Plants for Honey Bees in the North Carolina Piedmont

Alamance County Beekeepers
March 20, 2024

ALAMANCE COUNTY BEEKEEPERS

Plants for Honey Bees

- ✓ What do honey bees forage for?
- ✓ Honey Bee Vision
- ✓ Importance of bees as pollinators
- ✓ Parts of a Flower
- ✓ Bee forage regions of North America and Eco-Regions of NC
- ✓ Nectar Sources Lists
- ✓ Floral Fidelity
- ✓ Photos of the NC Piedmont Primary Nectar and Pollen Plants
- ✓ Secondary Nectar and Pollen Supportive Plants
- ✓ Reference Materials

What Do Honey Bees Forage For?

- ✓Water
- ✓Pollen – Source of Protein (along with amino acids, lipids, and minerals)
- ✓Nectar – Source of Carbohydrates
- ✓Resins and saps
- ✓Honeydew

Water

- ✓Hydration
- ✓Keeping the hive cool during hot weather (evaporative cooling)
- ✓Thinning and de-crystallizing honey

Pollen

- Bee field gathered
- Primary food source
  - 40-60% Simple sugars
  - 20-60% Proteins
  - 3% Minerals
  - 3% Vitamins
  - 1-32% Fatty acids
- Stored in brood cells, mixed with saliva and sealed with a drop of honey. (Bee bread)

Nectar

The importance of *pollen* to bees as a *protein* source goes hand in hand with *nectar* as the primary *carbohydrate* source to bees from a multitude of flower producing plants.

Resins and Saps

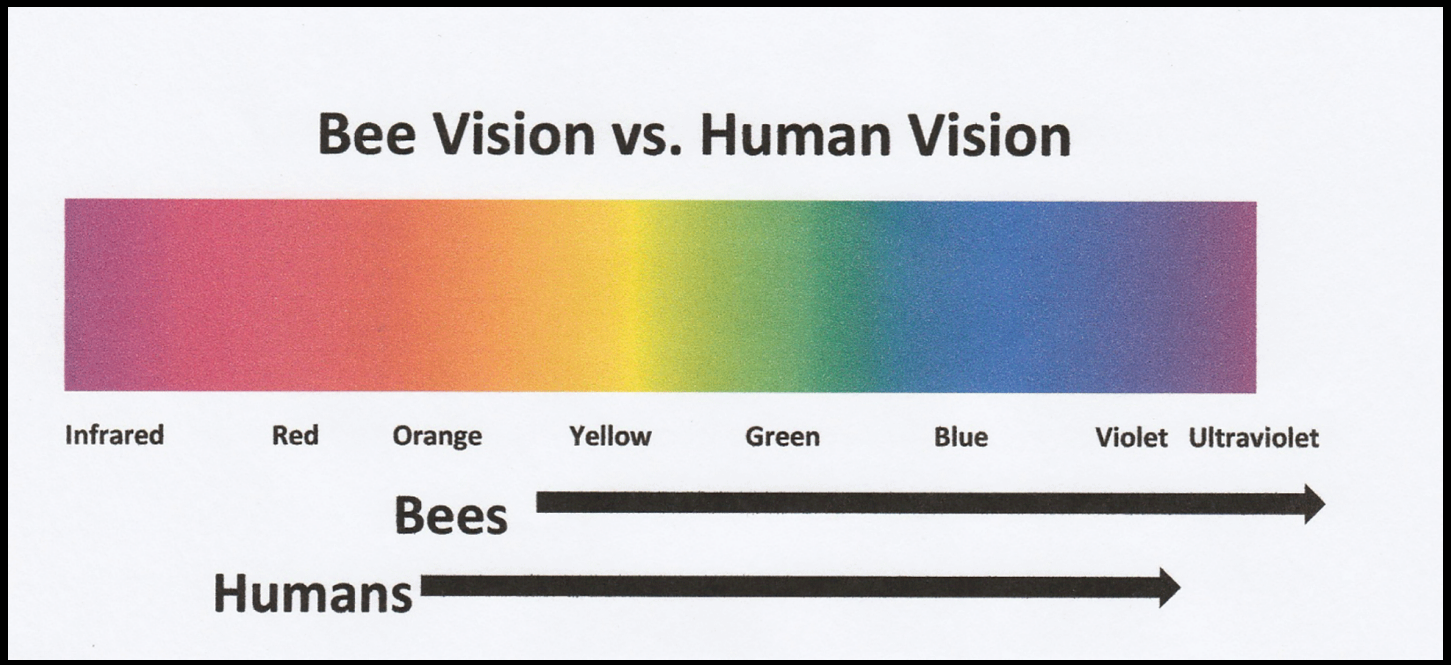
- ✓Collected from around the leaf buds
- ✓Resin exuded to protect the young leaves from fungi and other diseases
- ✓Combined with wax to make propolis (bee glue)

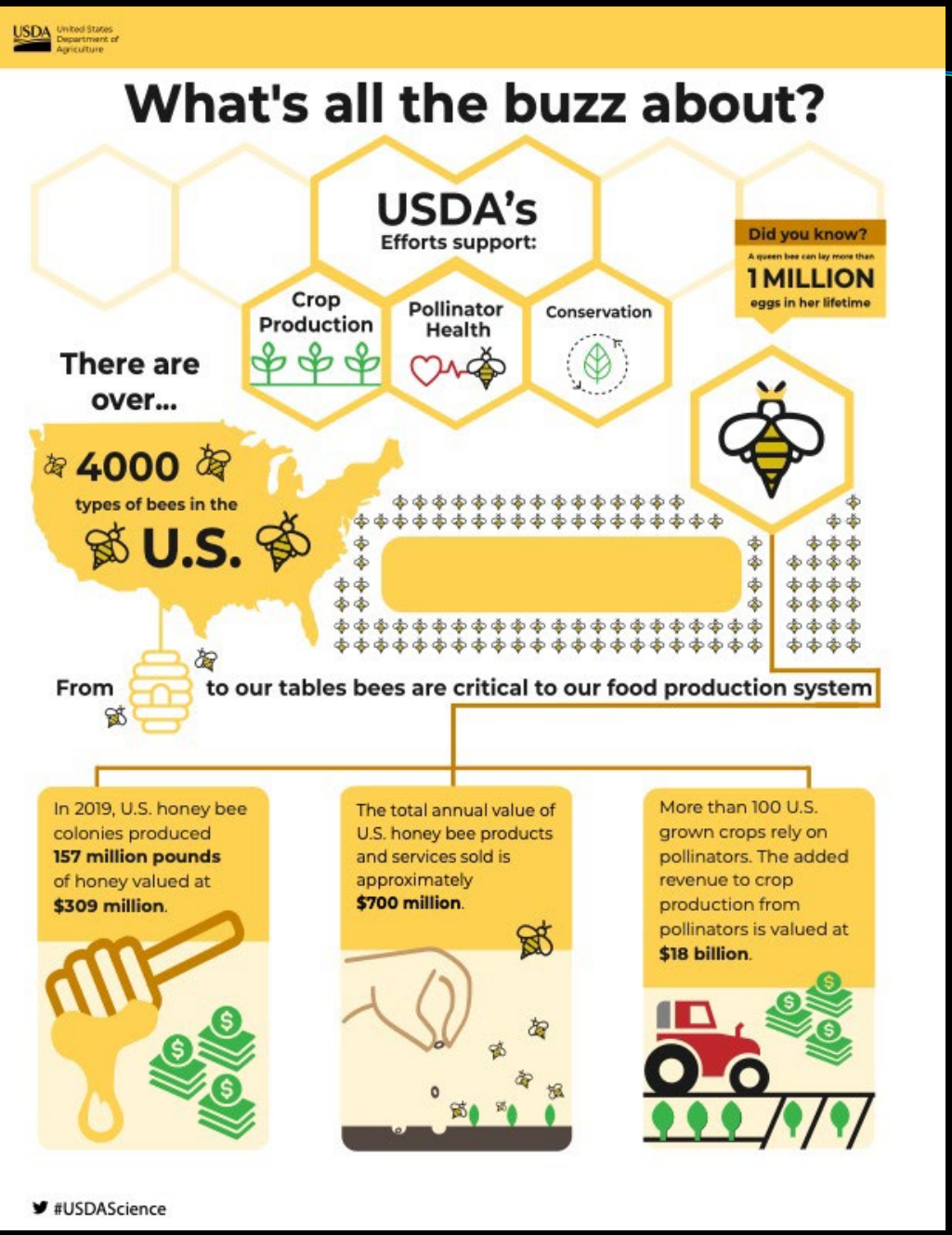
Honeydew

- ✓Insect secretions from Aphids
- ✓Aphids gather nectar from flowers, leaves and tree buds
- ✓“Honeydew honey”
- ✓Rich in enzymes and minerals

Honey Bee Vision

- ✓Bees have a 280 degree field of vision (humans have 180 degrees)
- ✓Very good at distinquishing light and dark, which helps them to see edges, helping them identify different shapes
- ✓Many flowers have distinctive ultraviolet color patterns (“landing zones”) which point them to the part of the flower containing pollen and nectar





Peach Blossom Pollination (?)

European Honey Bee (*Apis mellifera*)

CALIFORNIA GROWS NEARLY 80% OF THE WORLD'S ALMONDS

Almonds (*Prunus amygdalus*)
A tree native to Iran

Franz Eugen Köhler, *Köhler's Medizinal-Pflanzen 1887*

POLLINATORS & AGRICULTURE

A Partnership on the Land

Pollinators are essential to agriculture.
Los polinizadores son esenciales en agricultura.
Les pollinisateurs sont essentiels à l'agriculture.

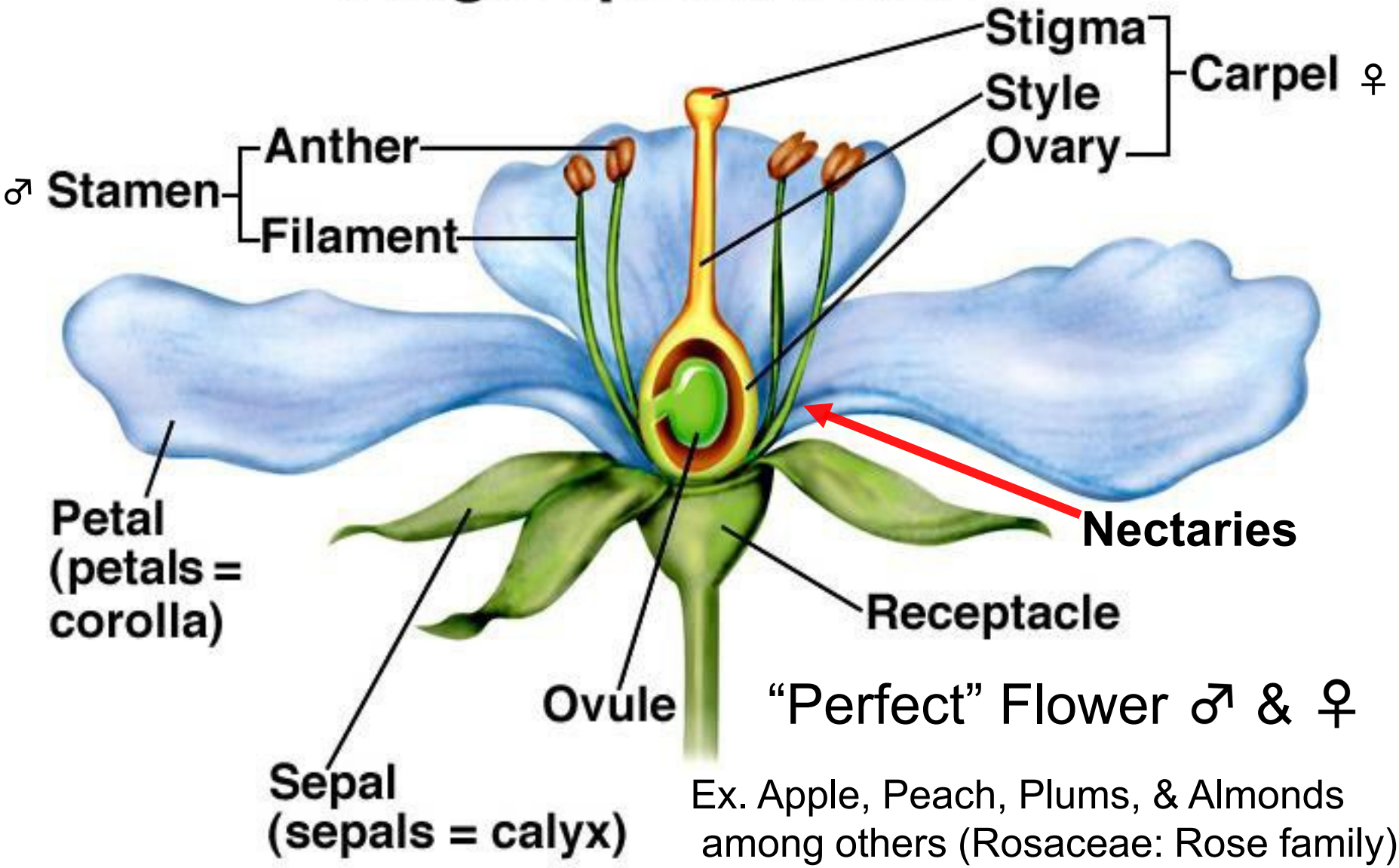
Pollinator-friendly Best Management Practices promote pollinator populations and pollinator diversity in agricultural landscapes, resulting in important benefits to farmers.

