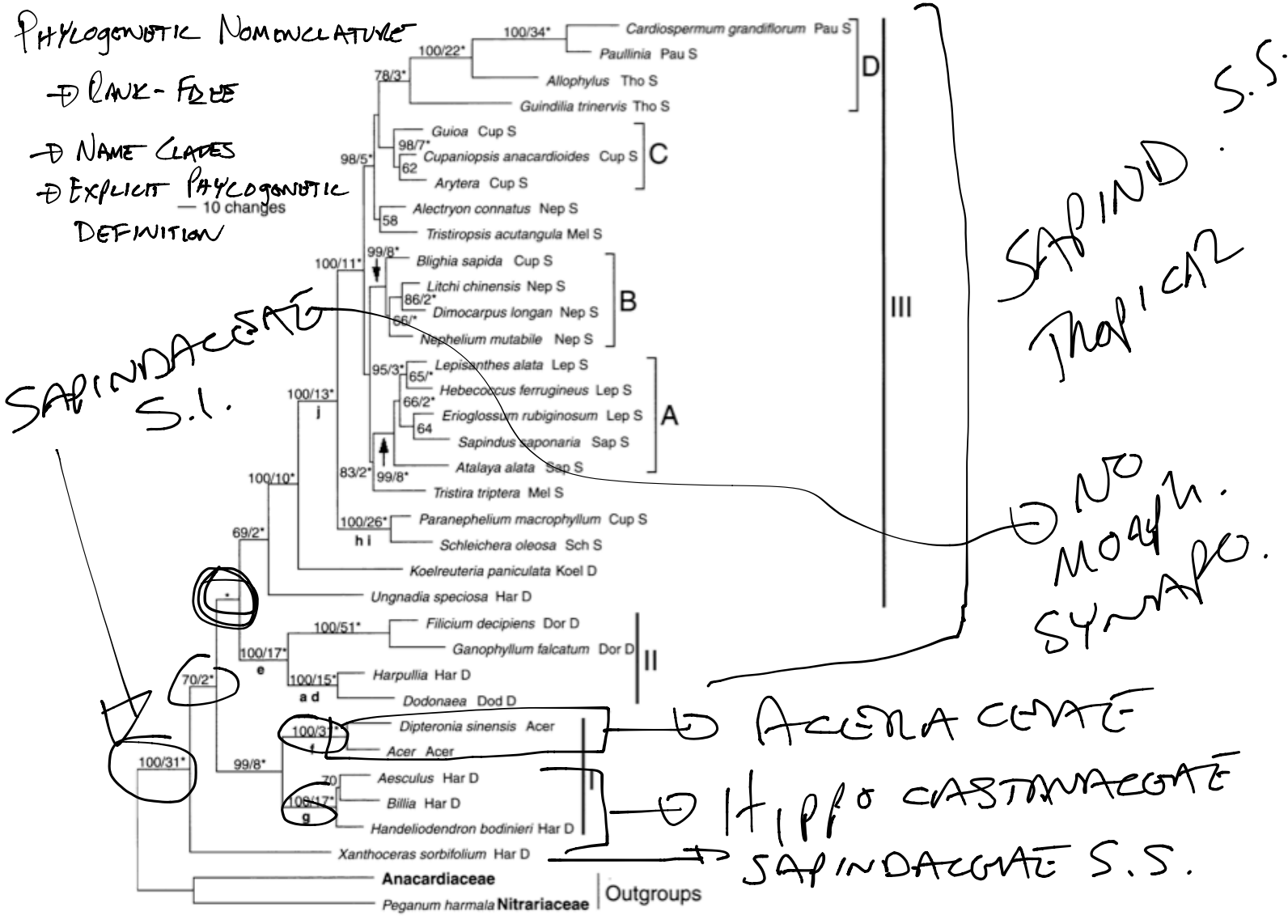
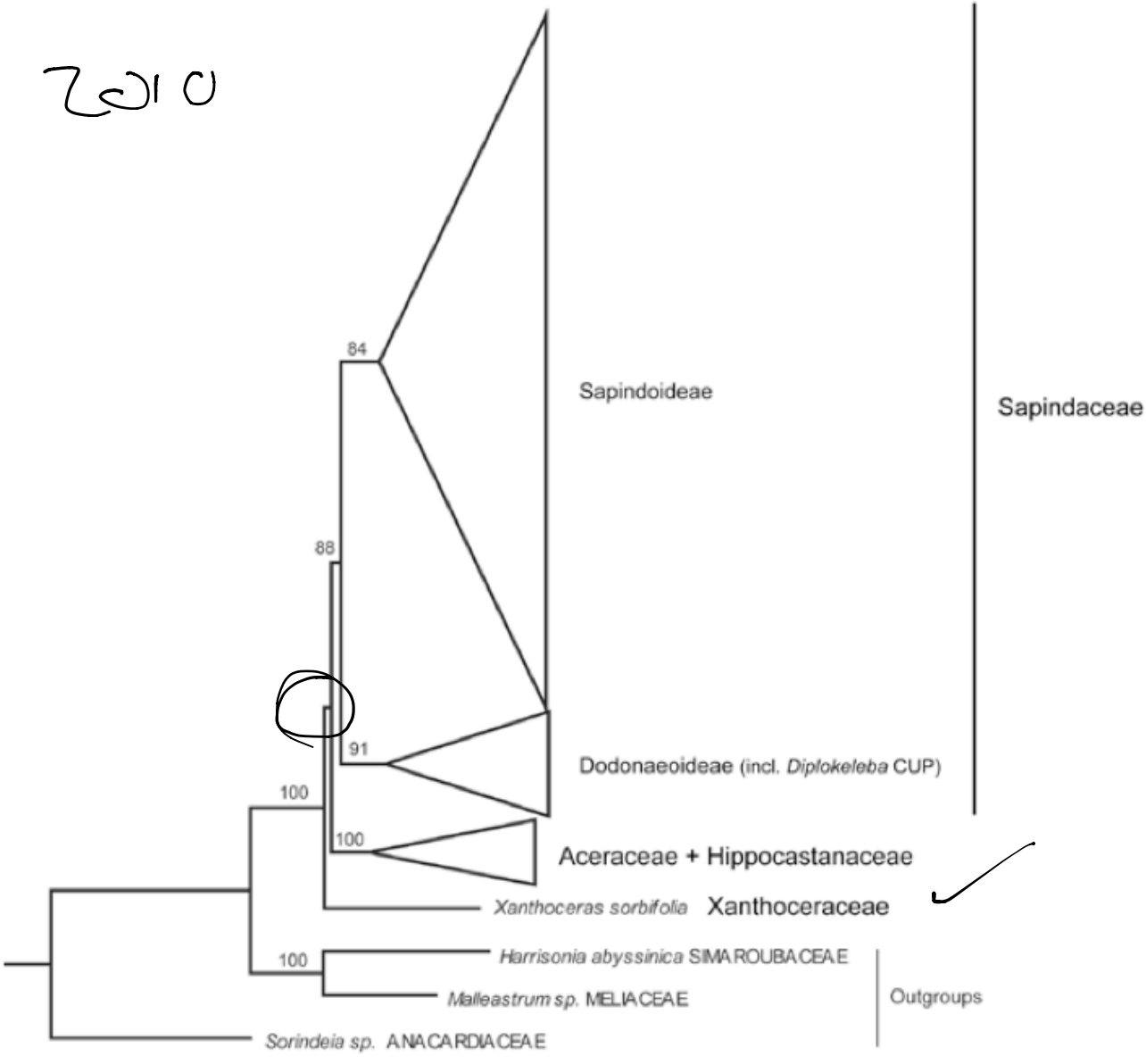
Sapindaceae s.l. APG II 2003, APG III 2009

Acer macrophyllum

Aceraceae (maple clade) is a monophyletic group, so is Hippocastanaceae (Horse chestnut family), but Sapindaceae s.s. is paraphyletic in relation to the other two families. Modern classifications include all three families in Sapindaceae s.l.. But Sapindaceae s.s. is mainly a tropical family and difficult to link with synapomorphies to these temperate clades.

Question: How can we avoid this nomenclatural catastrophe?


