## Crop tree management for mast production

A report of crop tree release treatments at Frolona Farm on the Davis properties, Heard County, GA. October 2024.

#### Site introduction and criteria overview

Crop tree release treatments have been initiated at four different sites on the property total ing 141 acres. The four areas are a twenty nine acre tract of a ten-year-old clear-cut with remaining oaks on an east-facing ridge, a thirteen acre tract of a middle aged Oak-Pine Woodland on an eastern-facing slope, a five acre tract of Dry-mesic Forest on a south-facing slope, a twenty-nine acre tract of a middle and old aged Oak-Pine Woodland on a north-western facing slope, and a sixty five acre tract of Montane Longleaf Woodland on a south-east facing slope.

Desired species of hard-mast producing trees are those that can benefit from being released and are 1) healthy and mature, and 2) naturally dominant or characteristic of the surrounding plant community. In few instances a tree may be desirable but not entirely characteristic of the natural plant community but has been selected and released due to its health and vigor. Oaks and hickories were the primary crop trees selected due to the frequent occurrence of fire onsite and the targeted reference conditions would continue to favor these species. Oak species released include *Quercus stellata, Q. falcata, Q. alba, Q. rubra, Q. velutina, Q. marilandica, Q. pagoda, Q. coccinea,* and *Q. nigra.* Hickory species released include *Carya glabra, C. lacinosa, C. ovata, C. pallida,* and *C. tomentosa.* A small number of *Fagus grandifolia* were identified as healthy and dominant/co-dominant and released.

Planning and implementation of crop tree release was performed according to CSP requirements, NRCS *CPS Code 666 Forest Stand Improvement*, and the University of Tennesee *PB1774 Technical Guide to Crop Tree Release in Hardwood Forests*. In all but the Montane Longleaf tract, crop trees were released at 1-2 trees per acre. In the Montane Longleaf tract, crop trees were released at a higher rate, averaging seven crop trees per acre. The increased amount in the Montane Longleaf tract has been applied due to additional considerations for the regeneration of Longleaf Pine, rare understory species such as *Symphyotrichum georgianum* and *Solidago tarda,* and declining animal species such as *Colinus virginianus* (bob-white quail). Treatments are applied during the dormant season o reduce the risk of habitat disturbance, disease, and insect infestation.

### Frolona Farm Crop tree management for mast production, 2024



Dry-mesic Forest



Old-age Oak-Pine Woodland

Montane Longleaf Woodland

#### Site summaries

In the five acre stand of Dry-Mesic Forest, a total five crop trees were selected for release. This stand has had some commercial thinning done in the past and many young and middleage trees currently exist. Releasing selected crop trees from this competition will reduce overall stand density to some extent, but will more closely resemble patch cuts leaving openings around crop trees where understory biodiversity can be encouraged. Species selected for release in this area are *Fagus grandifolia, Quercus alba,* and *Quercus stellata, r*epresenting five separate size classes with DBH ranging from 30-66 cm. 80% of the crop trees were pulpwood timber quality due to various factors such as cat-faces. Allowance for these injuries were made because of the prominence of Beeches in this area compared to the other stands.

In the thirteen acre stand of Middle-age Oak-Pine Woodland, a total of thirteen crop trees were selected for release. This stand has had some commercial thinning done in the past and many mature and a few old-age trees currently exist. In addition to releasing high quality crop trees that are characteristic of the plant community the treatments will also maintain the open structure of Piedmont Oak-Pine Woodlands allowing for the maintenance of high quality wildlife habitat and oak and pine regeneration. Species selected for release in this area are predominantly *Quercus stellata* and *Quercus falcata*, but also include *Quercus alba*, *Quercus coccinea*, and *Quercus marilandica*, representing six size classes ranging from 29-55 cm DBH. 78% of the crop trees selected were of sawtimber quality. This ensures a high likelihood of positive response from release treatments and promotion of healthy genetics for the ecological succession of the stand overall. Pulpwood allowances were made for sweeps only.