Learn more at | Más información en | En savoir plus

www.pollinator.org

POLLINATOR PARTNERSHIP
Monarch Watch.org
NATIONAL MUSEUM of NATURAL HISTORY
ABF
ShopRite
NAPPC
BASF
Fresh Energy
CropLife
syngenta
WILDLIFE HABITAT COUNCIL
USDA National Institute of Food and Agriculture
U.S. DEPARTMENT OF AGRICULTURE
NATIVE PLANTS
TOYOTA
EPRI ELECTRIC POWER RESEARCH INSTITUTE
EEI Edison Electric Institute
BAYER
ISCA
MITSUI CHEMICALS AGRO, INC.
United States Botanic Garden
VESTARON
American Honey Producers Association
GreenLight BIOSCIENCES
THE J.M. SMUCKER Co
BOEING
USDA United States Department of Agriculture
Natural Resources Conservation Service
APHIS
Pheasants Forever
Quail Forever
california almonds
Almond Board of California

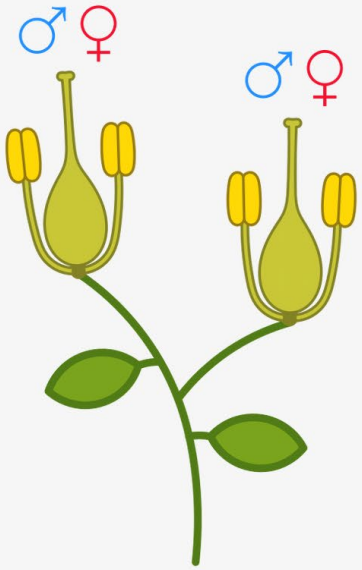
Angiosperm Flower



"Perfect" Flower ♂ & ♀

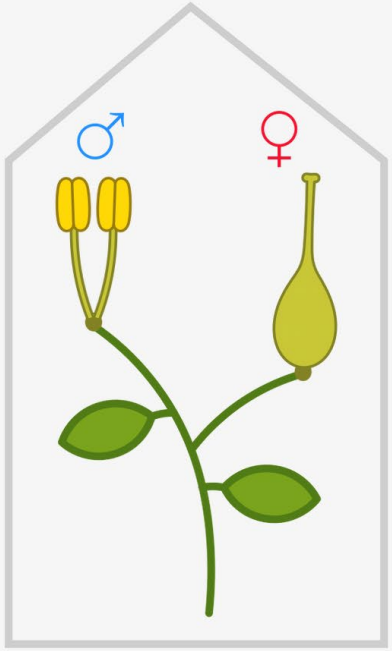
Ex. Apple, Peach, Plums, & Almonds among others (Rosaceae: Rose family)

Dioecious vs Monoecious



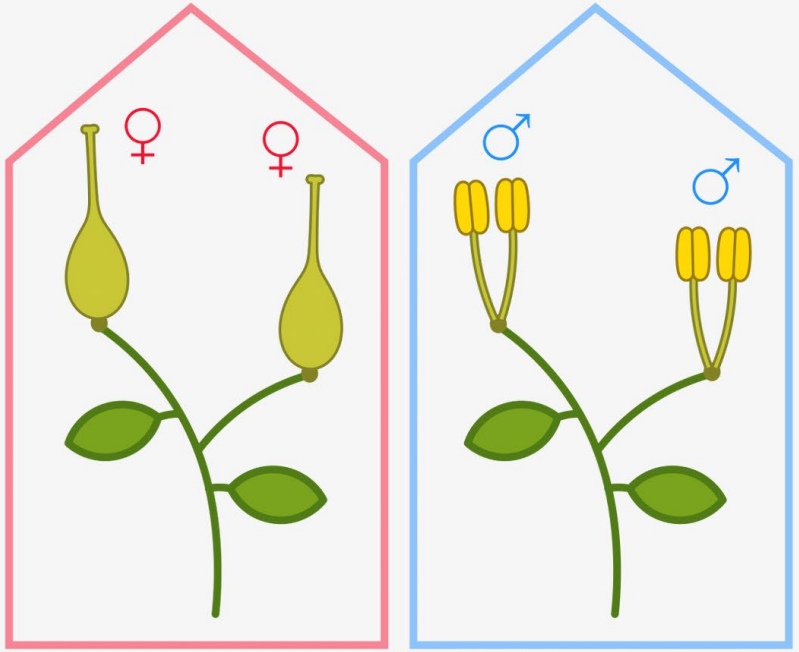
Perfect Flowers

- Red Bud
- Almonds
- Cherry
- Plum
- Cherry
- Apple
- Pear



Monoecious (one house)

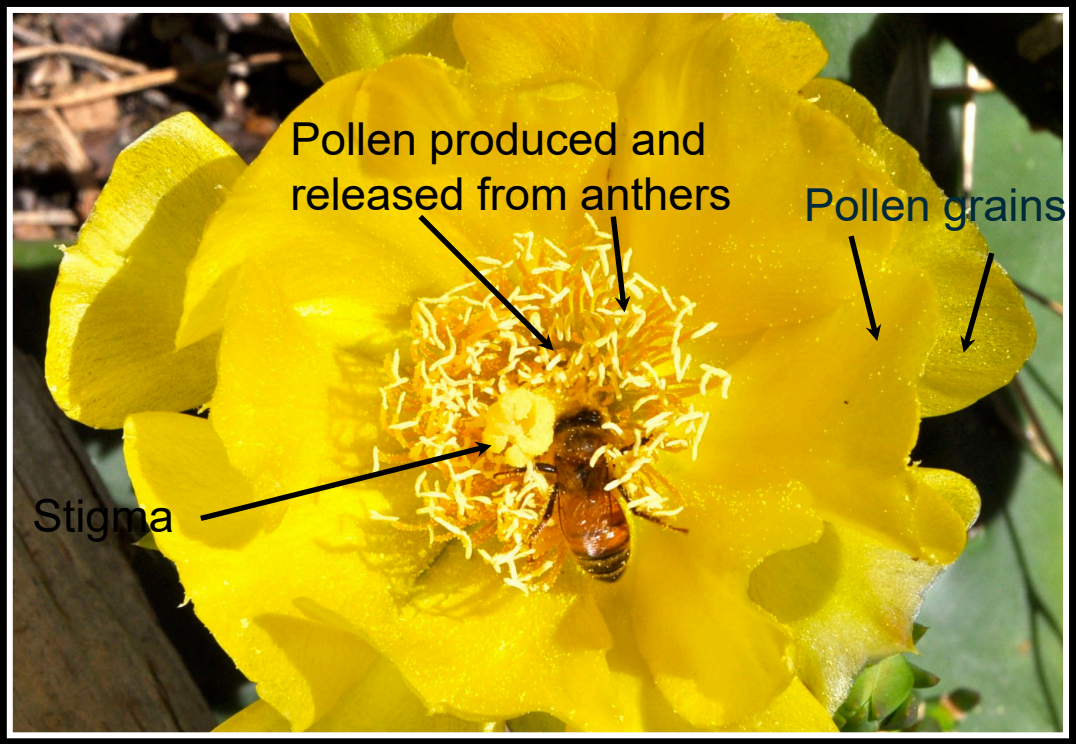
- Hazelnut
- Oak
- Pine
- Cedar
- Sweetgum
- Birch
- Corn
- Squash

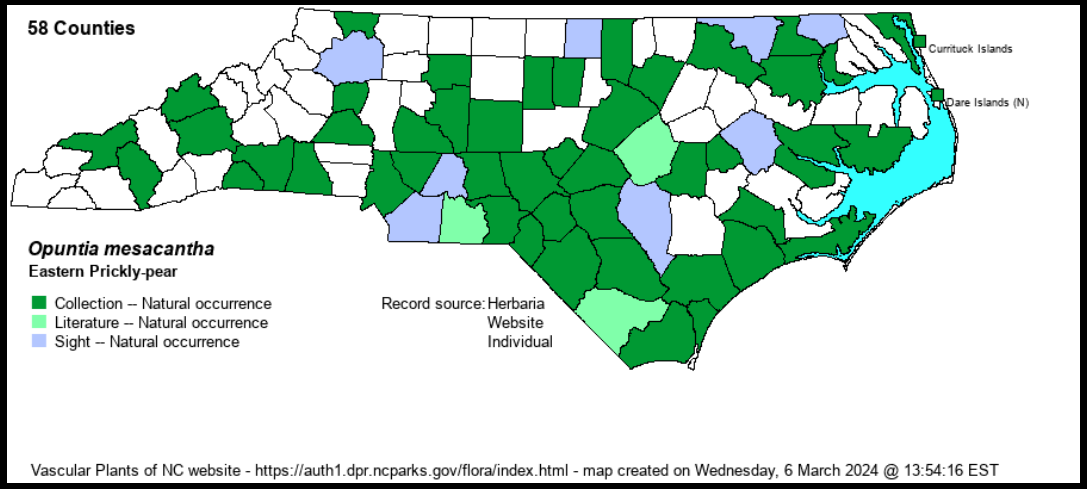


Dioecious (double house)

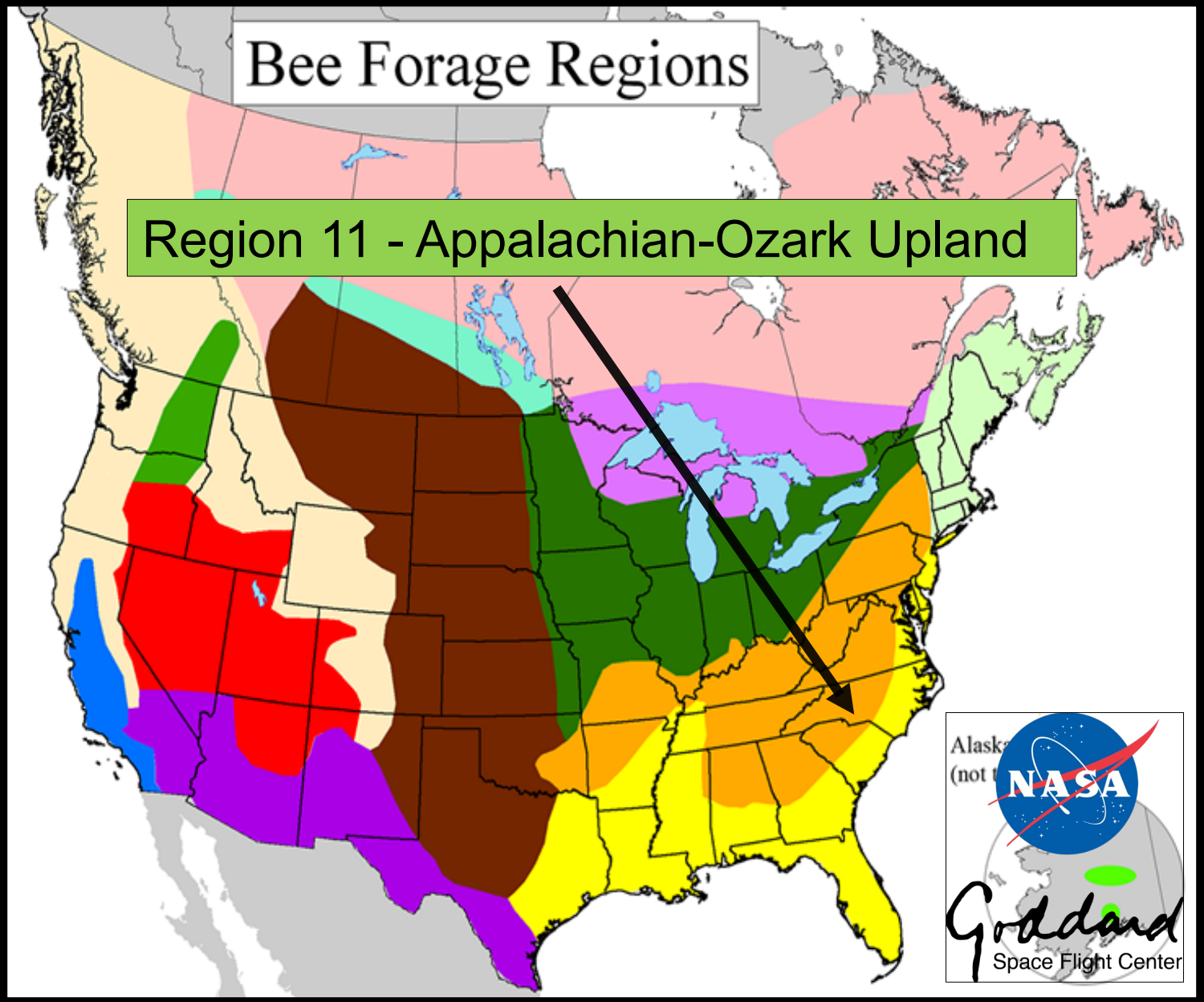
- Red Maple
- Willow
- Ash
- Holly
- Spicebush
- Persimmon
- Mulberry

