Department of Conservation & Recreation

Division of Water Supply Protection

Continuous Forest Inventory Update: 60 Years of Tree Measurements on DWSP Watershed Lands

Water Supply Citizens Advisory Committee, November 9, 2021

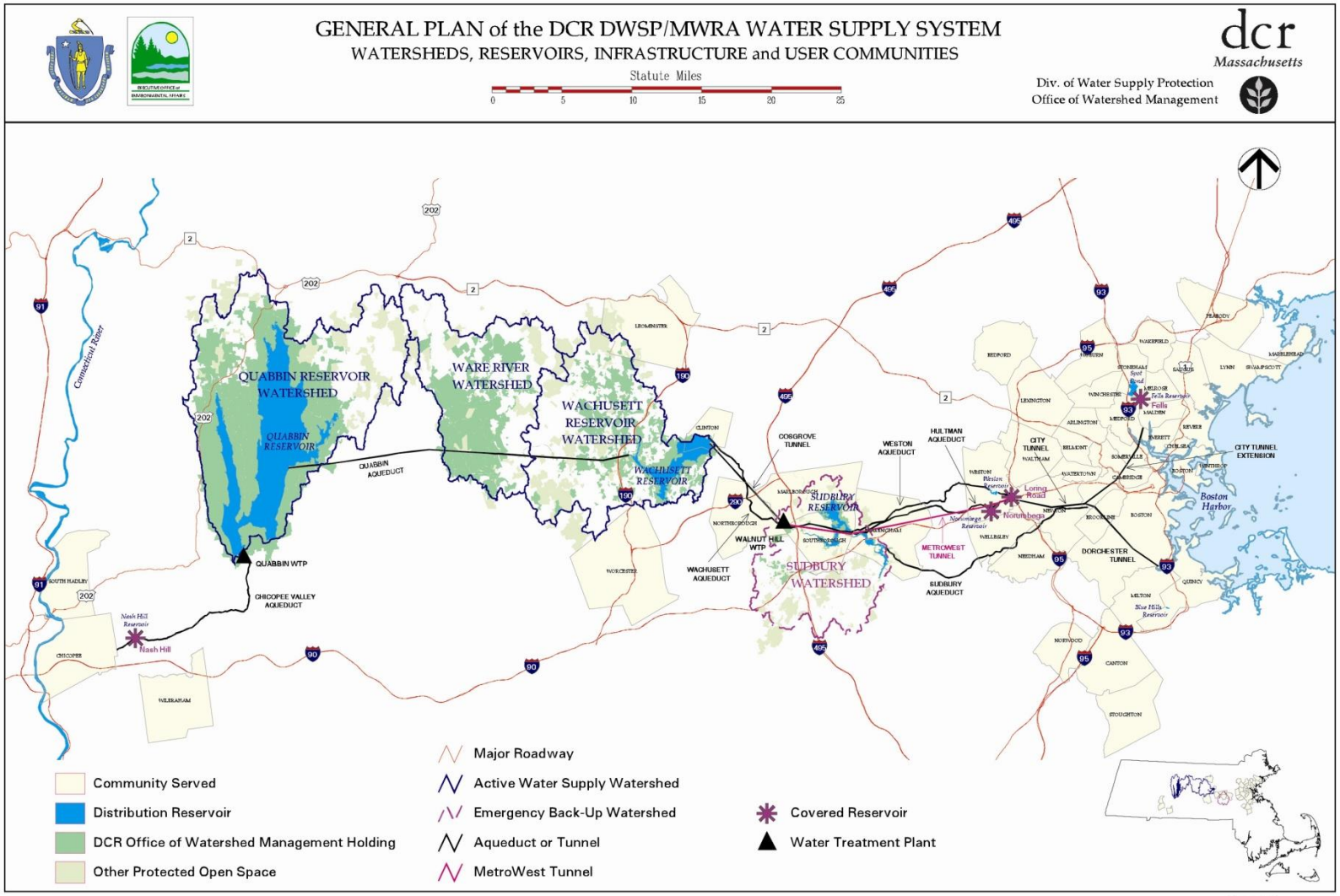
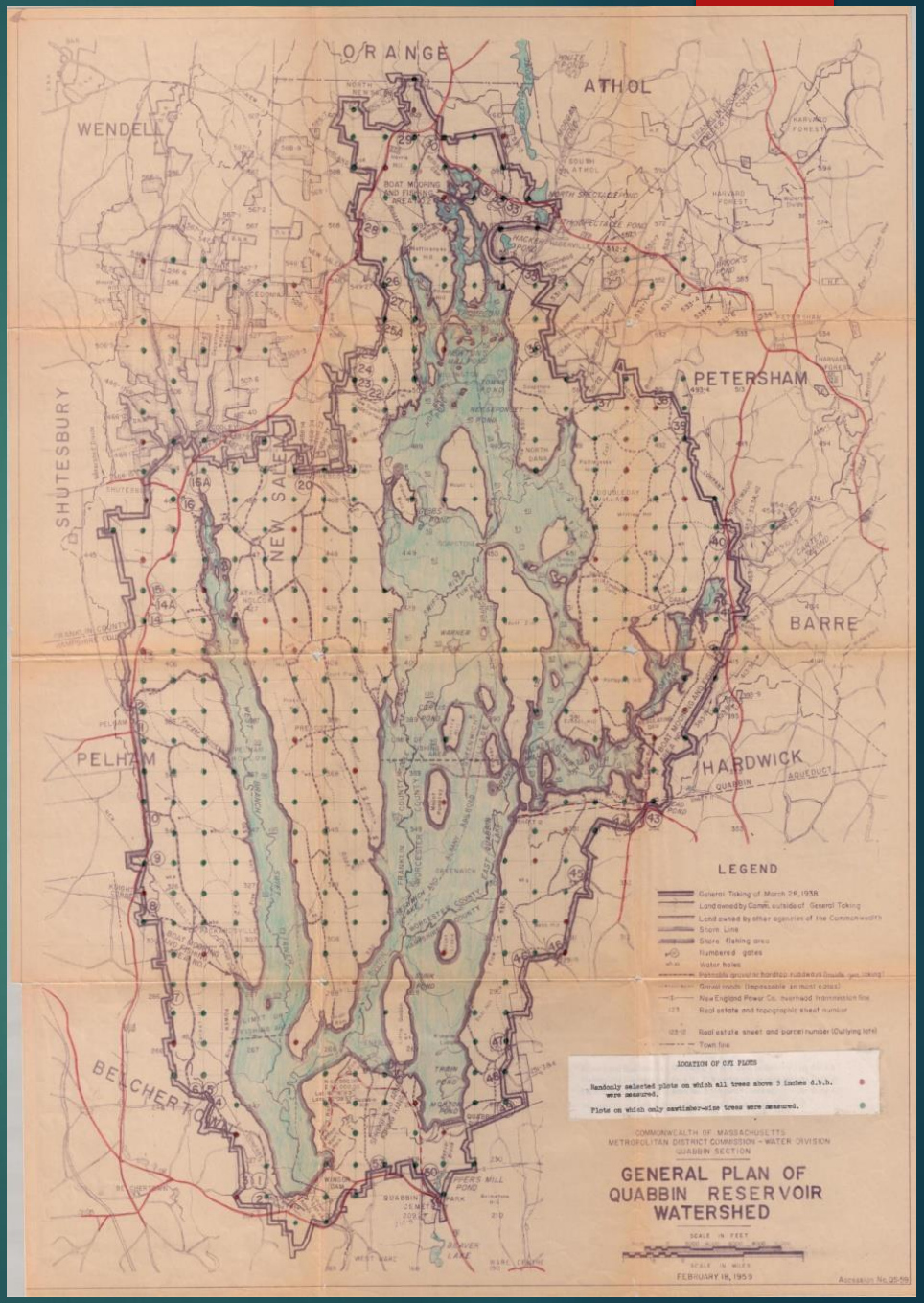