In the sixty-five acre stand of Montane Longleaf Woodland, a total of 453 trees were selected for release. This stand had been previously high-graded in the past; with less than 100 middle-old age Pinus palustris and hundreds of mostly pulpwood or cull quality hardwoods (predominantly oaks and hickories) remaining. After logging, the site was planted with Pinus palustris, most of which are now young saplings (few are still in the grass stage at the time of this report). *Pinus palustris* regeneration is also occurring on this site due to continued management with prescribed fire. Due to the unique and rare ecology of this stand, several alterations in selection criteria and treatment guidelines have been made. Allowances were made for a higher number of pulpwood quality crop trees due to the insufficient amount of sawtimber quality trees that could be found. Additional guidelines were included that 1) A higher number of crop trees per acre were selected to cut in order to encourage the open canopy savanna characteristic of Montane Longleaf systems, 2) no mature or old Pinus palustris or Pinus echinata can be removed, 3) Pinus palustris and Pinus echinata trees competing with the selected crop tree must be prioritized to remain, if possible, and 4) no

more than two *Pinus palustris* or *Pinus echinata* saplings were allowed to be removed per crop tree. These additional guidelines were sometimes difficult to adhere to, but the enhancement has still been able to be achi ved. For more information on the justification of oak management in Longleaf ecosystems, see "Considerations" below. Species selected for

release in this area were *Quercus alba, Quercus coccinea, Quercus falcata, Quercus marilandica, Quercus pagoda, Quercus rubra, Quercus stellata, Quercus velutina, Carya glabra, Carya lacinosa, Carya ovata, Carya pallida, Carya tomentosa, and Fagus grandifolia, representing thirteen size classes ranging from 16-84 cm DBH. 17% of the selected crop trees were of sawtimber quality, 45% were of pulpwood quality, and 0.2% were culls. However, 37.8% of the crop trees' timber quality were not initially assessed as this data did not begin to be collected until later in the project and will be collected at a later date.* 

In the twenty nine acre stand of Oaky clear-cut a total of twenty four crop trees were selected for release. This stand had been mostly clear-cut with a few old and mostly even-aged pines and oaks remaining of mixed timber quality with a dense and nearly impenetrable understory of young hardwood saplings and shrubs. Due to existing conditions, few treatments may be required in this stand except perhaps mulching (which may be outside the scope of this enhancement) and prescribed fire (which is applied in another enhancement program). However, some selected crop trees still required release. Species selected for release in this area were *Quercus alba, Quercus coccinea, Quercus falcata, Quercus nigra,* and *Quercus stellata,* representing five size classes ranging from 35-63 cm DBH. 63% of the crop trees selected were of sawtimber quality, and 38% were of pulpwood quality, mainly due to sweeps.

In the twenty nine acre stand of Old-age Oak-Pine Woodland, thirty seven crop trees were selected for release. This stand has had shelterwood cuts in the past and has maintained a relatively open characteristic. The lower—1-2 trees per acre—guidelines were used here to enhance some of the existing openness with small gaps, as is characteristic of Piedmont Oak-pine Woodlands. Species selected for release in this area were predominantly *Quercus alba,* as well as a number of *Carya glabra, Carya tomentosa, Quercus coccinea, Quercus falcata, Quercus rubra, and Quercus stellata,* representing twelve size classes ranging from 16-70 cm DBH. 58% of selected crop trees are of sawtimber quality, and the remaining 42% were of pulpwood quality, mainly due to sweeps.

### **Ecological considerations**

When marking competing trees for culling, snagging, or harvesting, the health of the competing trees and plant community characteristics are all considered; sometimes healthy competing trees that are characteristic of the surrounding plant community are left standing if the crop tree can still be released on remaining other three sides.

