

Longleaf: The Tree

A Natural History

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Overview

- Plant Biology 101
- Growth stages of longleaf
- Managing along the life cycle
- Cone production
- Natural regeneration process



Plant Biology 101

Photosynthesis produces sugars (carbon based compounds) that are the building blocks for growth & maintenance of living cells.

Photosynthesis is controlled by the availability of key resources from the environment:

- Water
- Sunlight
- Soil nutrients
- Carbon dioxide



Plant Biology 101

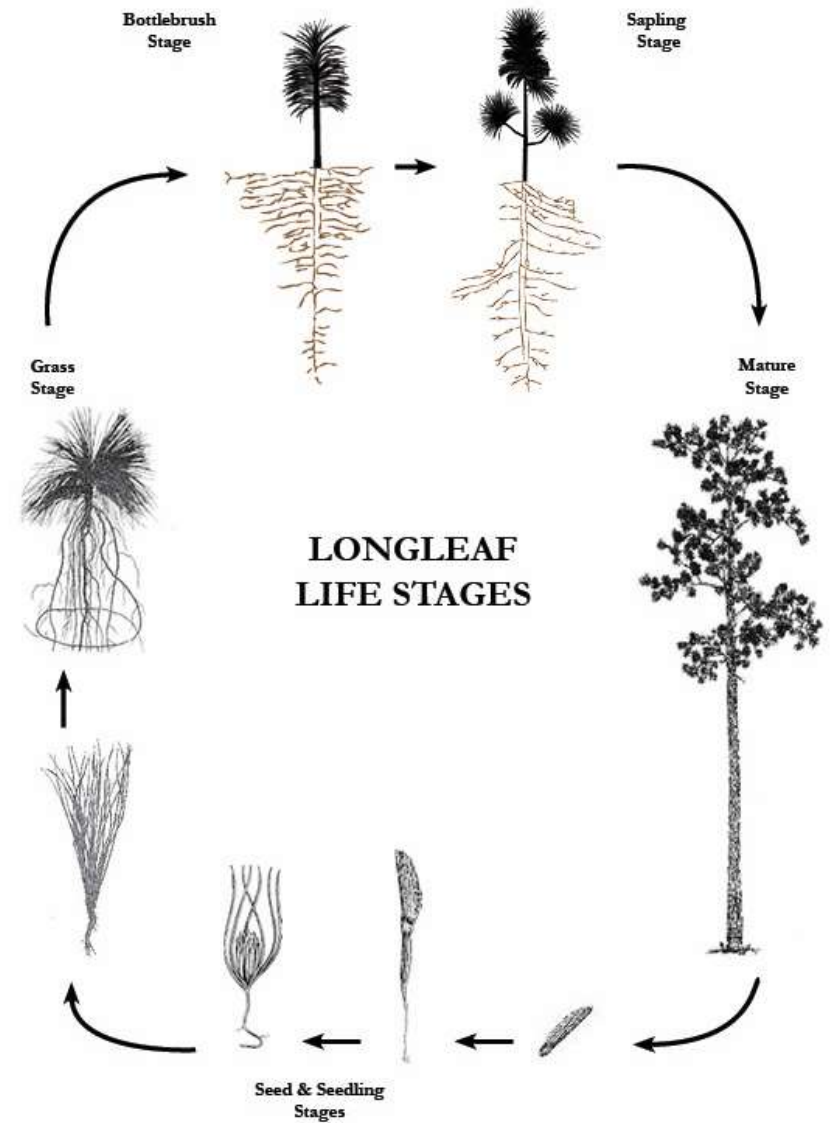
Resource availability is impacted by plant competition:

- Species
- Density
- Structure

Silvicultural tools are used to manage competition, maximize growth, and increase leaf area. Ultimately, silviculture can manage to maximize a plant's photosynthetic potential.



Managing through the natural life stages of longleaf

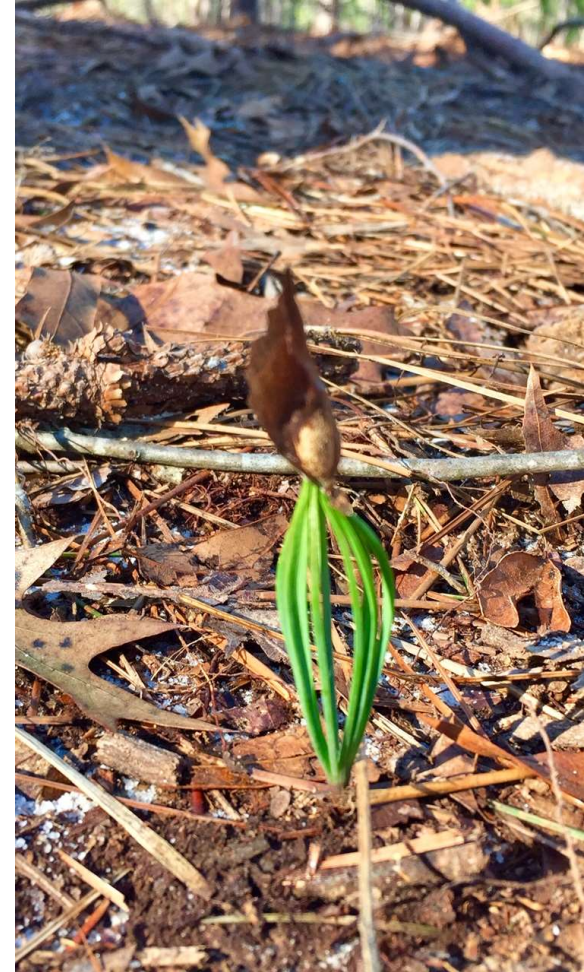


Seedling Stage

- Cones release seeds in Oct and Nov of seed year
- Seeds will germinate almost anywhere, but they generally need to land on mineral soil to survive subsequent droughty periods.
- *Or this stage occurs in the nursery

Management:

- Very susceptible to fire, drought and predation during this stage.
- Avoid burning the year following seedfall if natural regeneration is your objective.
- **1 year** or more to reach the next life stage...