GENERAL PLAN of the DCR DWSP/MWRA WATER SUPPLY SYSTEM
WATERSHEDS, RESERVOIRS, INFRASTRUCTURE and USER COMMUNITIES
Statute Miles
0 5 10 15 20 25
dcr
Massachusetts
Div. of Water Supply Protection
Office of Watershed Management
QUABBIN RESERVOIR WATERSHED
QUABBIN RESERVOIR
WARE RIVER WATERSHED
WACHUSETT RESERVOIR WATERSHED
WACHUSETT RESERVOIR
QUABBIN AQUEDUCT
QUABBIN WTP
CHICOPEE VALLEY AQUEDUCT
Nash Hill Reservoir
Nash Hill
Connecticut River
COSGROVE TUNNEL
WESTON AQUEDUCT
HULTMAN AQUEDUCT
SUDBURY RESERVOIR
Norumbega Reservoir
Norumbega
Long Road
WALNUT HILL WTP
SUDBURY WATERSHED
WACHUSETT AQUEDUCT
SUDBURY AQUEDUCT
METROWEST TUNNEL
CITY TUNNEL
CITY TUNNEL EXTENSION
DORCHESTER TUNNEL
Boston Harbor
Fells Reservoir
Spot Pond
Blue Hills Reservoir
Community Served
Distribution Reservoir
DCR Office of Watershed Management Holding
Other Protected Open Space
Major Roadway
Active Water Supply Watershed
Emergency Back-Up Watershed
Aqueduct or Tunnel
MetroWest Tunnel
Covered Reservoir
Water Treatment Plant

Figure: 1-1

"Forest Resources on Metropolitan District Commission Lands Surrounding Quabbin Reservoir"

- Masters Thesis, UMass 1961
- Fred Hunt
- Established CFI based on State/USFS model
- ½ mile grid spacing
- Each 1/5-acre plot 'represents' 160 acres (giving a sampling rate of 1/800 or 0.00125)

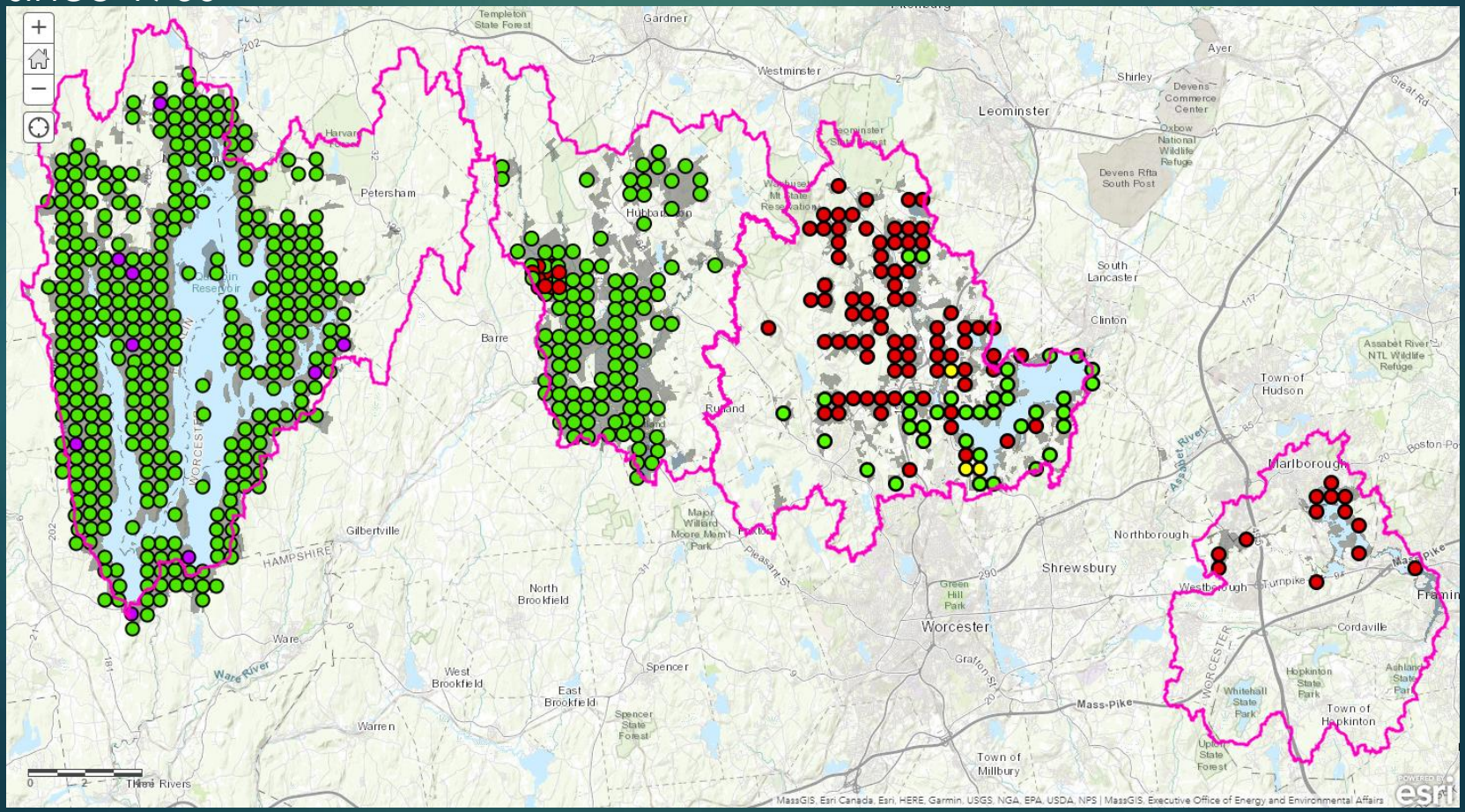


Continuous Forest Inventory

Quabbin: 364 plots, most sampled since 1960

Ware River: 112 plots, most sampled since 1962

Wachusett/Sudbury: 130 plots newly established and sampled beginning July 2021



Continuous Forest Inventory

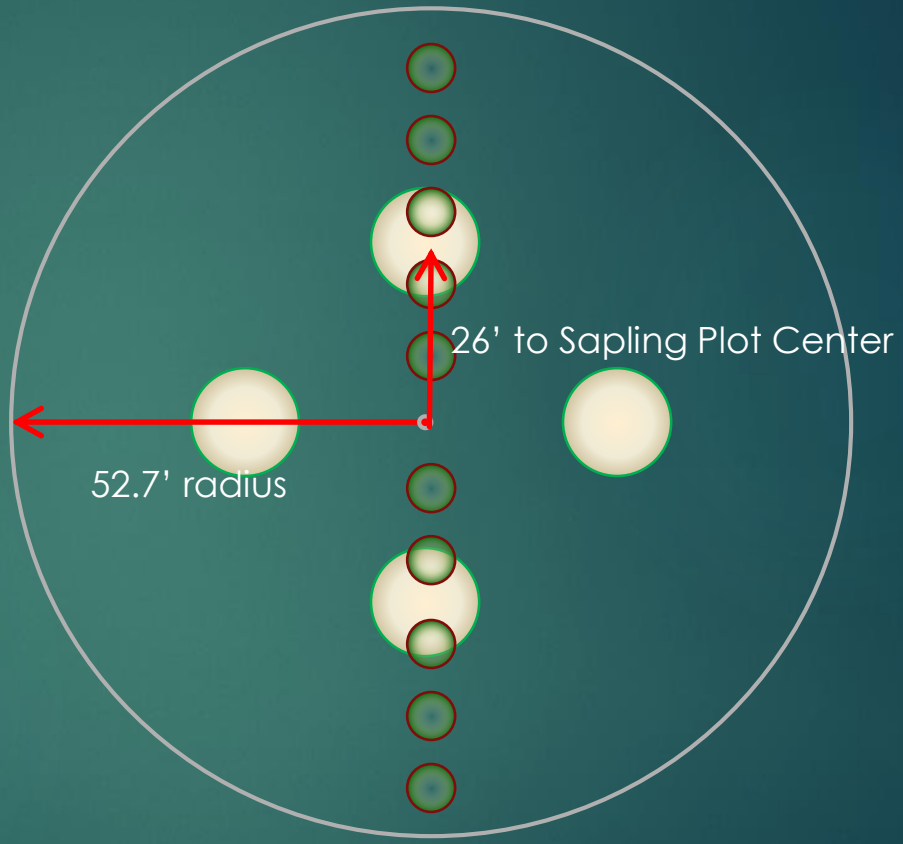
- QWR CFI data collection completed
  - Ware River: 112 plots visited between December 2019 and April 2020
  - Quabbin: 364 plots visited between June 2020 and March 2021
  - Three seasonal Forestry Assistants teamed with Foresters for three consecutive seasons; should repeat in 2029
  - COVID safety protocols enforced
- Wachusett/Sudbury 2021

