Select Species of Concern, but an Overall Healthy Northeastern Forest after the 2023 Forest Health Monitoring Season

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Through long-term forest health monitoring in seven (7) northeastern states, the Forest Health Monitoring (FHM) program has observed and analyzed relatively stable health conditions throughout the northeastern forest. However, due to specific damages and diseases, certain species should be continued to be closely monitored and managed, such as American beech and white ash.

Introduction

The FHM program of the FEMC has previously conducted long-term monitoring assessments of forest health throughout Vermont since 1990. As of 2023, the FEMC has established 194 total plots throughout Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont (Fig. 4). These new sites were primarily co-located at established, long-term forest health monitoring plot locations through the Continuous Forestry Inventory (CFI) and the United States Forest Service (USFS) Forest Inventory and Analysis (FIA) surveys, representing the major forest types and geographies on public lands.

During the 2023 field season, the FEMC FHM crews assessed seedling regeneration, sapling survivorship, and overstory health. Forest health metrics included tree heights, tree diameter at breast height (DBH), vigor, dieback, transparency, defoliation, and discoloration of the forest canopy. Lastly, crews documented special damages for each tree, along with invasive species presence and the degree of browse pressure observed within each plot.

Our primary analyses were focused on several different metrics: a temporal comparison of mean seedling density for each tree species (Fig. 2), comparing the FIA and the FEMC tree inventory of 2023 (Fig. 3), the average percent of vigor for each overstory tree species (Fig. 5), and the average dieback for each tree species, categorized by state (Fig. 6).

Plot Layout

Figure 1. Our nested (CFI-style) (left) and clustered (FIA-style) (right) FHM plots are shown. Our FHM program adopted these to accommodate plot layouts from each state's historical FHM efforts. The nested plots contain an overstory plot (large circle) and four regeneration microplots (small circles at cardinal directions), while the clustered plots contain four subplots and four regeneration microplots, based upon the USFS FIA style plot network.
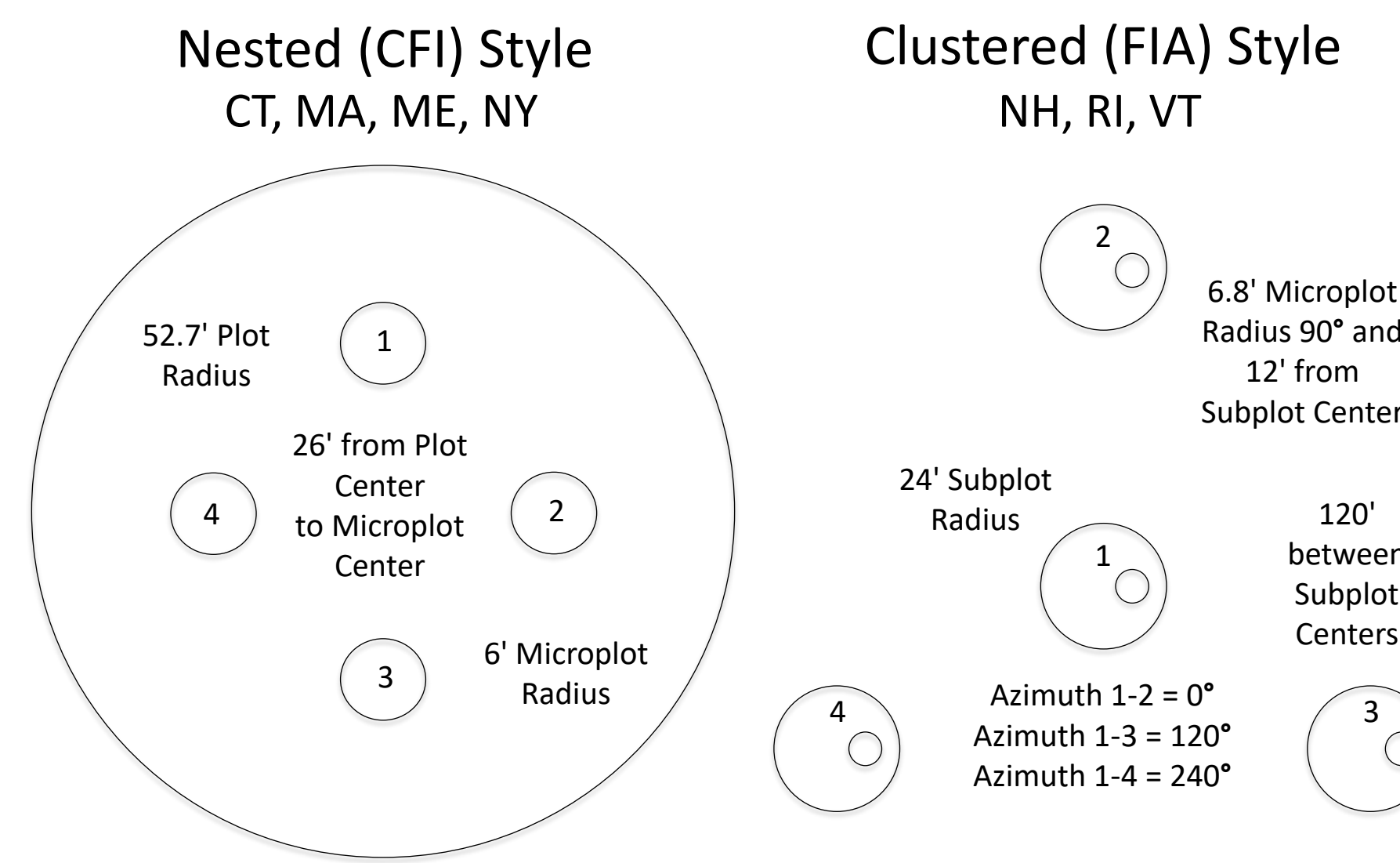
Results

