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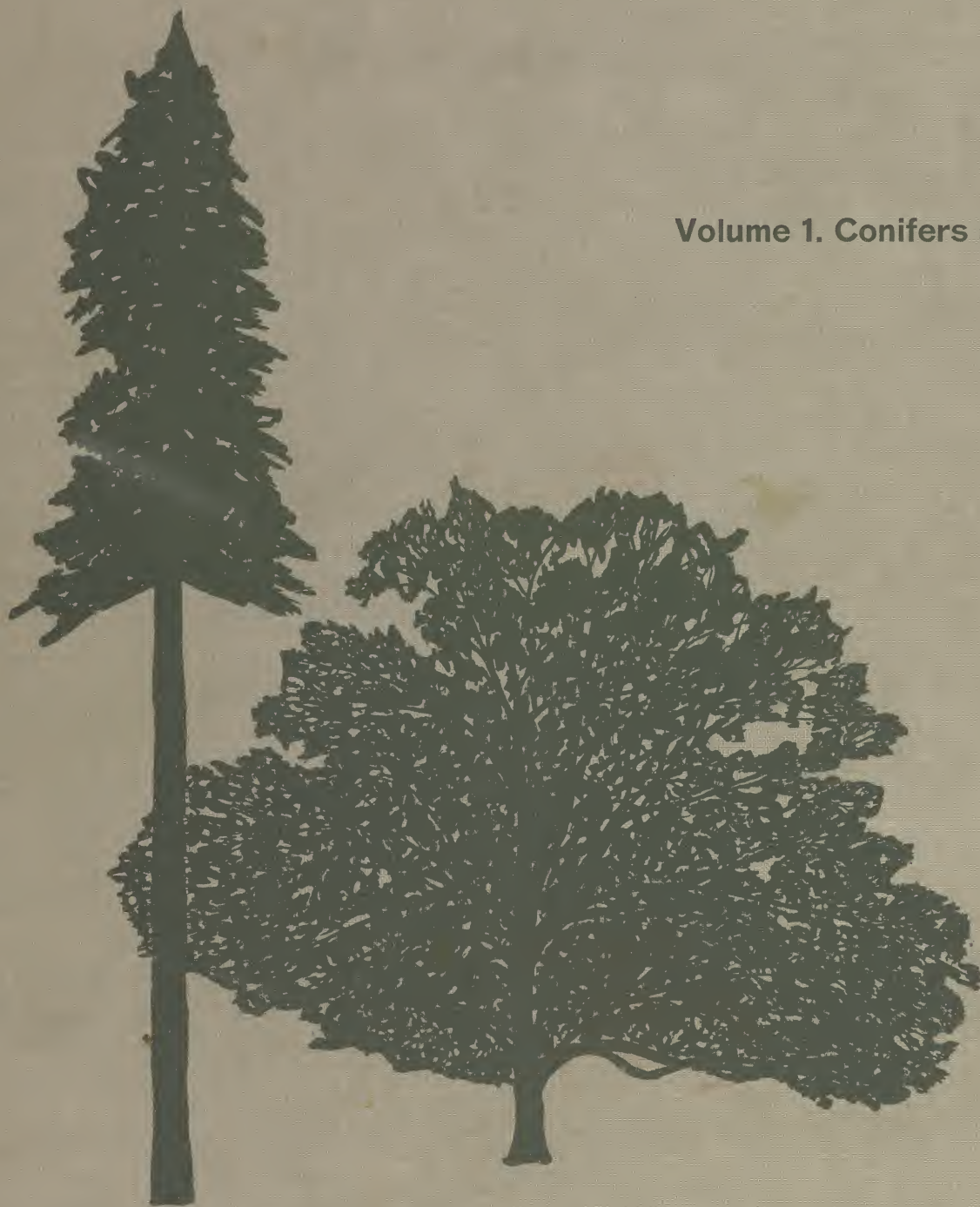
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ATLAS OF UNITED STATES TREES

Volume 1. Conifers and Important Hardwoods

by Elbert L. Little, Jr.



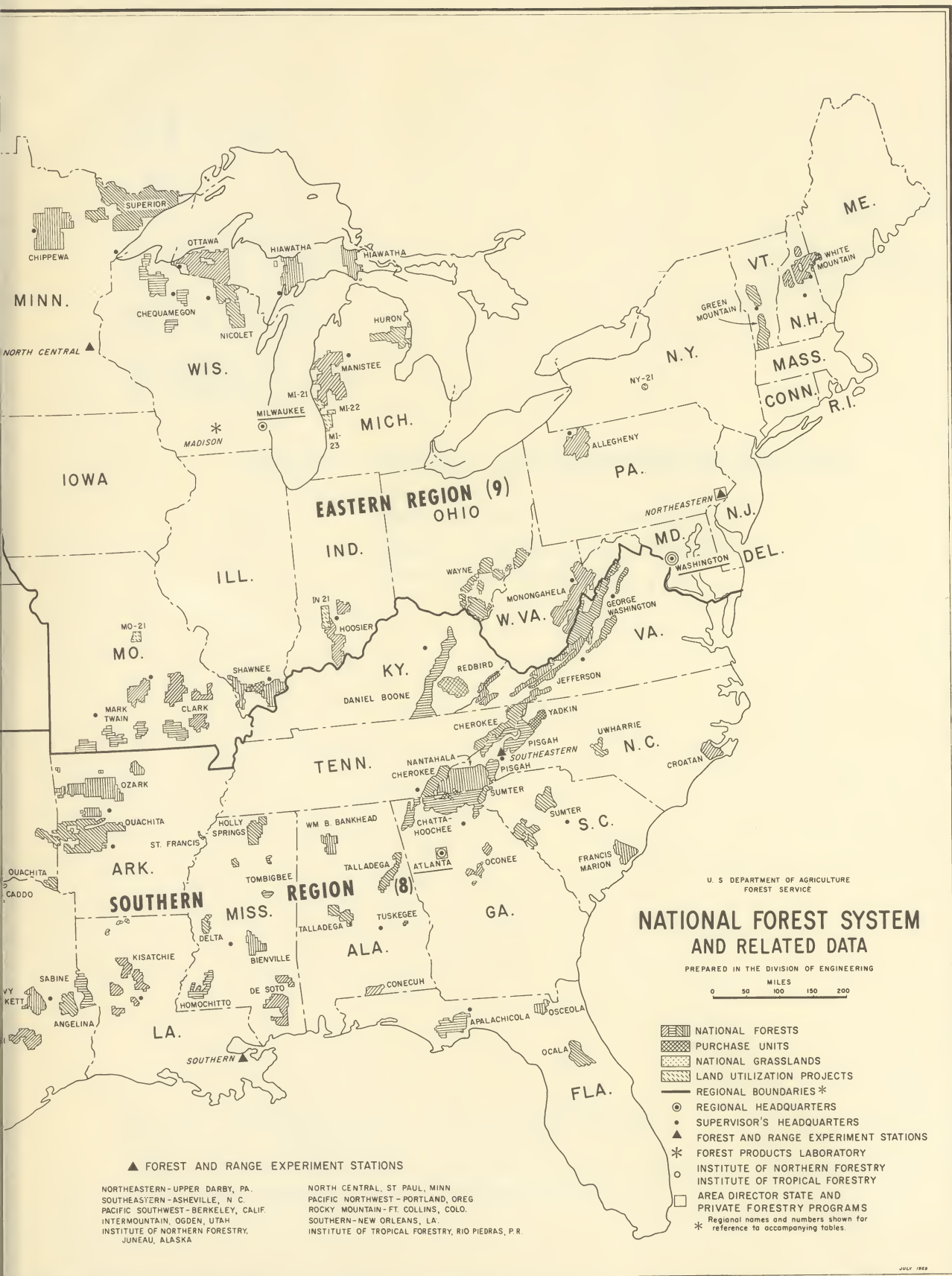
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NATIONAL FOREST SYSTEM
AND RELATED DATA

1. National Forest System
2. Related Data
3. State boundaries
4. Major rivers
5. Grid lines

Scale: 1 inch = 100 miles
Source: U.S. Forest Service, 1952-1953

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ATLAS OF UNITED STATES TREES

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Volume 1. Conifers and Important Hardwoods

by Elbert L. Little, Jr., Chief Dendrologist,
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ATLAS
OF
UNITED
STATES
TREES

Volume I: Conifers and Important Hardwoods

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| 2-N | North America. Base map with names of States of the United States, Provinces and other subdivisions of Canada, States of Mexico, and names of additional countries. |

Overlays (In pocket)

- | | |
|----------|--|
| 1-W, 1-E | Rivers and Natural Lakes. |
| 2-W, 2-E | Physical Subdivisions, or Land-Surface Form. |
| 3-W, 3-E | Topographic Relief. Contour lines at selected elevations. |
| 4-W, 4-E | Plant Hardiness Zones. Approximate range of average annual minimum temperatures for each zone (in degrees Fahrenheit). |
| 5-W, 5-E | Length of Growing Season. Mean length of freeze-free period (days) between last 32° F. temperature in spring and first 32° F. temperature in autumn. |
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| 8-W, 8-E | Maximum Extent of Glaciation in the Wisconsin Glacial Stage (Pleistocene Epoch). |
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Conifers

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6-W	grand fir, <i>Abies grandis</i> (Dougl.) Lindl.	51-W	Coulter pine, <i>Pinus coulteri</i> D. Don
7-W, 7-N	subalpine fir, <i>Abies lasiocarpa</i> (Hook.) Nutt.	52-E	shortleaf pine, <i>Pinus echinata</i> Mill.
8-W	California red fir, <i>Abies magnifica</i> A. Murr.	53-W	pinyon, <i>Pinus edulis</i> Engelm.
9-W	noble fir, <i>Abies procera</i> Rehd.	54-E	slash pine, <i>Pinus elliottii</i> Engelm.
10-W	Port-Orford-cedar, <i>Chamaecyparis lawsoniana</i> (A. Murr.) Parl.	55-W, 55-N	Apache pine, <i>Pinus engelmannii</i> Carr.
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13-W	Arizona cypress, <i>Cupressus arizonica</i> Greene	58-E	spruce pine, <i>Pinus glabra</i> Walt.
14-W	Modoc cypress, <i>Cupressus bakeri</i> Jeps.	59-W	sugar pine, <i>Pinus lambertiana</i> Dougl.
15-W	Gowen cypress, <i>Cupressus goveniana</i> Gord.	60-W	singleleaf pinyon, <i>Pinus monophylla</i> Torr. & Frém.
16-W	Tecate cypress, <i>Cupressus guadalupensis</i> S. Wats.	61-W, 61-N	Chihuahua pine, <i>Pinus leiophylla</i> Schiede & Deppe
17-W	MacNab cypress, <i>Cupressus macnabiana</i> A. Murr.	62-W	western white pine, <i>Pinus monticola</i> Dougl.
18-W	Monterey cypress, <i>Cupressus macrocarpa</i> Hartw.	63-W	bishop pine, <i>Pinus muricata</i> D. Don
19-W	Sargent cypress, <i>Cupressus sargentii</i> Jeps.	64-W, 64-N	ponderosa pine, <i>Pinus ponderosa</i> Laws.
20-W	California juniper, <i>Juniperus californica</i> Carr.	65-E	longleaf pine, <i>Pinus palustris</i> Mill.
21-W, 21-E	Ashe juniper, <i>Juniperus ashei</i> Buchholz	66-E	Table-Mountain pine, <i>Pinus pungens</i> Lamb.
22-W, 22-E, 22-N	common juniper, <i>Juniperus communis</i> L.	67-W	Parry pinyon, <i>Pinus quadrifolia</i> Parl.
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23-W, 23-N	alligator juniper, <i>Juniperus deppeana</i> Steud.	69-N, 69-E	red pine, <i>Pinus resinosa</i> Ait.
24-W, 24-N	drooping juniper, <i>Juniperus flaccida</i> Schlecht.	70-W	Digger pine, <i>Pinus sabiniana</i> Dougl.
25-W, 25-N	one-seed juniper, <i>Juniperus monosperma</i> (Engelm.) Sarg.	71-E	pitch pine, <i>Pinus rigida</i> Mill.
26-W	western juniper, <i>Juniperus occidentalis</i> Hook.	72-W, 72-N	southwestern white pine, <i>Pinus strobiformis</i> Engelm.
27-W	Utah juniper, <i>Juniperus osteosperma</i> (Torr.) Little	73-N, 73-E	eastern white pine, <i>Pinus strobus</i> L.
28-W	Pinchot juniper, <i>Juniperus pinchotii</i> Sudw.	74-E	pond pine, <i>Pinus serotina</i> Michx.
29-E	southern redcedar, <i>Juniperus silicicola</i> (Small) Bailey	75-E	loblolly pine, <i>Pinus taeda</i> L.
30-W, 30-N	Rocky Mountain juniper, <i>Juniperus scopulorum</i> Sarg.	76-W	Torrey pine, <i>Pinus torreyana</i> Parry
31-W, 31-E	eastern redcedar, <i>Juniperus virginiana</i> L.	77-E	Virginia pine, <i>Pinus virginiana</i> Mill.
32-N, 32-E	tamarack, <i>Larix laricina</i> (Du Roi) K. Koch	78-W	Washoe pine, <i>Pinus washoensis</i> Mason & Stockwell
33-W	subalpine larch, <i>Larix lyallii</i> Parl.	79-W	bigcone Douglas-fir, <i>Pseudotsuga macrocarpa</i> (Vasey) Mayr
34-W	western larch, <i>Larix occidentalis</i> Nutt.	80-W, 80-N	Douglas-fir, <i>Pseudotsuga menziesii</i> (Mirb.) Franco
35-W	incense-cedar, <i>Libocedrus decurrens</i> Torr.	81-W	redwood, <i>Sequoia sempervirens</i> (D. Don) Endl.
36-W	Brewer spruce, <i>Picea breweriana</i> S. Wats.	82-W	giant sequoia, <i>Sequoiadendron giganteum</i> (Lindl.) Buchholz
37-W, 37-N	Engelmann spruce, <i>Picea engelmannii</i> Parry	83-W, 83-N	Montezuma baldcypress, <i>Taxodium mucronatum</i> Ten.
38-N, 38-E	black spruce, <i>Picea mariana</i> (Mill.) B.S.P.	84-E	baldcypress, <i>Taxodium distichum</i> (L.) Rich.
39-W, 39-E, 39-N	white spruce, <i>Picea glauca</i> (Moench) Voss	85-E	Florida yew, <i>Taxus floridana</i> Nutt.
40-W	blue spruce, <i>Picea pungens</i> Engelm.	86-W, 86-N	Pacific yew, <i>Taxus brevifolia</i> Nutt.
41-N, 41-E	red spruce, <i>Picea rubens</i> Sarg.	86.1-N, 86.1-E	Canada yew, <i>Taxus canadensis</i> Marsh.
42-W, 42-N	Sitka spruce, <i>Picea sitchensis</i> (Bong.) Carr.	87-W	California torreya, <i>Torreya californica</i> Torr.
43-W, 43-N	whitebark pine, <i>Pinus albicaulis</i> Engelm.	88-E	Florida torreya, <i>Torreya taxifolia</i> Arn.
44-W	bristlecone pine, <i>Pinus aristata</i> Engelm.	89-N, 89-E	northern white-cedar, <i>Thuja occidentalis</i> L.
45-W	foxtail pine, <i>Pinus balfouriana</i> Grev. & Balf.	90-W, 90-N	western redcedar, <i>Thuja plicata</i> Donn
		91-N, 91-E	eastern hemlock, <i>Tsuga canadensis</i> (L.) Carr.
		92-W, 92-N	western hemlock, <i>Tsuga heterophylla</i> (Raf.) Sarg.
		93-W, 93-N	mountain hemlock, <i>Tsuga mertensiana</i> (Bong.) Carr.
		94-E	Carolina hemlock, <i>Tsuga caroliniana</i> Engelm.

Hardwoods

Map No.

95-W, 95-N	bigleaf maple, <i>Acer macrophyllum</i> Pursh	149-W, 149-E	eastern cottonwood, <i>Populus deltoides</i> Bartr.
96-W, 96-E, 96-N	boxelder, <i>Acer negundo</i> L.		Fremont cottonwood, <i>Populus fremontii</i> S. Wats.
97-E	black maple, <i>Acer nigrum</i> Michx. f.	150-W	swamp cottonwood, <i>Populus heterophylla</i> L.
98-N, 98-E	red maple, <i>Acer rubrum</i> L.		bigtooth aspen, <i>Populus grandidentata</i> Michx.
99-N, 99-E	sugar maple, <i>Acer saccharum</i> Marsh.	151-E	black cottonwood, <i>Populus trichocarpa</i> Torr. & Gray
100-W	Pacific madrone, <i>Arbutus menziesii</i> Pursh		quaking aspen, <i>Populus tremuloides</i> Michx.
101-E	silver maple, <i>Acer saccharinum</i> L.	152-N, 152-E	black cherry, <i>Prunus serotina</i> Ehrh.
102-E	Ohio buckeye, <i>Aesculus glabra</i> Willd.		California live oak, <i>Quercus agrifolia</i> Née
103-E	yellow buckeye, <i>Aesculus octandra</i> Marsh.	153-W, 153-N	white oak, <i>Quercus alba</i> L.
104-W, 104-N	red alder, <i>Alnus rubra</i> Bong.		canyon live oak, <i>Quercus chrysolepis</i> Liebm.
105-N, 105-E	yellow birch, <i>Betula alleghaniensis</i> Britton	154-W, 154-E, 154-N	swamp white oak, <i>Quercus bicolor</i> Willd.
106-E	sweet birch, <i>Betula lenta</i> L.	155-N, 155-W, 155-E	blue oak, <i>Quercus douglasii</i> Hook. & Arn.
107-N, 107-W, 107-E	paper birch, <i>Betula papyrifera</i> Marsh.	156-W	scarlet oak, <i>Quercus coccinea</i> Muenchh.
108-N, 108-E	gray birch, <i>Betula populifolia</i> Marsh.	157-E	Emory oak, <i>Quercus emoryi</i> Torr.
109-N, 109-E	American hornbeam, <i>Carpinus caroliniana</i> Walt.	158-W	northern pin oak, <i>Quercus ellipsoidalis</i> E. J. Hill
110-E	river birch, <i>Betula nigra</i> L.	159-E	Gambel oak, <i>Quercus gambelii</i> Nutt.
111-E	water hickory, <i>Carya aquatica</i> (Michx. f.) Nutt.	160-W	southern red oak, <i>Quercus falcata</i> Michx.
112-E	bitternut hickory, <i>Carya cordiformis</i> (Wangenh.) K. Koch	161-E	Oregon white oak, <i>Quercus garryana</i> Dougl.
113-E	pignut hickory, <i>Carya glabra</i> (Mill.) Sweet	162-W	California black oak, <i>Quercus kelloggii</i> Newb.
114-W, 114-E, 114-N	pecan, <i>Carya illinoensis</i> (Wangenh.) K. Koch	163-E	laurel oak, <i>Quercus laurifolia</i> Michx.
115-E	shellbark hickory, <i>Carya laciniosa</i> (Michx. f.) Loud.	164-W	overcup oak, <i>Quercus lyrata</i> Walt.
116-E	nutmeg hickory, <i>Carya myristicaeformis</i> (Michx. f.) Nutt.	165-E	California white oak, <i>Quercus lobata</i> Née
117-E	mockernut hickory, <i>Carya tomentosa</i> Nutt.	166-W	blackjack oak, <i>Quercus marilandica</i> Muenchh.
118-N, 118-E	shagbark hickory, <i>Carya ovata</i> (Mill.) K. Koch	167-W	bur oak, <i>Quercus macrocarpa</i> Michx.
119-W	golden chinkapin, <i>Castanopsis chrysophylla</i> (Dougl.) A. DC.	168-E	chinkapin oak, <i>Quercus muehlenbergii</i> Engelm.
120-E	northern catalpa, <i>Catalpa speciosa</i> Warder	169-E	swamp chestnut oak, <i>Quercus michauxii</i> Nutt.
121-W, 121-E	hackberry, <i>Celtis occidentalis</i> L.	170-W	water oak, <i>Quercus nigra</i> L.
122-W, 122-E, 122-N	sugarberry, <i>Celtis laevigata</i> Willd.	171-E	Nuttall oak, <i>Quercus nuttallii</i> Palmer
123-E	common persimmon, <i>Diospyros virginiana</i> L.	172-W, 172-E	pin oak, <i>Quercus palustris</i> Muenchh.
124-N, 124-E	flowering dogwood, <i>Cornus florida</i> L.	173-W, 173-E	willow oak, <i>Quercus phellos</i> L.
125-N, 125-E	American beech, <i>Fagus grandifolia</i> Ehrh.	174-E	chestnut oak, <i>Quercus prinus</i> L.
126-N, 126-E	white ash, <i>Fraxinus americana</i> L.	175-E	northern red oak, <i>Quercus rubra</i> L.
127-W	Oregon ash, <i>Fraxinus latifolia</i> Benth.	176-E	Shumard oak, <i>Quercus shumardii</i> Buckl.
128-E	blue ash, <i>Fraxinus quadrangulata</i> Michx.	177-E	post oak, <i>Quercus stellata</i> Wangenh.
129-N, 129-E	black ash, <i>Fraxinus nigra</i> Marsh.	178-E	black oak, <i>Quercus velutina</i> Lam.
130-W, 130-E, 130-N	green ash, <i>Fraxinus pennsylvanica</i> Marsh.	179-E	live oak, <i>Quercus virginiana</i> Mill.
131-E	American holly, <i>Ilex opaca</i> Ait.	180-N, 180-E	cascara buckthorn, <i>Rhamnus purshiana</i> DC.
132-W, 132-E	honeylocust, <i>Gleditsia triacanthos</i> L.	181-W, 181-E	mangrove, <i>Rhizophora mangle</i> L.
133-E	butternut, <i>Juglans cinerea</i> L.	182-W, 182-E	black locust, <i>Robinia pseudoacacia</i> L.
134-E	black walnut, <i>Juglans nigra</i> L.	183-E	cabbage palmetto, <i>Sabal palmetto</i> (Walt.) Lodd.
135-N, 135-E	sweetgum, <i>Liquidambar styraciflua</i> L.	184-N, 184-W, 184-E	peachleaf willow, <i>Salix amygdaloides</i> Anderss.
136-W	tanoak, <i>Lithocarpus densiflorus</i> (Hook. & Arn.) Rehd.	185-W, 185-N	black willow, <i>Salix nigra</i> Marsh.
137-E	yellow-poplar, <i>Liriodendron tulipifera</i> L.	186-N, 186-E	sassafras, <i>Sassafras albidum</i> (Nutt.) Nees
138-W, 138-E	Osage-orange, <i>Maclura pomifera</i> (Raf.) Schneid.	187-E	West Indies mahogany, <i>Swietenia mahagoni</i> Jacq.
139-W, 139-E	red mulberry, <i>Morus rubra</i> L.	188-E	American basswood, <i>Tilia americana</i> L.
140-E	cucumbertree, <i>Magnolia acuminata</i> L.	189-W, 189-E, 189-N	white basswood, <i>Tilia heterophylla</i> Vent.
141-E	southern magnolia, <i>Magnolia grandiflora</i> L.	190-N, 190-W, 190-E	winged elm, <i>Ulmus alata</i> Michx.
142-E	sweetbay, <i>Magnolia virginiana</i> L.	191-E	American elm, <i>Ulmus americana</i> L.
143-E	water tupelo, <i>Nyssa aquatica</i> L.	192-E	cedar elm, <i>Ulmus crassifolia</i> Nutt.
144-N, 144-E	black tupelo, blackgum, <i>Nyssa sylvatica</i> Marsh.	193-E	September elm, <i>Ulmus serotina</i> Sarg.
145-E	Ogeechee tupelo, <i>Nyssa ogeche</i> Bartr.	194-E	slippery elm, <i>Ulmus rubra</i> Mühl.
146-N, 146-W, 146-E	eastern hophornbeam, <i>Ostrya virginiana</i> (Mill.) K. Koch	195-E	California-laurel, <i>Umbellularia californica</i> (Hook. & Arn.) Nutt.
147-W, 147-E, 147-N	American sycamore, <i>Platanus occidentalis</i> L.	196-N, 196-W, 196-E	rock elm, <i>Ulmus thomasi</i> Sarg.
148-N, 148-W, 148-E	balsam poplar, <i>Populus balsamifera</i> L.	197-E	
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ATLAS OF UNITED STATES TREES

VOLUME 1. CONIFERS AND IMPORTANT HARDWOODS

INTRODUCTION

This volume is the first of an Atlas with large maps (mostly 12 in. x 11 in.) showing the natural distribution or range of the native tree species of continental United States including Alaska. The project is to be completed in a few volumes over a period of several years. Maps show clearly and graphically where the trees grow wild better than written summaries and have many obvious uses.

Assembled in atlas form for ready reference, these distribution maps are available to foresters, botanists, and all others interested in trees for use without restriction, since U.S. Government publications are not copyrighted. Users will render a service toward the improvement of the maps by reporting errors and range extensions. Review and correction is desired for a later, revised edition. The ultimate aim is to produce a set of highly accurate maps of wide acceptance.

Volume 1 contains maps of 200 native tree species, all native conifers or softwoods, including the needleleaf evergreens (94 species, also 2 shrub species) and the important hardwoods (106 species). Almost all trees commercially important for lumber at present are included. Completing the volume are about 10 additional hardwoods useful for other products or common in the forests.

Maps of 142 species in volume 1 have appeared in two recent Forest Service publications. "Silvics of Forest Trees of the United States" (Fowells 1965) has maps of 124 species prepared by the author of this Atlas. "Geographic Distribution of the Pines of the World" (Critchfield and Little 1966) has maps in color of all 36 native species of pine (*Pinus*), including 18 not in the preceding reference. These maps, some slightly revised, have been used, along with those of 58 additional species. Incidentally, some maps of the same species are larger and more detailed here. County boundaries were lacking on 45 North American maps in the first cited reference and on 16 maps of native pines (*Pinus*) in the second. However, the latter has enlarged maps of a few local species.

List of Maps cites the number and order of maps of the 200 tree species. Further listings are Index of Common Names and Index of Scientific Names.

The order of the List of Maps is alphabetical by scientific name; first are the conifers and second the hardwoods. Thus, a map can be found quickly by scientific name without reference to list or index. Also, related species in the same genus are placed together.

Each species has a separate map, many also a second or third map as needed. The method of numbering consists of a number for each species followed by a letter for the base map: W (Western United States), E (Eastern United States), N (North America). If a species has two maps, they are on facing pages. If three, the map of North America precedes or follows the double-page divided map of the United States. To avoid separating maps of a species, minor exceptions to alphabetical order were necessary, as noted under List of Maps.

Common names and scientific names follow the Forest Service Check List (Little 1953). That reference contains other common names in use ("Index of Common Names," p. 451-472), current synonyms of the scientific names, and "Commercial Names for Lumber" (p. 440-443). Thus, names of any important native forest tree species not found in this volume may be traced and

correlated in the Check List.

Minor changes in scientific names from those of the Check List have been adopted here, as follows:

Southwestern white pine, *Pinus strobiformis* Engelm. Formerly treated as a variety, *P. flexilis* var. *reflexa* Engelm. Accepted by Critchfield and Little (1966).

Eastern cottonwood, *Populus deltoides* Bartr. Includes as a variety, plains cottonwood, *P. deltoides* var. *occidentalis* Rydb. (*P. sargentii* Dode). Accepted by Fowells (1965).

Sargent cypress (*Cupressus sargentii* Jeps.) of the Coast Ranges of California. In the 1953 Check List treated as a synonym of Gowen cypress (*C. goveniana* Gord.). Varieties (also regarded as species) have been accepted and mapped in 3 other species of cypress (*Cupressus*).

American beech, *Fagus grandifolia* Ehrh. Includes as a variety, Mexican beech, *F. grandifolia* var. *mexicana* (Martínez) Little (*F. mexicana* Martínez).

Ohio buckeye, *Aesculus glabra* Willd. Includes the variety Texas buckeye, *A. glabra* var. *arguta* (Buckl.) Robins. (*A. arguta* Buckl.).

Giant sequoia, *Sequoiadendron giganteum* (Lindl.) Buchholz. Formerly *Sequoia gigantea* (Lindl.) Decne.

General ranges of the tree species mapped in this Atlas are recorded in the Forest Service Check List and not repeated here. The Check List mentions States along the corners and borders of distribution. However, these maps were prepared later, and they contain some ranges slightly revised.

Further information on the botanical classification including plant families is contained in the Forest Service Check List (Little 1953) under Botanical Index of Plant Families and Genera (pages 444-450).

The native conifers, all species of which are mapped here, may be classified in 4 (or 2) plant families. The yew family (Taxaceae) is represented by 2 native genera: yew (*Taxus*), with 2 native tree species (also 1 shrub species) and torreyia (*Torreya*), with 2 native tree species. The remaining conifers, 90 tree species (also 1 shrub species), are classified in 14 genera in these 3 families (formerly only the first): Pine family (Pinaceae), with 6 native genera and 61 species; redwood family (Taxodiaceae), with 3 native genera and 4 species; and cypress family (Cupressaceae), with 5 native genera and 25 tree species (also 1 shrub species). Maps of both shrubby conifers have been added.

Conifers belong to the larger group gymnosperms, composed of plants with naked seeds and without true flowers. The only other native gymnosperms are 2 genera of shrubs. Ephedra (*Ephedra*) has about 11 species in the Southwest. *Zamia* (*Zamia*) is a tropical genus of cycads with 4 species in Florida. Thus, all native tree gymnosperms are mapped in this volume.

The 106 species of important native hardwoods mapped here are grouped in 39 genera and 25 plant families. One species, cabbage palmetto (*Sabal palmetto*), belongs to the monocotyledons, while all the others are dicotyledons. Both groups comprise the angiosperms, or flowering plants.

Almost one-third of the tree species in this volume are in 2 of the largest genera of native trees. All 36 native species of pine (*Pinus*) are included. Likewise, 29 species of oak (*Quercus*), about half of the native tree species (a few others being shrubby).

HISTORY OF TREE DISTRIBUTION MAPS

Distribution studies of native tree species of the United States have been conducted by the dendrology project and other offices in the U.S. Department of Agriculture even before the Forest Service was established during a reorganization in 1905. Kinds of tree distribution maps and early work by the Forest Service have been reviewed by Little (1951).

Much information on tree ranges is contained in the first comprehensive report on the forests of the United States prepared as part of the Tenth Census in 1880 by Charles S. Sargent (1884), special agent, with the help of several associates in different parts of the country. His detailed catalogue of the forest trees of North America (exclusive of Mexico), published within this large volume, contained 412 species and a statement of the distribution of each. The first published distribution maps of native tree species of the United States appeared in this report, along with maps of the distribution and density of forests in many States. The collection of 16 large colored maps (size 19 by 28¾ inches) accompanying the volume was prepared by Andrew Robeson. These maps showed the distribution of about 15 important tree genera and about 25 tree species. A few other maps of native tree species appeared in another volume of the same census.

As early as 1897, tree species maps appeared in a bulletin of the Division of Forestry, predecessor of the Forest Service in the U.S. Department of Agriculture. Mohr (1897) in this forestry monograph of the southern pines (*Pinus*) prepared colored maps of the 4 principal species.

Many publications devoted to the trees of a single State have maps for each species. Perhaps the first State tree publication with species distribution maps was that of the forests of North Carolina by Pinchot and Ashe (1897), both authors afterwards with the USDA Forest Service. Soon afterwards, Hitchcock (1899) prepared maps for a second State, Kansas, not only of trees but of the vascular flora totaling about 1,350 species. These tiny maps were the first to show distribution by counties with dots. Tree distribution maps for a third State, Georgia, were printed in a series of articles by Harper (1907-08).

Within the Forest Service, much work on tree ranges was done by its first dendrologist, George B. Sudworth. His career with the U.S. Department of Agriculture in Washington, D.C., first with the Bureau of Forestry and Division of Forestry, afterwards with the Forest Service, extended 41 years, from 1886 to 1927. Tree ranges were summarized in the two editions of his "Check List of Forest Trees of the United States, Their Names and Ranges" (Sudworth 1898, 1927).

Soon after the Forest Service was established in 1905, Sudworth undertook a project of preparing a distribution map for each native tree species of North America, exclusive of those occurring wholly in Mexico and minor tropical trees of southern Florida. His assistants in a Section of Forest Distribution, chiefly W. H. Lamb, Georgia E. Wharton, and Mary C. Gannett, compiled on separate cards many thousand locality records for individual species, based upon published botanical lists, unpublished notes, and herbarium specimens. For each species these localities were plotted by number on a large cloth-backed contour map of North America. These maps and the card file have been preserved in the dendrology project in Washington, D.C.

Publication of these maps was begun by Sudworth (1913) under the title, "Forest Atlas—Geographic Distribution of North American Trees." Only Part I—Pines ever appeared. This part, approximately 18 by 21 inches, contained maps of the 36 native species of *Pinus*, all on a green overlay on a large black-and-white base map of North America. His introduction gave credit to unpublished field notes, observations, and reports of Forest Service officials on the National Forests, members of the Biological Survey, records from several herbaria, and published data. He emphasized the present knowledge of the geographic range of North American trees was still very incomplete. The cooperation of many observers was requested, as no one person could hope to accomplish so great a task from personal observations alone.

It is indeed unfortunate that the entire atlas, with a map for each of nearly 500 native tree species distinguished at that time was not published in 1913 or soon afterwards, when the maps represented current knowledge. Some smaller maps of conifers, poplars, tree willows, and walnuts of the Rocky Mountain region appeared in five later bulletins by Sudworth (1915, 1916, 1917, 1918; 1934), the last completed posthumously by William A. Dayton. The 1927 Check List with revised information on tree ranges was issued less than 2 months before Sudworth's untimely death on May 10, 1927. At that time an assistant was working on the maps. However, no successor was appointed, and numerous maps drafted in final form remained unpublished.

These old out-of-date maps contain a wealth of information and interesting early records, though their value is chiefly historical. Each map usually has 50 to 100 or more, sometimes as many as 200, numbered locality dots, which can be traced by number to source in the card file, if questioned. A few records apparently were erroneous, and others were not plotted exactly. However, a greater source of error resulted from the lines of range limits drawn around the scattered dots. Field work of that period was largely by horse and buggy, horseback, or foot from points along railroads and before the modern era of botanical exploration by automobile travel over networks of highways. Also, the records were most numerous in the West, where nearly all the National Forests were located, and fewer in the East.

Some years later, Munns (1938) published distribution maps of 170 important forest tree species of the United States, because of the strong demand for maps with greater accuracy, simplicity, and detail than was possible in the condensed, generalized form of the Check List. The purpose of that publication was to make readily accessible the information available in the Forest Service on the distribution of important forest trees. The maps were based very largely upon data collected by Sudworth, but some later data were compiled mostly by William W. Mitchell. This publication was criticized because of various inaccuracies in the maps but was sufficiently popular to be reprinted. Much additional information on tree distribution had accumulated in the quarter century after the appearance of the first part of the atlas in 1913, but compilation was discontinued during most of the interval. A quick review by interested botanists and foresters before publication would have improved the maps somewhat.

Most of those maps were redrafted on a smaller scale and often with slight revisions in the Forest Service series of leaflets known as American Woods, by Betts (1945). After being transferred to Washington, D.C., in February 1942 as the dendrologist, the compiler revised several maps for that series.

His first detailed work in this field was the preparation of 165 small maps for the article, "Important Forest Trees of the United States" (Little 1949), in "Trees, the Yearbook of Agriculture, 1949" (also reprinted in 1950 and afterwards as Yearbook separate No. 2156). These small yearbook maps were compiled hastily to meet a publication deadline from about 200 published references, supplemented by his field experience in a few States, as explained later (Little 1951).

Along with other work, preparation of the atlas begun by Sudworth was continued. Two recent Forest Service publications with tree species distribution maps have been mentioned (Fowells 1965; Critchfield and Little 1966).

EXPLANATION OF THE MAPS

Two base maps are used for the 200 tree species in Volume 1 of the Atlas, one of the United States for all 200 and another of North America for 67 species. These base maps have no lettering. However, place names are given on two additional base maps inserted for reference. Base map 1-W, 1-E of the United States, has names of counties, also Provinces of Canada and States of northern Mexico. Base map 2-N of North America contains names of States of the United States, Provinces and other subdivisions of Canada, States of Mexico, and names of additional countries.

The base map of the United States is 12 by 19 inches, scale 1:10,000,000, Albers Conical Equal Area Projection—standard parallels $29\frac{1}{2}^{\circ}$ and $45\frac{1}{2}^{\circ}$. This base, adapted from one compiled by the U.S. Geological Survey, was selected to conform to the National Atlas of the United States, which was projected in 1954 as a series of looseleaf maps. (However, as modified afterwards, most maps of the National Atlas are of other scales.) Limited to black-and-white, the base map shows State and county boundaries, also boundaries of adjacent Provinces of Canada and States of Mexico, and latitude and longitude marked by crosses at 5-degree intervals.

All base maps of the United States in this volume have the same scale, 1:10,000,000, or 1 inch equal to approximately 158 miles, or 1 centimeter equals 100 kilometers. Incidentally, this scale is visualized under the metric system, the meter defined as $1/10,000,000$ of the distance from the equator to the pole. Thus, a map 1 meter high would represent that distance, or 10,000 kilometers. A globe map of the earth at this scale would have a circumference of 4 m. (13 ft. 2 in.) and a diameter of 1.27 m. (4 ft. 2 in.). The scale is shown also by a line 400 miles long and on most maps also by a line 600 kilometers long. Comparison among maps is facilitated by the use of the same scale and same base map throughout, even though some species have limited geographic range. Also, transparent overlays can be applied to all.

The size of the atlas and especially of the pages is kept within convenient limits by the division of the maps into two parts of one page each, Eastern and Western United States. Nearly all native tree species are separable into these two geographic groups, though a few extend across the interior. The separation line, particularly the western limit of most eastern species, is east of Longitude 100° W. Similarly, the eastern limit of nearly all western species is west of the same line. Thus, the maps are divided into eastern, approximately 11 inches wide, and western, mostly $8\frac{1}{4}$ inches wide (sometimes more). The 28 species with broader range have a double-page spread of the entire United States.

The second base map, North America, is added for the 67 tree species whose natural range extends beyond the limits of the first, either northward into Canada and Alaska or southward into Mexico. Thus, the entire distribution is shown, with rare exceptions. This one-page base map of North America represents a reduction to about three-eighths the scale of the United States base, or a scale of roughly 1:27,000,000. Thus, 1 inch equals about 425 miles, and 1 centimeter about 270 kilometers. State and national boundaries, also principal rivers, and latitude and longitude are shown.

Another base map of the United States, National Forest System and Related Data, is reproduced in the end papers, both front and back. This map shows the location of the 153 National Forests, which are widely distributed in 40 States, also the 21 National Grasslands in 12 States. Comparison with a tree species map will indicate the National Forests where that species can be found. Many tree species are also within specially managed areas, such as experimental forests and research natural areas.

The natural distribution or range of a tree species, as mapped in this atlas, is the geographical area where the species, including all varieties, is native or wild. The distribution of the native tree species of the United States is mapped as of the present time, exclusive of changes caused directly or indirectly by European man. However, where changes have occurred following European settlement, the distribution is intended to be before Columbus, or pre-Columbian. In nearly all native tree species, the man-caused changes in range limits up to the present are believed to be negligible or recognizable. Most of the western half of the country has been settled less than a century. The commercial timber supply in the West is still mostly from virgin forests. Vast areas of natural forests remain in the Western States, mostly in less accessible parts of the National Forests. In the East, including agricultural and urban areas, sufficient scattered trees and secondary forests remain to show the natural distribution. However, total destruction has taken place in cities and artificial lakes.

Records of planted or introduced trees outside the continuous natural ranges have not knowingly been mapped. Nevertheless, in the future, maps adding forest plantations or other successful

introductions beyond the original occurrence may merit compilation.

Limits of natural geographic distribution are shown on each map by lines, and the area occupied is filled in by dots (stippling) or gray shading. The effect is a colored map with range in gray on a black-and-white base. Broken lines along the limits of several species, particularly those widely naturalized, indicate uncertainty of the exact position.

Outlying stations or outliers are shown similarly by large or small dots according to size. However, the smallest areas, such as a grove with only a few trees, must be enlarged to a dot, representing several miles in diameter, to be visible on a map. Records from two or three adjacent outlying counties often have been combined as a single large dot. Width of strips, such as along rivers, has been broadened slightly. A few localities beyond the main range, where a species is known to have occurred naturally within historic times but is now extinct, are designated by X. Arrows have been added to direct attention to isolated dots.

In those Eastern States where presence or absence of trees is recorded on published maps merely by counties, the range limits are not intended to be accurate to smaller detail. Lines in those States generally have been drawn to avoid counties without records. Where much collecting has been done over a period of years, the continuous limits of many native tree species are now known approximately by counties and mostly within 25 miles.

The maps of the 124 species in "Silvics of Forest Trees of the United States" (Fowells 1965) have been reproduced here, though larger, uniform in size, and with moved borders. These maps are recognized by the stippling. Several have been revised slightly, such as by addition of range extensions, and a few have been redrafted. As mentioned above, corresponding United States maps with county boundaries are added here for the 47 species represented in the previously mentioned publications by North American maps.

New maps in this volume were prepared by a simpler process. Pencil maps traced from rough drafts or working maps have been reproduced directly as halftones made with a very fine screen. Thus, redrafting was avoided, detail and accuracy were retained, and time was saved. Also, these maps with area shown in lead pencil can be revised quickly as needed and thus maintained current for use in other publications. A projector in a dark room was used to copy exactly from other maps of different scales, as well as between maps of a species on the two bases.

The primary object is to map the natural distribution of tree species. Some related information is supplied by the 9 transparent overlays described below. Ranges are those of a species including any and all varieties. Except for geographic varieties in a few species, varieties have not been mapped. Hybrids are omitted.

Presence or absence is shown, but not abundance or density. Any large areas within the main range where a species is known to be absent, for example, high mountains, are marked by lines or holes unshaded within. Commercial range, formerly designated on some old maps, is not shown for obvious reasons. Such information becomes out-of-date following cutting of virgin forests, abnormal losses by fire, insects, and disease, and changing demands, practices, and standards in utilization. Altitudinal limits, which vary in different latitudes, are not indicated, except in Overlay 3.

The species maps do not indicate forest types, or forest cover types, which are the subject of Overlay 9. Forest type maps show areas where one or few tree species are the commonest elements comprising the bulk of the forest. Nevertheless, most tree species are not confined to a single forest type and have ranges somewhat beyond. Colored maps of forest types and data on volumes of standing timber of commercial tree species are contained in forest survey publications by the Forest Service for States.

These maps do not show where a species grows outside the natural range after having been introduced directly or indirectly by man, whether planted, escaped, adventive, or naturalized. Records of trees planted for forestry, shade, or other purposes and of escapes from cultivation have been omitted. Also excluded are naturalized trees, those introduced outside their natural range and thoroughly established and reproducing as though native.

A few tree species have been planted so widely and have become so thoroughly naturalized that the limits of their original ranges are in doubt and are mapped as broken lines. Examples are black locust (*Robinia pseudoacacia*), northern catalpa (*Catalpa speciosa*), and Osage-orange (*Maclura pomifera*). Others with edible seeds or other useful products may have been disseminated by the American Indians.

It is not always easy to determine whether an isolated group of trees is native or an introduction by man directly or indirectly. Large mature or old trees in an undisturbed forest are more likely to be native than a group of small, young trees in a disturbed or secondary forest. Also, the presence of other species with similar pattern of separated or disjunct distribution strengthens the evidence possibly of natural occurrence in a relic forest.

OVERLAYS

Nine transparent overlay maps of the United States that illustrate special details of the environment are added as Overlays 1-9. Titles are given in the List of Maps after Contents and also below, along with explanatory notes and sources. Printed in green ink on one side of transparent paper, these maps can be removed along perforations as eastern and western parts and placed on the tree species maps by alignment at the outside corners. Thus, comparison and correlation (if any) between the natural range and certain environmental factors can be made readily.

A few overlays contribute additional details to the background of the base maps of the United States, for example, rivers and altitudes. These features could not be shown clearly on black-and-white maps. Other overlays mostly summarize climatic records and thus show graphically for a species the extreme environmental conditions and their geographic location. Four overlays have been adapted from colored maps in the National Atlas, and two are from black-and-white maps in the Climatic Atlas.

Caution should be exercised in applying the overlays to mountainous regions, especially in the Western United States. The generalized maps cannot show precisely the climatic limits in small areas of great relief or wide variation in altitude. Further information on each overlay follows.

Overlay 1. Rivers and Natural Lakes.—Drainage with rivers and natural lakes is taken from a base map of the same scale compiled by the U.S. Geological Survey (1959). Also printed in blue on the map, National Forests and other Lands Administered by the Forest Service (1962), issued by the Forest Service, USDA, as a sheet of the "National Atlas of the United States" (Library of Congress—G-3701.K3; Dewey Decimal—634.9250973).

Overlay 2. Physical Subdivisions, or Land-Surface Form.—From the colored map in the National Atlas, Land-Surface Form, Sheet No. 61 (1966), scale 1:17,000,000. This classification by Edwin H. Hammond (1965) contains 6 major divisions and 36 provinces, listed below and designated on the overlay by number.

I. Atlantic Division.

1. Gulf-Atlantic Coastal Flats.
2. Lower New England.
3. Gulf-Atlantic Rolling Plain.
4. Lower Mississippi Alluvial Plain.

II. Eastern Highland Division.

5. Adirondack-New England Highlands.
6. Appalachian Highlands.
7. Eastern Interior Uplands and Basins.
8. Ozark-Ouachita Highlands.

III. Interior Division.

9. North-Central Lake-Swamp-Moraine Plains.
10. Southwest Wisconsin Hills (Driftless Area).
11. East-Central Drift and Lake-bed Flats.
12. Dakota-Minnesota Drift and Lake-bed Flats.
13. Middle Western Upland Plain.
14. North-Central Lake-Swamp-Moraine Plains.
15. West-Central Rolling Hills.

16. Nebraska Sand Hills.
17. Mid-continent Plains and Escarpments.
18. High Plains.
19. Upper Missouri Basin Broken Lands.
20. Rocky Mountain Piedmont.
21. Stockton-Balcones Escarpment.

IV. Rocky Mountain Division.

22. Northern Rocky Mountains.
23. Middle Rocky Mountains.
24. Southern Rocky Mountains.
25. Wyoming-Big Horn Basins.
26. Blue Mountains.

V. Intermontane Division.

27. Columbia Basin.
28. Harney-Owyhee Broken Lands.
29. Snake River Lowland.
30. Basin and Range Area.
31. Colorado River Plateaus.
32. Upper Gila Mountains.

VI. Pacific Mountain Division.

33. Cascade-Klamath-Sierra Nevada Ranges.
34. Puget-Willamette Lowland.
35. Central Valley of California.
36. Coast Ranges.

Overlay 3. Topographic Relief. Contour lines at selected elevations. This general contour map is slightly simplified from the colored map in the National Atlas, Physiography, Sheet No. 59 (1968), scale 1:17,000,000. Some relationships in species distribution may be indicated, though altitudes cannot be shown precisely at this scale. The seven contour lines are listed below.

Feet	Meters
12,000	3,658
9,000	2,743
5,000	1,524
2,000	610
1,000	305
500	152
0	0 (sea level)

Overlay 4. Plant Hardiness Zones. Approximate range of average annual minimum temperatures for each zone (in degrees Fahrenheit).

Zone 1	Below -50° F.	Zone 6	-10° to 0°
Zone 2	-50° to -40°	Zone 7	0° to 10°
Zone 3	-40° to -30°	Zone 8	10° to 20°
Zone 4	-30° to -20°	Zone 9	20° to 30°
Zone 5	-20° to -10°	Zone 10	30° to 40°

From map prepared by U.S. National Arboretum, Agricultural Research Service (1965), U.S. Dep. Agr. Misc. Publ. 814, folded map. This map indicates only the coldest winter temperatures under which a tree species grows wild. It may suggest roughly where the species would be hardy when planted outside the natural range.

Overlay 5. Length of Growing Season. Mean length of freeze-free period (days) between last 32° F. temperature in spring and first 32° F. temperature in autumn. Adapted and slightly simplified from black-and-white map of same scale, page 31, in "Climatic Atlas of the United States, U.S. Dep. Commerce, Environmental Science Services Administration, Environmental Data Service (1968)."

Overlay 6. Precipitation or Rainfall. Normal annual total precipitation (inches). Adapted and slightly simplified from black-and-white map of same scale, page 43, in "Climatic Atlas of the United States (1968)," (cited above).

Overlay 7. Climates of the United States. Normal distribution of the principal climates in the United States. Precipitation effectiveness (P-E) index.

Climatic type	Vegetation type	P-E index
A superhumid	rain forest	128 up
B humid	forest	64 to 127
Cr moist subhumid	grassland	48 to 63
Cd dry subhumid	grassland	32 to 47
D semiarid	steppe	16 to 31
E arid	desert	0 to 15

From colored map, plate 3, scale 1:17,000,000, in Thornthwaite, C. W. "Atlas of Climatic Types in the United States 1900-1939." U.S. Dept. Agr. Misc. Publ. 421, 7 p., maps. 1941. The precipitation-effectiveness (P-E) index is a means of evaluating the effectiveness of precipitation at the temperature at which it fell.

Overlay 8. Maximum Extent of Glaciation in the Wisconsin Glacial Stage (Pleistocene Epoch).—The composite line across the Northern United States represents the southern border of continental ice sheets mostly 10,000 to 15,000 years ago or more than 35,000 years westward, as in Iowa. Lines in the Western United States show the maximum extent of mountain glaciers at the same time. Compiled from maps of the Geological Society of America by Flint et al. (1945, 1959).

This map illustrates climatic change and corresponding migration of tree species. Some northern tree species have present ranges mostly within regions buried by thick ice sheets several thousand years ago.

Overlay 9. Major Forest Types.—Adapted and slightly simplified from colored map, scale 1:7,500,000, prepared by Forest Service, USDA, in the National Atlas, Forest Types, Sheet No. 182 (1969).

The 20 major forest types are listed below by number and name of characteristic tree species or genera.

Eastern forests

1. White-red-jack pine (*Pinus strobus*, *P. resinosa*, *P. banksiana*).
2. Spruce-fir (*Picea-Abies*).
3. Longleaf-slash pine (*Pinus palustris*, *P. elliotii*).
4. Loblolly-shortleaf pine (*Pinus taeda*, *P. echinata*).
5. Oak-pine (*Quercus-Pinus*).
6. Oak-hickory (*Quercus-Carya*).
7. Oak-gum-baldcypress (*Quercus-Nyssa-Taxodium*).
8. Elm-ash-cottonwood (*Ulmus, Fraxinus, Populus*).
9. Maple-beech-birch (*Acer, Fagus, Betula*).
10. Aspen-birch (*Populus-Betula*).

Western forests

11. Douglas-fir (*Pseudotsuga menziesii*).
12. Hemlock-Sitka spruce (*Tsuga-Picea sitchensis*).
13. Redwood (*Sequoia sempervirens*).
14. Ponderosa pine (*Pinus ponderosa*).
15. White pine (*Pinus monticola*).
16. Lodgepole pine (*Pinus contorta*).
17. Larch (*Larix occidentalis*).
18. Fir-spruce (*Abies-Picea*).
19. Hardwoods (*Quercus, Populus*, etc.).
20. Chaparral (*Arctostaphylos, Quercus*, etc.).
21. Pinyon-juniper (*Pinus, Juniperus*).

Nonforest

Land never forested or now developed for other uses.

The 9 overlays are folded in pocket inside back cover.

PREPARATION OF THE MAPS

The maps in this volume have been compiled from various sources, published and unpublished, supplemented by some field experience in several States. Fortunately, much more detailed information on tree distribution is available now than in Sudworth's time or even when the present compiler began preparing maps about a quarter century ago.

Credit is due many persons for their valuable assistance. The list of publications and persons consulted is too long for citation here. Naturally the compiler is responsible for all errors.

More than 300 references have been consulted, including for each State those with the most detailed information on tree ranges. Many sources acknowledged for the maps of the species of pine (*Pinus*) in the United States (Critchfield and Little 1966) served also for this volume. Other helpful references were cited in bibliographies by Blake and Atwood (1942), Dayton (1952), and Andresen (1961).

About one-fourth of the States now have publications with distribution maps of all or most native tree species, mainly with dots by counties. These, with author and year, are: Alaska (Hultén 1941-1949, 1968), Georgia (Harper 1907-1908; Duncan 1950), Idaho (Johnson 1961), Illinois (Miller and Tehon 1929; Jones and Fuller 1955), Indiana (Deam 1932), Kansas (Gates 1938), Missouri (Steyermark 1963), Montana (Booth and Wright 1962), Nebraska (Pool 1919), Ohio (Braun 1961), North and South Carolina (Radford, Ahles, and Bell 1965), and Wisconsin (Fassett 1930).

State herbaria in these and other States maintain unpublished card files of maps showing by dots where herbarium specimens were collected, either by counties or localities. Detailed card files based upon numerous collections have been consulted in Colorado, Kentucky, New Mexico, New York, North Dakota, Pennsylvania, Tennessee, West Virginia, and Wyoming. Card files have been examined in a few other State herbaria. Additional card files are in preparation or have been enlarged in recent years. Naturally, this compilation over a period of years does not contain all the latest herbarium records.

The Forest Service, USDA, through its Forest Survey has published distribution maps of commercial forest trees in four Southeastern States, based upon intensive field surveys and measurements on thousands of sample plots. These States are: Mississippi (Sternitzke and Duerr 1950), North Carolina (Roberts and Cruikshank 1941a), South Carolina (Roberts and Cruikshank 1941b), and Virginia (Evans 1942). Also consulted were the unpublished Forest Survey records for the more important commercial species by counties for all Southeastern and Southern States.

Detailed maps of most native tree species in California were prepared some years ago by the California vegetation-type survey of the Forest Service but have not yet been completed for publication. The large-scale quadrangles show scattered and irregular distribution too minute to be copied precisely on small maps. Sudworth's unpublished maps have been reexamined for old records also.

Probably the most reliable published maps are those of taxonomic monographs and those of a single species based upon extensive field work, such as a doctoral thesis. Unfortunately, few tree species of the United States have been the subject of such detailed studies. Examples are the maps of species of buckeye (*Aesculus*) by Hardin (1957), those of western larch (*Larix occidentalis*) and subalpine larch (*Larix lyallii*) by Knudsen et al. (1968), and that of Table-Mountain pine (*Pinus pungens*) by Zobel (1969).

After species maps, the next best sources have been publications on the trees and plants of individual States, such as tree guides, State floras or manuals, and catalogs. Several States have publications recording tree species distribution accurately and in detail almost as precise as maps, such as by counties or counties along the border or, for rare species, by localities. In other States, scattered published local floras with lists by counties or similar geographic units have been helpful in filling in the gaps. The classic Manual by Sargent (1926) contains important locality records. Much information on range extensions is scattered in published notes.

Maps of forest types and vegetation have been very helpful, especially in the Western States where sharp limits of forests and climatic zones of vegetation are based largely upon differences in altitude. Regrettably, maps of the same region sometimes differ in their classifications and type boundaries. Forest type maps in color have been issued by the Forest Survey of the Forest Service for nearly all forested parts of the country in many scattered publications, mostly on the forest resources of one State or smaller unit. Detailed vegetation maps have been published for a number

of States, also one of natural vegetation of the United States by Zon and Shantz (1924). The recent maps of the vegetation of conterminous United States by Kuchler (1964) and Vegetation, National Atlas Sheet No. 90 (1967) are detailed and highly accurate but lack county boundaries for orientation and were not available until after most maps in this volume had been prepared. The map Forest Types, National Atlas Sheet No. 182 (1969), prepared by the Forest Service, has been reduced and adapted slightly for inclusion in this volume as an overlay (Map 9).

Much information on land forms and vegetation has been obtained on field trips in various parts of the country, also from airplane and car windows. Relief maps and those of topography and land forms have been consulted.

Herbarium specimens have been a minor source of additional records, especially for a few States not otherwise adequately covered. On trips the compiler has examined some specimens in a few State herbaria. Also, the extensive collections in the U.S. National Herbarium of the U.S. National Museum, Washington, D.C., have been consulted for several species, particularly to determine limits of distribution or to verify range extensions. However, except for local species, one large herbarium alone probably would not have enough specimens for the preparation of a detailed tree species map. Of course, the compiled published and unpublished records cited above were based upon hundreds or thousands of specimens for each species.

Tree ranges in Canada have been compiled from various publications by Canadian foresters and botanists. Valuable small maps of each species were printed in "Native Trees of Canada" (Canada Dep. Forestry 1961). Floras and tree guides of the different provinces, a few with species maps, were examined. Among other useful sources were the maps of species limited to southern Ontario prepared by Fox and Soper (1952-54), those by Halliday and Brown (1943), and the map of forest regions of Canada by Rowe (1959).

Ranges of tree species extending south into Mexico or beyond into Central America are not so well known but have been compiled from several publications. Noteworthy were the thorough researches on the Mexican members of the pine family (Pinaceae) with some maps, by Martínez (1948, 1963).

For review and correction of the rough draft maps, credit is due many persons who have given freely of their time, especially foresters of the Forest Service and botanists familiar with the trees of their States or other areas. Regretably, some of the maps finished last could not be circulated and reviewed more widely before publication.

Acknowledgment is due James R. Griffin for assistance in the preparation of maps of several tree species in California. Brother L. Robert has reviewed the maps of elm (*Ulmus*), and Marion T. Hall those of juniper (*Juniperus*). Donald E. Stone has added records for the species of hickory (*Carya*). Extensions of Mexican ranges have been contributed by Arturo Gómez-Pompa.

All important native tree species of Alaska are represented among the 18 species of that State mapped here. Their range is shown on the maps of North America, where Alaska appears in a slightly distorted projection. A publication on Alaska trees and shrubs with more detailed maps of the native tree species is being prepared.

The native tropical trees of Hawaii and the Commonwealth of Puerto Rico are best mapped separately. Only one tree species is recorded as native both in continental United States and Hawaii. However, several, including mangrove (*Rhizophora mangle*) of this volume, are common to southern Florida and Puerto Rico. Maps of 100 species in Puerto Rico based on a forest survey were published in "Common Trees of Puerto Rico and the Virgin Islands" (Little and Wadsworth 1964).

Users naturally are interested in the reliability of the maps. Several have expressed a desire for publication of dots for localities based upon specimens, published records, and sight records. A few taxonomists would prefer maps only of dots from herbarium specimens and without interpolated lines, but these would be incomplete and inadequate. Moreover, sight records of easily recog-

nized species by competent observers are dependable. Crowded State herbaria might not accept or preserve numerous specimens of a common tree species, such as from every county.

Careful compilation of dot records, as in Sudworth's project, and their publication would show readers the gaps in the information and where more detailed field work is needed. While the reliability would be indicated, the accuracy would remain unchanged. These maps have been compiled through the years along with other work by the author and a clerical assistant. Sources of most locality records were indicated on the working maps and could be traced if necessary. However, detailed record keeping and reproduction of hundreds of dots on most maps would have added greatly to the time in preparation and would have delayed publication.

The great reduction in the scale of the maps tends to reduce errors and to eliminate irregularities in the drawing of lines along range limits. Mapping of range as a dotted area bordered by dots perhaps would be more natural, as individual trees would appear as dots on a large-scale map. However, a line serves for emphasis, in spite of problems in connecting dots.

NOTES ON RANGES

Some observations on tree distribution may be noted from the maps of the 200 species in this atlas. However, analyses of the ranges are outside the scope of this volume. An attempt has been made to record where each species grows naturally now, not to explain or speculate how and why.

Conifers, as shown by the maps of all 94 native tree species and the 2 additional shrubby ones, are much better displayed in the Western than in the Eastern United States. About two-thirds, or 64 species, are on western maps, only 27 on eastern maps, and 5 on both. All 16 of the native genera of conifers occur on western maps, though *Taxodium* barely crosses 100° longitude. Also, these 5 genera are absent in the East: *Cupressus*, *Libocedrus*, *Pseudotsuga*, *Sequoia* and *Sequoiadendron*. Western species comprise 26 of the 36 native species of pine (*Pinus*), 7 of the 9 of fir (*Abies*), 4 of the 7 of spruce (*Picea*; 2 others both western and eastern), 7 or more of the 12 species of juniper (*Juniperus*), all 7 species of cypress (*Cupressus*), and 2 of the 3 species of *Chamaecyparis* and *Larix*.

Hardwoods, according to the 106 important species mapped here, have much greater representation in the East than in the West. Almost two-thirds, or 64 species, are on eastern maps, only 18 on western, and 24 on both eastern and western (including 14 eastern species not reaching the Rocky Mountains). For example, 16 of the 29 important species of oaks (*Quercus*) are eastern, 8 western, and 5 on both maps.

Many maps show distinctive or unusual ranges. Especially noteworthy are the species of farthest geographic extent and greatest variation in environmental conditions. These species may be widely adapted to many combinations or else apparently variable or composed of geographic races. Nearly all widely distributed native trees are represented among the conifers and important hardwoods mapped here.

Relatively few tree species have broad East-West ranges across the continent and can be classed as transcontinental. The seven listed below are widespread in the northern coniferous forests from Labrador, Newfoundland, and the Northeastern United States across Canada to Alaska:

common juniper, *Juniperus communis*
tamarack, *Larix laricina*
white spruce, *Picea glauca*
black spruce, *Picea mariana*
paper birch, *Betula papyrifera*
balsam poplar, *Populus balsamifera*
quaking aspen, *Populus tremuloides*

Two northern associates, balsam fir (*Abies balsamea*) and jack pine (*Pinus banksiana*), stop in the Rocky Mountains of western Canada, where they meet western relatives.

Boxelder (*Acer negundo*) is the only tree species of this volume ranging from the Atlantic to Pacific coasts across continental

United States south of Alaska. Variable and often divided into varieties, it reaches also far into Canada and Mexico, even to Guatemala. Black willow (*Salix nigra*) would be a second, according to authors uniting a southwestern segregate as a variety.

Quaking aspen (*Populus tremuloides*) is the species of greatest geographic distribution as a tree in North America. Besides being transcontinental across more than 3,500 miles in the northern coniferous forests, it ranges southward through the western mountains to scattered outposts in Mexico, more than 3,200 miles through 48 degrees of latitude.

Common juniper (*Juniperus communis*) is a low shrub of very broad occurrence in northern regions and high mountains, which rarely becomes a small tree in New England and elsewhere in the northeastern States. Its entire natural range in North America as a shrub extends northward in the tundra beyond the tree limits from Labrador across Canada to northwestern Alaska. Southward in mountains it reaches South Carolina, New Mexico, and Arizona, a range of more than 35 degrees of latitude. It is the only tree species of the United States native also in Greenland and Iceland. This variable species is circumpolar, growing around the world across northern Europe and Asia, commonly as a small tree in the Old World. Records claimed for this species are the most widely distributed conifer in North America and the world, also, the most widespread tree species native in the north temperate zone. No other species mapped in this volume is native also on continents of the Old World. Very few tree species are native in both Eastern and Western Hemispheres, nearly all of these being tropical.

Red maple (*Acer rubrum*) has the greatest continuous north-south distribution of trees along the Atlantic coast, from the Everglades of southern Florida north beyond Maine to Nova Scotia, Cape Breton Island, and Quebec, also Newfoundland, about 23 degrees of latitude. A closely related species, sometimes classed as a variety, is found in Japan.

Many tree species have wide distribution through the deciduous forests of the eastern third of the United States from New England to northern Florida and west to the Mississippi River or to the forest-grassland border from Minnesota to Texas. Several extend westward into the grasslands nearly to the Rocky Mountains. Among the eastern trees with broad western ranges are: eastern redcedar (*Juniperus virginiana*), hackberry (*Celtis occidentalis*), green ash (*Fraxinus pennsylvanica*), bur oak (*Quercus macrocarpa*), and American elm (*Ulmus americana*).

Several common tree species of the Eastern United States reappear southward on mountains of Mexico or also Central America, sometimes as distinct botanical varieties or named again as separate species. Eleven examples, as shown on the North American maps, are:

eastern white pine, *Pinus strobus*
American hornbeam, *Carpinus caroliniana*
pecan, *Carya illinoensis*
shagbark hickory, *Carya ovata*
flowering dogwood, *Cornus florida*
American beech, *Fagus grandifolia*
sweetgum, *Liquidambar styraciflua*
black tupelo or blackgum, *Nyssa sylvatica*
eastern hophornbeam, *Ostrya virginiana*
American sycamore, *Platanus occidentalis*
black cherry, *Prunus serotina*

In the Western United States, most tree species have discontinuous and irregular distribution patterns because of great variations in topography, altitude, and climate. The two with greatest geographic area in the Western United States are ponderosa pine, (*Pinus ponderosa*) and Douglas-fir (*Pseudotsuga menziesii*). With their geographical varieties, both range from British Columbia southward through the Rocky Mountains and west to the Pacific coast and beyond into mountains of Mexico. Douglas-fir has an extreme latitudinal range of about 36 degrees and ponderosa pine nearly 30 degrees. Ponderosa pine and Rocky Mountain juniper (*Juniperus scopulorum*) are the Rocky Mountain trees with greatest eastward extension into the Plains grassland.

Lodgepole pine (*Pinus contorta*) is the only conifer native in

both Alaska and Mexico. It ranges from southeast Alaska and Yukon southward in mountains to Colorado and southern California, also mountains of northern Baja California, more than 32 degrees of latitude. Subalpine fir (*Abies lasiocarpa*) also extends more than 30 degrees through mountains from Yukon and Alaska to Arizona and New Mexico.

Black cottonwood (*Populus trichocarpa*) is the hardwood or deciduous tree with farthest continuous north-south occurrence along the Pacific coast, from southern Alaska to northern California, through 20 degrees of latitude, and beyond about 10 more degrees in mountains of California to those of northern Baja California. A few other tree species are continuous through the Pacific coniferous forests from southern or southeastern Alaska to northern California or beyond. Examples are red alder (*Alnus rubra*), Sitka spruce (*Picea sitchensis*), and western hemlock (*Tsuga heterophylla*).

Naturally, a few coniferous species of the Rocky Mountains and southwestern mountains extend southward at high altitudes into Mexico. Illustrations are white fir (*Abies concolor*) and one-seed juniper (*Juniperus monosperma*). Also, others of the California mountains reappear on peaks of Baja California, for example, incense-cedar (*Libocedrus decurrens*), sugar pine (*Pinus lambertiana*), and Jeffrey pine (*P. jeffreyi*).

Two tropical species of southern Florida are mapped, both with their main distribution beyond the United States, West Indies mahogany (*Swietenia mahagoni*) and mangrove (*Rhizophora mangle*). Also, a subtropical palm in the Southeast, cabbage palmetto (*Sabal palmetto*).

Tree species of local or narrow distribution are of special interest. Some may be rare or endangered and in need of preservation. Most appear to be relics or ancient species of former wide range, while others may be relatively young.

The hardwoods of this volume are not local or rare, being selected because of their commercial importance or abundance. Exceptions just mentioned are the two tropical species reaching continental United States in southern Florida.

Conifers have a large representation of local species in this volume, partly because all native conifers are mapped and perhaps because some are survivors of groups with broader fossil records. About one-third, or 32 species of the 94 native tree conifers have local or restricted distribution in the United States. However, 7 of these are southwestern or primarily Mexican and more widespread south of the border. The 25 conifer species of local range entirely or mostly within the United States are grouped in the following 12 genera: *Abies* (2 species), *Chamaecyparis* (1), *Cupressus* (all 7 species and a few local varieties accepted also as species), *Juniperus* (1), *Larix* (1), *Picea* (1), *Pinus* (6), *Pseudotsuga* (1), *Sequoiadendron* (1), *Taxus* (1), *Torreya* (2), *Tsuga* (1). Names and ranges are shown in the maps. Fortunately, most have some protection within National Forests, National Parks, and other specially designated parks and preserves. While some are rare, relatively few of these local species would be classed as endangered and threatened with extinction. Nevertheless, without continued and increased protection, these species could become scarcer.

APPLICATIONS OF THE MAPS

Several applications of these maps of native trees of the United States may be mentioned, though most uses are obvious. First, the maps show where each tree species grows wild and can be found for study for any purposes. Also, where plantations or trees from locally collected seed should be successful.

To specialists, the maps may reveal errors and suggest corrections, also likely localities where further field work is needed for revision and where range extensions and State records may be sought. The natural ranges are preserved for the historical record, before the forests are destroyed or partly replaced by plantations of improved varieties and hybrids. The maps have economic value, suggesting possible sources of wood and other products in addition to the detailed information on timber volumes provided by forest surveys.

The transparent overlays and maps together summarize graph-

ically the average and extreme conditions of the environment (temperature, precipitation, latitude, altitude, etc.) of each species. They provide the basis for correlation studies of distribution of a species and the environment, including limiting factors. Also, these maps indicate local climates to which geographical or local races may be adapted.

The maps are of special importance in the collection of seed. They show first the geographic areas and localities where seed can be collected from wild trees. They suggest the possible occurrence of geographic races and seed sources, particularly for tree improvement programs including hybridization tests and for testing or introduction beyond the native range, such as foreign countries with similar climates.

Maps can be helpful in identifying wild trees, indicating the presence or absence of a species in a particular area. For tree identification a new handbook with revised small maps is planned.

Finally, the maps serve as background material for such studies as classification, evolution, paleobotany, and genetics.

FUTURE WORK

Early completion of the remaining volumes of this Atlas covering all native tree species of the United States is desirable. Future human activities may affect tree distribution and obscure the natural ranges. Some species may become extinct at outlying

stations. Also, a revised edition with highly accurate maps acceptable universally should be undertaken afterwards.

Unpublished notes and publications on tree distribution, including range extensions and corrections, will be welcome at any time. Such material may be addressed to the Dendrologist, Forest Service, U.S. Department of Agriculture, Washington, D.C. 20250. To those with many changes to make in the published maps, a copy of volume 1 will be sent for marking with colored pencil.

These maps may reveal gaps in the knowledge or lack of information about tree distribution in many localities, for example, isolated western mountains. Places where field work is needed may be indicated. Careful exploration of promising areas should contribute significant range extensions.

There is still a need for more articles, bulletins, and books devoted to distribution maps of native tree species prepared by experienced resident botanists or foresters in those States not already covered by published tree species maps.

Botanists and foresters are urged to publish promptly articles containing records on range extensions of trees from their collections, herbaria, or observations. Duplicate specimens confirming these records should be deposited in one or more large herbaria, as well as in the State or institution herbarium. Care should be taken in all distribution records including maps and herbarium labels to distinguish between wild trees apparently native and trees introduced into the locality directly or indirectly by man, whether planted, escaped, adventive, or naturalized.

LITERATURE CITED

- Andresen, John W.
1961. An evaluation of State tree identification guides of the United States. *J. Forest.* 59: 349-355.
- Betts, H. S.
1945. American woods, a series of leaflets on individual species of economically important American woods. U.S. Dep. Agr. Forest Service, illus.
- Blake, S. F., and Atwood, Alice C.
1942. Geographical guide to floras of the world. Part I. U.S. Dep. Agr. Misc. Publ. 401, 446 p.
- Booth, W. E., and Wright, J. C.
1959. Flora of Montana. Part II. Dicotyledons. 280 p., illus. (maps). Bozeman, Montana.
- Braun, E. Lucy.
1961. The woody plants of Ohio; trees, shrubs, and woody climbers native, naturalized, and escaped. Columbus: Ohio State Univ. Press. 362 p., illus. (maps).
- Canada, Department of Forestry.
1961. Native trees of Canada. Bull. 61, ed. 6, 291 p., illus. (maps). Ottawa.
- Critchfield, William B., and Little, Elbert L., Jr.
1966. Geographic distribution of the pines of the world. U.S. Dep. Agr. Misc. Publ. 991, 97 p., illus. (maps).
- Dayton, William A.
1952. United States tree books; a bibliography of tree identification. U.S. Dep. Agr. Bibliogr. Bull. 20, 32 p.
- Deam, Charles C.
1932. Trees of Indiana. Indiana Dep. Conserv. Publ. 13, ed. 2 rev., 326 p., illus. (maps).
- Duncan, Wilbur H.
1950. Preliminary reports on the flora of Georgia. 2. Distribution of 87 trees. *Amer. Midland Natur.* 43: 742-761, illus. (maps).
- Evans, T. C.
1961. The distribution of commercial forest trees in Virginia. U.S. Dep. Agr. Forest Service. Appalachian Forest Exp. Sta. Forest Surv. Release 10, 32 p., illus. (maps).
- Fassett, Norman C.
1930. Preliminary reports on the flora of Wisconsin. *Wis. Acad. Sci. Arts Lett. Trans.* 24: 249-256, illus. (maps). (First of a series).
- Flint, Richard Foster, et al.
1945. Glacial map of North America. *Geol. Soc. Amer. Special Papers* 60, 37 p., illus. (map). New York.
- Flint, Richard F., et al.
1959. Glacial map of the United States east of the Rocky Mountains. *Geol. Soc. Amer.*, New York.
- Fowells, H. A., compiler.
1965. Silvics of forest trees of the United States. U.S. Dep. Agr., Agr. Handb. 271, 762 p., illus. (maps).
- Fox, W. Sherwood, and Soper, James H.
1952-54. The distribution of some trees and shrubs of the Carolinian zone of southern Ontario. *Royal Canadian Inst.* 29: 65-84; 30: 3-32, 99-130, illus. (maps).
- Gates, Frank C.
1938. Woody plants, native and naturalized in Kansas. *Kans. Acad. Sci. Trans.* 41: 99-118, illus. (maps).
- Halliday, W. E. D., and Brown, A. W. A.
1943. The distribution of some important forest trees in Canada. *Ecology* 24: 353-373, illus. (maps).
- Hardin, James W.
1957. A revision of the American Hippocastanaceae. *Brittonia* 9: 145-195, illus. (maps).
- Harper, Roland M.
1907-08. Georgia's forest resources. *South. Woodlands* 1(3): 4-23, illus. (maps); 1(4): 1-19, illus. (maps); 1(5): 3-19, illus. (maps); 1(6): 15-32, illus. (maps).
- Hitchcock, A. S.
1899. Flora of Kansas. A series of maps illustrating the distribution of flowering plants by counties . . . Maps prepared by J. B. Norton and J. M. Westgate. 22 p., illus. (maps). Manhattan. (Partly reprinted from *The Industrialist*, v. 24, 1898.)
- Hultén, Eric.
1941-49. Flora of Alaska and Yukon. *Lunds Univ. Arsskr.*, N.F., Avd. 2, 37(1): 1-27, illus. (maps); 38(1): 129-412, illus. (maps); 39(1): 413-567, illus. (maps); 40(1): 569-795, illus. (maps); 41(1): 797-978, illus. (maps); 42(1): 979-1,066, illus. (maps); 43(1): 1,067-1,200, illus. (maps); 44(1): 1,203-1,341, illus. (maps); 45(1): 1,343-1,481, illus. (maps).

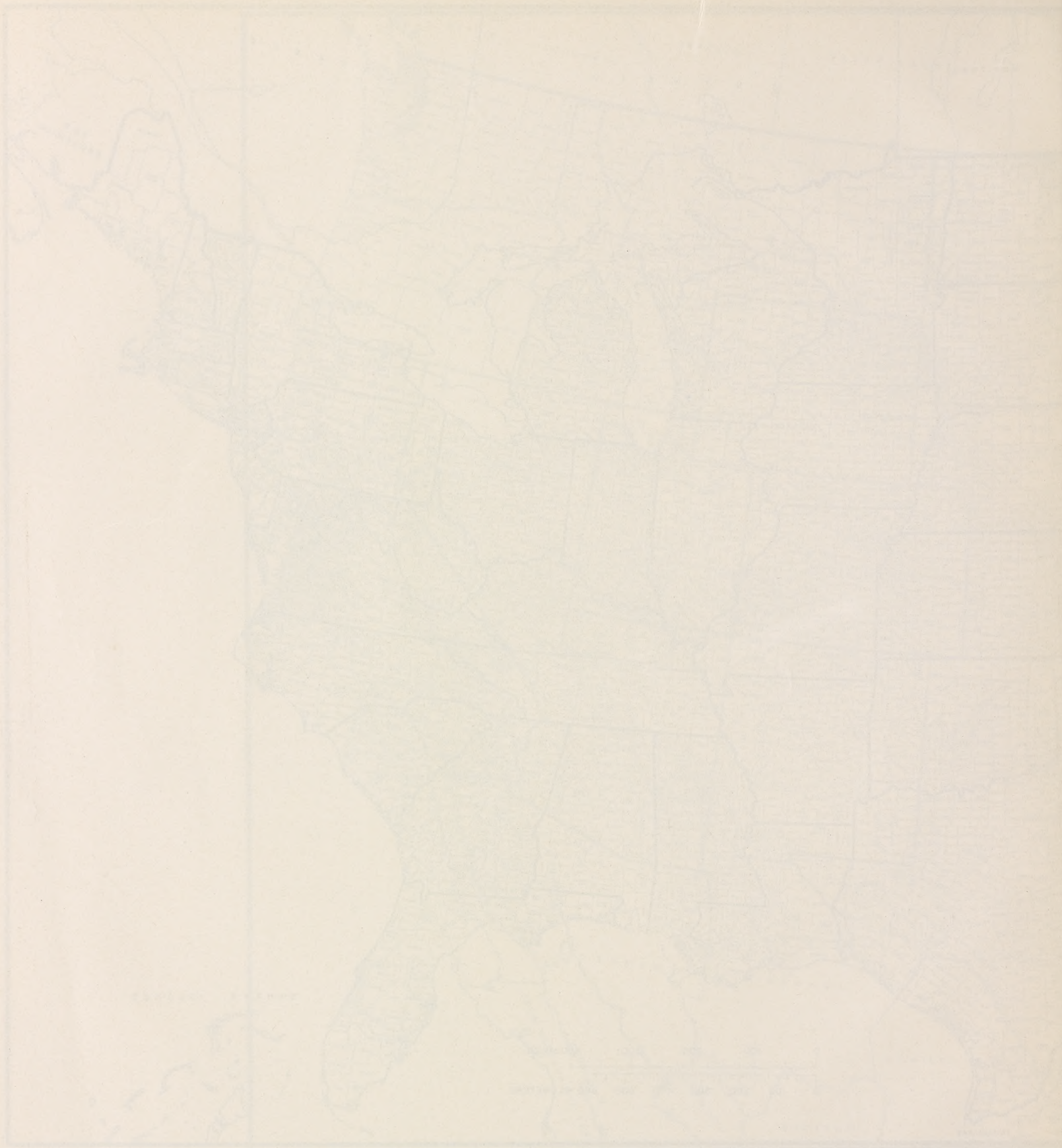
- Hultén, Eric.
1968. Flora of Alaska and neighboring territories; a manual of the vascular plants. Stanford, Calif.: Stanford Univ. Press. 1,008 p., illus. (maps).
- Johnson, F. D.
1961. Native trees of Idaho. Idaho Univ. Agr. Ext. Serv. Bull. 289, 31 p., illus. (maps).
- Jones, George Neville, and Fuller, George Damon.
1955. Vascular plants of Illinois. Ill. State Mus., Mus. Sci. Ser. vol. 6, 593 p., illus. (maps).
- Knudsen, Gerhard M., Arno, Stephen F., Habeck, James R., and Glake, George M.
1968. Natural distribution of western larch and subalpine larch. Mont. Forest Conserv. Exp. Sta. Res. Note 7, 2 p., illus. (maps).
- Küchler, A. W.
1964. Potential natural vegetation of the conterminous United States. Amer. Geogr. Soc. Special Publ. 36, 39 p., illus. (Map and manual).
- Little, Elbert L., Jr.
1949. Important forest trees of the United States. U.S. Dep. Agr. Yearbook 1949: 763-814, illus. (Reprinted 1950 as Yearbook separate 2156).
- Little, Elbert L., Jr.
1951. Mapping ranges of the trees of the United States. Rhodora 53: 195-203.
- Little, Elbert L., Jr.
1953. Check list of native and naturalized trees of the United States (including Alaska). U.S. Dep. Agr., Agr. Handb. 41, 472 p.
- Little, Elbert L., Jr., and Wadsworth, Frank H.
1964. Common trees of Puerto Rico and the Virgin Islands. U.S. Dep. Agr., Agr. Handb. 249, 548 p., illus. (maps).
- Martínez, Maximino.
1948. Los pinos mexicanos. Ediciones Botas. Ed. 2, 361 p., illus. (maps). México.
- Martínez, Maximino.
1963. Las pináceas mexicanas. Univ. Nac. Autón. Méx. Ed. 3, 400 p., illus. (maps). México.
- Miller, Robert Barclay, and Tehon, L. R.
1929. The native and naturalized trees of Illinois. Ill. Natur. Hist. Surv. Bull. 18, art. 1, 339 p., illus. (maps).
- Mohr, Charles.
1897. The timber pines of the southern United States. (Rev. ed.). U.S. Dep. Agr. Div. Forest. Bull. 13, 176 p., illus. (maps).
- Munns, E. N.
1938. The distribution of important forest trees of the United States. U.S. Dep. Agr. Misc. Publ. 287, 176 p., illus. (maps).
- Pinchot, Gifford, and Ashe, W. W.
1897. Timber trees and forests of North Carolina. N.C. Geol. Surv. Bull. 6, 227 p., illus. (maps).
- Pool, Raymond J.
1919. Handbook of Nebraska trees. Nebr. Conserv. and Soil Surv. Bull. 7, 171 p., illus. (maps).
- Radford, Albert E., Ahles, Harry E., and Bell, C. Ritchie.
1965. Atlas of the vascular flora of the Carolinas. N.C. Agr. Exp. Sta. Tech. Bull. 165, 208 p., illus. (maps).
- Roberts, E. V., and Cruikshank, J. W.
1941a. The distribution of commercial forest trees in North Carolina. U.S. Dep. Agr. Forest Service, Appalachian Forest Exp. Sta. Forest Surv. Release 8, 27 p., illus. (maps).
- Roberts, E. V., and Cruikshank, J. W.
1941b. The distribution of commercial forest trees in South Carolina. U.S. Dep. Agr. Forest Service, Appalachian Forest Exp. Sta. Forest Surv. Release 9, 20 p., illus. (maps).
- Rowe, J. S.
1959. Forest regions of Canada. Canada Dep. North. Aff. and Natur. Res., Forest. Branch Bull. 123, 71 p., illus. (map).
- Sargent, Charles Sprague.
1884. Report on the forests of North America (exclusive of Mexico). U.S. Census, 10th, 1880, vol. 9, 612 p., illus. (maps). (Also folio vol. of maps.)
- Sargent, Charles Sprague.
1926. Manual of the trees of North America (exclusive of Mexico). Ed. 2, reprinted with corrections. 910 p., illus. Boston and New York: Houghton Mifflin Co. (Reprinted 1933, 1961.)
- Sternitzke, Herbert S., and Duerr, William A.
1950. Tree distribution in Mississippi. U.S. Dep. Agr. Forest Service, South. Forest Exp. Sta. Forest Survey Release 64, 19 p., illus. (maps).
- Steyermark, Julian A.
1963. Flora of Missouri. Iowa State Univ. Press. 1,752 p., illus. (maps).
- Sudworth, George B.
1898. Check list of the forest trees of the United States, their names and ranges. U.S. Dep. Agr. Div. Forest. Bull. 17, 144 p.
- Sudworth, George B.
1913. Forest atlas. Geographic distribution of North American trees. Part I. Pines. U.S. Dep. Agr. Forest Service. 36 maps (folio).
- Sudworth, George B.
1915. The cypress and juniper trees of the Rocky Mountain region. U.S. Dep. Agr. Bull. 207, 36 p., illus. (maps).
- Sudworth, George B.
1916. The spruce and balsam fir trees of the Rocky Mountain region. U.S. Dep. Agr. Bull. 327, 43 p., illus. (maps).
- Sudworth, George B.
1917. The pine trees of the Rocky Mountain region. U.S. Dep. Agr. Bull. 460, 47 p., illus. (maps).
- Sudworth, George B.
1918. Miscellaneous conifers of the Rocky Mountain region. U.S. Dep. Agr. Bull. 680, 45 p., illus. (maps).
- Sudworth, George B.
1927. Check list of the forest trees of the United States, their names and ranges. U.S. Dep. Agr. Misc. Cir. 92, 295 p.
- Sudworth, George B.
1934. Poplars, principal tree willows and walnuts of the Rocky Mountain region. U.S. Dep. Agr. Tech. Bull. 420, 112 p., illus. (maps).
- Thorntwaite, C. W.
1941. Atlas of climatic types in the United States 1900-1939. U.S. Dep. Agr. Misc. Publ. 421, 7 p., illus. (maps, folio).
- U.S. Department of Commerce, Environmental Data Service.
1968. Climatic atlas of the United States. 80 p., illus. (maps, folio).
- U.S. National Arboretum, Agricultural Research Service.
1965. Plant hardiness zone map. U.S. Dep. Agr. Misc. Publ. 814, folded map. (1960, rev. 1965).
- Zobel, Donald B.
1969. Factors affecting the distribution of *Pinus pungens*, an Appalachian endemic. Ecol. Monogr. 39: 303-333, illus. (map).
- Zon, Raphael, and Shantz, H. L.
1924. Natural vegetation. In Atlas of American agriculture. Part I, Sect. E. U.S. Dep. Agr. Bur. Agr. Econ. 29 p., illus. (maps, folio).



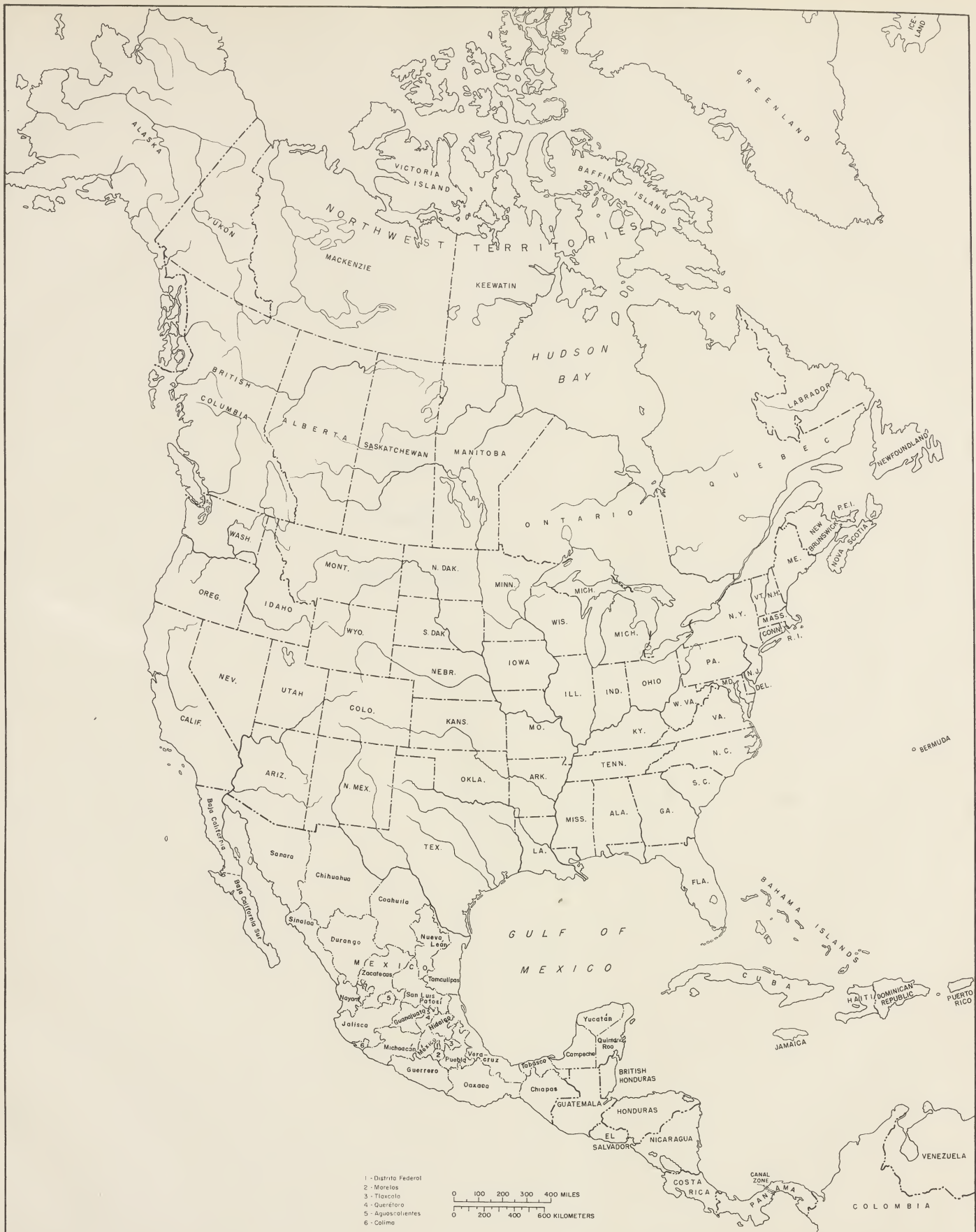
Base Map 1-W. United States (western part). Base map with names of counties, Provinces of Canada, and States of the northern part of Mexico.



Base Map 1-E. United States (eastern part). Base map with names of counties, Provinces of Canada, and States of the northern part of Mexico.



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Base Map 2-N. North America. Base map with names of States of United States, Provinces and other subdivisions of Canada, States of Mexico, and names of additional countries.

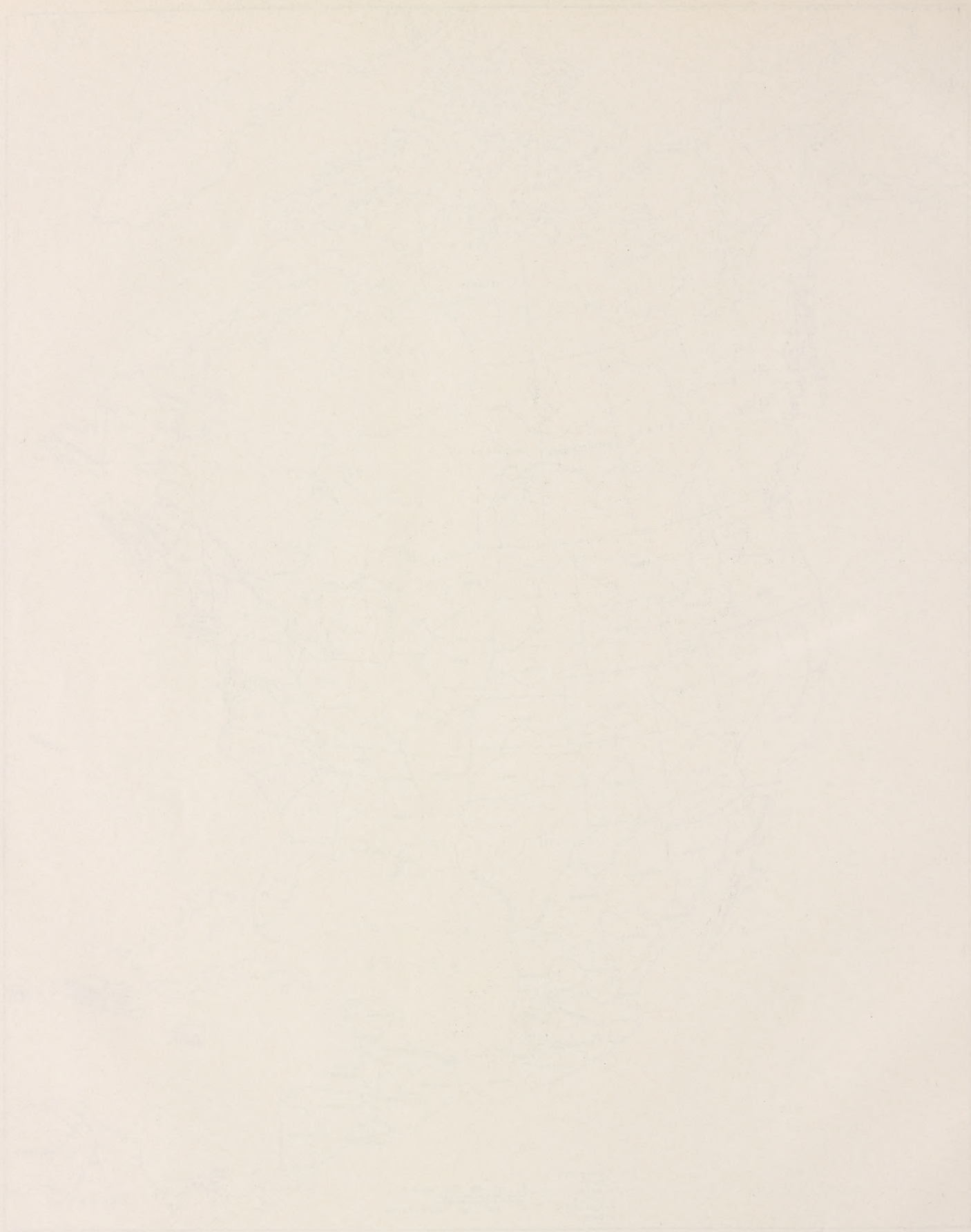
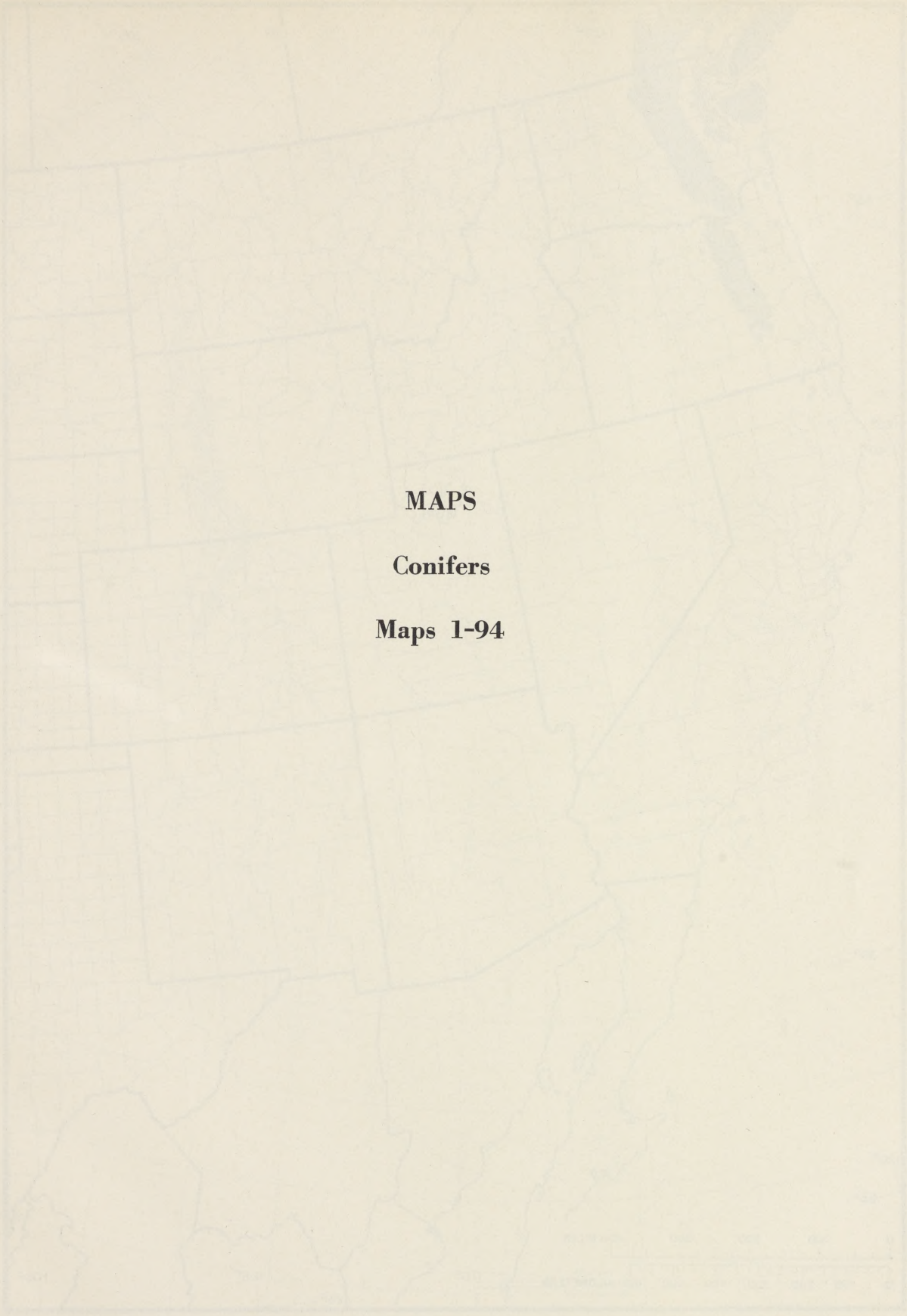


FIG. 1. A geological cross-section showing the relationship between the various rock masses and the structure of the region. The diagram illustrates the complex folding and faulting of the strata, with the older rocks forming the core of the fold and the younger rocks deposited on top. The fault lines are clearly marked, showing the displacement of the rock layers.



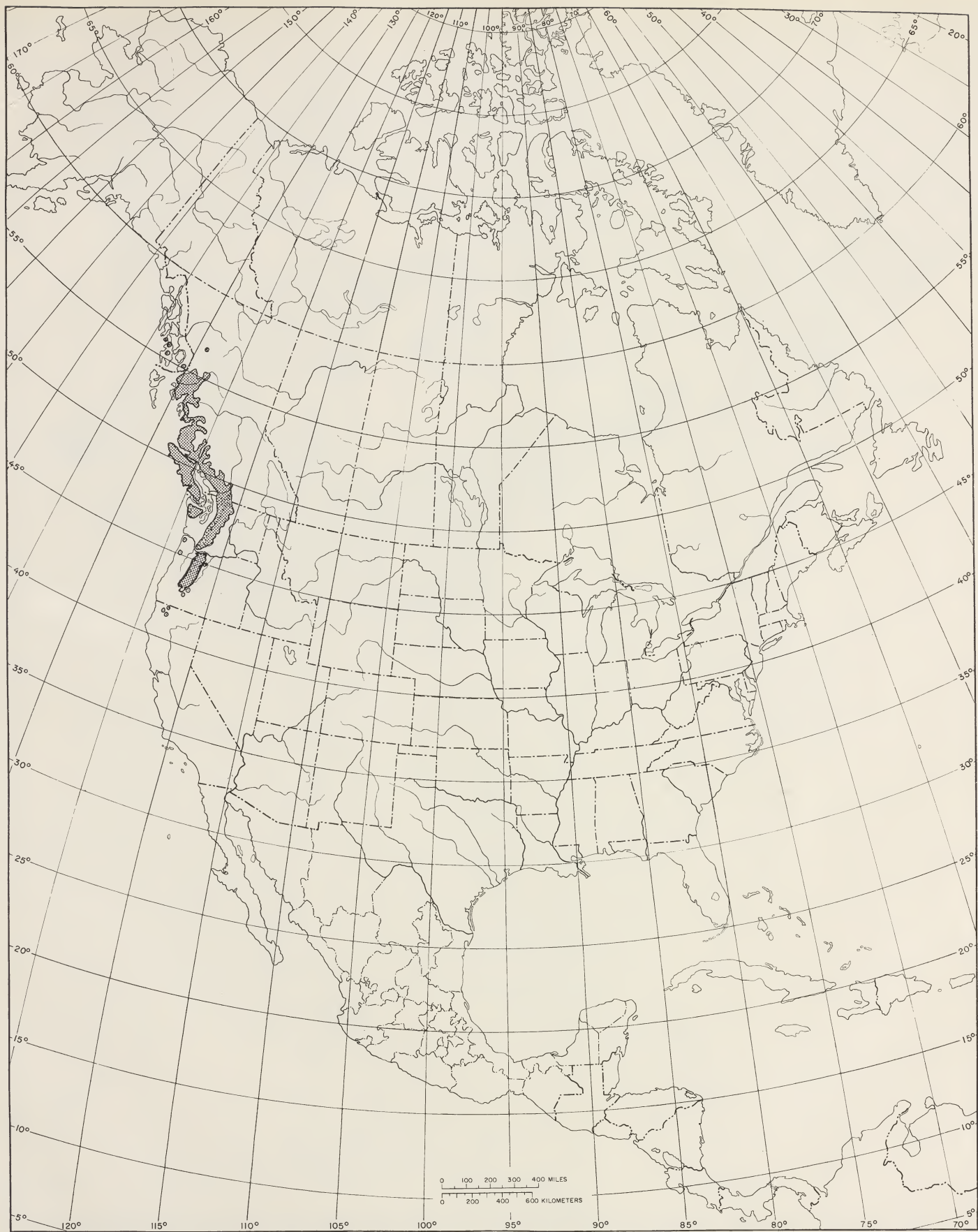
MAPS

Conifers

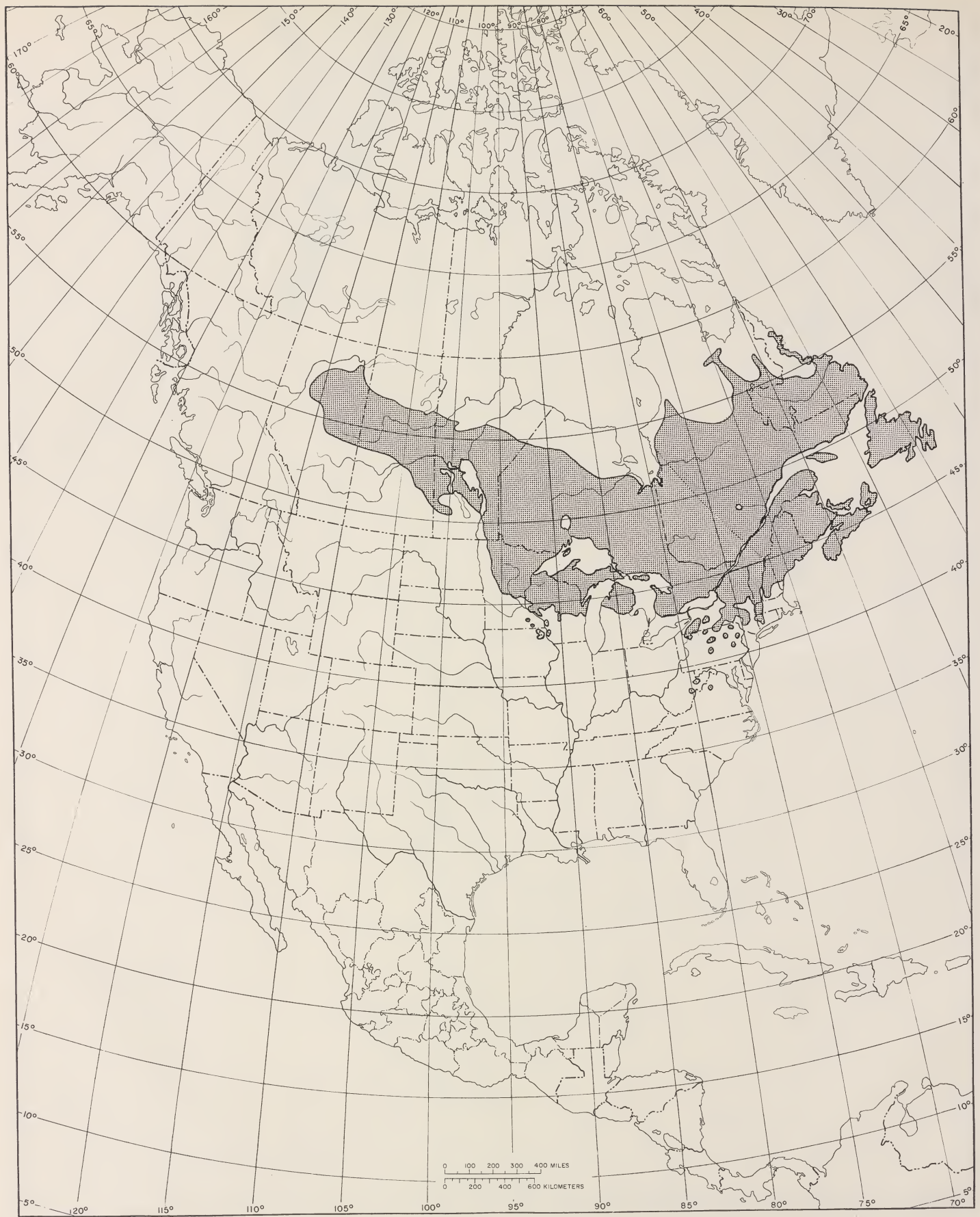
Maps 1-94



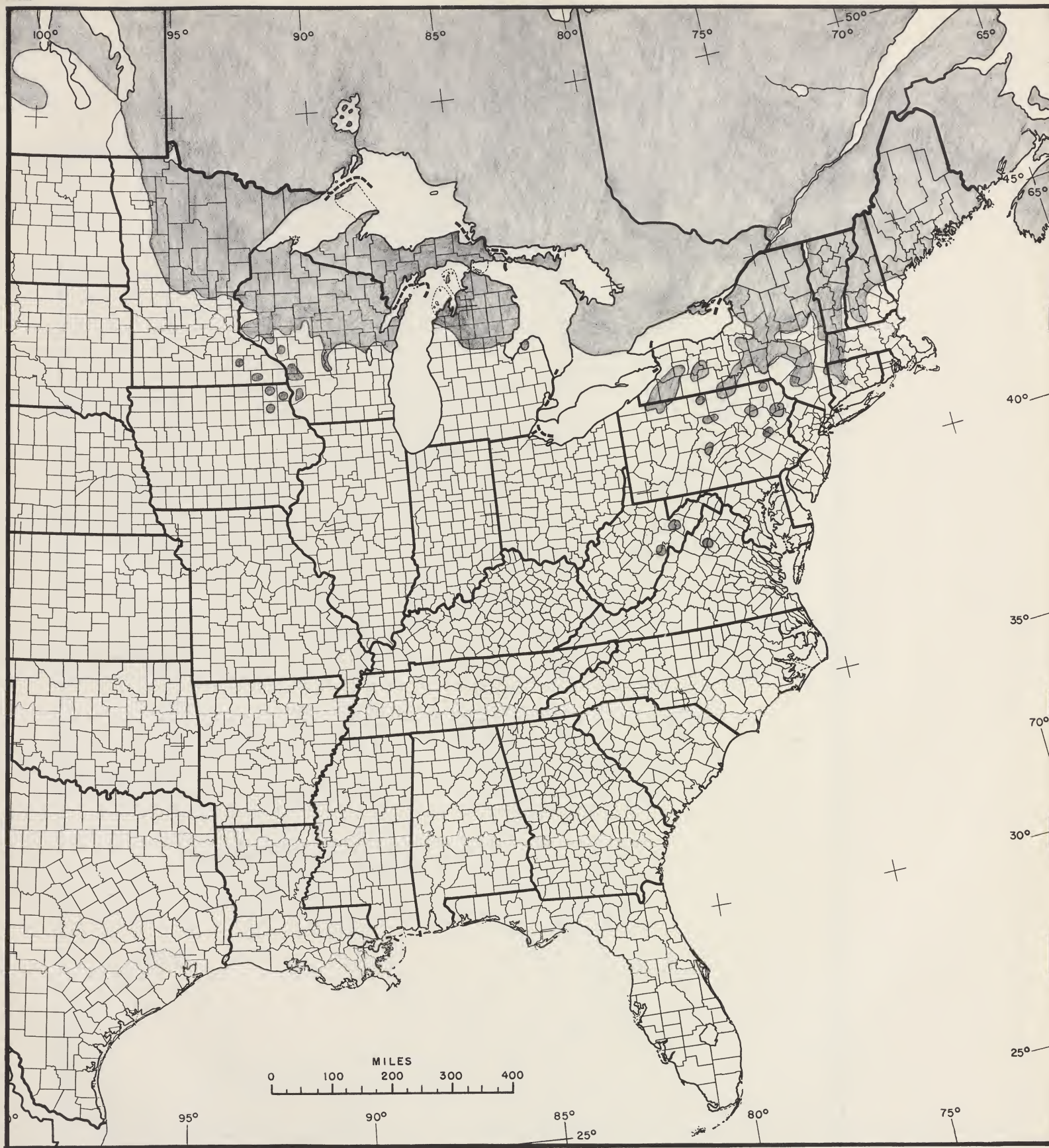
Map 1-W. Pacific silver fir, *Abies amabilis* (Dougl.) Forbes



Map 1-N. Pacific silver fir, *Abies amabilis* (Dougl.) Forbes



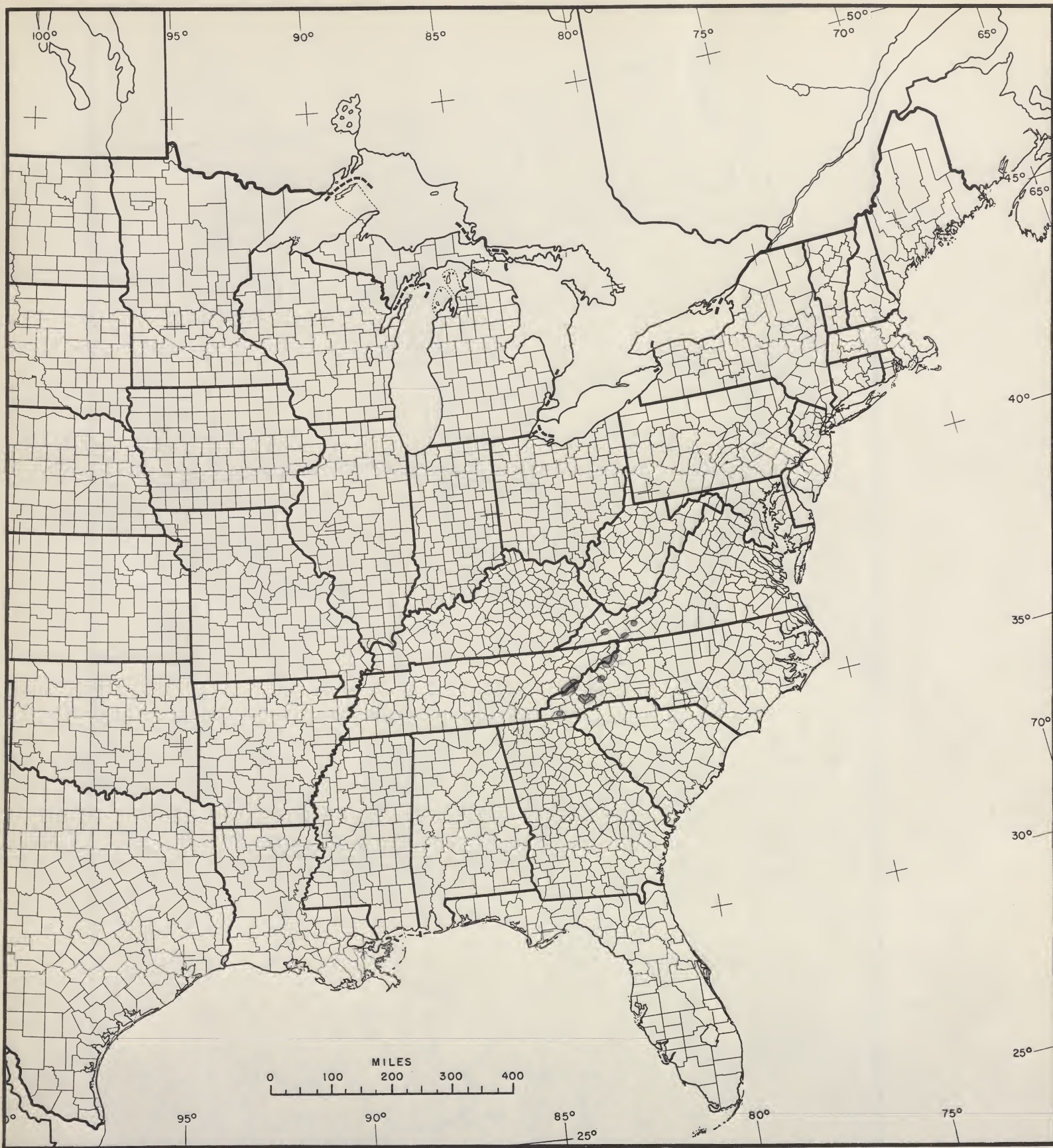
Map 2-N. balsam fir, *Abies balsamea* (L.) Mill.



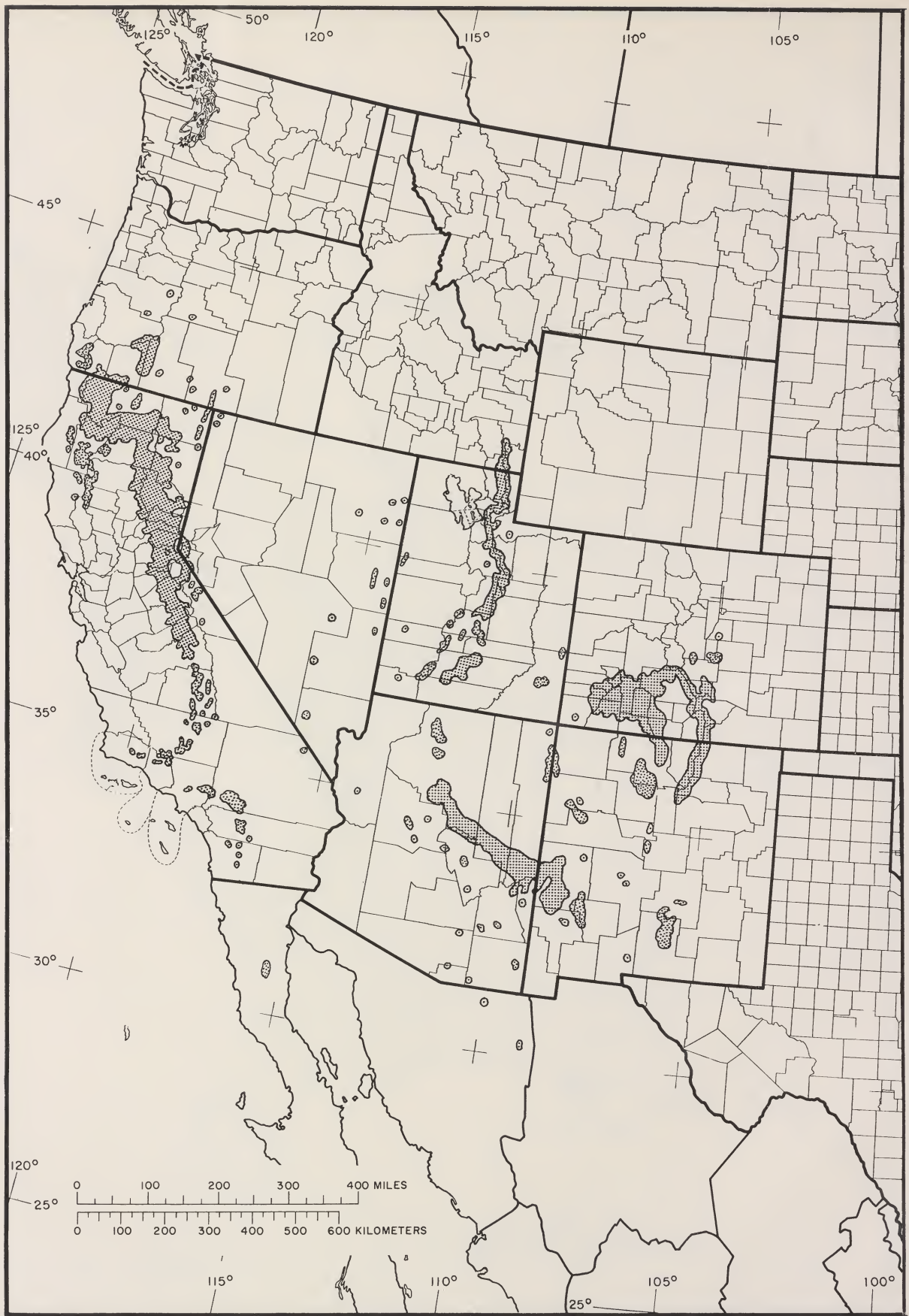
Map 2-E. balsam fir, *Abies balsamea* (L.) Mill.



Map 3-W. bristlecone fir, *Abies bracteata* D. Don. California only.



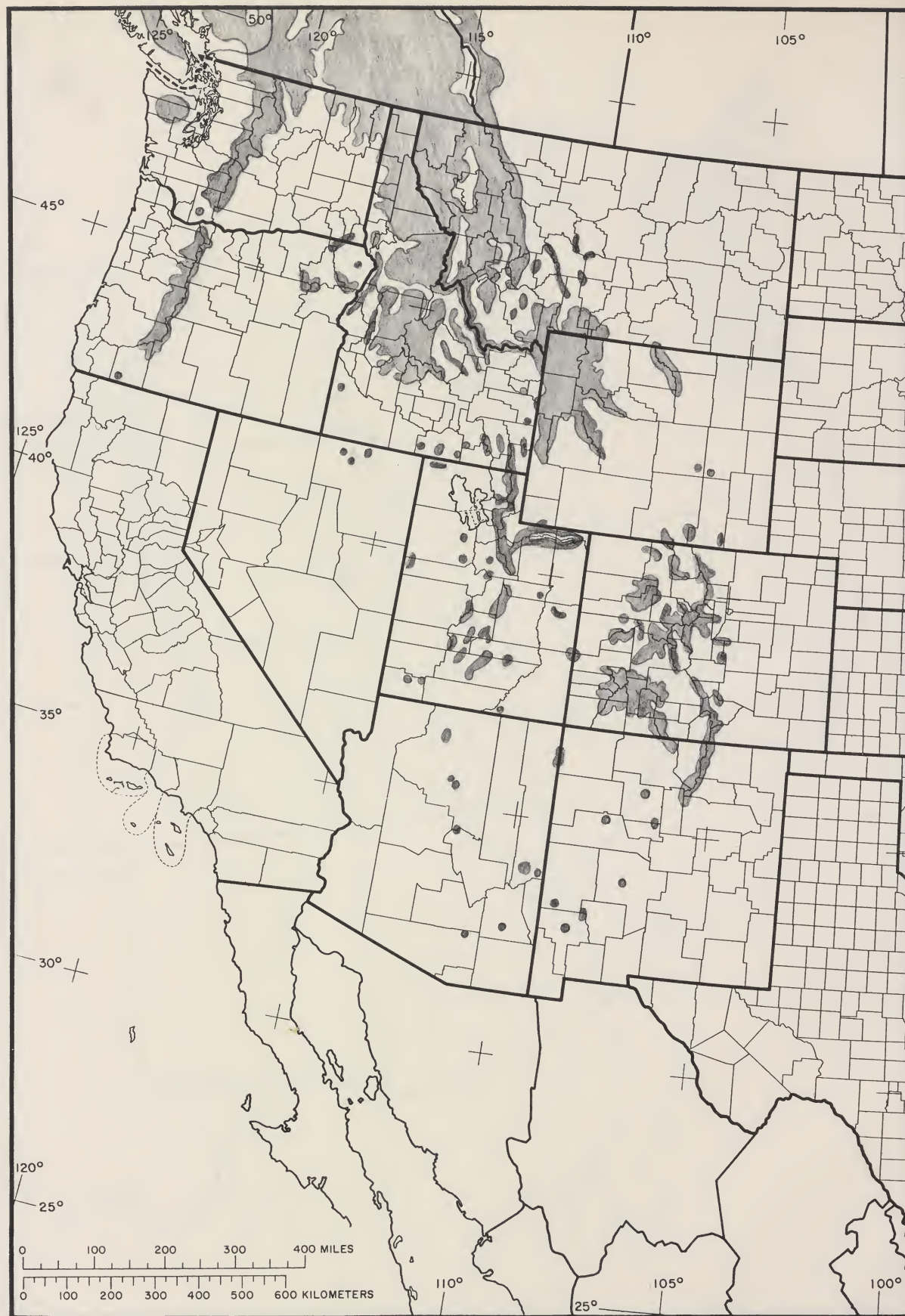
Map 4-E. Fraser fir, *Abies fraseri* (Pursh) Poir. Virginia, North Carolina, and Tennessee only.



Map 5-W. white fir, *Abies concolor* (Gord. & Glend.) Lindl.



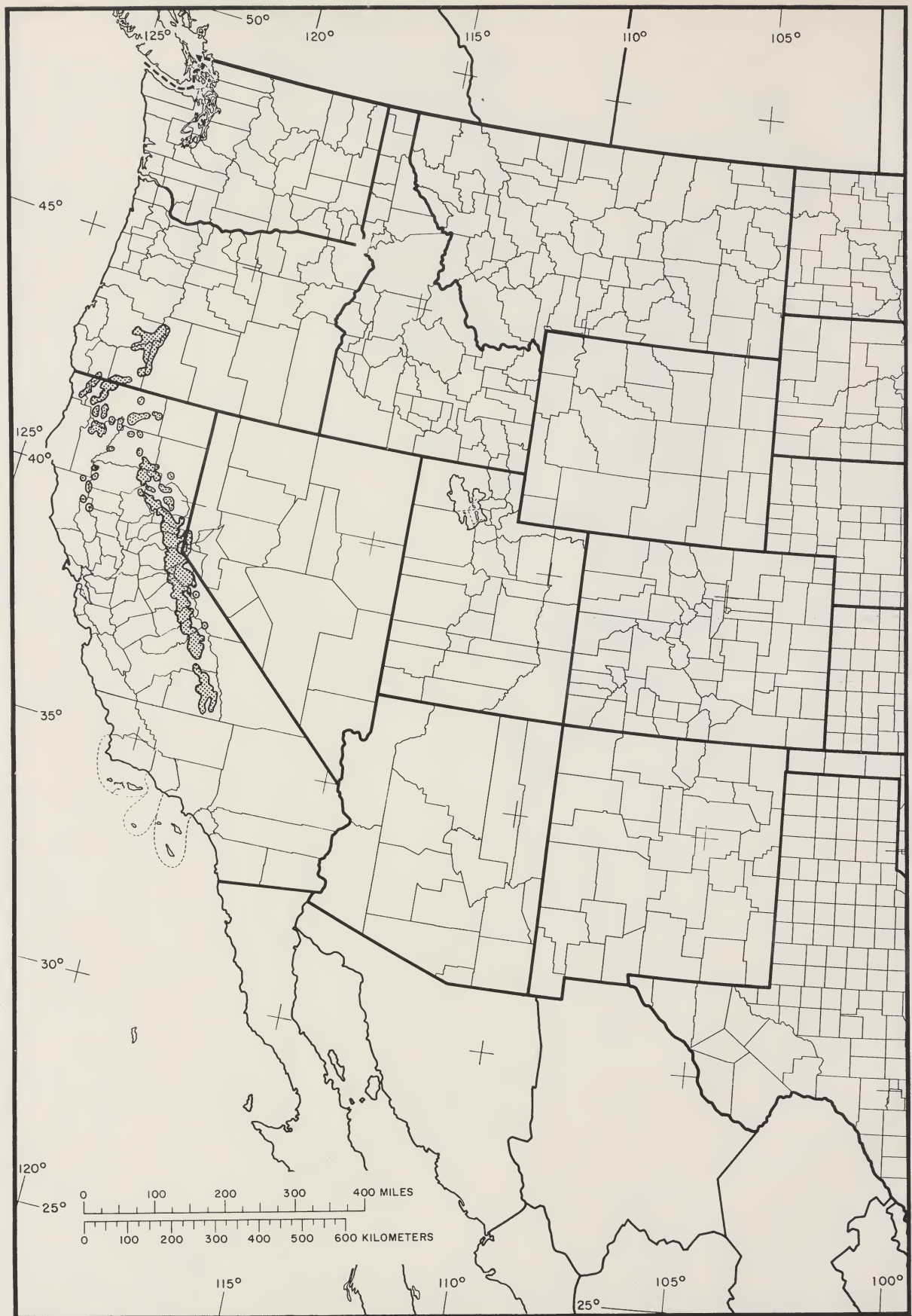
Map 6-W. grand fir, *Abies grandis* (Dougl.) Lindl.



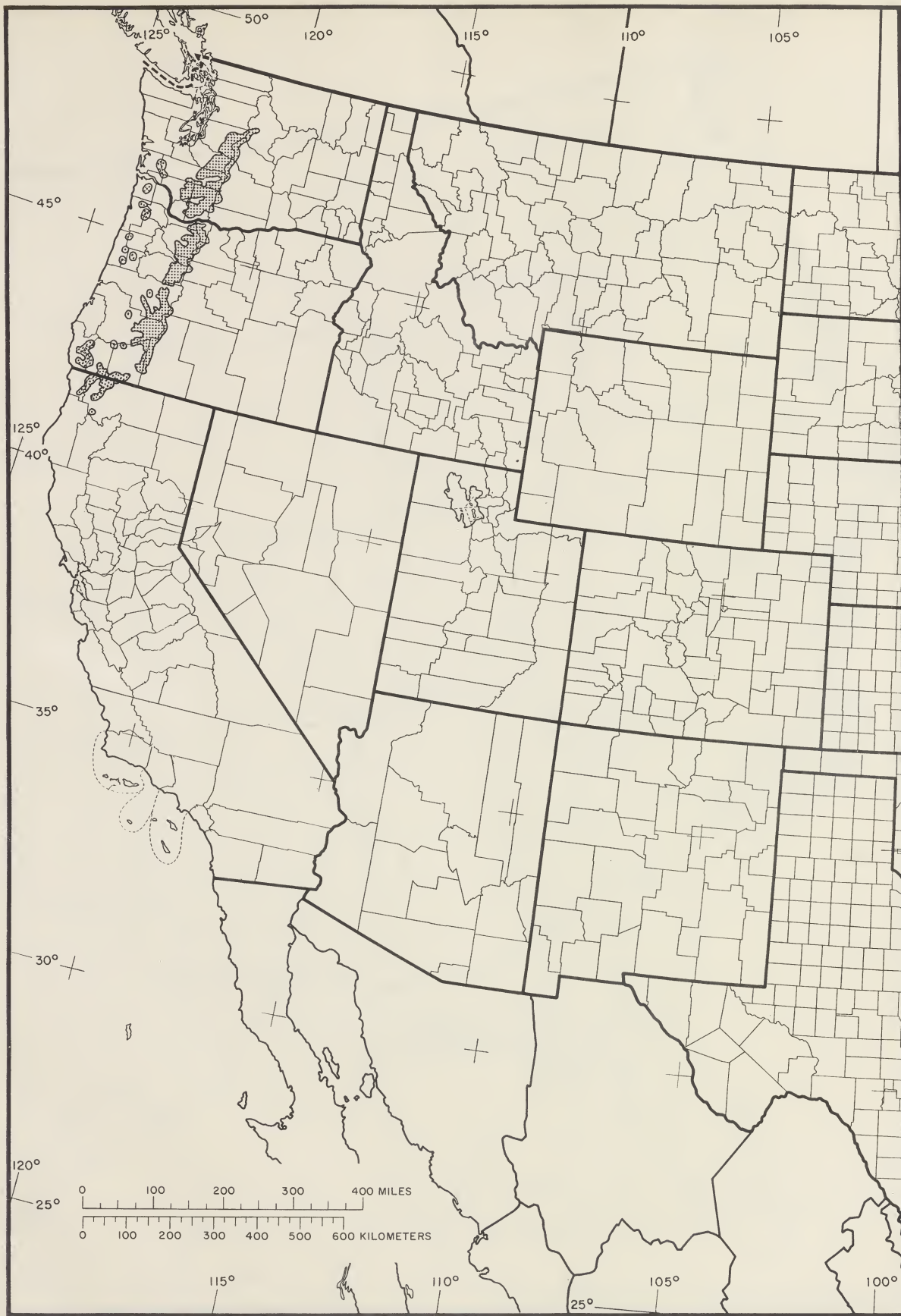
Map 7-W. subalpine fir, *Abies lasiocarpa* (Hook.) Nutt.



