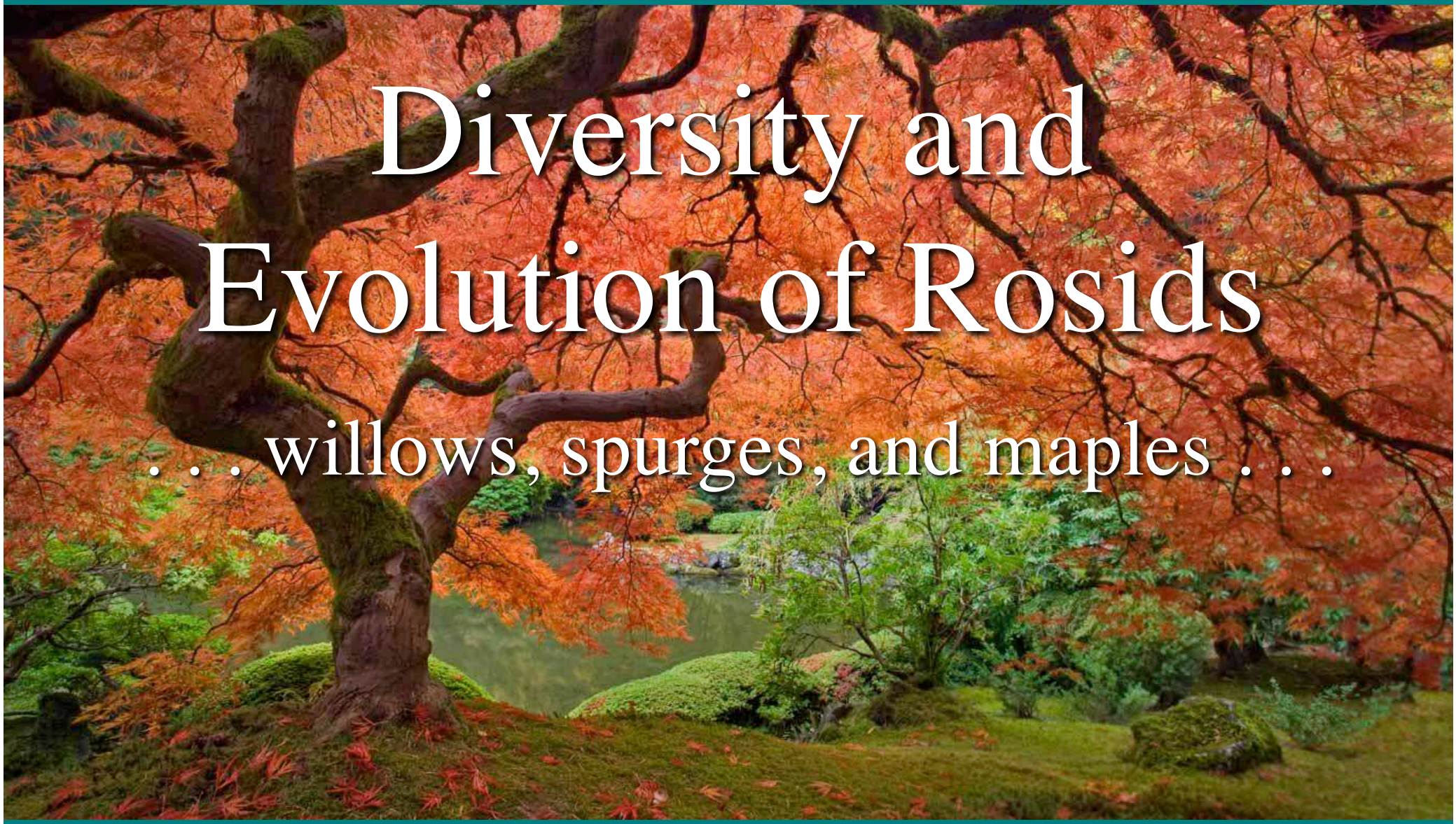
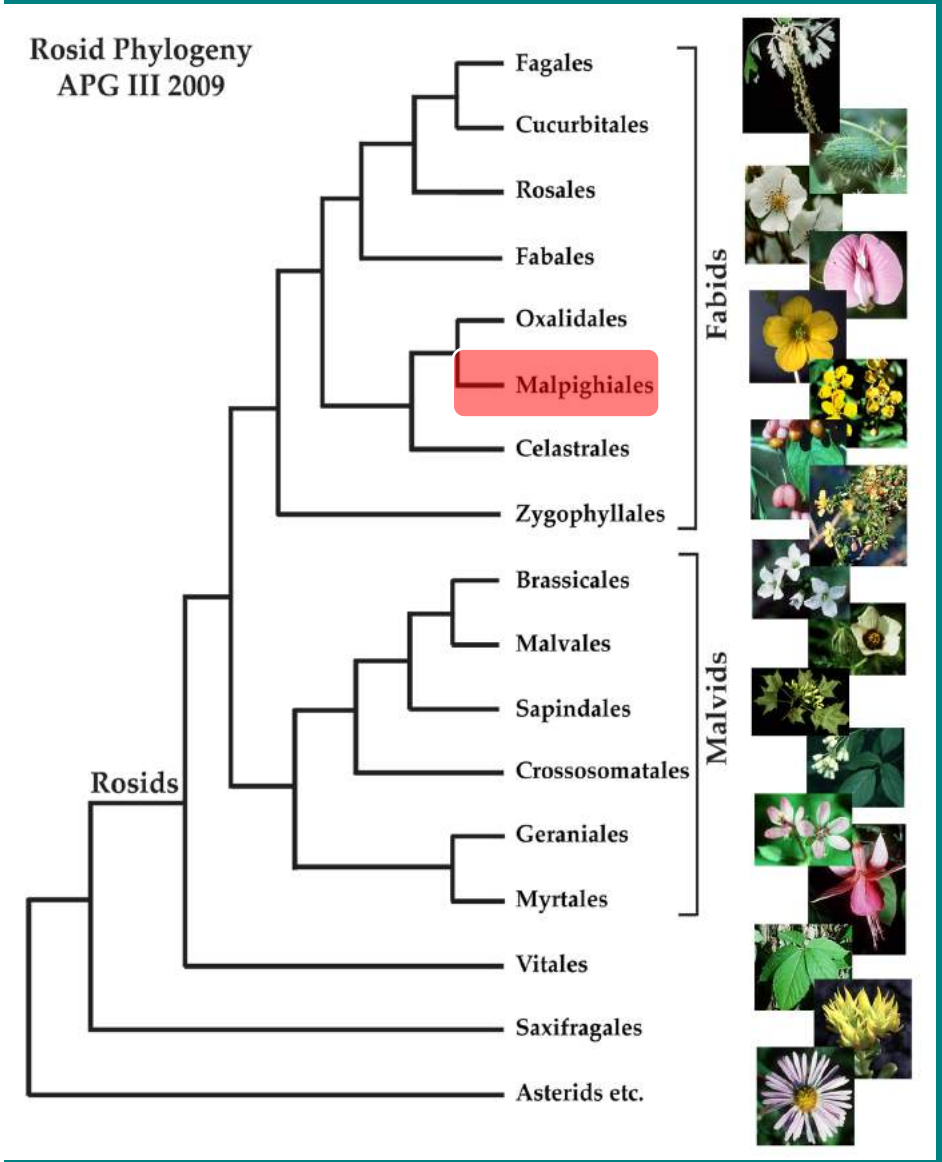