PHYLOGENETIC NOMENCLATURE
→ RANK-FREE
→ NAME CLADES
→ EXPLICIT PHYLOGENETIC DEFINITION
— 10 changes
SAPINDACEAE S.L.
SAPIND. S.S. TROPICAL
→ NO MORPH. SYNAPO.
→ ACERACEAE
→ HIPPOCASTANACEAE
→ SAPINDACEAE S.S.
Cardiospermum grandiflorum Pau S
Paullinia Pau S
Allophylus Tho S
Guindilia trinervis Tho S
Guioa Cup S
Cupaniopsis anacardioides Cup S
Arytera Cup S
Alectryon connatus Nep S
Tristiropsis acutangula Mel S
Blighia sapida Cup S
Litchi chinensis Nep S
Dimocarpus longan Nep S
Nephelium mutabile Nep S
Lepisanthes alata Lep S
Hebecoccus ferrugineus Lep S
Erioglossum rubiginosum Lep S
Sapindus saponaria Sap S
Atalaya alata Sap S
Tristira triptera Mel S
Paranephelium macrophyllum Cup S
Schleichera oleosa Sch S
Koelreuteria paniculata Koel D
Ungnadia speciosa Har D
Filicium decipiens Dor D
Ganophyllum falcatum Dor D
Harpullia Har D
Dodonaea Dod D
Dipteronia sinensis Acer
Acer Acer
Aesculus Har D
Billia Har D
Handeliodendron bodinieri Har D
Xanthoceras sorbifolium Har D
Anacardiaceae
Peganum harmala Nitrariaceae
Outgroups
D
C
B
A
III
II
I


2010
84
88
91
100
100
100
Sapindoideae
Sapindaceae
Dodonaeoideae (incl. Diplokeleba CUP)
Aceraceae + Hippocastanaceae
Xanthoceras sorbifolia Xanthoceraceae
Harrisonia abyssinica SIMAROUBACEAE
Malleastrum sp. MELIACEAE
Outgroups
Sorindeia sp. ANACARDIACEAE

Phylogeny and circumscription of Sapindaceae revisited: molecular sequence data, morphology and biogeography support recognition of a new family, Xanthoceraceae

Sven Buerki[1], Porter P. Lowry II[2,3,*], Nadir Alvarez[4], Sylvain G. Razafimandimbison[5], Philippe Küpfer[6] & Martin W. Callmander[2,7]

Key to distinguish Xanthoceraceae from closely related families

1. Leaves alternate, compound (rarely unifoliate in some *Allophylus* and *Dodonaea* species, both Sapindaceae).....2
1'. Leaves opposite, simple or compound.....3
2. Flower large, petals c. 2 cm long; disc with 5-horn-like appendages; ovules 7 or 8 per locule, all fertile; seeds > 15 per fruit; leaves imparipinnately compound, plants deciduous; temperate regions of eastern Asia, from inner Mongolia across China to Korea.....**Xanthoceraceae**
2'. Flower small, petals < 1.5 cm long; disc lacking horn-like appendages; ovules 1 or 2 per locule (7 or 8 in the South American genus *Magonia*), fertile ovule generally 1 per locule; seeds 1 to 3 per fruit; leaves paripinnately compound (rarely imparipinnate, unifoliolate or simple), plants evergreen; tropical to subtropical regions.....**Sapindaceae**
3. Flower actinomorphic, leaves palmately lobed or pinnately compound; fruit a schizocarpic fruits with 1-seeded samaroid mericarps.....**Aceraceae**
3'. Flower zygomorphic, leaves palmately compound; fruit a 3-carpellate, usually 1-seeded capsule.....**Hippocastanaceae**

Aceraceae (maple clade of Sapindaceae s.l.)

Aceraceae - 2 genera/113 species, including *Acer* and *Dipteronia*.

Lolio spp → 14 NAm.

Woody trees or shrubs, mostly N temperate.

Leaves opposite.

Flowers actinomorphic;

perianths 4-5 parted; petals reduced and sepal-like;

Stamens 4-10;

nectary disk;

flowers bisexual or unisexual; if unisexual, plants either mono- or dioecious, or androdioecious;

ovary superior (2 fused carpels), winged;

Fruit of 2 fused carpels each with pronounced wing and single seed that split apart at maturity and dispersed by wind — samaroid schizocarp.

Aceraceae (maple clade of Sapindaceae s.l.)

Woody trees or shrubs, mostly N temperate.

Leaves opposite.

Acer negundo

Acer saccharum subsp. floridanum

Note the opposite leaves;

N. hemisphere woody plant families with opposite leaves

A MAD CAP HORSE =

A DOXACEAE → VIBURNUM, ELDERBERRY

M APLES → ACER

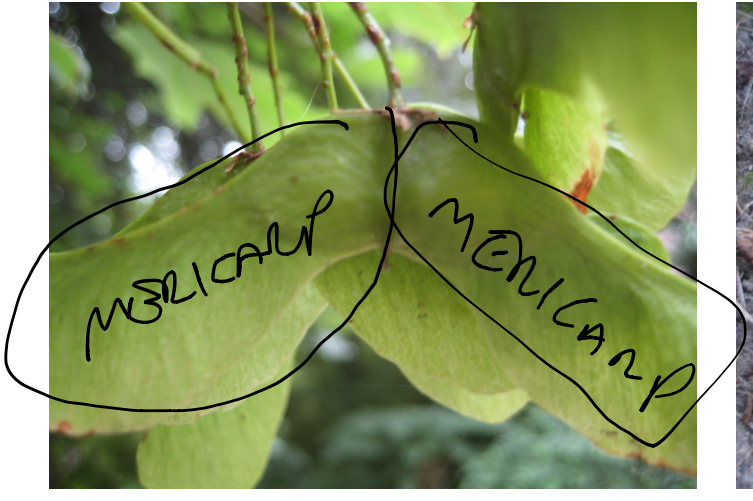
A SHES → FRAXINUS (OLEACEAE)

D OGWOODS → CORNUS (CORNACEAE)

Cap RIFOLIACEAE → HONEYSUCKLES, SNOWBERRIES

Horse CHESTNUTS → AESCULUS (HIPPOCASTANACEAE)

Aceraceae (maple clade of Sapindaceae s.l.)



Note the samaroid schizocarp;

Samara: WINGED, SINGLE SEEDED, INDEHISCENT

Schizocarp: BREAKS APART INTO MERICARPS AT MATURITY

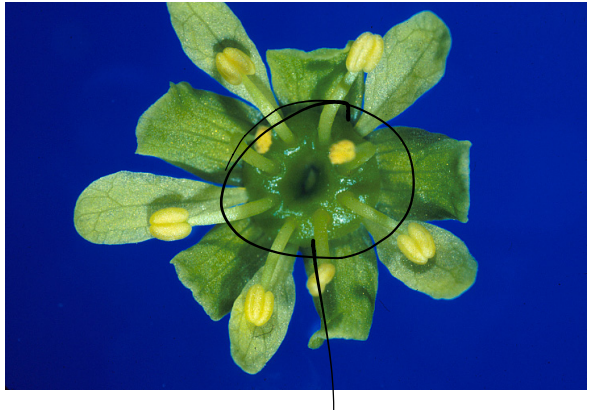
D CORRESPONDS TO CARPELS

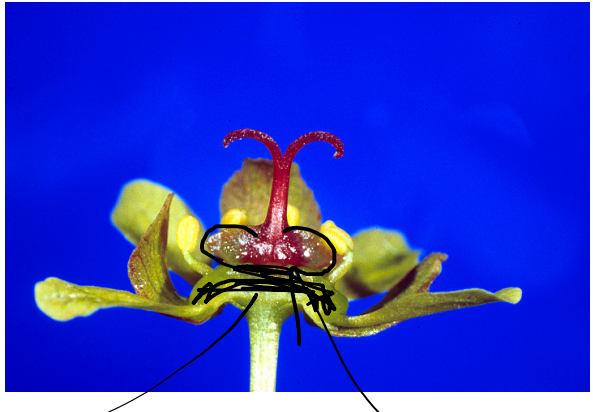
Aceraceae (maple clade of Sapindaceae s.l.)

Acer negundo

Flowers could be unisexual; then plants can be mono- or dioecious, or Androdioecious (some plants with perfect flowers, some plants with male flowers only)

Aceraceae (maple clade of Sapindaceae s.l.)





Acer platanoides

Petals are reduced and sepal-like;

Nctary disk;

Superior ovary (2 fused carpels), developing wings;

Hippocastanaceae (buckeye clade of Sapindaceae s.l.)

Hippocastanaceae - 2 genera/25species, including *Aesculus*.

↳ Buckeyes → 7 spp. Midwest of N. Am.

Woody trees or shrubs, mostly N temperate.

Leaves opposite, palmately compound.

Inflorescence a terminal raceme;

Flowers zygomorphic;

perianths with distinct calyx and corolla;

flowers bisexual;

ovary superior;

Fruit a capsule – often single seeded by abortion of other ovules

Hippocastanaceae (buckeye clade of Sapindaceae s.l.)

Aesulus hippocastanum

Note the palmately compound and opposite leaves

Hippocastanaceae (buckeye clade of Sapindaceae s.l.)

1- seeded capsule

Seeds are poisonous

→ Rotenone

Aesulus hippocastanum

Note the single-seeded (often), capsular fruit

Acer saccharinum - silver maple

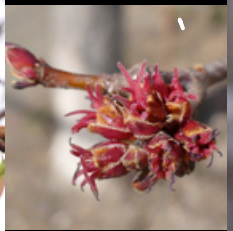
BOTTOMLANDS → WET AREAS

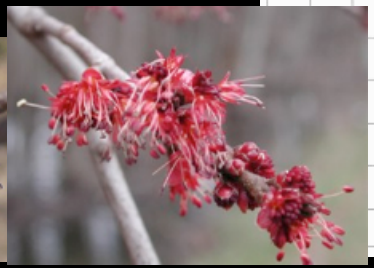
→ INVASIVE IN W. US.

Acer rubrum - red maple

→ SWAMP RED MAPLE

PURE STANDS IN ~~BOG~~/ALONG SWAMPS





Acer saccharum - sugar maple

MAPLE SYRUP

- CLIMAX SPECIES W BIRCH-BEECH-MAPLE FORESTS OF NE

Acer negundo - box-elder

DIOECIOUS

→ DISTURBED AREAS → WATER-WAYS (ESPECIALLY) IN WEST.

