

Yale Toumney Forest

A 120-year history of research and management

Yale-Toumey Forest 1913-2025

History and Background

Land Acquisition

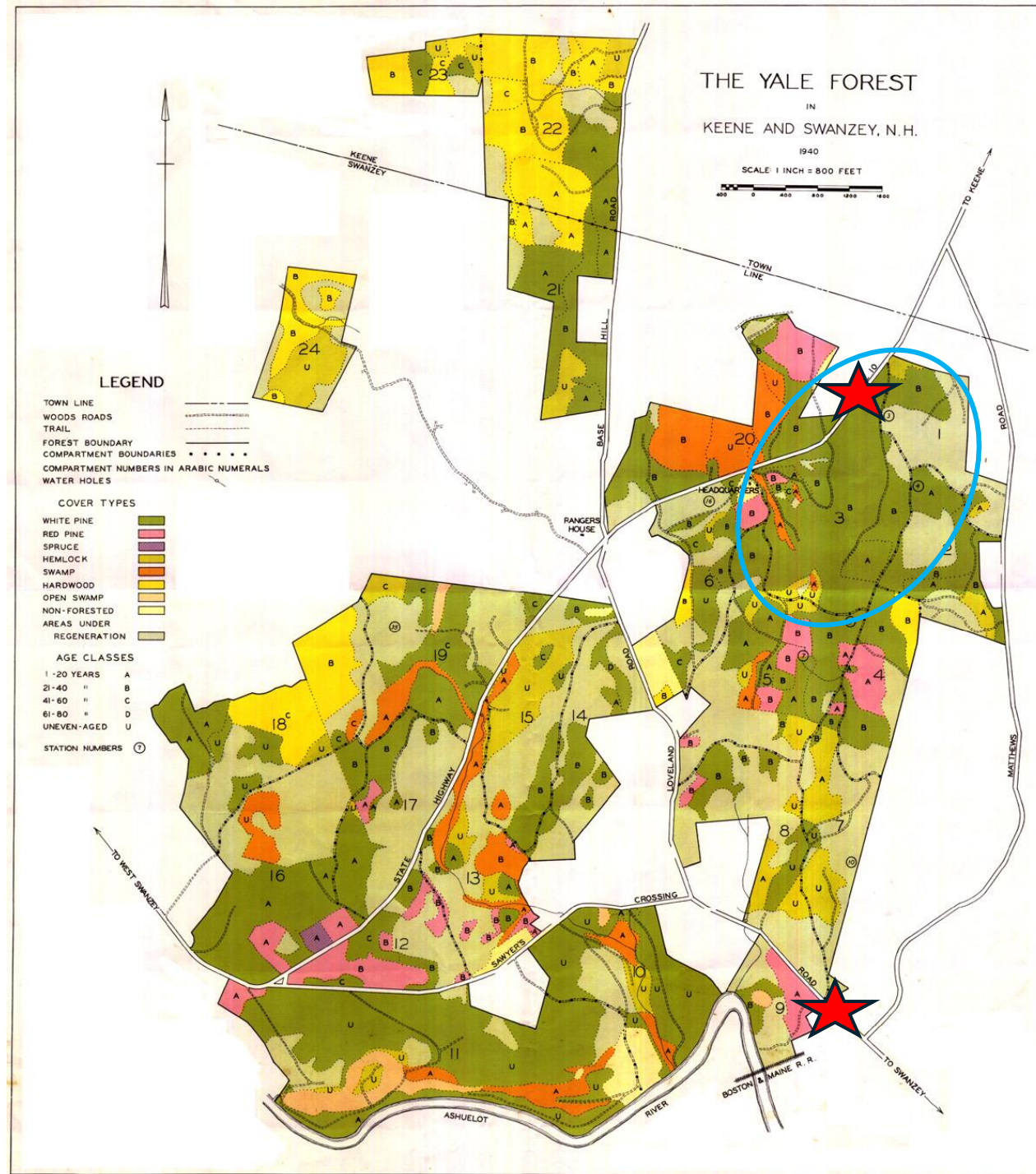
- 1900 - Keene, a town of 16,000 (now 22,500) - center of the white pine box business, a big container industry of that time.
- “Keene Forest” first assembled by George Hewitt Myers in 1900s. Gifted 624 acres to Yale in 1913 - switched to acquiring land elsewhere because of excessively high prices (\$ 667 per acre [\$37.57 in 1913 dollars]).
- Toumey embarked on purchasing 1000 more acres of land from 1915-1929 all pre-merchantable old farmland going back to grey birch.
- Only 60 acres of the original land showed no evidence of complete deforestation – these now have mostly hemlock-hardwood

Yale-Toumey Forest Keene and Swanzey, New Hampshire -1940 map



www.sitesatlas.com

Acres today: 1930 ac.
 Elevation: 140-320m
 Precipitation: 1206mm/yr
 Average temp: 8°C
 Soils: Till upland to west Rt 10
 and outwash to east



Management Goals

- ❖ Goal - Demonstrate sustainable forest management.
- ❖ Yale University has never carried the forest on its budget; cost the university nothing to operate it under sustained yield
- ❖ The Yale Forests were originally managed as fully taxed private land and derived income solely from the forest itself.
- ❖ A story of restoration and demonstration of successful forest management – 150 years of records
- ❖ Today there is endowment to supplement timber income
- ❖ Today's goals – managing for resilience – all-aged – all species – all structured – “life is a box of chocolates”

Early Management 1913-1938-Establishing Coniferous Forest on Old Fields

- 1913-1930 - property transitioned from pastureland to forest - focus on pine management - planting of 2-year white and red pine
- Systematic release cleanings undertaken on pine overtopped by hardwoods
- Gray birch was a fuel for wood stoves. People would come and cut hardwoods - paid \$4 - \$9 per cord stumpage (50¢ - \$1 in \$1920).
- After the death of Toumey (1932), Ralph Hawley, Prof. Silviculture and Robert Clapp, Forest Manager, focused on growing knot-free white pine
- Pine pruning and improvement cuttings on badly weevilled pine. High pruning was done using a ladder and hand-saw by single forest worker
- By 1938 the forest had been transformed into one of the largest continuous areas of pine in New England