Diversity and Evolution of Rosids

. . . willows, spurges, and maples . . .

*Malpighiales

- large and diverse group of 39 families - many of them contributing importantly to tropical forest diversity



*Salicaceae - willows, poplars

Chemically defined by salicins (salicylic acid). Many members of the tropical "Flacourtiaceae" with showy flowers also have salicins and are now part of the Salicaceae

Dovyalis hebecarpa

Oncoba spinosa

*Salicaceae - willows, poplars

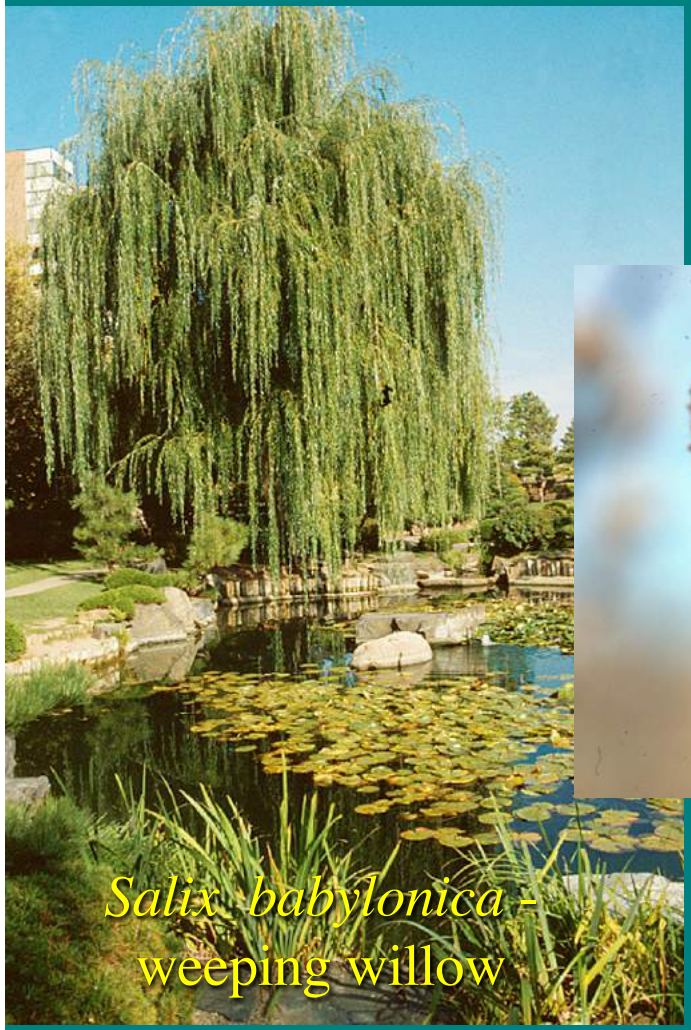
55 genera, 1000+ species of shrubs/trees - 450 are willows (*Salix*), less numerous are poplars, aspens (*Populus*).

Populus deltoides - American cottonwood

Salix babylonica - weeping willow

*Salicaceae - willows, poplars

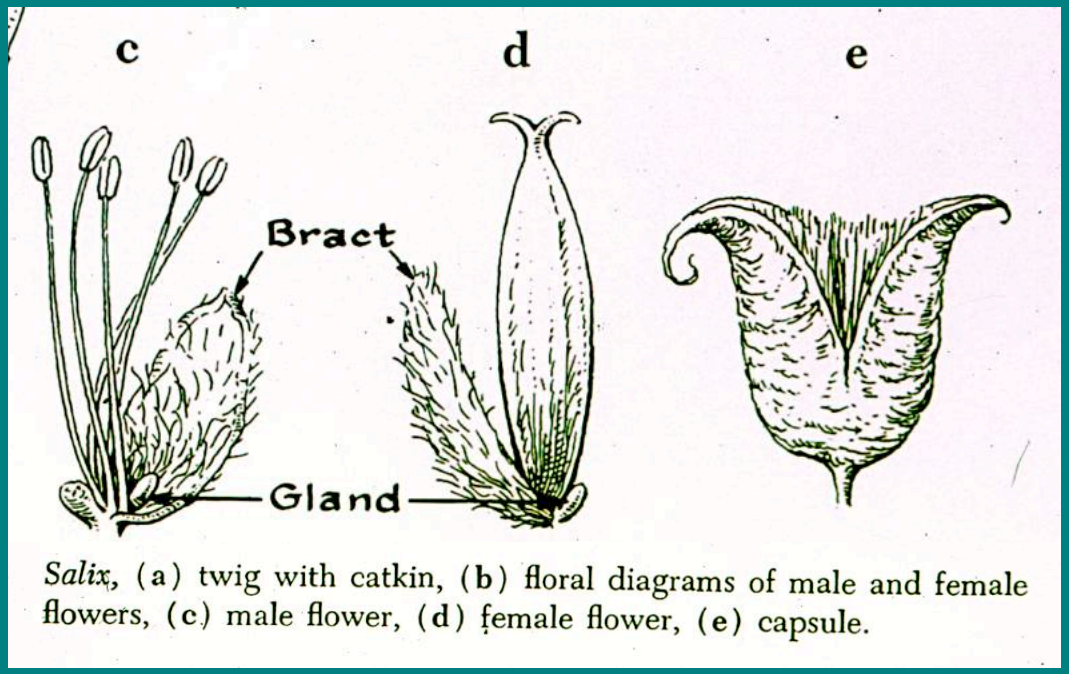
Willows (*Salix*) are dioecious trees of temperate regions with reduced flowers in aments - both insect and wind pollinated



Salix babylonica - weeping willow

*Salicaceae - willows, poplars

- nectar glands at base of bract allows insect as well as wind pollination
- fruit is a capsule with cottony seeds for wind dispersal



Salix, (a) twig with catkin, (b) floral diagrams of male and female flowers, (c) male flower, (d) female flower, (e) capsule.