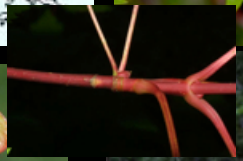
SMALL TREE (30')

MULTI-STEMMED

Acer macrophyllum - big leaf maple

WET FORESTS AT LOWER ELEV. CASCADES + SIERRAS

Acer glabrum - Rocky mountain maple



UNDERSTORY + RIPARIAN →
→ MID ELEV.

→ ANDRODIOECIOUS

→ TERNATE LVS. IN CENTRAL + S. ROCKIES

Acer platanoides - Norway maple

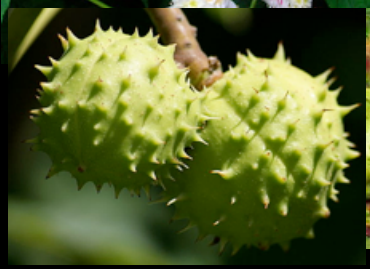
NORTHERN EURASIA

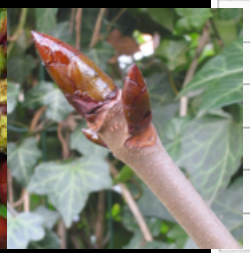
→ COMMON ORNAMENTAL

NATURALIZED THROUGHOUT N. AM

(*Acer circinatum* - vine maple)

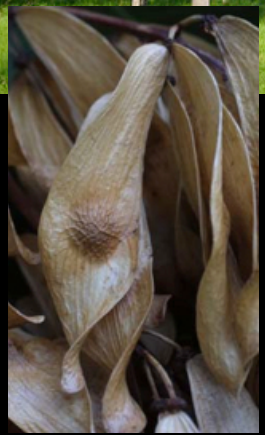
Aesculus hippocastanum - horsechestnut





NATIVE TO BALKANS OF EAST EUROPE.

Ailanthus altissima - tree of heaven (Simaroubaceae)

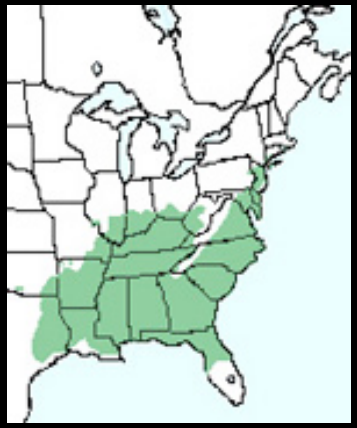


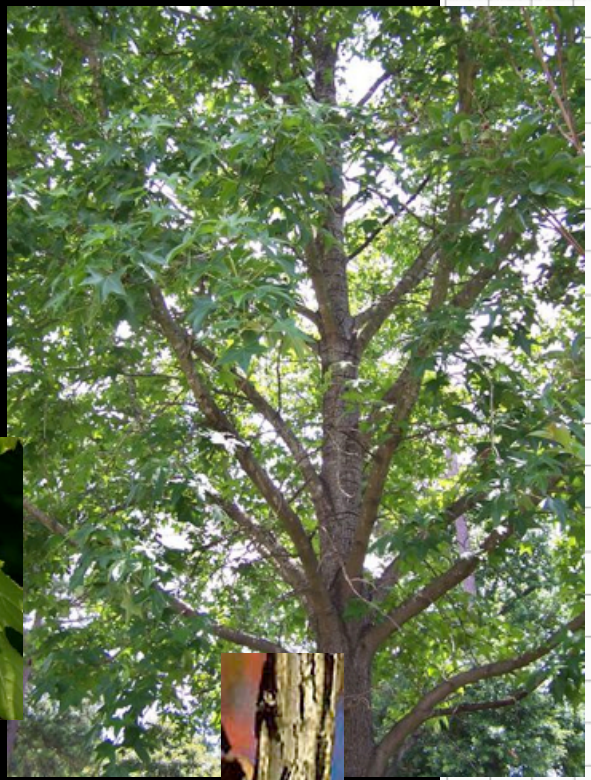
NATIVE TO E. ASIA

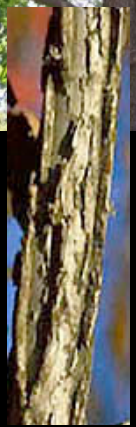
→ INTRODUCED N AM. NATURALIZED
→ INVASIVE!

→ POOREST SOILS / HIGH LEVELS OF POLLUTION.

Liquidambar styraciflua - sweet gum (Altingiaceae)



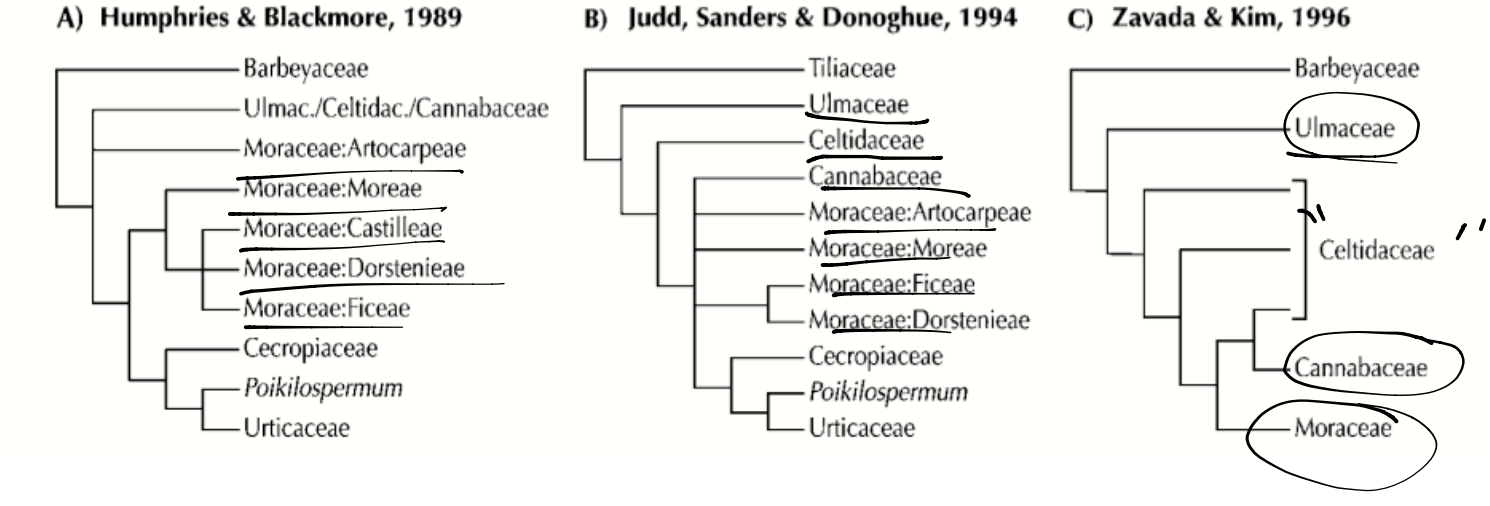




SE DECIDUOS ZONE

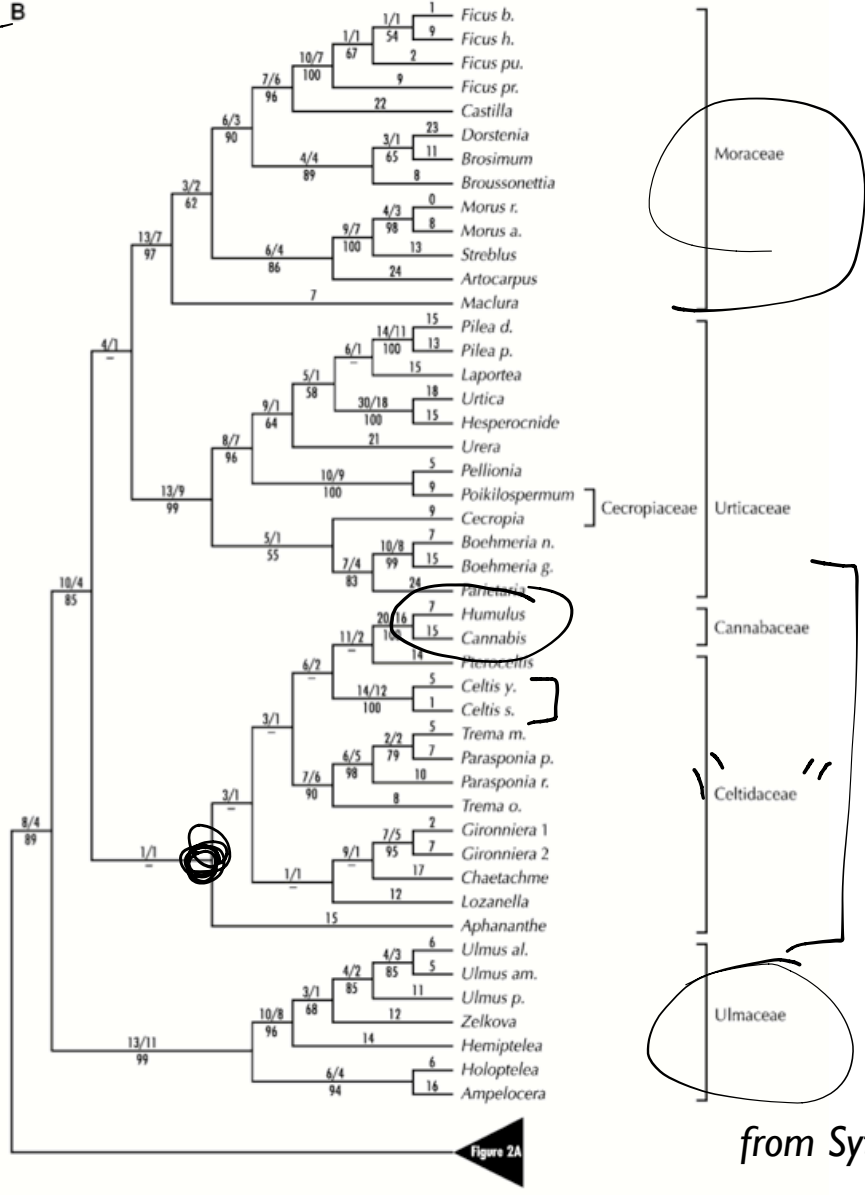
COMMON IN MIXED HARDWOOD FORESTS & SCATTERED

