PLANTS OF ALLERGENIC IMPORTANCE





HollisterStier
Allergy

INTRODUCTION

Many years ago in response to physician requests, HollisterStier Allergy commissioned Mary Foley Benson to illustrate the common allergenic plants of North America. The project continued for more than a decade with the artist and our staff botanists working together. Fresh specimens were sent several times during the pollination period for each species so that preliminary sketches and color matches could be made. Many specimens were flown across the continent in order to preserve the colors and textures which would be lost during surface shipment in the heat of summer. The project was immensely successful.

It is said that beauty is in the eye of the beholder, which is true for most allergenic plants. Lacking conspicuous petals and sepals, the usual devices for attracting birds and insects, the flowers of many of these plants are inconspicuous to most people. The beauty of these illustrations is that through the eye of the sensitive artist it has been possible to capture the detail of “homely” plants as no camera can. The artist visually describes the plant, rather than merely recording it, judiciously emphasizing those characteristics which are unique for each species, and understating those aspects which might confuse the reader. No camera is equal to such a project.

This volume should be useful as well as enjoyable. It has scientific value in providing a visual reference to the common plants of clinical importance. The illustrations can also help your patients learn to recognize common allergenic plants. They are by no means sufficient for proper identification of individual species, but valuable for general identification of plant types.

In the electron micrographs on the last page you can see the intricate structures of some of the common airborne pollens as only the scanning electron microscope can show them. The images were made by electrons rather than light and must be viewed indirectly on a screen or photograph.

HollisterStier Allergy

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Illustrations are in alphabetical order by common name.
Name in parentheses is common synonym.






WHITE ALDER
(*alnus rhombifolia*)

TAG ALDER
(alnus rugosa)

WHITE ALDER *(Alnus rhombifolia)* TAG ALDER *(Alnus rugosa)*

	WHITE ALDER	TAG ALDER
FAMILY	Betulaceae	
GENUS:	*Alnus*	
SPECIES:	*rhombifolia*	*rugosa*
COMMON NAMES:	White Alder, Giant Alder	Tag Alder, Smooth Alder
POLLEN GRAINS:	Oblately flattened, angular 19 to 27 microns in diameter. Germ pores mostly 4 or 5 protruding and surrounded by lens shaped thickening. Apertures slit shaped. Exine smooth or slightly granular. Pairs of band-like thickenings of exine extend from pore to pore, one on each side of equator.	
POLLINATING PERIOD:	January - March	January - April
	Time of pollination governed by latitude and altitude.	
DISTRIBUTION:	California, Oregon, Washington, Eastern B.C. west to Rocky Mountains in Idaho.	Texas, Nebraska, Minnesota eastward to Atlantic seaboard from Florida to Maine.
ALLERGENIC IMPORTANCE:	Generally of secondary importance.	

The alders are deciduous trees or shrubs with simple, petioled, toothed leaves. Flowers of both sexes are borne on separate catkins on the same plant. Flowering precedes the opening of the leaf buds. The catkins occur in clusters usually on forked branchlets. The staminate catkins are pendulous and early deciduous. The pistillate catkins are small, erect and spike like. They ripen into ovoid woody cones which become spreading or pendulous at maturity and are persistent on the tree for a year or more, finally falling whole.

The White alder (*A. rhombifolia*) is a tree that grows up to 100 feet tall. The bark is whitish to gray and smooth. Leaves are serrate and tapering to the base and apex. The cones are 1/2 to 7/8 inch long. White alder is found along rivers and streams and is considerably planted as a street and yard tree in California.

Tag alder is a shrub growing to 25 feet tall. The leaves are 2-5 inches long, finely serrated, and somewhat variable in shape. The apex is usually rounded, but sometimes pointed. The cones are about 1/2 inch long. Some cones occur without the usual short stem. Tag alder is found along streams and in the wettest places, and like other alders is among the first to pollinate with the waning of winter.

BERMUDA GRASS
(Cynodon dactylon)

BERMUDA GRASS *(Cynodon dactylon (Pres.))*

FAMILY:	Gramineae
TRIBE:	Chlorideae
GENUS:	*Cynodon*
SPECIES:	*dactylon*, referred to by some authors as *Capriola dactylon (Ktze.)*
COMMON NAMES:	Bermuda Grass, Scutch Grass, Wire Grass , Bahama Grass, Devil Grass
POLLEN GRAINS:	Spheroidal, 35 microns in diameter
POLLINATING PERIOD:	April - September (or frostless months of the year)
DISTRIBUTION:	Maryland to Oklahoma and south to Florida and Texas. West to Nevada and California. Occasional and very spotty from Michigan to New Hampshire and Southern Oregon shows an occasional incidence. Most abundant in the semi-arid and the irrigated arid regions of the Southwest.
ALLERGENIC IMPORTANCE:	Large quantities of very buoyant pollen are produced. It is considered one of the most important of hay fever grasses within its range.

Bermuda Grass is a perennial, four to sixteen inches high. It spreads by both rhizomes and stolons to form a thick mat or turf. The leaf blades are short and flat. The head is composed of four or five digitate spikes one to two inches long at the summit of a slender flowering stem.

GRAY BIRCH
(*Betula populifolia*)

SPRING BIRCH
(Betula occidentalis)

SPRING BIRCH *(Betula occidentalis)* GRAY BIRCH *(Betula populifolia)*

	SPRING BIRCH	GRAY BIRCH
FAMILY:	Betulaceae	
GENUS:	*Betula*	
SPECIES:	*occidentalis*	*populifolia*
COMMON NAMES:	Spring Birch, Black Birch	Gray Birch, White Birch, American White Birch, Poplar-leaved Birch
POLLEN GRAIN:	Flattened and angular, 20 to 28 microns in diameter. Germ pores 3.	
POLLINATING PERIOD:	March - May	April & May
DISTRIBUTION:	British Columbia and eastern Washington to the Black Hills of South Dakota, southward along the Rocky Mountains to northern New Mexico. Northern California and the east slope of the Sierra Nevada.	Nova Scotia to Delaware and westward to Minnesota and Ontario. Most abundant in coastal states.
ALLERGENIC IMPORTANCE:	Moderately important where prevalent.	

Spring Birch grows to 25 ft. (50 ft. for variety Piperi found in eastern Washington) with a short trunk and ascending, spreading, and somewhat pendulous branches, forming a broad open crown. The leaves are acutely pointed with a rounded base. Leaf margins are sharply toothed. Mature leaves are dull dark green above and pale yellow green below. The bark is a lustrous dark bronze and doesn't separate into thin layers. The staminate catkins are clustered; the pistillate usually solitary.

Gray Birch is a short-lived tree rarely over 30 ft. tall. The leaves are nearly triangular in outline, coarsely double toothed, and a lustrous dark green color. The bark is dull white on the outer surface and bright orange on the inner, and doesn't separate into thin layers. Male and female catkins occur singly. The branches are slender, often drooping, and usually clothe the trunk to the ground to form a narrow, pyramidal crown.

The staminate catkins of all birches are formed in the late summer or fall and remain naked and erect on the bare twigs through the winter. With spring they increase in size rapidly and become pendulous prior to pollination.

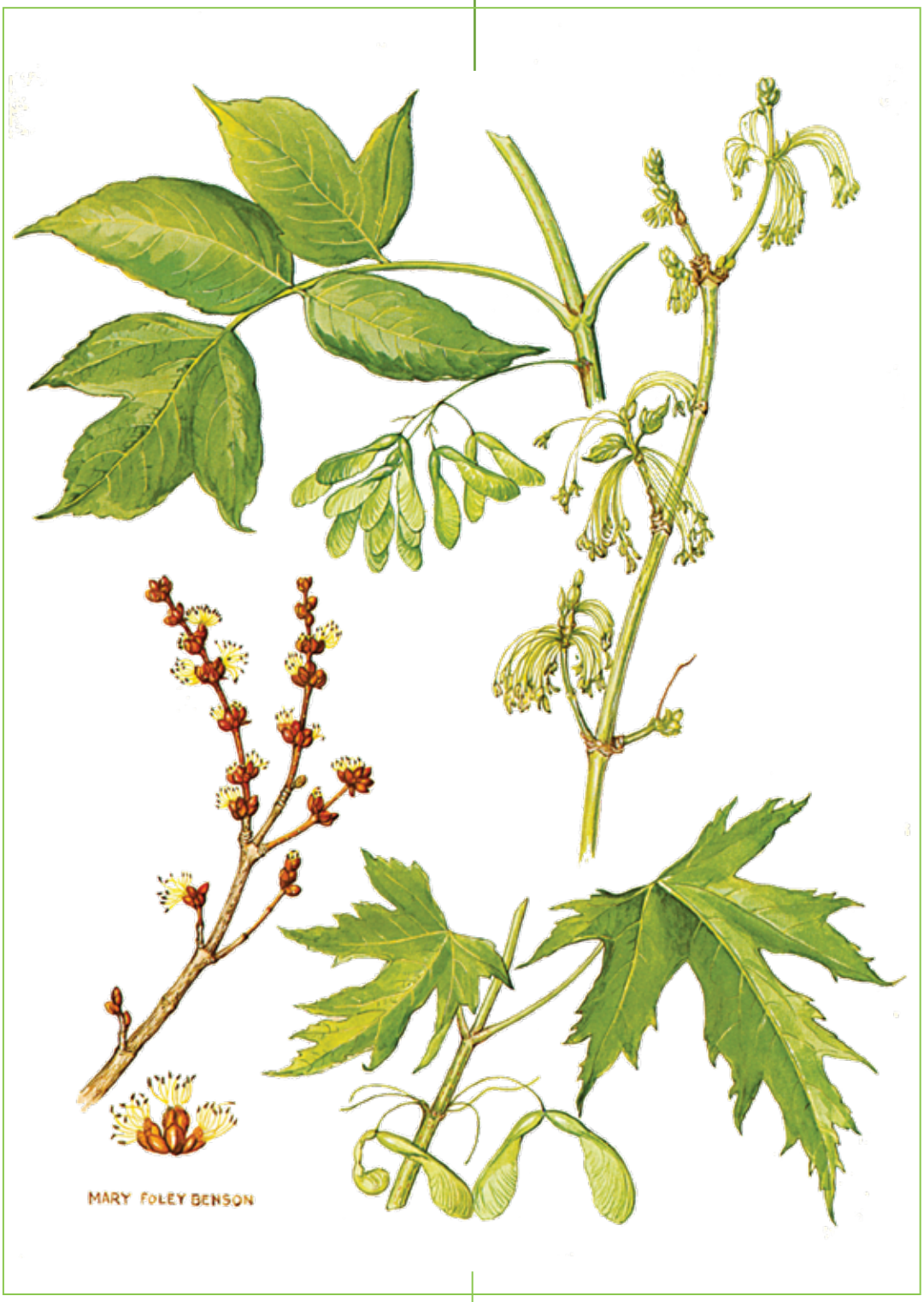
KENTUCKY BLUEGRASS
(Poa pratensis)

