Managing Oak Forests in Pennsylvania: Some Common Prescriptions

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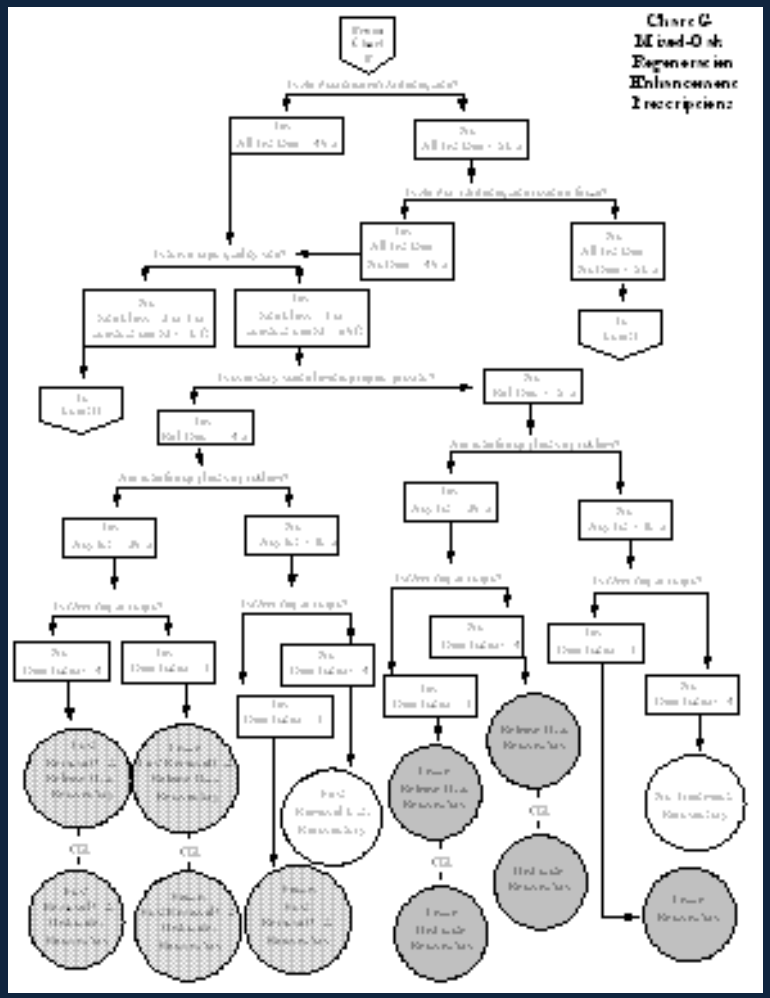
OBJECTIVES

- **Show how SILVAH generates oak regeneration prescriptions and how those prescriptions are implemented by foresters.**

