Forest Data Summaries for Saratoga National Historical Park: 2006-2018.

Background

Summaries are based on data collected in Northeast Temperate Network (NETN) long-term forest monitoring plots. There are 32 NETN forest plots in Saratoga National Historical Park (SARA). Each plot is sampled on an alternating 4-year cycle, with plots 1-16 are sampled in 2006, 2010, 2014, and 2018, and plots 17-32 sampled in 2008, 2012, and 2016. Note that plot 15 was not sampled in the second cycle (2010) because all of the plot markers were lost in a flooding event and the plot had to be reestablished. Within each forest plot, tree and stand measurements, including an assessment of deer browse impact, are made within 20x20 m square plots. Tree regeneration is tallied by size class within three 2-m radius circular microplots within each square plot. Coarse woody debris (CWD) is assessed using line intersect sampling along three 15-m transects originating at plot center. Understory diversity is monitored within eight 1-m^2 quadrats, and soil samples are obtained from a location adjacent to the plot. Plots are permanently marked and measured at the same location every cycle. For a more detailed description of the forest monitoring protocol, including background information, field methods, and sample design, refer to the NETN forest monitoring protocol.

This document provides summaries and interpretations of tree regeneration and invasive species data to help inform park staff of any potential forest issues detected by NETN forest monitoring. This report has been updated to include results from the 5/29-6/4/2018 survey, which is the first of two panels in Cycle 4. Note that summaries are considered preliminary until after the 2018 forest data are thoroughly quality checked and certified at the end of the field season.

Summary

Lack of regeneration and the composition of existing regeneration are widespread concerns in SARA, with chronic deer overabundance and invasive species the primary causes. More than half of the plots in SARA do not have enough regeneration to replace the canopy (see maps 1, 2 & 4 and Table 1). Much of the regeneration that is present is made up of white ash (*Fraxinus americana*) and American elm (*Ulmus americana*), which are likely to succumb to exotic pests and diseases before becoming canopy trees (see map 5). In fact, several plots, including plot 8 and 13, had white ash with significant canopy die back and epicormic branches in 2018. While emerald ash borer is suspected, we were unable to verify the cause of the poor condition.

Another major forest health concern relates to the stands that were impacted by the microburst in early May, 2018. While only a few plots (7 and 9) sampled in 2018 were marginally impacted by the microburst, there's considerable area in the northern part of the park that was severely impacted. The stands impacted by the storm are highly vulnerable to invasive species, particularly invasive shrubs like bush honeysuckle (*Lonicera* spp.) and common buckthorn (*Rhamnus cathartica*), which have continually increased in % cover and frequency over the 12 years we have monitored forests in SARA (see map 7 and Table 2). Treating invasive shrubs in the storm-impacted stands should therefore be a high management priority to ensure the stands can regenerate into forest rather than convert to invasive shrub thicket, a pattern that is already occurring in other parts of the park (e.g. 4 and 12; see map 8). Deer overabundance, the impacts of which are high and appear to be increasing over time in SARA (see map 3), will also likely impact the ability of the stands affected by the microburst to regenerate. Planting seedlings and saplings of native trees may be necessary to ensure these areas remain forested in the long term.

Interpretation of Maps

Map 1. Tree Regeneration by Cycle

Tree regeneration remains consistently low across all cycles in the majority of forest plots in SARA, particularly in the invasive shrub thickets (e.g. 4, 12, and 32) which show little sign of converting to forest. Plot 29 is the only plot with a large increase in number and size of seedlings over time. However, this spike is primarily driven by increases in white ash seedlings (see map 5).

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Map 2. Regeneration by Size Class

Healthy forests typically have tree seedlings of varying sizes, whereas forests with impacts from deer browse tend to be dominated by seedlings less than 30 cm (~1 ft) tall. In SARA, 20 out of 32 plots (63%) follow the latter pattern. Seedlings are primarily < 100 cm tall, although saplings are present, but not abundant, in roughly half of the plots (53%). While the lack of seedlings over 100 cm tall is concerning, the overall lack of regeneration throughout the park, particularly in the areas of the park that were impacted by the microburst, is even more concerning (see Map 4)

Map 3. Index of Deer Browse Impacts: 2016 & 2018

The index of deer browse impacts (DBI) is a 1 to 5 scale that qualitatively assesses deer impacts to a plot. A DBI value of 1 describes a forest understory in the complete absence of deer and a value of 5 corresponds to an understory experiencing very high deer impacts (i.e. deer-preferred tree regeneration and herbaceous species are absent and even on non-preferred species are browsed). Mean DBI scores above 3.5 indicate that forest plots have sustained such heavy browse that the understory composition has shifted from browse-preferred woody and herbaceous species (e.g., sugar maple and liliaceous herbs) to browse-resistant or non-preferred species (e.g., beech, ferns and invasive species). The mean DBI of the 16 plots that were sampled in 2018 for Cycle 4 was 4.12, which is up from 3.2 for the same group of plots during Cycle 3 (2014). Additionally, all but 3 plots were rated high or very high for deer impacts in the last 4 years of monitoring.

Map 4. Regeneration Stocking Index: 2016 & 2018

The regeneration stocking index quantifies whether current seedling and sapling densities are sufficient to restock a forest canopy. The index is a weighted sum of native seedling and sapling densities where larger size classes are weighted higher in the calculation. Areas with high deer impacts, such as in SARA, require a stocking index of 100 to be sufficiently stocked to replace the forest canopy. Based on the most recent 4 years of sampling (2016 & 2018), only two out of 32 plots (6%) are sufficiently stocked for areas with high deer impacts. 18 out of 32 plots (56%) are severely understocked, and do not have enough regeneration to replace the forest canopy. Trends in the stocking index across cycles are also concerning, with the number of plots that are severely understocked increasing over time (Table 1).

Map 5. Regeneration Composition

White ash dominates the regeneration layer in many SARA plots. American elm is an important component in the regeneration layer in nearly half of the plots as well. The dominance of both species is a concern, as forest pests/pathogens threaten their long-term status in the forest canopy. Emerald ash borer (EAB) is the primary concern for ash. EAB was detected in Saratoga County in 2015 and it is only a matter of time before EAB begins impacting ash in the park (if not already happening). While American elm has persisted across the landscape, individual trees typically succumb to Dutch elm disease after reaching a seedbearing age but before attaining an appreciable size (typically ~20 cm DBH). As a result, American elm has lost its status as an important canopy species.

There is also a predominance of low canopy (e.g., American hornbeam (*Carpinus caroliniana*) and striped maple (*Acer pensylvanicum*)), and exotic tree species (i.e. hawthorn, *Crataegus* spp.) regeneration in a number of plots. The presence of native low canopy tree species does not necessarily indicate a problem, as these species contribute to forest diversity and structure. However, low canopy species, which tend to be browse resistant, have been shown to increase in areas with high deer densities to the point where the regeneration of other tree species is suppressed. Plots with a majority of their regeneration in these categories are also at risk of losing native canopy coverage if the lack of native canopy tree regeneration persists. Encouraging native canopy tree regeneration, such as maples (*Acer* spp.), oak (*Quercus* spp.), and hickory (*Carya* spp.) will help ensure continual forest cover in SARA.

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Map 6. Canopy Tree Composition by Basal Area

Nearly half of plots in SARA are dominated by white pine (*Pinus strobus*), many of which are large (e.g., >40 cm DBH) open grown trees. In contrast, white pine regeneration is rare in these plots. With the early May 2018 microburst largely impacting white pine stands in the park, and given the lack of white pine regeneration, these stands are not likely to remain white-pine dominated forests in the future.

