

A New Form for Reporting Hardwood Superior Tree Candidates

by

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USE OF THE FORM

We are in the process of establishing a Regional Superior Tree Register. There are many superior trees whose locations are recorded only in someone's mind or on a sheet of paper stuffed in someone's desk drawer. We believe that this regional register of superior trees will increase their value by making their existence known to agencies involved in tree improvement. Exchange of plant materials between cooperators will broaden and intensify individual programs. This register will be maintained by the U. S. Forest Service as a joint venture between National Forest Administration (NFA), North Central Forest Experiment Station (NCFES), Northeastern Forest Experiment Station (NEFES), and the Northeastern Area of State and Private Forestry (NA, S&PF).¹

Forms have been printed by NFA for distribution to interested parties through State and Private Forestry and experiment stations.

Reports submitted by foresters working on state or private land will come into the Northeastern Area Office of S&PF at Upper Darby, Pa. This is a contradiction of the instructions on the back of the form. Do not send them to Milwaukee as shown on the form. This is only for the people on the National Forests.

Please send your reports directly to U. S. Forest Service, Northeastern Area, Office of State and Private Forestry, Division of Cooperative Forest Management, 6816 Market Street, Upper Darby, Pa. 19082. When the present form is reprinted, it will be changed to show this address. Completed reports will be assigned an accession number sequentially, preceded by the last two digits of the year reported: 67001. 67002. etc.

¹The area encompassed by this region is the Northeastern quarter of the country—the portion bounded by the states of Maine, Minnesota, Missouri and Maryland.

The pertinent data will be entered on ADP cards and a print-out tear sheet will be run twice each year. Each cooperating agency, whether Federal, state, private, or industry, will receive copies of the Superior Tree Register. This will be revised each printing to add recent accessions and delete trees cut or rejected because of performance when this information is reported. The data will be sorted by state and then by species within the state for each print-out, with the trees within each species arranged in order of decreasing DBH.

The data which will appear on the print-out are: 1. Accession number; 2. Species; 3. State; 4. County; 5. Land ownership; 6. DBH of selected tree; 8. Height superiority over comparison trees; 9. Stem volume of selected tree; 10. Volume superiority over comparison trees; 11. Percent apical dominance; 12. Percent apical dominance superiority over comparison trees; 13. Age at DBH of selected tree; 14. Roundness ratio of selected tree; 15. Lean degree of selected tree; 16. Sweep inches of selected tree; 17. Branch angle class of selected tree; 18. Seed crop class of selected tree; 19. Grain pattern class of selected tree.

Region 9, NCFES, NEFES, and NA, S&PF will join initially in financing the cost of printing the reporting form, clerical time for maintenance of the register, ADP machine time, duplicating, and mailing. However, it may be necessary at a future date to finance the register on a subscription basis. This will depend upon use of the register and the cost of operation.

Any cooperating agency, industry or individual can request copies of the original candidate report by writing the U. S. Forest Service Office in Upper Darby. Requests should cite the accession number on the Register.

The Superior Tree Candidate Report is designed to collect only basic information on outstanding trees. Standards of performance have been set up to screen

out average and slightly above average trees. Only candidates which meet or exceed these standards will be reported on the Register.

The purpose of the Register is to have available in one central location, with adequate facilities for processing, duplicating and distribution, a list of superior trees meeting or exceeding certain standards which are familiar to all cooperators. When supporting data become available, the Regional Superior Tree Register will also separate "elite" trees from "plus" or "superior" trees to denote progeny tested parents.

In many instances, additional information, measurements, or evaluations will be required for individual cooperators before the reported tree is acceptable for inclusion in their particular seed orchard programs. Such things as specific gravity, tracheid length, fruit size, phenology, polyploidy, etc., may be essential in one program but not another. Certain basic information is pertinent to all programs. Rather than collect a burdensome amount of data for all candidates, we set up and described standards of performance under natural conditions. These data will enable forest geneticists to evaluate the utility of reported trees and determine whether or not additional information is necessary before deciding to reject or include an individual. If more specific information is required, a cooperator may request another cooperator for this information.