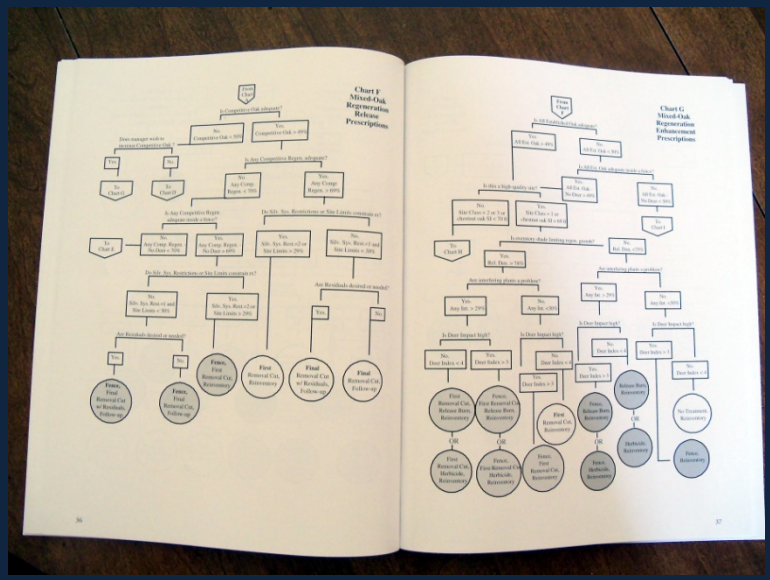
SILVAH – Oak Prescriptions

- At the heart of the SILVAH decision-support system is a series of dichotomous decision charts that are navigated with summary inventory data to a recommended prescription.
- There are 11 charts (A – K). The first five (A – E) are for Allegheny & northern hardwood stands. The last six (F – K) are for mixed oak stands.
- The oak charts are arranged in order of increasing regeneration problems. The further you go into the charts, the more serious are the obstacles preventing stand renewal.
- Many prescriptions are multi-treatment and sequential.
- Prescriptions are color coded to reflect their relative risk and cost.