COMMON ORNAMENTAL



from Sytsma et al. 2002, AJB

SYTSMA 2002 B



CANNABACEAE S.l.

from Sytsma et al. 2002, AJB

Ulmaceae (elm family)

Ulmaceae - 6 genera/40species, including *Ulmus*. ZELKOVA

Woody trees or shrubs, mostly N temperate.

Leaves simple, alternate, bases often oblique, pinnate venation with secondary veins ending in teeth.

Flowers inconspicuous, bisexual or unisexual, wind pollinated

Fruit a flattened, disc-like samara with central seed surrounded by thin wing

Ulmus americana - American elm

DUTCH-ELM DISEASE

Ulmus pumila - Siberian elm

CULTIVATED
escaped
naturalized
invasive

NATIVE TO ASIA

→ WINDBREAK IN W. N AM.

WEEDY IN RIPARIAN ZONES IN DRY WEST

Cannabaceae s.l. USED TO BE JUST CANNABIS + HUMULUS

Cannabaceae – 11 genera/180 species, woody members include *Celtis* (previously Celtidaceae or Ulmaceae subfamily Celtidoidaea).

Woody or herbaceous

Leaves simple, alternate, pinnate venation with secondary

Veins forming series of loops.

Flowers inconspicuous, bisexual or unisexual

Fruit a drupe (fleshy, indehiscent with stony endocarp surrounding single seed)

Celtis reticulata - netleaf hackberry

Celtis occidentalis - northern hackberry

Moraceae

Moraceae – 50 genera/1500 species, of trees, shrubs, vines. Primarily distributed in the warmer regions of the world, but with several temperate species. *Ficus* (figs) is the most diverse genus with over 800 species – mostly tropical and shows an amazing array of growth forms from **epiphytes, vines, shrubs, small trees, shrubs etc. to large trees.**

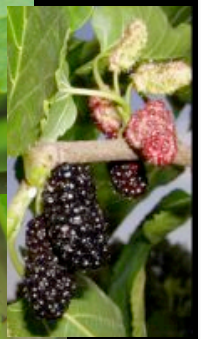
Flowers small, inconspicuous, bisexual or unisexual, wind pollinated (*Ficus is an exception)*

Milky latex distributed throughout the plant.

Fruits are multiples.

Morus alba - white mulberry

CULTIVATED
escaped
naturalized
invasive



MORUS → 2 NAM.

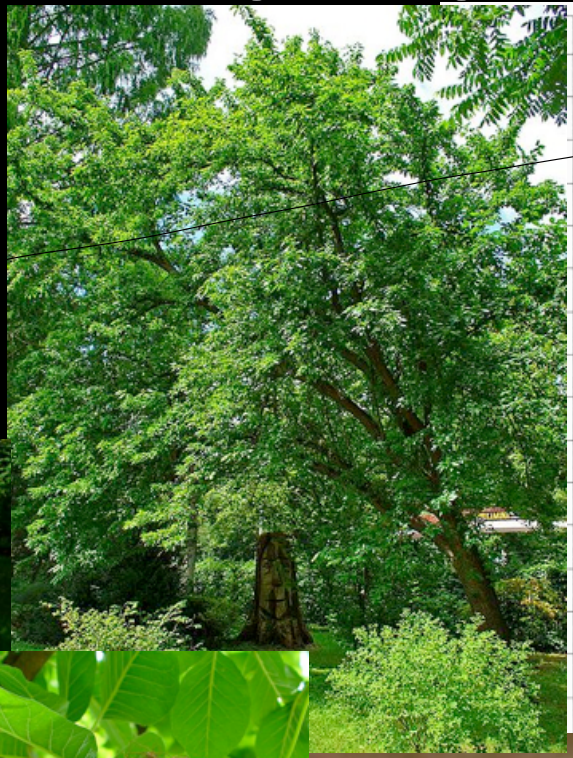
NATIVE TO CHINA

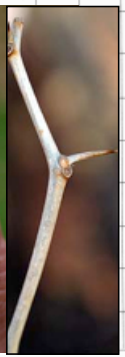
[LIGHT-COLORED BUDS]

NATIVE → M. RUBRA

[DARK BUDS]

Maclura pomifera - osage orange





Restricted Native Range

Gomphothere Hypothesis

Anacardiaceae

Rhus glabra
smooth sumac

Rhus typhina
staghorn sumac

CASHEW FAMILY → TROPICAL DIVERSITY

→ MULTISTEMMED SHRUBS → OFTEN ARIDAS

Anacardiaceae

TOXICODENDRON → URUSHIOL (OIL → SKIN IRRITANT)

T. radicans
poison ivy

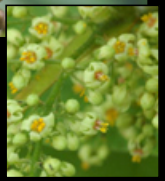
EAST

T. diversilobum
poison oak

WEST

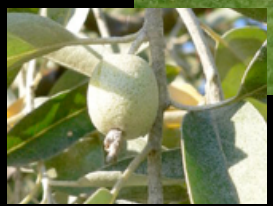
T. vernix
poison sumac

NE



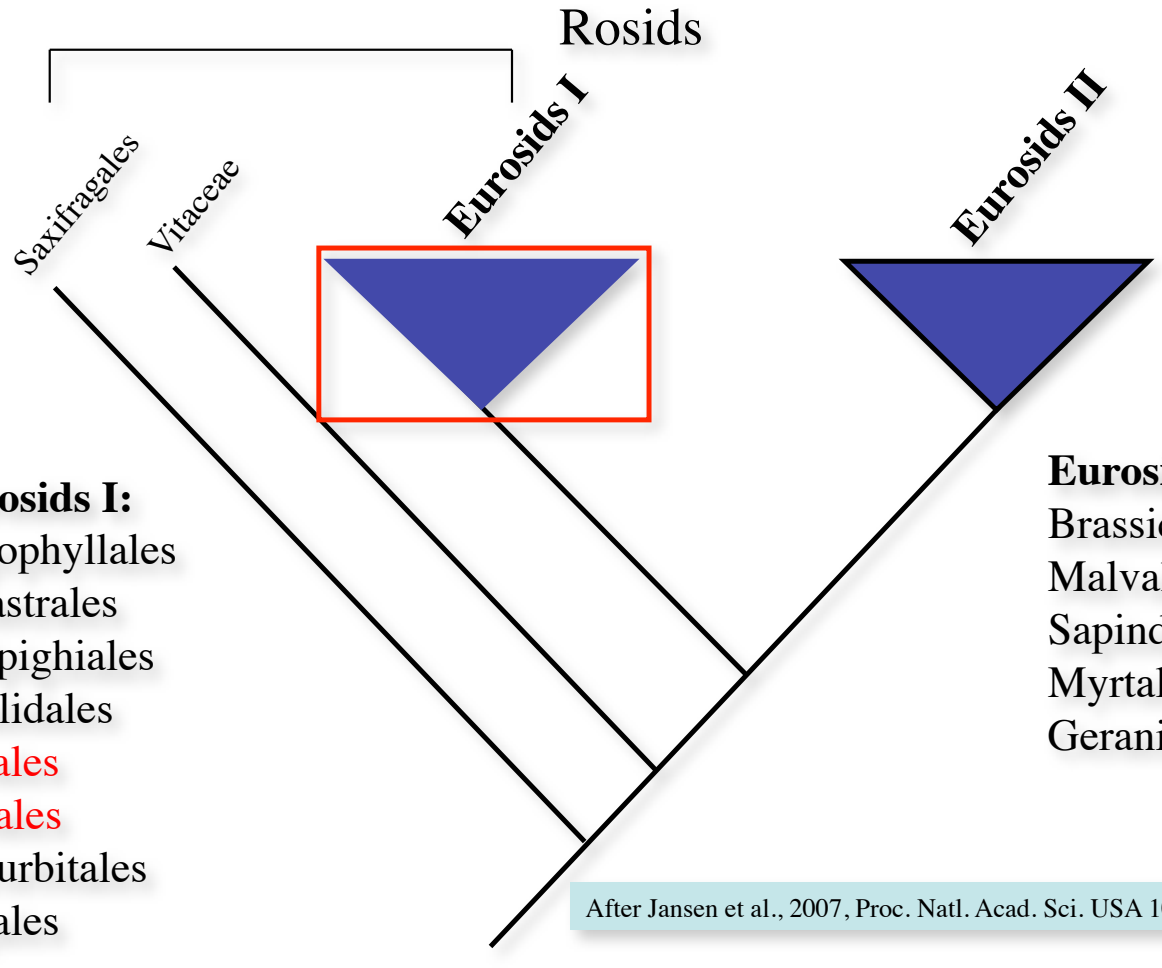
Elaeagnus angustifolia - Russian olive (Elaeagnaceae)