KENTUCKY BLUEGRASS *(Poa pratensis)*

FAMILY:	Poaceae
TRIBE:	Festuceae
GENUS:	*Poa*
SPECIES:	*pratensis*
COMMON NAMES:	Kentucky Bluegrass, June Grass, Common Meadow Grass
POLLEN GRAINS:	Spheroidal, 22.5 to 32 microns in diameter. Germ pore somewhat irregularly shaped and capped by a small operculum likewise irregular. The exine more coarsely granular compared to other grasses.
POLLINATING PERIOD:	May & June
DISTRIBUTION:	Widely distributed throughout the United States except in arid regions. Not common in the Gulf states.
ALLERGENIC IMPORTANCE:	Of prime importance in areas of abundance.

Kentucky Bluegrass is a slender erect perennial 1 to 3 feet tall. It is tufted and spreads by creeping rhizomes. The blades are soft, flat or folded. The panicle is pyramidal, loosely spreading at maturity. This grass is a common lawn and pasture grass, also found in open woods, meadows and open ground.

BOXELDER
(*Acer negundo*)



SILVER MAPLE
(Acer saccharinum)

BOXELDER *(Acer negundo)*

SILVER MAPLE *(Acer saccharinum)*

	BOXELDER	SILVER MAPLE
FAMILY:	Aceraceae	
GENUS:	*Acer*	
SPECIES:	*negundo*	*saccharinum*
COMMON NAMES:	Boxelder, Cutleaved Maple, Ashleaved Maple, Water Ash	Silver Maple, Soft Maple, White Maple, Swamp Maple, River Maple
POLLEN GRAINS:	Rounded triangular to spheroidal; oblately flattened when fully expanded. Germ pores absent.	
	Exine very thin without striae.	Exine thicker and inconsistently striate.
POLLINATING PERIOD:	April	February & March
DISTRIBUTION:	Throughout most of the United States.	Native east of the Rocky Mountains. Widely cultivated throughout the U.S.
ALLERGENIC IMPORTANCE:	Important where abundant.	Of secondary importance except where very abundant.

The boxelder is a spreading, medium sized tree reaching to 70 feet tall. The leaves are divided into three leaflets, or occasionally five or seven. The trees flower just before the leaves appear. The male flowers occur as clusters of stamens on long drooping pedicels; the female flowers as drooping racemes of long pediceled pistils. The boxelder is our only maple which is entirely wind pollinated. This accounts for its greater importance in the group.

The silver or soft maple is a handsome tree growing to 100 feet tall. It is much planted throughout the country as a street and yard tree. Several horticultural varieties are found in cultivation. Flowering occurs some weeks before the leaves. The flowers are rudimentary and closely grouped in fascicles. Male and female flowers occur in different clusters on the same or different trees. The silver maple, as is also the red maple (*A. rubrum*) and sugar maple (*A. saccharum*) is considered to be partially insect pollinated and partially wind pollinated.

SMOOTH BROME
(Bromus inermis)

SMOOTH BROME *(Bromus inermis)*

FAMILY:	Poaceae
TRIBE:	Festuceae
GENUS:	*Bromus*
SPECIES:	*inermis*
COMMON NAMES:	Smooth Brome, Hungarian Brome, Awnless Brome
POLLEN GRAINS:	Spheroidal or ovoidal, 40 to 48.5 microns in diameter. Exine finely granular or inconspicuously reticulate. Germ pores 3.4 to 6.3 microns in diameter.
POLLINATING PERIOD:	At a peak through the grass season of May & June.
DISTRIBUTION:	Northern half of the United States. Occasionally southward.
ALLERGENIC IMPORTANCE:	Moderately important in areas of abundance.

Smooth Brome is an erect perennial, native to Eurasia. The culms are 1-4 feet tall arising from creeping rhizomes. The blades are smooth, 1/4-1/2 inch wide. The panicle is 4-9 inches long, with branches whorled. The panicle becomes spreading in flower, contracted at maturity. The spikelets are roundish, 3/4-1 inch long, awnless or with very short awns. Smooth Brome is cultivated for hay and pasture, especially from Minnesota and northern Kansas westward to Washington and Oregon.

Male Plant

Female Plant

CARELESS WEED
(Amaranthus palmeri)

CARELESS WEED *(Amaranthus palmeri)*

FAMILY:	Amaranthaceae
GENUS:	*Amaranthus*
SPECIES:	*palmeri*
COMMON NAMES:	Careless Weed, Palmer's Amaranth
POLLEN GRAINS:	Spheroidal, 22.8 to 25.3 microns in diameter, with granular texture similar to Chenopodiaceae. Numerous pores varying in size and distance apart. Pore apertures circular with slightly wavy margins.
POLLINATING PERIOD:	Summer months
DISTRIBUTION:	Interior valleys of central and southern California eastward to Colorado, Kansas, Missouri and eastern Texas.
ALLERGENIC IMPORTANCE:	Important in areas of abundance.

Careless Weed is an erect, stout-stemmed annual, 1½ to 6 feet in height. Leaves are pale green, oval to lance shaped with petioles as long or longer than the blade. Flowers are borne in long, slender spikes. Male and female flowers occur on separate plants. Spine-tipped bracts make the spikes sharp to the touch, especially so the female inflorescence. Careless Weed produces pollen in profuse amounts, much exceeding the quantity shed by a more wide-spread *Amaranthus*, the common Redroot Pigweed.

Female Plant

MOUNTAIN CEDAR
(Juniperus ashei)

Male Plant

MOUNTAIN CEDAR *(Juniperus ashei)*

FAMILY:	Cupressaceae
TRIBE:	Cupressineae
GENUS:	*Juniperus*
SPECIES:	*ashei*
COMMON NAMES:	Mountain Cedar, Mexican Cedar, Rock Cedar, Ozark White Cedar
POLLEN GRAINS:	Spheroidal, 20.5 to 23 microns in diameter. Exine thin, transparent, and irregularly flecked with granules. Intine very thick with inner boundary more or less angular. Moisture absorption causes swelling and rupturing with the exine being thrown off. Cast exines are often found with intact grains.
POLLINATING PERIOD:	December & January
DISTRIBUTION:	Southern Missouri, Arkansas and Texas into Mexico
ALLERGENIC IMPORTANCE:	Important where occurring in quantity.

Mountain Cedar typically is a small shrub-like tree varying in shape from broad, round-topped to narrow and pyramidal. Although usually not more than 30 ft. in height, occasional specimens are found to 100 ft. Like most other Junipers this species is dioecious, the male trees producing the pollen from myriads of tiny staminate cones and the female trees producing the bluish “berries”.

Although of limited distribution, this species of Juniper has received considerable mention as a serious cause of winter hay fever within its range. Overgrazing practices in the past are reported to have made possible the invasion by the Mountain Cedar over much of what used to be Texas grassland.

COCKLEBUR
(Xanthium strumarium)

COCKLEBUR *(Xanthium strumarium)*

FAMILY:	Compositae
TRIBE:	Ambrosieae
GENUS:	*Xanthium*
SPECIES:	*strumarium*
COMMON NAMES:	Cocklebur, Pennsylvania Cocklebur, Clotbur
POLLEN GRAINS:	Spheroidal, 22.1 to 29.1 microns in diameter. Spines are vestigal, hardly apparent. Germ furrow usually three and very short. Exine thin and finely granular.
POLLINATING PERIOD:	Last half of August & September. In milder areas some pollination from June into October.
DISTRIBUTION:	Throughout the United States.
ALLERGENIC IMPORTANCE:	Moderately important.

Of the dozen or more species of the Cocklebur growing in the United States, this species is the most common and widespread. Several varieties of this species, such as *X. canadense* and *X. pennsylvanicu*m, are sometimes referred to as separate species. A similar but more robust species, Great Clotbur (*Xanthium speciosum*), is reportedly a much heavier pollen producer and is of greater importance within its range of the Great Plains states and the Mississippi Valley.

Cocklebur is a scabrous (rough to the touch) annual, weedy herb 2-5 feet high and often much branched. Leaves are obtusely and acutely 3-5 lobed with dentate margins. Leaf-blades are 2-5 inches long, borne on petioles of equal length. Staminate flower heads are sub-spherical and occur in terminal clusters. The pistillate flower heads are two flowered and occur in the leaf axils below the staminate clusters. Staminate clusters drop soon after pollination, leaving the troublesome burs to ripen. The body of the bur is cylindrical, 1/2-3/4 inches long, covered with sharp, hooked spines 1/4-5/16 long. Two stout hooked beaks form the apex of the bur.

Cocklebur is a common weed of neglected land, roadsides, waste places, etc. In arid regions it is restricted to moist bottom lands and seems to thrive most abundantly in ground that is flooded some time during the year.

FREMONT COTTONWOOD
(Populus fremontii)

FREMONT COTTONWOOD *(Populus fremontii)*

FAMILY:	Salicaceae
GENUS:	*Populus*
SPECIES:	*fremontii*
COMMON NAMES:	Fremont Cottonwood, Common Cottonwood, California Cottonwood
POLLEN GRAINS:	Spheroidal or somewhat deformed, 27 to 34 inches in diameter. Grains are without germinal furrows or pores. Exine thin and fragmentary appearing as a granular network thinly covering intine.
POLLINATING PERIOD:	February & March
DISTRIBUTION:	Below 6000 feet from Sacramento Valley in California southward into lower California. Arizona cottonwood (*P. McDougallii*), a species so similar it is sometimes considered a variety of *P. fremontii*, is found in desert regions of California, Arizona and Nevada.
ALLERGENIC IMPORTANCE:	Important in regions of abundance.