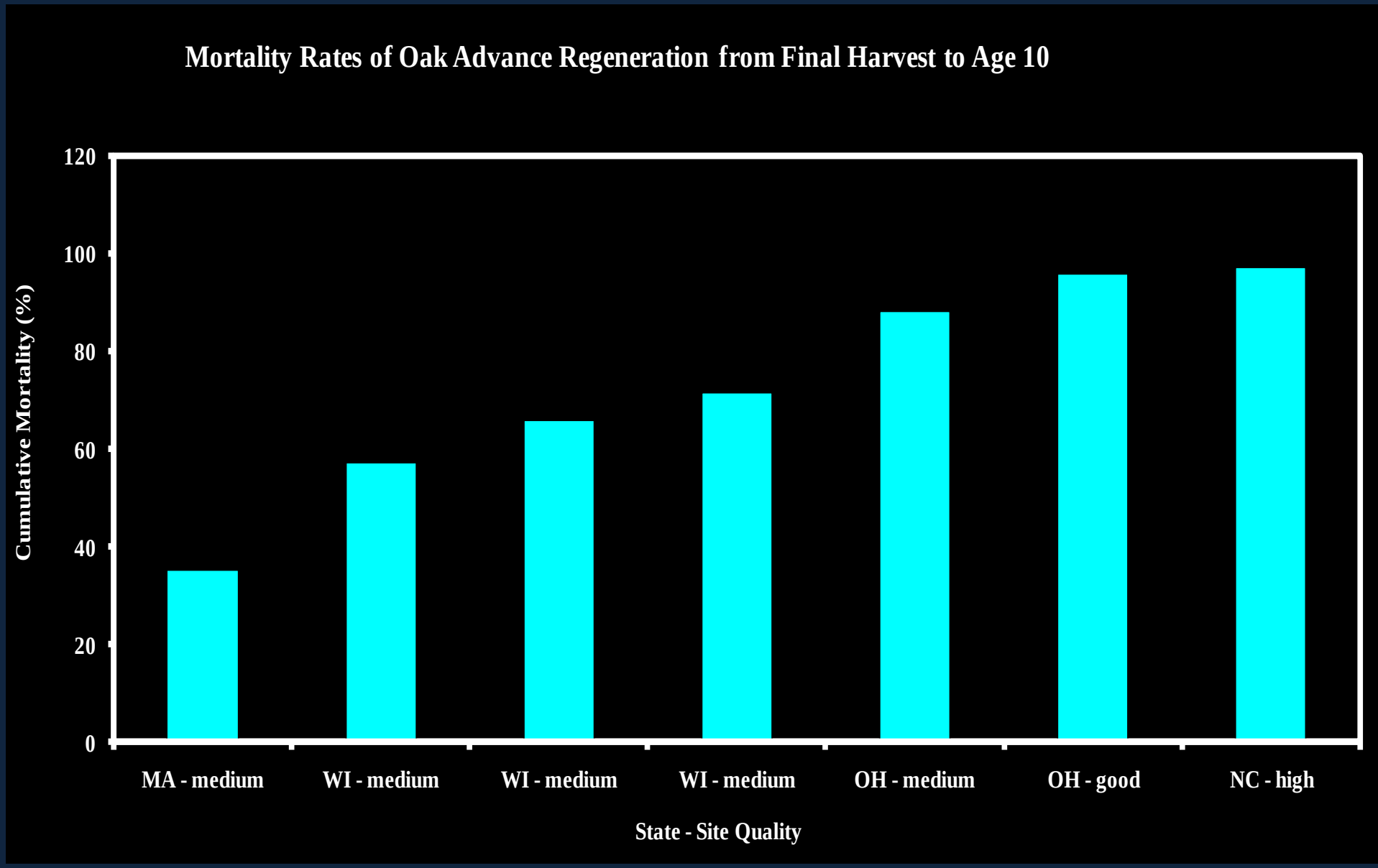
SILVAH – Oak Prescriptions

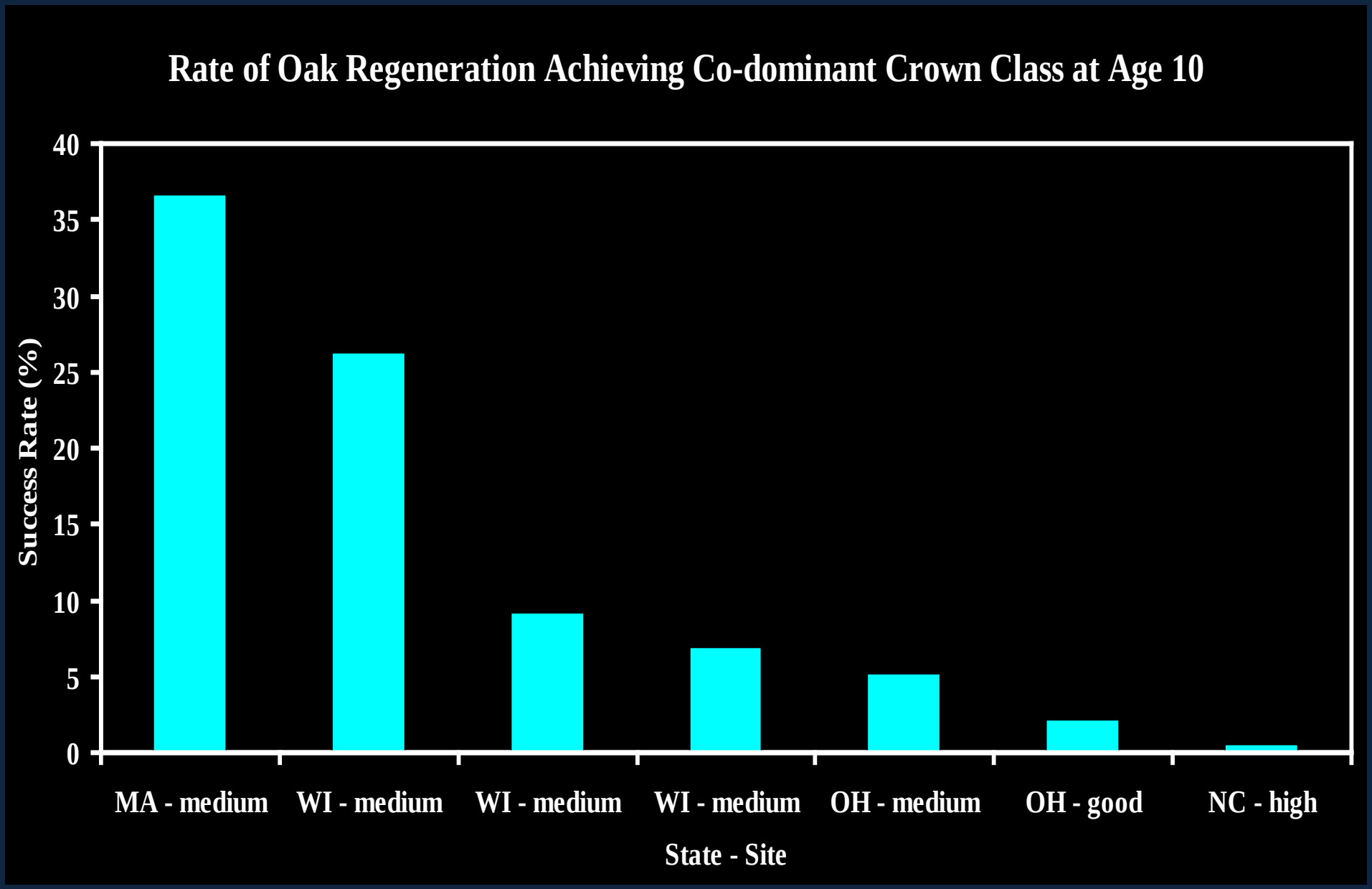
- The oak charts are grouped into two sets: regeneration and preparation.
- The regeneration charts are designed to replace existing oak stands with new oak stands within a few years using 1 or 2 overstory removal cuts.
- The preparation charts are designed to either establish oak seedlings or gently foster their development via shelterwood prep cuts and/or low shade removal techniques. In these charts, final stand harvest is many years away.