Grass Stage

- The growing bud of the tree is protected by a thick arrangement of needles at ground level.
- The grass stage may last anywhere from 1 to 7 years depending on the degree of competition (resource availability).

Management:

- Burn early to establish a frequent fire regime.
- Introduce a cool-season fire as early as conditions are met (fine fuels, RCD, vigorous growth)
- Control competition with herbicide as alternative or complementing treatment to fire.



Grass Stage

“When will the grass stage end?”



- We do not understand all the physiological controls
- Appears to be genetically controlled
- Length of time in the grass stage also influenced by the environment
 - Cultural treatments can reduce time to reach a **1” Root Collar Diameter** (*resource availability)
 - Seems to require considerable root development
 - Do we want to speed it up?



Seedling and Grass Stage Root Growth



Planted seedling roots can grow 6 feet or more in length during the first year after out-planting



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Height Initiation



Begins once root collar diameter (RCD) = 1"

Also depends on the availability of light, water and nutrients



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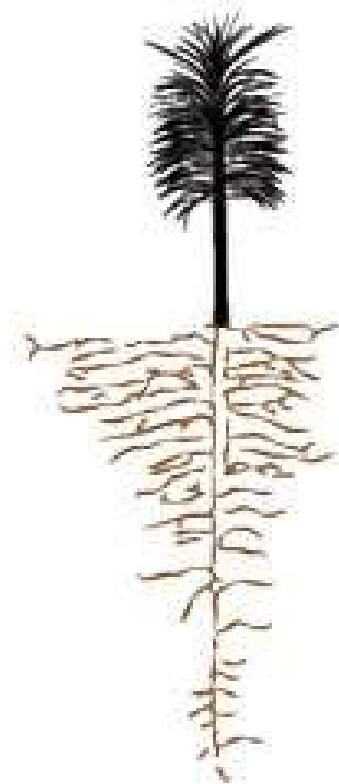
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'The Rocket Stage'

- Characterized by a single, white growing 'leader' bud emerging quickly, usually first in February, followed by subsequent growth flushes
- Protective needles begin to grow throughout spring/summer
- Height initiation is now "on"!

Management:

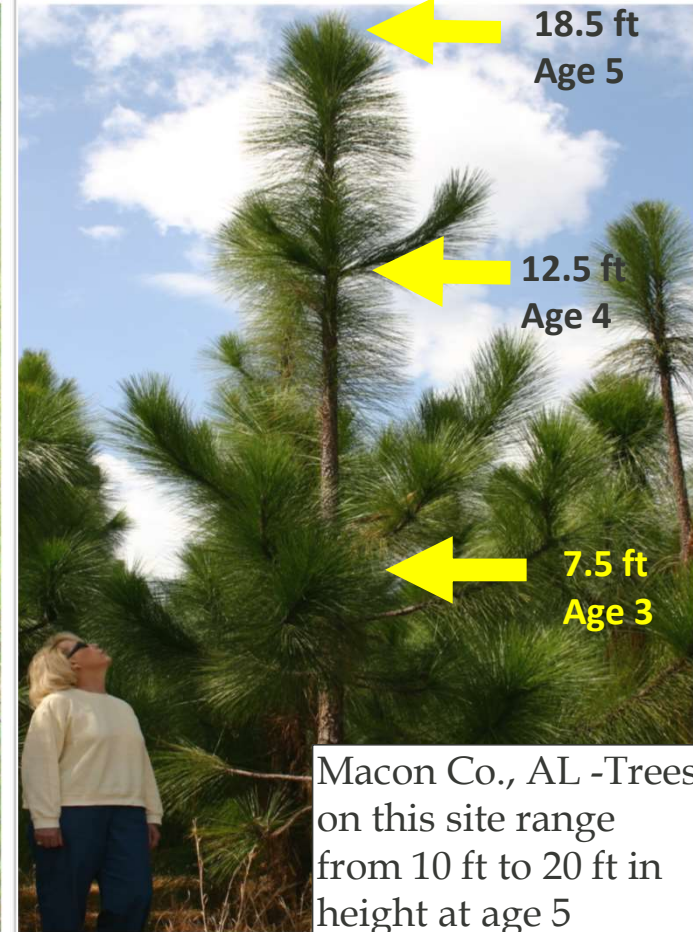
- Opt for dormant season fires during this phase.
 - Avoid candling periods, mindful of fuel loading at height of longleaf.
 - Herbicide spot-treatment of competition – good chance to get a handle before problems grow out of control.
 - Consider groundcover seeding if fine fuels are lacking.
- Balance this with selective herbicide plans, if any.



**Bottlebrush
Stage**



'The Rocket Stage'



Macon Co., AL -Trees on this site range from 10 ft to 20 ft in height at age 5

'The Rocket Stage'

Primary Growth Flushes Southern Pines



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'The Rocket Stage'