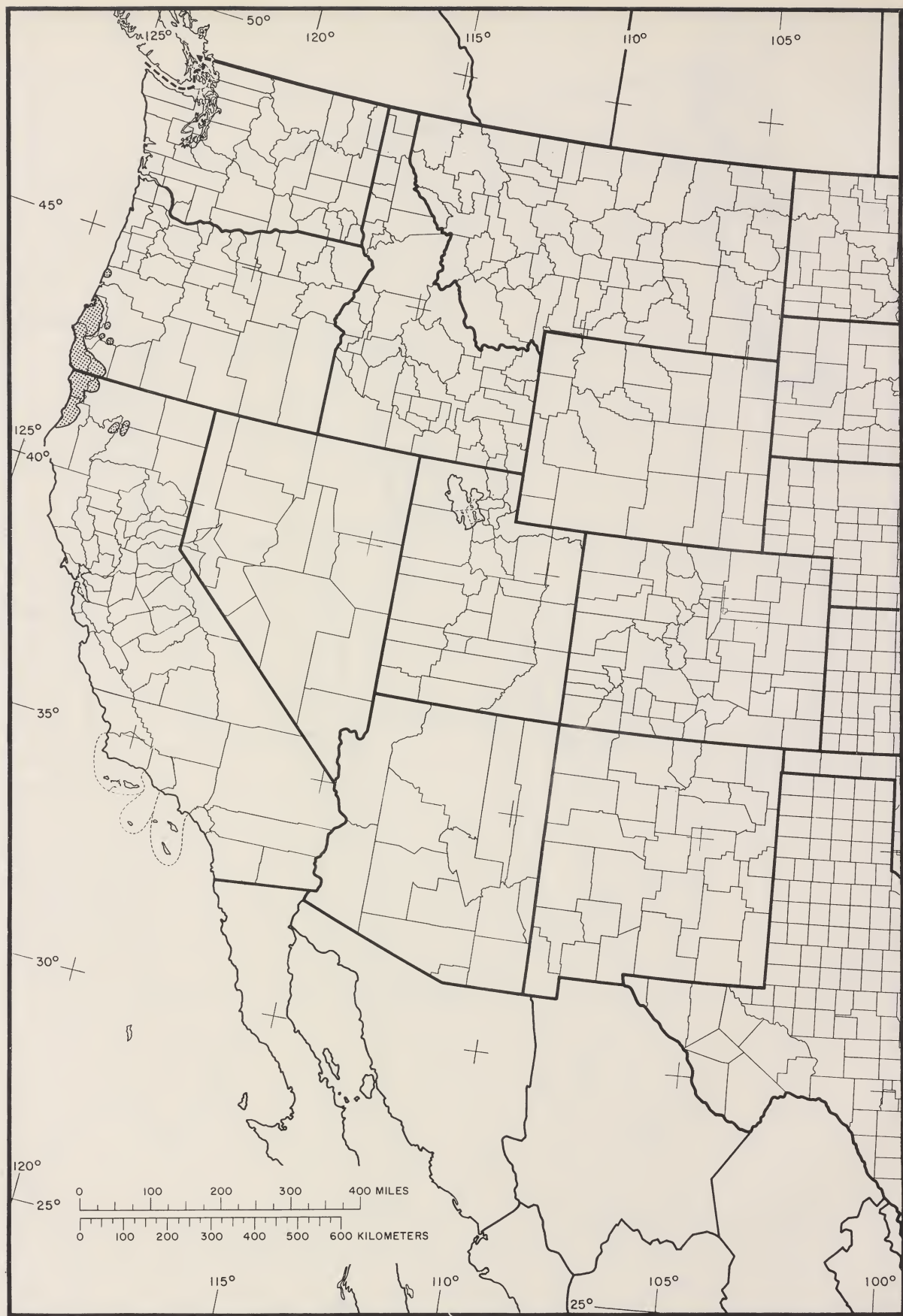
Map 7-N. subalpine fir, *Abies lasiocarpa* (Hook.) Nutt.



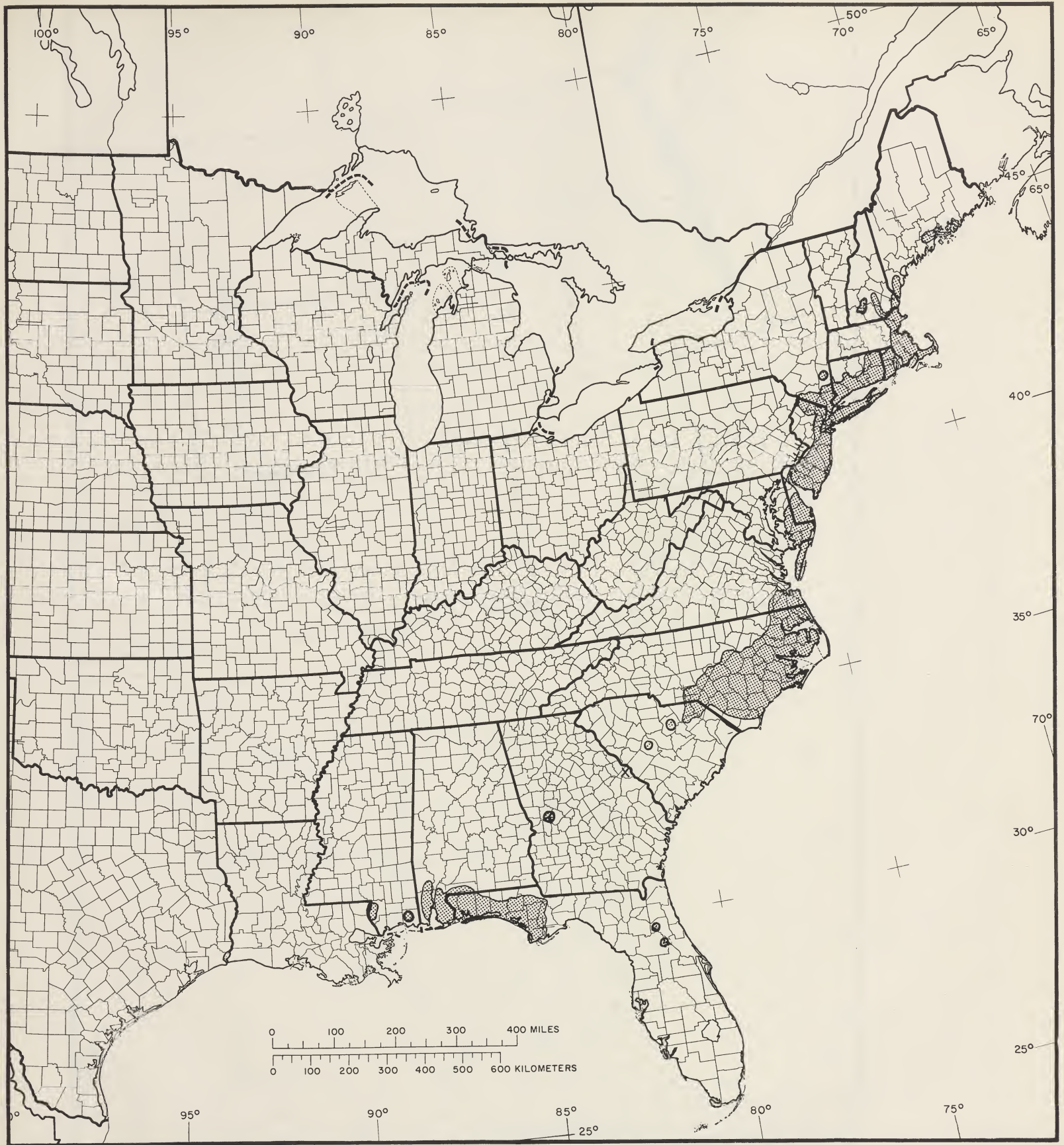
Map 8-W. California red fir, *Abies magnifica* A. Murr.



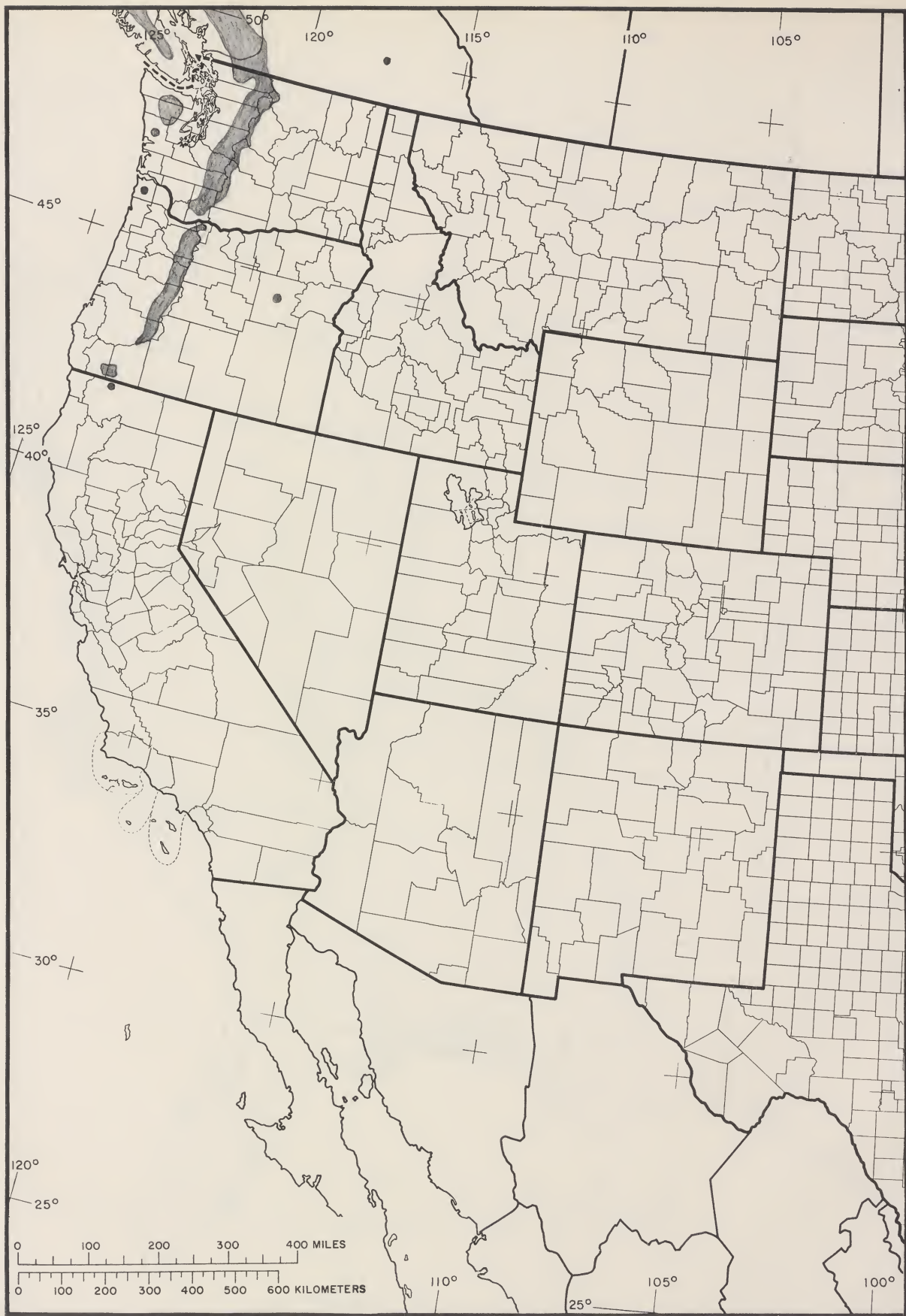
Map 9-W. noble fir, *Abies procera* Rehd.



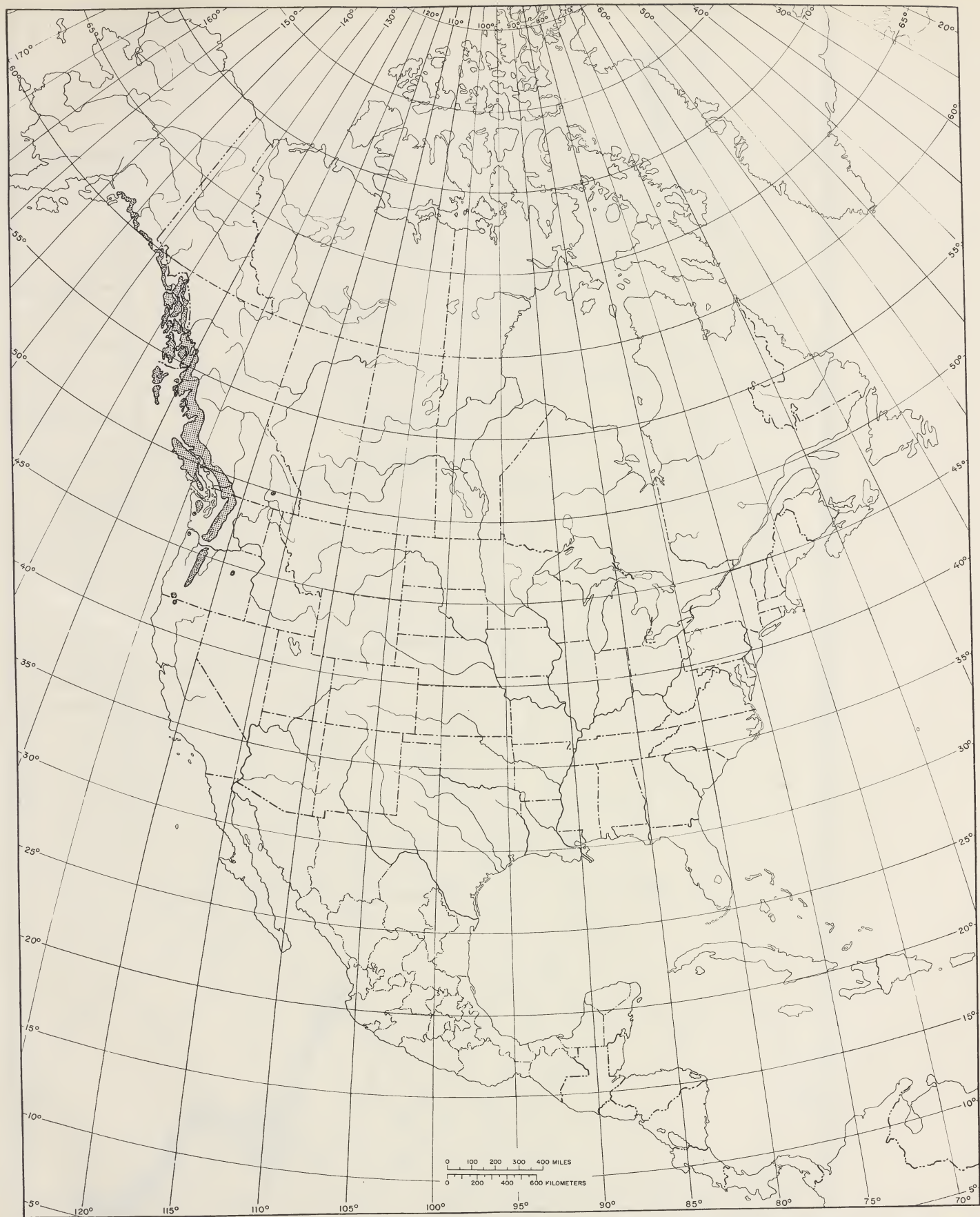
Map 10-W. Port-Orford-cedar, *Chamaecyparis lawsoniana* (A. Murr.) Parl. Oregon and California.



Map 11-E. Atlantic white-cedar, *Chamaecyparis thyoides* (L.) B.S.P.



Map 12-W. Alaska-cedar, *Chamaecyparis nootkatensis* (D. Don) Spach



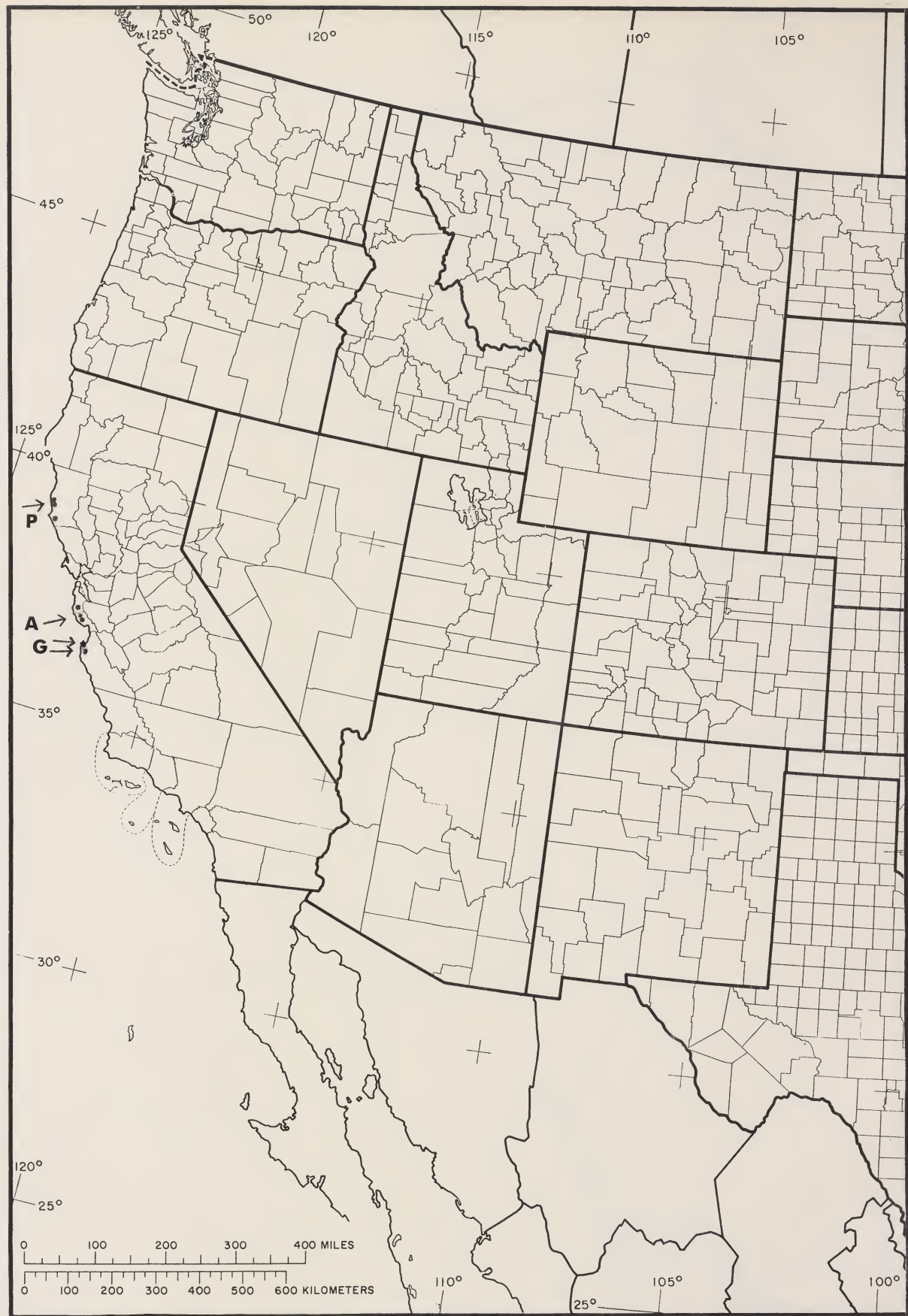
Map 12-N. Alaska-cedar, *Chamaecyparis nootkatensis* (D. Don) Spach



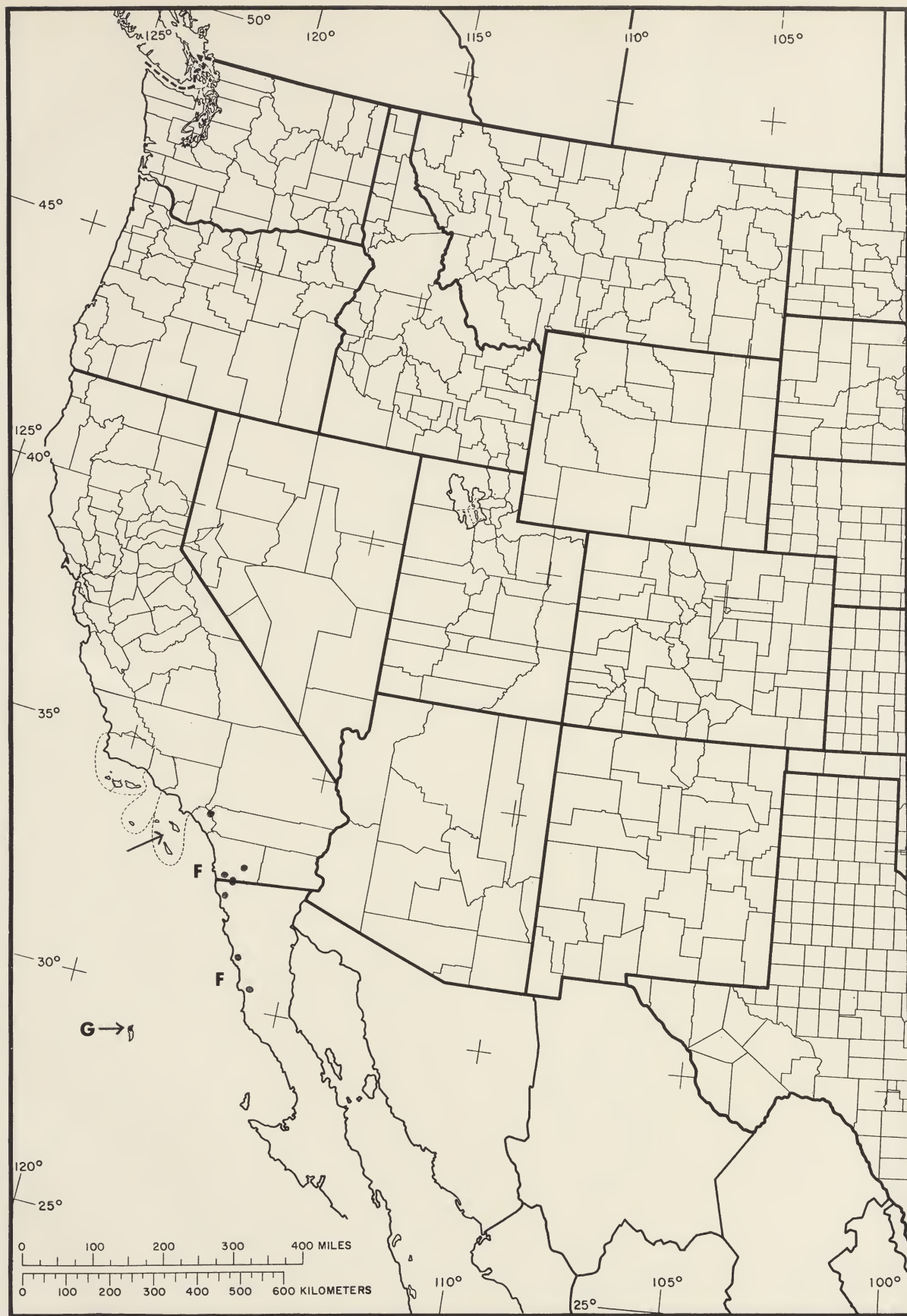
Map 13-W. Arizona cypress, *Cupressus arizonica* Greene. Five geographical varieties (or species) are designated by letter: A, Arizona cypress (typical), *C. arizonica* var. *arizonica*; G, Arizona smooth cypress, var. *glabra* (Sudw.) Little; N, Piute cypress, var. *nevadensis* (Abrams) Little; S, Cuyamaca cypress, var. *stephensonii* (C. B. Wolf) Little; and M, San Pedro Mártir cypress, var. *montana* (Wiggins) Little.



Map 14-W. Modoc cypress, *Cupressus bakeri* Jeps. Oregon and California only.



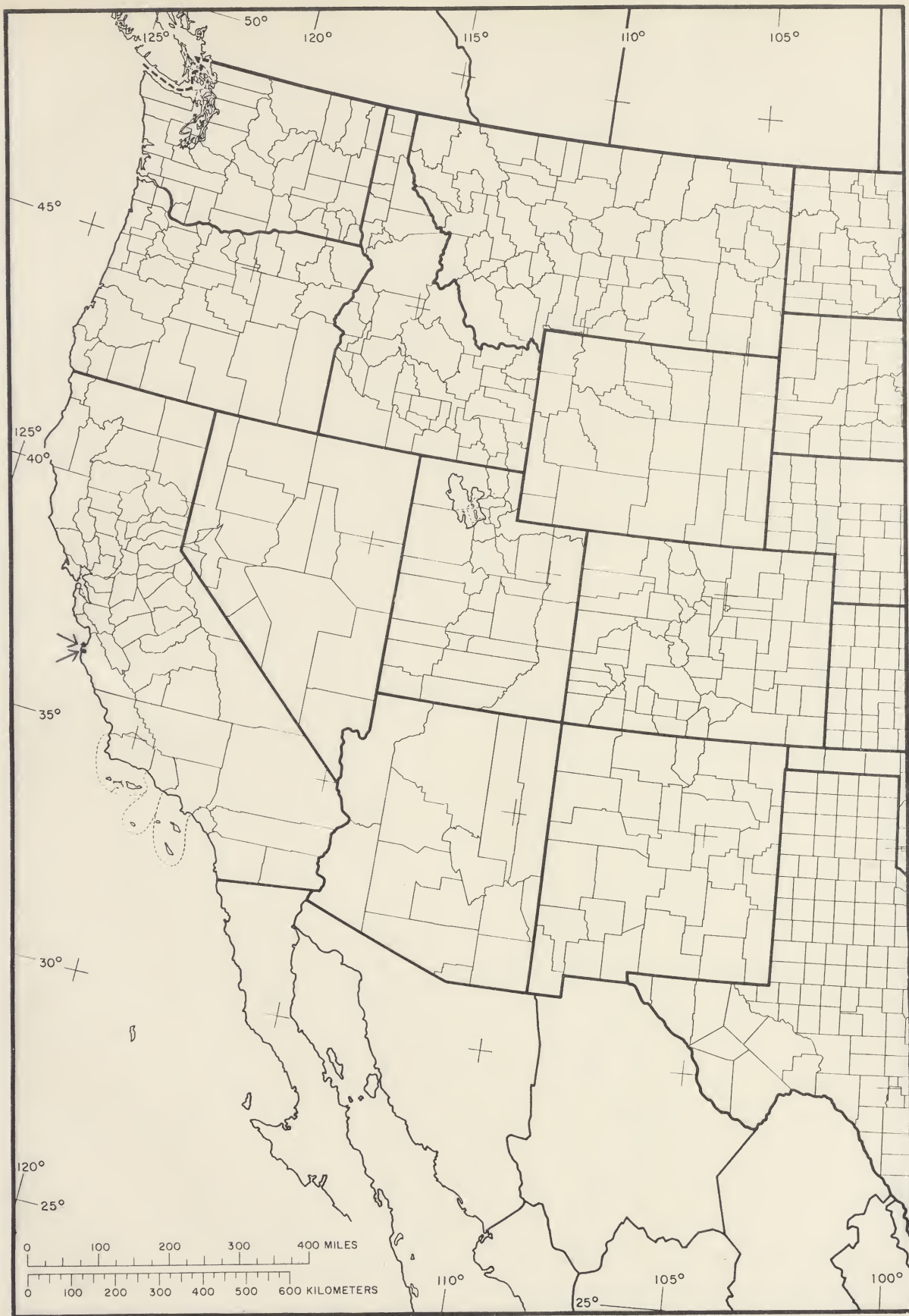
Map 15-W. Gowen cypress, *Cupressus goveniana* Gord. Three geographical varieties (or species) are designated by letter: G, Gowen cypress (typical), *C. goveniana* var. *goveniana*; A, Santa Cruz cypress, var. *abramsiana* (C. B. Wolf) Little; and P, Mendocino cypress, var. *pigmaea* Lemm. California only.



Map 16-W. Gaudalupe cypress, *Cupressus guadalupensis* S. Wats. Two geographical varieties (or species) are designated by letter: G, Guadalupe cypress (typical), *C. guadalupensis* var. *guadalupensis*; and F, Tecate cypress, var. *forbesii* (Jeps.) Little. California and Baja California only.



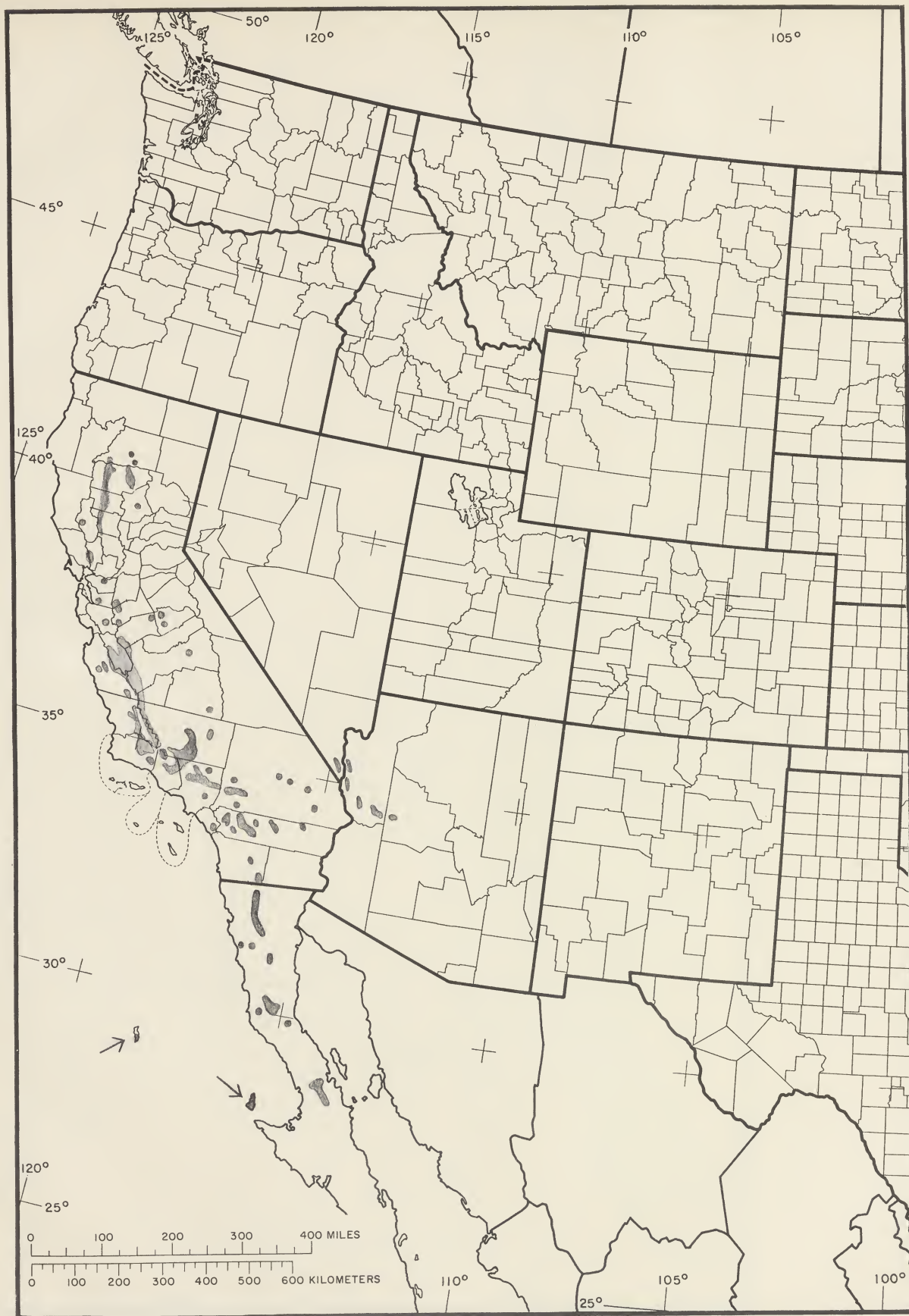
Map 17-W. MacNab cypress, *Cupressus macnabiana* A. Murr. California only.



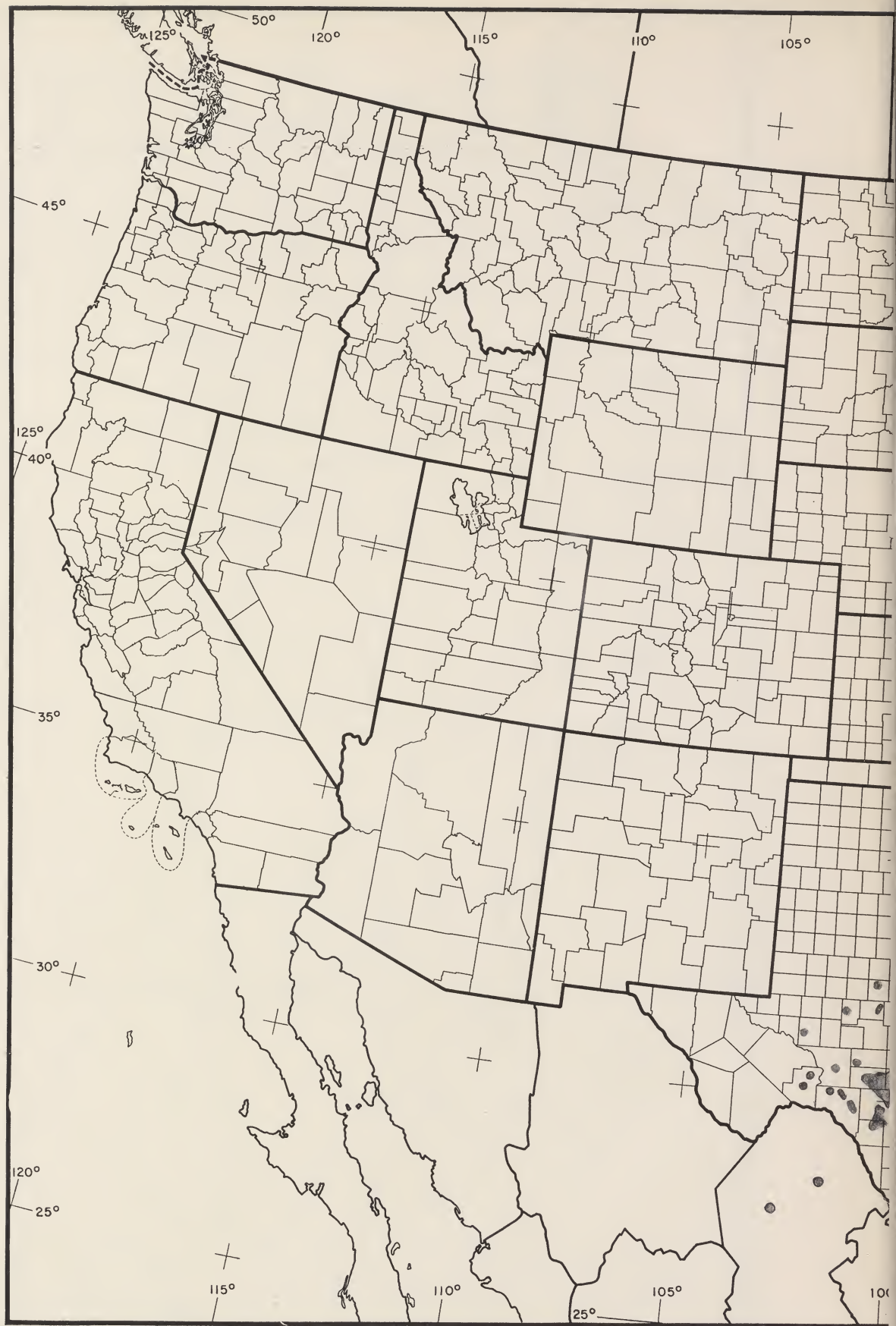
Map 18-W. Monterey cypress, *Cupressus macrocarpa* Hartw. California only.



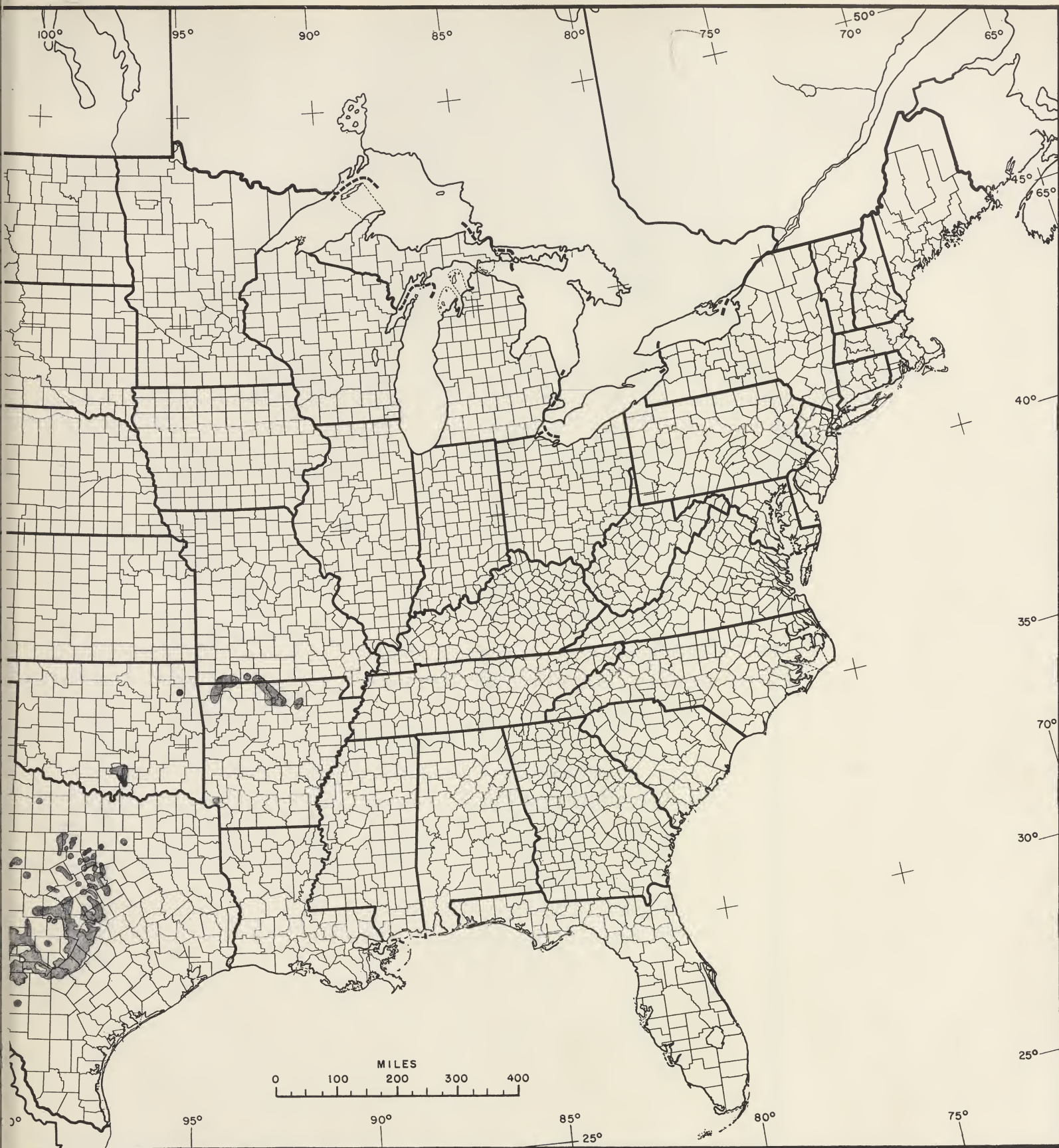
Map 19-W. Sargent cypress, *Cupressus sargentii* Jeps. California only.



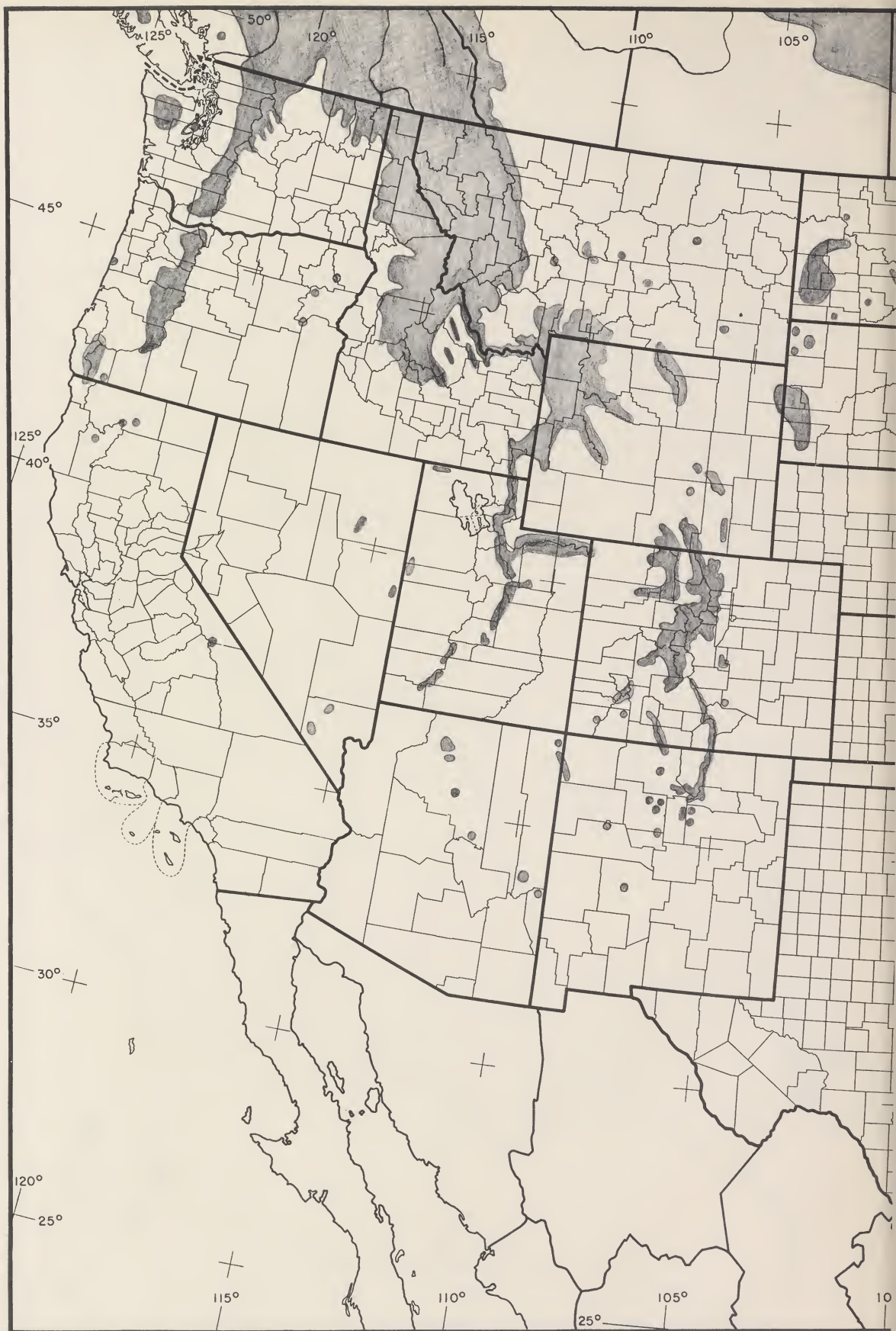
Map 20-W. California juniper, *Juniperus californica* Carr.



Map 21-W. Ashe juniper, *Juniperus ashei* Buchholz, western range.



Map 21-E. Ashe juniper, *Juniperus ashei* Buchholz, eastern range.



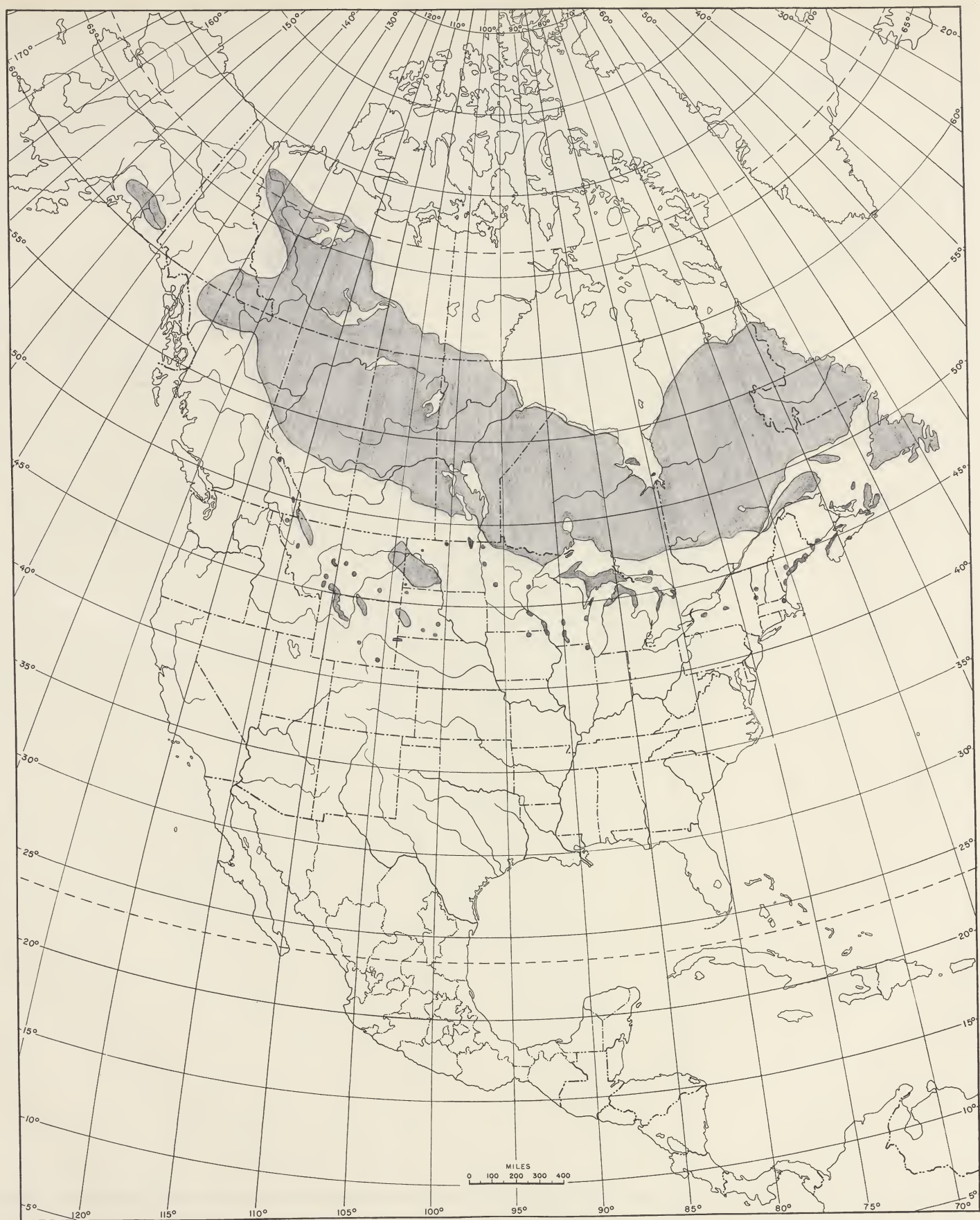
Map 22-W. common juniper, *Juniperus communis* L., western range. Usually a low shrub, rarely a small tree in Northeastern United States. Also in Europe and Asia.



Map 22-E. common juniper, *Juniperus communis* L., eastern range.
Usually a low shrub, rarely a small tree in Northeastern United States. Also in Europe and Asia.



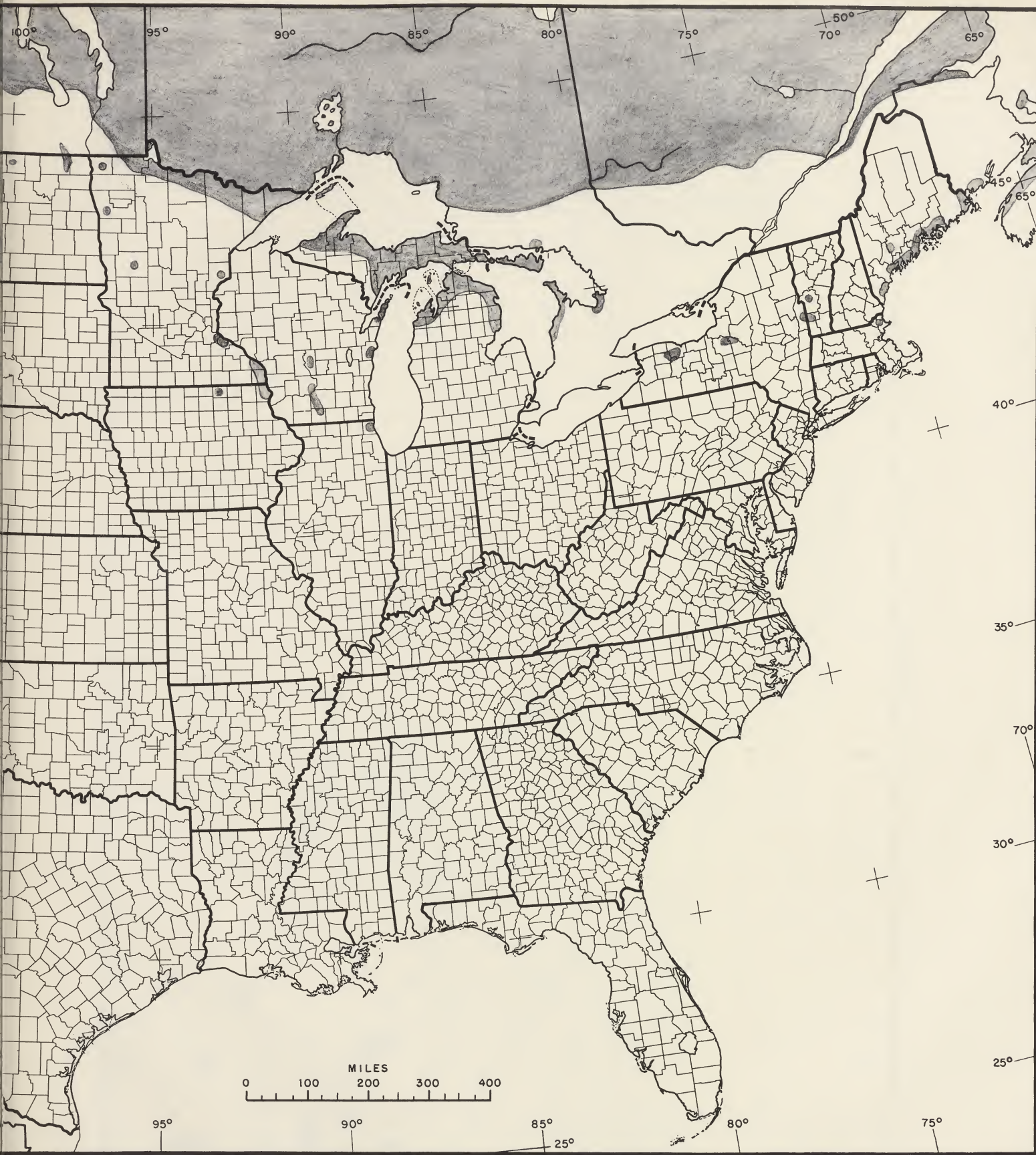
Map 22-N. common juniper, *Juniperus communis* L.
 Usually a low shrub, rarely a small tree in Northeastern United States. Also in Europe and Asia.



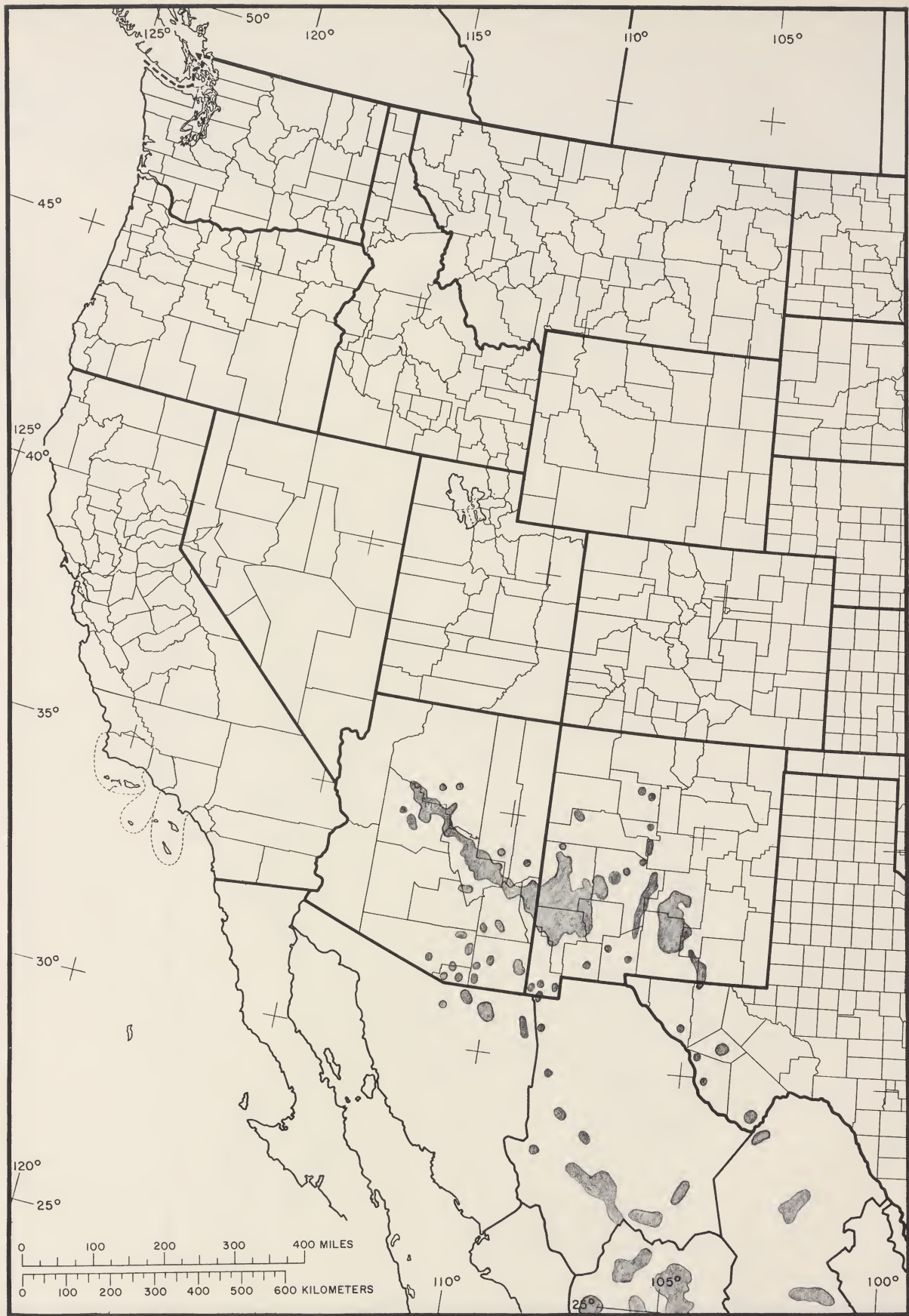
Map 22.1-N. creeping juniper, *Juniperus horizontalis* Moench. A prostrate shrub.



Map 22.1-W. creeping juniper, *Juniperus horizontalis* Moench, western range. A prostrate shrub.



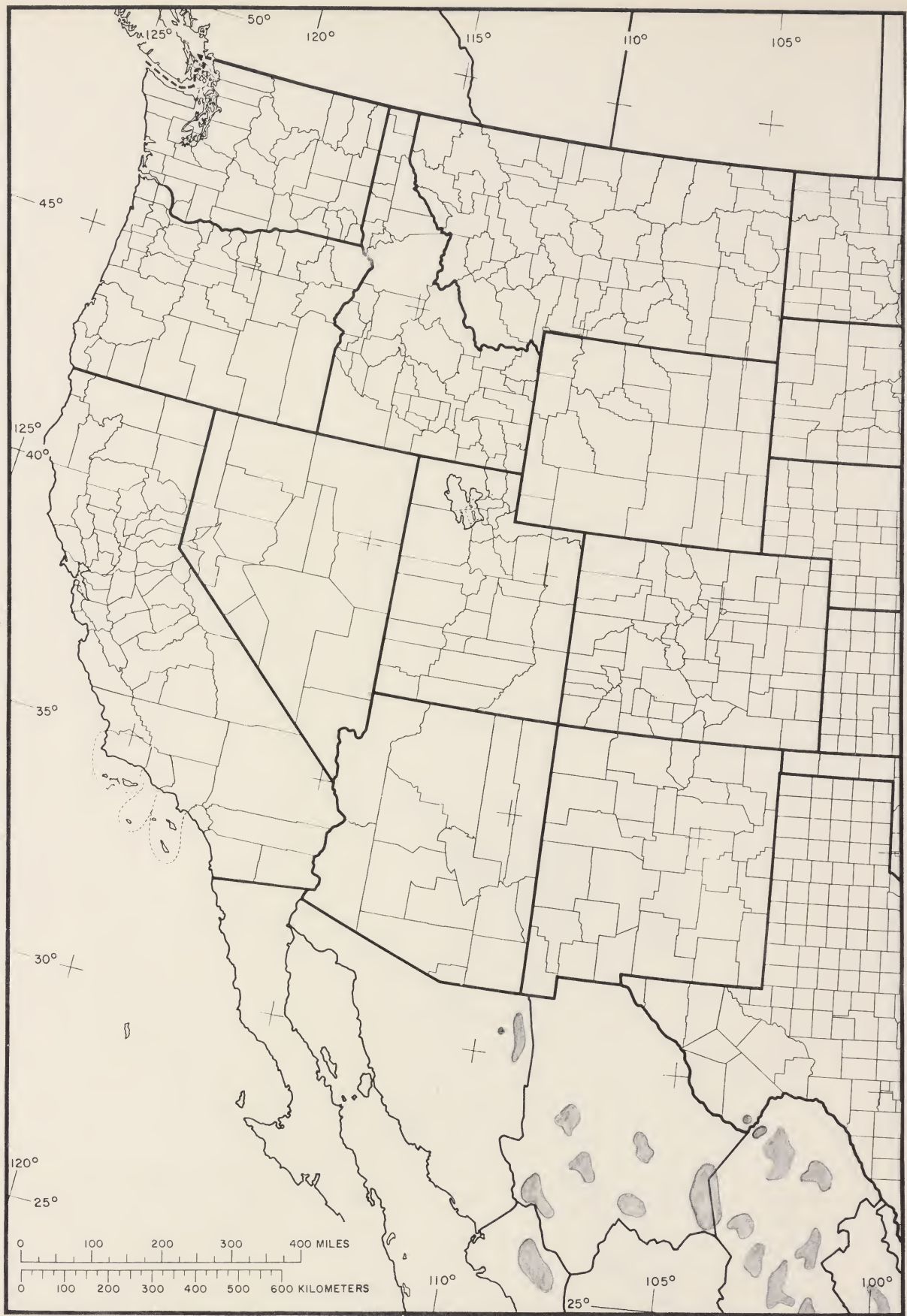
Map 22.1-E. creeping juniper, *Juniperus horizontalis* Moench, eastern range. A prostrate shrub.



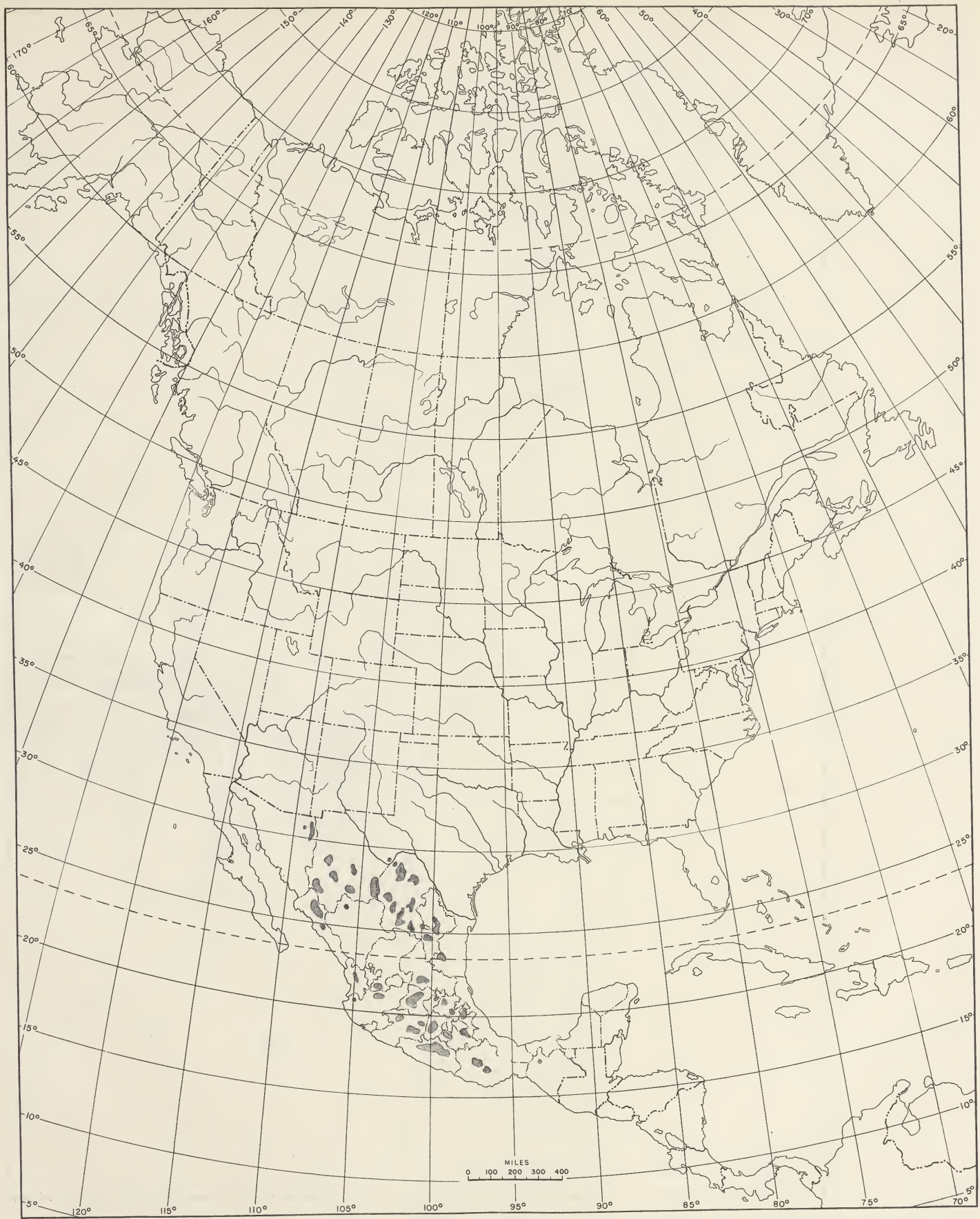
Map 23-W. alligator juniper, *Juniperus deppeana* Steud.



Map 23-N. alligator juniper, *Juniperus deppeana* Steud.



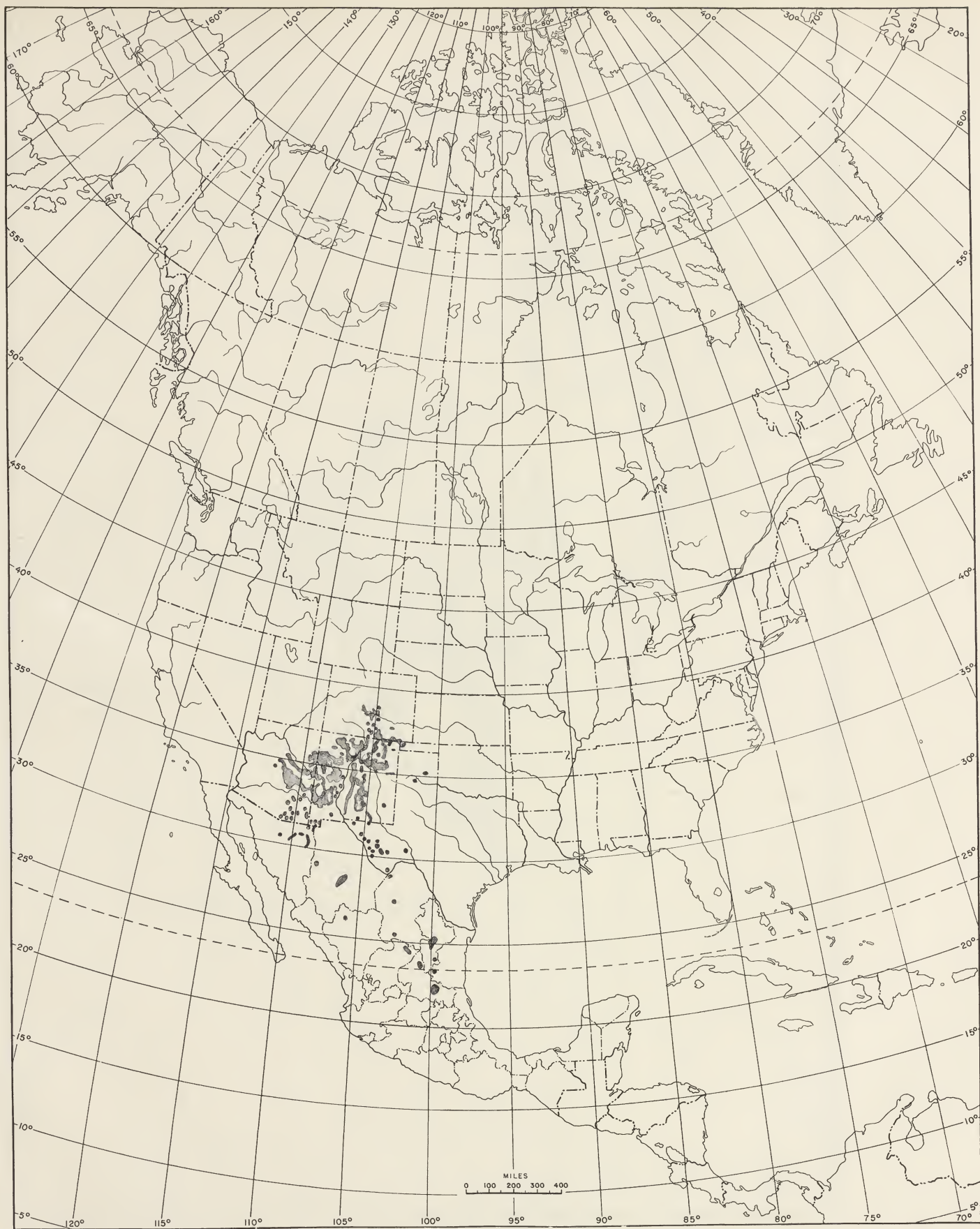
Map 24-W. drooping juniper, *Juniperus flaccida* Schlecht.



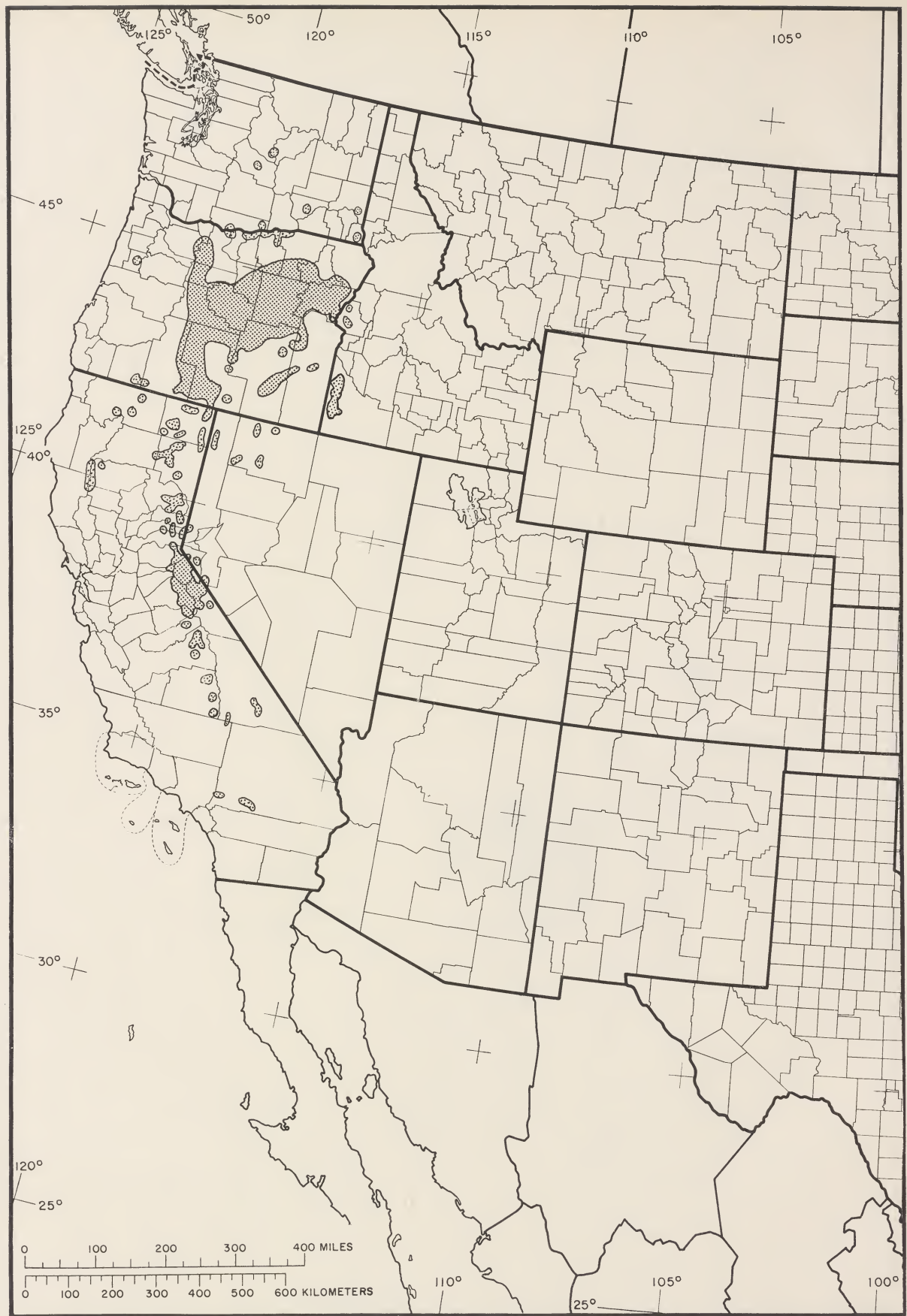
Map 24-N. drooping juniper, *Juniperus flaccida* Schlecht.



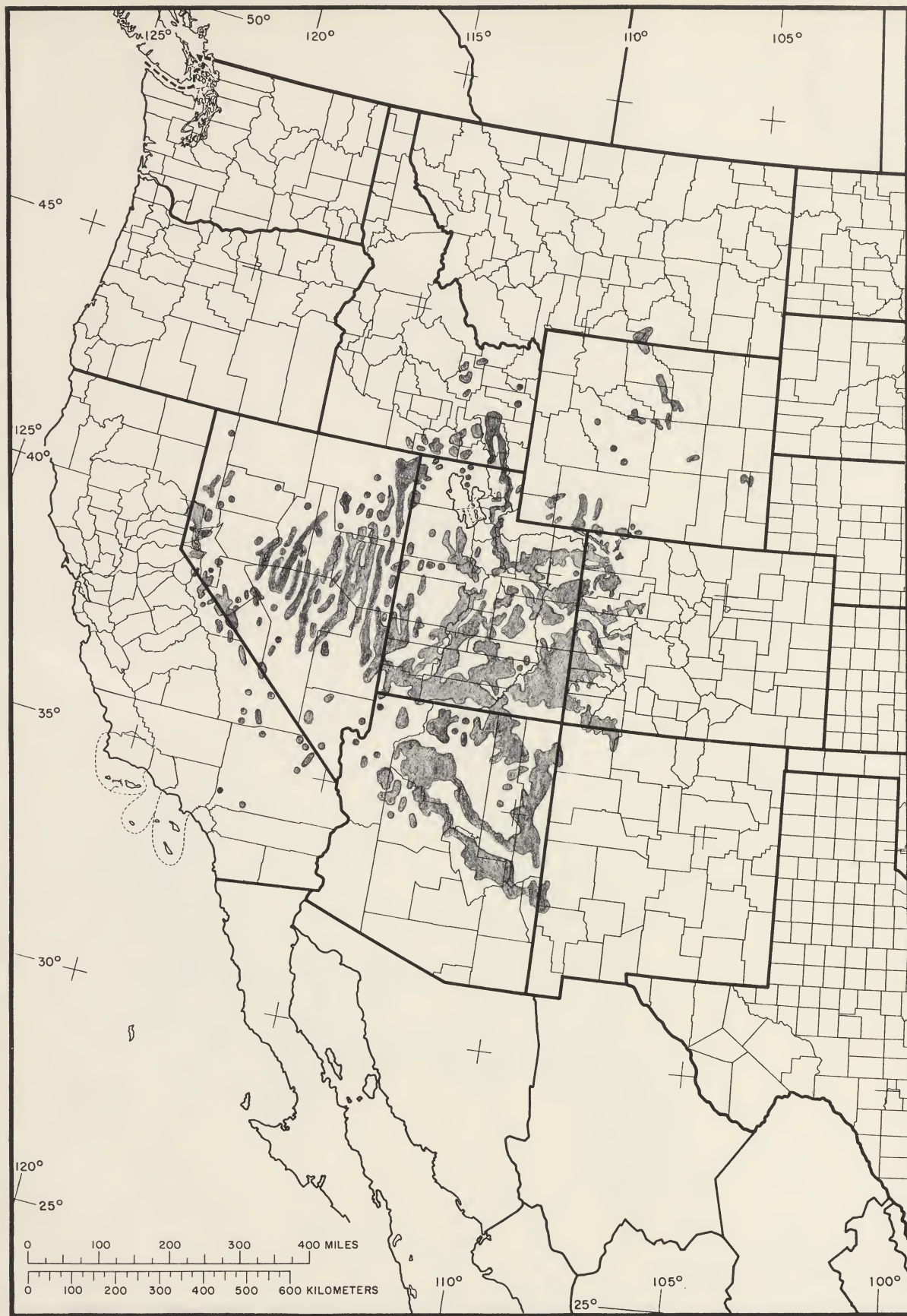
Map 25-W. one-seed juniper, *Juniperus monosperma* (Engelm.) Sarg.



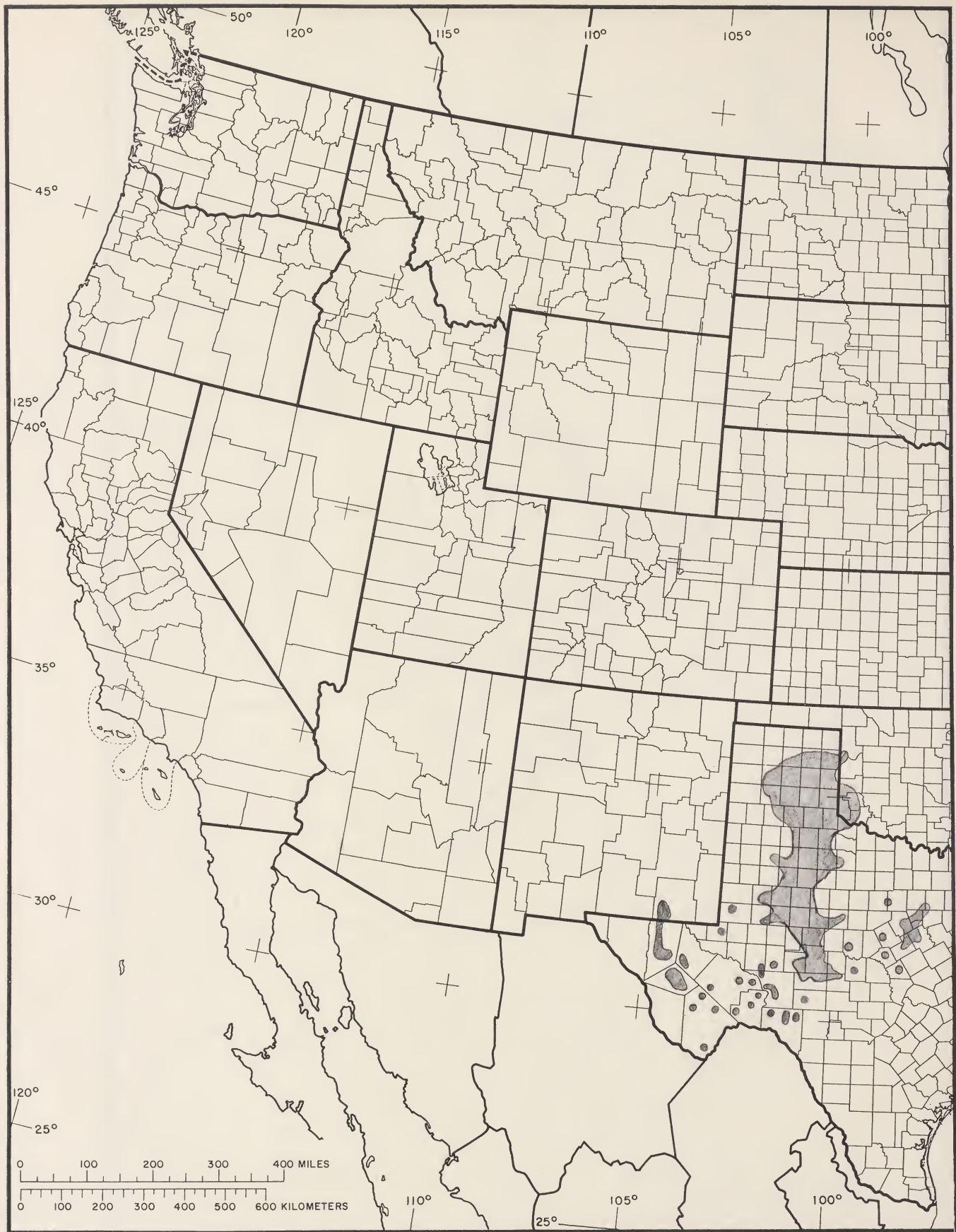
Map 25-N. one-seed juniper, *Juniperus monosperma* (Engelm.) Sarg.



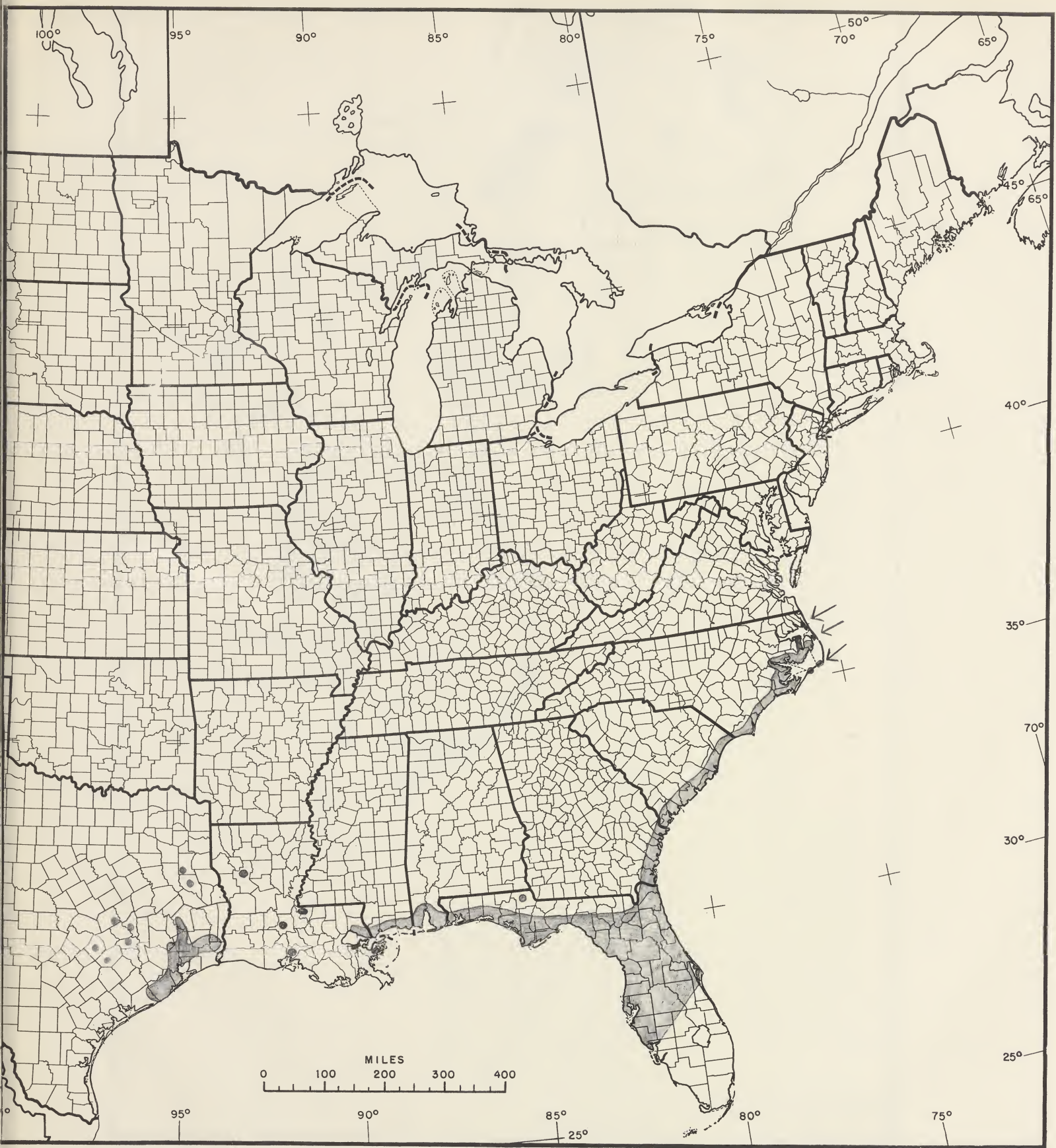
Map 26-W. western juniper, *Juniperus occidentalis* Hook.



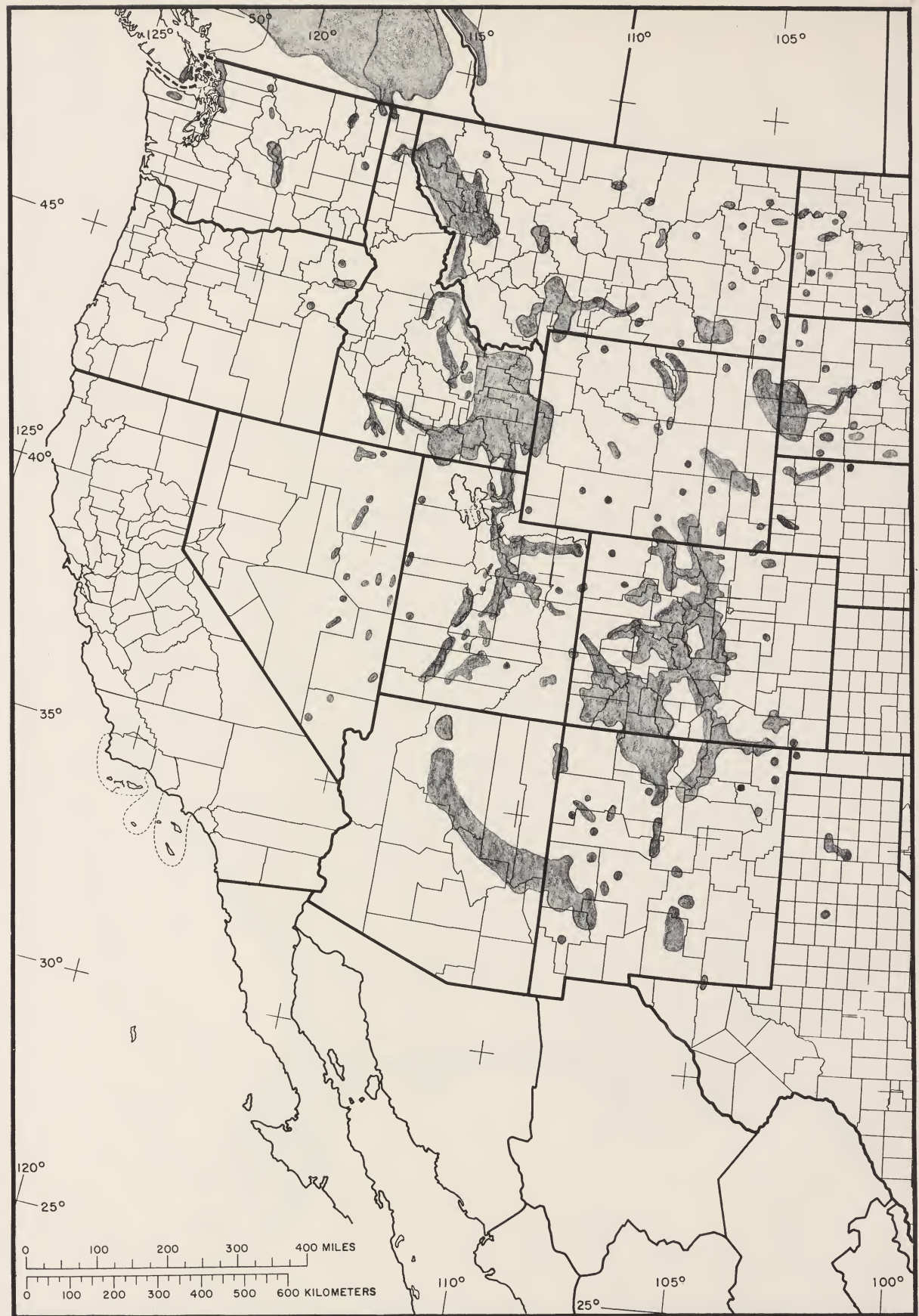
Map 27-W. Utah juniper, *Juniperus osteosperma* (Torr.) Little



Map 28-W. Pinchot juniper, *Juniperus pinchotii* Sudw.



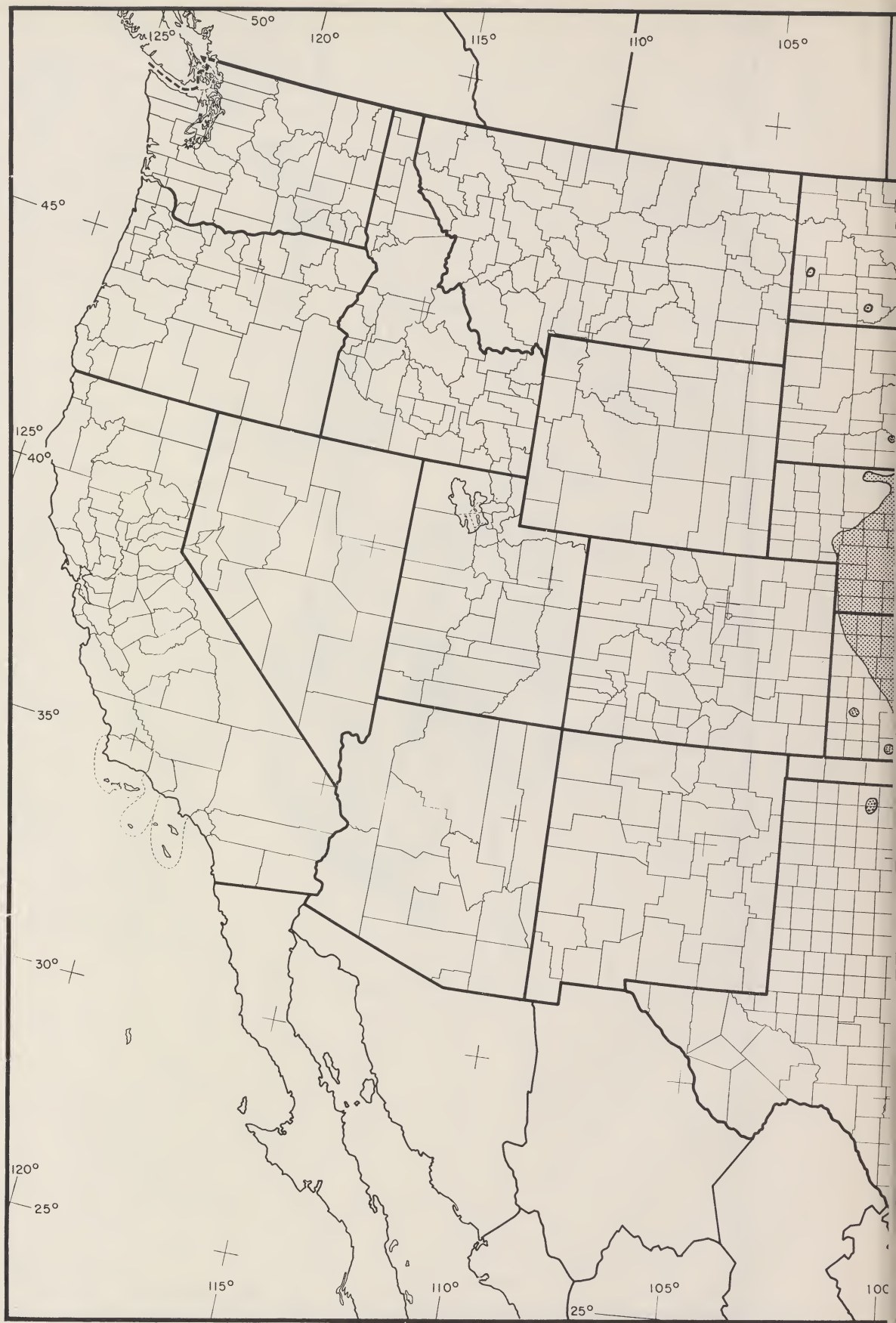
Map 29-E. southern redcedar, *Juniperus silicicola* (Small) Bailey



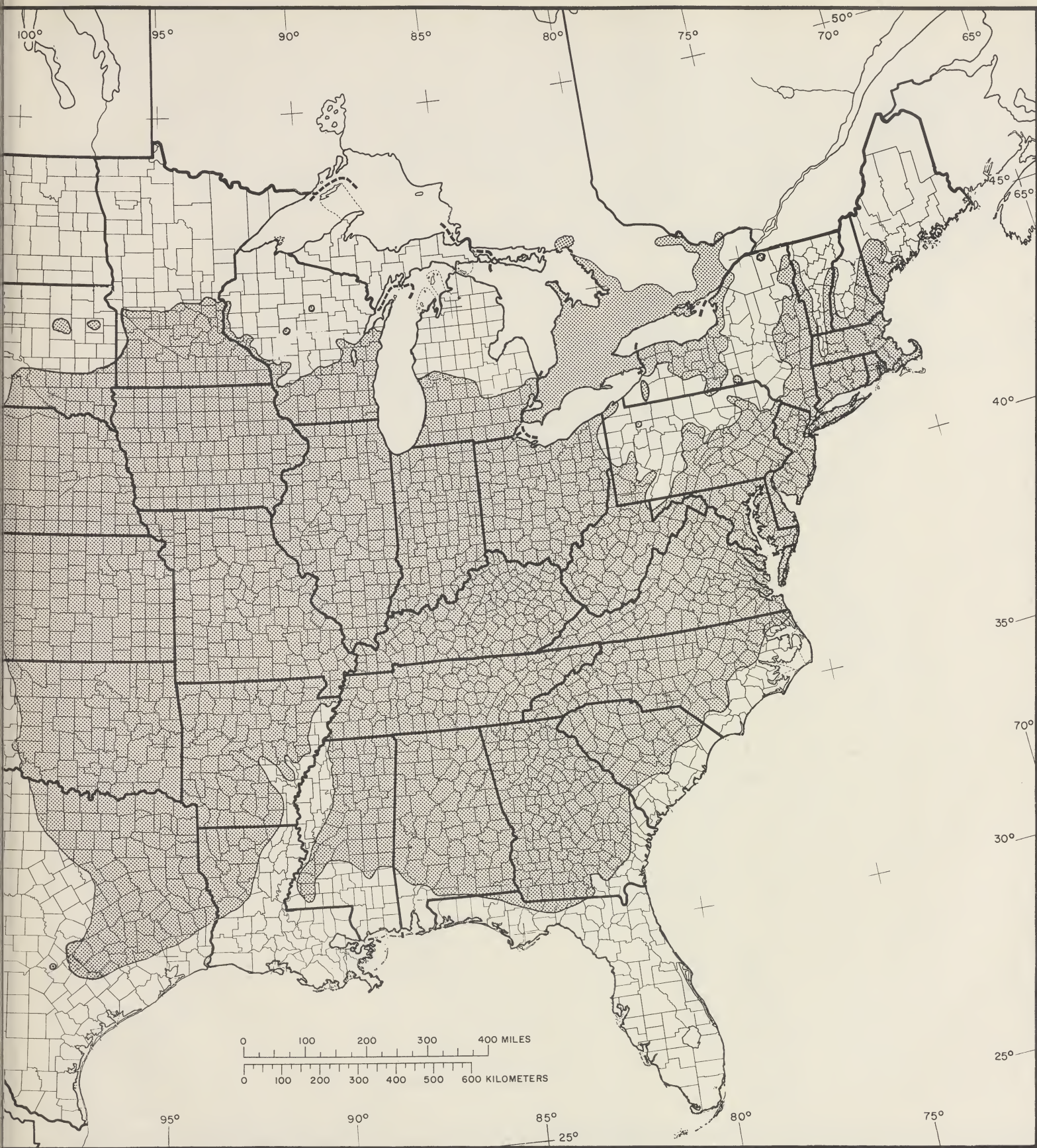
Map 30-W. Rocky Mountain juniper, *Juniperus scopulorum* Sarg.



Map 30-N. Rocky Mountain juniper, *Juniperus scopulorum* Sarg.



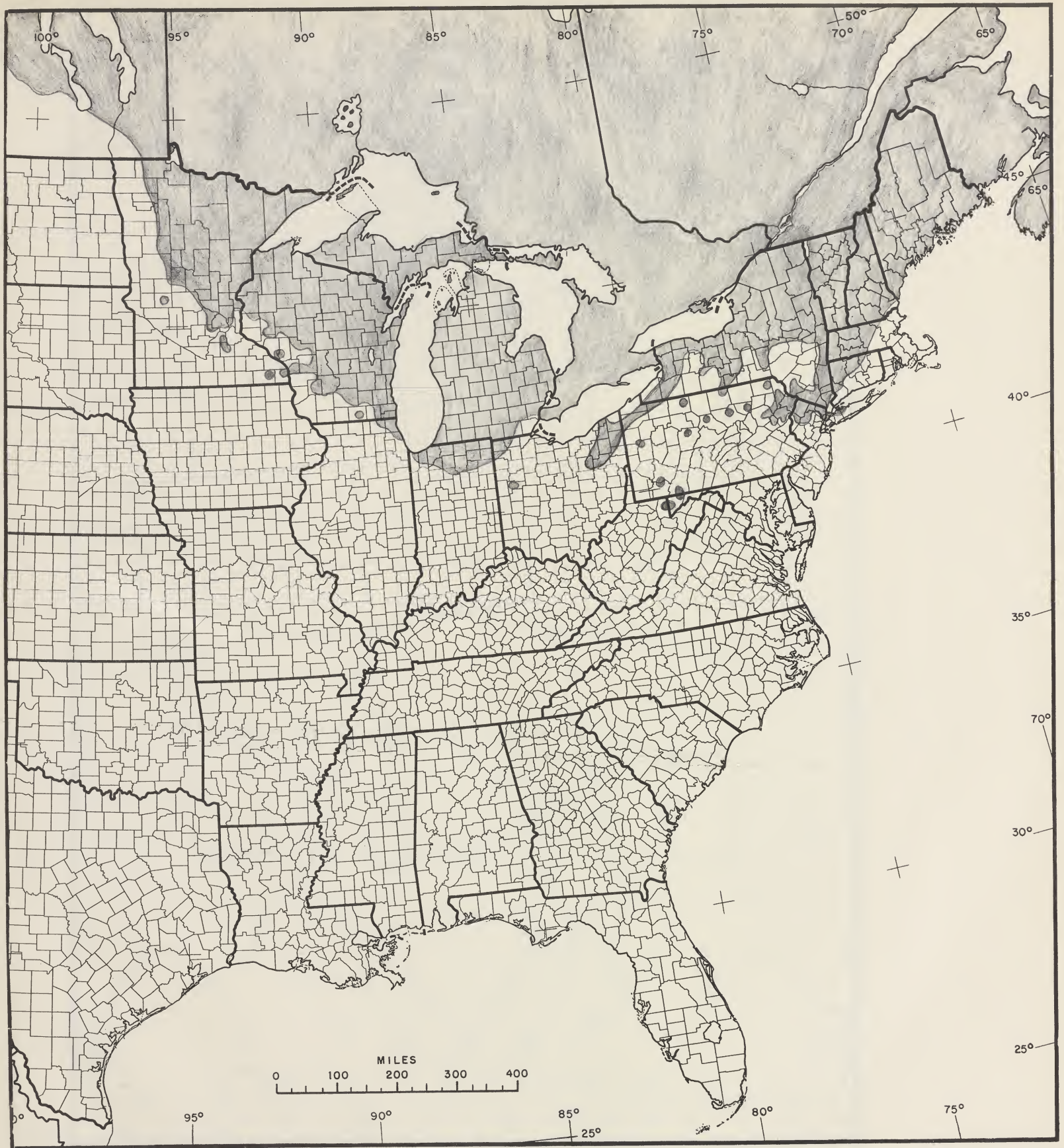
Map 31-W. eastern redcedar, *Juniperus virginiana* L., western range.



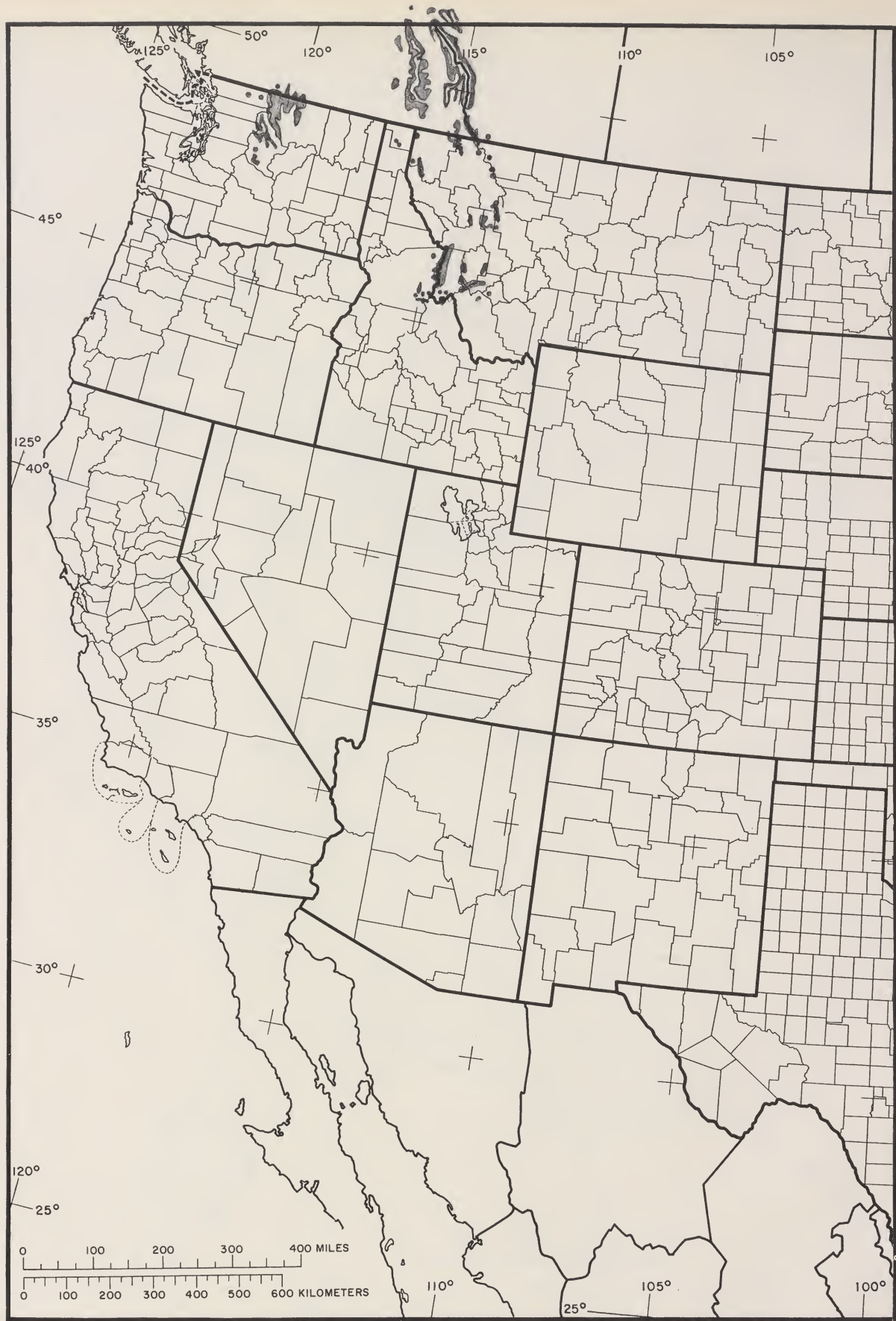
Map 31-E. eastern redcedar, *Juniperus virginiana* L., eastern range.



Map 32-N. tamarack, *Larix laricina* (Du Roi) K. Koch



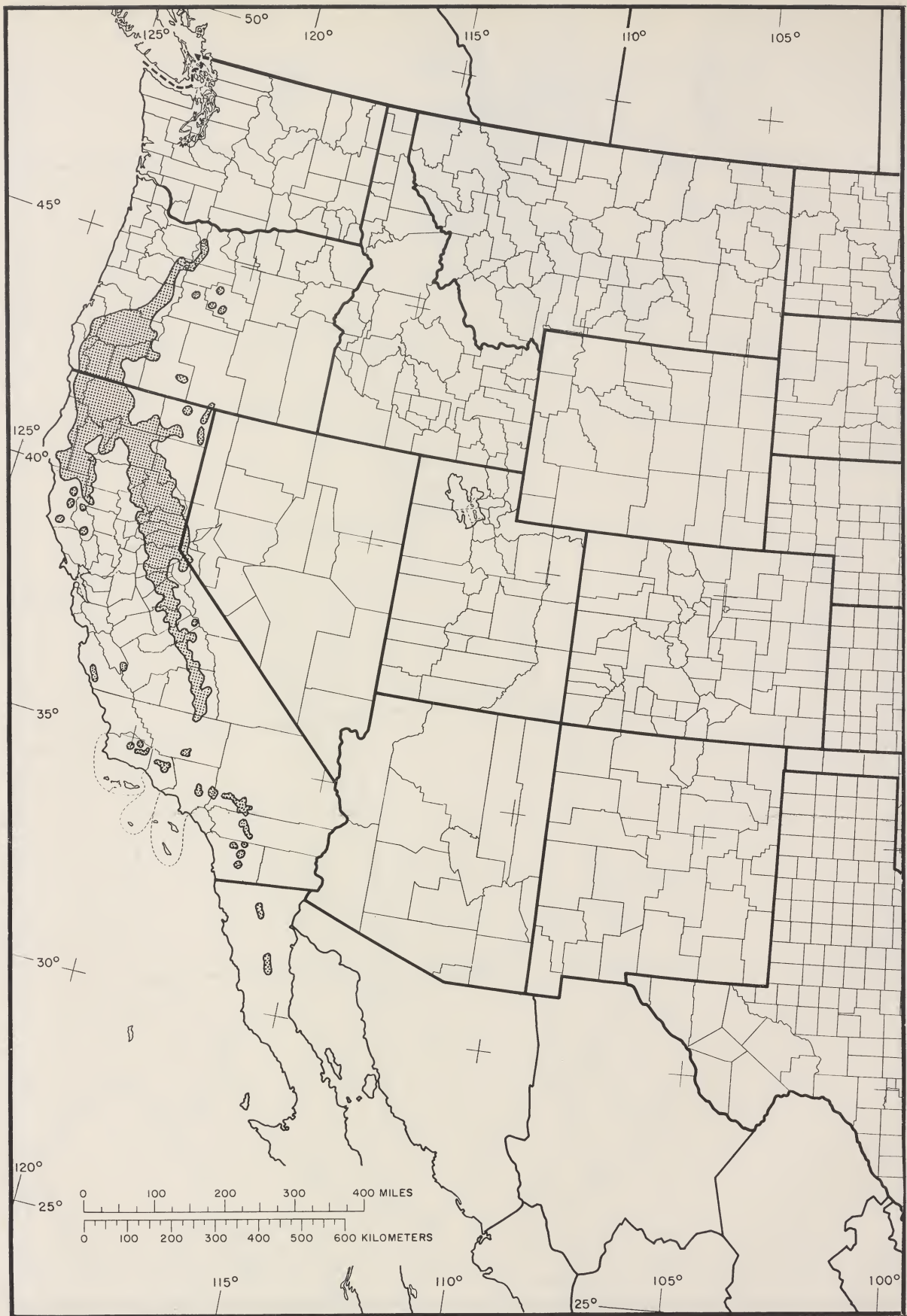
Map 32-E. tamarack, *Larix laricina* (Du Roi) K. Koch



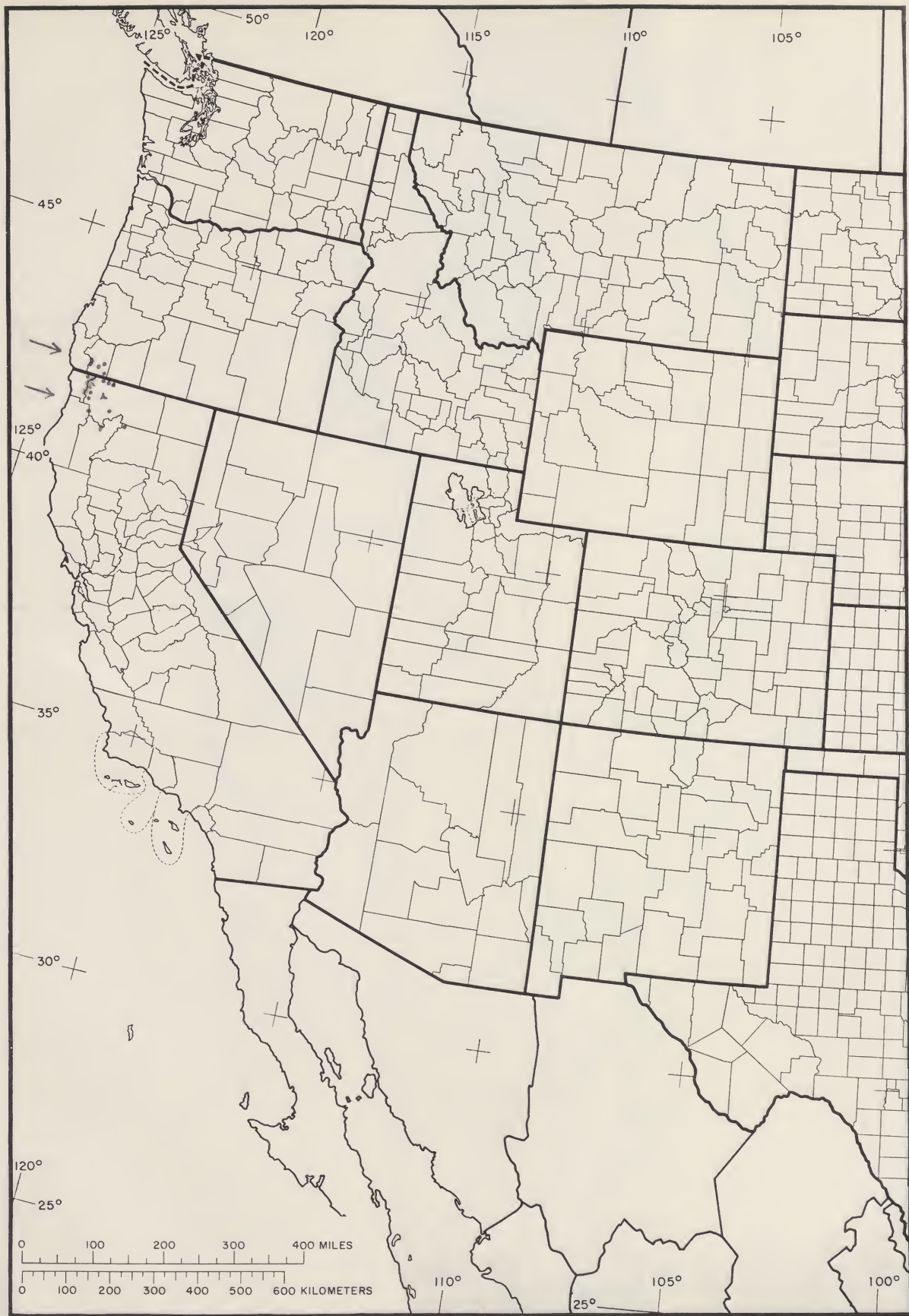
Map 33-W. subalpine larch, *Larix lyallii* Parl.



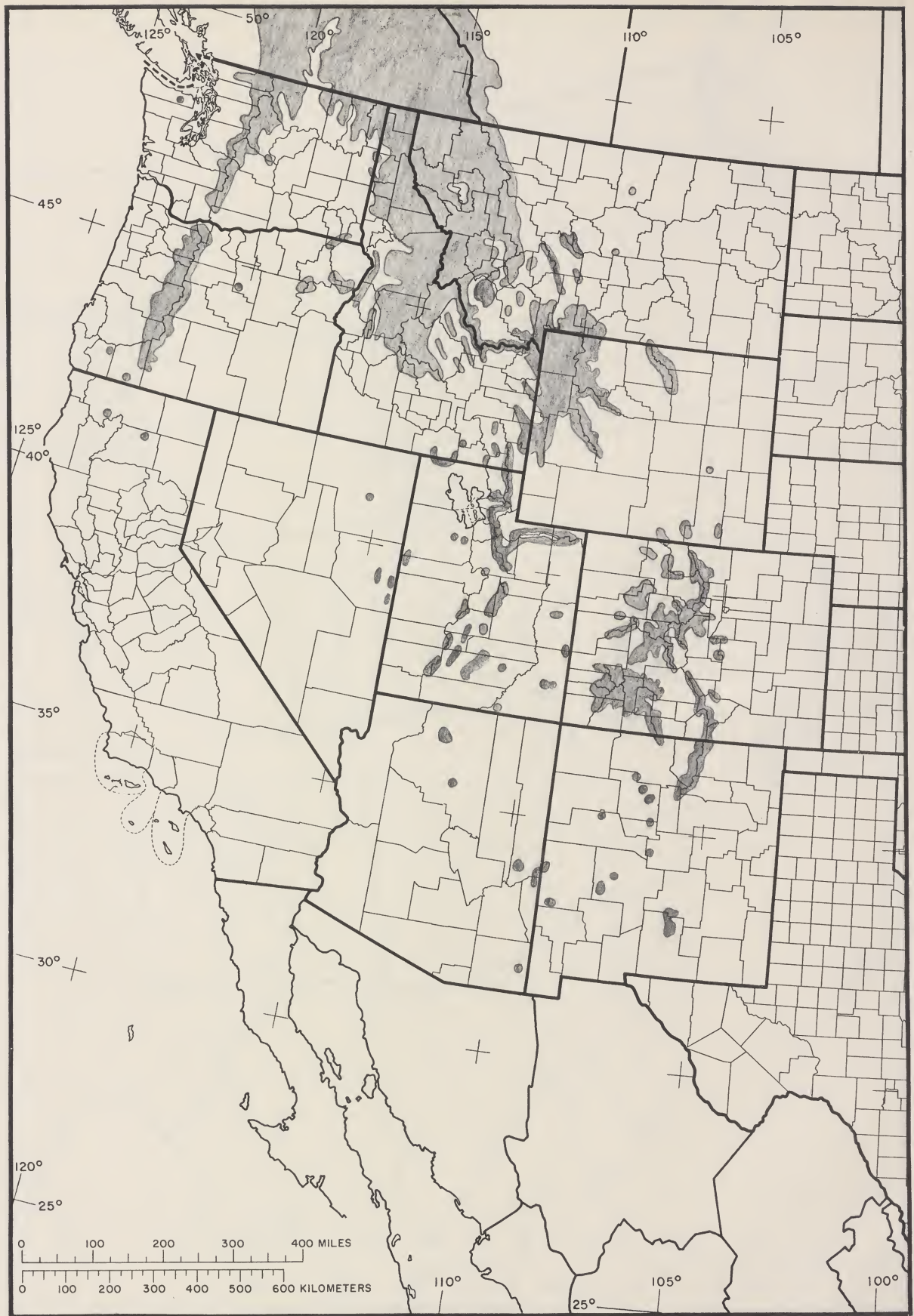
Map 34-W. western larch, *Larix occidentalis* Nutt.



Map 35-W. incense-cedar, *Libocedrus decurrens* Torr.



Map 36-W. Brewer spruce, *Picea breweriana* S. Wats. Oregon and California only.



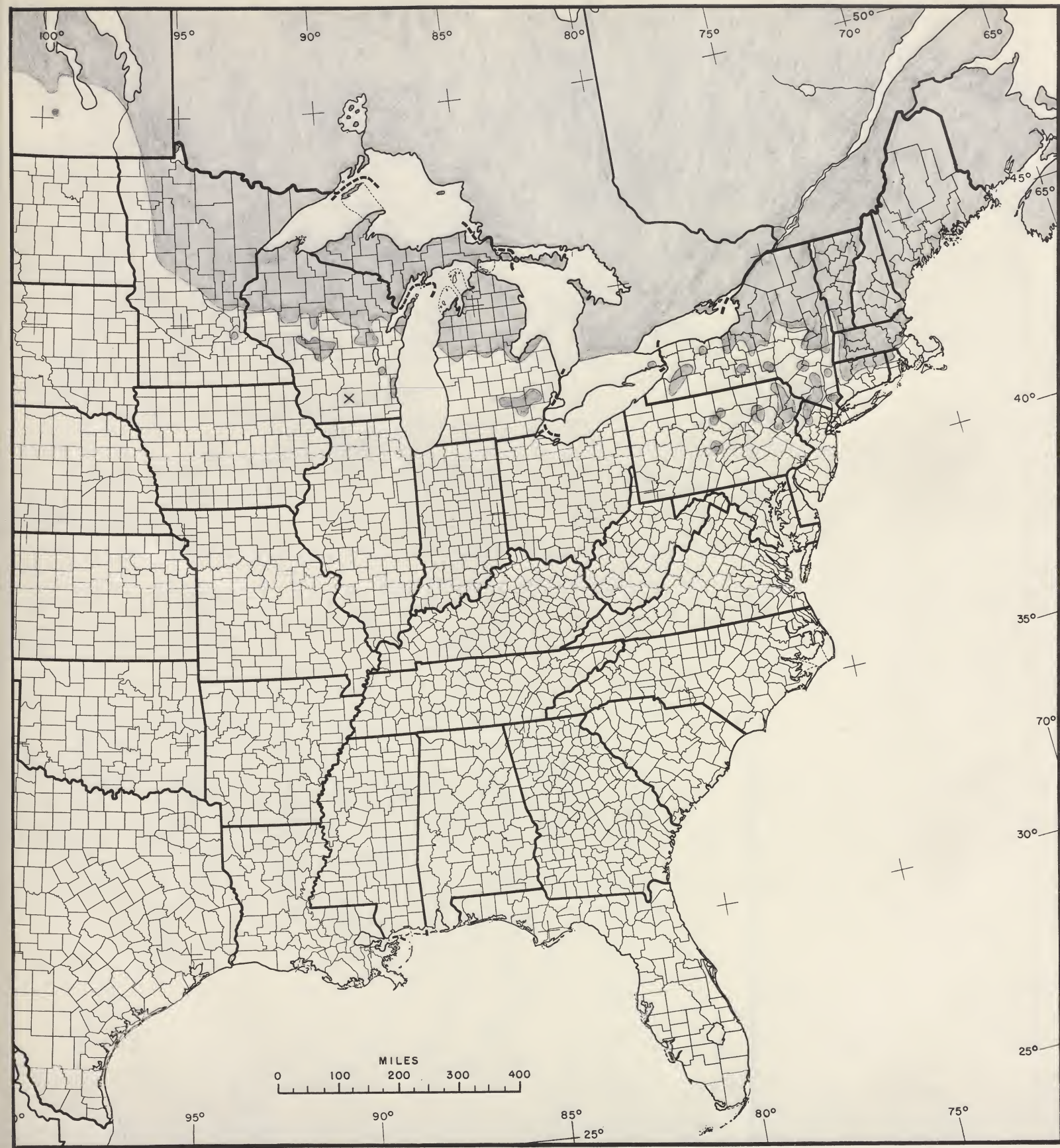
Map 37-W. Engelmann spruce, *Picea engelmannii* Parry



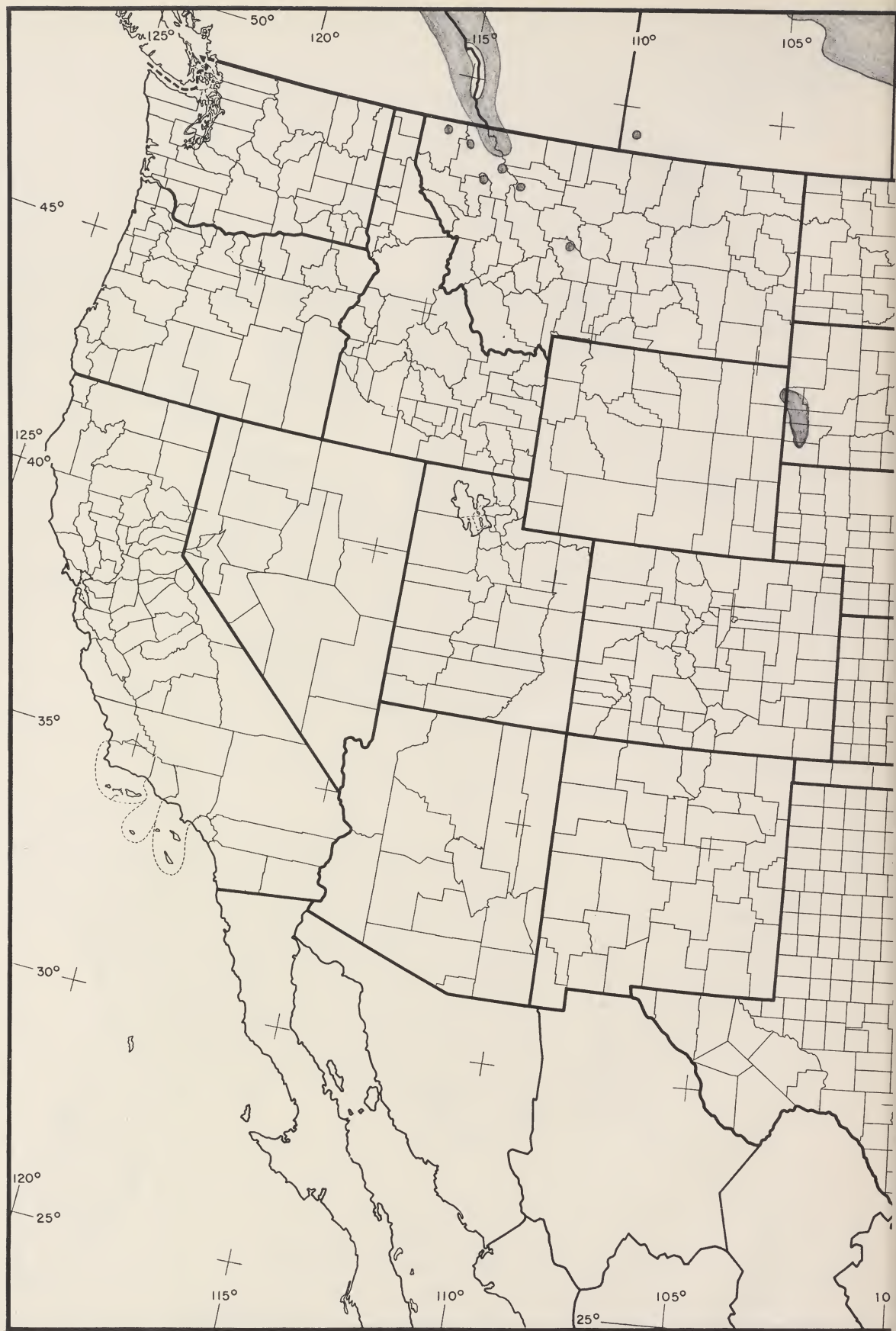
Map 37-N. Engelmann spruce, *Picea engelmannii* Parry



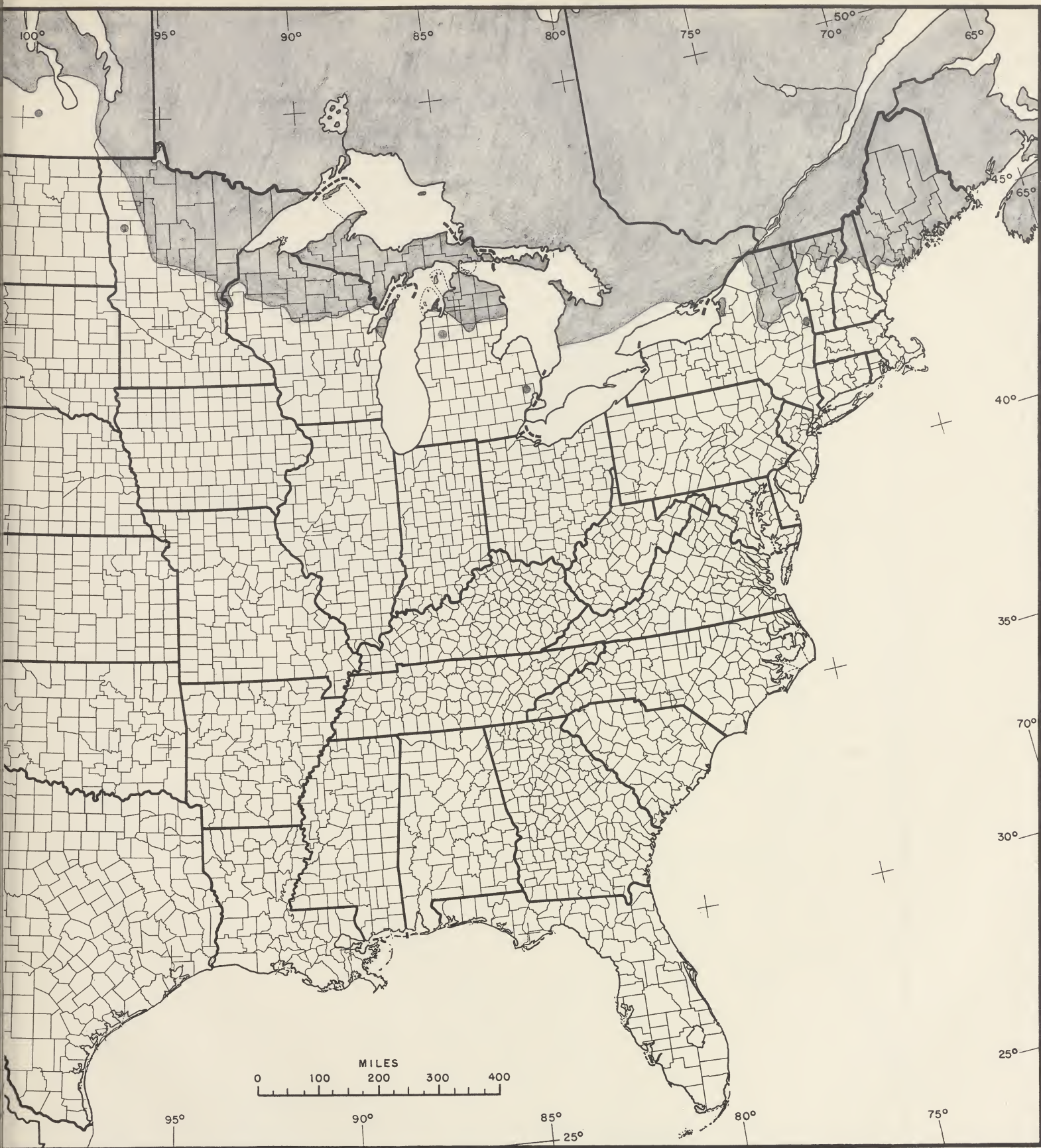
Map 38-N. black spruce, *Picea mariana* (Mill.) B.S.P.



Map 38-E. black spruce, *Picea mariana* (Mill.) B.S.P.



Map 39-W. white spruce, *Picea glauca* (Moench) Voss, western range.



Map 39-E. white spruce, *Picea glauca* (Moench) Voss, eastern range.



