

Forest Data Summaries for Roosevelt-Vanderbilt National Historic Sites: 2007-2017.

Background

Data summaries are based on data collected in Northeast Temperate Network (NETN) long-term forest monitoring plots. There are 40 NETN forest plots in ROVA, with 16 plots located in Vanderbilt Mansion NHS (VAMA) and 24 plots spread across Home of Franklin D. Roosevelt NHS (HOFR), Roosevelt Farm and Forest (ROFF), and Eleanor Roosevelt NHS (ELRO). Each plot is sampled on an alternating 4-year cycle, where plots 1-20 are sampled were sampled in 2007, 2011, and 2015, and plots 21-40 were sampled in 2009, 2013, and 2017.

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-m² 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 data summaries and brief interpretations of tree regeneration and invasive species data to help inform resource management staff of any potential forest issues detected by NETN forest monitoring. Note that summaries are considered preliminary until after the 2017 forest data are thoroughly quality checked and certified at the end of the field season.

Interpretation of Maps

Regeneration Stocking Index

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 get higher weights in the calculation. Based on the most recent survey cycle (2015 and 2017), 20 of 40 (50%) of forest plots are severely understocked, particularly in HOFR and parts of VAMA. Fifteen plots are moderately to sufficiently stocked, however, this level of stocking may not be sufficient if white-tailed deer impacts remain the same and continue to increase throughout the park.

Index of Deer Browse Impacts

Deer browse impacts are high or very high, particularly in HOFR and parts of VAMA. Deer browse impacts are lowest in the Roosevelt Farm & Forest unit, although high impacts were still observed at several plots in that unit. In addition, deer browse impacts may be increasing, as the average deer browse index score in cycle 3 was 17% higher than in cycle 2. More information on the impacts that varying levels of deer browse have on the forest are described in the Assessing Vegetation Impacts and Deer protocol.

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 30cm (~1 ft) tall. Where regeneration is abundant, such as in the Roosevelt Farm & Forest unit, seedlings are present in a range of size classes, including saplings. In contrast, regeneration in HOFR is sparse and largely confined to the smallest size class.

Regeneration Composition

Forest Data Summaries for Roosevelt-Vanderbilt National Historic Sites: 2007-2017.

While regeneration tends to be more abundant in VAMA forest plots than other sections of ROVA, a significant portion of the regeneration in VAMA plots is occupied by the invasive species Norway maple (*Acer platanoides*) (56 % of plots). Tree-of-heaven (*Ailanthus altissima*) regeneration is also present in two plots each in VAMA and the Roosevelt Farm and Forest unit. Continued management of tree-of-heaven and Norway maple is important to encourage healthy native regeneration. The regeneration layer in most forest plots is dominated by native species of maples (*Acer* spp.). Oak (*Quercus* spp.) regeneration is also fairly common in the Roosevelt Farm and Forest unit, and at ELRO. Areas with higher deer browse impacts (e.g., VAMA plot 27) tend to have more beech (*Fagus grandifolia*) and/or ash (*Fraxinus* spp.) seedlings than maples, which is less ideal given the presence of emerald ash borer and beech bark disease in the park.

Invasive Plant % Cover by Cycle

While invasive plants are present in all but four plots that are located in the Roosevelt Farm and Forest unit (80% of plots), they do not appear to be increasing since monitoring began in 2007. Invasive cover is highest in sections of VAMA and HOFR, with Japanese stiltgrass (*Microstegium vimineum*), garlic mustard (*Alliaria petiolata*), and Japanese barberry (*Berberis thunbergii*), Norway maple and tree-of-heaven as the most abundant invasive species in ROVA forest plots.