Primary Growth Flushes Longleaf with no branch whorls



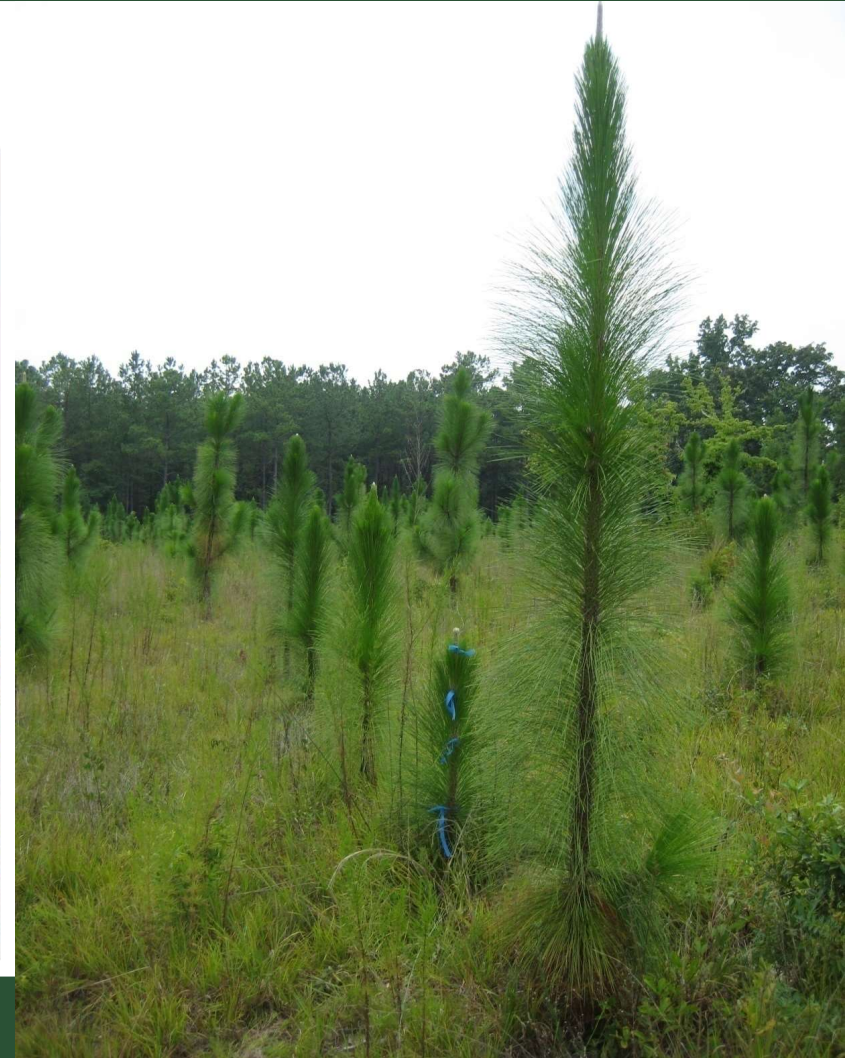
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'The Rocket Stage'

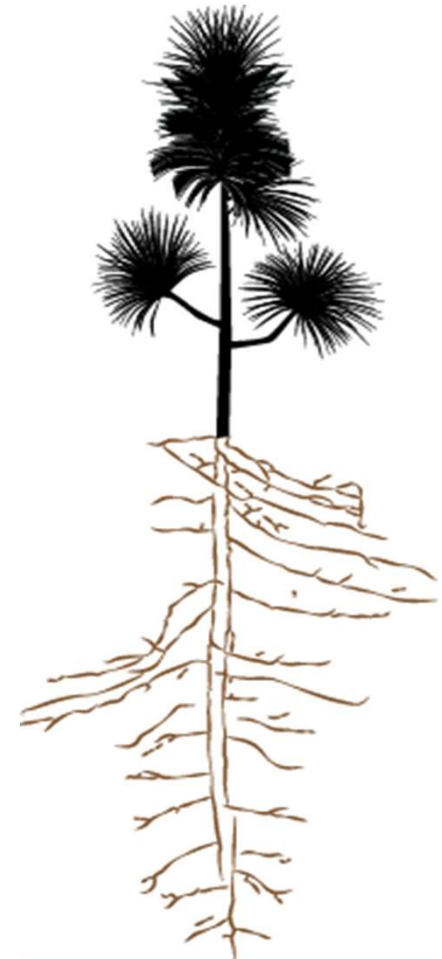
Considerable height variation is common in planted longleaf

Multiple leaders may develop, but one will emerge as dominant



Sapling or Juvenile Stage

- Lateral branches begin to emerge.
- Diameter increases and bark thickens modestly; continues to grow in height at roughly of 3' per year.
- As the tree grows taller and the bark becomes thicker, it becomes less susceptible to fire.
- Once it reaches 8 feet in height and about 2 inches in diameter, it becomes rather robust and is rarely killed by fires of moderate intensity.
- The tree will remain in this stage for several years.



Sapling or Juvenile Stage

Management:

- Continue a frequent burn program. Less concern now over damage to terminal bud.
- Still mindful of fuel loading and ignition techniques employed to minimize heat residence.
- Begin to see pine straw potential.
- Keep nuisance plants at bay.
- Monitor for pests and pathogens.
- As the stand matures, first thinning may occur.
- Reduction to desired basal area for objectives.
- Cull out malformed or low vigor trees for a robust developing stand for wildlife or timber objectives.

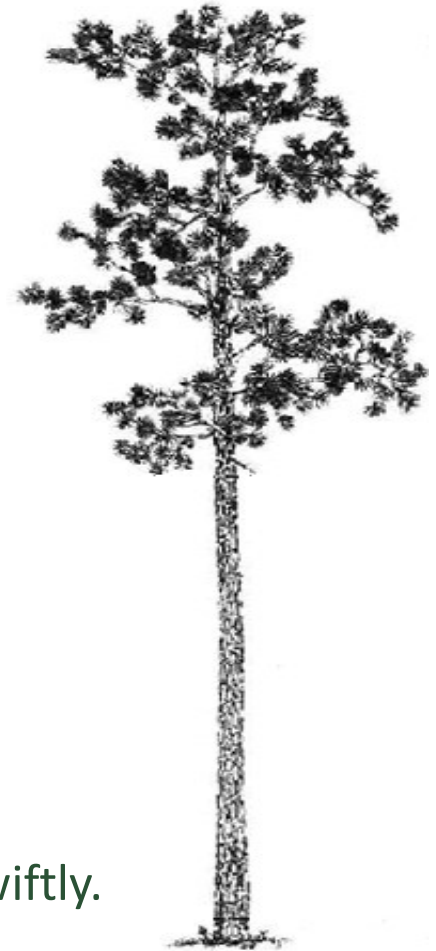


Mature Stage

- Marked by sustained growth and cone production
- Lower limbs may be shed or pruned off by fire. The trunk is relatively straight, first branches beginning high above the ground level.
- On more fertile soils, the tree may continue to grow in height up to 110 feet. On poorer soils, the tree may only grow to 60 feet.

Management:

- Continue frequent fire, varying season of burn
- Harvesting to meet landowner objectives and income potential
- Pole and sawtimber markets may become available
- Increasing value for wildlife habitat
- Ecosystem services of a long-lived tree and ecosystem
- Monitor for pest and pathogens, deal with appropriately and swiftly.