Basal area, which is a common metric to assess tree abundance, is the cross-sectional area occupied by each species (based on the diameter at breast height) on a plot, converted to m2/ha. Plots with a high basal area have larger and/or more trees than plots with a low basal area. In SARA, there is a large difference in plot-level basal area between plots found in intact forest and the plots found in and around invasive shrub thickets. Plots outside of the invasive shrub thickets have relatively high basal area, and are largely closed-canopy forests. In contrast, the plots associated with the invasive shrub thickets (plots 12, 27, 29 and 32) have only a few small trees per plot, and are primarily composed of white pine and white ash. Based on consistently low percent canopy cover measurements and lack of regeneration over the last 12 years of monitoring, these plots show no evidence of converting to closed canopy forest. In fact, as of 2018, plot 12 no longer has a single living tree present on the plot.

Map 7 & 8. Invasive Shrub % Cover by Cycle and Composition

Invasive shrub percent cover and frequency continue to increase over time in SARA forest plots (Map 7; Table 2). Exotic bush honeysuckle is by far the most abundant invasive species in SARA (present in 29 out of 32 plots in Cycle 3; Table 3), and is the most problematic invasive in the park. While common buckthorn and multiflora rose (*Rosa multiflora*) are lower in average percent cover, they are both also found in the majority of SARA forest plots (28/32 and 29/32 plots, respectively). Note that while invasive shrub cover appears to decrease on Plots 24 and 32 between Cycle 2 and Cycle 3, this is most likely because much of the leafing canopy of the honeysuckle shrubs has grown above 1.5 m, which is the height cutoff for estimating percent cover in our quadrats (Map 7). In fact, we only see evidence of honeysuckle increasing in abundance in SARA, rather than decreasing.

Map 9. *Earthworms: Presence or Absence*

Earthworms are not native to New England and have been linked, along with overabundant deer and invasive plant species, to losses in native plant diversity. Earthworms have been detected in 30 out of 32 plots in SARA. The two plots (11 and 18) without earthworms are found in sandier soils and near vernal pools. While it is possible that earthworms have not yet reached these plots, it is more likely that the soil isn't suitable to support earthworms in these areas, or that earthworms occur at such low levels that they are not easily detected.

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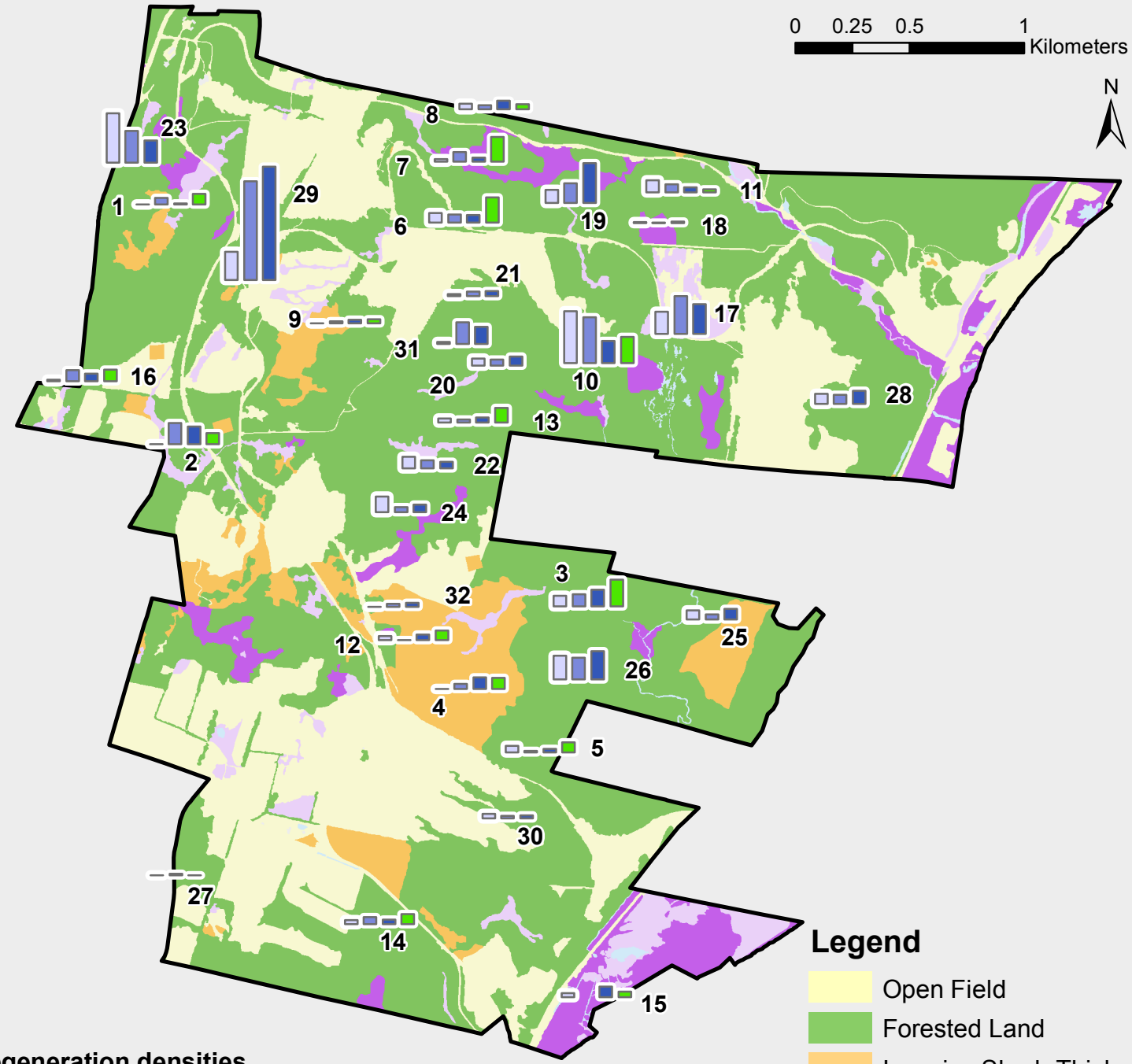
Map 1. Regeneration by Cycle

Trends in tree regeneration stem densities, including seedlings and saplings, observed in forest plots sampled from 2006-2018. Each plot is sampled on a 4-year cycle in an alternating panel, with plots 1-16 sampled in 2006, 2010, 2014, and 2018, and plots 17-32 sampled in 2008, 2012, and 2016. Densities range from 0 to 67,376 stems/hectare. Plot 15 was not sampled in Cycle 2. Date: 6/11/2018.