CULTIVATED
escaped
naturalized
invasive



PEST IN RIPARIAN ZONES!
+ DISTURBED AREAS

Phylogeny of Rosids



Eurosids I:
Zygophyllales
Celastrales
Malpighiales
Oxalidales
Fabales
Rosales
Cucurbitales
Fagales

Eurosids II:
Brassicales
Malvales
Sapindales
Myrtales
Geraniales

After Jansen et al., 2007, Proc. Natl. Acad. Sci. USA 104: 19369-19374

Rosaceae (Rose family)

Rosaceae – 90 genera/3000 species, including apples, pears, raspberries, blackberries, strawberries, plums, cherries, peaches, etc..

Woody or herbaceous;

Leaves usually compound, but sometimes simple; usually with stipules

Flowers actinomorphic;

Sepals and Petals 5, polypetalous;

Stamens many;

Hypanthium usually present;

Carpels 1 to many; ovary superior, inferior, or half inferior.

Fruit a drupelet, achene, pome, drupe, capsule, or follicle.

Rosaceae (Rose family)

Exochorda racemosa;

Fruit type: Follicle

A dry, dehiscent fruit composed of a single carpel and opening along a single side

Spiraea alba;

Fruit type: Capsule

A dry, dehiscent fruit composed of more than one carpel

Rosaceae (Rose family)

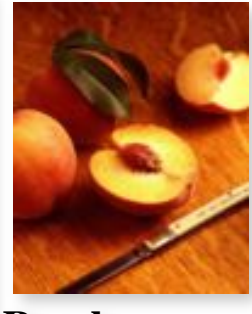
Apple; *Malus domestica;*

Pear; *Pyrus sp.;*

Fruit type: Pome

Fleshy, indehiscent, from cmp pistil
→ core surrounded by fleshy receptacle

Cherry;
Prunus avium



Peach;
Prunus persica

Plum;
Prunus domestica

Fruit type: Drupe

A fleshy, indehiscent fruit with a stony endocarp surrounding a usually single seed

Rosaceae (Rose family)

Rose; *Rosa sp.*

Fruit type: Hip

A berry-like structure composed of an enlarged hypanthium surrounding numerous achenes

Rosaceae (Rose family)

Prunus padus;

Note flowers are actinomorphic, numerous stamens,
1 carpel, and the hypanthium.
Subfamily: Prunoideae

Rosaceae (Rose family)

Malus hupehensis;

Note flowers are actinomorphic, numerous stamens, 2-5 carpels, inferior ovary fused with the hypanthium.

Subfamily: Pomoideae

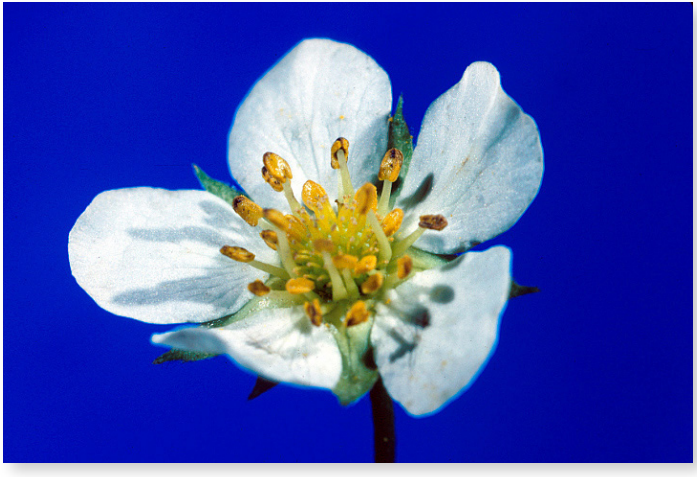
Pyrus serrulata;

Rosaceae (Rose family)

Exochorda racemosa;

Note flowers are actinomorphic, numerous stamens,
2-5 carpels, and the hypanthium.
Subfamily: Spiraeoideae

Rosaceae (Rose family)



Fragaria virginiana;

Note flowers are actinomorphic, numerous stamens, numerous pistils, and the hypanthium.

Subfamily: Rosoideae

Traditional classification within Rosaceae

Subfamilies	Carpels	→	Fruit type
Spiraeoideae	2-5 [free or connate]		follicle or capsule
Prunoideae (Amygaloideae)	1		drupe
Pomoideae (Maloideae)	2-5, inferior, connate		pome
Rosoideae	numerous [free]		achene or drupelet

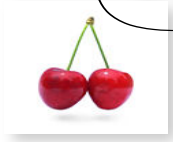
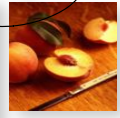
PHYSOCARPUS
HOLODISCUS

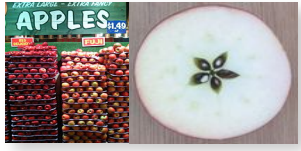
PRUNUS

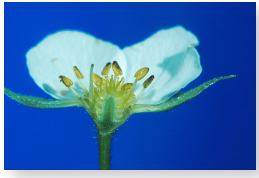
CRATAEGUS
AMELANCHIER





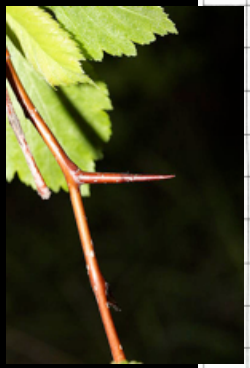



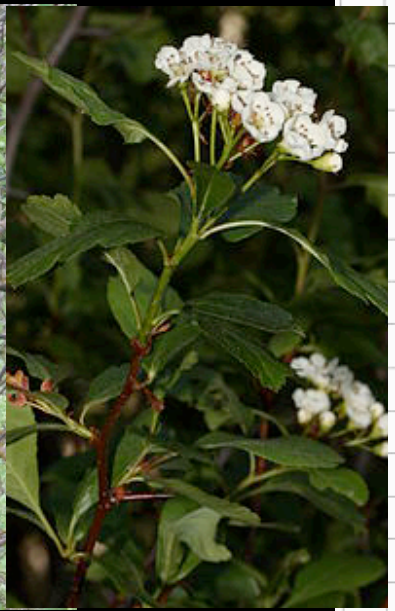




Amelanchier alnifolia - serviceberry

Crataegus douglasii - black hawthorn

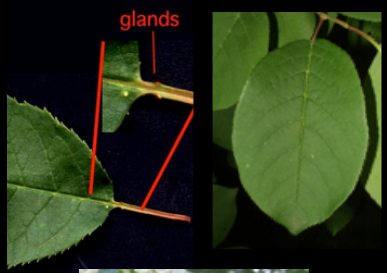




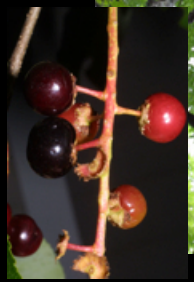
Prunus virginiana - chokecherry

Rosaceae - Prunoideae

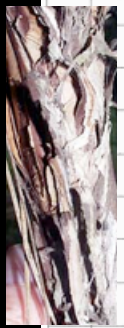
Prunus virginiana
chokecherry



Prunus serotina
black cherry



Physocarpus malvaceous - mallow ninebark



Holodiscus discolor - oceanspray

Fabaceae = Leguminosae (Legume or Bean family)

Fabaceae – 640 genera/18,000 species, 3rd largest family of angiosperm, including peas, beans, peanuts, soybeans, alfalfa, lupine, clover, etc..

N_2 Fixers → Mutualism w/ Rhizobium

Mostly woody tropical trees, but in temperate zone mostly herbs;

Leaves usually compound (pinnate, palmate, ternate), stipules present.