Fremont cottonwood is a large tree to 100 feet with trunk diameters up to 5 and 6 feet. Bark is white, rough furrowed and cracked. Twigs are stoutish. Bright green leaves are irregularly and coarsely toothed with a sharp-pointed apex. The petioles are flattened.

Fremont cottonwood was selected to illustrate the characteristics of its genus, the commonly termed poplars, cottonwoods and aspens. Male and female flowers occur on separate trees. The inflorescence is a catkin. The staminate catkin is pendulous consisting of many stamens which are frequently rather colorful in shades of red and yellow. Pollination occurs just before the opening of the leaf buds. The pistillate catkins are greenish comprised of a loose series of pistils which develop into a capsule fruit, each capsule subtended by a cup shaped disk. At maturity the capsules split open to release the cotton in which the small seeds are embedded.

There are 15 species of *Populus* native to North America. Several introduced species are widely used ornamentally. To these add a few hybrids and numerous horticultural varieties and the result is some confusion in the nomenclature of the group.

CURLY DOCK
(Rumex crispus)

SHEEP SORREL
(Rumex acetosella)

CURLY DOCK *(Rumex crispus)* SHEEP SORREL *(Rumex acetosella)*

	CURLY DOCK	SHEEP SORREL
FAMILY	Polygonaceae	
GENUS:	*Rumex*	
SPECIES:	*crispus*	*acetosella*
COMMON NAMES:	Curly Dock, Yellow Dock, Sour Dock, Narrow-leaved Dock	Sheep Sorrel, Sorrel Dock, Field Sorrel, Red Sorrel, Wood Sorrel, Sour-weed
POLLEN GRAINS:	Spheroidal, 23 to 27 microns in diameter. A thin exine is finely pitted. Three or four (sometimes six) linear furrows are evenly arranged, each having a small elliptical germ pore.	
POLLINATING PERIOD:	June - August. Earlier in warmer areas.	Throughout the summer but heaviest in May & June.
DISTRIBUTION:	Throughout the United States.	Throughout the United States. Rarely found in Southern California or desert areas of the Southwest.
ALLERGENIC IMPORTANCE:	Of only moderate importance in areas of abundance.	

Curly Dock is a stout perennial 1½ to 5 feet tall. During the first year the plant forms a dense rosette of leaves. Leaves are elongated with wavy margins. The upright stems are leafy. The terminal inflorescence is dense with few or no leaves and is 1 to 2 feet long. In fruit in the late summer and fall the tops turn a characteristic reddish brown.

Sheep Sorrel is a perennial ½ to 2 feet tall arising from a slender running rootstock. The leaves are rather fleshy and vary in size and shape from lower to upper. The lower leaves are halberd-shaped with two basal lobes. The inflorescence is terminal and mostly leafless. Individual flowers are of separate sex with the female being red and the male a yellowish green color. The foliage of the docks is acid but especially so in this species.

AMERICAN ELM
(Ulmus americana)

AMERICAN ELM *(Ulmus americana)*

FAMILY:	Ulmaceae
GENUS:	*Ulmus*
SPECIES:	*americana*
COMMON NAMES:	American Elm, White Elm
POLLEN GRAINS:	Slightly angular in outline, oblately flattened, 29 to 43 microns in diameter. Five elliptical pores, five microns long, are situated around the equator. Moderately thick exine is arranged in noticeable ripple-like thickenings and is usually thicker around the pores.
POLLINATING PERIOD:	March & April, February in the South.
DISTRIBUTION:	Native to most of the United States east of the Rocky Mountains. Commonly planted as an ornamental in the Northern and Eastern States. Occasionally planted in the Western States.
ALLERGENIC IMPORTANCE:	Of moderate to questionable importance, but a prodigious producer of pollen.

The American or White Elm is our most common specie of this family, which includes at least fifteen other members. Reaching a height of 100 feet or more, it is one of our most beautiful native trees. The slender trunk usually divides into numerous upright limbs at thirty to forty feet to form a graceful, round-topped tree. Flowering occurs before the leaf buds open. The flowers are small and inconspicuous on clusters of slender, drooping pedicels about one inch long. The clusters of winged fruit ripen as the leaves unfold.

MEADOW FESCUE
(Festuca elatior)

WILD OAT
(Avena fatua)

MEADOW FESCUE *(Festuca elatior)* WILD OAT *(Avena fatua)*

	MEADOW FESCUE	WILD OAT
FAMILY:	Poaceae	
TRIBE:	Festuceae	Aveneae
GENUS:	*Festuca*	*Avena*
SPECIES:	*elatior*	*fatua*
COMMON NAMES:	Meadow Fescue, Tall Fescue, English Blue Grass, Dover Grass, Randall Grass, Evergreen Grass	Wild Oat, Wheat Oats, Oat Grass, Flex Grass
POLLEN GRAINS:	Spheroidal or ovoidal, 31 to 36.5 microns in diameter. Germ pore is circular with wavy microns and is 2.5 to 4.5 microns in diameter.	Ovoidal, 54 to 62 microns longs. Germ pore is circular to slightly irregular in outline, 4 to 8 microns in diameter and found at large end of grain. Operculum is half as broad as pore. Exine is coarsely granular.
POLLINATING PERIOD:	June & July. May in warmer sections	June - August. As early as January in Southern California.
DISTRIBUTION:	Throughout Canada and the United States except the deep South and other warmer areas.	Missouri to Pennsylvania and northward. Dakotas and Western States. Rare in the Eastern States.
ALLERGENIC IMPORTANCE:	Important where abundant.	Moderately important in areas of abundance.

Meadow fescue is an erect perennial 2-5 feet tall. The culms are simple and smooth. The panicle is 4-14 inches long, erect or nodding at the tip, much branched to nearly simple. Spikelets awnless or, rarely, short-awned. Leaf blades are flat, 3/16-3/8 inch wide. Widely cultivated for hay and pasture throughout the cooler parts of the United States. Considered the most important fescue as to distribution and pollination.

Wild Oat is an erect annual, 1-4 feet tall. Culms are stout and glabrous. Leaf blades are numerous, flat and from 1/4 to 1/2 inch wide. The panicle is loose and open with the slender branches becoming horizontal with maturity. The three-flowered spikelets have stiff geniculate awns 1-2 inches long. Wild oat is a common weed in cultivated soil and waste places and is a very modest producer of pollen. Found mostly in the Pacific States. Cultivated oat, though widely and extensively cultivated produces a scant amount of pollen.

GOLDENROD
(Solidago spp.)

GOLDENROD

FAMILY:	Compositae
TRIBE:	Astereae
GENUS:	*Solidago*
SPECIES:	*canadensis*
COMMON NAMES:	Goldenrod
POLLEN GRAINS:	Spheroidal to slightly flattened, 17 to 26 microns in diameter. Spines short, conical, and sharply pointed, 2.5 to 3.4 microns long. Germinal furrows mostly three, long tapering, each with a germ pore. Exine fine granular.
POLLINATING PERIOD:	August & September
DISTRIBUTION:	Various species throughout the United States.
ALLERGENIC IMPORTANCE:	A secondary factor where abundant.

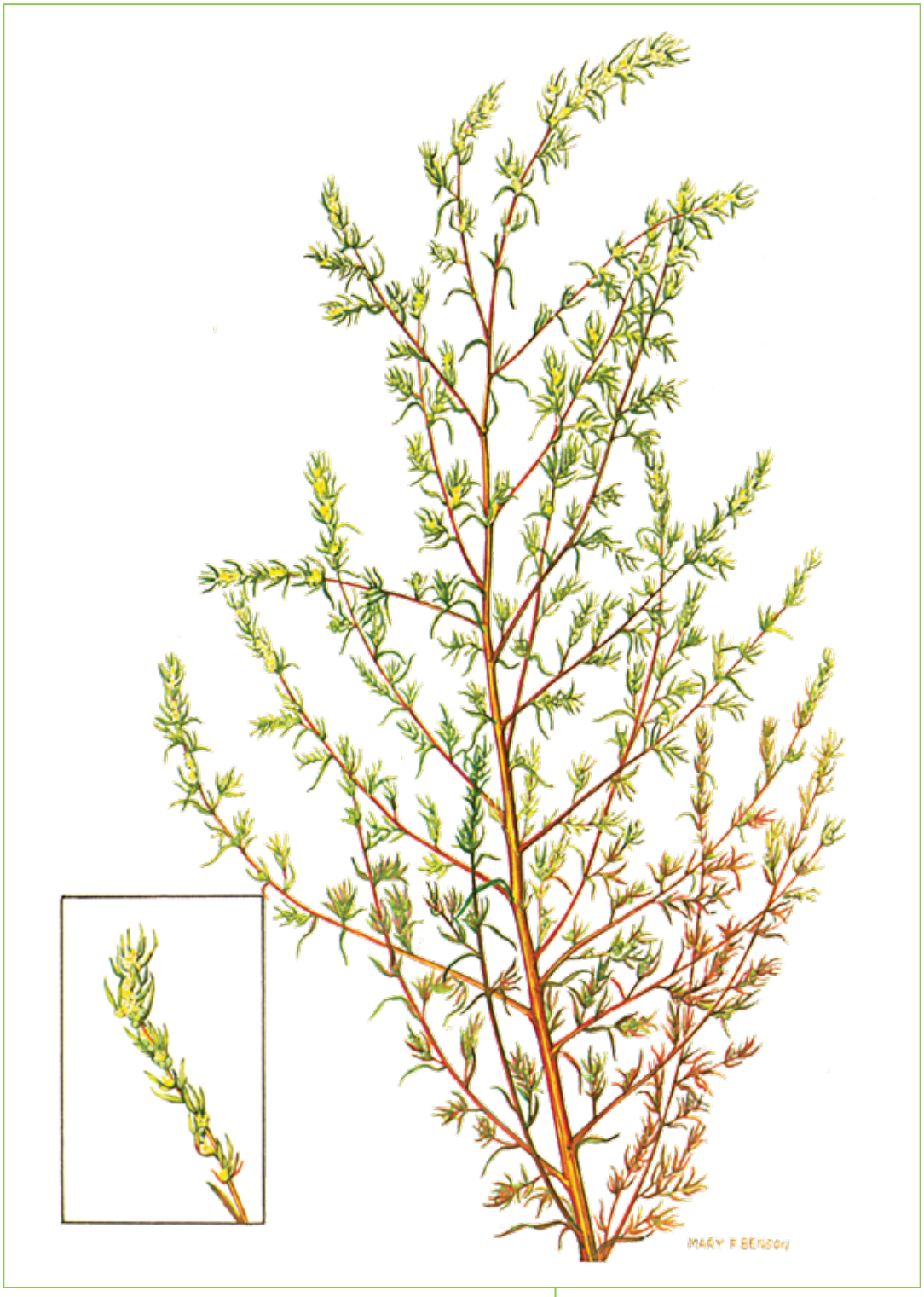
The Goldenrods are perennial herbs usually with simple stems. The leaves are alternate, toothed or entire. The flower heads are small, numerous, and brilliant yellow in most species. The Goldenrods, like other members of the Aster tribe, are all insect pollinated. Most species produce meager amounts of pollen. However it is reported by Wodehouse that two eastern species, the Noble Goldenrod (*S. speciosa*) and the Seaside Goldenrod (*S. sempervirens*), yield considerable pollen, some of which becomes atmospheric.