INSTRUCTIONS FOR COMPLETING THE FORM

The form is designed as a complete unit on one letter-size sheet of paper. The front side provides spaces for location, including a map area, and spaces for entering measurement and performance data. There is also space provided for remarks as well as examination by two separate individuals. The reverse side of the form contains instructions for completing the measurement data. Copies of the forms may be obtained through the U. S. Forest Service office in Upper Darby.

Tree Number: This should be your local number or identification. Most of us actively engaged in the selection of superior trees have devised numbering systems which work well for us. We don't want to change this at all. Put in your local number. An accession number will be given to the report when it is added to the Register.

Species: Use the scientific name.

State, County: Self-explanatory.

Tree Located by: It is good to know who originally found the tree, since you may want to call upon him to help you relocate it at some future date.

Title: Or occupation or address. We want some means of locating the man who found the tree if it is necessary later on.

Date: Self-explanatory.

Tree Is Marked with: This item is important if you have to locate the tree without the help of the original finder. It helps to know if it's painted red, yellow, or white or if it has a blue ribbon tied on it. Sometimes the man may have to blaze a nearby scrub tree. This should be noted under "Other" and described.

Bearing and Distance from Reference Point: We have a difficult time relocating superior trees which are not carefully referenced. The reference point should be obvious throughout the year and easily seen from a long distance.

Name of Landowner: This is important to the tree breeder so he can obtain permission to get plant materials, cuttings, etc.

Map: The squares are exactly 1 inch x 1 inch so you can scale off a sketch map of the location of the selected tree. The instructions ask you to draw or trace a simple sketch map showing reference point, direction, and distance to the selected tree and its relationship to the comparison trees. There is space provided for section, township, and range as used in the public land surveys system. The trees in the Eastern United States, where the rectangular coordinate system of public land surveys was not used, will have to be located on the map area by political subdivision, town, tract number, or some other means.

Selected Tree Rating: After you have selected a tree you consider to be a superior tree, it must be compared with other trees of the same species and age, growing on essentially the same site and under similar stand density conditions. The selected comparison trees should provide a challenge to the superior tree candidate to prove its apparent superiority. The three largest trees in the immediate vicinity should be selected and marked A, B, and C so they can be relocated if later examination is necessary. The comparison trees do not have to be exactly within 66 feet of the selected tree. This requirement is only a guide so the comparison trees used are on the same site. It is very important to use judgment in picking comparison trees growing in the same environment as the selected tree.

DBH: Self-explanatory.

Total Height: This is a somewhat difficult measurement to obtain for many hardwoods. However, the length from the uppermost tip of the tree

HARDWOOD SUPERIOR TREE CANDIDATE REPORT	Tree No. _____		Species _____	
	Section _____ T _____		R _____	
State _____				
County _____				
Tree Located By _____				
Title _____				
Date _____				
Tree is marked with _____ paint, ribbon (Color) (Cross out one)				
Other _____ (Describe mark)				
Bearing and distance from reference point: _____				

Name of landowner _____				

SELECTED TREE RATING											
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
3 Largest Trees <i>(Same species) within 66 feet</i>	DBH <i>(Nearest 1/10 in.)</i>	Total Height <i>(Feet)</i>	Stem Volume <i>(cu. ft.)</i>	Apical Domin. <i>(%)</i>	Age <i>(At DBH)</i>	Round Ratio <i>(0.00)</i>	Straightness		Branch Angle	Seed Crop	Grain Pattern
							Lean	Sweep			
A											
B											
C											
Total											
Average											
Selected Tree											
% Superiority											

ACTION	
<p style="text-align: center;">Initial Screening</p> <p>Candidate <input type="checkbox"/> Accepted <input type="checkbox"/> Rejected</p> <p>Examined By _____</p> <p>Title _____ Date _____</p> <p>Remarks _____</p>	<p style="text-align: center;">Final Screening</p> <p>Candidate <input type="checkbox"/> Accepted <input type="checkbox"/> Rejected</p> <p>Examined by _____</p> <p>Title _____ Date _____</p> <p>Remarks _____</p>

INSTRUCTIONS

This form is used ONLY to report hardwood superior tree candidates. Send two copies to Division of Timber Management, U.S. Forest Service, 633 West Wisconsin Avenue, Milwaukee, Wisconsin, 53203.