Older mature and Old growth

- After about 70 -100 years longleaf essentially ceases height growth.
- May take on a “flat-topped” appearance.

Management:

- Take care to keep fire frequent and low intensity. Prevent build up of duff from fire exclusion.
- Wildlife value increases exponentially in mature and older mature stands of longleaf.



Longleaf Pine

- The longest-lived of the southern pine species. Throughout most of its range, individual longleaf pines can reach 250 years in age (with trees in excess of 450 years old having been documented).
- Although a longleaf forest looks like and is often defined as an "old-growth" stand, it still has approximately 2/3 of its trees less than 50 years old.



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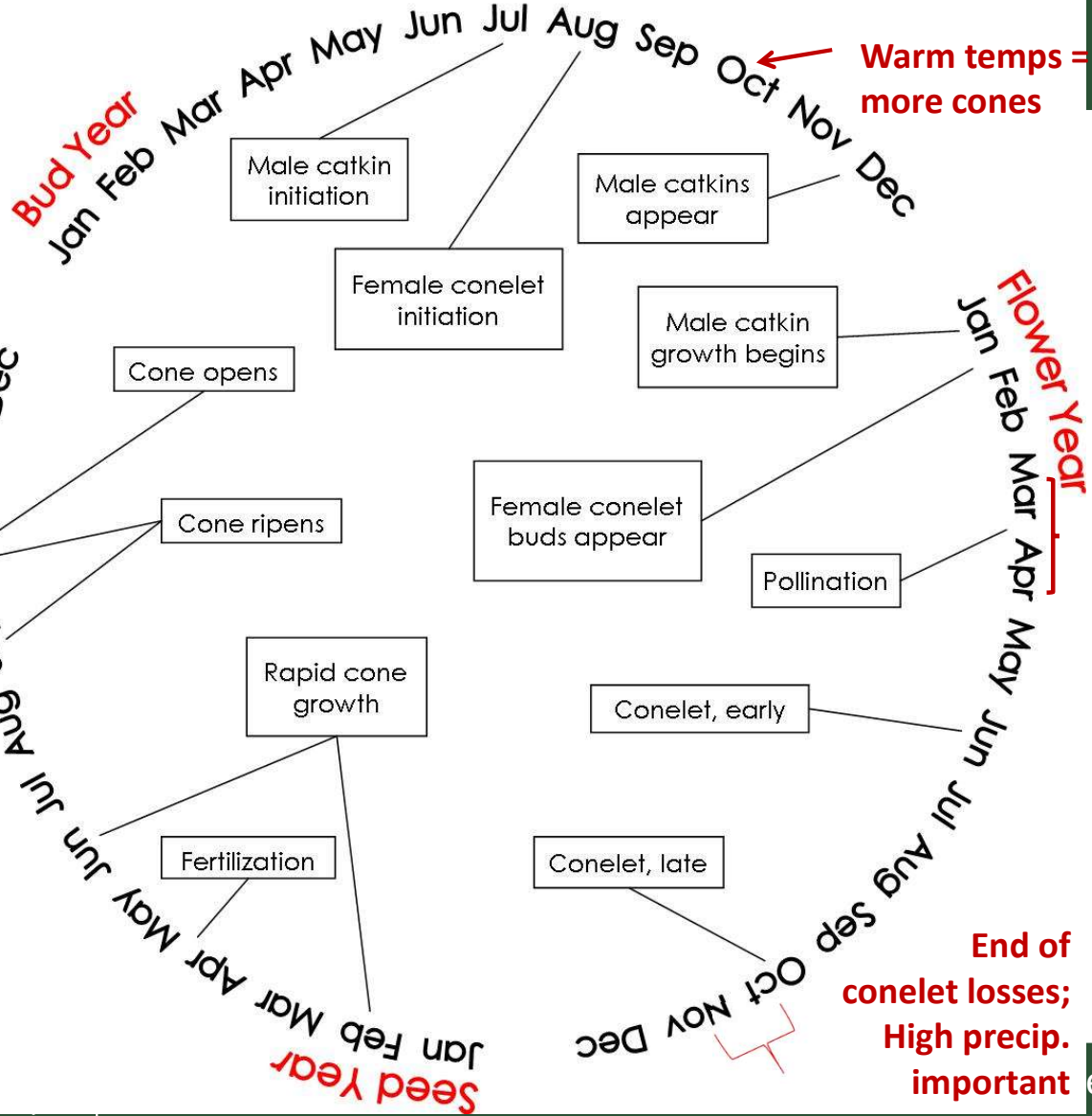
Cone Development in Longleaf Pine

A three-year cycle



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Warm temps = more cones

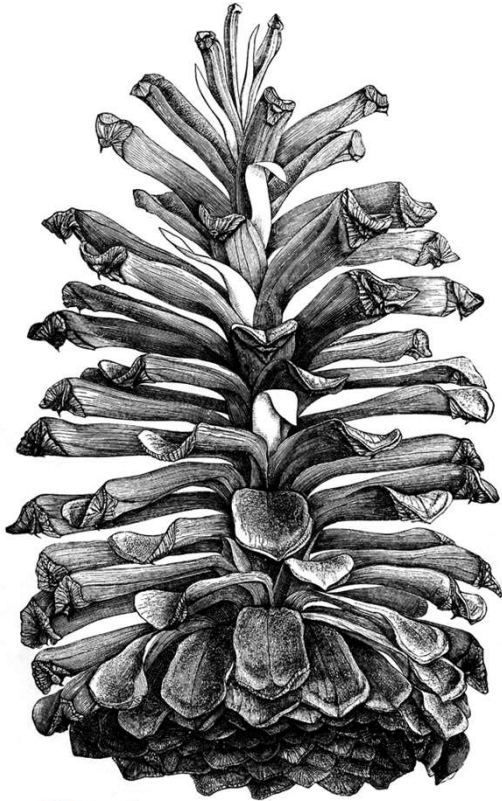
Warm temps prior to bud year increase conelet numbers