Continuous Forest Inventory (CFI) Plot Design Details

- Circular fixed 0.2-acre plot (52.7' radius)
- Located on ~½ mile grid
- Permanently staked center point
- TREES: Number (with paint) and collect data for all trees larger than 5.6" DBH within plot

- SAPLINGS (since 2000): Four 6-foot radius plots, centered 26 feet from plot center in each cardinal direction
  - Record # of stems 1" DBH to 5.5" DBH, by species

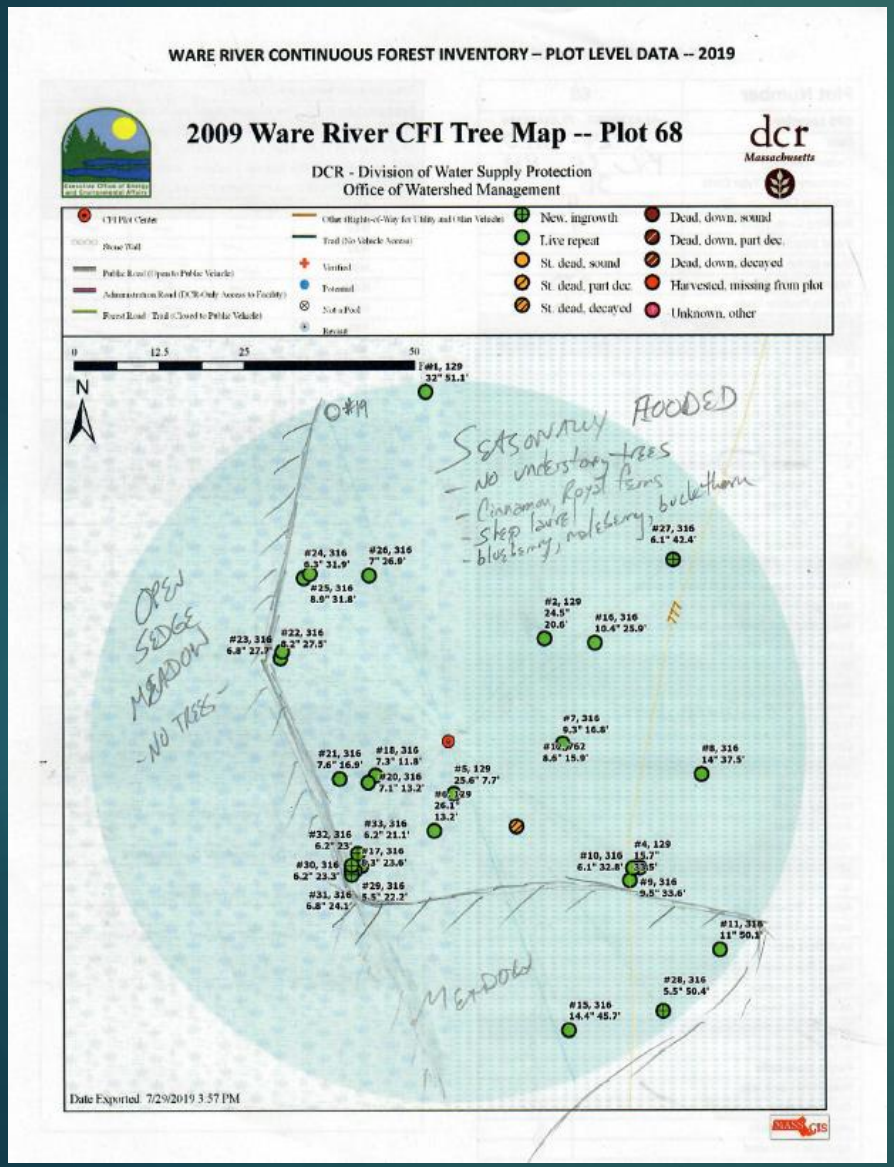
- REGENERATION (since 1990): Ten 1/1000th acre plots, 10 feet apart, N-S
  - Record species of two tallest stems >1' tall up to 1" Diameter



CFI **Plot Level** Data

- Plot Number – NOT unimportant at Quabbin!
- Location (Lat + Long)
- Slope and Aspect
- Terrain Position
- Cover Type
- Land Use
- Disturbances
- Interfering plants
- Invasive plants
- Browse
- Non-forest area

