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Establishment and Cultural Guidelines for Using Hybrid Tree Species in Agroforestry Plantings

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Agroforestry Notes

USDA Forest Service, Rocky Mountain Research Station • USDA Natural Resources Conservation Service

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Introduction

Hybrid poplars (and willows) are well-suited for agroforestry applications in many parts of the United States (See AFN-10). Their convenient propagation and fast growth allow them to establish and provide conservation benefits more quickly. This note provides general establishment and cultural guidelines to consider when using hybrid poplar cuttings for agroforestry plantings.

Species and Clones

Make sure clones or cultivars selected are suited to the climate and site where they will be planted. Use varieties that produce quality fiber or wood and have shown local disease and insect resistance. Check with local extension and Soil Conservation District offices for suitable clones and availability.

Soils/Sites

Poplars prefer well-drained soils such as sandy loams or silt loams. They will also grow in clayey poorly-drained soils, but growth and yield are lower. Poplars can tolerate short periods of flooding when they are dormant, but cannot tolerate standing water in summer months. The summer water table must be at least 1.5' below the soil surface. Growth and yield on upland sites where the water table is deeper than 6' may not be acceptable due to soil depth, pH, fertility, and moisture availability. Choose sites carefully depending on rainfall in the area.

Planting Stock

Cuttings 3/8" to 1" in diameter are made from one-year old shoots harvested during the dormant season. Length can range from 8" cuttings to 6' whips, depending on the site and purpose of the planting. On lowland sites with shallow summer water tables (1 1/2 to 3' deep), or sites that will be irrigated, cuttings can be 8 to 12" and planted with one bud above the ground. In all cases, buds should be "pointing up" after planting.

Longer cuttings, called "whips", planted 2 to 6' deep are recommended for unirrigated plantings where precipitation is less than 30 inches and the water table is deeper than 3'. The planting depth is the depth to the beginning of a moisture-holding soil layer, e.g., a clay loam layer beginning at 4' below a sandy loam layer. In Europe, unirrigated hybrid poplar plantations have been established for many years using this deep planting technique. On rich bottomland sites with a deep A horizon (over 18"), a planting depth of 2' should be sufficient. A small diameter power auger works well for planting at depths of 2' or more.



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Spacing

Tree spacing will depend on the target diameter, buffering or site remediation needs, maintenance methods, and product goals. Biomass plantings of poplar or willow with cutting cycles of 1 to 3 years are spaced at 2'x4' to 4'x4'. Most poplar plantations for fiber production with cutting cycles of 6 to 7 years are spaced at 8'x8', 9'x9' or 7'x10'. As the rotation lengthens, the tree spacing will increase, e.g. for a 10 to 12 year rotation, trees are spaced 12x12' to 10'x16'. Between-row spacing is influenced by the maintenance equipment used for weed control.

Thinning can also be used when longer rotations are needed for long-term resource protection and/or lumber or plywood products are desired. Trees could be spaced at 7'x10' and thinned for fiber in 6 to 7 years, leaving a spacing of 14'x10', 7'x20' or 14'x20'. *Caution*, on irrigated SRWC applications in wind prone areas, thinning could cause blow-down if roots are shallow. Pruning to 18' is recommended to produce clear wood for quality lumber, veneer, or plywood. Rotation age ranges from 10 to 25 years depending on the site.

Time of Planting

Planting should begin in spring when the soil temperature reaches 50 F. When planting in late spring, soak the lower fourth of the cuttings in water for at least 24 hours before planting to speed rooting.

Maintenance

For successful establishment and fast growth, good site preparation and weed control are extremely important. Contact herbicides (e.g. glyphosate) can be used to kill vegetation followed by deep tillage or ripping to allow easier planting and better rooting. Within-row and between-row weed control is done with preemergent herbicides and/or shallow tillage for at least 2 to 3 years until the trees have shaded out competing vegetation. Make sure herbicides used are labeled for hybrid poplar or willow.

For Short Rotation Woody Crop (SRWC) applications in riparian buffers or wastewater treatment plantings, legumes or non-rhizomatous grasses can be used in the early years between the rows as long as they are mowed to reduce rodent habitat and the tree rows have at least a 6' weed/grass-free strip for root development. On riparian sites where herbicide restrictions apply and competing vegetation will be difficult to control, long cuttings (whips) are needed and should be planted to the depth of the summer water table. The above-ground portion of the whip should be above the height of competing vegetation so leaves can capture sunlight.

Additional Information

“Biology of Populus and its Implications for Management and Conservation.” 1996.

Edited by R.F. Stettler, H.D. Bradshaw, Jr., P. E. Heilman, T. M. Hinckley.

“High Yield Hybrid Poplar Plantations in the Pacific Northwest.” by P.E. Heilman, R.F. Stettler, D.P. Hanley, and R.W. Carkner. 1995. Research paper PN 356.

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