Frost can kill catkins & conelets

End of conelet losses; High precip. important



Development of Longleaf Pine Seed



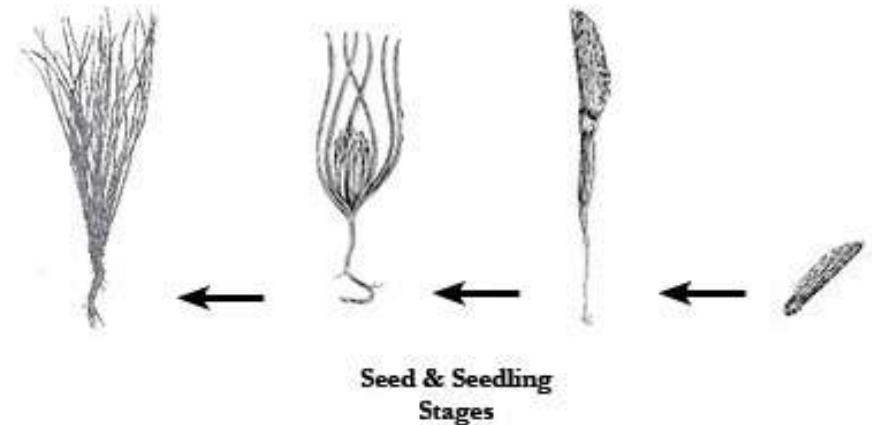
Months prior to seed fall

- 36 months – Warmer temperatures enhance conelets
- 27 months – Differentiation between male & female flowers
- 22 months – Male catkins appear
- 19 months – Female conelets appear and pollination occurs
- 5 months – Fertilization occurs
- Seed fall occurs in Oct/Nov and germination occurs immediately



Cones & Seeds

- Cones most abundant on good sites
- Cones greatest on trees with well-formed crowns, over 30 years old and at least 10" DBH
- Cones decreases when BA exceeds 30 ft²/Ac
- Seeds per cone vary from
 - 50/cone in a good year
 - 35 in an average year
 - 15 in a poor year



From Croker & Boyer 1975



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Evaluating cone stands, from Wahlenberg

Heavy cone crop

- 85-95% of trees bear cones
- 50% of trees have 50 cones or more

Medium cone crop

- 65-85% of trees bear cones
- 20% of trees have 50 cones or more

Light cone crop

- less than 65% of trees bear cones
- 5% of trees have 50 cones or more

“Round, sound specimens, ranging from 11”-15” DBH and with ample crown and moderately dense foliage were the most dependable cone bearers...”