MAP. Draw or trace a simple map showing reference point, direction and distance to location of selected tree, and its relationship to comparison trees. Indicate township, range and section. Eastern Forests use county, political subdivision and tract number, or when available use quadrangle number and tract number.

COMPARISON TREES. Three closest dominant trees of same species and age (+ 5 years) within one chain. Comparison trees will be paint marked with the letters A, B and C respectively, to retain their identity. For certain species, not growing in pure stands, comparison trees more than one chain from the candidate will be acceptable providing that the site can be considered similar. Three comparison trees must be used, except for black walnut where no comparison trees are required.

DBH. Measure diameter at 4½' above ground.

TOTAL HEIGHT. Measure total height to nearest foot with a clinometer such as an Abney level or Haga altimeter.

STEM VOLUME. Use Volume Table for Gross Peeled Volume printed below. Interpolate and record volume to nearest cubic foot.

APICAL DOMINANCE. Candidate must maintain a central stem to one-half its total height. Measure the length of the stem to first fork or point where definite central stem is no longer apparent. Record as the percentage of total height.

AGE AT DBH. Determine by increment core which has intercepted pith. DO NOT BORE BLACK WALNUT CANDIDATES.

ROUNDNESS RATIO. Measure long and short diameter. Divide smaller number by the larger number. Record as a decimal to nearest hundredth (0.00). All black walnut, black cherry, yellow poplar, yellow birch candidates must be 0.90 or greater. All other hardwood candidates must exceed 0.80.

LEAN. Record lean as maximum measured in degrees from tree vertical. Record 0° for no lean. Superior tree candidates of black cherry and yellow poplar must not exceed 3°; all other hardwoods, 5°. (5°=1' deviation in 11' length)

SWEEP. Record as maximum inches deviation from straight line projected from point outside bark at top of butt 16' log to 12" stump top along line of maximum sweep. Record 0" for no sweep. Maximum allowable for black walnut, black cherry, yellow poplar and yellow birch is 2". All other hardwood candidates, 4".

BRANCH ANGLE. Measure at mid-point of total height or top of second log, whichever is greater. Record: 1 for branches 60°-90° and 2 for less than 60° or more than 90°. Reject all candidates with branches which exceed 1/3 diameter of main stem at point of branching when this is in first two logs.

FORKING. Reject all candidates having forks below 33' in black walnut, black cherry and yellow poplar; below 25' in yellow birch and below 17' in all other hardwoods. One or more of the following conditions constitutes forking: (a) the smaller of two adjacent branches exceeds 1/3 the diameter of the larger or (b) the main stem is deflected more than 10° at the juncture or (c) the angle between branch and main stem is less than 30°.

SEED CROP. Indicate seed production by the following grades: 0 - no crop; 1 - light; 2 - medium; 3 - heavy.

GRAIN PATTERN. Record as 0 - straight grain; 1 - spiral grain; 2 - figured grain.

PERCENT SUPERIORITY. Divide value of the selected tree by the average value of the three comparison trees to obtain the percent superiority. Use the following formula:

$$\% \text{ Superiority} = 100 \frac{S}{C} - 100$$

Where: S = Value selected tree
C = Average value comparison trees

MINIMUM SELECTION STANDARDS. To be considered as a superior tree candidate, the selected tree must meet or exceed the following standards:

CHARACTER	SPECIES				
	Black Walnut	Black Cherry	Yellow Poplar	Yellow Birch	Other Hdwds.
1. DBH	8"	6"	6"	6"	6"
2. % Height Superiority	0	10	5	5	5
3. % Volume Superiority	0	20	10	10	10
4. % Apical Dom, Super.	0	15	20	20	20
5. Roundness Ratio	0.90	0.90	0.90	0.90	0.80
6. Lean	5°	3°	3°	5°	5°
7. Sweep	2"	2"	2"	2"	4"
8. Forking(Lower limits)	33'	33'	33'	25'	17'
9. Crown Class	Dom.	Dom.	Dom.	Dom.	Dom/CD