Forest Pest Detections

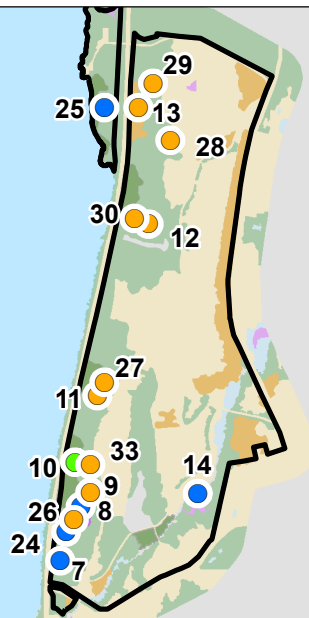
Emerald Ash Borer (EAB), Hemlock Woolly Adelgid (HWA), Elongate Hemlock Scale (EHS), and Beech Bark Disease (BBD) were detected in at least one plot during the most recent survey cycle (2015 & 2017). EAB has only been detected in forest plot 22, but this is primarily because ash is infrequent in ROVA and few forest plots have ash. The ash on plot 22 had heavy woodpecker damage, including a blonding appearance from woodpecker bark removal, and D-shaped holes in the bole. Similar damage from EAB can be seen for most of the ash trees encountered throughout the park. Despite detecting HWA and EHS in all of the plots where hemlock (*Tsuga canadensis*) is still present (14 out of 40 plots), impacts from these pests remain minor to moderate for 12 (67%) of these plots. Moderate BBD impacts were observed in 7 out of 8 plots with beech, including detection of the BBD scale and minor nectria cankers present on the bole.

Summary

Impacts from deer overabundance, including reduced tree regeneration and understory diversity, are widespread throughout ROVA sites, and are most severe in HOFR and sections of VAMA. Deer management may be necessary to ensure sufficient regeneration and maintain understory native diversity. While invasive plant species are present in the majority of forest plots, they do not appear to be increasing in abundance since monitoring began in 2007. Managing deer densities where impacts are most severe (e.g. HOFR, parts of VAMA) will help ensure invasives remain at relatively low levels, as deer tend to facilitate expansion of invasive species by preferentially browsing native species.



Vanderbilt Mansion NHS



Index of Deer Browse Impacts: Cycle 3

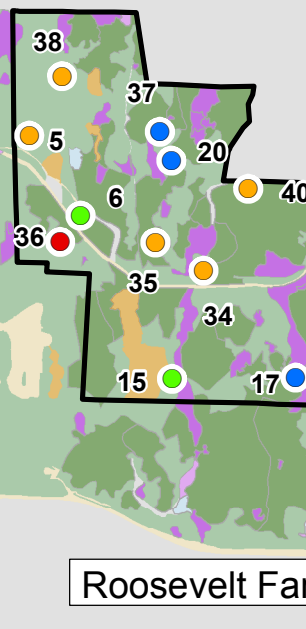
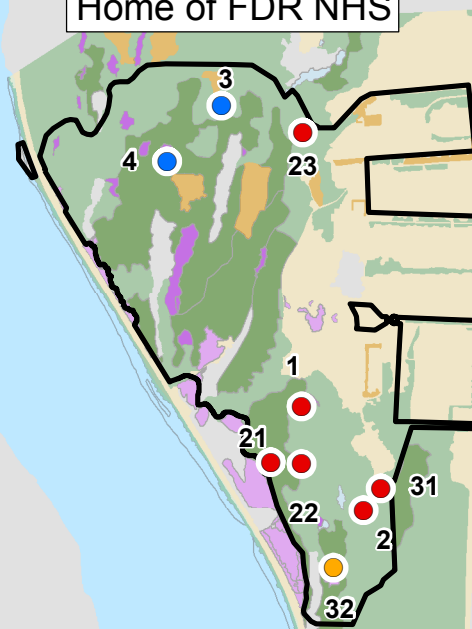
Index of deer browse impacts observed in forest plots in the most recent survey cycle (Cycle 3= 2015 & 2017). Each plot is sampled on a 4-year cycle, with plots 1-20 sampled in 2015 and plots 21-40 sampled in 2017. Deer browse impacts are assessed on a scale of 1-5 and follow the methods described on page 3 of the Assessing Vegetation Impacts from Deer (AVID) protocol. Date: 6/12/2017.