JOHNSON GRASS
(Sorghum halepense)

JOHNSON GRASS *(Sorghum halepense (Pers.))*

FAMILY:	Poaceae
TRIBE:	Andropogoneae
GENUS:	*Sorghum*
SPECIES:	*halepense*, some authors refer to this species as *Holcus halepensis (L.)* or *Andropogon halepensis (Brot.)*
COMMON NAMES:	Johnson Grass, Egyptian millet, Evergreen
POLLINATING PERIOD:	July - September. June - October in warmer parts of its range.
DISTRIBUTION:	Central California south. Southwestern and southern states; Mississippi valley states north to Kansas and Iowa. From the Mississippi eastward to the Atlantic coast. New Jersey and Pennsylvania are the northeastern limits.
ALLERGENIC IMPORTANCE:	Due to the comparatively large size of the pollen grain, Johnson Grass pollen is not as readily airborne as most grass pollens. Also in some warm moist regions Johnson Grass is extensively blighted by smut, preventing pollination. Though Johnson Grass is generally considered a wide-spread allergic factor the above reasons make it of secondary Importance.

Johnson Grass is a coarse perennial growing three to six feet tall. A fleshy creeping root stock enables this plant to spread and form dense patches. The loose spreading heads, averaging a foot long, characteristically are a purplish red color. This coupled with its broad flat leaf blades and upright growing habit make for easy recognition.

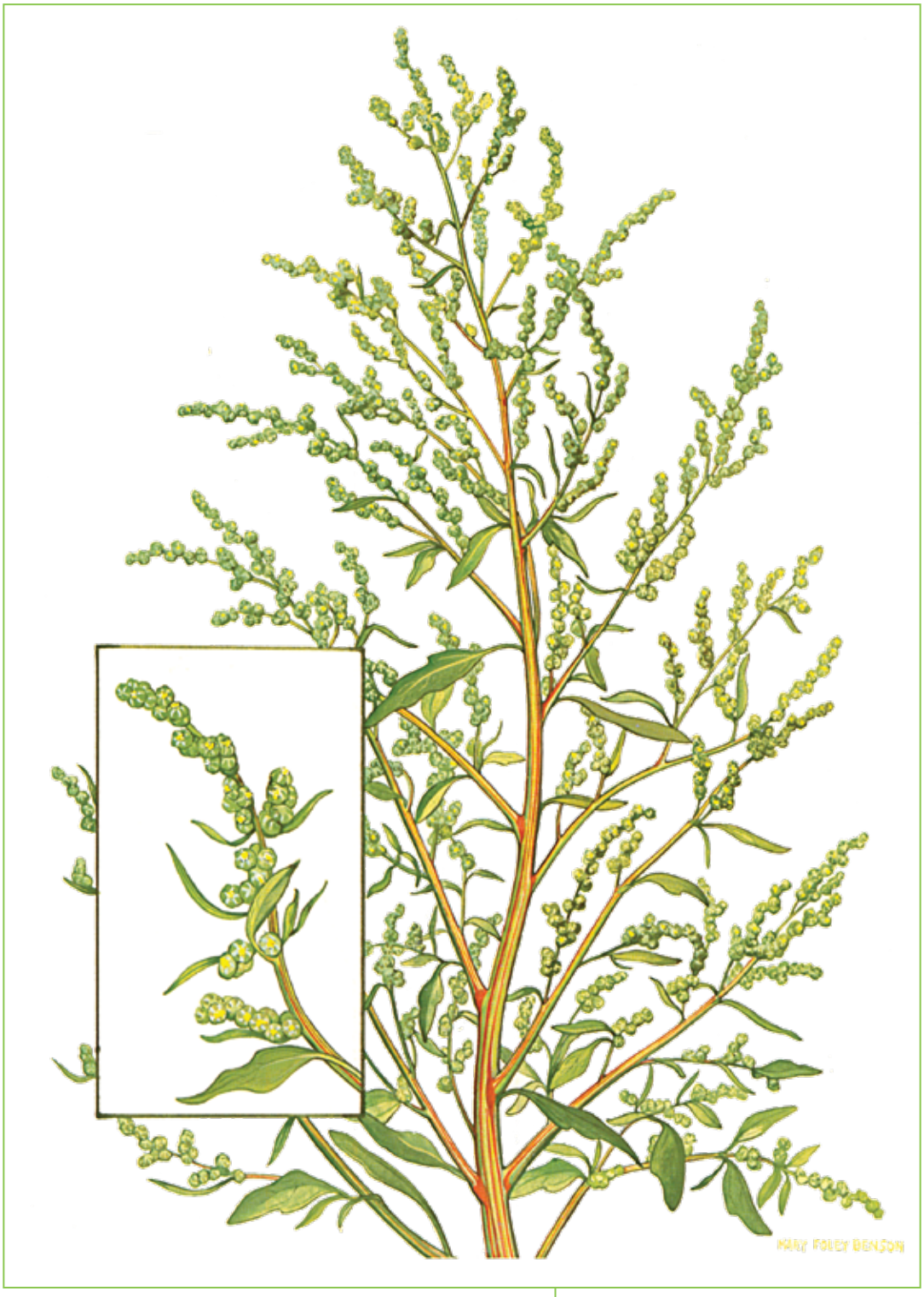


BURNING BUSH
(Kochia scoparia)

BURNING BUSH *(Kochia scoparia)*

FAMILY:	Chenpodiaceae
GENUS:	*Kochia, Bassia*
SPECIES:	*scoparia*
COMMON NAMES:	Burning Bush, Fire Bush, Summer Cypress, Belvedere, Kochia
POLLEN GRAINS:	Spheroidal 29 to 30 microns in diameter. Germinal pores 3 microns in diameter and 6 microns apart. Exine thin and granular.
POLLINATING PERIOD:	July - September
DISTRIBUTION:	Originally an escape in Colorado, it has spread into most western states, north to South Dakota and Montana and eastward into Illinois.
ALLERGENIC IMPORTANCE:	Considered important where abundant.

Burning Bush is a much branched annual somewhat resembling Russian Thistle. However, the leaves are longer and are not spine tipped. It has been planted ornamentally because of its compact, pyramidal shape and the red color it assumes in late summer and early fall. However, where the species has become naturalized, it loses this formal character and is a rank growing weed to six feet tall. This species is seldom grown ornamentally now. A similar species, *Kochia trycophylla* (sometimes erroneously labeled *K. scoparia*), also called Fire Bush and Summer Cypress, is widely used ornamentally. This latter species has a more formal compact growth habit and more brilliant fall coloration. *Kochia scoparia* produces considerable pollen. Due to the active migration of this plant, it is to be expected that its importance in hay fever will increase in additional regions.



LAMB'S QUARTERS
(Chenopodium album (L .))

LAMB'S QUARTERS *(Chenopodium album (L .))*

FAMILY:	Chenpodiaceae
GENUS:	*Chenopodium*
SPECIES:	*album*
COMMON NAMES:	Lamb's Quarters, White Pigweed, White Goosefoot
POLLEN GRAINS:	Spheroidal, 28 microns in diameter, small pores 2 microns in diameter and 5 microns apart.
POLLINATING PERIOD:	May - October
DISTRIBUTION:	Throughout the United States
ALLERGENIC IMPORTANCE:	Lamb's Quarters pollen is buoyant and is shed in moderate quantities. Becomes a hay fever factor in localities of abundance.

Lamb's Quarters is an annual herb two to seven feet tall. The plant is usually much branched. The leaves are one to two inches long and lanceolate shaped. The upper leaves have entire margins; the lower leaf margins are toothed (dentate). New growth is densely white mealy; the older growth is more or less mealy throughout. Very small flowers are densely clustered in spikes to form an upright or slightly spreading panicle.

BURWEED MARSH ELDER OR
PRAIRIE RAGWEED
(Iva xanthifolia)

BURWEED MARSH ELDER OR PRAIRIE RAGWEED

(Cyclachaena xanthifolia, "Iva xanthifolia")

FAMILY:	Compositae
TRIBE:	Ambrosieae
GENUS:	*Cyclachaena*
SPECIES:	*xanthifolia*
COMMON NAMES:	Prairie Ragweed, Burweed, Horseweed, Carelessweed, "Burweed Marshelder", Giant Poverty
POLLEN GRAINS:	Spheroidal, 17 to 19 microns in diameter. Spines short and blunt, the germinal furrow long, extending almost from pole to pole.
POLLINATING PERIOD:	July & August
DISTRIBUTION:	Eastern Washington, Idaho, Nevada, New Mexico and Texas eastward to Missouri and Illinois.
ALLERGENIC IMPORTANCE:	Very important where abundant.

