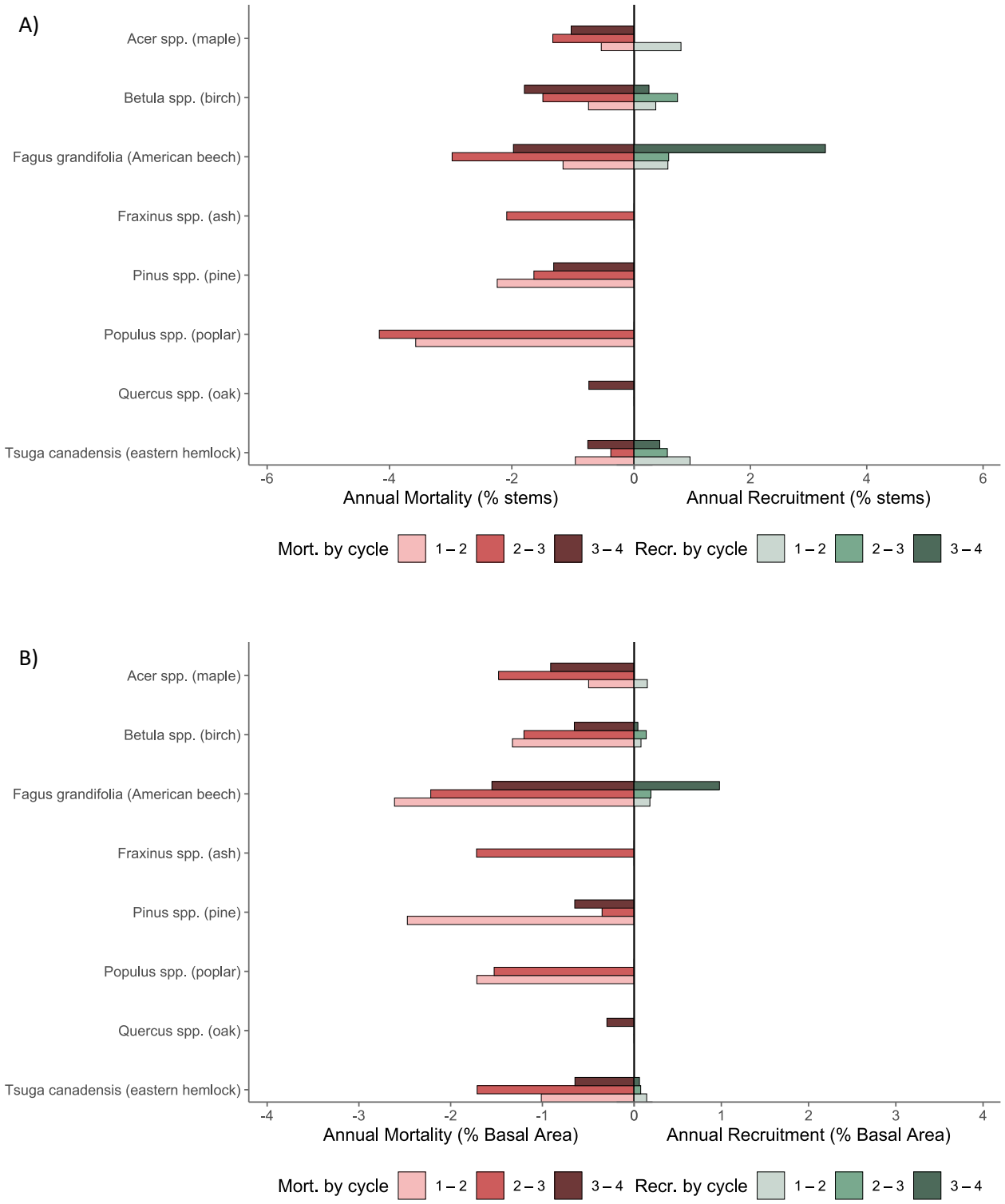


Figure 2. Annual tree mortality and recruitment rates by cycle in Saint-Gaudens National Historical Park. Figure A represents % of stems that died (mortality) and the % of stems gained (recruitment) per year from the previous cycle. Figure B is the % of basal area per year that died or was gained from the previous cycle.