Eastern Prickly-pear Cactus

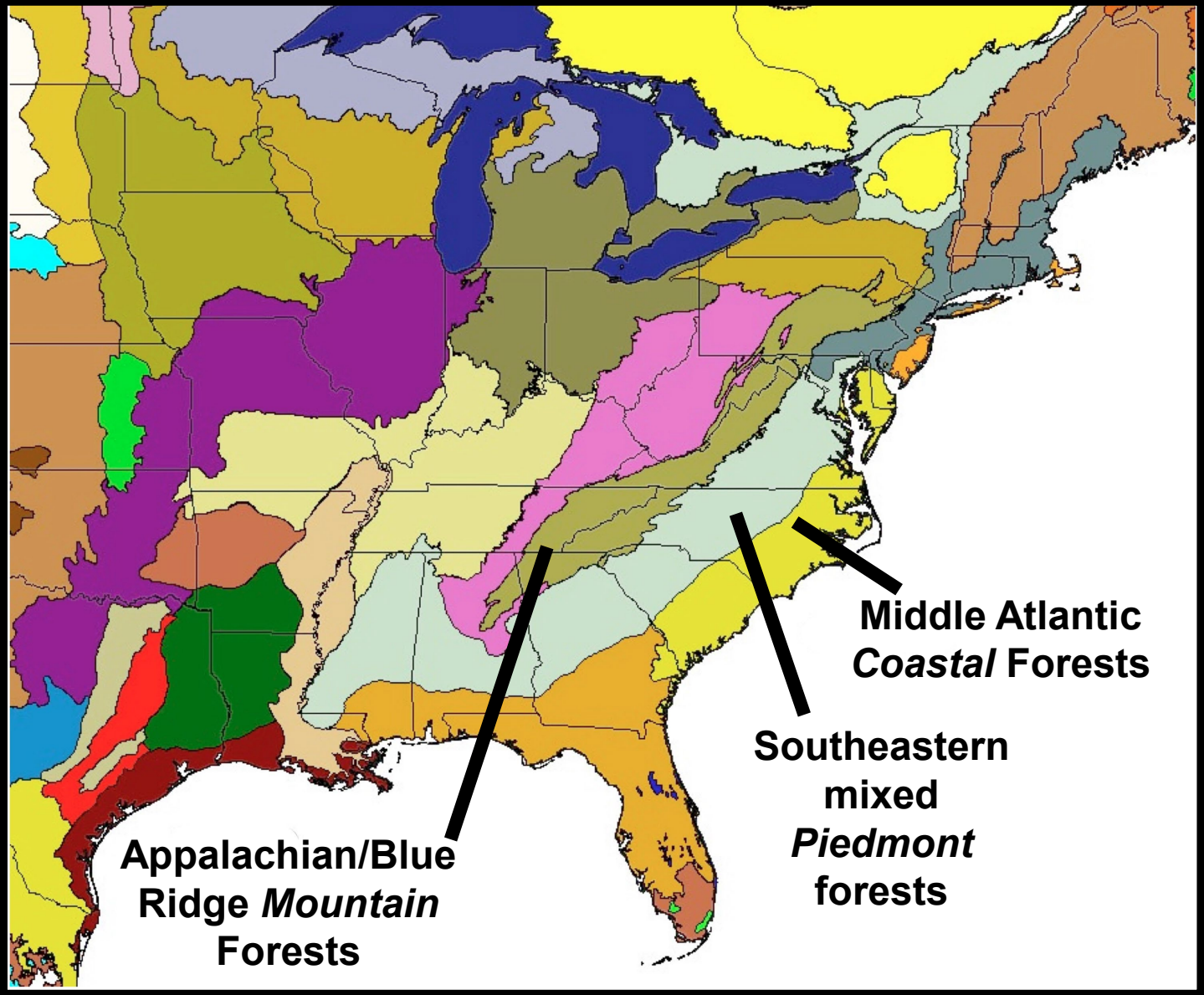




14 Regions of the Ayers and Harman honey bee forage map for North America



Three North American Eco-regions of NC



+ SCALE HIVES & CLIMATE | + HONEY BEES | + SITE DATA | + NEWS | + LINKS

List of Honey Bee Forage Species within Region 11 for the State of NC

Ordered by Begin Bloom Month https://honeybeenet.gsfc.nasa.gov/Honeybees/ForageRegion.php?StReg=NC_11

RETURN to map

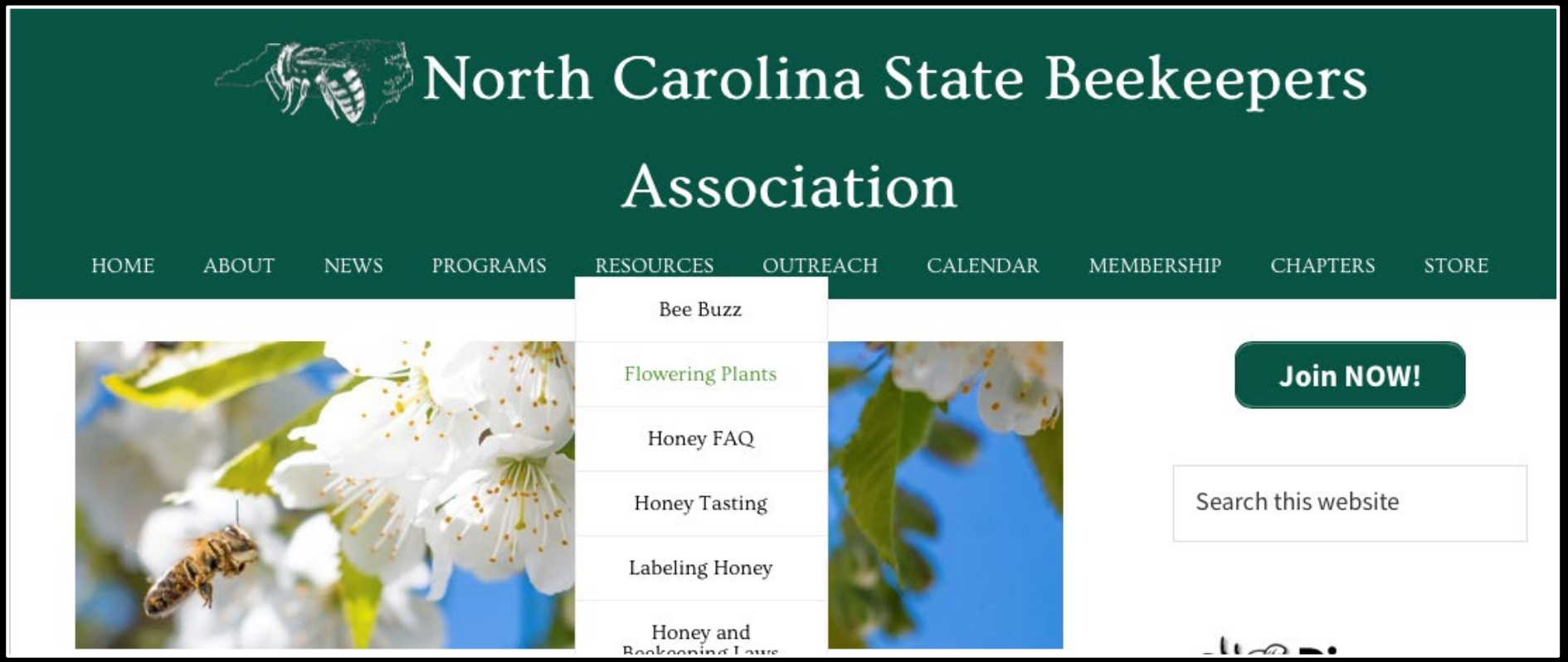
USDA code	Family	Latin Name	Common Name	Plant Type	Begin Bloom Month	End Bloom Month	Sig
STELL	Caryolphyllaceae	*Stellaria*	Chickweed, stitchwort	F	1	12	N
TAOFC	Asteraceae	*Taraxacum*	Dandelion, blow-balls	F	2	10	N
VACCI	Ericaceae	*Vaccinium*	Blueberry, huckleberry	SDB	2	6	N
ACER	Aceraceae	*Acer*	maple	TDB	2	6	N
ALNUS	Betulaceae	*Alnus Mill.*	Alder	TDB	2	5	N
PRUNU	Rosaceae	*Prunus*	Plum (cultivated)	C	3	5	N
VICIA	Fabaceae	*Vicia*	Vetch, tare	F	3	10	N
RUBUS	Rosaceae	*Rubus*	Blackberry	S, C	3	6	Y
RUBUS	Rosaceae	*Rubus*	Blackberry	S, C	3	6	N
CERCI2	Fabaceae	*Cercis*	Redbud, judas tree	TDB	3	5	N
MALUS	Rosaceae	*Malus*	Apple	TDB	3	5	N
SALIX	Salicaceae	*Salix*	Willow, osier	TDB	3	6	N
PRAV	Rosaceae	*Prunus*	Cherry (cultivated)	TDB,C	3	5	N
ILEX	Aquifoliaceae	*Ilex*	Holly, yaupon	TEB	3	6	Y
FRAGA	Rosaceae	*Fragaria _ananassa*	Strawberry	F	4	5	N
MELIL	Fabaceae	*Melilotus*	Sweet clover (white/yellow)	F	4	10	N
TRHY	Fabaceae	*Trifolium hybridum*	Alsike clover	F	4	9	N
TRIN3	Fabaceae	*Trifolium incarnatum*	Crimson / Italian clover	F	4	7	N
TRPR2	Fabaceae	*Trifolium pratense*	Red clover	F	4	9	N
TRRE3	Fabaceae	*Trifolium repens*	White, dutch clover	F	4	10	N
SALVI	Lamiaceae	*Salvia*	Sage, romona	F, C	4	6	N
LIGUS2	Oleaceae	*Ligustrum*	Privet, hedge plant	S	4	7	N
RIBES	Saxifragaceae	*Ribes*	Currant	SDB	4	6	N
AESCU	Hippocastanaceae	*Aesculus*	Buckeyes and horse chestnuts	TDB	4	6	N
GLTR	Fabaceae	*Gleditsia triacanthos*	Honey and sweet locust, honeyshuck	TDB	4	6	N
LITU	Magnoliaceae	*Liriodendron tulipifera*	Tulip tree, poplar, whitewood	TDB	4	6	Y
PRAV	Rosaceae	*Prunus*	Cherry (uncultivated)	TDB	4	5	N
QUERC	Fagaceae	*Quercus*	Oak	TDB	4	5	N
ROPS	Fabaceae	*Robinia pseudoacacia*	Black locust, false acacia, yellow locust	TDB	4	6	Y
SAMBU	Caprifoliaceae	*Sambucus*	Elderberry, elder	TDB, S	4	7	N
LONIC	Caprifoliceae	*Lonicera*	honeysuckle	V	4	9	N
CILAL	Cucurbitaceae	*Citrullus lanatus*	watermelon	C	5	8	N
CUCUR	Cucurbitaceae	*Cucurbita L.*	Pumpkin, squash, gourd	C	5	9	N
CUME	Cucurbitaceae	*Cucumis melo*	Cantaloupe, muskmelon, casaba,	C	5	8	N
ASCLE	Asclepiadaceae	*Asclepias*	Milkweed, butterfly flower	F	5	9	N
BAVU	Brassicaaceae	*Barbarea vulgaris*	Yellow rocket, winter cress	F	5	6	N
HELEN	Asteraceae	*Helenium*	Bitterweed, sneezeweed	F	5	10	N
MONAR	Lamiaceae	*Monarda*	Horsemint, wild bergamot, bee-balm	F	5	9	N
POLYG4	Polygonaceae	*Polygonum*	Smartweed, knotweed, fleece flower	F	5	11	N
FAES2	Polygonaceae	*Fagopyrum esculentum*	Buckwheat, brank	F, C	5	10	N
RHUS	Anacardiaceae	*Rhus*	Sumac, sugar bush, lemonade berry	S	5	8	N
DIVI5	Ebenaceae	*Diospyros virginiana*	Persimmon, possumwood, date plum	TDB	5	6	N
TILIA	Tiliaceae	*Tilia*	Basswood, lime tree, whitewood	TDB	5	7	Y
CUSA4	Cucurbitaceae	*Cucumis sativus*	cucumber	C	6	9	N
ZEMAM2	Poaceae	*Zea mays*	Corn, maize	C	6	9	N
ASTER	Asteraceae	*Aster*	Aster	F	6	11	Y
BIDEN	Asteraceae	*Bidens*	Spanish needles, beggar-ticks, bur marigold, stick-tights, pitchforks, tickseed	F	6	10	N
CIRSI	Asteraceae	*Cirsium*	Thistles	F	6	10	N
EUPEP	Asteraceae	*Eupatorium*	Boneset, joe-pye weed	F	6	10	N
HELIA3	Asteraceae	*Helianthus*	Sunflower	F	6	10	N
LYSA2	Lythraceae	*Lythrum salicaria*	Loosestrife, purple loosestrife	F	6	9	N
OXAR	Ericaceae	*Oxydendrum arboreum*	Sourwood, sorrel tree, titi	TDB	6	7	Y
VIUN	Fabaceae	*Vigna unguiculata*	Cowpea, black-eyed pea	C	7	8	N
AGAST	Lamiaceae	*Agastache*	Anise hyssop, blue hyssop	F	7	9	N
SOLID	Asteraceae	*Solidago*	Goldenrod	F	7	11	Y