Individual plot tree maps

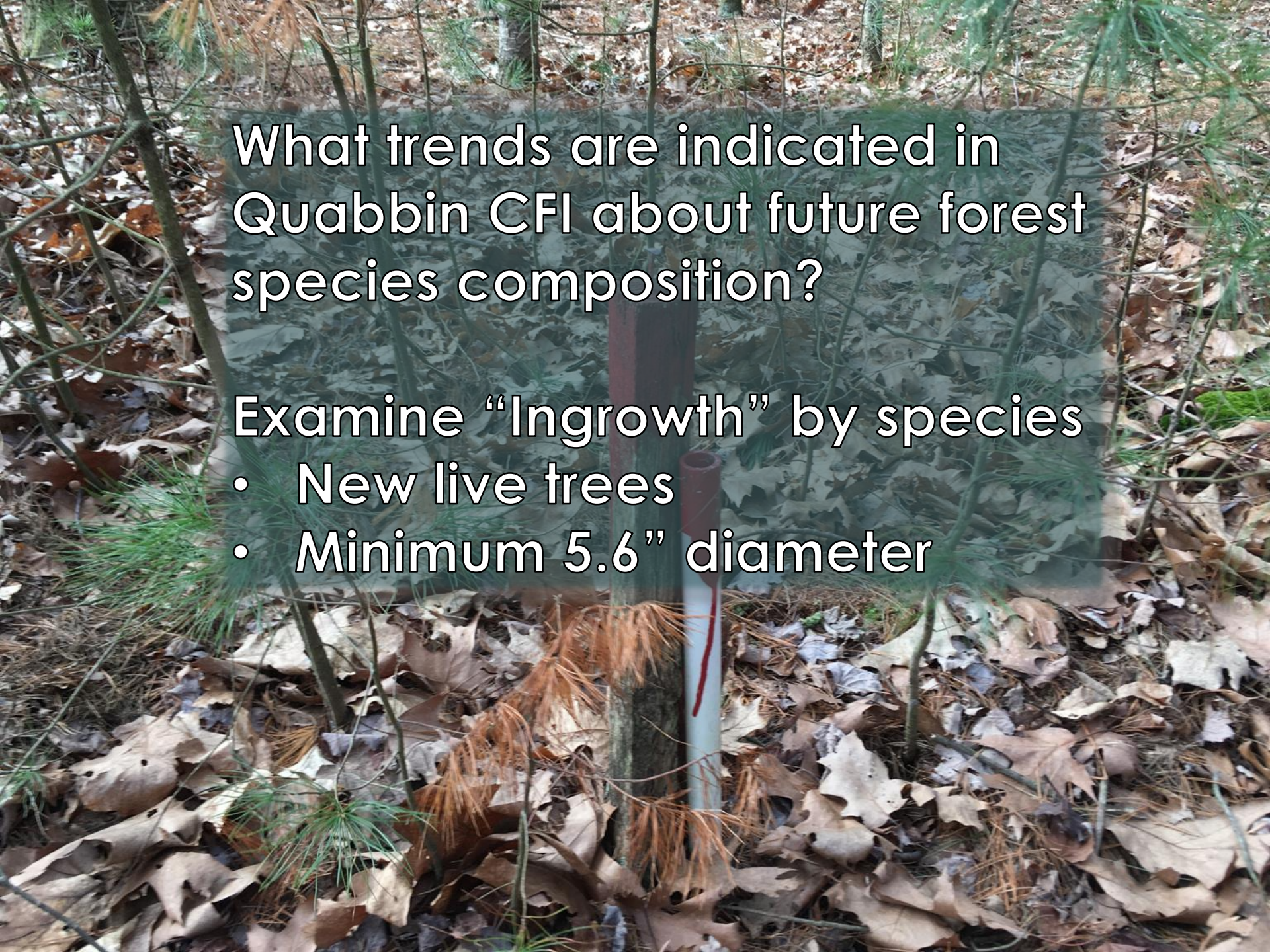


CFI Tree Level Data

- Number
- Species
- Location (Azimuth + Distance)
- Diameter
- Live/dead status
- Tree classification
- Height
- Sawlogs
- Crown position
- Live crown ratio
- Cavities





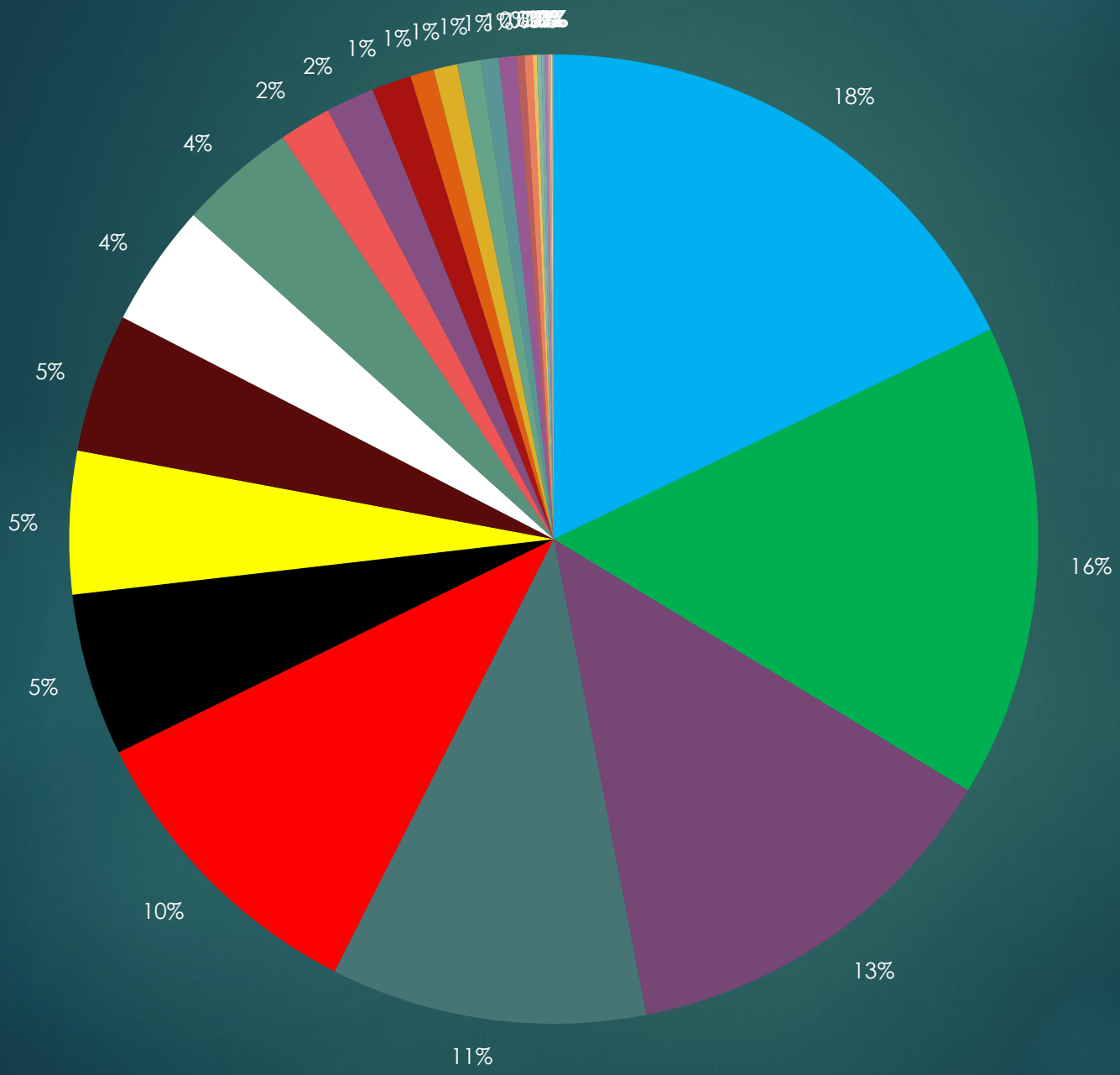


What trends are indicated in Quabbin CFI about future forest species composition?