James W. Toumey – Succession and Vegetation Studies

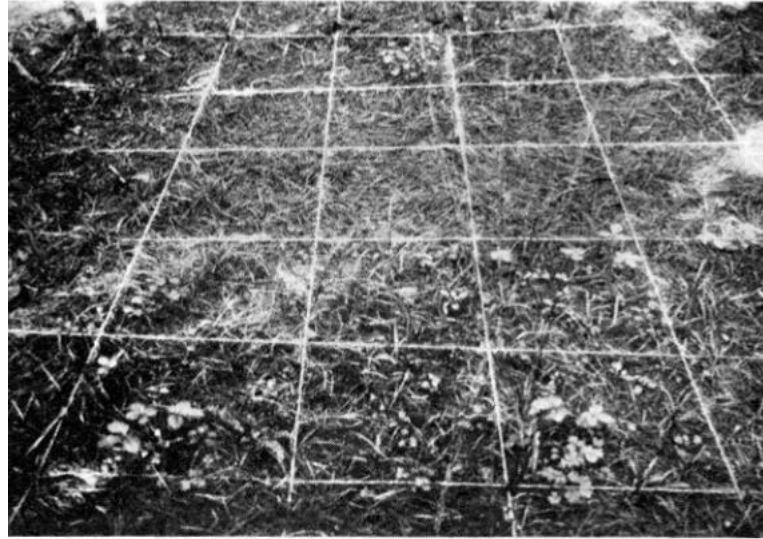


Fig. 23. Quadrat No. 70. View taken of the trenched quadrat two years after the initial trenching, showing the half with the litter removed in the foreground and the half with the litter intact in the background. Note the abundant vegetation on the half in the foreground,



Fig. 22. Quadrat NO.5. A close-up view along the margin of the quadrat three years after the initial trenching, showing the contrast in the vegetation on the two sides of the trench.

- Seeding and Planting in the Practice of Forestry: A manual for the guidance of forestry students, foresters, nurserymen, forest owners, and farmers. 1916. J.W. Wiley & Sons
- **Foundations of Silviculture Upon an Ecological Basis. 1928. J.W. Wiley & Sons**
- Trenched plots under forest canopies. 1931. The Yale Forest School Bulletin