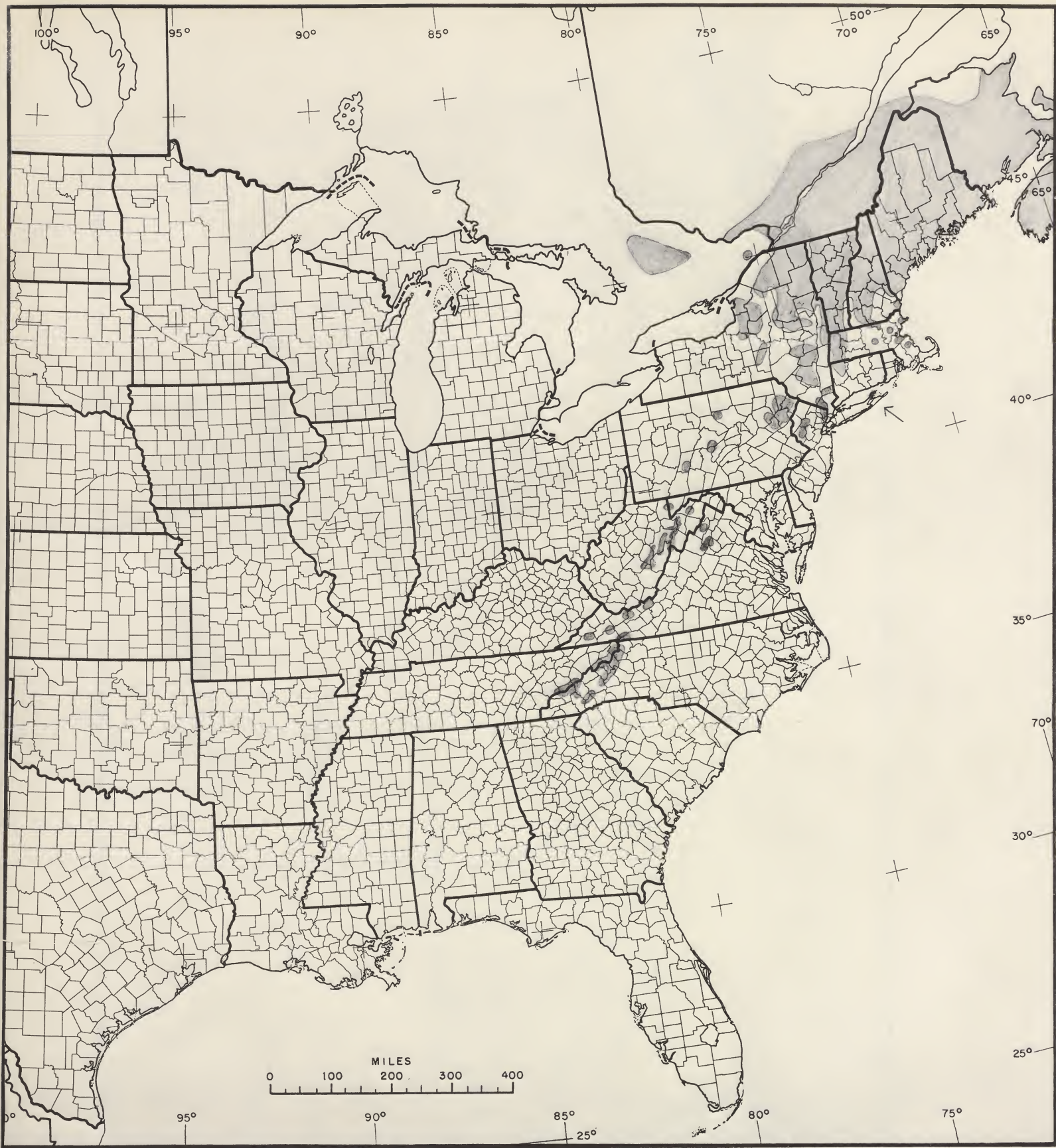
Map 39-N. white spruce, *Picea glauca* (Moench) Voss



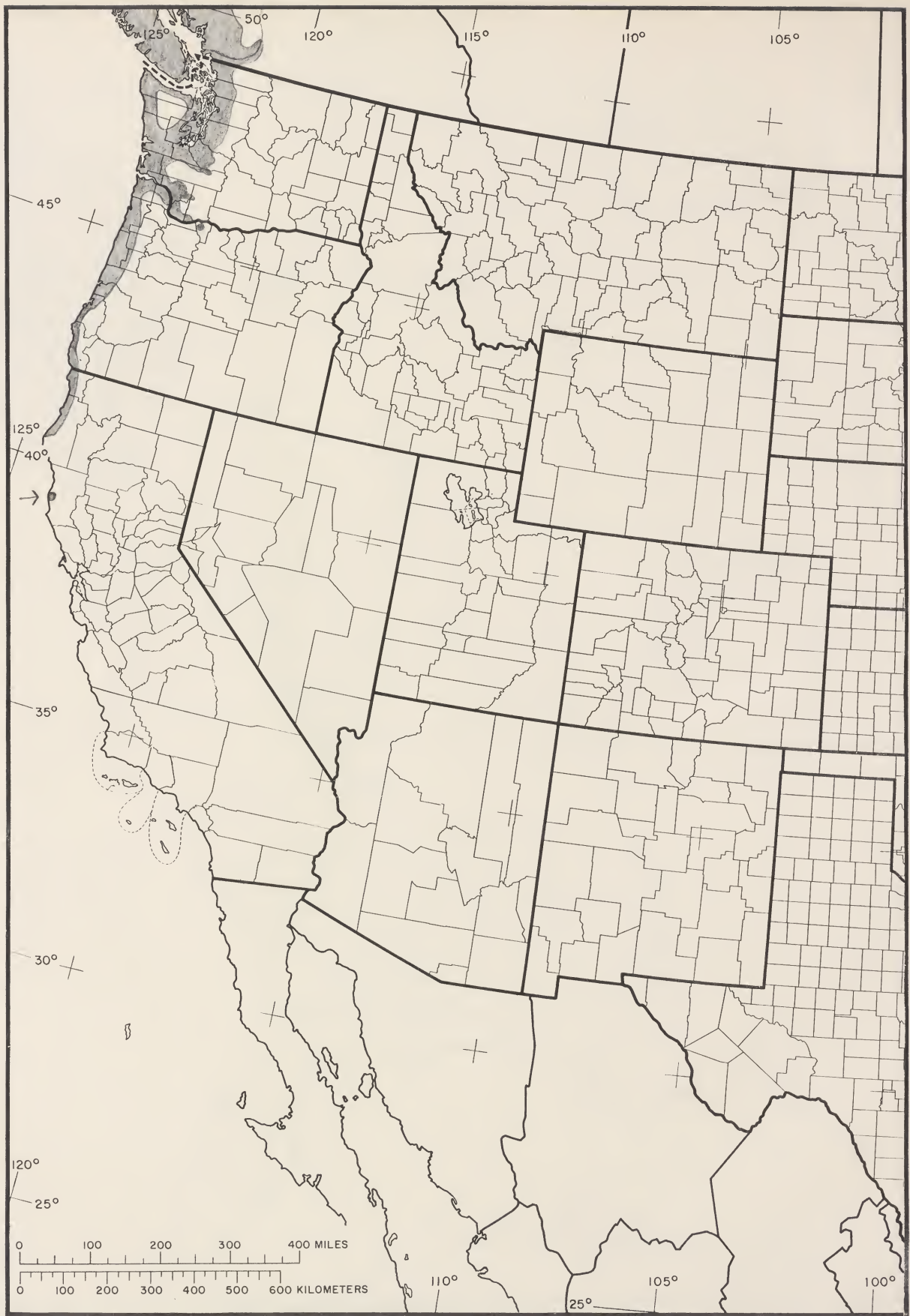
Map 40-W. blue spruce, *Picea pungens* Engelm.



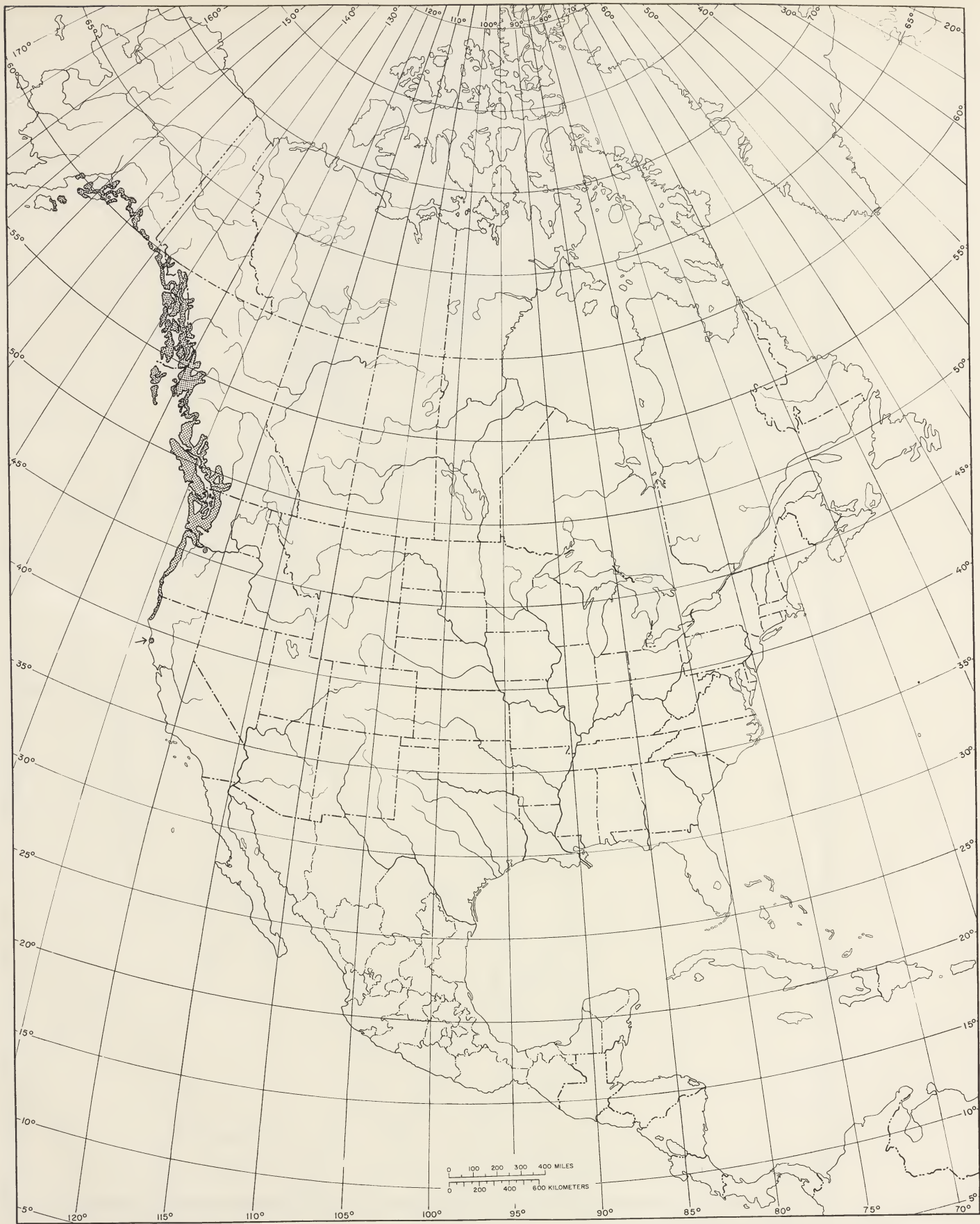
Map 41-N. red spruce, *Picea rubens* Sarg.



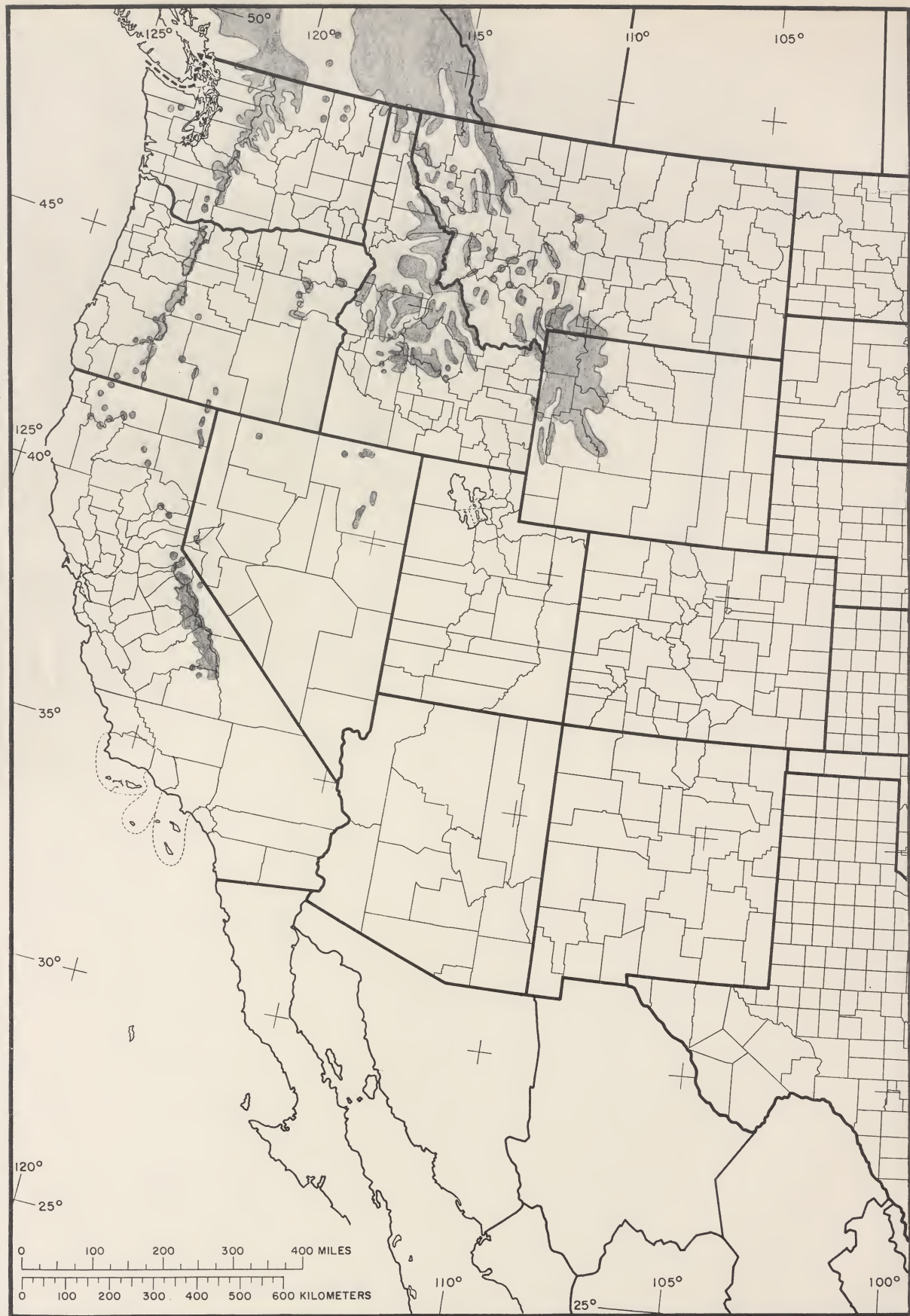
Map 41-E. red spruce, *Picea rubens* Sarg.



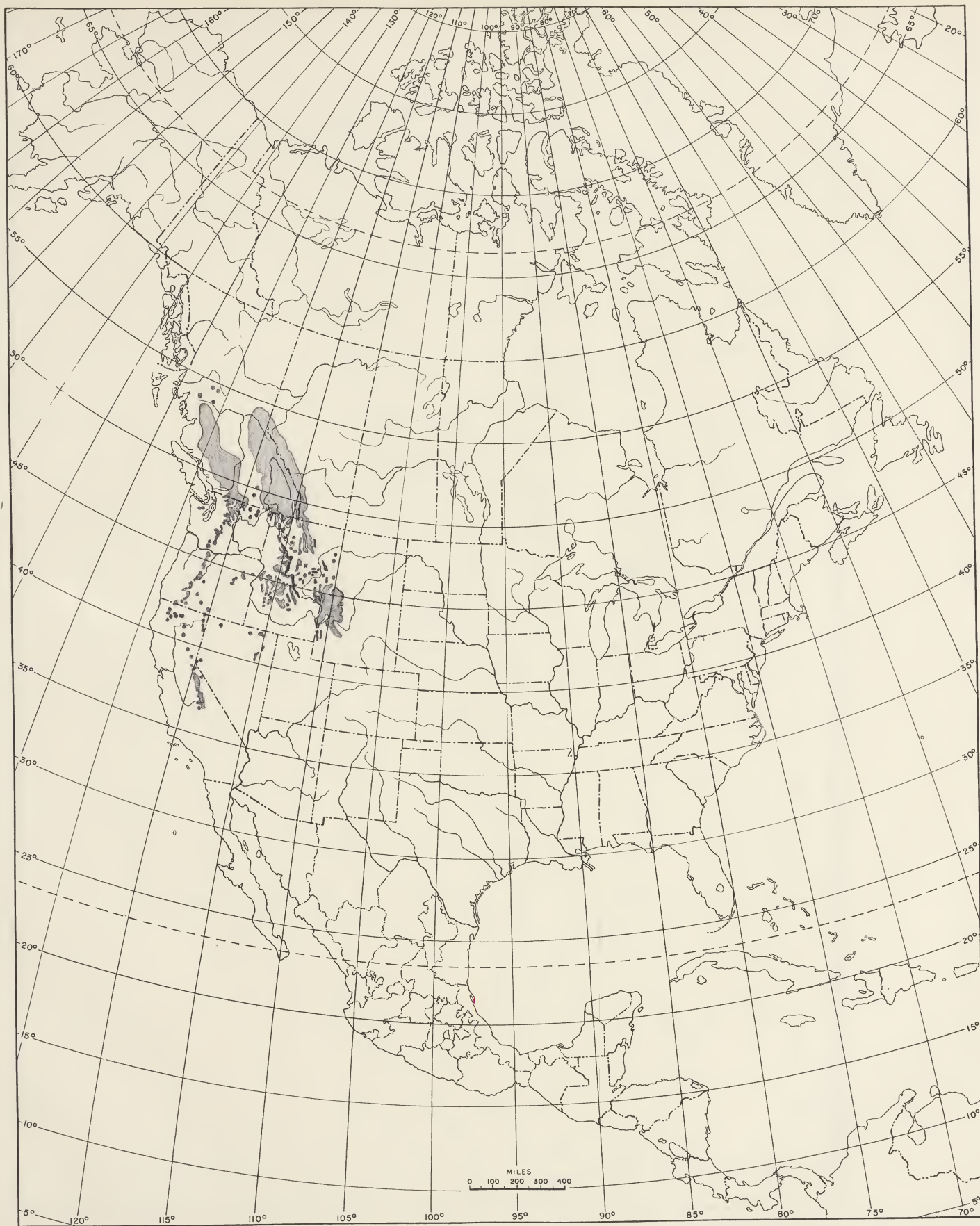
Map 42-W. Sitka spruce, *Picea sitchensis* (Bong.) Carr.



Map 42-N. Sitka spruce, *Picea sitchensis* (Bong.) Carr.



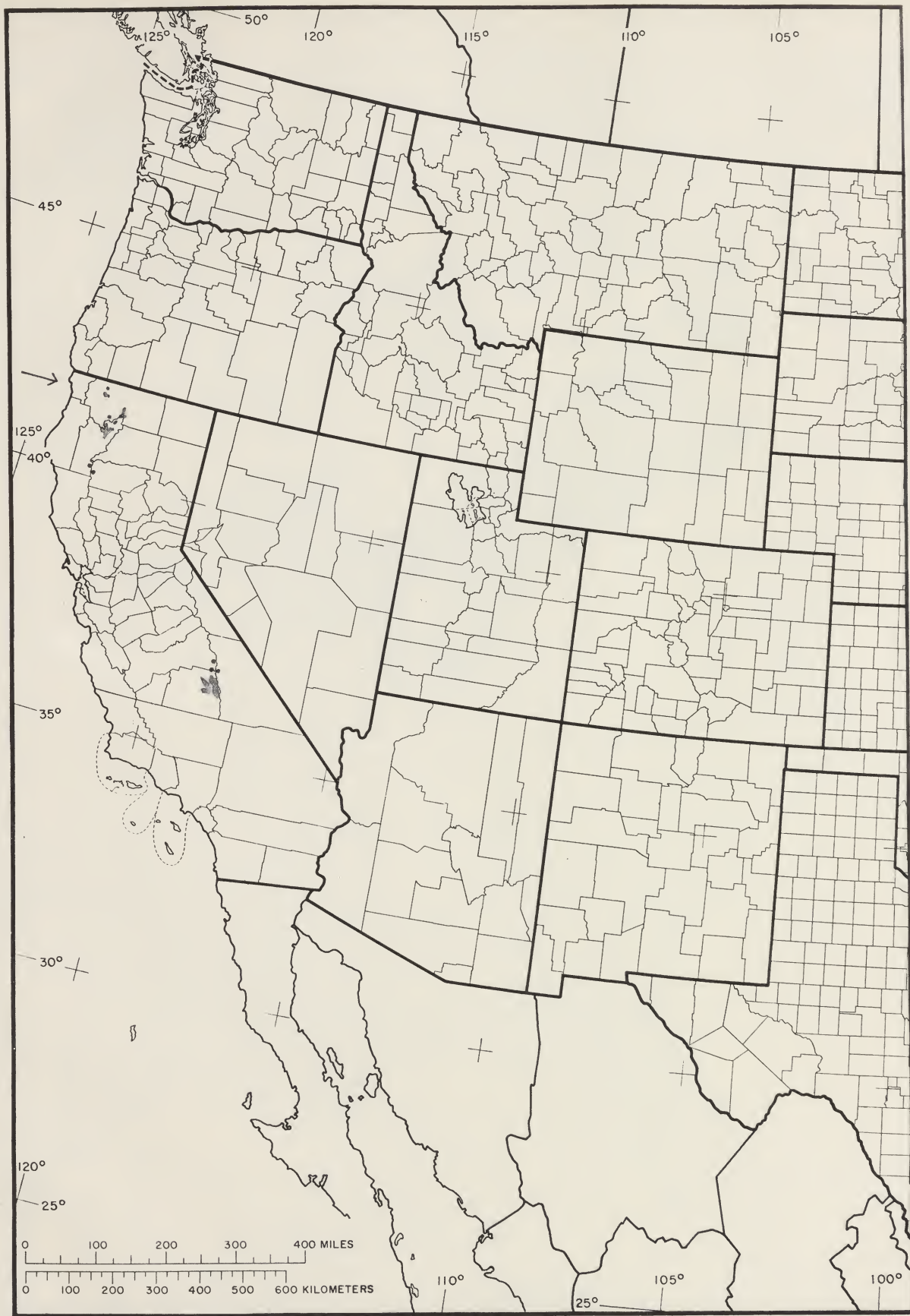
Map 43-W. whitebark pine, *Pinus albicaulis* Engelm.



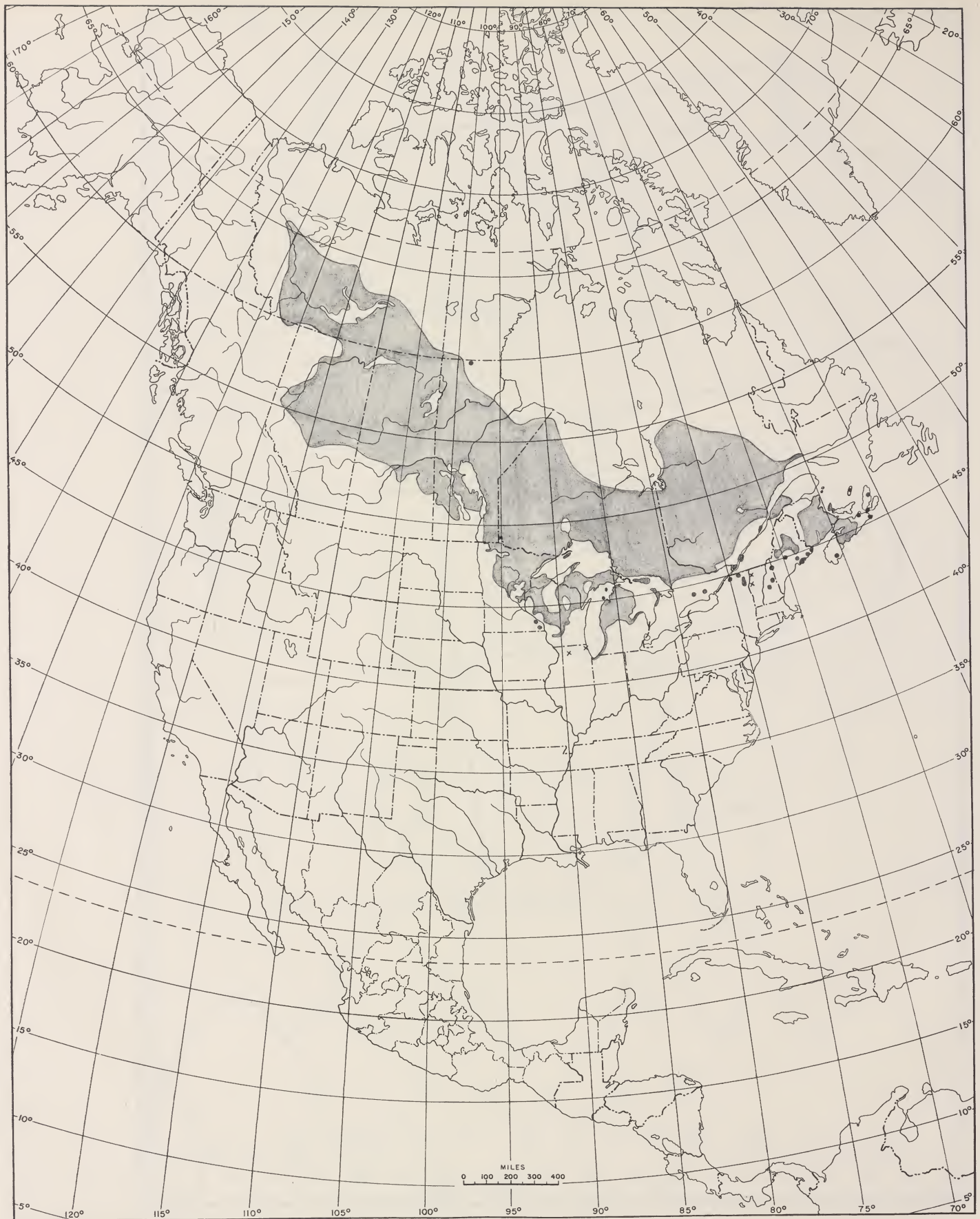
Map 43-N. whitebark pine, *Pinus albicaulis* Engelm.



Map 44-W. bristlecone pine, *Pinus aristata* Engelm.



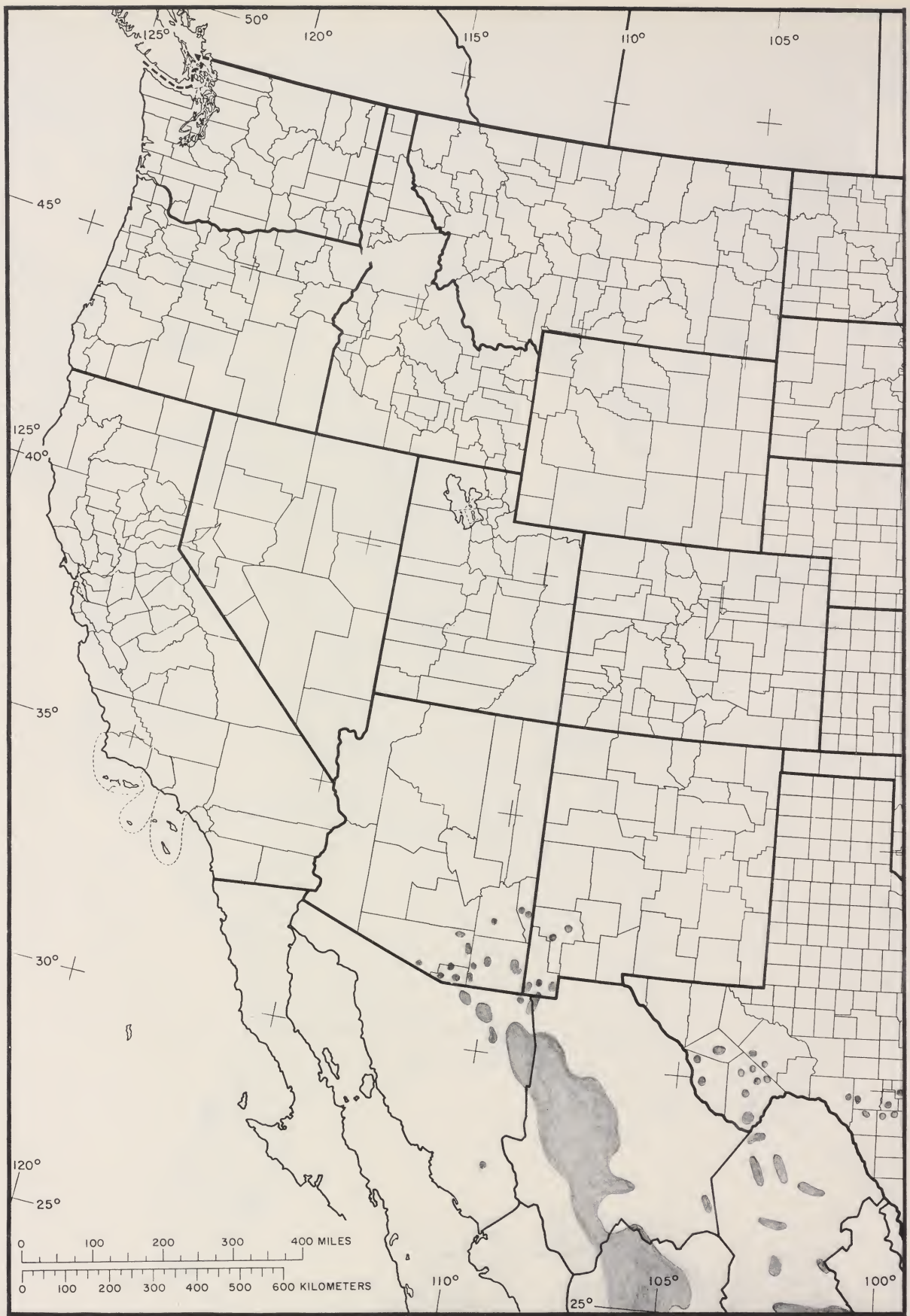
Map 45-W. foxtail pine, *Pinus balfouriana* Grev. & Balf. California only.



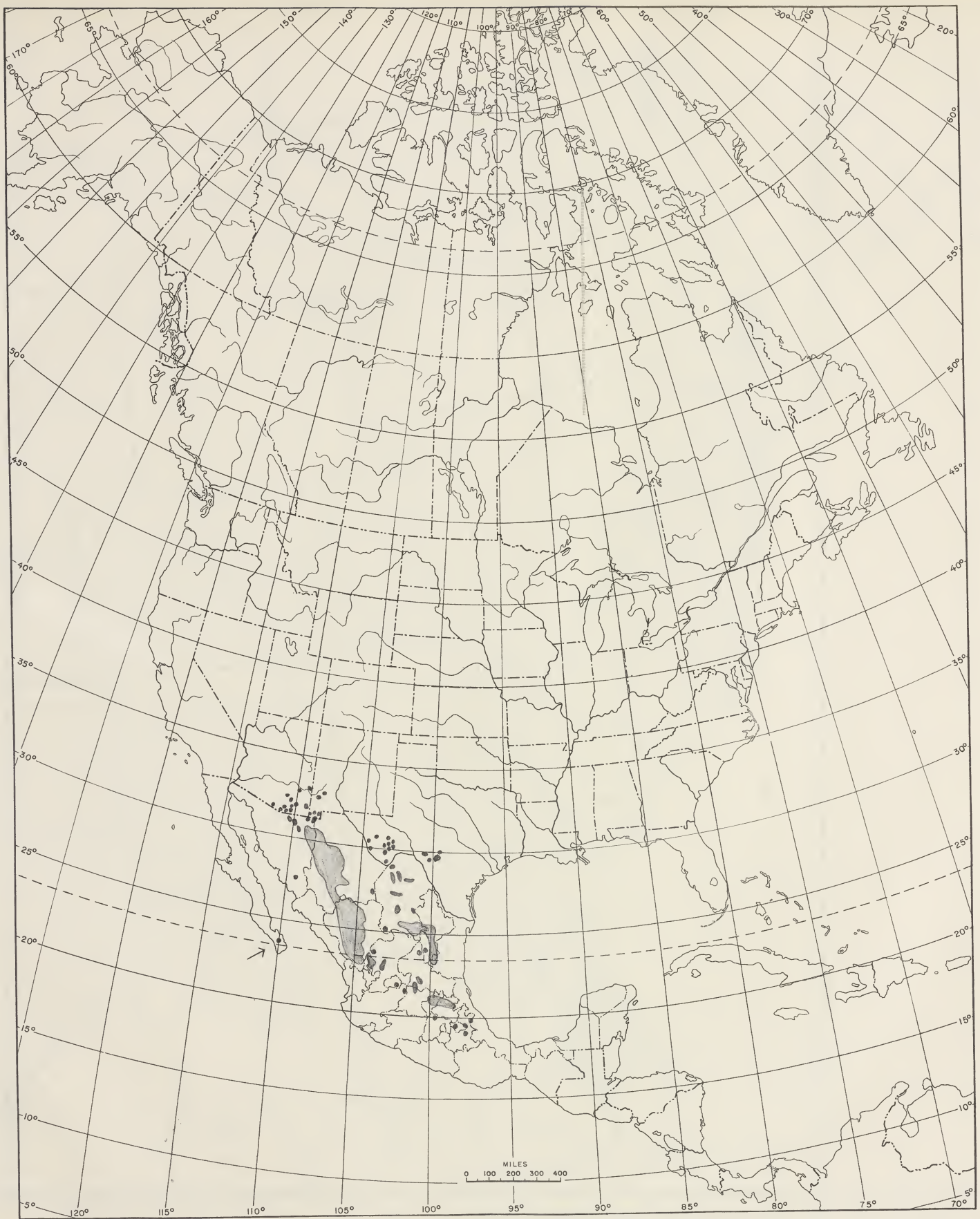
Map 46-N. jack pine, *Pinus banksiana* Lamb.



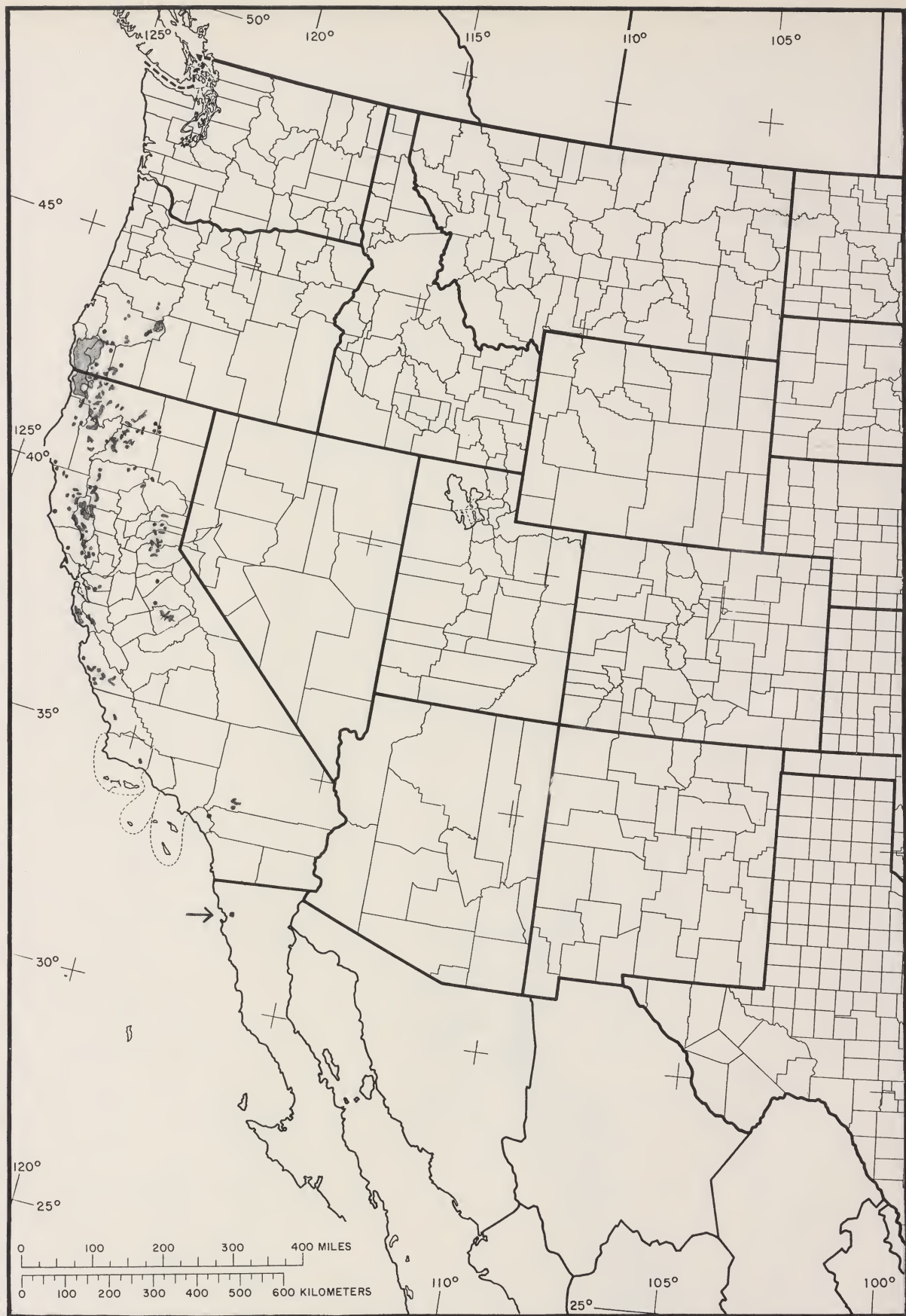
Map 46-E. jack pine, *Pinus banksiana* Lamb.



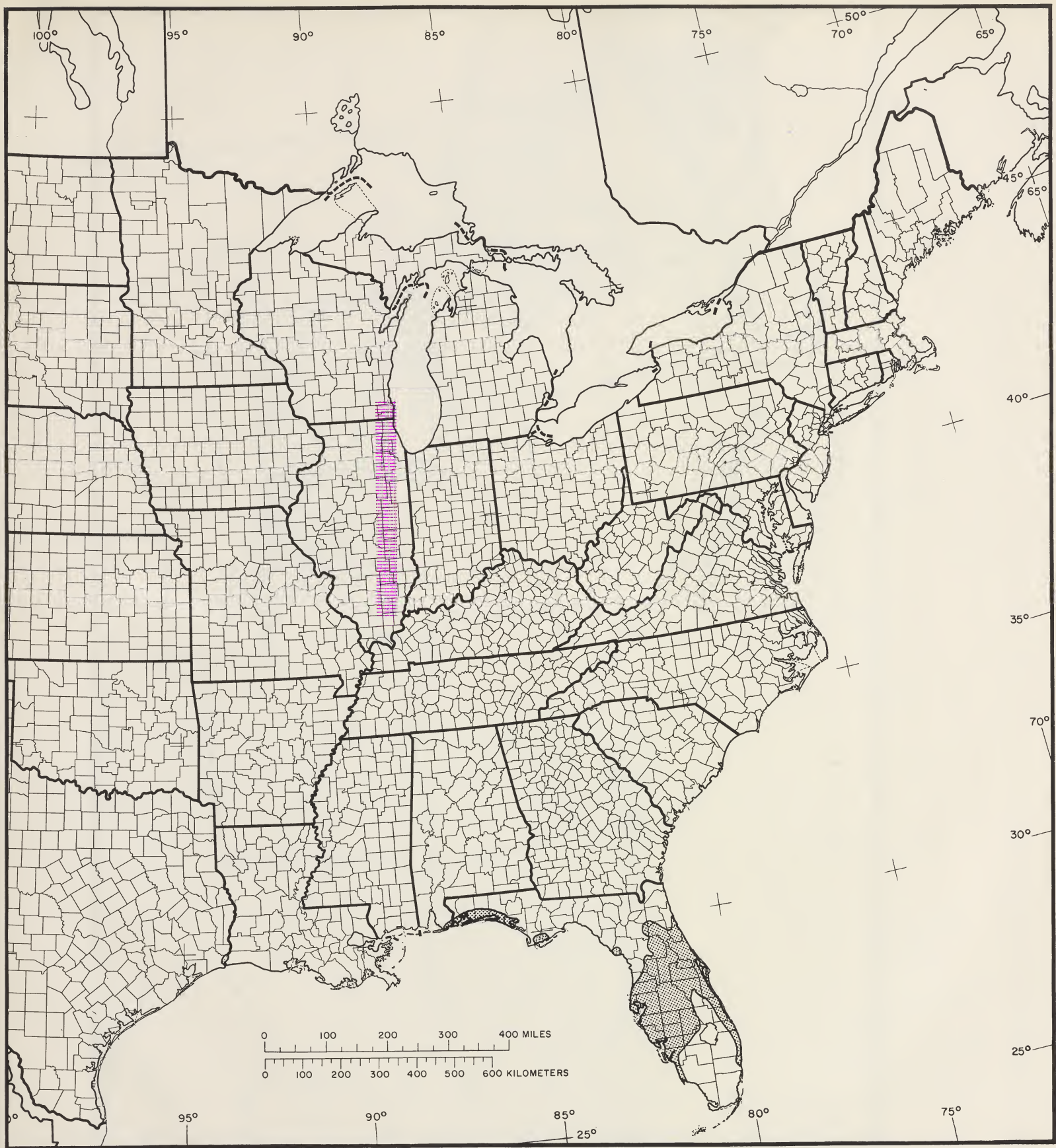
Map 47-W. Mexican pinyon, *Pinus cembroides* Zucc.



Map 47-N. Mexican pinyon, *Pinus cembroides* Zucc.



Map 48-W. knobcone pine, *Pinus attenuata* Lemm.



Map 49-E. sand pine, *Pinus clausa* (Chapm.) Vasey. Florida and Alabama only.



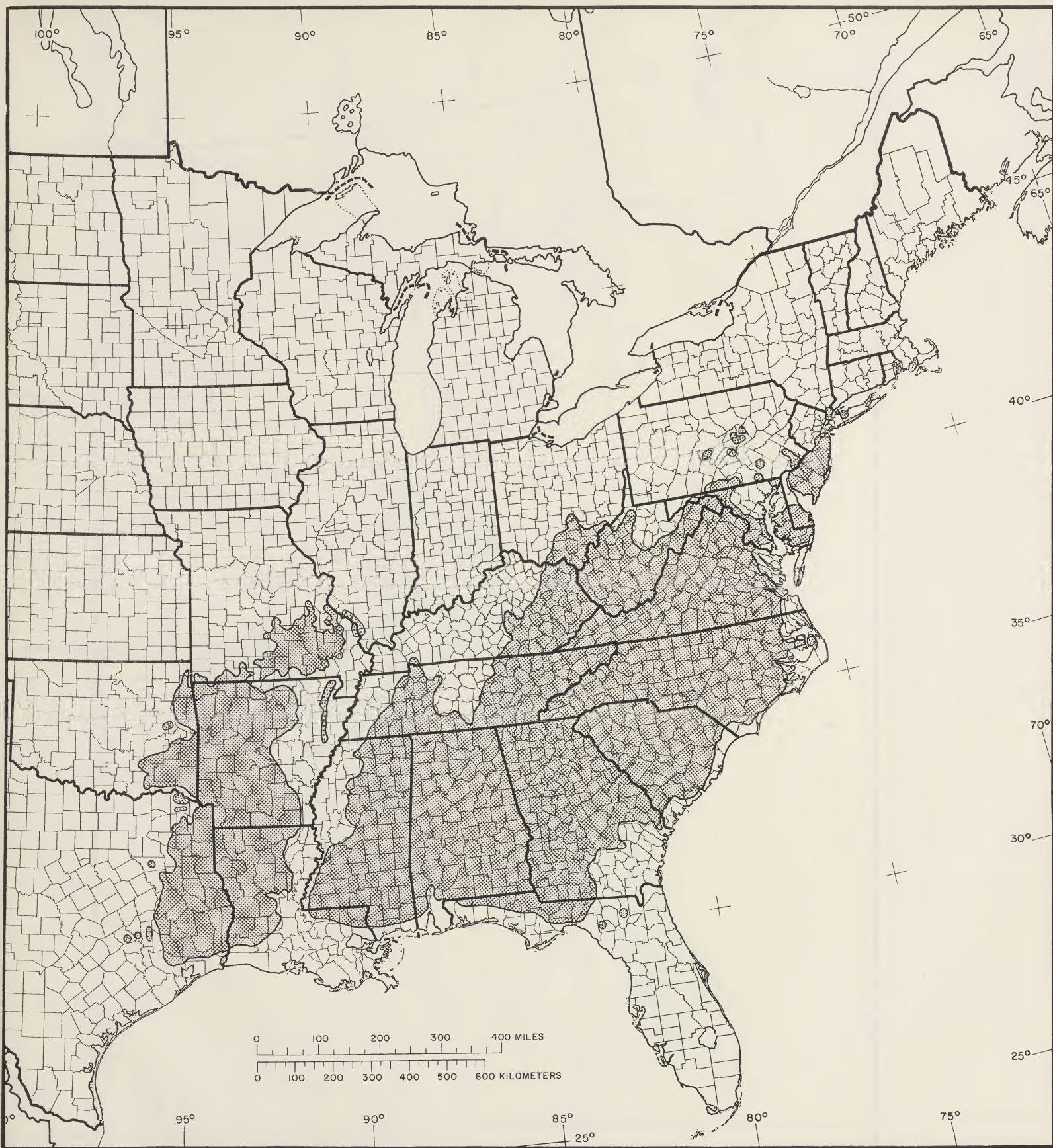
Map 50-W. lodgepole pine, *Pinus contorta* Dougl. The broken lines separate 3 geographical varieties, eastward, *P. contorta* var. *latifolia* Engelm., westward, shore pine, *P. contorta* var. *contorta*, and in Cascades and Sierra Nevada, *P. contorta* var. *murrayana* (Grev. & Balf.) Engelm.



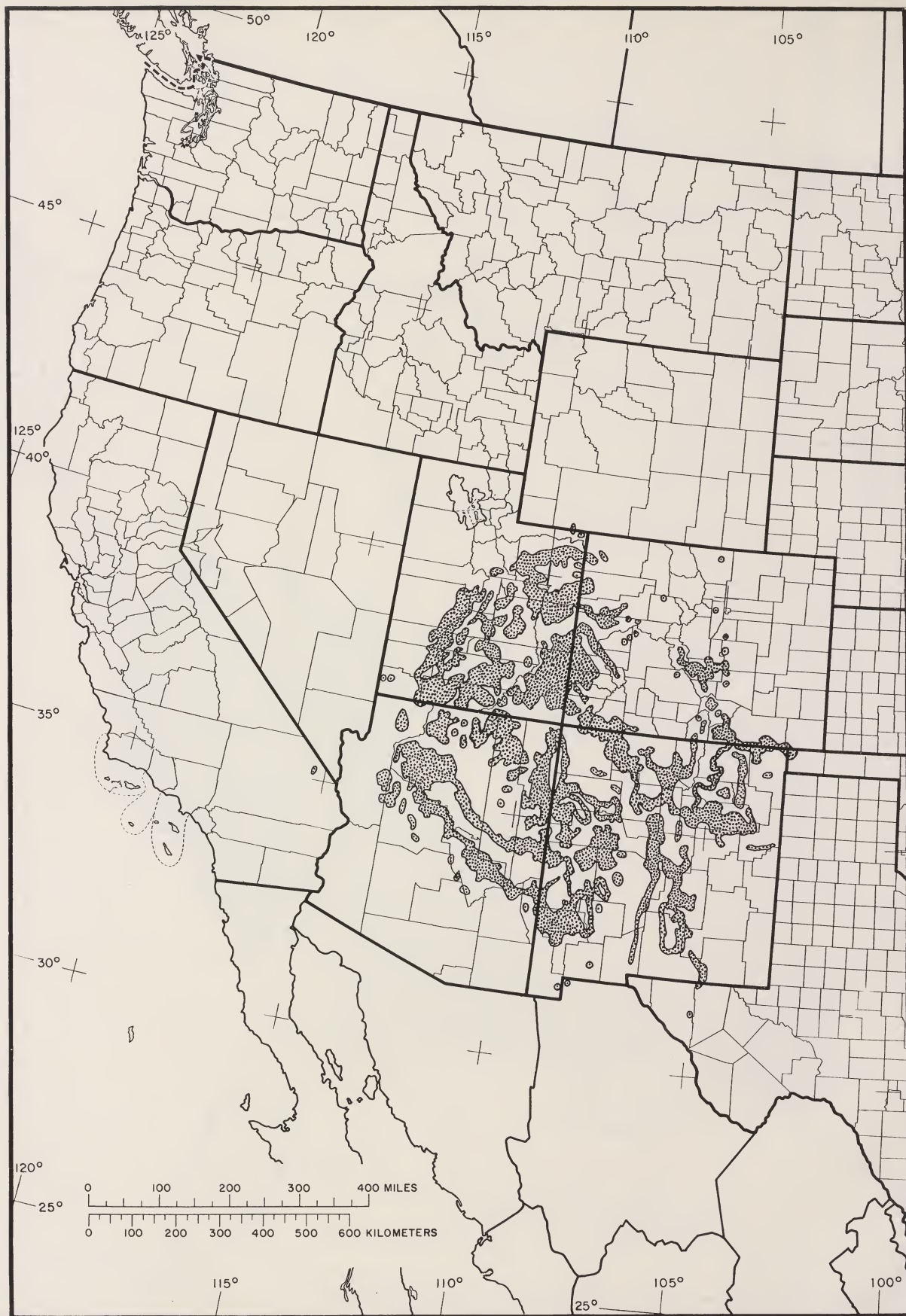
Map 50-N. lodgepole pine, *Pinus contorta* Dougl. The broken lines separate 3 geographical varieties, eastward, *P. contorta* var. *latifolia* Engelm., westward, shore pine, *P. contorta* var. *contorta*, and in Cascades and Sierra Nevada, *P. contorta* var. *murayana* (Grev. & Balf.) Engelm.



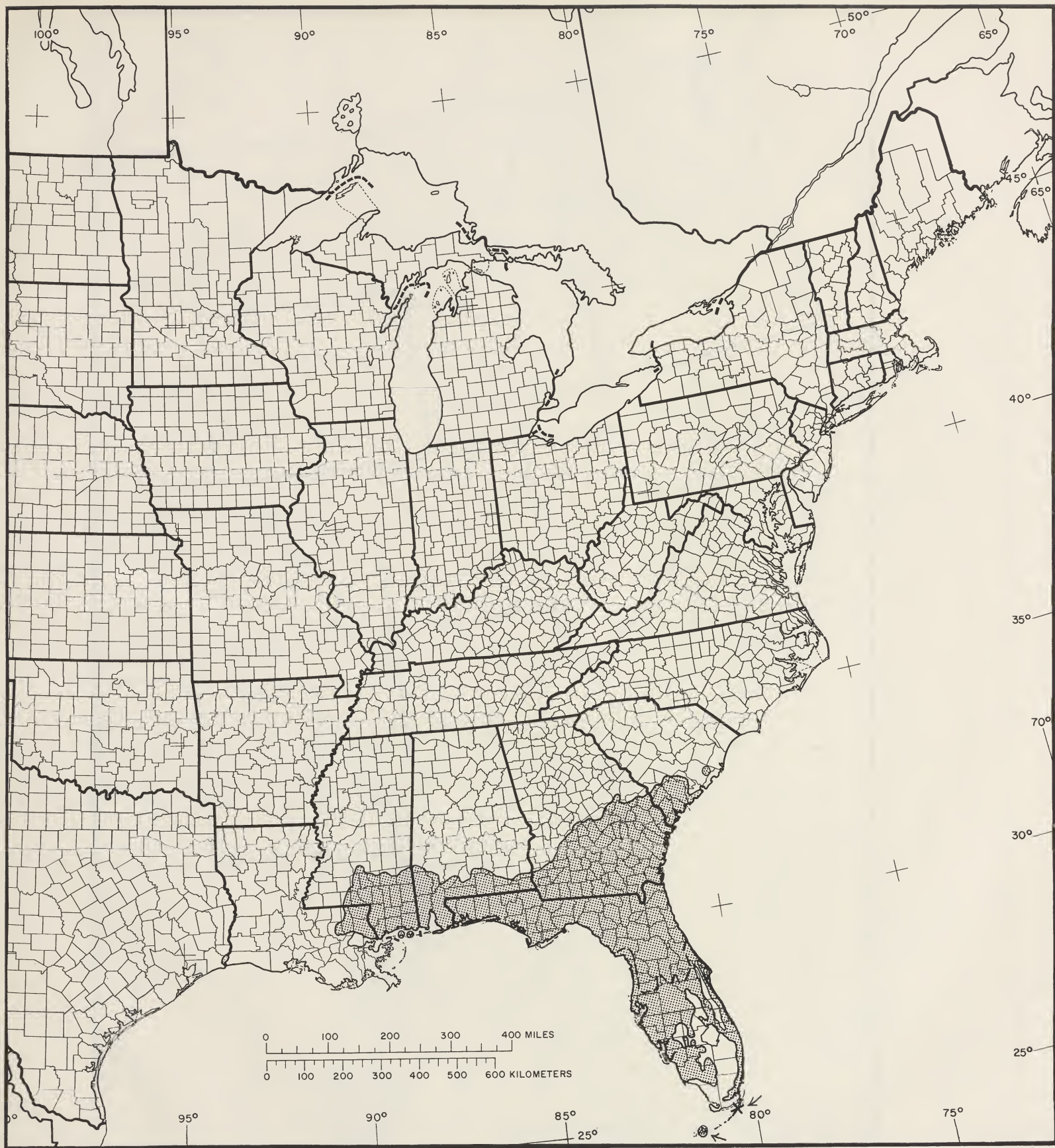
Map 51-W. Coulter pine, *Pinus coulteri* D. Don. California and Baja California only.



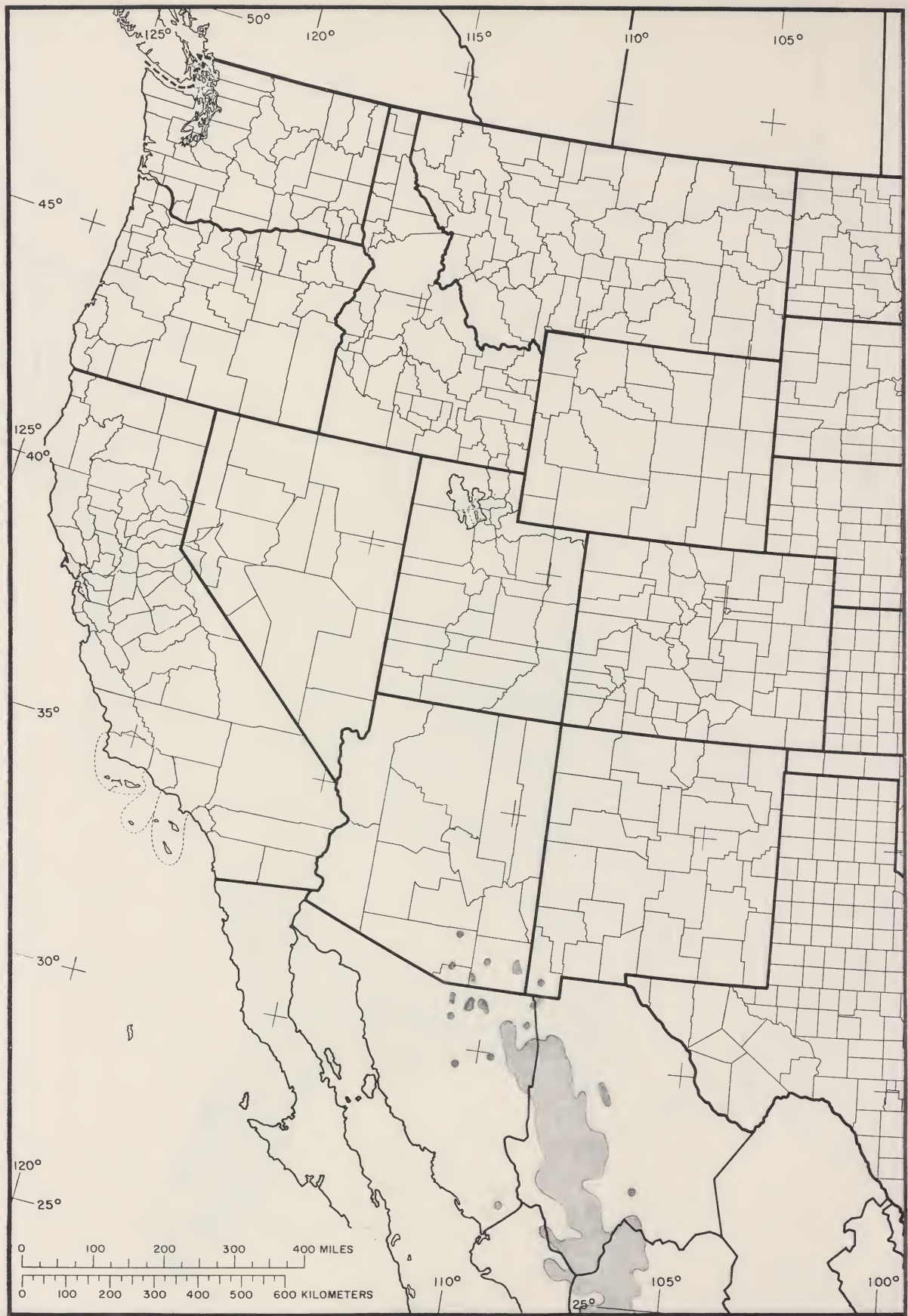
Map 52-E. shortleaf pine, *Pinus echinata* Mill.



Map 53-W. pinyon, *Pinus edulis* Engelm.



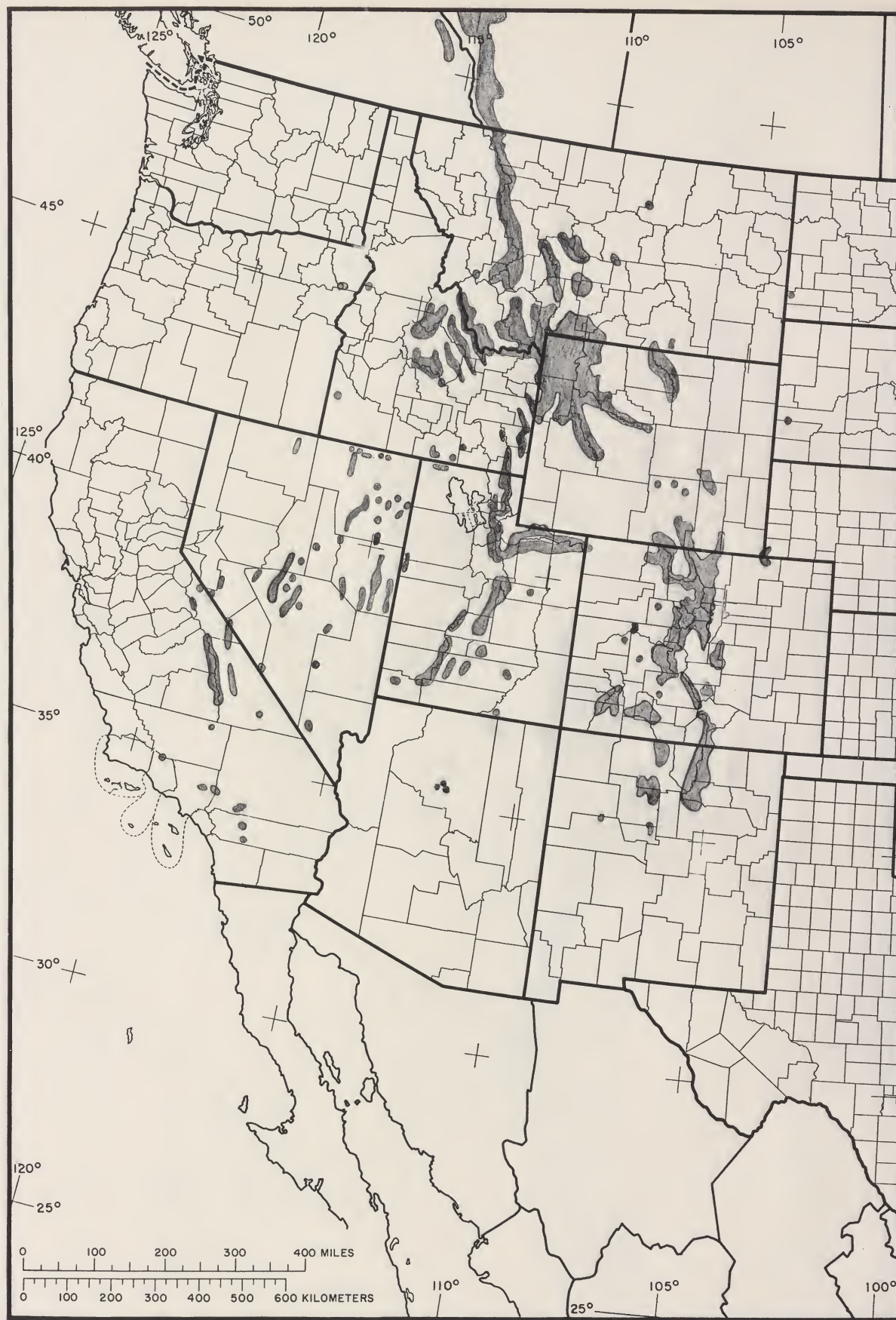
Map 54-E. slash pine, *Pinus elliottii* Engelm. The broken line separates northward the typical variety and southward, South Florida slash pine, *P. elliottii* var. *densa* Little & Dorman.



Map 55-W. Apache pine, *Pinus engelmannii* Carr.



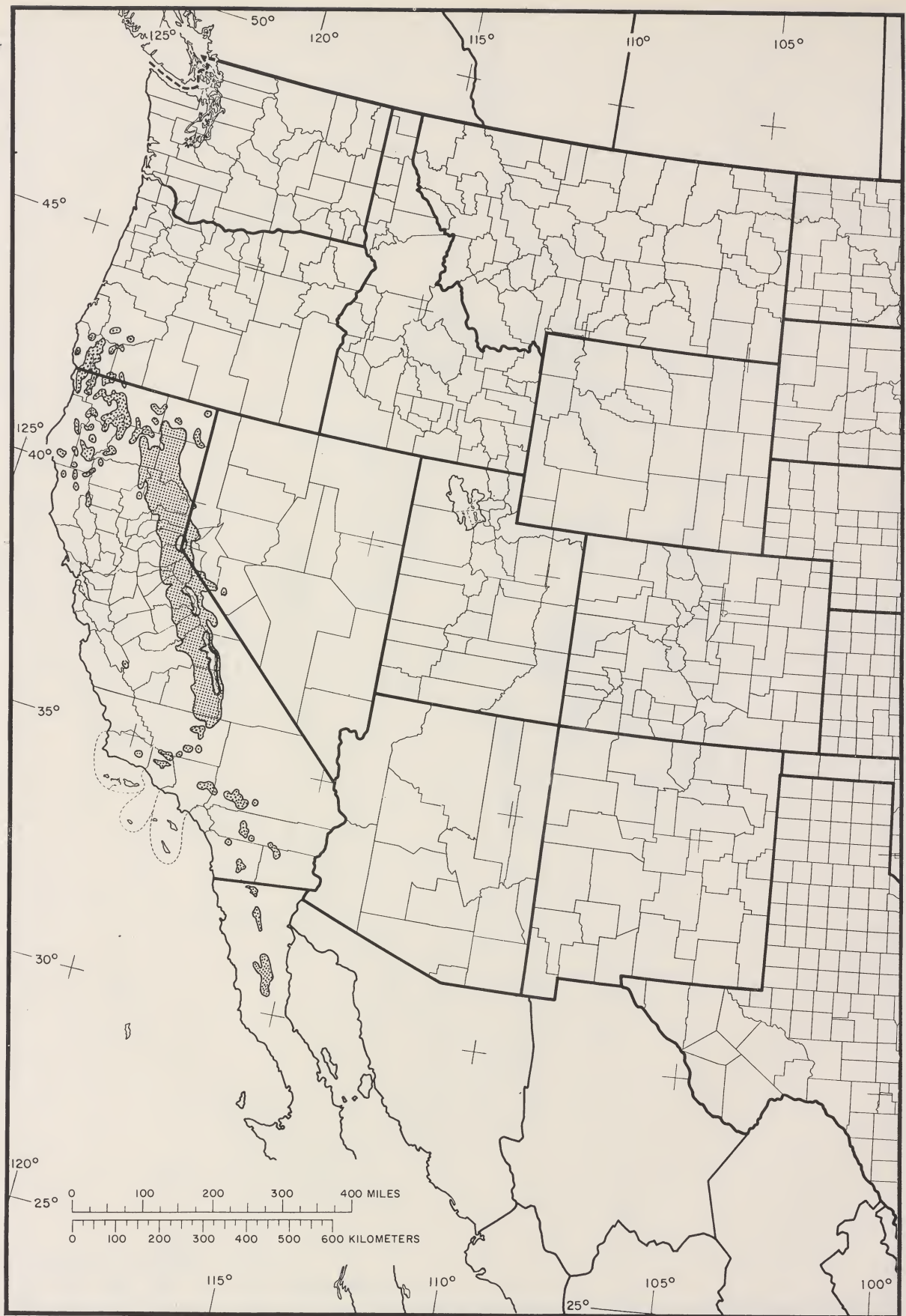
Map 55-N. Apache pine, *Pinus engelmannii* Carr.



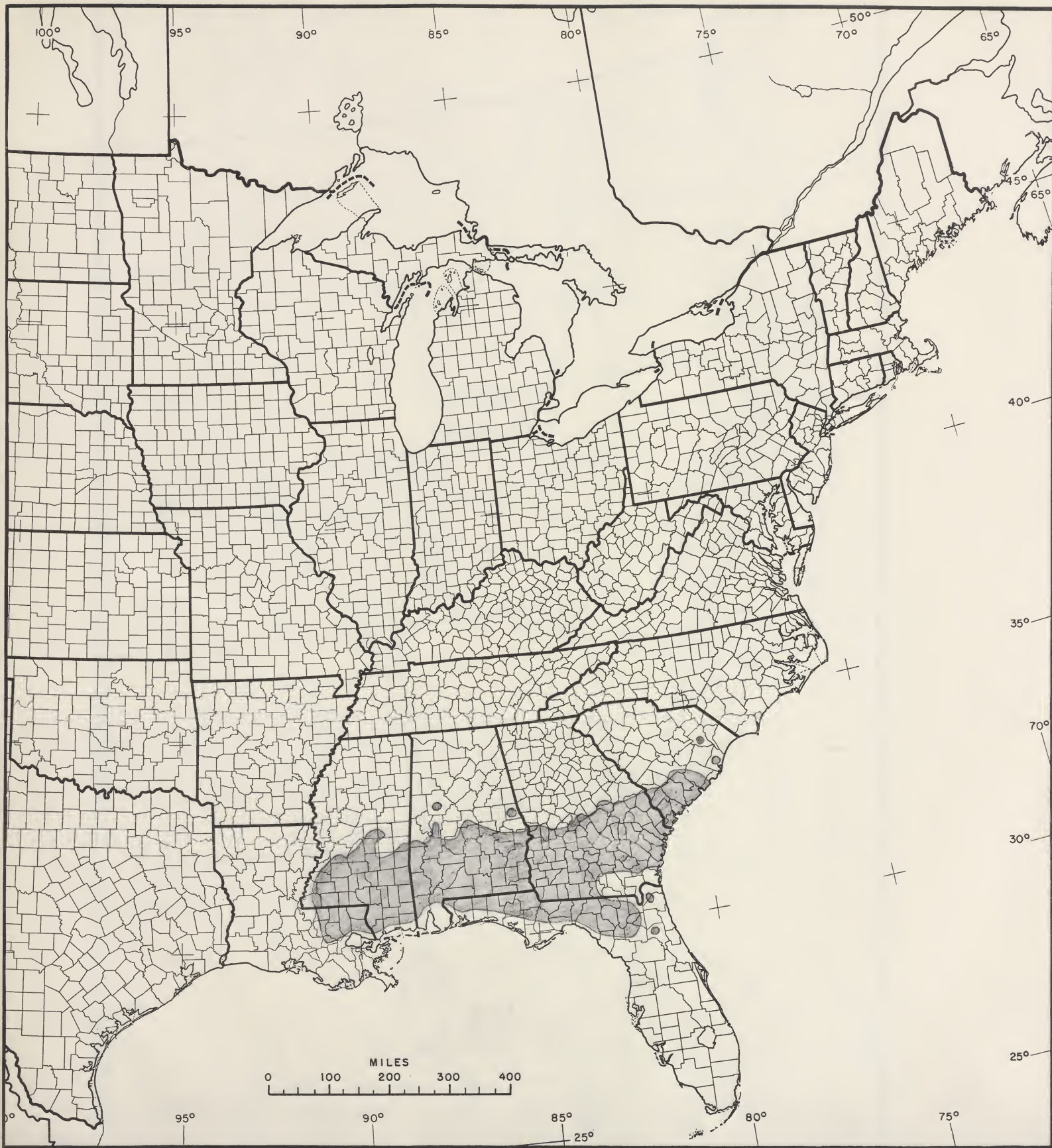
Map 56-W. limber pine, *Pinus flexilis* James



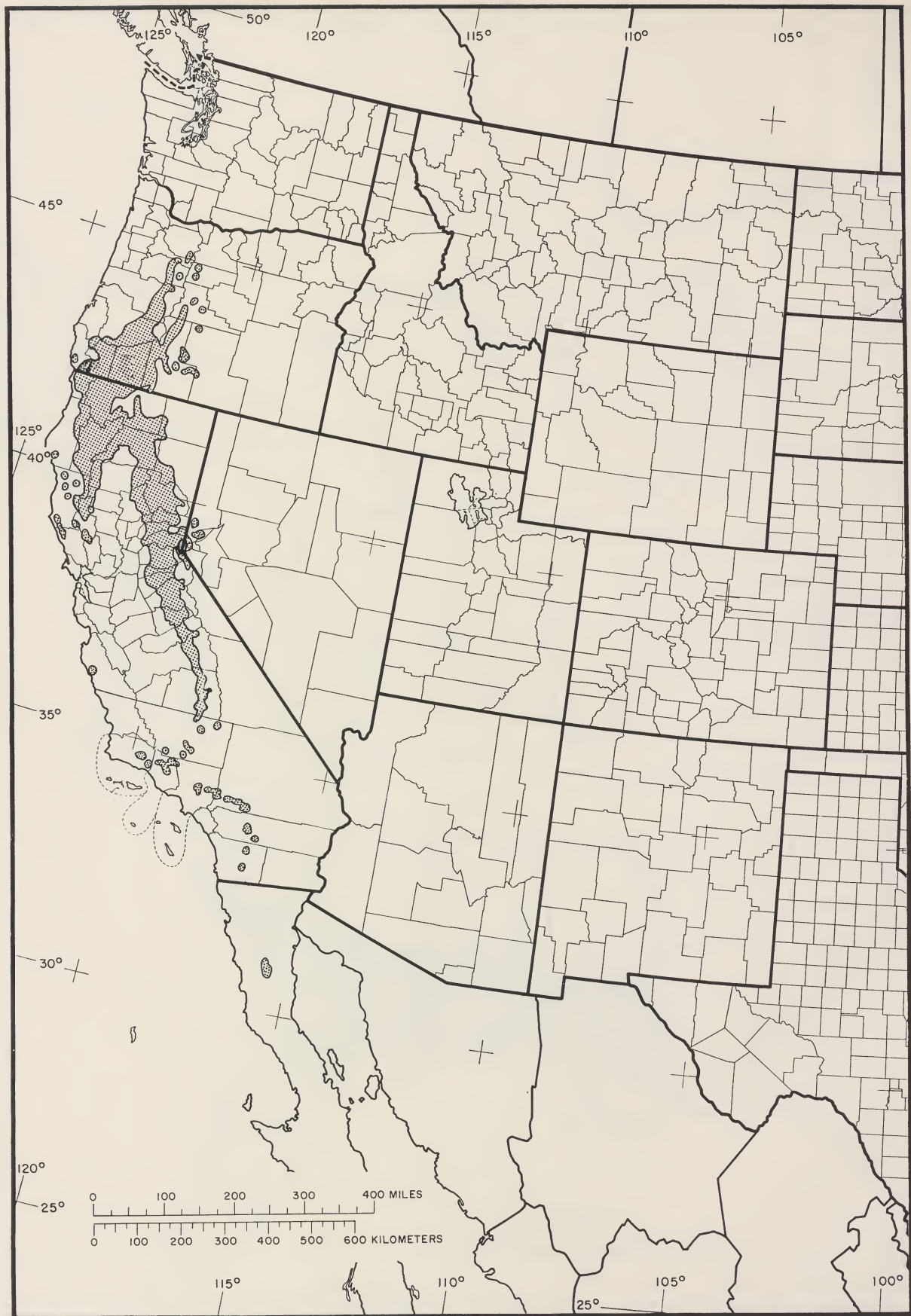
Map 56-N. limber pine, *Pinus flexilis* James



Map 57-W. Jeffrey pine, *Pinus jeffreyi* Grev. & Balf.



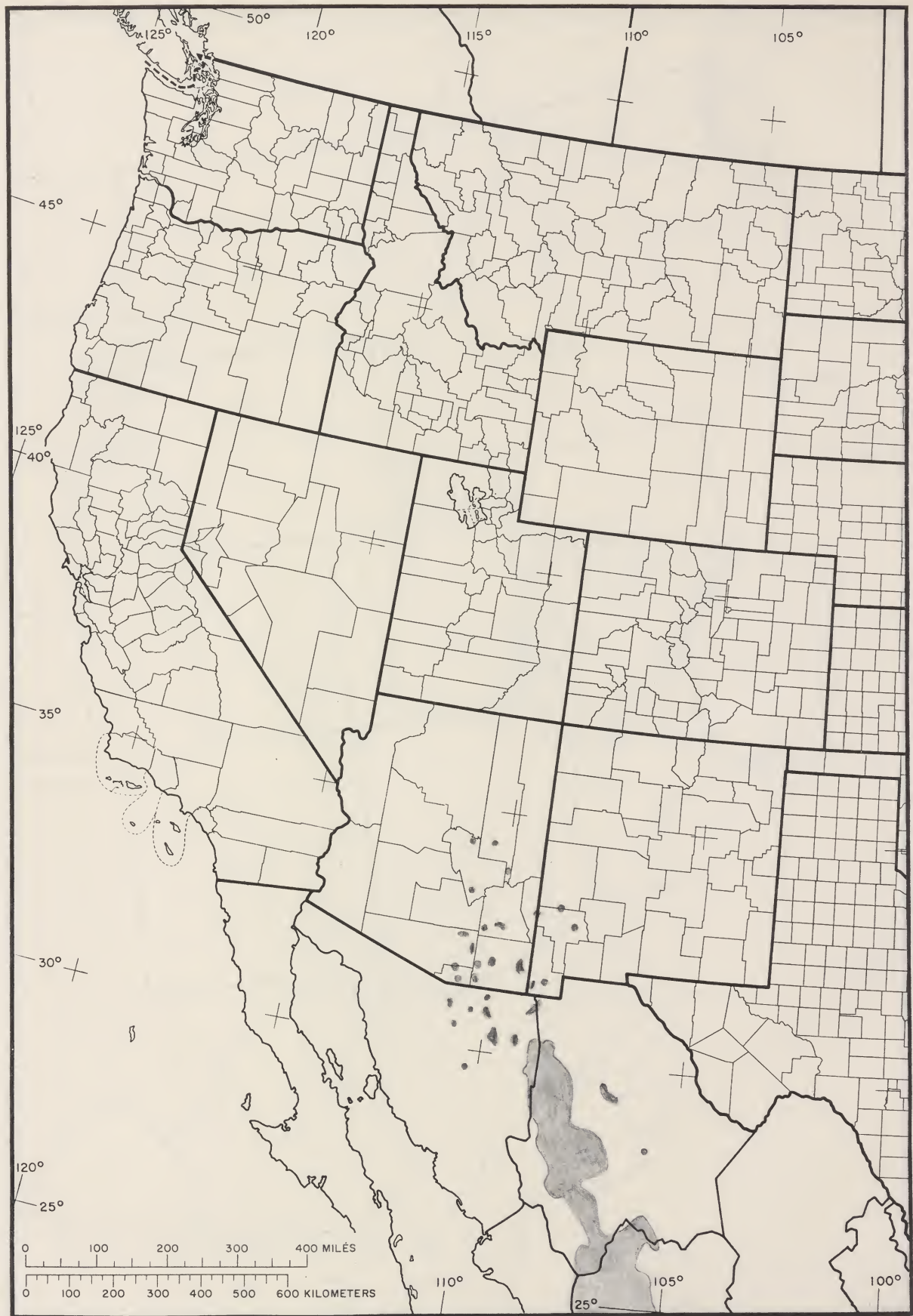
Map 58-E. spruce pine, *Pinus glabra* Walt.



Map 59-W. sugar pine, *Pinus lambertiana* Dougl.



Map 60-W. singleleaf pinyon, *Pinus monophylla* Torr. & Frém.



Map 61-W. Chihuahua pine, *Pinus leiophylla* Schiede & Deppe



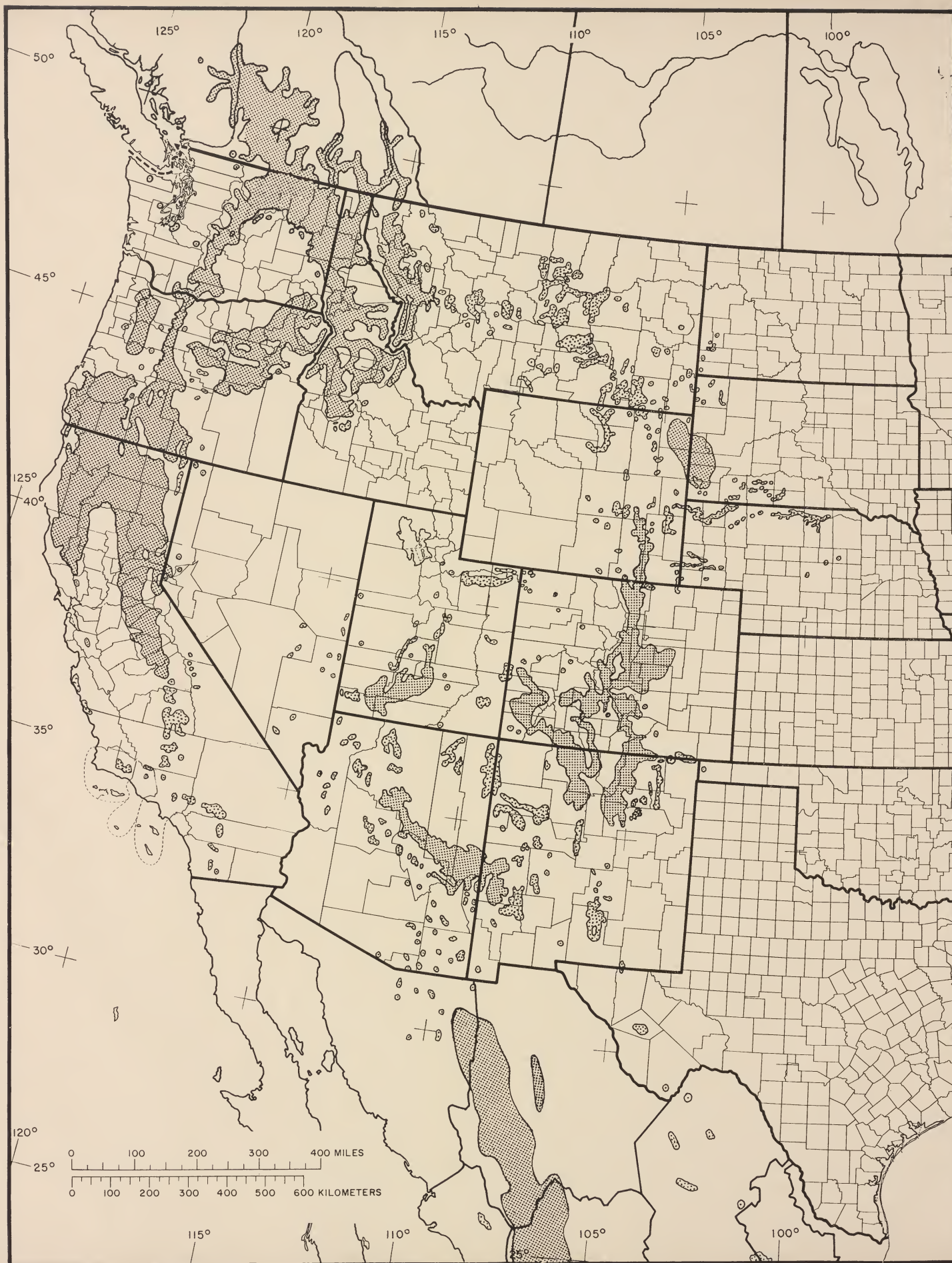
Map 61-N. Chihuahua pine, *Pinus leiophylla* Schiede & Deppe



Map 62-W. western white pine, *Pinus monticola* Dougl.



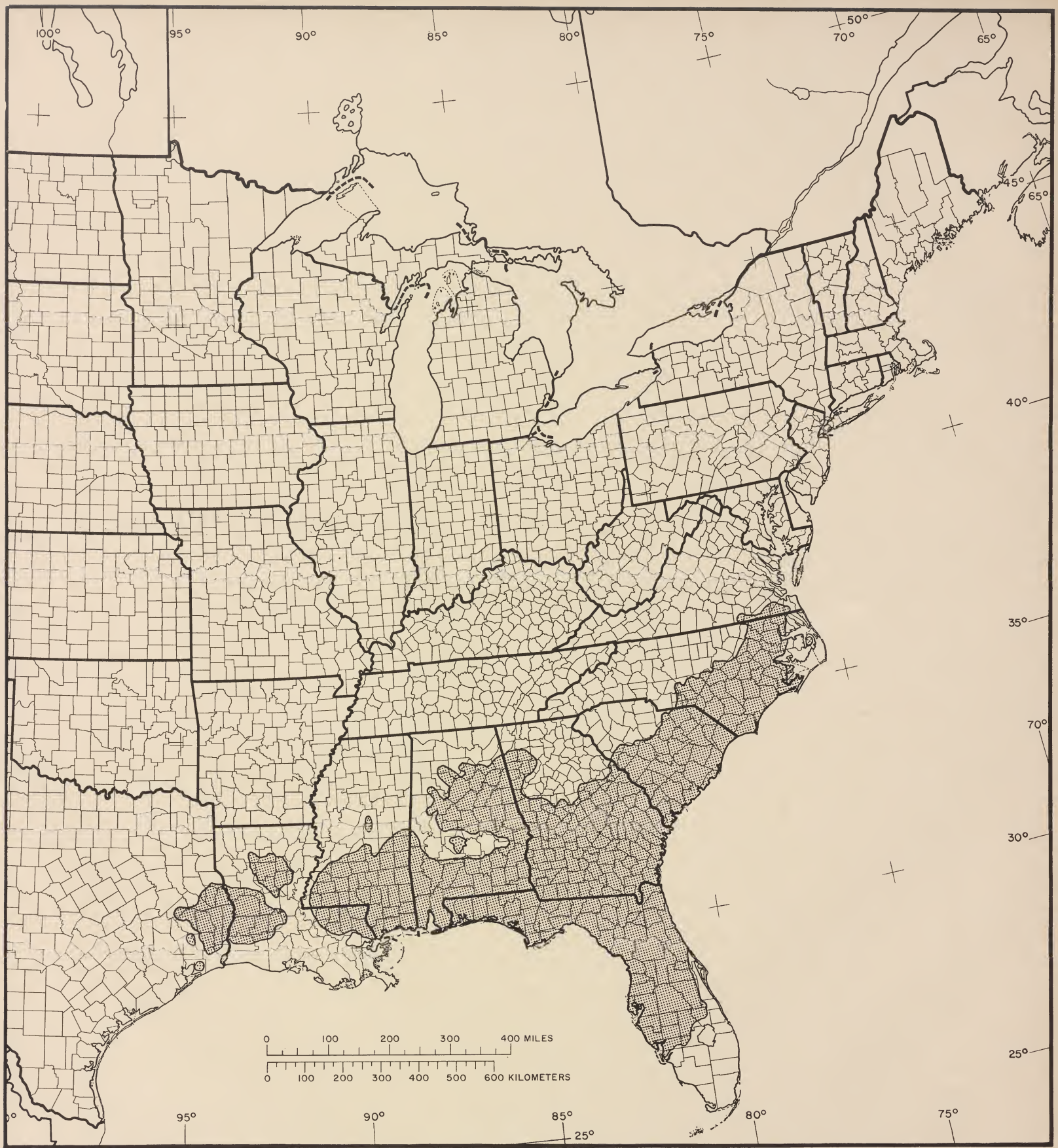
Map 63-W. bishop pine, *Pinus muricata* D. Don. Also enlarged map (Critchfield and Little 1966, map 59).
California and Baja California only.



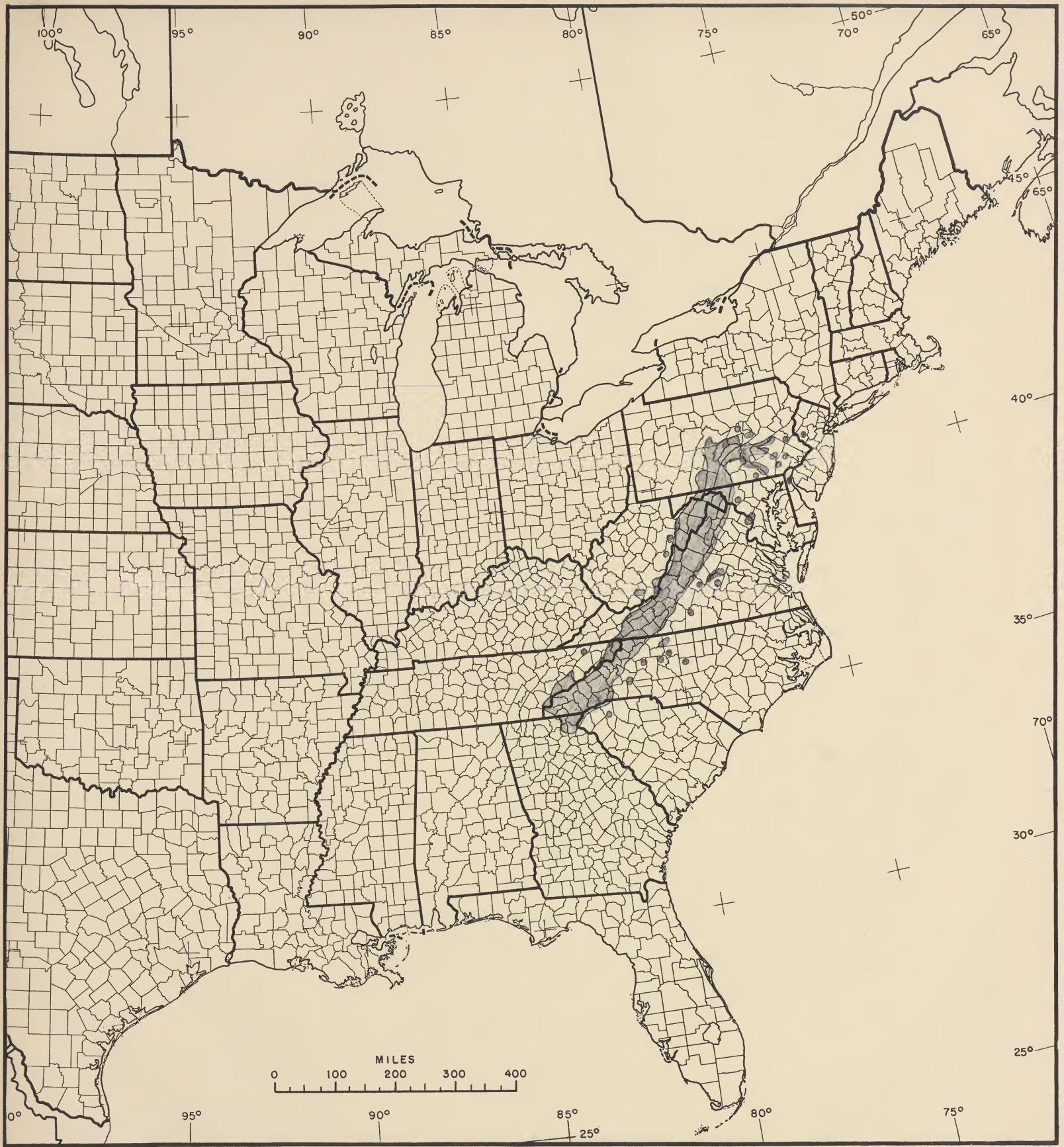
Map 64-W. ponderosa pine, *Pinus ponderosa* Laws.



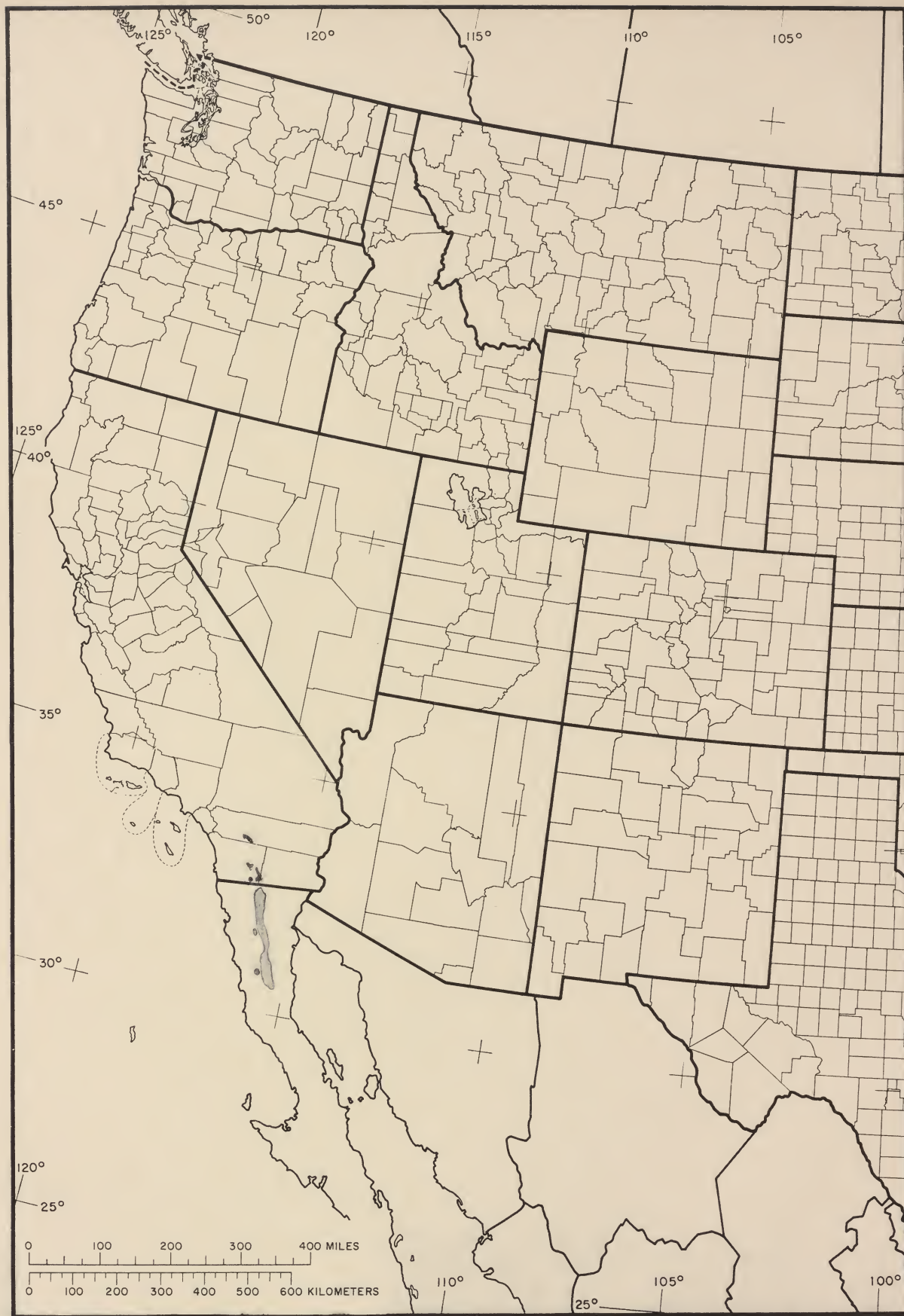
Map 64-N. ponderosa pine, *Pinus ponderosa* Laws.



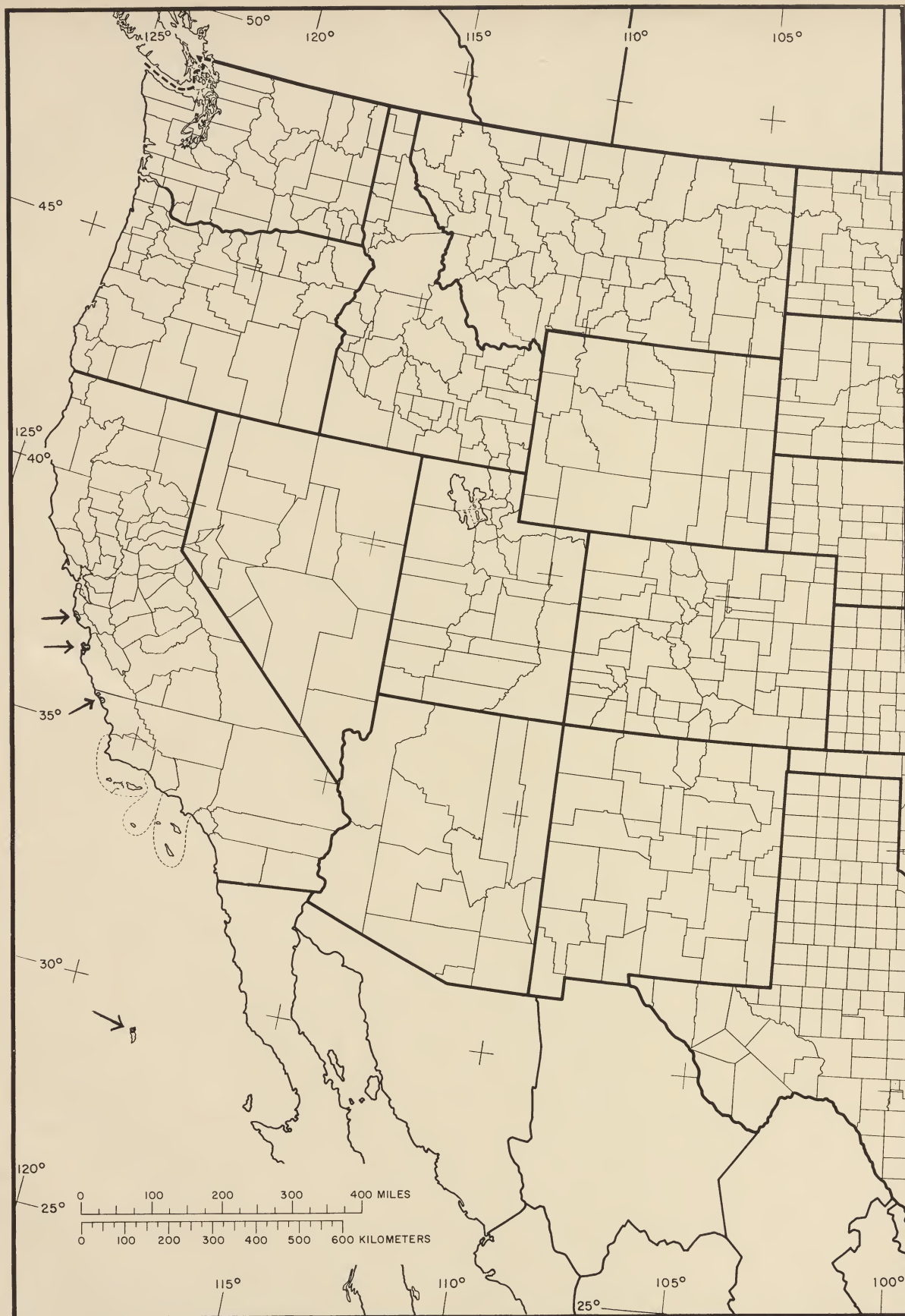
Map 65-E. longleaf pine, *Pinus palustris* Mill.



Map 66-E. Table-Mountain pine, *Pinus pungens* Lamb.



Map 67-W. Parry pinyon, *Pinus quadrifolia* Parl. California and Baja California only.



Map 68-W. Monterey pine, *Pinus radiata* D. Don. California and Guadalupe Island only. Also enlarged map (Critchfield and Little 1966, map 58).



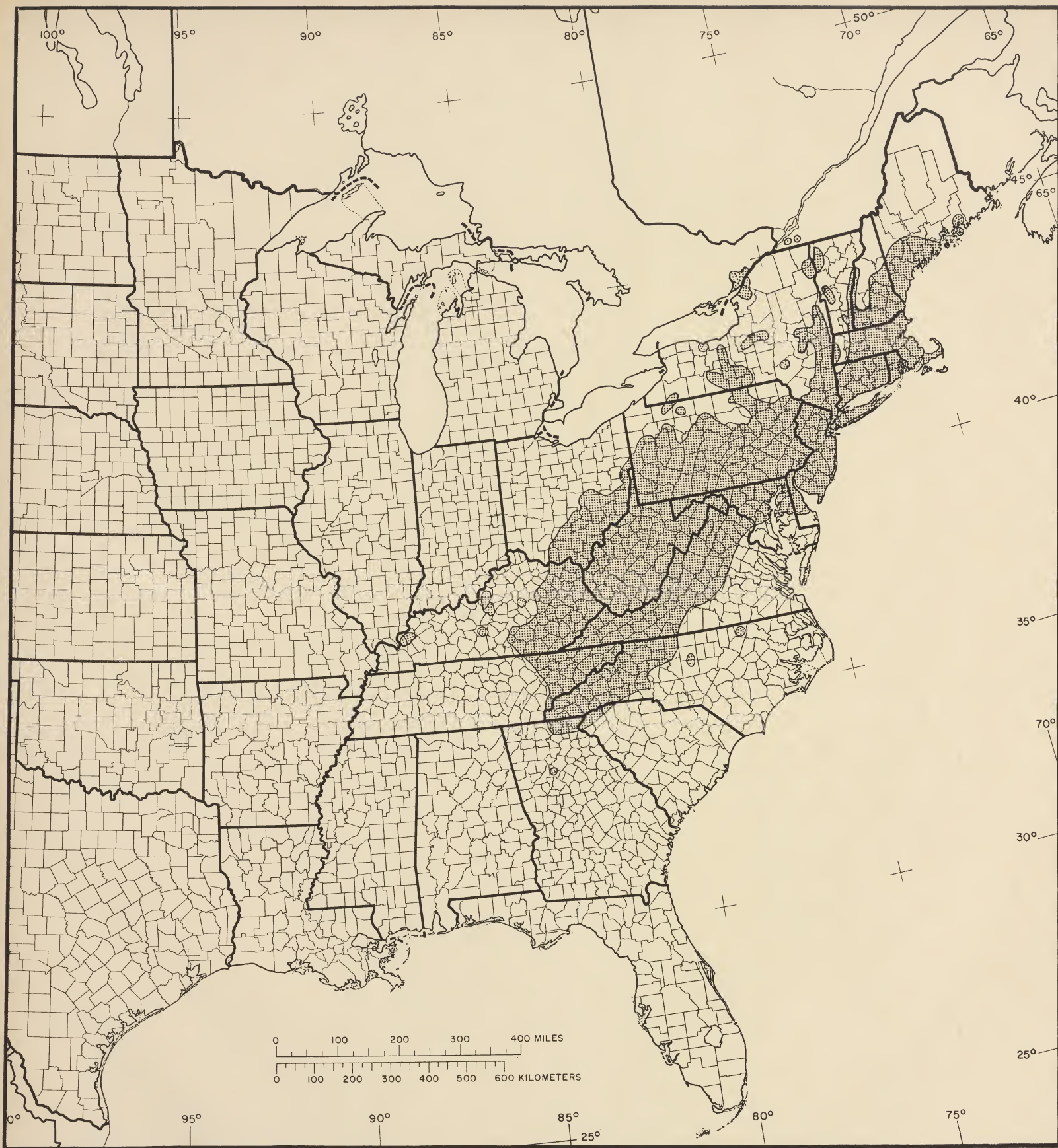
Map 69-N. red pine, *Pinus resinosa* Ait.



Map 69-E. red pine, *Pinus resinosa* Ait.



Map 70-W. Digger pine. *Pinus sabiniana* Dougl. California only.



Map 71-E. pitch pine, *Pinus rigida* Mill.



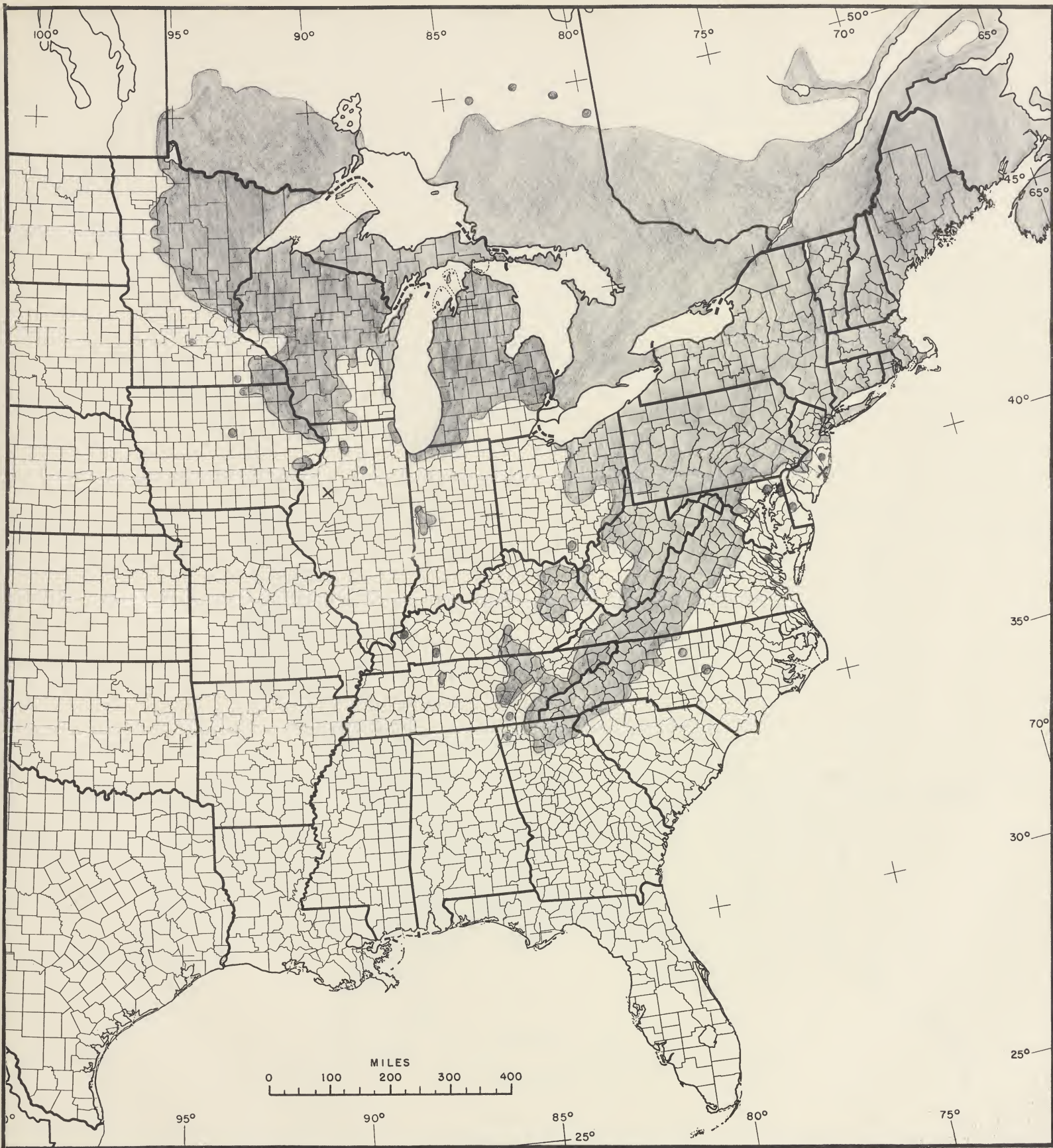
Map 72-W. southwestern white pine, *Pinus strobiformis* Engelm.



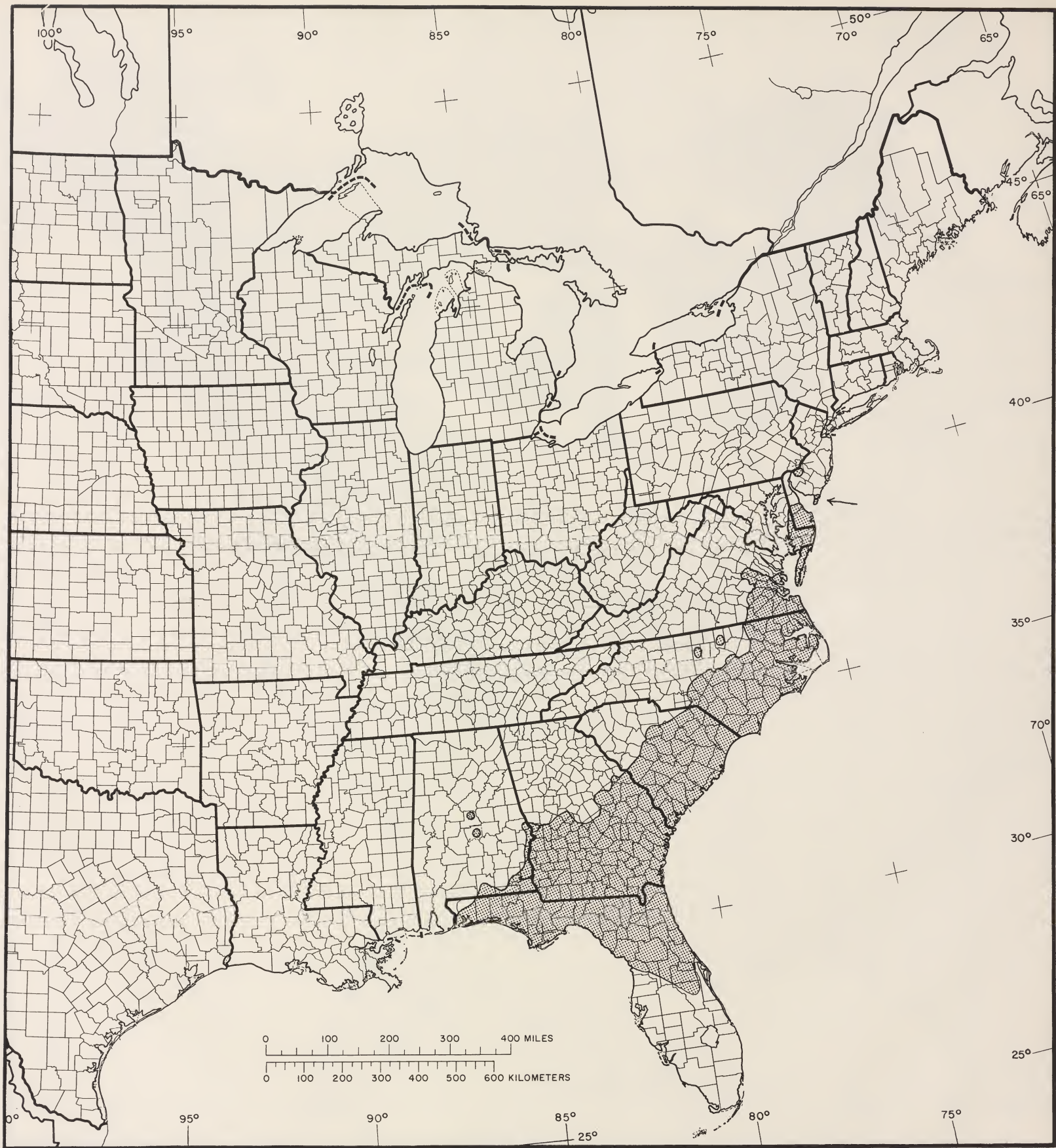
Map 72-N. southwestern white pine, *Pinus strobiformis* Engelm.



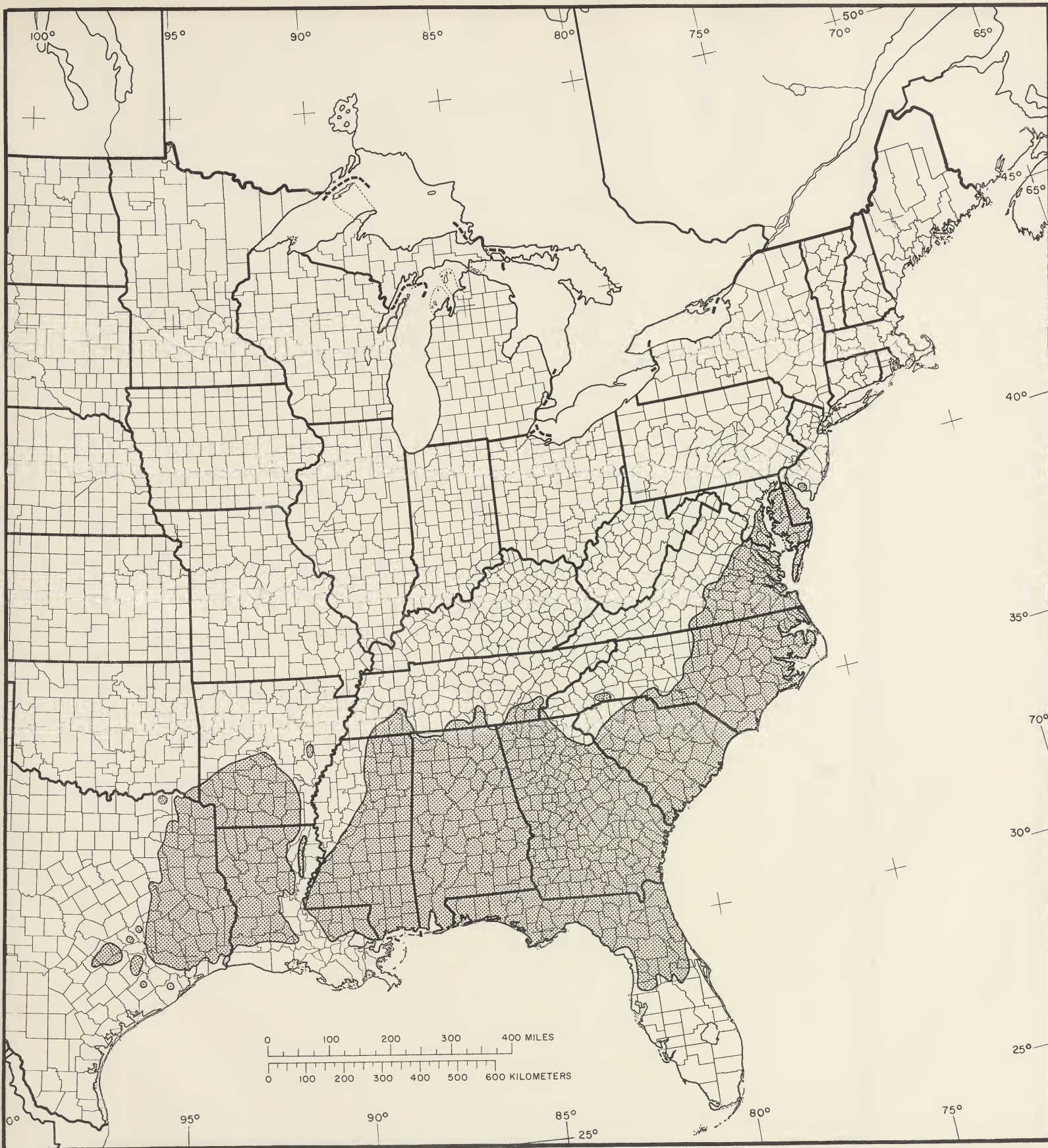
Map 73-N. eastern white pine, *Pinus strobus* L.



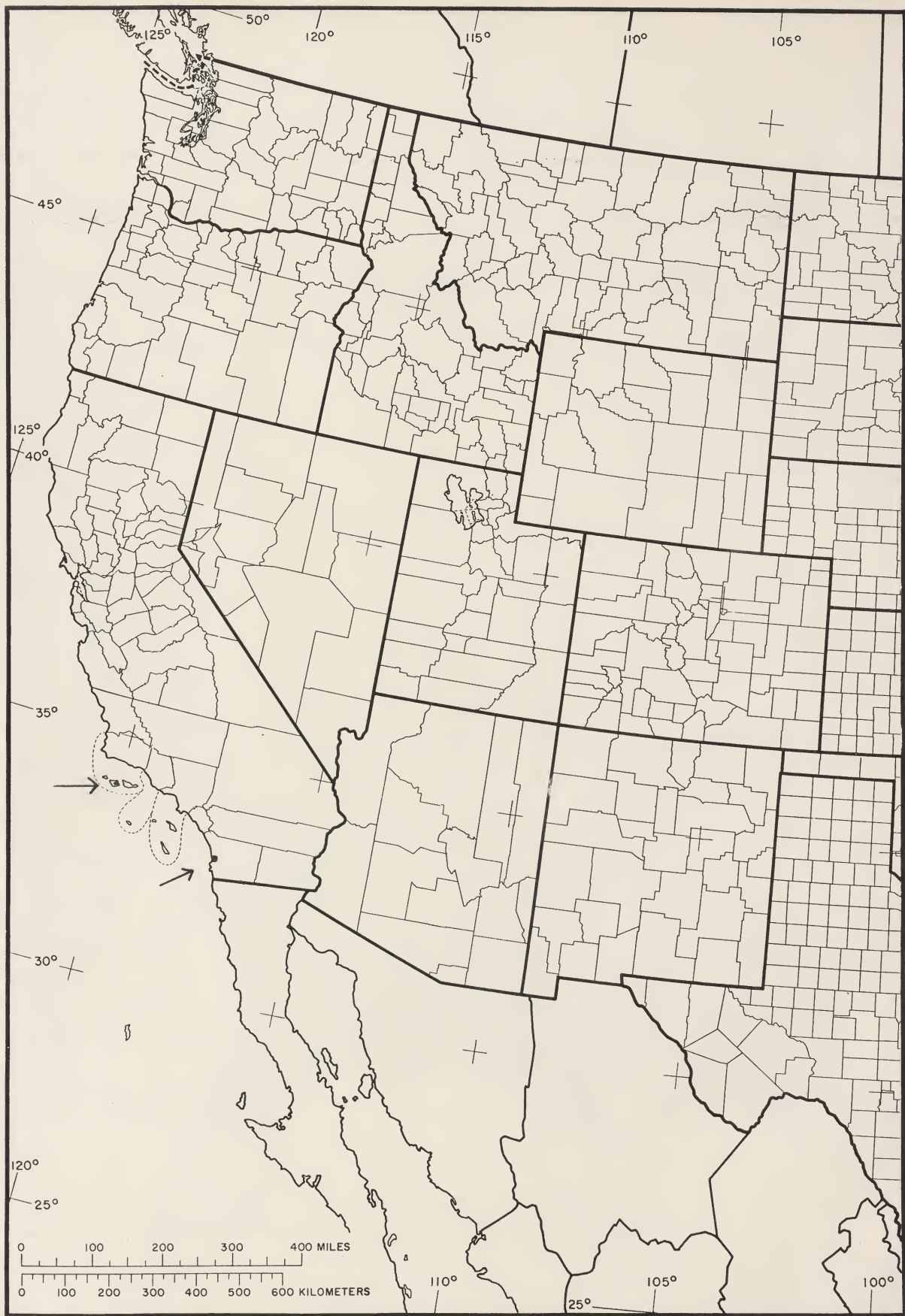
Map 73-E. eastern white pine, *Pinus strobus* L.



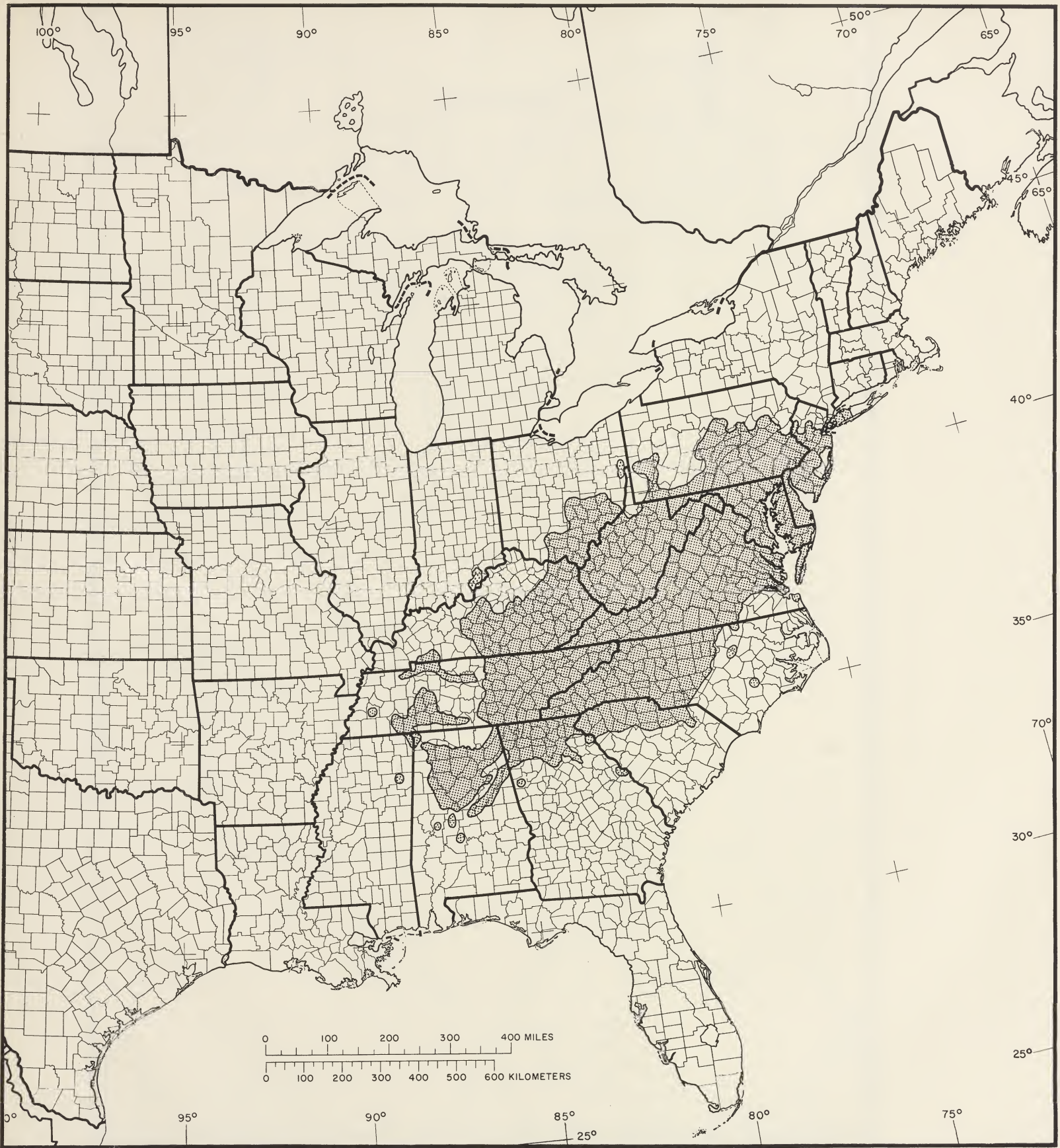
Map 74-E. pond pine, *Pinus serotina* Michx.



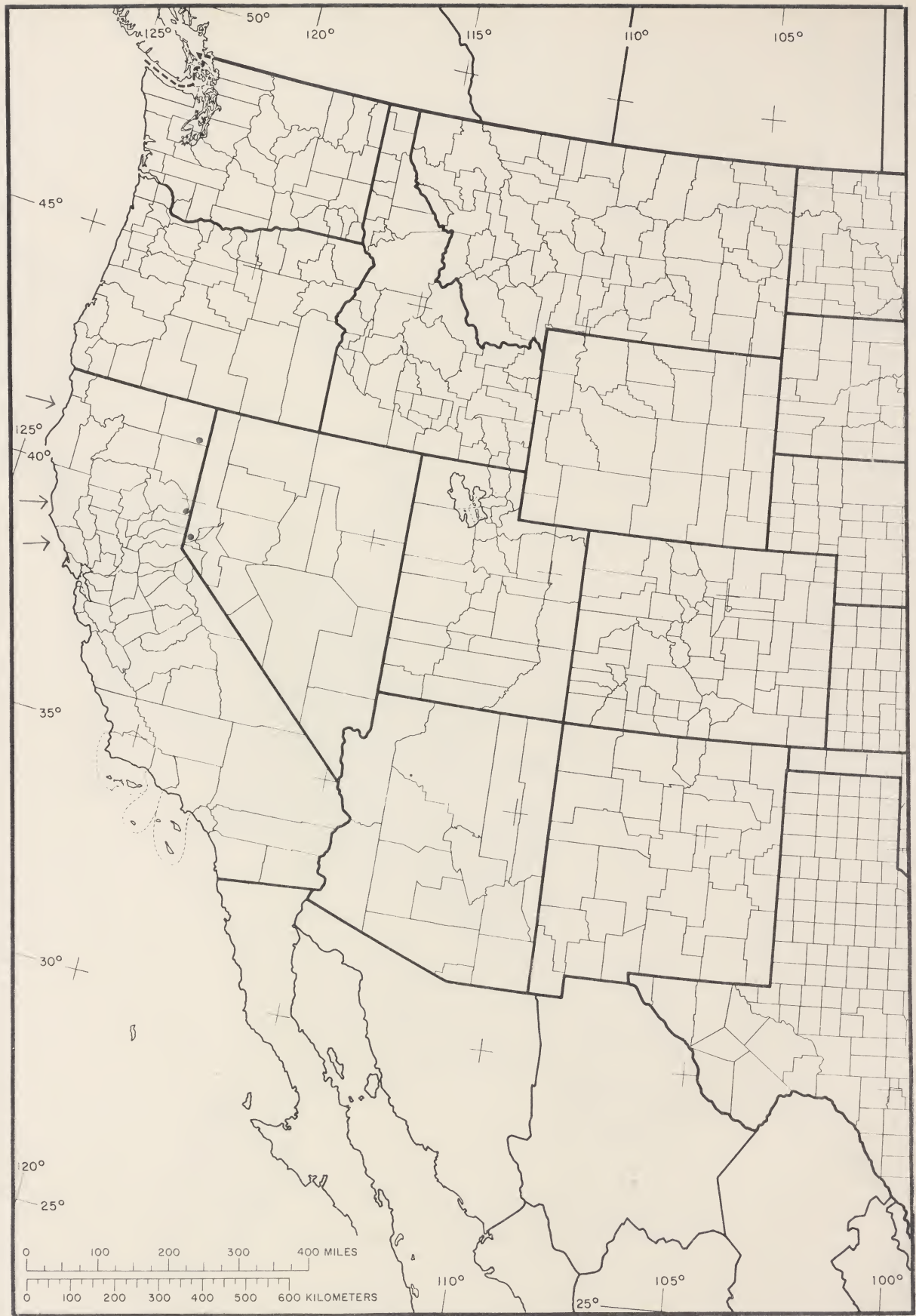
Map 75-E. loblolly pine, *Pinus taeda* L.



Map 76-W. Torrey pine, *Pinus torreyana* Parry. Also enlarged map (Critchfield and Little 1966, map 55). California only.



Map 77-E. Virginia pine, *Pinus virginiana* Mill.



Map 78-W. Washoe pine, *Pinus washoensis* Mason & Stockwell. California and Nevada only.



Map 79-W. bigcone Douglas-fir, *Pseudotsuga macrocarpa* (Vasey) Mayr. California only.



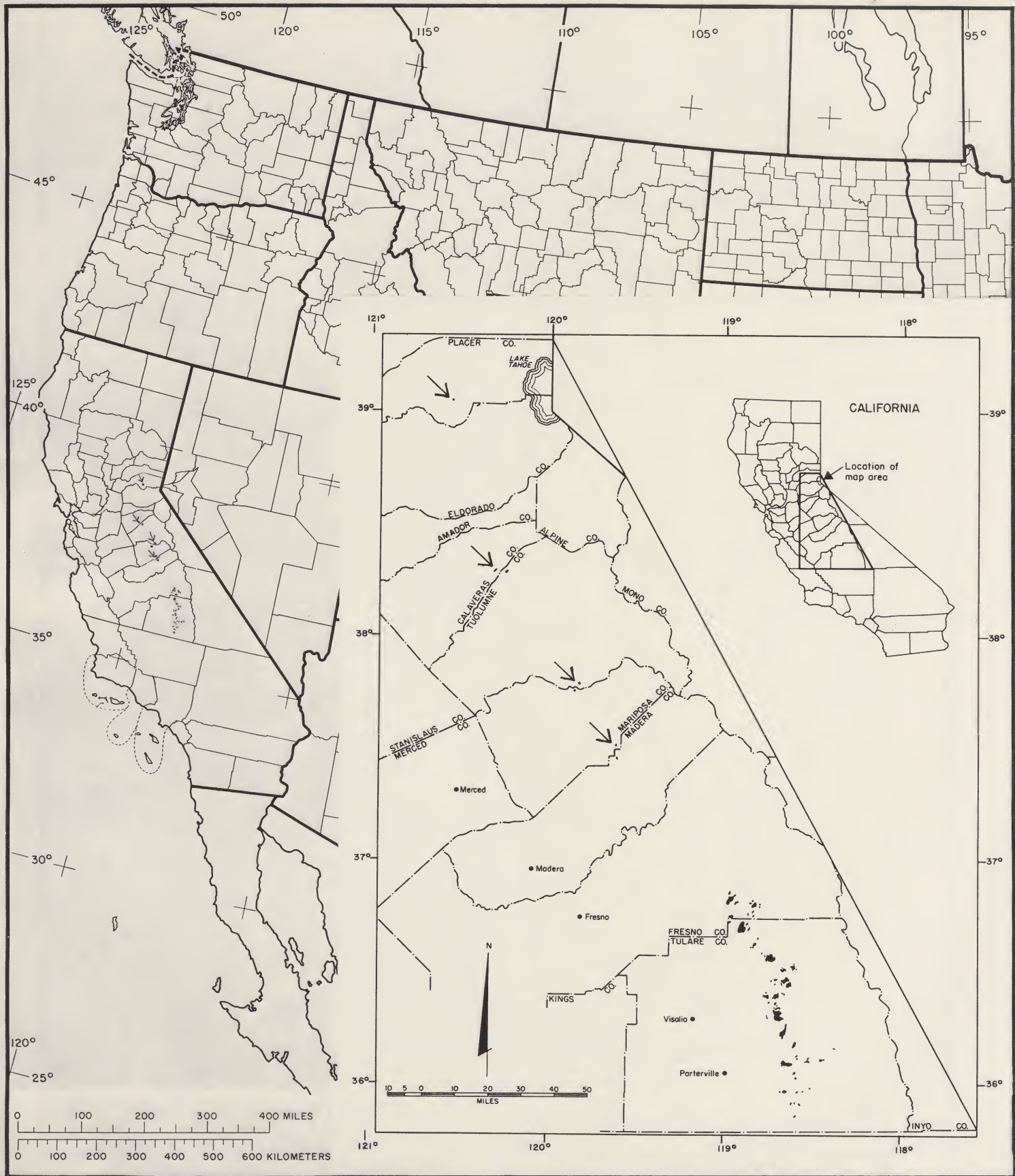
Map 80-W. Douglas-fir, *Pseudotsuga menziesii* (Mirb.) Franco. The broken line separates eastward the Rocky Mountain variety, *P. menziesii* var. *glauca* (Beissn.) Franco, and westward the coast variety, *P. menziesii* var. *menziesii*.



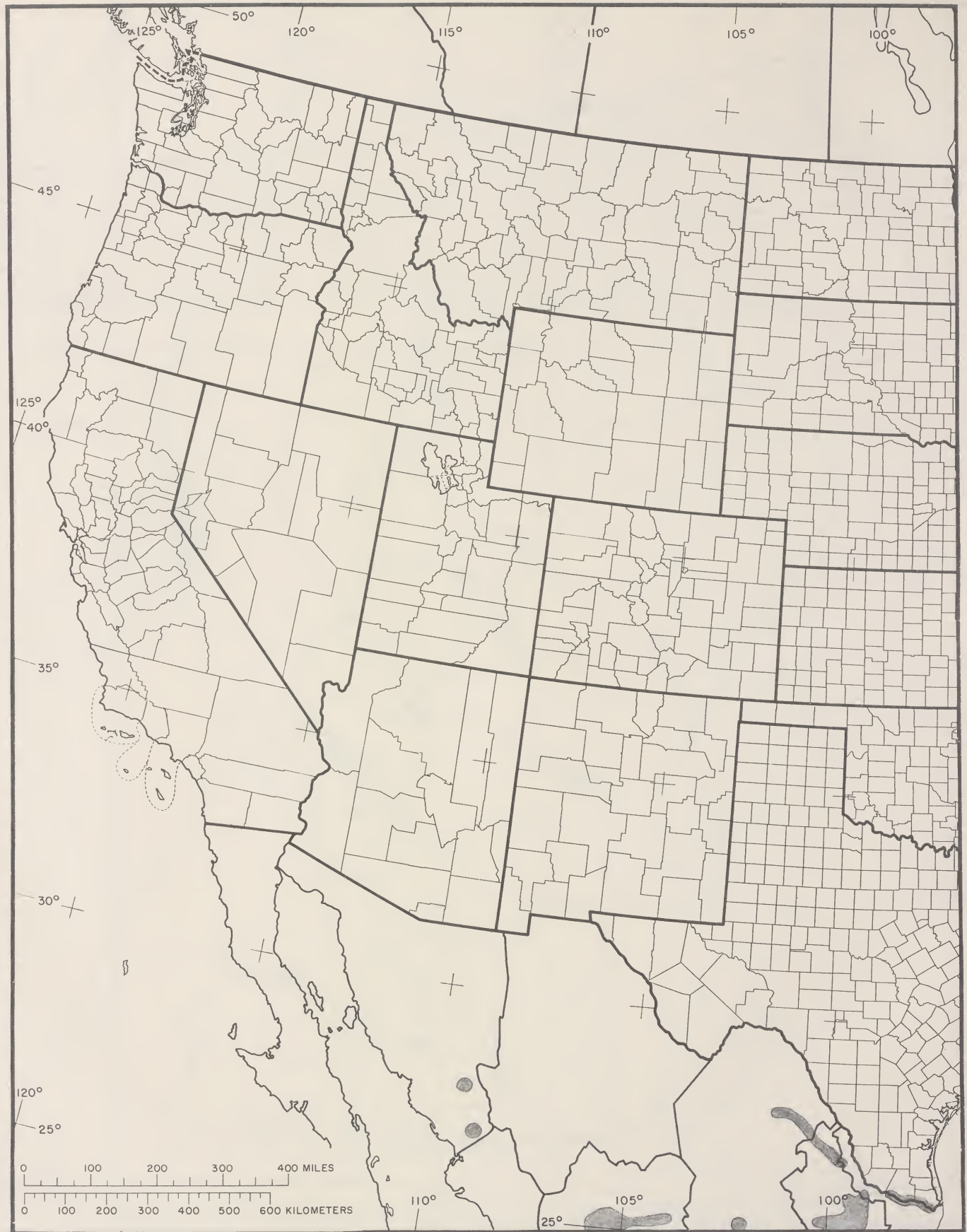
Map 80-N. Douglas-fir, *Pseudotsuga menziesii* (Mirb.) Franco. The broken line separates eastward the Rocky Mountain variety, *P. menziesii* var. *glauca* (Beissn.) Franco, and westward the coast variety, *P. menziesii* var. *menziesii*.