Significant Nectar Sources Region 11 North Carolina

- Blackberry (*Rubus*)
- Holly (*Ilex*)
- Tulip Tree (*Liriodendron*)
- Black Locust (*Robinia*)
- Basswood (*Tilia*)
- Aster (*Aster*)
- Sourwood (*Oxydendrum*)
- Goldenrod (*Solidago*)

https://honeybeenet.gsfc.nasa.gov/

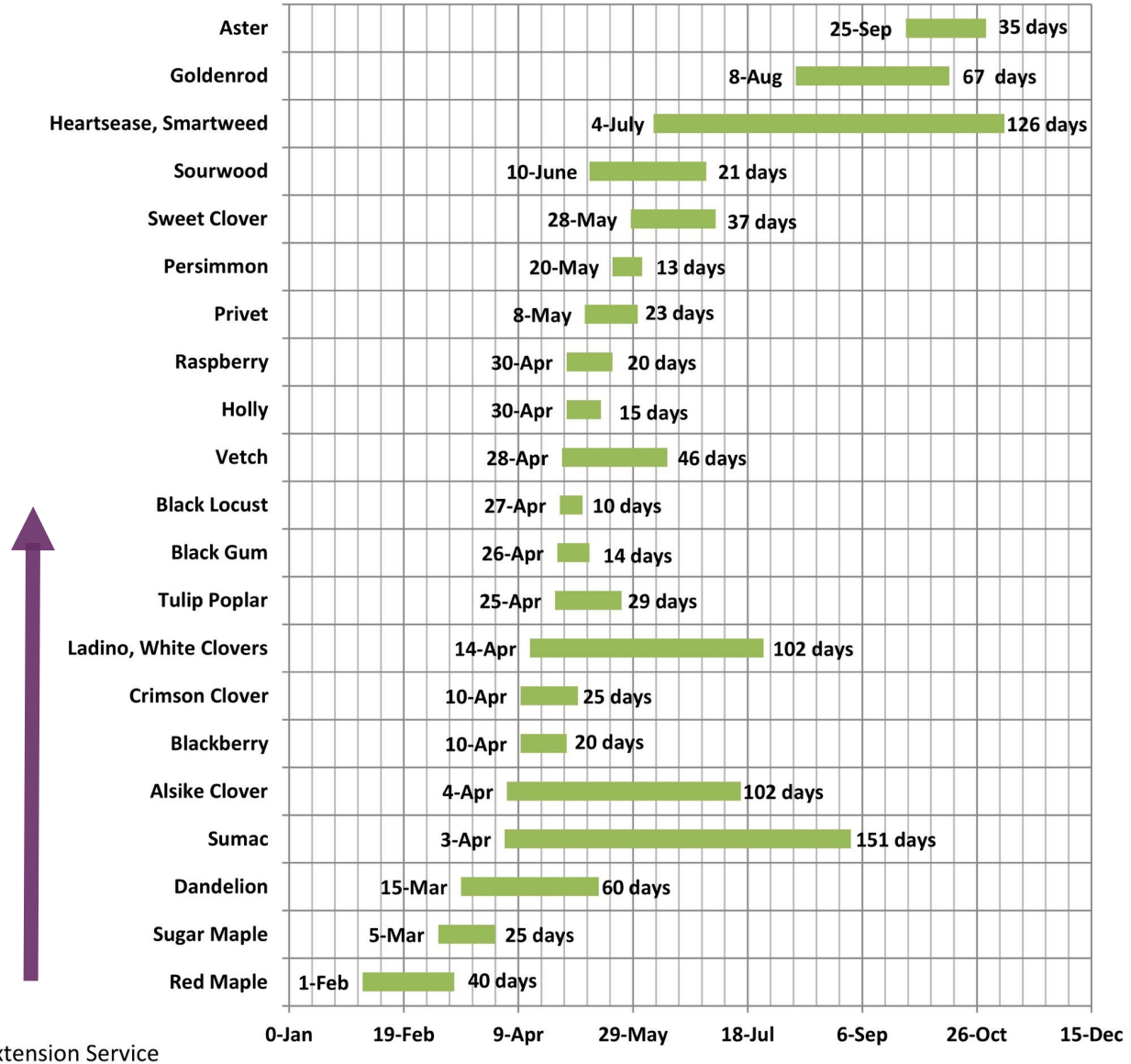
North Carolina Pollen & Nectar Plants



https://www.ncbeekeepers.org/resources/flowering-plants

Piedmont Region		*Average Piedmont Bloom Period*			*Pollen*
Plant Name	**Scientific Name**	**Starts**	**Days**	**Ends**	
Red Maple	*Acer rubrum*	1-Feb	40	12-Mar	C0B095
Sugar Maple	*Acer saccharum*	5-Mar	25	30-Mar	DAF7A6
Dandelion	*Taraxacum officinale*	15-Mar	60	14-May	F29D4B
Sumac	*Rhus spp.*	3-Apr	151	1-Sep	F6BB43
Alsike Clover	*Trifolium hybridum*	4-Apr	102	15-Jul	
Blackberry	*Rubus spp.*	10-Apr	20	30-Apr	D3D3D3
Crimson Clover	*Trifolium incarnatum*	10-Apr	25	5-May	
Ladino, White Clover	*Trifolium repens*	14-Apr	102	25-Jul	859D6C
Tulip Poplar	*Liriodendrum tulipifera*	25-Apr	29	24-May	FCF3CF
Black Gum	*Nyssa sylvatica*	26-Apr	14	10-May	F7DC6F
Black Locust	*Robinia pseudoacacia*	27-Apr	10	7-May	DAF7A6
Vetch	*Vicia spp.*	28-Apr	46	13-Jun	
Holly	*Ilex spp.*	30-Apr	15	15-May	F7DC6F
Raspberry	*Rubus spp.*	30-Apr	20	20-May	DCDCDC
Privet	*Ligustrum spp.*	8-May	23	31-May	DAF7A6
Persimmon	*Diospyros virginiana*	20-May	13	2-Jun	FAD749
Sweet Clover	*Melilotus spp.*	28-May	37	4-Jul	
Sourwood	*Oxydendrum arboreum*	10-Jun	20	30-Jun	FCF3CF
Heartsease, Smartweed, Knotweed	*Polygonum spp.*	4-Jul	126	7-Nov	FCF3CF
Goldenrod	*Solidago spp.*	8-Aug	67	14-Oct	FAD749
Aster	*Aster spp.*	25-Sep	35	30-Oct	F8CD76

Piedmont North Carolina Nectar Plants

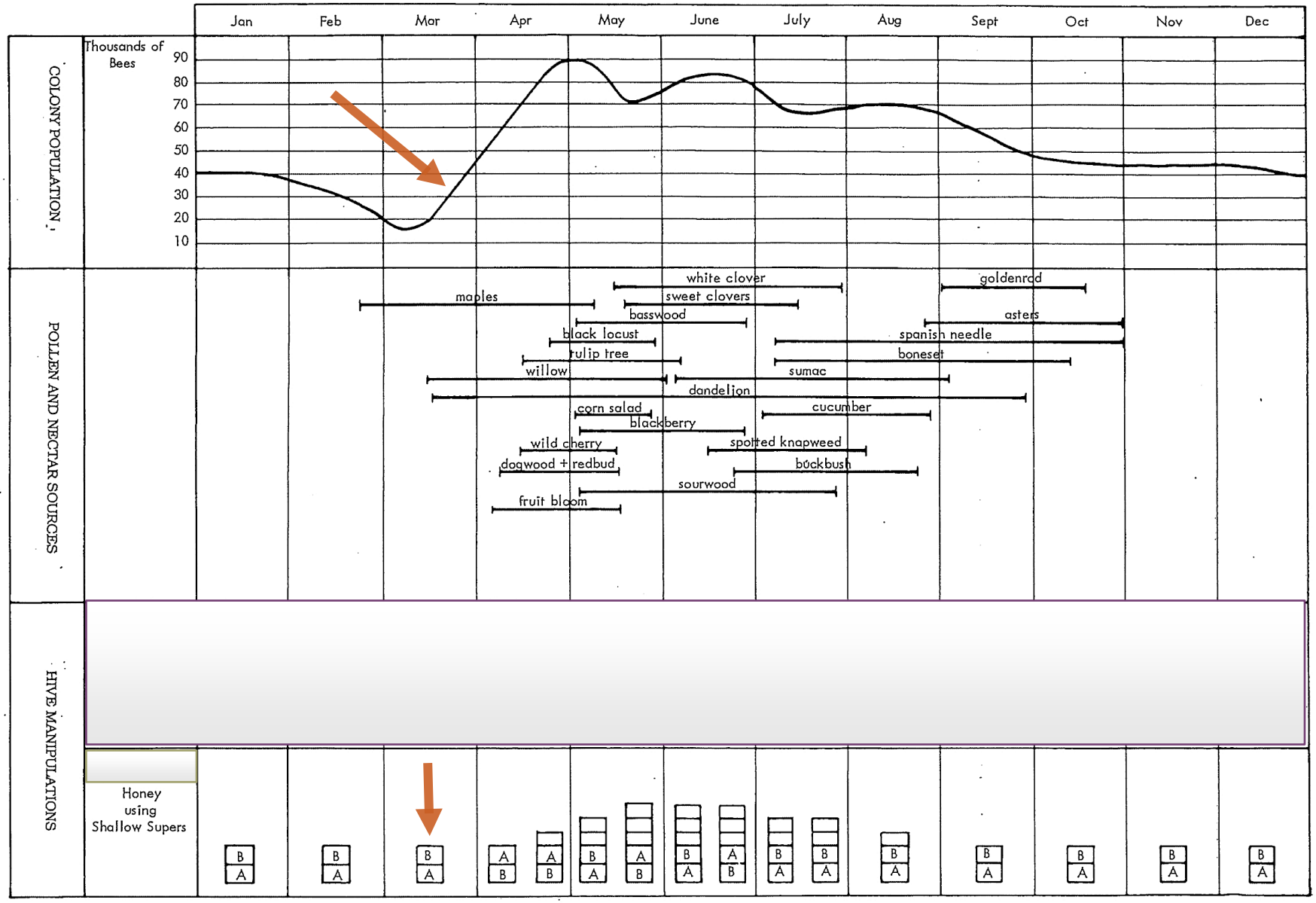


Source:
N.C. Cooperative Extension Service
Honey Plants of North Carolina
prepared by: J. Ambrose; revised by S. Bambara

Updated 2/20/2019-GLL

Compiled by Pat Allen, SCBA
10/29/2012

Colony Population, Pollen & Nectar Sources, & Hive Configuration



Floral Fidelity/ Floral Constancy

- ✓Honey Bees are polylectic (visit many different types of flowers)
- ✓Visit only one type of flower on any given foraging trip (floral fidelity)
- ✓Will visit the same type of flower all day, if enough available
- ✓Allows for production of varietal kinds of honey (Sourwood, etc.)

Common Blue Violet

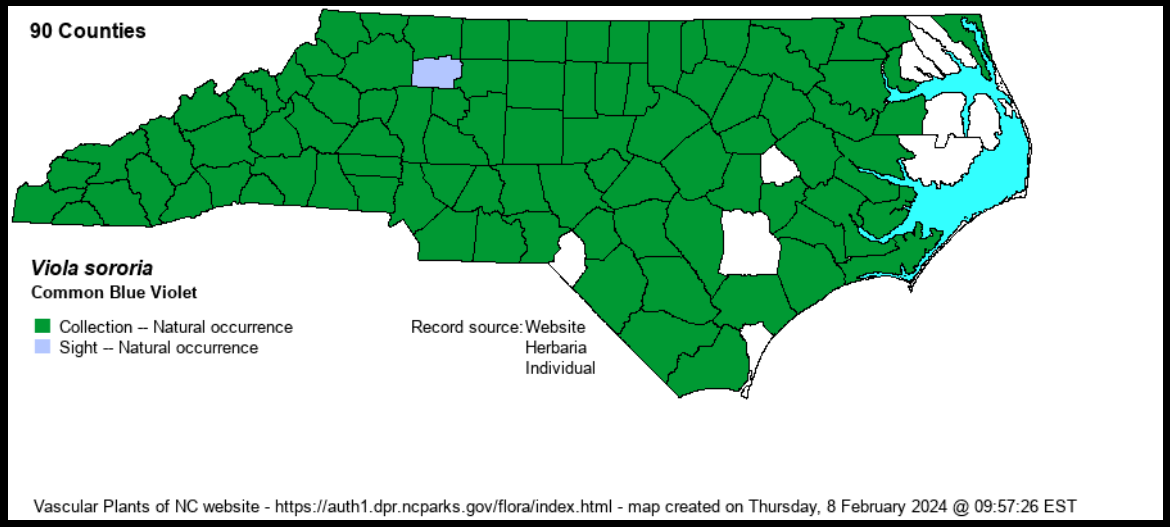
(Viola sororia)