The Early Years – White Pine Silviculture

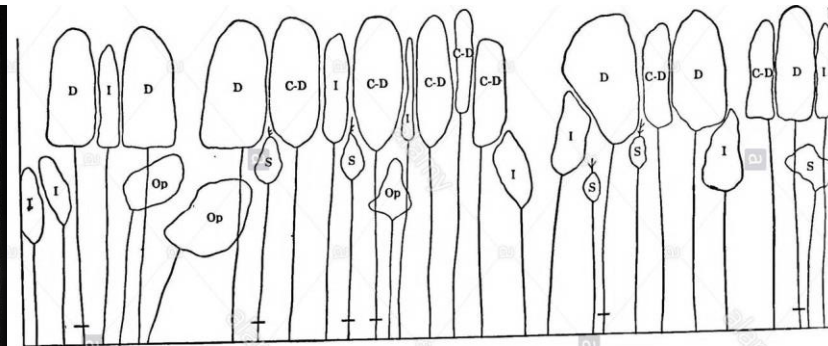
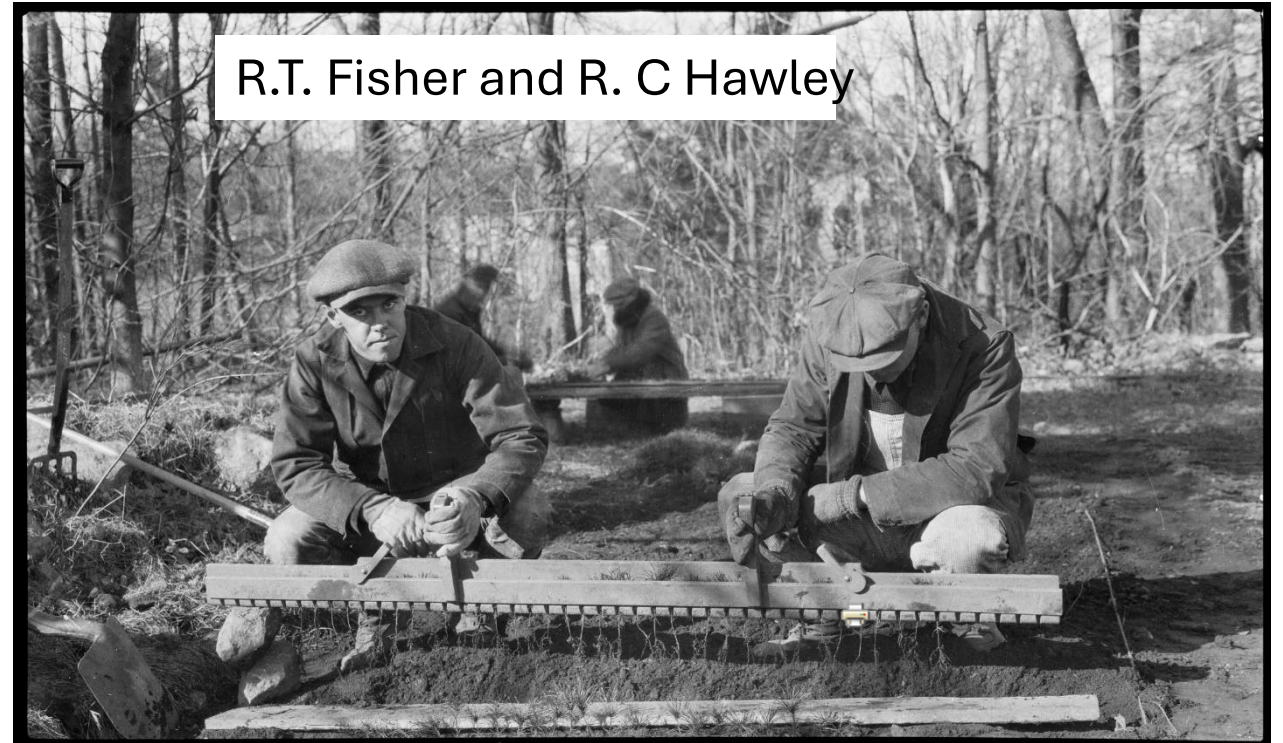
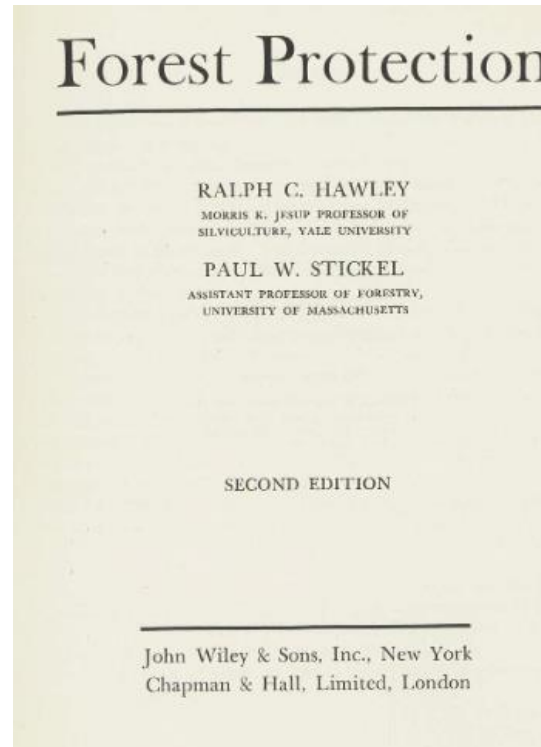
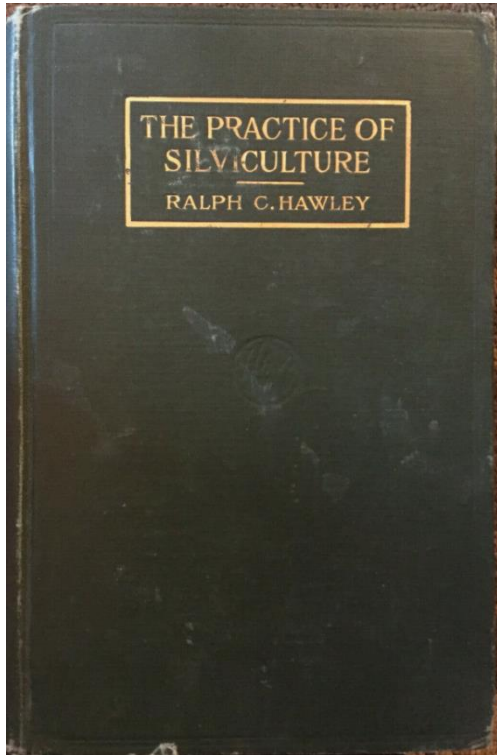
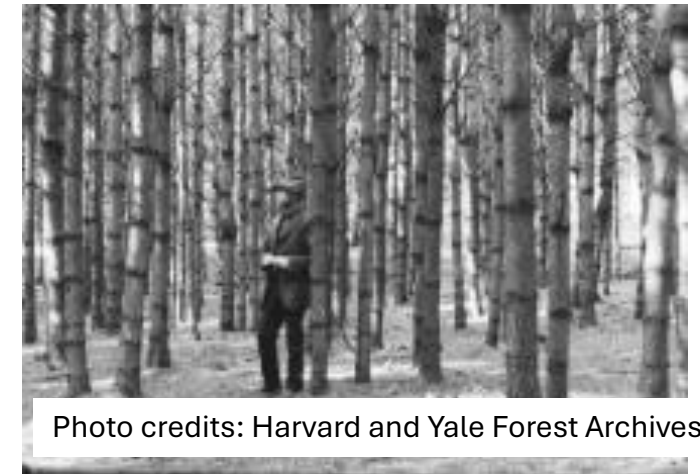


FIG. 73.

The same stand as in Figs. 71 and 72, but 10 years after the Borggreve thinning. Due to the taking out of dominant trees in the thinning certain trees have advanced from a lower to a higher crown class during the last 10 years. The stand is marked for a second Borggreve thinning, the trees to come out being indicated by dashes. The evenaged form of the stand is maintained and at the end of the rotation the area will be cut clear.