Deer Browse Index

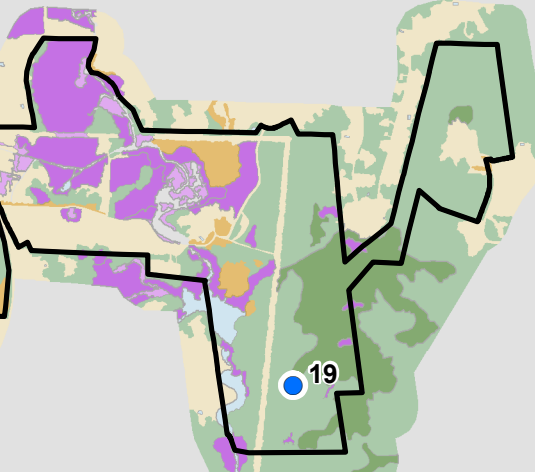
- 1) No Impact: found only in well-maintained deer exclosures.
- 2) Low Impact: deer preferred (DP) species abundant and of varying heights.
- 3) Medium impact: DP species present, but mostly under 30 cm tall. DP herbs present but stunted and flowering is uncommon.
- 4) High Impact: DP species are rare to absent. Non-preferred 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. Non-preferred species also reduced by heavy browsing. Distinct deer browse line.