In the Dry-Mesic Forest, Beeches were of primary importance to promote mast diversity across the CSP site and to render the results of treatment closer to Piedmont Mesic Forest reference conditions. In the Middle-age Oak-Pine Woodland, previous thinning activities have resulted in high quality wildlife habitat nearly typical of historical conditions and crop tree release is done simply as an enhancement of mast quality and abundance. In the older aged Oak-Pine Woodland, crop tree release was made only on ridges in order that the moist ravines do not lose water from evaporation. In the Oaky clear-cut area, minimal treatments are done, but a small section of river cane (*Arundinaria gigantea*) was released at the same

time as a few oaks to increase the density of canebrakes in the understory, a valuable wildlife asset that has become rare in the modern Inner Piedmont landscape. And in the Montane Longleaf Woodlands, pyrophytic oaks were prioritized over other mast producing species and the average crop trees released per acre was much higher o that the resulting structure promote the proper ecological succession of these rare ecosystems and to allow for high quality habitat of many declining warbler, sparrow, woodpecker, and quail species.

Individual soft mast trees and shrubs were not targeted as part of this project because the resulting canopy openings will likely promote the existing soft mast species on site as well as the targeted canopy hard mast trees. Soft mast species encou tered during survey and treatment activit es include *Vaccinium arboreum, Vaccinium pallidum, Vaccinium corymbosum, Asimina parviflora, Rubus spp., Rhus glabra, Rhus copallinium, Nyssa sylvatica, Cornus florida, Smilax spp., Toxicodendron spp., Vitis rotundifolia, Fragaria virginiana, Rhododendron spp, and Passiflora spp. Neighboring tracts will be placed under stand density reduction treatments with basal area objectives rather than crop tree releases, increasing light to the understory and encouraging soft mast production. All designated tracts for crop tree release (except the Montane Longleaf Woodland) are managed with prescribed fire at average return intervals of 3-4 years, which will maintain peak soft mast production in the understory; the Montane Longleaf tract receiving a 2-year average fire return interval.* 

In situations where the opportunity presented itself, crop tree release treatments were applied in such a way to also release or partially release (1-2 "sides") individual *Pinus palustris* and/or *P. echinata* trees in order to promote the health and regeneration of these important species.

### Frolona Farm Canopy openings from crop tree release management



Montane Longleaf Woodland

### Plans and specifications

Crop trees being selected are hard-mast producing canopy trees (*Quercus, Carya, Fagus,* and *Castanea*) that are—with some allowances—healthy sawtimber quality and presumed to maintain good health into the future. Primary crops are hard mast (nuts) for wildlife habitat enhancement, but various other non-timber forest crops produced by the same species include oils, tannins, sap (sugars), and medicinal compounds. It is advised that selected crop trees not be harvested, but allowed to be seed stock for ecosystem recovery and future timber production. No specimens of *Castanea* were found in any site.

# Diagrams from *Technical Guide to Crop Tree Release in Hardwood Forests*, University of Tennessee Extension







Crop trees ar released on a minimum of three sides of their crown with a minimum of fifteen feet between their crowns and neighboring tree crowns. Trees must exhibit crowns that are dominant or co-dominant; intermediate crown classes are only allowed with suitable justification (eg at-risk species). Trees that are underneath the crop tree canopy are not considered competing trees.

Selected crop trees are marked with double wrap of flagging and the following data collected on each tree: species, approximate location, sides released, crop type, DBH (cm), understory brush density, timber quality index, timber quality reasons (eg "sweep"), crown competitive class, and all competing trees. Competing trees are marked with a single wrap flagging and have the following data collected: species, stem origin, whether to cull (remove) or not, and timber quality reasons. Competing trees with their timber quality reasons were recorded to be able to have a list of reference for any marketable pulpwood/craftwood timber that may be harvestable during treatments. A minimum of one tree per acre is snagged and a minimum of one tree per acre is left dead and down to provide sufficient nesting and habitat choices. There were no minimum DBH requirements for dead and down trees. Any *Pinus spp.* hat is culled or removed must not be snagged, but felled completely down to reduce the risk of pine bark beetle infestation during the initial stress responses of girdling.