Flowers zygomorphic (Papilionoideae, Caesalpinoideae) or actinomorphic (Mimosoideae, common in tropics and not in temperate zones);

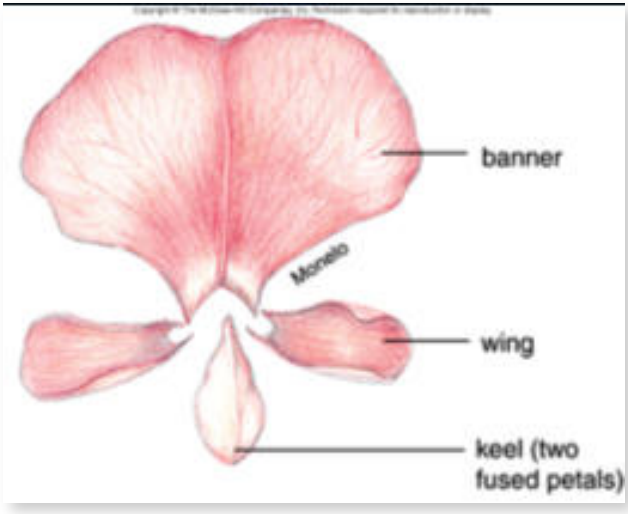
Sepals and Petals 5, polypetalous;

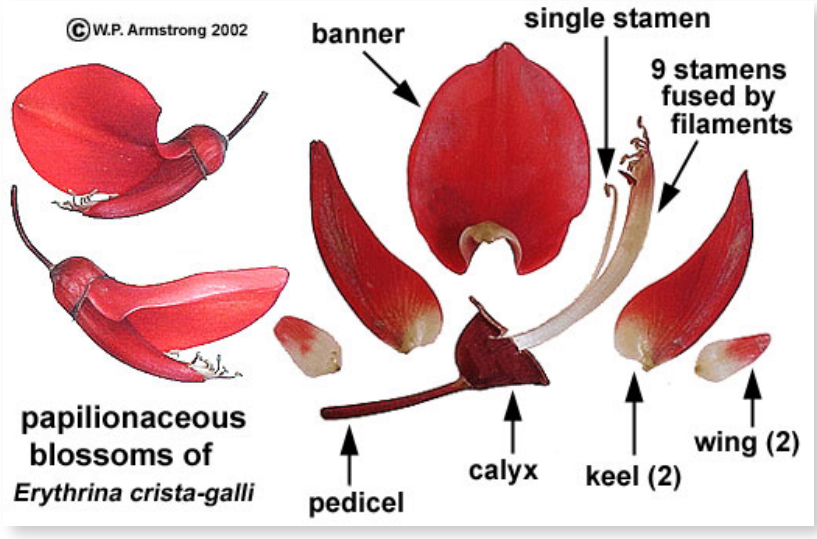
Stamens 10 (in Papilionoideae, diadelphous) or many;

Ovary superior (carpel 1);

Fruit a legume.

Fabaceae = Leguminosae (Legume or Bean family)





Note flowers are zygomorphic and showy, composed of a banner, two wings, and a keel (two fused petals); The 10 stamens are diadelphous (1+9).

Diadelphous: stamens united into two, often unequal, sets by their filaments.

Fabaceae = Leguminosae (Legume or Bean family)

Lathyrus latifolia;

Note the structure of the flower (a banner, two wings, and a keel) and 9 filaments united into a tube.

Fabaceae = Leguminosae (Legume or Bean family)

Cassia grandis;

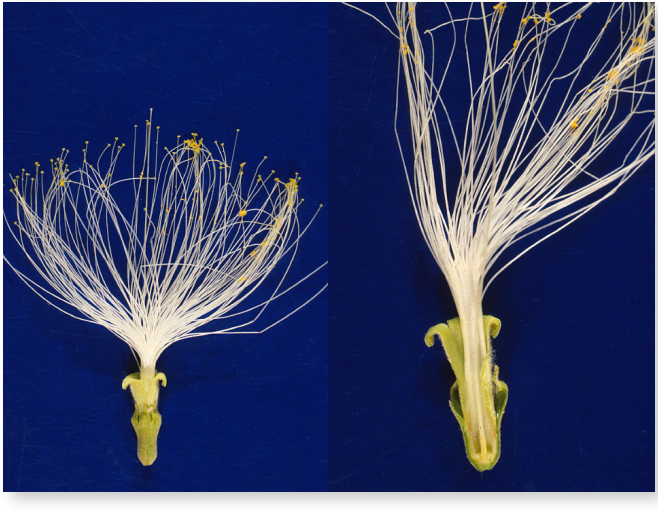
Chamaecrista fasciculata;

Note flowers are showy and more or less zygomorphic; the lower two petals are not fused; the 10 stamens are all free

Fabaceae = Leguminosae (Legume or Bean family)

Acacia nilotica;

Prosopis juliflora;



Note that each inflorescence has very dense flowers opening more or less simultaneously. Each individual flower is actinomorphic and not showy. Stamens many, with long exerted filaments, form a brush that covers visiting insects or birds with pollen.

Fabaceae = Leguminosae (Legume or Bean family)

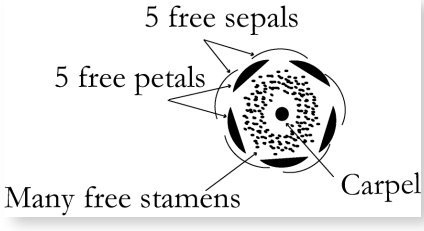
3 Subfamilies based on floral type:

Papilionoideae (Faboideae) flowers are typical pea/ "Flag" flowers:
bilaterally symmetric
conspicuous petal = banner for attraction
2 wings (that form a landing platform)
2 lower petals fused to form a "keel" (which encloses stamens & carpel)
diadelphous stamens (9 fused + 1 free)
[di = two]

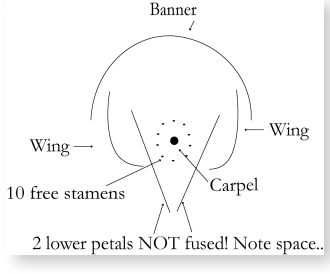
Flag Flower

•

Mimosoideae flowers are called "brush" flowers
radially symmetric
many stamens that are exerted on long filaments and
stamens form a brush that covers visiting insects or birds with pollen.



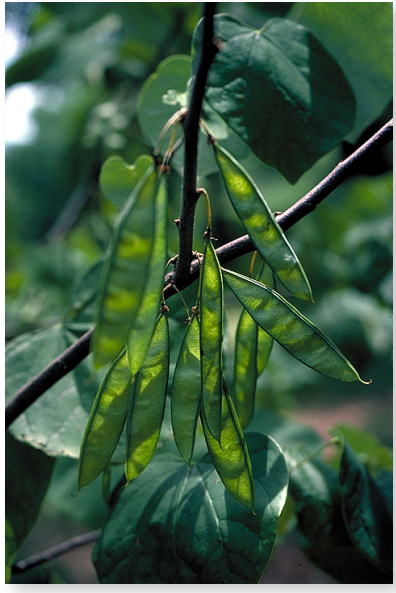
Caesalpinoideae flowers
bilaterally symmetric like flag flower
but the lower petals are NOT fused into a keel (5 free)
and the 10 stamens are all free



Fabaceae = Leguminosae (Legume or Bean family)

Pisum sativum;
Papilionoideae (Fabaoideae)

Albizia julibrissin;
Mimosoideae

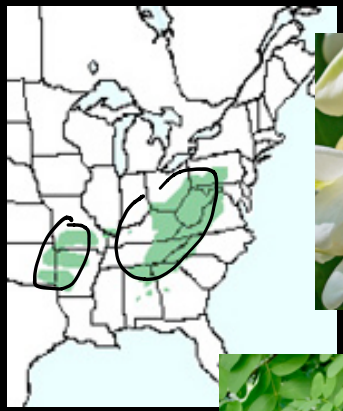


Cercis canadensis;
Caesalpinoideae

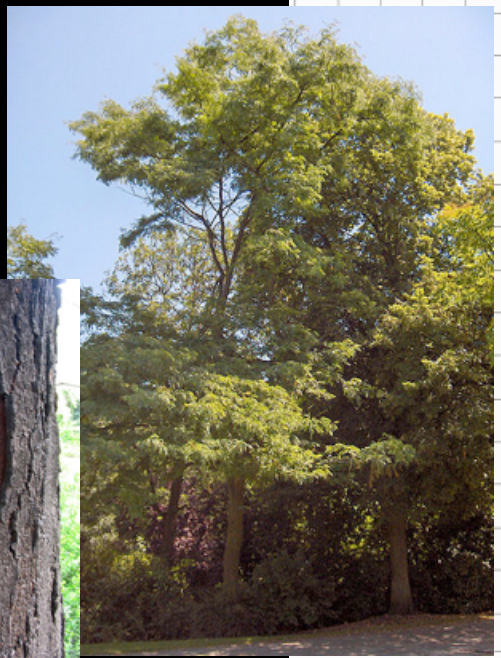
Note that although the flowers of these three traditionally recognized subfamilies are very different, the the fruits are essentially the same.