10. Show no past evidence of serious disease, insect or weather injury.

VOLUME TABLE										
Gross Peeled Volume in Cubic Feet to a Variable Top DIB of Not Less Than 8.0 Inches ¹ /Merch. Height in Ft.										
DBH	8'	16'	24'	32'	40'	48'	56'	64'	72'	80'
10"	6	8	10							
12	7	11	14	16						
14	8	13	18	22	25	28				
16	10	16	22	27	32	37	42	46		
18	12	20	27	34	41	48	54	69	73	77
20	16	25	33	42	50	58	65	72	78	83
22	23	32	42	52	61	70	78	86	94	101
24	28	39	50	61	72	83	93	103	112	121
26	32	45	58	72	85	97	110	121	132	143
28	35	51	68	83	98	112	126	140	152	163
30	39	58	76	95	113	129	146	161	175	187
32	43	65	88	109	129	148	166	183	198	210
34	47	72	98	123	146	168	188	207	223	237
36	52	81	110	139	164	188	210	230	247	262
38	60	90	121	152	180	207	232	257	278	296
40	68	101	135	168	200	230	258	285	308	328

¹/ Adapted from Tables 1 and 2, USDA Tech. Bul. 1104, January 1955.

to the ground line should be measured as accurately as possible and recorded for each comparison tree as well as the selected tree. Space is provided to add up the heights of the comparison trees and to figure the average height of the three comparison trees.

Percent Superiority: This is used as an index to selection. It shows at a glance just how much better the selected tree is in comparison to the average of the next three best trees in the area. To figure this, divide the comparison tree average into the figure for the selected tree and multiply by 100. This should give you a value of more than 100. If you then subtract 100 from this value, you will have the percent value by which the selected tree exceeds the *average* of the comparison trees.

Stem Volume: A cubic foot volume table is shown in the lower right hand corner of the reverse side of the form. Determine the merchantable height to an 8-inch top d.i.b. to the nearest foot, if possible. Enter the volume table from the left side under DBHOB and read across to the appropriate height column. You will have to interpolate between heights and DBH to arrive at the volume figure.

Compute the stem volume for the three comparison trees, average it, and compare it to the volume of the selected tree to obtain percent volume superiority.

Apical Dominance. This is an indicator of how well the tree holds its timber form. Measure the stem to the point where it forks or where a definite central stem is no longer apparent. A definition of forking is given in the instructions on the form. Record this as a percentage of the total height. Do this for the comparison trees as well as the selected tree and compute the percent superiority. We are interested in trees which maintain a central stem to one-half or more of their total height or 33 feet, whichever is greater.

Age: So that we can be sure our comparison and selection are on sound ground, we want to know the age of the trees at DBH. The ages of the comparison trees should be within 5 years of the age of the selected tree, either more or less. But, please, *do not bore black walnut.*

Roundness Ratio: This is an expression of the roundness or symmetry of the stem. Measure the long and short diameters of the stem at DBH. You will have to use tree calipers for this. Divide the smaller number by the larger number. This will always give a number less than 1.00 unless the tree is perfectly round.

Lean: Lean is a factor in quality hardwoods, Compression and tension wood is formed in leaning trees, causing warping, checking, and cupping in

sawn lumber and sheering in veneer. This can best be measured with a plumb bob and transparent protractor. Lean is measured as degrees from true vertical in the butt log only.

Sweep: Sweep is undesirable for the same reasons as lean compression and tension wood are formed. In addition, trees with sweep are scaled as less than actual volume because there is loss in squaring up the log on the saw carriage. Sweep is measured as the maximum deviation from a straight line projected from the top of the first 16-foot log to a 12-inch stump.

Branch Angle: Branch angle may be critical where heavy snows and ice glaze are common. Trees with more horizontal branching appear to have less breakage than those with more acute angles. Research in branch angle inheritance indicates that we can influence this characteristic by careful selection of parent stock. Branch angle also affects knot size, a grading factor in select hardwoods. Larger knots will also take longer to heal over where pruning of lower limbs is considered in timber management.