Starting with the forest floor, the FHM recorded relatively similar numbers of total seedlings of each species compared to previous years, particularly between the years 2022 and 2023 (Fig. 2). Large discrepancies between these years could be due to masting (e.g., red maple in 2023). Red maple was the most abundant seedling (35%), with balsam fir and sugar maple following after (15% and 14%, respectively). Continuing upward in the canopy, 1,094 total saplings were observed, with balsam fir and American beech representing the most abundant species.

Out of the 6,348 trees that we recorded (≥5 inch DBH), most species were similar in composition between the FHM and FIA programs except balsam fir, sugar maple, and American beech (Fig. 3). Vigor ratings for most tree species appear to be relatively similar in proportion, illustrating stable and healthy forests (Fig. 5). Lastly, dieback varied across the FHM region, with American beech and white ash having the largest averages and sweet birch having one of the lowest averages across states (Fig. 6).

Out of all diseases and damages recorded, beech bark disease was the most common (observed in 35% of plots with 74% of American beech showing symptoms), followed by emerald ash borer and hemlock wooly adelgid. Additionally, browse was most common in red maple (17.4 ft²/acre) and sugar maple (17.2 ft²/acre).
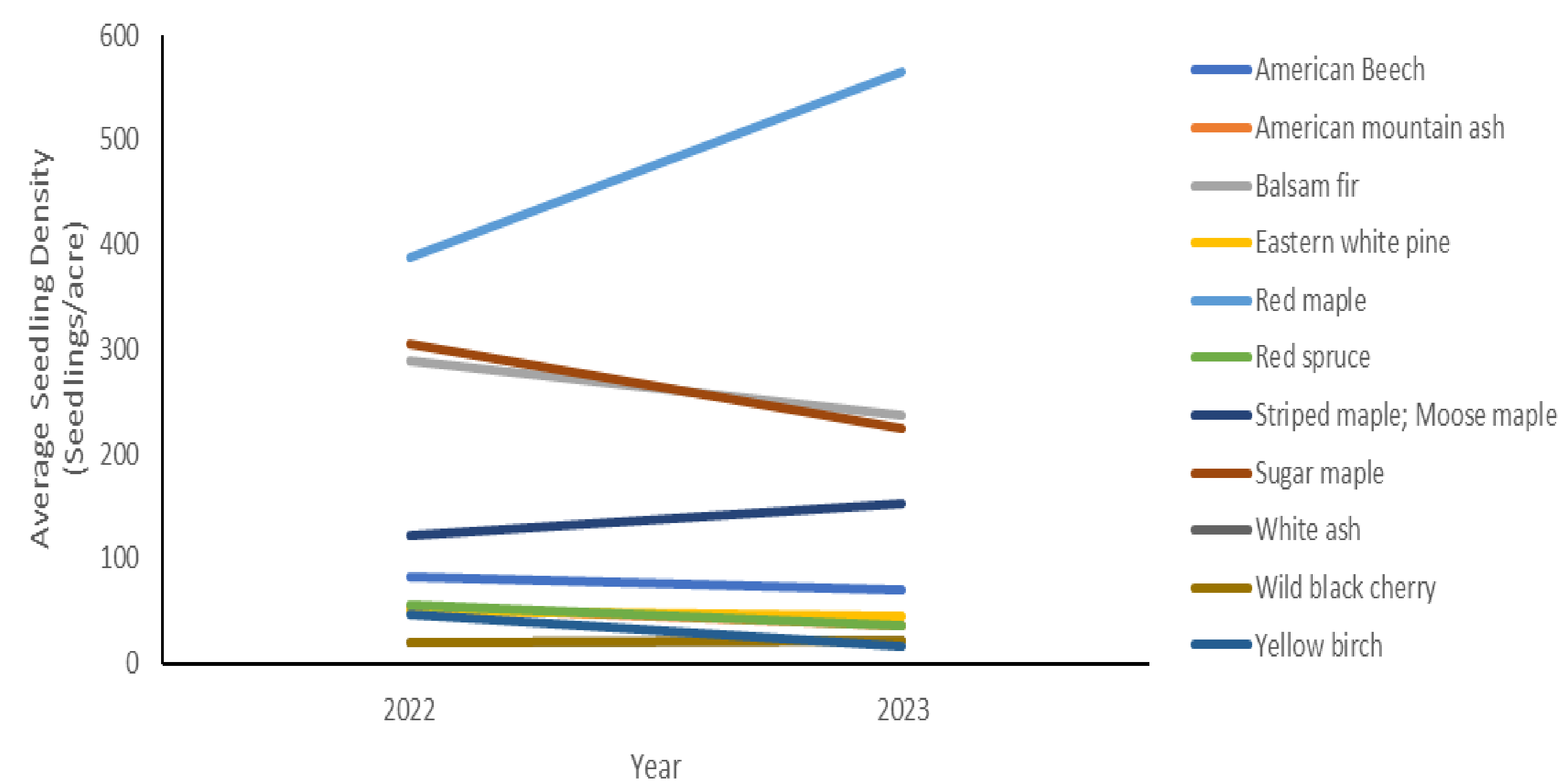