Legume: FLESHY OR DRY, DEHISCENT, OPEN ALONG A SINGLE, CONTINUOS SUTURE FROM 1 SIMPLE PISTIL

Robinia pseudoacacia - black locust



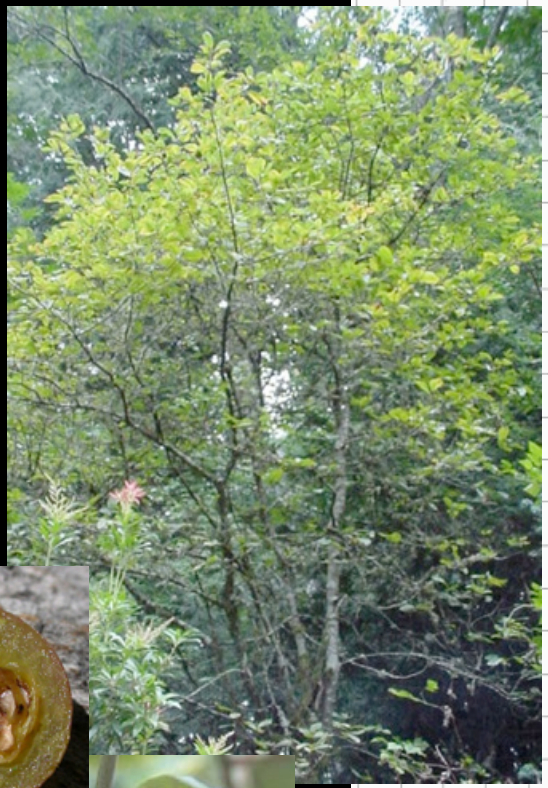
Gleditsia triacanthos - honeylocust



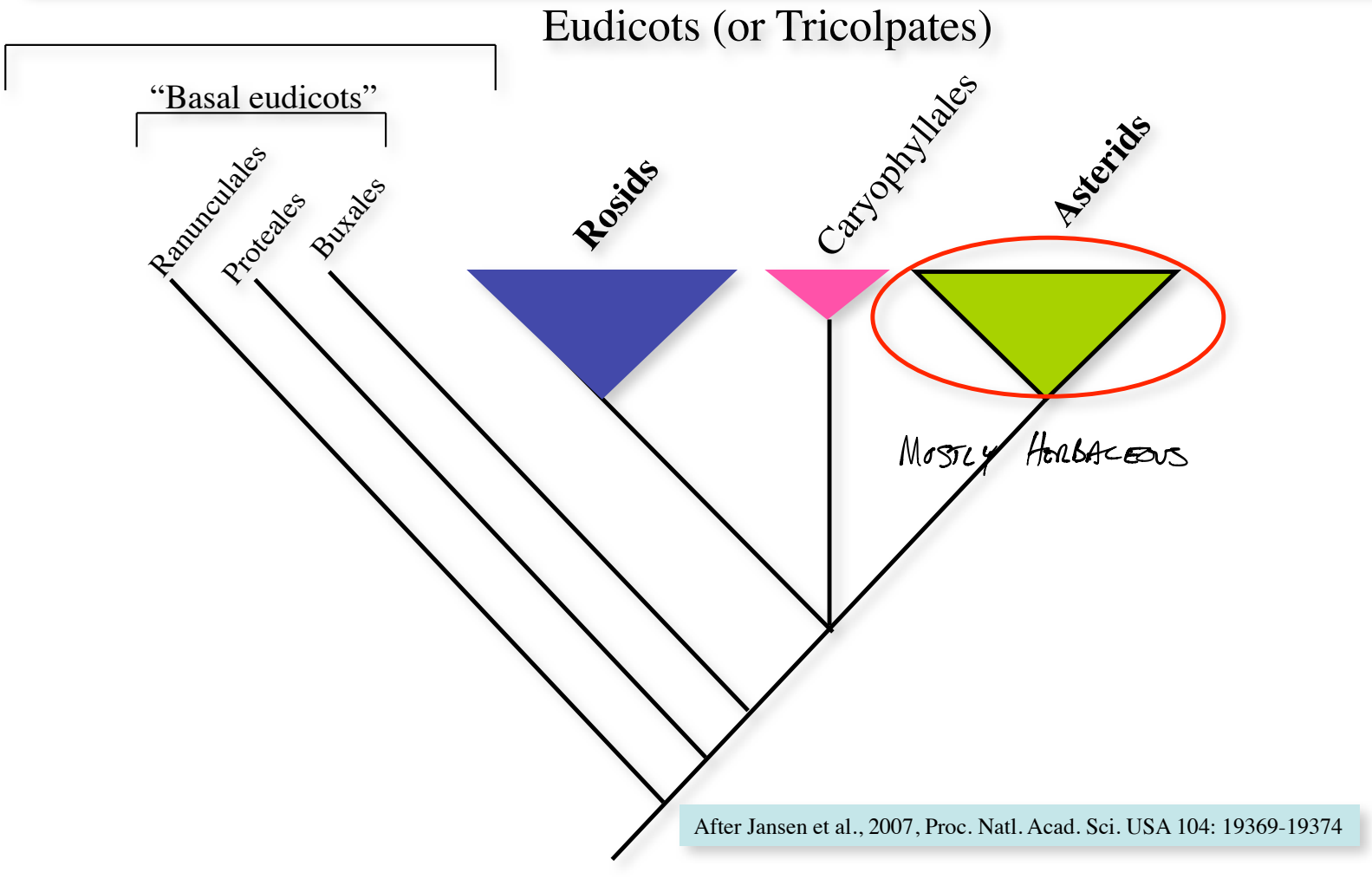
GLOMPHOTHERE HYPOTHESIS
- D JANZEN (ECOLOGIST)

NO N_2 FIXATION

Rhamnus purshiana - cascara (Rhamnaceae)

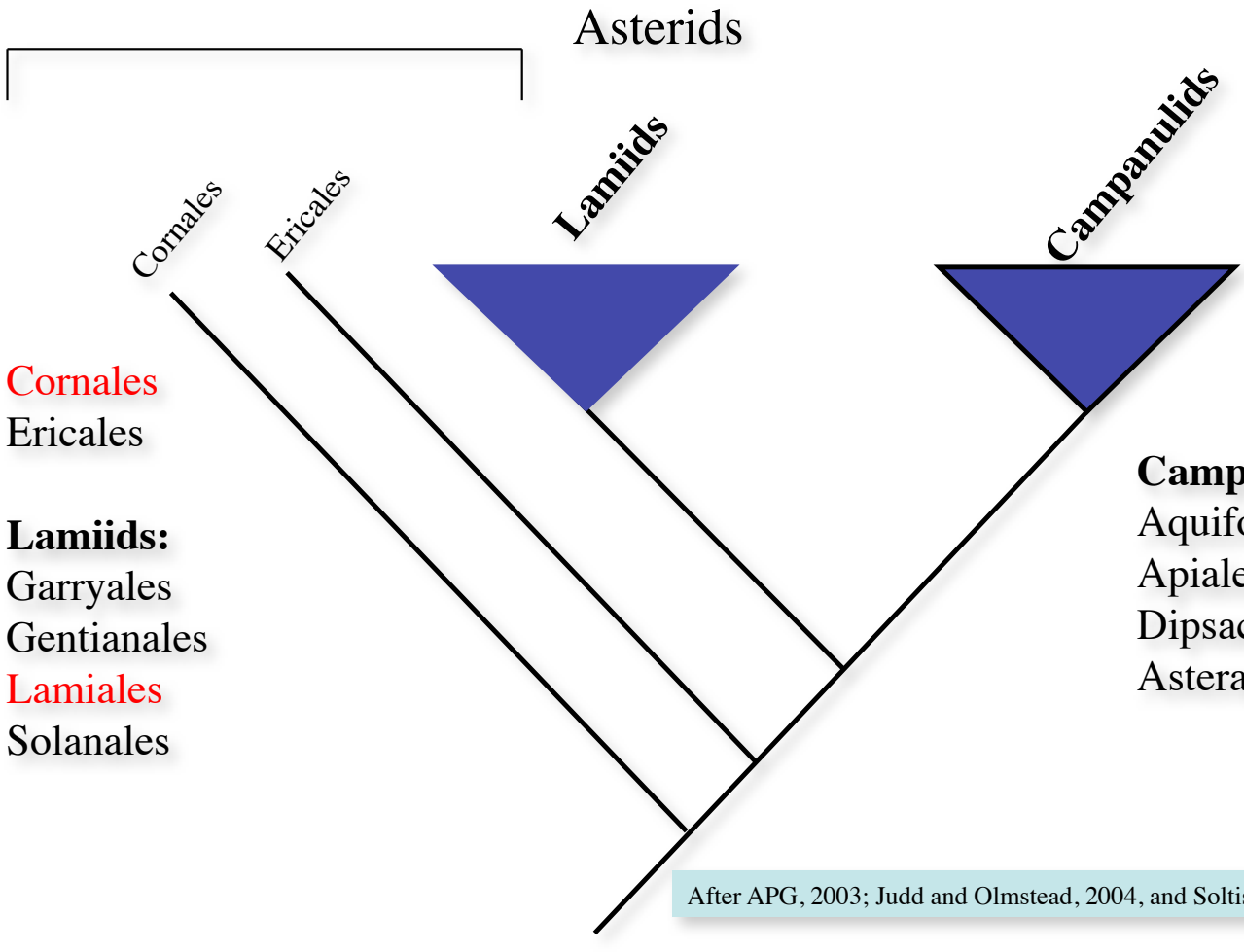


Phylogeny of Eudicots (or Tricolpates)



After Jansen et al., 2007, Proc. Natl. Acad. Sci. USA 104: 19369-19374

Phylogeny of Asterids



Cornales
Ericales

Lamiids:
Garryales
Gentianales
Lamiales
Solanales

Campanulids:
Aquifoliales
Apiales
Dipsacales
Asterales

After APG, 2003; Judd and Olmstead, 2004, and Soltis et al., 2005

Synapomorphies for Asterids and Core Asterids

Synapomorphies for Asterids:

Iridoid compounds;

Unitegmic ovules;

Tenuinucellate ovules.