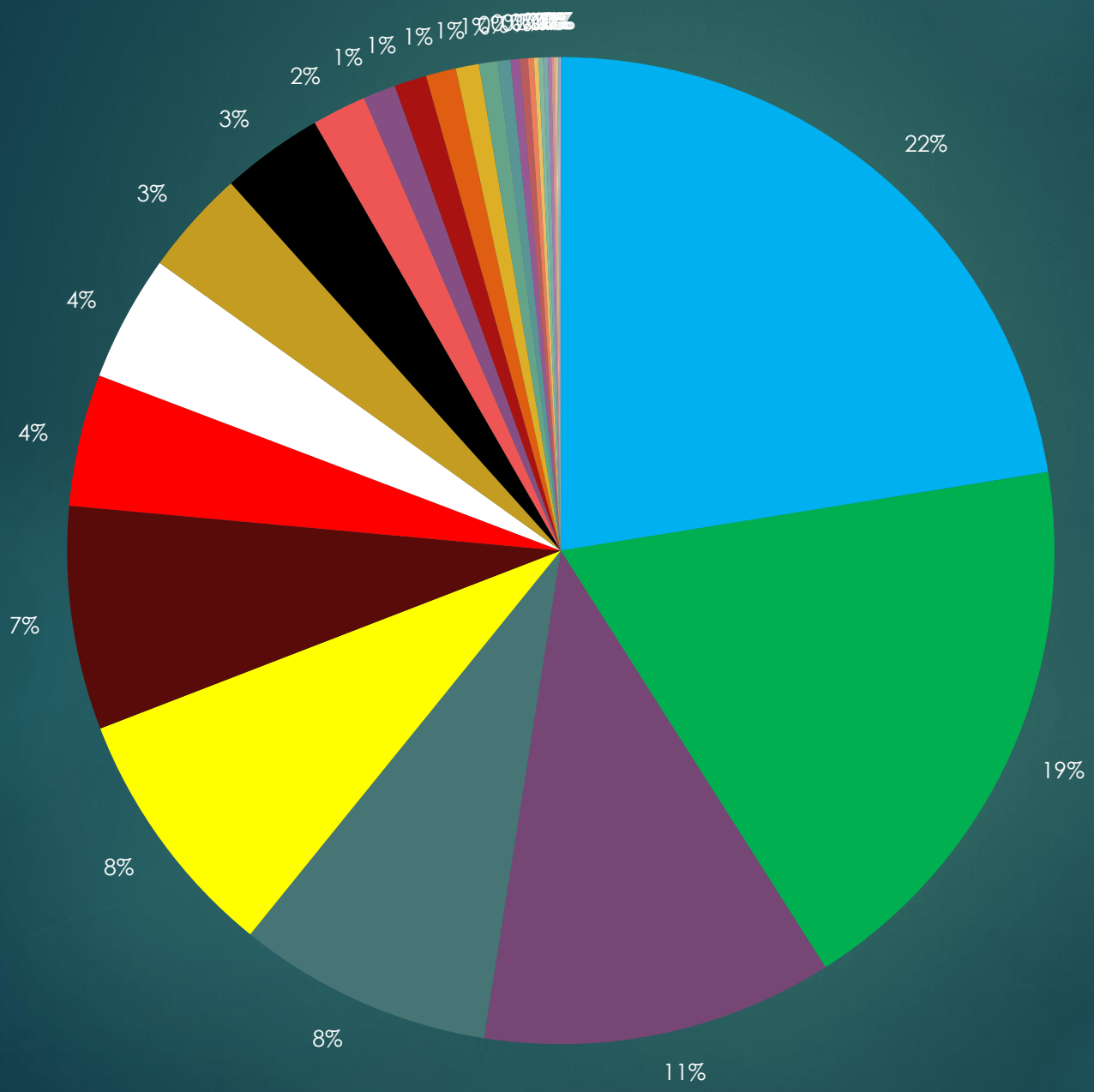
Examine "Ingrowth" by species

- New live trees
- Minimum 5.6" diameter

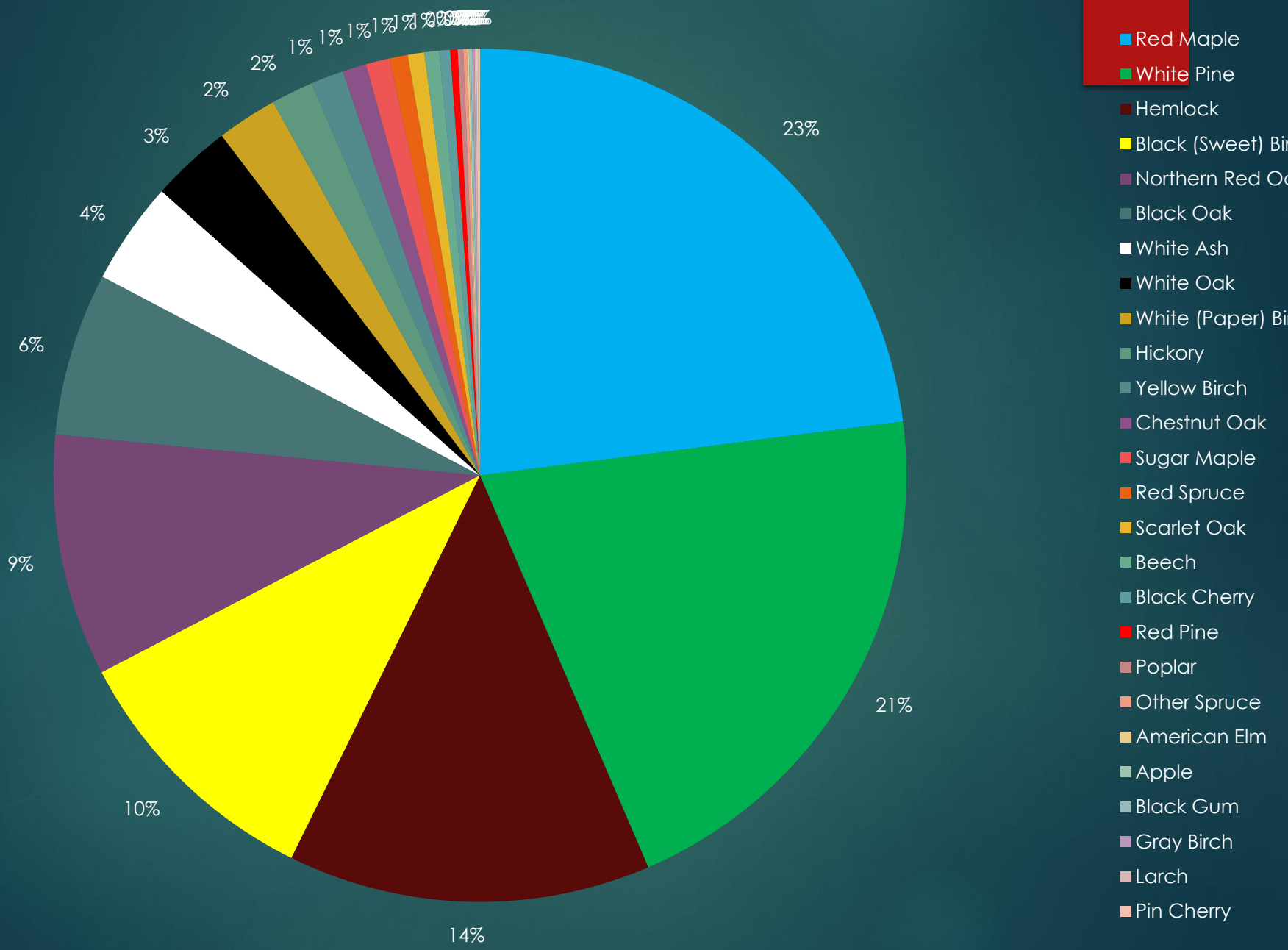
Percentage of "New" Trees By Species - 1970