Figure 2. A temporal analysis of the mean seedling density (counts per acre) for each species between 2022 and 2023. Tree species with relatively high importance (abundance) values were included. Masting could also be the cause of large seedling discrepancies.
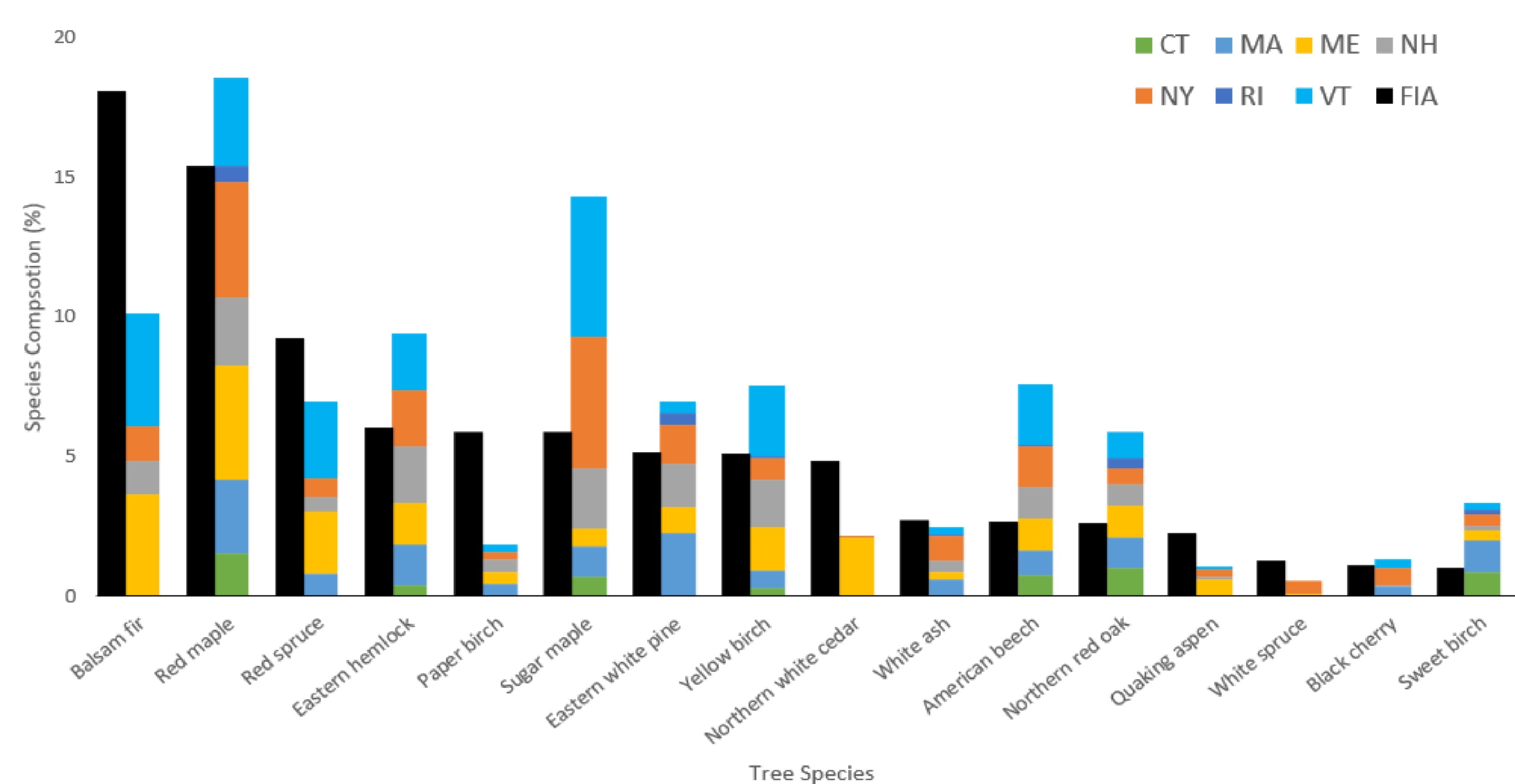