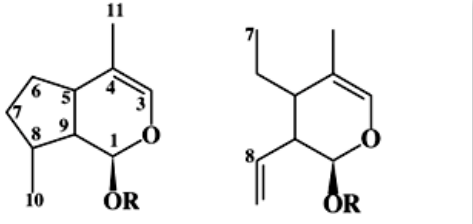


Figure 1. Numbering system for iridoid compounds (R= H or glucose).

Synapomorphies for Core Asterids (Lamiids + Campanulids):

Gamopetalous corollas;

A single whorl of stamens that alternate with the petal lobes;

Epipetalous stamens;

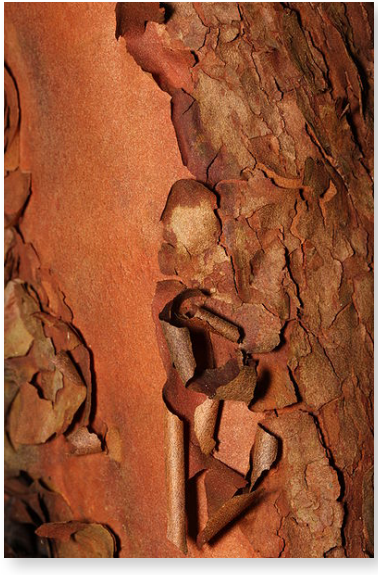
2 fused carpels.

Ericaceae (Rhododendron family)

Rhododendron macrophyllum

(Pacific Rhododendron, WA State Flower)

Ericaceae (Rhododendron family)



Arbutus menziesii

(Pacific madrone)

Ericaceae (Rhododendron family)

Vaccinium corymbosum;

The genus *Vaccinium* contains about 450 species, including blueberry, cranberry, huckleberry, etc..

N. hemisphere woody plant families with opposite leaves

A MAD CAP HORSE =

Adoxaceae (Elderberry family)

Maple family (Aceraceae, included in Sapindaceae s.l. now)

Ash family (Oleaceae)

Dogwood family (Cornaceae)

Caprifoliaceae (honeysuckle family)

Horse chestnut family (Hipposcastanaceae, included in Sapindaceae s.l. now)

Cornaceae (dogwood family)

Cornaceae – 7 genera/110 species - *Cornus* (dogwoods) and *Nyssa* (tupelo) with native representatives in US (7 spp., 4 SE US)

Trees, shrubs.

Leaves simple, opposite, arcuate venation (*Cornus* test).

Flowers actinomorphic.

usually 4 parted; corolla polypetalous.

ovary inferior;

Inflorescence often associated with several enlarged, showy, often petaloid bracts

Fruit a drupe.

Cornaceae (dogwood family)

Cornus sericea;

Note opposite leaves, arcuate venation

Cornaceae (dogwood family)

***Cornus* test**

note: other species will do this too, but good along with other characters!

Cornaceae (dogwood family)

Cornus florida;

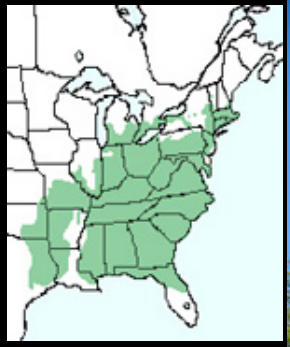
Note showy, petaloid bracts, small 4-parted flowers

Cornaceae (dogwood family)

Cornus florida;

Note drupaceous fruits; inferior ovaries

Cornus florida - flowering dogwood



Cornus nuttallii - Pacific dogwood

ASSOCIATION W/ MOSIC CONIFEROUS FORESTS

→ DISJUNCT IN RAINFORESTS OF IDAHO (SELWAY)

Cornus sericea - red-osier dogwood

RIPARIAN SPECIES

Oleaceae (Ash or Olive family)

Oleaceae- 24 genera/615 species, including *Fraxinus* (ash), *Syringa* (lilac), and *Olea* (olive). ***Fraxinus* has 65 spp. of temperate hardwoods (only important timber group in Oleaceae) – 17 spp. native to US. *Syringa* is a very important ornamental shrub/small tree. *Olea* is locally important as a timber source, *Olea europaea* is the species for cultivated olives.**

Woody, trees, shrubs, lianas.

Leaves opposite, simple, ternate, or pinnately compound.

Flowers actinomorphic, inflorescence often umbellate.

Perianth parts in 4's, connate (gamopetalous).

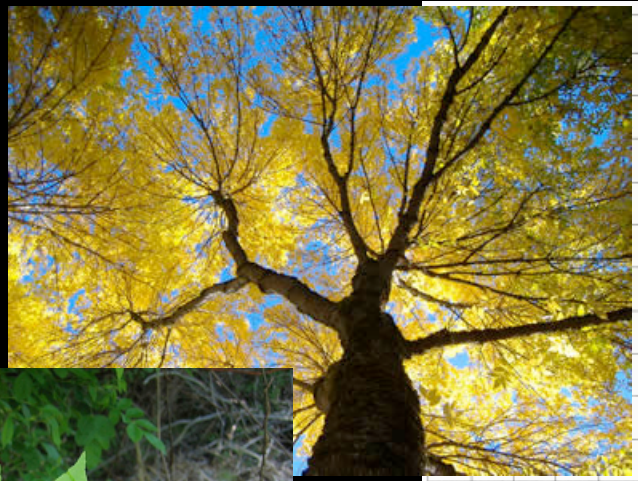
Stamens 2;

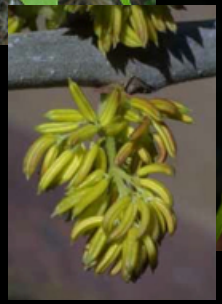
Carpels 2, connate;

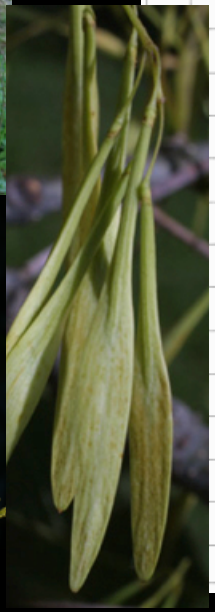
Ovary superior

Fruit a capsule, samara, berry, or drupe.

Fraxinus pennsylvanica - green ash







Syringa vulgaris - common lilac

N. hemisphere woody plant families with opposite leaves

HA, MAD CAP HORSE =

Hydrangeaceae (*Hydrangea* or mockorange [*Philadelphus*] family)

Adoxaceae (Elderberry family)

Maple family (Aceraceae, included in Sapindaceae s.l. now)

Oleaceae (**A**sh family)

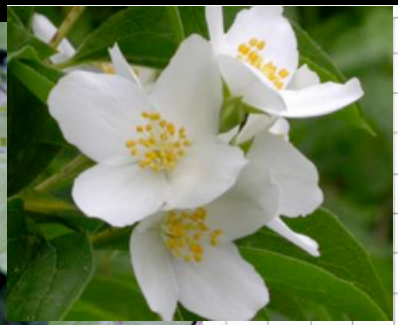
Dogwood family (Cornaceae)

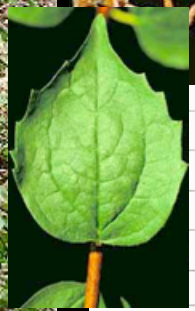
Caprifoliaceae (honeysuckle family)

Horse chestnut family (Hipposcastanaceae, included in Sapindaceae s.l. now)

Hydrangeaceae

Philadelphus lewisii - mockorange (Syringa in north ID)





Adoxaceae (Elderberry family)

Adoxaceae - 5 genera/245 species, including Viburnum and elderberry.
***Viburnum* has 220 spp., many of which are popular horticultural plants; *Sambucus* (elderberry) has 20 spp. The other three genera have 5 spp. together.**

Viburnum and *Sambucus* are woody, the other 3 genera (5 spp.) are herbaceous.

Leaves opposite, simple, trifoliate, or pinnately compound.

Flowers actinomorphic, inflorescence often umbellate.

Petals (4-) 5, connate, with usually short corolla tube and well developed lobes.

Stamens 5;

Carpels 3-5, connate, **styles short**, stigma capitate;

Ovary inferior

Fruit a drupe.

Adoxaceae (Elderberry family)

Sambucus canadensis; elderberry

Adoxaceae (Elderberry family)

Viburnum sargentii;

Note the peripheral sterile flowers; You may think this is Hydrangea at the first glance — they do look very similar, but Hydrangea usually with floral parts 4, and corolla are polypetalous!

Adoxaceae (Elderberry family)

Sambucus canadensis;

Viburnum lentago;

Plants in Adoxaceae have quite universal flower morpholgy. Note the 5 petals are connate (fused) with usually short corolla tube and well developed corolla lobes. Stamens 5.

Adoxaceae (Elderberry family)

Viburnum carlesii;

Note the inferior ovary and the **short style** with capitate stigma