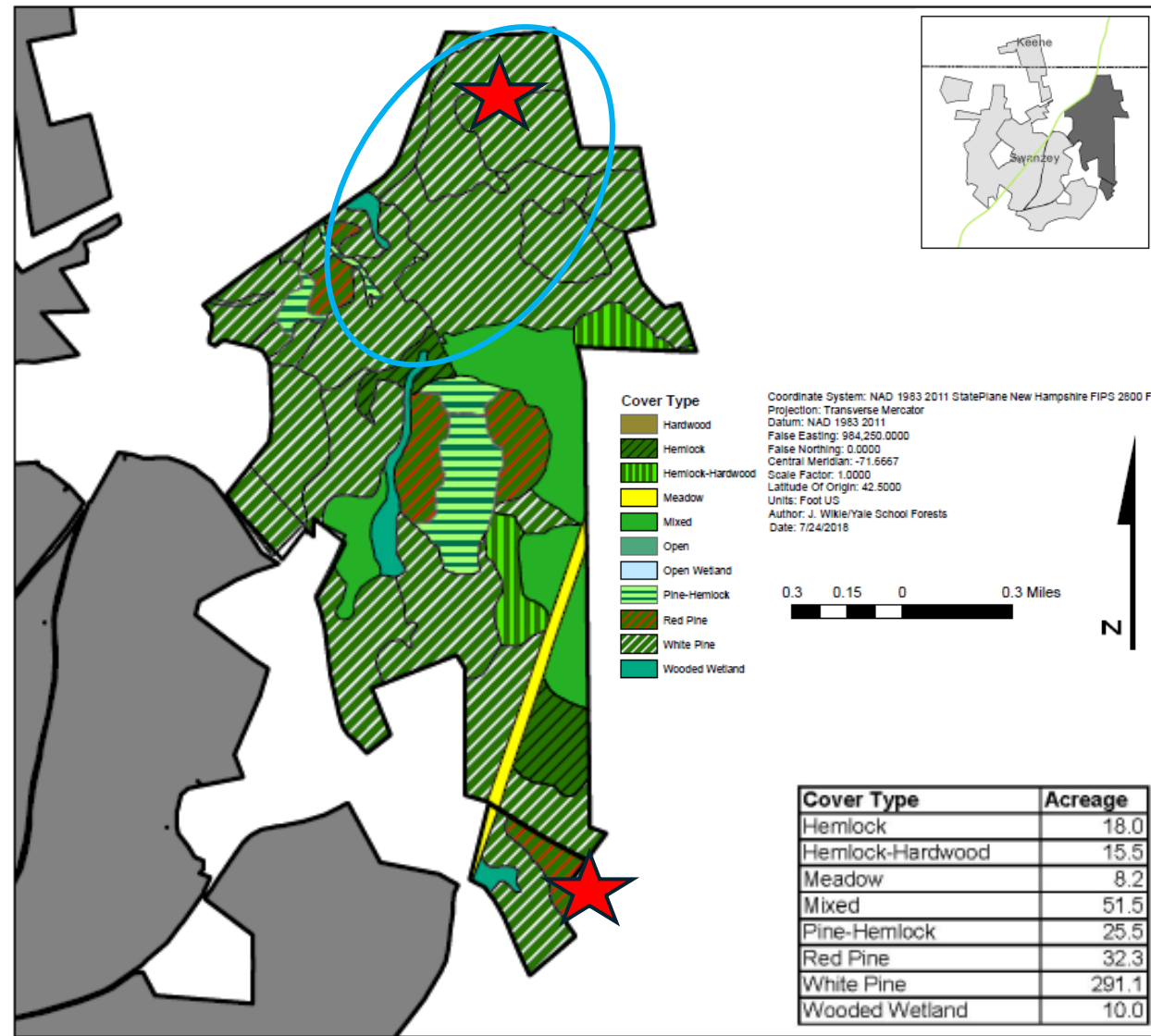
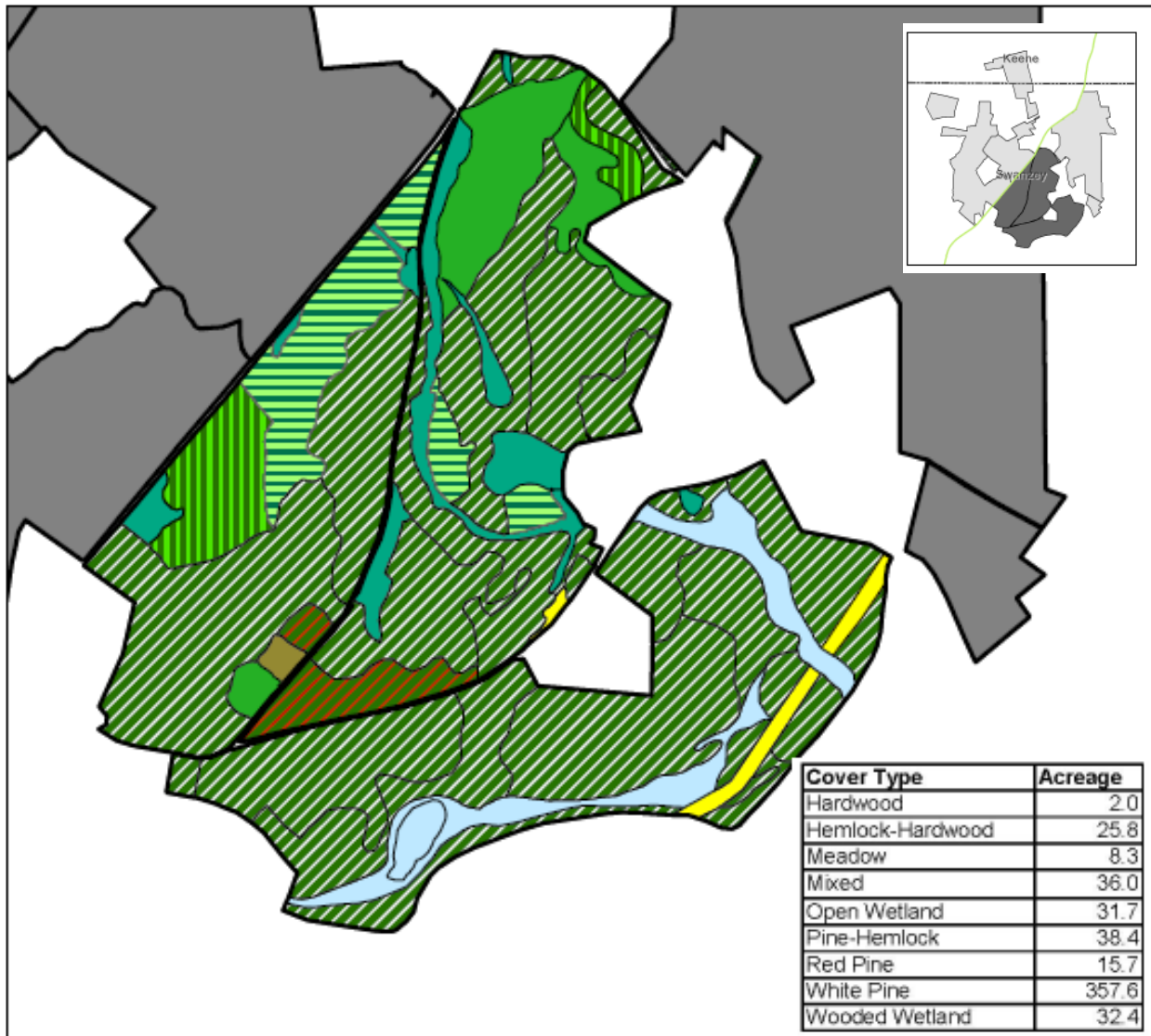
Yale Toumey Forest