Home of FDR NHS



0 0.25 0.5 1
Kilometers

Eleanor Roosevelt NHS

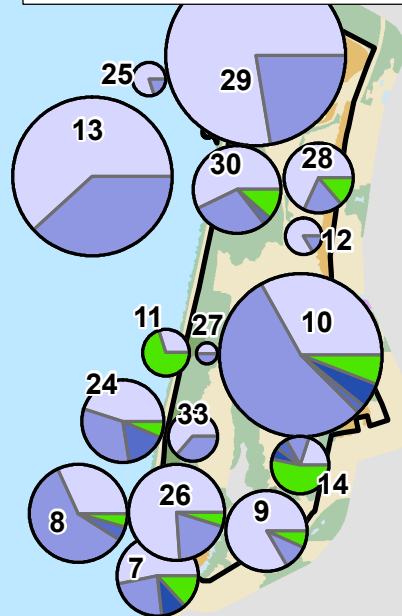


Roosevelt Farm & Forest





Vanderbilt Mansion NHS

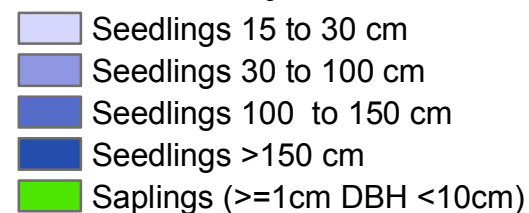


Regeneration by Size Class

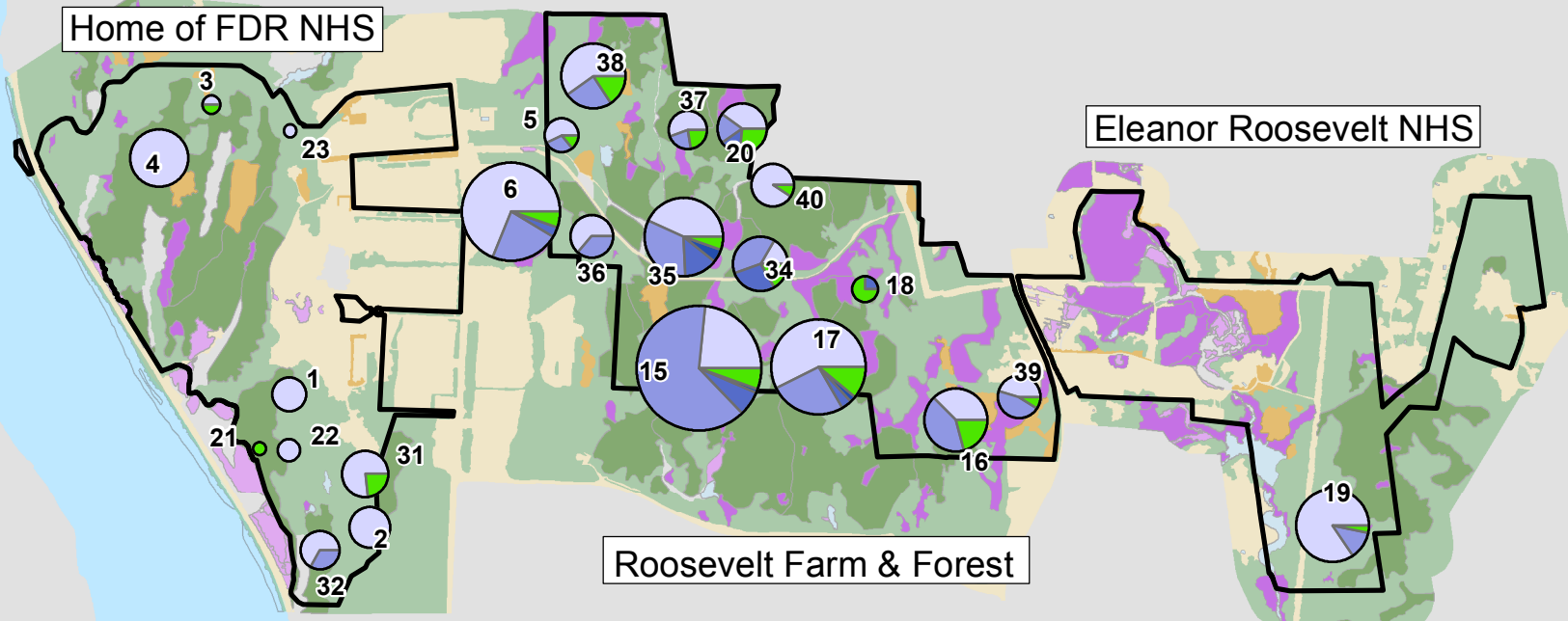
Trends in tree regeneration stem densities by size class observed in forest plots in the most recent survey cycle (2015 & 2017). Each plot is sampled on a 4-year cycle, with plots 1-20 sampled in 2015 and plots 21-40 sampled in 2017. Pie size is proportional to the total plot-level regeneration (range 0 to >30,000 stems/ha in a size class). Pies may be shifted from actual location to prevent overlap. Date: 6/12/2017.



Stem Densities by Size Class



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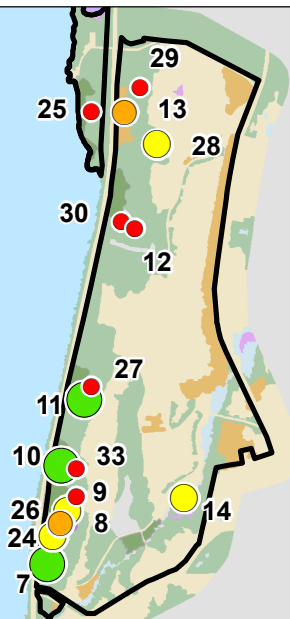