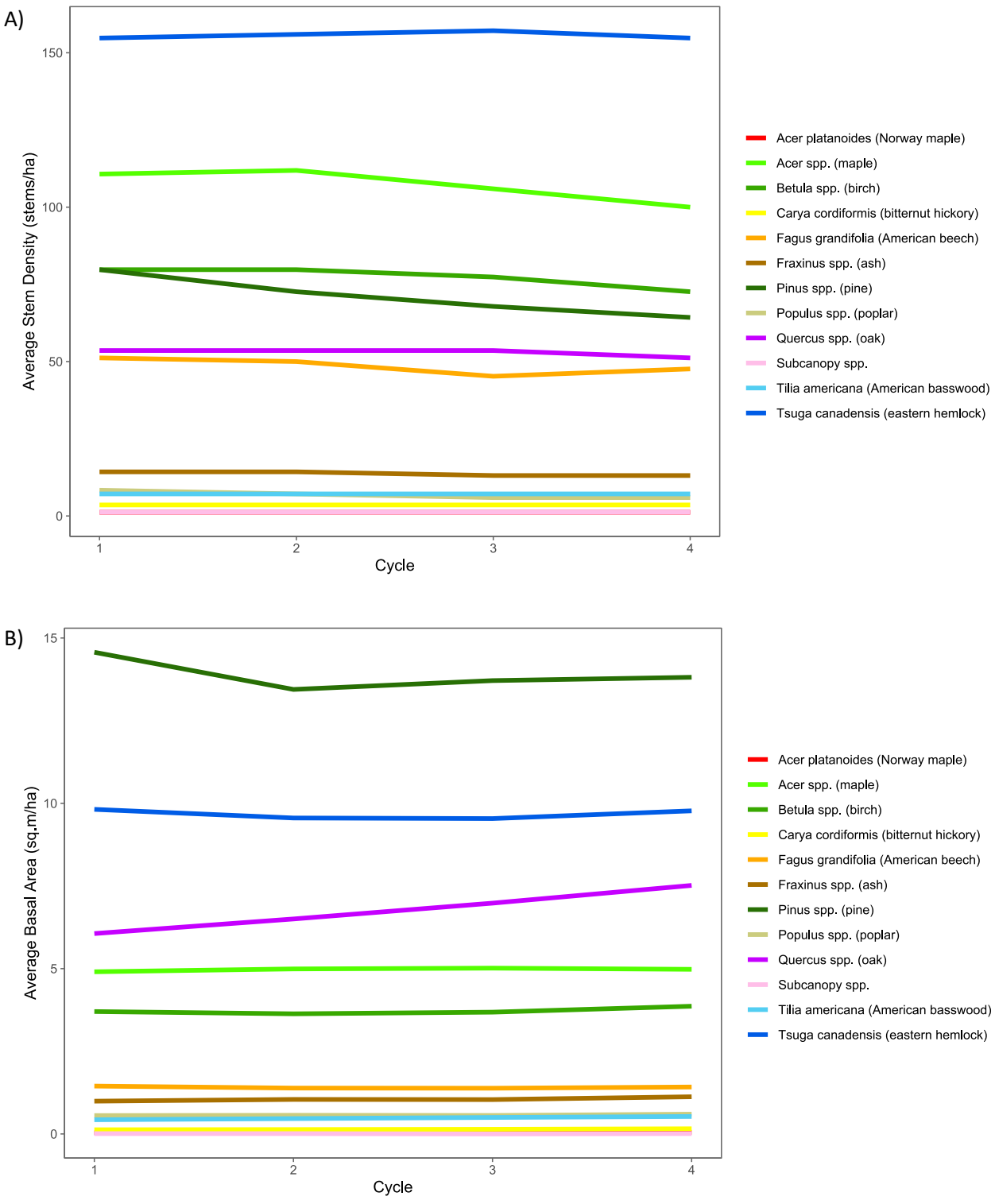


Figure 3. Change in stem density (A) and basal area (B) by species and cycle in Saint-Gaudens National Historical Park. Cycle 1 = 2006 – 2009; Cycle 2 = 2010 – 2013; Cycle 3 = 2014 – 2017; Cycle 4 = 2018 – 2022.