SILVAH – Oak Designed Around These Basic Principles

- **Oak regeneration difficulties increase as site quality improves.**
- **Large oak advance regeneration is required on high quality sites before final removal of the overstory.**
- **High densities of oak seedlings are needed to eventually produce large oak advance regeneration.**
- **Oak regeneration is a process, not an event! Plan on 10 - 20 years for this process to run its course.**
- **Oak regeneration must be adequately released.**


Mortality Rates of Oak Advance Regeneration from Final Harvest to Age 10
Cumulative Mortality (%)
120
100
80
60
40
20
0
MA - medium
WI - medium
WI - medium
WI - medium
OH - medium
OH - good
NC - high
State - Site Quality


Rate of Oak Regeneration Achieving Co-dominant Crown Class at Age 10
Success Rate (%)
40
35
30
25
20
15
10
5
0
MA - medium
WI - medium
WI - medium
WI - medium
OH - medium
OH - good
NC - high
State - Site

The Oak Regeneration Process

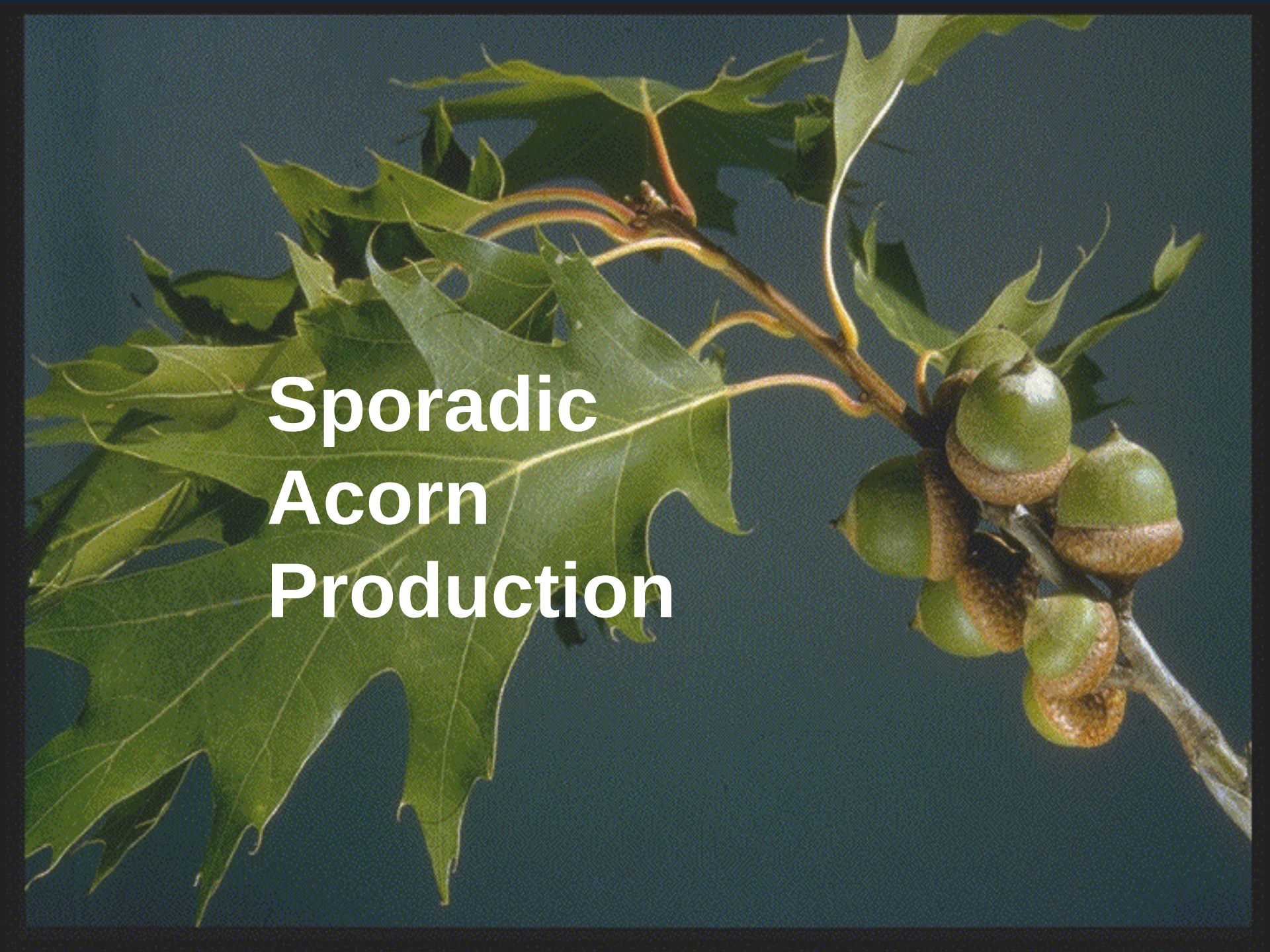
3 Phases (10 to 20 years)