Eleanor Roosevelt NHS

Roosevelt Farm & Forest



Vanderbilt Mansion NHS



Regeneration Stocking Index

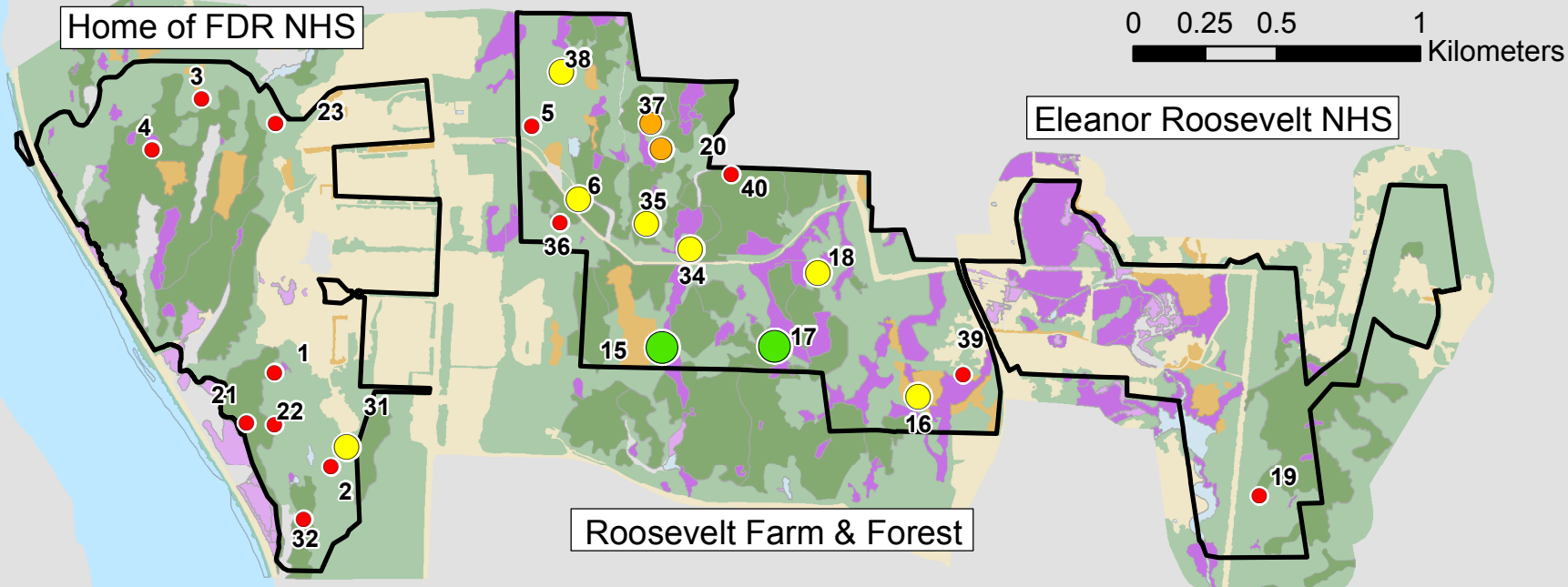
Trends in the regeneration stocking index for the most recent survey cycle (2015 & 2017). The stocking index quantifies whether current regeneration densities are sufficient to restock a forest canopy. The index is a weighted sum of seedling and sapling densities where larger seedling size classes get higher weights. The stocking index is averaged over three 2-m microplots per forest plot (range 0.3 to 180.3). Date: 6/12/2017.



Stocking Index Ranges

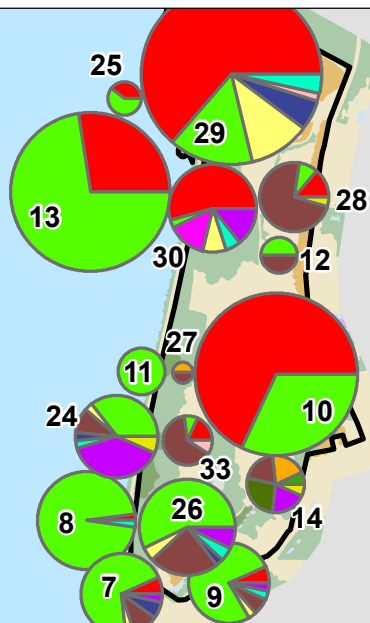
- < 25 : Severely understocked. Regeneration is insufficient to replace the forest canopy.
- 25 to 50: Moderately stocked regeneration for areas with low deer impacts.
- 50 to 100: Sufficient regeneration to replace forest canopy in areas with low deer impacts.
- > 100: Sufficiently stocked with regeneration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

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Vanderbilt Mansion NHS

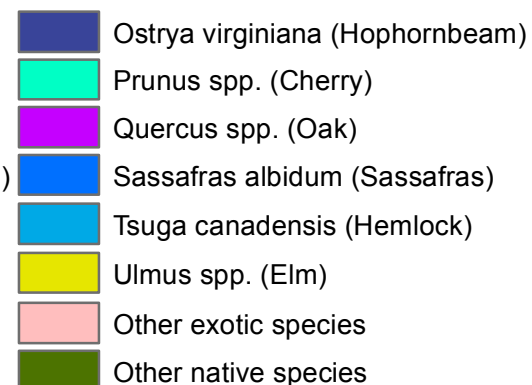
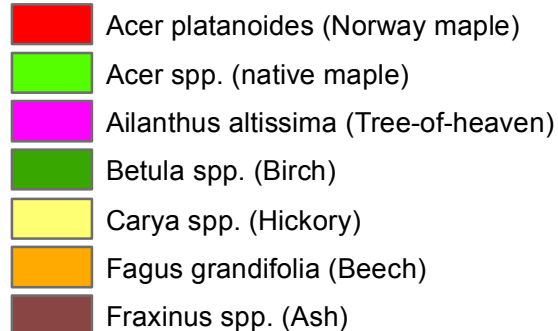