Ashuelot River Division - 548 Acres



Yale Toumey Forest

Swanzey Division - 452 Acres



Management in the Middle Years 1938-1980 – Starting Again and Working with Mixed Conifer Dynamics of Late Stem Exclusion

- The forest was looking good - The hurricane of 1938 blew down many of the older commercially valuable pine stands all scheduled for crown thinning. The salvage operation was break even.
- Subsequent years – release of young pine regeneration from advanced regeneration of hardwoods in blow-down areas (used a curved-handled blade - billhook). Resprouting was vigorous requiring two cleanings.
- Late 1940's Harold Lutz and David Smith, then the Professor of Silviculture, started marking older stands as crown thinnings.
- CFI plots were established in 1957 - monitored at 10-y intervals.
- In the 1960's and 70's pine released or planted in the '38 hurricane blowdown areas pruned and pre-commercially thinned using hack-and-squirt herbicide

Stand Dynamics of Second Growth Forests 1965-1990



David M. Smith

From Kimmins 2003

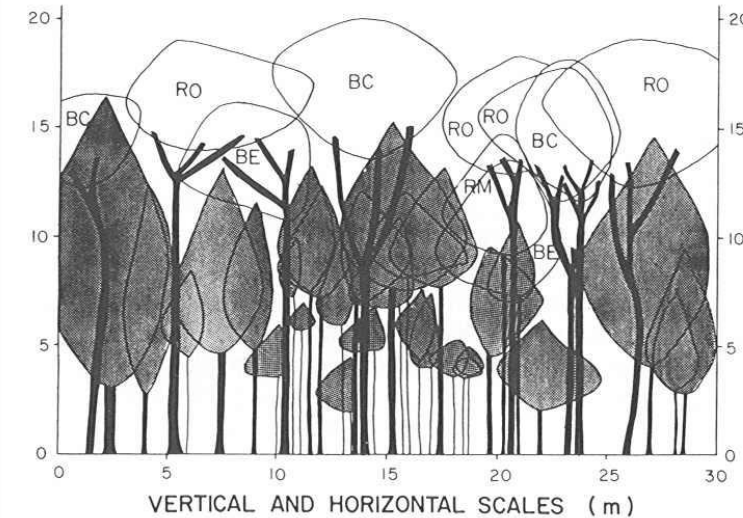
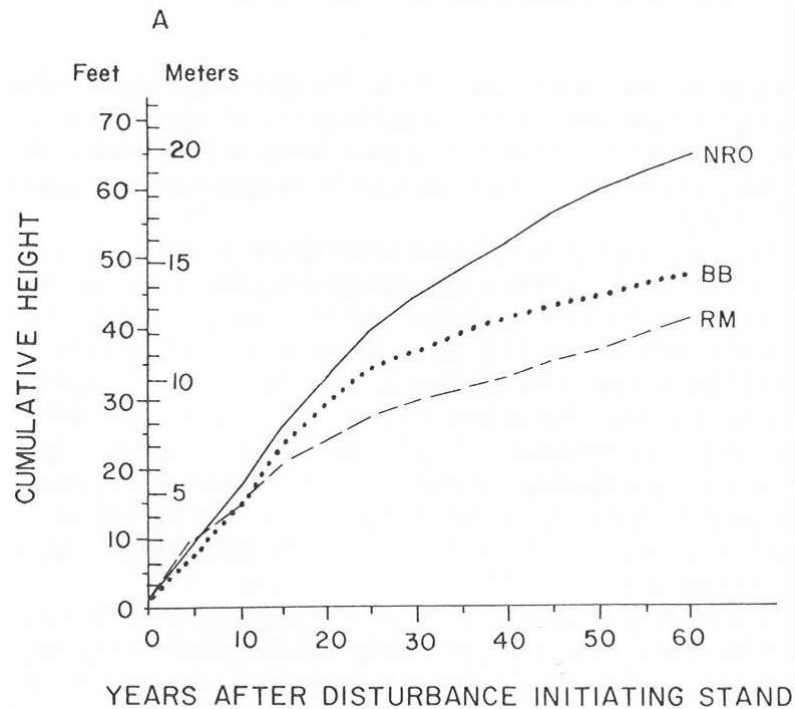
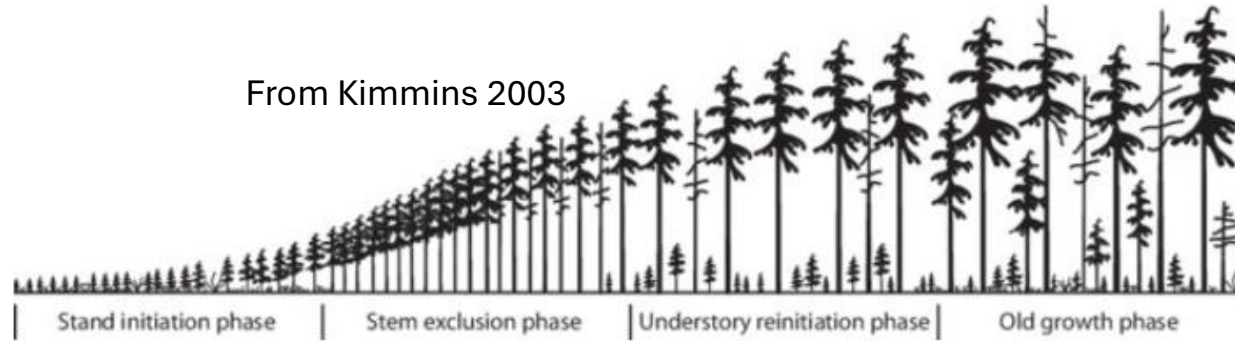