Acorn Production

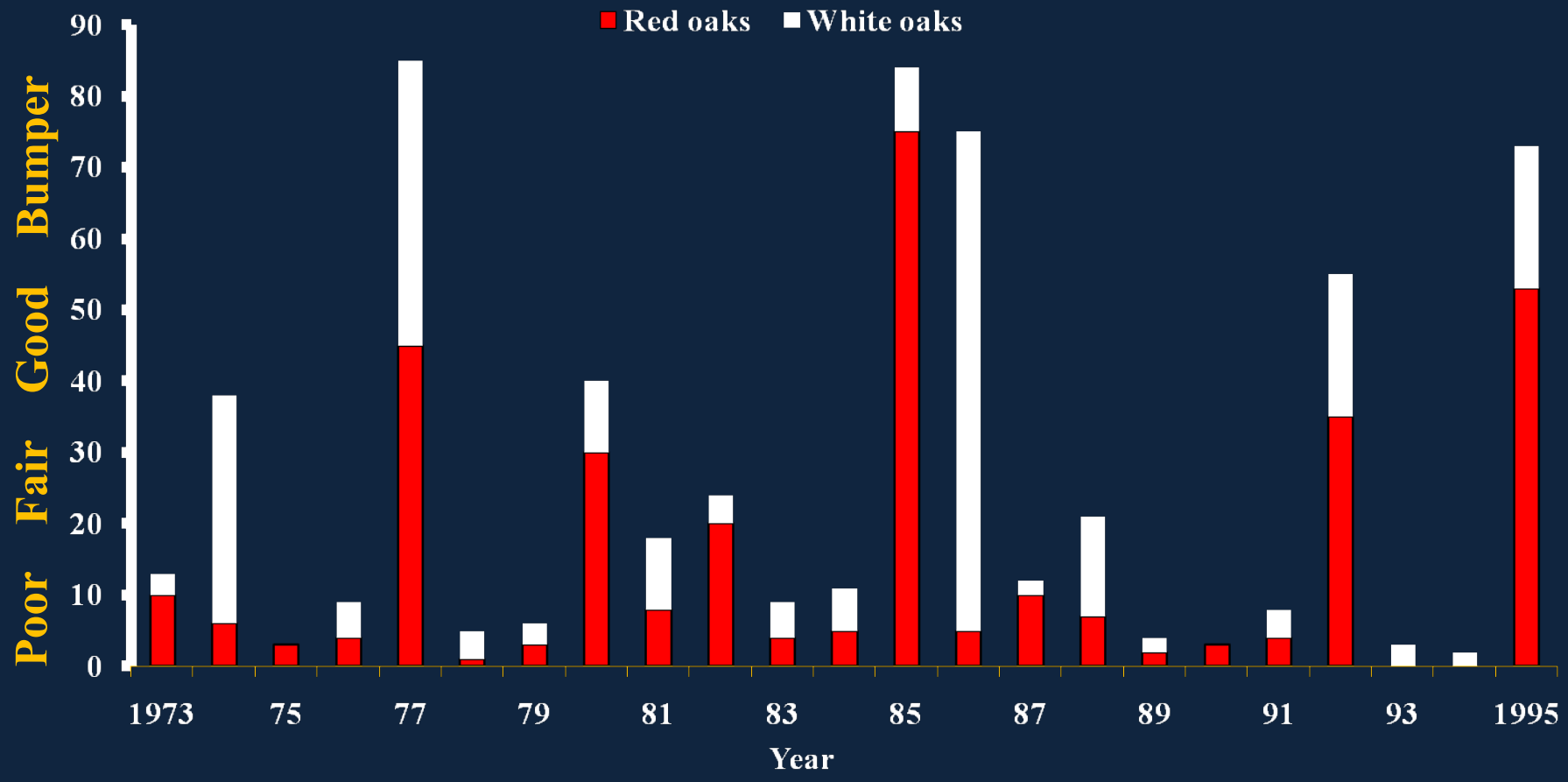
Seedling Establishment

Seedling Development

WHY SO LONG?