Pollen Color: FCF3CF

Light grayish yellow

Minor Nectar & Pollen Source

Bruce Sorrie

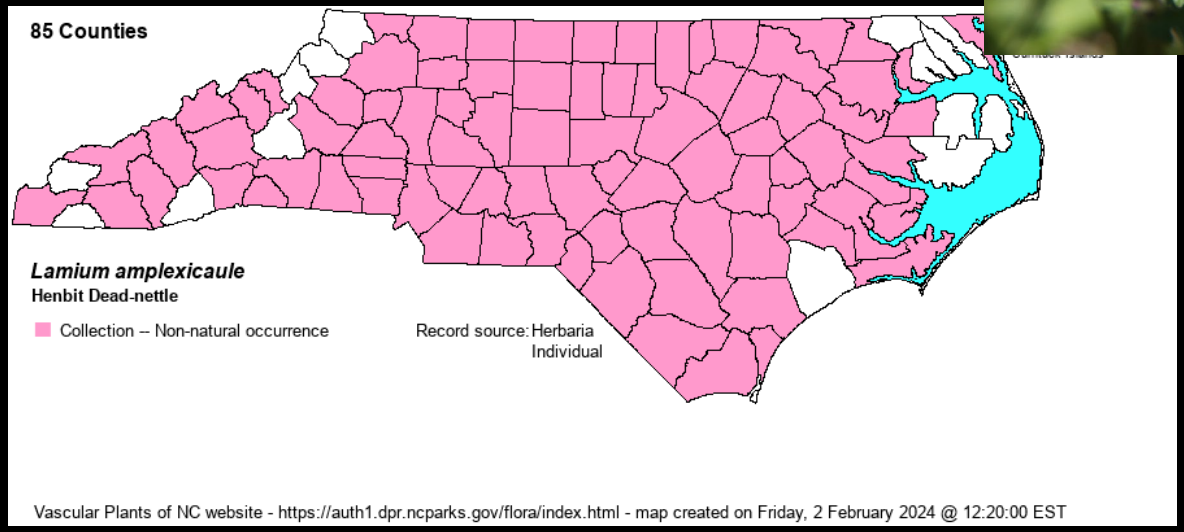


11 Native and 1 Non-native species of Violets in Alamance County

Henbit Dead-nettle

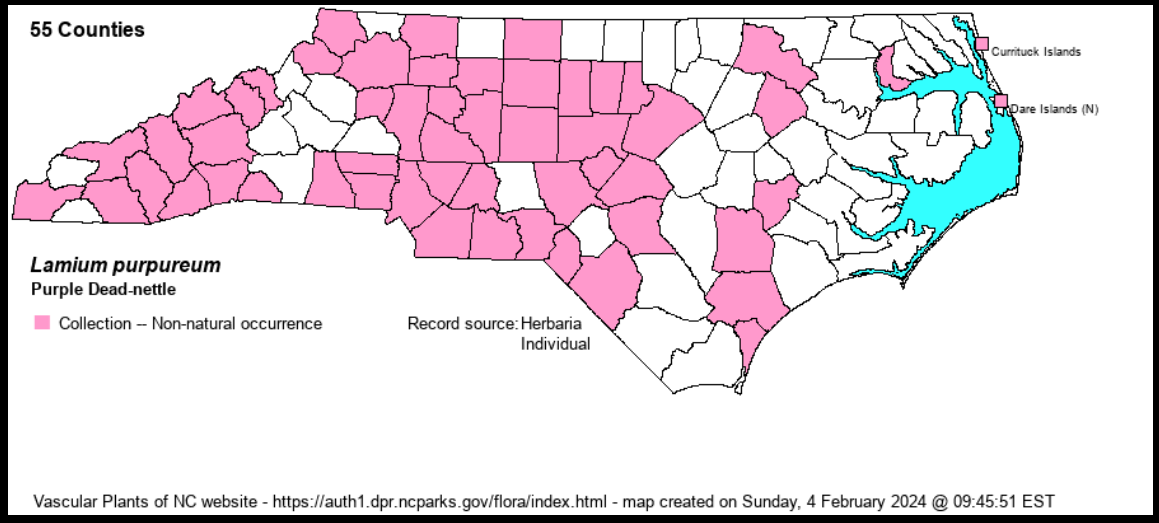
(*Lamium amplexicaule*)

Bruce Sorrie



Purple Dead-nettle

(*Lamium purpureum*)



Flowering begins in February and March

Piedmont Region		*Average Piedmont Bloom Period*			*Pollen*
Plant Name	**Scientific Name**	**Starts**	**Days**	**Ends**	
Red Maple	*Acer rubrum*	1-Feb	40	12-Mar	C0B095
Sugar Maple	*Acer saccharum*	5-Mar	25	30-Mar	DAF7A6
Dandelion	*Taraxacum officinale*	15-Mar	60	14-May	F29D4B

Mike Connor: Bees and Trees on YouTube

Mike Connor, arborist, nursery grower and beekeeper talks about the importance of trees for all pollinators in this full-length presentation, "Bees and Trees", at the 2015 Heartland Apicultural Society annual conference.

Red Maple

(*Acer rubrum L. var. rubrum*)

Feb 1 – Mar 12 (40 days)

Pollen Source: Good

Nectar Source: Major

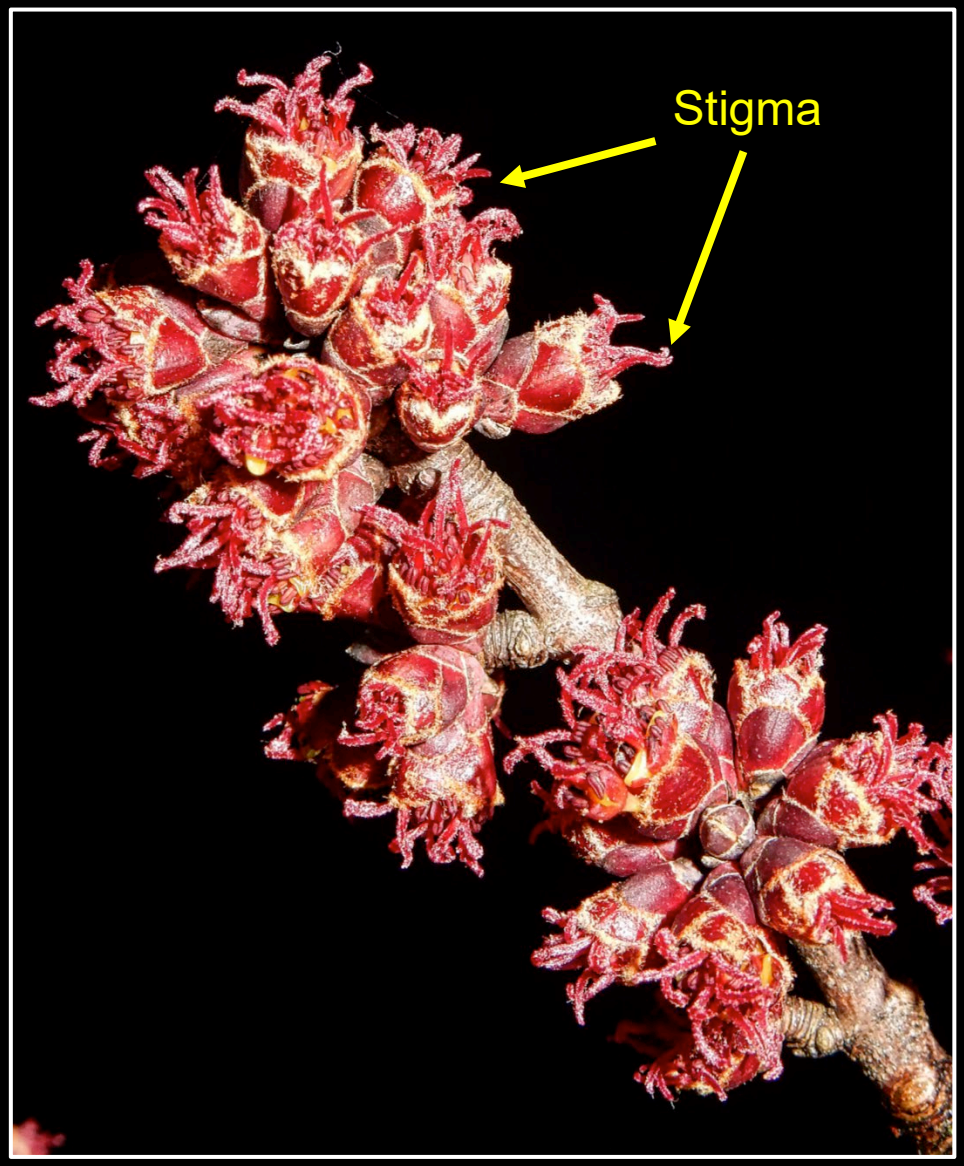
Pollen Color: grey brown

grey brown

Trees are dioecious

Red Maple during February

Female Red Maple Flowers



Dioecious female flower cluster

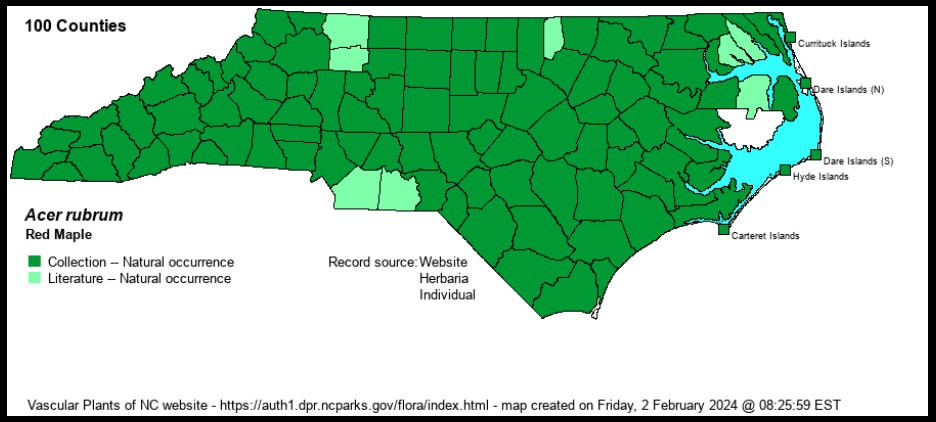
Developing paired samaras (winged fruit)

Male Red Maple Flowers

Young dioecious male flower cluster

Mature dioecious male flower cluster

Native Red Maple



Red Maple during autumn

Florida maple *(Acer floridanum)*

Alternate name: Southern Sugar Maple

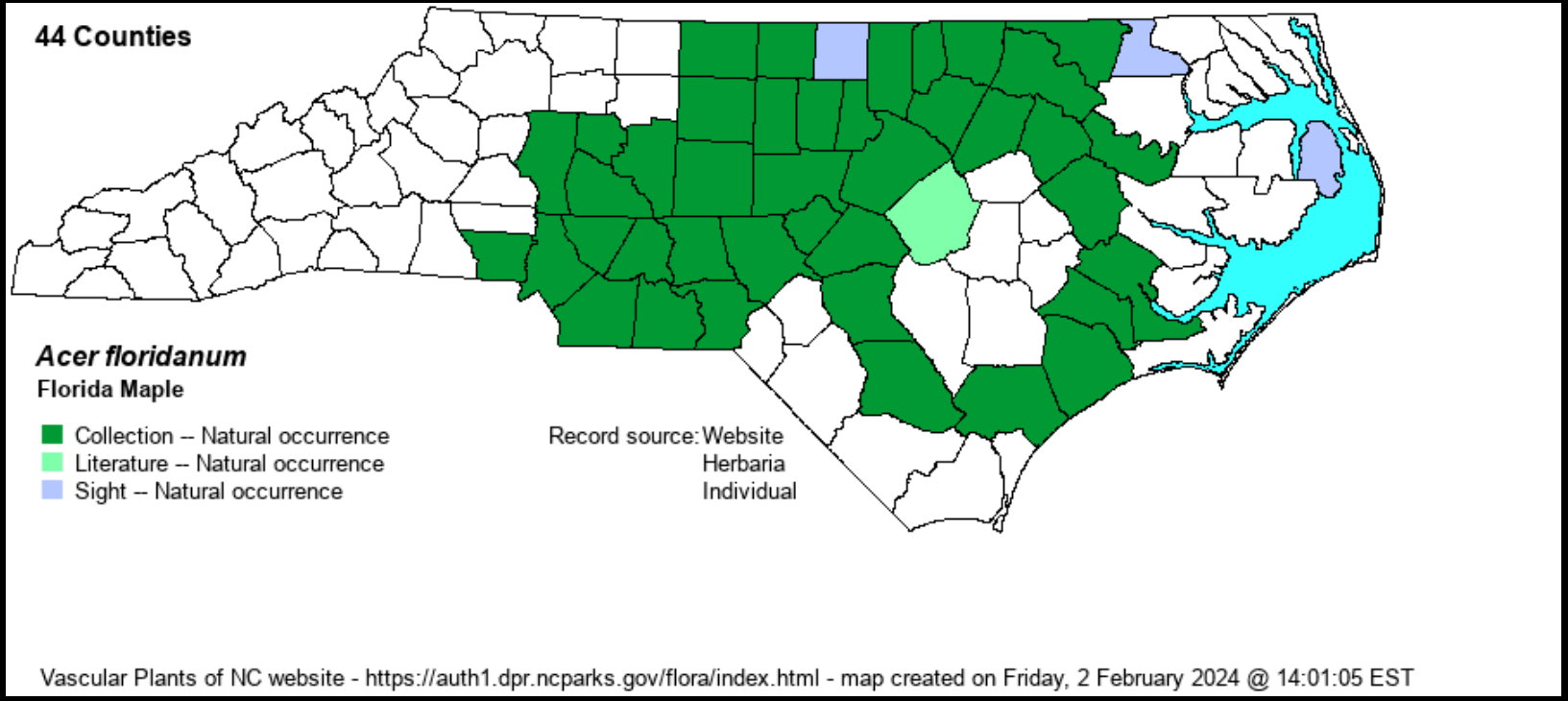
Mar 5 – Mar 30 (25 days)

Pollen Color light yellow

Major Nectar & Pollen Source

Florida Maple Leaf Characteristics

Leaf undersides with white hairs



Dandelion (*Taraxacum officinale*)

Dandelion (*Taraxacum officinale*)

Mar 15 – May 14 (60 days)

Major Nectar & pollen source

Honey is deep yellow will granulate quickly; mostly consumed by bees doing brood rearing.