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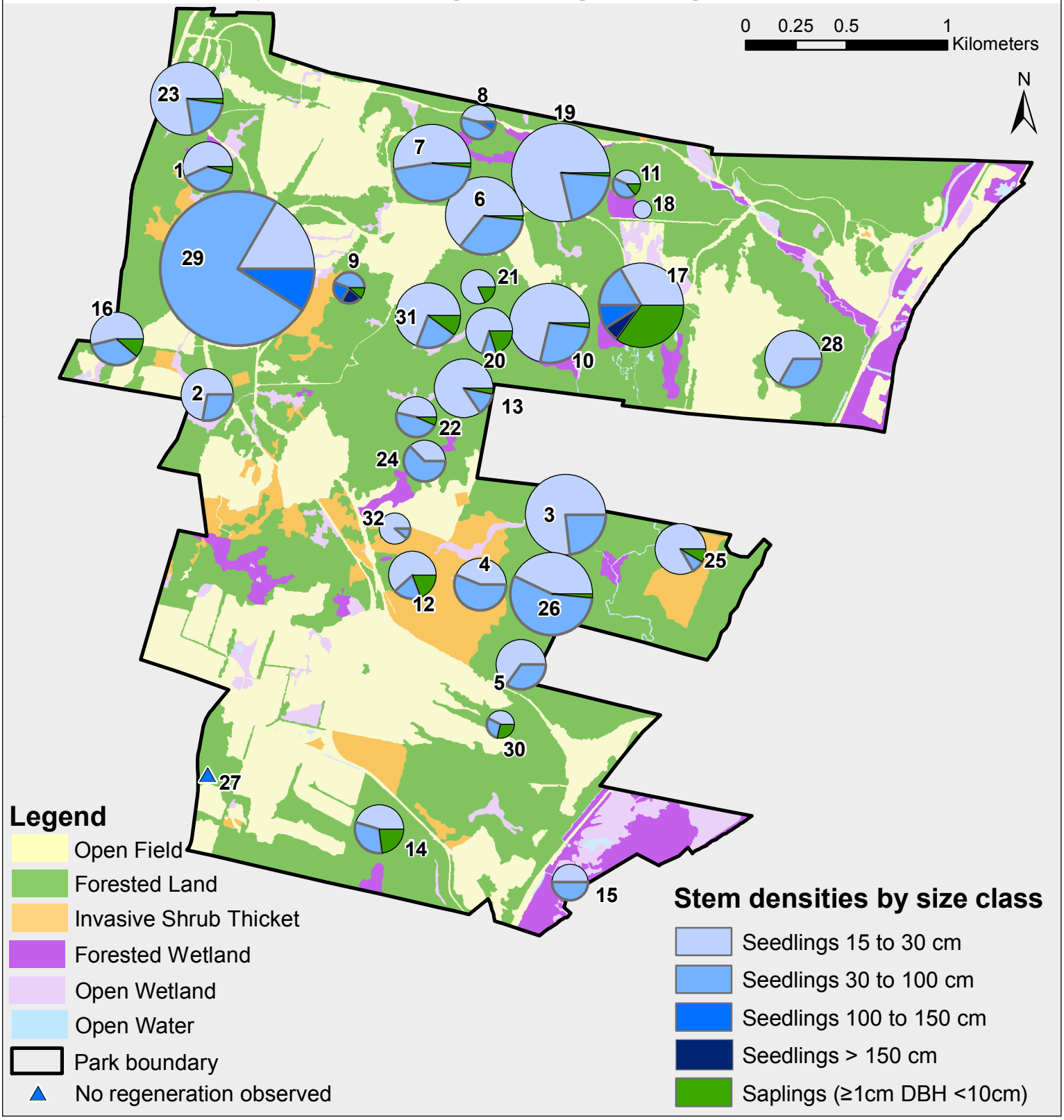
Map 2. Regeneration By Size Class

Trends in tree regeneration stem densities by size class observed in forest plots in the most recent 4 years of sampling (2016 & 2018). Each plot is sampled on a 4-year cycle in an alternating panel, with plots 1-16 sampled in 2018, and plots 17-32 sampled in 2016. Pie size is proportional to the total plot-level regeneration (plot-level density range: 0 to 49,869 stems/hectare for an individual size class). Pies may be shifted from actual plot location to prevent overlap. Date: 6/11/2018.



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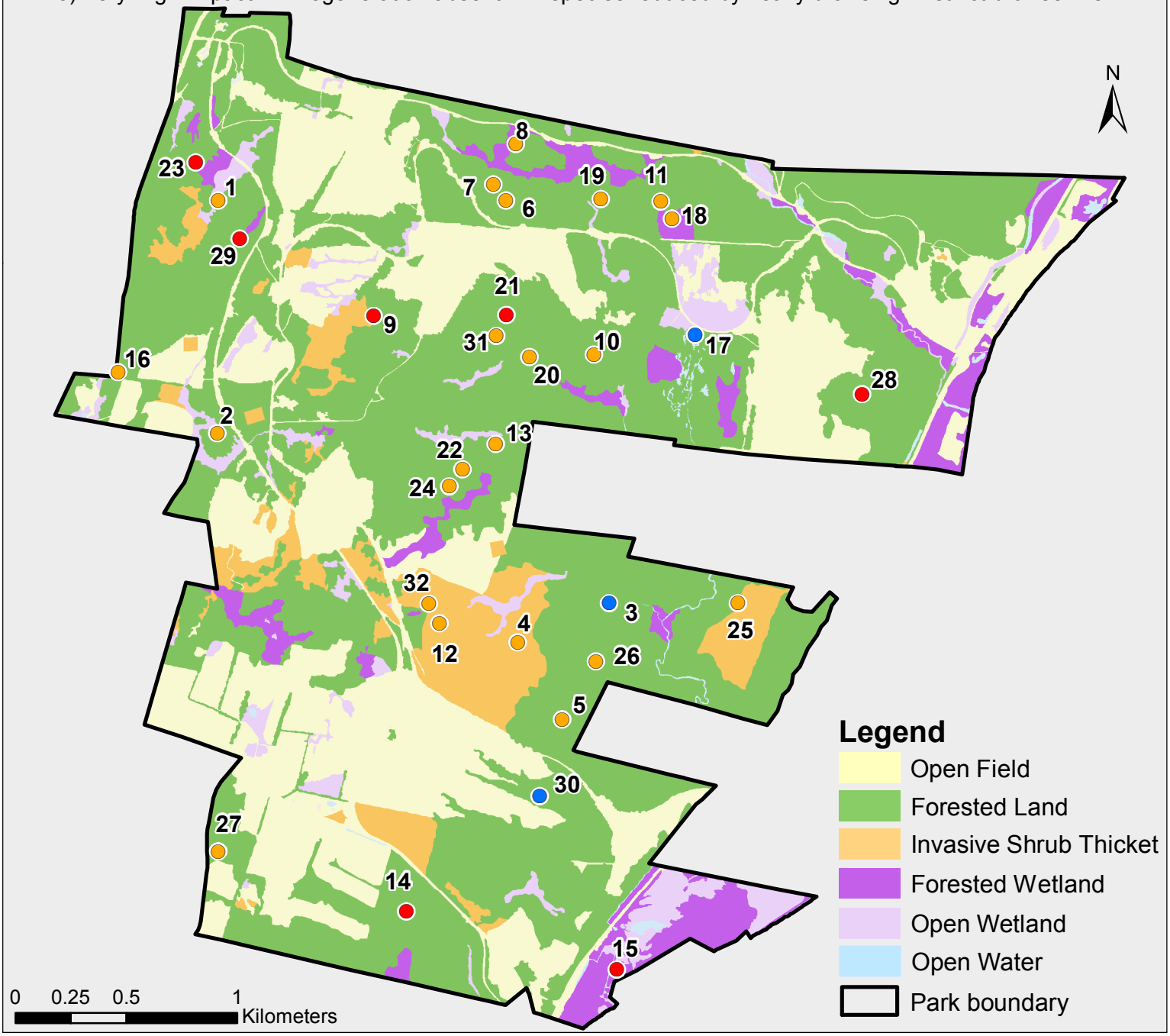
Map 3. Index of Deer Browse Impacts: 2016 & 2018

Index of deer browse impacts observed in forest plots in the most recent 4 years of sampling. Each plot is sampled on a 4-year cycle in an alternating panel, with plots 1-16 sampled in 2018 and plots 17-32 sampled in 2016. Deer browse impacts are assessed on a scale of 1-5, with 1 representing no impact and 5 representing severe impacts. Date: 6/11/2018.