Prairie ragweed is a coarse annual growing to six or seven feet tall. The leaves are rough textured resembling those of cocklebur. The upper leaves are simple with dentate margin, the lower leaves larger and becoming three-lobed. Numerous flower heads occur in naked terminal panicles and axillary spikes. Prairie ragweed produces large quantities of pollen which in most cases interacts with ragweed. A native of the Great Plains, this weed favors disturbed soil and is often abundant along roadsides and in waste places in inhabited areas.

More often than not this plant is listed in hay fever literature as "Burweed Marsh Elder, *Iva xanthifolia*." Most botanists now consider that there are generic differences between this plant and the *Ivas*, so the better nomenclature is *Cyclachaena xanthifolia*.

CALIFORNIA MUGWORT
(Artemisia vulgaris var. heterophylla)

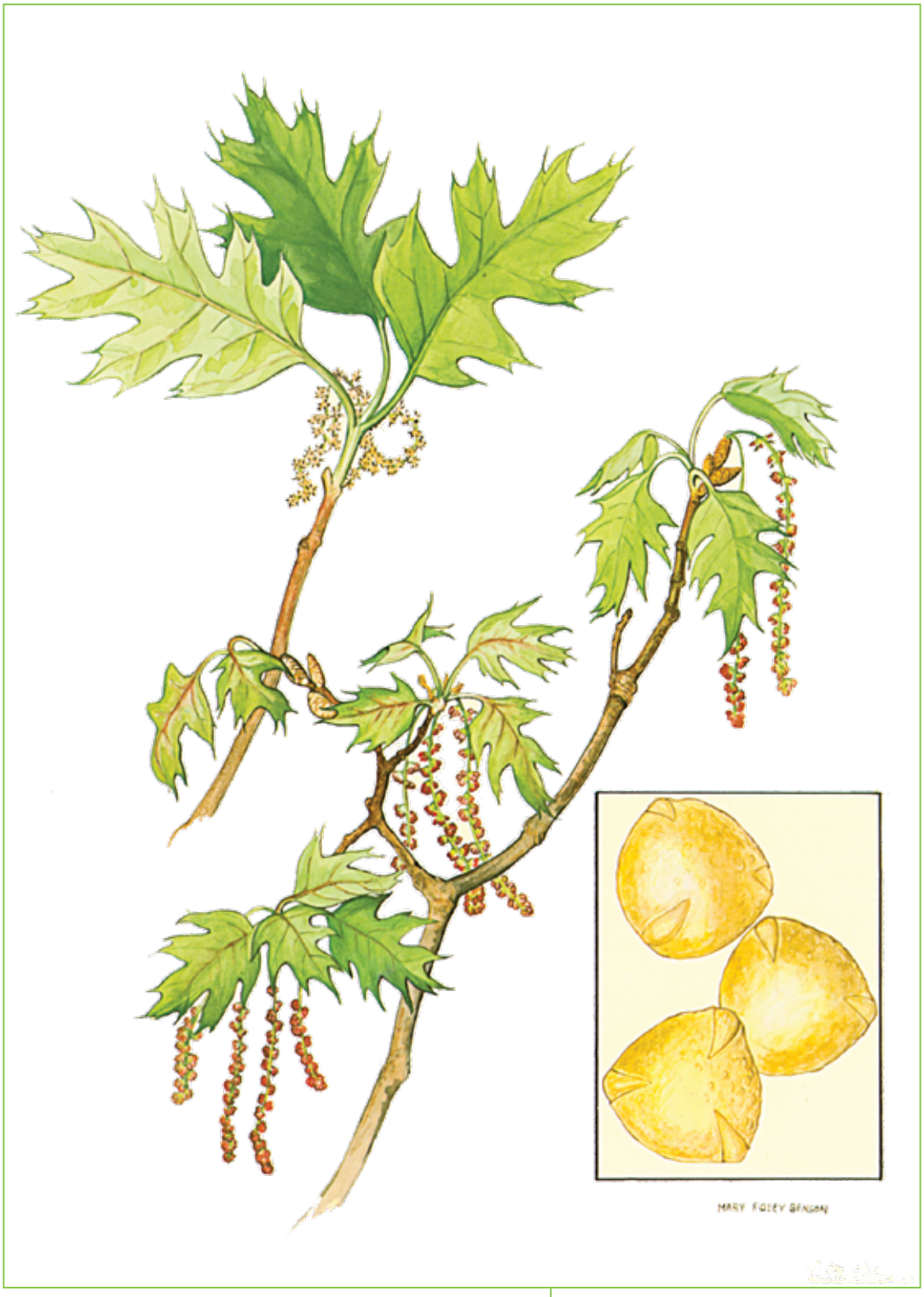
CALIFORNIA MUGWORT *(Artemisia vulgaris var. heterophylla)*

FAMILY:	Compositae
TRIBE:	Anthemideae
GENUS:	*Artemisia*
SPECIES:	*heterophylla*, *vulgaris var. heterophylla, or douglasiana*
COMMON NAMES:	California Mugwort, Mugwort
POLLEN GRAINS:	Oblately spheroidal 17.5 to 28.5 microns in diameter, normally having three long furrows tapering to pointed ends with margins sharply defined and well marked central pore. Exine thick with coarse granular texture. Spines, usually found in this family, are absent or represented by merest vestige. Pollen grains of this genus all essentially alike.
POLLINATING PERIOD:	July - October
DISTRIBUTION:	California to British Columbia, Saskatchewan, Idaho and Western Nevada.
ALLERGENIC IMPORTANCE:	Important.

A. vularis (Massachusetts) (New Hampshire) *A. ludoviciana* (Illinois) *A. gnaphalodes*

Artemisia vulgaris var. heterophylla was selected as a representative plant in the *vulgaris* group. There is confusion in terminology within this group because some authorities consider all of the members to be a *vulgaris* species and relegate an identifiable change to the rank of sub-species or variety. Other authorities give each member a full species status. The line of difference between the members is very fine, but variations do become evident at the species level.

California Mugwort is a perennial herb growing from running root stalks. The stems are erect, woody at the base and three to six feet high. Leaves are lance-shaped to oblong. The upper leaves are entire with the lower leaves sparingly cleft, green above and white-woolly beneath. Flower heads are arranged on an erect terminal panicle composed of dense spikes. Panicle usually 6-20 inches long.



OAK
(Quercus kellogii)

OAK *(Quercus kelloggii)*

FAMILY:	Fagaceae
GENUS:	*Quercus*
SPECIES:	*kelloggii*
COMMON NAMES:	Oak
POLLEN GRAINS:	Spheroidal or oblately flattened and triangular in outline with three meridionally arranged germinal furrows. Exine thin but warty-granular. Intine thin.
POLLINATING PERIOD:	April & May
DISTRIBUTION:	Oaks inhabit the temperate regions of the northern hemisphere and the higher altitudes within the tropics.
ALLERGENIC IMPORTANCE:	In regions where oaks abound, they are usually the most important of the hay fever producing trees. The oak catkin produces prodigious amounts of pollen and is usually considered important in the region where the trees are plentiful. The pollen is not as toxic as some and this factor is reduced because of adverse climatic conditions during the pollinating period. The Live Oak of California pollinates in a more favorable climatic environment and will produce seasonal exacerbation of symptoms.

White Oak *Quercus alba*

Chestnut Oak *Quercus prinus*

Black Oak *Quercus velutina*

Live Oak *Quercus virginiana*

There are about 65 species of oaks native to North America with a few European species grown ornamentally. They vary in size from small scrubby trees to large forest trees of 150 feet. Oaks blossom in the spring with the opening of the leaf buds or after the leaves are out. Most oaks are deciduous in the autumn. Some species (the Live Oaks) retain their leaves until spring or until the third or fourth year. The staminate flowers are borne in clusters of slender, pendulous catkins. These are usually yellow varying to pink or red.

The oak tree here illustrated (*Quercus kellogii)* is the largest and most abundant of the Sierra Nevada region. Though limited in range to the mountain slopes and valleys of California and southwestern Oregon, it is typical of the Black Oak group and is very similar to the Black Oak of the eastern states (*Quercus velutina*).

OLIVE
(Olea europea)

OLIVE *(Olea europaea)*

FAMILY:	Oleaceae
GENUS:	*Olea*
SPECIES:	*europaea*
COMMON NAMES:	Olive
POLLEN GRAINS:	22 microns in diameter with slightly flattened sides between the furrows. Exine rather coarsely reticulate. Broad germinal furrows three (occasionally four) without germ pores.
POLLINATING PERIOD:	April & May
DISTRIBUTION:	California from the upper Sacramento Valley to Mexico; lowland desert areas of southern Nevada, Arizona, and occasionally in New Mexico. Also occasionally in Florida.
ALLERGENIC IMPORTANCE:	Important where trees are numerous.

The Olive is native to the eastern Mediterranean region where it has been cultivated from earliest times. It is a small, evergreen tree becoming 25-30 feet tall. The leaves are opposite, average 2 inches long and 1/2 inch wide, sharp-tipped, tapering at both ends, dark green above and silvery scurfy beneath. The Olive is considered to be primarily insect pollinated. However, the myriad small white blossoms produce an abundance of pollen much of which becomes wind-borne. Because of the pollen production, it can be of primary importance particularly because of its popularity as an ornamental.

ORCHARD GRASS
(Dactylis glomerata)

ORCHARD GRASS *(Dactylis glomerata)*

FAMILY:	Poaceae
TRIBE:	Festuceae
GENUS:	*Dactylis*
SPECIES:	*glomerata*
COMMON NAMES:	Orchard Grass, Cocksfoot, Dew Grass, Hard Grass
POLLEN GRAINS:	Spheroidal to ellipsoidal. 28.5 to 38.8 microns in diameter.
POLLINATING PERIOD:	May & June are peak months with small amounts of pollen produced through the first half of summer. Season earlier in regions of mild climate.
DISTRIBUTION:	Found throughout the United States except in arid regions. Not common in the gulf states.
ALLERGENIC IMPORTANCE:	Of prime importance in areas of abundance.