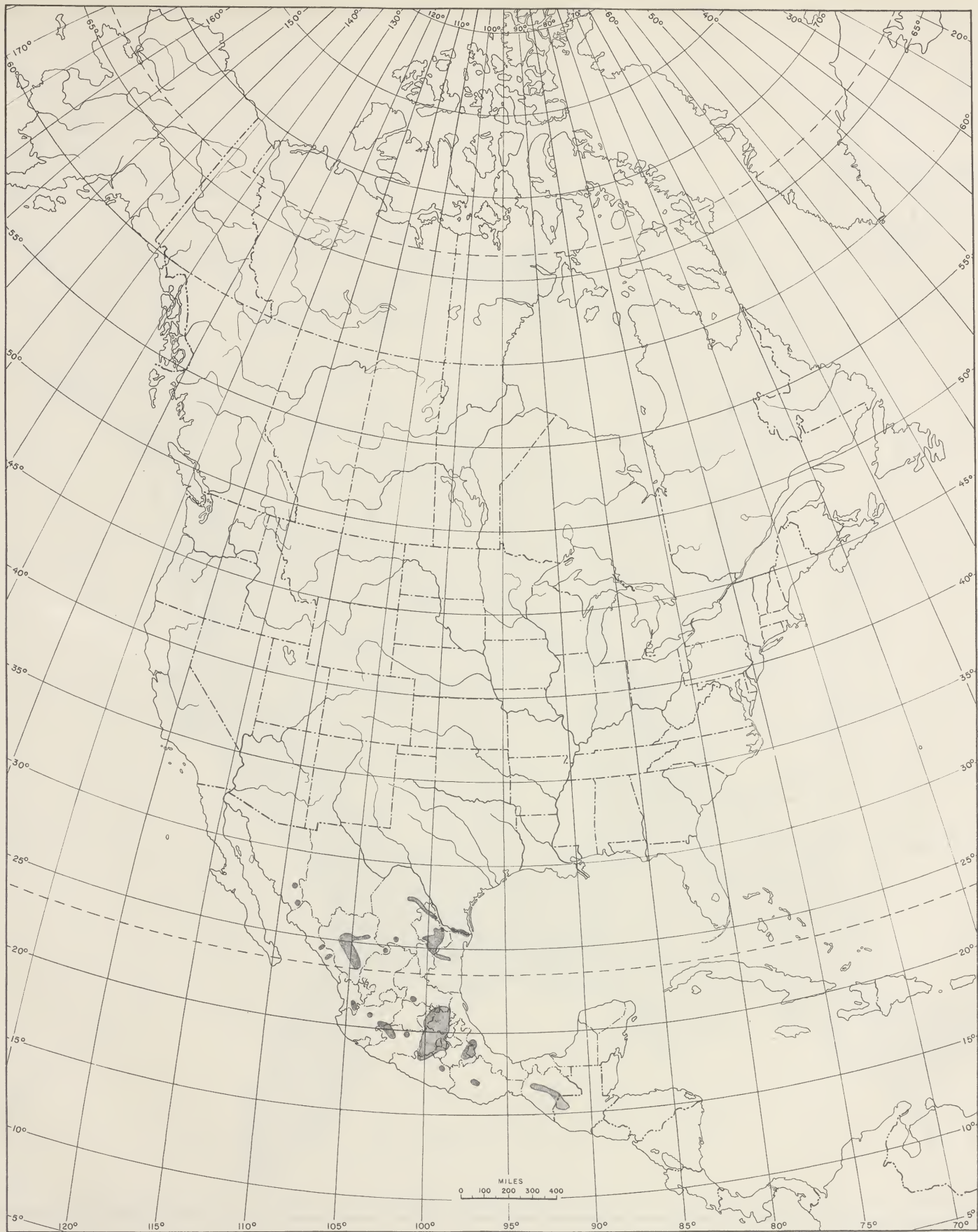
Map 81-W. redwood, *Sequoia sempervirens* (D. Don) Endl. California and Oregon only.



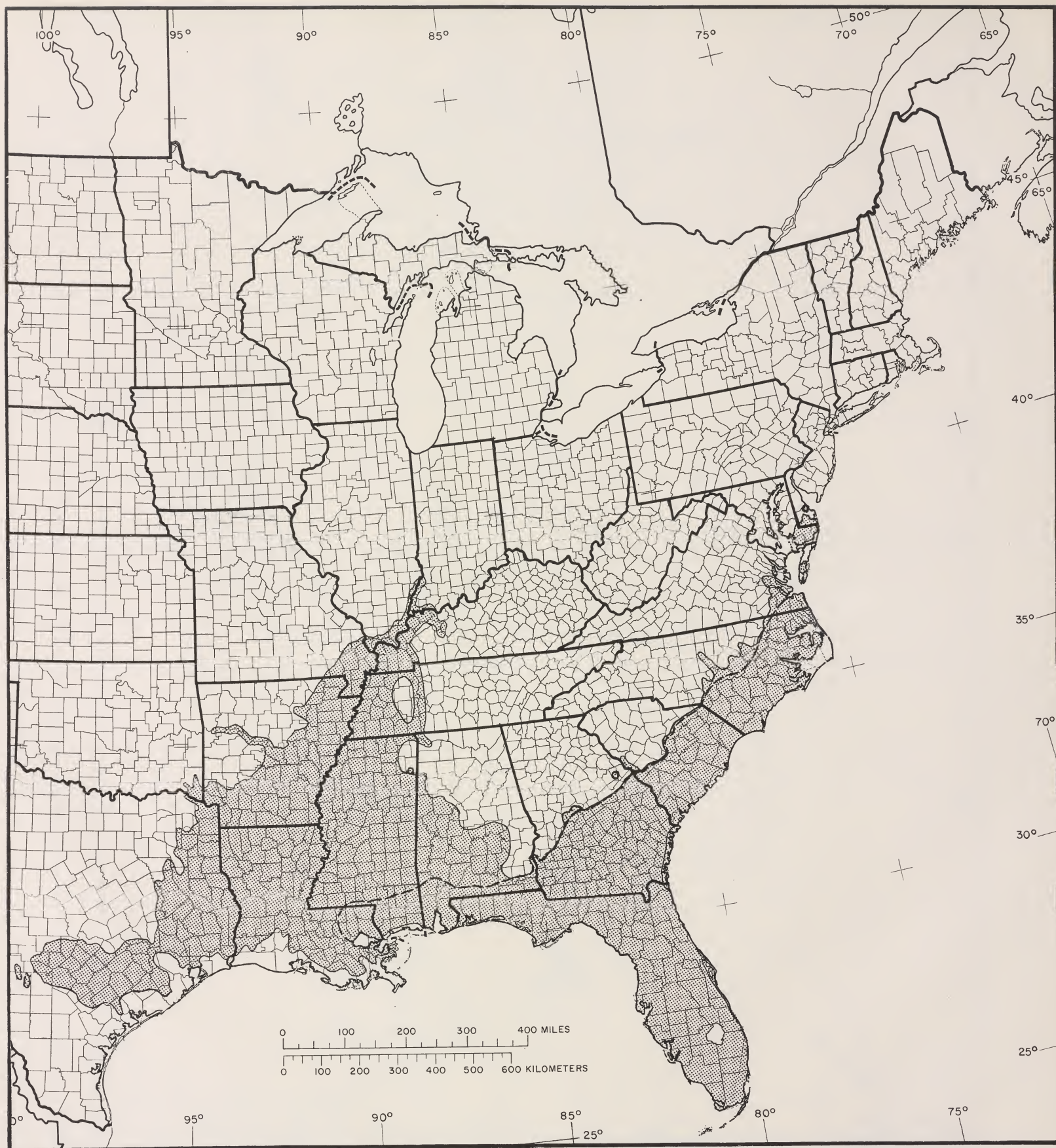
Map 82-W. giant sequoia, *Sequoiadendron giganteum* (Lindl.) Buchholz. Enlargement at right is adapted from a map by the California Department of Natural Resources. California only.



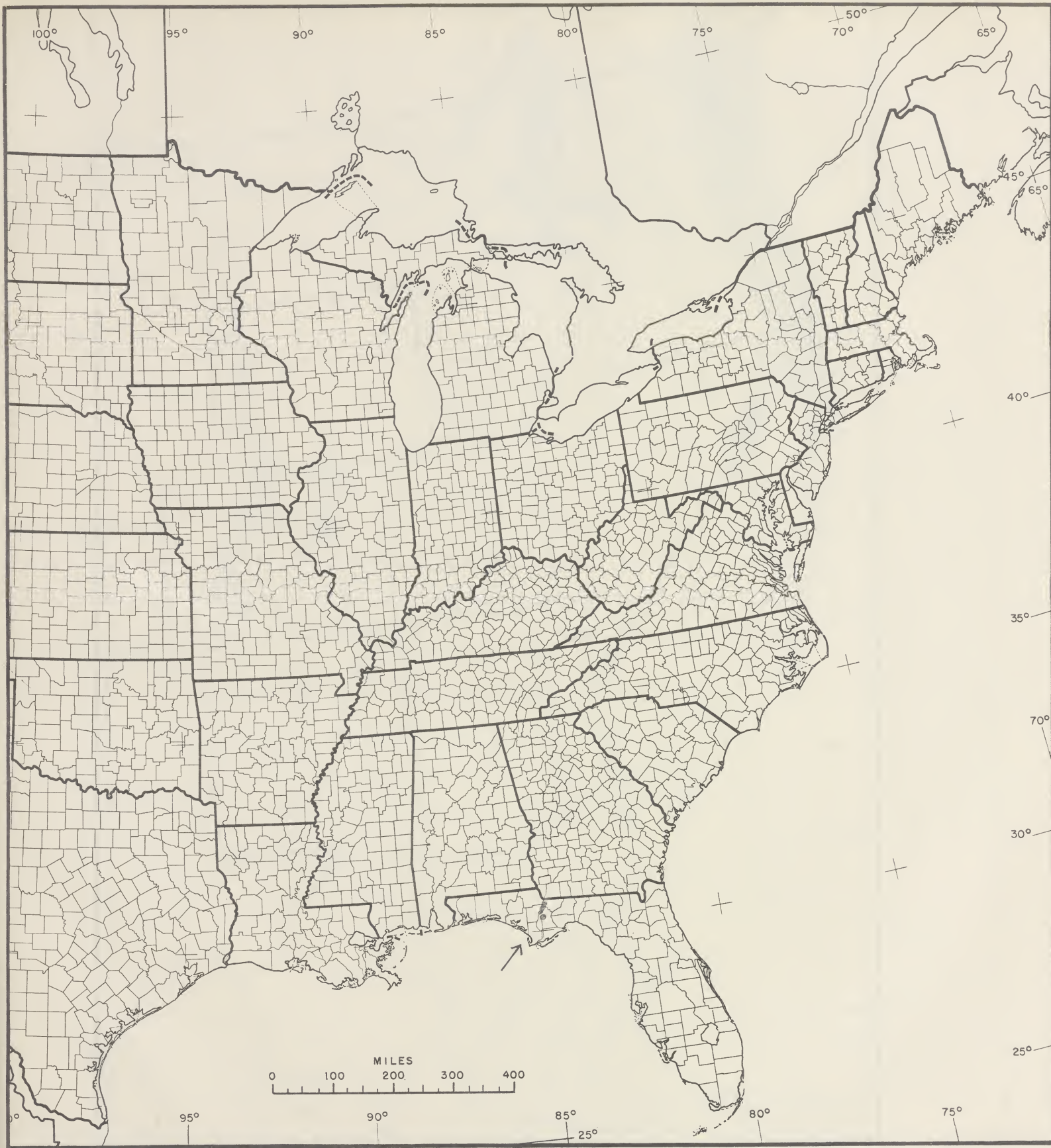
Map 83-W. *Montezuma baldcypress*, *Taxodium mucronatum* Ten.



Map 83-N. Montezuma baldcypress, *Taxodium mucronatum* Ten.



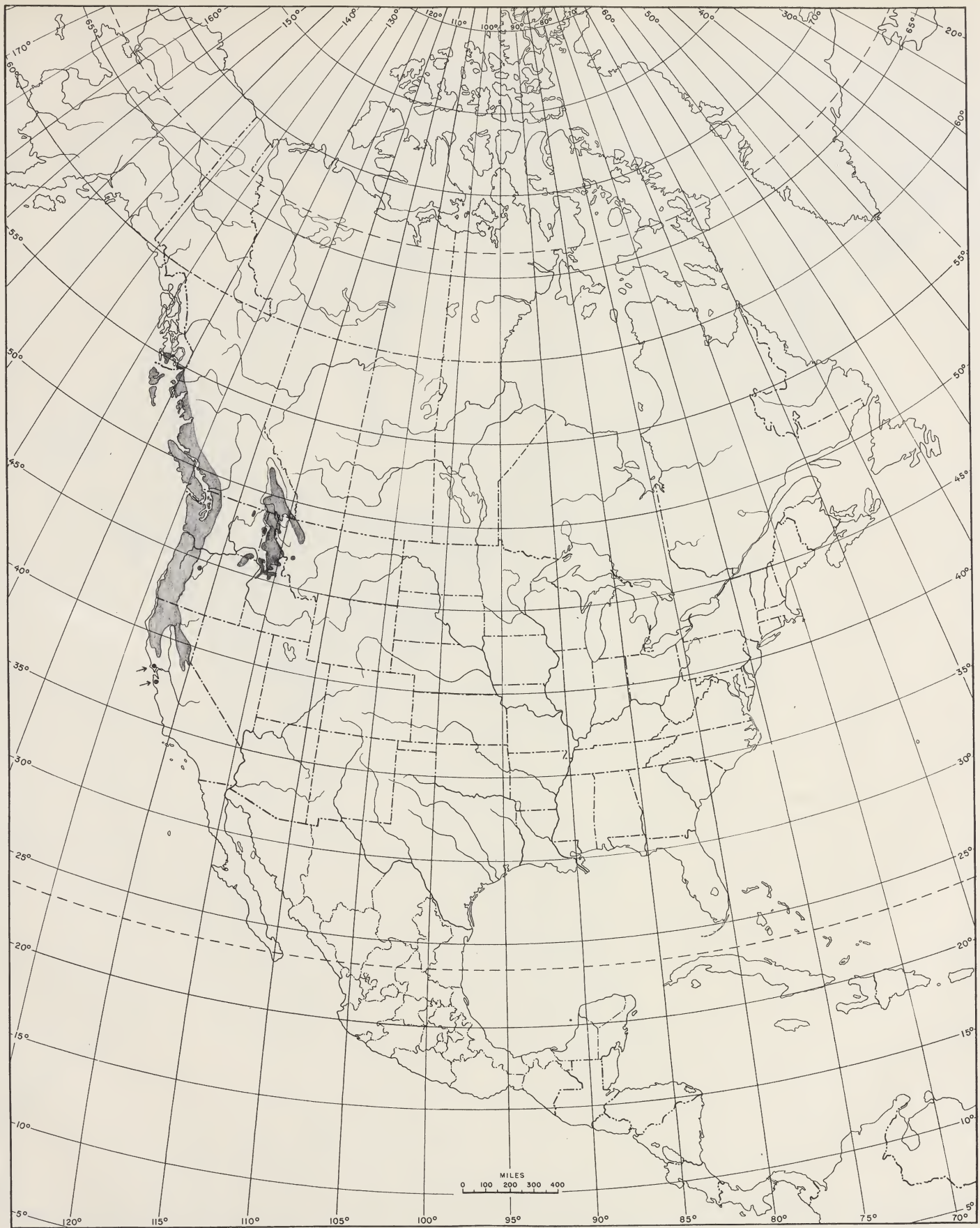
Map 84-E. baldcypress, *Taxodium distichum* (L.) Rich. The broken line indicates the northern limit of the variety pondcypress, *T. distichum* var. *nutans* (Ait.) Sweet.



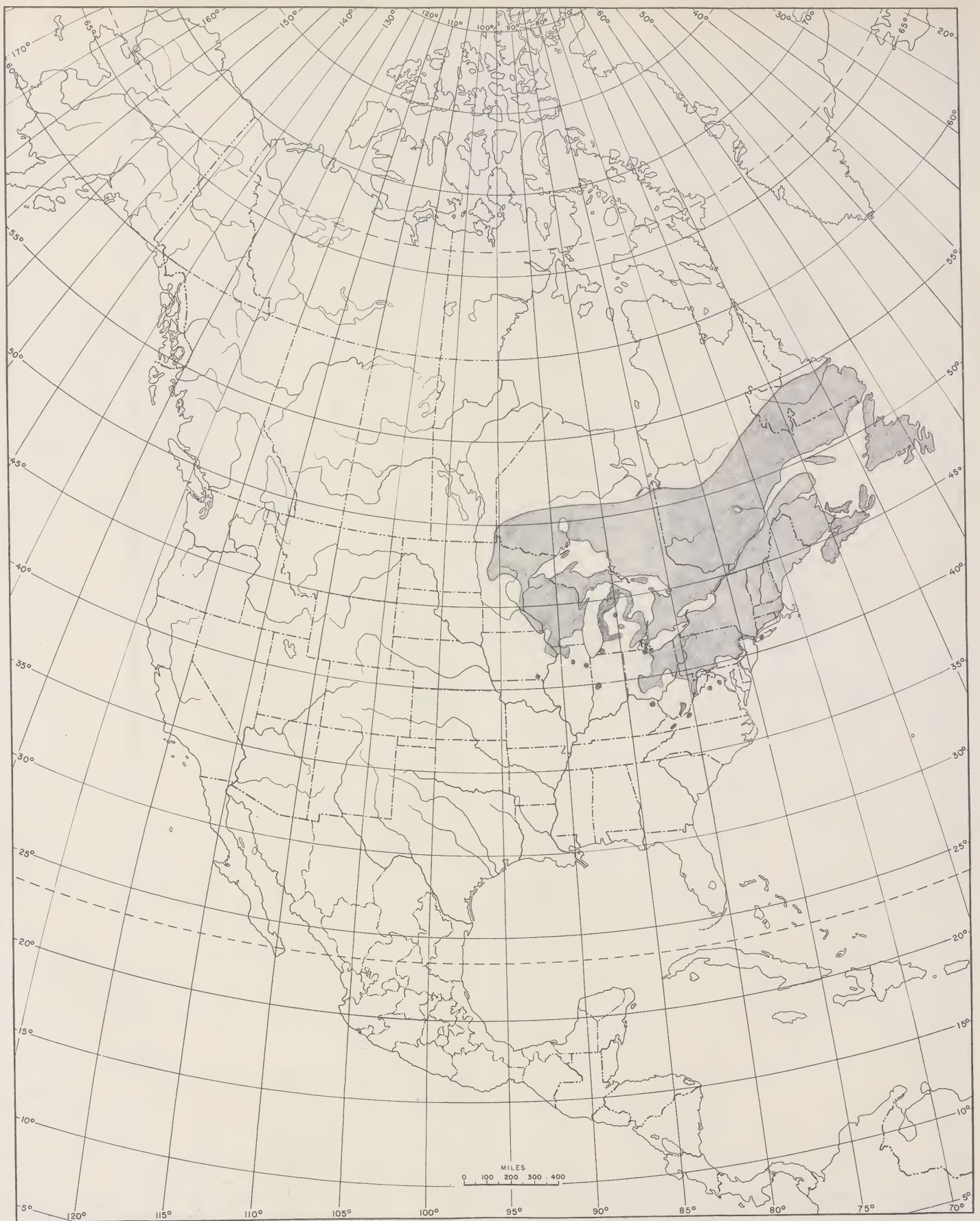
Map 85-E. Florida yew, *Taxus floridana* Nutt. Florida only.



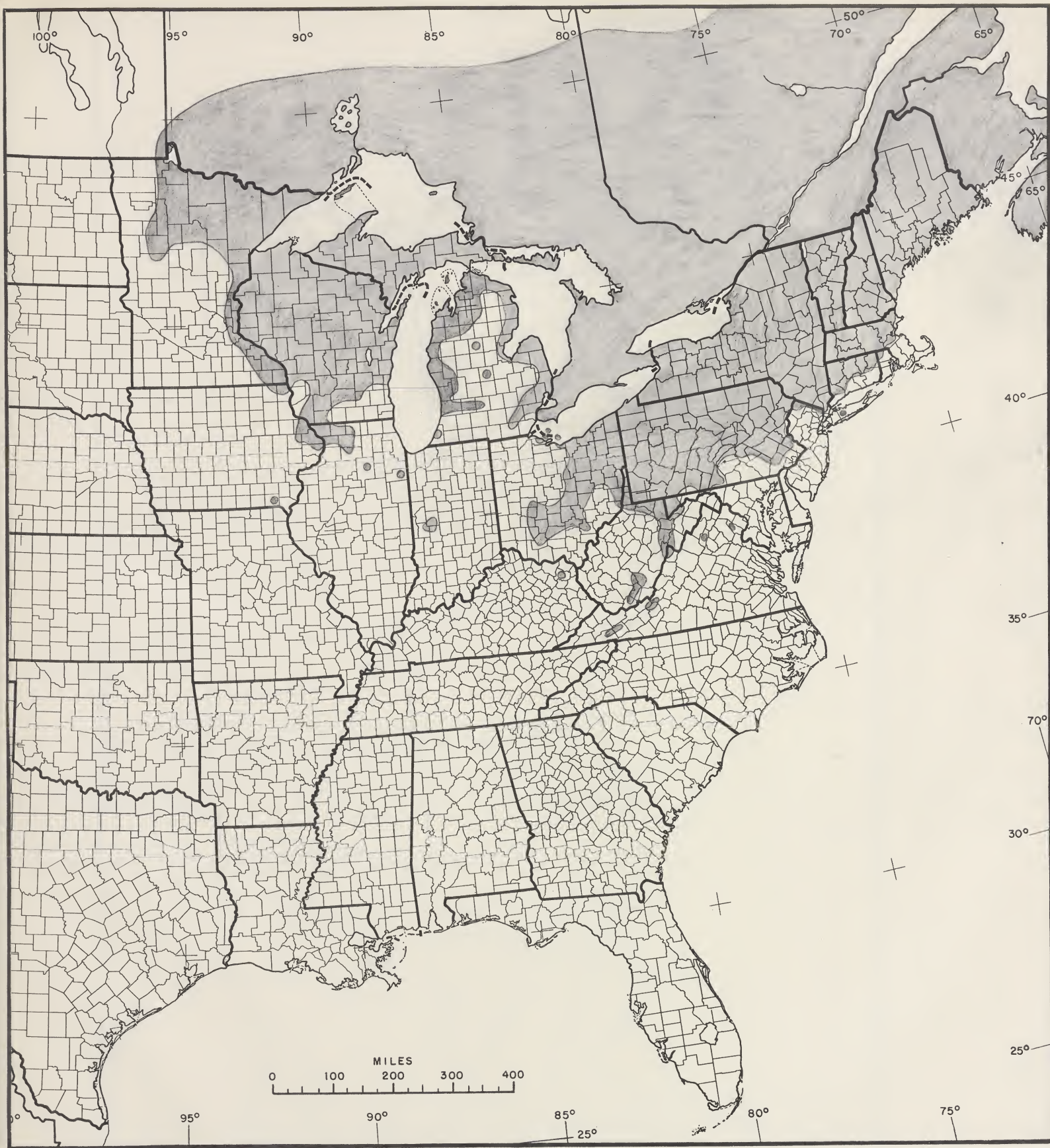
Map 86-W. Pacific yew, *Taxus brevifolia* Nutt.



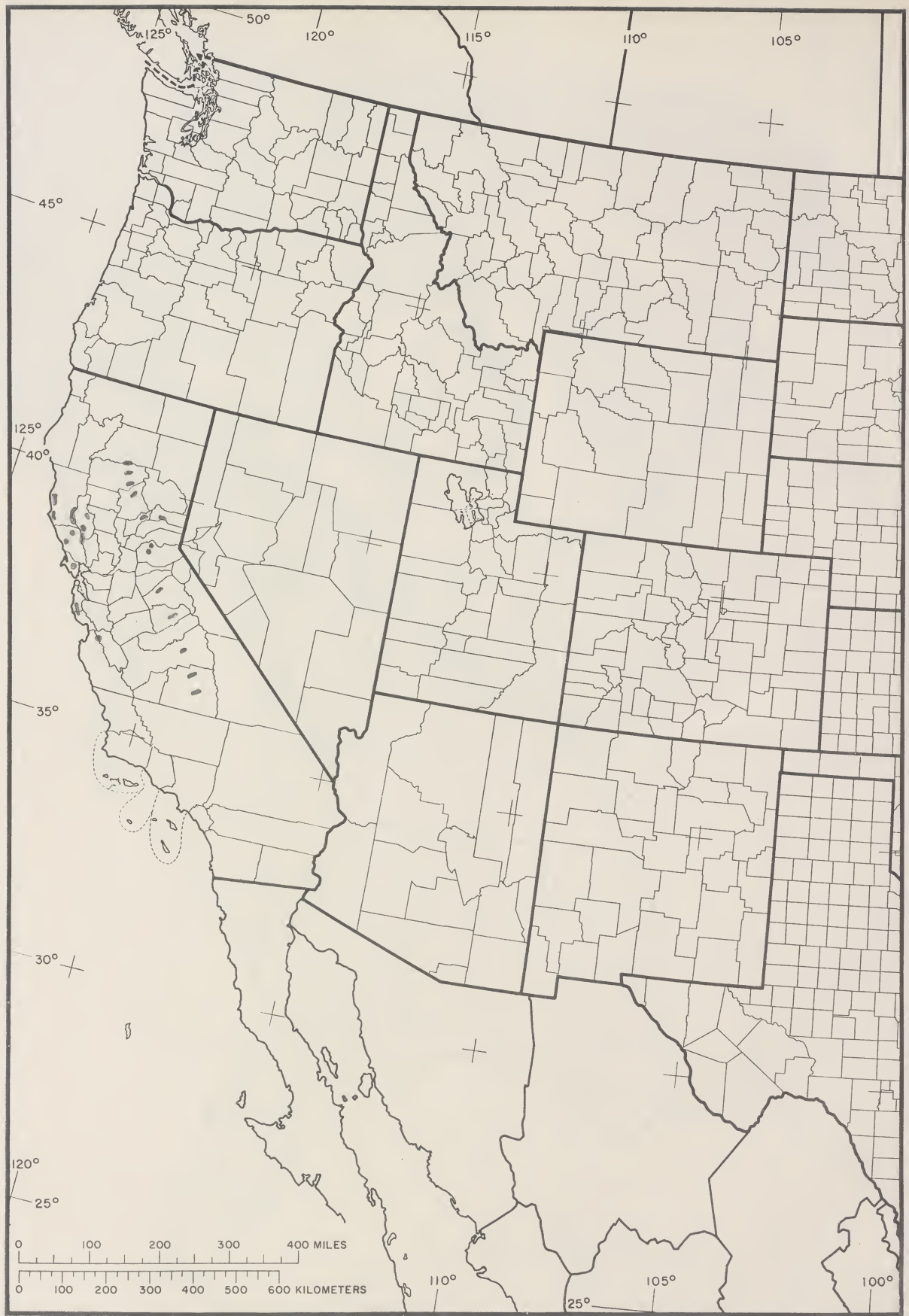
Map 86-N. Pacific yew, *Taxus brevifolia* Nutt.



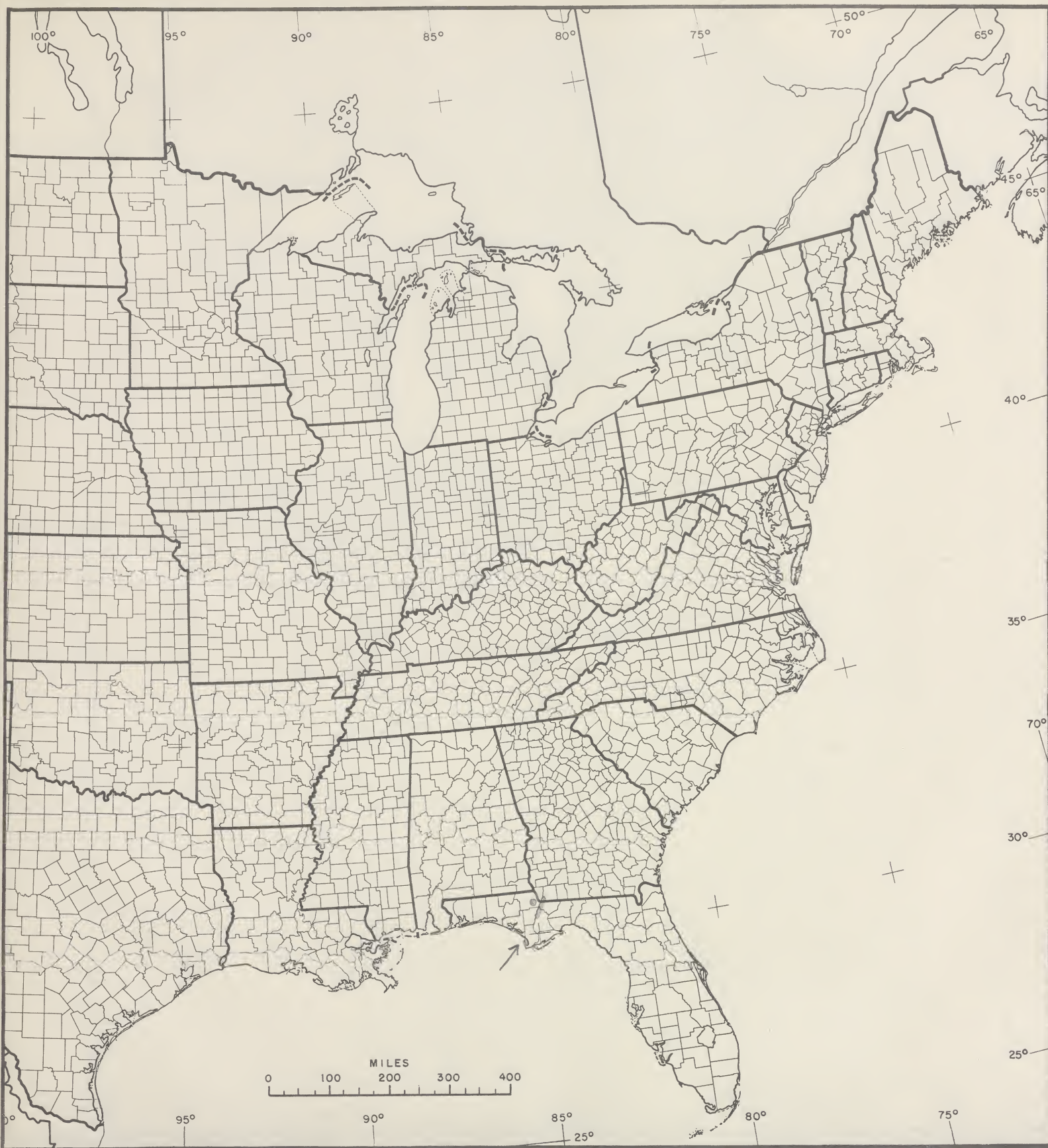
Map 86.1-N. Canada yew, *Taxus canadensis* Marsh. A low shrub.



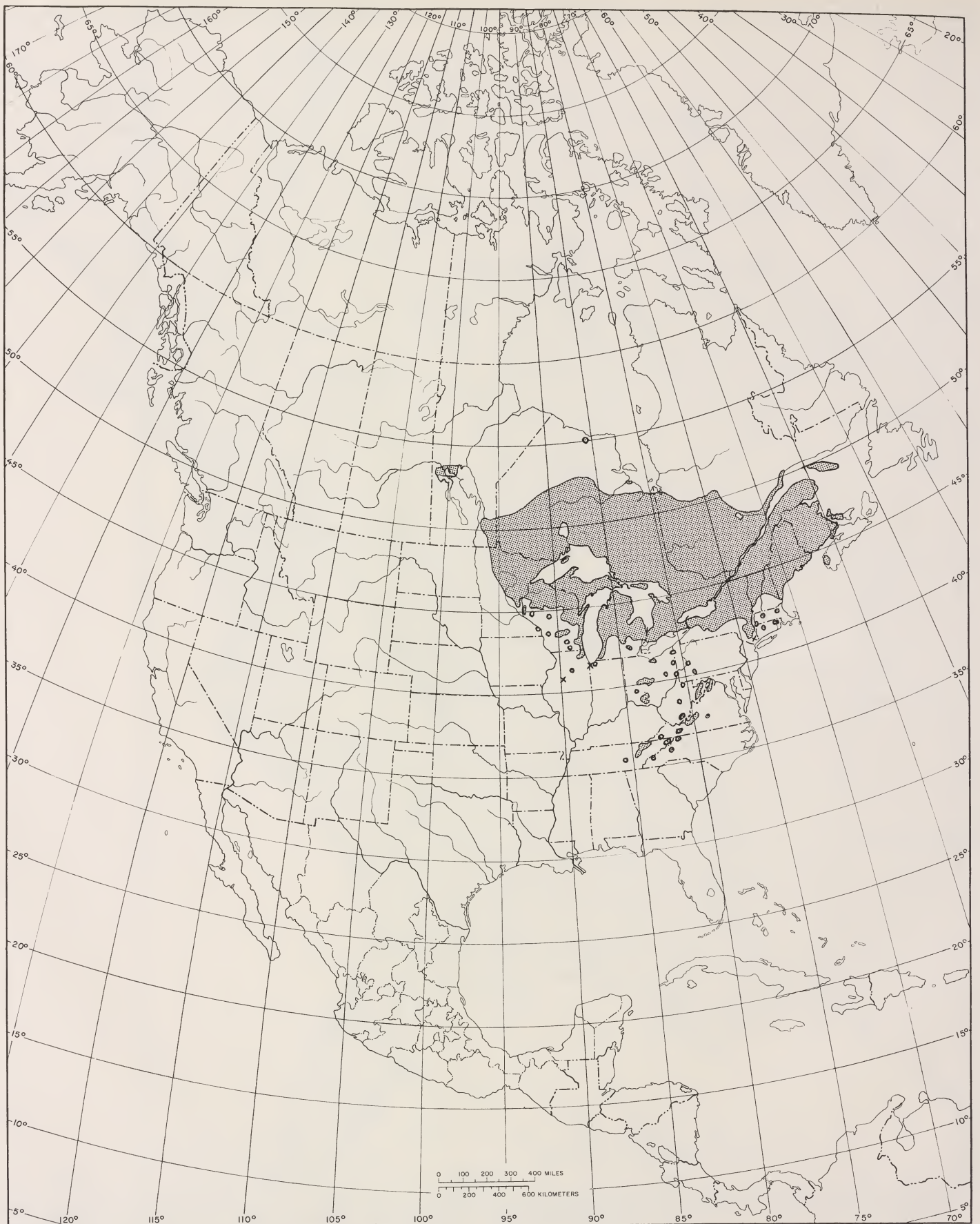
Map 86.1-E. Canada yew, *Taxus canadensis* Marsh. A low shrub.



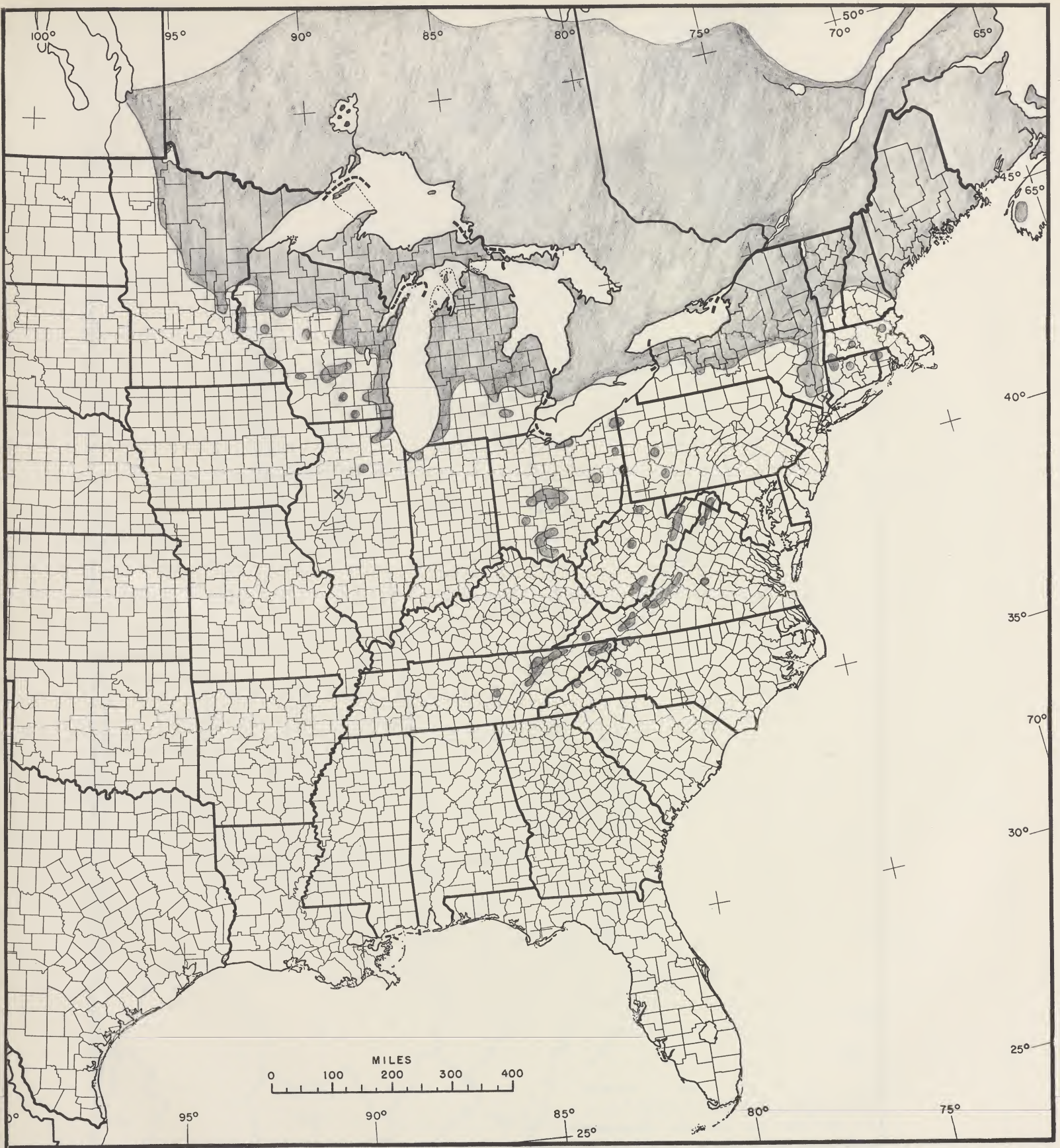
Map 87-W. California torrey, *Torrey californica* Torr. California only.



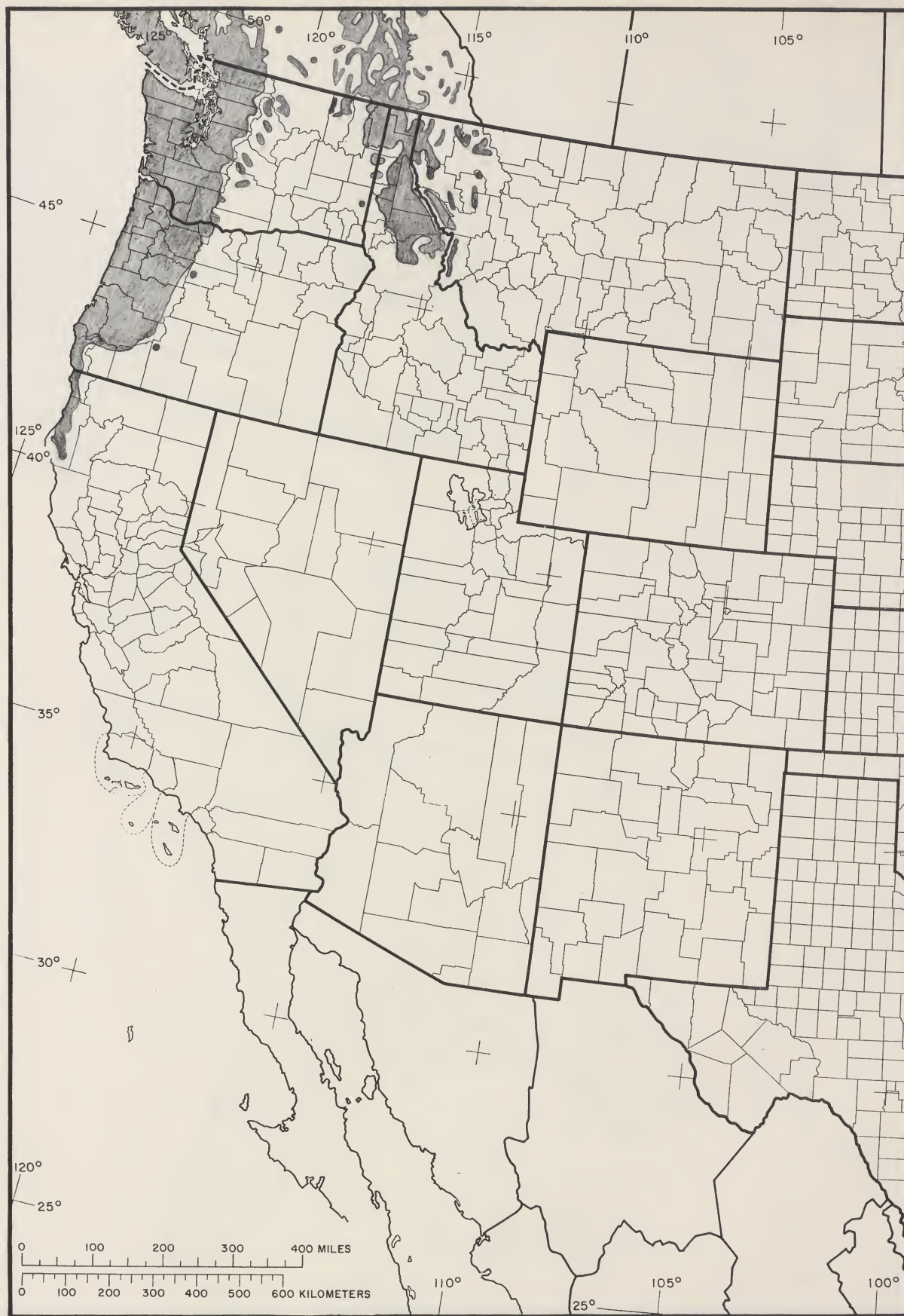
Map 88-E. Florida torreya, *Torreya taxifolia* Arn. Florida and Georgia only.



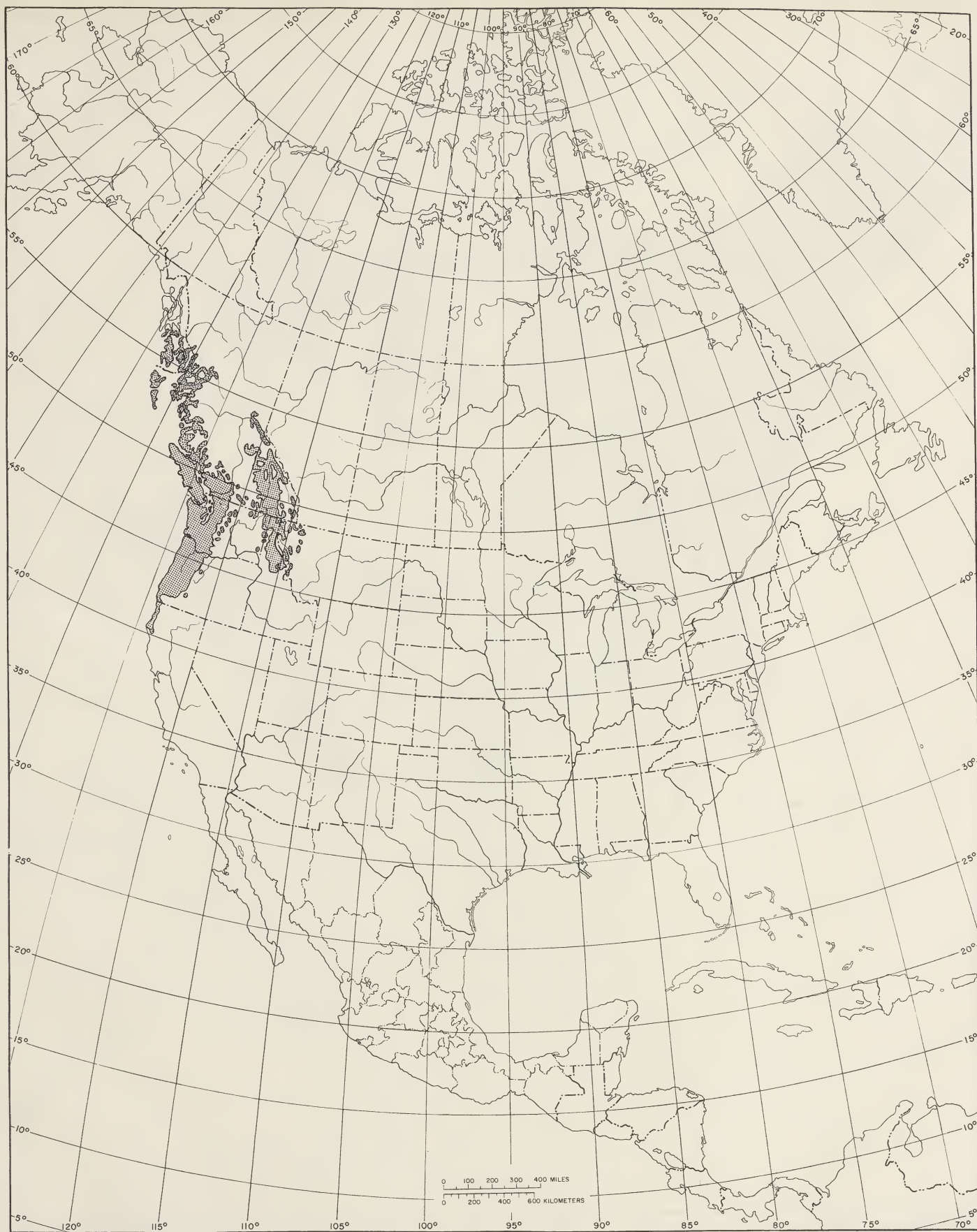
Map 89-N. northern white-cedar, *Thuja occidentalis* L.



Map 89-E. northern white-cedar, *Thuja occidentalis* L.



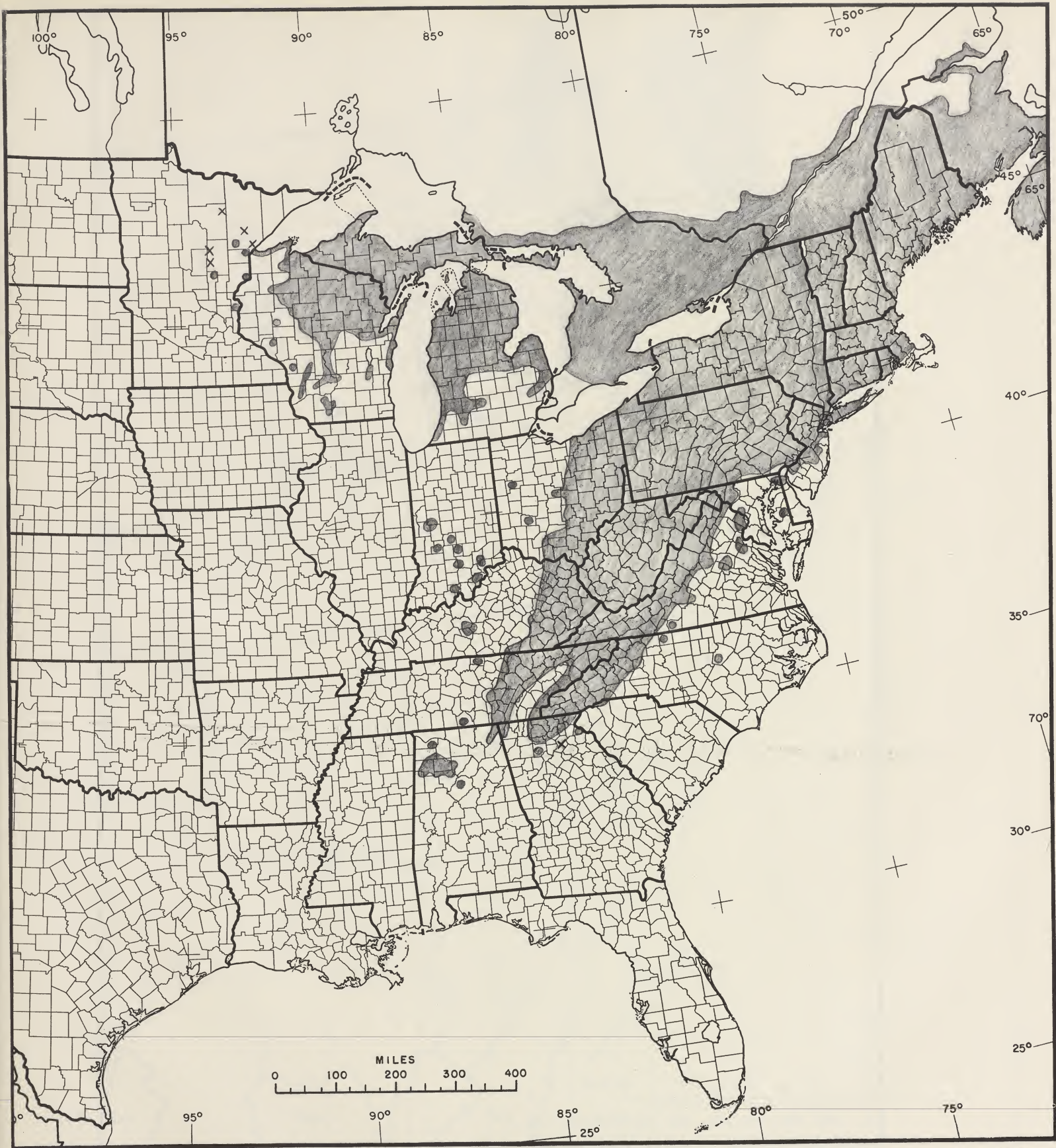
Map 90-W. western redcedar, *Thuja plicata* Donn



Map 90-N. western redcedar, *Thuja plicata* Donn



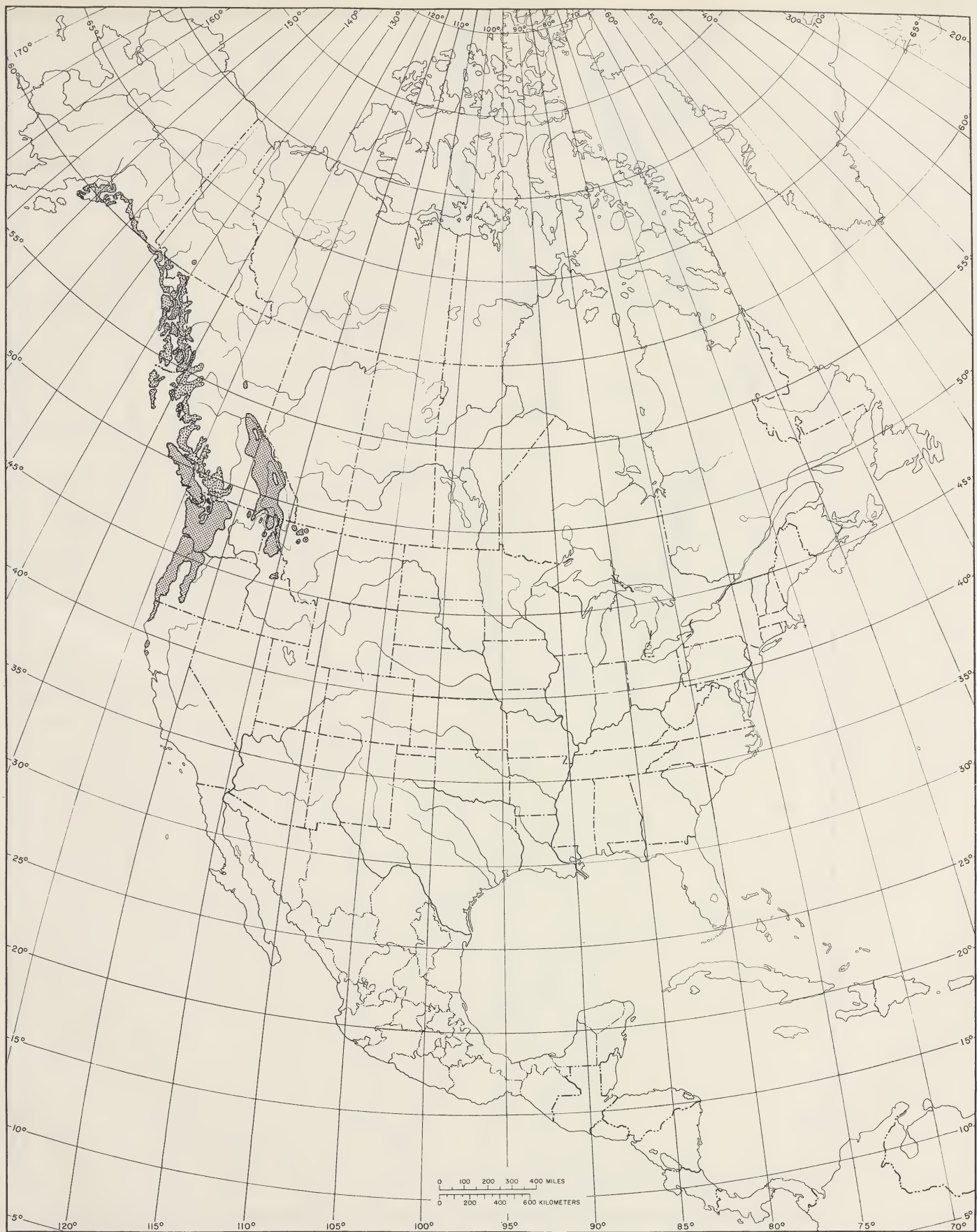
Map 91-N. eastern hemlock, *Tsuga canadensis* (L.) Carr.



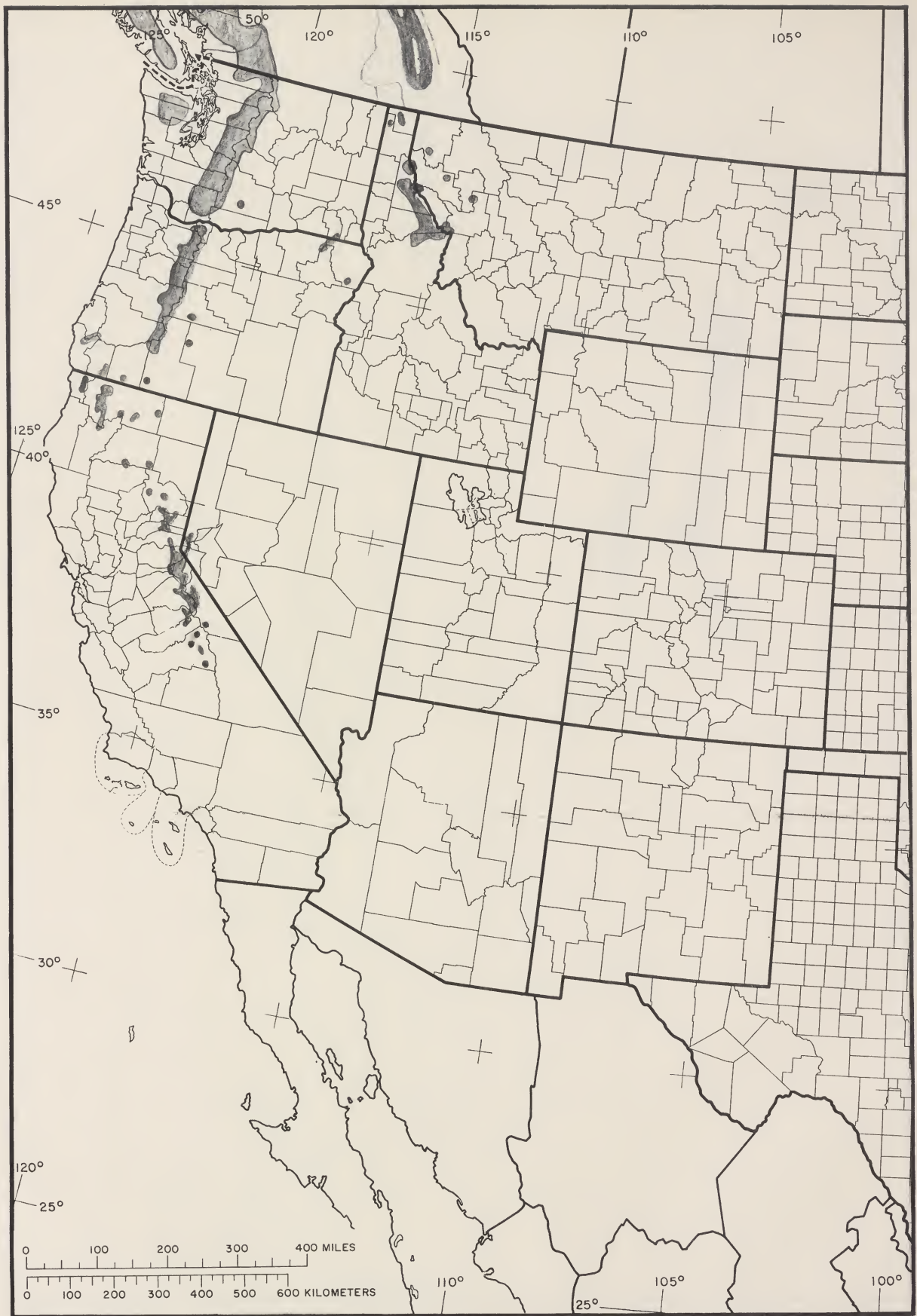
Map 91-E. eastern hemlock, *Tsuga canadensis* (L.) Carr.



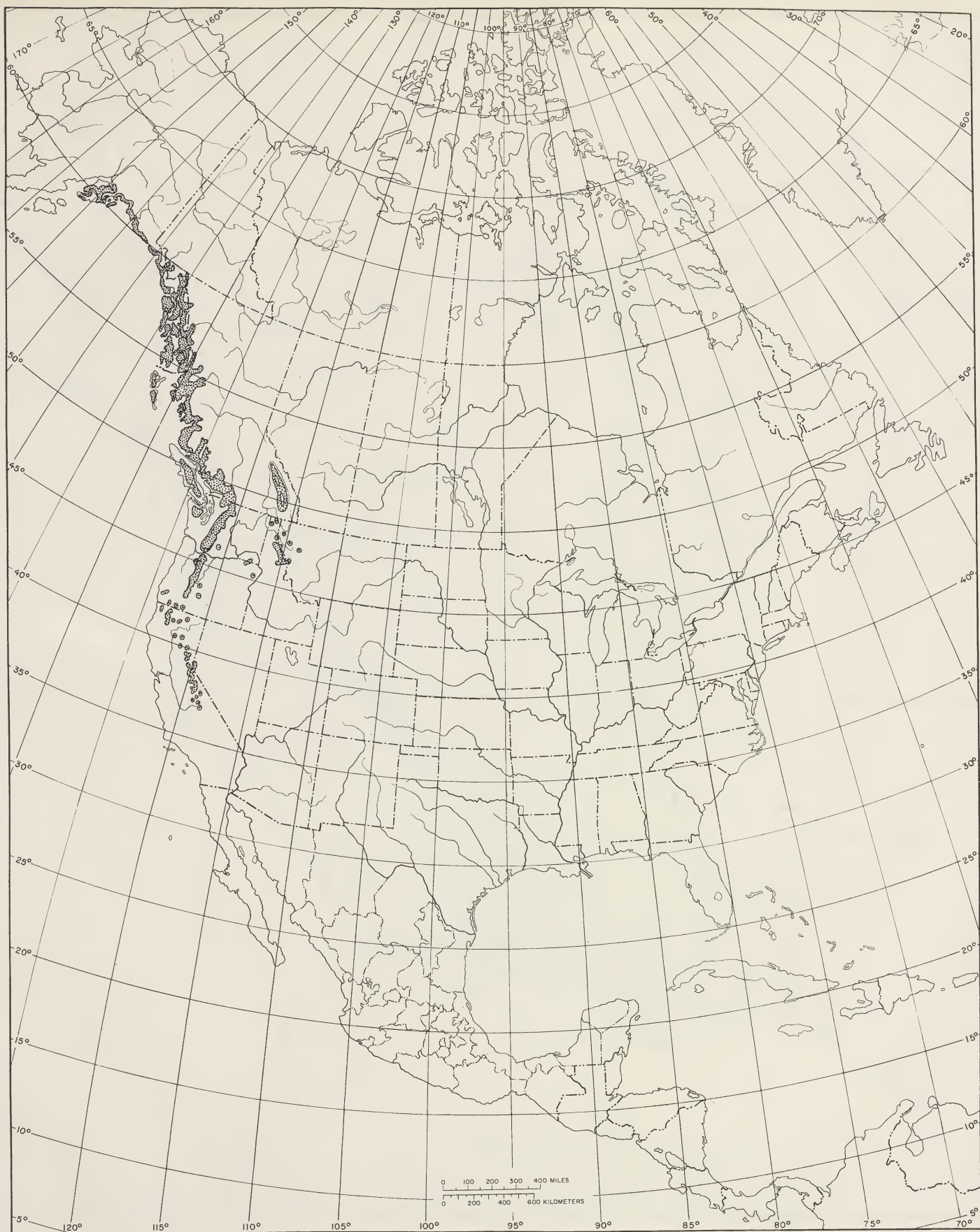
Map 92-W. western hemlock, *Tsuga heterophylla* (Raf.) Sarg.



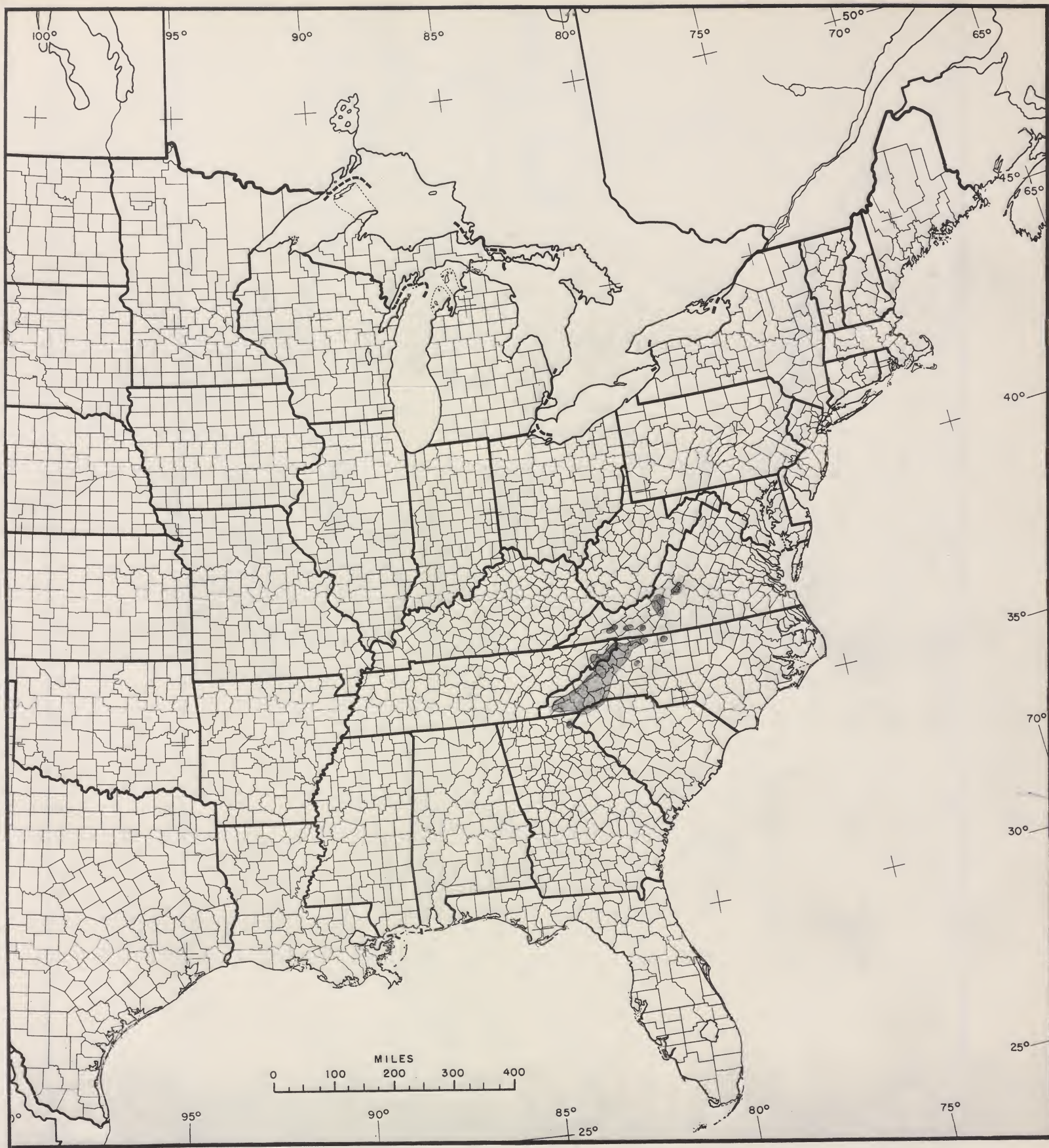
Map 92-N. western hemlock, *Tsuga heterophylla* (Raf.) Sarg.



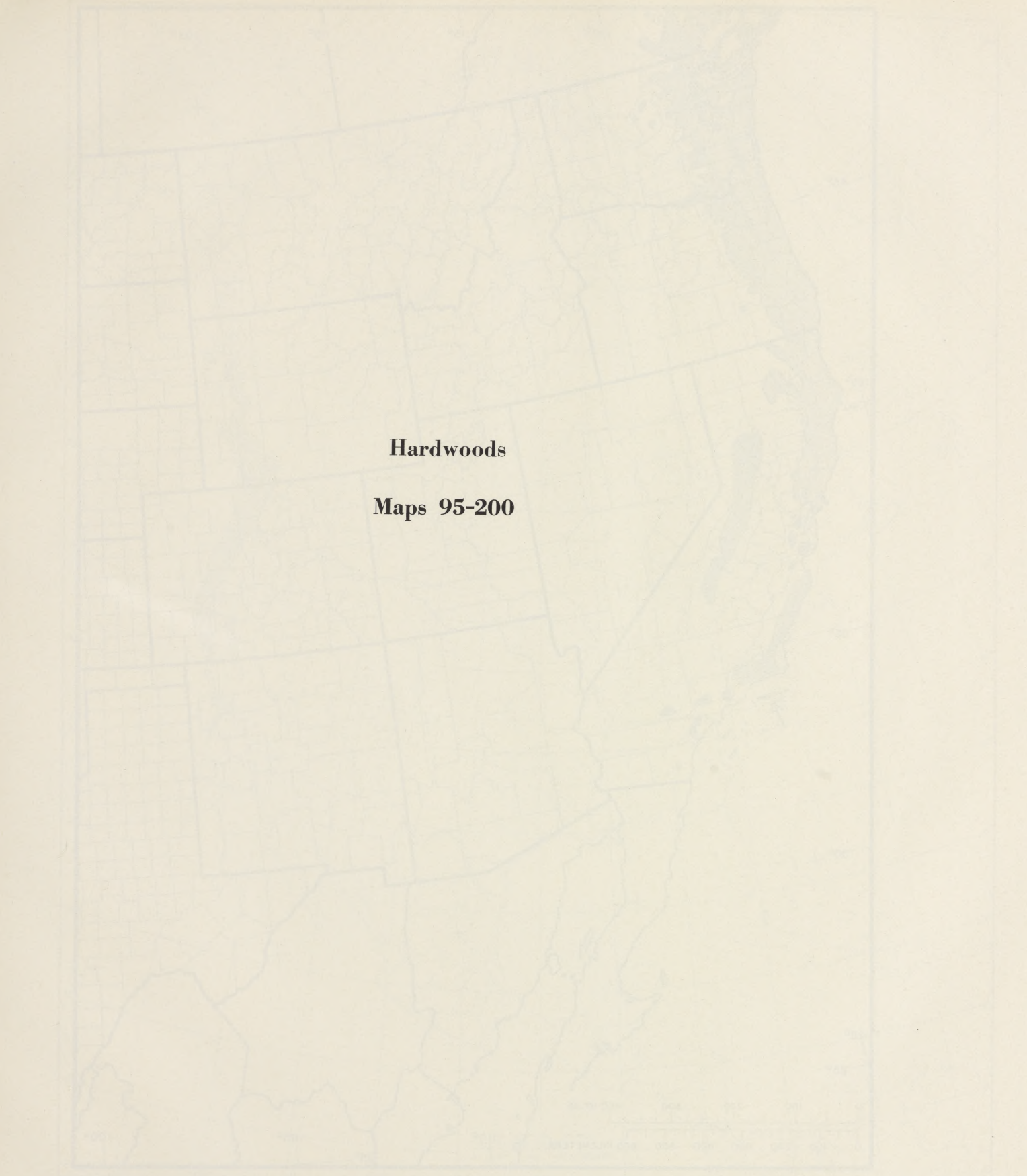
Map 93-W. mountain hemlock, *Tsuga mertensiana* (Bong.) Carr.



Map 93-N. mountain hemlock, *Tsuga mertensiana* (Bong.) Carr.

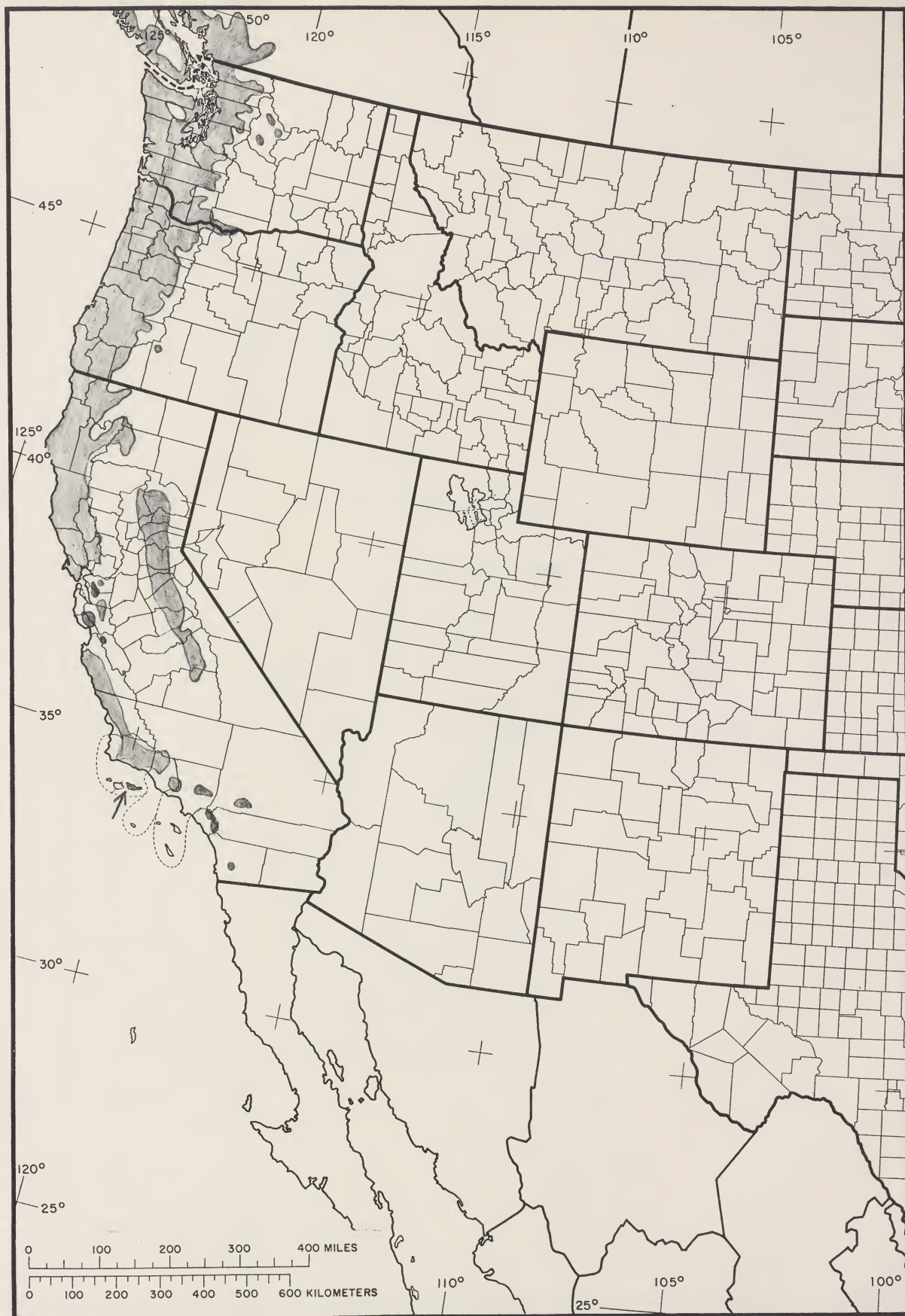


Map 94-E. Carolina hemlock, *Tsuga caroliniana* Engelm.

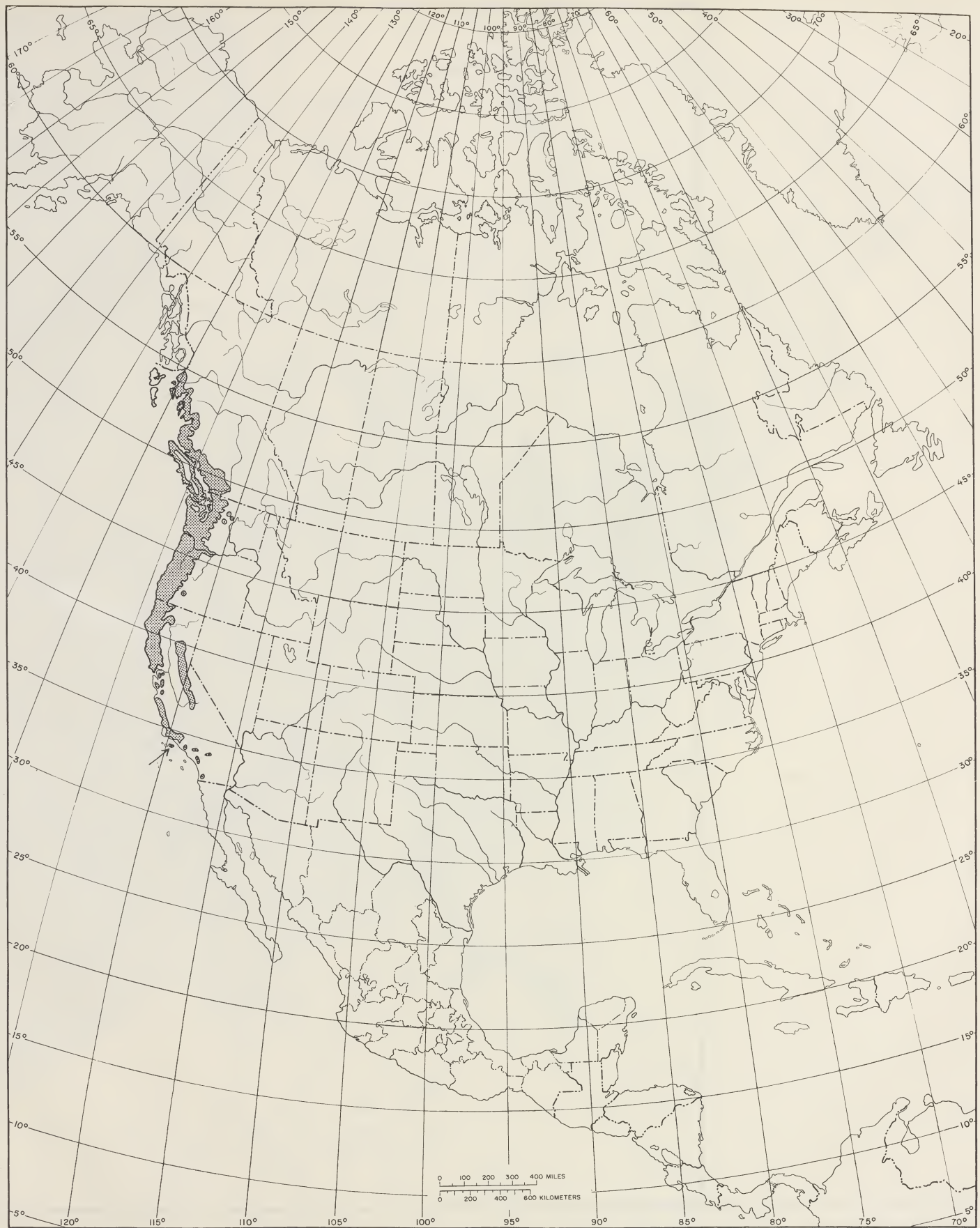


Hardwoods

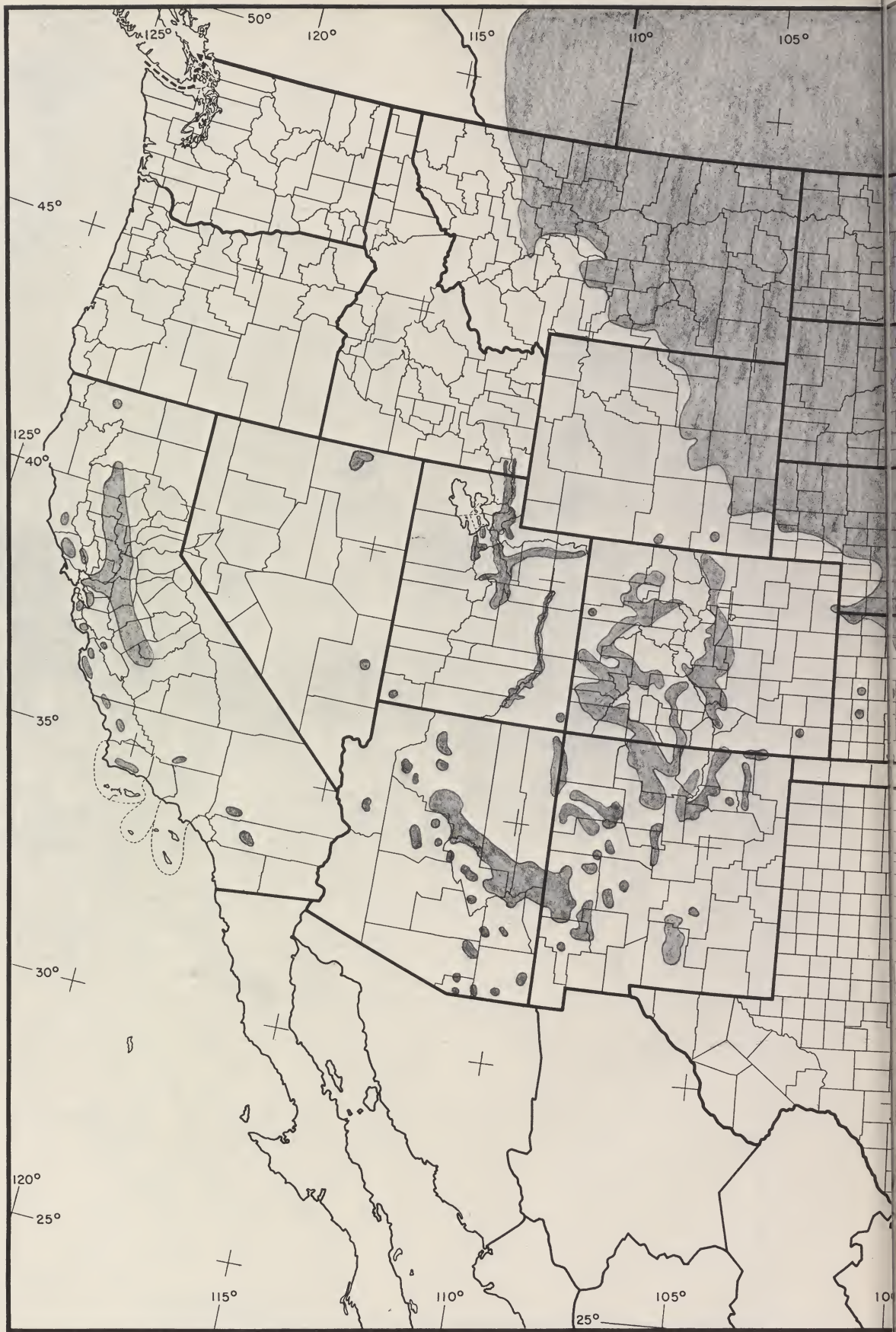
Maps 95-200



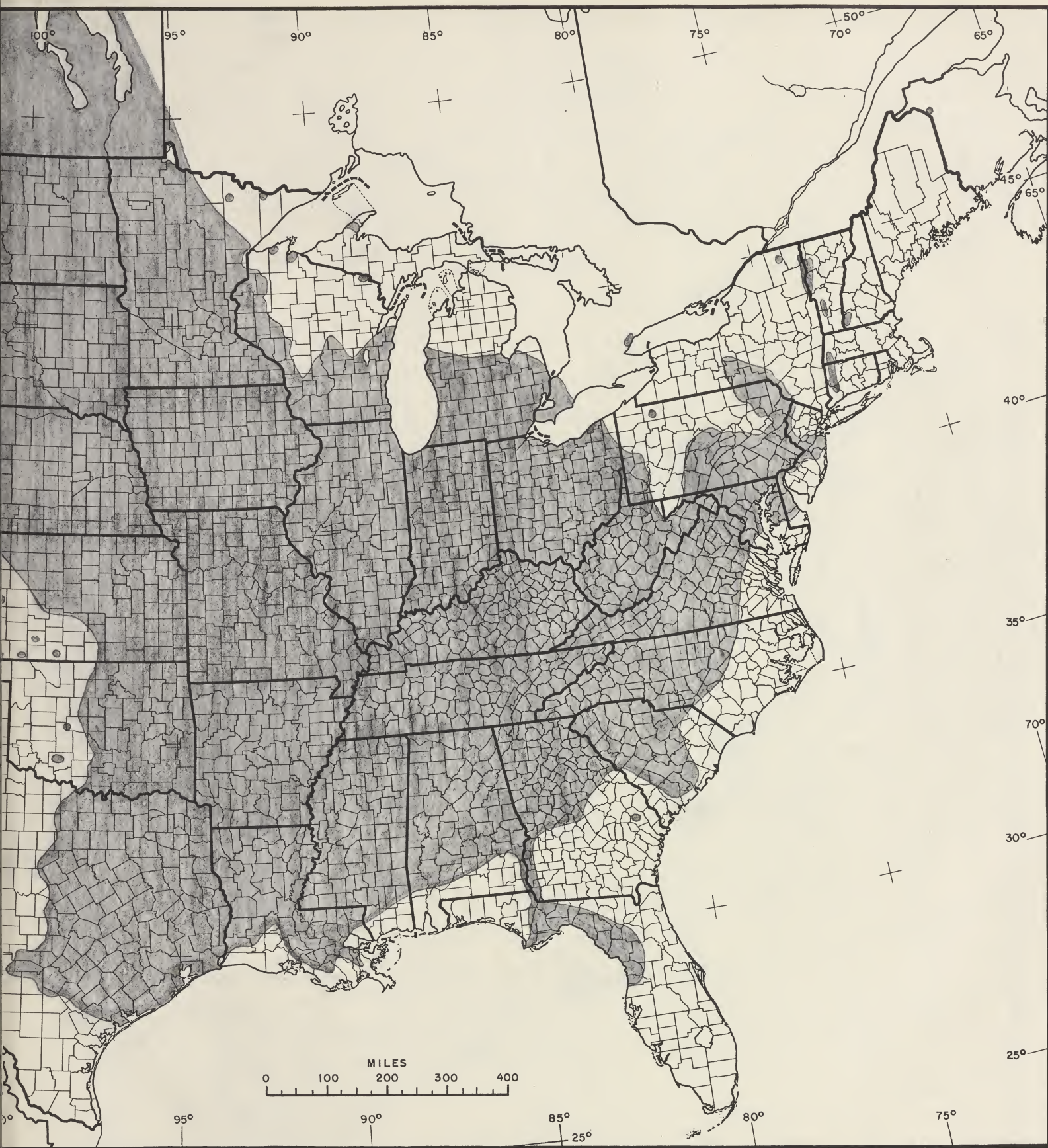
Map 95-W. bigleaf maple, *Acer macrophyllum* Pursh



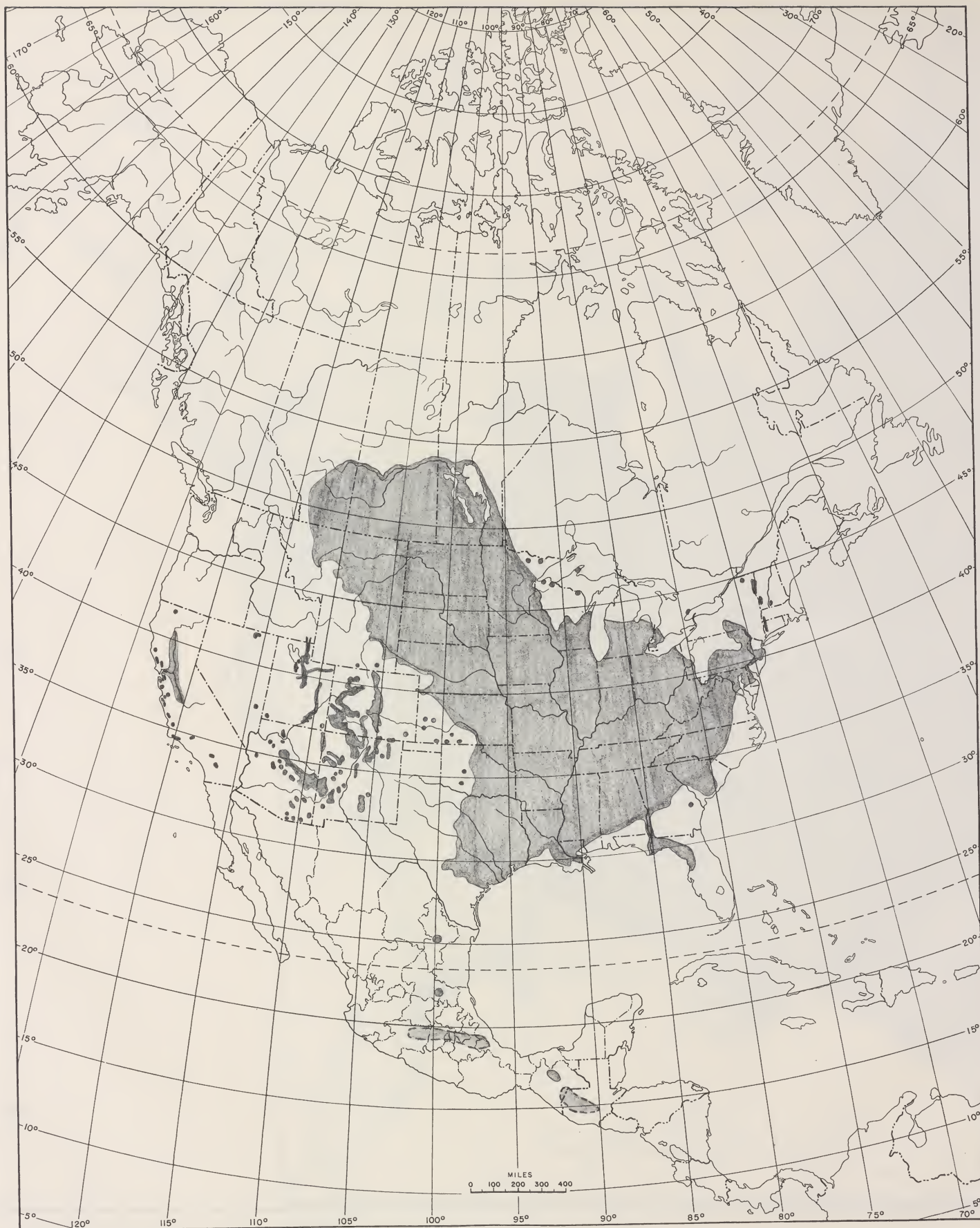
Map 95-N. bigleaf maple, *Acer macrophyllum* Pursh



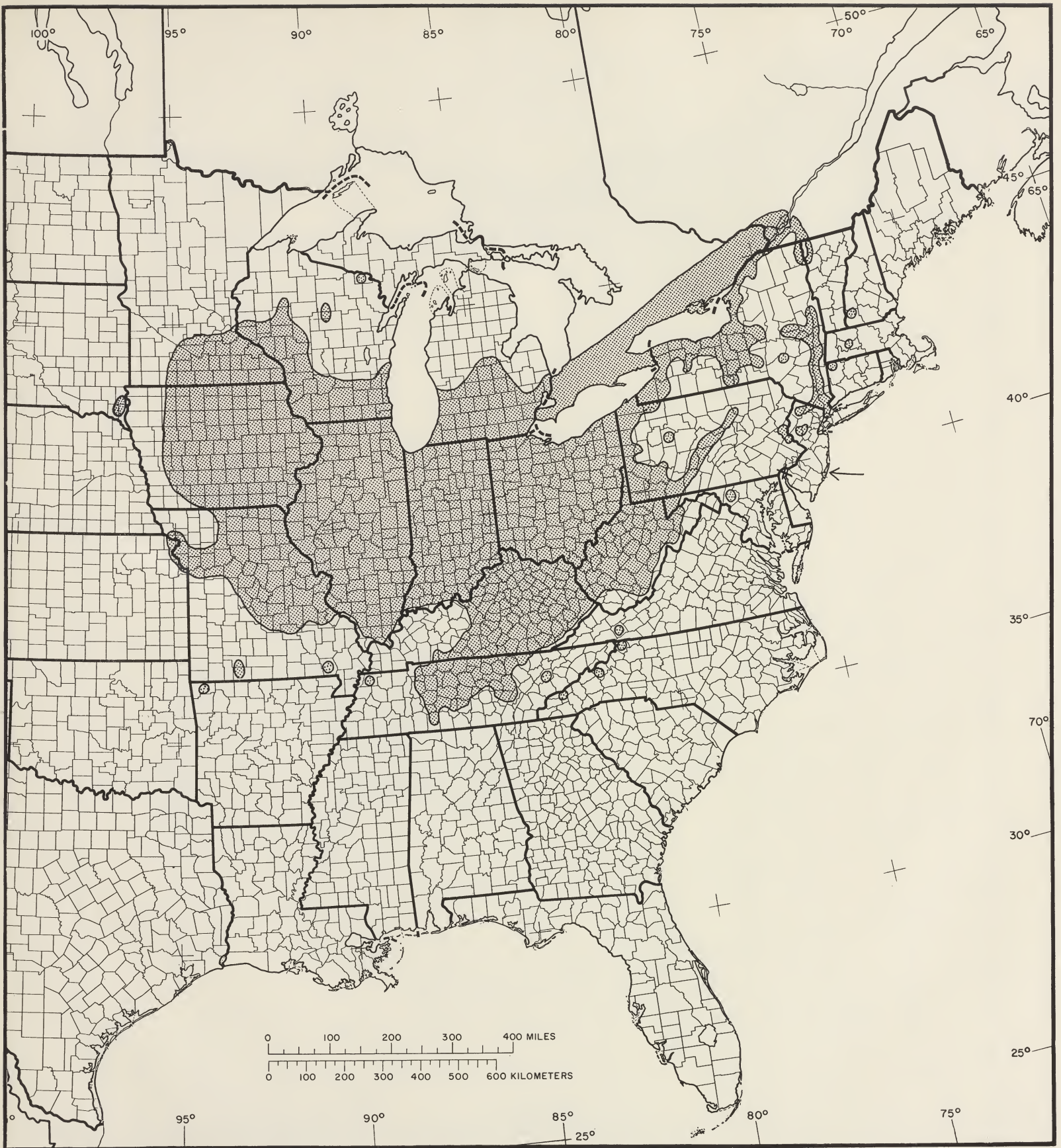
Map 96-W. boxelder, *Acer negundo* L., western range.



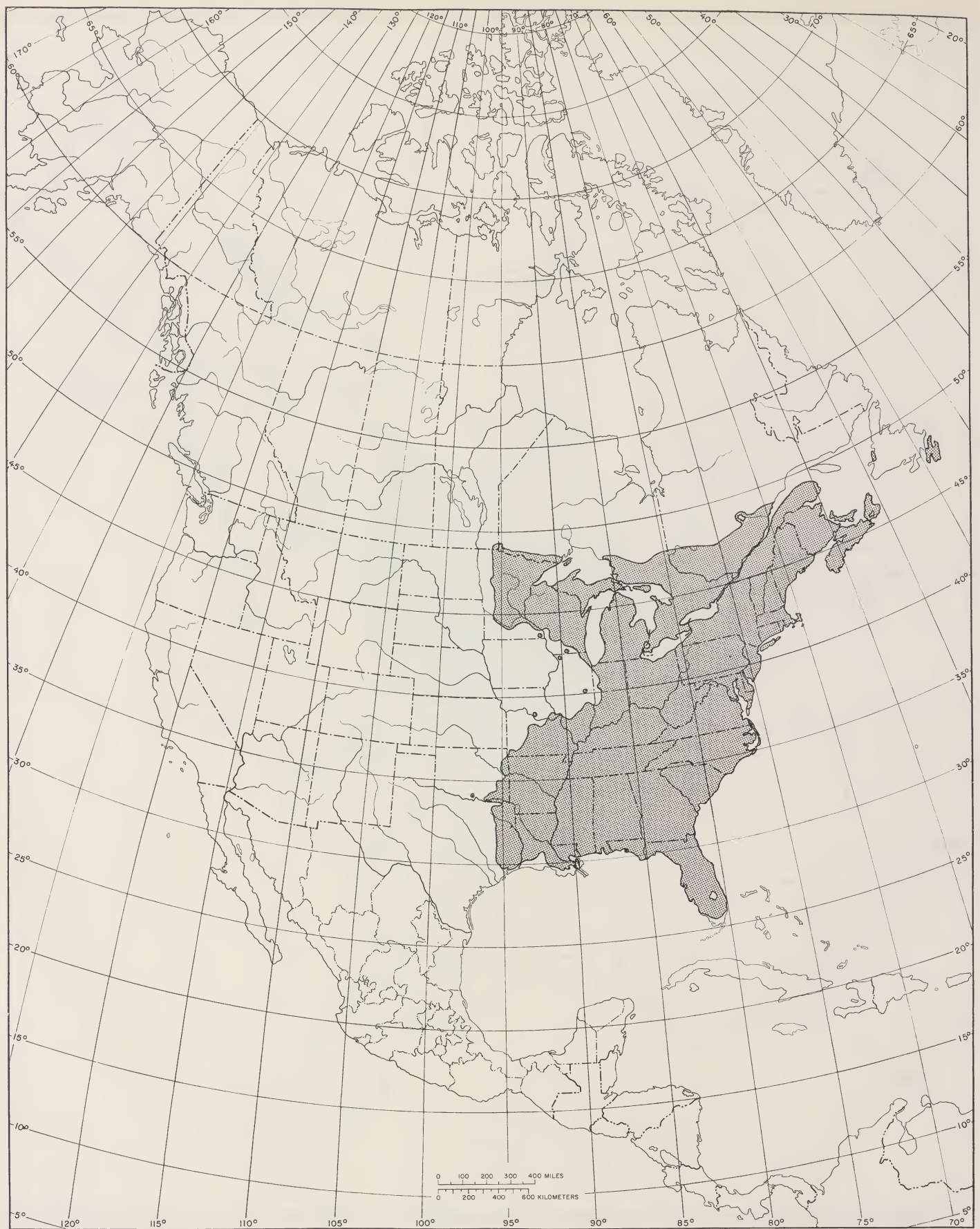
Map 96-E. boxelder, *Acer negundo* L., eastern range.



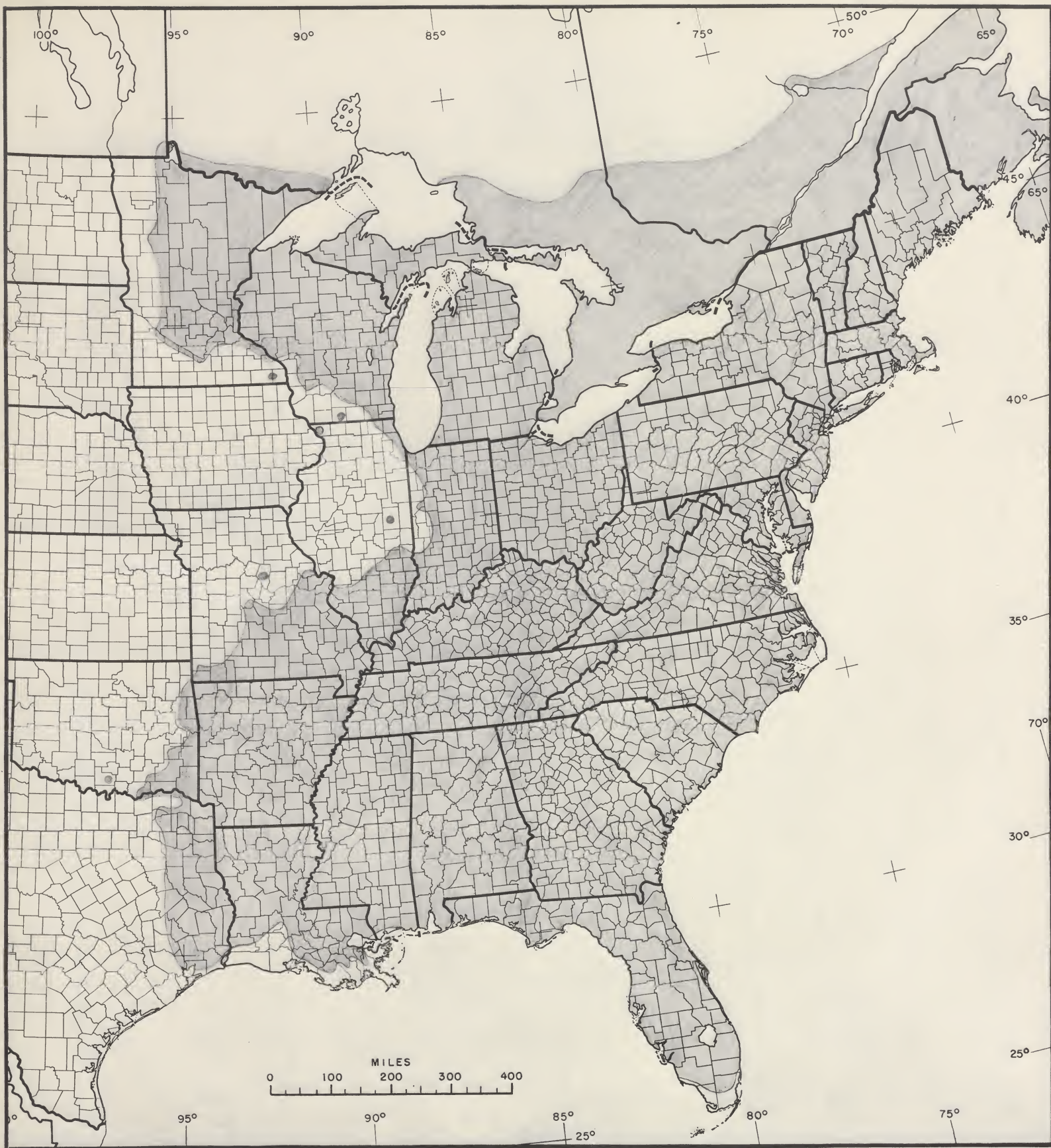
Map 96-N. boxelder, *Acer negundo* L.



Map 97-E. black maple, *Acer nigrum* Michx. f.



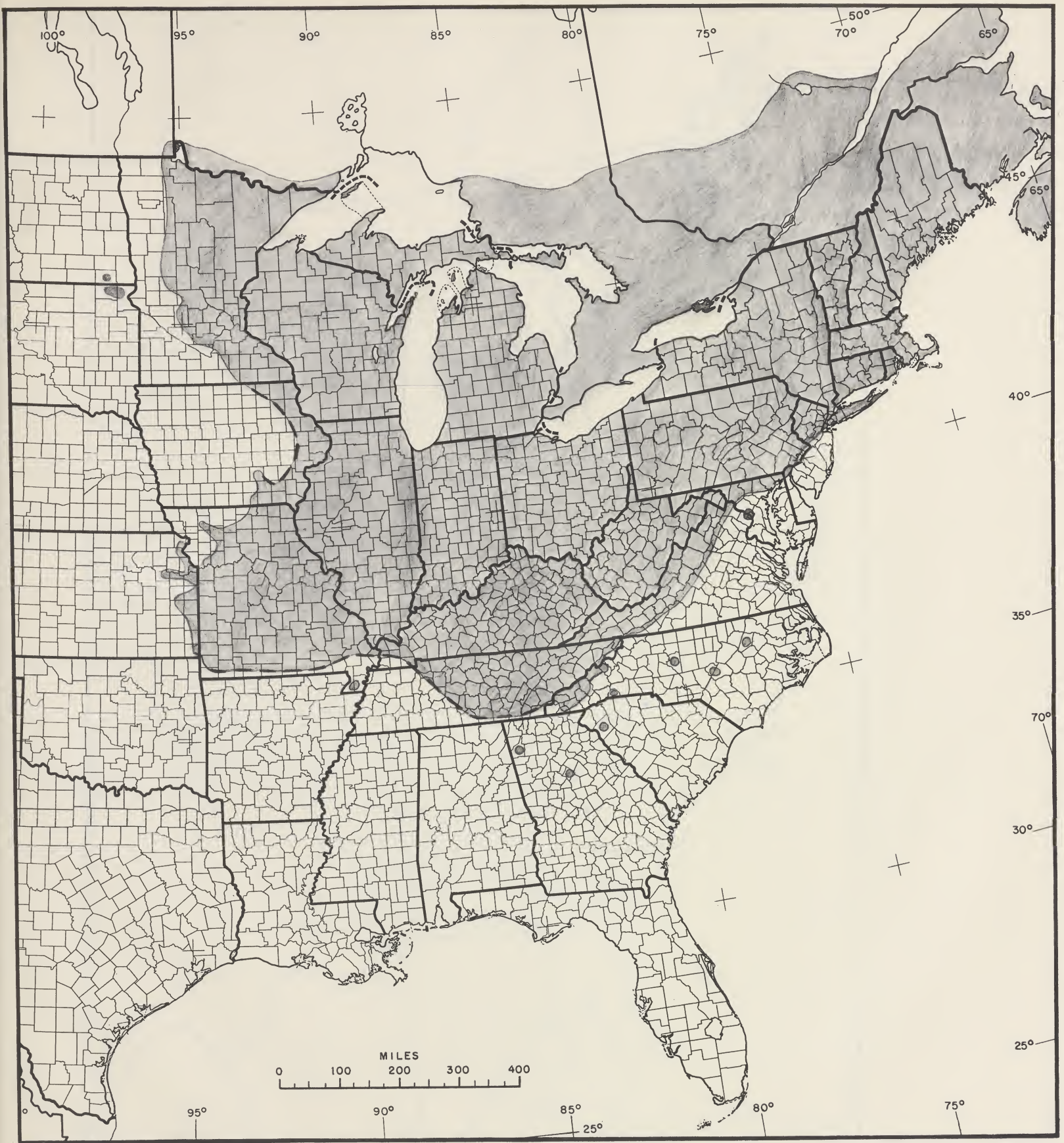
Map 98-N. red maple, *Acer rubrum* L.



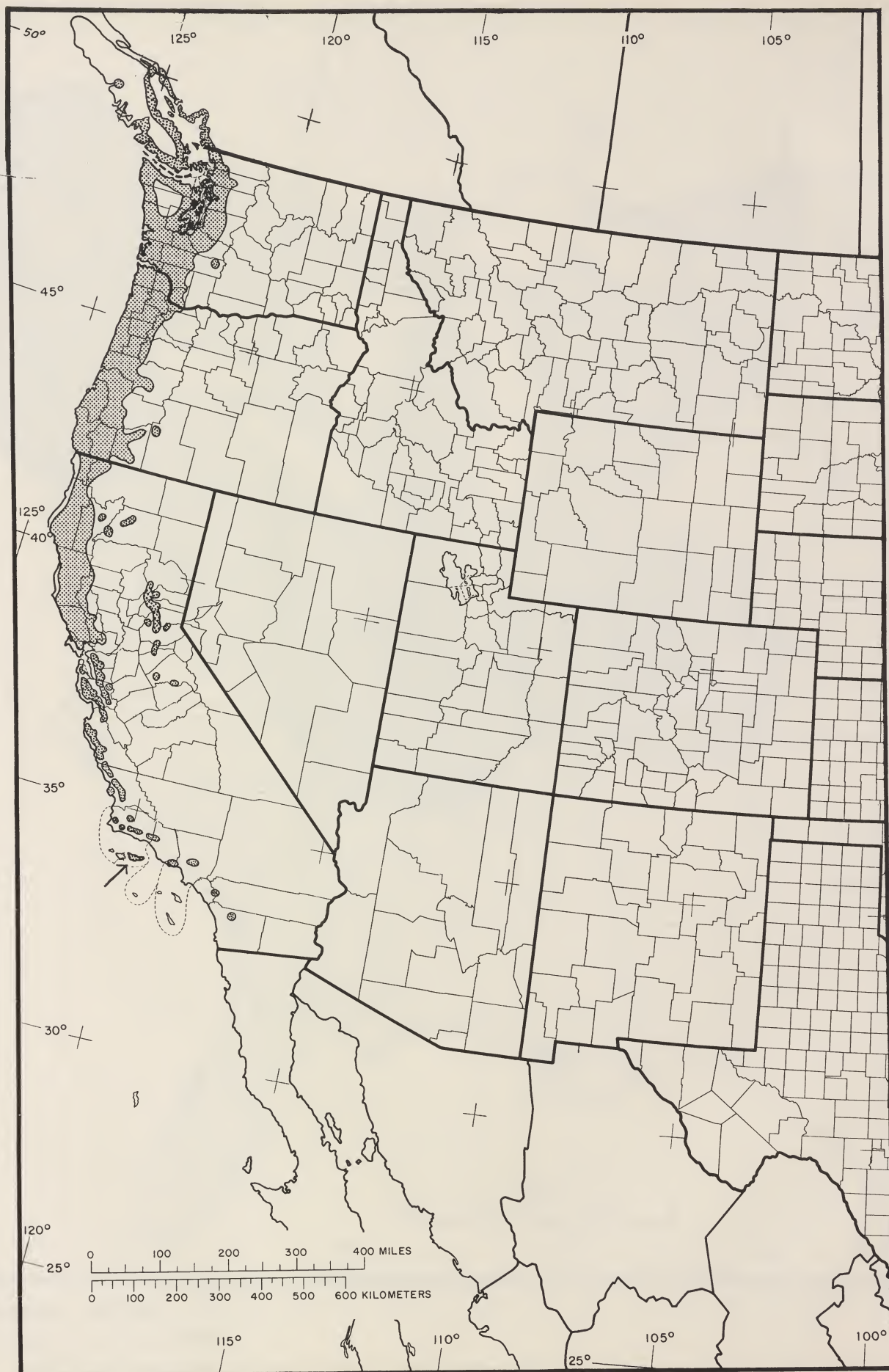
Map 98-E. red maple, *Acer rubrum* L.



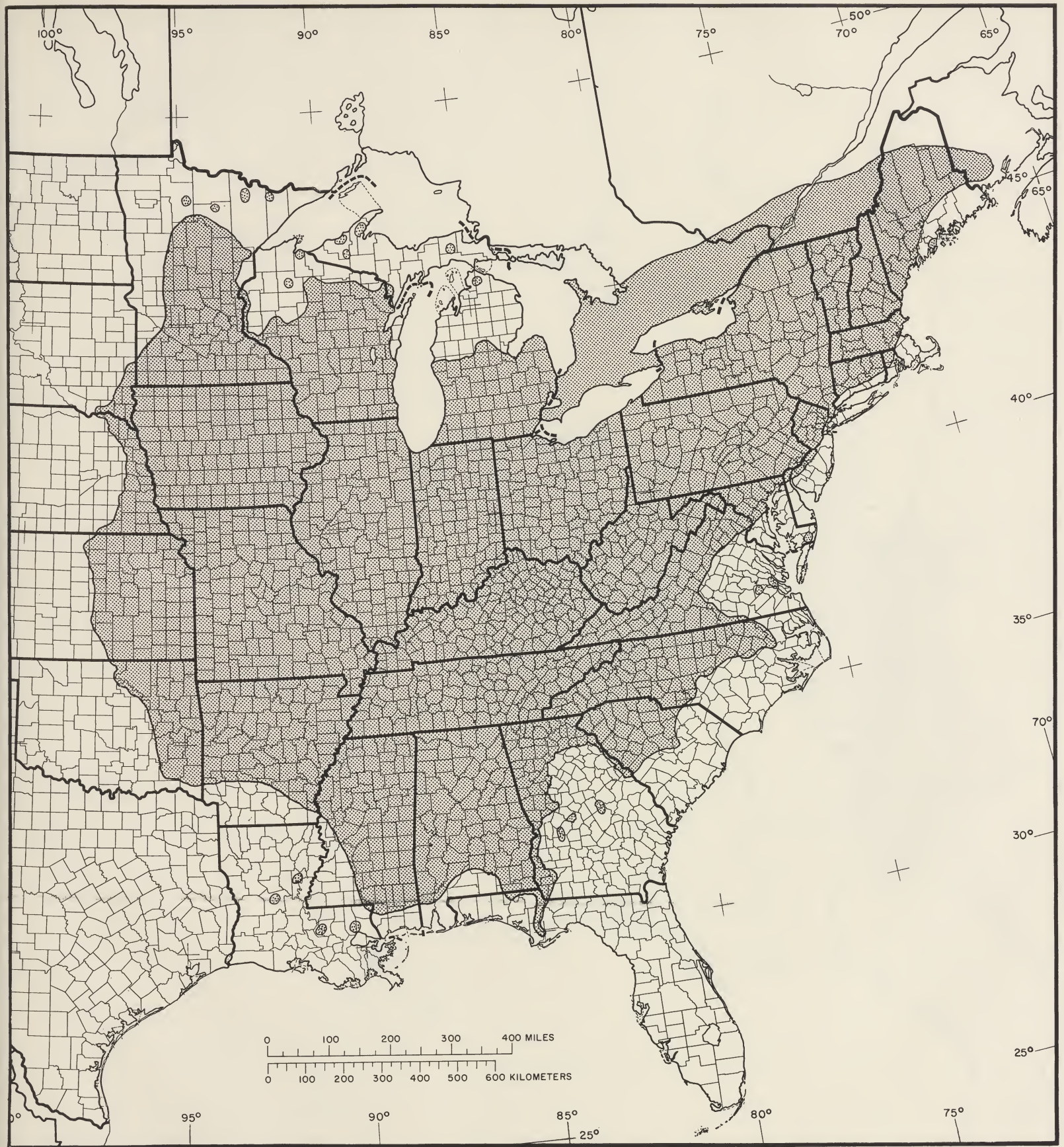
Map 99-N. sugar maple, *Acer saccharum* Marsh.



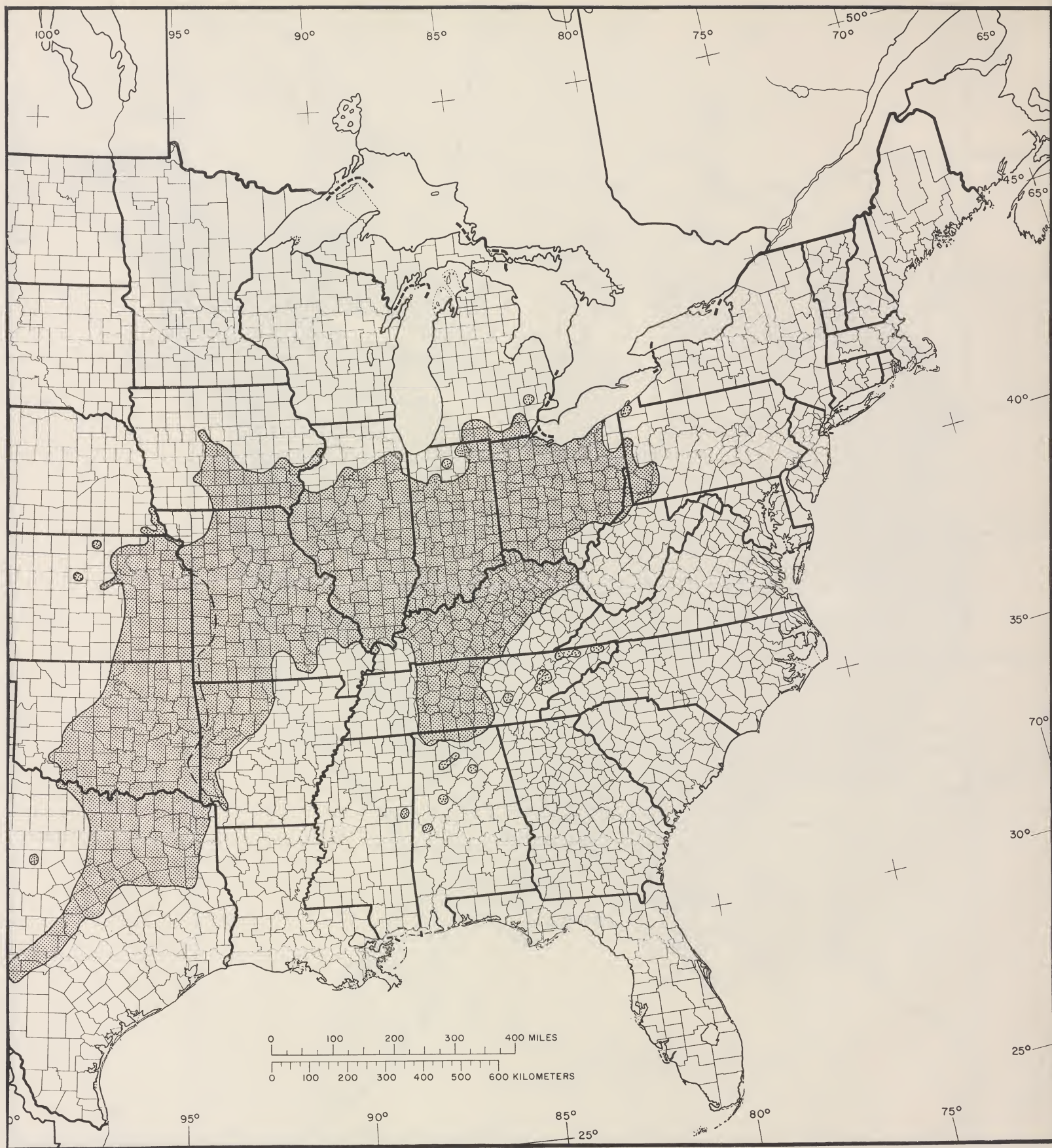
Map 99-E. sugar maple, *Acer saccharum* Marsh.



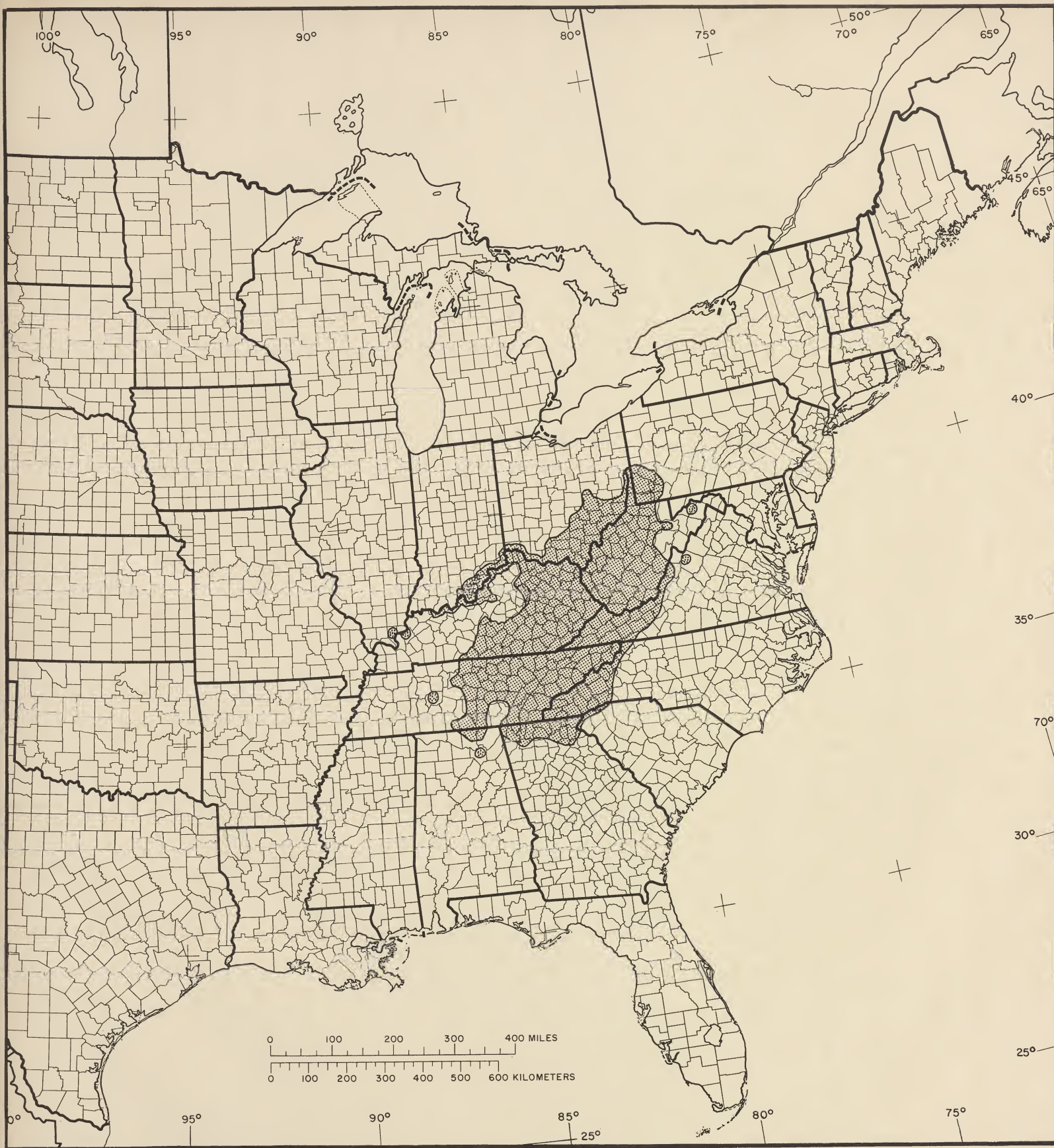
Map 100-W. Pacific madrone, *Arbutus menziesii* Pursh



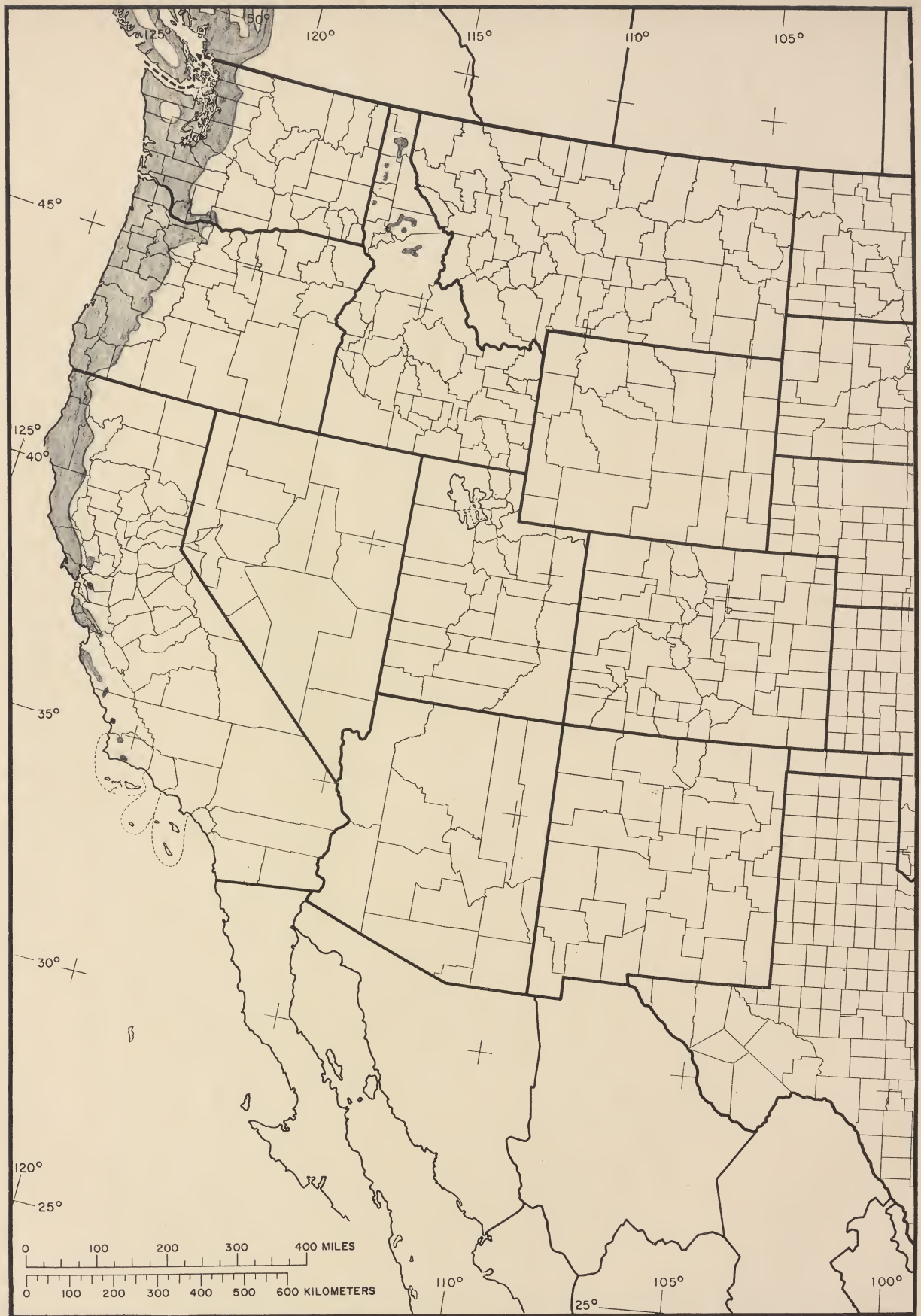
Map 101-E. silver maple, *Acer saccharinum* L.



Map 102-E. Ohio Buckeye, *Aesculus glabra* Willd. The broken line separates eastward the typical variety and westward the variety Texas buckeye, *A. glabra* var. *arguta* (Buckl.) Robins. (*A. arguta* Buckl.).



Map 103-E. yellow buckeye, *Aesculus octandra* Marsh.



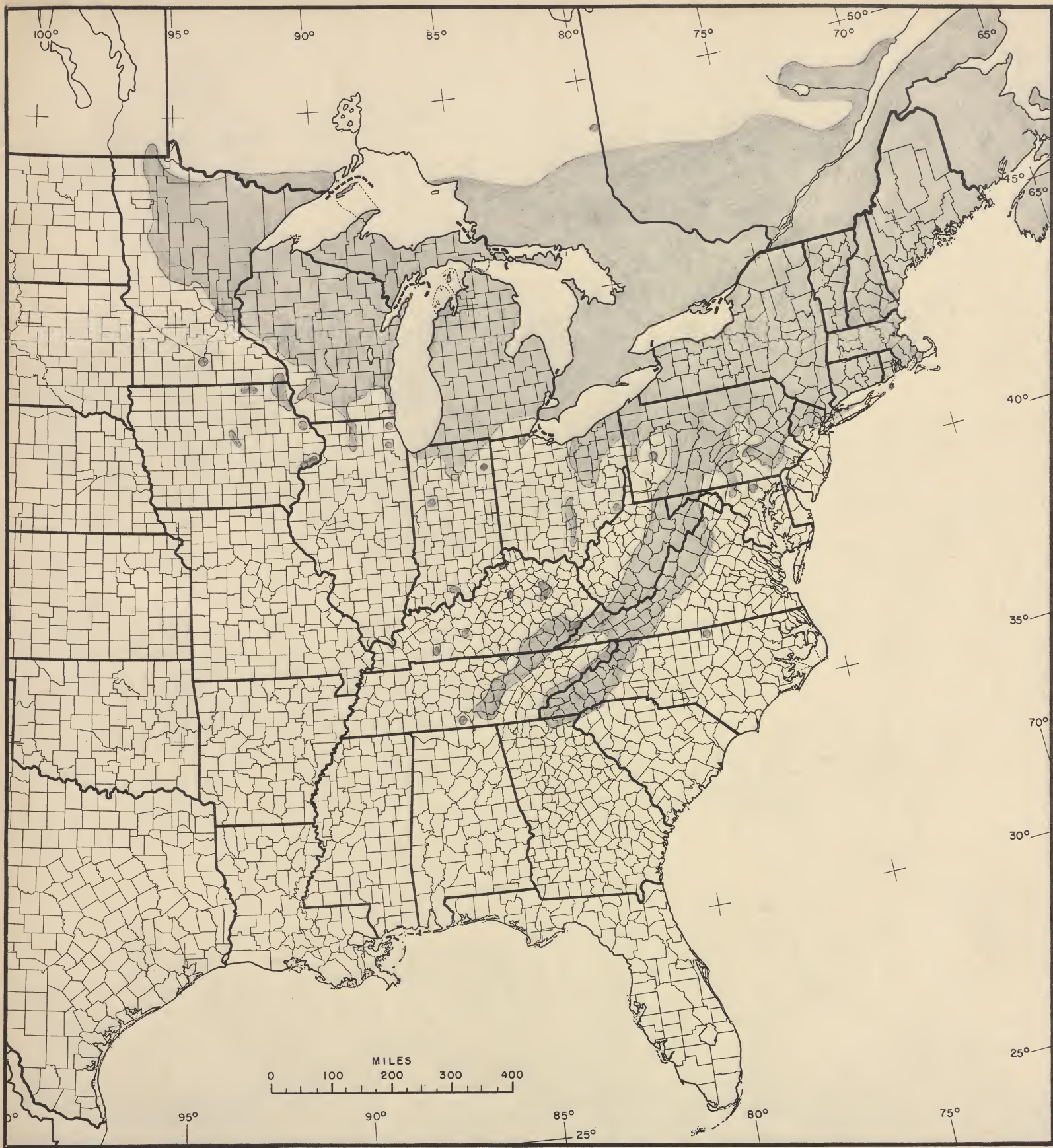
Map 104-W. red alder, *Alnus rubra* Bong.