Figure 3. A comparative analysis between the FEMC FHM and the USFS FIA species compositions. Percent live species composition for CT, MA, ME, NH, NY, RI, and VT from both the FHM 2023 season and the FIA 2020 season were included (only trees with ≥5 inch DBH were included; USFS 2020).
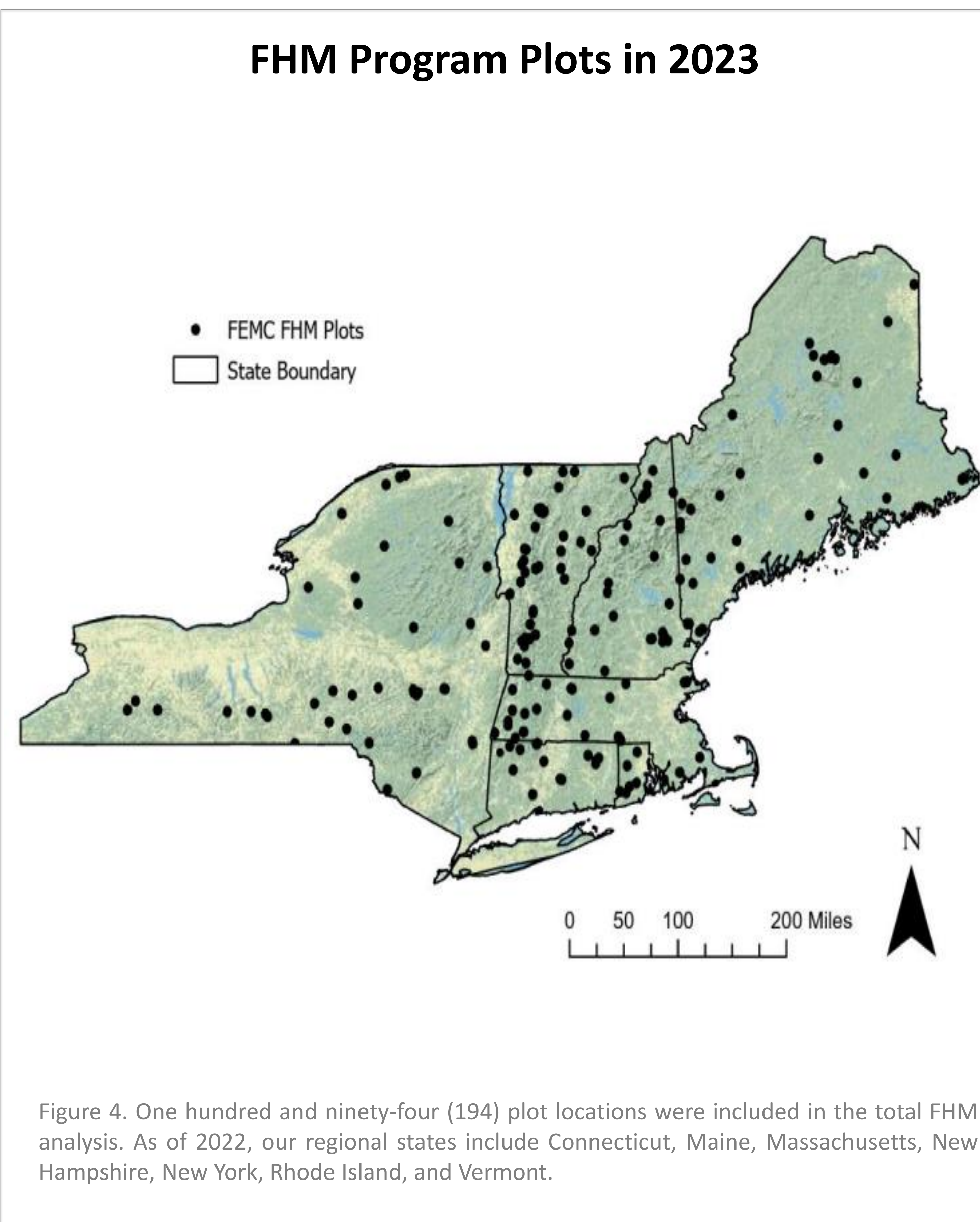
FHM Program Plots in 2023