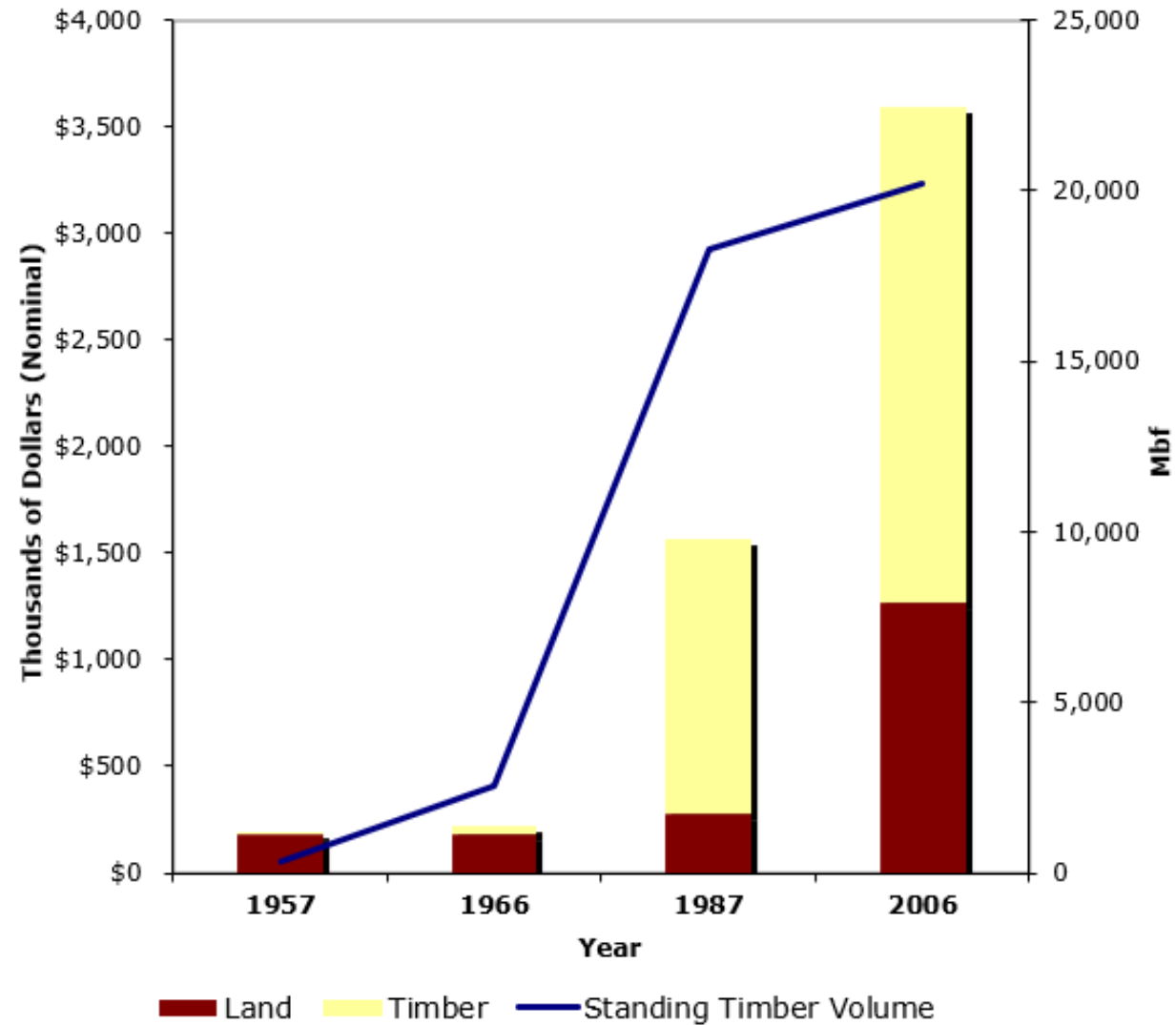
FIG. 3. Profile diagram of a 10 m x 30 m plot in the Great Mountain Forest stand. Tree height, stem diameter, crown dimensions, and position of major branches are drawn to scale, based directly upon measurement. Shaded crowns are hemlock. Hardwood species codes: RO, red oak; RM, red maple; BC, black cherry; BE, beech.



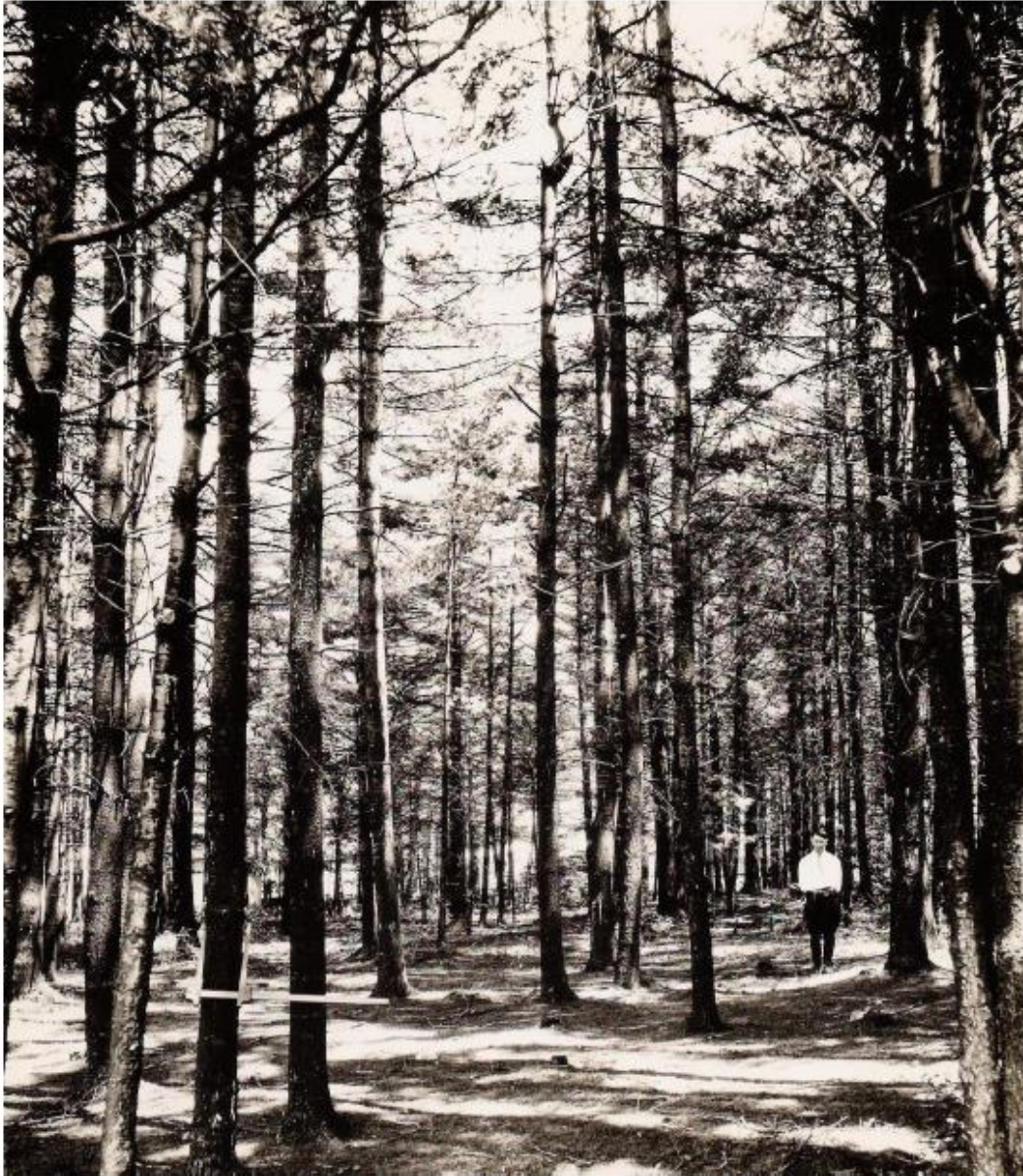
Management from 1980 to Present – Moving to All-Aged