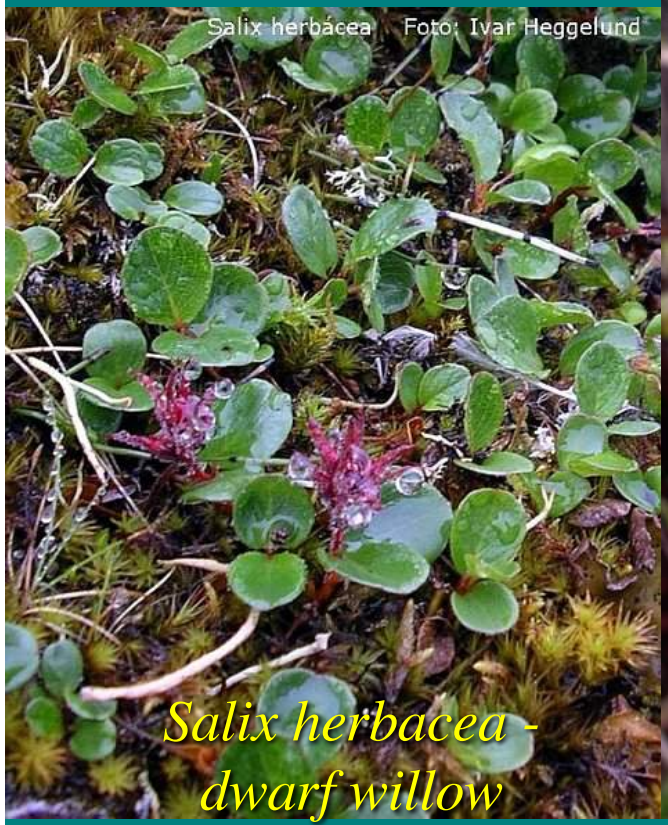
*Salicaceae - willows, poplars

Salix discolor - pussy willow

- many species are "*precocious*" - flower before leaves flush in spring

*Salicaceae - willows, poplars

- species vary from large trees, shrubs, to tiny tundra subshrubs



Salix herbacea - *dwarf willow*

Salix pedicellaris - bog willow

Salix fragilis - crack willow

*Salicaceae - willows, poplars

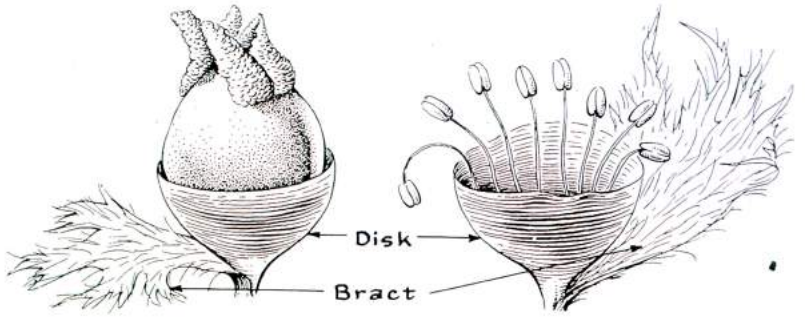
male

Populus deltoides
American cottonwood

Populus - poplars, cottonwood, aspens

- flowers possess a disk
- cottony seeds in capsule

female

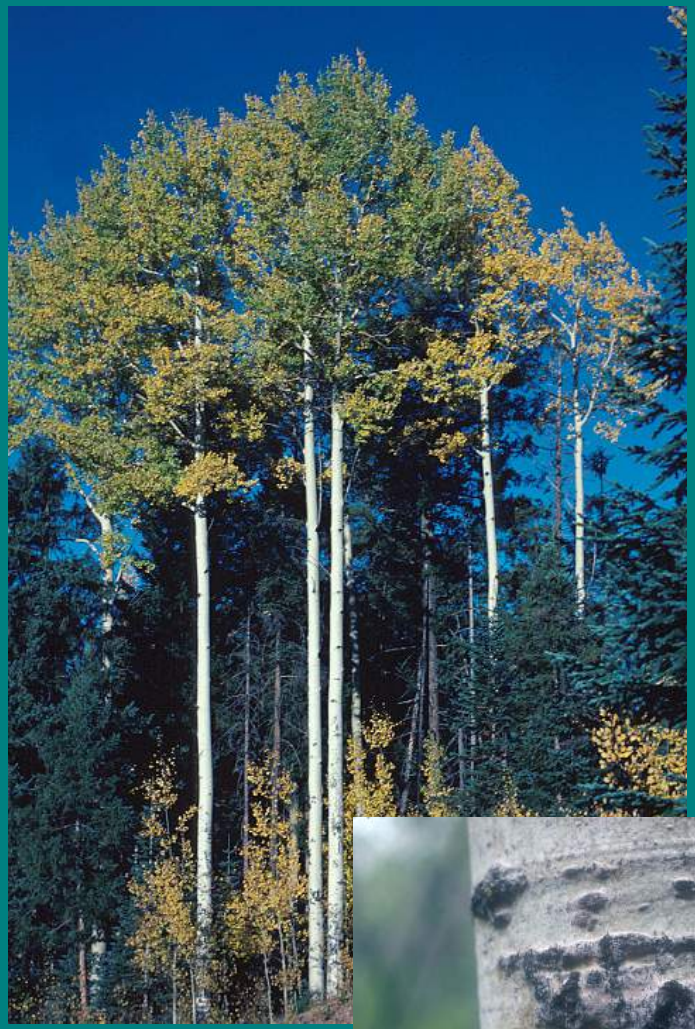


134 *Populus*, (left) female flower, (right) male flower.

