Seed Sources of Tamarack, *Larix laricina* (Du Roi) K. Koch

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Introduction

As a contributing project to Regional Project NC-51 [1], the Minnesota Agricultural Experiment Station has undertaken the assembly of provenances of several species in the genus *Larix*. Initial emphasis has been placed on tamarack, *Larix laricina*. The first seed collections of this species were made in 1961 and 1962 and recollections of certain key sources during the current year (1964) are underway. This report summarizes the progress on the tamarack seed source study to date.

Tamarack, also known as "Eastern larch" or "American larch," is a small to medium size tree confined to cool swamps or bogs in the southern part of its range. A common associate in these localities is black spruce, *Picea mariana* (Mill.) B.S.P. Farther north, in common with black spruce, tamarack frequently occurs on moist beaches and better-drained uplands where the best growth occurs. Although infrequently planted for ornamental purposes or in forest plantations on upland sites of the northern and eastern United States, the growth rate of tamarack under such conditions greatly exceeds that of trees grown on bog sites of the same localities.

Tamarack is transcontinental in distribution, ranging from Alaska southeastward through Canada to Newfoundland, and into the northeastern and north central United States (Fig. 1). Coincidentally, the natural range of tamarack is almost identical with that of black spruce and, together with white spruce, *P. glauca* (Moench) Voss, marks the northern limit of coniferous tree distribution in North America.

Because of its thin bark and shallow root system tamarack is highly susceptible to fire damage on dry sites. Its most serious parasite is the larch sawfly which may cause widespread damage through repeated defoliation. The species is moderately important locally as a timber tree for small, rough lumber, poles, fence posts, mine props and, increasingly, for pulp.

[1] Regional Project NC-51 is entitled: "Tree improvement through selection and breeding of forest trees of known origin."

Objectives

The objectives of the NC-51 tamarack seed source study are:

(1) To provide information on the range and pattern of genetic diversity in this widely distributed but little known native species of *Larix*.

(2) To determine relationships between phenotypic and genetic variation patterns.

(3) To isolate the best adapted sources for plantation culture and for the establishment of breeding arboreta.

Hybridization of tamarack with other species of the Section *Pauciseriales (L. leptolepis, L. gmelini, L. sibirica, L. decidua,* and their varieties) appears to be feasible and a promising improvement method.

Seed Collections

Seed collections were obtained by written request, chiefly to state, provincial, dominion and federal forest agencies in Canada and the United States. The first requests were made in late summer, 1961, but cone production in that year was spotty throughout the range. Only 12 usable collections were received and it was decided to store these and add them to collections that might be made in 1962.

The 1962 season proved to be a moderately good cone production year for tamarack throughout most of the range. To the 12 usable collections obtained in 1961, an additional 50 collections were added in 1962. Sixty-two collections (Fig. 1, Table 1) were thus available for sowing in autumn, 1962 and spring, 1963.

The requests for 1961 and 1962 specified that collections of 200-250 cones from each of five average trees growing in a natural stand be made. The collectors were also requested to extract the seed. This arrangement was not entirely satisfactory since many cooperators encountered difficulties in seed extraction and considerable correspondence was necessary to explain the necessity of soaking the cones and redrying them.

Repeat collection of a number of sources is underway during the current (1964) season. Based on our previous experience we have requested cooperators to collect 200—

500 cones from each of five trees and send the cones to us for extraction. Such an arrangement has resulted in the prompt receipt of more than 75 percent of our requested collections before September 25. Fortunately, there has been an abundant cone crop throughout most of the species' range this season.

Nursery Propagation

Nursery sowings were made in the North Central Experiment Station nursery at Grand Rapids, Minnesota, in autumn, 1962; spring, 1963; and autumn, 1963. Each of the first two sowings consisted of 40-inch row plots replicated five times. The sowing in autumn, 1963 was an unreplicated bulk sowing of the remainder of the seed in 20 of the sources.

Samples of most seed sources were also supplied Dr. J. W. Wright, Michigan State University, and Dr. Hans Nienstaedt, Northern Institute of Forest Genetics, U.S.F.S., Rhinelander, Wisconsin, in autumn, 1962 and spring 1963. Replicated sowings were made at these institutions in autumn, 1963.

Germination and survival in all sowings have been disappointing and prompted the decision to request recollection of about 30 of the sources during the 1964 season. There is adequate surviving 2-0 stock of 20 sources in the Grand Rapids nursery to permit establishment of one 4-tree plot, 5 replicate outplanting in spring, 1965.

Adequate survival in all replicates of 16 sources in the sowing made in autumn 1962, has permitted a comparison of height measured on August 24, 1964. Mean height in the plots ranged from 24 cm. (ca. 9.5 inches) for an east-central Minnesota source to 59 cm. (ca. 21.2 inches) for a Nova Scotia source. Analysis of variance indicated a source difference significant at the 2.5% level. All of the 16 sources represented were confined to the southeastern portion of the species' range where sources generally adapted to the North Central Region might be expected to occur. Active growth in length of the 16 sources was still in progress at the time of measurement.