Orchard Grass is a rather coarse perennial 2 to 4 feet tall. The panicle, 2 to 10 inches long, has few and rather stiff branches which are spreading or ascending at flowering and oppressed at maturity. The blades are flat, the culms (grass stems) typically grow in large clumps. This grass is commonly cultivated as a meadow and pasture grass, and is used as ground cover in orchards. It is also common in fields and waste places, preferring a moist condition.

PECAN
(Carya pecan)

PECAN - Carya pecan *(Hicoria pecan)*

FAMILY:	Juglandaceae
GENUS:	*Carya (Hicoria)*
SPECIES:	*pecan (illinoensis)*
COMMON NAMES:	Pecan
POLLEN GRAINS:	Spheroidal, uniform, 44.4 microns in diameter. Germ pores three, elliptical apertures 3.4 microns in diameter. Texture most noticeably granular of species of this genus.
POLLINATING PERIOD:	April & May
DISTRIBUTION:	Iowa and Kentucky to North Carolina and Florida; westward to Oklahoma, Texas and California. Now widely cultivated as far north as 45°.
ALLERGENIC IMPORTANCE:	Very important where at all prevalent.

The Pecan is a handsome spreading type growing to 170 feet tall. The grayish brown bark is deeply furrowed with age. Winter buds are yellow. The leaves are compound with 11 to 17 leaflets. The lance shaped leaflets are 4 to 7 inches long, short-stalked, serrate and somewhat tomentose when young. The slender staminate catkins are 2 to 5 inches long and usually occur in crowded clusters. The fruit develops 3 to 10 in a cluster or spike.

The Pecan is native from Iowa to the south central part of the United States. Cultivation considerably extends its range. Planted both as an ornamental and orchard tree, the Pecan is a prime example of a tree causing extensive hay fever because of man.

REDROOT PIGWEED
(Amaranthus retroflexus)

REDROOT PIGWEED *(Amaranthus retroflexus)*

FAMILY:	Amaranthaceae
GENUS:	*Amaranthus*
SPECIES:	*retroflexus*
COMMON NAMES:	Redroot Pigweed, Pigweed, Rough Pigweed, Green Amaranth
POLLEN GRAINS:	Spheroidal, 25 to 30 microns in diameter. Germ pores numerous 2.5 microns in diameter. Exine is thin and somewhat granulated. Pollen of this genus very similar to pollen of *Chenopodiaceae*.
POLLINATING PERIOD:	Late summer for peak period.
DISTRIBUTION:	Throughout the United States.
ALLERGENIC IMPORTANCE:	Generally of minor importance. Considered a factor in areas of abundance.

Redroot Pigweed is a stout, rough-pubescent weed, commonly with ascending branches from the base. It is 1 to 10 feet tall with dense terminal flower cluster. Typically a garden and orchard weed, it prefers cultivated soil. The coarseness of the plant belies the small amount of pollen produced. In warm southern areas there is a prolonged pollinating period (March-November) but the peak is still late summer.

ENGLISH PLANTAIN
(Plantago lanceolata)

ENGLISH PLANTAIN *(Plantago lanceolata)*

FAMILY:	Plantaginaceae
GENUS:	*Plantago*
SPECIES:	*lanceolata*
COMMON NAMES:	English Plantain, Ribwort Plantain, Narrow-leaved Plantain, Buckhorn Plantain, Buck Plantain
POLLEN GRAINS:	Spheroidal, 25 to 40 microns in diameter. 7 to 14 circular germ pores with a thickened rim. No furrows. Exine rough granular.
POLLINATING PERIOD:	From April on through the summer. Heaviest in May & June.
DISTRIBUTION:	Throughout the United States.
ALLERGENIC IMPORTANCE:	Important cause of hay fever but does not compare with the grasses with which it is seasonally associated.

English Plantain is a perennial herb 12 to 28 inches tall. The leaves, 3 to 8 inches long, are oblong-lanceolate narrowing at the base into a slender petiole, strongly 3 to 5 ribbed. Leaves are erect or spreading from a dense basal cluster. The flowers are crowded on a short spike ¾ to 3 inches long. The naked flower stem is slender, grooved and angular. English Plantain is a common lawn weed. It is found in moist agricultural land and waste places.

GIANT RAGWEED
(Ambrosia trifida)

GIANT RAGWEED *(Ambrosia trifida)*

FAMILY:	Compositae
TRIBE:	Ambrosieae
GENUS:	*Ambrosia*
SPECIES:	*trifida*
COMMON NAMES:	Giant Ragweed, Tall Ragweed, Crownweed
POLLEN GRAINS:	Spheroidal, 16.5 to 19.2 microns in diameter (smallest of the ragweeds) with short, blunt spines. Spines are more prominent than those of Short Ragweed. Germinal furrows - three.
POLLINATING PERIOD:	Early August to late September - varying with latitude. Generally a few days earlier than Short Ragweed.
DISTRIBUTION:	Quebec to North Carolina, west to British Columbia and Colorado. The Dakotas, Nebraska, and Kansas are its western limits of dense distribution.
ALLERGENIC IMPORTANCE:	Very important where occurring in any quantity.

Giant Ragweed is a coarse, rank annual, sometimes 10 to 15 feet tall. The herbage is rough. Leaves are three to five cleft (sometimes entire) on long petioles. The numerous staminate heads are borne in long terminal spikes. The pistillate heads are borne in small clusters at the base of the staminate spikes. Giant Ragweed prefers moist regions. The seeds are somewhat aquatic and travel long distances by water. This explains its abundance along stream banks and flood plains. Giant Ragweed probably produces the most copious amounts of pollen of any of our weeds.

SHORT RAGWEED
(Ambrosia artemisiifolia)

SHORT RAGWEED *(Ambrosia artemisiifolia)*

FAMILY:	Compositae
TRIBE:	Ambrosieae
GENUS:	*Ambrosia*
SPECIES:	*artemisiifolia*
COMMON NAMES:	Short Ragweed, Common Ragweed, Dwarf Ragweed
POLLEN GRAINS:	Spheroidal 17.6 to 19.2 microns in diameter. Spines short and blunt, a little smaller than spines of Giant Ragweed pollen grains. Germinal furrows nearly always three.
POLLINATING PERIOD:	August - October, varying with the latitude. It pollinates earlier in the north, except for the extreme south where it starts as early as May.
DISTRIBUTION:	Although found throughout most of the United States its range as an important hay fever plant extends from Montana and eastern Texas to the Atlantic coast. Even though the geographical area of Short Ragweed is well defined, it may show spotty growth in unexpected localities.
ALLERGENIC IMPORTANCE:	Of greatest importance within its effective range.

Short Ragweed is a rough annual growing as high as 4 feet. It is usually considerably branched with finely cleft, fern-like leaves. Flowering heads are numerous in long terminal spikes. This species is greatly variable. Several of its genotypes have been given specific names. Two most commonly referred to in the literature are *Ambrosia artemisiifolia* and *Ambrosia monophylla*. Short Ragweed typically is found along roadsides and in vacant lots and fallow fields.

WESTERN RAGWEED
(Ambrosia psilostachya)

WESTERN RAGWEED *(Ambrosia psilostachya)*

FAMILY:	Compositae
TRIBE:	Ambrosieae
GENUS:	*Ambrosia*
SPECIES:	*psilostachya*
COMMON NAMES:	Western Ragweed
POLLEN GRAINS:	Spheroidal 22 to 25 microns in diameter. Spines slightly larger and more pointed than those of Short Ragweed. Germinal furrows three and four.
POLLINATING PERIOD:	Mostly August & September. Some scattered flowering from June into November in milder areas.
DISTRIBUTION:	From Louisiana and Illinois westward into California, Idaho, and Saskatchewan.
ALLERGENIC IMPORTANCE:	Important where occurring in quantity.

Western Ragweed is a rough perennial 1 to 5 feet tall, arising from a slender creeping rootstock. This is the only allergically important species of Ambrosia that is perennial. Western Ragweed is similar in appearance to the Short Ragweed but is a harsher plant, the leaves and stems being rough and hairy. The leaves are mostly one pinnately divided; the upper leaves alternate, the lower usually opposite. Leaves are 2 to 5 inches long. Typical nodding flower heads are borne in dense, erect clusters. The staminate (male) heads are numerous and the pistillate (female) are few at the base of the staminate cluster.

Western Ragweed favors disturbed soil. It is commonly found on roadsides and in waste ground. It seldom obtains the growth density of the Short and Giant Ragweeds and also is of more scattered occurrence. It also falls far short of its eastern cousins as a pollen producer, but compared to most weeds it produces large amounts of pollen.

SWEET VERNALGRASS
(Anthoxanthum odoratum)

REDTOP
(Agrostis alba)