Deer Browse Index

- 1) No Impact: found only in well-maintained deer exclosures.
- 2) Low Impact: deer preferred (DP) species abundant and of varying heights.
- 3) Medium Impact: DP species present, but most under 30 cm tall. DP herbs present, but stunted, and flowering is uncommon.
- 4) High Impact: DP species are rare to absent. Non-preferred (NP) and browse-resilient vegetation (e.g. beech) limited in height by deer browse. DP herbs absent or severely stunted.
- 5) Very High Impact: DP regeneration absent. NP species reduced by heavy browsing. Distinct browse line.



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Map 4. Regeneration Stocking Index: 2016 & 2018

Trends in the regeneration stocking index for the most recent 4 years of sampling (2016 & 2018). The index is a weighted sum of seedling and sapling densities where larger seedling size classes get higher weights. This index is averaged over three 2-m radius microplots per forest plot (range 0-504). See Table 1 for plot-level stocking index values by cycle. Date: 6/12/2018.

Stocking Index Ranges

- < 25: Severely understocked. Regeneration is insufficient to replace the forest canopy.
- 25 to 50: Moderately stocked regeneration for areas with low deer impacts.
- 50 to 100: Sufficient regeneration to replace forest canopy in areas with low deer impacts.
- > 100: Sufficiently stocked with regeneration for areas with high deer impacts.

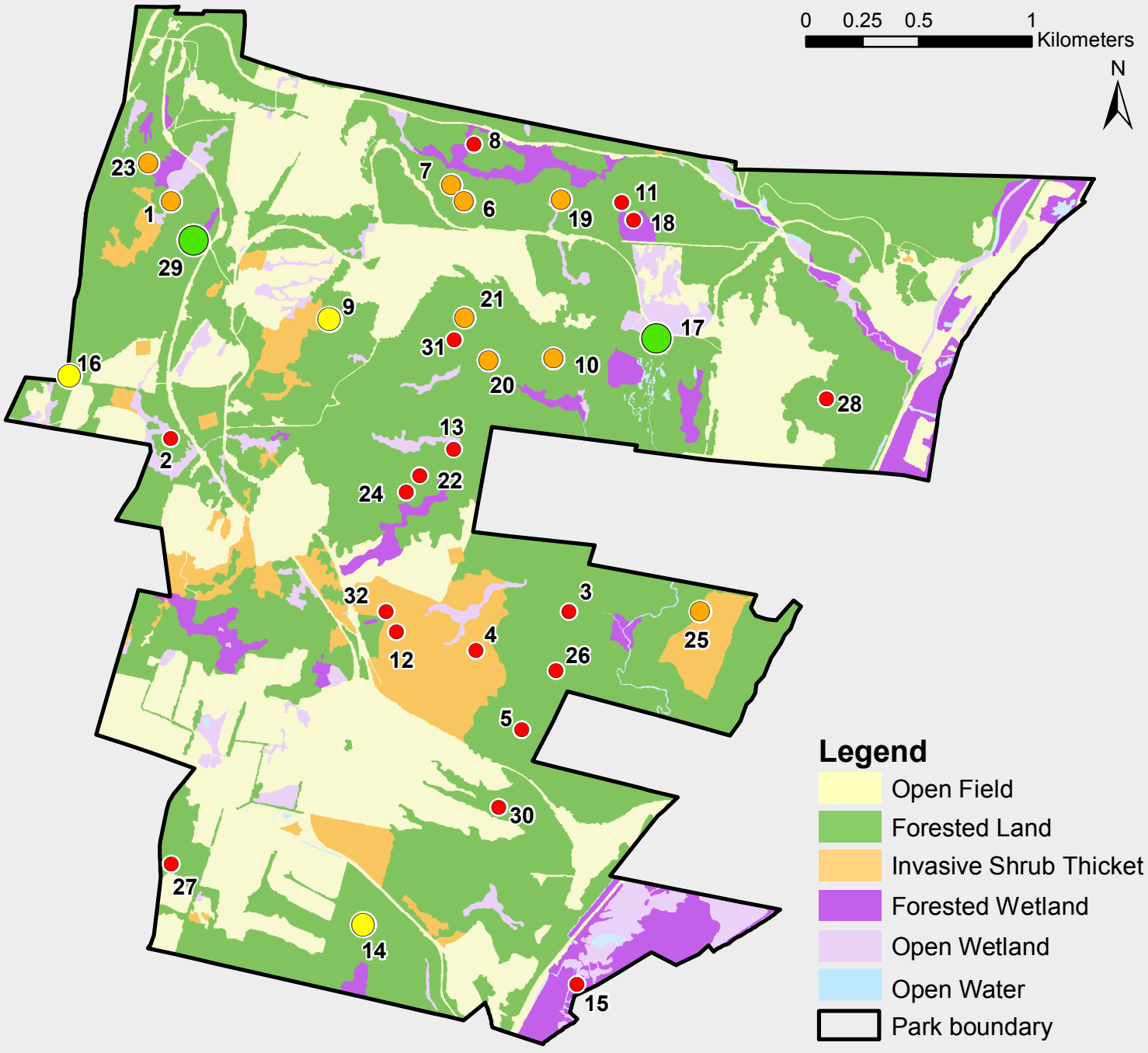

Table 1. Average plot-level seedlings and saplings stem densities per hectare and stocking index by cycle. Cycle 1 = 2006 & 2008; Cycle 2 = 2010 & 2012; Cycle 3 = 2014 & 2016; Cycle 4 = 2018. Plots are sampled in alternating years, with Panel 1 sampled the first year, and Panel 2 sampled the second year. The stocking index qualifies 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 classes get higher weights. Bolded, green fields are plots that have a stocking index >100, sufficient to replace a forest canopy in areas of high deer impacts. Color coding matches the Regeneration Stocking Index map. Plot 15 was not sampled in Cycle 2 and plots 17-32 have not been sampled in Cycle 4 yet.