### Operation and maintenance

Surveying, data collection, and record-keeping are done with the QField mobile device application. Data is synced from the field to QfieldCloud, an Open GIS cloud service. All data collected is synced through QGIS to a hard-drive where the all the main GIS project files for the entire Frolona Farm boundaries are stored. Back-up of data is done weekly and QfieldCloud stores the three latest versions of all data files. A QField map layer with a 1x1 acre grid overlay is used to navigate during surveying and snagging operations. Using the Open GIS suite of software (QGIS) reduces administrative costs, increases the ability to innovate, and ensures trust and transparency in the IT software that we use on a daily basis. The ability to use a smart-phone rather than a laptop or tablet has made a huge difference in traversing terrain and recording treatments. Marking trees is done with non-toxic dyed biodegradable flagging tape to eliminate introduction of PFAS, phthalates, an other toxins associated with plastic residues.

Snagging and felling are done by chainsaw. Snagging is done by mechanical girdling. A cut with a chainsaw is made one-inch deep all the way around the stem at the base of the stem. Another cut is made one-inch deep all the way around the stem, six inches above the first cut. During logging activities, logging arches will be utilized for harvesting to reduce scarring and rutting of soils and avoid excessive damage to understory vegetation. Snagging, felling, and logging operations are done in the dormant season to reduce adverse impacts to vegetation and wildlife. Georgia Forestry Commission best management practices for streamside management zones and road buffers are respected in all acreages where crop tree management is occurring. Trees are not felled or snagged within these zones. NRCS *CPS Code 560 Access Road* will be used in directing access for logging. Slash and woody residue are converted to biochar amendments on-site. Small branches and twigs can remain for prescribed fire fuels and invertebrate habitat.

Crop Tree								
Status	Species name	Sides released	Crop type	DBH (cm)	Understory brush	Timber quality	TOI reason	Crown class
Released	Quercus stellata	3	{Hard mast, Mulch, Oil, Tannin, Wood}	29	Moderate	Sawtimber	{No damage}	Co-dominant
Competing	Trees							
	Tree species	Tree origin	Cull?	Cull reason				
	Quercus stellata	Seed	true	{Fork, Sweep}				
	Quercus rubra	Seed	false	{No damage}				
	Quercus velutina	Seed	false	{No damage}				
	Quercus velutina	Seed	true	{Catface. sweep}				

Sample record of a single crop tree being released.



Selecting a crop tree within an existing woodland stand.



The crown of the selected crop tree is circled in red. This tree is released on one side naturally and must be released on at least two other sides to achieve objectives.





*crown that is co-dominant. Once released, it should begin to expand its crown, increasing acorn production. The health of the tree makes it much more likely to survive and provide acorns for decades or centuries into the future.* 



The crop tree has been selected and marked (center, double-flagging). The two competing trees to be girdled are marked (left and right, single-flagging). The selected crop tree has a straight bole and a full crown. The tree on the left has a catface (fire injury) and sweeps; the tree on the right has a fork in the bole and sweeps. These injuries (deformities) put these trees at risk of disease, rot, and further injury in the future, making them poor choices for crop trees. Removing their genetics will reduce the susceptibility to these injuries from the overall gene-pool of the ecosystem as a whole.



Crop tree release Competing tree (injured, girdled) Crop tree Crop tree Crop tree Competing tree (injured, girdled) Competing tree (healthy, remaining) Crop tree

Diagram of the applied release for the selected crop tree.

Mechanical girdling as applied to a competing tree with an injury.

The following NRCS Conservation Practice Standards are applied in the crop tree release program for hard mast (nut) production:

- Forest Stand Improvement (666)
- Access Road (560)
- Early Successional Habitat Development/Management (647)
- Forest Trails and Landings (655)
- Integrated Pest Management (595)
- Prescribed Burning (338)
- Restoration and Management of Rare and Declining Habitats (643)
- Upland Wildlife Habitat Management (645)
- Woody Residue Treatment (384)

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