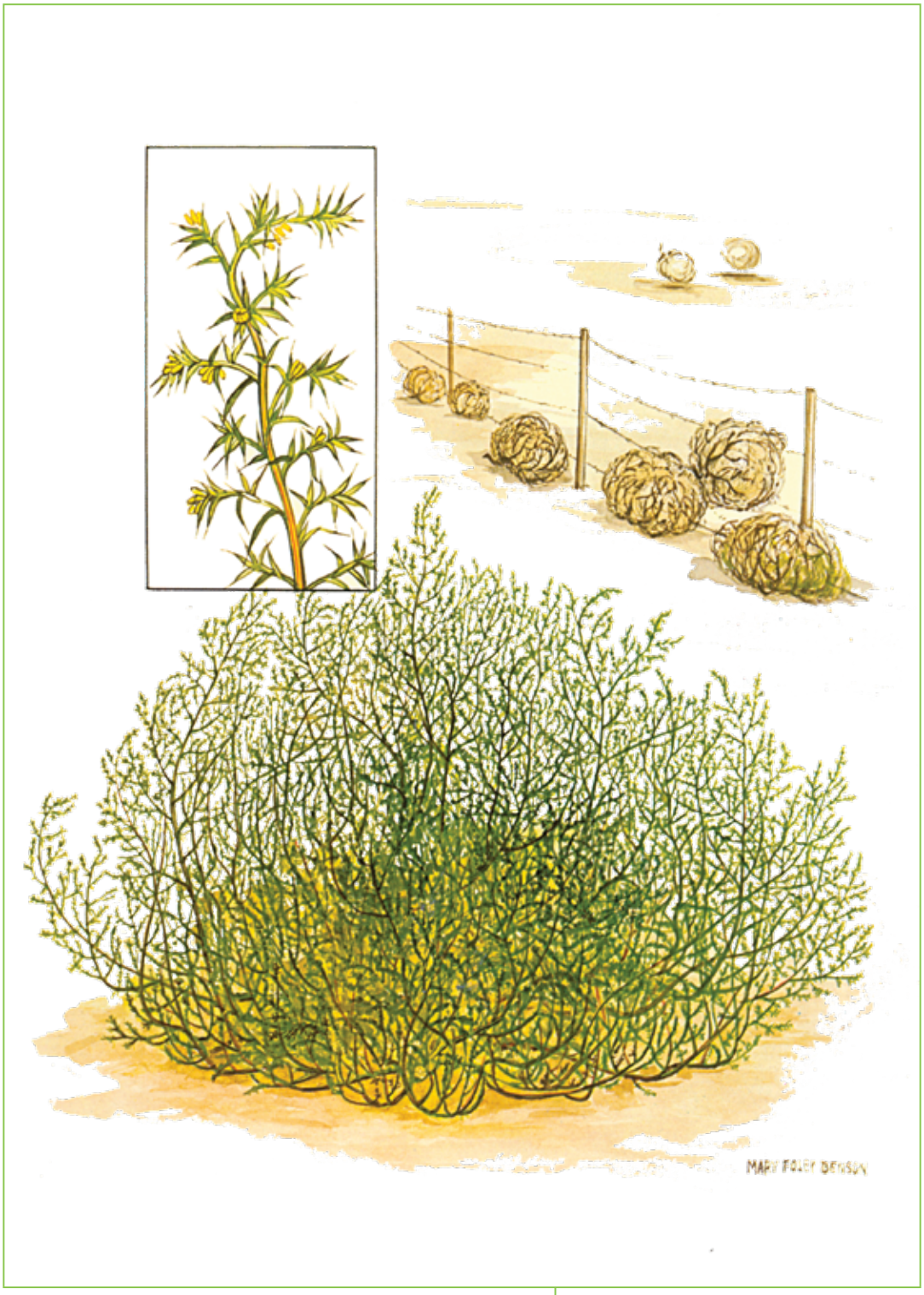
SWEET VERNALGRASS *(Anthoxanthum odoratum)*

REDTOP *(Agrostis alba)*

	SWEET VERNALGRASS	REDTOP
FAMILY:	Poaceae	
TRIBE:	Phalarideae	Agrostideae
GENUS:	*Anthoxanthum*	*Agrostis*
SPECIES:	*odoratum*	*alba*
COMMON NAMES:	Sweet Vernalgrass	Redtop, Herd's Grass, Creeping Bent Grass
POLLEN GRAINS:	Spheroidal 37 to 45 microns in diameter. Exine faintly granular. Germ pore irregular in shape 4 to 6.3 microns in diameter. Operculum small and irregular.	Spheroidal 26 to 31 microns in diameter. Germ pores nearly circular 2.3 to 4.6 microns in diameter. Operculum generally small and irregular. Exine finely granular.
POLLINATING PERIOD:	May & June. April into July in milder areas.	June through mid-August, mostly June and July. As early as April in Pacific Coast states.
DISTRIBUTION:	In the United States east of the Mississippi River, and northern California, Oregon and Washington.	Throughout the United States except for the warmest areas.
ALLERGENIC IMPORTANCE:	Important throughout much of its range.	One of the most important grasses.

Sweet Vernalgrass is a slender, tufted perennial grass. It grows from one to three feet tall. Leaf blades are 1/8 to 3/8 inches wide. The heads are narrow and elongated from 1 to 4 inches long. This grass is commonly found in meadows, pastures, and waste places. It is sometimes seeded in meadow mixtures, more for its fragrance than forage value.

Redtop is a perennial grass having a creeping rootstock. Usually erect, it grows from 2 to 5 feet tall with pyramidal oblong heads up to 12 inches long. Spikelets of the head are usually reddish. Redtop is widely cultivated for lawns, pastures, and meadows and is a common escape in cooler regions. It is considered a fairly heavy pollinator.



RUSSIAN THISTLE
(Salsola kali (L.) var. tenuifolia)

RUSSIAN THISTLE *(Salsola kali (L.) var. tenuifolia)*

FAMILY:	Chenopodiaceae
GENUS:	*Salsola*
SPECIES:	*kali*, some authors refer to this species as *Salsola pestifer (A. Nels.)*
COMMON NAMES:	Russian Thistle, Tumbleweed, Saltwort
POLLEN GRAINS:	Spheroidal, 27 microns in diameter with pores about 4 microns in diameter and about 7 microns apart.
POLLINATING PERIOD:	June - September
DISTRIBUTION:	Dryer regions of the West and Midwest and to lesser extent in saline waste areas of the East coast.
ALLERGENIC IMPORTANCE:	Generally considered the most important hay fever plant in the chenopod family.

Russian Thistle is an annual herb one to four feet tall. It is intricately branched to form a dense tangle and usually grows in a sphere-like shape. Leaves are small (¼'') linear and spine tipped. Flowers are inconspicuous and occur throughout the plant. In the fall of the year the individual plant dries and breaks off at the root. Because of their sphere-like shape winds will roll the plant over long distances of open land scattering the seed for future growth. Large accumulations of these dried plants are observed in fence corners or other obstructions. From this action the plant is often called Tumbleweed.

ITALIAN RYEGRASS
(Lolium multiflorum)

TIMOTHY
(*Phleum pratense***)**

ITALIAN RYEGRASS *(Lolium multiflorum)* TIMOTHY *(Phleum pratense)*

	ITALIAN RYEGRASS	TIMOTHY
	Poaceae	
TRIBE:	Hordeae	Agrostideae
GENUS:	*Lolium*	*Phleum*
SPECIES:	*multiflorum*	*pretense*
COMMON NAMES:	Italian Ryegrass, Ryegrass, Australian Ryegrass, Winter grass	Timothy, Herd's Grass
POLLEN GRAINS:	Spheroidal or ovoidal 37.5 microns in diameter. Circular germ pore 2.8 to 5 microns in diameter at large end of grain. Operculum small; exine faintly granular or reticulate.	Spheroidal 32 to 36.5 microns in diameter. Germ pore circular or slightly irregular 1.7 to 2.8 microns in diameter. Operculum very irregular and sometimes fragmentary. Exine fine-granular.
POLLINATING PERIOD:	June - August. As early as April in warmer areas.	June & July
DISTRIBUTION:	Found throughout the United States except in the far south. Rarely found south of Virginia and California. Especially abundant on the Pacific coast.	Found throughout the United States except in arid regions.
ALLERGENIC IMPORTANCE:	Important in areas of abundance.	Of prime importance in areas of abundance.

Italian Ryegrass is a short-lived perennial, usually erect and 1 to 3½ feet tall. The inflorescence is a spike, somewhat curved, slender and flattened. The blades are flat, narrow and elongated. The foliage is glossy. This species is similar in distribution and appearance to Perennial Ryegrass *(L. perenne)*. It differs from Perennial Ryegrass in being generally more robust and having awns on the spikelets. Both are used for lawn and pasture. Italian Ryegrass is commonly found along roadsides, in meadows, and waste places.

Timothy is a short-lived perennial 1½ to 4 feet tall. Erect culms arise from a bulb-like base forming large clumps. Blades are elongated and mostly flat. The spikelets are crowded to form a cylindrical panicle 1½ to 5 inches long. Timothy is the most common and important pasture and hay grass of the humid areas of northern United States. It has escaped to become common along roadsides and in fields and waste places.

SYCAMORE
(Platanus occidentalis)

SYCAMORE *(Plantanus occidentalis)*

FAMILY:	Platanaceae
GENUS:	*Platanus*
SPECIES:	*occidentalis*
COMMON NAMES:	Sycamore, Buttonwood, Buttonball, Plane Tree
POLLEN GRAINS:	Oblately flattened, 18 to 20 microns in diameter. Membranes of the three or four broad furrows copiously flecked with granules. Germ pore absent. The exine is thin and finely reticulate pitted.
POLLINATING PERIOD:	April & May
DISTRIBUTION:	Maine to Central Florida, westward to Minnesota, Nebraska, Oklahoma and Texas. Cultivated throughout most of the United States, especially the eastern states and eastern Texas.
ALLERGENIC IMPORTANCE:	Moderately important.

WESTERN SYCAMORE

(Platanus racemosa)

The Western Sycamore, found on the coast of California, characteristically bears the flowering heads in racemes of three to six.

MAPLE LEAF SYCAMORE

(Platanus aceritolia)

The Maple Leaf Sycamore or London Plane Tree is a hybrid tree planted as a street tree in the Eastern and Western States. The flower heads usually appear in racemes of two. This tree is often erroneously called Oriental Sycamore.

There are three native species of Sycamore in the United States, all closely related and similar; *Platanus occidentalis*, *Platanus racemosa* and *Platanus aceritolia*. *Platanus orientalis* is seldom found in the United States. The leaf sketches will illustrate variations of the different species.

The common Eastern Sycamore is one of the largest deciduous trees in the East, reaching a height of 130 feet with a trunk diameter of 14 feet. The bark is smooth and exfoliating. The leaves are alternate and palmately lobed with petioles hollow near the base. The flowers are rudimentary and inconspicuous, growing in a curious ball-shaped cluster or head. Male and female flowers are in separate heads.