Figure 4. One hundred and ninety-four (194) plot locations were included in the total FHM analysis. As of 2022, our regional states include Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont.
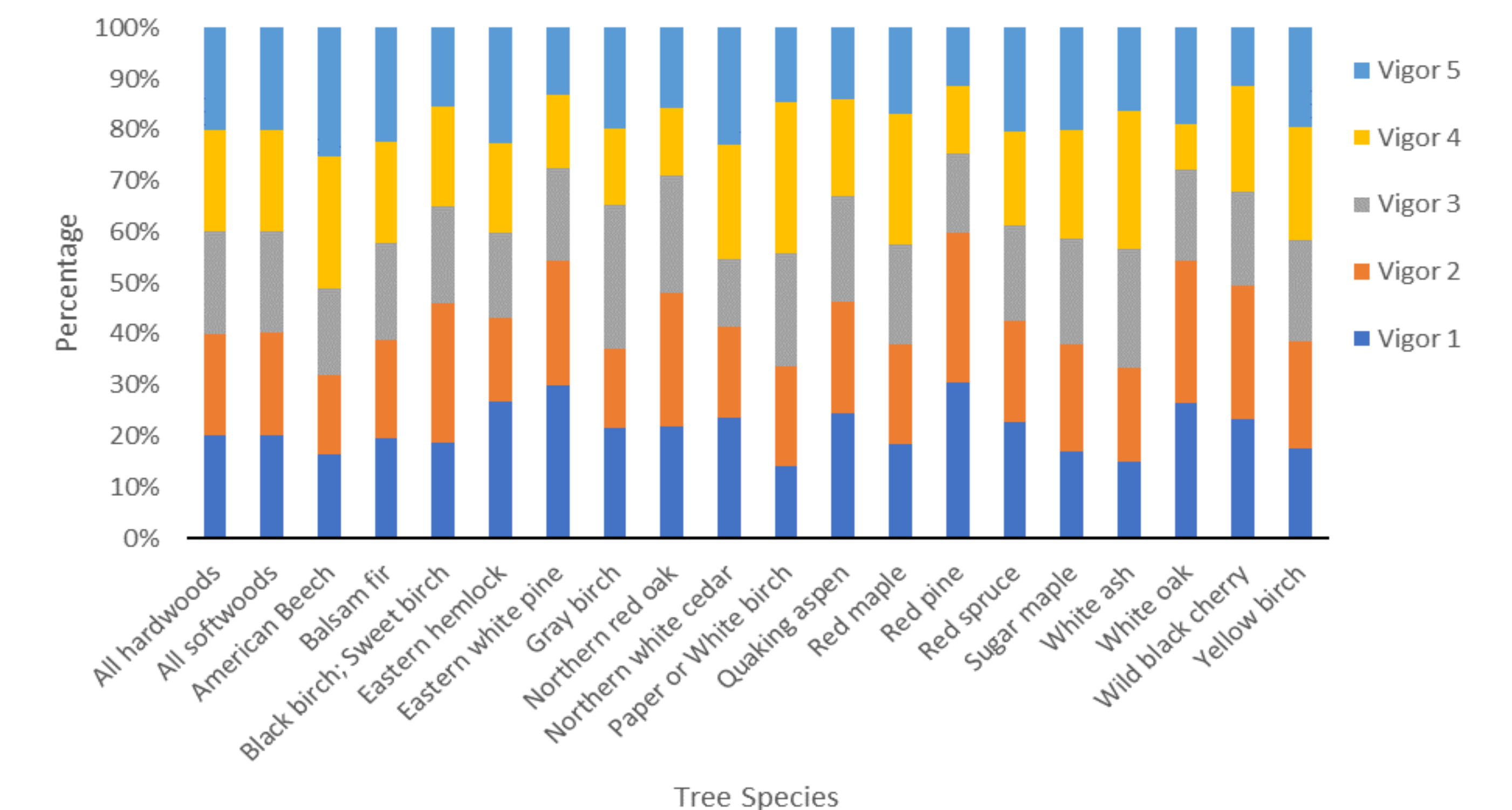