Plot	Panel	Seedlings per hectare				Saplings per hectare				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	0.0	3448.4	265.3	5835.7	0.0	265.3	265.3	265.3	**0.0**	**23.0**	**17.3**	**27.0**
2	1	0.0	12732.4	10610.3	6631.5	0.0	0.0	0.0	0.0	**0.0**	**22.3**	**15.3**	**9.7**
3	1	6366.2	7162.0	9814.6	15915.5	0.0	0.0	0.0	0.0	**9.0**	**7.0**	**8.0**	**9.0**
4	1	0.0	3183.1	6896.7	6631.5	0.0	0.0	0.0	0.0	**0.0**	**6.0**	**17.3**	**13.0**
5	1	3183.1	1061.0	2122.1	6100.9	795.8	0.0	0.0	0.0	58.0	**1.0**	**1.7**	**4.0**
6	1	5570.4	4509.4	4509.4	14589.2	0.0	265.3	0.0	265.3	**3.0**	**3.3**	**4.0**	**27.3**
7	1	795.8	5570.4	2122.1	14323.9	795.8	265.3	265.3	265.3	52.0	**23.7**	**19.0**	**42.3**
8	1	3183.1	2387.3	5039.9	2917.8	0.0	0.0	0.0	0.0	**4.0**	**3.0**	**6.7**	**9.7**
9	1	0.0	1326.3	2122.1	2122.1	0.0	0.0	0.0	265.3	**0.0**	**3.3**	**11.3**	**65.3**
10	1	30239.4	27056.3	12997.7	15385.0	795.8	265.3	265.3	265.3	95.0	52.7	32.3	32.7
11	1	6366.2	4509.4	2652.6	1591.5	795.8	265.3	265.3	265.3	78.0	26.3	27.0	**19.3**
12	1	795.8	0.0	2917.8	4509.4	1591.5	0.0	265.3	1061.0	101.0	**0.0**	29.0	**23.0**
13	1	1591.5	1591.5	2652.6	8223.0	795.8	265.3	265.3	265.3	52.0	**18.3**	**18.0**	**22.0**
14	1	795.8	1856.8	1061.0	4509.4	1591.5	2387.3	1591.5	1326.3	101.0	153.0	101.3	90.3
15	1	1591.5	NA	5835.7	3183.1	795.8	NA	0.0	0.0	54.0	NA	30.3	**6.0**
16	1	795.8	5835.7	4509.4	6100.9	0.0	795.8	0.0	795.8	**0.0**	53.3	**5.7**	56.3
17	2	12997.7	18568.1	11406.1	---	0.0	3713.6	6100.9	---	326.3	661.3	504.0	---
18	2	530.5	265.3	795.8	---	0.0	0.0	0.0	---	**1.3**	**0.3**	**1.0**	---
19	2	6896.7	11406.1	23342.7	---	795.8	265.3	265.3	---	42.0	**15.3**	30.0	---
20	2	3713.6	2122.1	4244.1	---	530.5	1326.3	1061.0	---	**3.0**	**20.0**	36.0	---
21	2	0.0	2122.1	2387.3	---	1061.0	530.5	530.5	---	66.7	35.3	35.3	---
22	2	6631.5	4774.6	3713.6	---	265.3	0.0	265.3	---	**9.7**	**5.7**	**6.3**	---
23	2	28117.4	18037.6	12732.4	---	1061.0	795.8	265.3	---	81.7	78.7	36.0	---
24	2	9018.8	2917.8	4244.1	---	0.0	0.0	0.0	---	**12.3**	**6.0**	**7.3**	---
25	2	4244.1	2122.1	5835.7	---	1061.0	795.8	530.5	---	72.7	54.3	40.0	---
26	2	13528.2	12467.1	16446.0	---	530.5	530.5	265.3	---	**5.0**	**14.7**	**11.0**	---
27	2	0.0	1061.0	0.0	---	0.0	0.0	0.0	---	**0.0**	**0.7**	**0.0**	---
28	2	5835.7	5305.2	7957.7	---	265.3	265.3	0.0	---	**22.3**	**23.0**	**10.3**	---
29	2	16976.5	58887.3	67375.6	---	0.0	0.0	0.0	---	39.0	179.3	309.3	---
30	2	795.8	530.5	1326.3	---	1856.8	795.8	530.5	---	67.7	**17.3**	**2.3**	---
31	2	530.5	11406.1	9284.0	---	795.8	1591.5	1061.0	---	**0.7**	**7.7**	**9.3**	---
32	2	0.0	1591.5	2387.3	---	0.0	0.0	0.0	---	**0.0**	**2.3**	**2.7**	---

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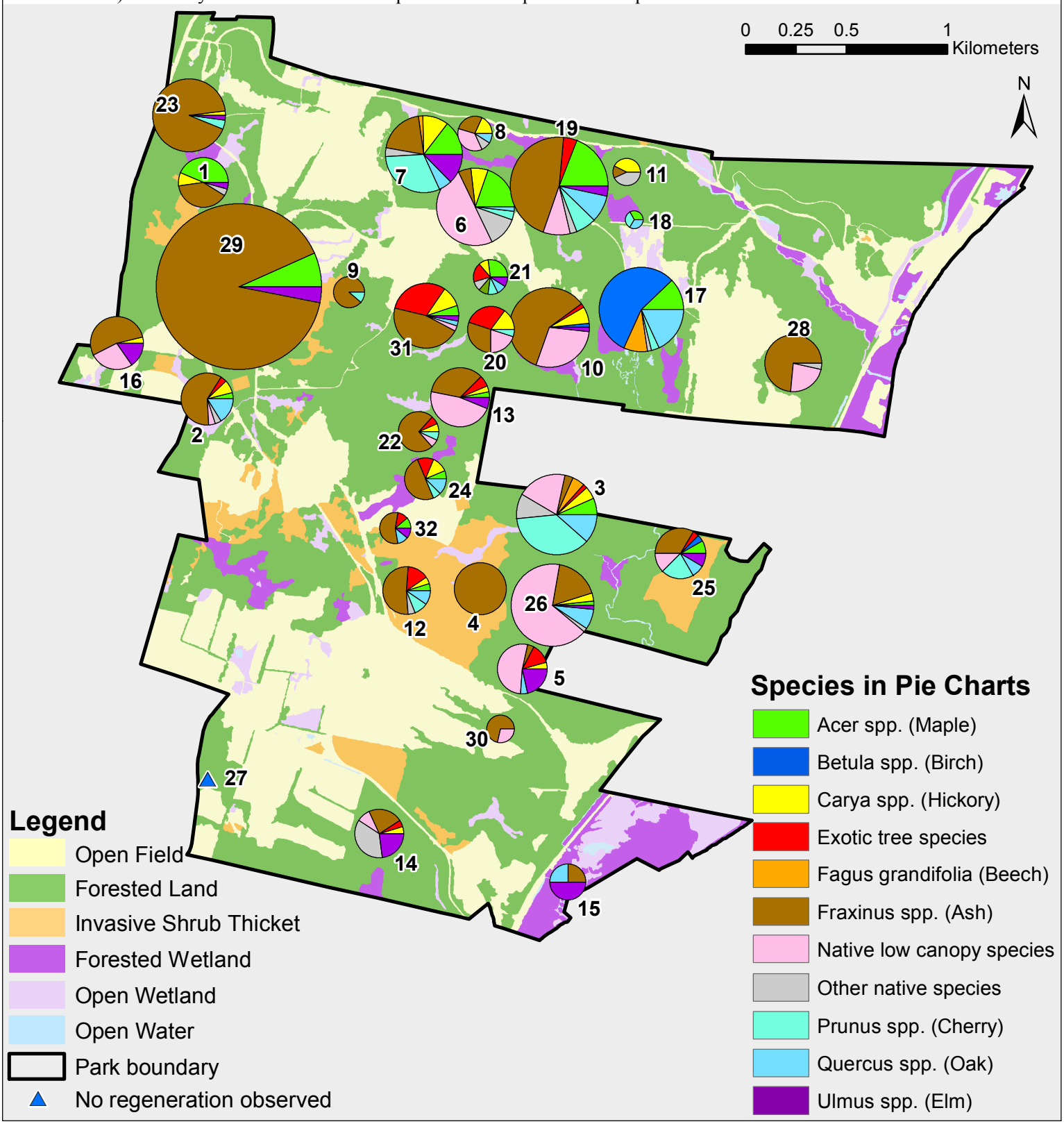
Map 5. Regeneration Composition

Trends in tree regeneration, including seedlings and saplings, by species group observed in forest plots in the most recent survey cycle (2016 & 2018). Each plot is sampled on a 4-year cycle in an alternating panel, with plots 1-16 sampled in 2018, and plots 17-32 sampled in 2014. Pie size is proportional to the total plot-level regeneration (plot-level density range: 0 to 67,376 stems/hectare). Pies may be shifted from actual plot location to prevent overlap. Date: 6/11/2018.