WINGSCALE/SHADSCALE
(Atriplex canescens)

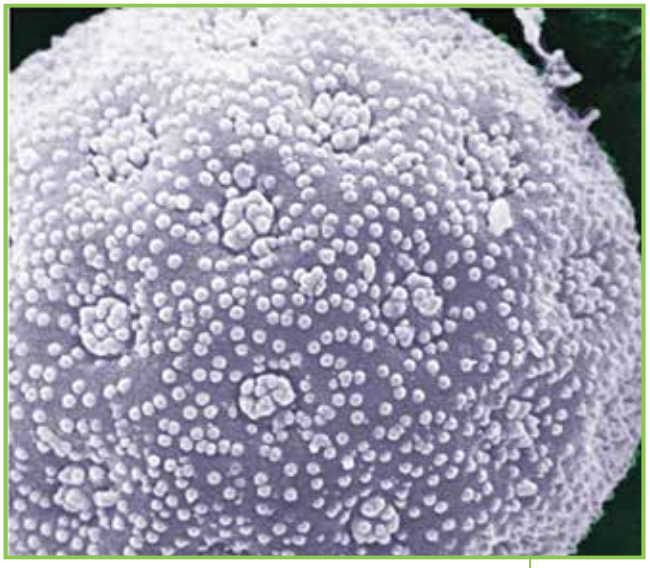
WINGSCALE *(Atriplex canescens)*

FAMILY:	Chenopodiaceae
GENUS:	*Atriplex*
SPECIES:	*canescens*
COMMON NAMES:	Wingscale, Shadscale, Four-winged Saltbush
POLLEN GRAINS:	Spheroidal, 23 to 25 microns in diameter. Germ pores 2.2 to 2.6 microns in diameter and 4.5 to 5.2 microns apart. Granular texture.
POLLINATING PERIOD:	June - mid-September
DISTRIBUTION:	West Texas to Kansas to Montana and Alberta. Eastern Washington to southern California and Mexico.
ALLERGENIC IMPORTANCE:	Most important of the shrubby species of Atriplex.

Wingscale is a large woody shrub, densely branched and grayish in appearance. It is a dioecious species (male plants and female plants). Wingscale has a wide range of adaptability, but is most prevalent in alkaline and saline soil. It has the widest distribution of the shrubby saltbushes. The staminate glomerules are in dense terminal spike-like clusters which produce great quantities of pollen. The characteristic four-winged fruits are pale green when immature, becoming tinged with purple and finally turning brown in late fall.

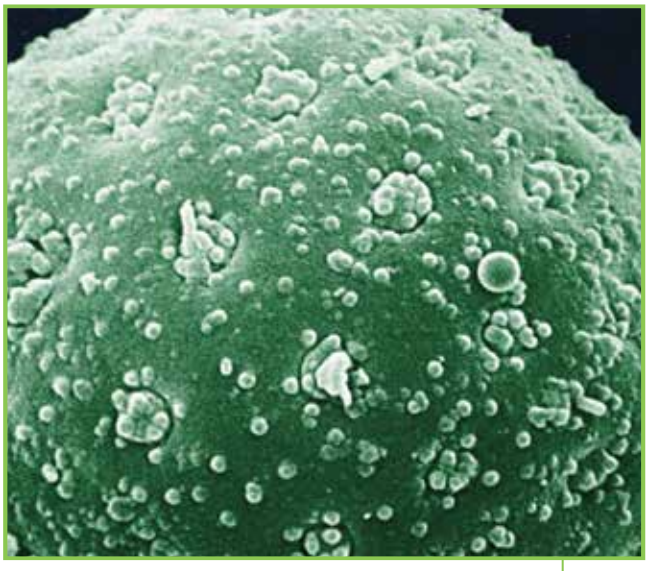
Though this species has a prolonged summer pollinating period throughout its range, within a locale the pollinating period is usually within a month duration. The *Atriplex* genus is divided into two major groups: the shrubby, perennial species here represented by Wingscale; and the herbaceous, annual species such as Spearscale and Silverscale. The shrubby species produce much more pollen than the herbaceous species.

SCANNING ELECTRON MICROGRAPHS OF POLLEN



Atriplex polycarpa, ALL SCALE. The pores appear plug-like, and the surface papillate at this magnification.

Lolium perenne, PERENNIAL RYEGRASS. The papillate surface appears smooth (psilate) under the light microscope.

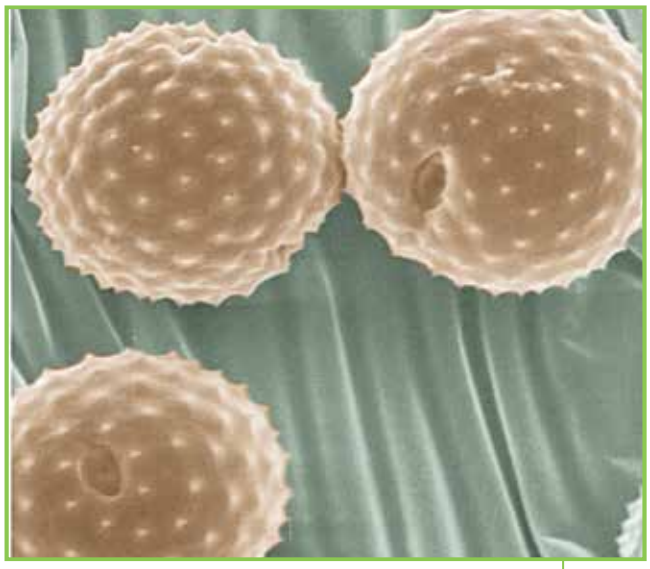


Chenopodium album, LAMB'S QUARTERS. Although practically indistinguishable from *Atriplex* by light microscopy, the electron microscope shows subtle differences in surface (exine) ornamentation.

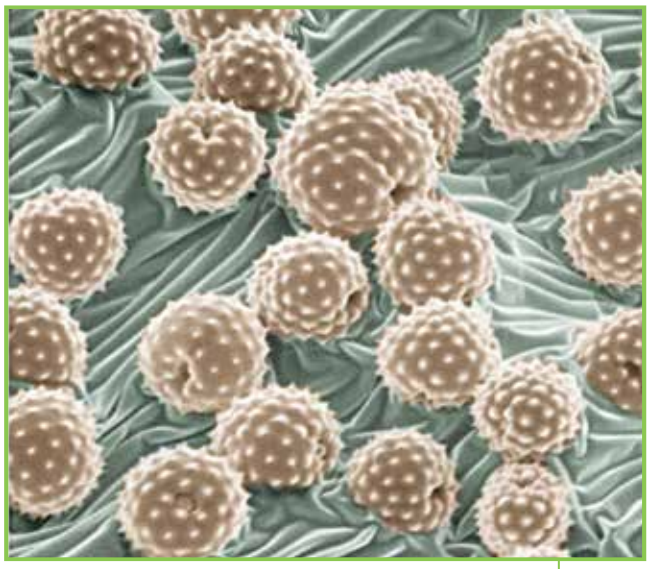
Poa pratensis, KENTUCKY BLUEGRASS. Note that the pore is larger and surface texture finer than *Lolium*. Grass pollens are very easy to recognize as a family, but very difficult to distinguish between species.

All scanning electron micrographs on this page are the same magnification, 4,000 times actual size. Courtesy Dr. R. Holm, Bayer A.G., Leverkusen, F.R.G. pollinator.

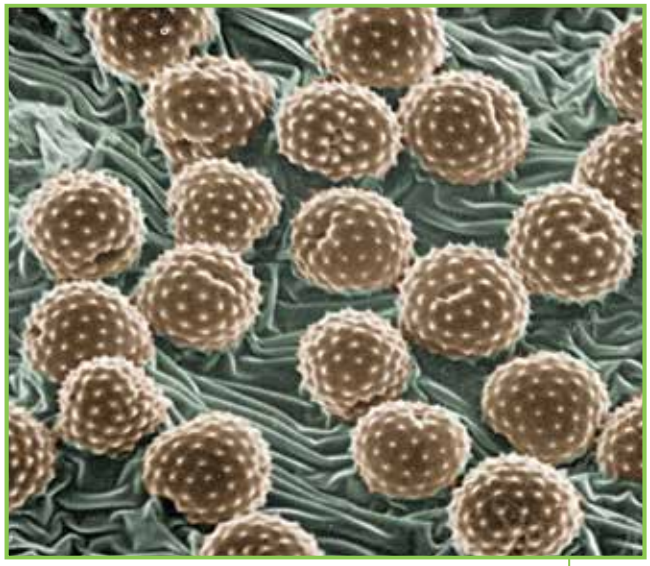
SCANNING ELECTRON MICROGRAPHS OF POLLEN



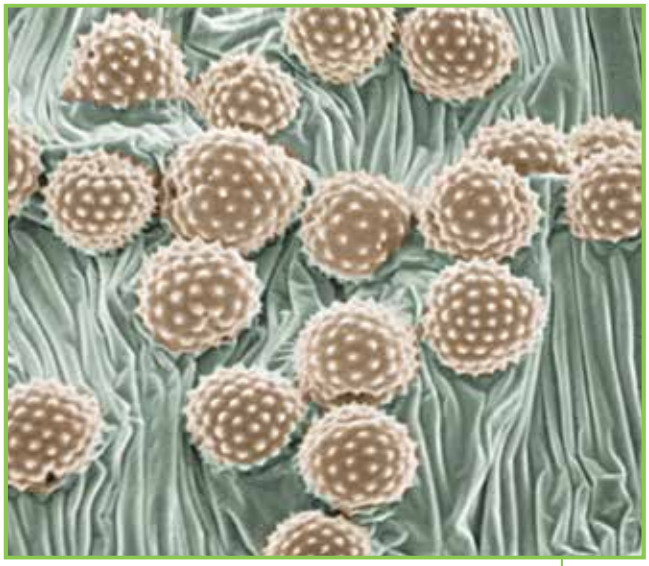
Ambrosia acanthicarpa, FALSE RAGWEED, X 2,000. Note pores within depressed furrows (colpi). All *Ambrosia* and *Franseria* species have three evenly spaced furrows per grain.



Ambrosia trifida, GIANT RAGWEED, X 800. Grains appear somewhat coarser than those of *A. artemisiifolia*, and range from 16.5 to 19.2 microns in diameter.



Ambrosia artemisiifolia (A. elatior), SHORT RAGWEED, X 800. Grains range from 17.6 to 19.2 microns in diameter, so have a larger average diameter than those of *A. trifida*.



Ambrosia confertifolia, SLENDER RAGWEED, X 800. Note spinier appearance, due to longer and broader spines. Although all these species are closely related and consequently similar in appearance, the discerning technician can make accurate identification.

Scanning electron micrographs courtesy Gerald J. Gleich, M.D. and Kristin M. Leiferman, B.S., Mayo Foundation, Rochester, Minnesota.

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