Figure 5. Average basal area per hectare (%) of each vigor (1 is healthiest, 2-4 is increasing decline, 5 is dead and standing) for each overstory tree species. Tree species with relatively high importance (abundance) values were included and only standing trees were included.
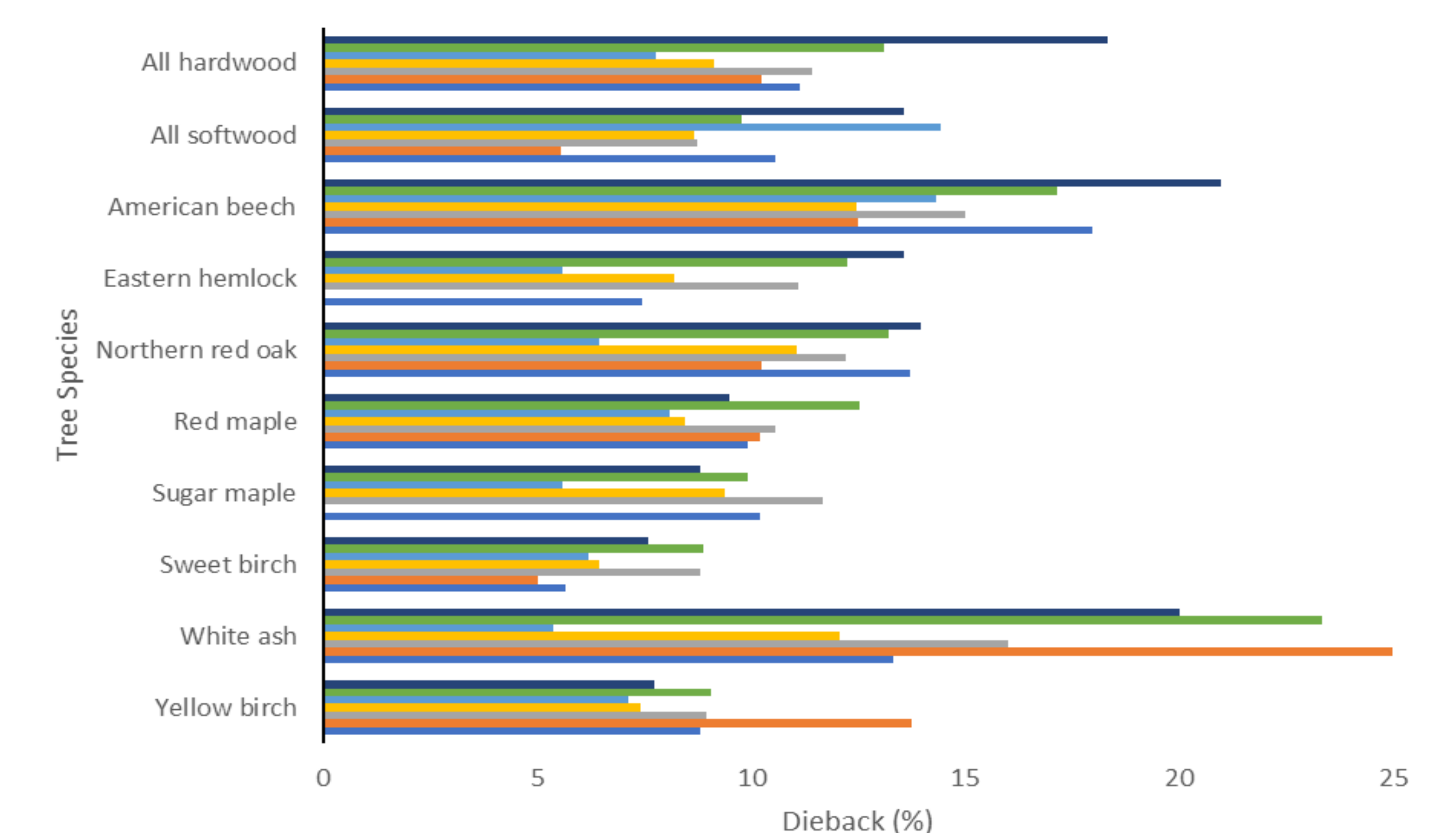

Figure 6. A comparison of average crown dieback (%) per species across seven (7) regional states. Crown dieback is identified as the percent of fine twig dieback and is rated from 0-100% (0% indicating no fine twig dieback, 100% indicating complete fine twig dieback). Tree species with relatively high importance (abundance) values were included.