Photo taken near Uppsala, Sweden

Flower is composed of many ray florets in this member of Asteraceae family

Common Dandelion (*Taraxacum officinale*)

Pappus hairs

Pollen Color: F29D4B

Soft Orange

Eastern Redbud (*Cercis canadensis* L.)

Alternate names: Redbud, Judas tree

March 10 – April 10 (32- days)

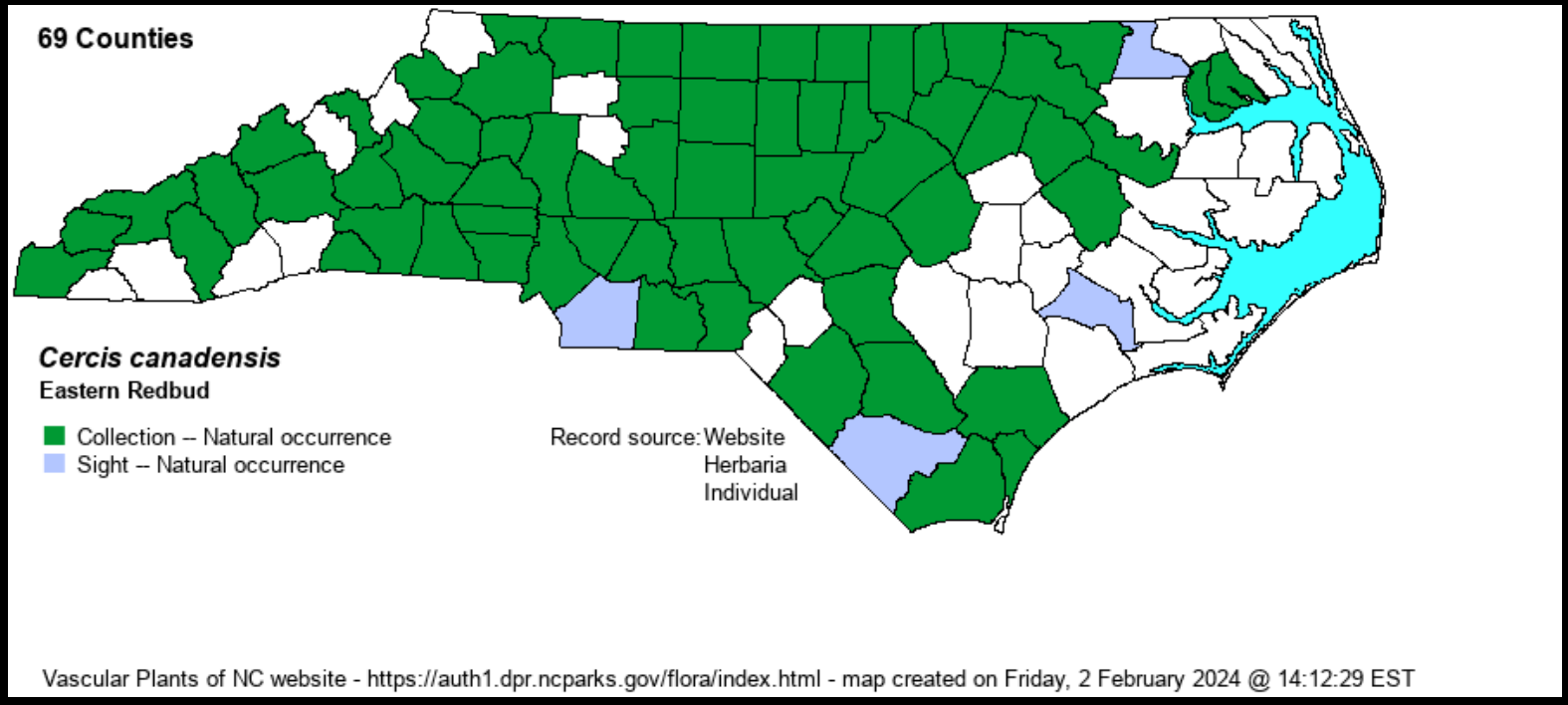
Minor Nectar & Pollen source during Brood-rearing.

Pollen Color: White

Leaves are alternate, simple, cordate in shape.

Flowers appearing in clusters all along even older stems. (Cauliflory)

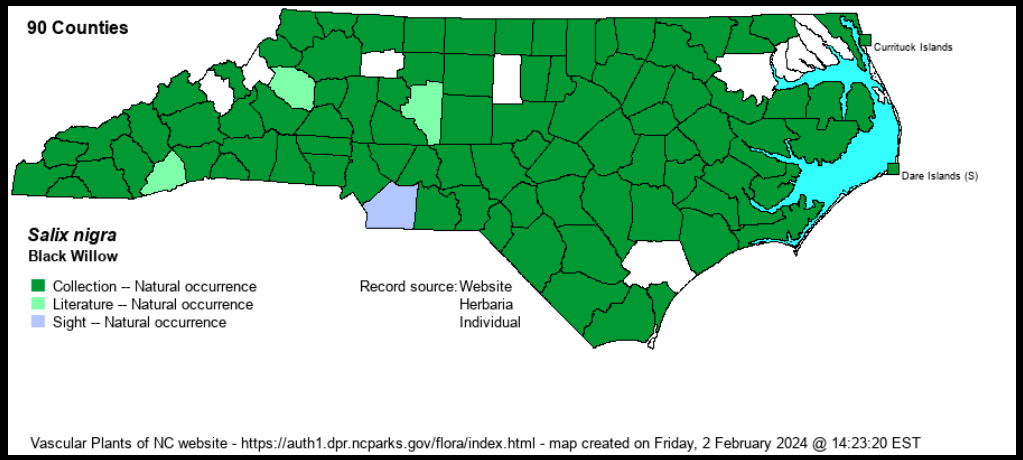
Pea-like flowers



Black Willow (*Salix nigra*) (dioecious)

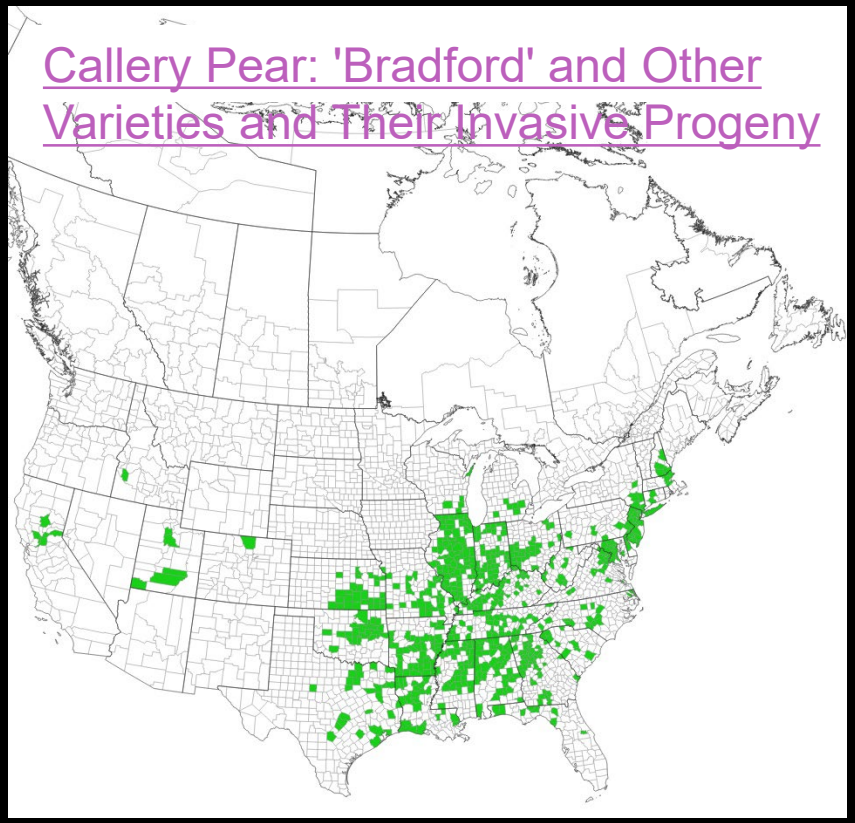
Nectar & Pollen source

Late March early April



Male and female catkins on separate plants

Callery Pear (*Pyrus calleryana* 'Bradford')



- ✓ Unpleasant Odor
- ✓ Listed as Rank 1 Exotic, Invasive Species (Severe Threat) in NC
- ✓ Brittle and splits
- ✓ Attractive to pollinators to the detriment of native plants such as Hawthorne and Seviceberry (reduced pollination and declining populations)
- ✓ NC Bradford Pear Bounty replace with native:
  Red Maple, Flowering Dogwood, Redbud

https://www.invasive.org/browse/subinfo.cfm?sub=10957

Flowering begins in April

Sumac	*Rhus spp.*	3-Apr	151	1-Sep	F6BB43
Alsike Clover	*Trifolium hybridum*	4-Apr	102	15-Jul	
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Holly	*Ilex spp.*	30-Apr	15	15-May	F7DC6F
Raspberry	*Rubus spp.*	30-Apr	20	20-May	DCDCDC

Winged Sumac (*Rhus copallinum* L. var. *copallinum*)

Alternate name: Shining sumac, Dwarf sumac

April 3 – Sept 1 (151 days)

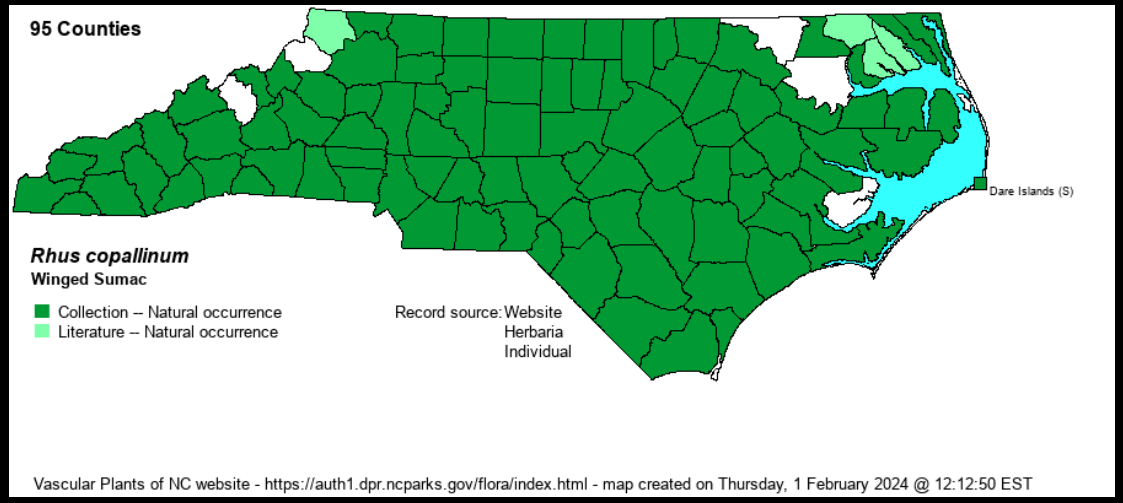
Pollen Color: F6BB43

Bright Orange

Nectar & Pollen source:
Major

Winged Sumac: Flowers & Fruits

Plant monoecious; flowers on terminal stalk



Fruit is a drupe (fleshy & one seeded)

Smooth Sumac (*Rhus glabra* L.)

April 3 – Sept 1 (151 days)

Pollen Color F6BB43

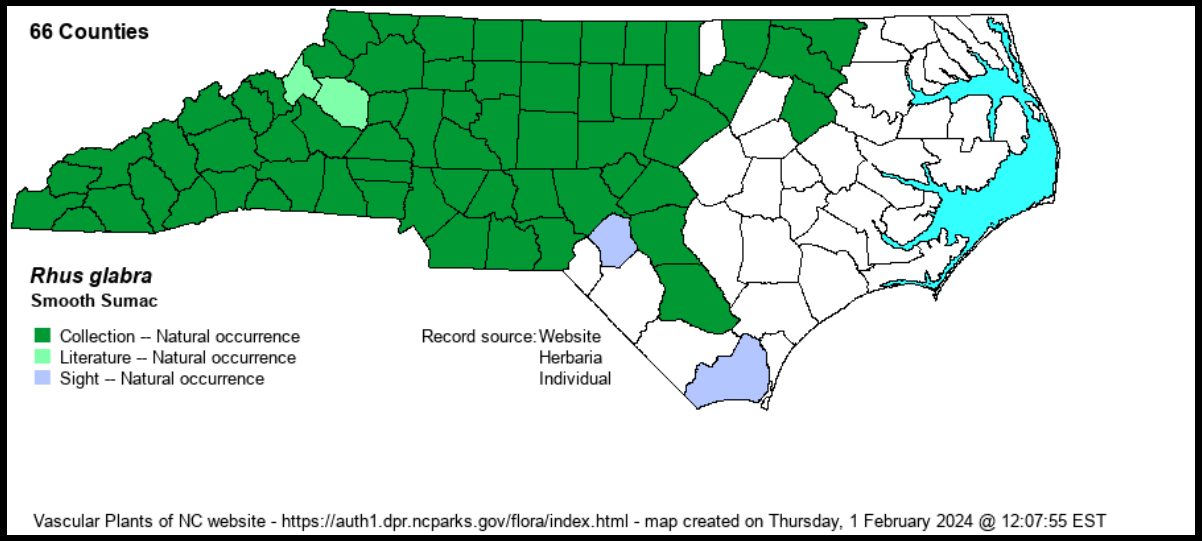
Bright Orange

Pinnately compound leaf composed of 11-31 toothed leaflets.