Longleaf Flowers



**Female
Conelets**



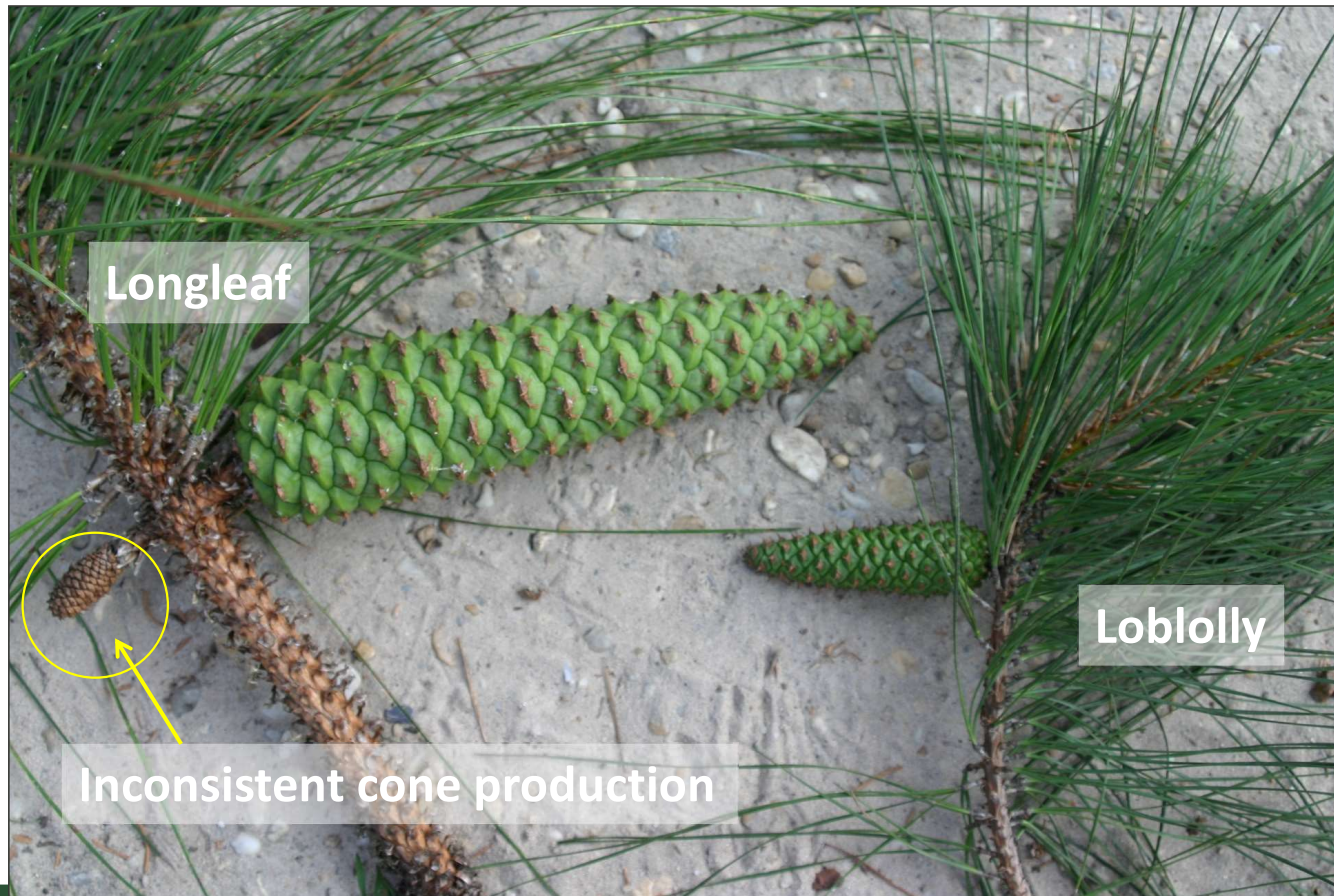
**Male
Strobili**



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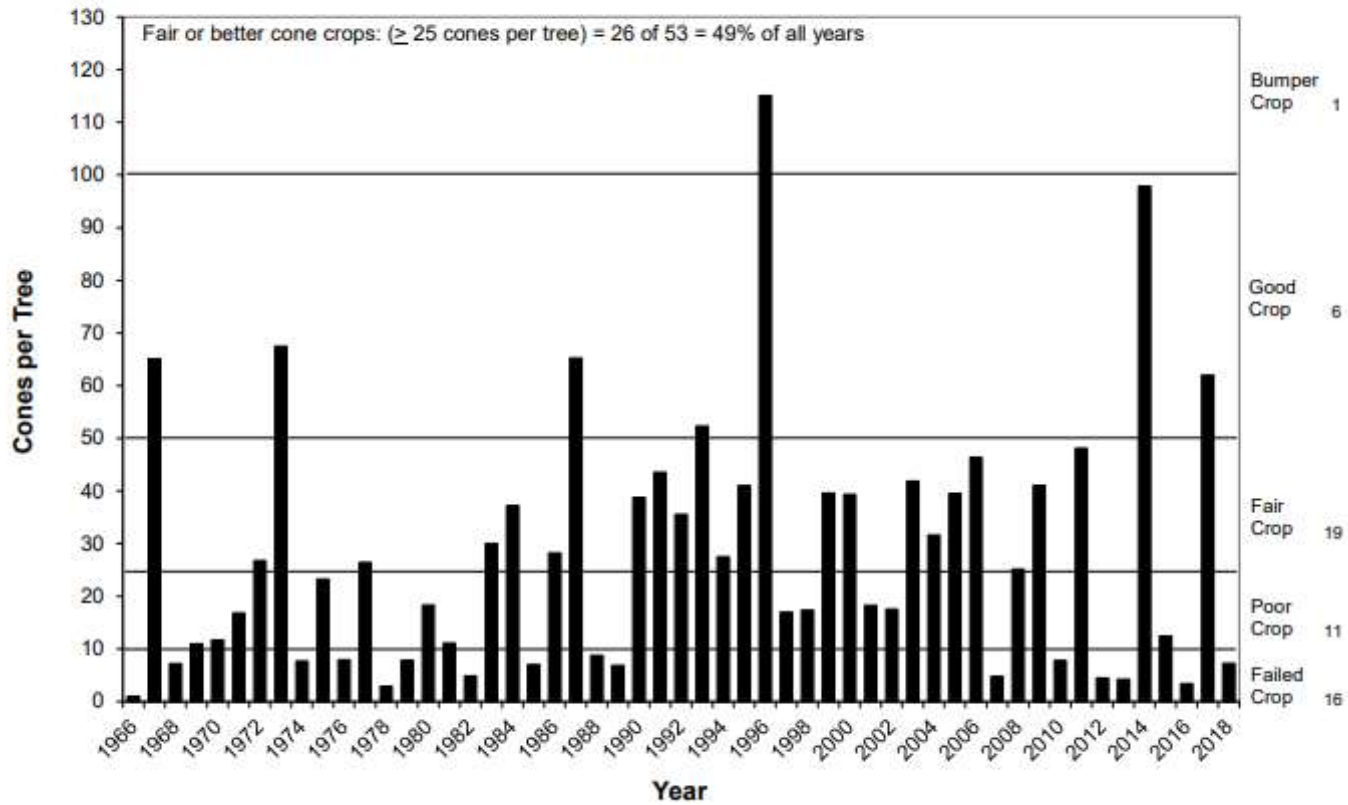
Longleaf Cone