- By 1976 Toumey's work creating a pine forest had come to fruition - almost 82% of the forest
- The original emphasis on pine was because no hardwood markets until the 1960's; and don't do well on outwash and very sandy glacial tills
- Since the collapse of the wooden bucket industry – 70's, commercial thinnings of small diameter conifers has been difficult. The only alternative is pulpwood – here an unpredictable market
- 1980-2000 continued application of crown thinning to maturing 60-80 y old stands released in 1940's; pruned/ TSI'd during the 1950-70's after established post 1938 Hurricane.
- Since 2000 focused on continuing an annual cut under volume and area regulation. Annual cut 250 mmbf y on 25 ac thinning and 10 ac regeneration. Standing volume in production 22 mmbf - 15 mmbf in pine
- Regeneration methods on pine stands - irregular seed tree and shelterwood and their hybrids. To convert to mixed hardwoods or to regenerate for pine.

Yale- Toumey Standing Volume and Value / Acre



Stop 1 – Stand 6 - Production



Stop 1; photo by Prof. James W. Toumey, 1930.

1. Agricultural land that had been allowed to grow up to old-field pine trees around 1880-1890
2. Thinning performed in 1916 removing 20-30% of volume
3. 1930 Toumey described it as pure white pine, 40-60 years old, and fully stocked.
4. Hurricane of 1938 leveled the stand
5. Pine planted with release cleaning with adv. oak in 1940 – followed by TSI and pruning 1960's. Crown thinning in 1985.
6. Today – 2005 - Pine irregular shelterwood with 75+ y single/group reserves of pine and oak – conversion to stratified mixed hardwoods – 2 aged. One entry Prep/Estab. – no Removal.

Stop 2 – Stand 7 - Production

2. A Tale of Two Pine Stands



Stop 2 (north); photo by Prof. James W. Toumey, 1916

1. Acquired as cut over old-field white pine in 1916.
2. Natural regeneration gray birch/red maple was enriched with white pine in 1923 - 700-1000 TPA
3. Precommercial release treatment (cleaning) was performed in 1927.
4. Pines blew down in the hurricane of 1938
5. Enrichment planting of red pine performed 1940 with release.
6. Timber Stand Improvement (TSI) via stem-injection of herbicide 1975
7. Heavy low thinning of pine in 2010 at which time approximately 1/3+ of the basal area (50 ft²) was removed – pulp and sawtimber. 15 ac 78 mbf. Harvested 50 mbf WP/21 mbf RP

Stop 3 – Stand 10 - Reserve



Stop 3 (south) photo by Prof. James W. Toumey, 1930.

1. Photographed in 1930 (with Professor Toumey at left) – white pine/ hemlock - 40-60 years old.
2. Thinned the previous winter (1929-1930) with 15-20% of total volume removed.
3. Leveled in the Hurricane of 1938. Release cleaning of pine and oak adv. regeneration from other hardwoods (1945-50)
5. TSI in 1970's – stem injection and pruning select pine facilitated stratification of existing stand structure with hemlock and beech subcanopy
6. The succeeding growth is now at an older stage of development than 1930 – mixed single-aged - stratified oak-pine-hemlock – now a zoned a reserve in 2000.

Stop 4 – Stand 8 - Production



Stop 4 Photo by Prof. James W. Toumey, 1916

1. Old-field pine - free-form thinned in 1913.
2. In 1929 this area underwent a uniform shelterwood Prep/Estab. followed by Removal 5 y later to obtain pine regeneration
3. Followed by release cleaning of hardwoods for pine
4. Pruning and TSI in 1950s via stem-injection
5. A crown thinning done 1983 1/3 BA removed.
6. 2008 irregular shelterwood with single-tree and group reserves (large white pines/hardwoods) with areas of hardwood regeneration protected. Reserves promote habitat and structural diversity.
7. One Prep/Estab. cut. 250 mbf was cut from 32 acres representing 80% of the 200 ft² ac of basal area. 98% was white pine.



