

Care and Handling of Experimental Tree Material From Seed Identification to Outplanting

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A systematic procedure for accurately identifying, sowing, raising, and establishing experimental tree materials is described.

The field testing of experimental trees is expensive and long term and requires accurate identification and care of seeds and seedlings from collection through field establishment. Years of effort can be wasted if seedlot identification is lost or erroneous or if improper attention is given the seedlings during nursery growth and field planting.

This article describes systematic procedures that proved efficient and effective in sowing and raising over 200 *Juniperus* seed sources and establishing them in 14 plantations throughout the Great Plains.

Seed Identification

Seeds, still in the cones, were collected in the field; and upon receipt from the collector, the collection from each individual tree was coded with its appropriate seed zone and tree number (e.g., 471-1, 471-2, 471-3 . . . 471-n). These identification

numbers will remain with the plant material from seeds to seedlings to mature trees. Field records of the exact geographical location of the source tree and other pertinent data for each numbered seed collection were maintained in the field station office.

The juniper cones were stored at 4° F (-15° C) until all collections were completed. In January, the seed was extracted from the cones, air dried, and stored again at 4° F (-15° C) by seedlot in small kraft paper sacks. The appropriate seed source code number was printed on the sack with a blue china-marker crayon.

Nursery Sowing

In August, the seedlots were randomly sown by hand in six parallel rows running linearly along the length of the outdoor nurserybeds. The seeds were spaced 0.75 inch (2 cm) apart in the rows. Two 8-inch-long (20 cm), white plastic pot markers (Lifetime Marker-Hortacraft Product No. 10-036-00) were placed in the center of the bed, one at each end of each seedlot. Since these markers had to remain legible for 2 years (through irrigation, wind, rain, sun, and snow), a black weatherproof pencil (Eberhard Faber No. 6639) was used to write seed source numbers on the markers. A 12- to 18-inch (30 to

45 cm) divider space was left between seedlots. After the seed sources had been sown, a map was made showing the location of each source and the number of linear feet it occupied in the nurserybeds. This map served as a safeguard in the event the plastic markers became mixed, broken, or lost. The seedlings were given regular production bed irrigation, fertilization, spraying, weeding, undercutting, and other treatments during the 2-year nursery period.

Lifting Seedlings

Seedlings were machine lifted from the nurserybeds at 2 years of age. To prevent seed sources from becoming mixed, one person walked closely behind the lifter to locate plastic markers as they popped out of the soil with the lifted seedlings. Markers were reinserted at each end of the appropriate seedling lots. Seedlings were shaken lightly to remove excess soil from the roots; packed into large, plastic-lined kraft sacks; identified with the seed source number written in china-marker pencil on the outside of the sack; closed; and taken immediately to a large walk-in refrigerator at 40° F (4° C). There, the bags were opened; the seedlings were lightly wetted with a fine water spray; and the roots were covered with damp peat moss.

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The bags of seedlings were closed, tied with twine, and put in numerical order on shelves in the refrigerator room.

Sorting, Labeling, and Mailing

Fourteen test plantations were to be established from the northern Great Plains southward to New Mexico and Texas. Some seed sources were to be tested by all the cooperators, others by only a few. Each plantation was to contain 20 seedlings per seed source (five replications of four-tree linear plots) of those sources assigned to it.

Before distribution, a numerical listing of the seed sources was made, indicating which of the seed sources the 14 cooperators were to receive (fig. 1). Fourteen large wooden boxes, each labeled with the name of one cooperator, were placed along a wall at one end of the refrigerated seedling storage room.

The bag (or bags) containing seedlings from one seed source was taken off the shelf and opened, and the seedlings were spread out on a table. In accordance with the distribution list, the seedlings were sorted into bunches of 20 seedlings for each cooperator receiving that particular seed source. The 20 seedlings were sorted into five bundles of four seedlings each.

Seed Source	Tree No.	Cooperators						n
		ND	SD	NE	KS	OK	TX	
741	1	X	X				X	X
	2	X	X	X	X	X	X	X
	3	X	X	X	X		X	X
	4	X	X	X	X	X	X	X
			X	X	X	X	X	X
								X

Figure 1.—List of seedling lots to be distributed to cooperators.