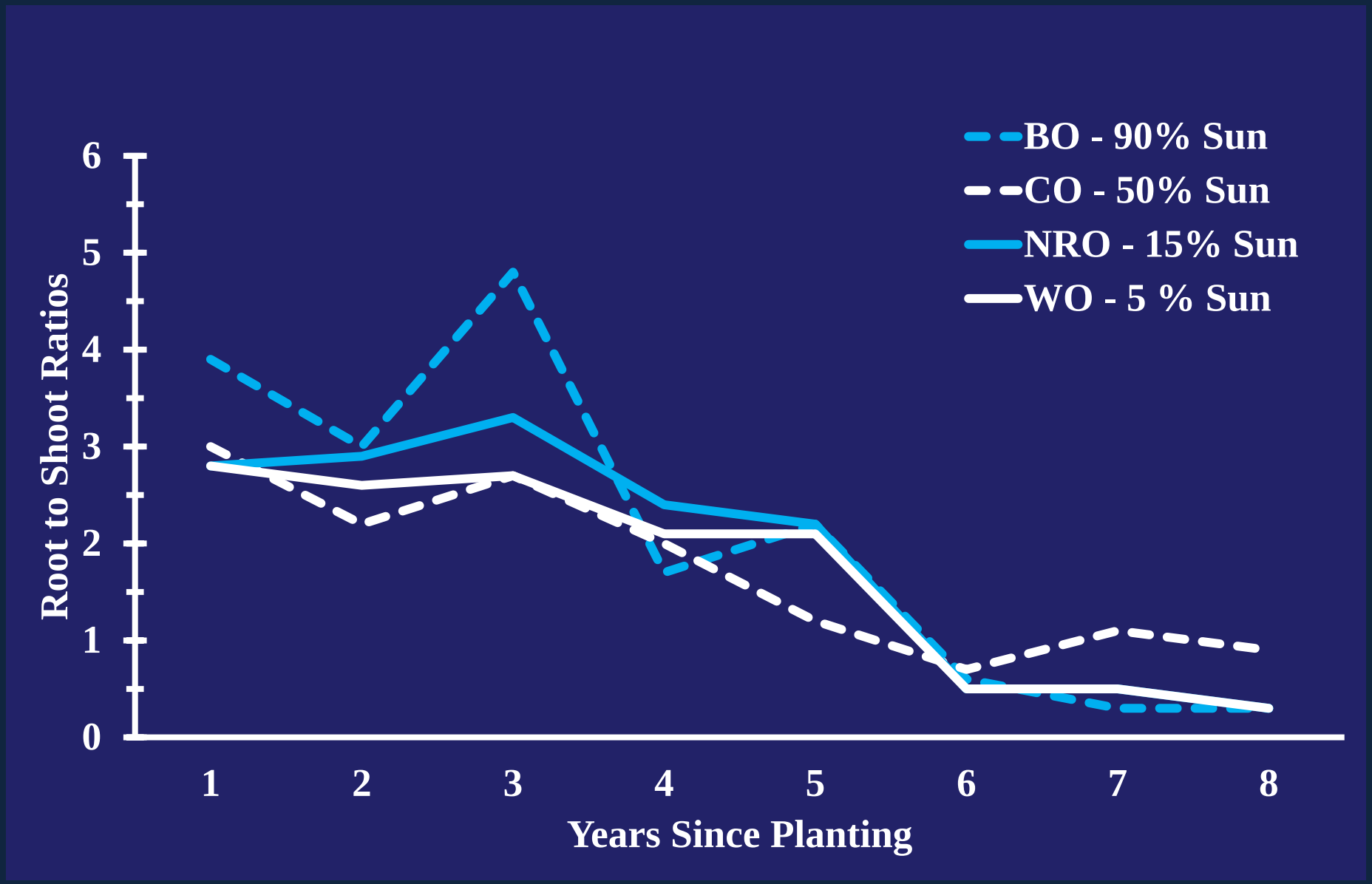

Sporadic
Acorn
Production

ACORN PRODUCTION IN WESTERN VIRGINIA, 1973 - 1995



Root-Centered Growth Strategy

Oak Root Development



The Oak Regeneration Process

- **Slowed or Stalled by**
  - **Insects**
  - **Disease**
  - **Weather**
  - **Competing Vegetation**
  - **Wildlife, especially deer**
  - **Lack of Sunlight (too much shade)**
  - **Poor Harvesting Practices**

The tools to help speed oak seedlings through the regenerative process

Example #1

- A northern red oak stand growing on Clear Creek SF.
- Oak SI_{50} ~ 85 ft.
- Stand age = 110 years.
- Basal Area = 169 sq. ft (60 sq. ft is NRO).
- Trees/acre = 300 (another 1600 striped maple/acre).
- Rel. Density = 105%.
- Merch. Vol. = 25 mbf/acre.
- Virtually no regeneration of any type.
- Deer Impact = 3.

Example #1

- **Manager wants to harvest this oak stand and grow another in its place.**

- **However, the absence of seedlings, the high oak site index, and abundance of striped maple saplings causes SILVAH to recommend preparatory treatments to facilitate a future acorn crop becoming a seedling cohort.**

Example #1

- **The forester chose to use prescribed fire (seedbed preparation burning) to remove the striped maple saplings.**

- **Fire burned on 4/19/2002. Striped maple buds were just begging to swell. Fire was very low intensity.**

- **The striped maple foliated postfire, but leaves wilted by August.**

Example #1

- **Many of the striped maple sprouted from the base in 2003 and the dense understory layer began to reform.**

- **By 2009, a second fire was necessary. It was conducted on May 20, 2009. Understory was fully foliated and fire intensity was low to moderate.**

- **Now, striped maple is virtually gone from the stand, but the lack of any decent acorn crops since the 2009 fire means oak seedlings are still lacking from the site.**

Example #1

- If fire was not an option, then a broadcast herbicide could be used to control the striped maple understory.
- Herbicide prescription would be a 3% solution of glyphosate + a non-ionic surfactant applied in July or August.
- If both fire and herbicide are possible, then one must weigh the benefits and costs.
- After controlling the understory interference, SILVAH will recommend monitoring for an acorn crop followed by another inventory once a cohort is established.

Example #2

- A 50-acre mixed oak stand in central Pennsylvania.
- Oak SI_{50} ~ 65 ft.
- Basal Area = 129 sq. ft (92 sq. ft is oak).
- Trees/acre = 225.
- Rel. Density = 95%.
- Merch. Vol. = 14 mbf/acre.
- >15,000 oak seedlings/acre due to a recent acorn crop, but all are < 6” tall.
- All Interference = 40%
- Deer Impact = 4.