*Salicaceae - willows, poplars

Populus deltoides -
American cottonwood

*Salicaceae - willows, poplars



P. tremuloides
trrembling aspen

P. grandidentata
bigtooth aspen

- aspens are clonal from root sprouts, fast growing, light wooded, and important for pulp in the paper industry

*Salicaceae - willows, poplars

Populus balsamifera
Balsam poplar, balm-of-gilead

Populus alba
White poplar
Introduced from Europe

*Euphorbiaceae - spurges

Euphorbiaceae s.l. is polyphyletic and now broken into 3 families

*Euphorbiaceae - spurges

- large cosmopolitan family of trees, shrubs, and herbs of 222 genera and 6000 species
- latex bearing and filled with nasty chemicals (source of rubber, castor oil, tapioca, poinsettia)
- leaves alternate, simple (often palmately lobed) or palmately compound

Ricinus - castor oil bean

*Euphorbiaceae - spurges

female

CA 5 CO 0 A ∞ G 0
CA 5 CO 0 A 0 G (3)

Majority of the family has unisexual flowers, 5 sepals, no petals, numerous stamens, 3 fused carpels, and capsules

*Euphorbiaceae - spurges

A quite different arrangement of unisexual flowers is seen in many of our spurges of the genera *Euphorbia* and *Chamaesyce*.

Flower or inflorescence?

*Euphorbiaceae - spurges

The "flower" of our flowering spurge is actually a highly modified inflorescence = cyathium

Shown here are 3 cyathia; the whole unit here is one cyathium

*Euphorbiaceae - spurges

Cyathium is composed of:

glands

*Euphorbiaceae - spurges

Cyathium is composed of:

glands

appendages of glands (bracts)

*Euphorbiaceae - spurges

Cyathium is composed of:

glands

appendages of glands (bracts)

∞ male flowers, 1- stamened (no perianth)

*Euphorbiaceae - spurges

Cyathium is composed of:

glands

appendages of glands (bracts)

∞ male flowers, 1- stamened (no perianth)

1 female flower (tricarpellate - 3 styles)

*Euphorbiaceae - spurges

Euphorbia virgata - leafy spurge

- one of several species labelled “obnoxious weed” by state law

*Euphorbiaceae - spurges

Euphorbia pulcherrima - poinsettia

Euphorbia canariensis

Euphorbia dendroides

Euphorbia is a "giant" genus (> 2,000 spp.) with some spectacular radiations - is the cyathium a "key innovation"?

*Euphorbiaceae - spurges

Hura - poison arrow

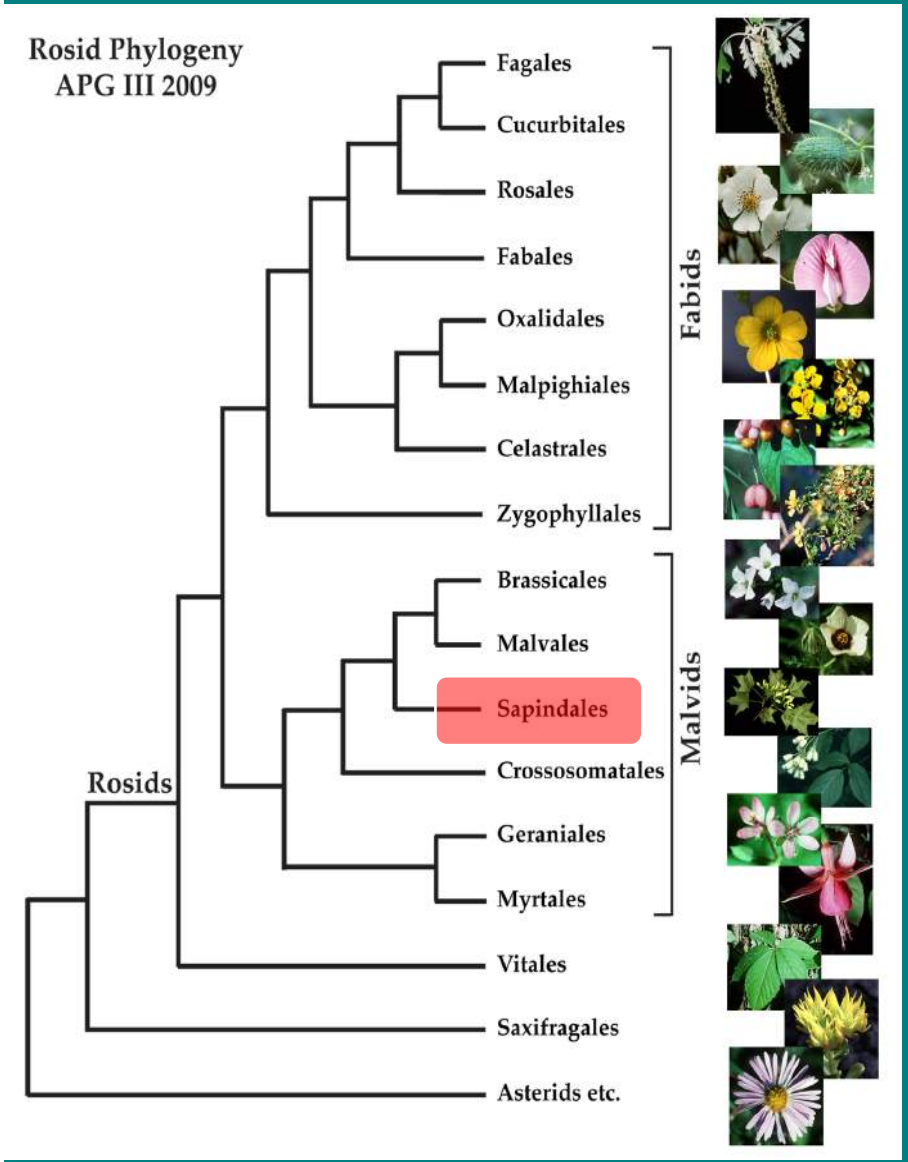
- economically important members from Neotropics