Regeneration Composition

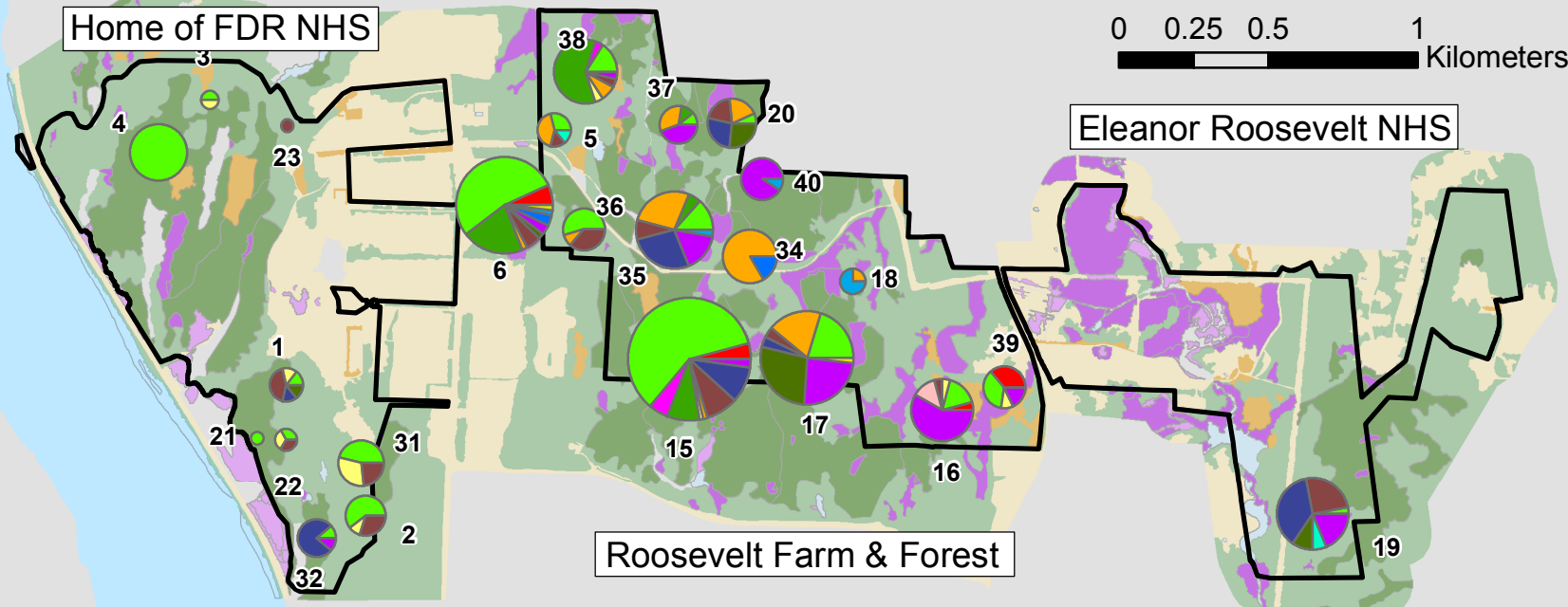
Trends in tree regeneration, including seedlings and saplings, by species group observed in forest plots in the most recent survey cycle (2015 & 2017). Each plot is sampled on a 4-year cycle, with plots 1-20 sampled in 2015 and plots 21-40 sampled in 2017. Pie size is proportional to the total plot-level regeneration (range 0 to over 24,600 stems/ha for a species). Pies may be shifted from actual location to prevent overlap. Date: 6/12/2017.