Example #2

- Manager wants to harvest this oak stand and grow another in its place.
- There are enough oak seedlings to begin stand regeneration.
- Deer and interfering vegetation are problematic.
- Can fire be used?

Example #2

- **Because fire is possible, then SILVAH recommends a shelterwood 1st removal cut followed by a fence.**

- **The harvest reduces basal area to about 60 sq. ft. per acre with canopy closure at about 50%. The sale nets $125,000.**

- **The fence is erected shortly after the harvest. It costs $10,500.**

Example #2

- **The harvest releases the oak reproduction to grow and the fence prevents deer browsing.**
- **But, non-oak seedlings are also unbrowsed and they grow faster than the small oaks.**
- **Within 4 to 7 years, the shelterwood looks like this. There are plenty of young oaks, but they are overtopped.**
- **Time to light the match.**

Example #2

- **Prescribed fire conducted in mid May 2005. Non-oak seedlings had foliated, but oak reproduction was still somewhat dormant.**

- **A late PM burn on a warm, dry day. Moderate to high intensity fire with flame lengths of 2 to 4 feet.**

- **Some damage to overstory trees.**

Example #2

- **The seedling pool responded quickly after the fire with oaks now dominating the layer.**
- **Final harvest done in 2007.**
- **Sale netted $133,000. Probably some value loss due to fire damage to some trees.**
- **Could things have been done differently?**

Example #2a

- An alternative approach is conducting the final harvest before doing the prescribed fire.
- That way there is no chance of fire damage to the residual crop trees.
- Post-harvest fires can be intense and must be executed carefully.

Example #2a

- **But the results can be amazing and extremely beneficial for oak.**

Example #2b

- If burning is not feasible, then a 3-step shelterwood sequence sometimes works.

- Step 1 is removal of the midstory. This reduces stocking to about 70% and creates a diffuse understory shade.

- If possible, make this treatment commercial. But, it may be an expense.

Example #2b

- Chestnut and northern red oak will slowly respond to this light level. Black and white oak will not.

- When the oak seedlings begin to fall behind in height growth, conduct a first removal harvest.

- Be sure to smash down all the understory, forcing the seedlings to sprout.

Example #2b

- Step 3 is a final removal cut that occurs in 7 to 10 years.

- Again, be sure to smash down the understory layer so the reproduction is forced to resprout. This will favor the oaks and other large-rooted species.

- Check the stand 7 to 10 years after the final harvest to see if crop tree management is needed.

Can SILVAH Be Used For Restoration?

- A mixed oak stand in southern Ohio.
- Oak SI_{50} ~ 65 ft.
- Stand age = 90 years.
- Basal Area = 123 sq. ft (80 sq. ft is oak).
- Trees/acre = 212.
- Rel. Density = 95%.
- Merch. Vol. = 17 mbf/acre.
- Oak Seedling Stocking = 35%
- Des. Seedling Stocking = 15%.
- Undes Seedling stocking = 80%
- Deer Impact = 2.

SILVAH & Restoration

- **Manager does not want to harvest the stand, but does want vigorous oak reproduction present to eventually replace the overstory oaks.**

- **At this time, SILVAH doesn't produce restoration prescriptions.**

- **This no-harvest objective causes SILVAH to recommend no action.**

SILVAH & Restoration

- **SILVAH can be forced to recommend a regeneration prescription.**
- **In this case, doing so leads to seedbed prep burning because of the lack of desirable reproduction and abundance of undesirable seedlings.**
- **Dormant-season burning is the best approach to maintain the existing oak seedlings while trying to establish more.**

SILVAH & Restoration

- **However, it is unlikely that vigorous oak reproduction can be maintained indefinitely without opening the canopy.**

- **Also, at some point in time, fire will have to be withheld for many years so the oak reproduction can grow to pole size and be able to withstand subsequent fire.**

- **I'm not sure this prescription is feasible.**

QUESTIONS ?