Manihot esculenta -
manioc, cassava, tapioca

Hevea - rubber

*Sapindales

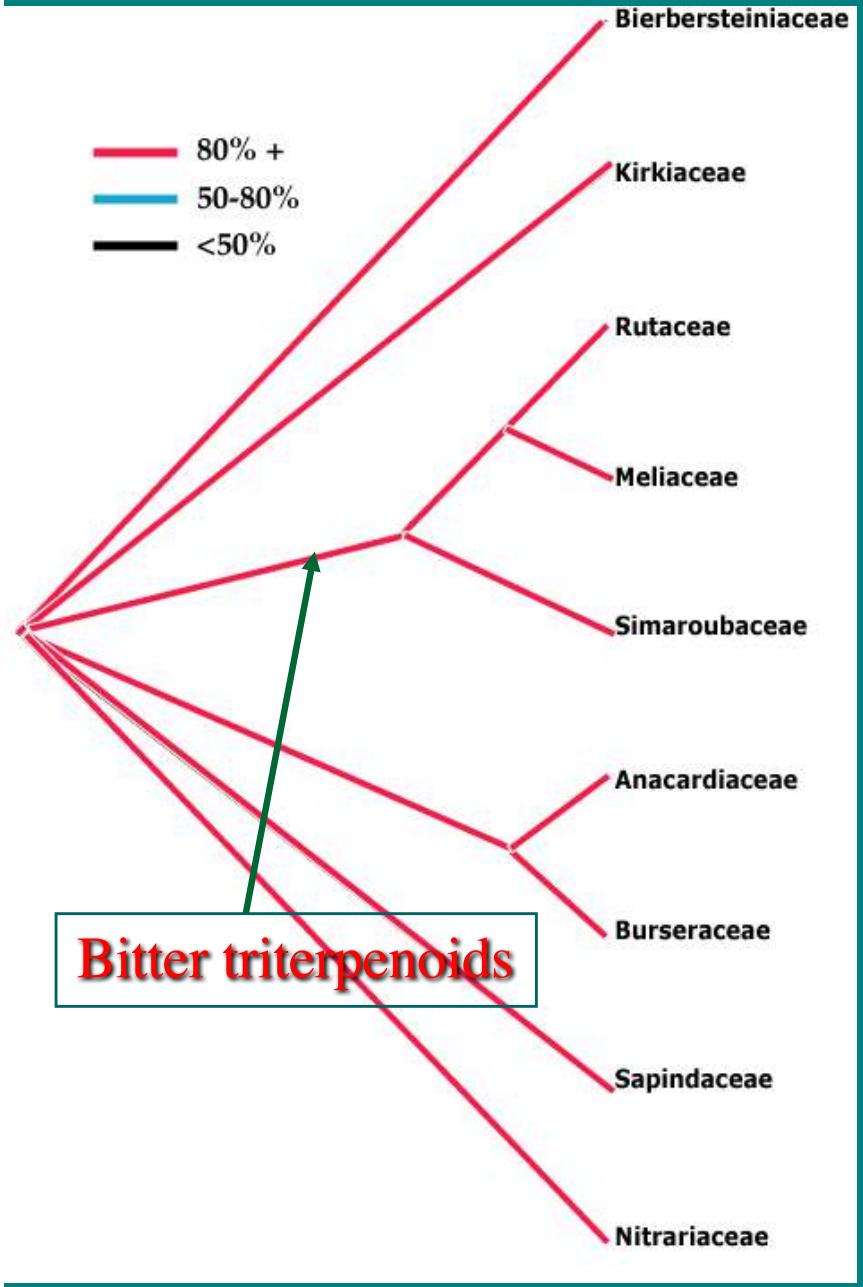
- long recognized group of 9 families
- woody, compound leaves
- nectar disk
- 1-2 seeded fruit



Sapindaceae
Acer platanoides

Rutaceae
Geijera multiflorum

*Sapindales



- chemically distinct (lemon smells)
- preferential herbivory by hemipteran *Calophya*

Calophya on *Schinus* (Anacardiaceae)

*Anacardiaceae - sumacs

Woody, worldwide family (70/985) with alternate, compound leaves and pungent, often nasty volatiles or black exudates (phenolics)

Rhus glabra - smooth sumac

*Anacardiaceae - sumacs

CA 5 CO 5 A 5, 10 G (2-3)