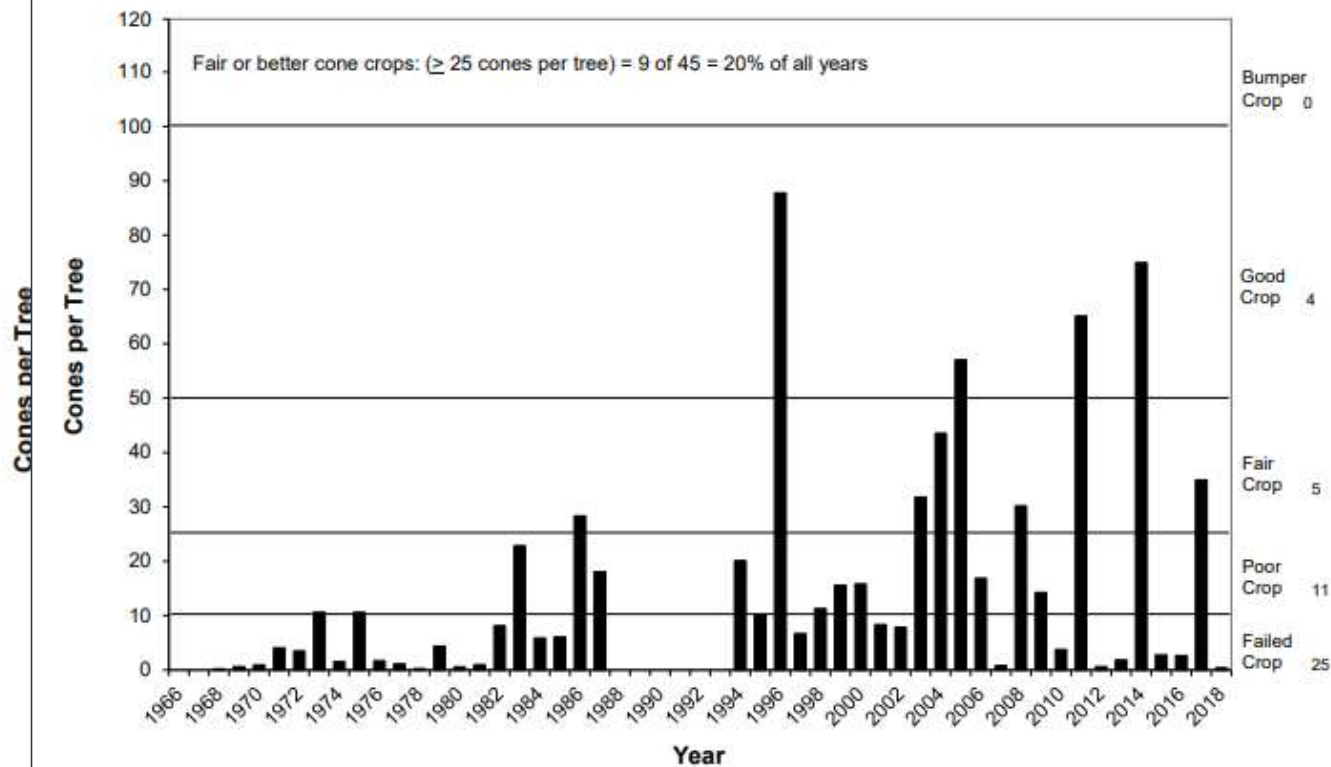
Longleaf Cones



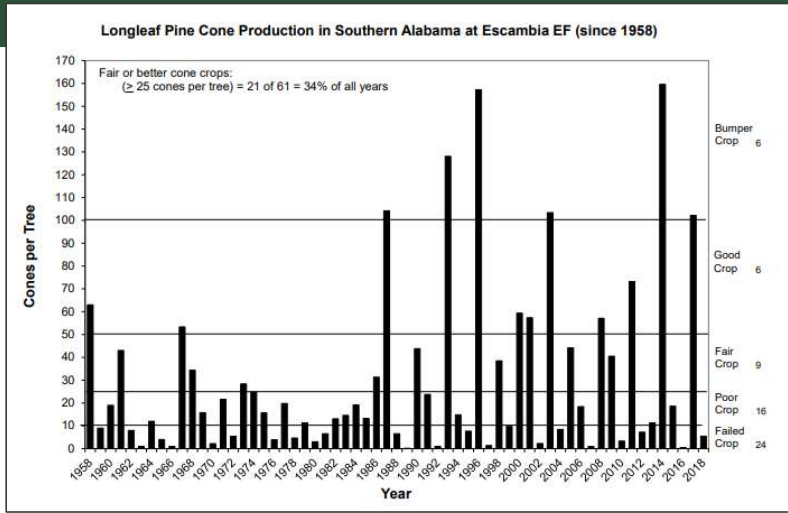
Longleaf Pine Cone Production in Southern Region (since 1966)



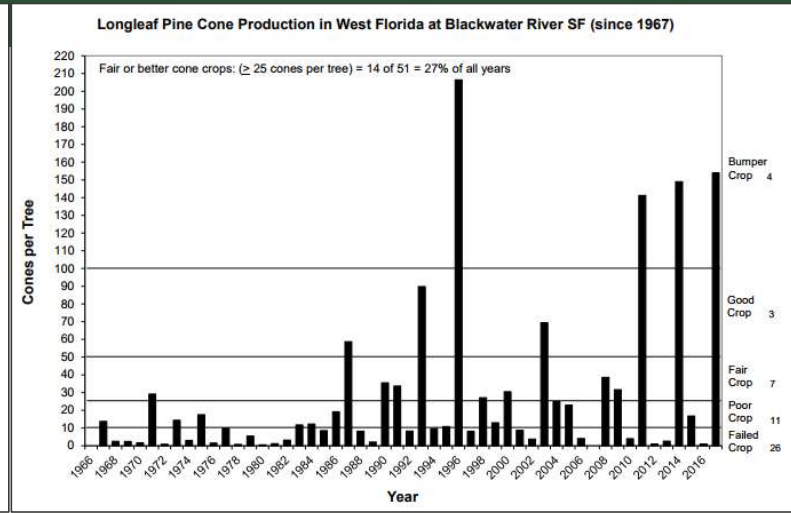
Longleaf Pine Cone Production in Western Florida at Eglin AFB (since 1968)