Species in Pie Charts



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Kilometers

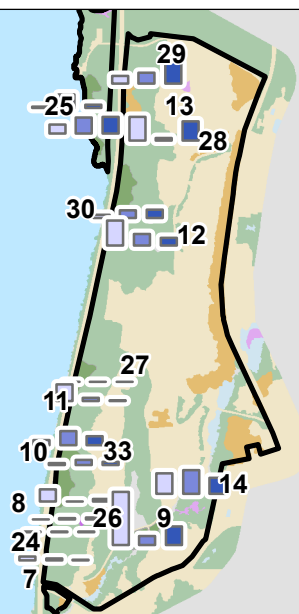
Eleanor Roosevelt NHS

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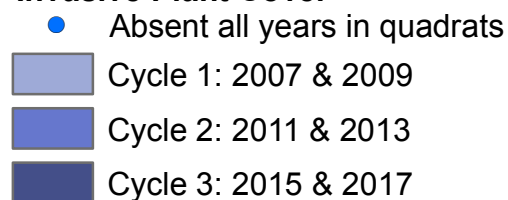


Invasive Plant % Cover by Cycle

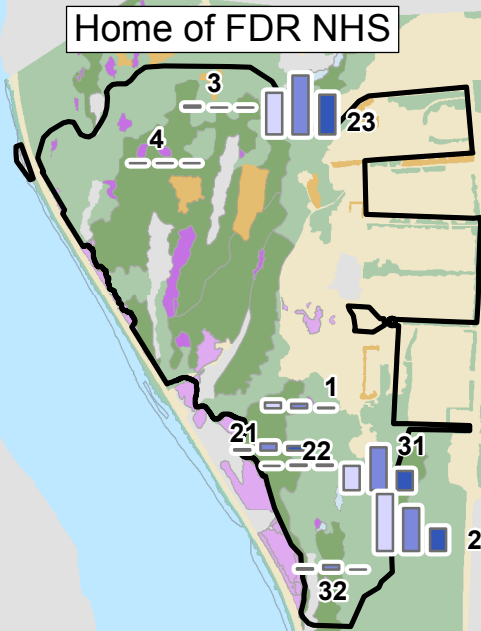
Trends in percent cover of invasive plant species observed in quadrats for plots sampled from 2007-2017. Each plot is sampled on a 4-year cycle in an alternating panel, with plots 1-20 sampled in 2007, 2011, and 2015, and plots 21-40 sampled in 2009, 2013, and 2017. Average invasive plant cover ranges from 0 to 27%. Bar chart locations may be shifted from actual location to avoid overlap. Date: 6/12/2017.