- flowers are small, congested, variously unisexual or perfect but with disk

Rhus glabra - smooth sumac

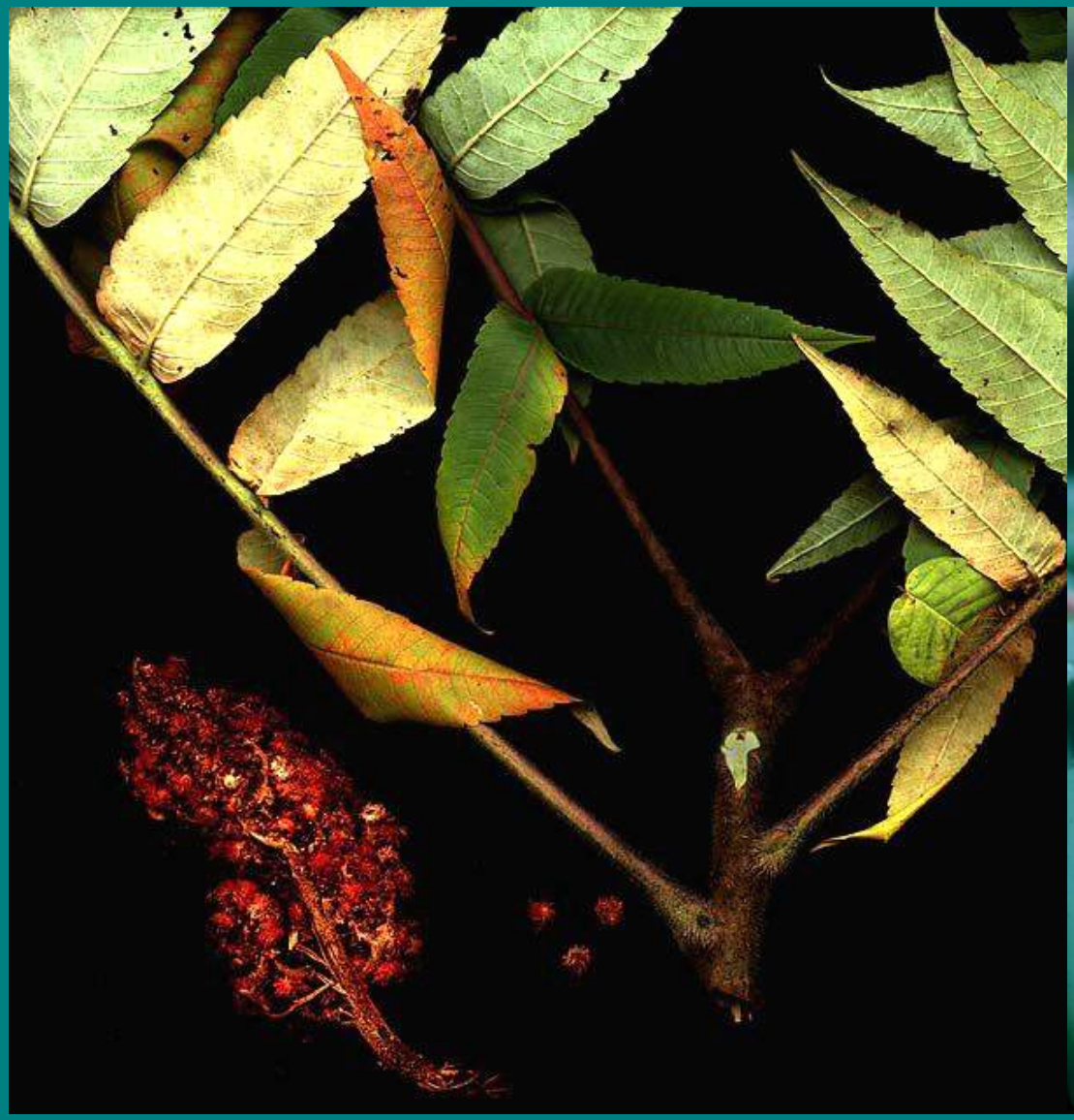
*Anacardiaceae - sumacs

CA 5 CO 5 A 5, 10 G (2-3)

- one-seeded drupes (mango, pistachio, cashew)

Rhus glabra - smooth sumac

*Anacardiaceae - sumacs



Rhus hirta - staghorn sumac

*Anacardiaceae - sumacs

Toxicodendron radicans - poison ivy: variable in habit

Toxicodendron includes our 3 poisonous species

*Anacardiaceae - sumacs

Toxicodendron vernix - poison sumac
Multi-stemmed shrub in wetlands

*Anacardiaceae - sumacs

One of the most poisonous members of this family is the source of Japanese lacquer – *Toxicodendron vernicifluum* (urushiol compound)

*Sapindaceae - maples

Largely tropical woody family of 735 genera and 1600 species and includes previously recognized smaller temperate families (maples - Aceraceae, buckeyes - Hippocastanaceae)

- most have opposite, compound leaves
- 1-2 seeded drupes or samaras

Sapindus -soapberry

*Sapindaceae - maples

The family includes 2 of the most important or dominant tree species in many of our forest types - sugar maple and red maple

Acer saccharum - sugar maple

Acer rubrum - red maple

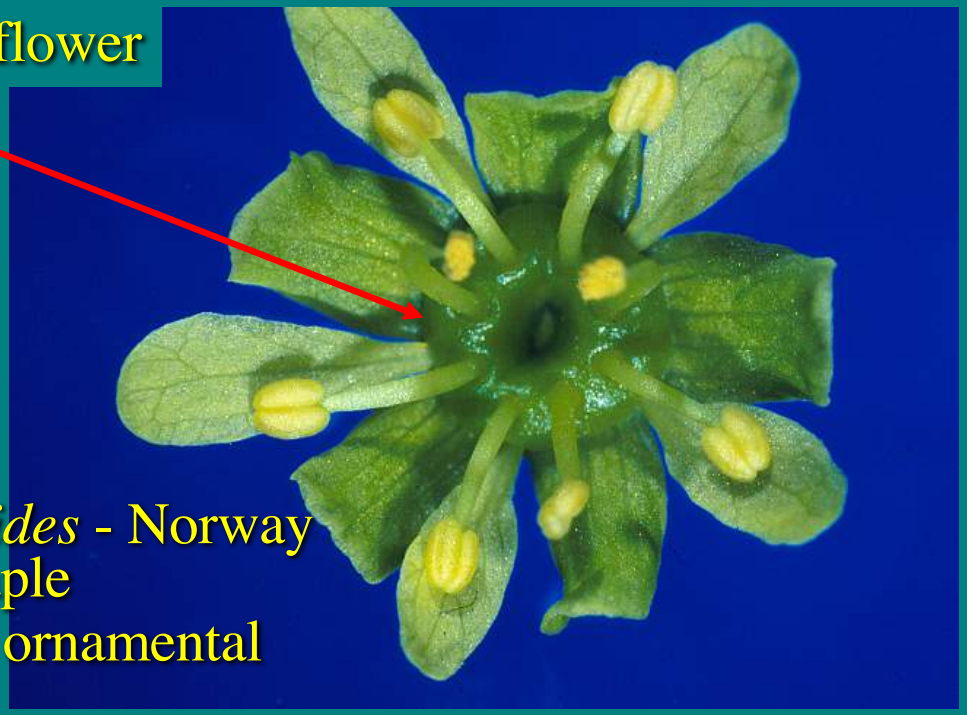
*Sapindaceae - maples

CA 4-5 CO 0 or 4-5 A 8, 10 G (2)

- maple flowers typically unisexual by abortion. Perianth 4-5 merous, but petals lacking in sugar and silver maples and boxelder