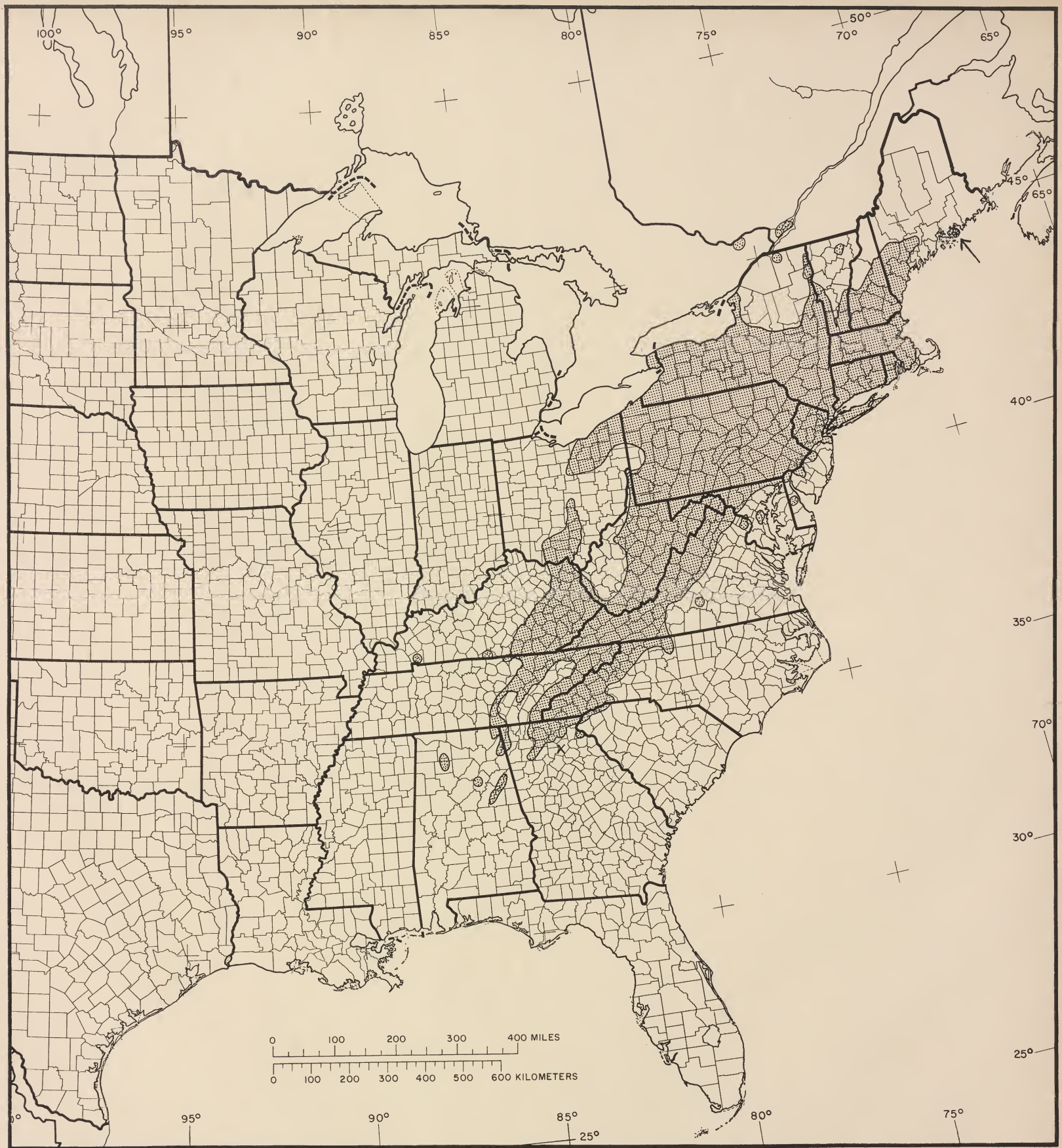
Map 104-N. red alder, *Alnus rubra* Bong.



Map 105-N. yellow birch, *Betula alleghaniensis* Britton



Map 105-E. yellow birch, *Betula alleghaniensis* Britton



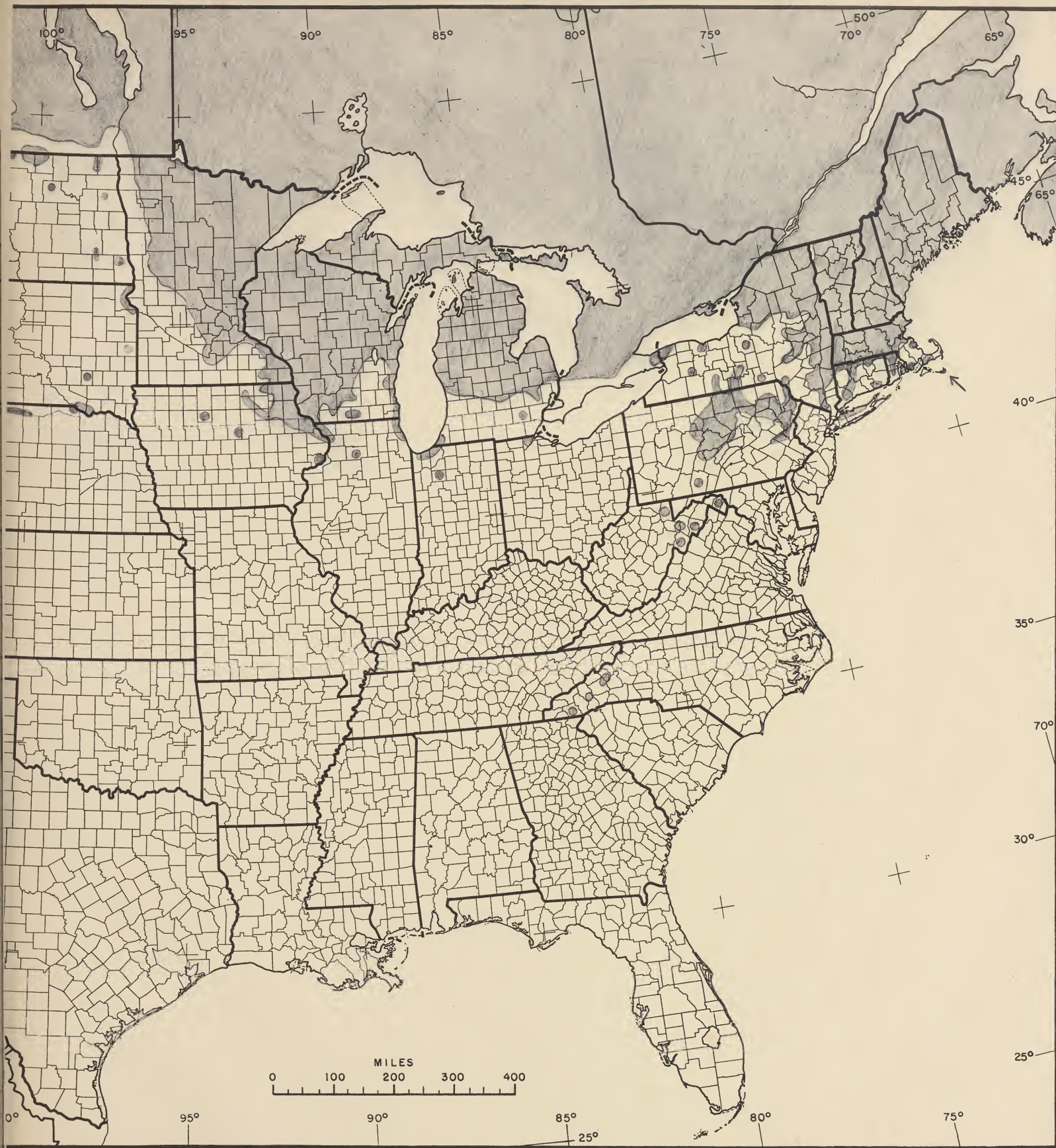
Map 106-E. sweet birch, *Betula lenta* L.



Map 107-N. paper birch, *Betula papyrifera* Marsh.



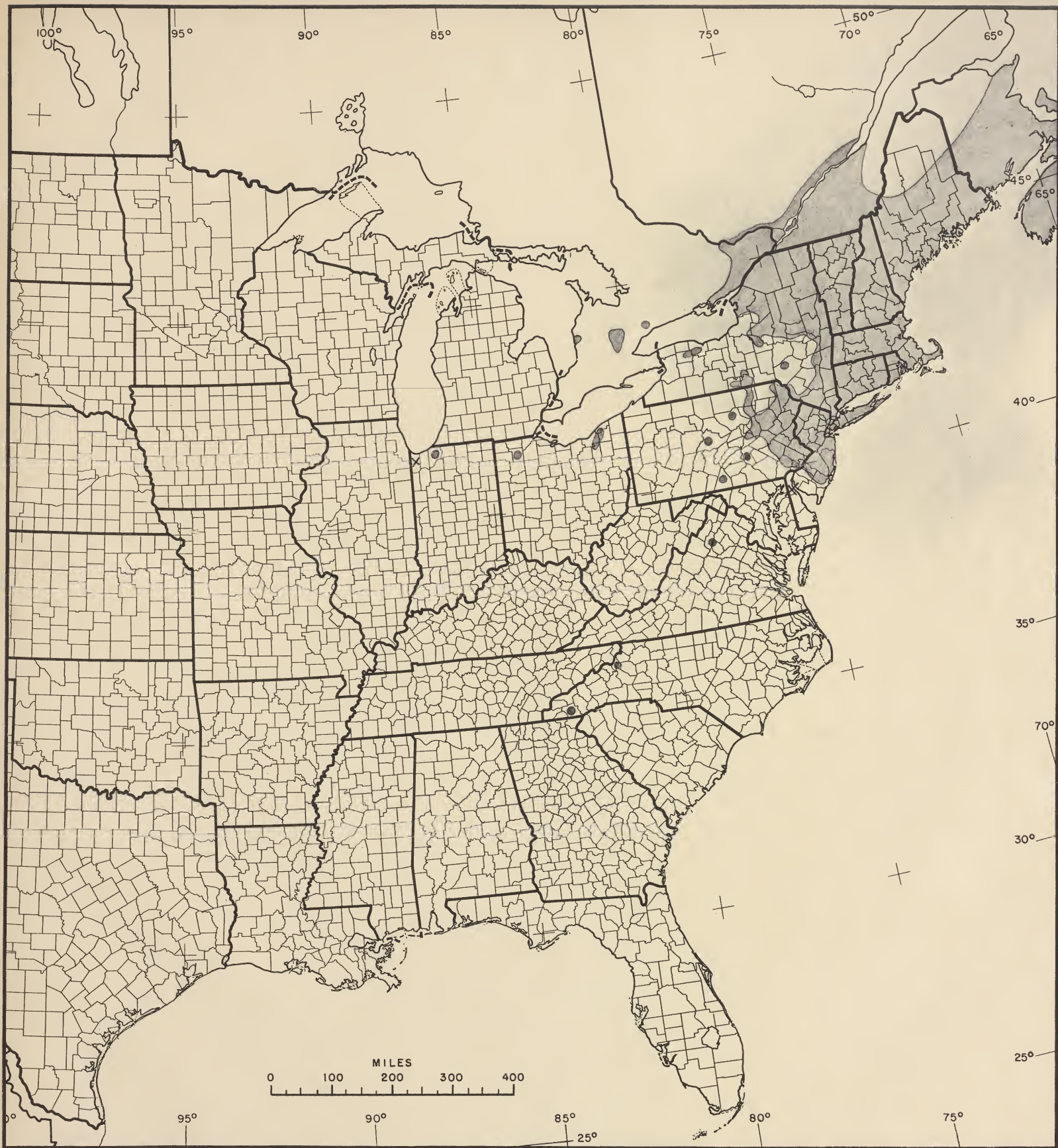
Map 107-W. paper birch, *Betula papyrifera* Marsh., western range.



Map 107-E. paper birch, *Betula papyrifera* Marsh., eastern range.



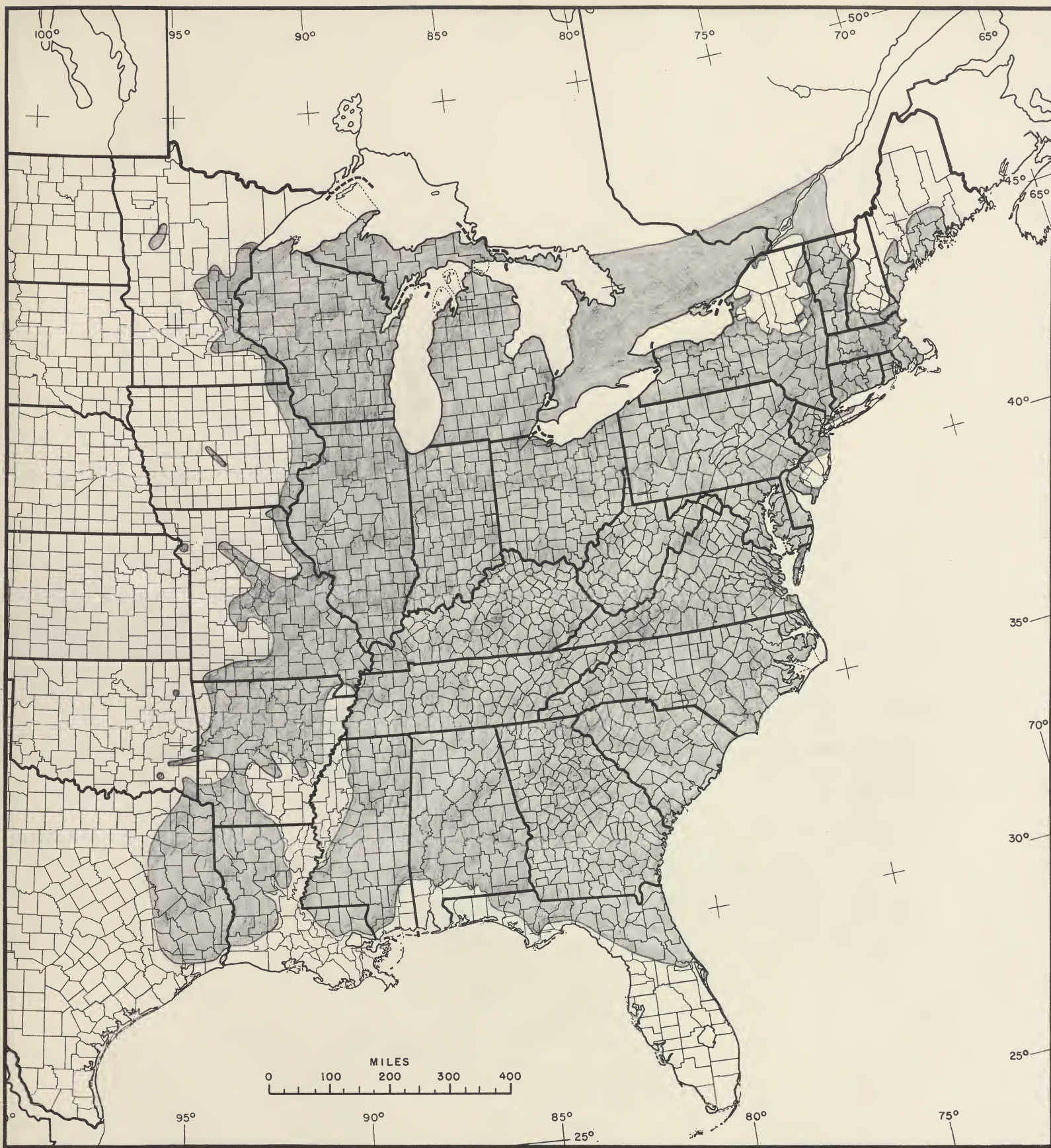
Map 108-N. gray birch, *Betula populifolia* Marsh.



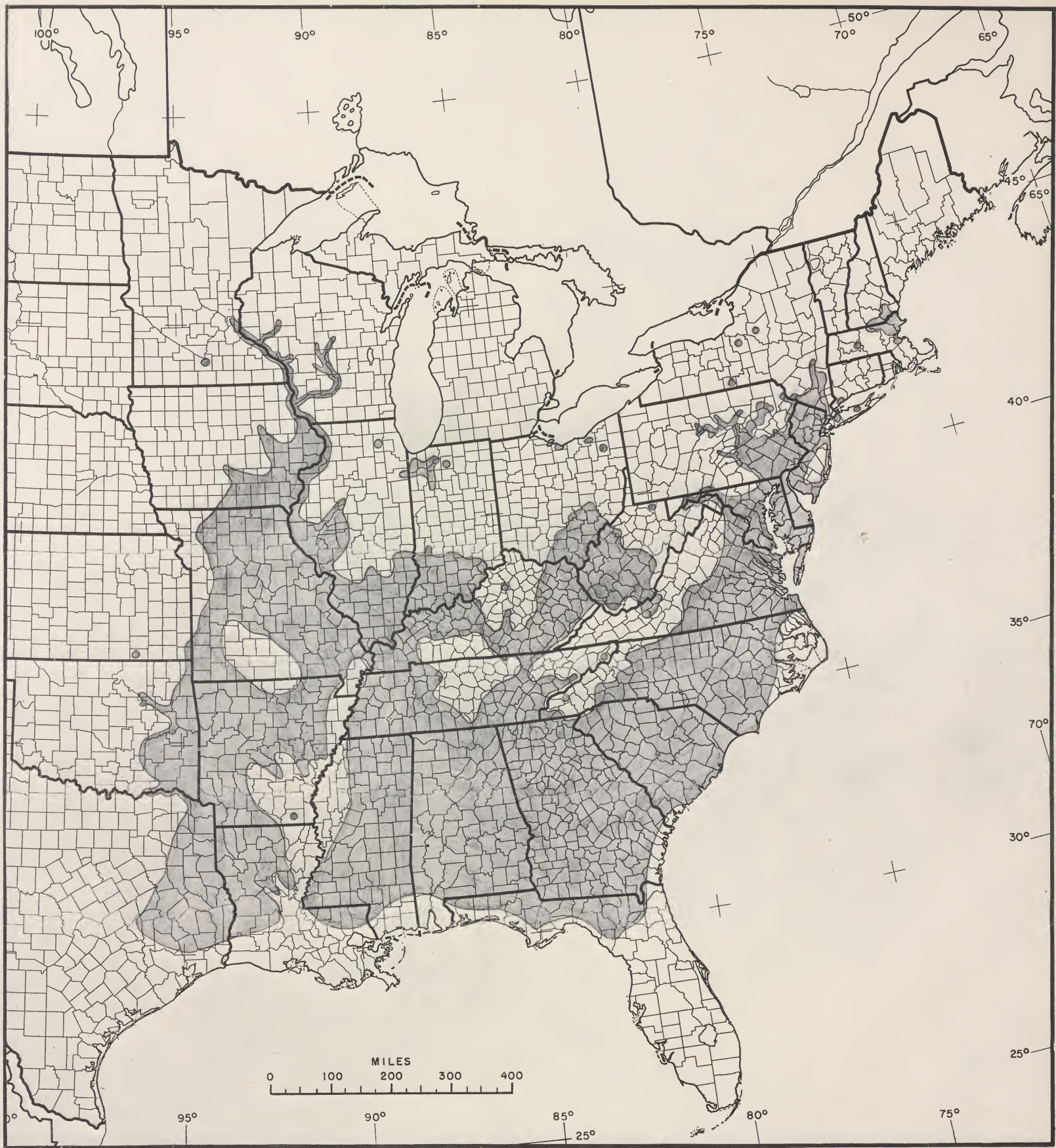
Map 108-E. gray birch, *Betula populifolia* Marsh.



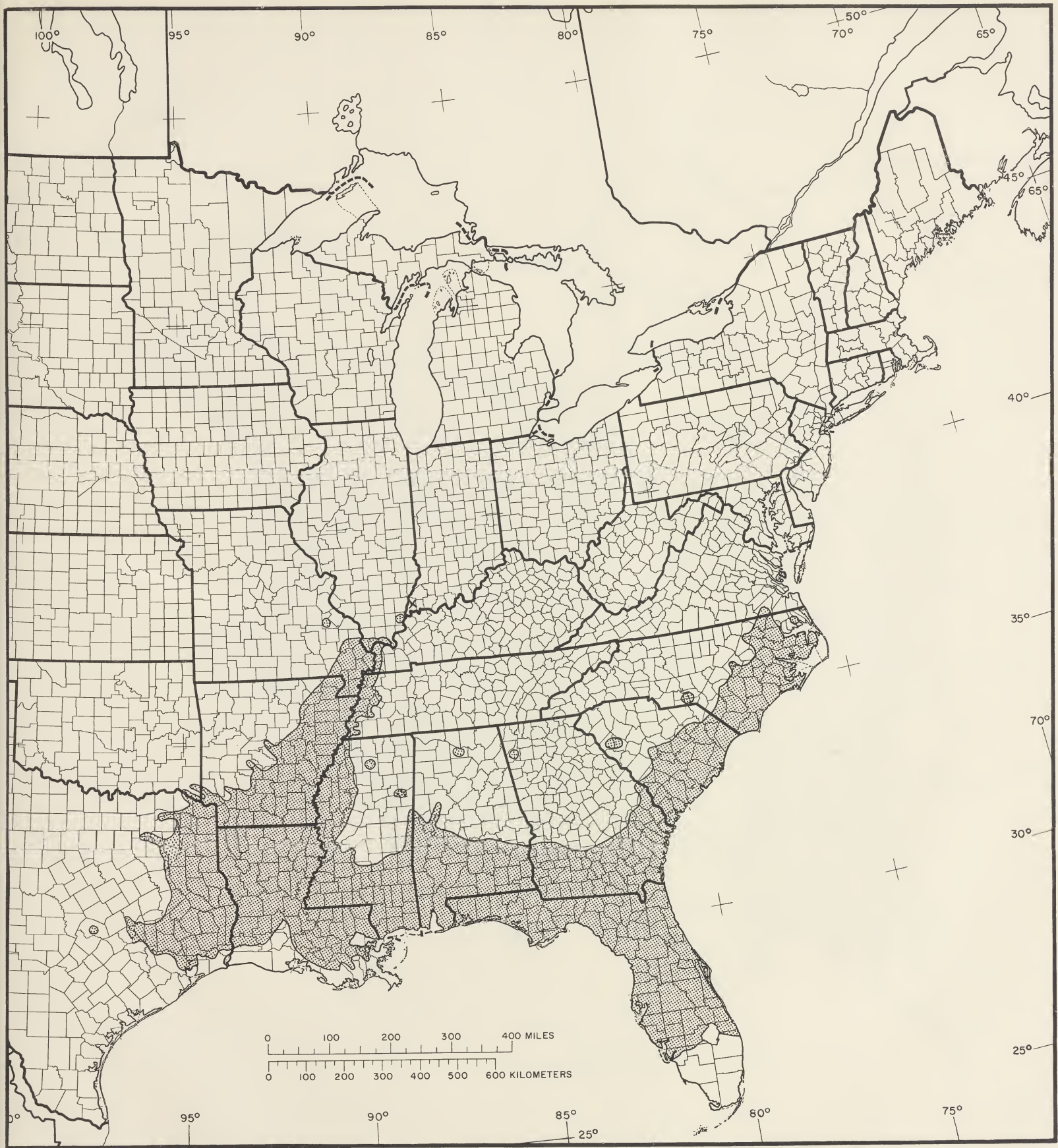
Map 109-N. American hornbeam, *Carpinus caroliniana* Walt.



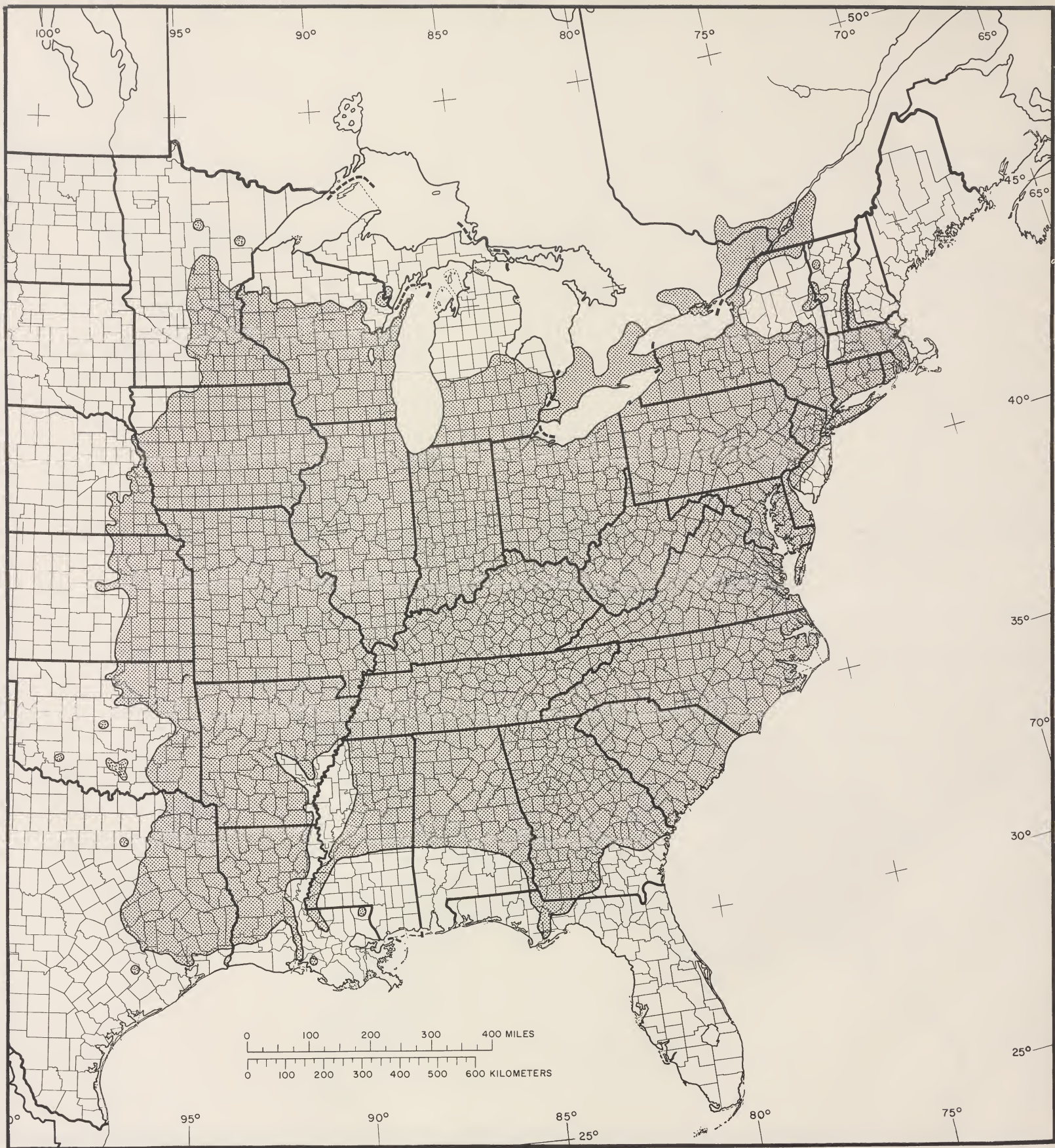
Map 109-E. American hornbeam, *Carpinus caroliniana* Walt.



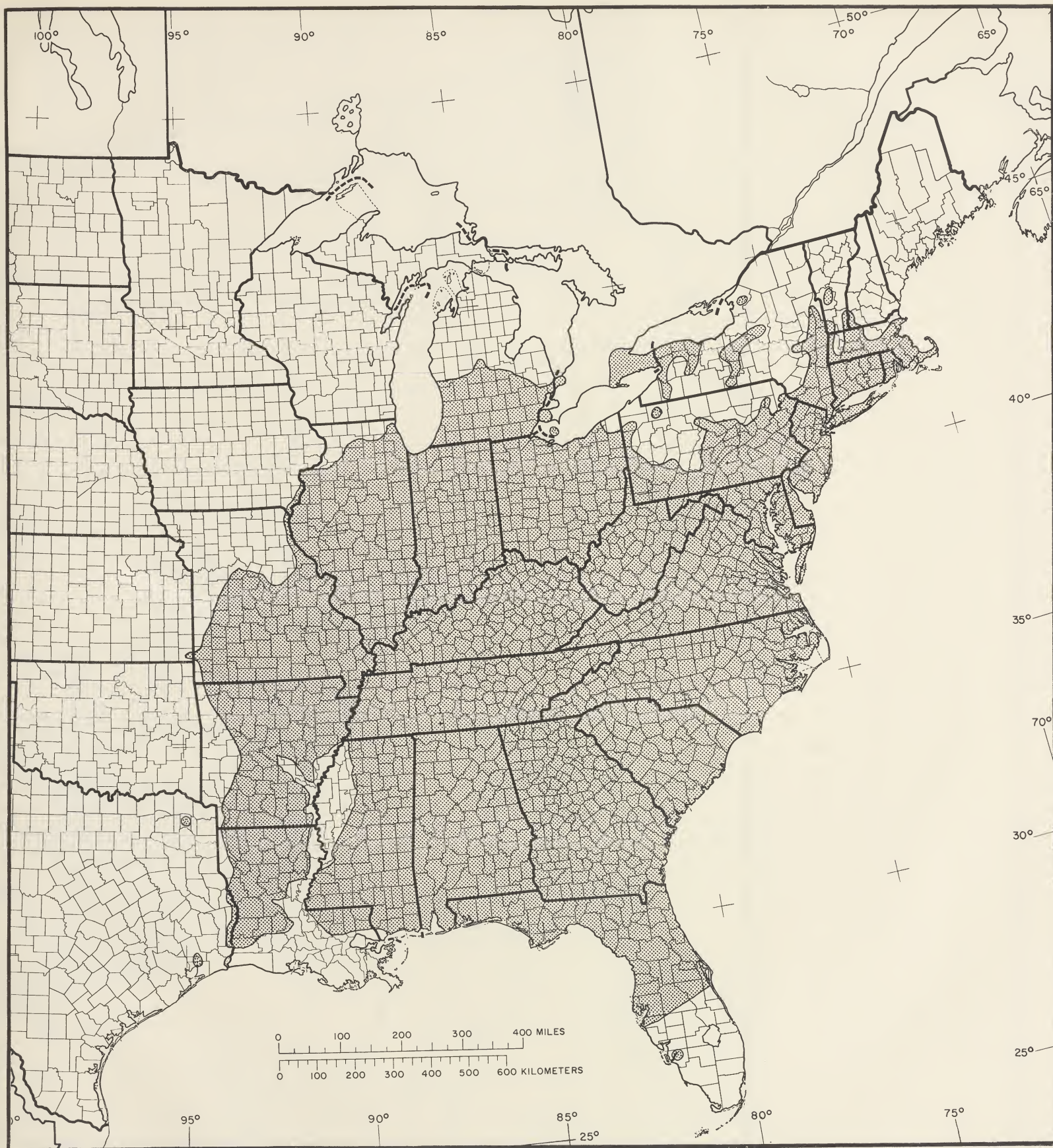
Map 110-E. river birch, *Betula nigra* L.



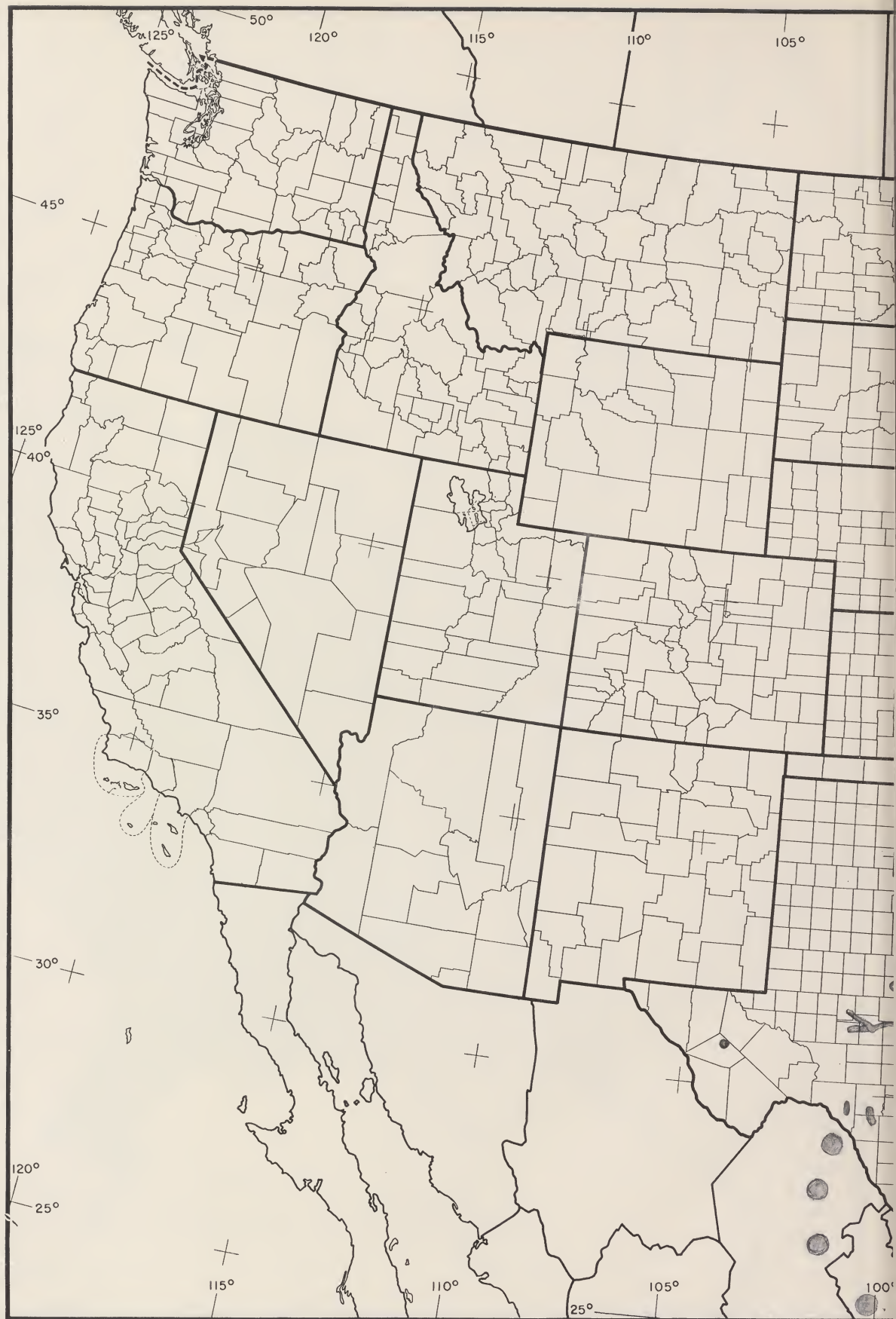
Map 111-E. water hickory, *Carya aquatica* (Michx. f.) Nutt.



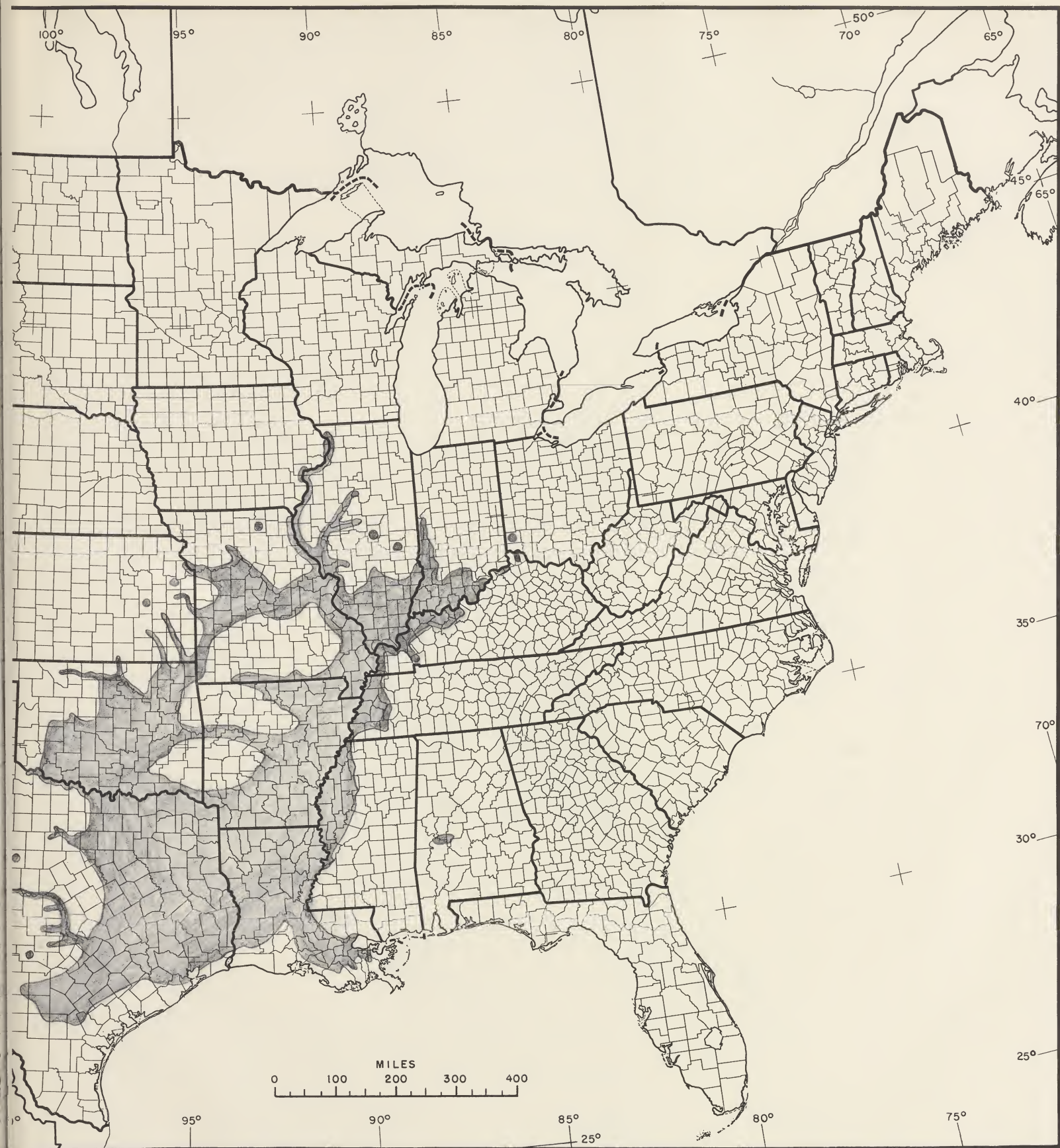
Map 112-E. bitternut hickory, *Carya cordiformis* (Wangenh.) K. Koch



Map 113-E. pignut hickory, *Carya glabra* (Mill.) Sweet



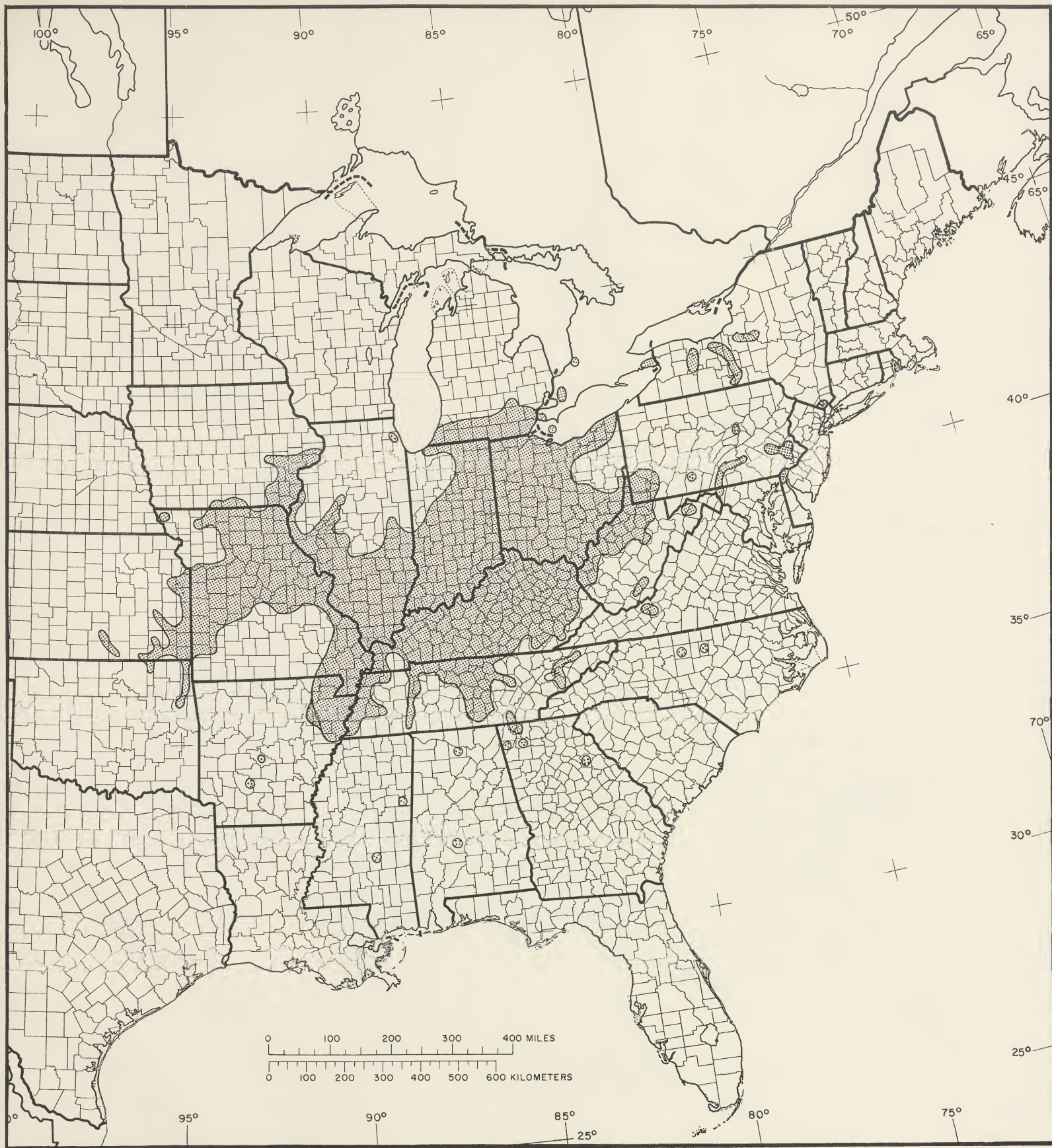
Map 114-W. pecan, *Carya illinoensis* (Wangenh.) K. Koch, western range.



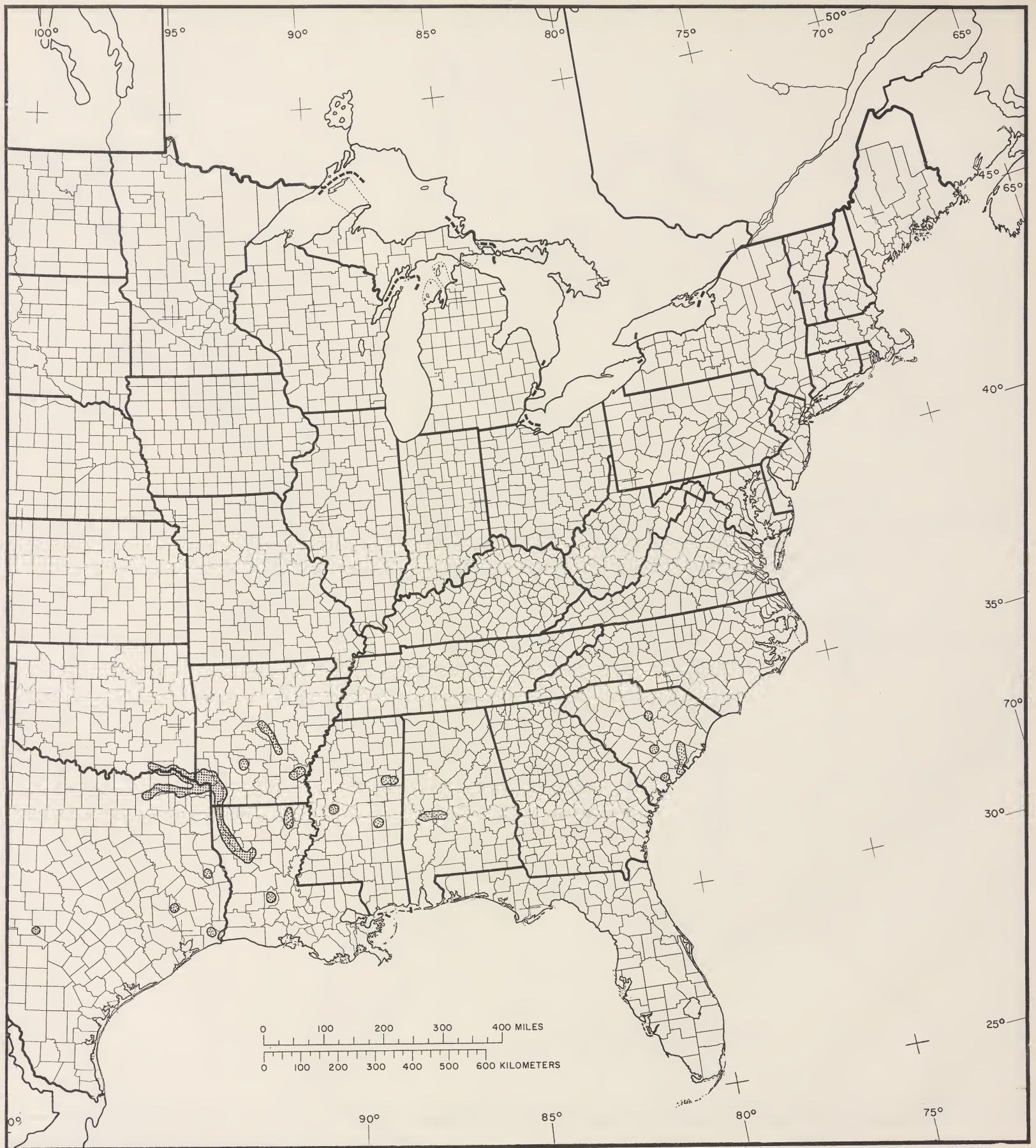
Map 114-E. pecan, *Carya illinoensis* (Wangenh.) K. Koch, eastern range.



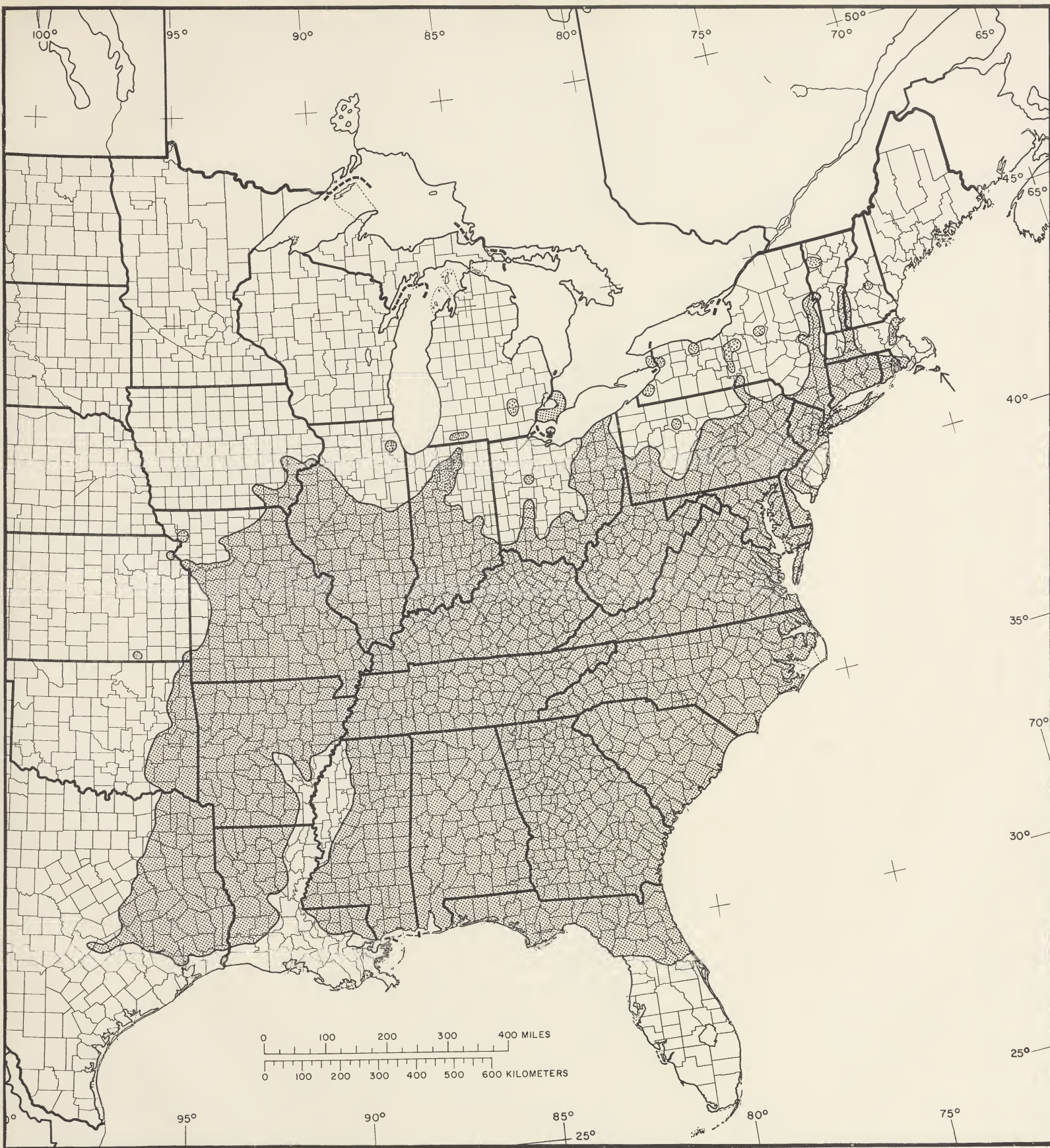
Map 114-N. pecan, *Carya illinoensis* (Wangenh.) K. Koch



Map 115-E. shellbark hickory, *Carya laciniosa* (Michx. f.) Loud.



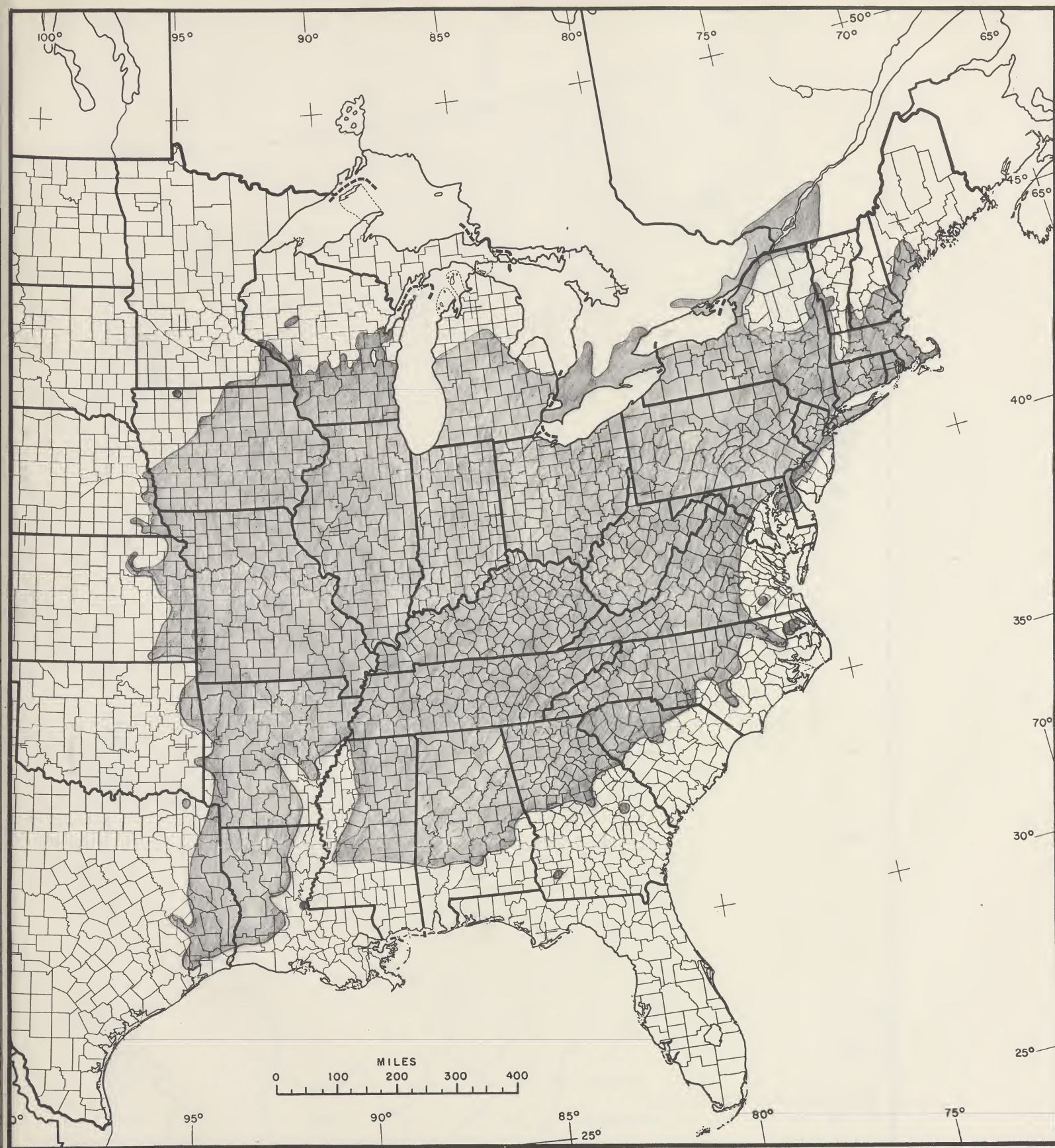
Map 116-E. nutmeg hickory, *Carya myristicaeformis* (Michx. f.) Nutt.



Map 117-E. mockernut hickory, *Carya tomentosa* Nutt.



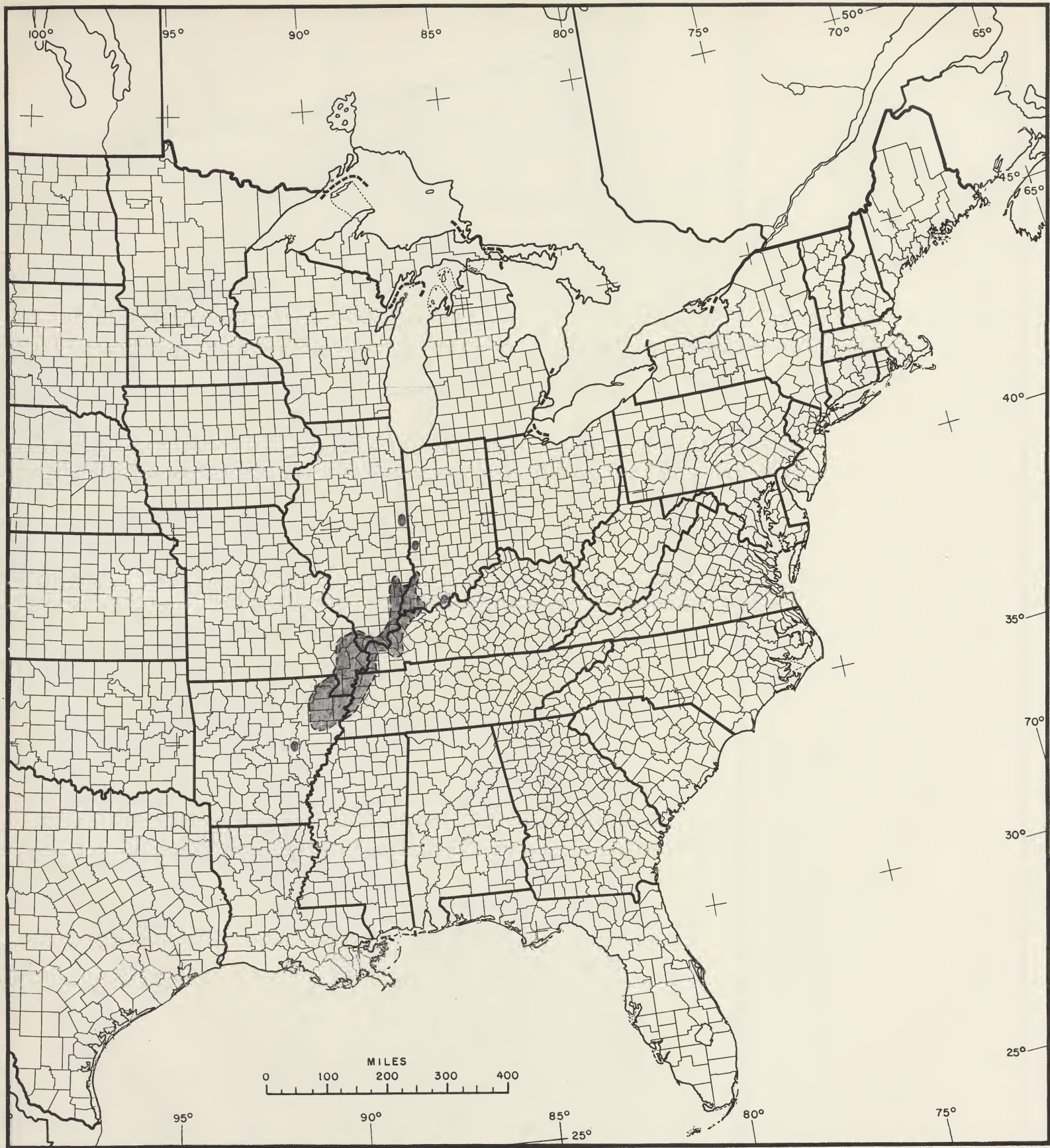
Map 118-N. shagbark hickory, *Carya ovata* (Mill.) K. Koch



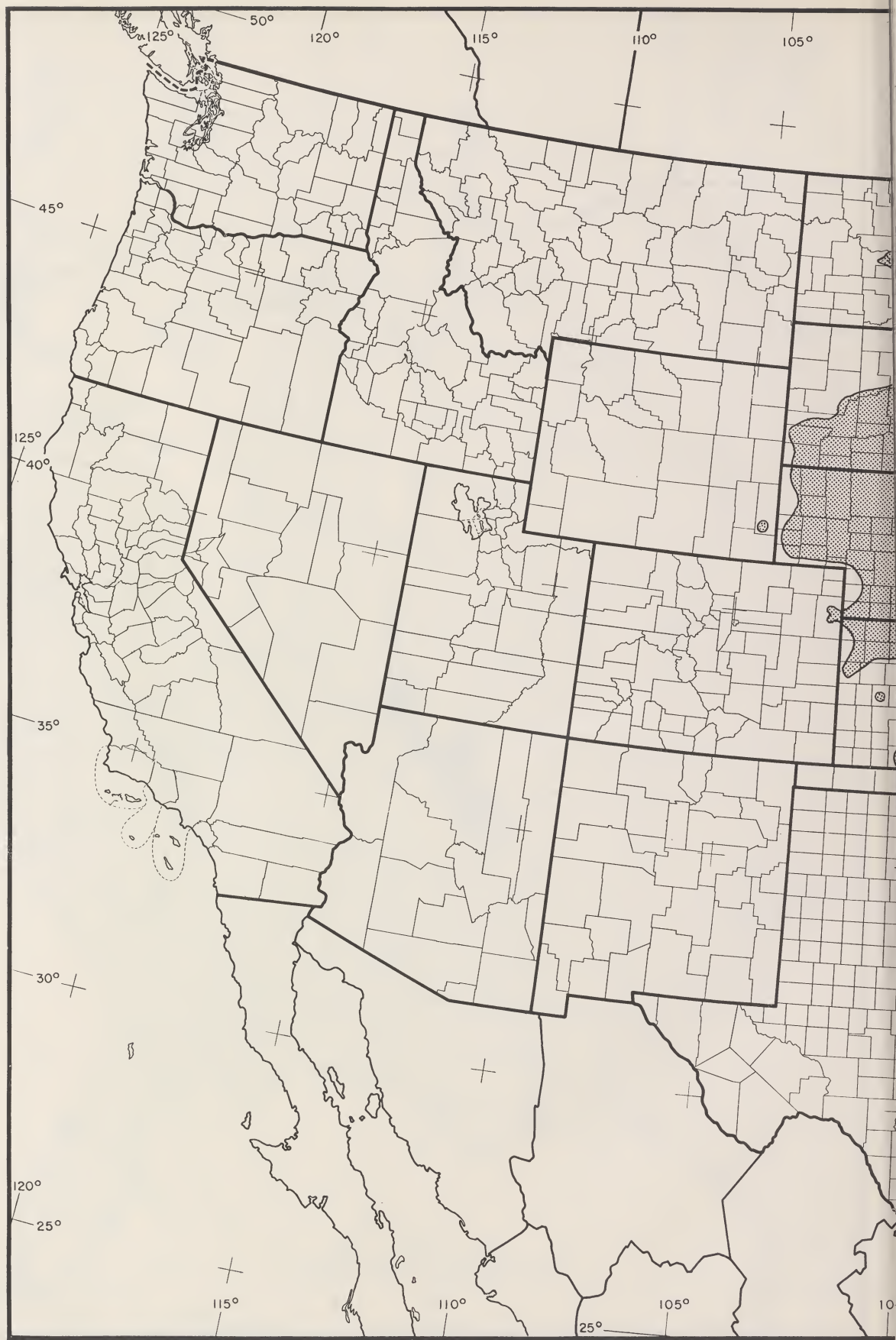
Map 118-E. shagbark hickory, *Carya ovata* (Mill.) K. Koch



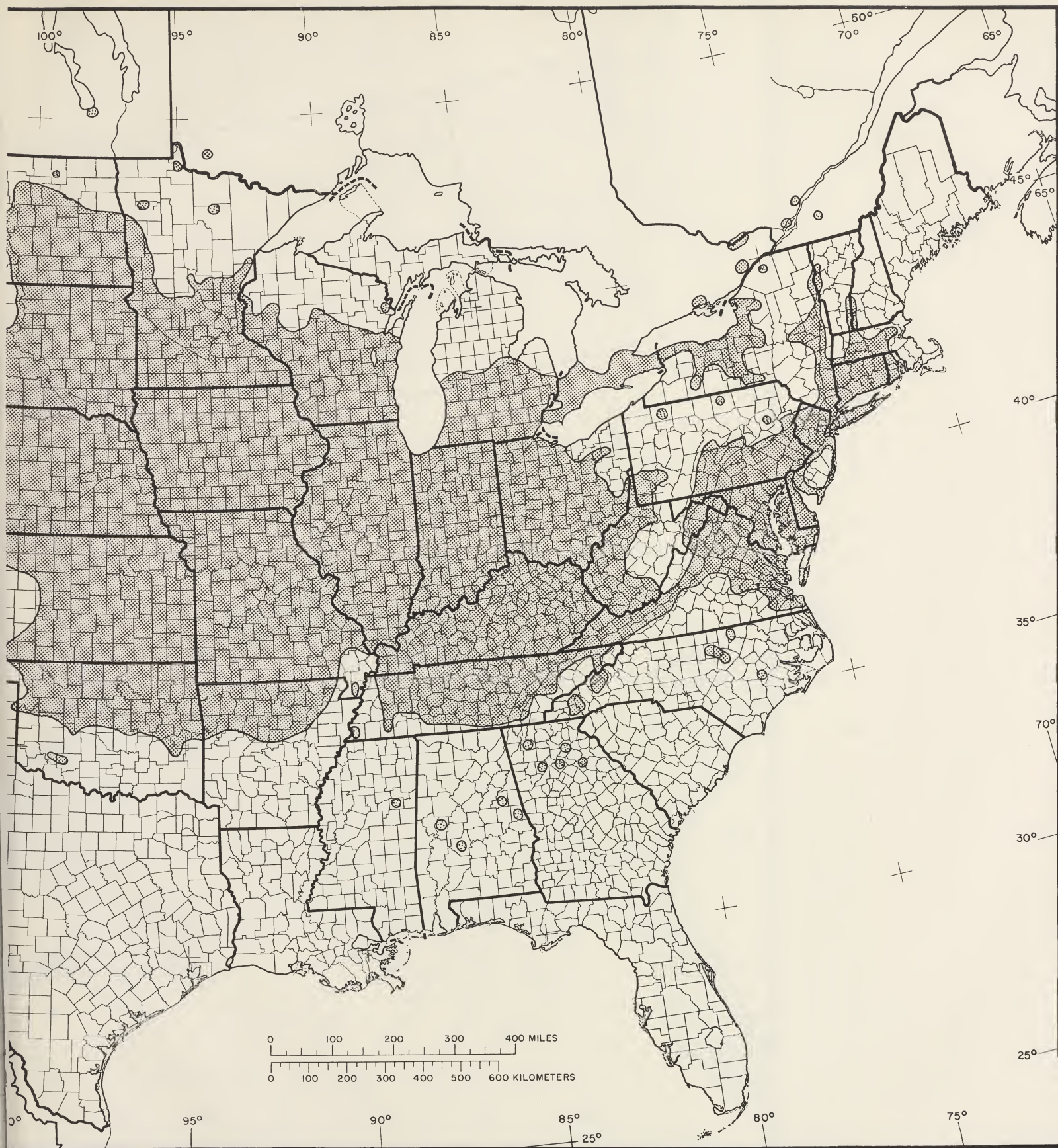
Map 119-W. golden chinkapin, *Castanopsis chrysophylla* (Dougl.) A. DC.



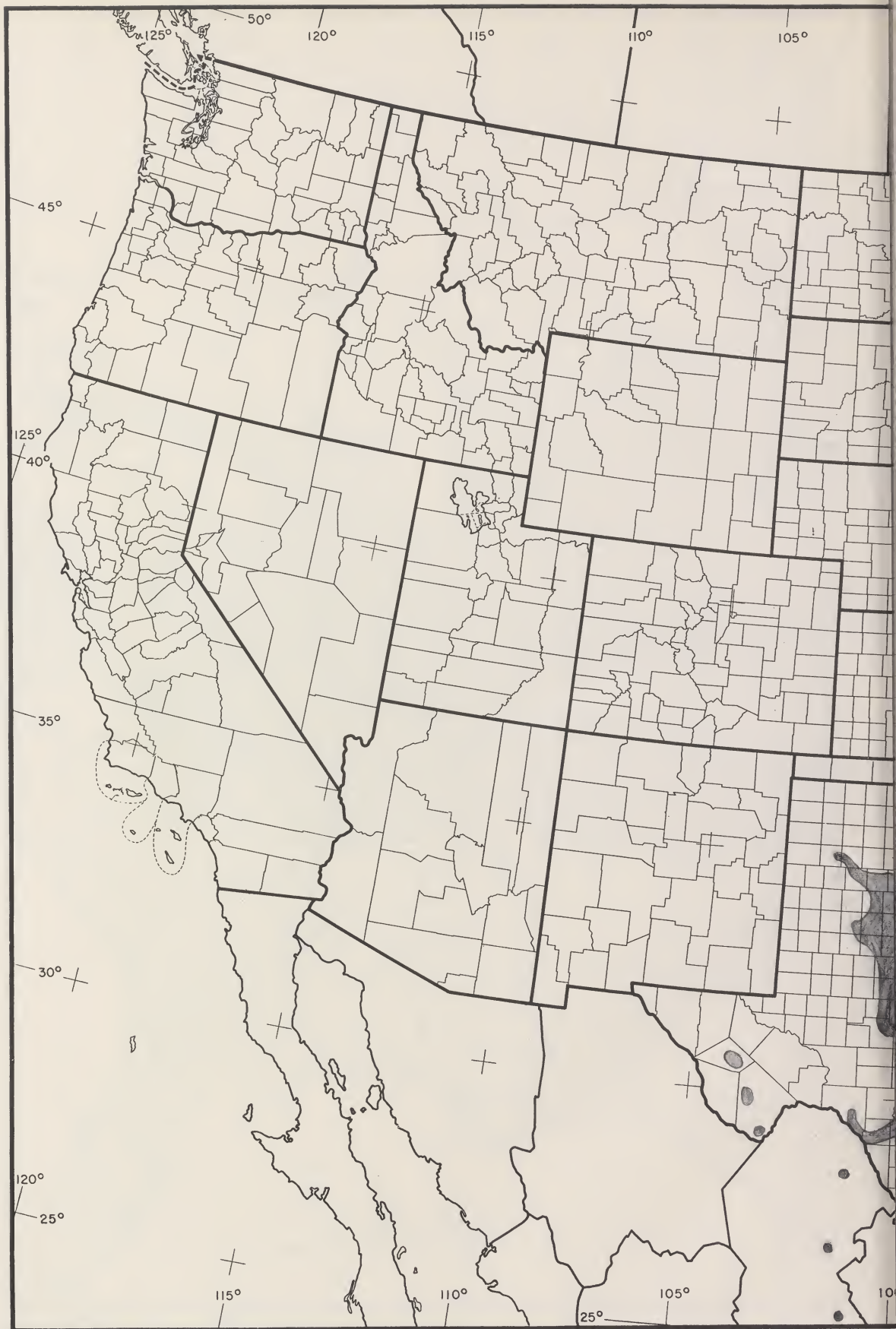
Map 120-E. northern catalpa, *Catalpa speciosa* Warder. Native range uncertain and may have extended south to Louisiana.



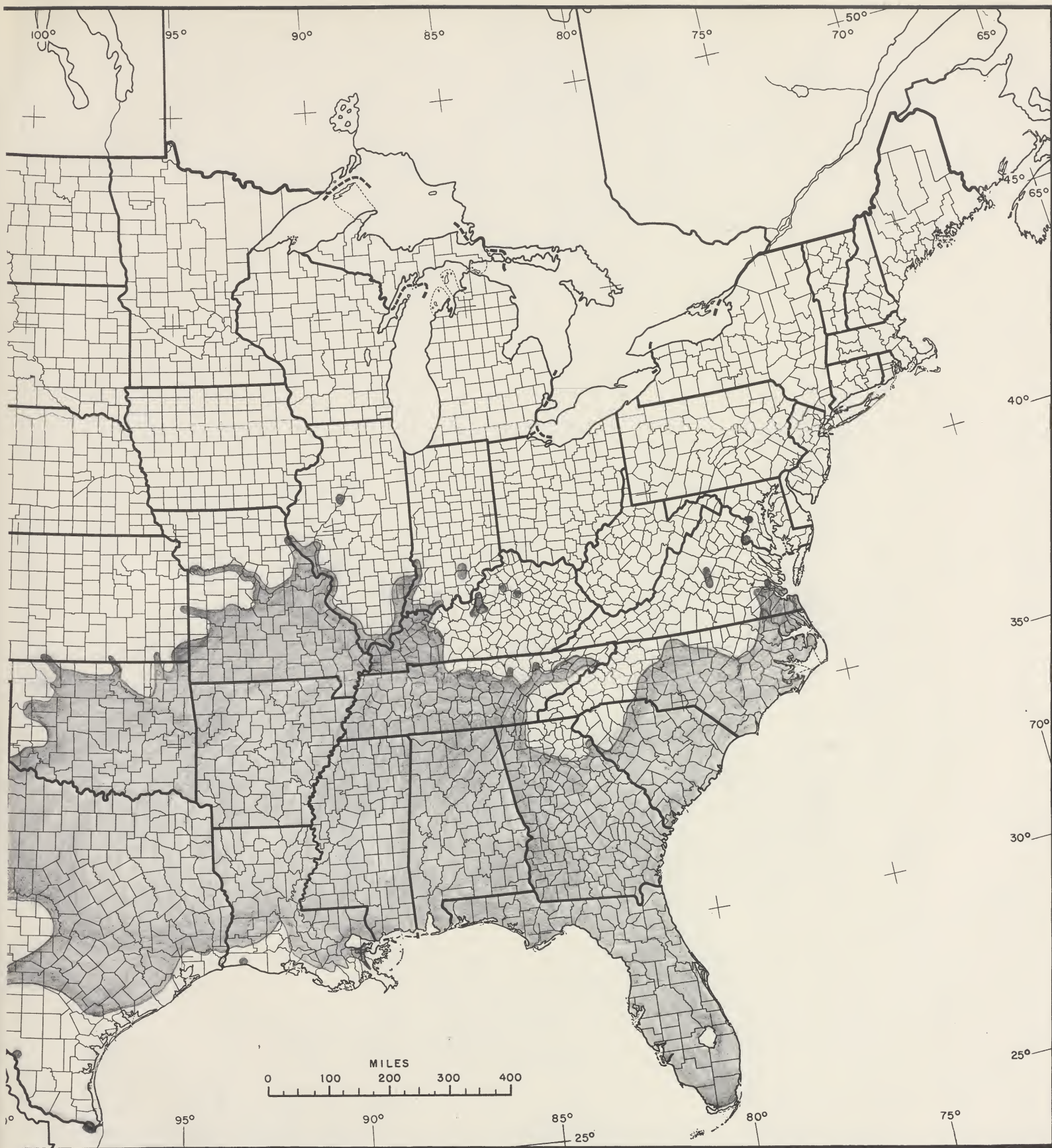
Map 121-W. hackberry, *Celtis occidentalis* L., western range.



Map 121-E. hackberry, *Celtis occidentalis* L., eastern range.



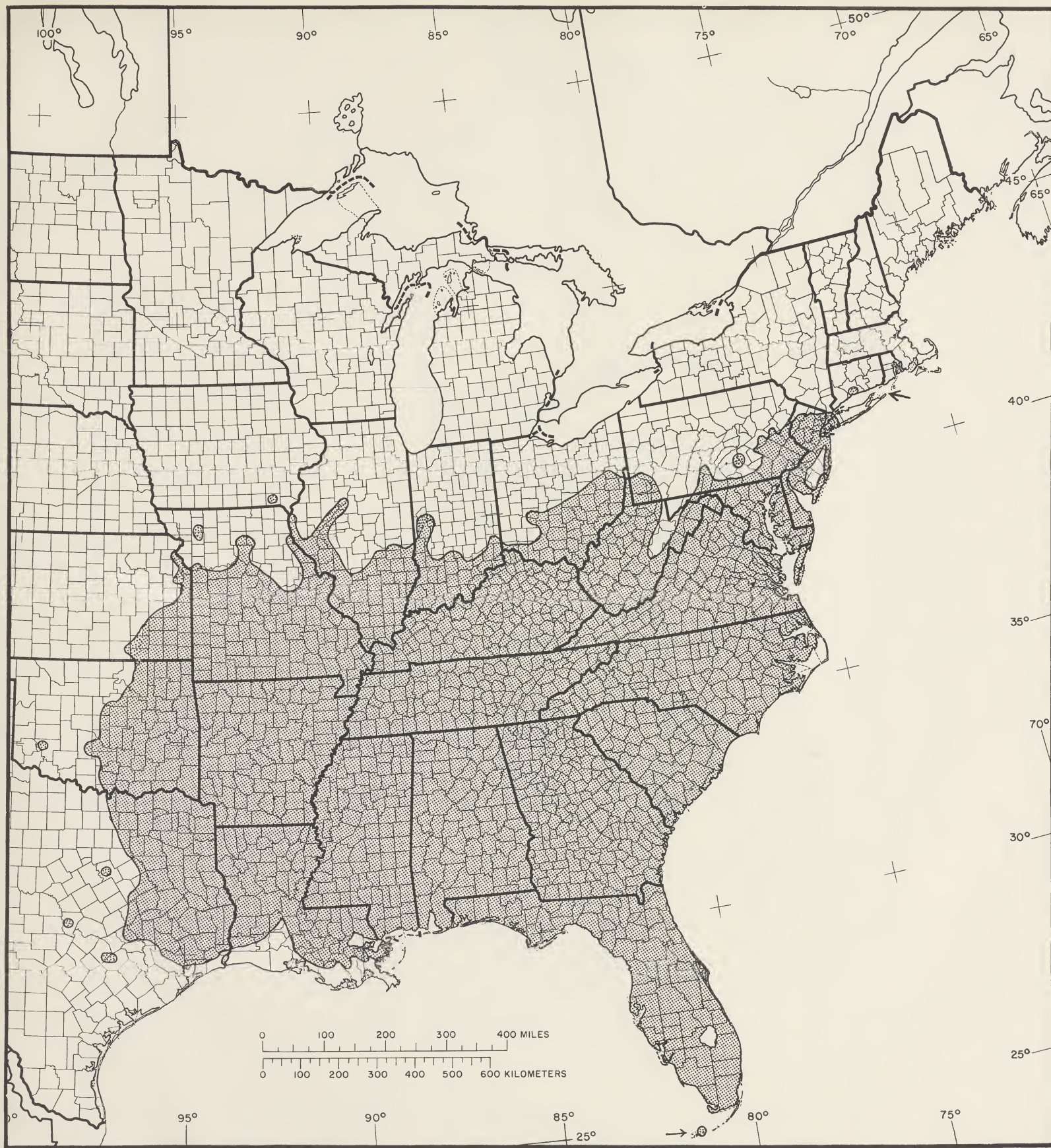
Map 122-W. sugarberry, *Celtis laevigata* Willd., western range.



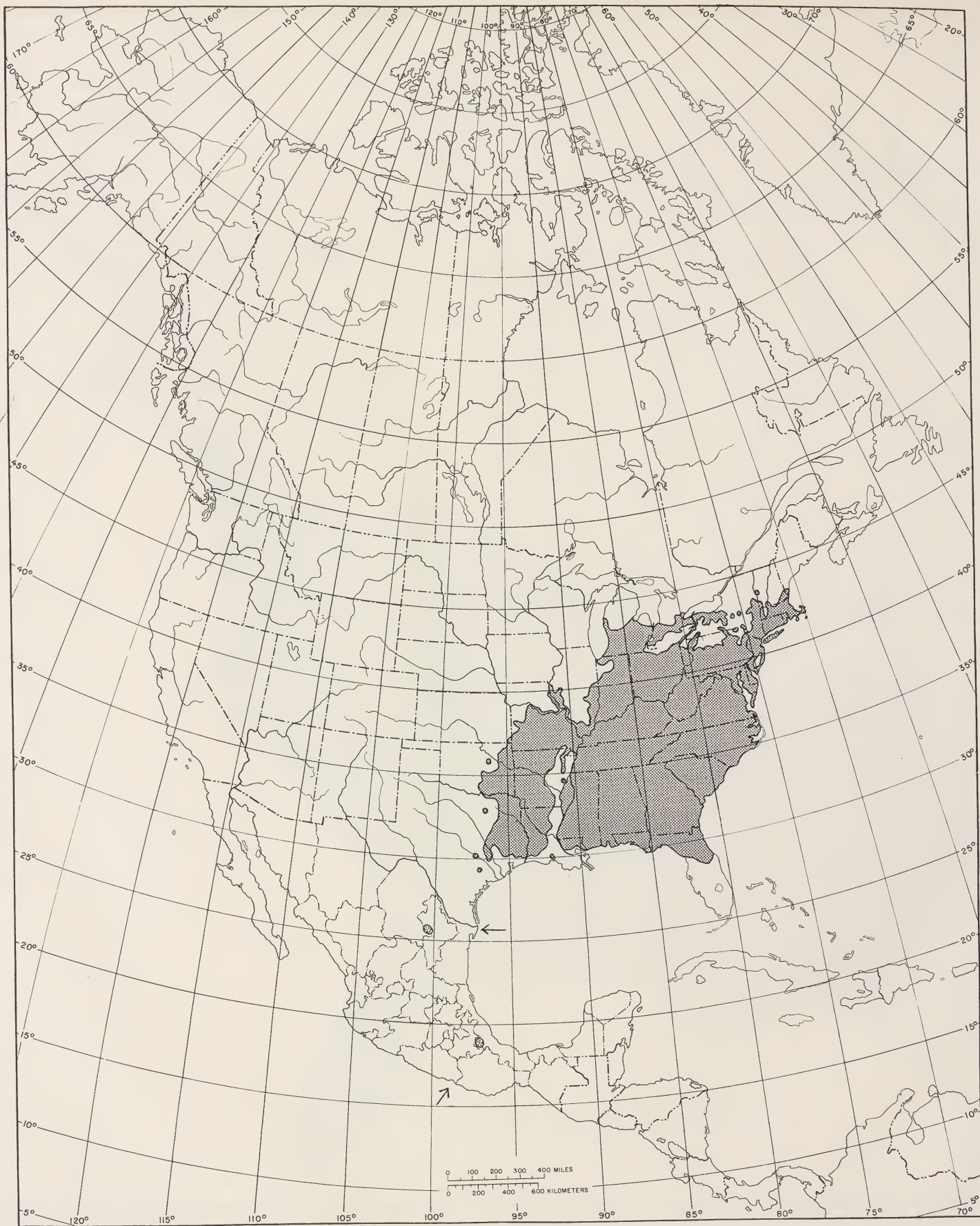
Map 122-E. sugarberry, *Celtis laevigata* Willd., eastern range.



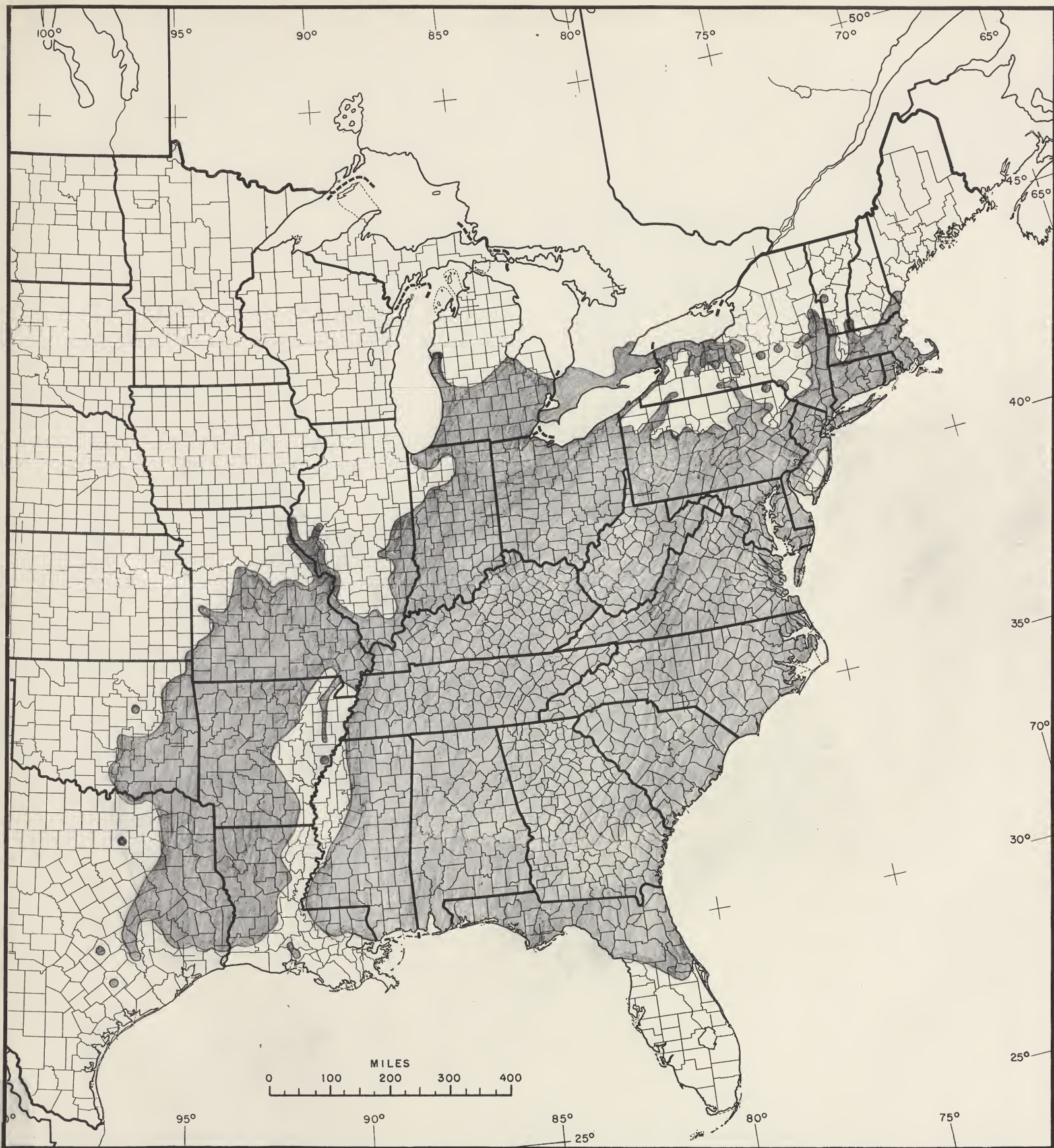
Map 122-N. sugarberry, *Celtis laevigata* Willd.



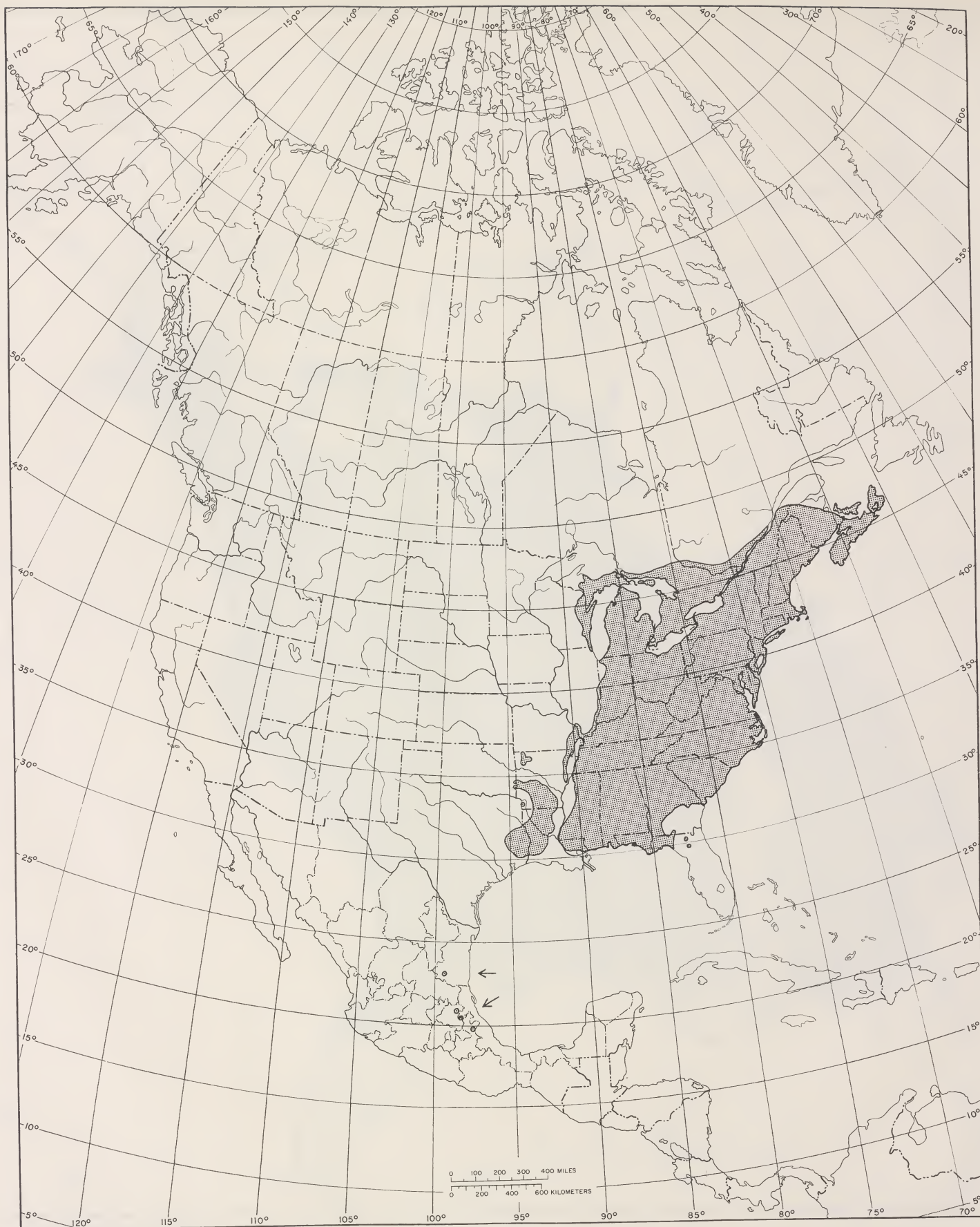
Map 123-E. common persimmon, *Diospyros virginiana* L.



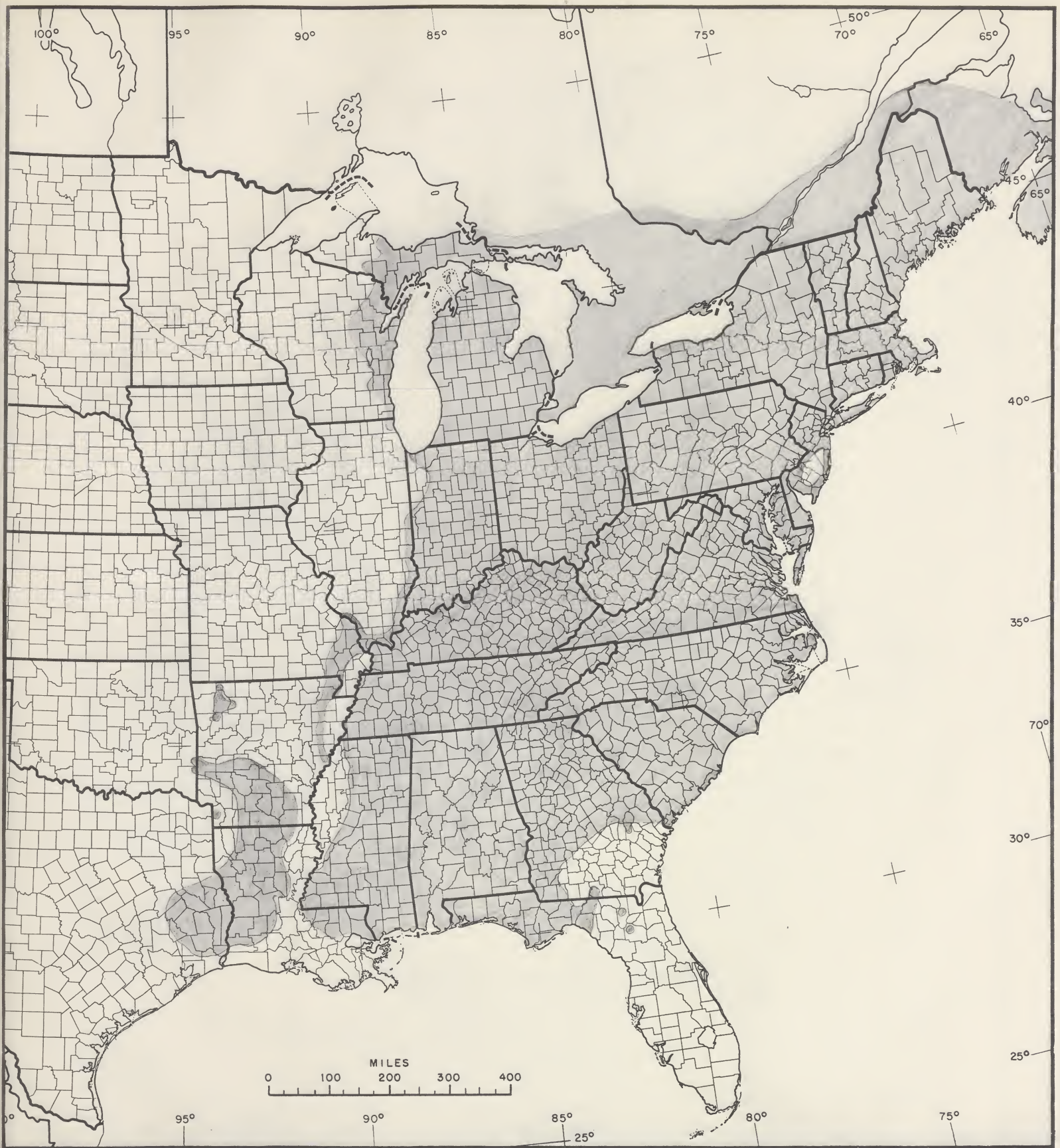
Map 124-N. flowering dogwood, *Cornus florida* L.



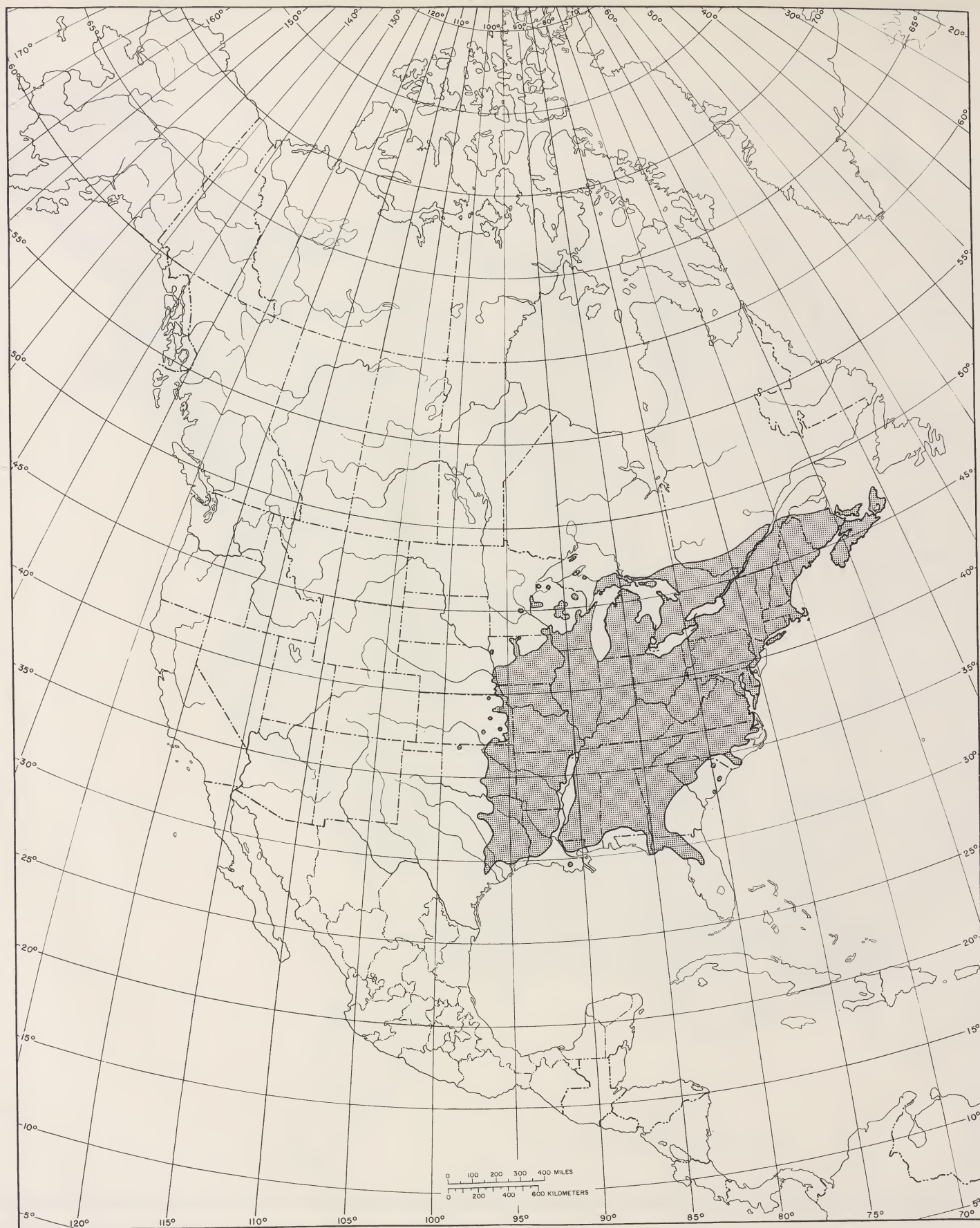
Map 124-E. flowering dogwood, *Cornus florida* L.



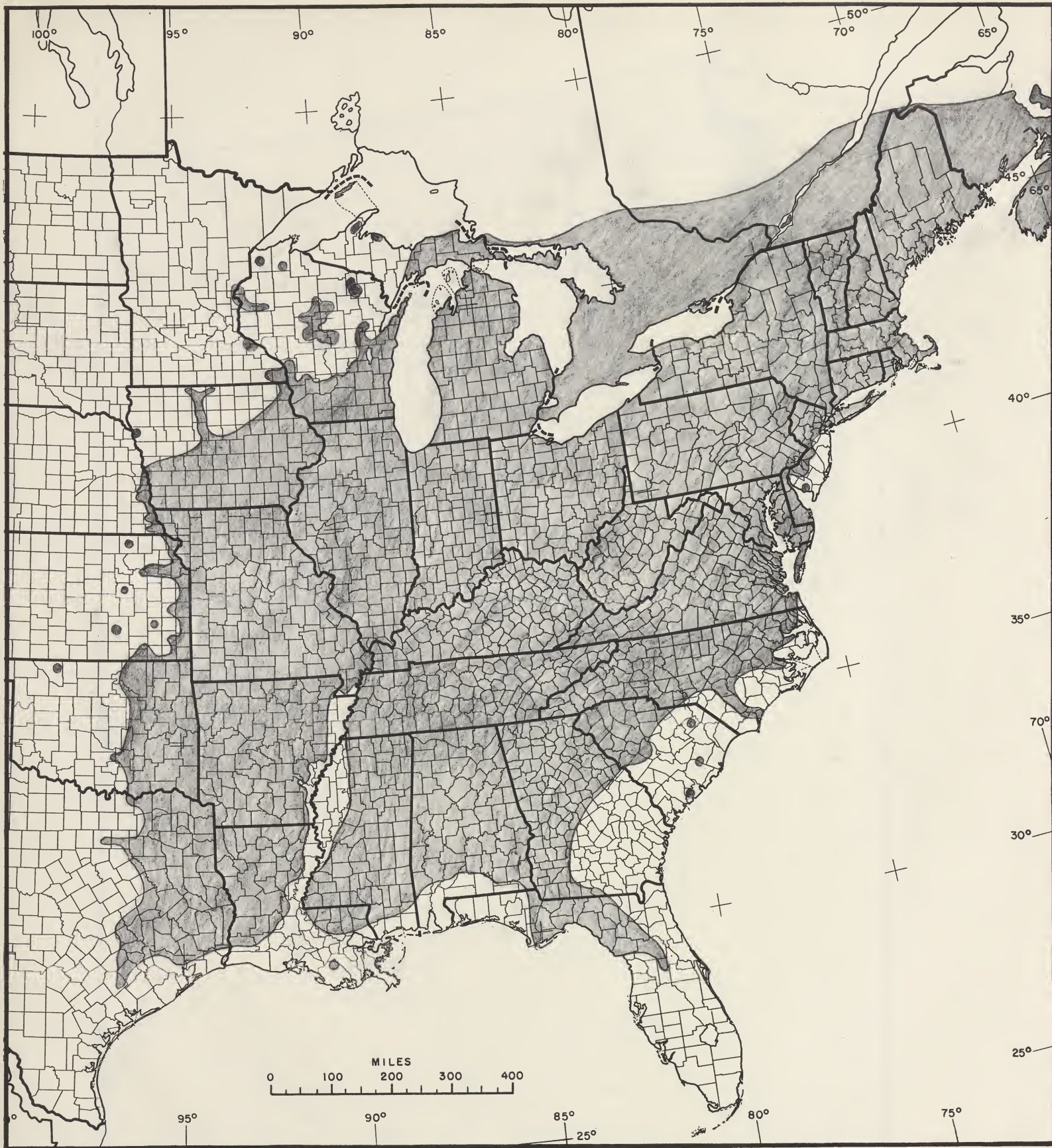
Map 125-N. American beech, *Fagus grandifolia* Ehrh.



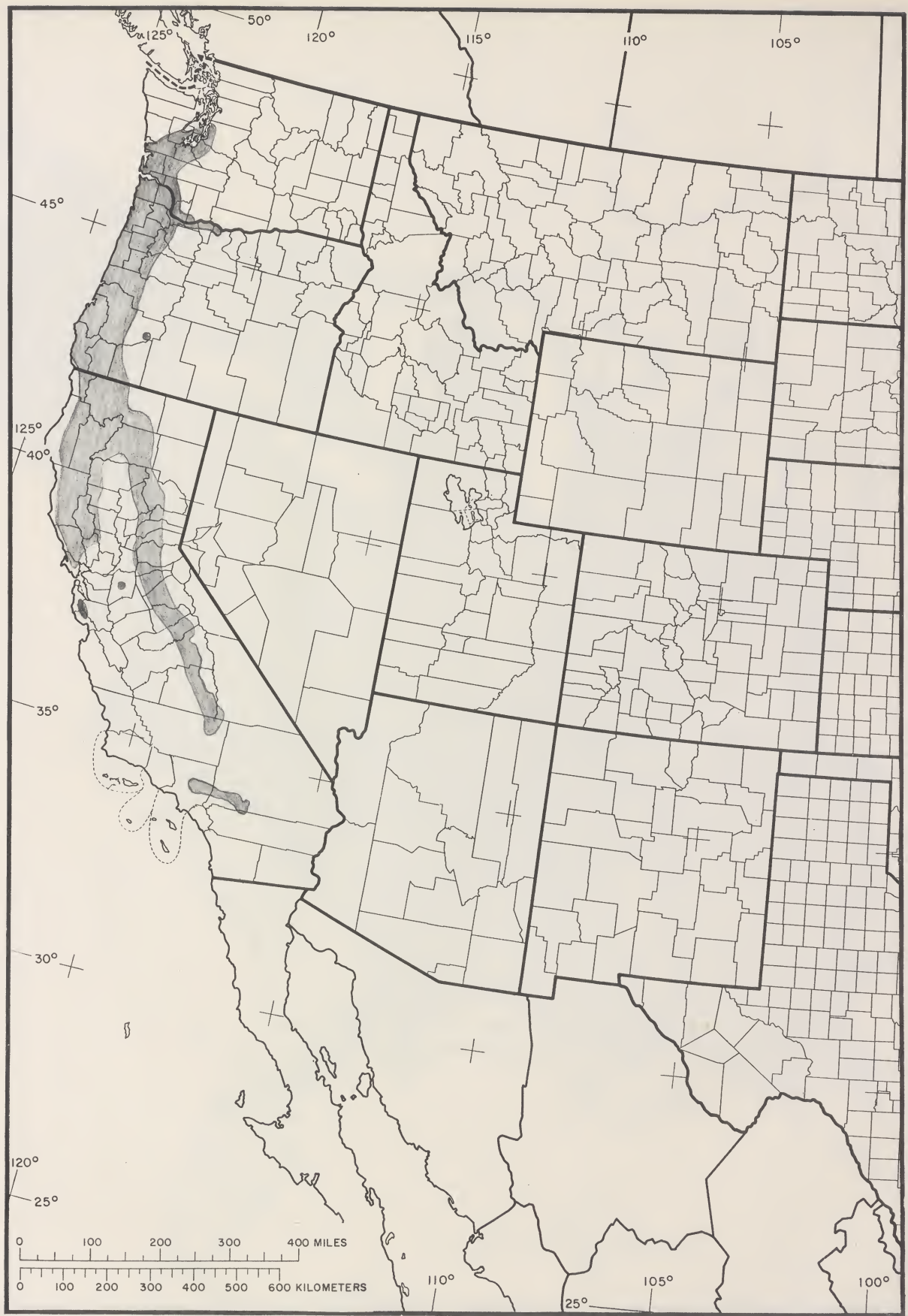
Map 125-E. American beech, *Fagus grandifolia* Ehrh.



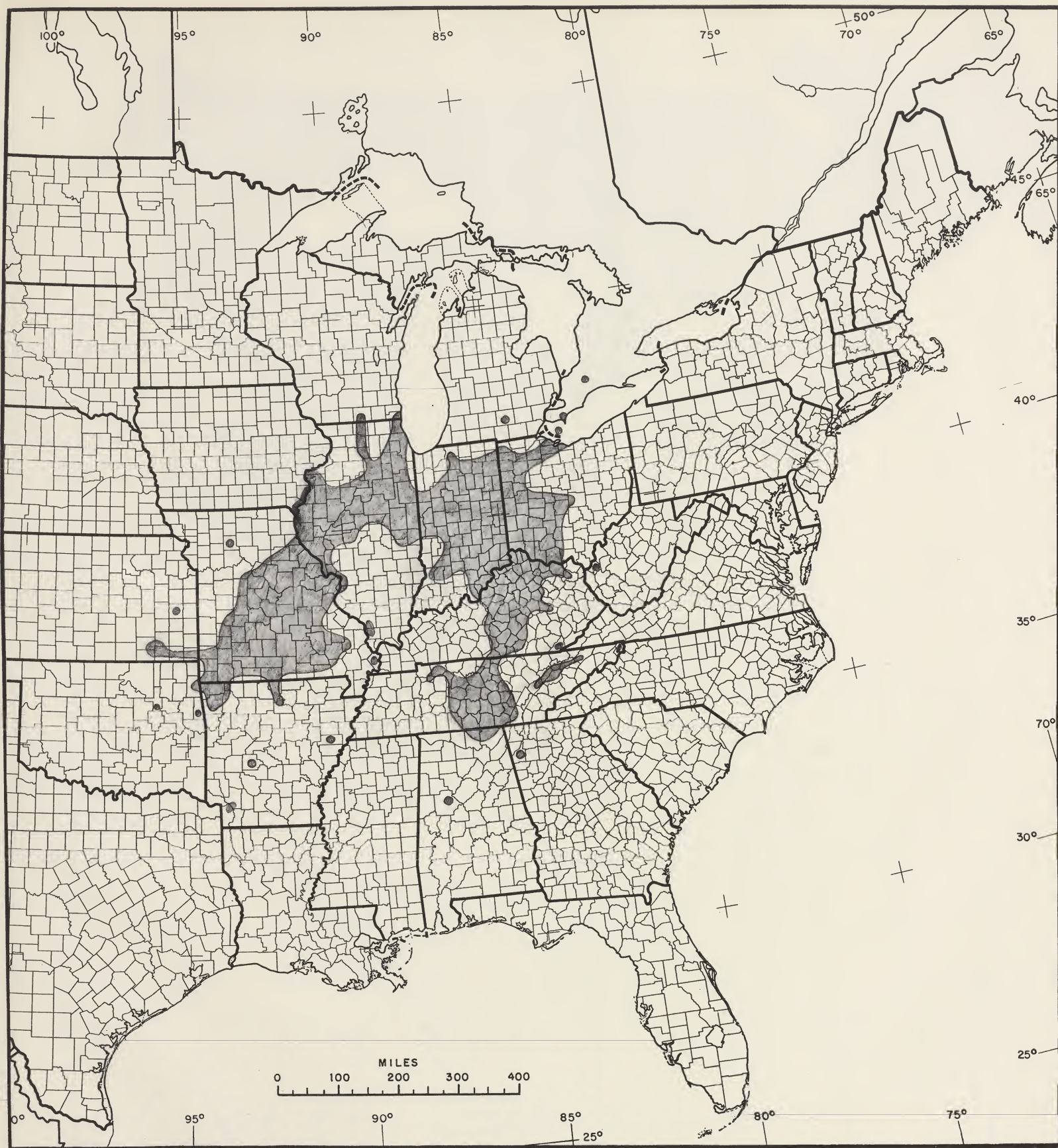
Map 126-N. white ash, *Fraxinus americana* L.



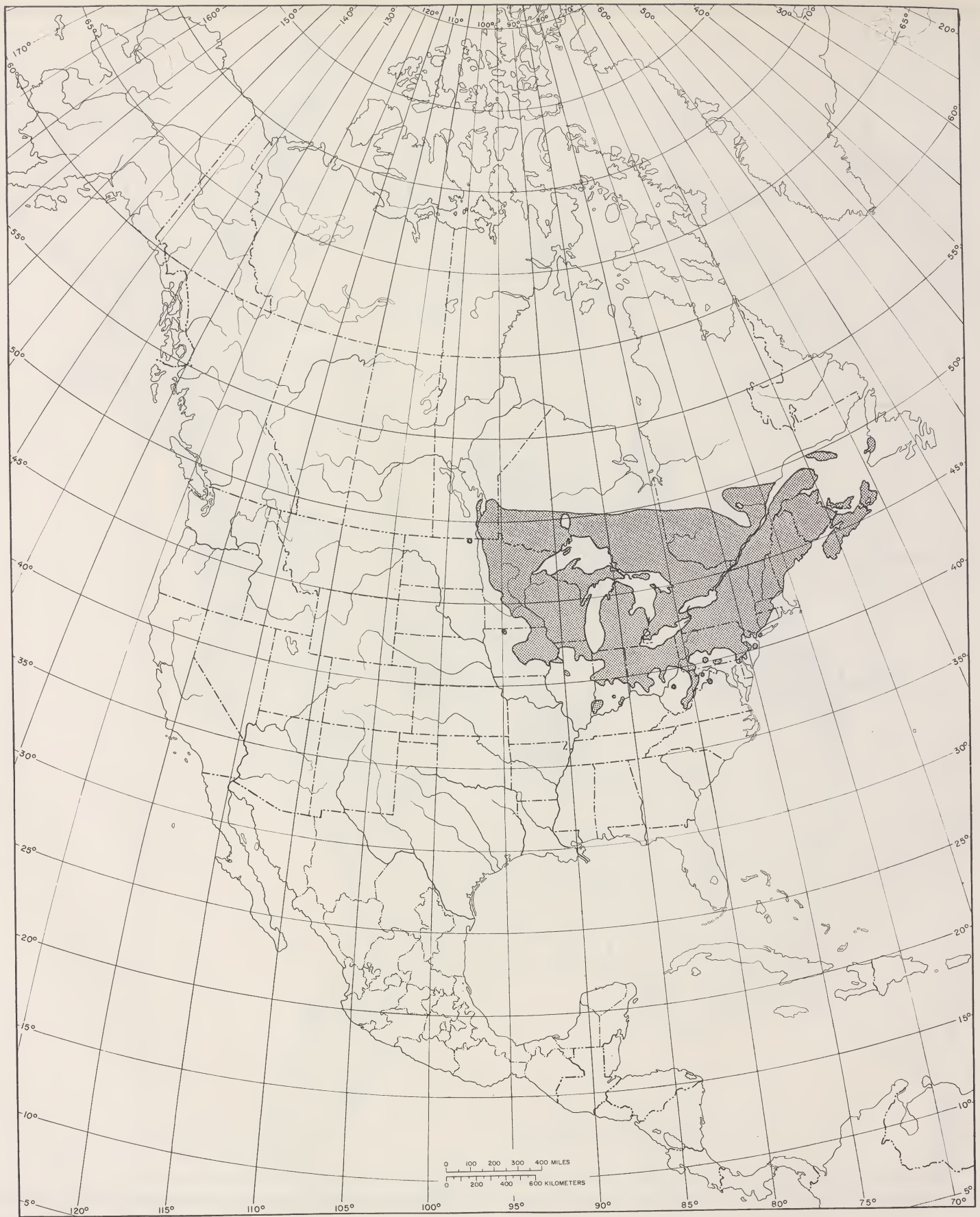
Map 126-E. white ash, *Fraxinus americana* L.



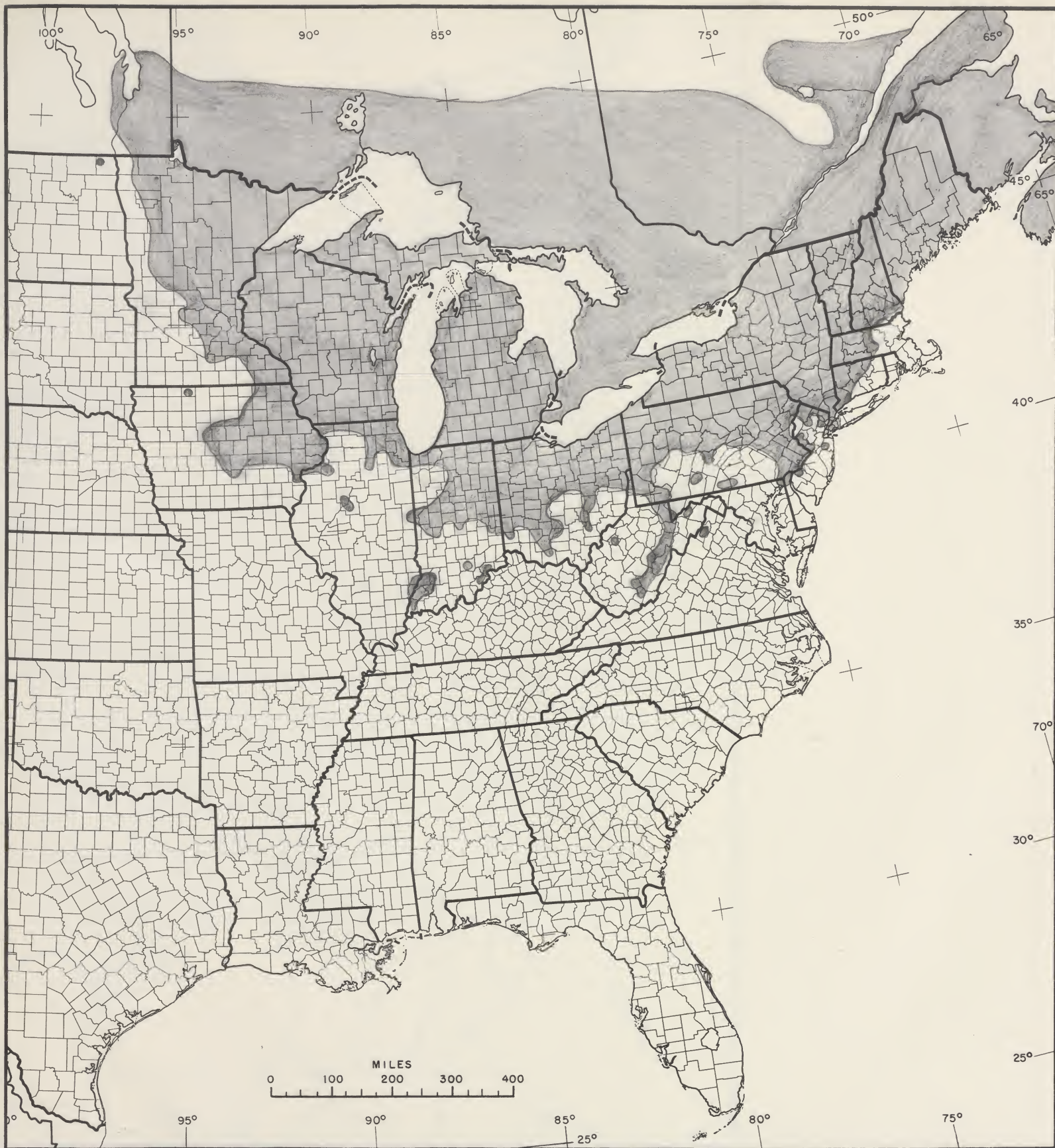
Map 127-W. Oregon ash, *Fraxinus latifolia* Benth.



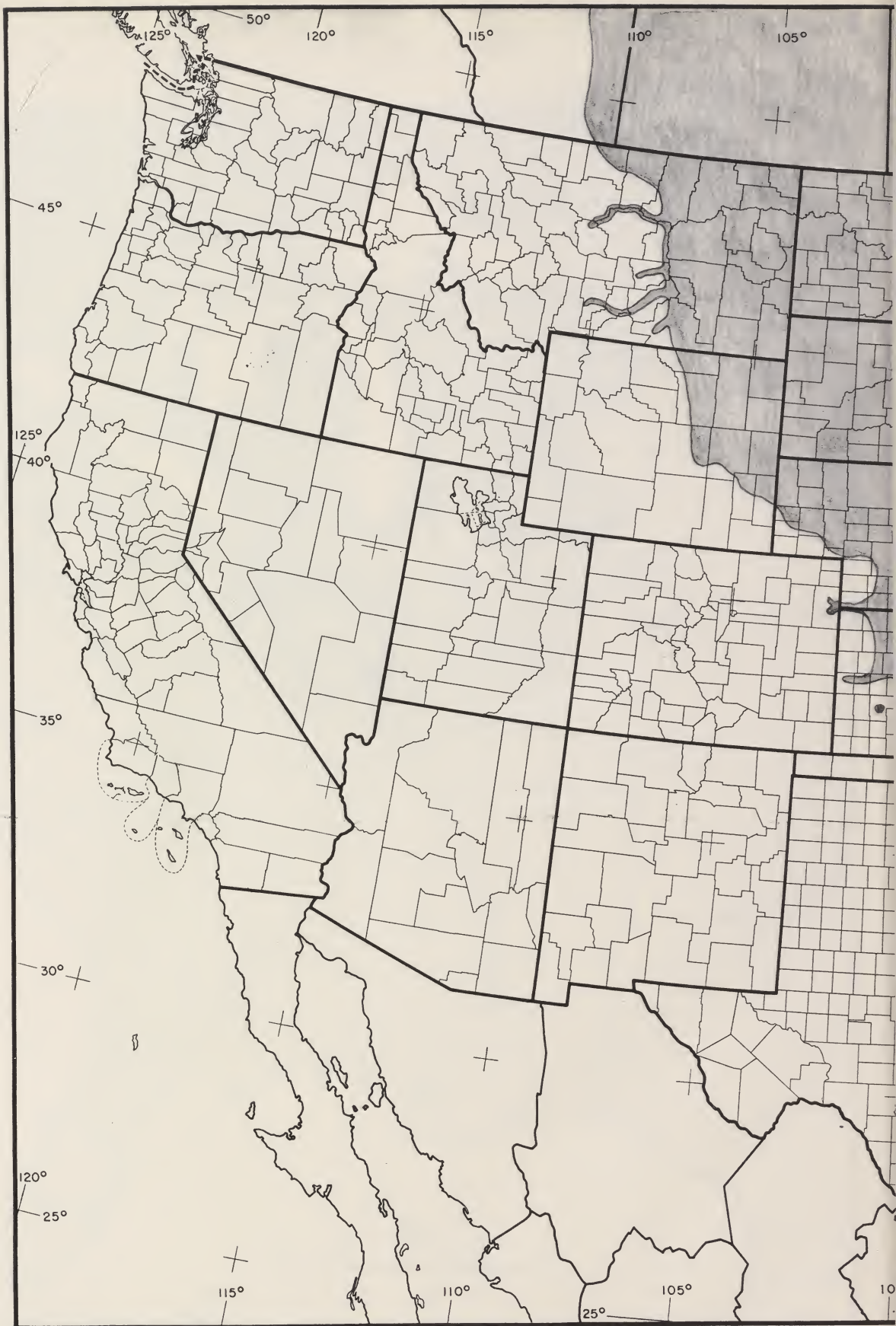
Map 128-E. blue ash, *Fraxinus quadrangulata* Michx.



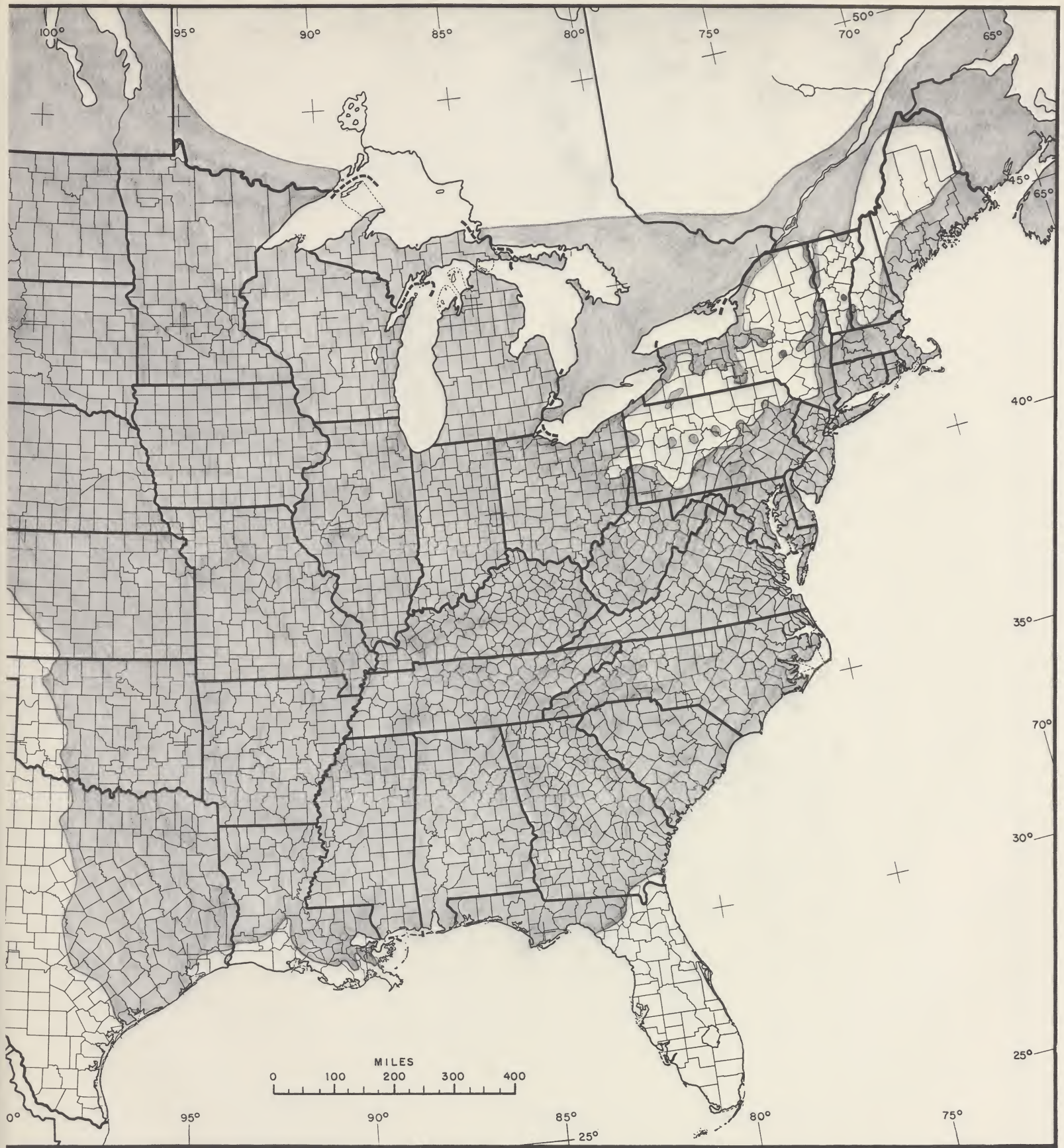
Map 129-N. black ash, *Fraxinus nigra* Marsh.



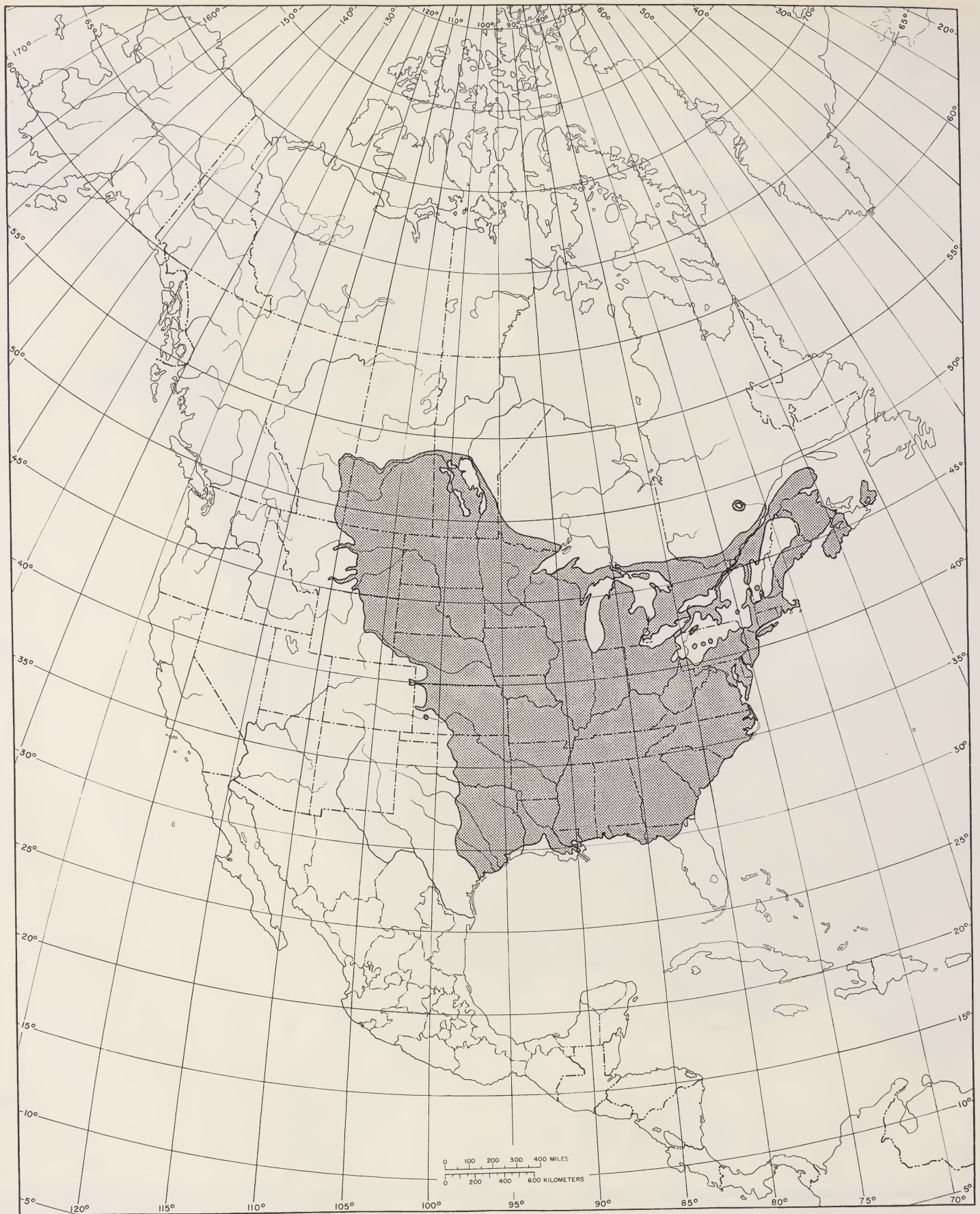
Map 129-E. black ash, *Fraxinus nigra* Marsh.