Stop 5 – Stand 29 - Reserve

1. Riparian Reserve
2. Mixed stratified hemlock with pine canopy
3. Old-field origin pine hardwood established circa 1916. Hemlock legacy seed source from old trees left along ephemeral stream.
4. Blew down in hurricane of 1938
5. No release cleaning for pine. Regenerated primarily to hemlock drawn-out age-class.
6. Dominant thinning of pine and some hemlock 1996
7. Zoned reserve in 2000

Stop 6 – Stand 24 - Production

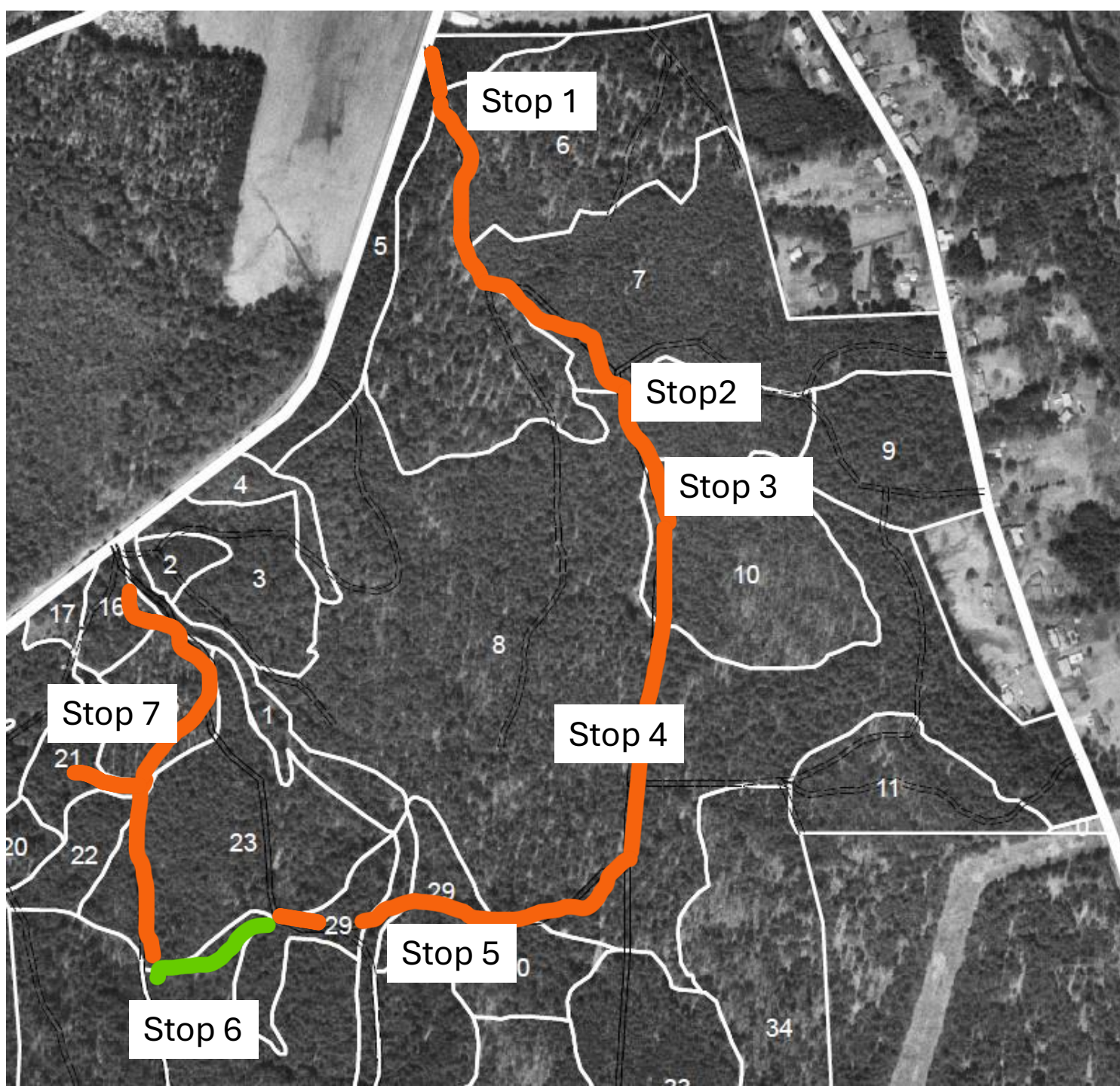
1. This stand was treated in the winter of 2003/4 using an irregular mixed shelterwood and seed tree method of regeneration. The combined prescription was used because of the intimate stratified mixture of dominant pines, canopy oak, and subcanopy hemlock. Scarify for pine and protect adv. Regen.
2. Both dominant pine and hardwood have been left at 70-80 ft intervals as a seed source with a large group reserve of small diameter pine, oak, and hemlock (45 y old) and single and small group wolf and den trees, snags, mixed strata retained to provide structural diversity
3. 314 Mbf was marked on 14 acres. The majority of this volume was pine at 250 Mbf. The remaining was red oak (46 Mbf), and hemlock (16 Mbf). Basal area before treatment ranged from 165 ft²/ac to 203 ft²/ac. Residual basal area is approximately 40 ft²/ac.
4. The original forest was 80-100 years old, with oak at 100 years and pine emergent somewhat younger. Hemlock ranged from 80 years in the canopy to younger (50+y) in the mid-and under story that seeded through prolonged recruitment.
5. The stand originated at the turn of the 20th century from prior heavy cutting for white pine which released advance hardwood regeneration (primarily oak). Two crown thinnings, in 1942 and most recently in the 1970s, removed some of the pine/oak components, but left hemlock/subcanopy untouched.



Stop 5 – Stand 21 - Toumey Grove



Photo by Prof. James W. Toumey, 1930.

1. There was red pine both planted and of natural origin. The photo adjacent (again, with Professor Toumey) shows a mixture of red and white pines planted in 1916 on what was a hardwood “brush field”.
2. The hardwoods were weeded out in two operations in 1922 and 1926
3. Like much of the rest of the forest, these pines were leveled in the Hurricane of 1938.
4. At this location was a large red pine grove of natural origin that was selected as Prof. Toumey’s burial place – it too was leveled by ‘28
5. Replanted to red pine in 1940 the stand has been release cleaned 1942-45, TSI-pruned in 1960; with two crown thinnings 1987 & 2001



-  Through forest
-  Trail