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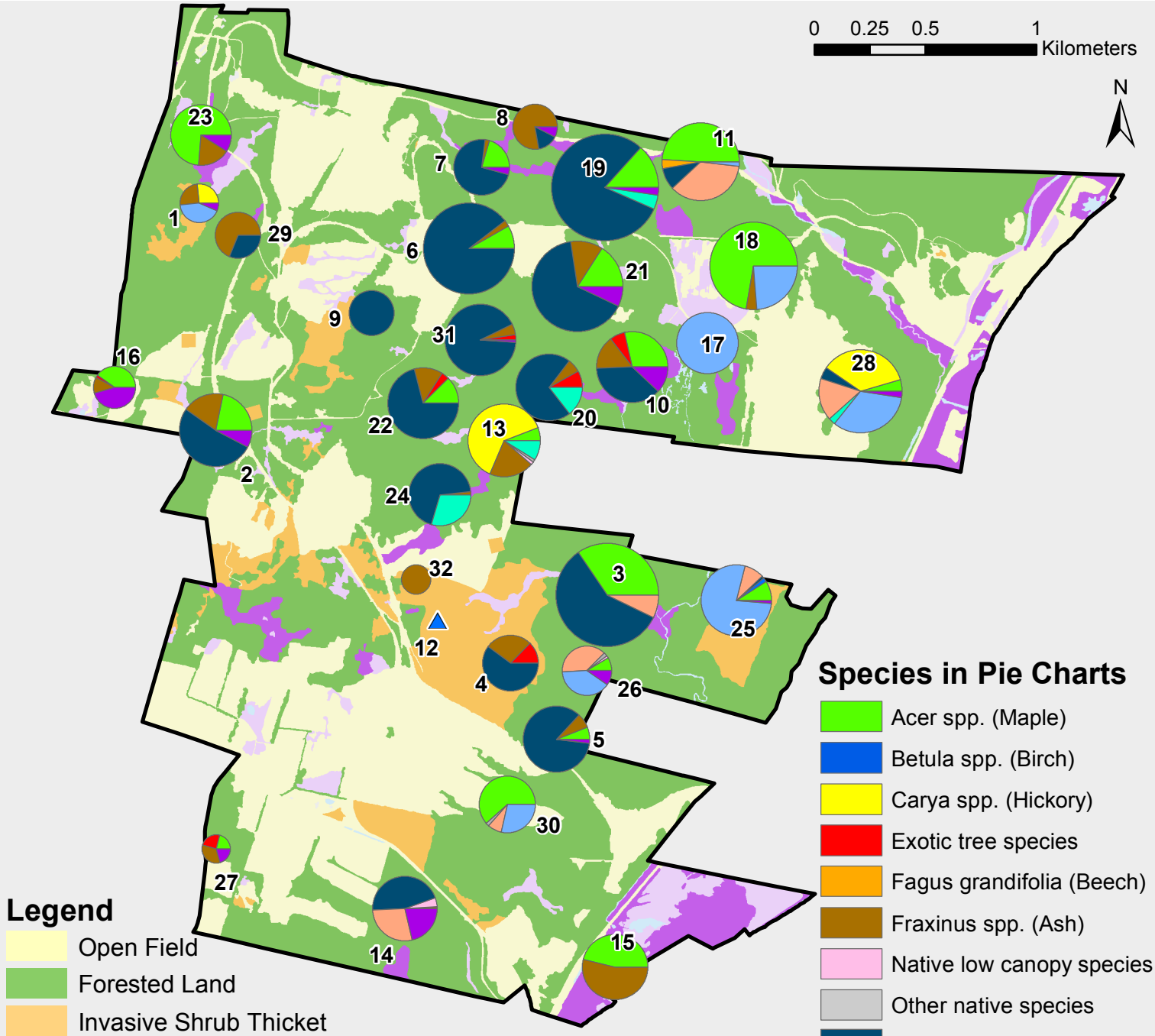
Map 6. Canopy Tree Composition by Basal Area

Trends in tree compostion, by species group, observed in forest plots in the most recent 4 years of sampling (2016 & 2018). Each plot is sampled on a 4-year cycle in an alternating panel, with plots 1-16 sampled in 2018, and plots 17-32 sampled in 2016. Pie size is proportional to the total plot-level basal area (plot-level density range: 0.4 to 63.2 m^2/hectare). Pies may be shifted from actual plot location to prevent overlap. Date: 6/12/2018.



Legend

- Open Field
- Forested Land
- Invasive Shrub Thicket
- Forested Wetland
- Open Wetland
- Open Water
- Park boundary
- No live trees present

Species in Pie Charts

- Acer spp. (Maple)
- Betula spp. (Birch)
- Carya spp. (Hickory)
- Exotic tree species
- Fagus grandifolia (Beech)
- Fraxinus spp. (Ash)
- Native low canopy species
- Other native species
- Pinus strobus (White pine)
- Populus spp. (Aspen)
- Prunus spp. (Cherry)
- Quercus spp. (Oak)
- Ulmus spp. (Elm)

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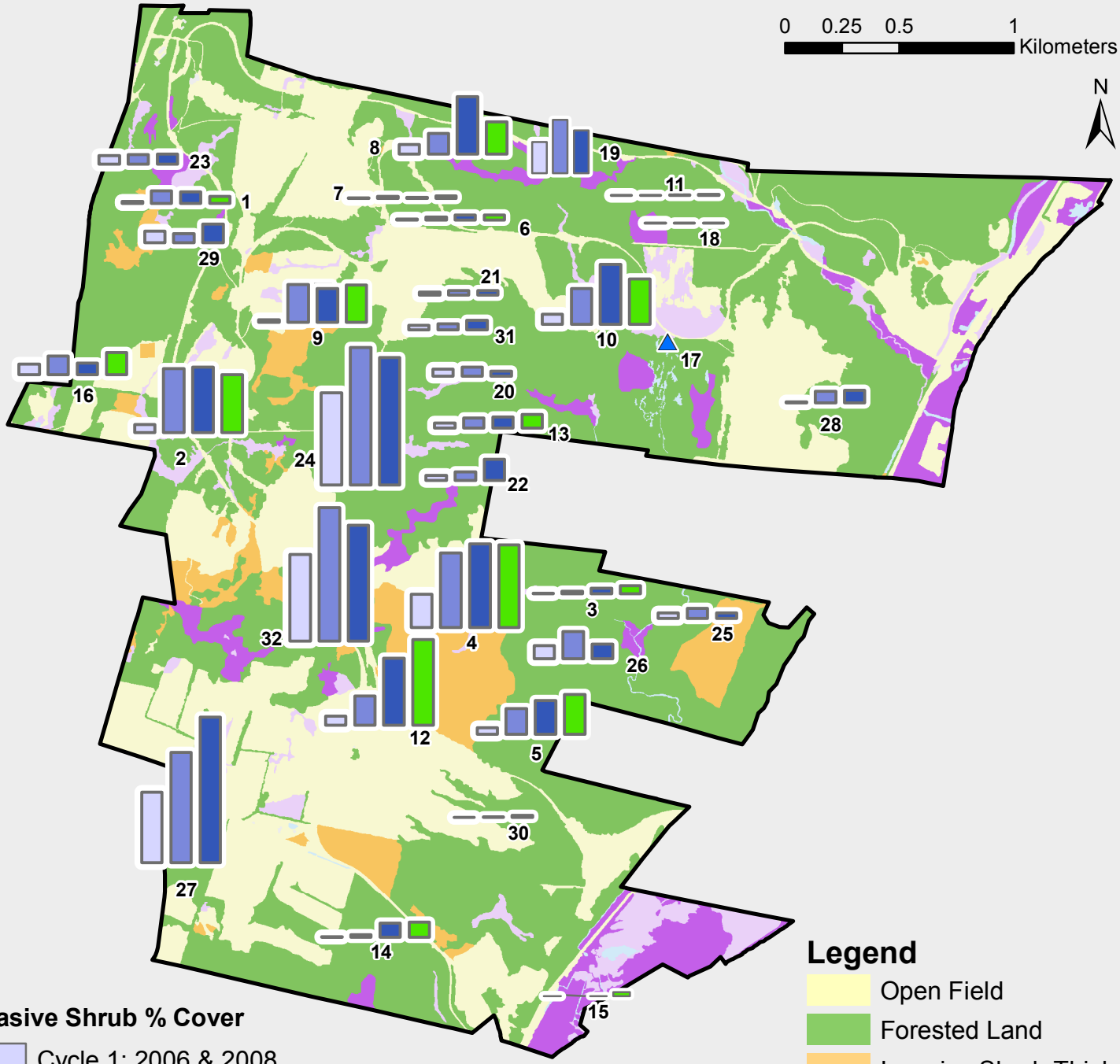
Map 7. Invasive Shrub % Cover by Cycle