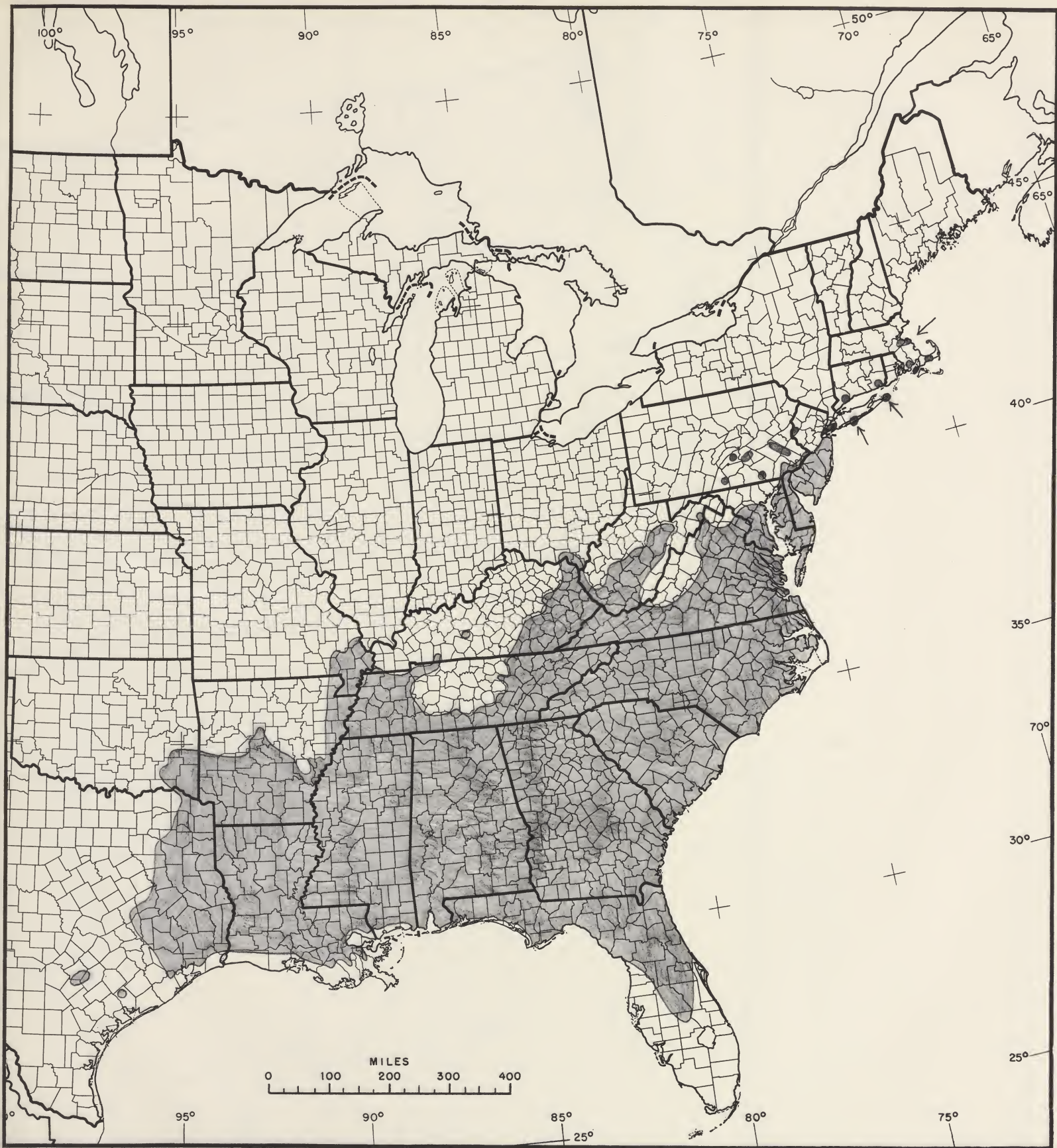
Map 130-W. green ash, *Fraxinus pennsylvanica* Marsh., western range.



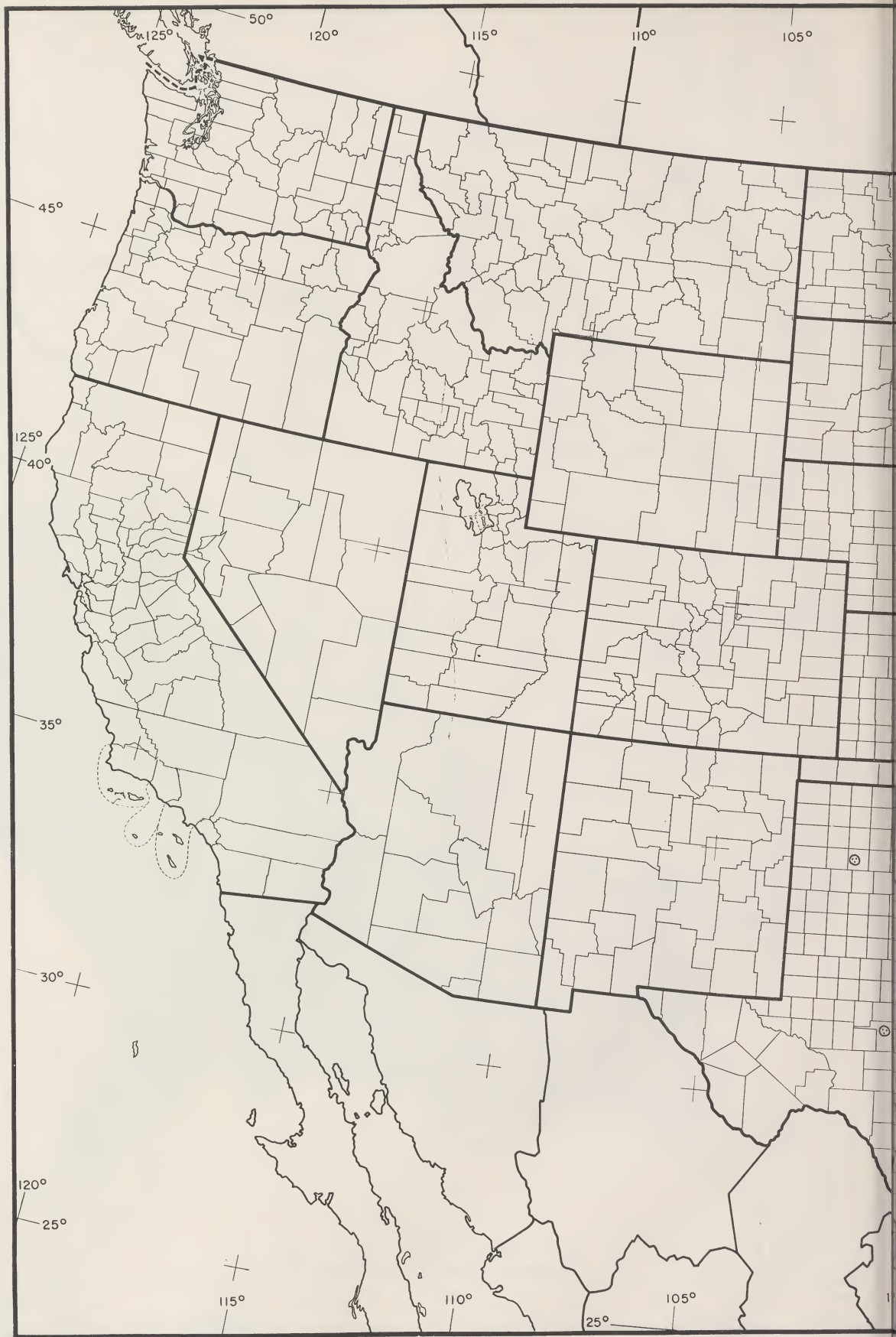
Map 130-E. green ash, *Fraxinus pennsylvanica* Marsh., eastern range.



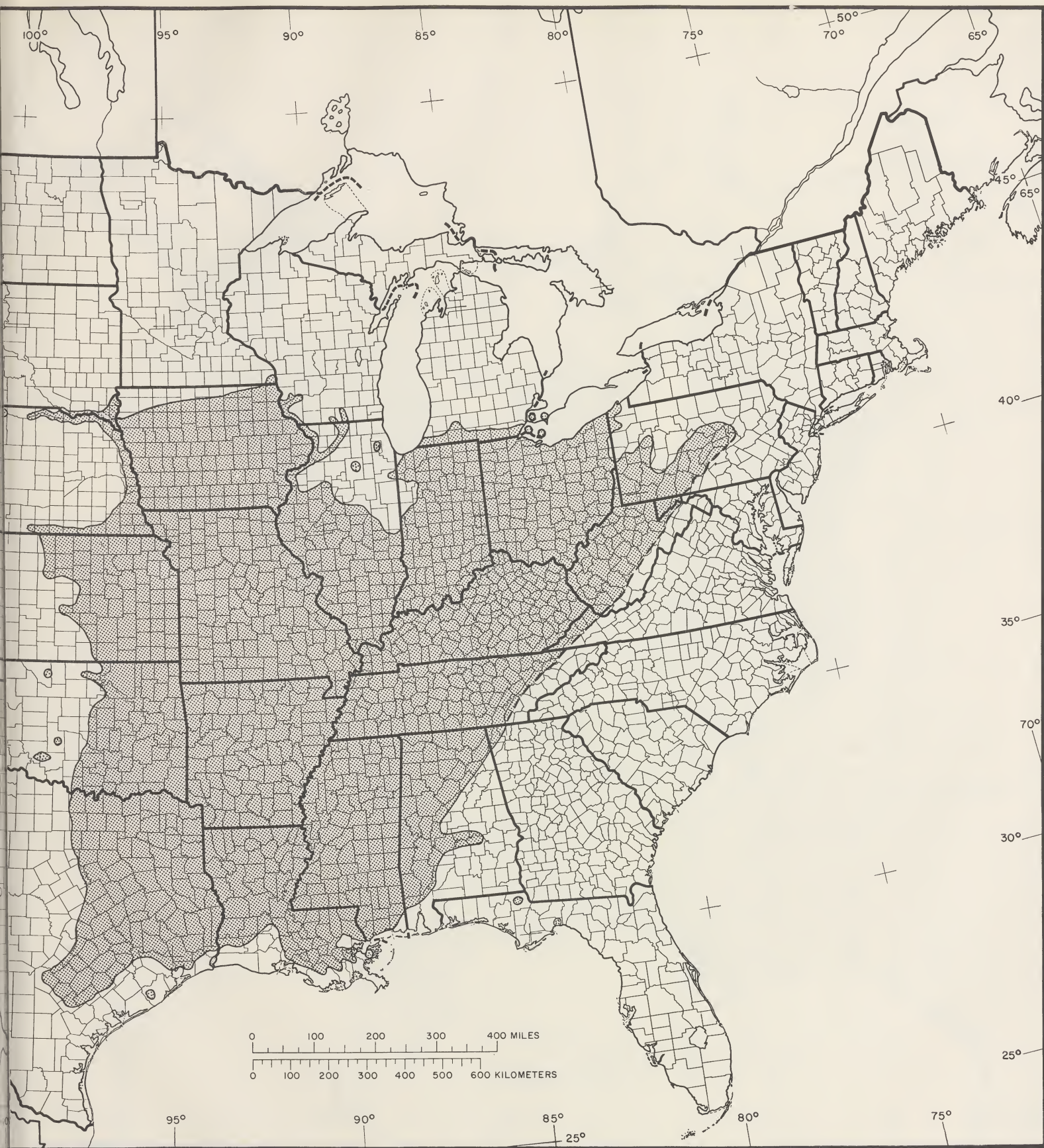
Map 130-N. green ash, *Fraxinus pennsylvanica* Marsh.



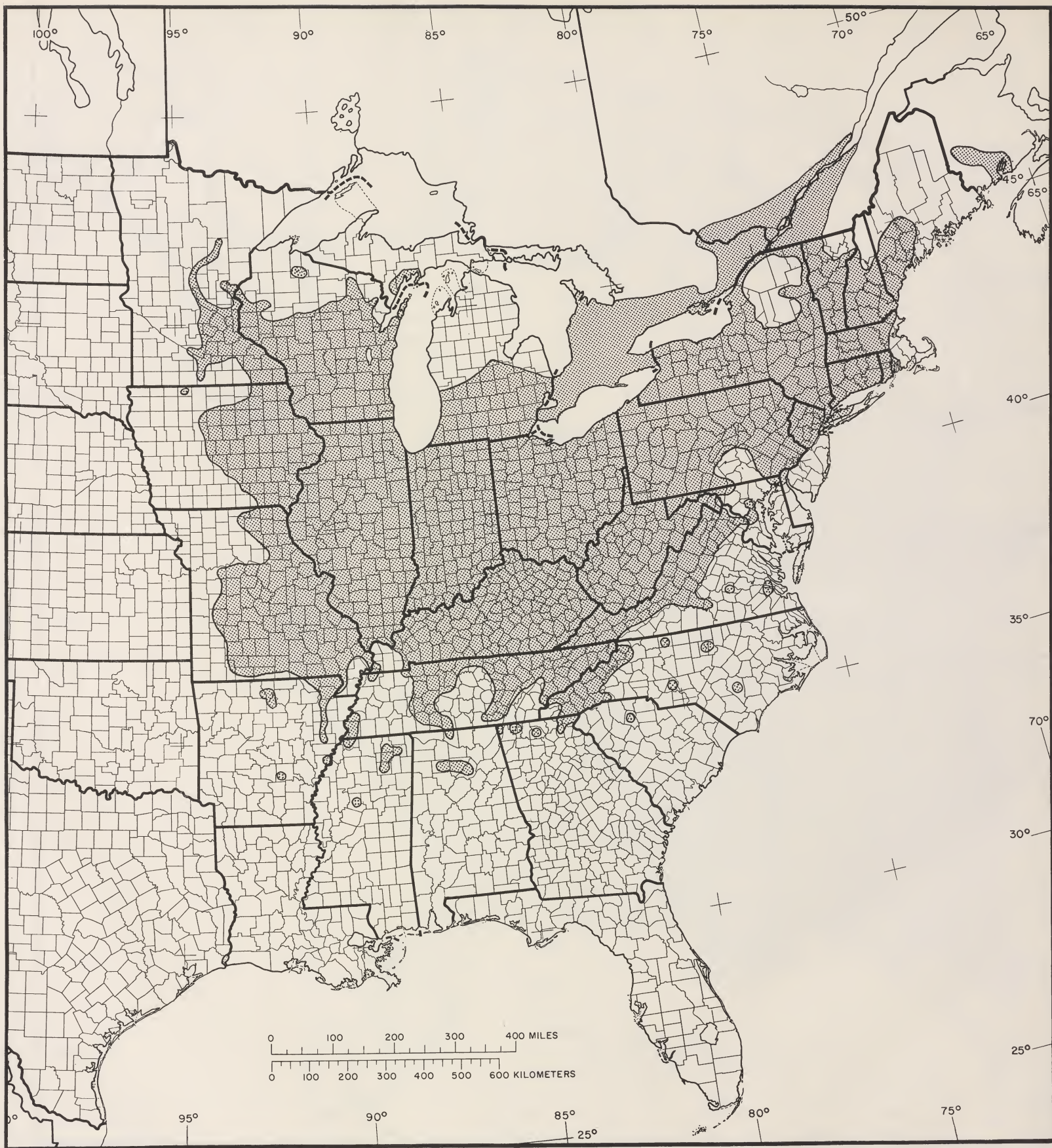
Map 131-E. American holly, *Ilex opaca* Ait.



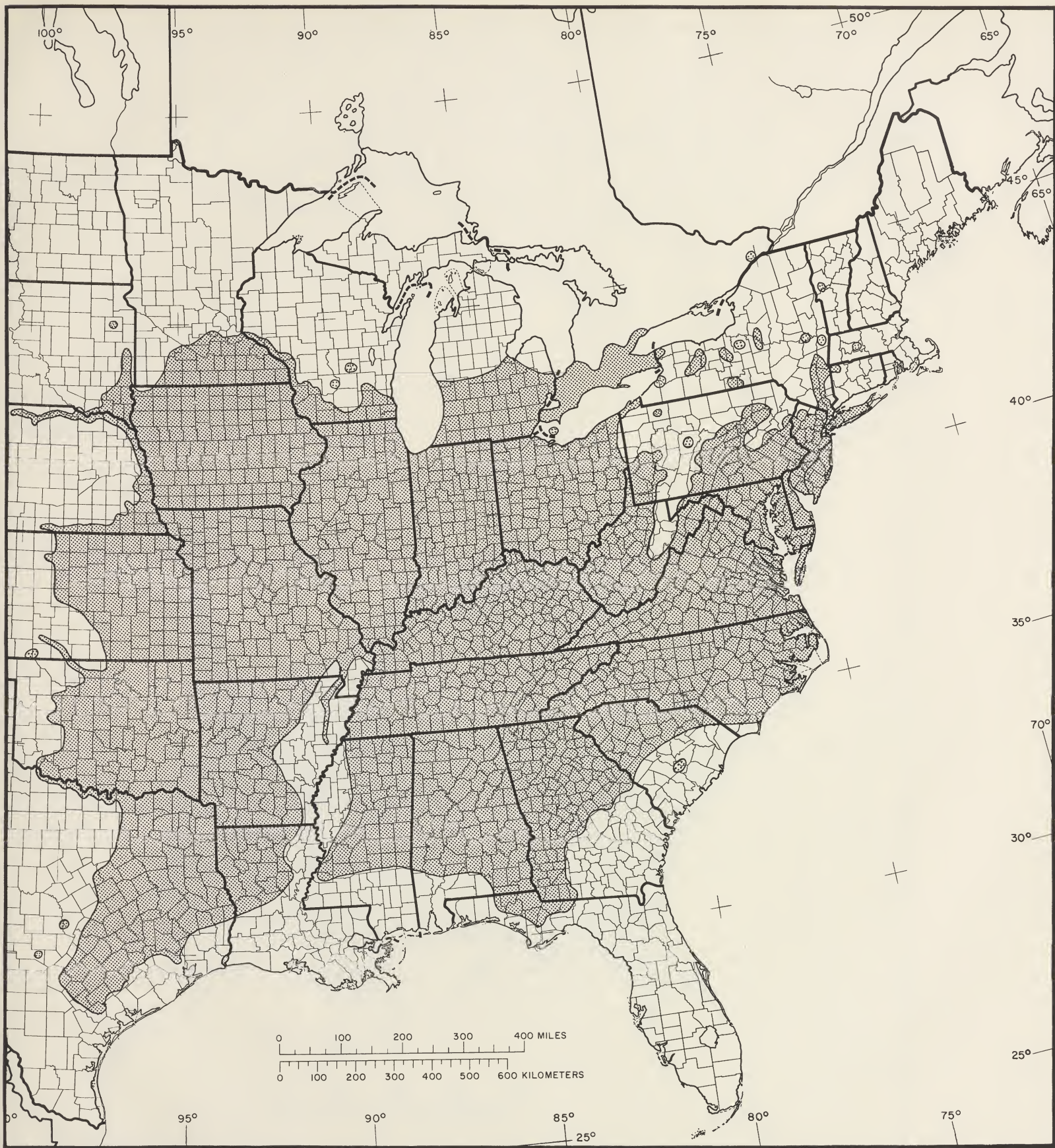
Map 132-W. honeylocust, *Gleditsia triacanthos* L., western range.



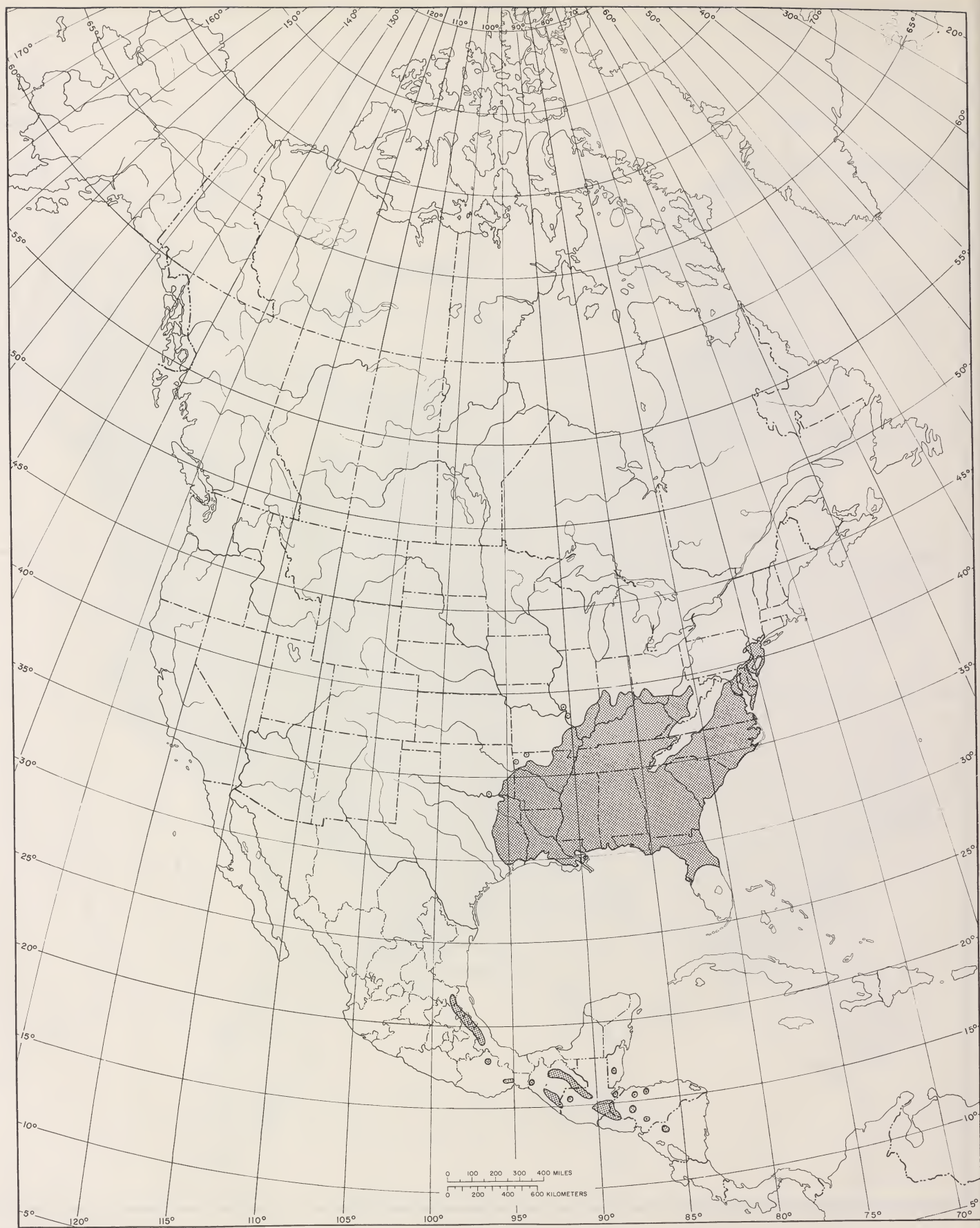
Map 132-E. honeylocust, *Gleditsia triacanthos* L., eastern range.



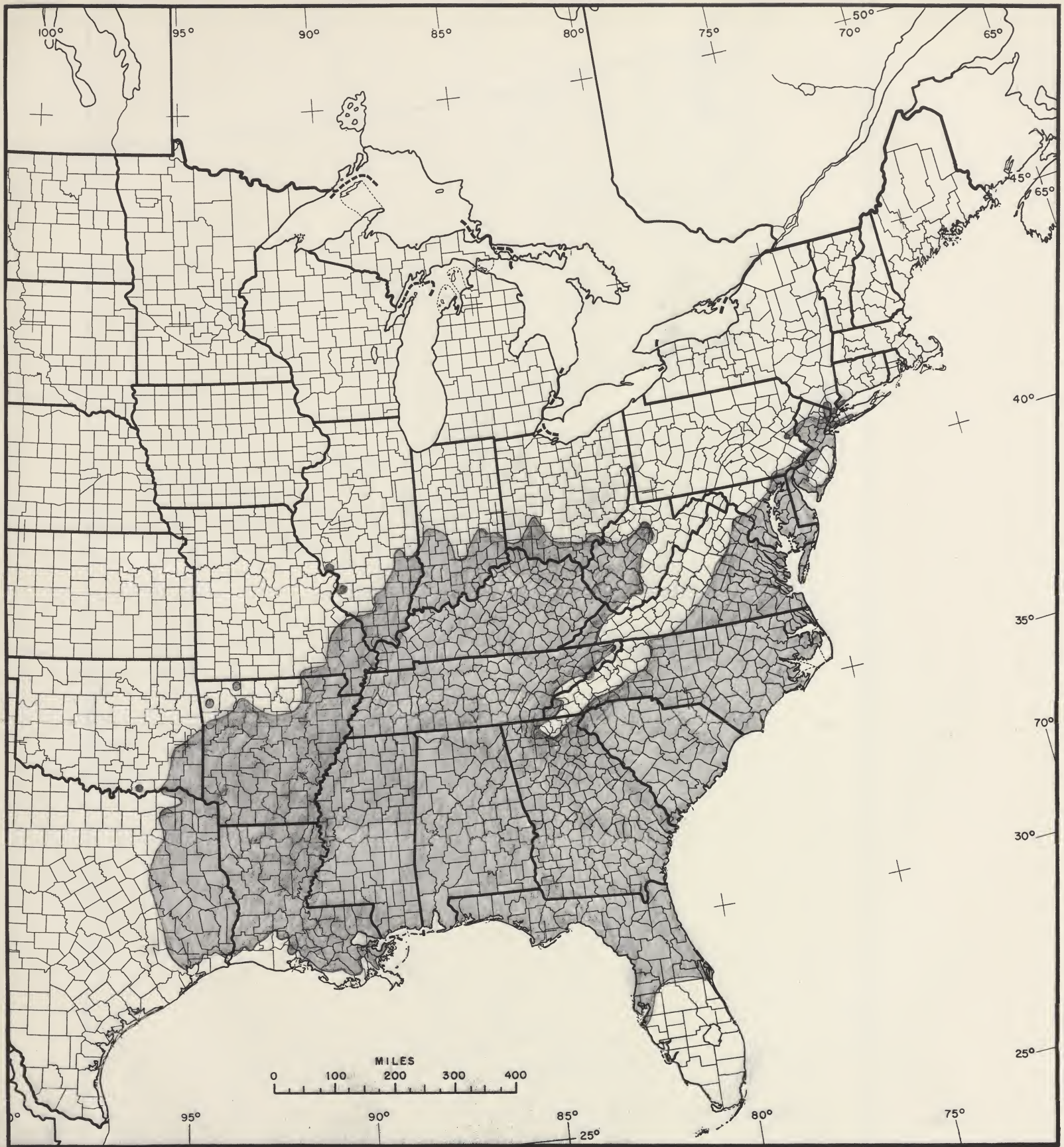
Map 133-E. butternut, *Juglans cinerea* L.



Map 134-E. black walnut, *Juglans nigra* L.



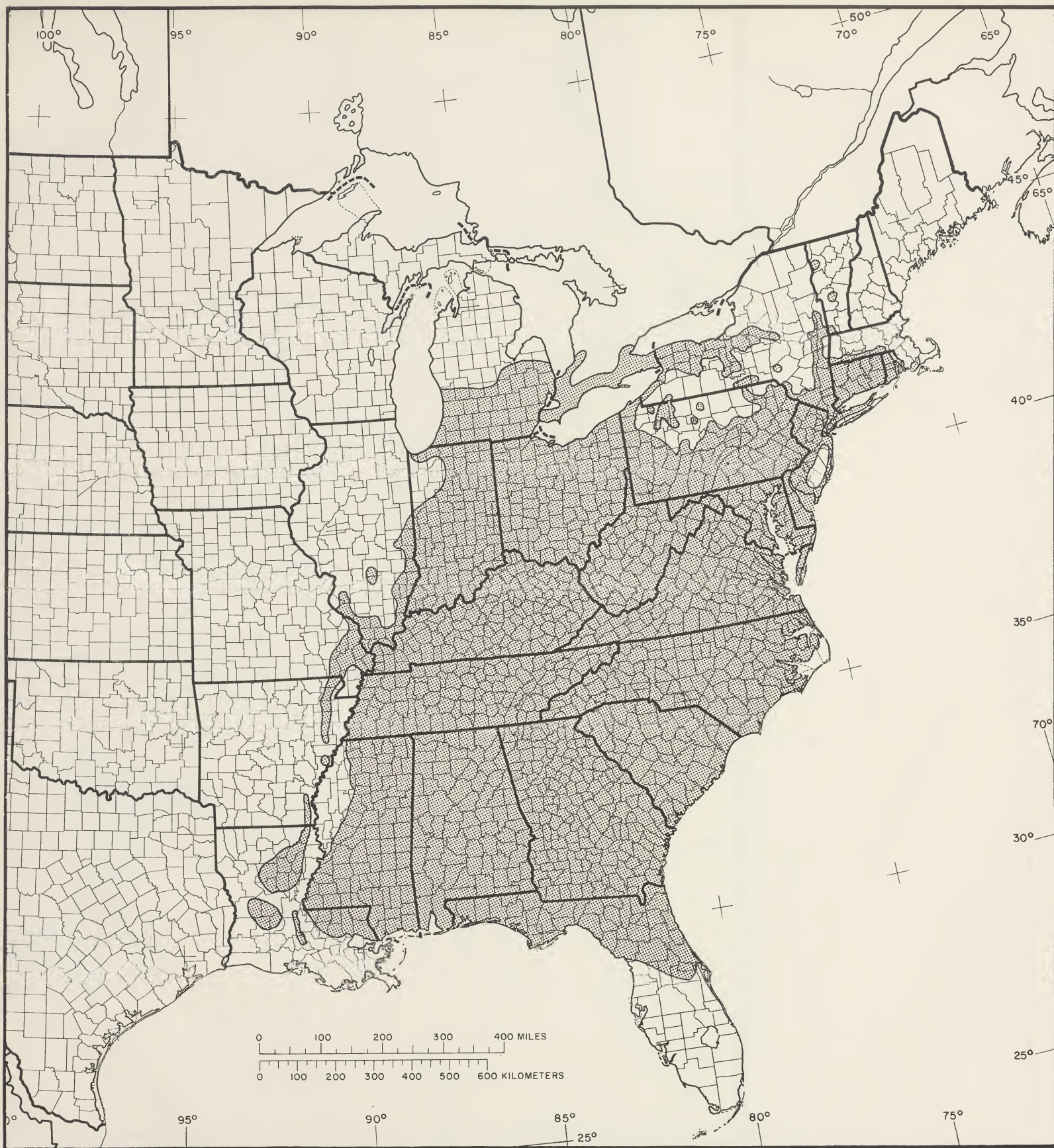
Map 135-N. sweetgum, *Liquidambar styraciflua* L.



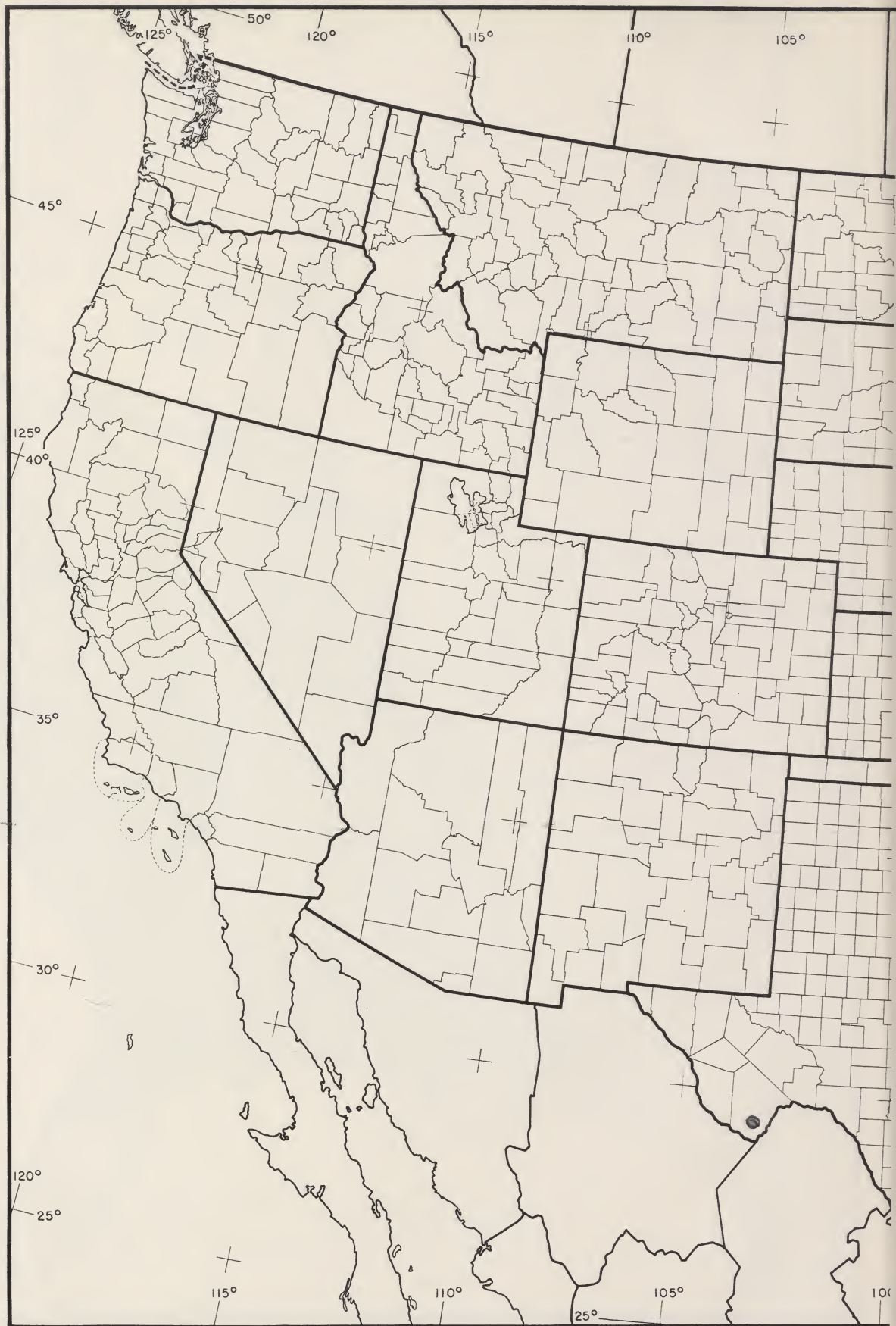
Map 135-E. sweetgum, *Liquidambar styraciflua* L.



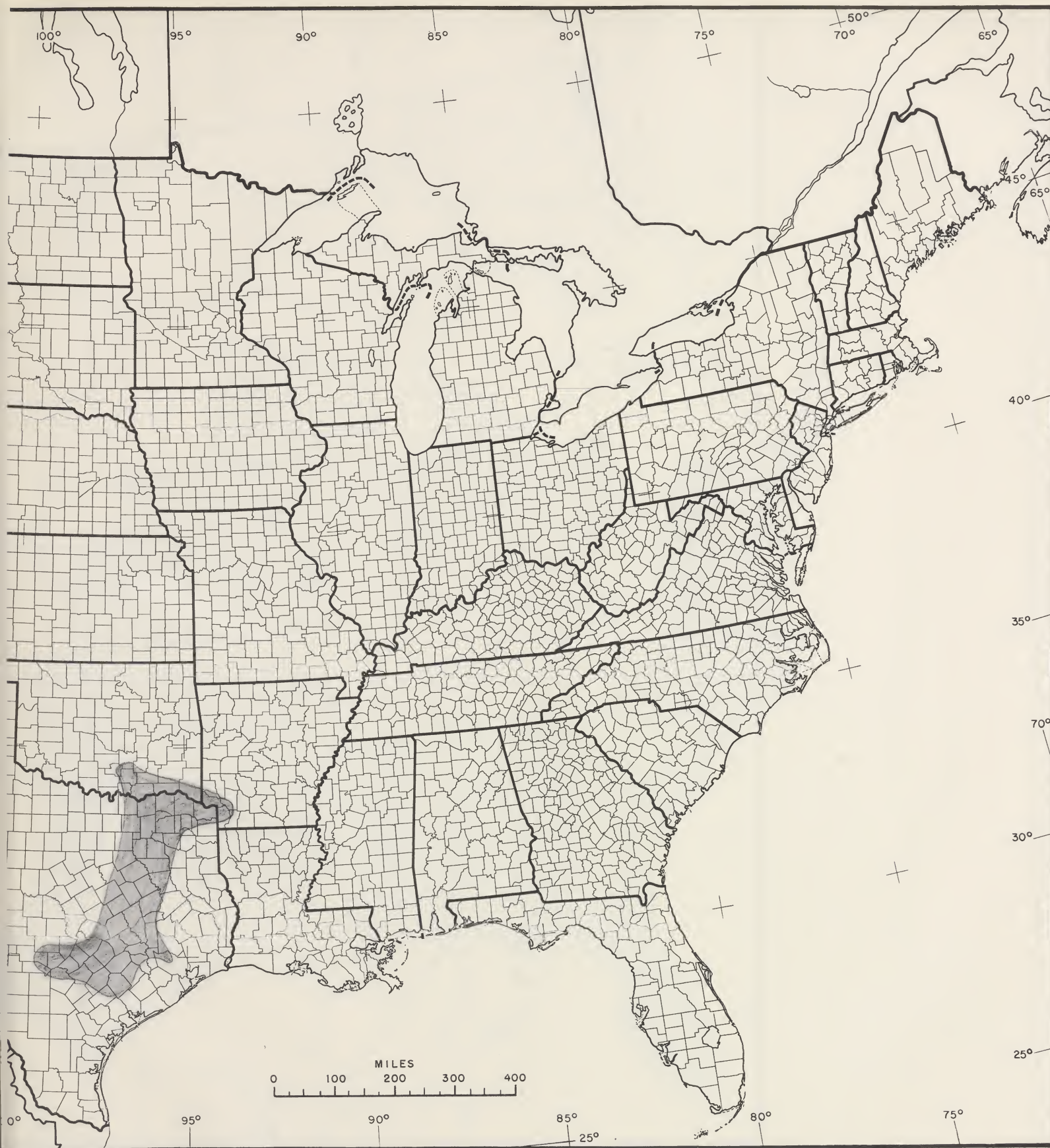
Map 136-W. tanoak, *Lithocarpus densiflorus* (Hook. & Arn.) Rehd.



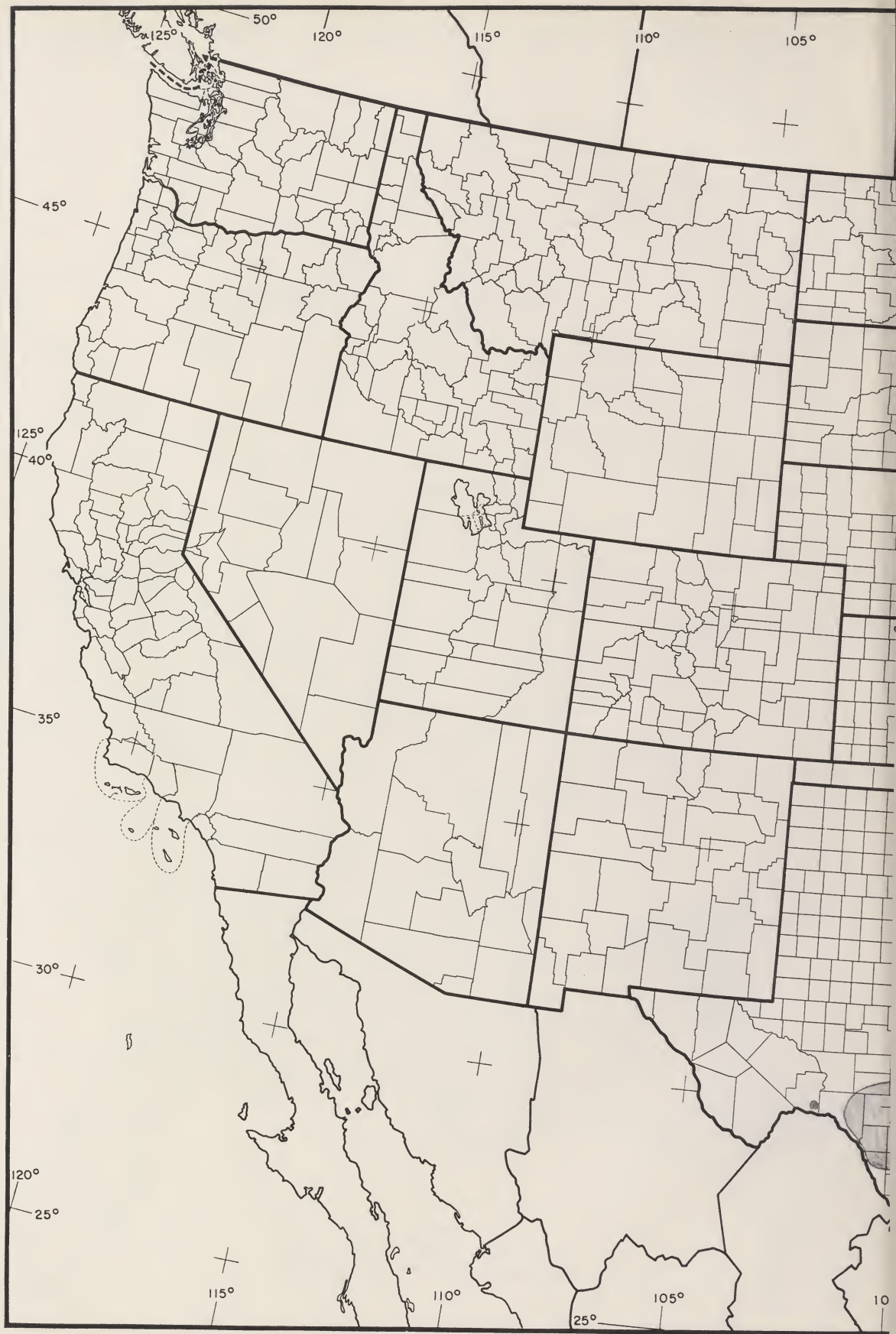
Map 137-E. yellow-poplar, *Liriodendron tulipifera* L.



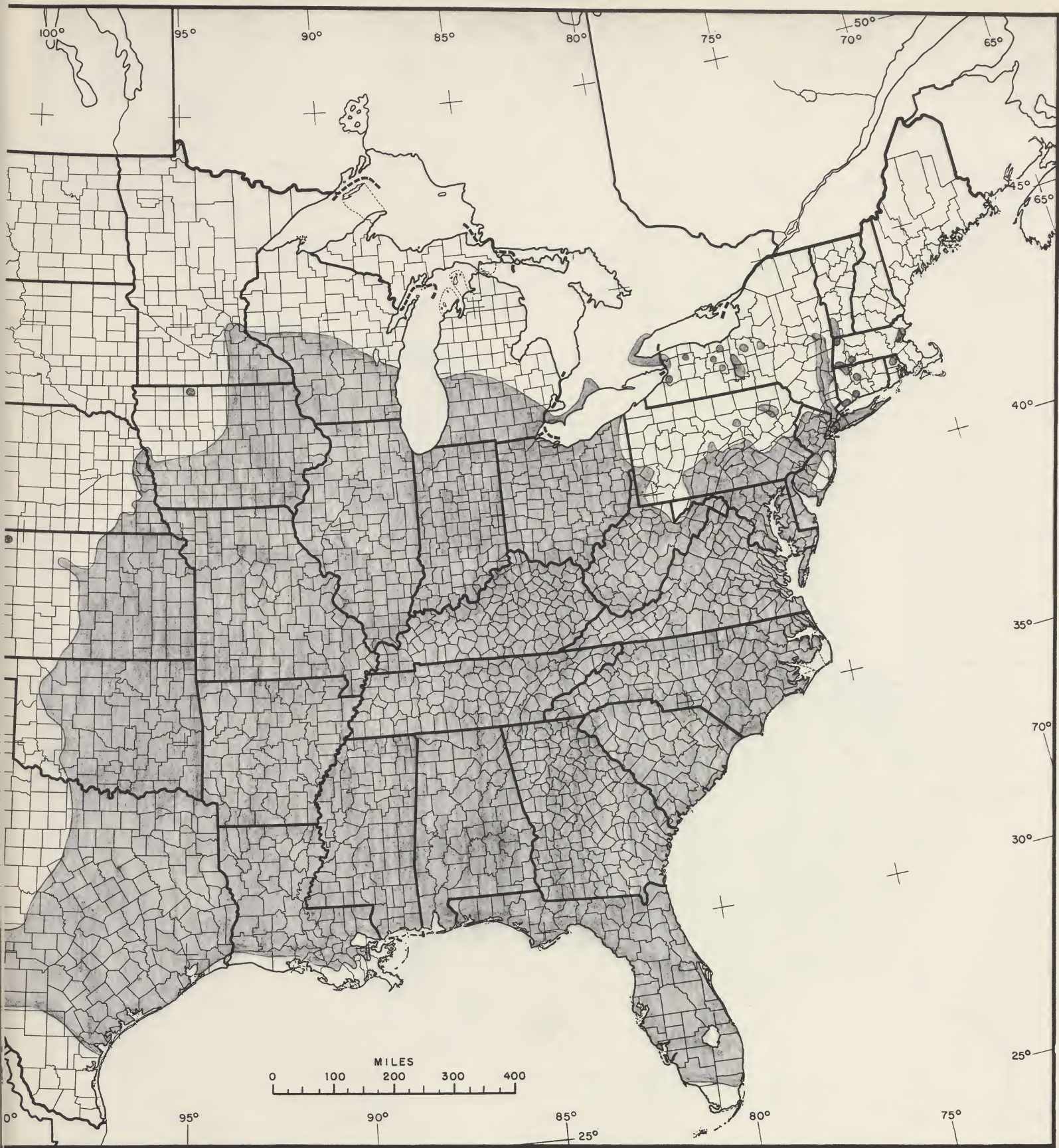
Map 138-W. Osage-orange, *Maclura pomifera* (Raf.) Schneid., western range.



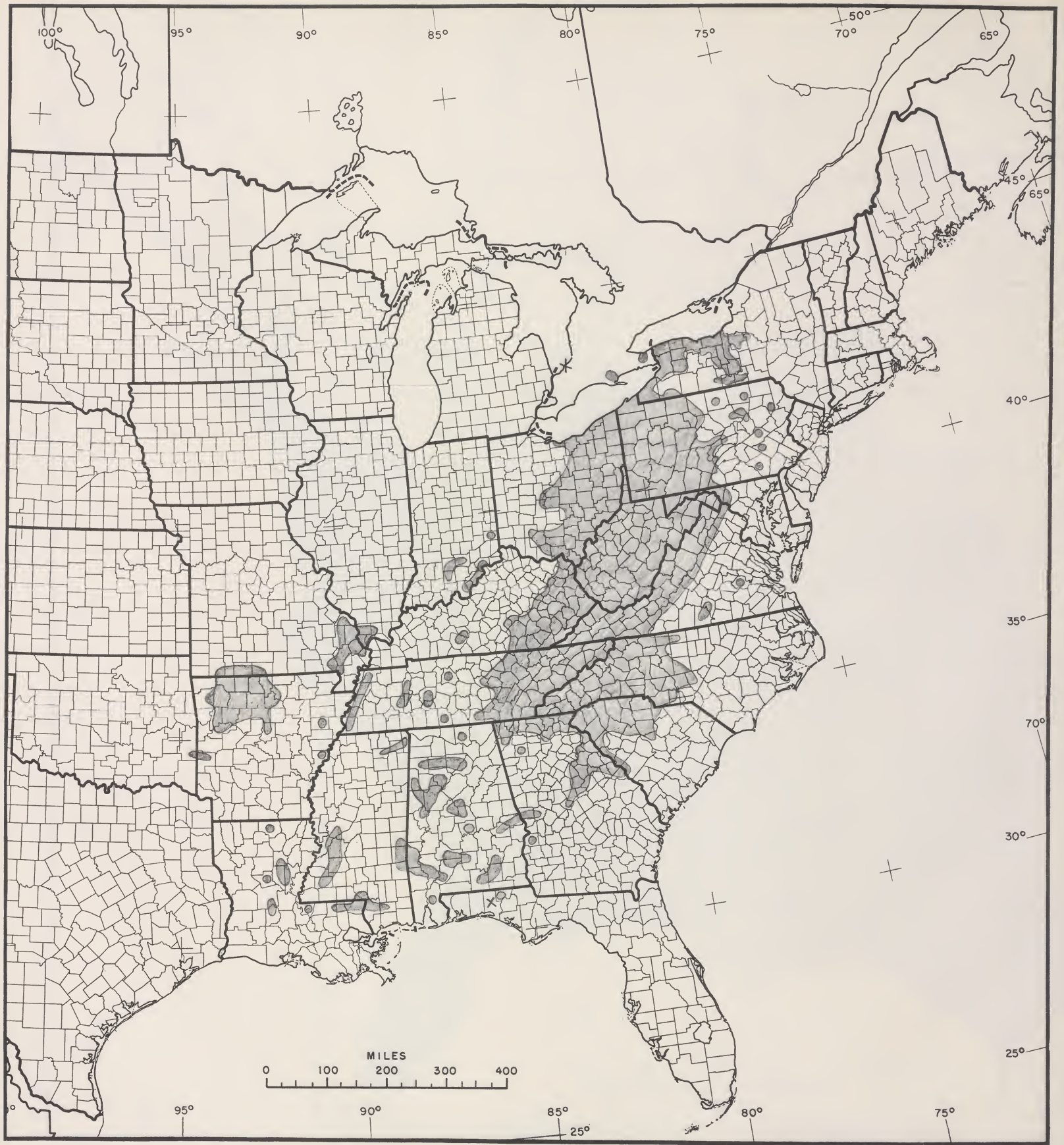
Map 138-E. Osage-orange, *Maclura pomifera* (Raf.) Schneid., eastern range.



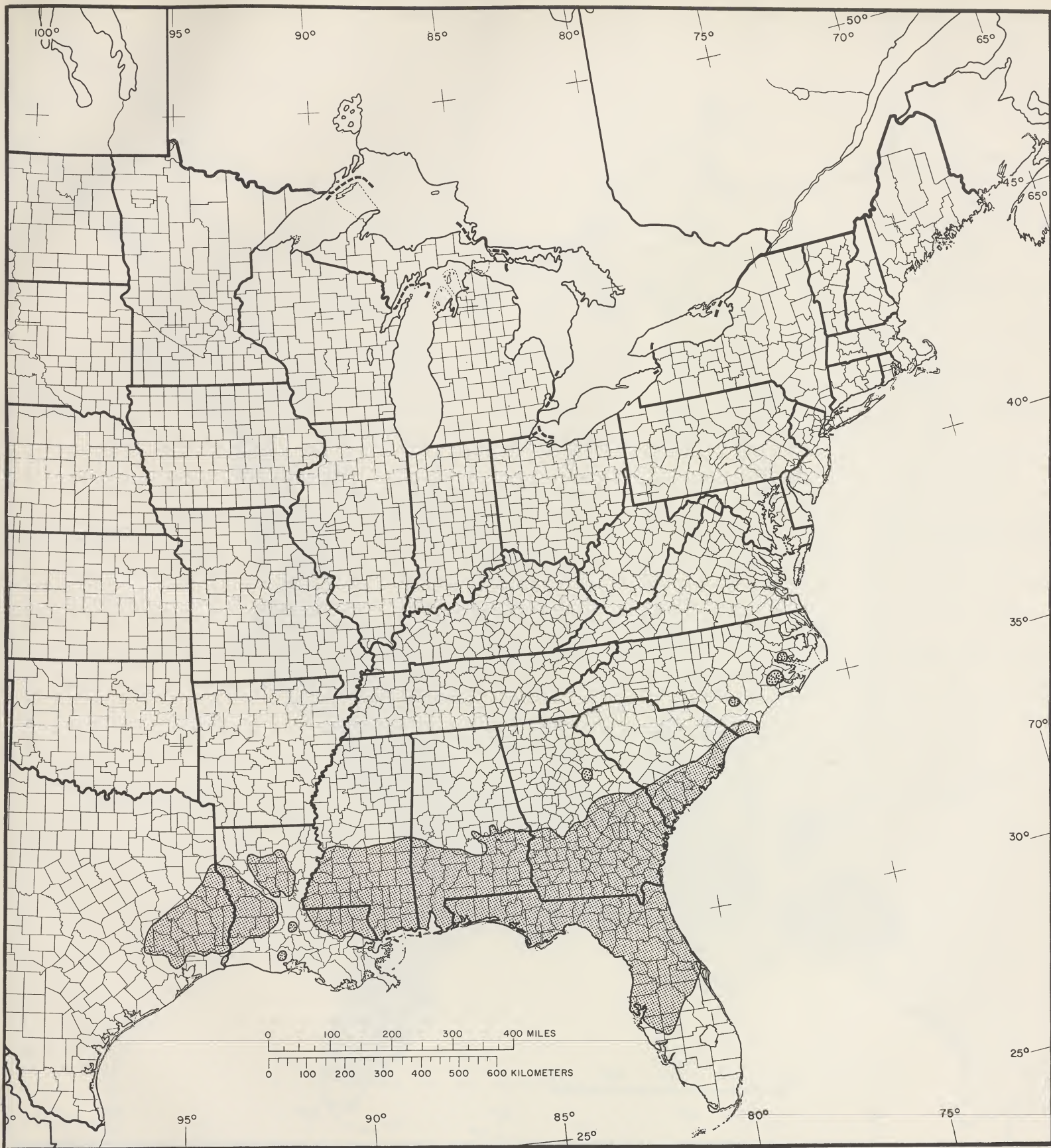
Map 139-W. red mulberry, *Morus rubra* L., western range.



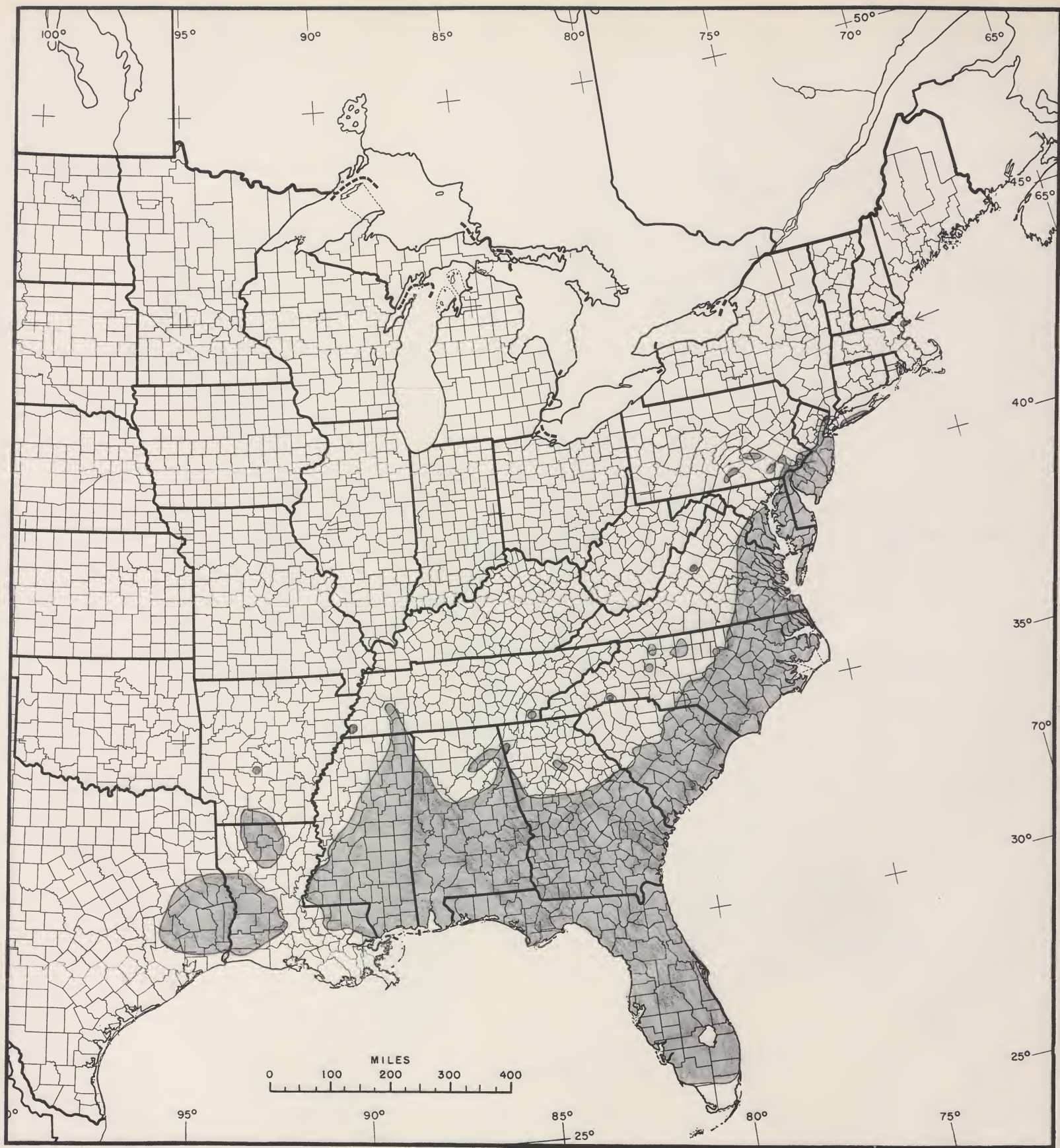
Map 139-E. red mulberry, *Morus rubra* L., eastern range.



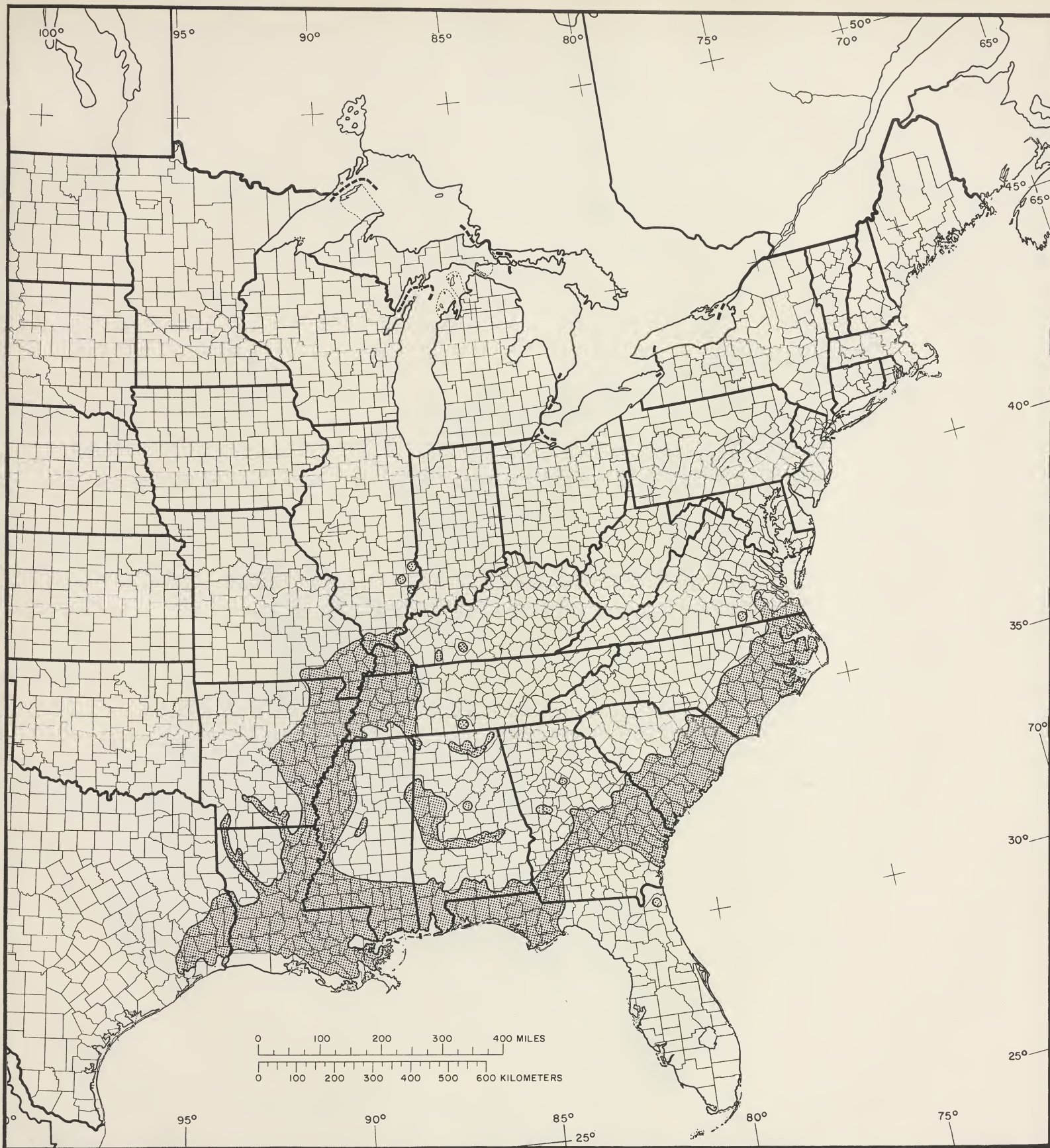
Map 140-E. cucumbertree, *Magnolia acuminata* L.



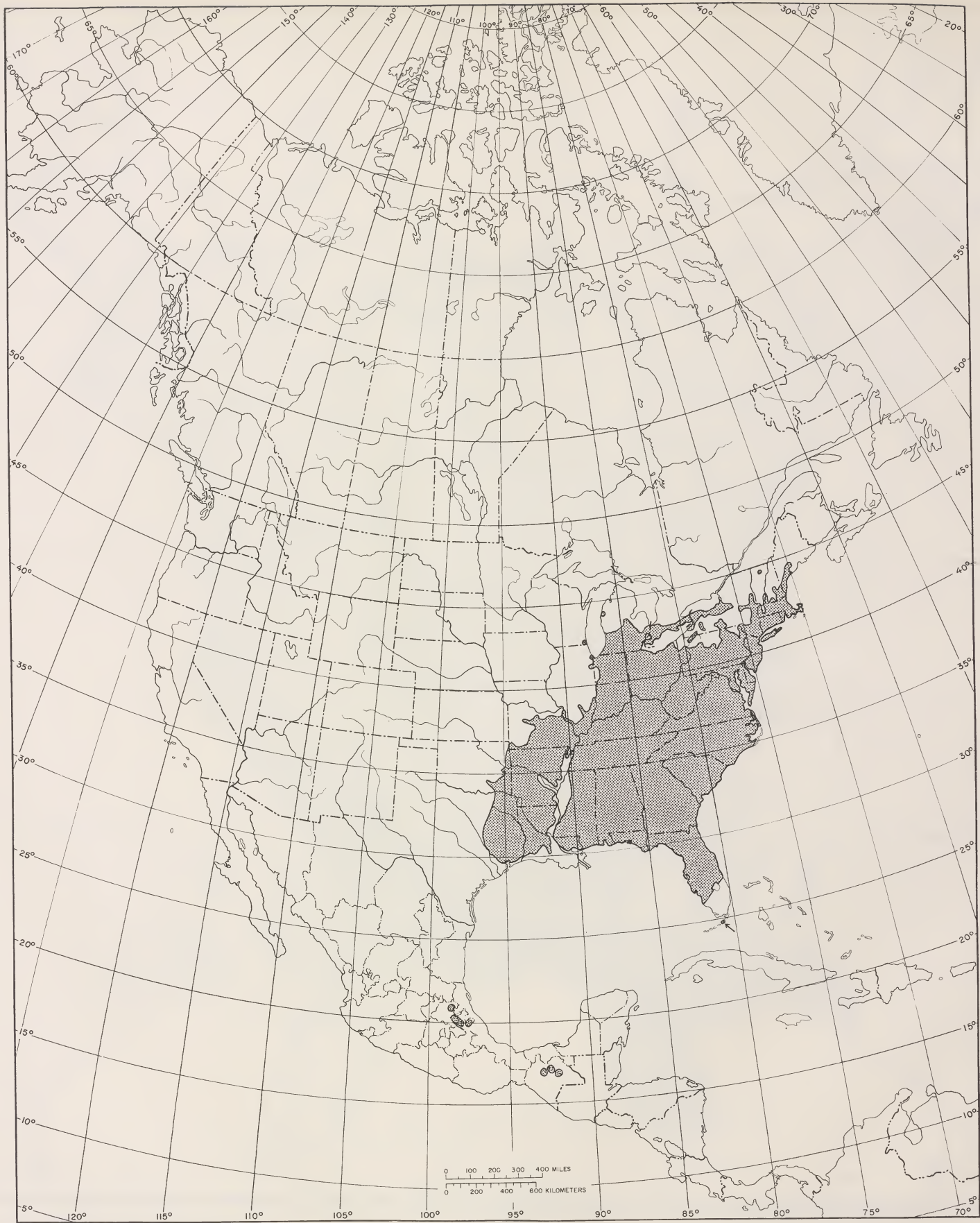
Map 141-E. southern magnolia, *Magnolia grandiflora* L.



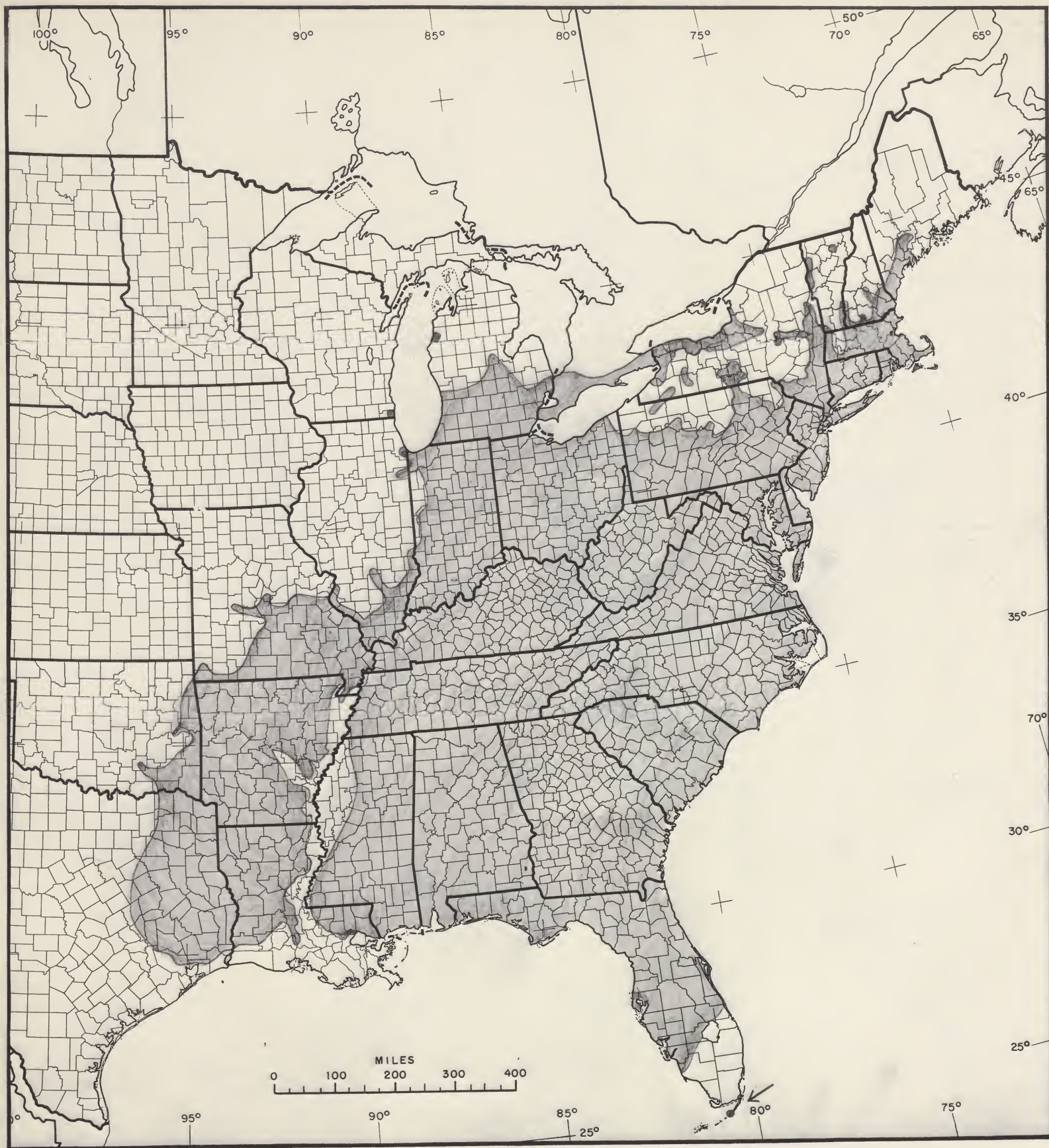
Map 142-E. sweetbay, *Magnolia virginiana* L.



Map 143-E. water tunnel, *Nyssa aquatica* L.



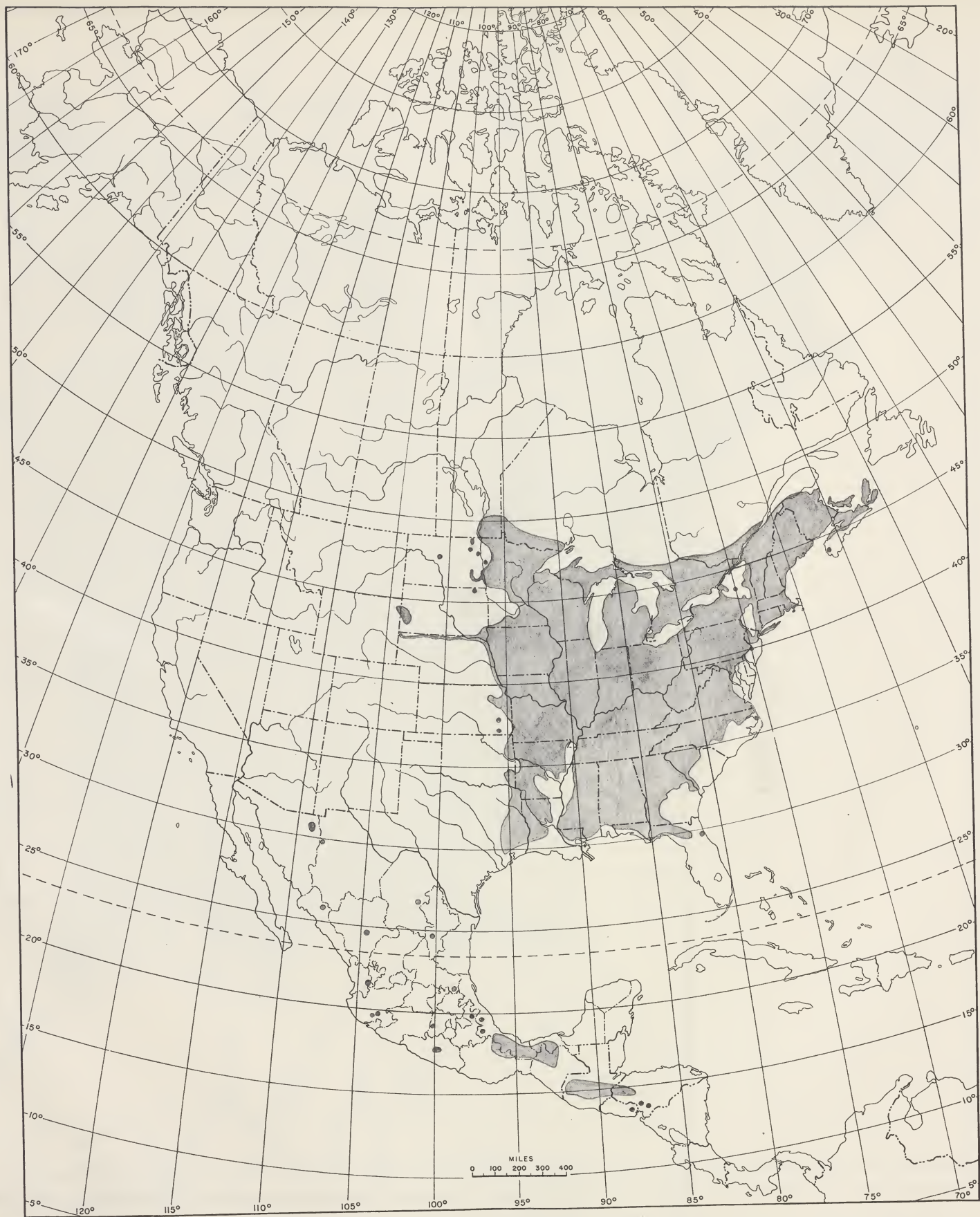
Map 144-N. black tupelo, blackgum, *Nyssa sylvatica* Marsh.



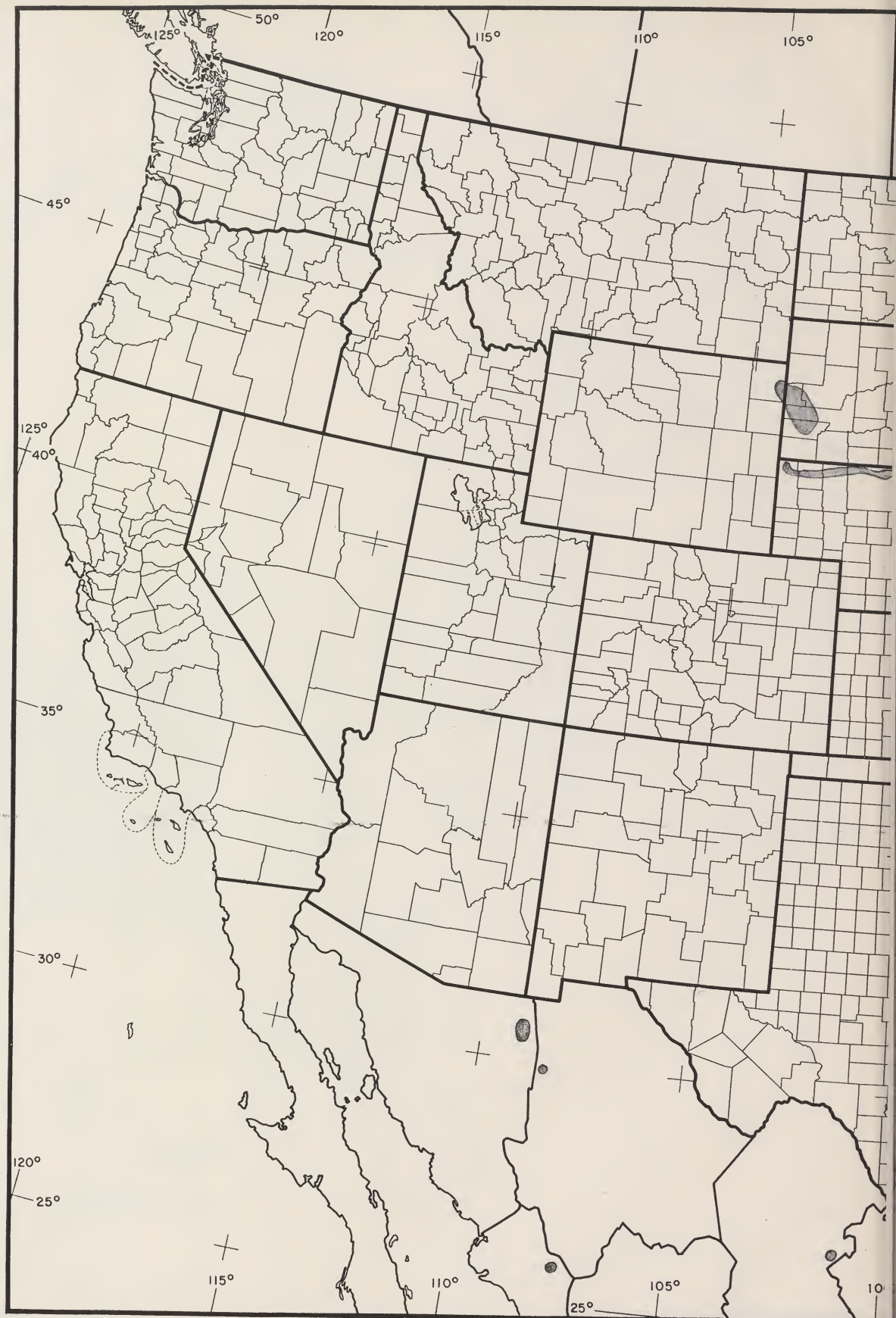
Map 144-E. black tupelo, blackgum, *Nyssa sylvatica* Marsh.



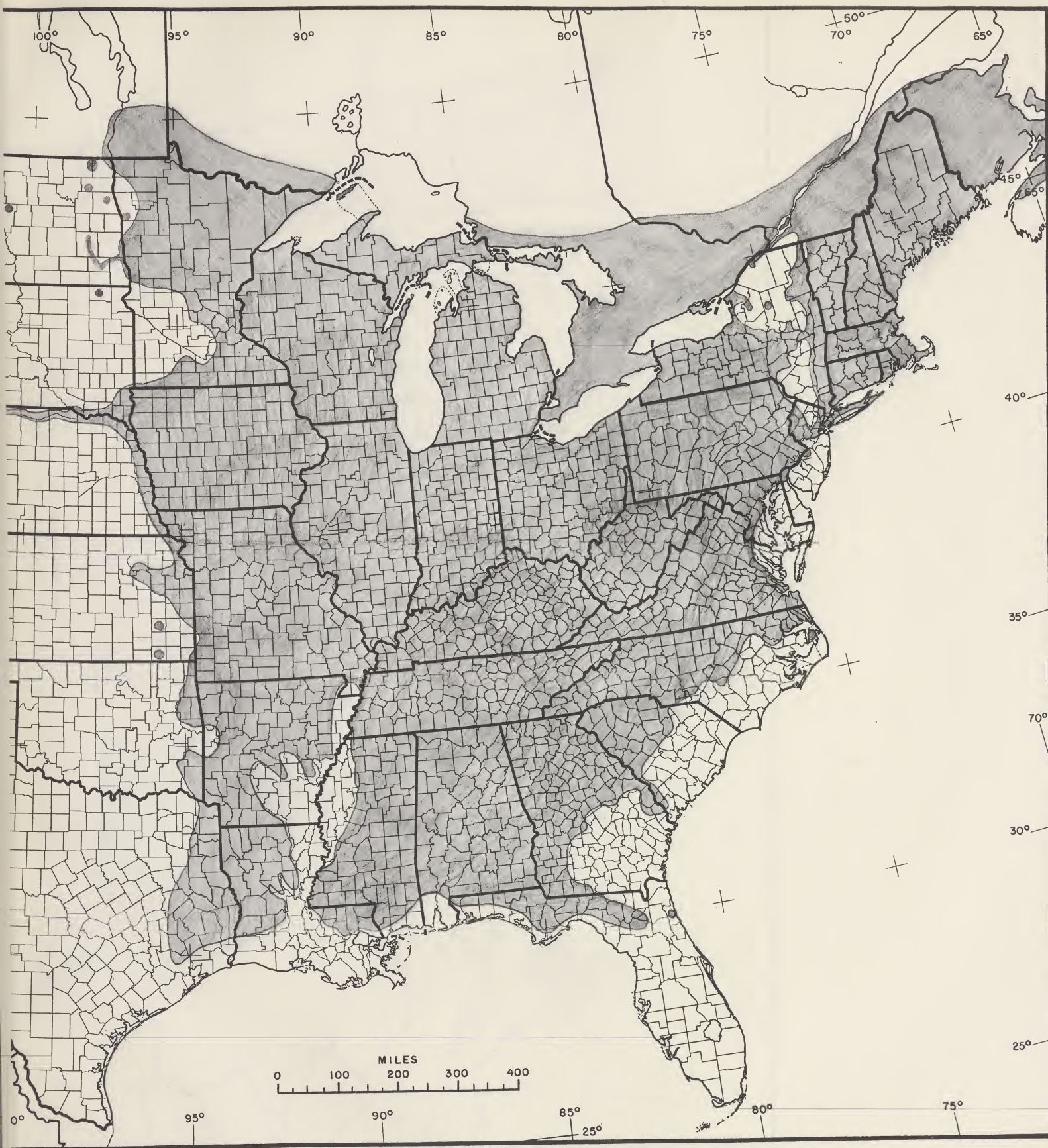
Map 145-E. Ogeechee tupelo, *Nyssa ogeche* Bartr.



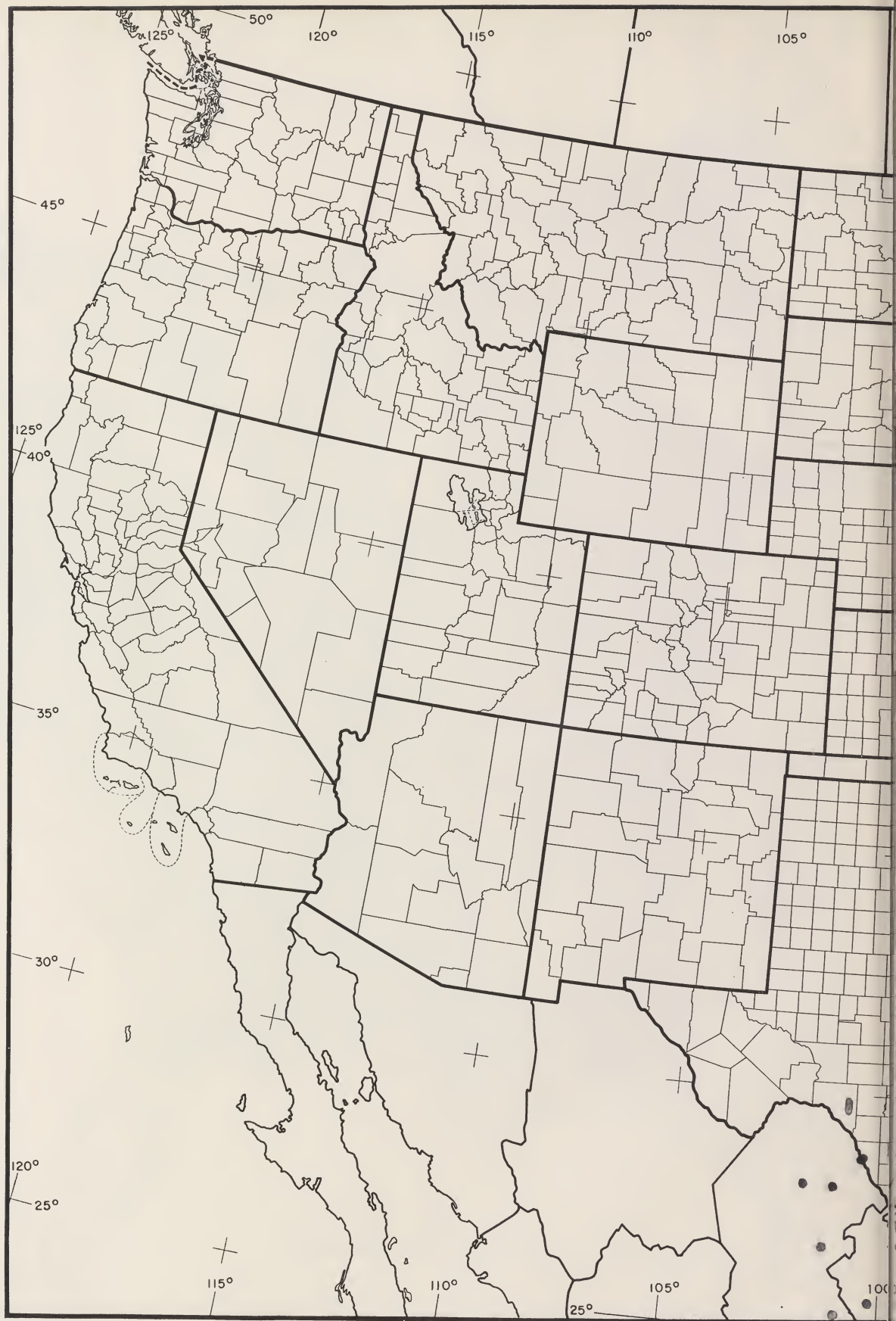
Map 146-N. eastern hophornbeam, *Ostrya virginiana* (Mill.) K. Koch



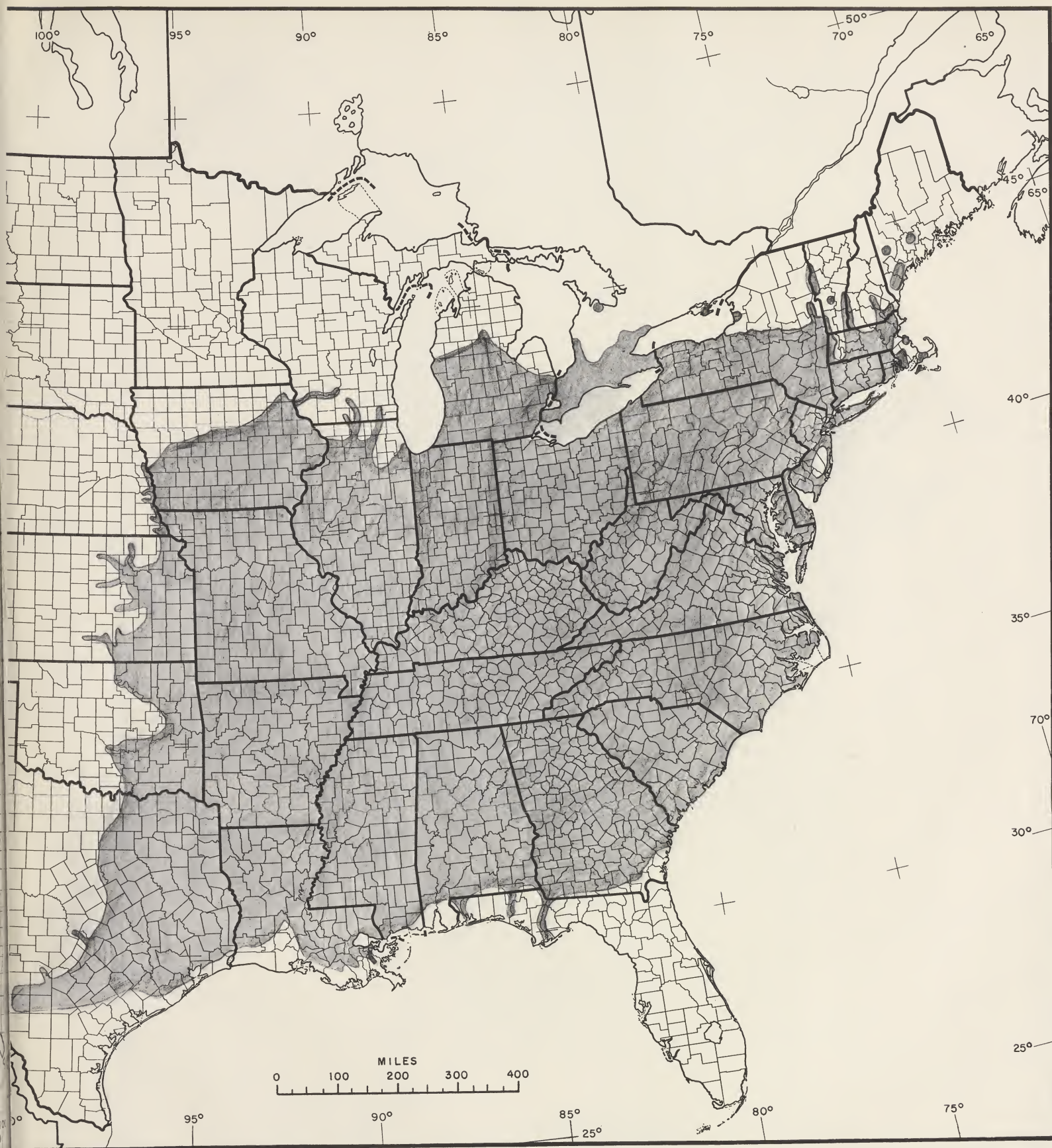
Map 146-W. eastern hophornbeam, *Ostrya virginiana* (Mill.) K. Koch, western range.



Map 146-E. eastern hophornbeam, *Ostrya virginiana* (Mill.) K. Koch, eastern range.



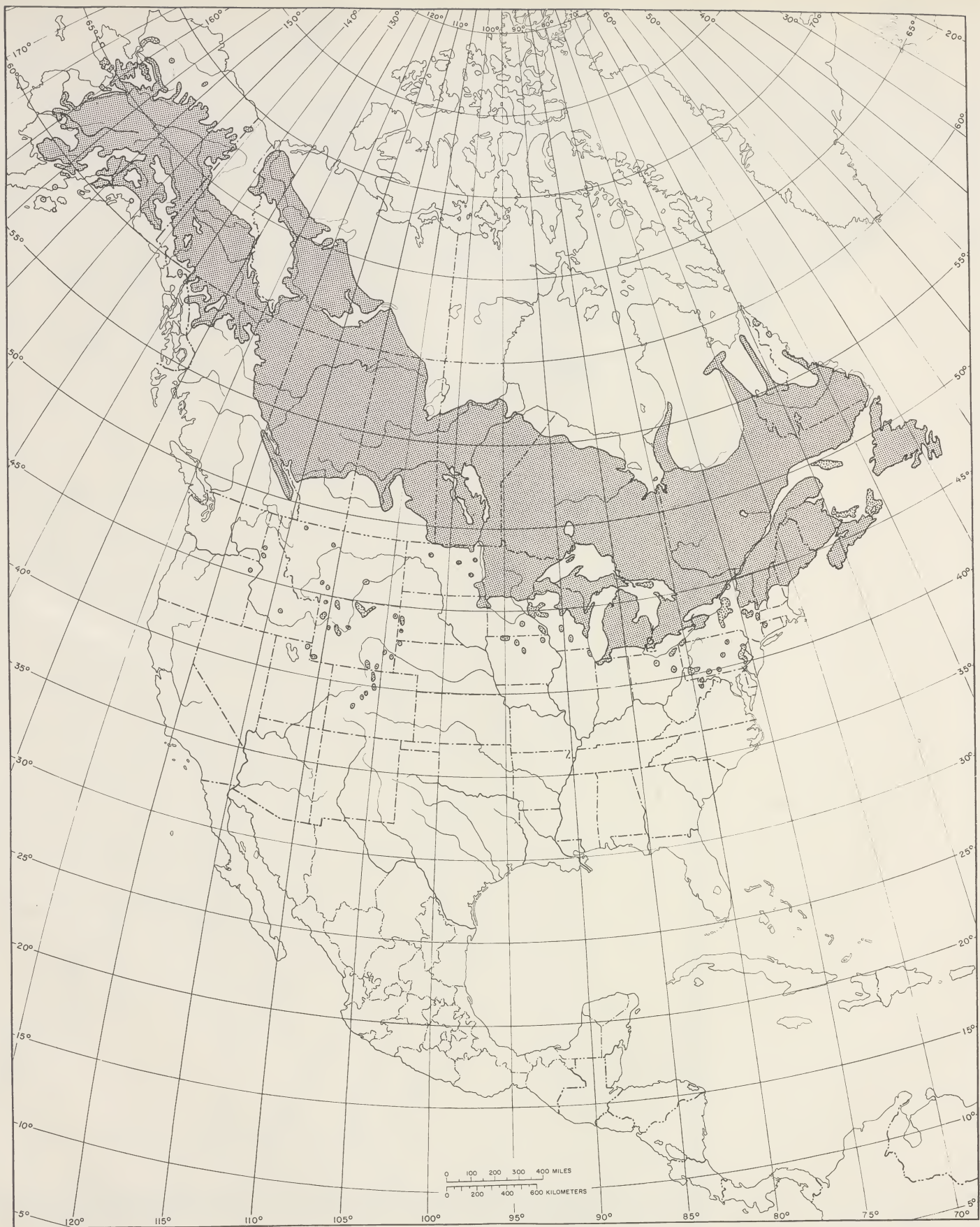
Map 147-W. American sycamore, *Platanus occidentalis* L., western range.



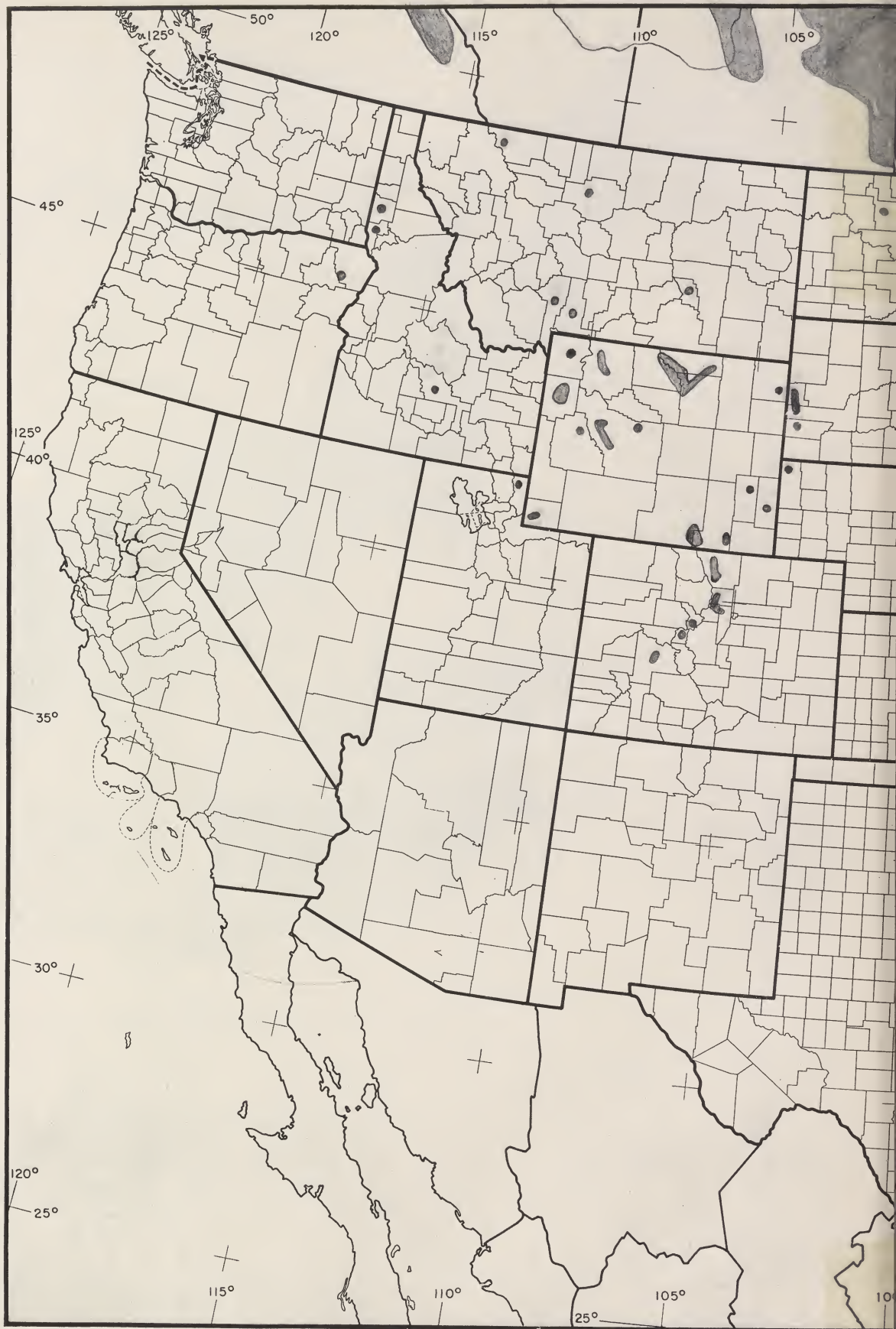
Map 147-E. American sycamore, *Platanus occidentalis* L., eastern range.



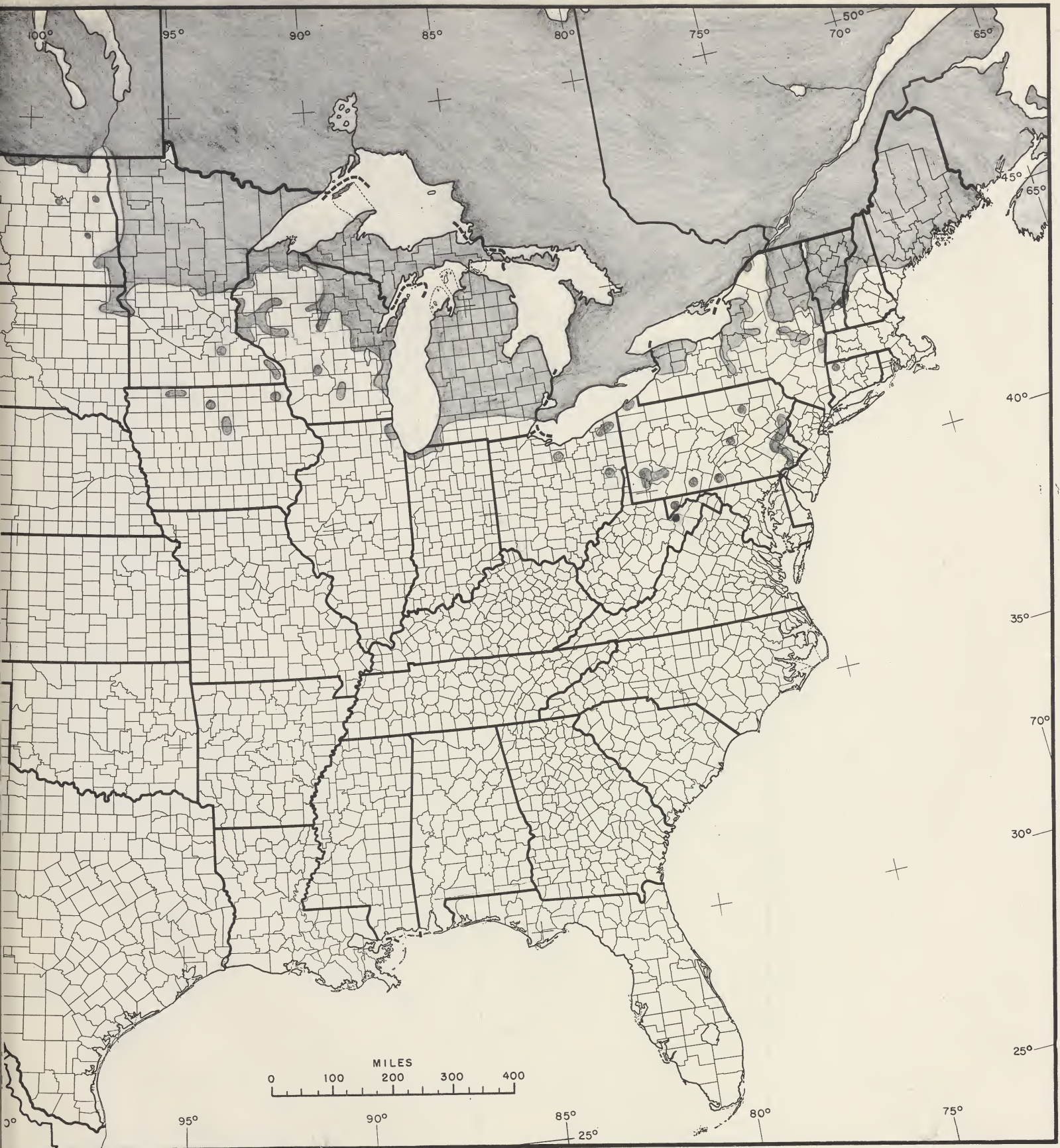
Map 147-N. American sycamore, *Platanus occidentalis* L.



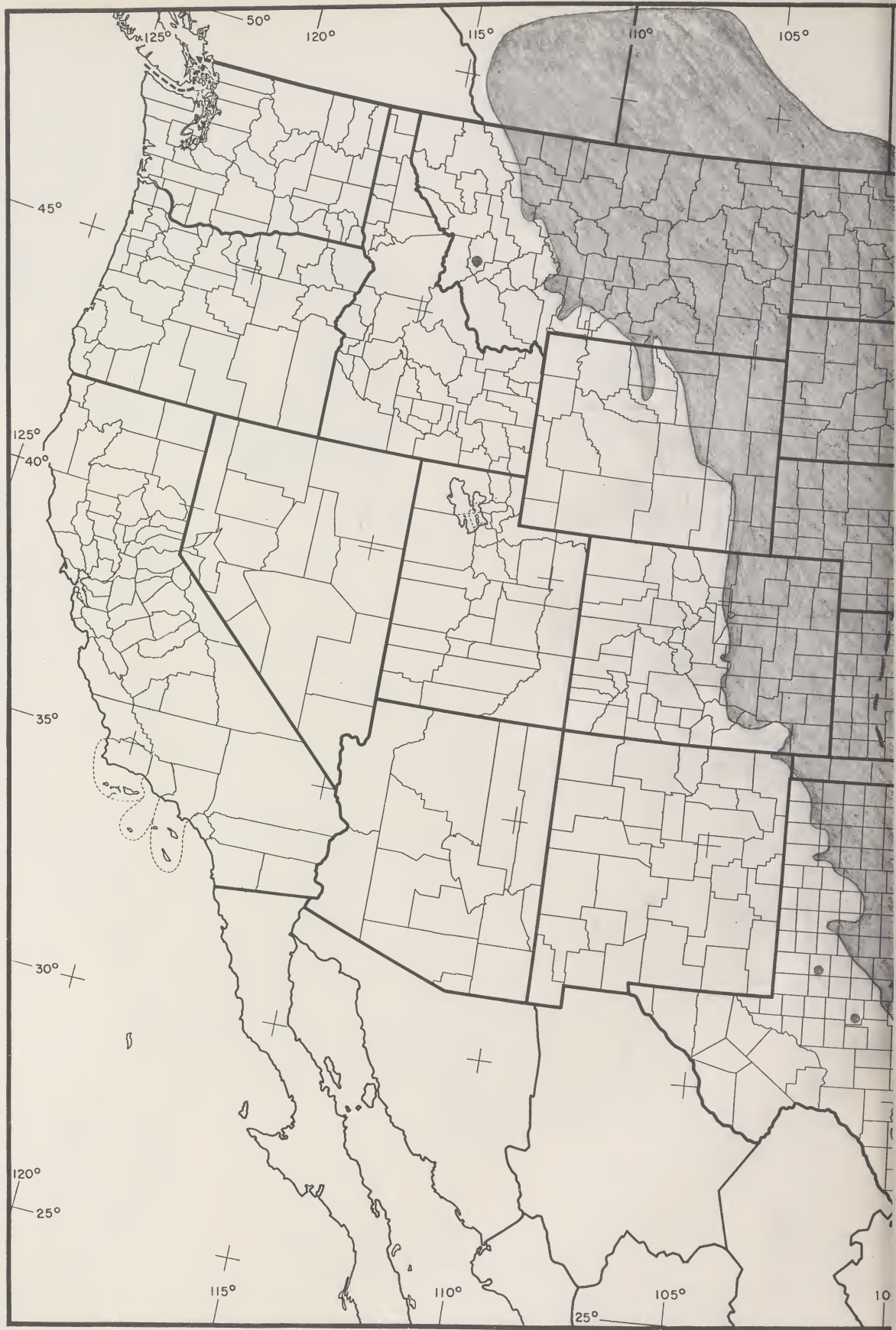
Map 148-N. balsam poplar, *Populus balsamifera* L.



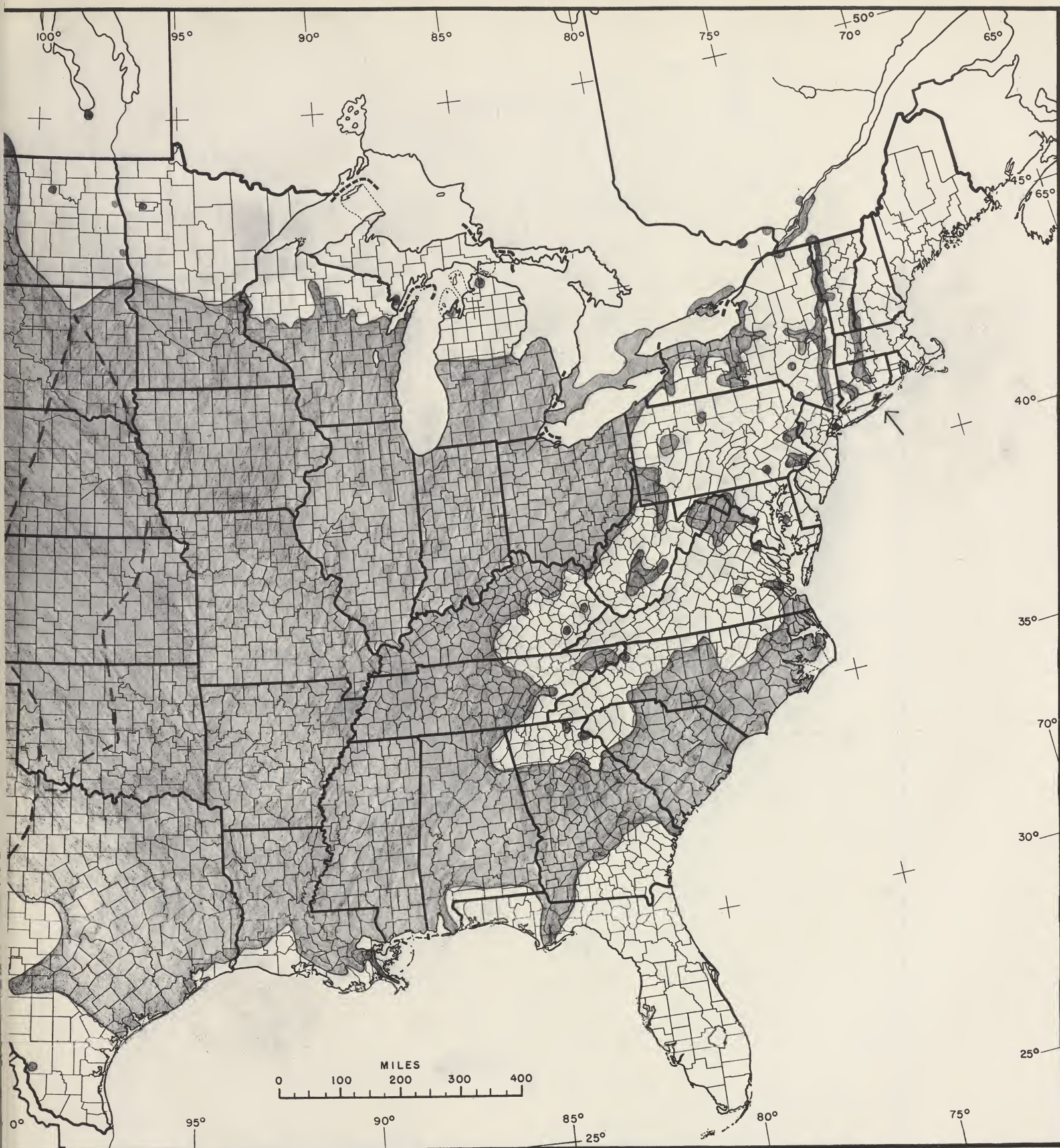
Map 148-W. balsam poplar, *Populus balsamifera* L., western range.



Map 148-E. balsam poplar, *Populus balsamifera* L., eastern range.



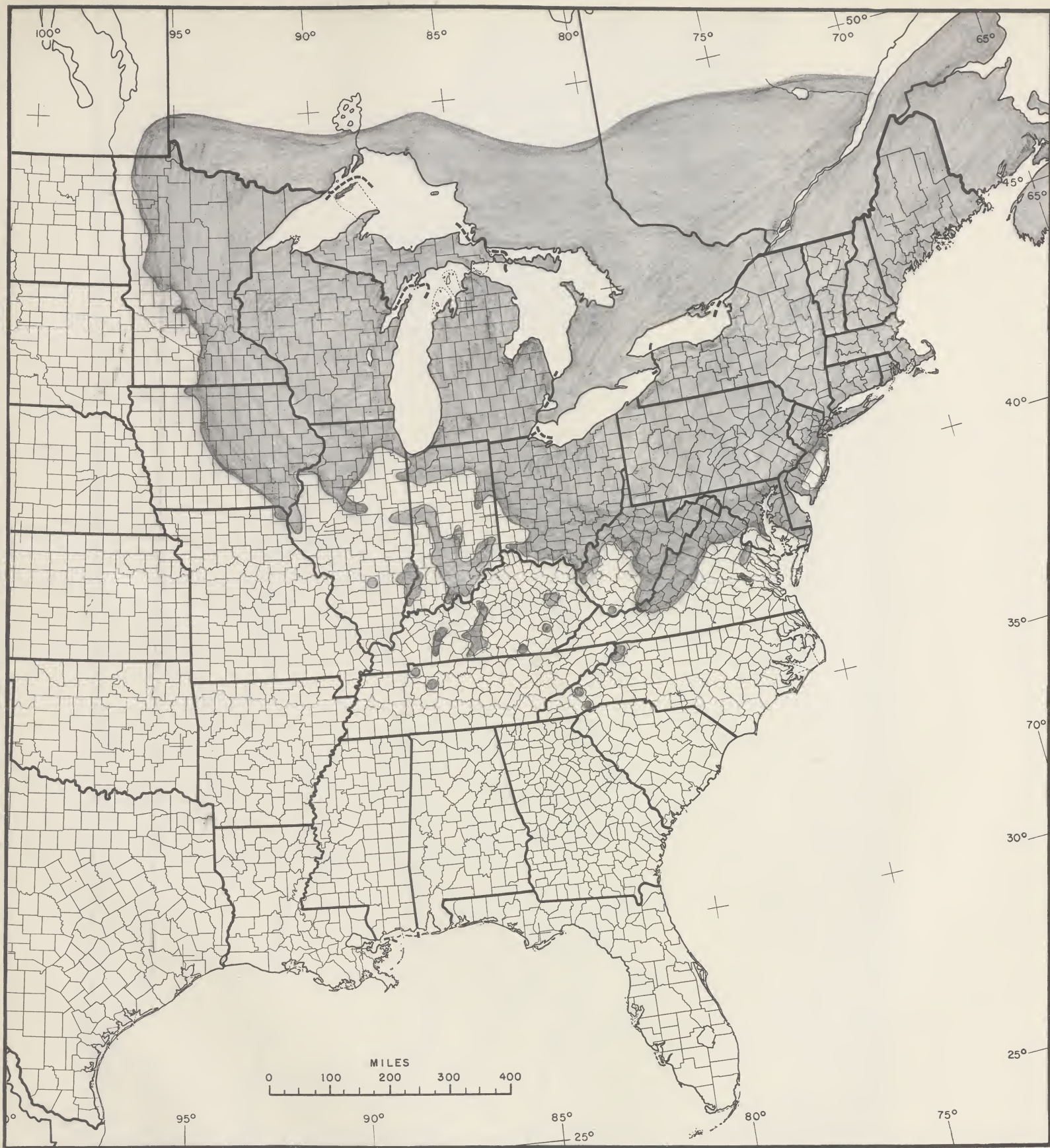
Map 149-W. eastern cottonwood, *Populus deltoides* Bartr., western range. Broken lines separate eastward the typical variety of eastern cottonwood, *P. deltoides* var. *deltoides*, and westward the plains cottonwood, *P. deltoides* var. *occidentalis* Rydb. (*P. sargentii* Dode), and indicate the intermediate zone of both and intergrades.



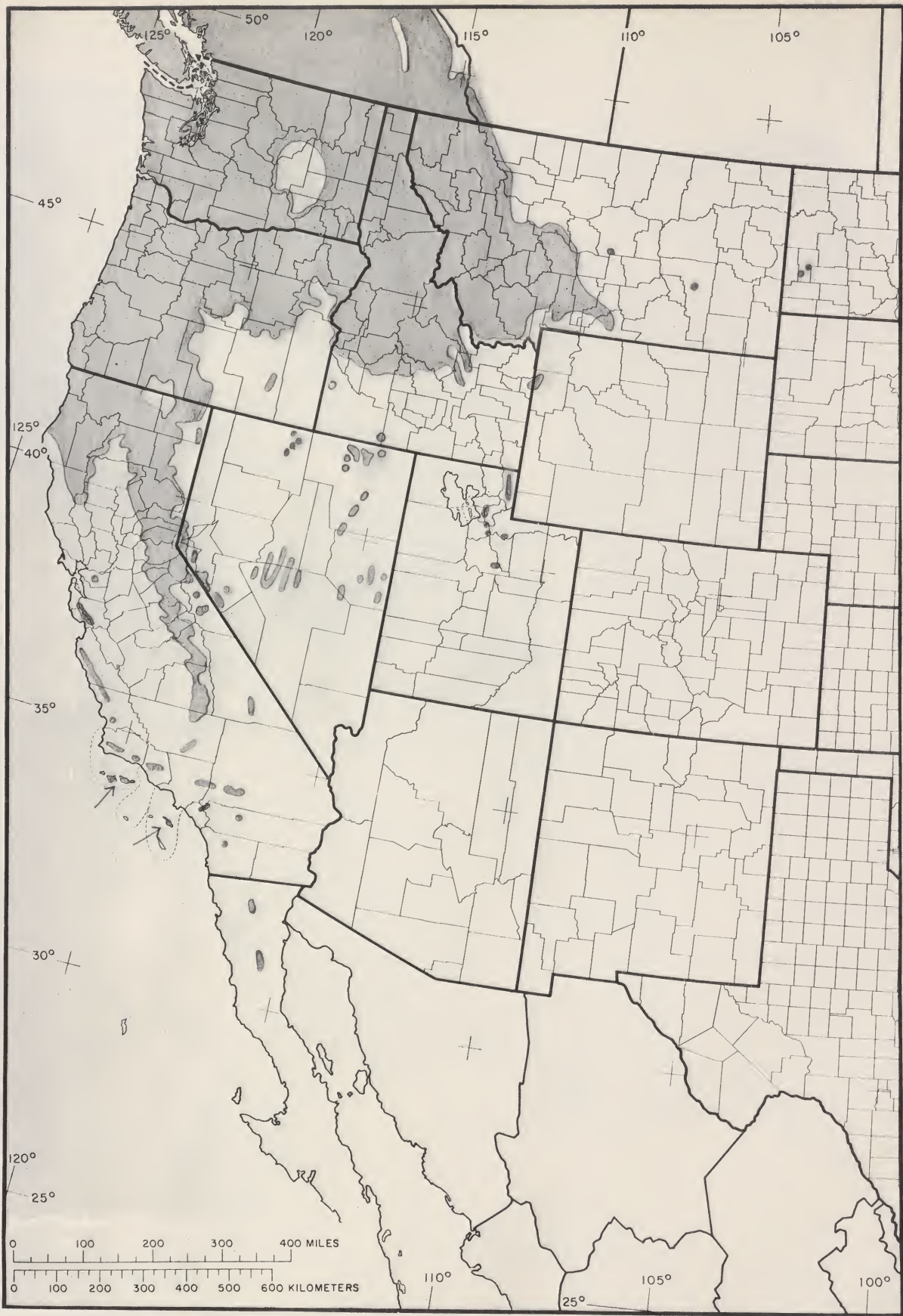
Map 149-E. eastern cottonwood, *Populus deltoides* Bartr., eastern range. Broken lines separate eastward the typical variety of eastern cottonwood, *P. deltoides* var. *deltoides*, and westward the plains cottonwood, *P. deltoides* var. *occidentalis* Rydb. (*P. sargentii* Dode), and indicate the intermediate zone of both and intergrades.



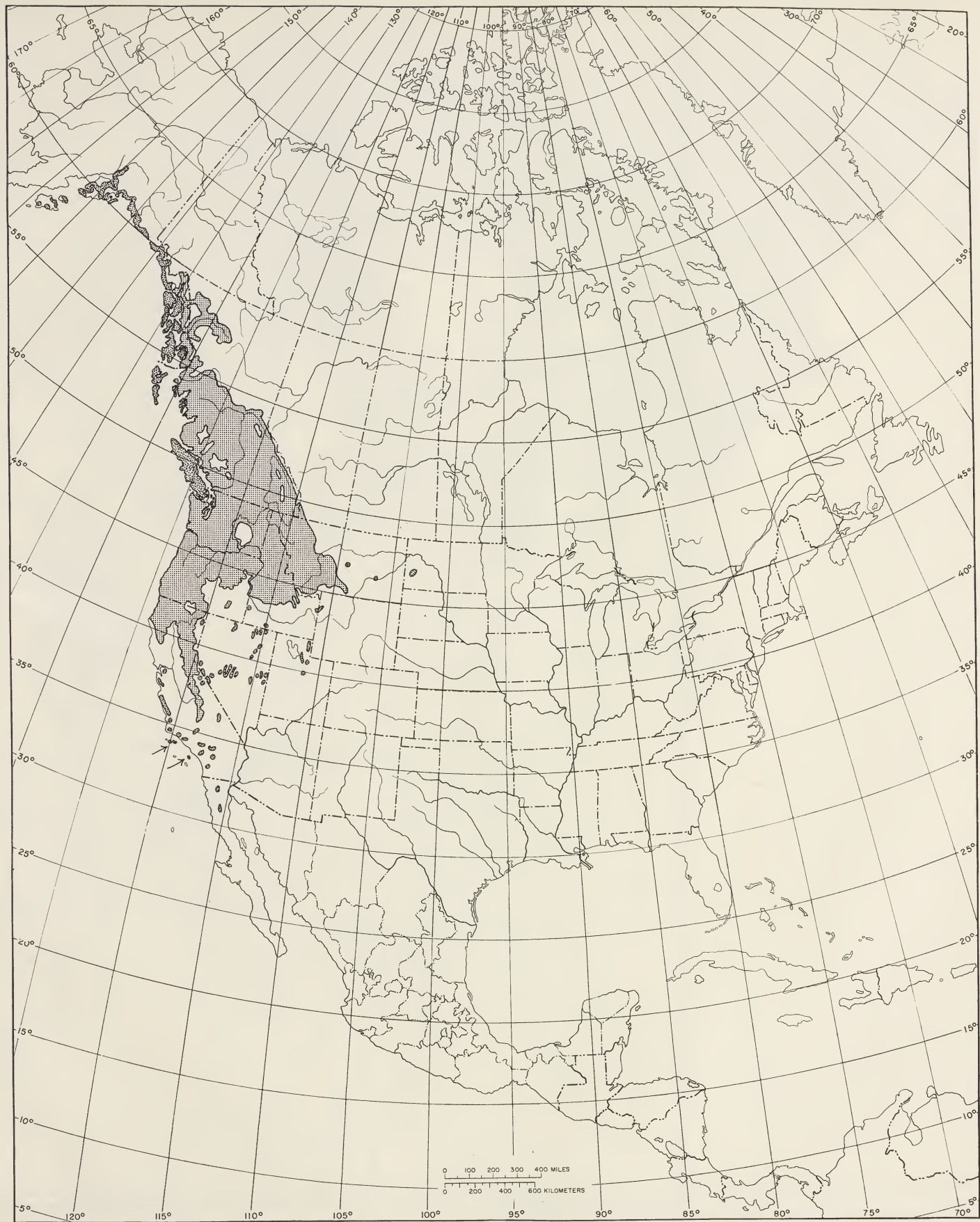
Map 152-N. bigtooth aspen, *Populus grandidentata* Michx.



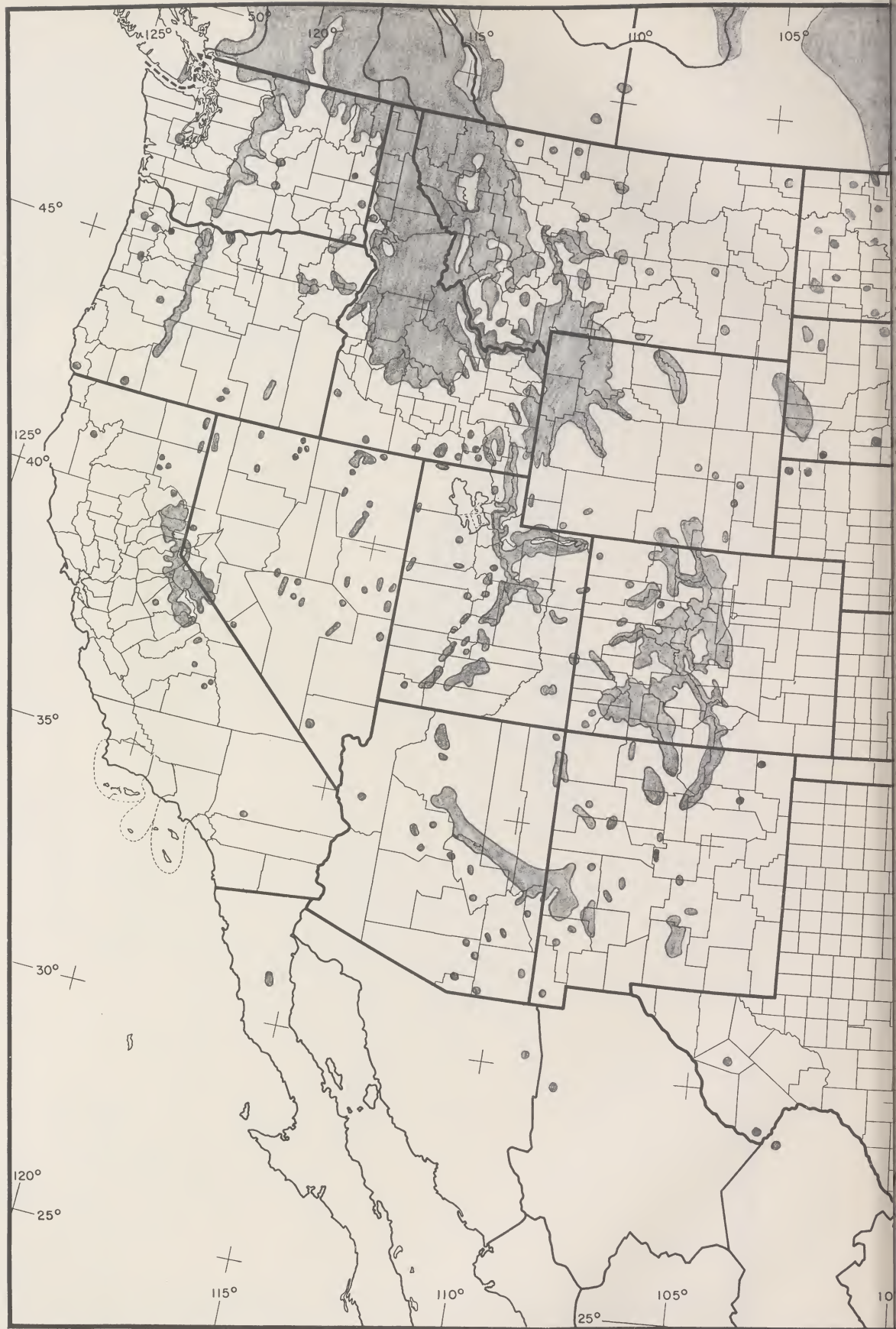
Map 152-E. bigtooth aspen, *Populus grandidentata* Michx.



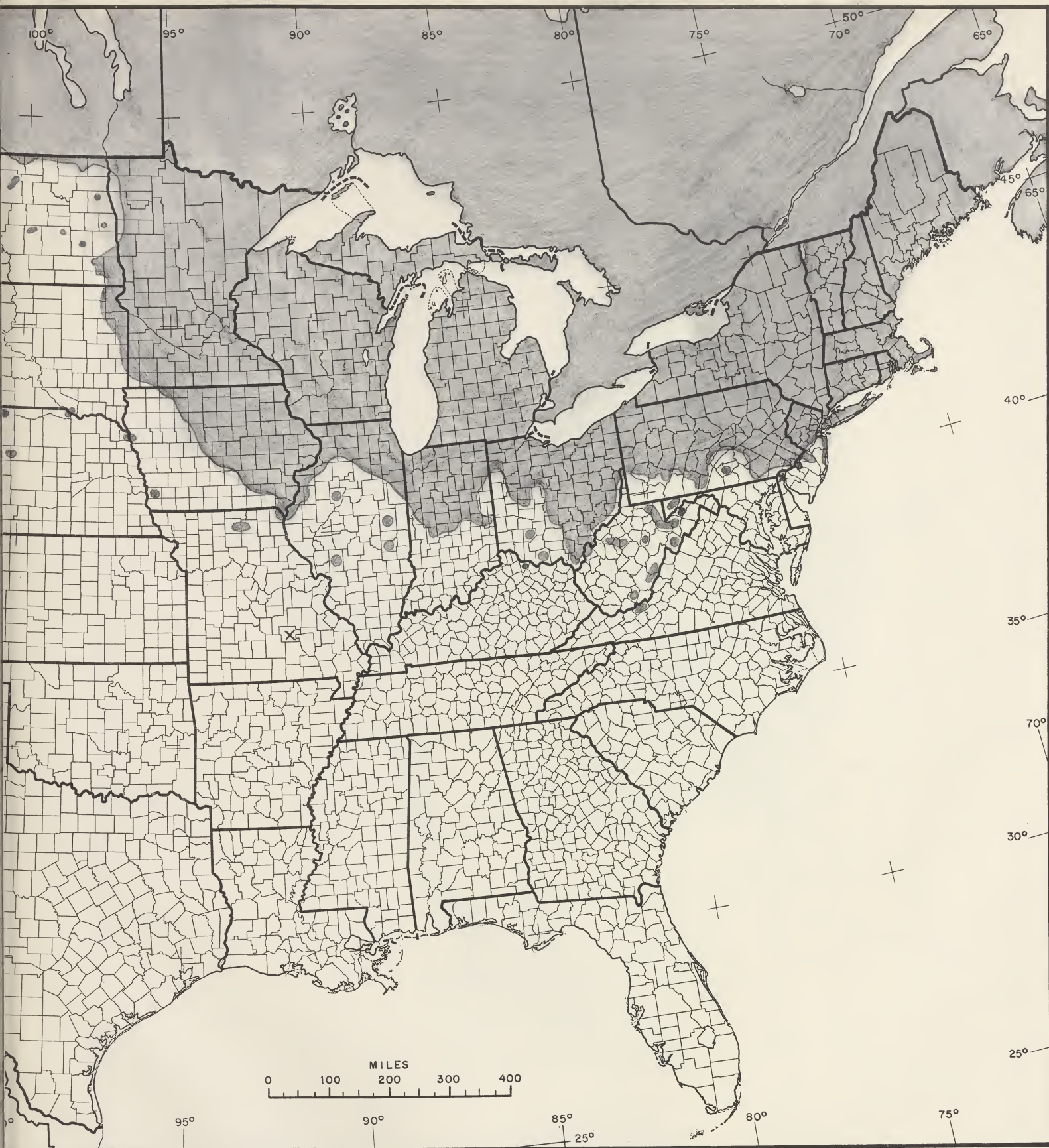
Map 153-W. black cottonwood, *Populus trichocarpa* Torr. & Gray



Map 153-N. black cottonwood, *Populus trichocarpa* Torr. & Gray



Map 154-W. quaking aspen, *Populus tremuloides* Michx., western range.



