ADVANCES IN TOOLS AND TECHNIQUES OF TREE MPRO\/EMENT

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The past ten years have seen a number of development in both laboratory and field techHque in *tree i* mprovement, Many of these have come as a result of the impetus of industrial interest in the program, mainly through university pogrom cooperators. Significant advances have bee2 made in the Jaboatory development of microtechniques for wood propeity and fibre evaluation. Although field techniques have progressed steadily, it would seem that some of them have been less weII pubicizea than those from the laboratory. This paper *will,* theiefore, emphasize the development of field equipment for tree improvement

The greauef physical barrier to the Forest tree breeder has been the fact that extensive *owering* occurs only in the upper crown of mature specimens of the species with which we have been wokHg The dese to u.se well-forned individuals amplifies the difficulties encounteted,

The first ci mbing was done on the west coast utilizing the recognized techniques developed by and for the tree trimming tade The climber simply tosses a peat -shaped lead weight, with ought Ii C attached, over a limb, He ties a heavier climbing rope to the light line, draws it up and aourd and climbs the rope eithe hand over hand o*r* using the hand-foot technique 1hs of cou e s very a duou, and the height one can nlsrrb is 1 imilited by the strength of his throwi'g arm and hk physical condition

The SAer1 sh rpec mb 'q ladde with whrt' you we all amWa, was introduced about *952 and* has been çi most sqfsfactoy tool for free climbing. Whete individual trees were cftrnbed and the area was easily ancessible by motor "chicle, it has been very satisfactory However , in concentrated climbing activities, suchas in seed production areas, a ladder is needed for each person climbinq In addition erecting and lowe ing the ladders is relatively $low, medcu and deiad'ci pysHaily

TH SwecHh v. CA vaiously *n* ar osttes a Auqel Shoes, row se H England. has been t ied snve a, pl aces in the United States The task of sawing aff all im to the live csown, oeve , is onerous and again the physical effort required is c;onsiderable

Some time ago the Southern Institute of Forest Genetics inserted pole steps into ore of their My frees '-0 csd itate repeated climbing While the steps made climbing easy. nstallaton

required a great deal effot and considerable"bleeding" followed, It was necessary to spray the entire tree with BHC to prevent insect attack. According to Bayne Snyder (13), more than 100 trees have been prepared in this manner. Incidentally, fear of encouraging bee infestations is the main reason for banning the use of standard climbing spurs in southern pine

In 1958, Johansen and Arline (9) at the Lake City Station developed the first extension ladder unit, which consisted of a frame for carrying and supporting the ladder and a 40-foot extension ladder. The frame can be quickly installed in a one-half ton truck bed for use and removed when the job is completed

Several different units have been constructed fom this basic design Wait Beers (1) of Buckeye Cellulose added, as refinements, bearing mounted swivels for the main ladder, expanded metal plate for the top platform and adjustable rods for angle supports. More recently, Ed Hinkle (8) of Union Bag has adapted the same frame to seed orchard work by adding a sliding platform which extends at right angles to the truck This enables the technicians to stand in the crown for control pollination or other seed orchard work

At the Southlands Experiment Forest where we are doing a great deal of more or less concentrated climbing, we have pivoted the ladder frame on ci trailer so that 360° rotation is possible This minimizes the necessity of maneuvering for the best climbing position, as the trailer can be stopped at the most advantageous point and the ladder frame turned into position, For ease in raising and lowering the 55-foot ladder, a 1/2-ton hand winch is used. The Texas Forest Service (2) has added a motor driven winch to handle the ladder mechanically. No guying is necessary as the ladder is supported by the tree in every case- We have more than doubled our control pollination efficiency with this unit and have used it for seed collection with very satisfactory results The trailer unit has a distinct advantage over the truck mounted ladder in that it can be drawn by almost any power unit available In extremely wet weather a crawler tractor can be and has been used for maximum flotation The best performance under most operatno

-ic Lke i es Foest Experiment S- *ece-* pubiished an ce in the F A 0 notes showing a ladder mounted an a *çrawi* hs has some advantages, but would have a slow rate of operato

An attempt was made in 1958 at Southlands EpeHrreot hoer 10 use a puey system to ase the climber into the tree, but the system was abandoned in favor of the ladder trailer. Ihis year, Strickland and Peters (15) have developed an excellent"climbing" technique using opes and block and tackle. A leading line is put into the tree using a sling shot Heavier a c ow' q1ti *d t a* bl rk n"– 0 We a

the tree with an electric capstan or by hand , Ed Hinkle (8) reports that Union Bag has used this system very successfully.