Each bundle of four seedlings was secured with a wire twist-tie, and one seedling in each 4-tree bundle was labeled with masking tape wrapped around the stem. The seed source number was written on this tape with a black felt-tipped nursery marking pen (Hortacraft Corp. No. 869). The five bundles of four seedlings each were then combined into one bundle with a larger twist-tie and placed in the appropriate wooden box. Wet peat was sprinkled over the roots. When the sorting of one seed source had been completed, the entry on the listing sheet (fig. 1) was circled; another sack was taken off the shelf; and the procedure was repeated. With a three- or four-person crew, the sorting and labeling became an assembly line process. To keep the seedlings moist

in the wooden boxes, they were lightly sprayed with water periodically and covered at night with wet burlap.

After all seedling lots had been labeled and sorted into the appropriate wooden boxes, they were transferred to and packed in waterproof-lined cardboard mailing boxes. Seedlings were lightly moistened again by spraying water on the tops, and wet peat was placed on the roots before the boxes were stapled shut and banded. The seed sources contained in each box were listed on the outside of the box. Boxes were stored at 40° F (4° C) until they were shipped air freight to the cooperators.

The remaining seedlings were transplanted into the nursery-beds, to be distributed the next spring as 2+1 stock for replace-

ment of any seedlings that did not survive the initial planting.

Planting Seedlings

Cooperators were provided with a planting list showing the exact order for planting each seed source in each replication and in each row (fig. 2), and they were instructed to store their boxed seedlings at 40° F (4° C) as soon as possible after receiving them. On planting day, the sealed boxes of seedlings were transferred from refrigeration to a shaded facility on or near the planting site.

The following sorting and planting procedures were not necessarily used by all fourteen cooperators. However, the authors found them to be both efficient and effective.

Small 10- by 12-inch (25 by 30 cm) burlap sacks were arranged in rows on the building floor, and a tag containing the number of one seed source was stapled to each sack. The floor and sacks were heavily watered. Shipping-box lids were opened, and each numbered bundle of 20 seedlings of a seed source was placed in the corresponding, numbered burlap sack. Seedling roots were dipped in water as they were transferred from the shipping boxes to the burlap sacks. The large twist-tie was removed from the 20-seedling bundle, leaving five 4-tree bundles per sack. Roots of the

Row Position	Rep I			N		
	Block A			n		
	Rows 1	2	3	n	n	n
1-4	741-2	732-1	851-3	561-4	534-4	661-4
5-8	532-1	861-6	1121-1	661-1	534-1	321-3
9-12	721-4	1332-3	1331-2	551-5	461-3	582-1
	722-3	1191-5	751-5	772-2	830-2	771-5
			871-3	751-4	584-4	732-6
						1023-4

Figure 2.—Planting list prepared for cooperators showing establishment sequence of seedling sources by replication block and row.

seedlings in the burlap sacks were sprayed with water periodically. The burlap sacks were placed on the floor in numerical sequence; thus any given seedling lot was easy to locate (fig. 3).

The planting map, as previously designed and illustrated in the study plan, was used to determine the order in which the seed sources were to be planted in the plantation rows. The seed source (four tree



Figure 3.—Systematic array of wetted burlap sacks containing seedlings, with seedling source identification number attached.

bunches) were arranged in that order in a separate box for transport to the field. This was accomplished very rapidly with two to five people working. One person called out the seed source number from the planting map, and the others located the burlap sack containing that source number and placed one four-tree bundle in its correct

planting order in the separate box for transport to the field. When seedlings for row 1 were in order, they were moistened; and wet burlap was placed over the roots before the seedlings were taken to the field for planting. With a large crew (five to seven), row 2 could be arranged in the garage while

row 1 was being planted.

If planting linear plots, it is advisable to consistently plant the labeled seedling first in the multiple-tree plot. Then, after all planting is done, each row should be walked to verify that the sequence of planted seedlings corresponds to the plantation map.