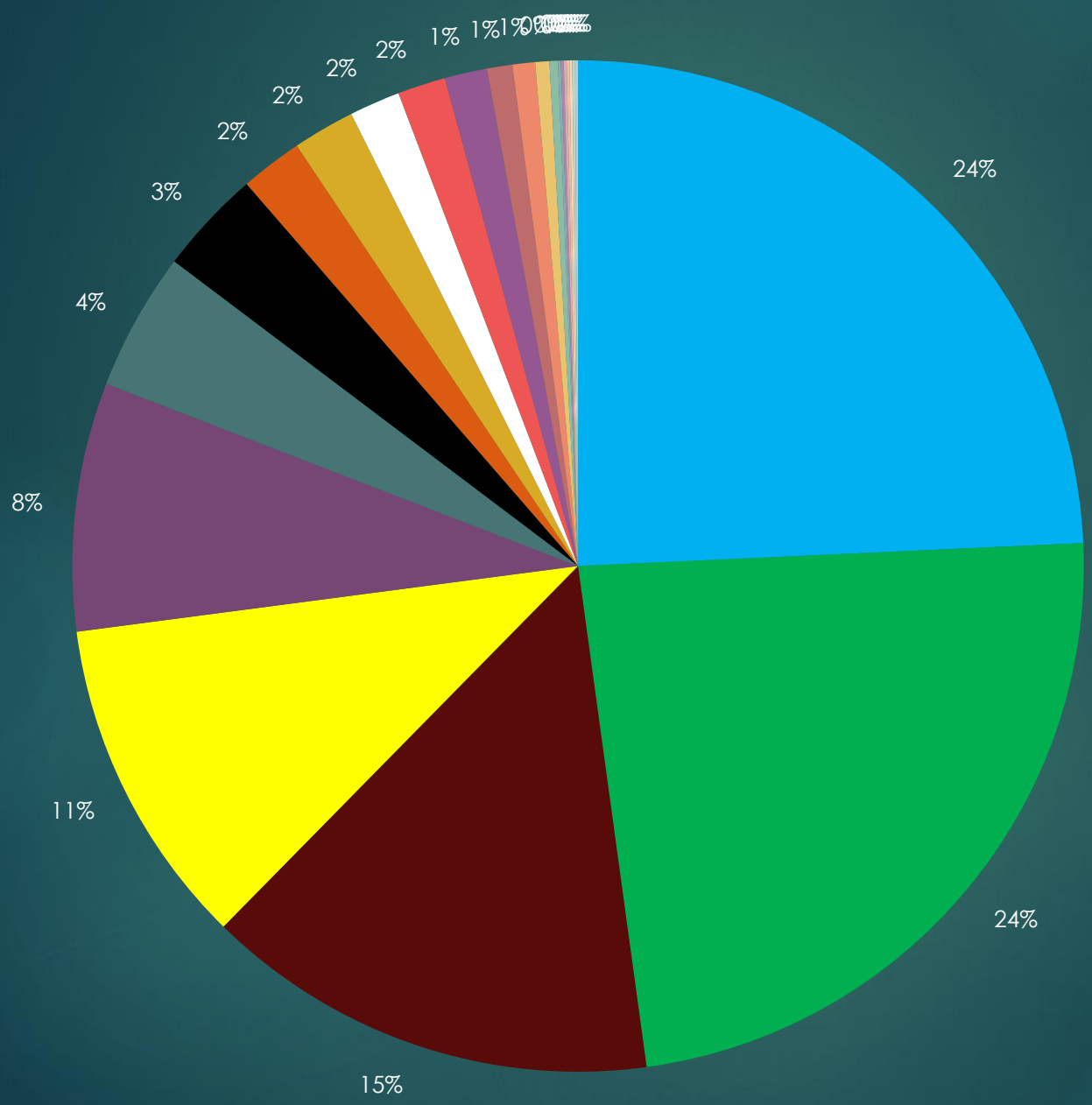
Percentage of "New" Trees By Species - 1980