- There have been few developments in isolation bags, the standard in the SoLth being the 3-3/4 inch sausage casing in various lengths and with a double fold stapled in one end Lost year we tried a few casings that had been commercially sealed with an aluminum cap The cap actually was a better pollen seal than the triple fold and stood Grp well H the weather. This year all of our isolation bags were sealed in this manner, and we were *very* pleased to find that we had less damage from folding. Union Bag also used the capped bags and Ed Hinkle (8) reports less than 2% damage from folding The standard isolation bag used by the Western Institute of Forest Genetics is made of light canvas with a plastic window glued in place. In Washington, Jack Duffield (4) uses a light, tough, weather-resistant pope, bag with a cellophane window Scotch-taped in place. They also use grafting tape or rubber electrical rape to attach the bags. Their female flowers are not on first order twigs and the use of electrical tape instead of the standard cotton and wire prevents water from collecting in the isolation bag John Matthews (10) of England is using an isolation bag made of °Terylene" non-woven fibres with a plastic window - all apparently glued in place-

Pollination syringes are fairly well standarized. There are three types in general use first, the ordinary ear syringe with the end trimmed and a needle inserted, This is light, easy to handle, clean and re-use. With careless handling, it has the distinct disadvantage of wasting pollen, and has been thought to reduce seed set by some authorities because of over-abundant pollen introduction: Second is the plastic syringe with a single curved tube for pollen agitation For more complete agitation, a curved tube is inserted both at the bulb and needle end of the syringe The most complicated syringe, by Tom Perry (11), utilizes an exchangeable handle and squeeze bulb. Pollen is prevented from entering the squeeze bulb bya rubber "policeman" placed *over* the syringe end of the tube. There may be some danger of pollen dilution if the policeman becomes stopped in an open position. Personally. I favor the simplest pollinator with a 3/4", 16 or 20 gauge needle for ease of handling and cost.

Most of our work in this country has been in fairly concentrated a'eas x but in England where a good bit of ground is covered by one small group, John Matthews (10) has developed ohouse trailer into a laboratory on wheels Here all his pollen is extracted and stored, and thefocilities are available wherever they are needed,

The necessity of making wood characteristic analyses on living trees has led to the development of laboratory micro-techniques _ These in turn have encouraged the development of techniques for removing small wood samples efficiently The most common method of taking such samples has been with the standard increment borer which has grown larger and larger the bit starter , available commercially, was the answer to the prayer of those who could never

get he bit tated Y ous other &ds such as the wooden plate developed by Echols (6) and the ratchet handle de-eloped h Dtjfeld 5't have eased the laborious process somewhat. The most rapid pores f$_{o}$r t0k 9 or$_{e}$s was *deveioped* at Southlands Experiment Forest by Roy Stonecyper (14) He *tilized* a oe-nch electric drill powered by a portable generator to drive the more-ment bo'er, hut backed the borer hit out by hand, A reversible drill s now being used so except for etac?np be tore, the entire procers is done mechanically This gives us a better core, cdeiH

H E Dad-,we *(3)* on Australia reauired a larger core or complete wood charoctetization, He has *cdaped* oorodification of the method originated by Echols and Mergen (7) Four holes large e'ough to oio'' a how saw blade to enter are drUed through the tree truik and, using an ordina'y how saw, rectangular plug s removed, The hole is then sealed

Wal Beers 1) o Buckeye Corpor&'ion has recently developed a bit for awng out a la qe ciculo co e A ore-fl drill is ut 7ed to drive the 37-mm core. bit The esuFLing $_{o}$/$_{e}$ is sealed with a sterflized bar'e hnq Boh Dadswet cd Reerr *ciar'* r H' Hoer o -ks size do not rroe the t'p

have n'esenfed a H' t e de'e p ns ; eld e:hniquer. Ma'''oe 'o'H *been* cited, and there is or' ertre area of ahoratory tech&aues th0t l have cok even touched. howeer • that those items discr!ssed may he of some hemn and that t will be an nspirotion to the t qadgeeecs n air group to turther the development o tools arid 'echniues DCti!r Lo tree no mo' "Ca

LITERATURE CITED

1, Beers, W. Personal Comments

2, Buijtenen, J. P. Van. Personal Comments

3, Dadswell, H. E. and A. B. Waldrop. Growing Trees with Wood Properties Desirable for Paper Manufacture. Jour. Austrailian Pulp and Paper Industry Technical Association 12(4) : 129-136, 1959,

4, Duffield, J. W. A Ratchet Wrench for Over-size Increment Borers. Forest Science 3(1) : 21, 1957.

5. . Personal Comments.

6, Echols, R. M. Variation in Tracheid Length and Wood Density in Geographic Races of Scotch Pine. School of Forestry But. #64, Yale University, P. 16, 1958.

7. , and F. Mergen. How to Extract Large Wood Samples from Living Trees, Jour, For, 53 (2) : 136, 1955.

8, Hinkle E. H., Personal Comments.

9, Johansen, R. W. and L. Arline. An Idea in Truck Mounted Ladders. Jour. For. 56 (11) : 852-853, 1958.

10, Matthews, J. D, Personal Comments.

11, Perry, T. O. Personal Comments.

12, Skilling, D. D. Tractor Mounted Ladder for Tree Crown Studies and Seed Collection. Forrestry Equipment Notes, A,20. 60, F,A.O® , February, 1960.

13. Snyder B., Per onal Comments .

14. Stonecypher, R.W. and F. C. Cech, An Efficent Method of Taking Large Increment Cores Jour. For. 58 (8) : 644-645, 1960.

15. Strickland, R. K. and W. J, Peters, A New Use for an Old SkI. in Tree Improvement, Res. Rept. #6 , School of Forestry, University of Florida, March 1961.