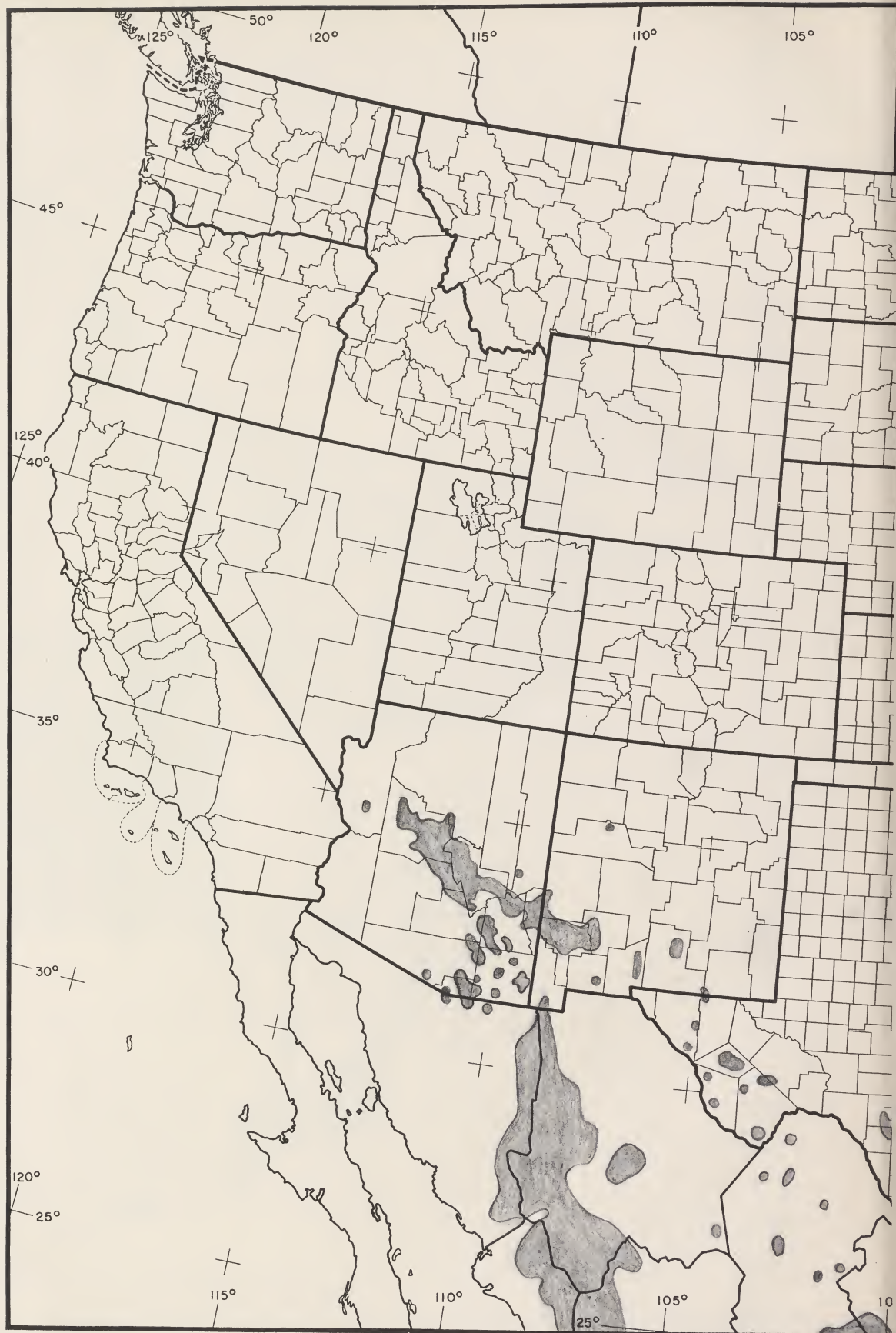
Map 154-E. quaking aspen, *Populus tremuloides* Michx., eastern range.



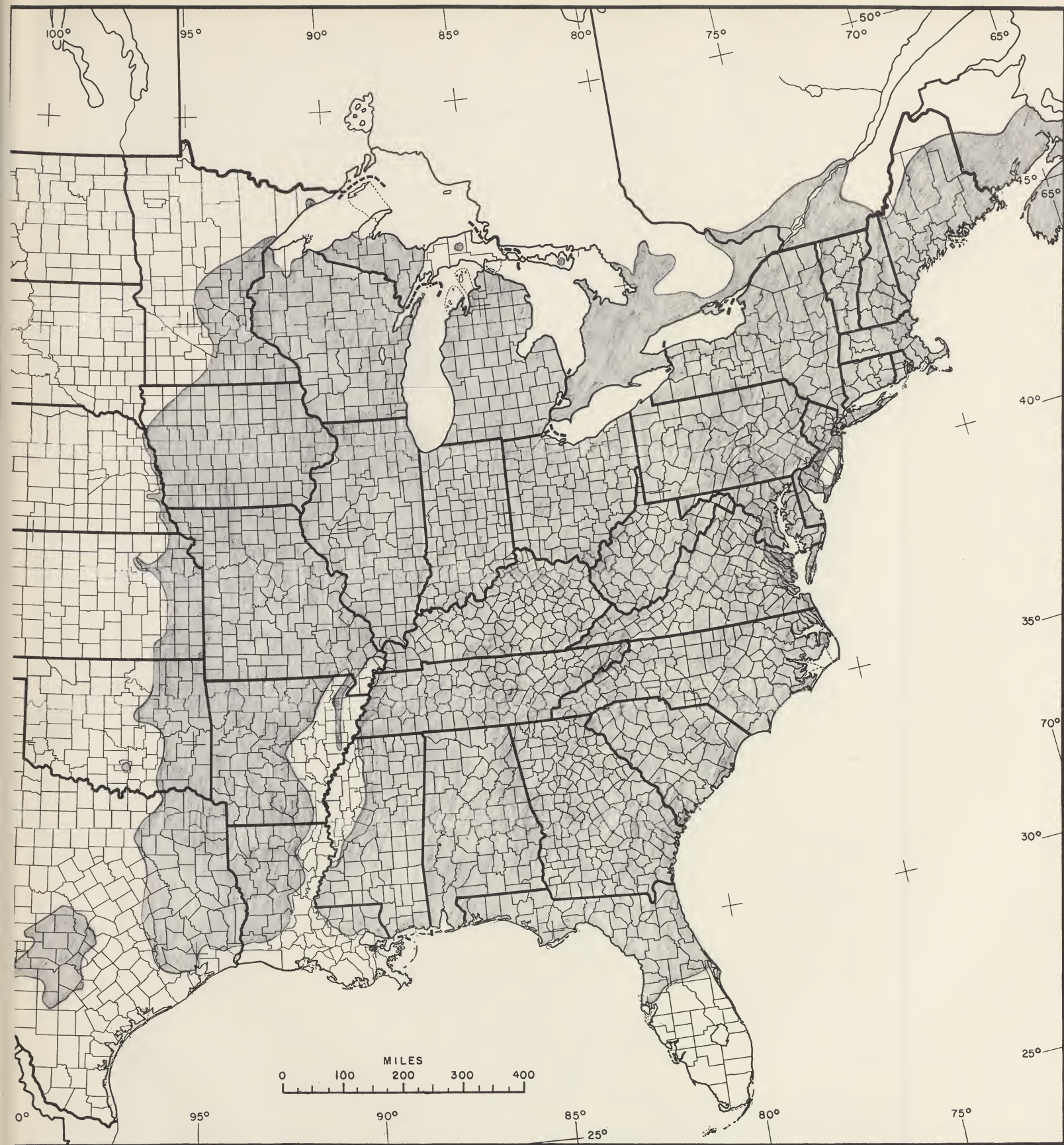
Map 154-N. quaking aspen, *Populus tremuloides* Michx.



Map 155-N. black cherry, *Prunus serotina* Ehrh.



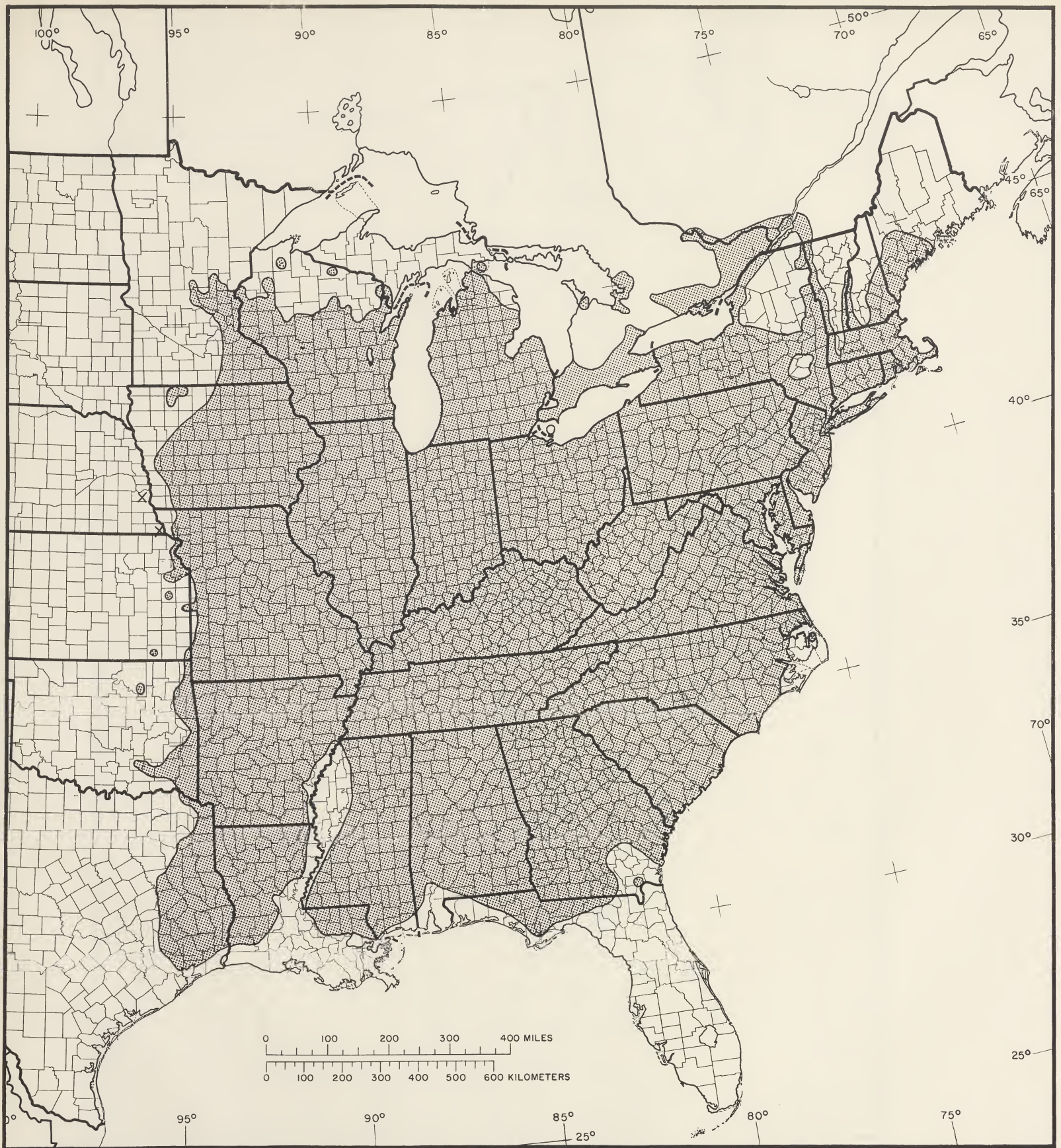
Map 155-W. black cherry, *Prunus serotina* Ehrh., western range.



Map 155-E. black cherry, *Prunus serotina* Ehrh., eastern range.



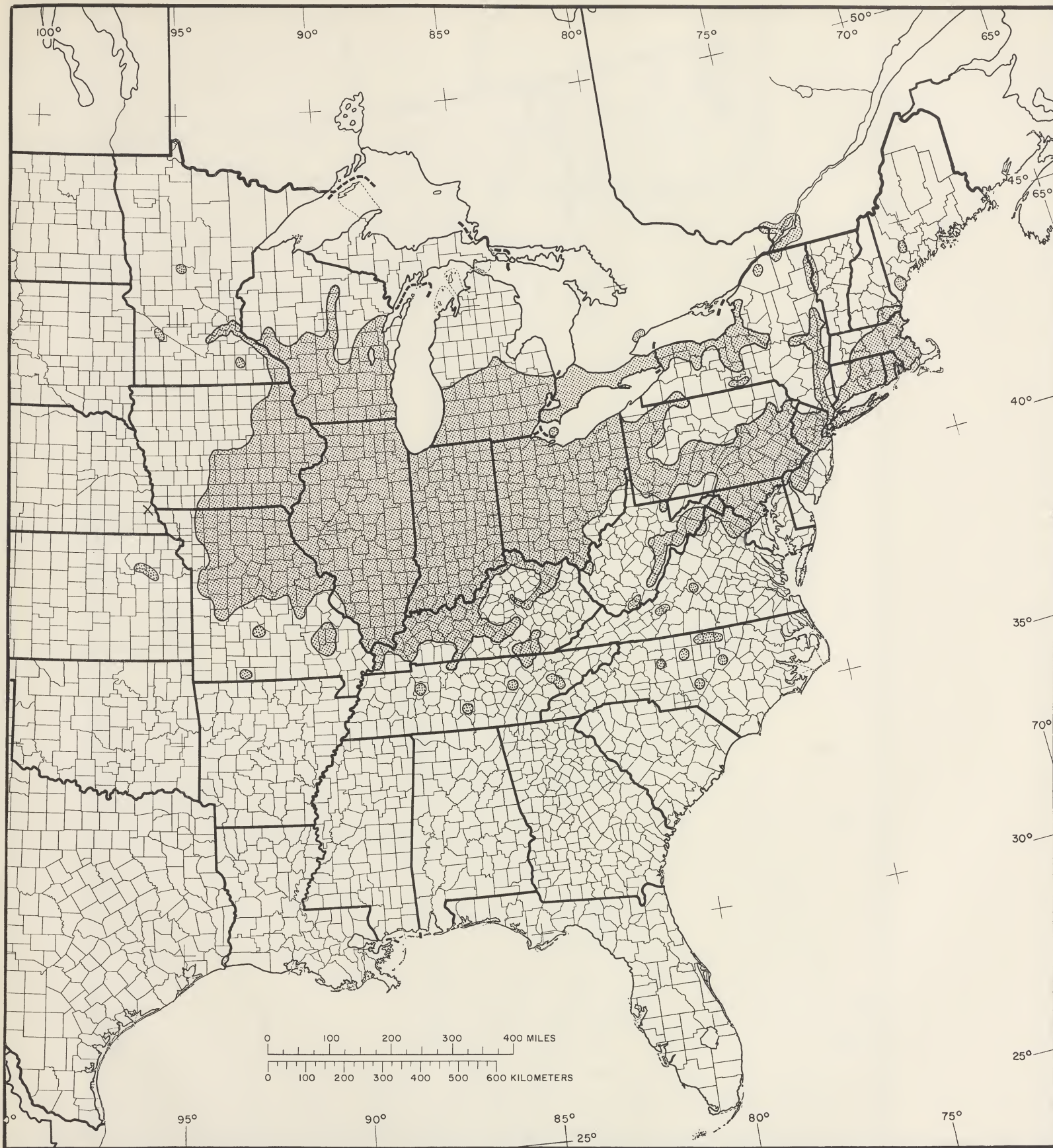
Map 156-W. California live oak, *Quercus agrifolia* Née



Map 157-E. white oak, *Quercus alba* L.



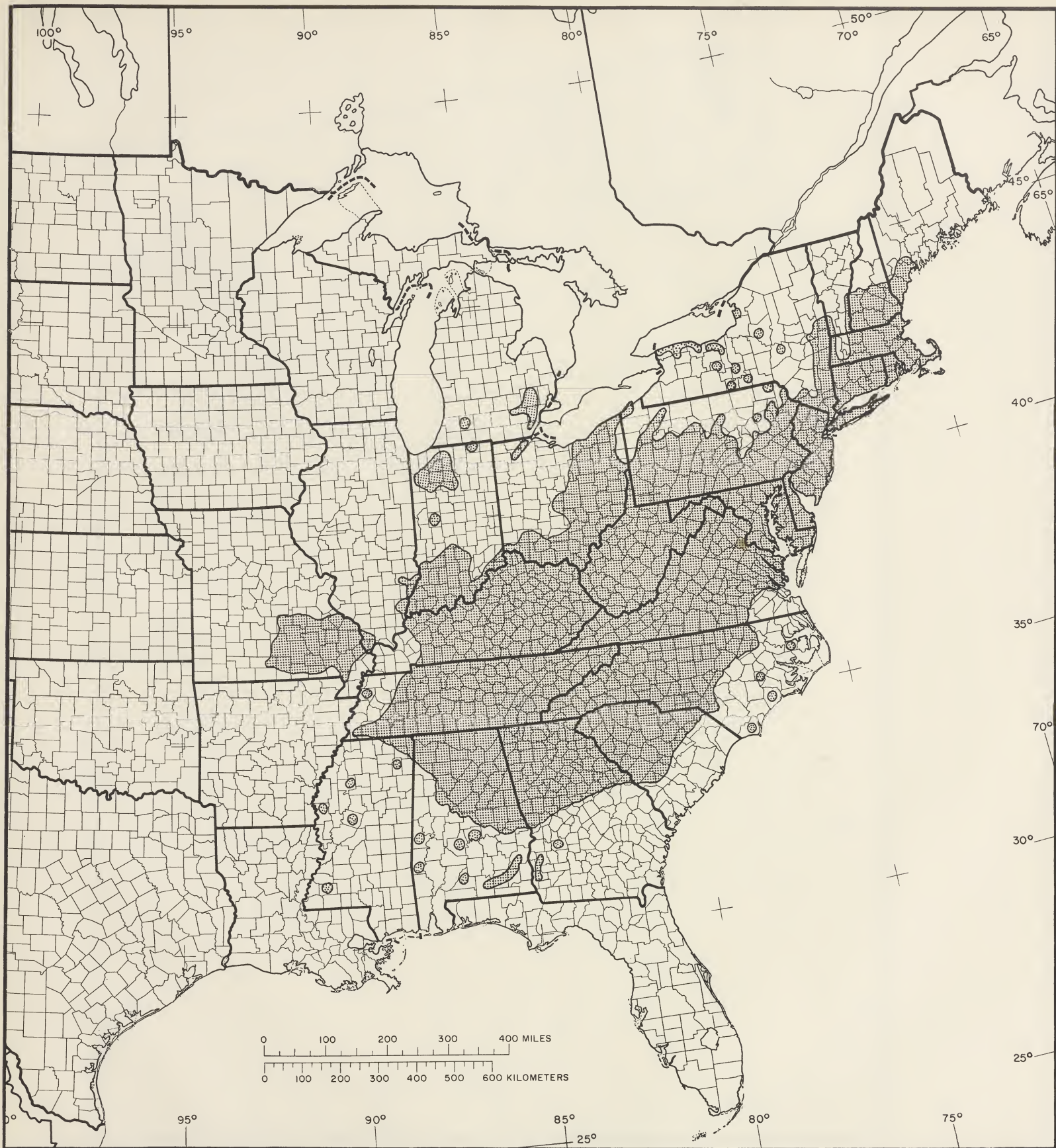
Map 158-W. canyon live oak, *Quercus chrysolepis* Liebm.



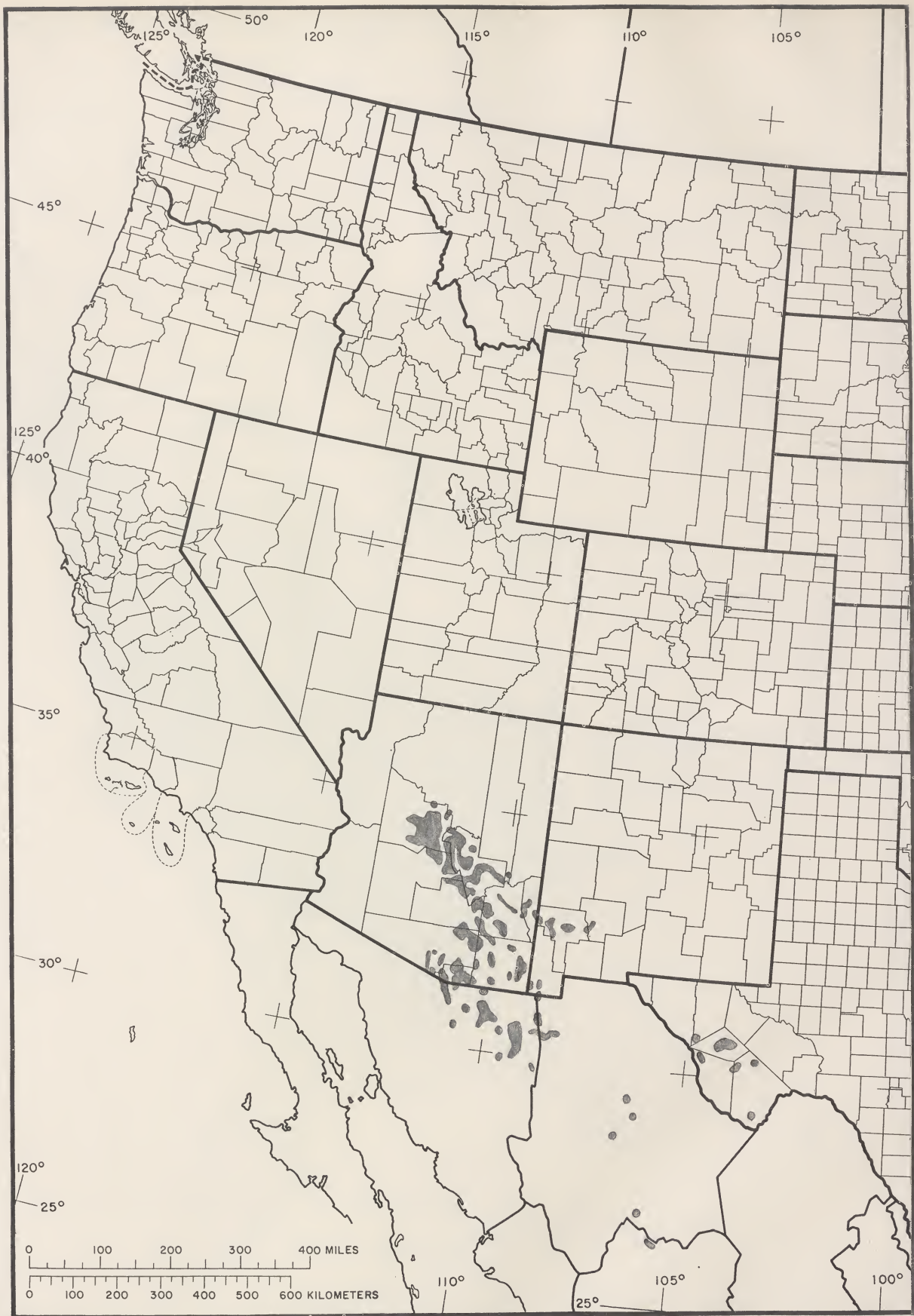
Map 159-E. swamp white oak, *Quercus bicolor* Willd.



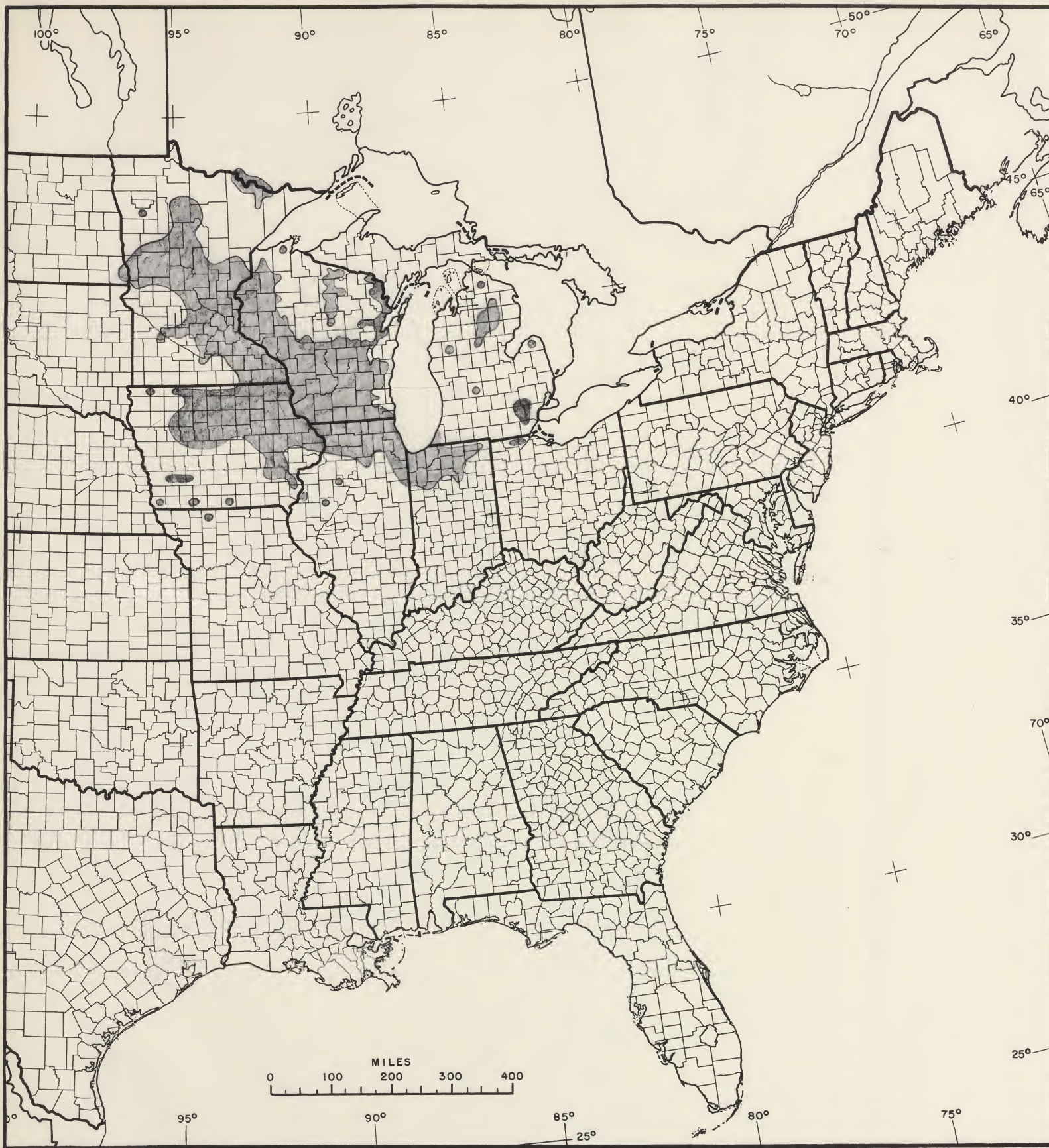
Map 160-W. blue oak, *Quercus douglasii* Hook. & Arn.



Map 161-E. scarlet oak, *Quercus coccinea* Muenchh.



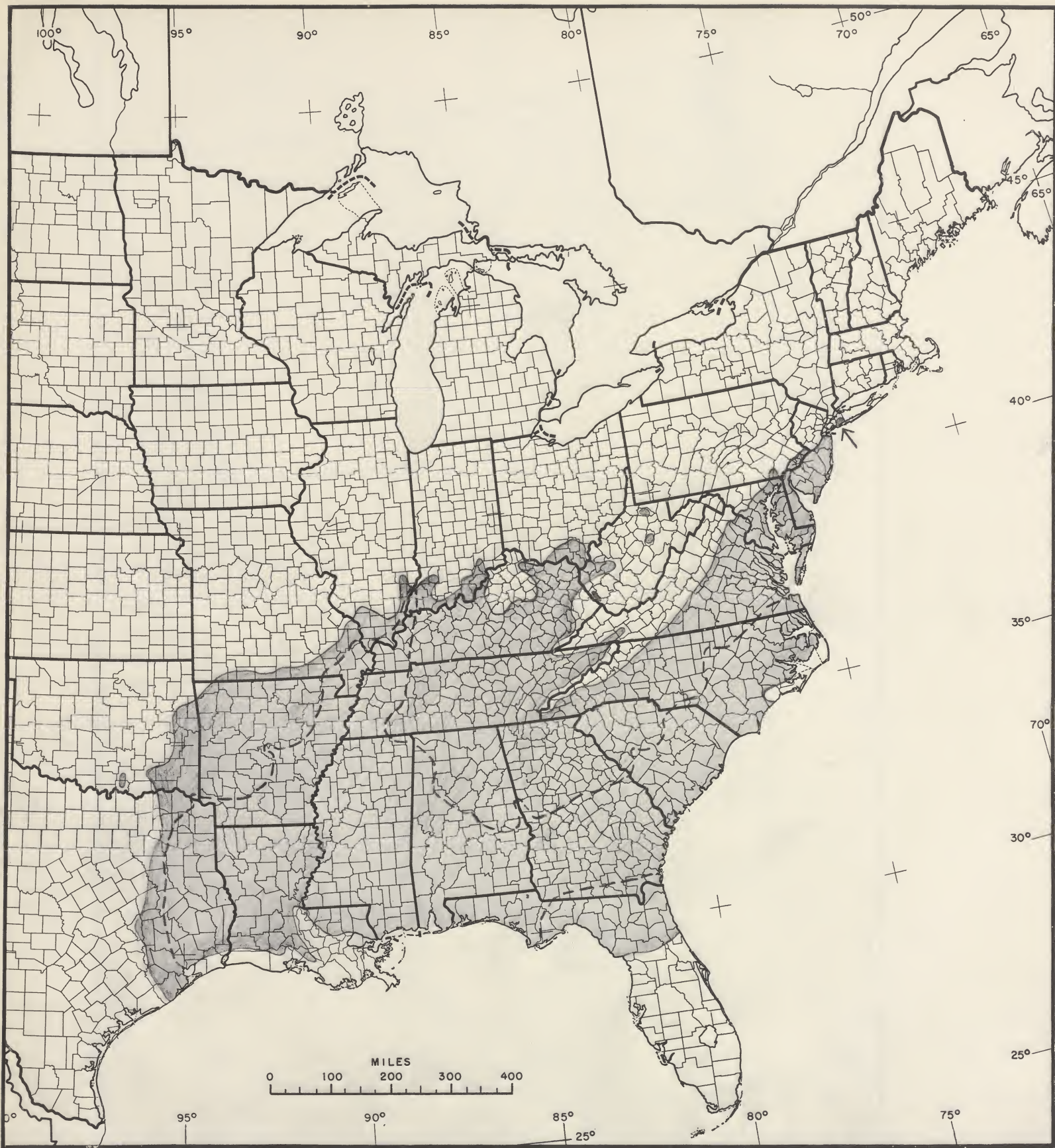
Map 162-W. Emory oak, *Quercus emoryi* Torr. Recorded also from Coahuila and Nuevo León, Mexico.



Map 163-E. northern pin oak, *Quercus ellipsoidalis* E. J. Hill



Map 164-W. Gambel oak, *Quercus gambelii* Nutt.



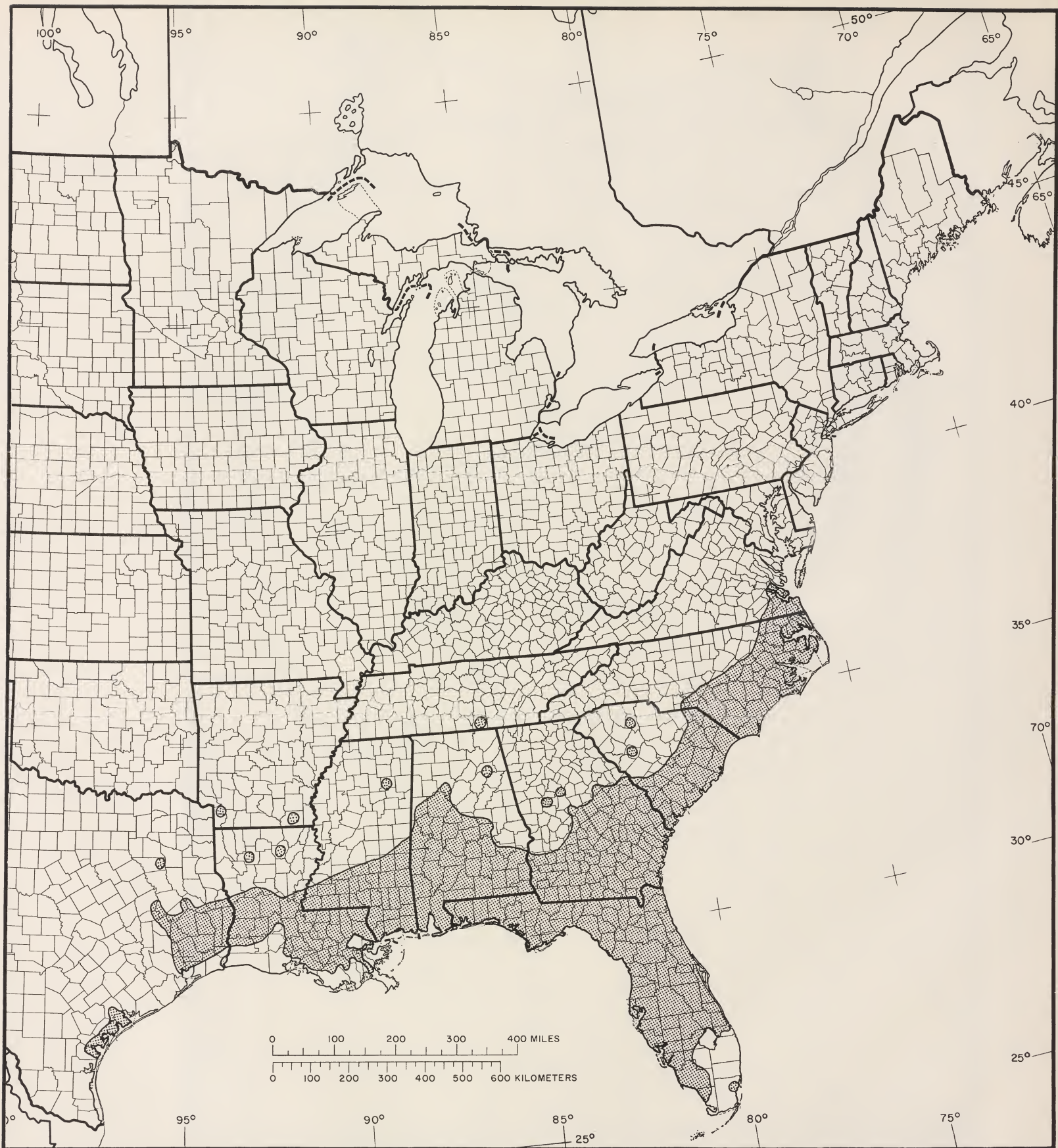
Map 165-E. southern red oak, *Quercus falcata* Michx. Broken lines indicate the approximate northern and southern limits of the variety cherrybark oak, *Q. falcata* var. *pagodaefolia* Ell., also in scattered localities northward.



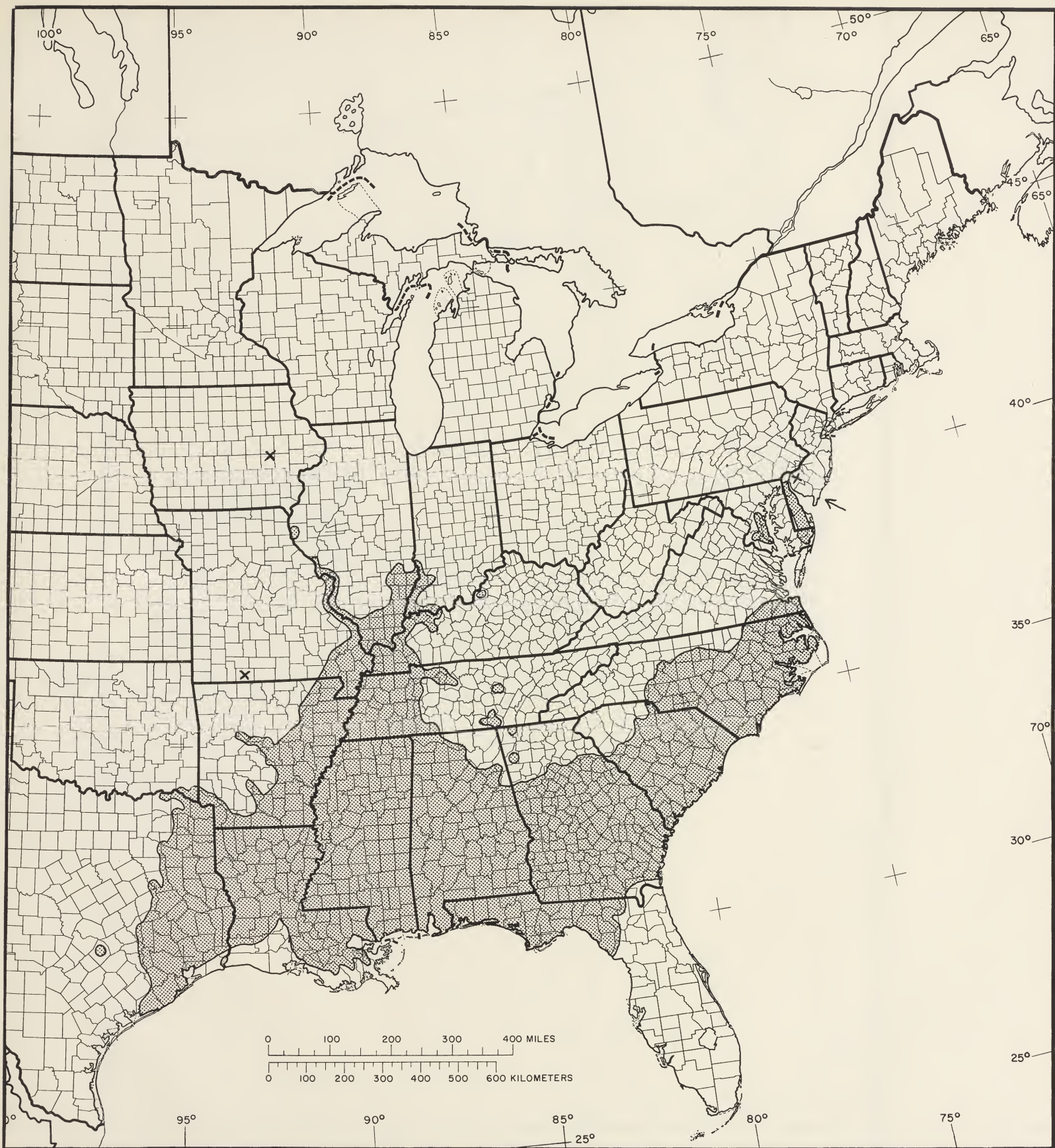
Map 166-W. Oregon white oak, *Quercus garryana* Dougl.



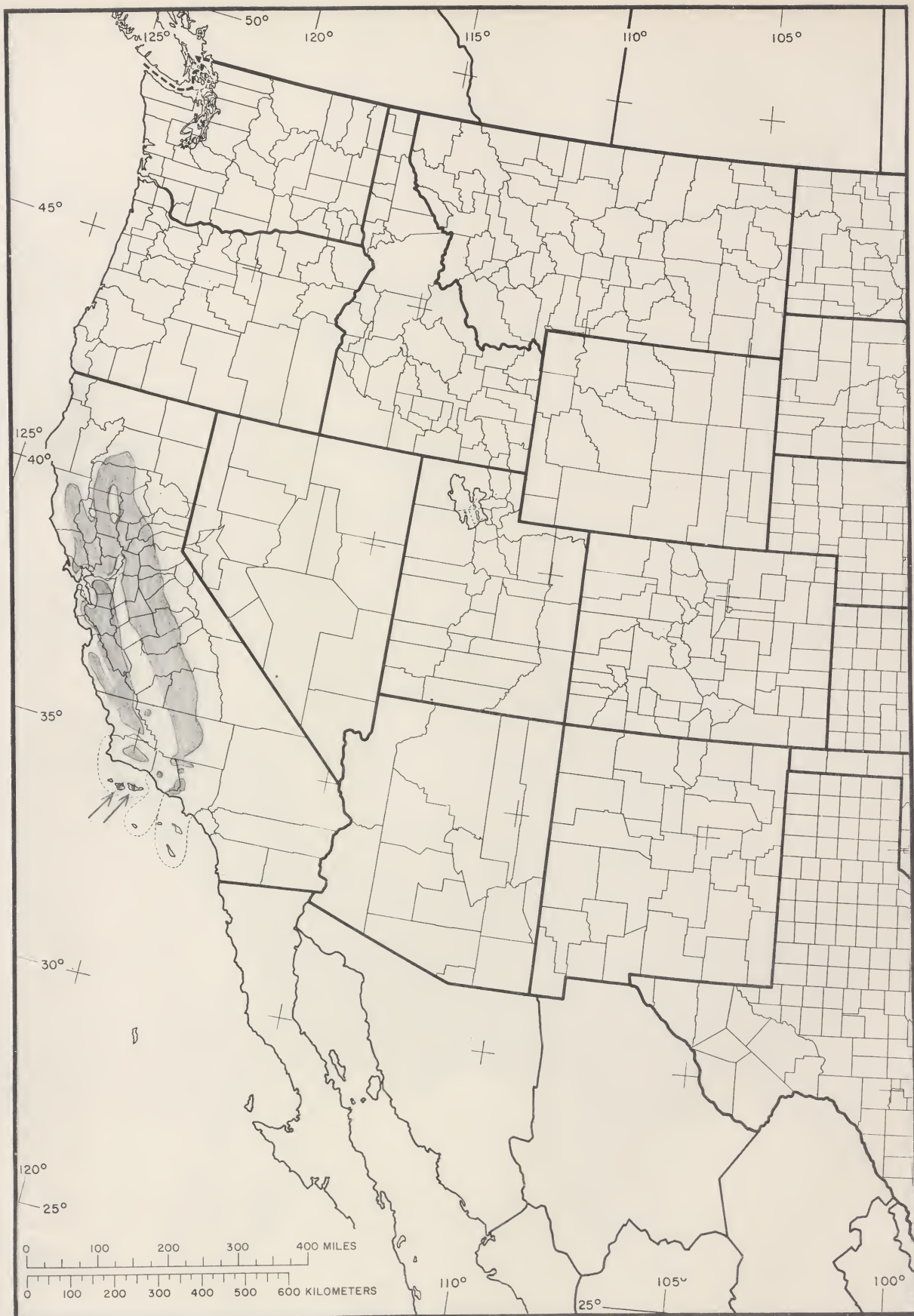
Map 167-W. California black oak, *Quercus kelloggii* Newb.



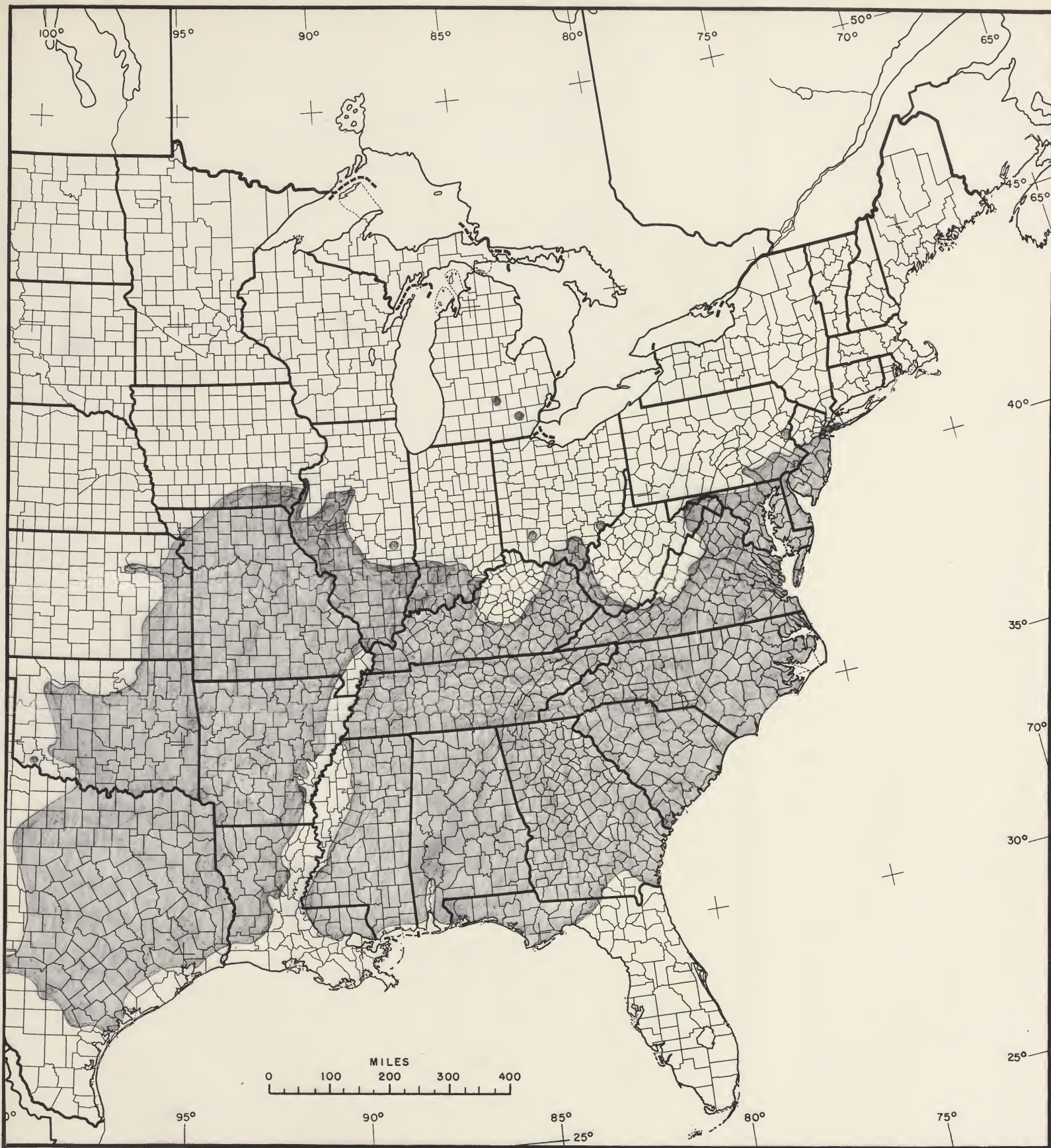
Map 168-E. laurel oak, *Quercus laurifolia* Michx.



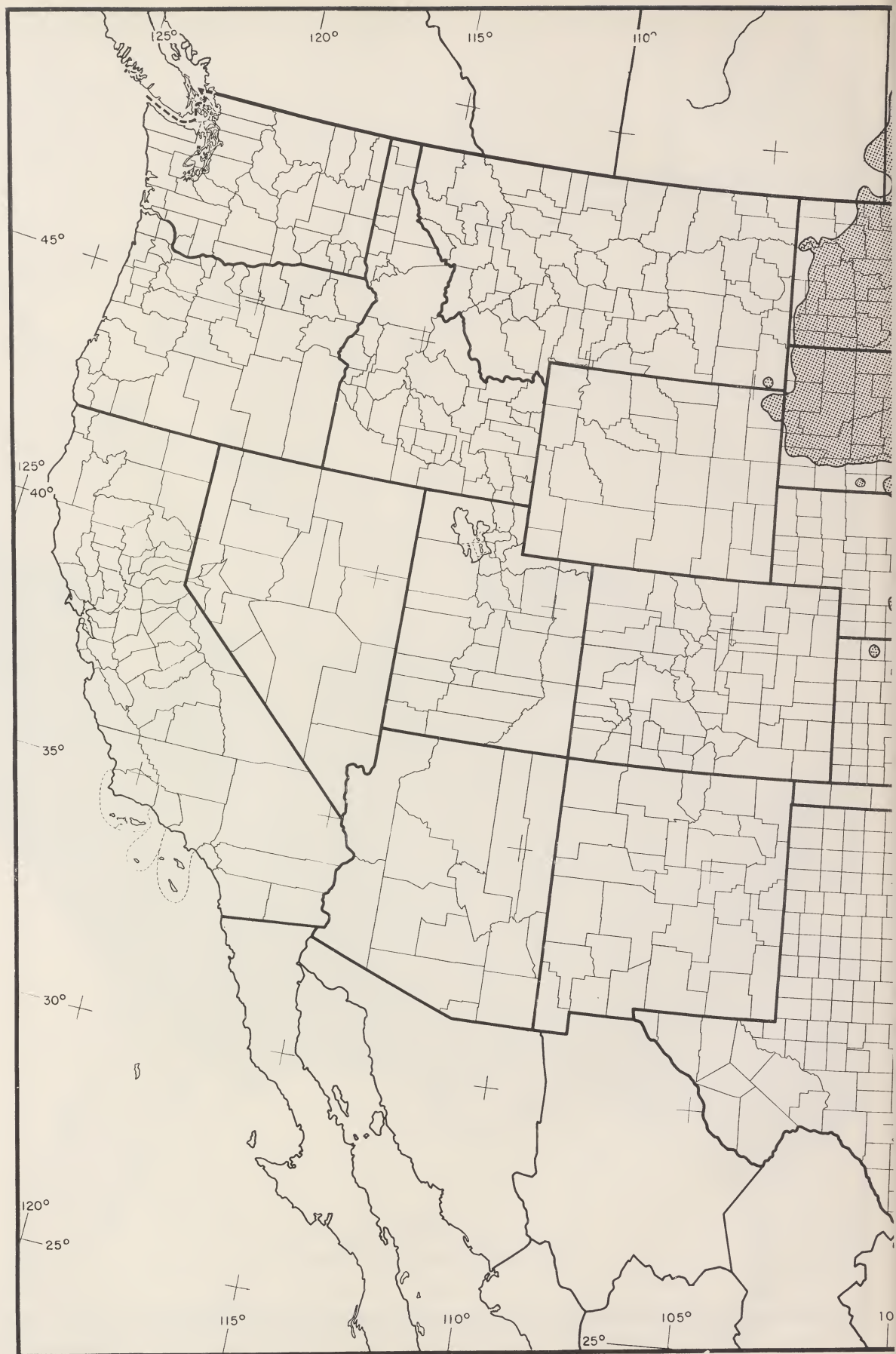
Map 169-E. overcup oak, *Quercus lyrata* Walt.



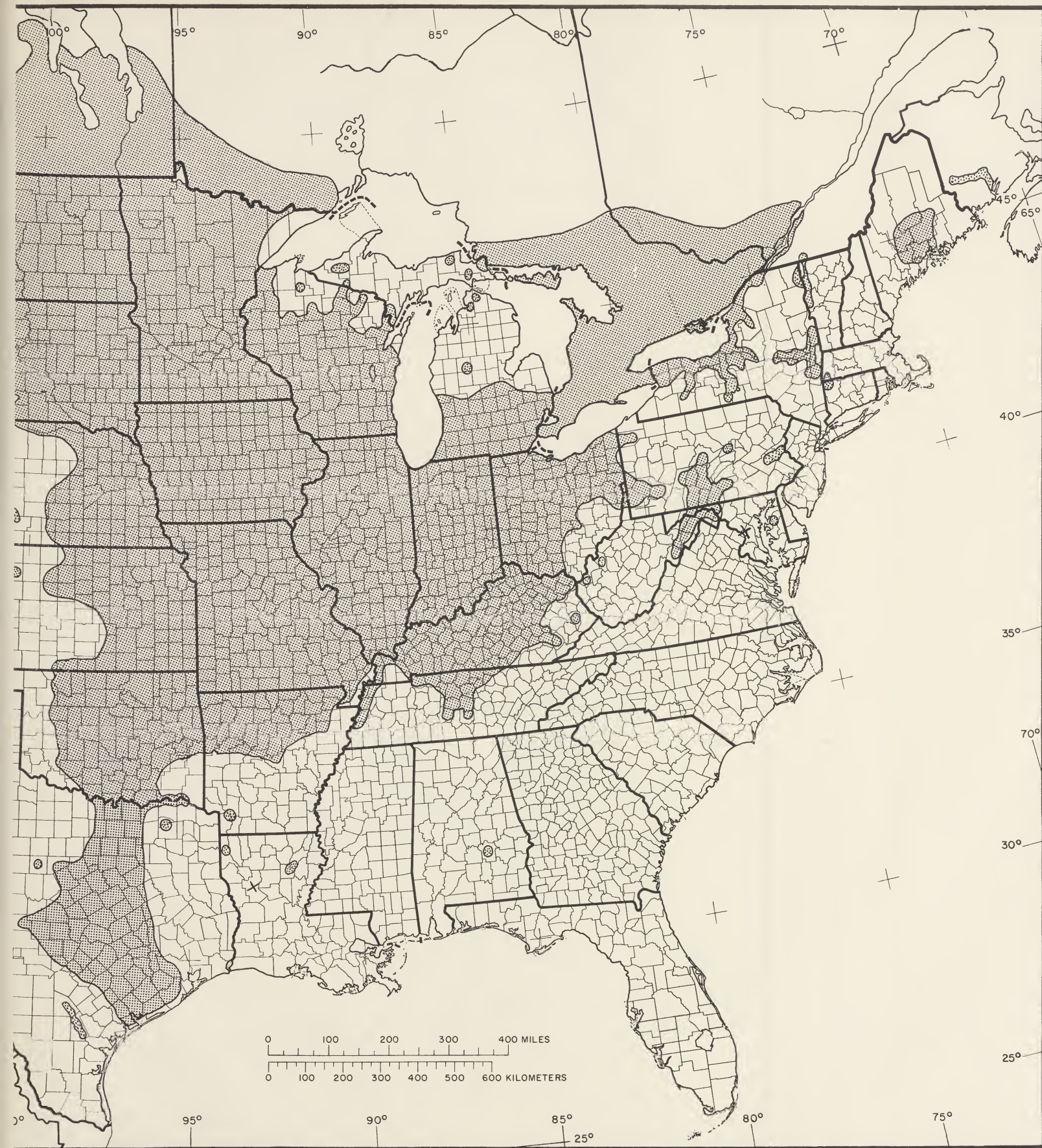
Map 170-W. California white oak, *Quercus lobata* Née



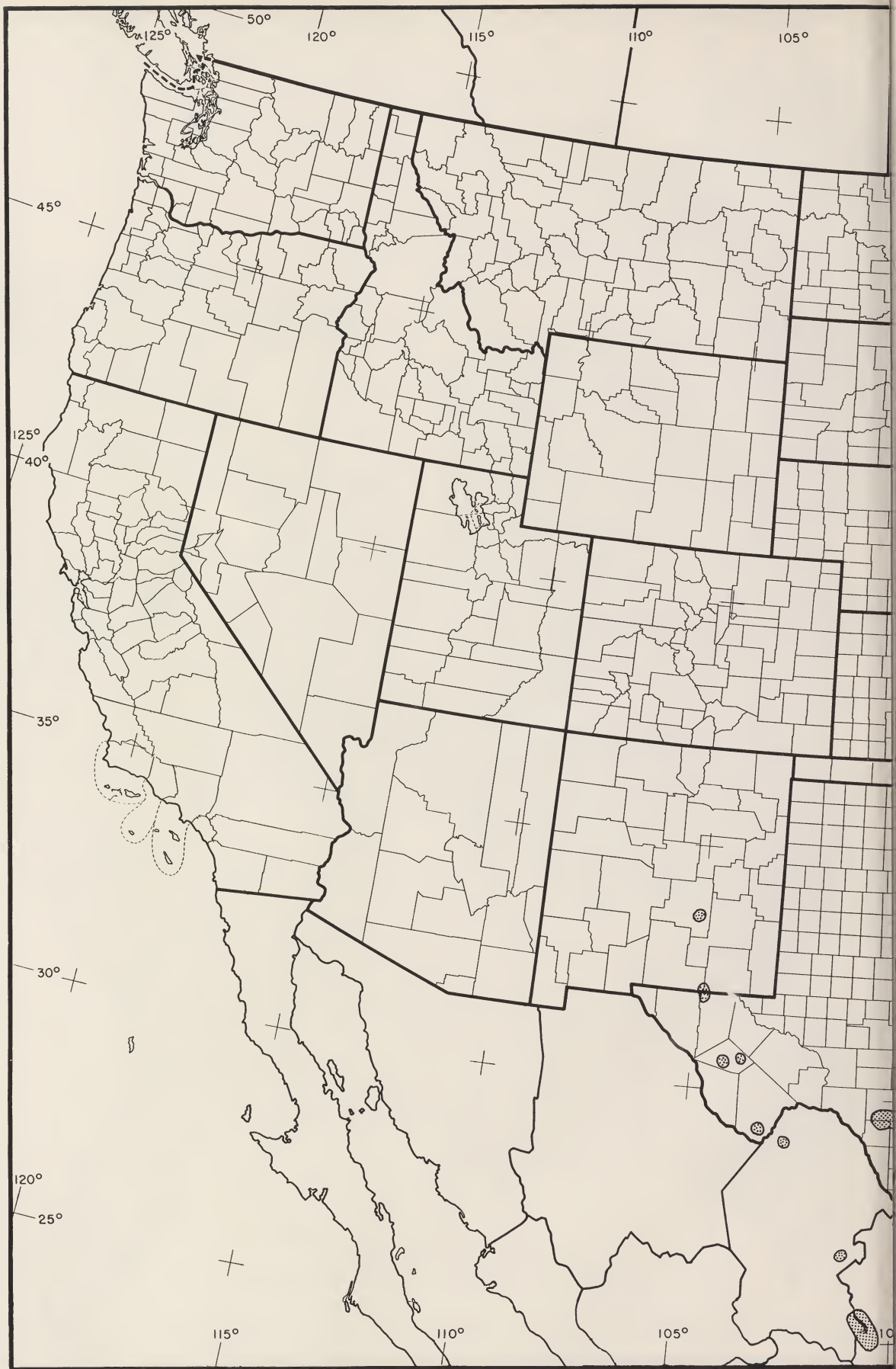
Map 171-E. blackjack oak, *Quercus marilandica* Muenchh.



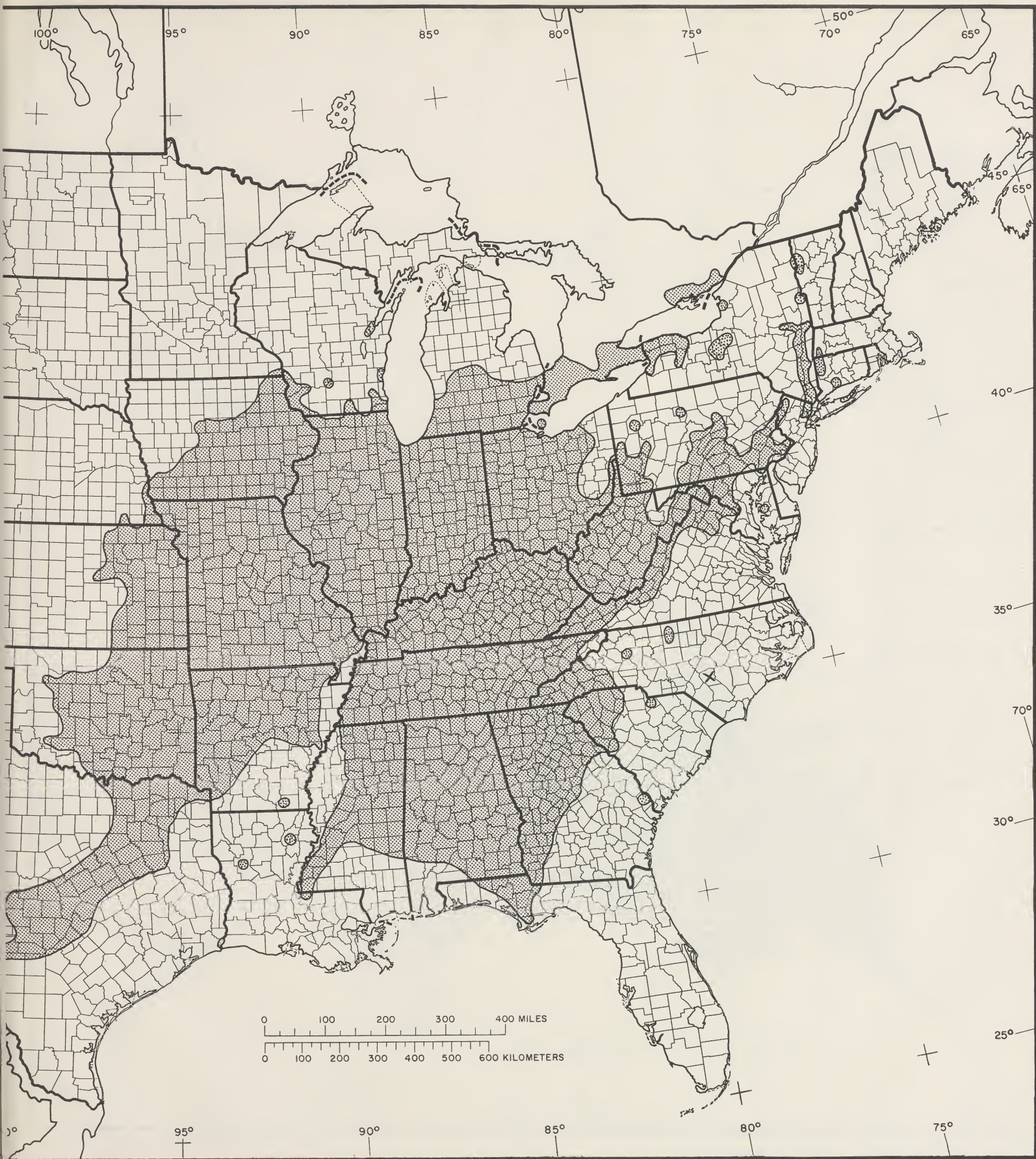
Map 172-W. bur oak, *Quercus macrocarpa* Michx., western range.



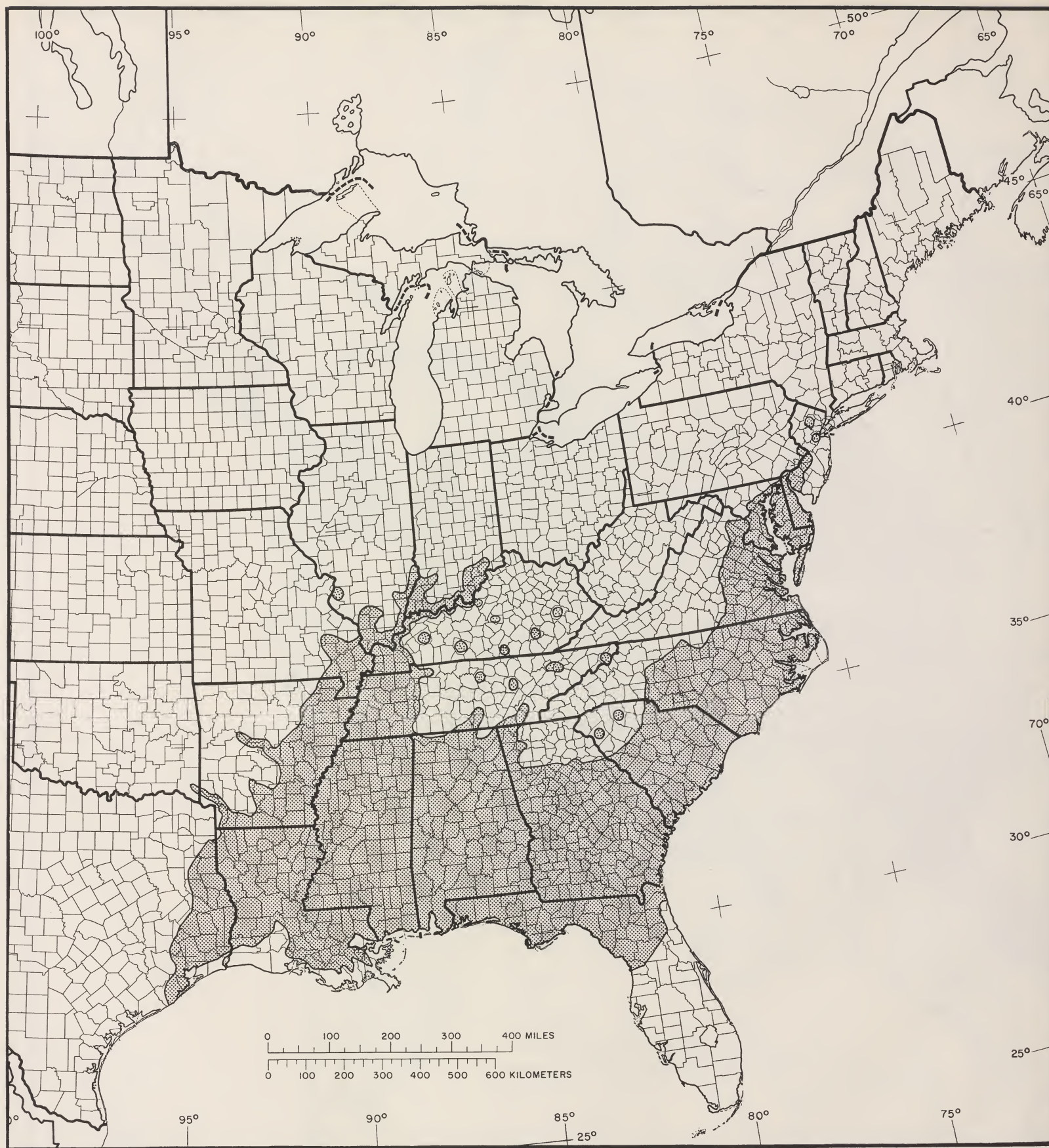
Map 172-E. bur oak, *Quercus macrocarpa* Michx., eastern range.



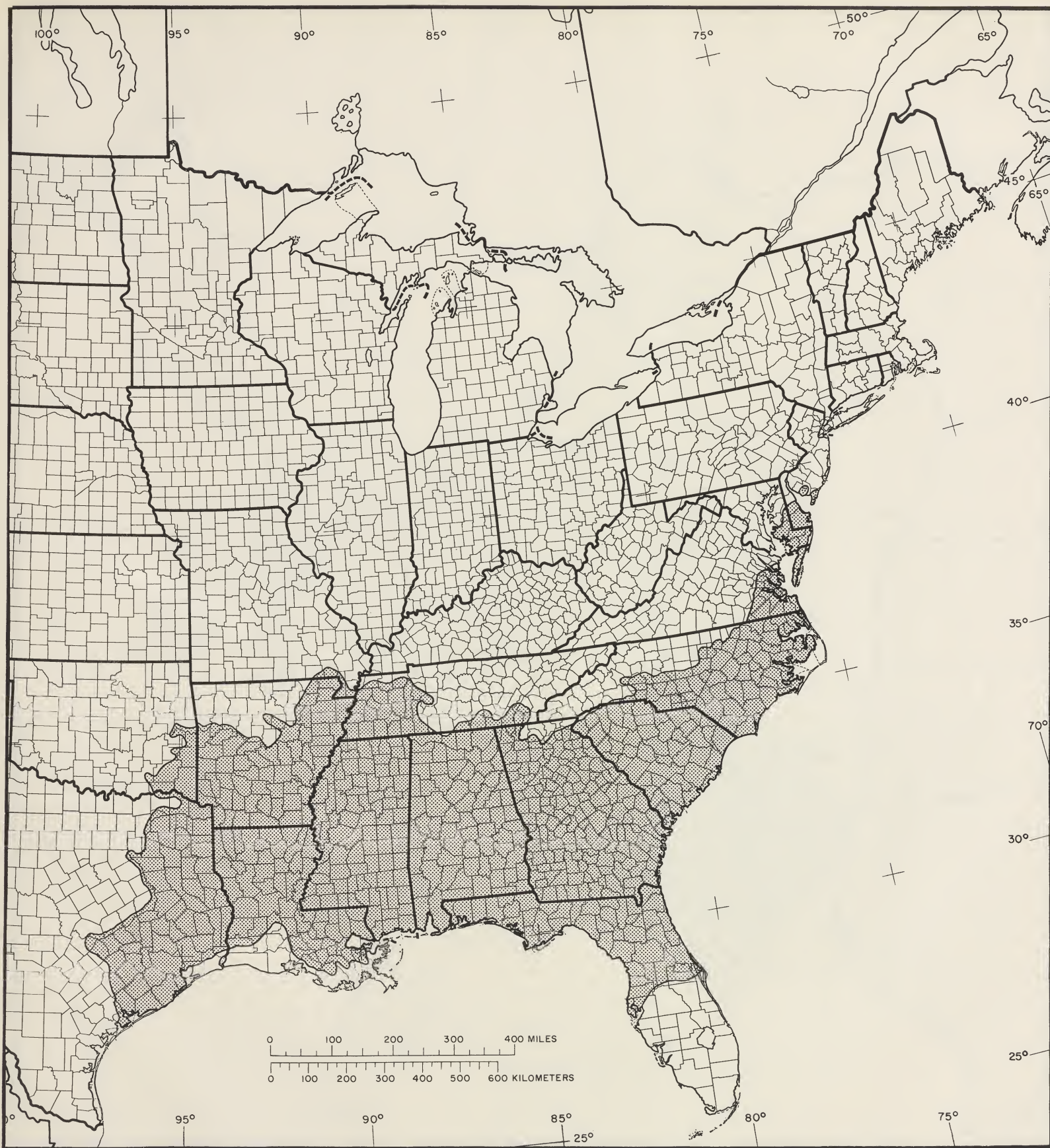
Map 173-W. chinkapin oak, *Quercus muehlenbergii* Engelm., western range.



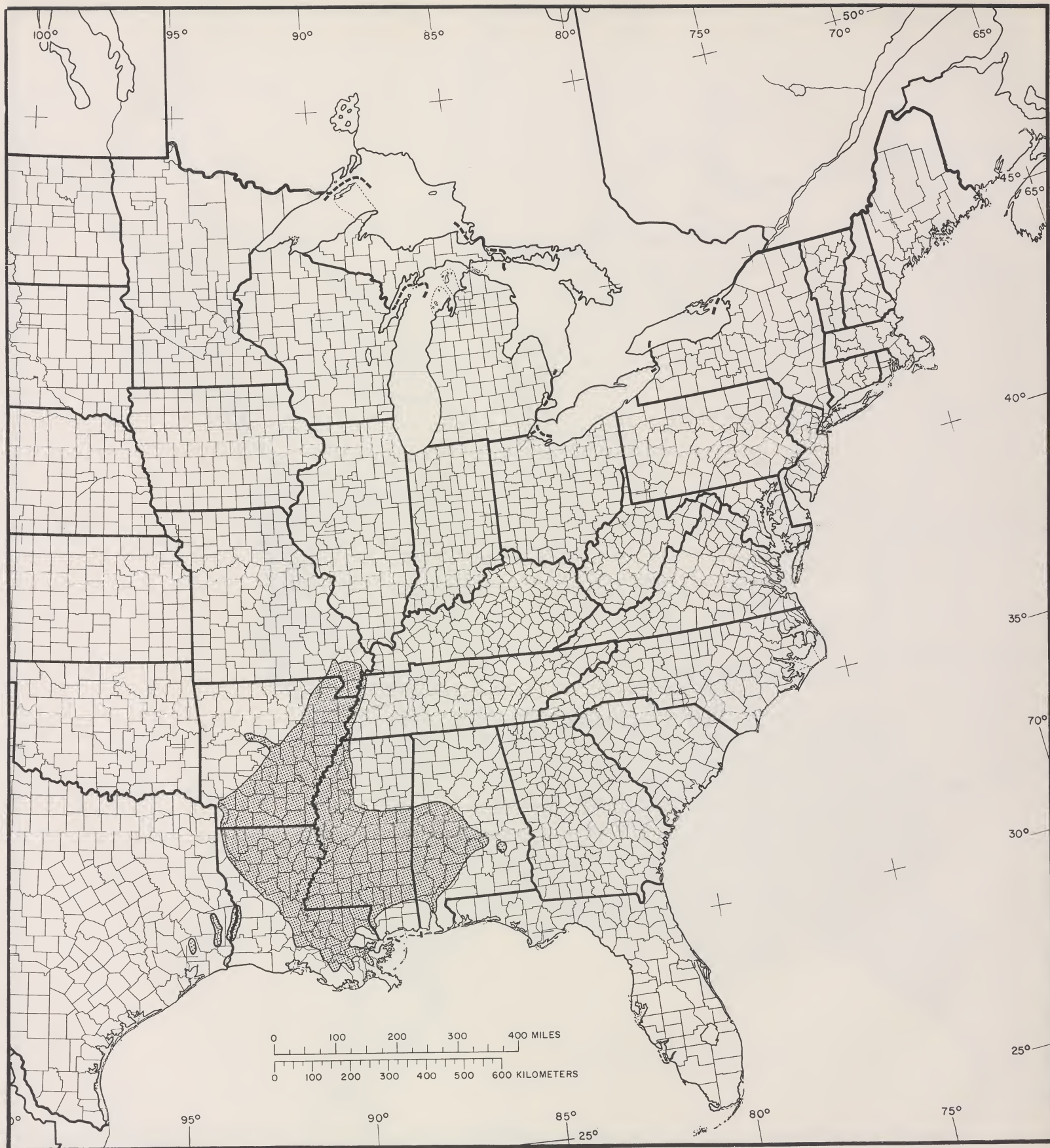
Map 173-E. chinkapin oak, *Quercus muehlenbergii* Engelm., eastern range.



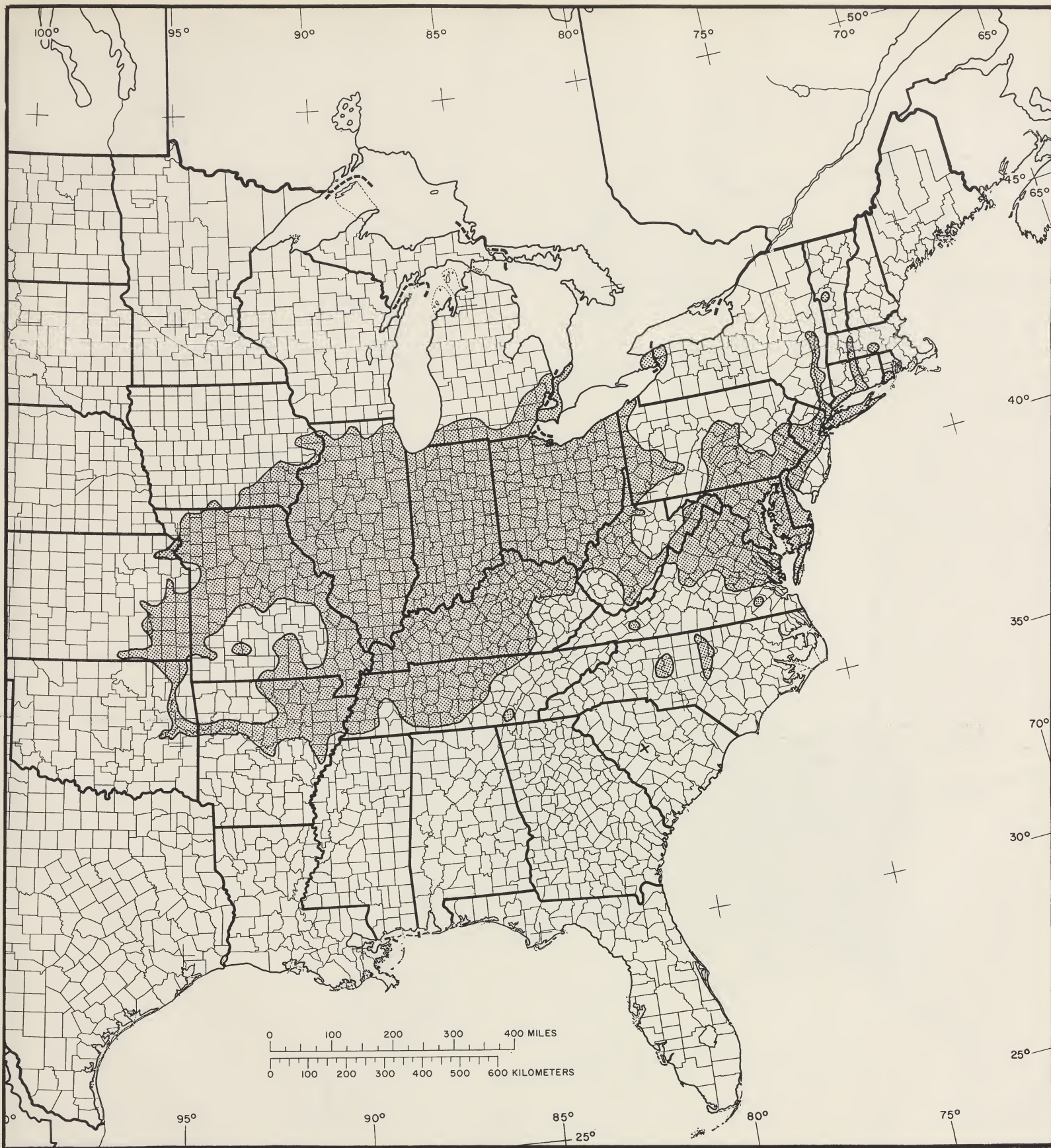
Map 174-E. swamp chestnut oak, *Quercus michauxii* Nutt.



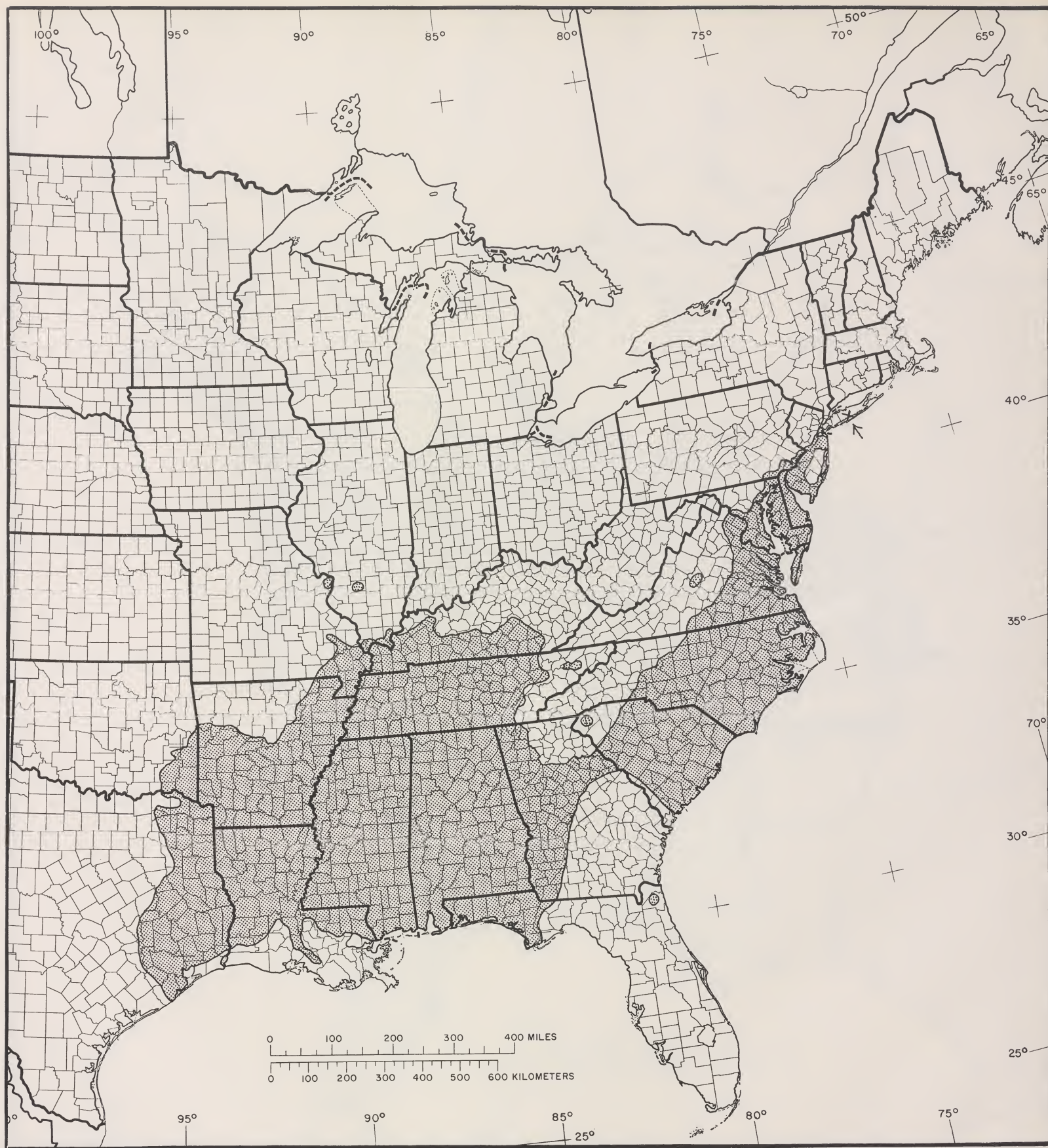
Map 175-E. water oak, *Quercus nigra* L.



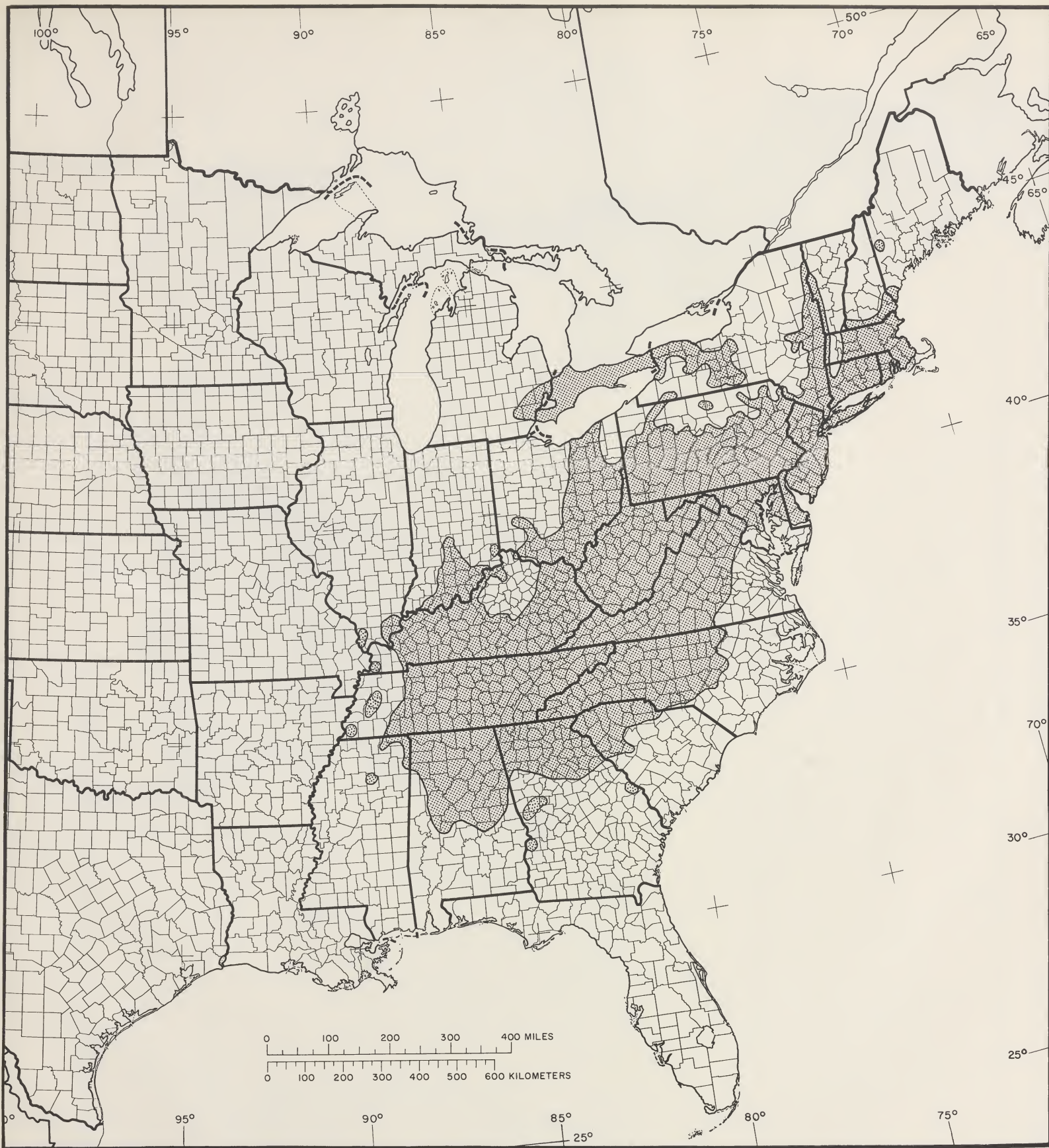
Map 176-E. Nuttall oak, *Quercus nuttallii* Palmer



Map 177-E. pin oak, *Quercus palustris* Muenchh.



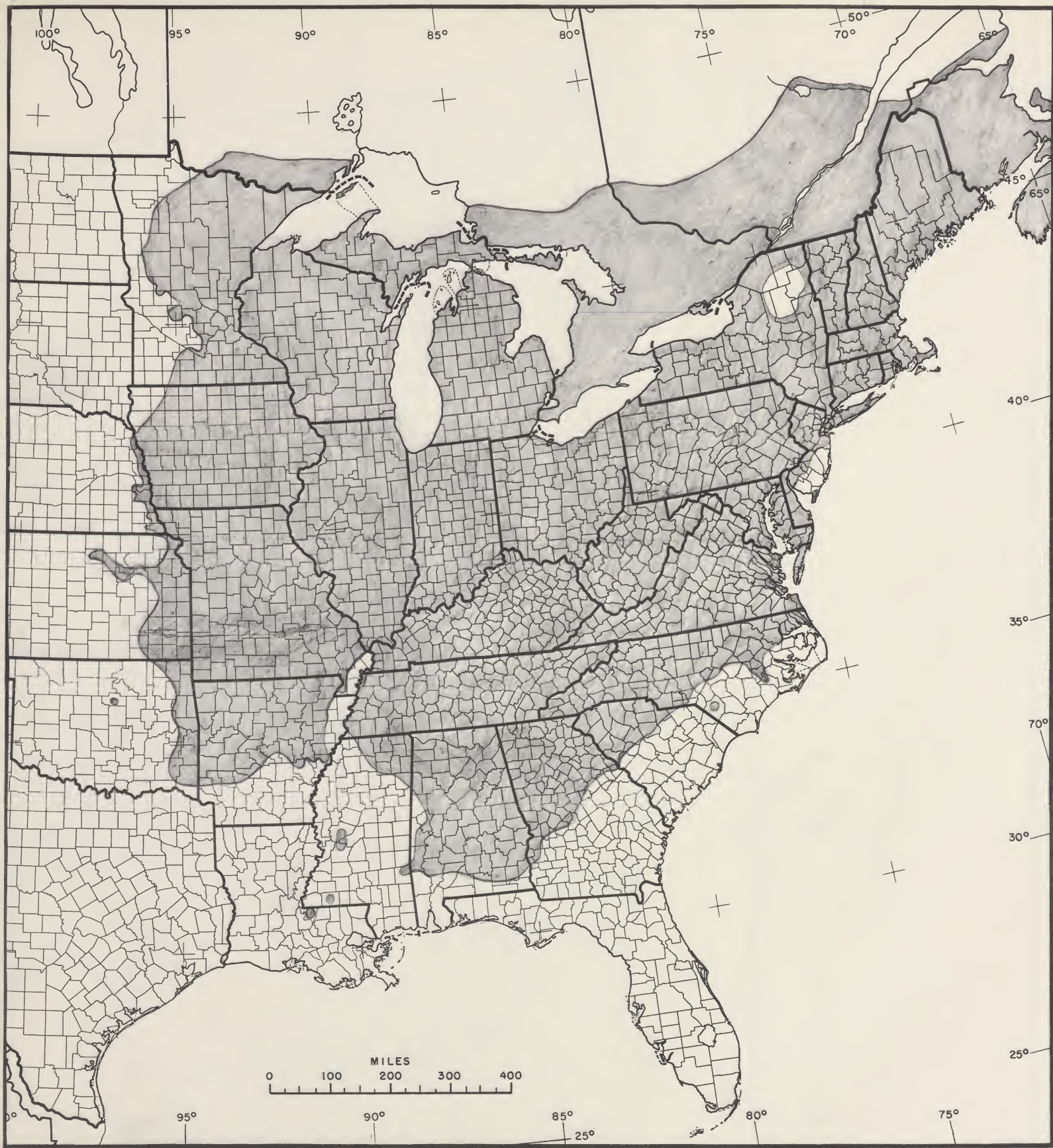
Map 178-E. willow oak, *Quercus phellos* L.



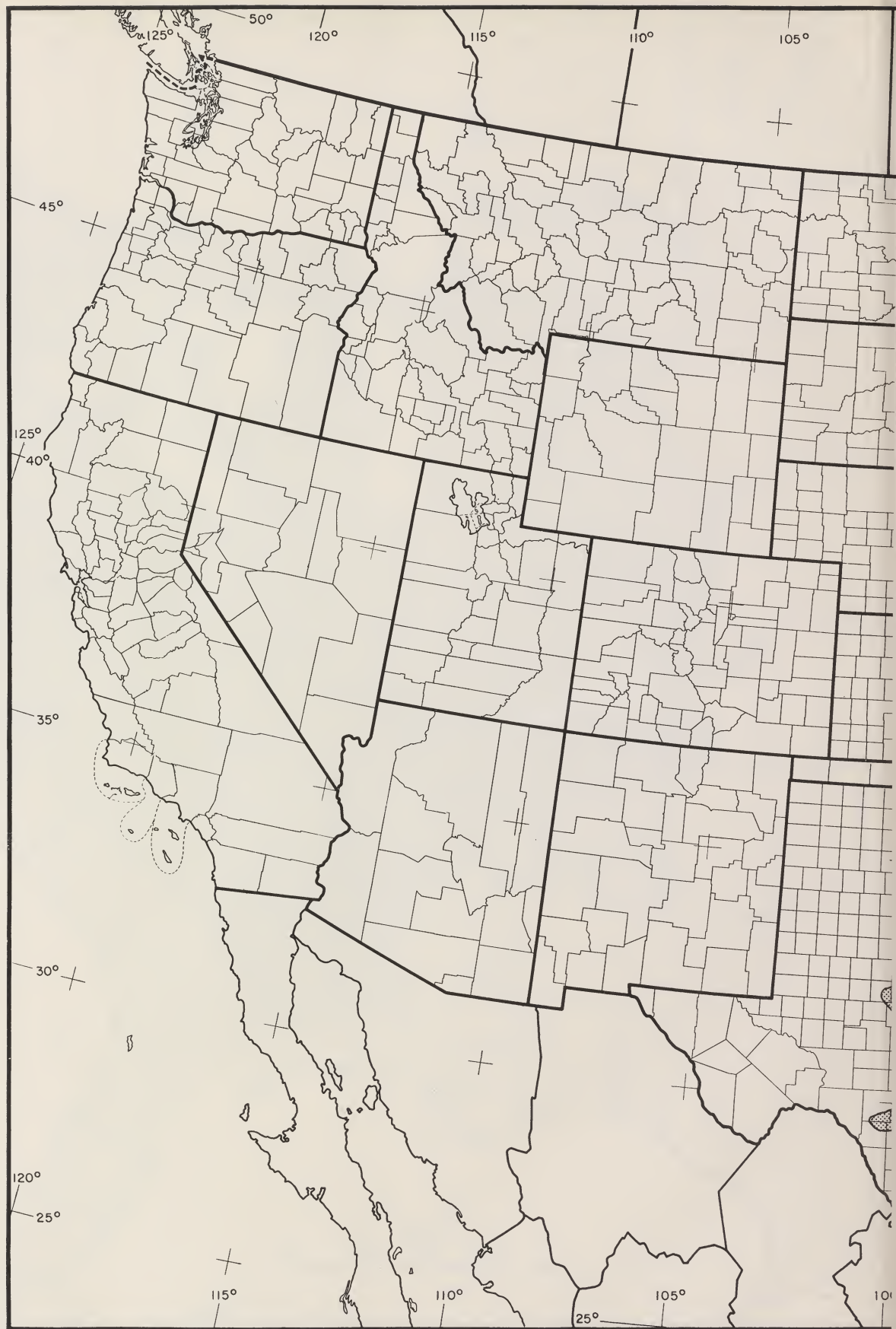
Map 179-E. chestnut oak, *Quercus prinus* L.



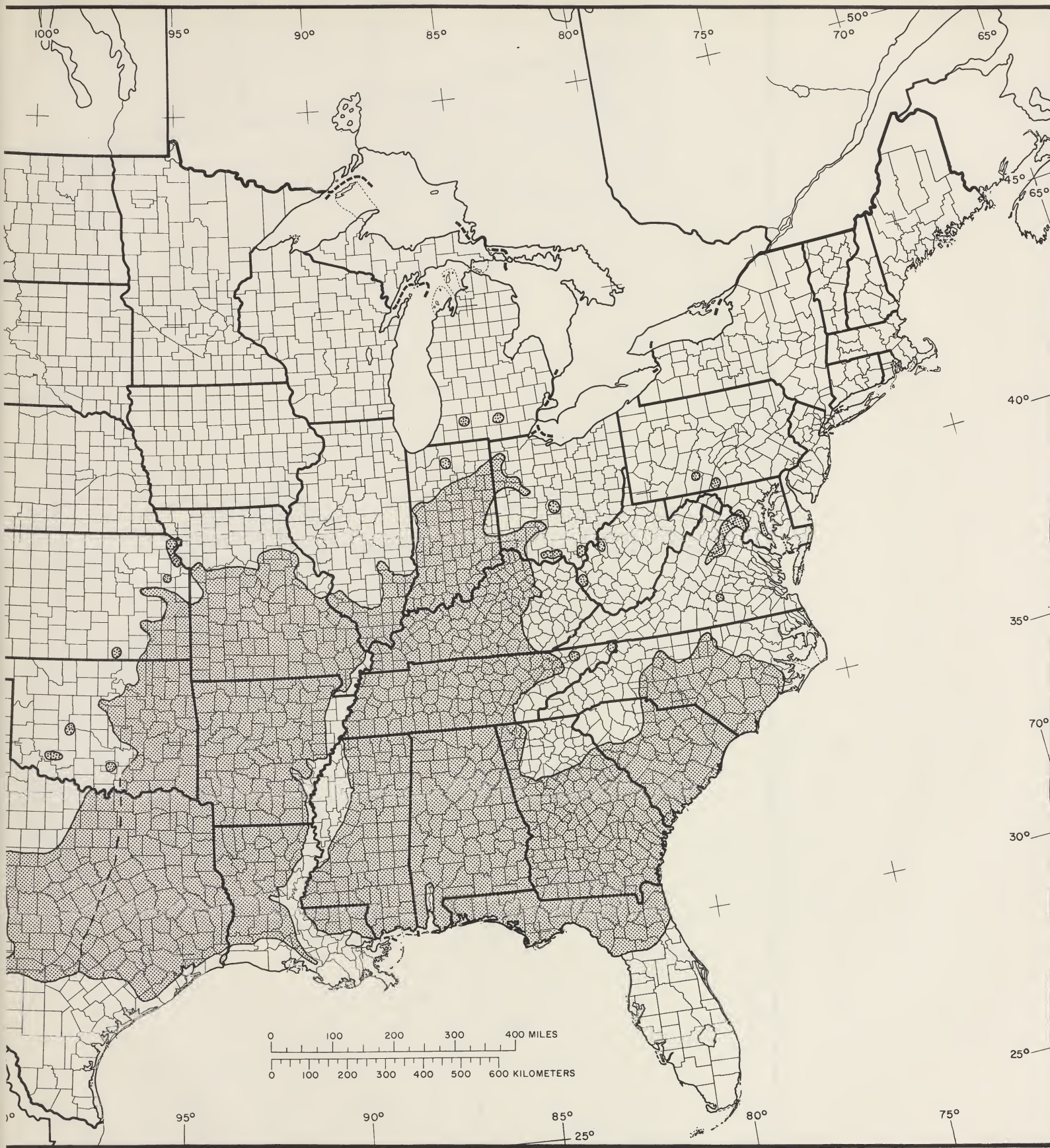
Map 180-N. northern red oak, *Quercus rubra* L.



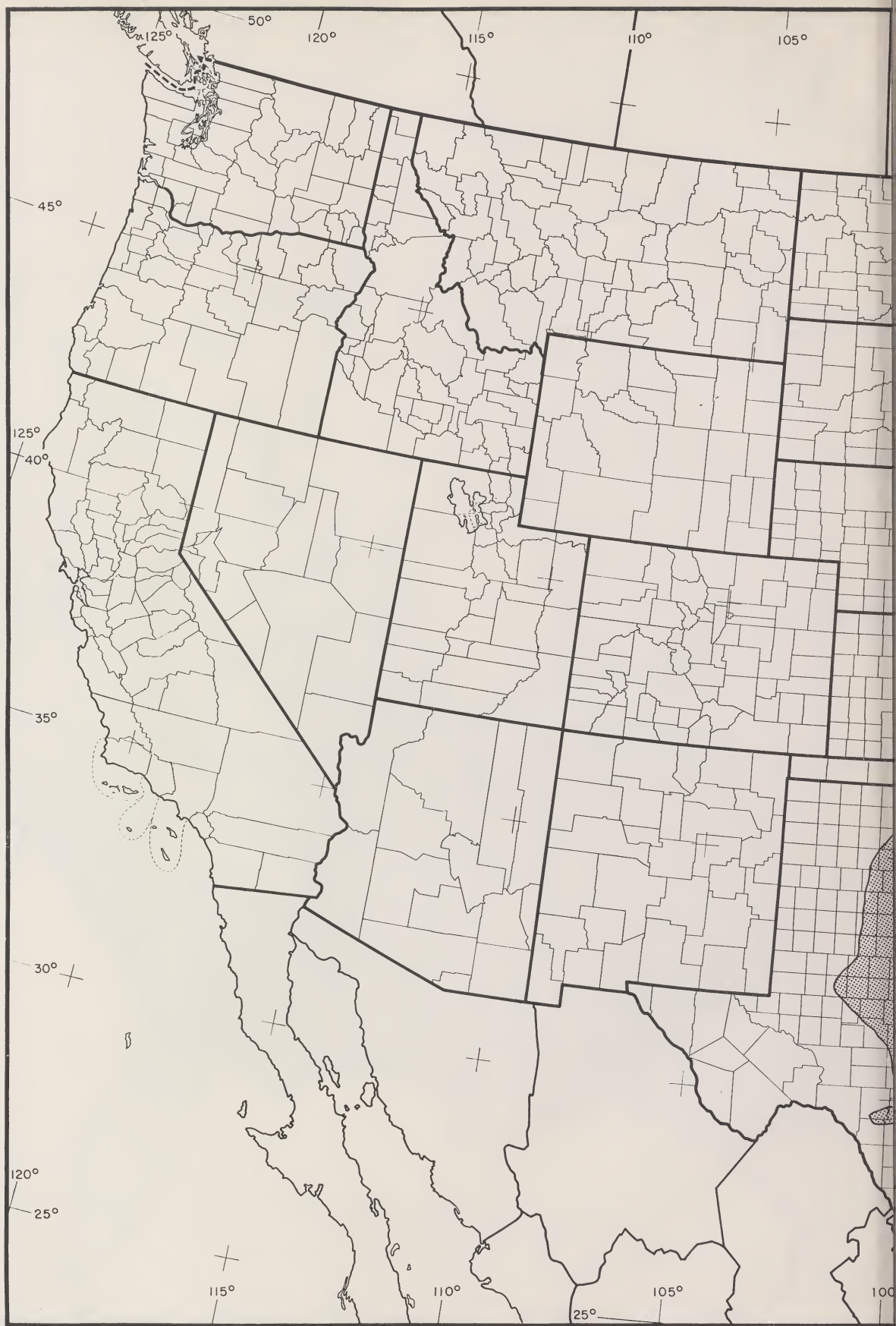
Map 180-E. northern red oak, *Quercus rubra* L.



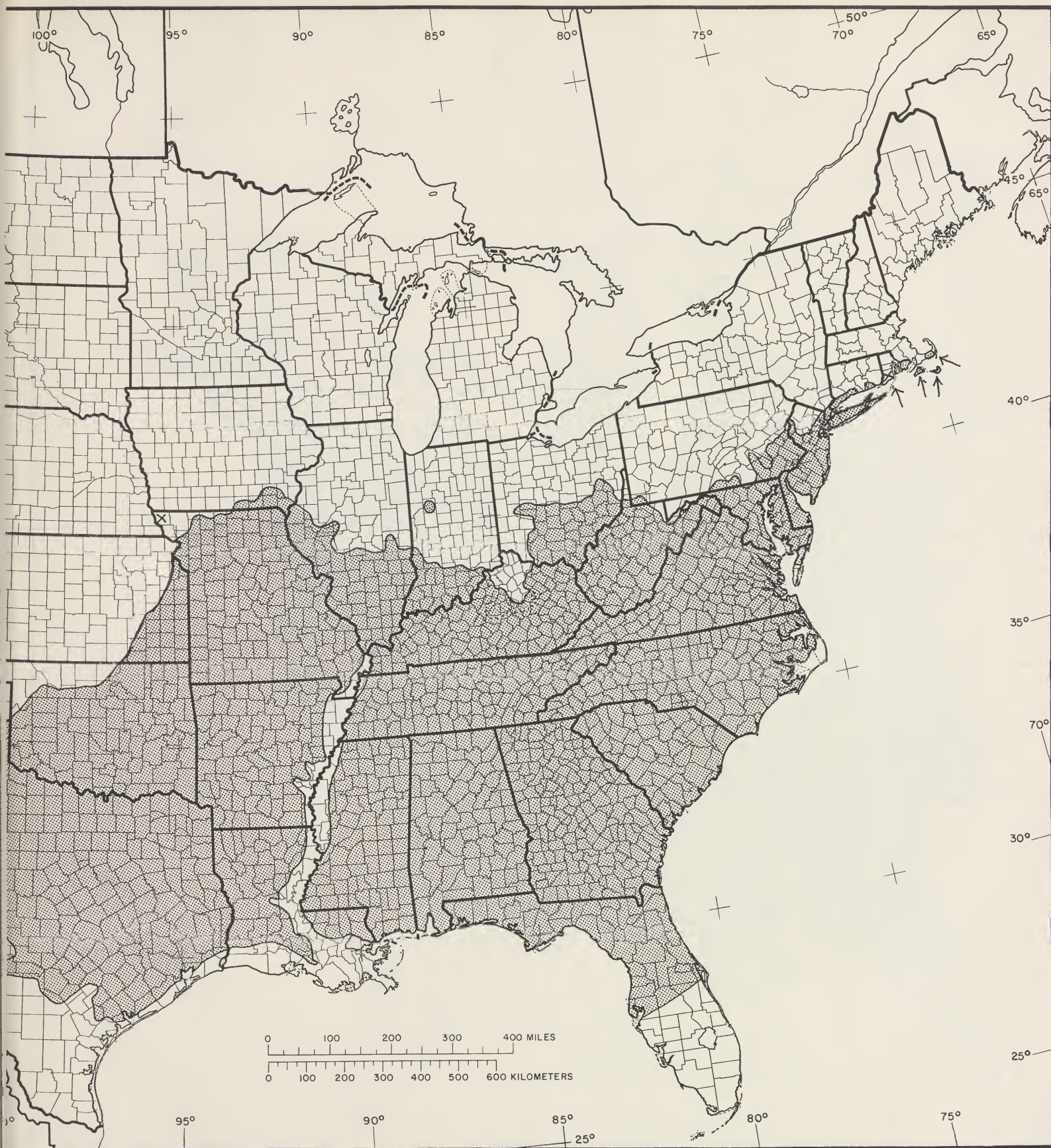
Map 181-W. Shumard oak, *Quercus shumardii* Buckl., western range. The broken line separates eastward the typical variety and westward the variety Texas oak, *Q. shumardii* var. *texana* (Buckl.) Ashe.



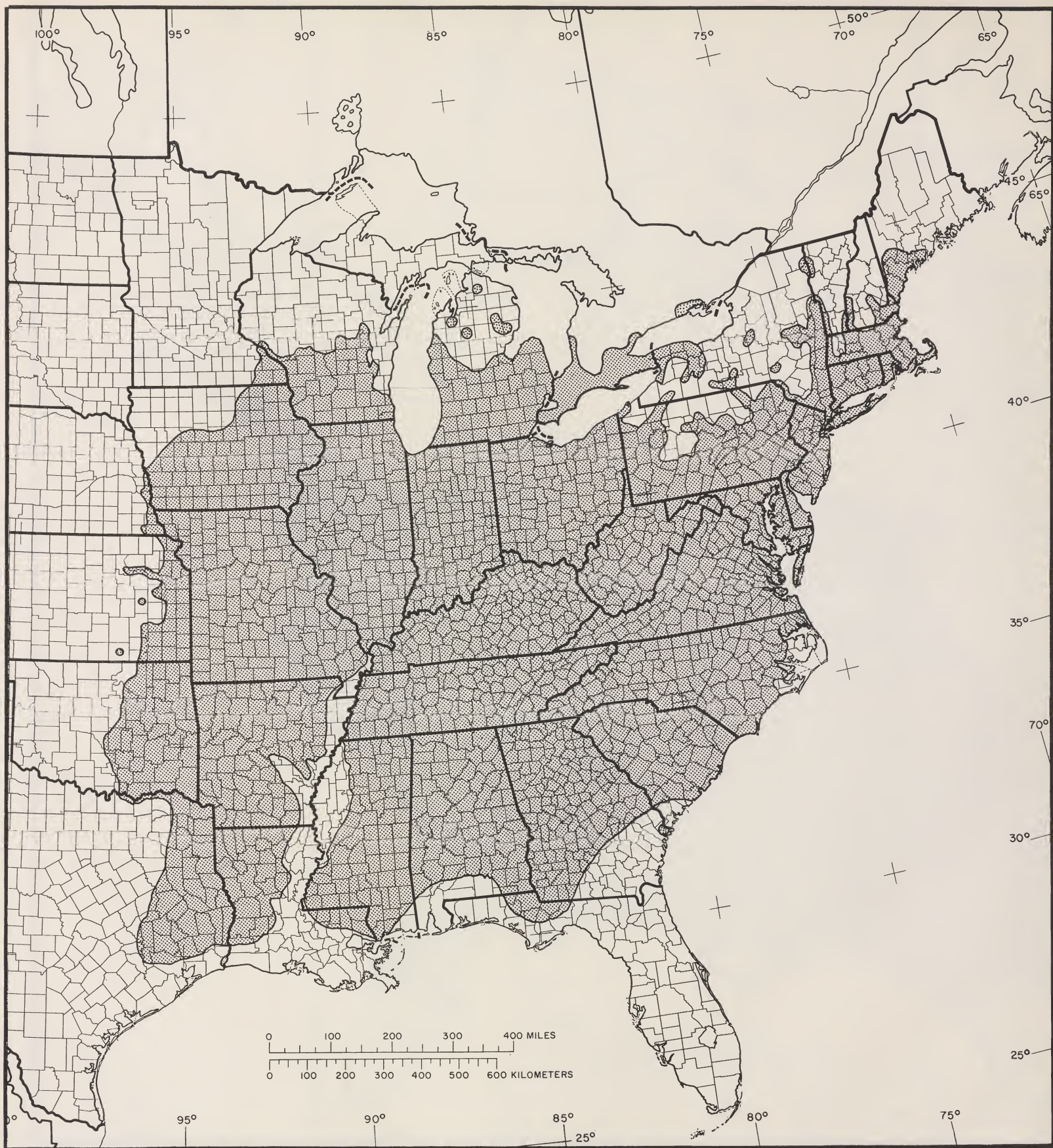
Map 181-E. Shumard oak, *Quercus shumardii* Buckl., eastern range. The broken line separates eastward the typical variety and westward the variety Texas oak, *Q. shumardii* var. *texana* (Buckl.) Ashe.



Map 182-W. post oak, *Quercus stellata* Wangenh., western range.



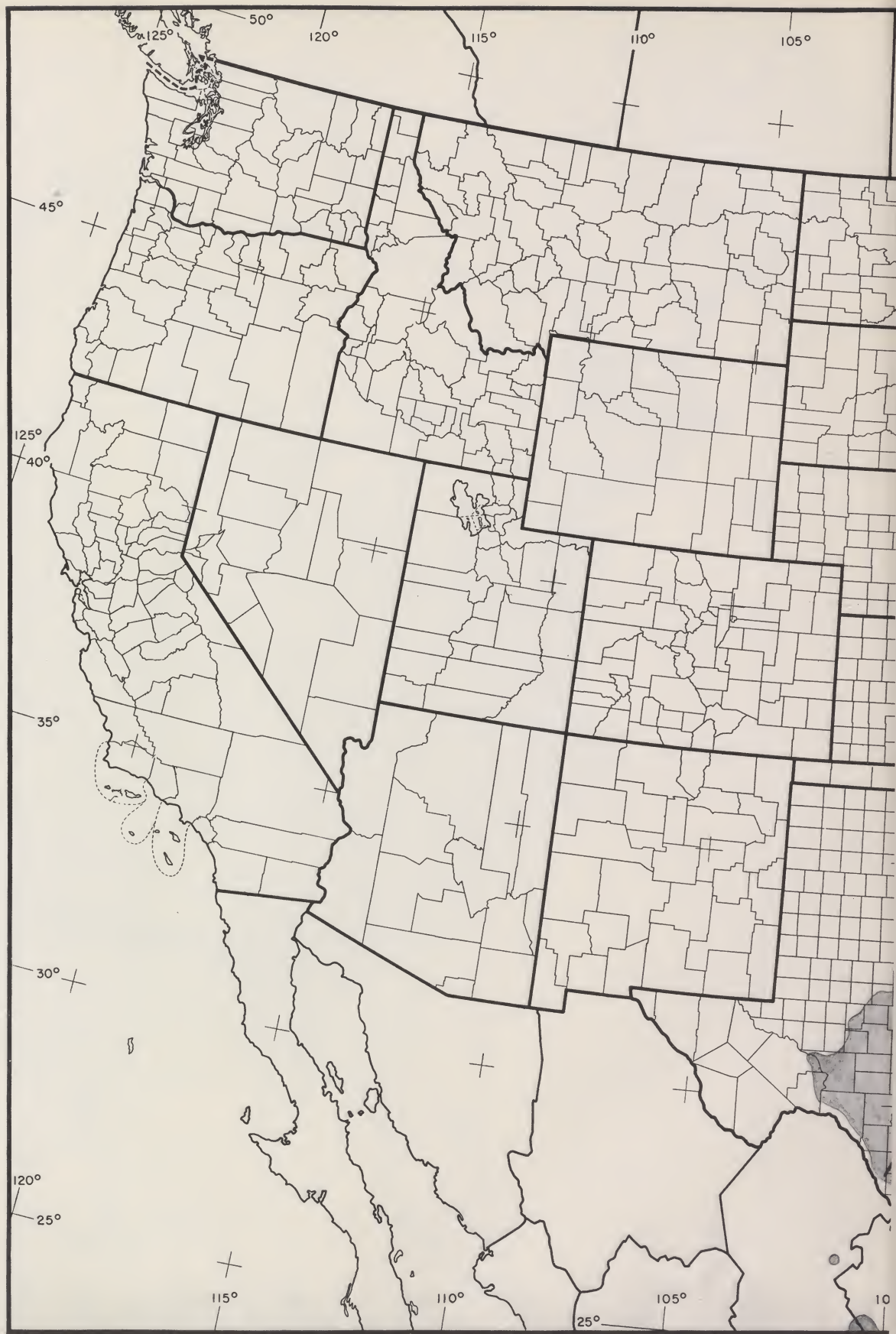
Map 182-E. post oak, *Quercus stellata* Wangenh., eastern range.



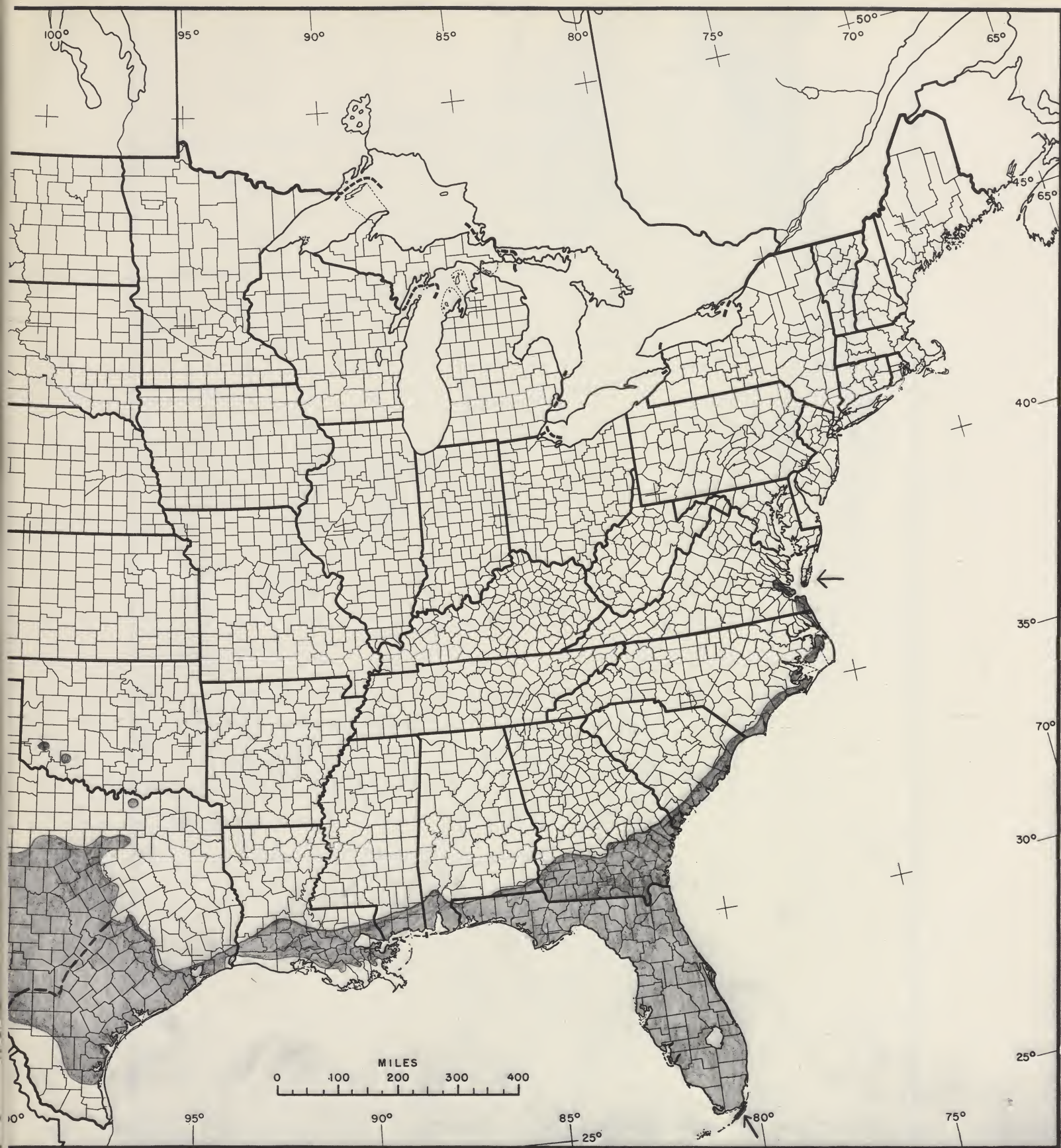
Map 183-E. black oak, *Quercus velutina* Lam.



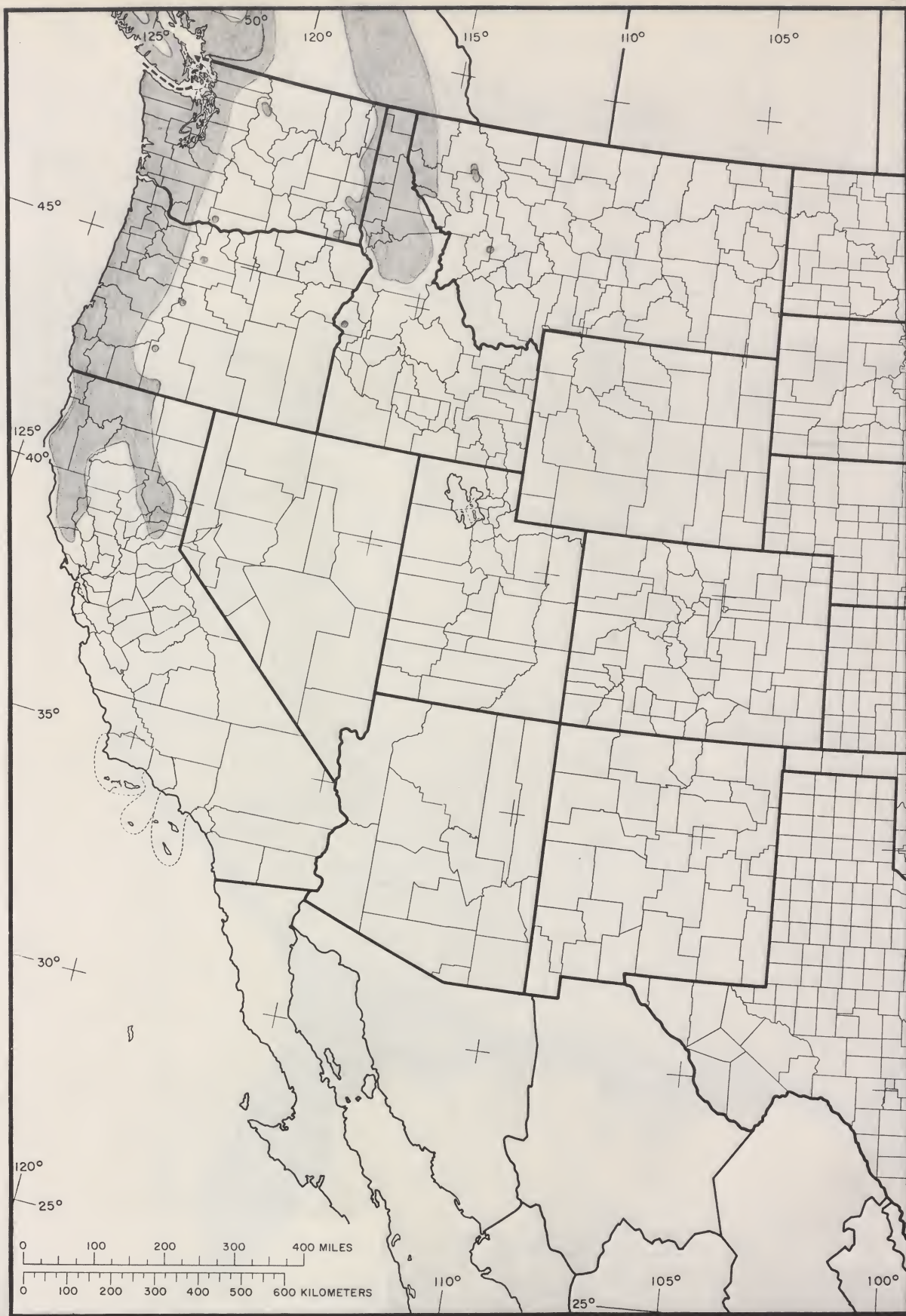
Map 184-N. live oak, *Quercus virginiana* Mill. Represented northwest of the broken line and in Mexico by a variety, *Q. virginiana* var. *fusiformis* (Small) Sarg.



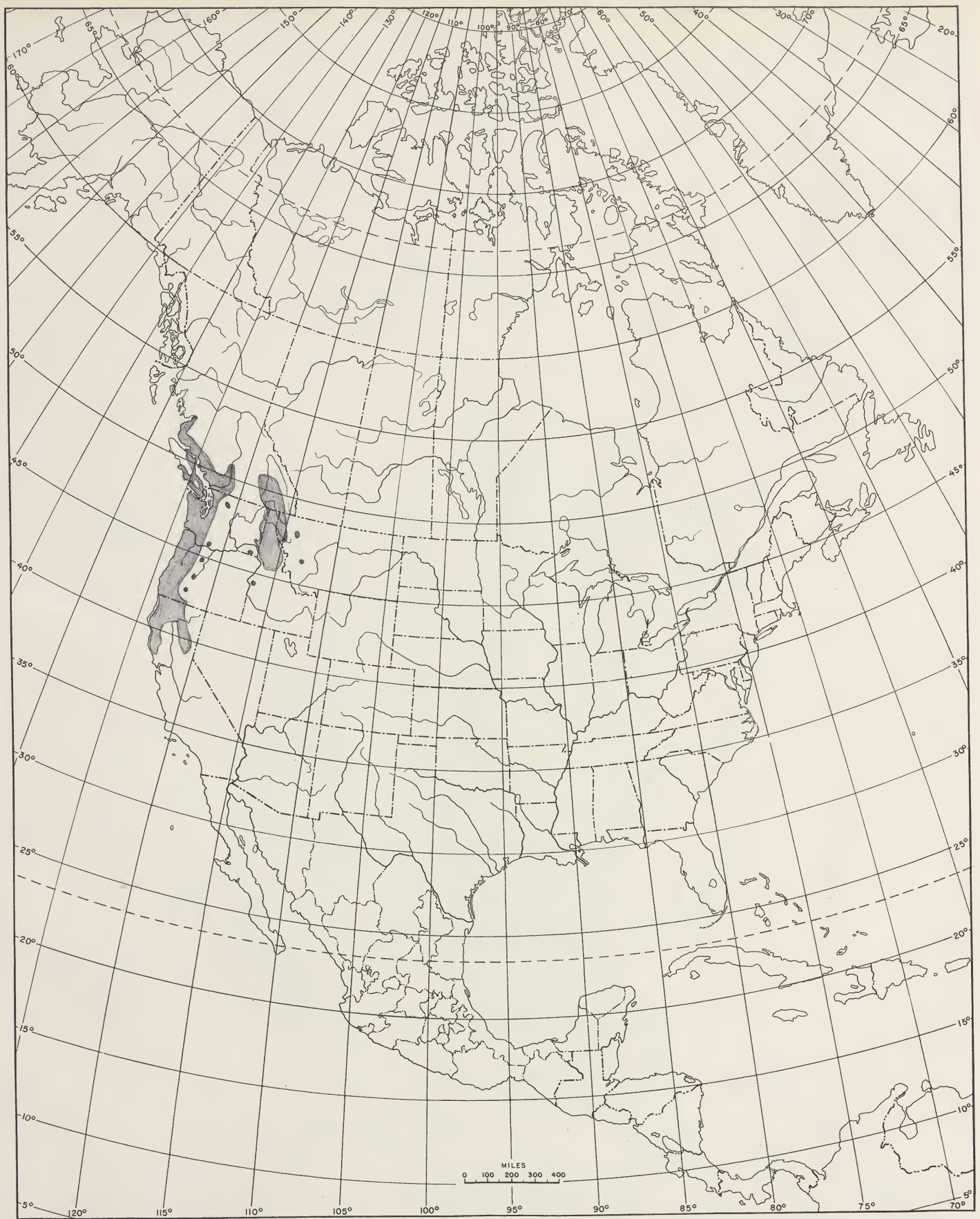
Map 184-W. live oak, *Quercus virginiana* Mill., western range. Represented northwest of the broken line and in Mexico by a variety, *Q. virginiana* var. *fusiformis* (Small) Sarg.



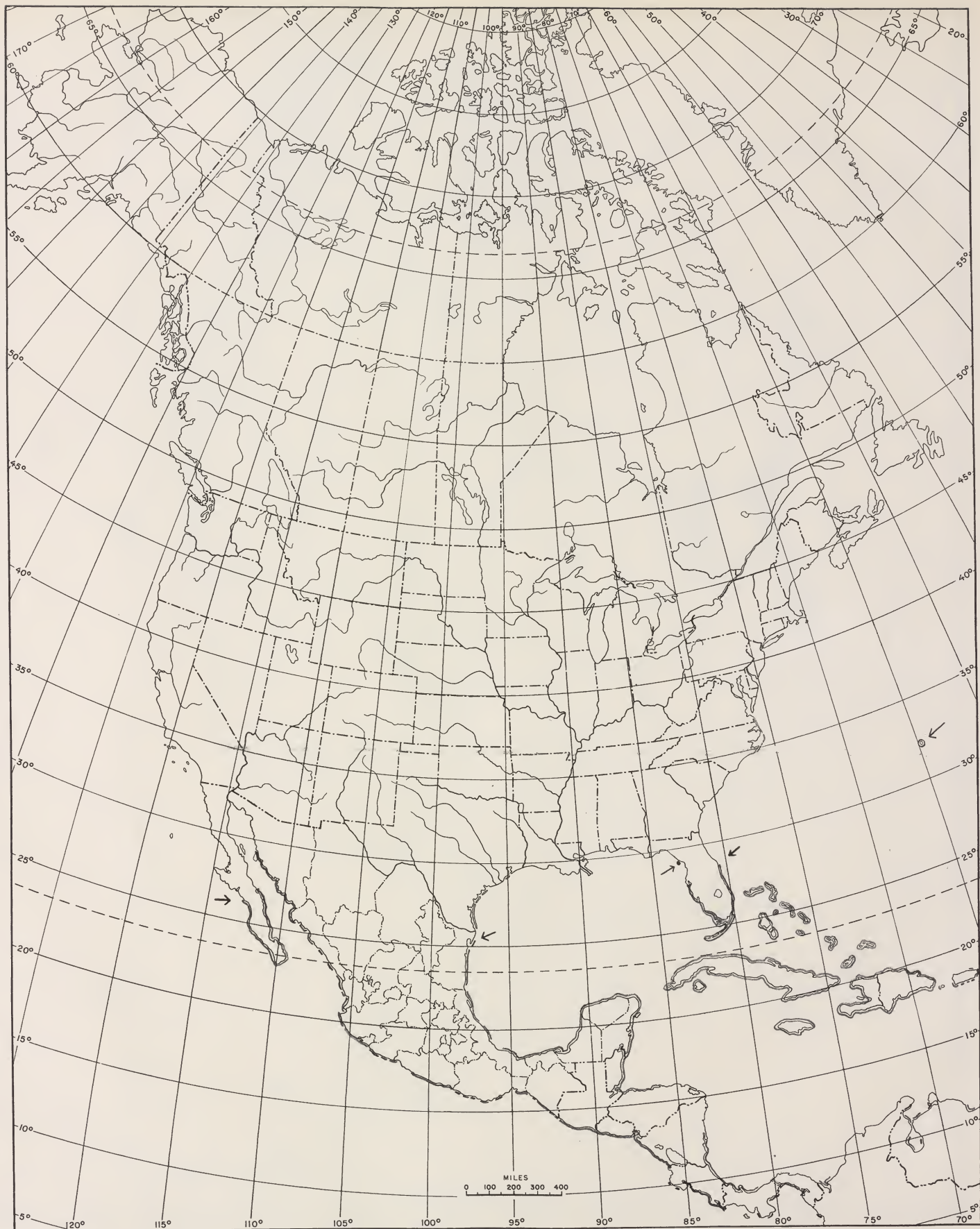
Map 184-E. live oak, *Quercus virginiana* Mill., eastern range. Represented northwest of the broken line and in Mexico by a variety, *Q. virginiana* var. *fusiformis* (Small) Sarg.



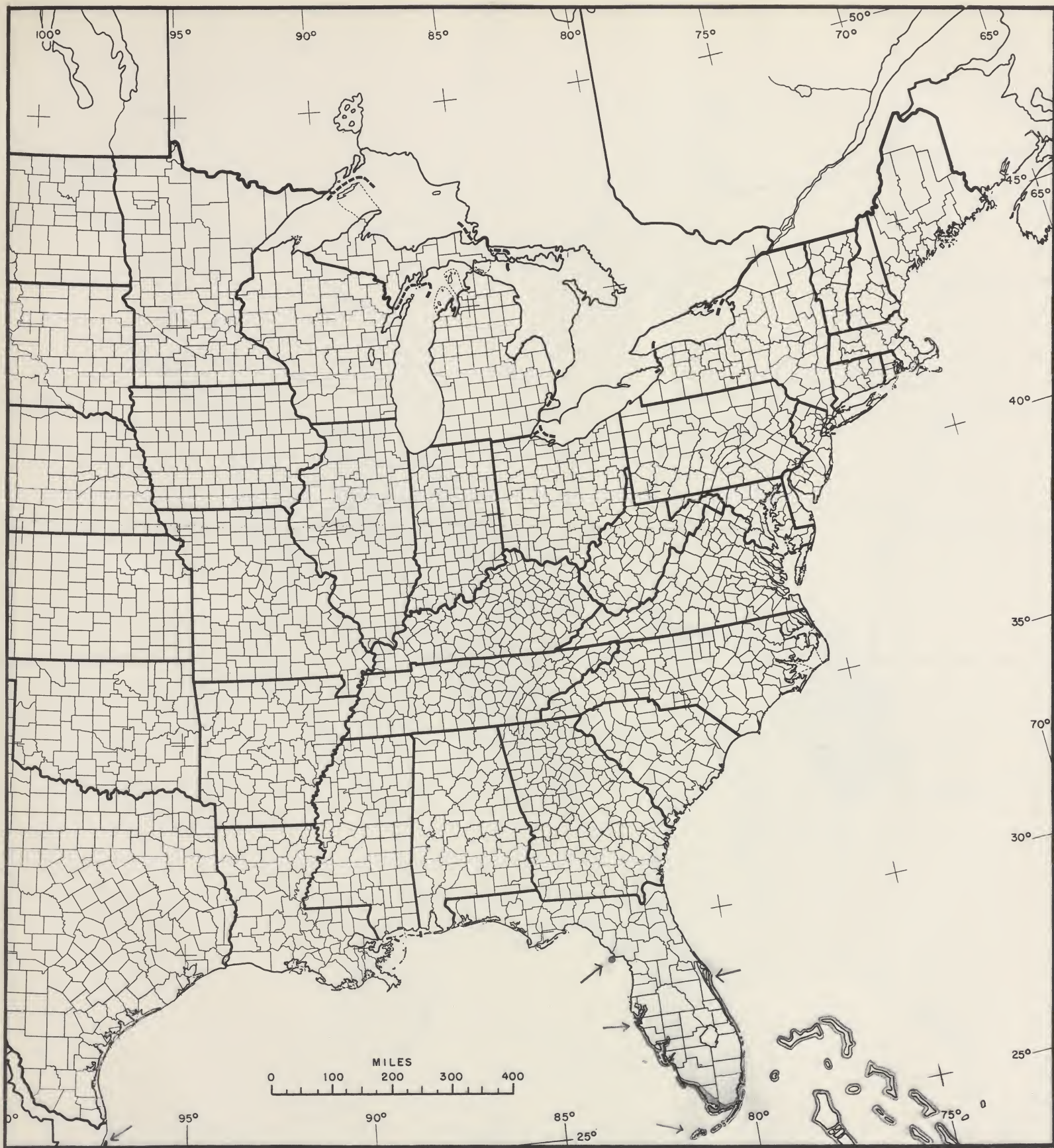
Map 185-W. cascara buckthorn, *Rhamnus purshiana* DC.