- nectariferous disk is often present in the whorl associated with stamens

Male flower



Acer platanoides - Norway maple
Introduced ornamental

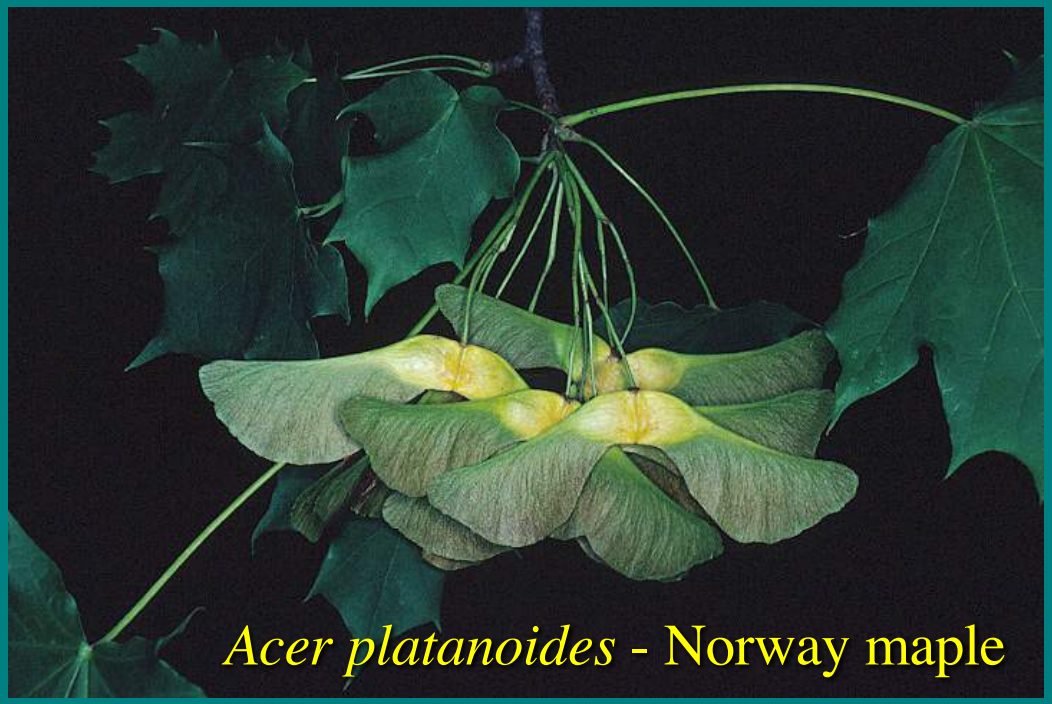
*Sapindaceae - maples

CA 4-5 CO 0 or 4-5 A 8, 10 G (2)

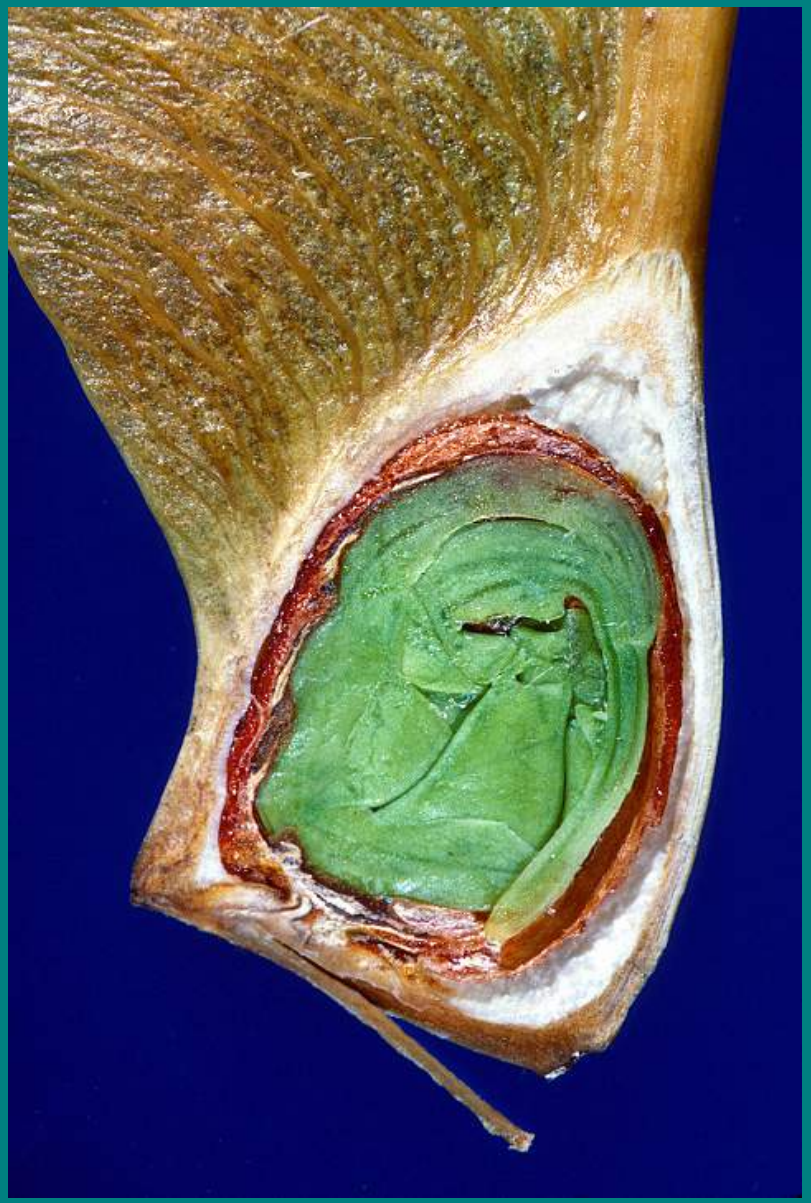
- superior pistil composed of 2 carpels and 2 extended styles
- note reduced and probably non-functional stamens