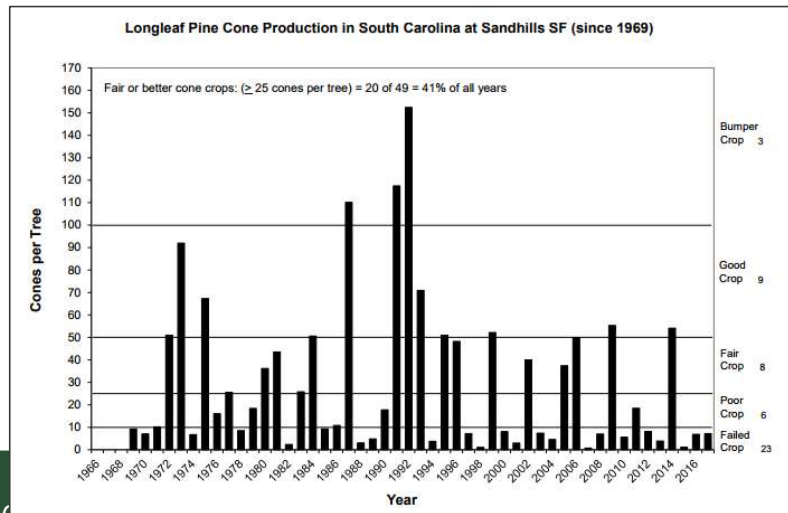
Alabama



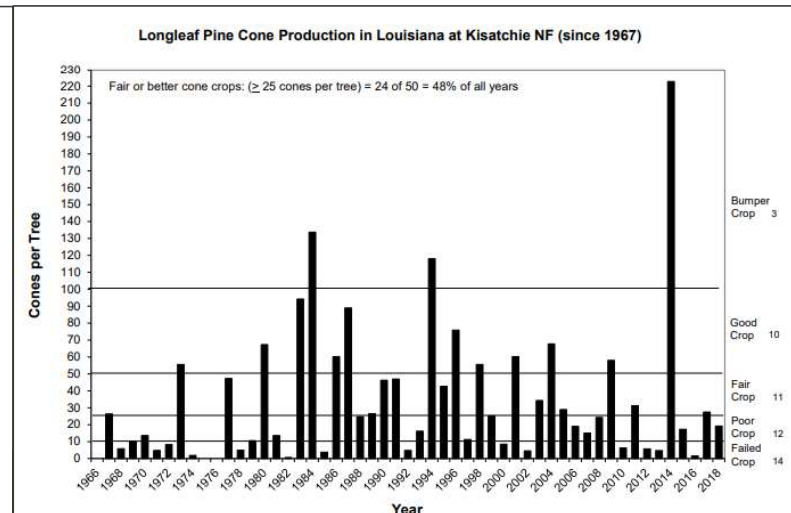
Florida



South Carolina



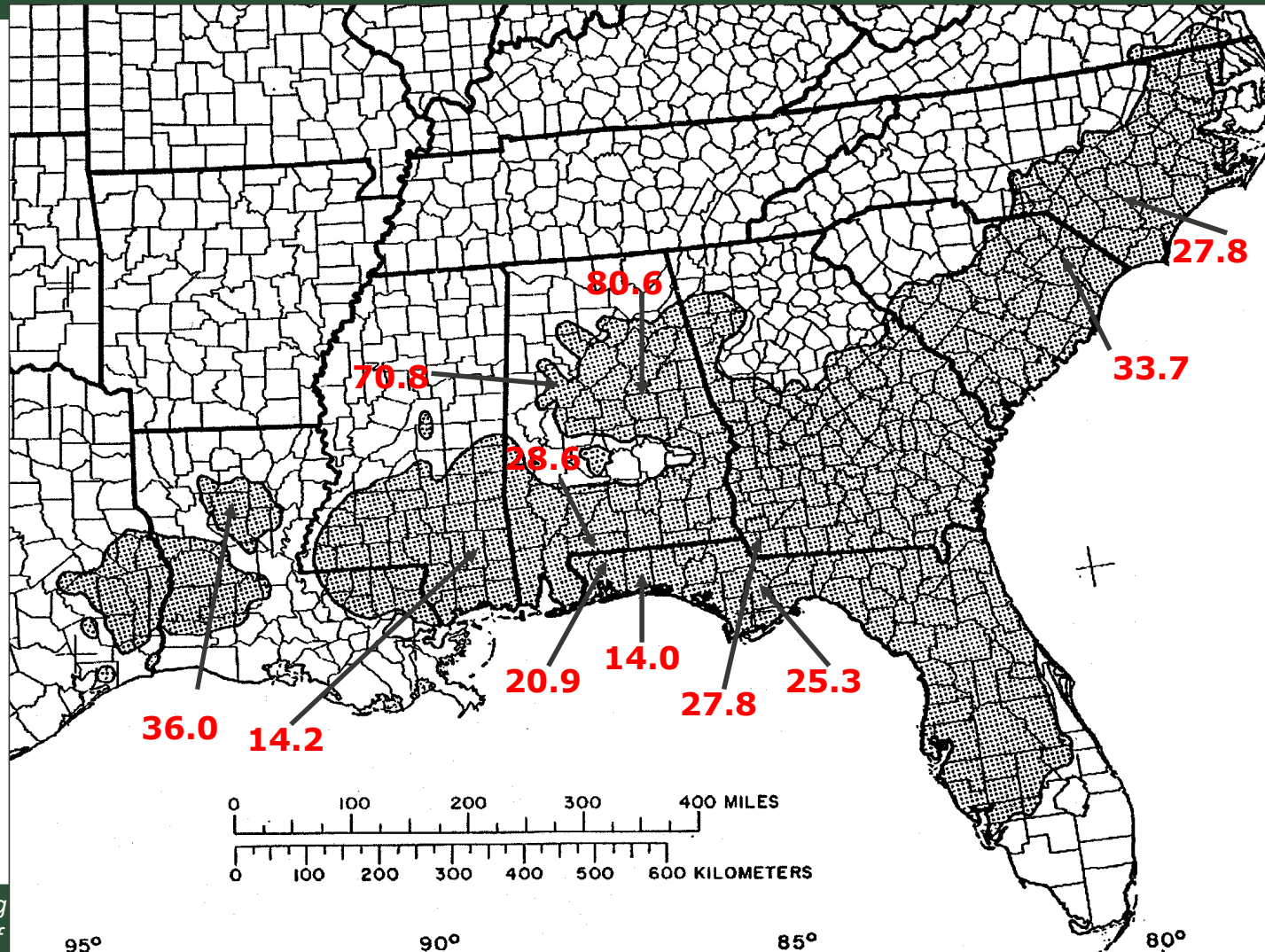
Louisiana



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ral History

Average annual cone production per tree



Seed Dispersal and Survival

- Heavy seed = short dispersal distance
- 71% disperse within 65 feet of the parent tree
- Wind dispersed in October and November, generally
- 1st year losses are greatest
 - Frost, flood, disease, logging, fire, drought, predation



Managing for Natural Regeneration

“Two-year” cone—allows for mgmt. to prepare a receptive seedbed

Sporadic seed producer

30-40 BA ideal for cone production

Needs 30 cones/tree or ~1000 cones/acre

Manage with frequent fire



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Managing for Natural Regeneration

- Plan for a dormant or early growing season burn prior to seed fall
 - If seed falls on fresh black, too easy for foragers to consume before germination
 - If seed falls on dense understory regrowth, likely will not reach bare soil for germination
 - Doubles rate of seedling establishment



Managing through the life of a longleaf

- Height growth begins when RCD=1”.
- Sound management practices can improve on how time is spent in the grass stage.
- Longleaf have between 2-7 flushes of growth/year.
- Longleaf grows in height comparably with other SYP; diameter lags during early life stages.
- Growth habit of longleaf pine and fire ecology go hand in hand.

“The pine that fire built”



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