PROPAGATION PROTOCOL FOR

Container Willows and Poplars

USING MINI-CUTTINGS

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Salicaceae, *Populus balsamifera, Salix exigua, S. drummondiana, S. prolixa*

NOMENCLATURE
USDA NRCS (2002)

The University of Idaho Forest Research Nursery is a unique facility in that it serves the university mission of teaching, research, and service as well as serving as the state nursery for Idaho. This blend of production nursery and research facility allows staff opportunity to solve "real world" problems. In the late 1980s, demand began growing steadily for both native and nonnative Salicaceae. Our traditional production regime for rooting cuttings involved using long (20 cm [8 in]), thick (12 to 19 mm [0.25 to 0.75 in]) hardwood cuttings struck about half way into relatively small containers (93 ml [5.9 in^3] volume; 14.9 cm [5.9 in] deep; 530 seedlings/m^2 [49/ft^2]). The result was a container mostly full of wood and multiple shoots emerging from the stem.

In the early 1990s we transitioned into a larger volume container (336 ml [20.5 in^3] volume; 15.2 cm [6 in] deep; 213 seedlings/m^2 [20/ft^2]) to meet customer demands and began moving to smaller and smaller cuttings. Currently, for our native plants as well as a few introduced willows grown for particular conservation needs, we have excellent results striking short (7.5 cm [3 in]), small diameter (6 to 10 mm [0.25 to 0.38 in]) cuttings having at least 2 buds.

STOOLING BEDS

The native willow cuttings grown are USDA Natural Resources Conservation Service cultivars (*Salix exigua* Nutt. 'Silvar,' *S. drummondiana* Barratt ex Hook. 'Curlew,' and *S. prolixa* Anderss. 'Rivar' [formerly *S. rigida* or *mackenzieana*). We also grow a hybrid *Populus* L. of unknown parentage discovered in southern Idaho as well as some black cottonwood (*P. balsamifera* L. ssp. *trichocarpa* [Torr. & Gray ex Hook.] Brayshaw) for specific restoration projects. All of the willows and the hybrid are maintained in beds at the nursery. In January and early February, we cut donor plants back to the ground and use the whips for cuttings. We prefer to use 1-y-old wood and actively manage for it because stems generally have many buds, small diameters, and root well. The benefit of using younger wood is immense. In the early 1990s, we grew *Salix geyeriana* Anderss. and *S. boothii* Dorn for a restoration project. The original cutting material, collected on the restoration site, was heavily grazed, lacked juvenile wood, and rooted poorly (about 50%). We took 150 one-y-old rooted cuttings and established a stooling bed. After 1 growing season under regular irrigation and fertilization, the bed yielded 4500 microcuttings that rooted at a 99%+ rate (Dumroese and others 1998).

Another benefit of using small cuttings is that less stooling bed area is required. By converting to smaller propagules we were able to drastically reduce the amount of area, labor, and maintenance necessary to produce larger cuttings.

PREPARING CUTTINGS, STORAGE, PRESOAKING

Once cut in the field, whips are brought to a storehouse, inspected for disease problems, and cut into 7.5-cm (3-in) lengths with a bandsaw. Material up to 13 mm (0.5 in) diameter may be used if good buds are present. Depending on weather, occasionally flowers may be open. If so, flowers are picked off the shoot. All of the cut material is placed inside a 1.5-ml plastic bag (64 x 38 x 89 cm [25 x 15 x 35 in]), sealed, and placed into refrigerated storage at 1 °C (34 °F). For each species, we count out a subsample of 200 cuttings, weigh them, and then use that relationship to estimate the mass of cuttings needed for the crop. We generally prepare 50% more cuttings than we need to meet sowing demand to compensate for culling during striking. Generally, we strike our cuttings in late May to early June. About 3 d before starting, we begin soaking the cuttings in a running tapwater bath, keeping them in the shade.

GRADING AND STRIKING

Our crews grade cuttings as they strike them. An acceptable cutting must have a healthy-looking bud within the top 2.5 cm (1 in) of the cutting and a second bud somewhere on the cutting. Our experience is that any lower buds generally abort or begin growing and rot away without consequence. Cuttings are struck into containers (336 ml [20.5 in^3] volume; 15.2 cm [6 in] deep; 213 seedlings/m^2 [20/ft^2]) containing a 1:1 (v:v) sphagnum peat moss:vermiculite medium. Once struck, the medium is saturated and allowed to drain to field capacity. Containers are placed inside an open-sided, polycarbonate-roofed growing structure. We use a traveling boom irrigation system.