As might be anticipated, there is an indication that bud set occurs earliest in northern sources. On August 24, 1964, for example, bud set was partial or complete in all plants of surviving replicates of seed lots 28 and 29 (Manitoba sources from ca. 55° N. Lat.) and lot 36, a Saskatchewan source at about the same latitude.

No striking differences in foliage color, leaf length or shape, or other morphological characteristics have been noted in the seedlings. Unfortunately, the extremely low survival of far northern seed lots, especially those from Alaska, makes such a generalization at this time of little value.

Our experience thus far has indicated that tamarack is apparently not as amenable to nursery culture as other species in the genus and that considerable improvement in technique is necessary to insure adequate survival. There are indications that poor drainage in the Grand Rapids nursery may have contributed to poor survival. Consequently, sowings of currently assembled seed sources are planned for next spring at the Cloquet Forest Research Center Nursery, Cloquet, Minnesota, under a more elegantly regimented culture regime.

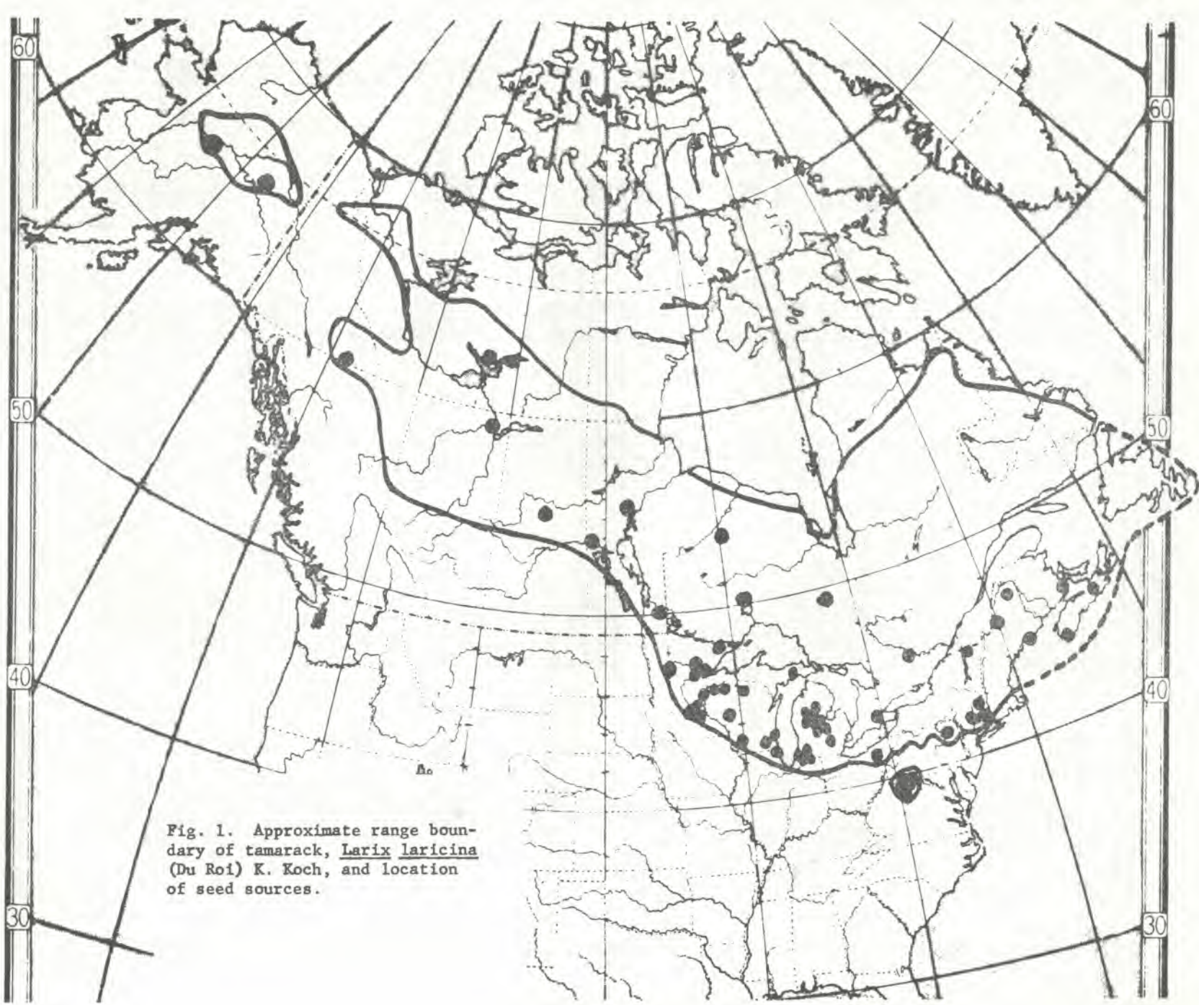

Fig. 1. Approximate range boundary of tamarack, Larix laricina (Du Roi) K. Koch, and location of seed sources.