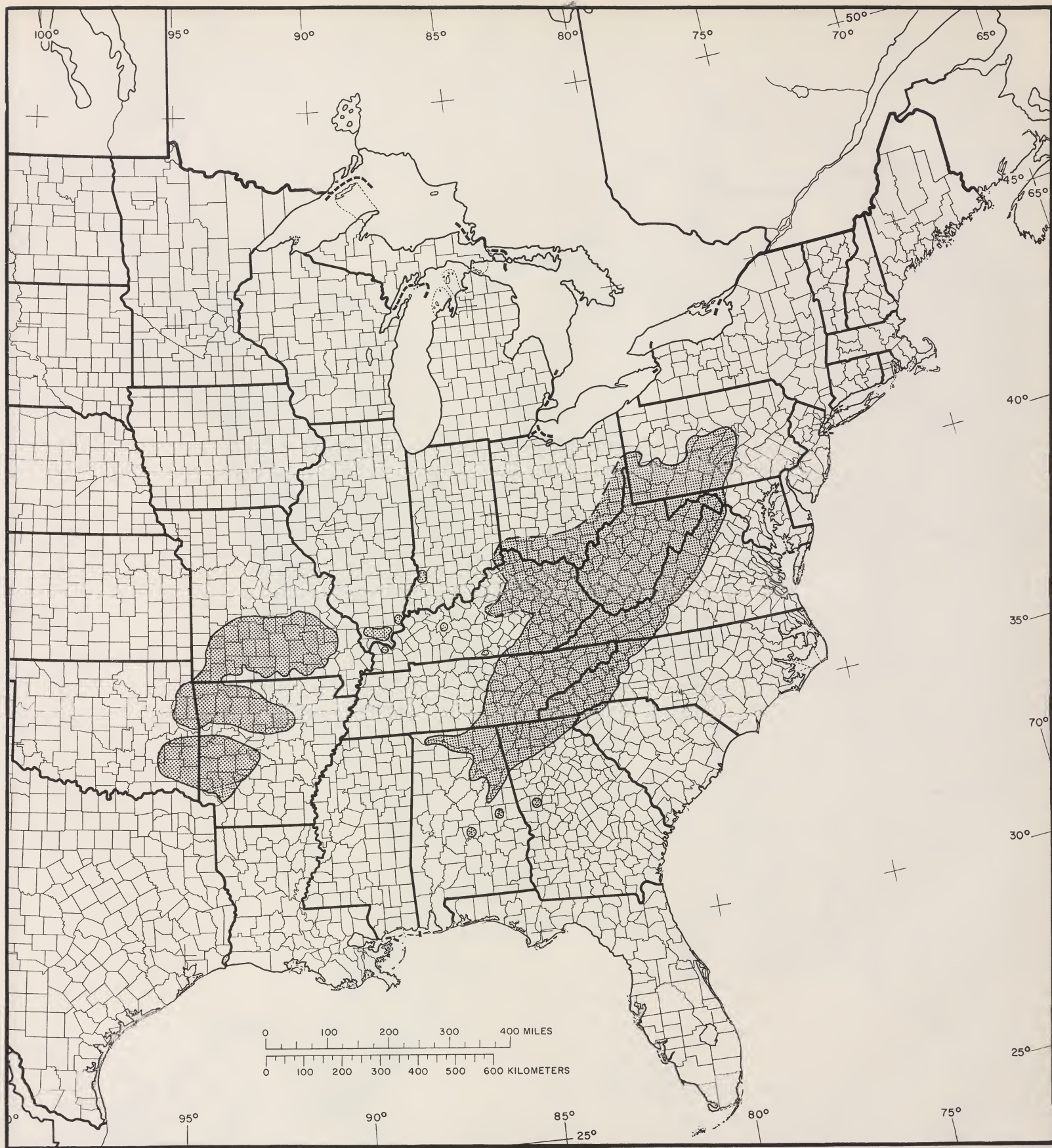
Map 185-N. cascara buckthorn, *Rhamnus purshiana* DC.



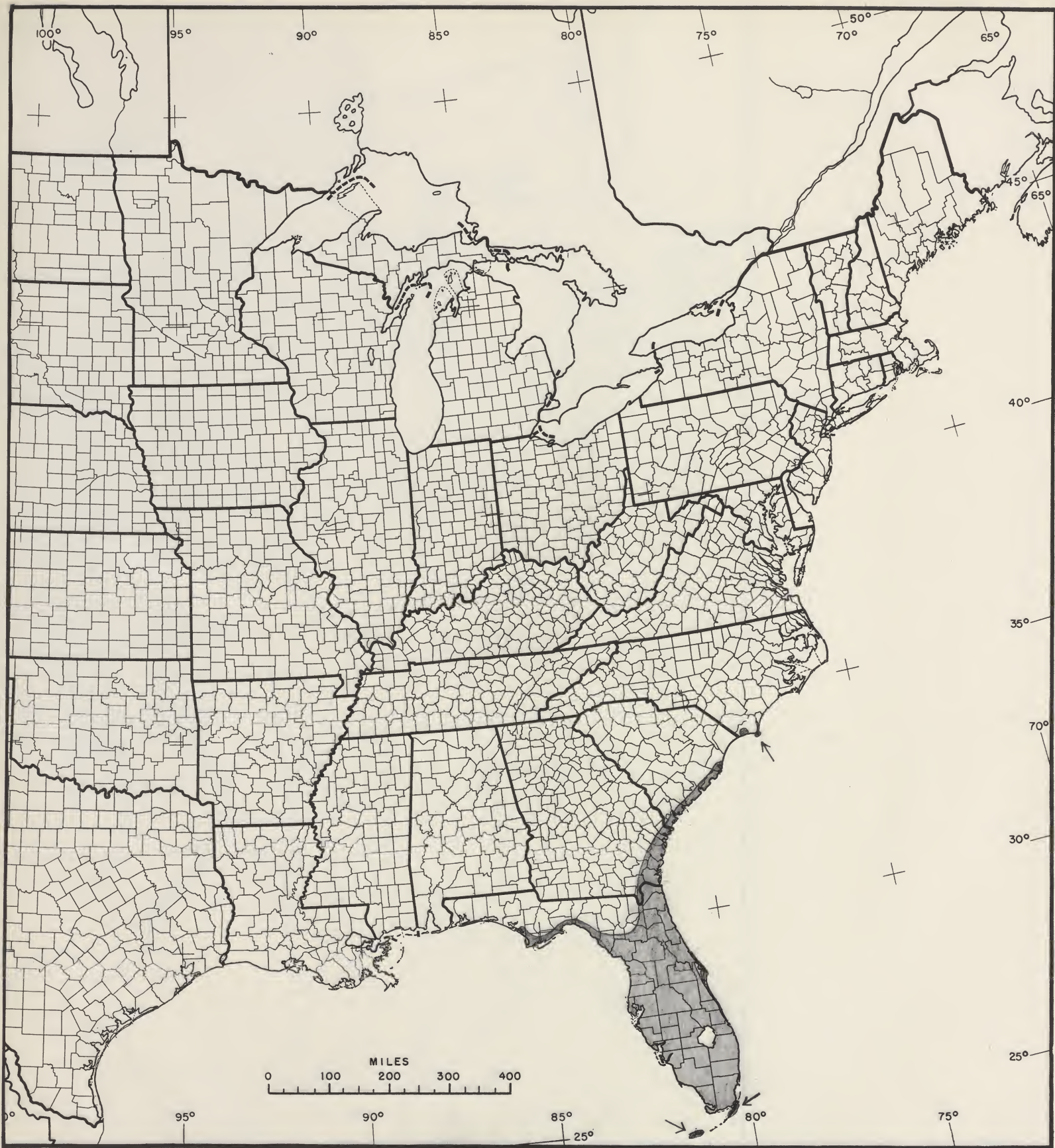
Map 186-N. mangrove, *Rhizophora mangle* L. Also in Virgin Islands and Lesser Antilles and south on Atlantic coast to Brazil. Represented by a variety (or closely related species) on the Pacific coast south to northern Peru and Galapagos Islands, and in Melanesia and Polynesia.



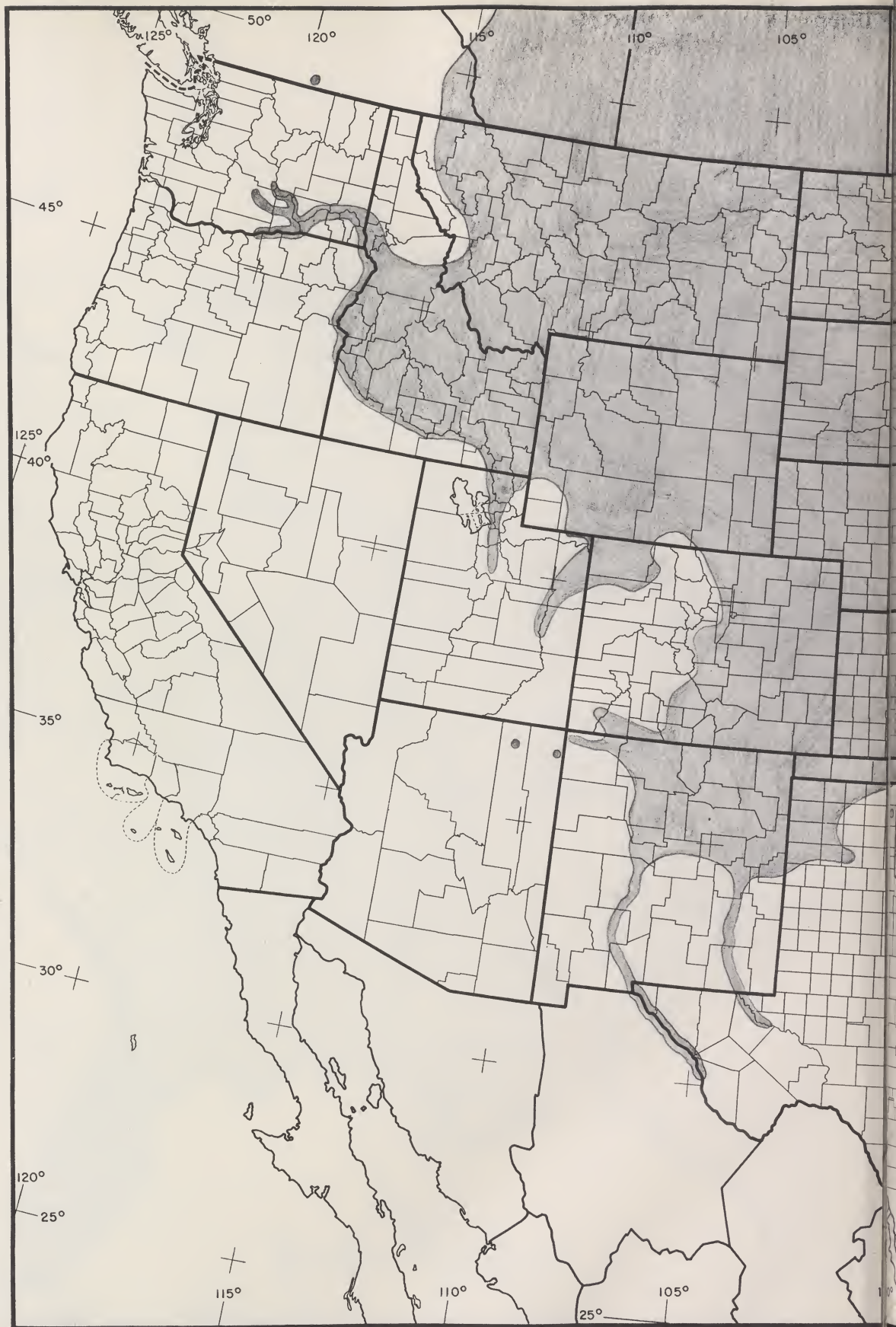
Map 186-E. mangrove, *Rhizophora mangle* L.



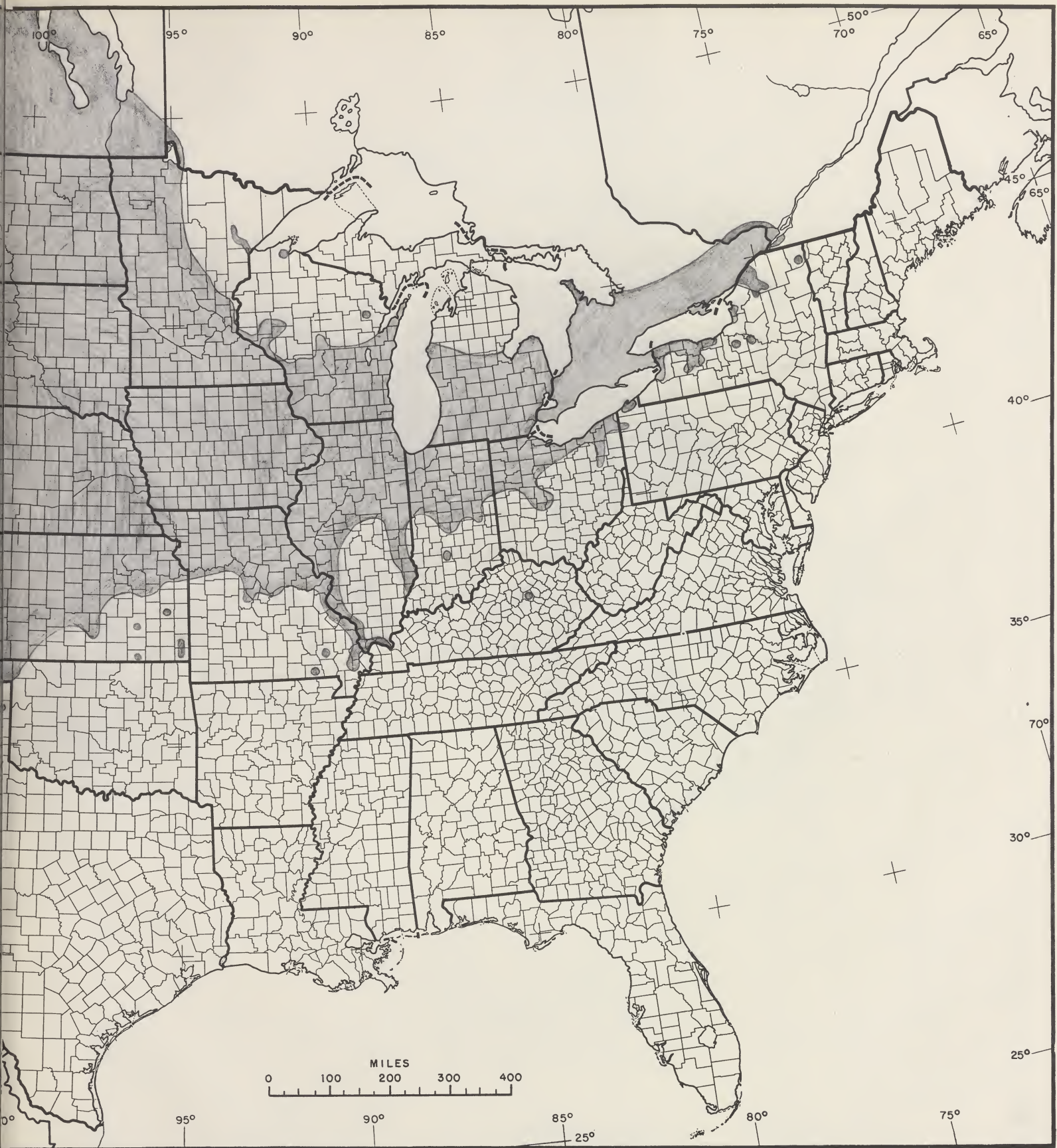
Map 187-E. black locust, *Robinia pseudoacacia* L.



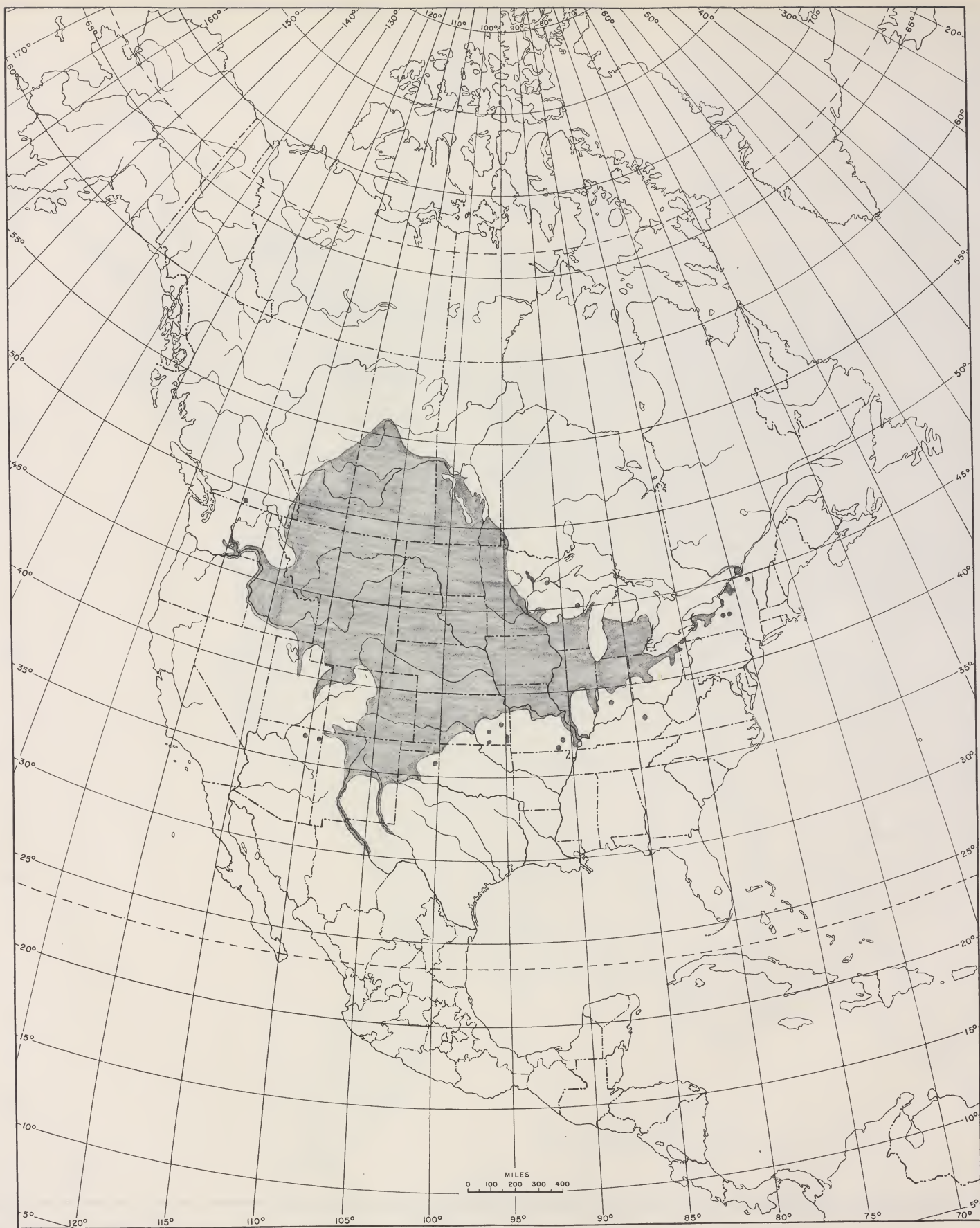
Map 188-E. cabbage palmetto, *Sabal palmetto* (Walt.) Lodd.



Map 189-W. peachleaf willow, *Salix amygdaloides* Anderss., western range.



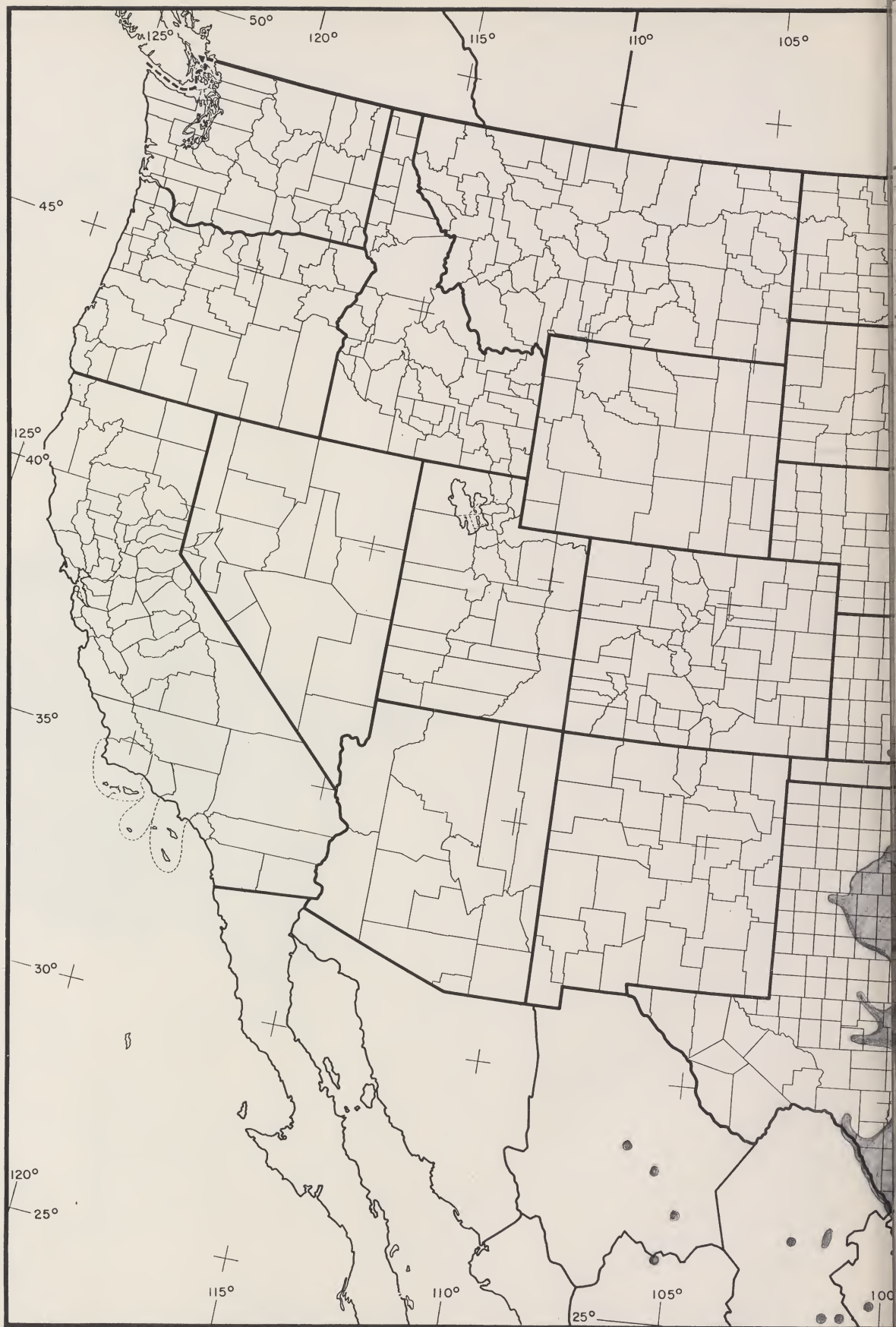
Map 189-E. peachleaf willow, *Salix amygdaloides* Anderss., eastern range.



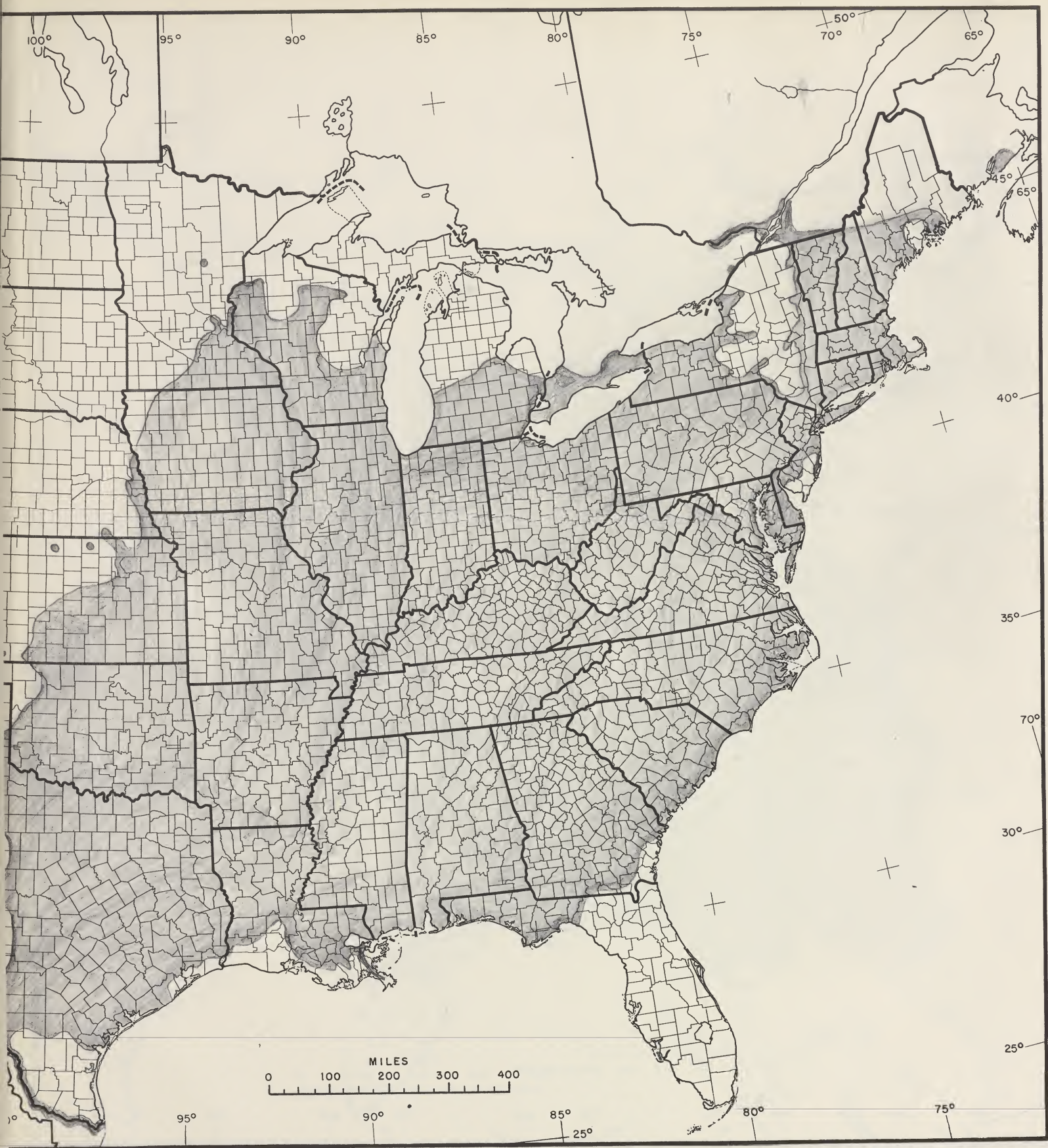
Map 189-N. peachleaf willow, *Salix amygdaloides* Anders.



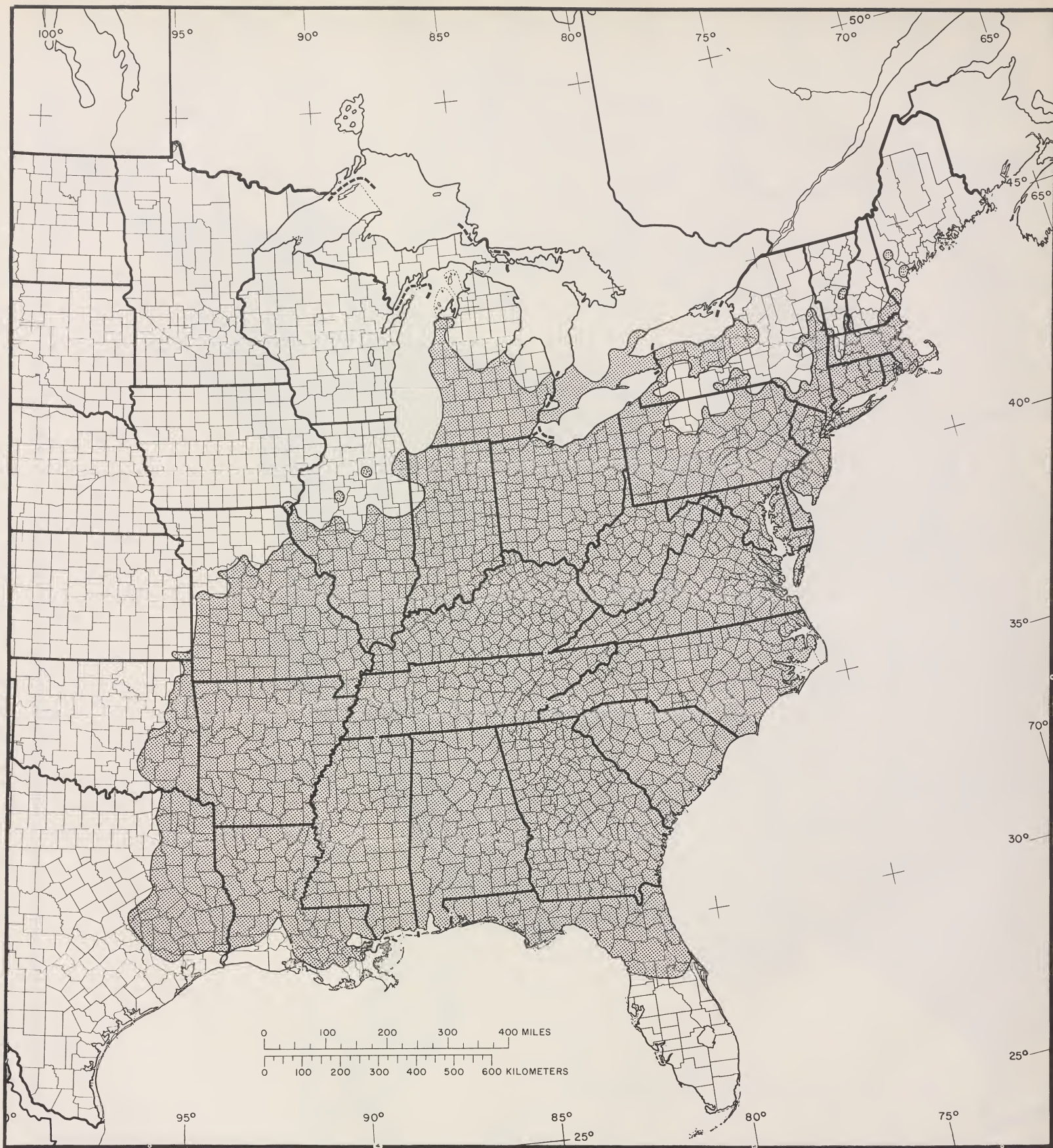
Map 190-N. black willow, *Salix nigra* Marsh.



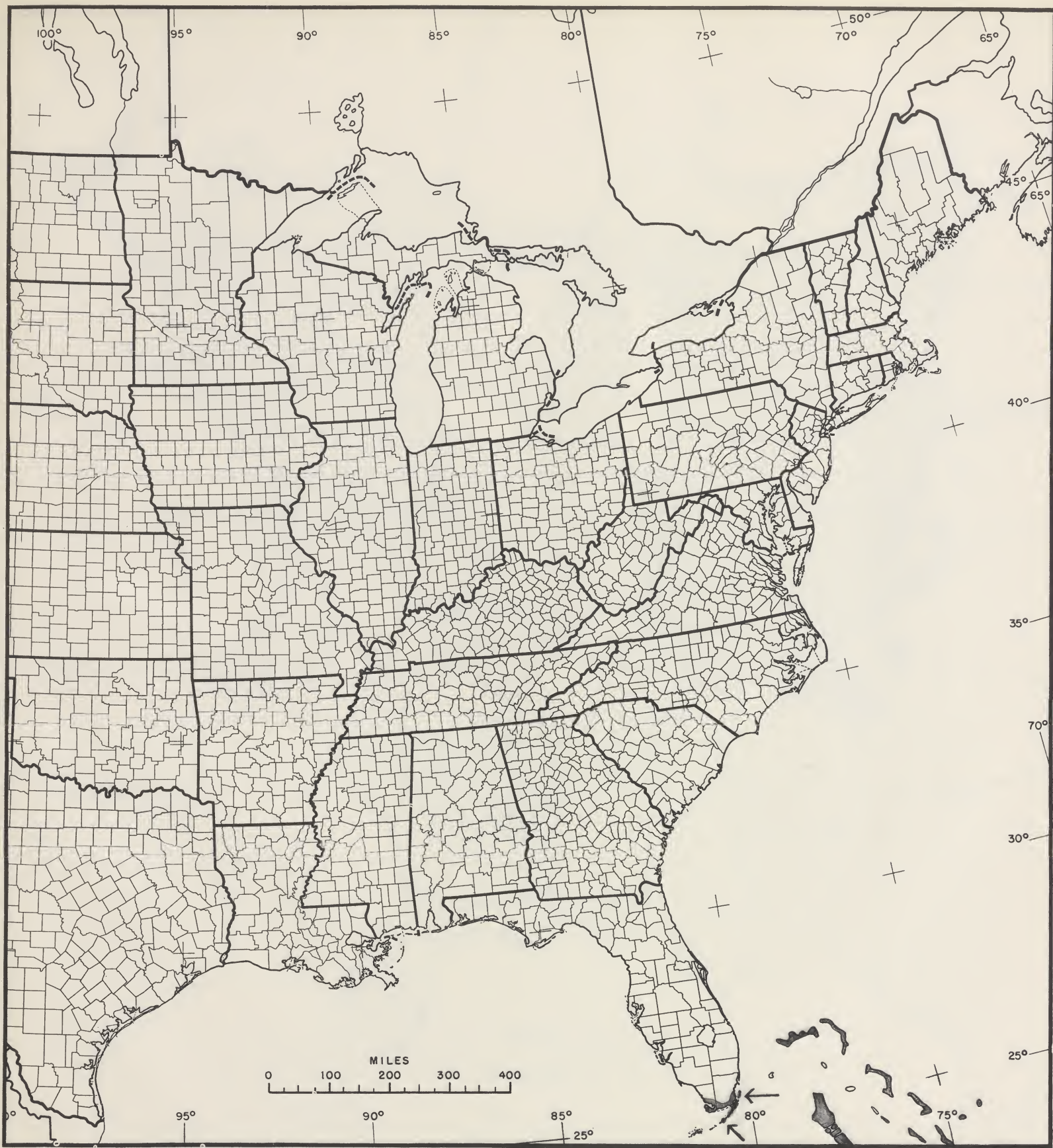
Map 190-W. black willow, *Salix nigra* Marsh., western range.



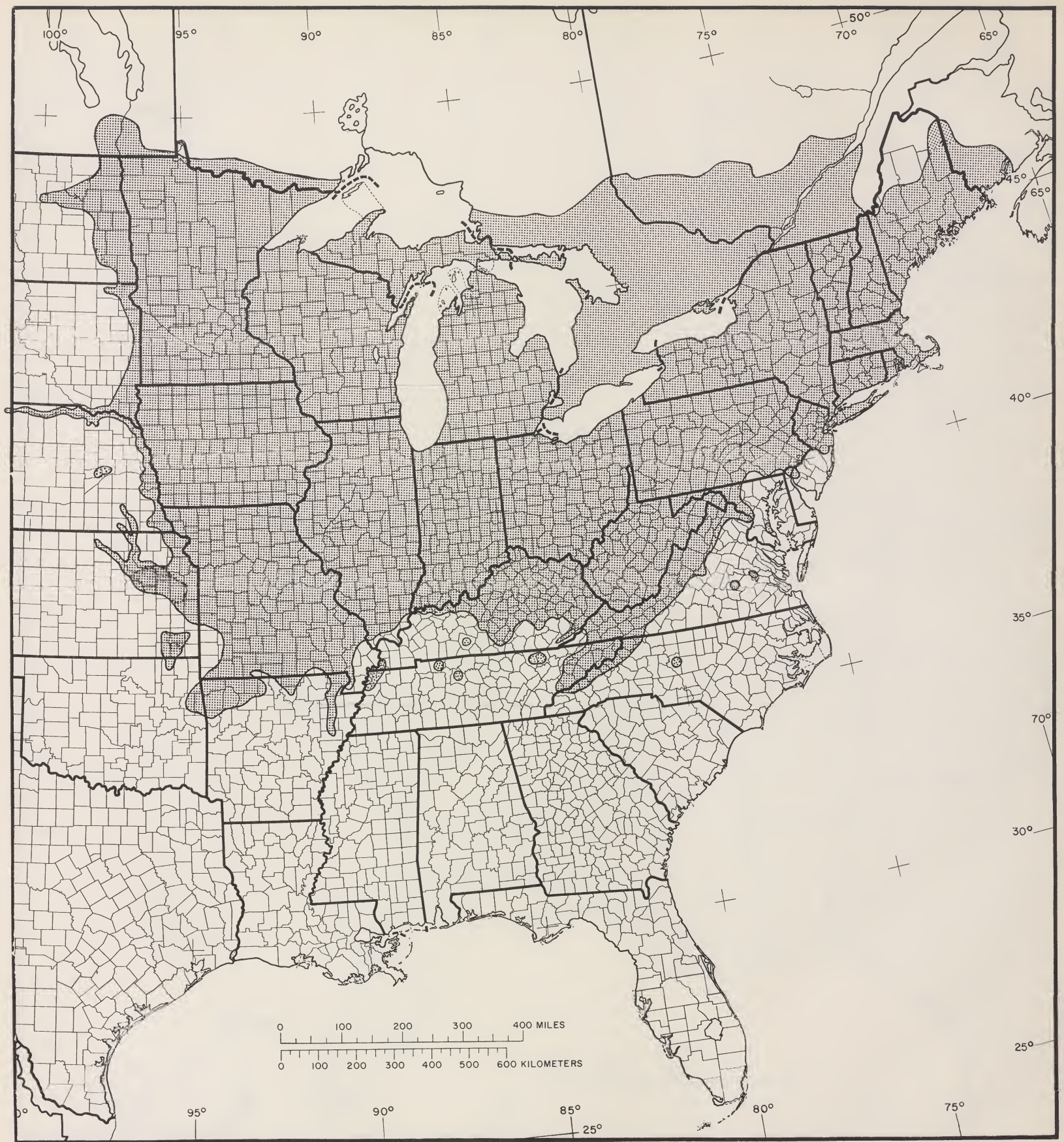
Map 190-E. black willow, *Salix nigra* Marsh., eastern range.



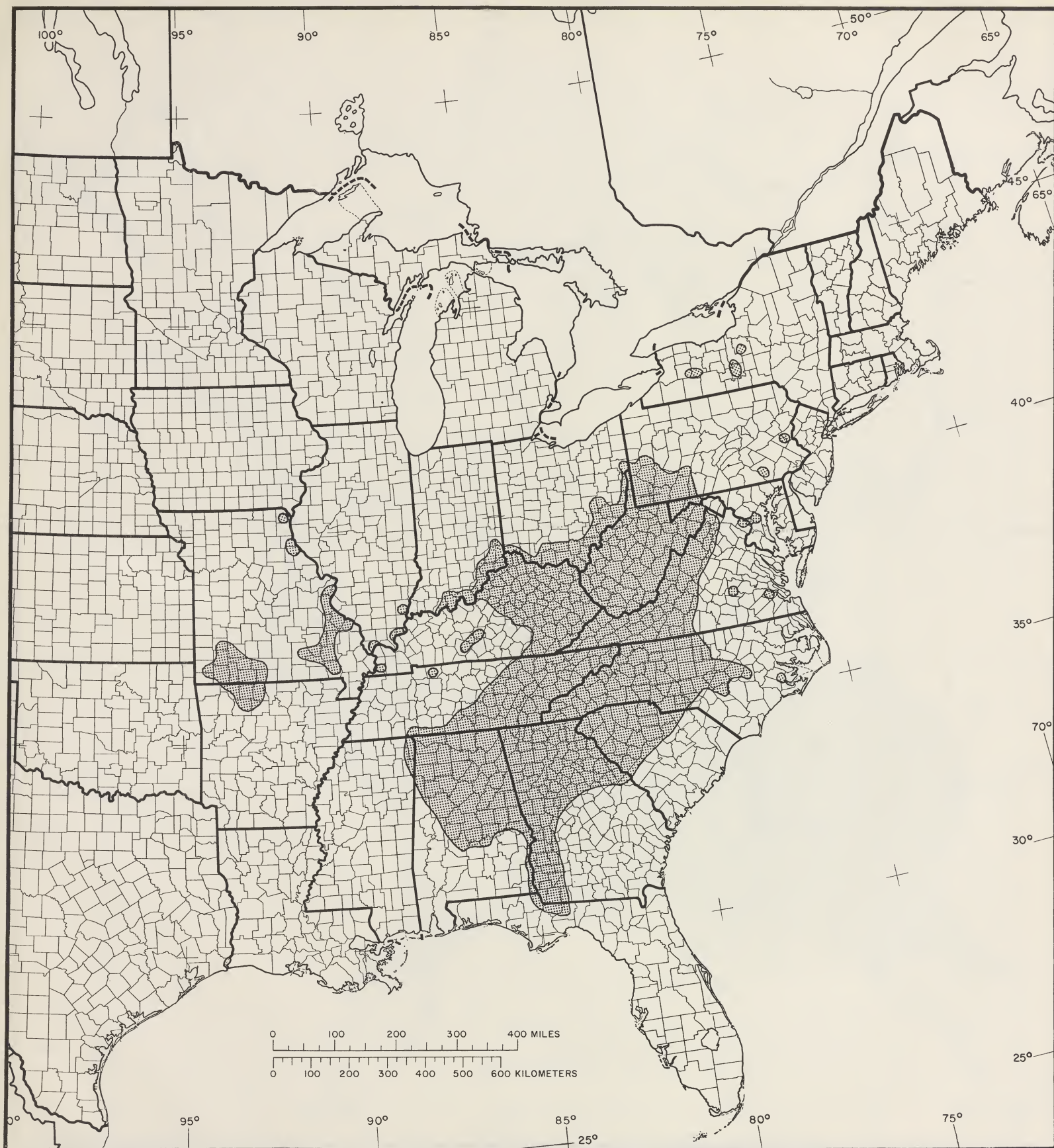
Map 191-E. sassafras, *Sassafras albidum* (Nutt.) Nees



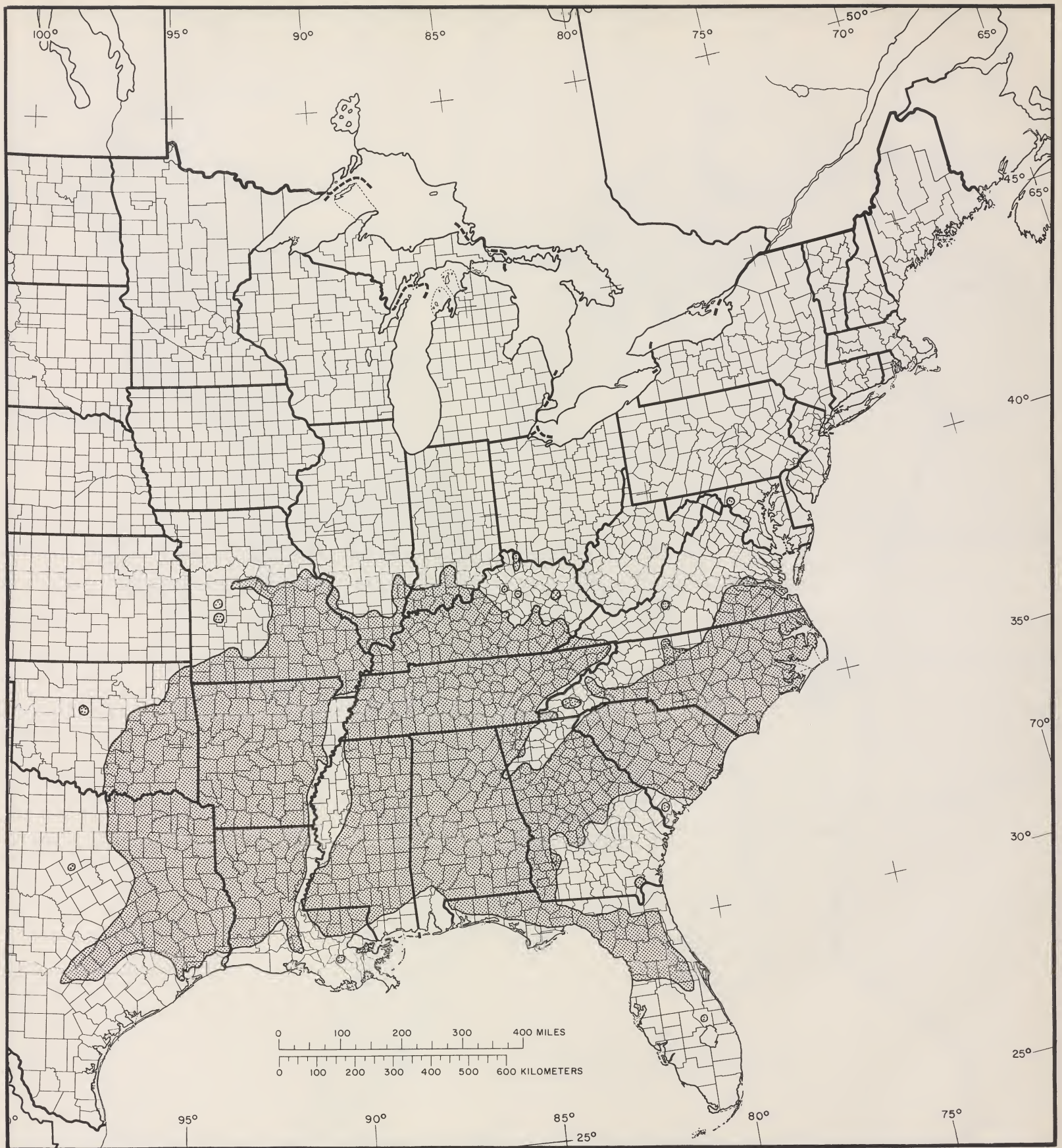
Map 192-E. West Indies mahogany, *Swietenia mahagoni* Jacq. Also in Bahamas, Cuba, Jamaica, and Hispaniola.



Map 193-E. American basswood, *Tilia americana* L.



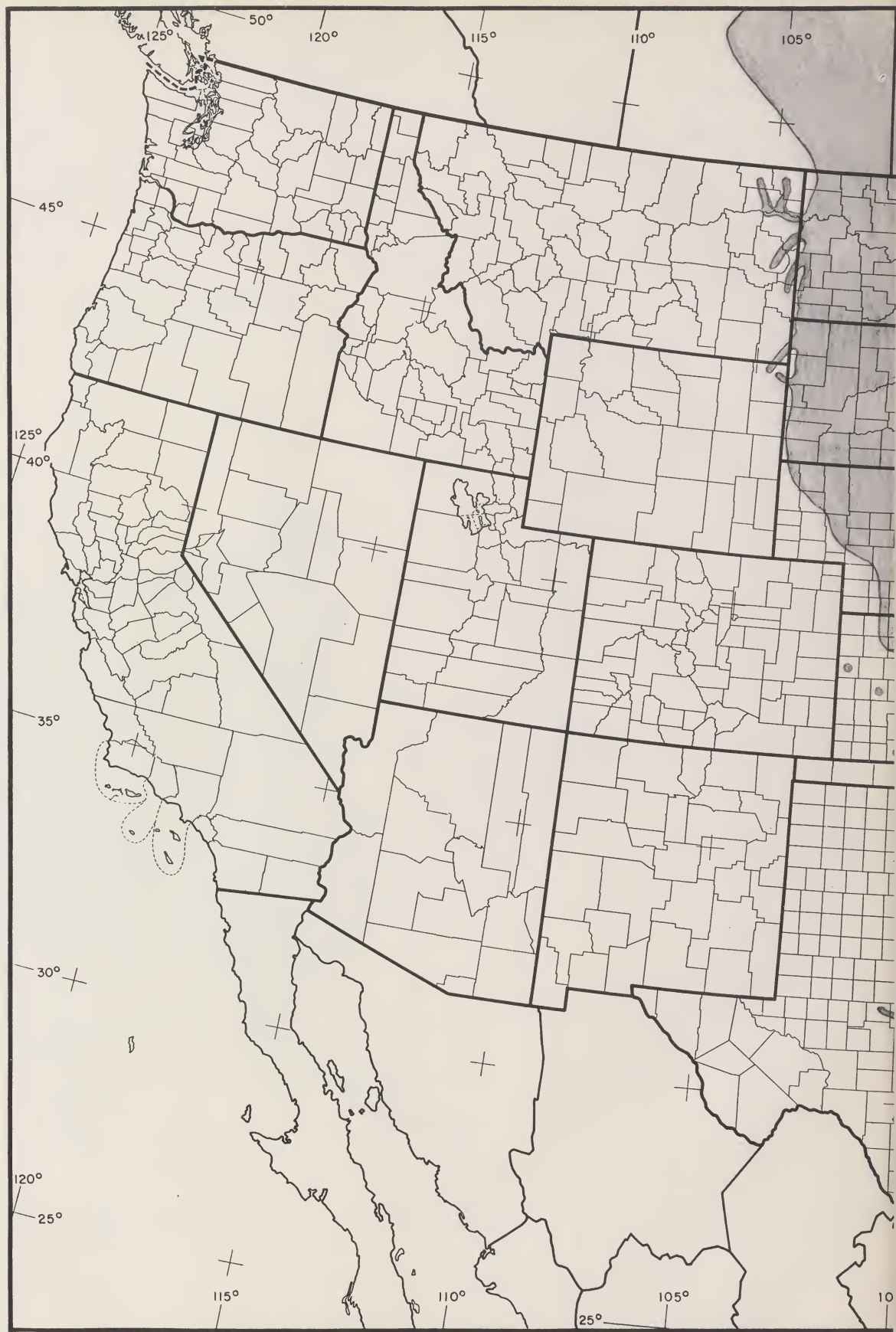
Map 194-E. white basswood, *Tilia heterophylla* Vent.



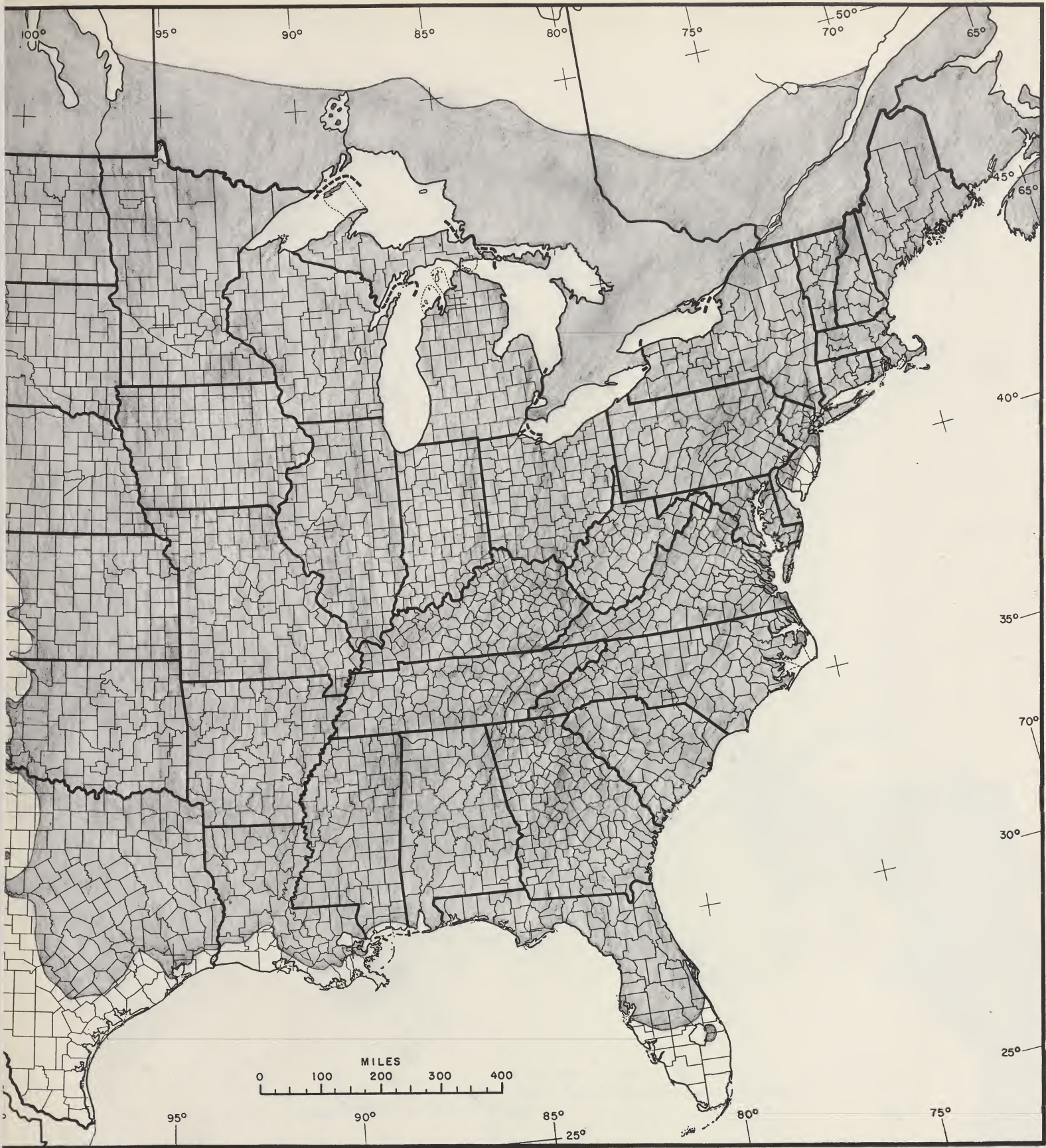
Map 195-E. winged elm, *Ulmus alata* Michx.



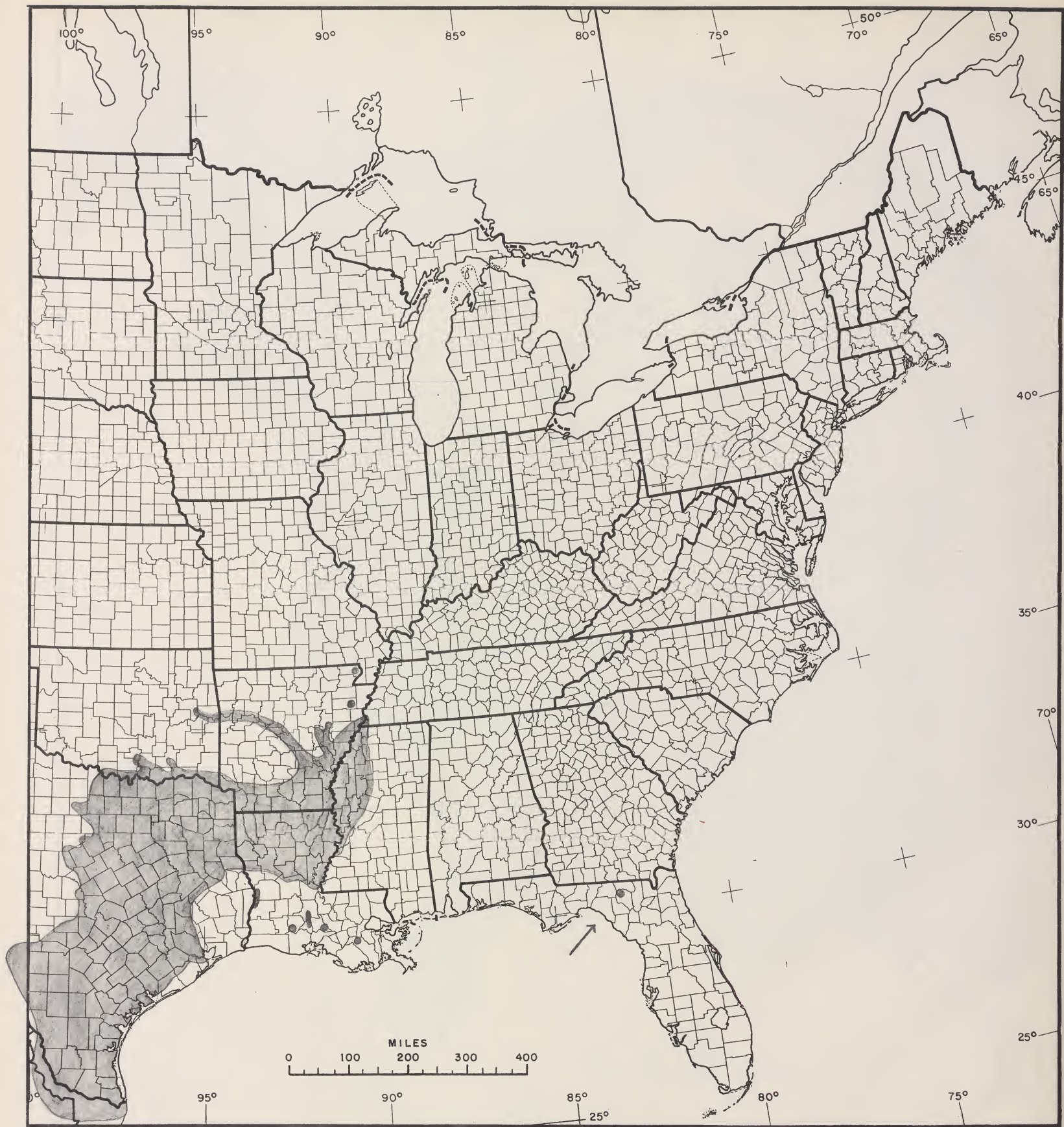
Map 196-N. American elm, *Ulmus americana* L.



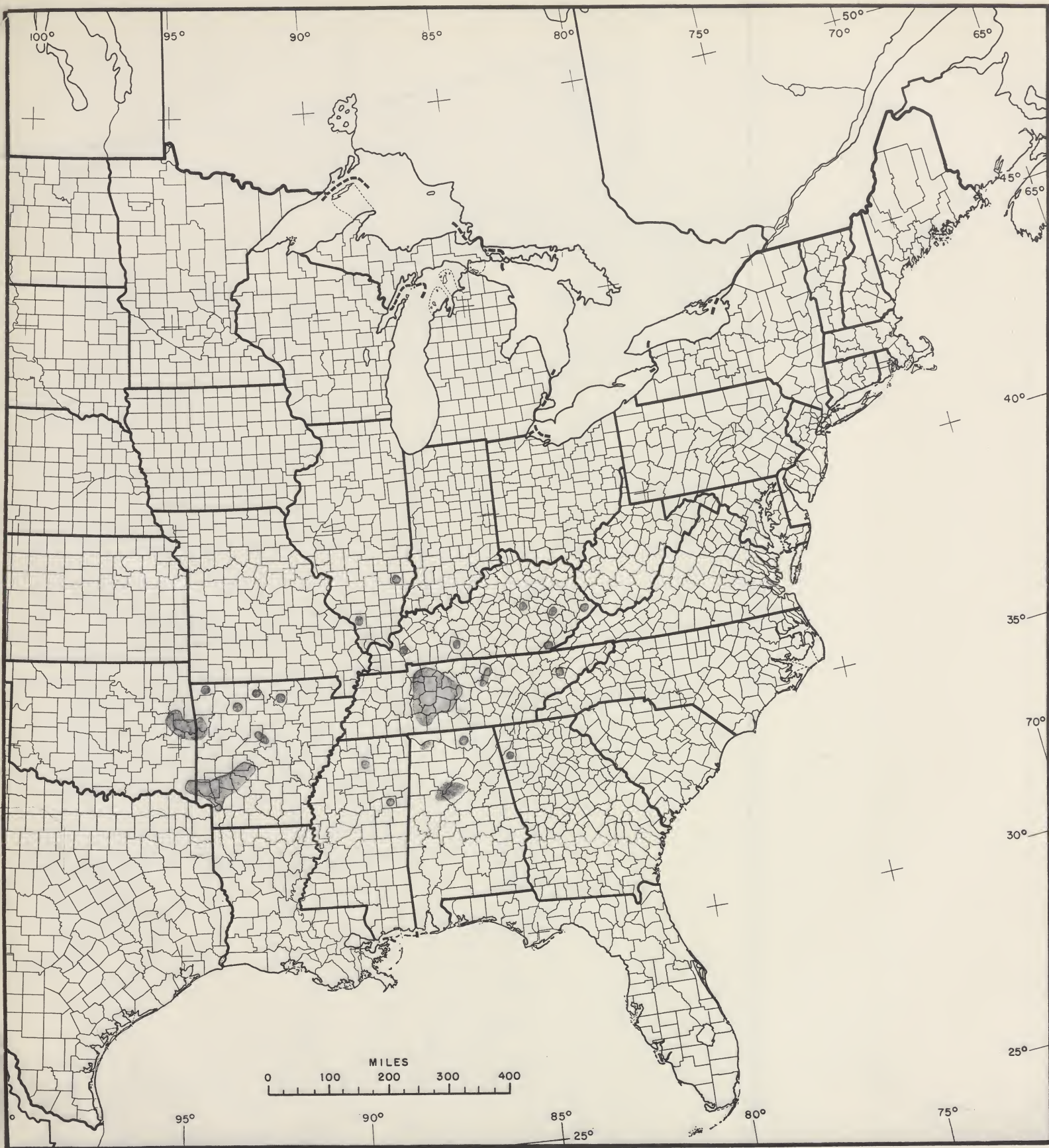
Map 196-W. American elm, *Ulmus americana* L., western range.



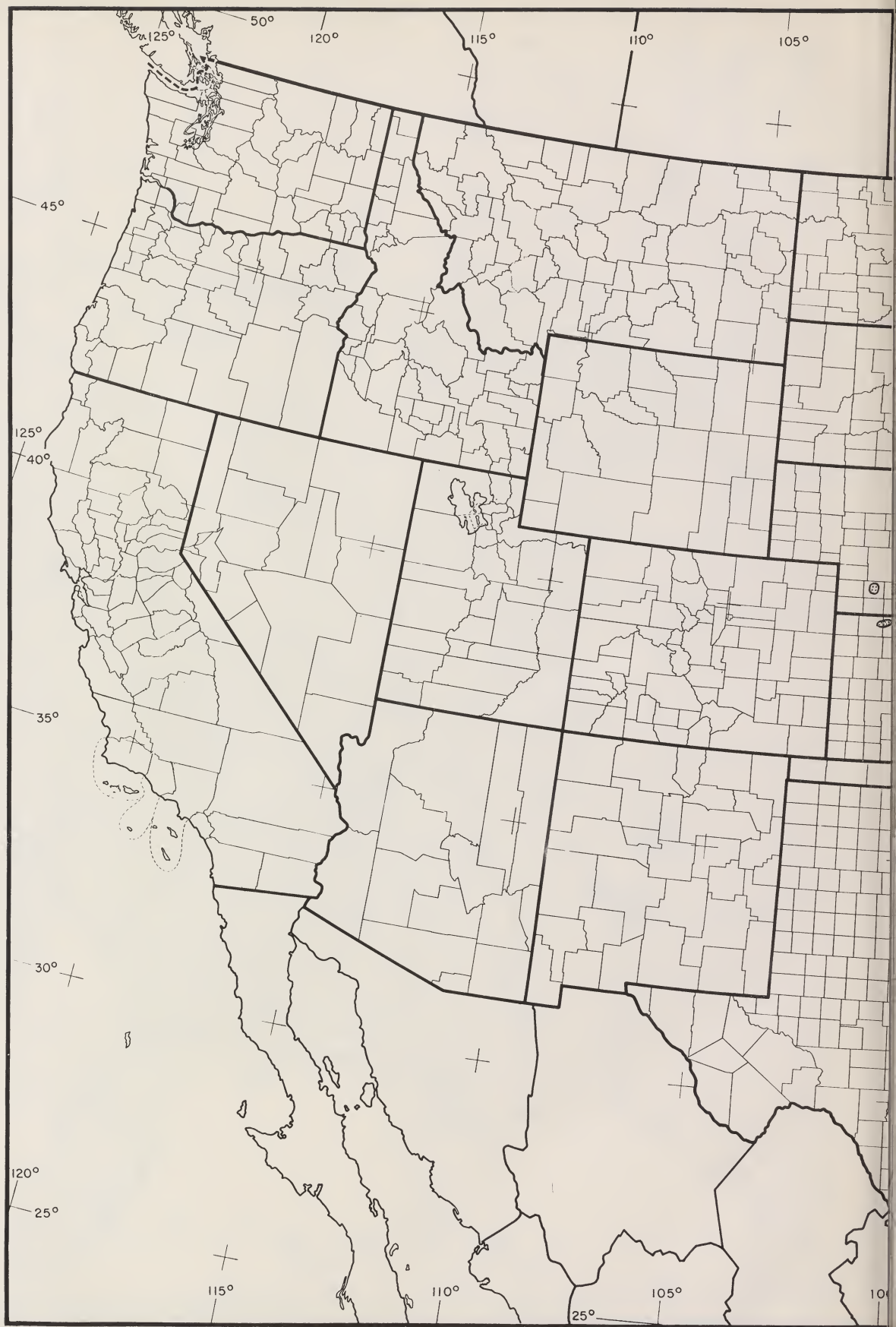
Map 196-E. American elm, *Ulmus americana* L., eastern range.



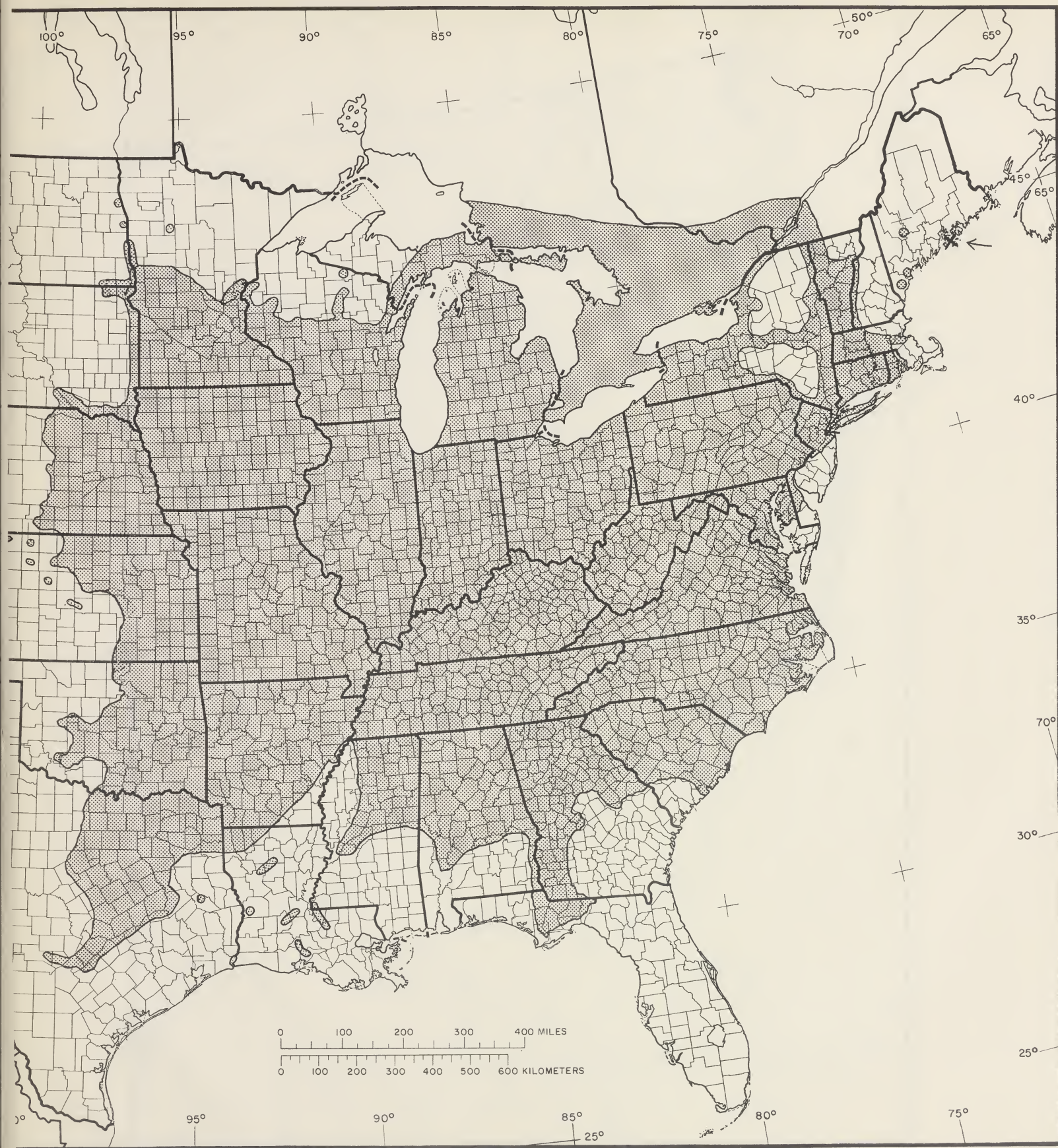
Map 197-E. cedar elm, *Ulmus crassifolia* Nutt.



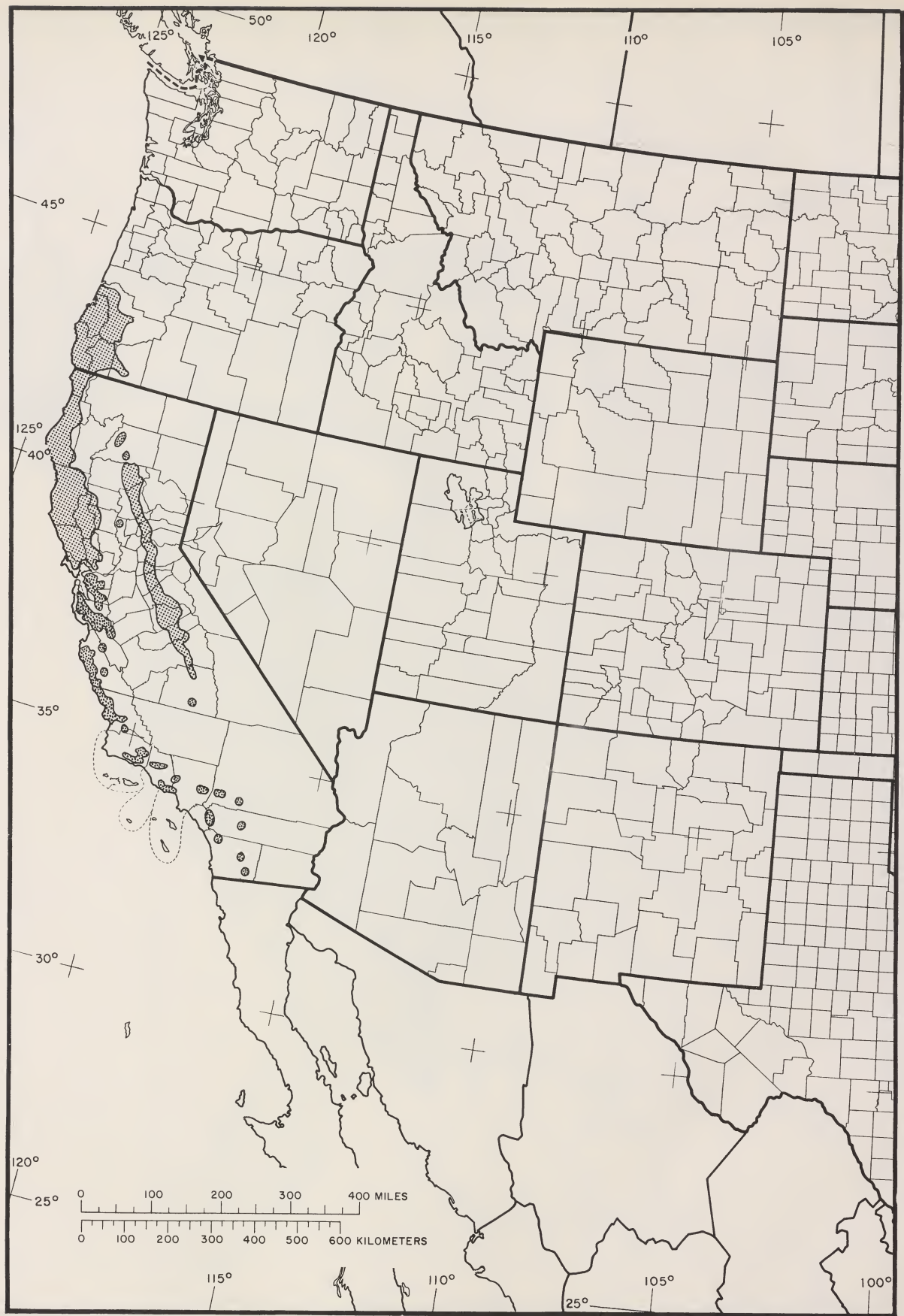
Map 197.1-E. September elm, *Ulmus serotina* Sarg.



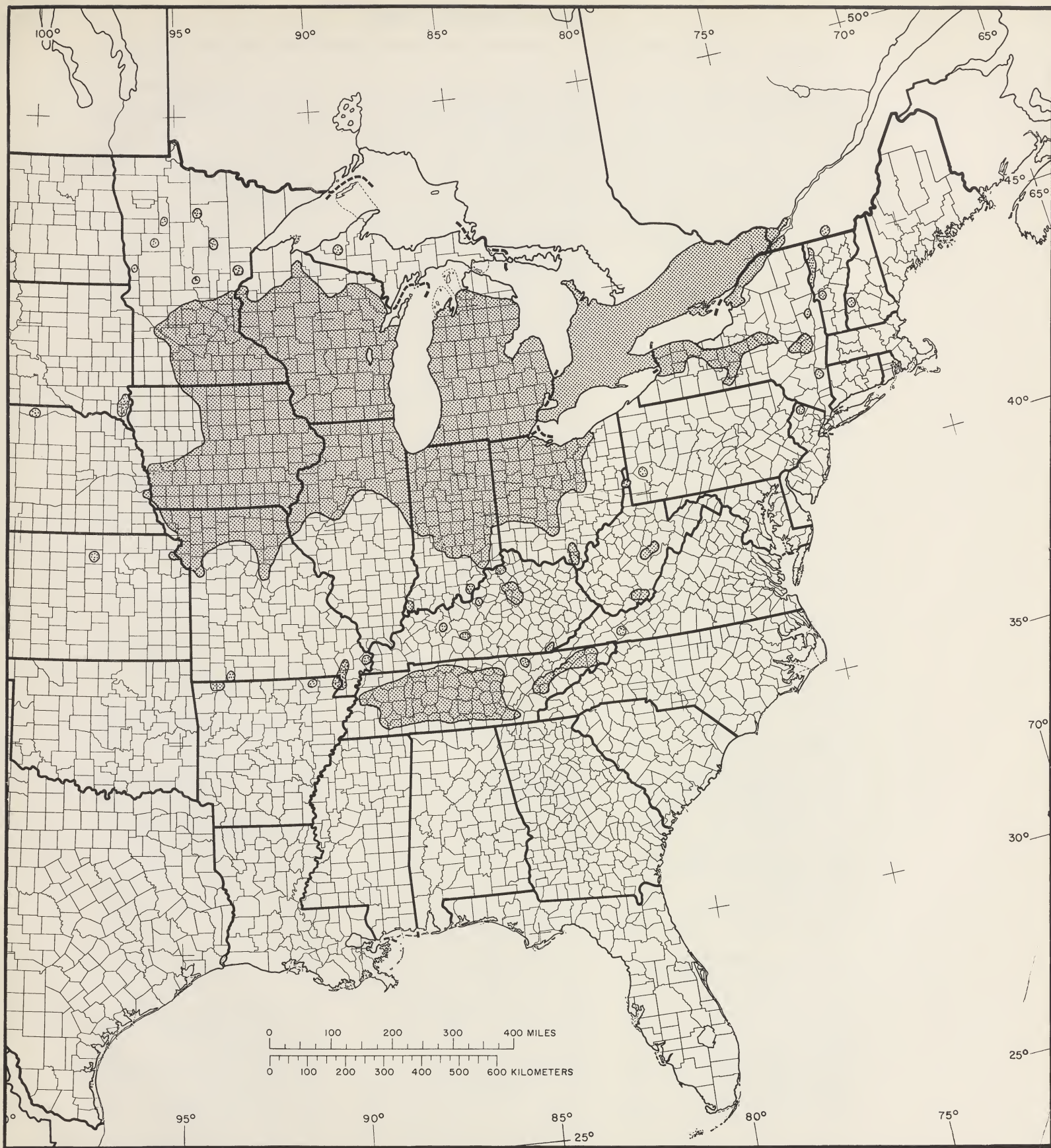
Map 198-W. slippery elm, *Ulmus rubra* Mühl., western range.



Map 198-E. slippery elm, *Ulmus rubra* Mühl., eastern range.



Map 199-W. California-laurel, *Umbellularia californica* (Hook. & Arn.) Nutt.



Map 200-E. rock elm, *Ulmus thomasi* Sarg.

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Numbers refer to maps. The letter W indicates a map of Western United States; E, a map of Eastern United States; and N, a map of North America.

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yew, Florida, 85-E
yew, Pacific, 86-W, 86-N

ABOUT THE FOREST SERVICE

As our Nation grows, people expect and need more from their forests—more wood; more water, fish and wildlife; more recreation and natural beauty; more special forest products and forage. The Forest Service of the U.S. Department of Agriculture helps to fulfill these expectations and needs through three major activities.

- Conducting forest and range research at over 75 locations ranging from Puerto Rico to Alaska to Hawaii.
- Participating with all State forestry agencies in cooperative programs to protect, improve, and wisely use our Country's 395 million acres of State, local, and private forest lands.
- Managing and protecting the 187-million acre National Forest System.

The Forest Service does this by encouraging use of the new knowledge that research scientists develop; by setting an example in managing, under sustained yield, the National Forests and Grasslands for multiple use purposes; and by cooperating with all States and with private citizens in their efforts to achieve better management, protection, and use of forest resources.

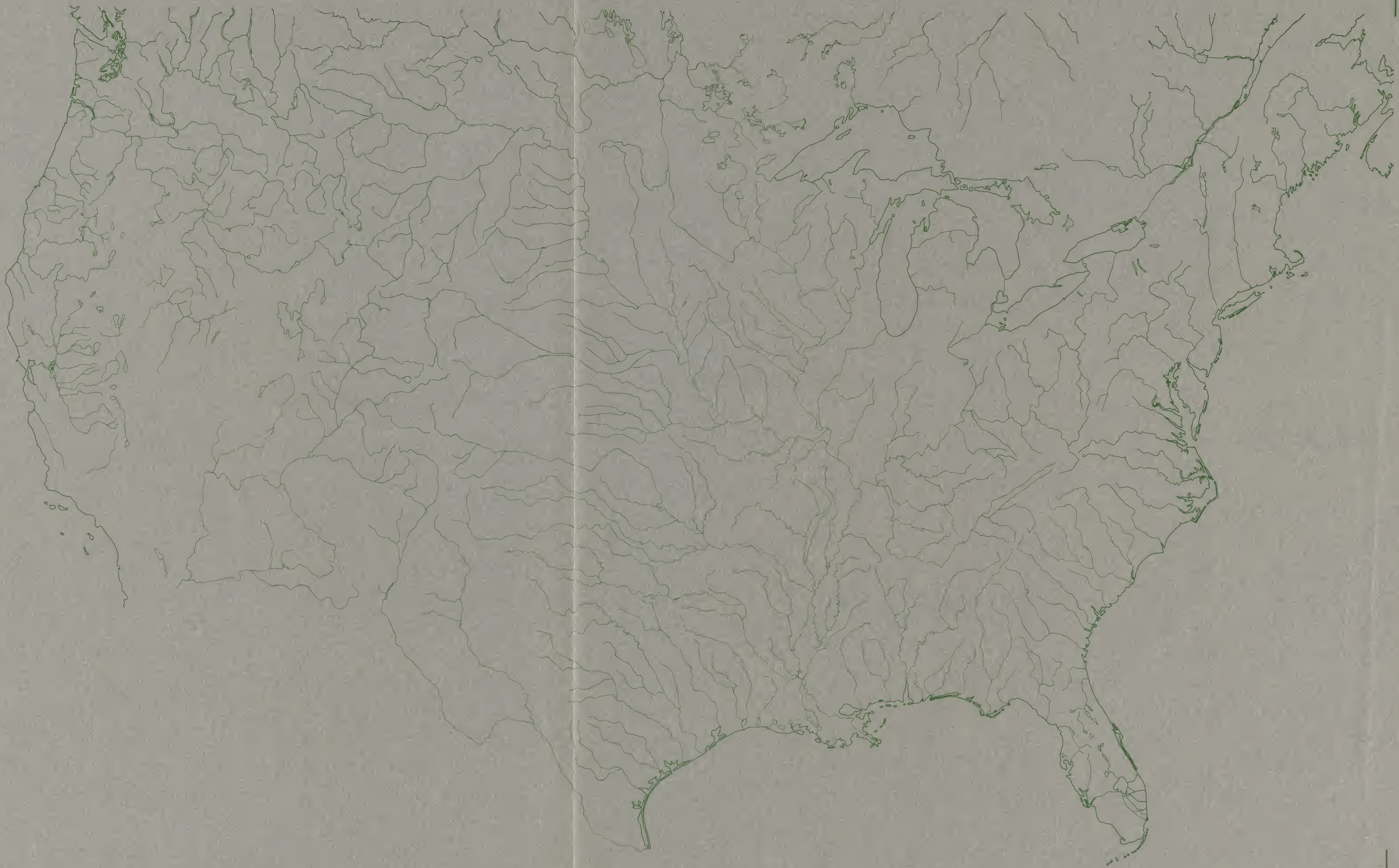
For more than 60 years, the Forest Service has been serving the Nation as a leading natural resource conservation agency.





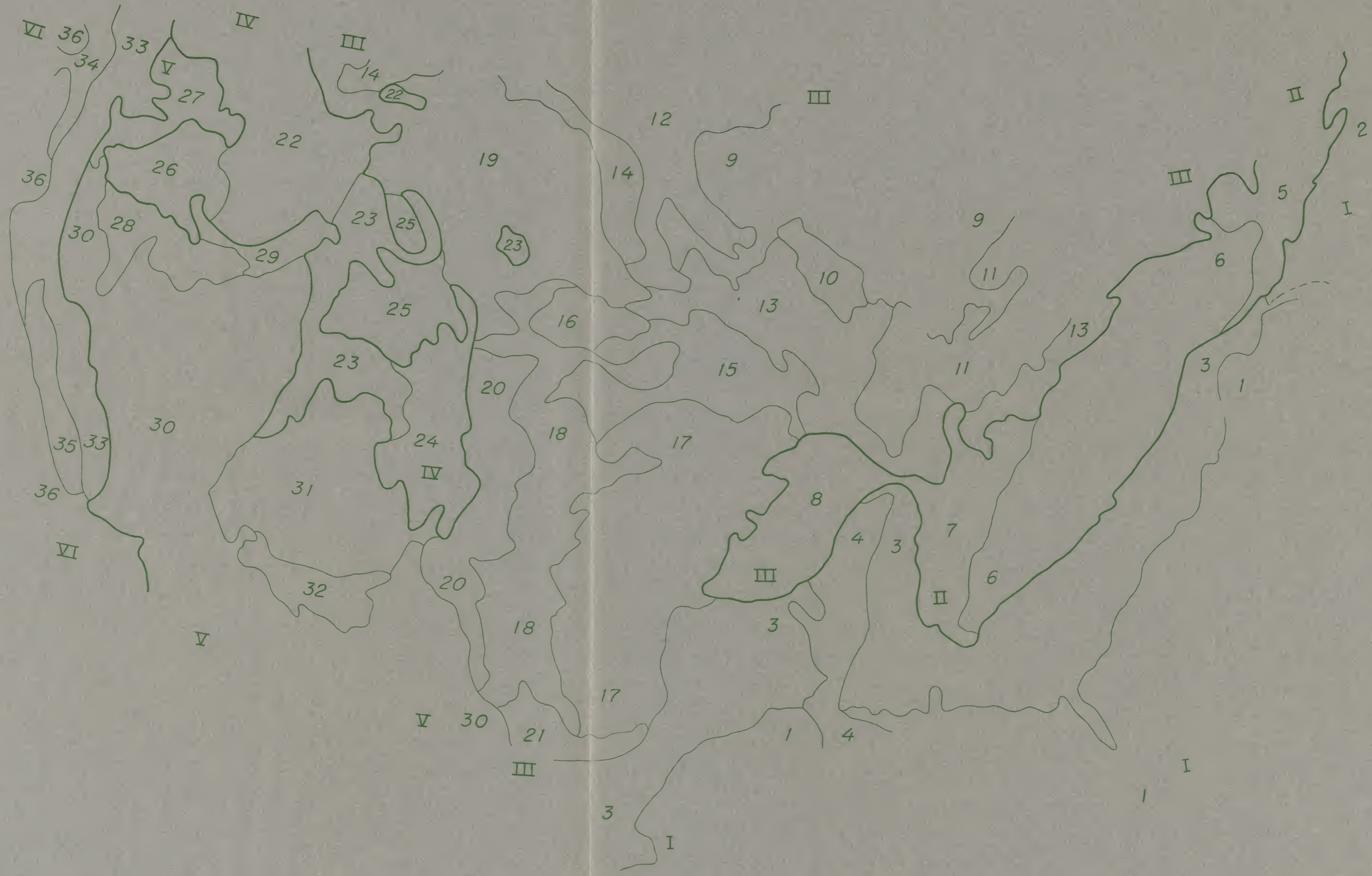






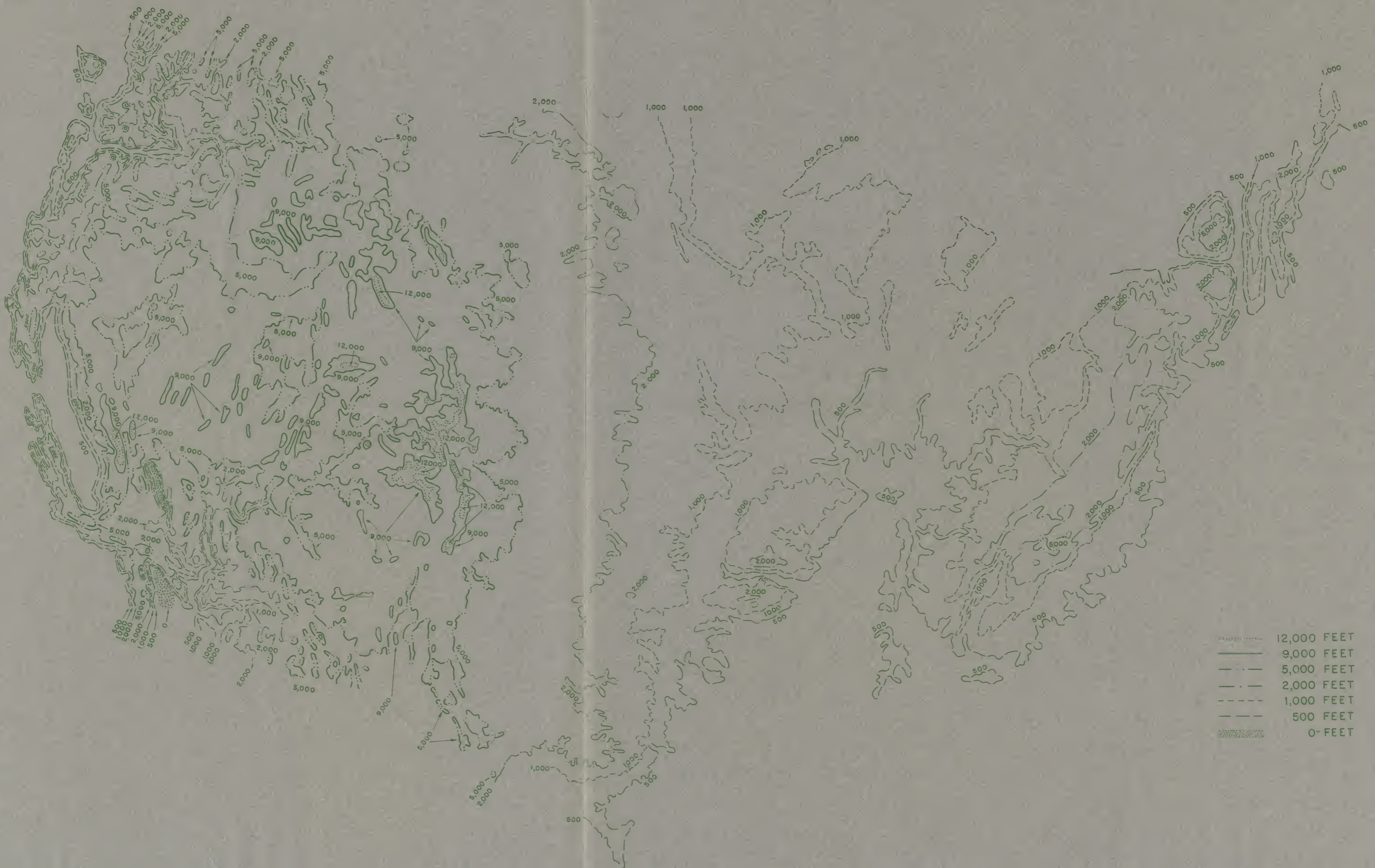
Overlay 1-W. Rivers and natural lakes. (Western United States.)

Overlay 1-E. Rivers and natural lakes. (Eastern United States.)



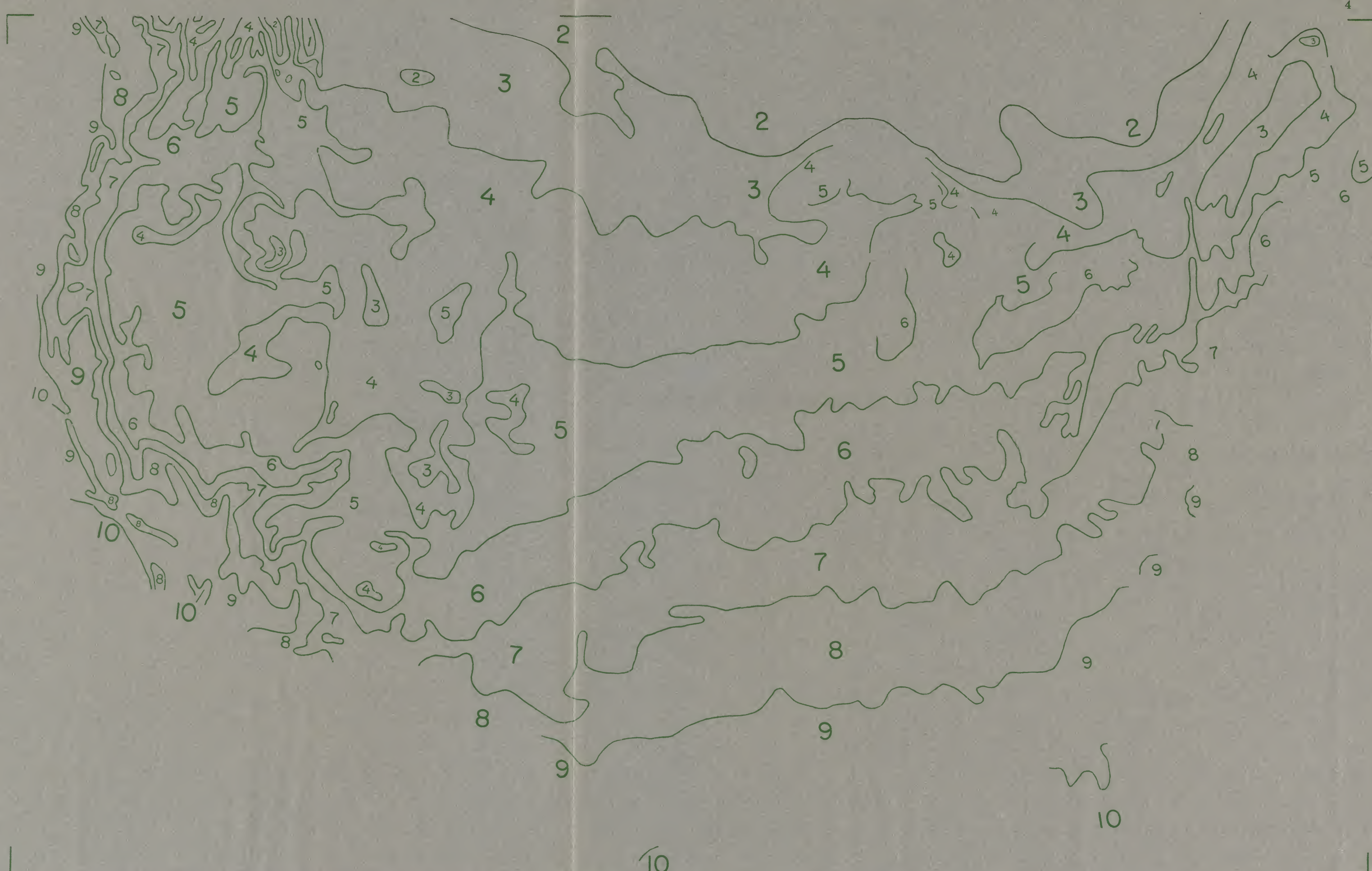
Overlay 2-W. Physical subdivisions, or land-surface form. Explanation on page 4. (Western United States.)

Overlay 2-E. Physical subdivisions, or land-surface form. Explanation on page 4. (Eastern United States.)



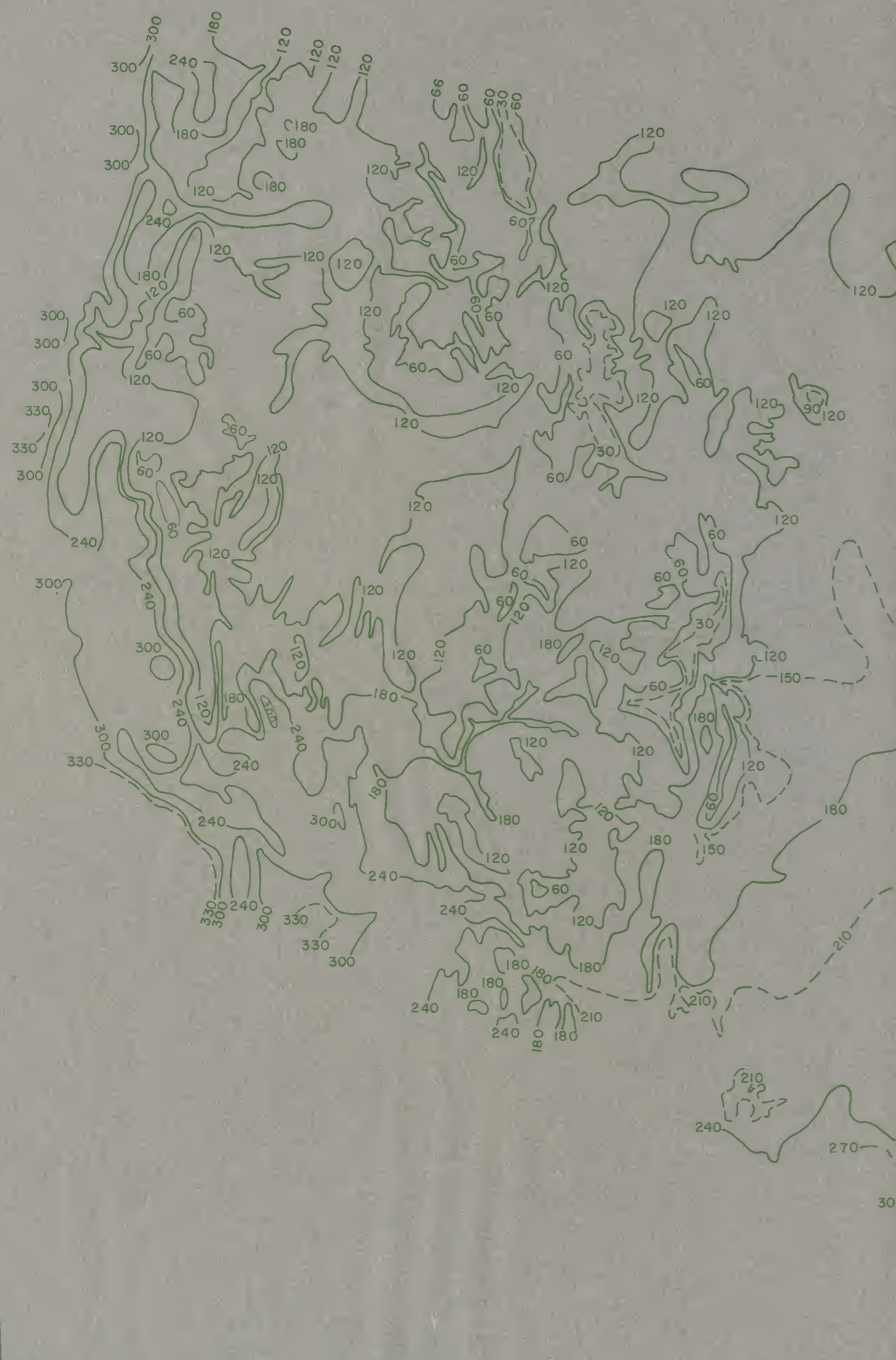
Overlay 3-W. Topographic relief. Contour lines at selected elevations. (Western United States.)

Overlay 3-E. Topographic relief. Contour lines at selected elevations. (Eastern United States.)

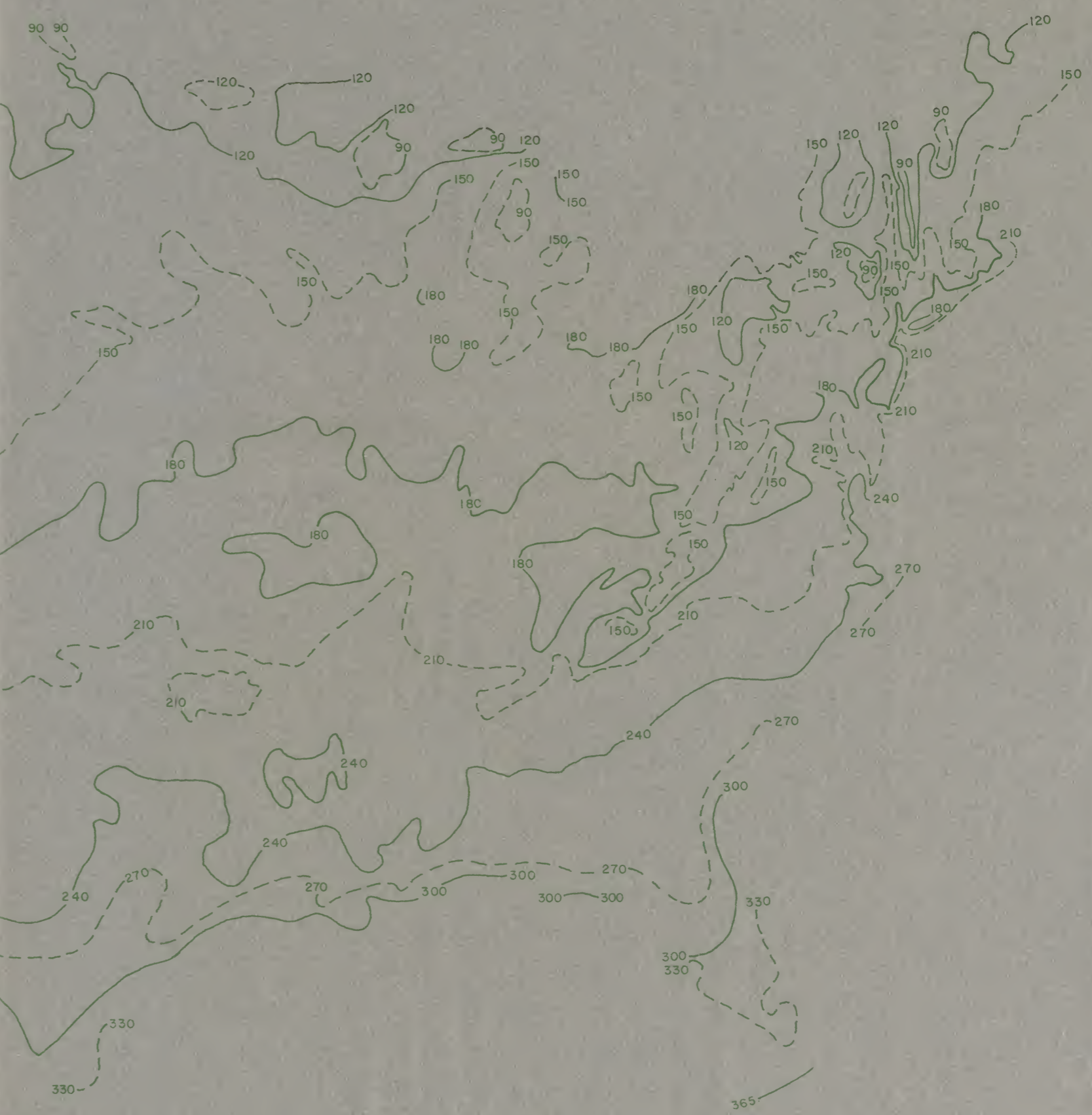


Overlay 4-W. Plant hardiness zones. Approximate range of average annual minimum temperatures for each zone (in degrees Fahrenheit). Explanation on page 4. (Western United States.)

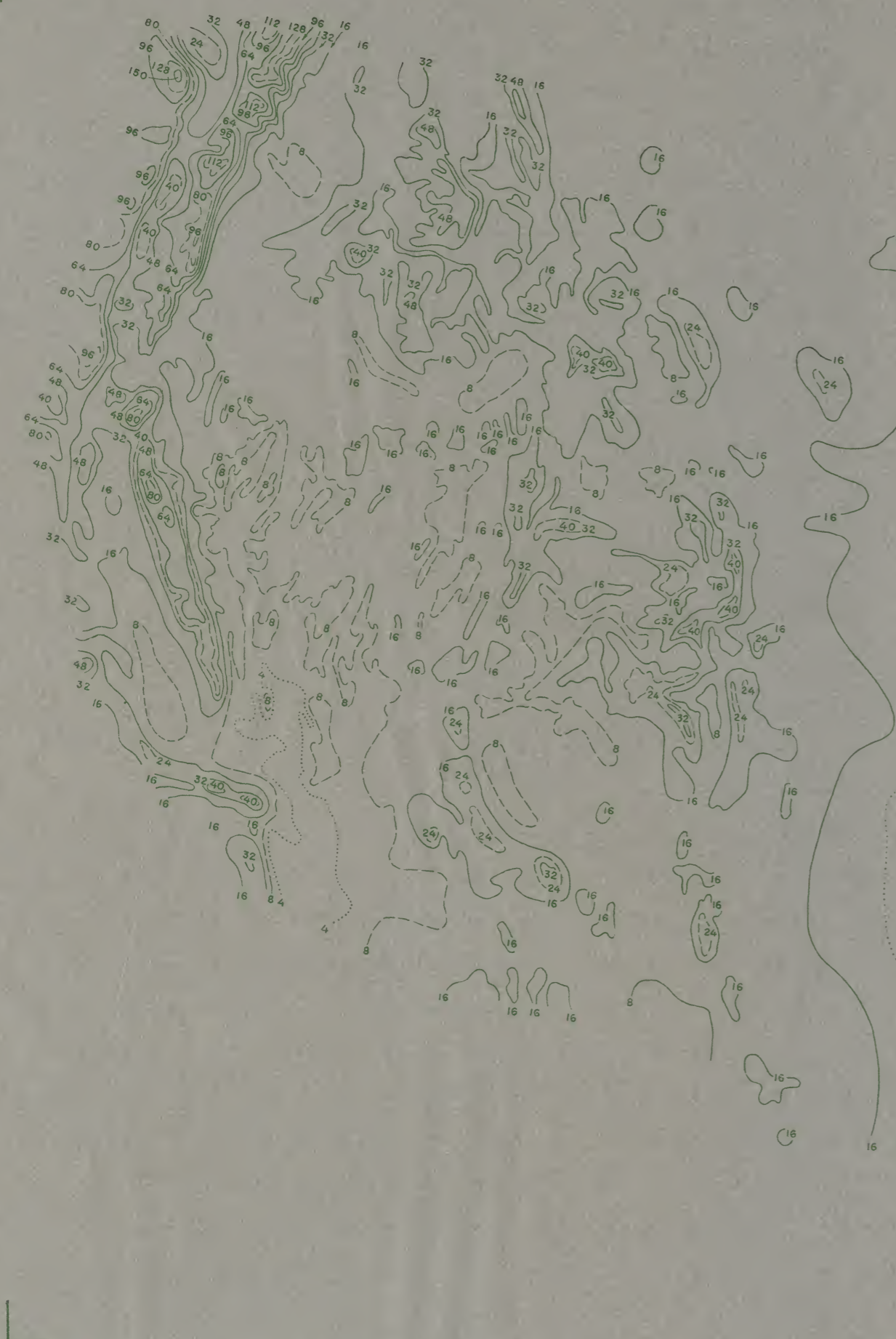
Overlay 4-E. Plant hardiness zones. Approximate range of average annual minimum temperatures for each zone (in degrees Fahrenheit). Explanation on page 4. (Eastern United States.)



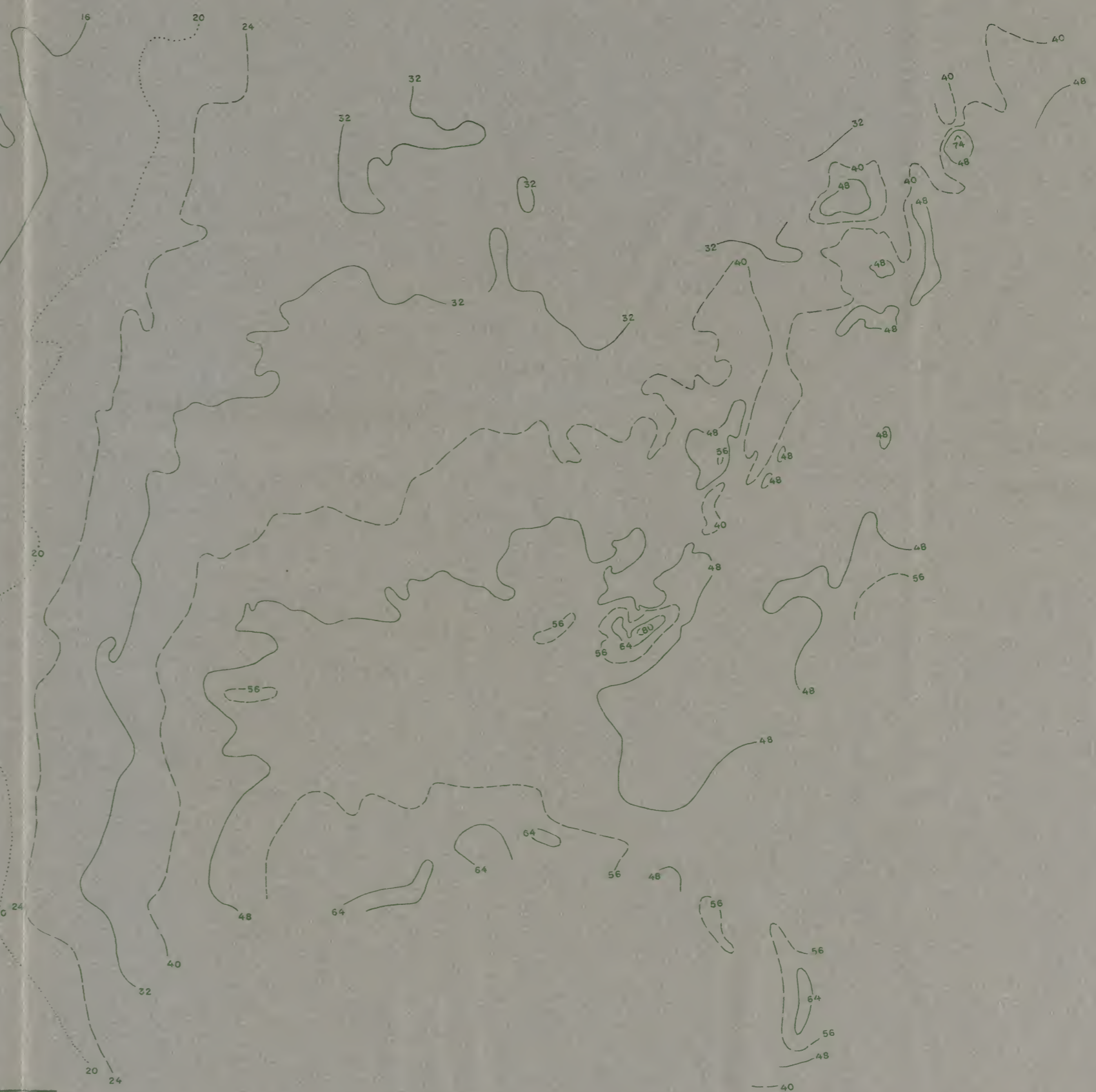
Overlay 5-W. Length of growing season. Mean length of freeze-free period (days) between last 32° F. temperature in spring and first 32° F. temperature in autumn. (Western United States.)



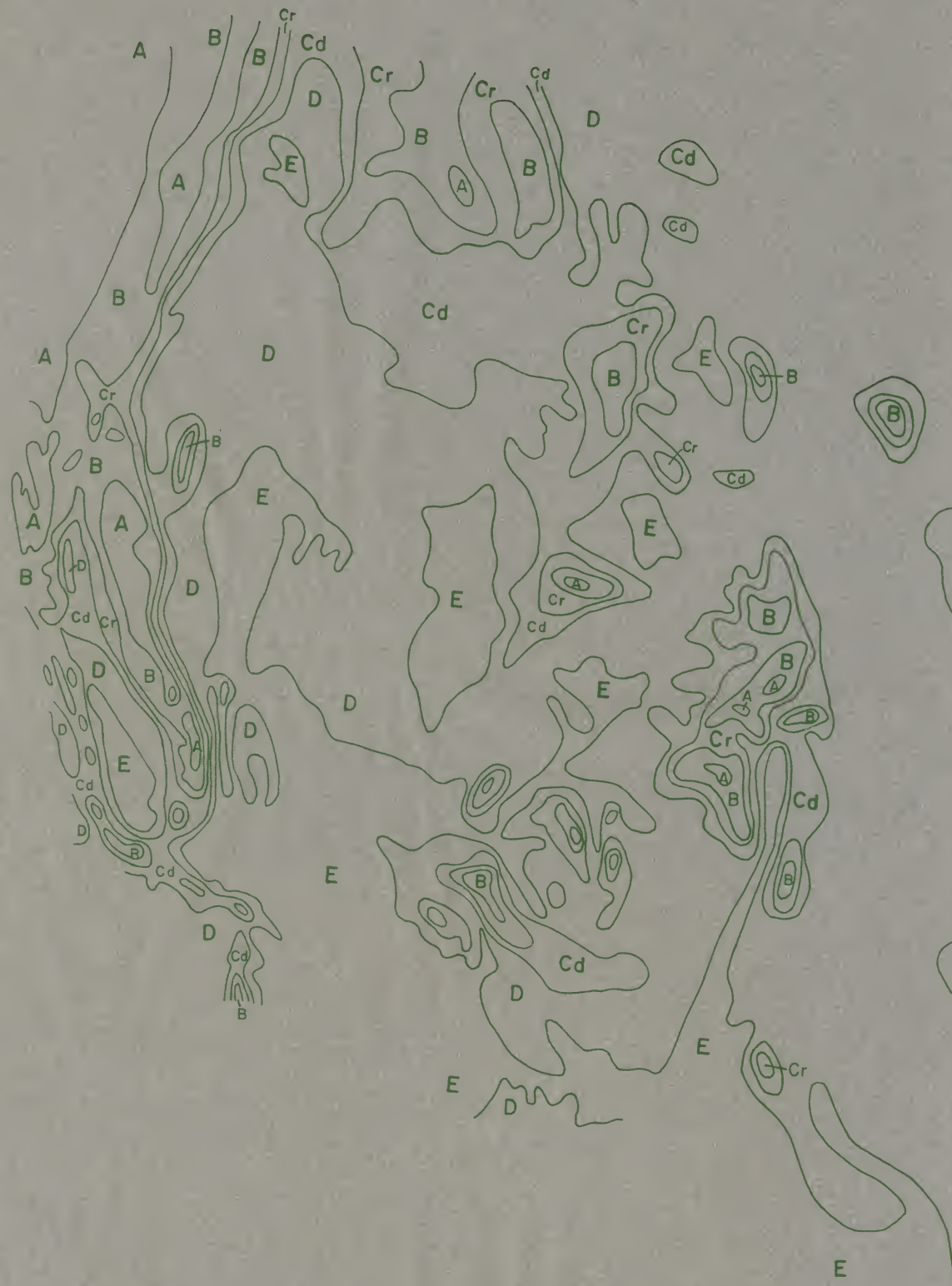
Overlay 5-E. Length of growing season. Mean length of freeze-free period (days) between last 32° F. temperature in spring and first 32° F. temperature in autumn. (Eastern United States.)



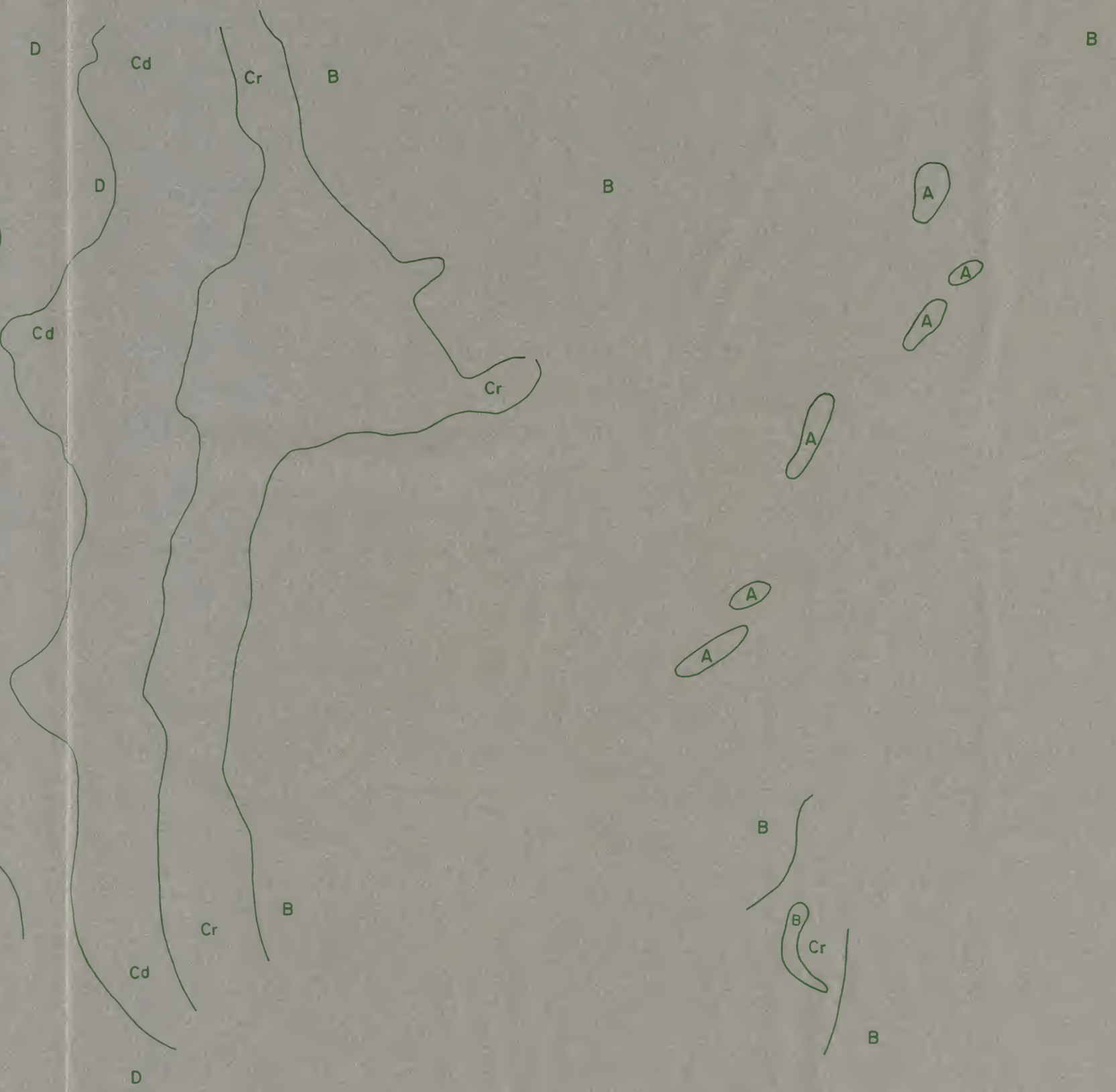
Overlay 6-W. Precipitation or rainfall. Normal annual total precipitation (inches). (Western United States.)



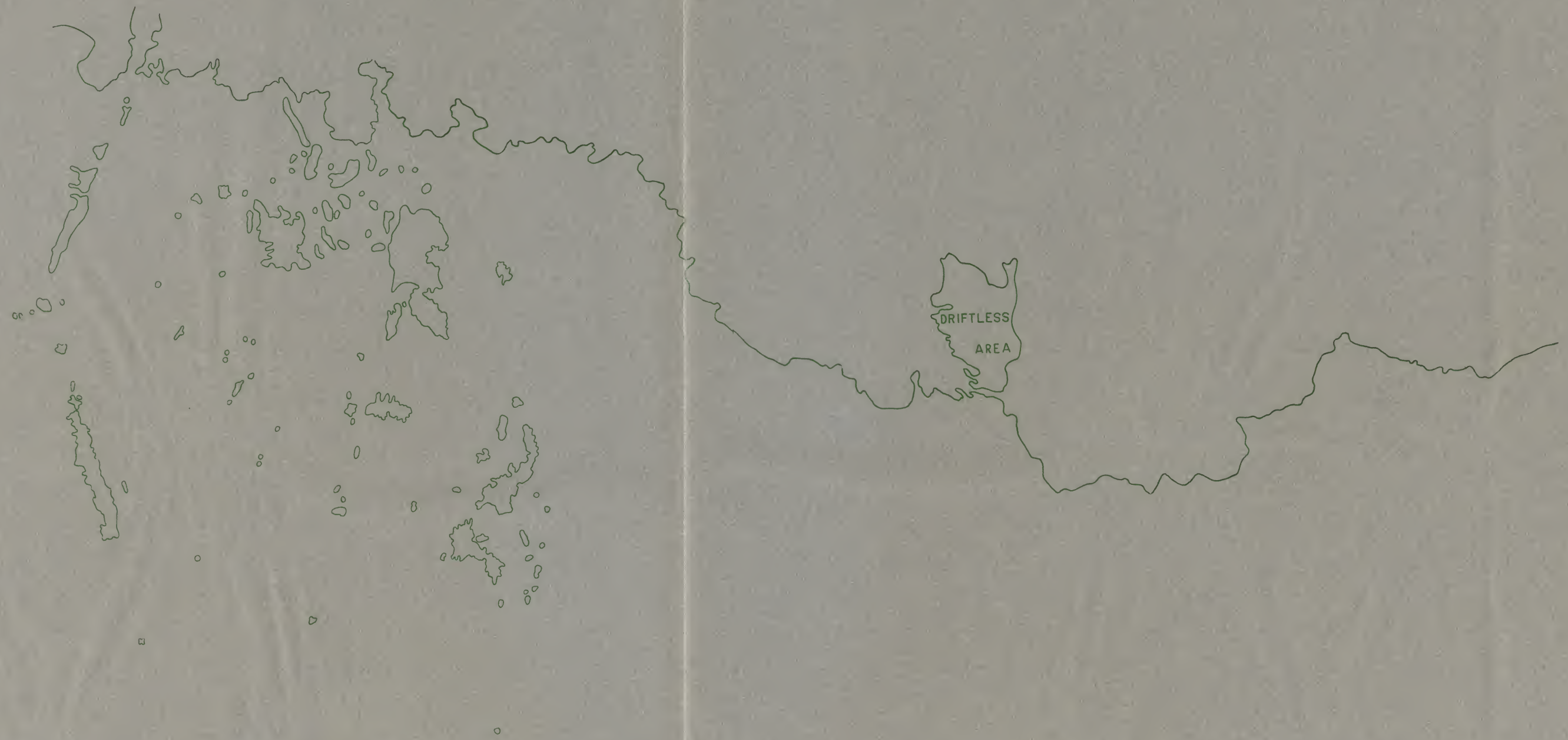
Overlay 6-E. Precipitation or rainfall. Normal annual total precipitation (inches). (Eastern United States.)



Overlay 7-W. Climates of the United States. Normal distribution of the principal climates in the United States. Precipitation effectiveness (P-E) index. Explanation on page 4. (Western United States.)

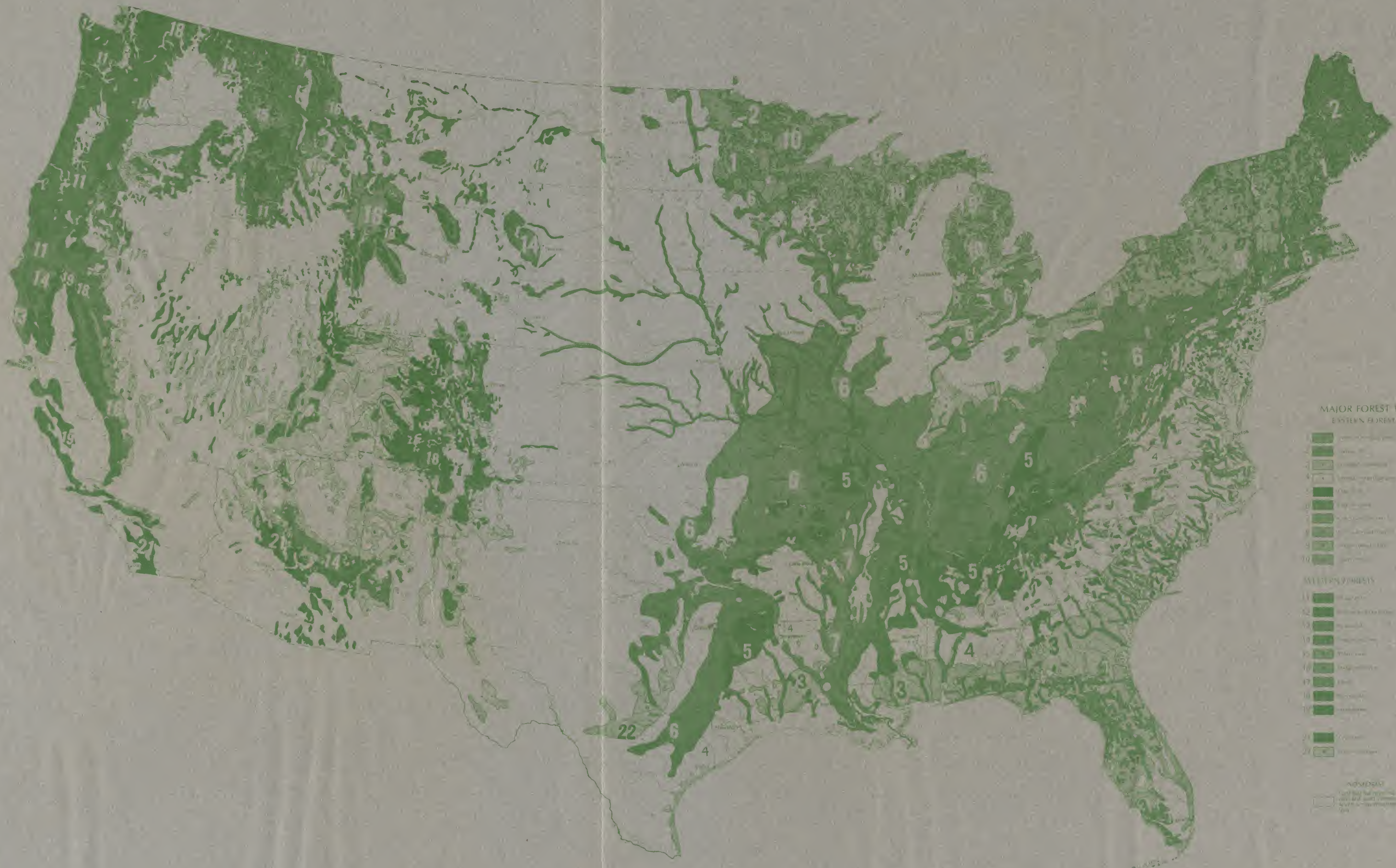


Overlay 7-E. Climates of the United States. Normal distribution of the principal climates in the United States. Precipitation effectiveness (P-E) index. Explanation on page 4. (Eastern United States.)



Overlay 8-W. Maximum extent of glaciation in the Wisconsin glacial stage (Pleistocene epoch).
Explanation on page 5. (Western United States.)

Overlay 8-E. Maximum extent of glaciation in the Wisconsin glacial stage (Pleistocene epoch). Explanation on page 5. (Eastern United States.)



MAJOR FOREST TYPES
EASTERN FORESTS

- 1. Longleaf-slash pine
- 2. White oak
- 3. Shortleaf-slash longleaf pine
- 4. Loblolly-shortleaf pine
- 5. Oak-pine
- 6. Hard pine
- 7. Shortleaf-slash longleaf pine
- 8. Longleaf-slash pine
- 9. Loblolly-shortleaf pine
- 10. Spruce-fir

WESTERN FORESTS

- 11. Sitka spruce
- 12. Western white pine
- 13. Fir-sitka spruce
- 14. Fir-sitka spruce
- 15. White oak
- 16. Douglas-fir
- 17. Fir
- 18. Fir-sitka spruce
- 19. Fir-sitka spruce
- 20. Fir-sitka spruce
- 21. Fir-sitka spruce
- 22. Fir-sitka spruce

NONFOREST
Land that has never been forested or
land that has been converted to
nonforest use (agriculture, urban, etc.)

Overlay 9-W. Major forest types. Explanation on page 5. (Western United States.)

Overlay 9-E. Major forest types. Explanation on page 5. (Eastern United States.)