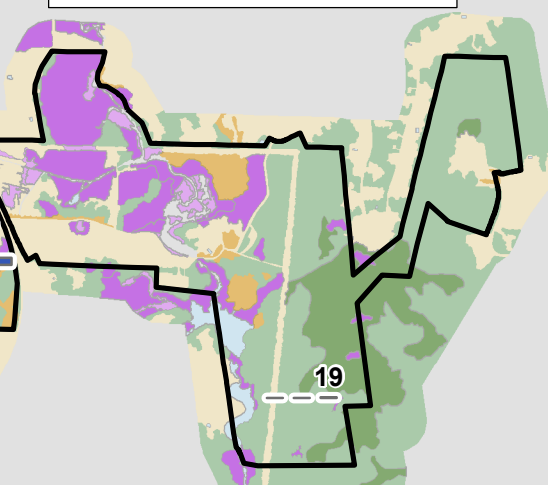
Invasive Plant Cover



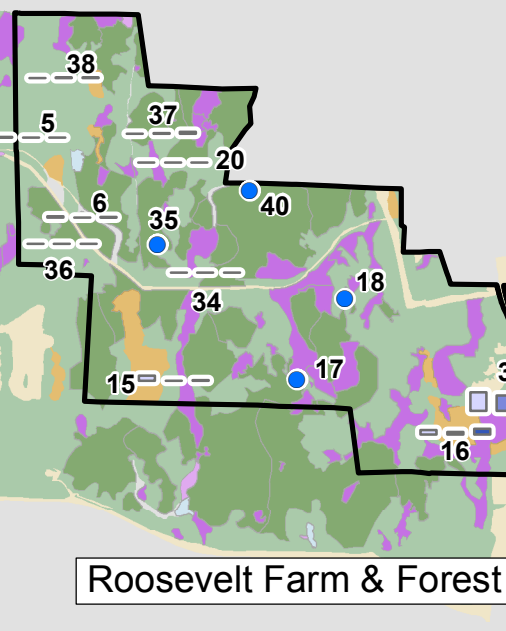
Home of FDR NHS



Eleanor Roosevelt NHS

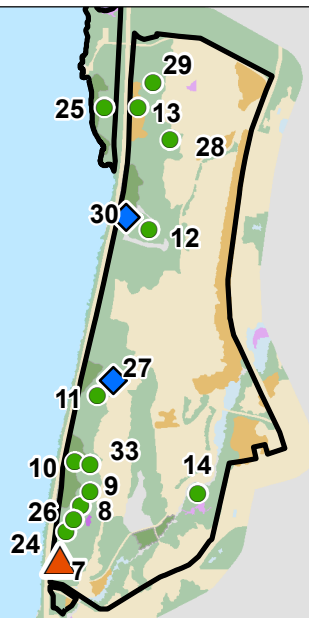


Roosevelt Farm & Forest





Vanderbilt Mansion NHS



Forest Pest Detections: Cycle 3

Detections of priority forest pests in forest plots sampled during the most recent survey cycle (2015 & 2017). Each plot is sampled on a 4-year cycle, with plots 1-20 sampled in 2015 and plots 21-40 sampled in 2017. Plots with multiple pests present (e.g. 3, 18, 34, etc.) have multiple symbols. BBD and HWA are assessed using an index of damage. EAB is recorded as presence/absence. Date: 6/12/2017.



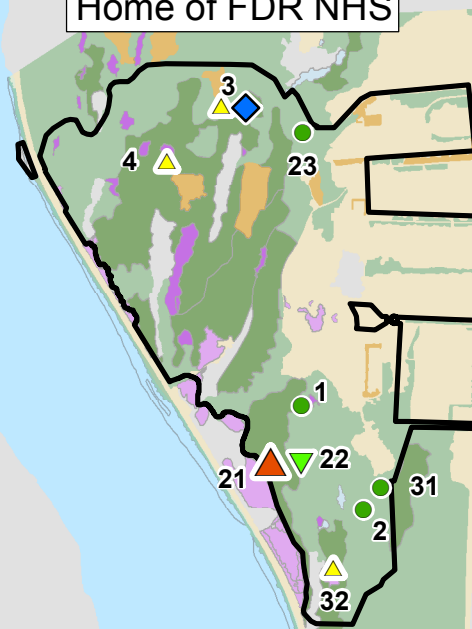
Legend

- No priority pest detections
- ▼ Emerald Ash Borer detected
- ◆ Beech Bark Disease: Moderate Impacts

Hemlock Woolly Adelgid Impacts

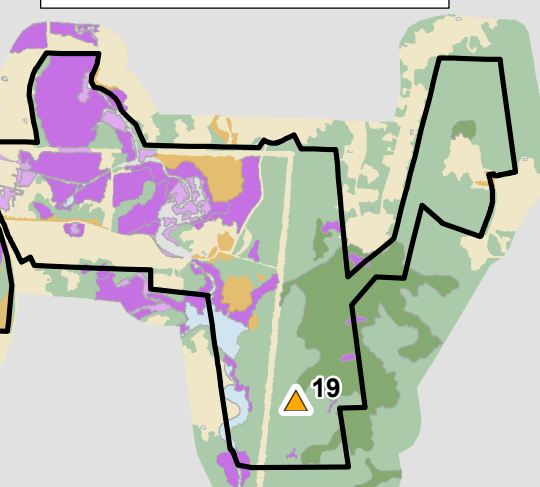
- ▲ Minor: <10% of foliage affected by chlorosis, necrosis or needle loss.
- ▲ Moderate: 10-25% of foliage affected by chlorosis, necrosis or needle loss.
- ▲ Severe: >25% of foliage affected by chlorosis, necrosis or needle loss.

Home of FDR NHS



0 0.25 0.5 1
Kilometers

Eleanor Roosevelt NHS



Roosevelt Farm & Forest

