

Populus acuminata Rydb., hybrid or hybrid-derived species?

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ABSTRACT

Populus acuminata Rydb. has mostly been considered to be a hybrid between *P. angustifolia* E. James and varieties of *P. deltoides* W. Bartram ex Marshall or *P. fremontii* S. Watson depending on location. Several populations of *P. acuminata* were observed for about 15 years for any seed production. Seed production did not occur in most years because the catkins were frozen by late spring freezes. Seed was finally obtained from one population, germinated, and grown in an unheated greenhouse for 2 years. First year leaves resembled *P. angustifolia* but second year leaves matched the parent *P. acuminata*. Seedling establishment rarely occurs because no seeds are produced or conditions are too dry for establishment in most years. Results of this study support recognizing *Populus acuminata* as a hybrid-derived species.

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KEY WORDS: *Populus acuminata*, Salicaceae, hybrid-derived species

INTRODUCTION

Populus acuminata Rydb. (Salicaceae) has been interpreted by some workers as a hybrid (BONAP 2019; Eckenwalder 2010; USDA, NRCS 2019) and by others as a hybrid-derived species (Cronquist 1964, Dorn 2001). One probable parent is *P. angustifolia* E. James (Figure 1) and the other is either (1) *P. deltoides* W. Bartram ex Marshall var. *occidentalis* Rydb. [ssp. *monilifera* (Aiton) Eckenw.] (Figure 1) at the type locality and at other locations where that variety occurs, or (2) *P. deltoides* var. *wislizeni* (S. Watson) Dorn where that variety occurs, or (3) *P. fremontii* S. Watson [*P. deltoides* var. *fremontii* (S. Watson) Cronquist] where that species occurs (Crawford 1974, Jones & Seigler 1975). It has also been observed that *P. acuminata* occurs in places where one or both probable parents do not occur (Cronquist 1964, Eckenwalder 1984, Cronquist & Dorn 2005). Crawford (1974) discussed the many problems regarding the status of *P. acuminata*. This study adds more data toward resolution of the problems.

METHODS

Several populations of *P. acuminata* were observed for about 15 years for any seed production. These populations included Carter Canyon, the type locality, and North Platte National Wildlife Refuge in Scotts Bluff County, Nebraska, Fort Laramie National Historic Site and Wyoming Game & Fish Rawhide Wildlife Unit in Goshen County, Wyoming, and Cottonwood Draw and North Platte River at Guernsey in Platte County, Wyoming. Twelve seeds were collected from catkins on one individual plant in Platte County, Wyoming, were germinated on a wet coffee filter in a petri dish, and grown in pots in an unheated greenhouse near Lingle, Wyoming for 2 years. All plants of *P. acuminata* in the population where the seeds were collected were measured at breast height for circumference which was then converted to diameter at breast height (DBH). This population is about 87 km from the type locality.

RESULTS AND DISCUSSION

The populations of *P. acuminata* that were observed were all interspersed with plants of *P. deltoides* var. *occidentalis*. The other probable parent of *P. acuminata*, *P. angustifolia*, was not present at most of the sites. Seed production did not occur in *P. acuminata* in most years because either the staminate catkins, or the pistillate catkins, or both, were frozen by late spring freezes. When seed production was finally

observed in a population along a dry wash (Cottonwood Draw) about 19 km northeast of Wheatland, Platte County, Wyoming, there was no seedling establishment because conditions were too dry. These observations along with the DBH measurements (Table 1) indicate that seedling establishment only occurs rarely, generally decades apart. Seedling establishment is likely somewhat more frequent at sites where the population is adjacent to a perennial stream.

Of the 12 seeds that were collected, 9 germinated, were transferred to pots of soil, and placed in an unheated greenhouse. Six of the plants survived their first growing season. A representative leaf from the first growing season is shown in Figure 2. It unexpectedly resembles a leaf of *P. angustifolia* with a short petiole and narrow blade. Four of the plants from the first growing season survived the winter. Representative leaves from about midlength of the second year's growth in July are shown in Figure 2 for each of the four plants. These leaves are all typical for *P. acuminata* with the longer petiole and broader blade. A specimen from the *P. acuminata* parent tree (Dorn 12006, MO, RM) and the type specimen (Rydberg 372, NY) are shown in Figure 3 for comparison. Figure 4 shows the four plants grown from seed. The closest known plants of *P. angustifolia* to the population of *P. acuminata* where the seeds were collected is about 14.5 km away near Guernsey, Platte County, Wyoming. The closest known plants of *P. angustifolia* to the type locality are about 50 km away near Lingle, Goshen County, Wyoming. A single plant was found in the seed producing population that suggested a hybrid between *P. acuminata* and *P. deltoides* var. *occidentalis* (Dorn 12195, RM, Figure 5)

The observed reproduction from seed supports a hybrid-derived species. That does not preclude possible extensive hybridization between *P. angustifolia* and *P. deltoides* var. *occidentalis* at other locations. Crawford (1974) concluded that *P. acuminata* had a hybrid origin based primarily on an additive flavonoid profile from the two parents. Jones and Seigler (1975), however, found a flavonoid compound in *P. acuminata* that was not present in the probable parent species. Crawford (1974) did not address the question of whether *P. acuminata* should be considered a hybrid or a hybrid-derived species. It is likely that some plants are F₁ hybrids and others are the result of later seed production and should be considered a hybrid-derived species. Since even the F₁ plants are likely capable of reproducing from seed, perhaps they should all be considered a hybrid-derived species.

The question of whether the plants called *P. acuminata* in the southwestern states where *P. deltoides* var. *occidentalis* does not occur are the same or similar genetically as the more northern and eastern plants is still open. A detailed genetic study might provide insights into that question.

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Table 1. Diameters at breast height (DBH) of *Populus acuminata* plants in the population from which seeds were collected for this study. Seeds were taken from the plant with a DBH of 23.4 cm. The similar DBH's of plants from 17.8 to 23.4 cm and from 79.2 to 88.1 cm suggest two favorable establishment periods. The others suggest establishment with less favorable conditions.

Plant Number	DBH (cm)	Plant Number	DBH (cm)	Plant Number	DBH (cm)
1	4.8	6	23.4	11	88.1
2	17.8	7	34.8	12	99.6
3	19.3	8	64.8	13	118.1
4	21.1	9	79.2	14	127.0
5	22.6	10	84.1	15	139.2



Figure 1. Typical leaves of *Populus angustifolia*, left, and *Populus deltoides* var. *occidentalis*, right, the probable parents of *Populus acuminata*.

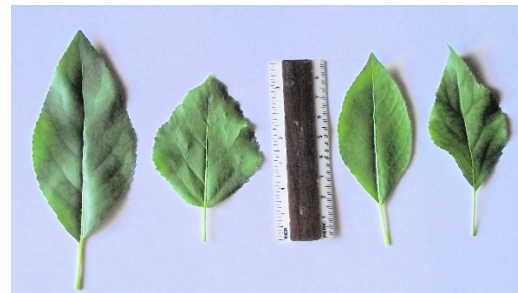


Figure 2. Left: Representative leaf from first growing season of plant grown from seed of *Populus acuminata*. Right: Leaves from midlength of second year's growth in mid July from four plants grown from seed of *Populus acuminata*. Scale is 9 cm.



Figure 3. Left: Specimen from *Populus acuminata* parent tree (Dorn 12006). Right: Type specimen of *Populus acuminata* (Rydberg 372, NY).



Figure 4. Four plants grown from seed of *Populus acuminata*, second growing season in mid July.



Figure 5. Probable hybrid between *Populus acuminata* and *Populus deltoides* var. *occidentalis* (Dorn 12195).