Table 1. Tamarack (Larix laricina) seed source study (Minnesota NC-51 project)

Lot No.	State or province	County	Lat. (N)	Long. (W)	Elev. (ft.)	Year of collection
10	Ohio	Geauga	41–26	81–11	1100	1962
11	Wisconsin	Washington	43–10	88–	980	1962
12	Wisconsin	Washburn	46–	91–45	1100	1962
13	Minnesota	Carver	45–	93–45	750	1962
14	Minnesota	Carlton	45–43	92–33	1250	1962
15	Ontario	. . .	43–12	80–39	975	1962
16	Minnesota	Itasca	47–10	95–10	1400	1962
17	Wisconsin	Waukesha	43–	88–15	820	1962
18	Maine	Acadia Nat. Pk.	44–14	68–18	. . .	1962
19	Illinois	McHenry	42–27	88–02	800	1962
20	Minnesota	St. Louis	47–53	91–51	1420	1962
21	Minnesota	Anoka	45–05	93–	. . .	1962
22	Minnesota	Itasca	47–10	93–20	. . .	1962
23	Pennsylvania	Lackawanna	41–16	75–39	2050	1962
24	Wisconsin	Richland	43–15	90–20	1000	1962
25	Wisconisn	Oneida	45–46	89–37	1108	1962
26	Michigan	Livingston	42–30	83–50	700	1962
27	Wisconsin	Eau Claire	44–45	91–	. . .	1962
28	Manitoba	. . .	54–	101–10	870	1962
29	Manitoba	. . .	55–30	97–45	600	1962
30	Manitoba	. . .	50–05	95–25	. . .	1961
31	Minnesota	Chisago	45–24	92–56	800	1961
32	Minnesota	Itasca	47–10	93–20	. . .	1961
33	Minnesota	Itasca	47–	93–10	. . .	1961
34	Nova Scotia	. . .	43–57	65–45	100	1961
35	Nova Scotia	. . .	45–21	62–15	500	1961
36	Saskatchewan	. . .	55–07	105–17	1225	1961
37	Alaska	. . .	64–50	147–42	650	1961
38	Alaska	. . .	64–44	155–30	500	1961
39	New Brunswick	Westmorland	46–05	64–20	200	1961
40	Massachusetts	Berkshire	42–20	73–15	1150	1961
41	Michigan	Schoolcraft	46–21	86–20	800	1962
42	Michigan	Wexford	44–14	85–30	. . .	1962
43	New York	Dutchess	41–40	75–35	500	1962
44	N.W.T.	. . .	62–33	113–59	560	1962
45	Alberta	. . .	59–5	111–39	800	1962
46	Connecticut	Litchfield	41–53	73–15	1400	1962
47	Wisconsin	Sawyer	46–	91–30	1196	1962
48	Maine	Somerset	45–40	70–15	1185	1962
49	Maine	Aroostook	46–40	68–20	700	1962
50	Michigan	Van Buren	42–10	86–08	775	1962
51	Michigan	Cass	42–00	85–50	880	1962
52	Michigan	Cass	41–52	85–57	840	1962
53	Michigan	Clare	44–	85–	. . .	1962
54	Michigan	Clare	44–	85–	. . .	1962
55	Michigan	Clare	44–	85–	. . .	1962
56	Michigan	Shiawassee	42–49	84–21	. . .	1962
57	Michigan	Clare	44–	85–	. . .	1962
58	Michigan	Roscommon	44–20	84–30	. . .	1962
59	Michigan	Clinton	42–49	84–22	. . .	1962
60	Ontario	. . .	45–55	77–35	550	1962
61	Yukon Territory	. . .	60–08	128–40	2000	1962
62	Ontario	. . .	50–24	89–08–15	1176	1962
63	Ontario	. . .	53–45	89–50	770	1962
64	Ontario	. . .	49–28	82–16	750	1962
65	Michigan	Kalamazoo	42–23	85–22	840	1962
66	West Virginia	Preston	39–33–10	79–29–02	2550	1962
67	West Virginia	Preston	39–33–10	79–29–02	2550	1962
68	Maryland	Garrett	39–29–04	79–21–12	2510	1962
69	Maryland	Garrett	39–42–08	78–56–22	2690	1962
70	Maryland	Garrett	39–31–07	79–28–07	2555	1962
71	Vermont	Franklin	44–57	72–55	320	1962