Trends in percent cover of invasive shrub and vine species observed in plots sampled from 2006-2018. Each plot is sampled on a 4-year cycle in an alternating panel, with plots 1-16 sampled in 2006, 2010, 2014, and 2018, and plots 17-32 sampled in 2008, 2012, and 2016. Average invasive shrub cover ranges from 0 to 72%. See Table 3 for % cover values. Date: 6/12/2018.



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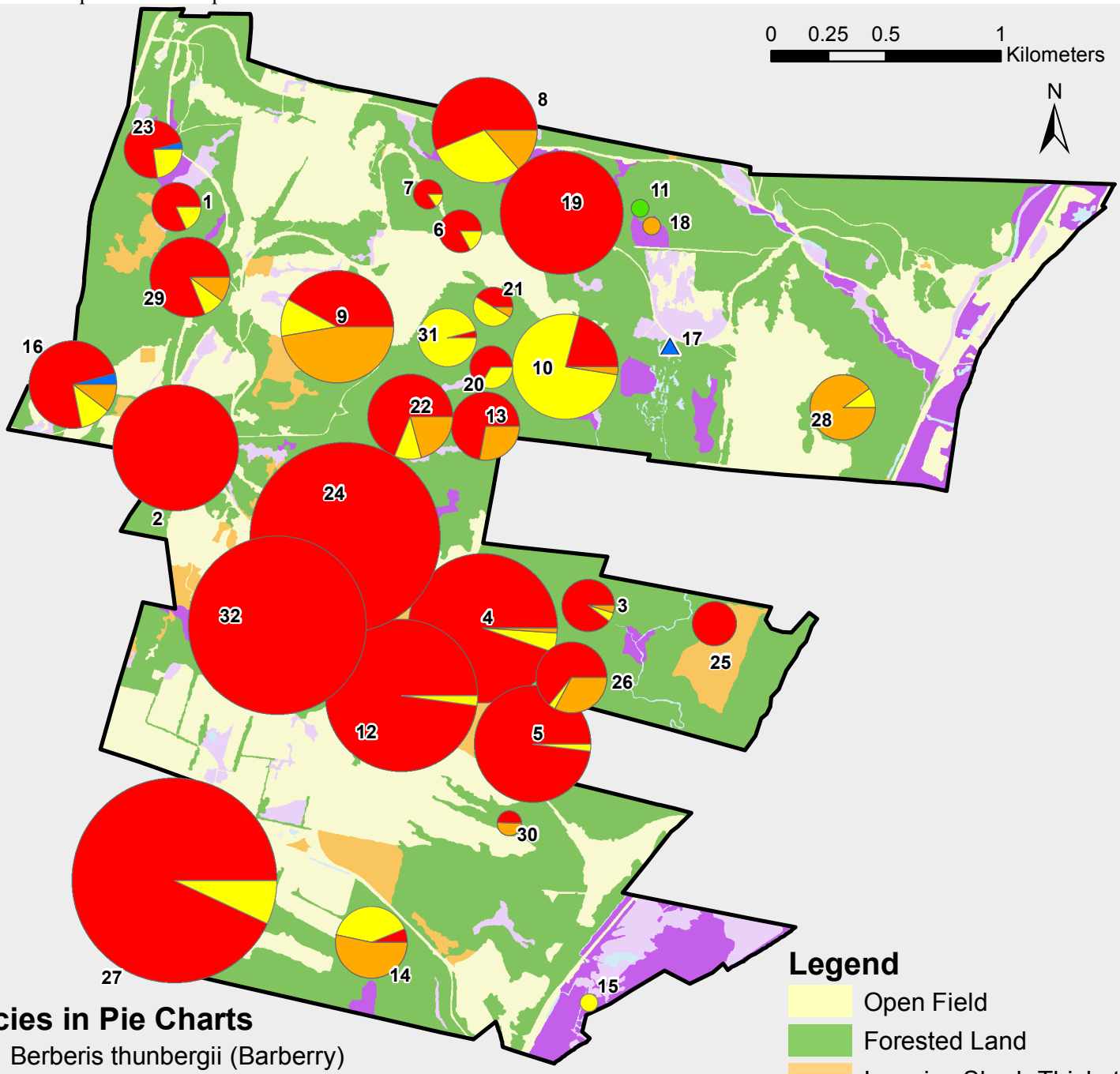
Map 8. Invasive Shrub Composition: 2016 & 2018

Invasive shrub and vine species composition observed in forest plots in the most recent 4 years of sampling (2016 & 2018). Each plot is sampled on a 4-year cycle in an alternating panel, with plots 1-16 sampled in 2018, and plots 17-32 sampled in 2016. Pie size is proportional to the average cover found in quadrats (cover range: 0 to 72.2%). Pies may be shifted from actual plot location to prevent overlap. Date: 6/12/2018.



Species in Pie Charts

- Berberis thunbergii (Barberry)
- Celastrus orbiculatus (Oriental bittersweet)
- Lonicera spp. (Exotic honeysuckle)
- Rhamnus cathartica (Common buckthorn)
- Rosa multiflora (Multiflora rose)
- No Invasive Shrub Cover

Legend

- Open Field
- Forested Land
- Invasive Shrub Thicket
- Forested Wetland
- Open Wetland
- Open Water
- Park boundary

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Map 9. Earthworms: Presence or Absence

Presence or absence of earthworms detected on forest plots for the most recent 4 years of sampling (2016 & 2018). Each plot is sampled on a 4-year cycle in an alternating panel, with plots 1-16 sampled in 2018 and plots 17-32 sampled in 2016. For this analysis, earthworms presence on a plot was considered permanent once detected. For instance, if earthworms were observed on a plot in Cycle 2, but not in Cycle 3, earthworms are still considered 'Present'. Date: 6/12/2018.