Percentage of "New" Trees By Species - 1990

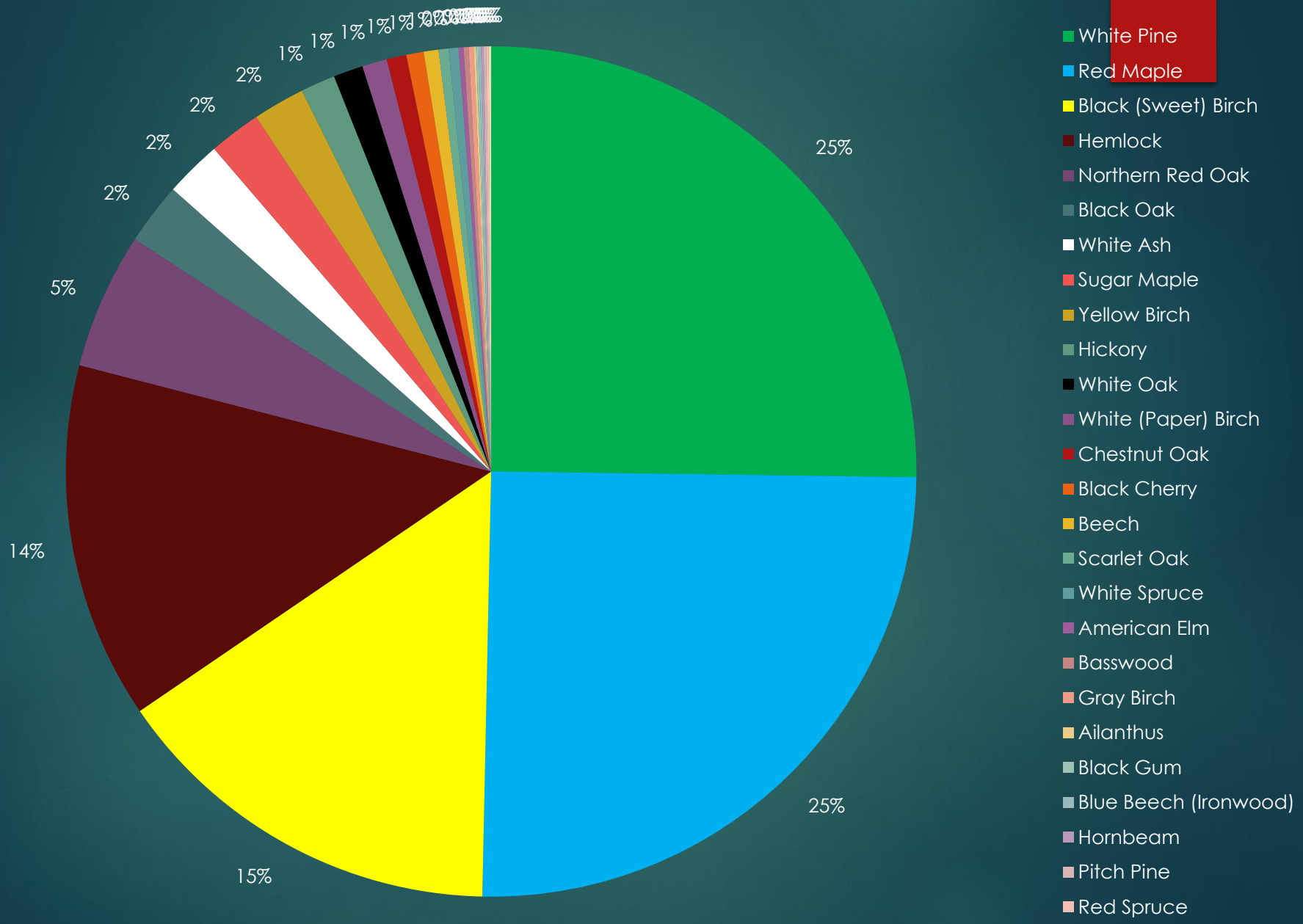


Percentage of "New" Trees By Species - 2000

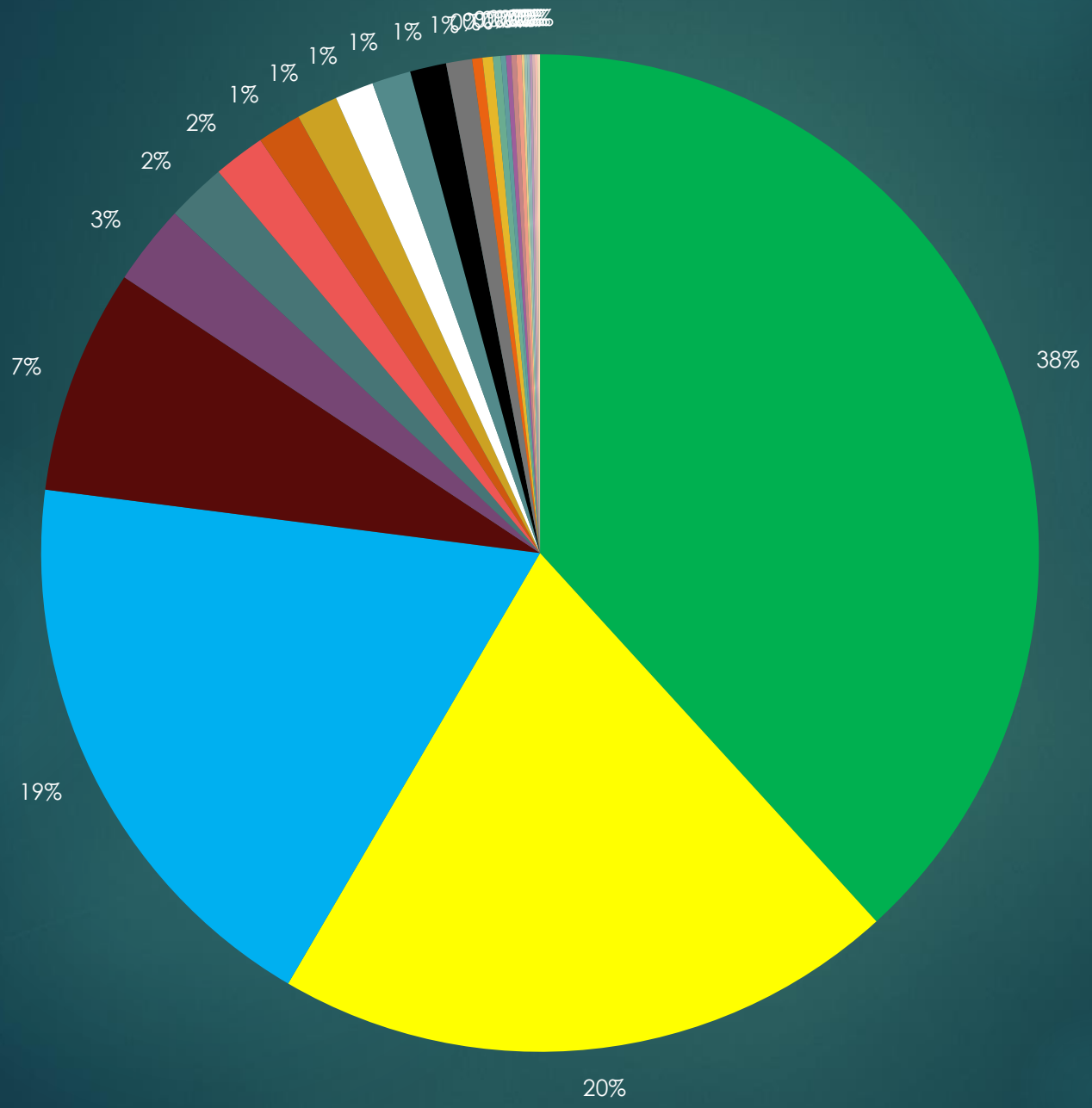


- Red Maple
- White Pine
- Hemlock
- Black (Sweet) Birch
- Northern Red Oak
- Black Oak
- White Oak
- White (Paper) Birch
- Yellow Birch
- White Ash
- Sugar Maple
- Hickory
- Chestnut Oak
- Black Cherry
- Scarlet Oak
- Red Pine
- Basswood
- Beech
- Blue Beech (Ironwood
- Chestnut
- Hornbeam
- Poplar
- White Spruce

Percentage of "New" Trees By Species - 2010

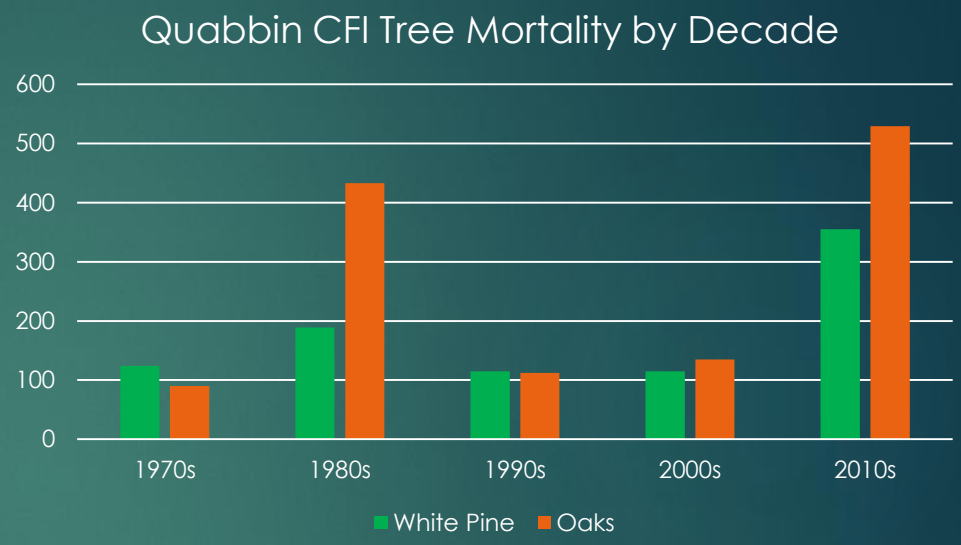


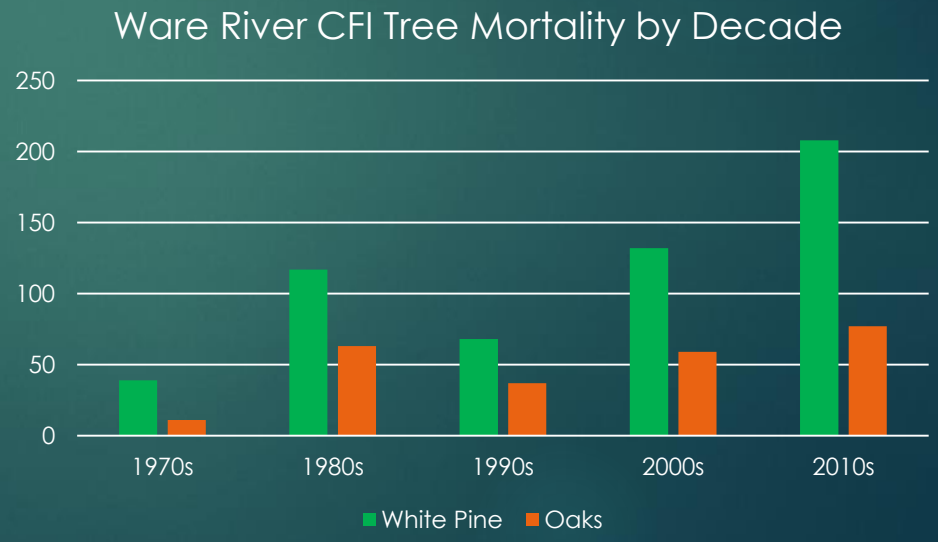
Percentage of "New" Trees By Species - 2020



CFI and Mortality Events

- Oak defoliation in the 1980s and 2010s
- White pine too? Maybe not what it appears…