Branch angle should be measured at the mid-point of the total height of the tree or at the top of the second log, whichever is greater. We only ask you to tell us whether the branch angle is between 60° and 90° or something else.

If there is some question as to whether it is 60° or 55° or whether it is 90° or 95°, you should use the plumb bob and protractor to determine the actual angle. Otherwise, an estimate will be sufficient.

Some trees may have very heavy or large branches. These candidates should be rejected as superior trees if any branches in the first two logs exceed one-third the diameter of the main stem at the point of branching.

Thus, an 8-inch diameter branch arising from the tree trunk at a point where the stem diameter is 20 inches would be cause for rejection of the entire tree, other characteristics being equal.

Forking: Forking is undesirable since low forking results in a serious loss of volume of potentially high quality wood. In selecting superior tree candidates, every effort should be made to locate hardwoods which do not fork in the first two logs. On low sites and in some species, this is a serious factor in selection. Therefore, some judgment is necessary in selecting trees on poor to medium sites.

For the purpose of selection of superior hardwood trees, one or more of the following conditions will be considered as forking:

a. The smaller of two adjacent branches exceeds one-third the diameter of the larger one.

b. The main stem is deflected more than 10° at the branch juncture.

c. The angle between the branch and the main stem is less than 30°.

Seed Crop: As best you can, indicate the seed crop of the selected tree and the comparison trees. This may require some detective work, depending on the time of the year when the selections are made. Look for old seed pods on the trees in winter and spring; look at the flowering later on in spring; in summer and fall, check the developing seed crop or the ground under the tree in late fall.

Grain Pattern: Some hardwoods show spiral grain by the arrangement of the bark plates. Where this is readily evident, indicate this character by writing the number 1 in the box provided. If you see no evidence of spiral grain, write 0. Sometimes it is possible to detect a figured grain such as "birdseye" in maple or "flame" in birch. Where you suspect that the grain is figured, even if you cannot positively state that it is figured, you should enter the number 2. This will give us a better lead to trees which might have figured grain, if someone should want to develop this trait through breeding.

Minimum Selection Standards: This table on the reverse side of the form is a summary of the various items and characteristics on which limitations have been set. If you locate a superior tree candidate which meets or exceeds these minimum standards, you can be pretty sure it is an outstanding tree.

Remarks: Often in the course of looking for superior trees, you may run across an "awfully good one" which just doesn't quite meet all the minimum standards. Maybe it is a yellow poplar and it forks at 30 feet instead of 33 feet. In all other respects it fits the description of a superior tree. You really don't want to turn it down cold so don't! Fill in the form completely. Then under "remarks" at bottom of the form, give a short explanation of why you consider it outstanding.

That completes the rundown on the new Hardwood Superior Tree Candidate Report form. We

are anxious to get this Register of Superior Trees built up and moving. You can help !

DISCUSSION

Question: What about a tree which is superior in one characteristic but not in others?

Dorn: It should be included. In fact, we have trees like that. Ted Grisez found a tree that he felt was outstanding because of the lack of epicormic branching. It was completely open grown and was pruned to 50 percent of its height. It had no epicormic branching whatever. We included it because of that particular trait. Another thing: This is only the first step. It doesn't mean these trees are elite trees. They are only superior phenotypes. We don't know whether they are superior because of their site or not. We are trying to eliminate those trees which are superior because of their site by comparing them with three other trees on that same site but that is still only the first step.

Comment: To me this is just like the beginning of hybrid seed corn. It is going to take us several years to develop what they could do in 2 years. We have to start with something like this. I think this is excellent. And I think you will find commercial people gathering these walnuts, cuttings, and seeds to start their own commercial operations because of the increased demand for such material. Wouldn't it be wise to limit the knowledge of these trees to state and Federal agencies?

Dorn: Our present plans are to make the data and location of these trees available to all cooperators, a cooperator being an individual or agency contributing one or more superior trees to the roster. Of course, permission should be obtained from the landowner before taking plant materials. My personal opinion on the question of too many people trying to make use of selected trees is that it may be a problem at the very beginning. After we have built up a large number of selected trees, however, I don't think it will be a problem.