Major Nectar & Pollen Source

Smooth Sumac: Flowers & Fruits

Plant dioecious; small, with pale yellow petals.



Fruit is a drupe; arranged on a panicle (highly branched)

Pennsylvania Blackberry (*Rubus pensilvanicus*)

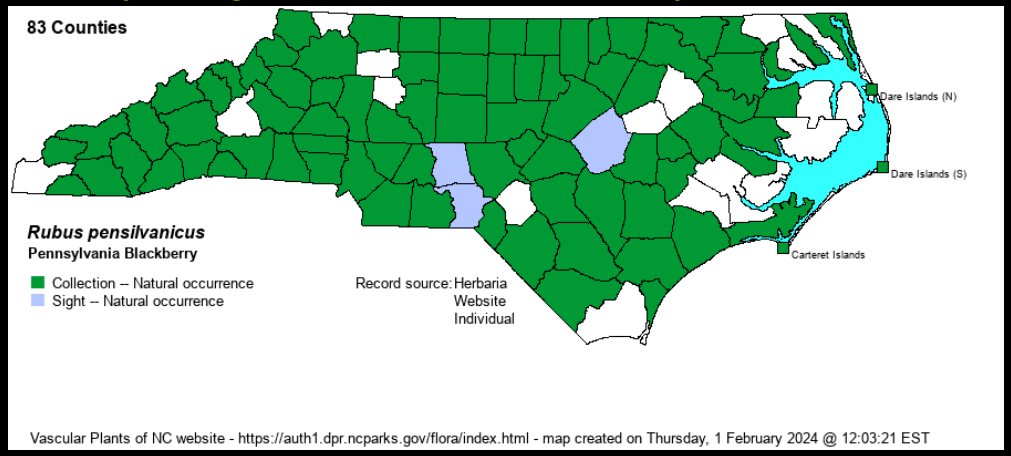
April 10 – April 30 (20 days)

Pollen Color:

D3D3D3

Light Grey

Honey: Slight taste of blackberry



Fruit “berries” are actually aggregate drupelets

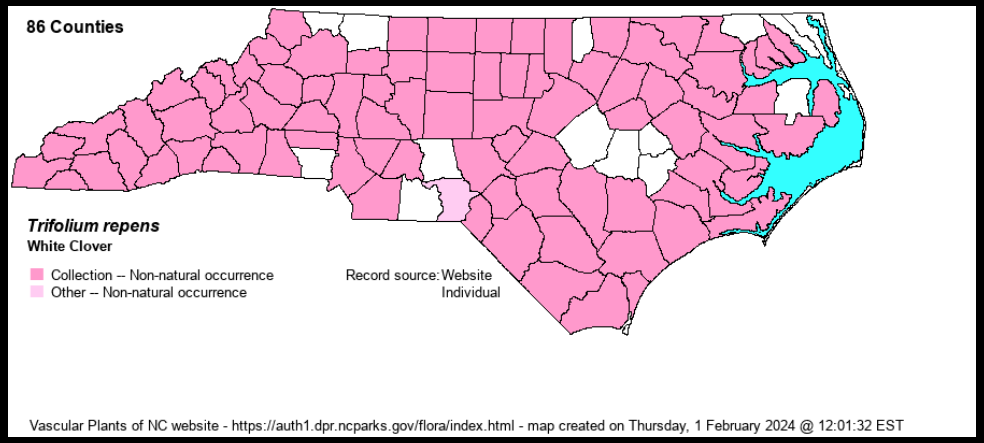
White Clover (*Trifolium repens)* Not Native!

Family: Fabaceae

April 14 – July 25 (102 days)

Pollen Color: caledonian brown

Major Nectar & Pollen Source

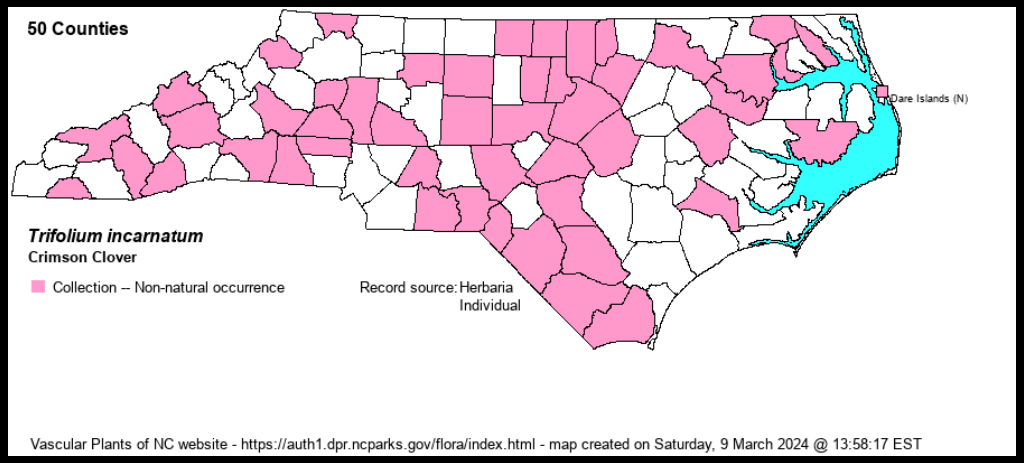


Crimson Clover (*Trifolium incarnatum)* Not Native!

Family: Fabaceae

April - May

Nectar & Pollen Source



Harnett County Pollinator Meadow
Crimson Clover and Toadflax

Harnett County Pollinator Meadow
Buckwheat and Zinnias

Harnett County Pollinator Meadow
Zinnias and Cosmos

Tuliptree (*Liriodendron tulipifera*)

Alternate Names: Yellow-poplar, Tulip-poplar, and the wood simply "poplar"

Magnolia family

April 25 – May 24
(29-day)

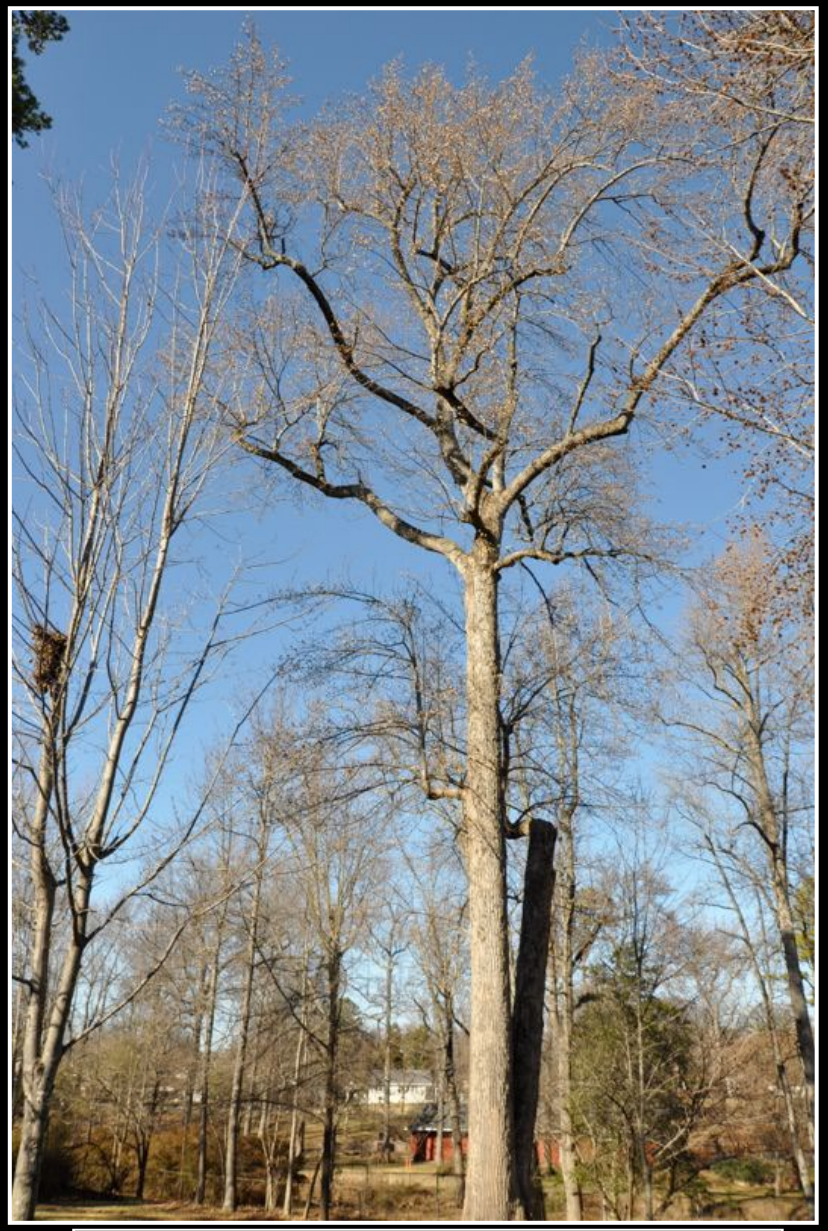
Pollen Color: Cream

cream

Monofloral Honey: Dark amber or black, when held to the light may appear reddish.

Nectar Source: **Major**

Pollen Source: Good



Tuliptree in Burlington City Park in January

Tuliptree in August

Tuliptree: Mature Aggregate Fruits

University of Tennessee
Herbarium B. Eugene Wofford

Tuliptree in Burlington City Park January 2012

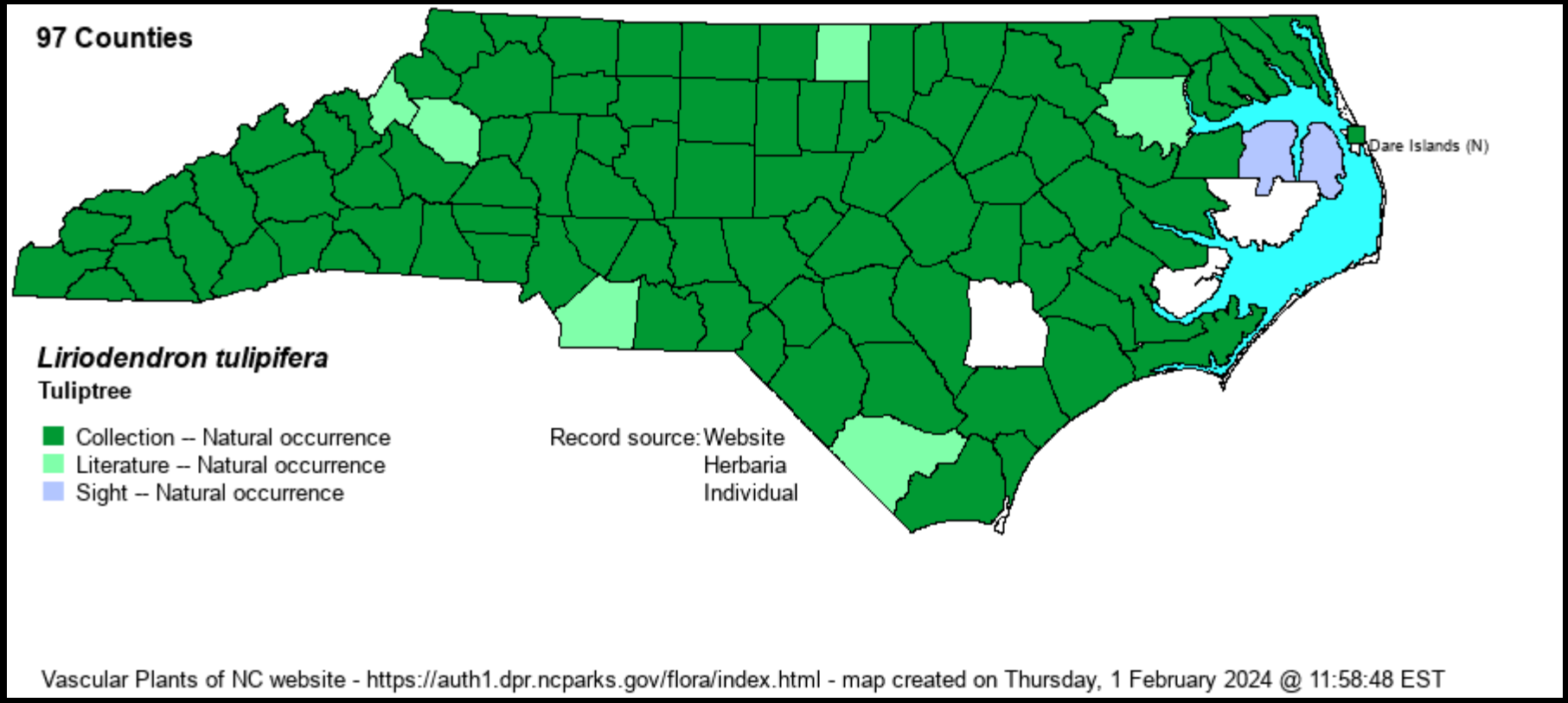
Tuliptree Flower

6 Petals

Stamens (male)

Multiple fused Pistils (female)

Nectaries


97 Counties
Dare Islands (N)
Liriodendron tulipifera
Tuliptree
Collection -- Natural occurrence
Literature -- Natural occurrence
Sight -- Natural occurrence
Record source: Website
Herbaria
Individual
Vascular Plants of NC website - https://auth1.dpr.ncparks.gov/flora/index.html - map created on Thursday, 1 February 2024 @ 11:58:48 EST

Blackgum (*Nyssa sylvatica* Marsh.)