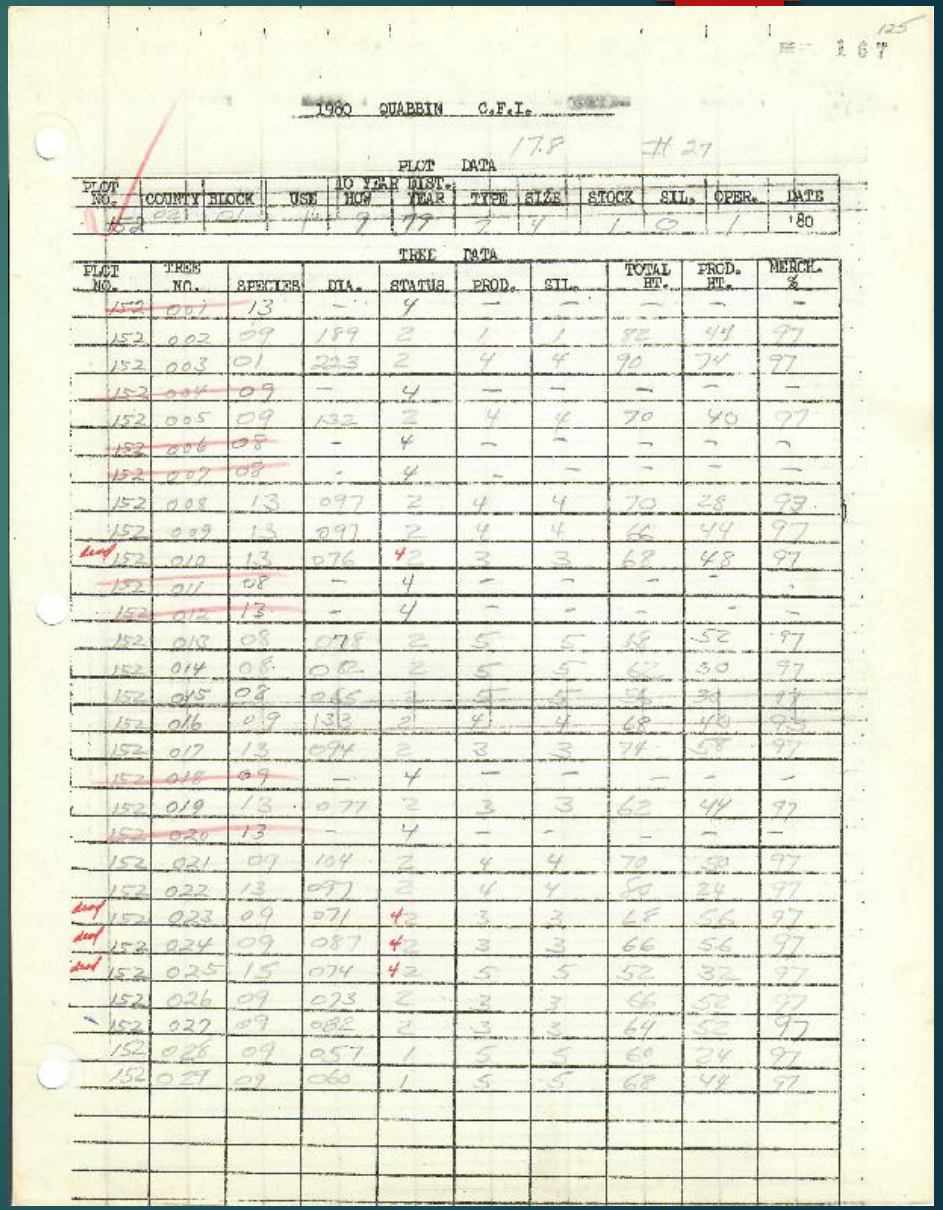




Continuous Forest Inventory: Database and Analysis Status

Tasks Completed:

- Retroactive continuity completed for all 27,000+ Q and WR trees
  - Species
  - Location (AZ + Dist)
  - Diameter
  - Live/dead status
- Most supplemental table code 'crosswalks' completed
- All paper data sheets digitized



Continuous Forest Inventory: Database and Analysis Status

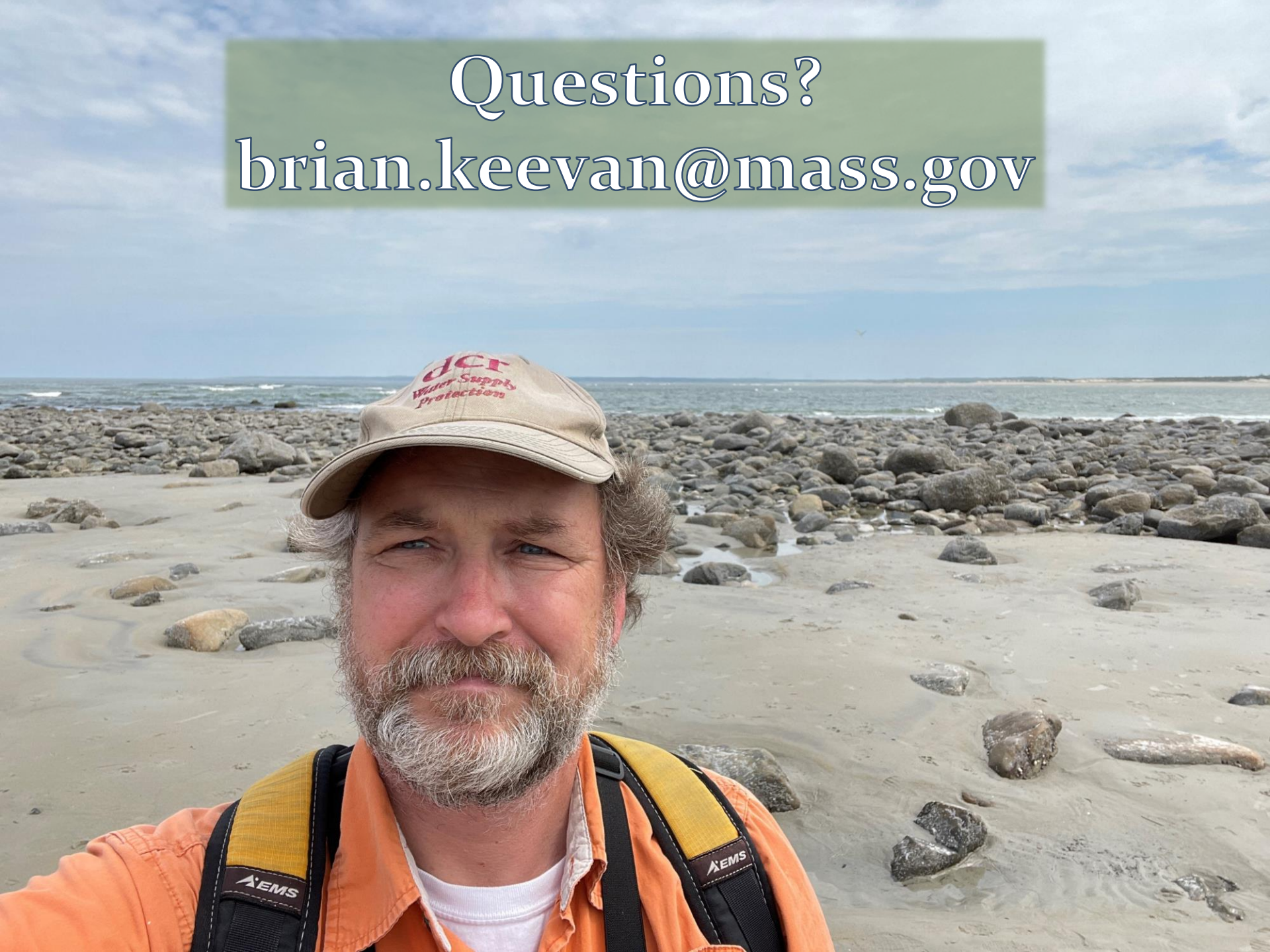
Tasks In Process:

- Local height : diameter equations by species
- Volume per tree per cycle
- Plot level table crosswalks
- Plot non-forested area calculations
- 'Future-proofing' and standardizing tables and code keys for sharing with FEMC

Continuous Forest Inventory: Database and Analysis Status

Tasks Envisioned

- Comprehensive report – summary in next LMP
- Front-end interface – internal (and public?) querying
- Complete Wachusett/Sudbury data collection/entry and merge
- Possible data additions: Downed Woody Debris transects, herbaceous microplots


Questions?
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