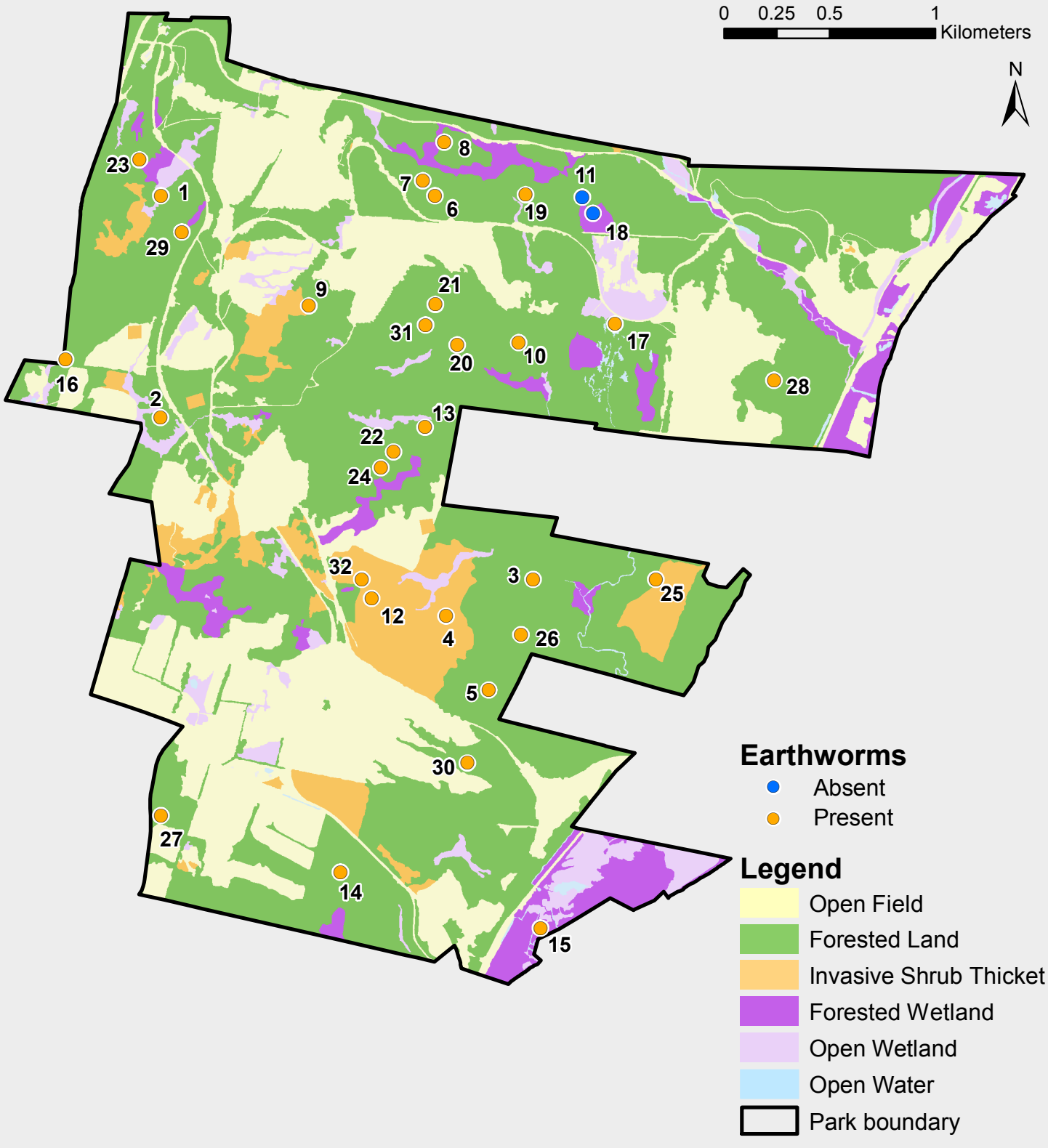

Table 2. Average invasive shrub cover per plot by cycle. Cycle 1 = 2006 & 2008; Cycle 2 = 2010 & 2012; Cycle 3 = 2014 & 2016; Cycle 4 = 2018. Plots are sampled in alternating years with Panel 1 sampled the first year, and Panel 2 sampled the second year. Plot 15 was not sampled in Cycle 2.

Plot	Panel	Cycle 1	Cycle 2	Cycle 3	Cycle 4
1	1	0.8	6.1	5.6	3.5
2	1	4.0	31.9	32.7	28.9
3	1	0.2	1.3	2.9	4.0
4	1	16.4	36.9	41.4	40.8
5	1	3.5	12.7	16.8	19.8
6	1	0.5	1.6	2.6	2.7
7	1	0.4	1.1	0.5	1.3
8	1	4.9	10.4	28.5	16.2
9	1	1.3	18.8	16.9	18.5
10	1	5.0	17.8	29.8	22.6
11	1	0.0	0.0	0.2	0.4
12	1	4.3	14.3	33.2	42.5
13	1	2.4	4.9	5.3	6.8
14	1	0.4	1.3	7.1	7.6
15	1	0.0	0.0	---	0.0
16	1	5.3	9.2	6.0	11.1
17	2	0.0	0.0	0.0	---
18	2	0.0	0.0	0.0	---
19	2	21.5	36.8	29.4	---
20	2	3.5	4.5	2.6	---
21	2	1.5	2.2	2.3	---
22	2	2.5	4.2	10.6	---
23	2	4.2	4.8	4.9	---
24	2	45.6	68.0	63.1	---
25	2	2.8	5.1	2.9	---
26	2	6.6	13.7	7.3	---
27	2	34.9	54.7	72.2	---
28	2	0.7	5.7	6.3	---
29	2	5.8	4.5	9.3	---
30	2	0.0	0.2	0.9	---
31	2	2.3	3.1	5.0	---
32	2	42.8	66.2	57.3	---

Table 3. Number of plots where priority invasive species were detected by cycle. Cycle 1 = 2006 & 2008; Cycle 2 = 2010 & 2012; Cycle 3 = 2014 & 2016; Cycle 4 = 2018. Species on the list include all exotic vascular plant species that are capable of dominating Northeastern US forest habitats, and does not include all exotic speciesdetected in SARA forest plots. Note that Cycle 4 only includes one panel, with a maximum count of 16.

Latin Name	Common Name	Cycle 1	Cycle 2	Cycle 3	Cycle 4
Alliaria petiolata	garlic mustard	8	11	13	6
Berberis thunbergii	Japanese barberry	3	3	6	2
Cardamine impatiens	narrowleaf bittercress	0	0	4	1
Celastrus orbiculatus	oriental bittersweet	0	5	6	6
Centaurea	knapweed	4	5	6	2
Cirsium vulgare	bull thistle	0	0	1	1
Euonymus spp.	burningbush	1	0	1	0
Glechoma hederacea	Gill-over-the-ground	4	7	6	2
Iris pseudacorus	paleyellow iris	0	0	1	1
Ligustrum spp.	ligustrum, privet	0	4	0	0
Lonicera spp.	honeysuckle - exotic	29	29	29	15
Lysimachia nummularia	creeping jenny	4	3	4	2
Lythrum salicaria	purple loosestrife	0	1	0	0
Persicaria maculosa	spotted ladysthumb	0	1	1	1
Phalaris arundinacea	reed canary grass	3	5	9	4
Rhamnus cathartica	common buckthorn	30	27	28	16
Rosa multiflora	multiflora rose	21	20	27	15
Valeriana officinalis	garden heliotrope	0	0	0	1
Viburnum lantana	wayfaringtree	0	0	1	0