Female flower

*Sapindaceae - maples

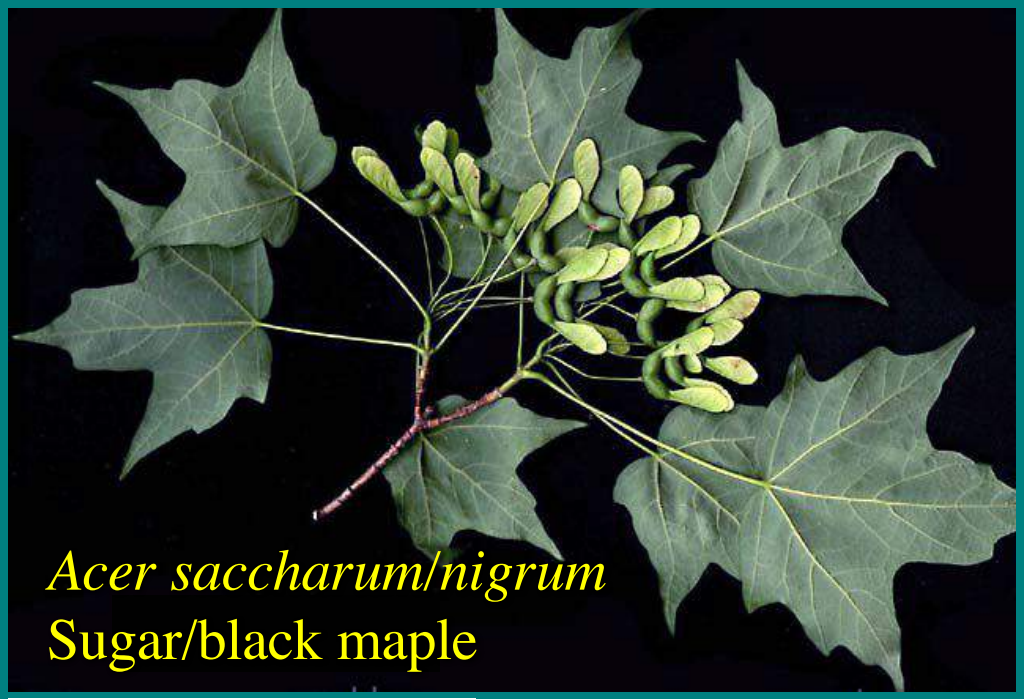


Acer platanoides - Norway maple



- fruit is a schizocarp - each carpel separates into a one seeded mericarp
- fruit is also a samara - 2 winged achenes

*Sapindaceae - maples



Acer saccharum/nigrum
Sugar/black maple

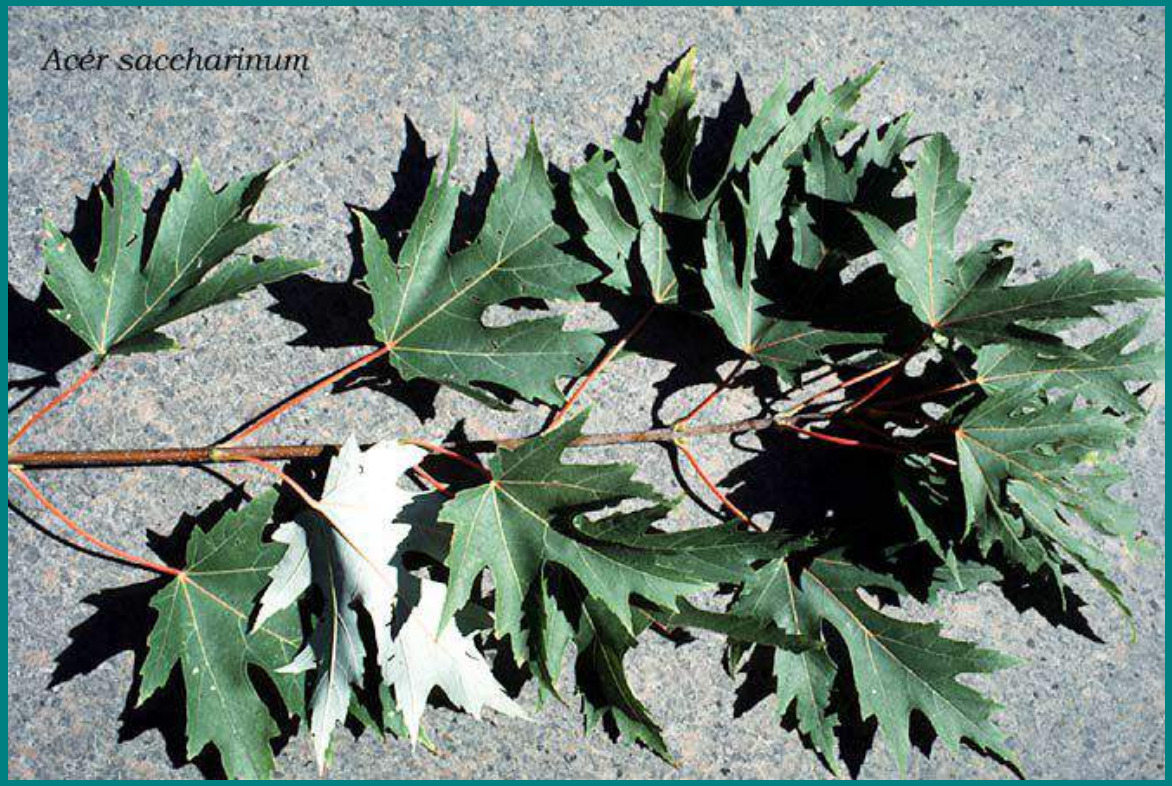
One of the most dominant mesic forest tree species throughout Wisconsin is the sugar maple; leaves smoothed lobed; flowers without petals

*Sapindaceae - maples

Acer rubrum - Red maple

Another dominant hydric-xeric forest tree species throughout Wisconsin and eastern North America

*Sapindaceae - maples



Acer saccharinum - silver maple

Silver maple is characteristic of wet conditions, fast growing, and with whitish underside to leaves; like sugar maple has no petals

*Sapindaceae - maples

- only dioecious species of maple and only one with compound leaves
- initially male only, as they age they switch to female

*Sapindaceae - maples

- buckeyes are now included in Sapindaceae along with the maples.

Aesculus glabra - Ohio buckeye

*Sapindaceae - maples

- buckeyes are now included in Sapindaceae along with the maples.
- leaves are palmately compound and opposite.

Aesculus glabra - Ohio buckeye

Aesculus hippocastanum - horsechestnut

Simaroubaceae - tree of heaven

The tree-of-heaven is originally from Asia, widely planted, and somewhat naturalized.

Like most members of the family, the tree is strongly (pungently) odored.

Ailanthus altissima - tree of heaven

Rutaceae - citrus

Ptelea trifoliata (hop tree, wafer-ash) - medicinal plant

Largely alternate, compound leaved family (except oranges and relatives)

Family is well known for its volatile terpenoid compounds that the leaves & flowers emit

Citrus sinensis

Rutaceae - citrus

Zanthoxylum americanum
Prickly-ash

Native clonal and spiny armed shrub with pinnately compound leaves; flowers reduced

Potentially invasive shrub in drier habitats