GROWING REGIME

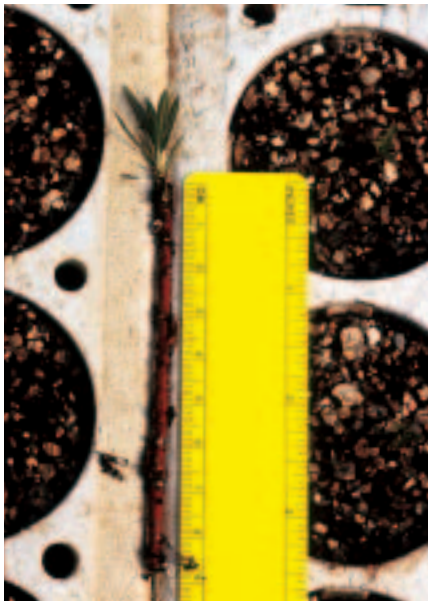
As soon as leaves begin appearing, we begin fertilizing using Peters Professional Conifer Starter (7N:40P_2O_5:17K_2O; The Scott's Company, Marysville, Ohio) at a rate of 42 ppm N, adding 1.5 ppm B (Solubor) and 24 ppm $MgSO_4$. Cuttings are fertilized twice per week. After 2 wk, we apply Peters Excel Cal-Mag (15N:5P_2O_5:15K_2O; The Scott's Company) at 114 ppm N twice each week. Every other week the cuttings receive 1 dose of Peters Professional Conifer Finisher (4N:25P_2O_5:35K_2O; The Scott's Company) at 24 ppm N. This rotation continues until mid August. Then we alternate Finisher with CAN-17 (liquid calcium ammonium nitrate [17N:8.8Ca]) at 77 ppm N for the twice per week fertilization. Because the cuttings are grown in an open-sided structure, they receive mostly ambient temperatures—leaves begin turning color and dropping in mid to late October and at that point we stop fertilization.

During the growing season, cuttings are pruned 3 or 4 times, depending on growth and available workers to do the pruning. As soon as shoots reach 20 to 25 cm (8 to 10 in) in height, we prune them back to 15 to 20 cm (6 to 8 in). We let them grow another 15 cm (6 in) or so, and then remove half of the new growth achieved since the last pruning, repeating this process as needed. In early September, cuttings are pruned the last time to about 41 cm (16 in), which is our target height. Cuttings then set a terminal bud in response to cooler growing temperatures and shorter days.

HARVESTING, STORAGE, AND SHIPMENT

In late November after the leaves have dropped, crews extract the rooted cuttings by hand and place 5 inside a 1.25-ml, 30 x 60 cm (12 x 24 in) plastic bag. A narrow, self-locking plastic tag printed with species common name is used to seal the bag. Acceptable plants have a firm root system, shoot diameter above the original cutting > 6 mm, and a healthy-looking stem. Because the cuttings have been top-pruned, height is not a factor. Often, cutting shoots extend above the sealed bag. We place 25 bags of seedlings (125 total) inside a stack-and-nest tote box (76 cm long x 51 cm deep x 38 cm wide [30 x 20 x 15 in]). Totes are stacked inside the cooler (1 °C [34 °F]). We like the stacking totes because they provide us great flexibility in organizing the cooler each year, and can be nested to save space when not in use. Rooted cuttings may stay in storage as lit-

Photos by Kas Dumroese



A typical mini-cutting of *Salix drummondiana* beginning to root and leaf out.

Mini-cuttings are inserted into the medium so the top of the cutting is nearly flush with the medium surface. Buds within 2.5 cm (1 in) of the cutting will produce foliage.

Rooted mini-cuttings of *Salix drummondiana* after 1 growing season. The ruler is 15 cm (6 in) long.

tle as 2 mo and as long as 6 mo. Stock stores well—we rarely have a disease problem during storage and if we do, it is contained within a few bags of rooted cuttings.

Most of the stock grown at the University of Idaho is sold in small lots to private landowners. Landowners can request particular shipping dates. On those scheduled dates, orders are pulled from storage, checked for accuracy and quality, and placed into cardboard shipping boxes. Customers may either accept delivery at the nursery or request their seedlings be delivered via United Parcel Service.

SUMMARY

Mini-cuttings are the propagule of choice at the Forest Research Nursery for producing rooted cuttings of native and introduced Salicaceae. Using short, thin, 1-y-old cuttings results in good rooting success in the containers and less labor and donor plants in the field. Nursery customers prefer our healthy-looking stems to the multiple tops and dead wood common with larger cuttings.

REFERENCES

Dumroese RK, Stumph T, Wenny DL. 1998. Revegetating Idaho's Henry's Fork: a case study. In: Rose R, Haase DL, editors. Native plants: propagation and planting; 1998 Dec 9–10; Corvallis, OR. Corvallis (OR): Oregon State University Nursery Technology Cooperative. p 108–112.

USDA NRCS. 2002. The PLANTS database, Version 3.5. URL: http://plants.usda.gov (accessed 8 Jul 2003). Baton Rouge (LA): National Plant Data Center.

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