Alternate Names: Black Gum; Black tupelo; Sour gum

April 26 – May 10 (14 days)

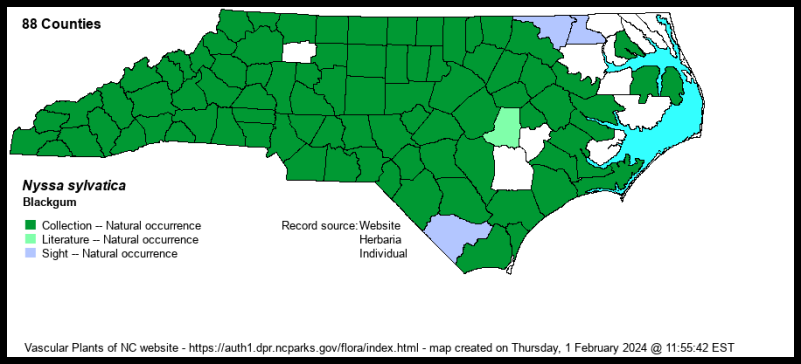
Nectar & Pollen source

Pollen Color: F7DC6F

Soft Yellow

Blackgum flowers & fruits

Plants dioecious; not showy, light green in color, in clusters hanging from slender stalk.



Fruit is dark, purplish blue drupe, when mature, 1/2 inch long, with a fleshy coating

Black Locust (*Robinia pseudoacacia*)

April 27– May 7 (10 days)

Nectar & Pollen Source: Major

Pollen Color DAF7A6

Very Soft Green

Black Locust

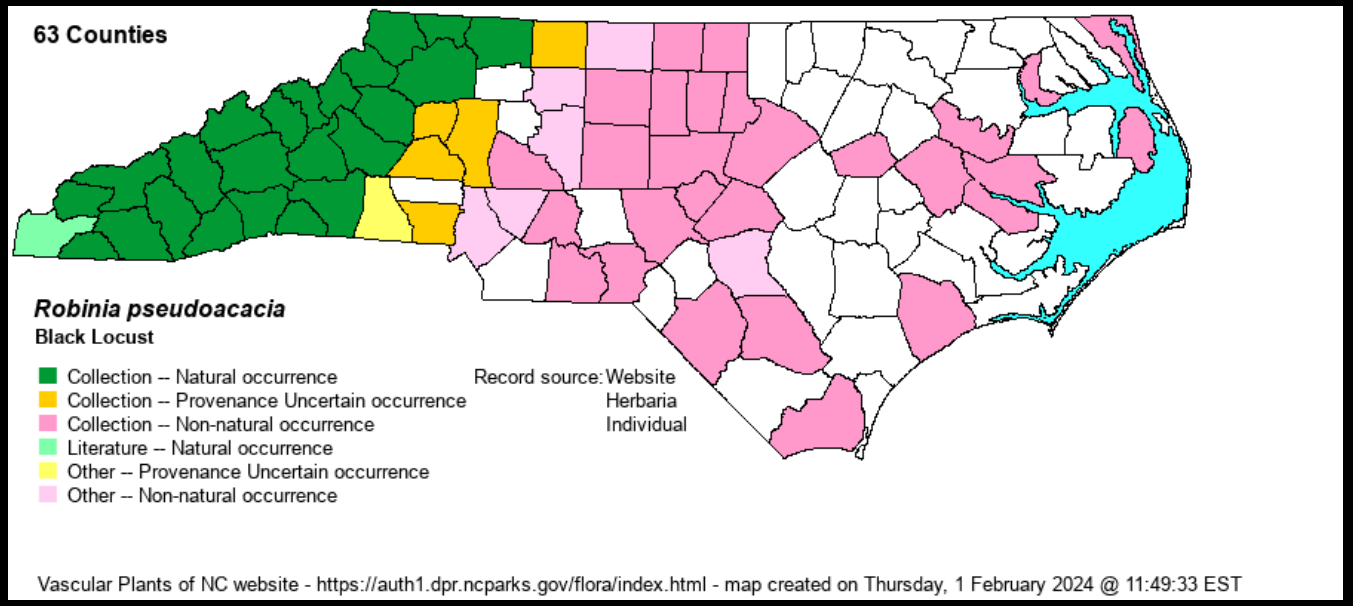
Plant monoecious; perfect, showy and fragrant, white, 1 inch long and pea-like.

Fruit is a flattened legume pod

Not recommended for climbing

Black Locust

Leaves are alternate, pinnately compound, with 7 to 19 leaflets



Vetch (Vicia spp.)

April 28 – June 13

(46-Days)

American Holly (*Ilex opaca* var. *opaca)*

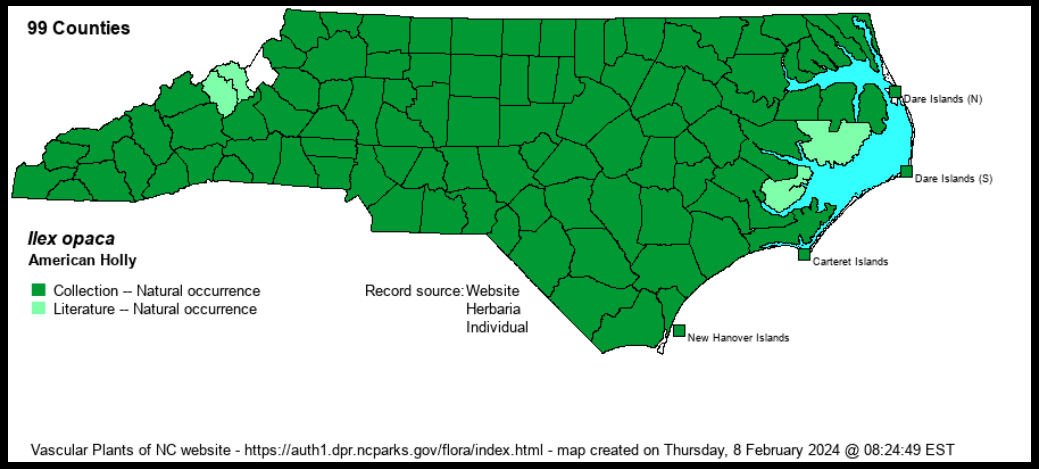
Alternate name: Christmas Holly

May 12 – June 9 (15-days)

Pollen & nectar source

Plants are evergreen & dioecious

Honey: Very dark amber, overpowering flavor



Pollen Color: F7DC6F

Soft Yellow

American Holly

Female flowers

Male flowers

Fruit is a shiny, berry-like drupe

Flowering begins in May & June

Privet	*Ligustrum spp.*	8-May	23	31-May	DAF7A6
Persimmon	*Diospyros virginiana*	20-May	13	2-Jun	FAD749
Sweet Clover	*Melilotus spp.*	28-May	37	4-Jul	
Sourwood	*Oxydendrum arboreum*	10-Jun	20	30-Jun	FCF3CF

Chinese Privet (*Ligustrum sinense*)

May 8 – May 31 (23-days)

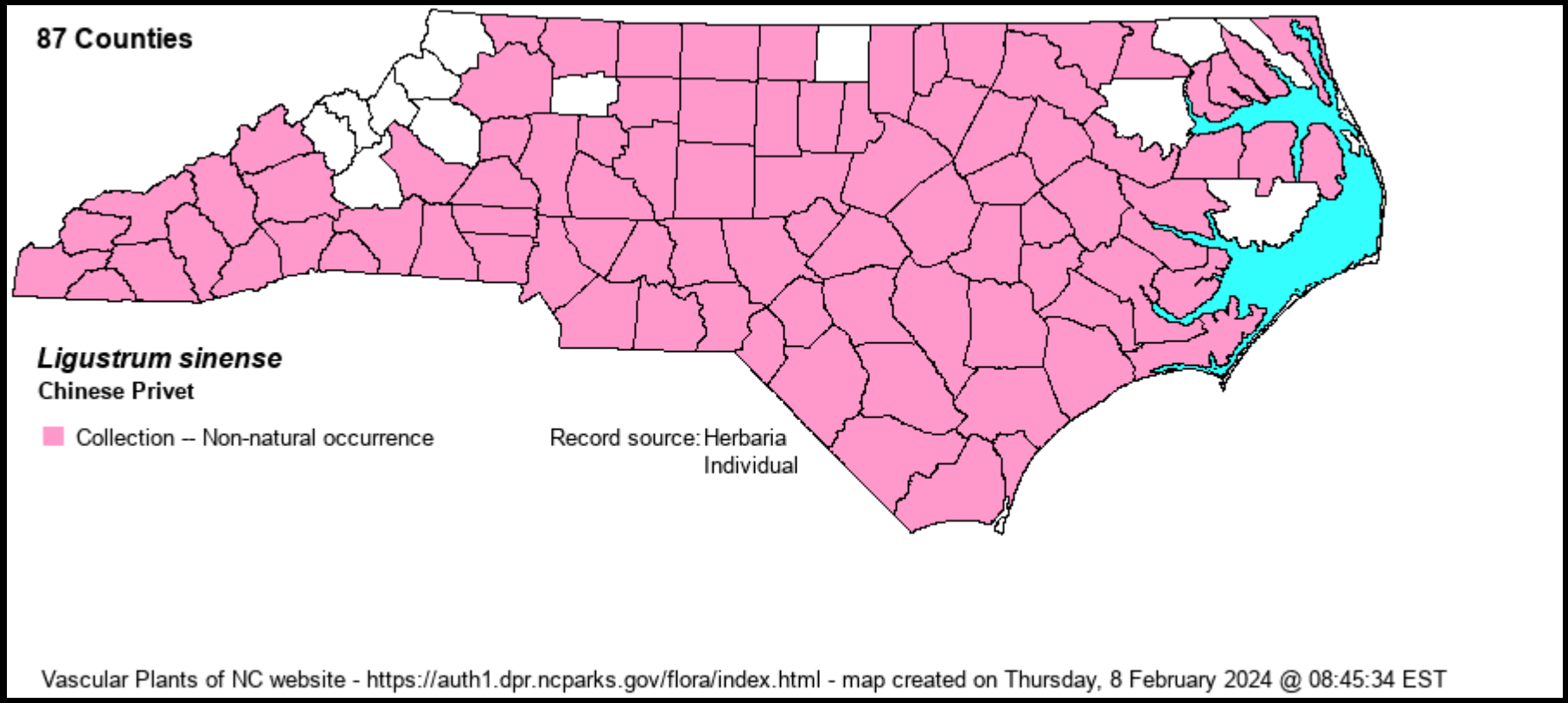
Native of China

Pollen Color:

DAF7A6

Very Soft Green

Major Source of Nectar & Pollen



Rank 1 Invasive Species in NC (Severe Threat)

American Persimmon (*Diospyros virginiana* L.)

Alternate Names: Persimmon, Common Persimmon, Eastern persimmon, possumwood

May 30 – June 2
(13 days)

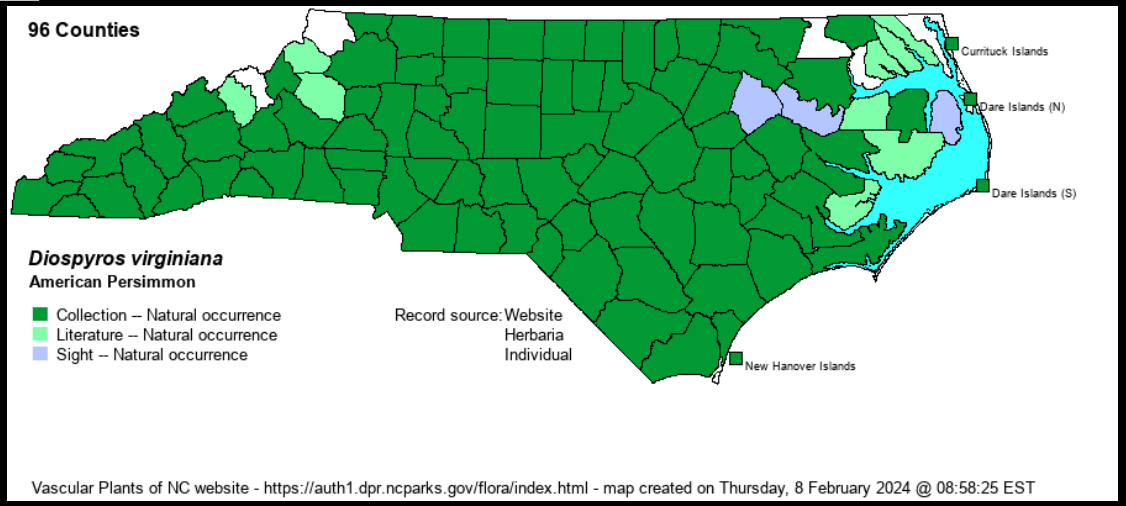
Pollen Color FAD749

Bright Yellow

Nectar and Pollen Source: Minor

Persimmon Fruit

Fruit is plum-like berry; Fleshy, with one or more Seeds.



Native Persimmon Trees are Dioecious

Male flowers solitary and urn-shaped

Female flowers solitary and urn-shaped

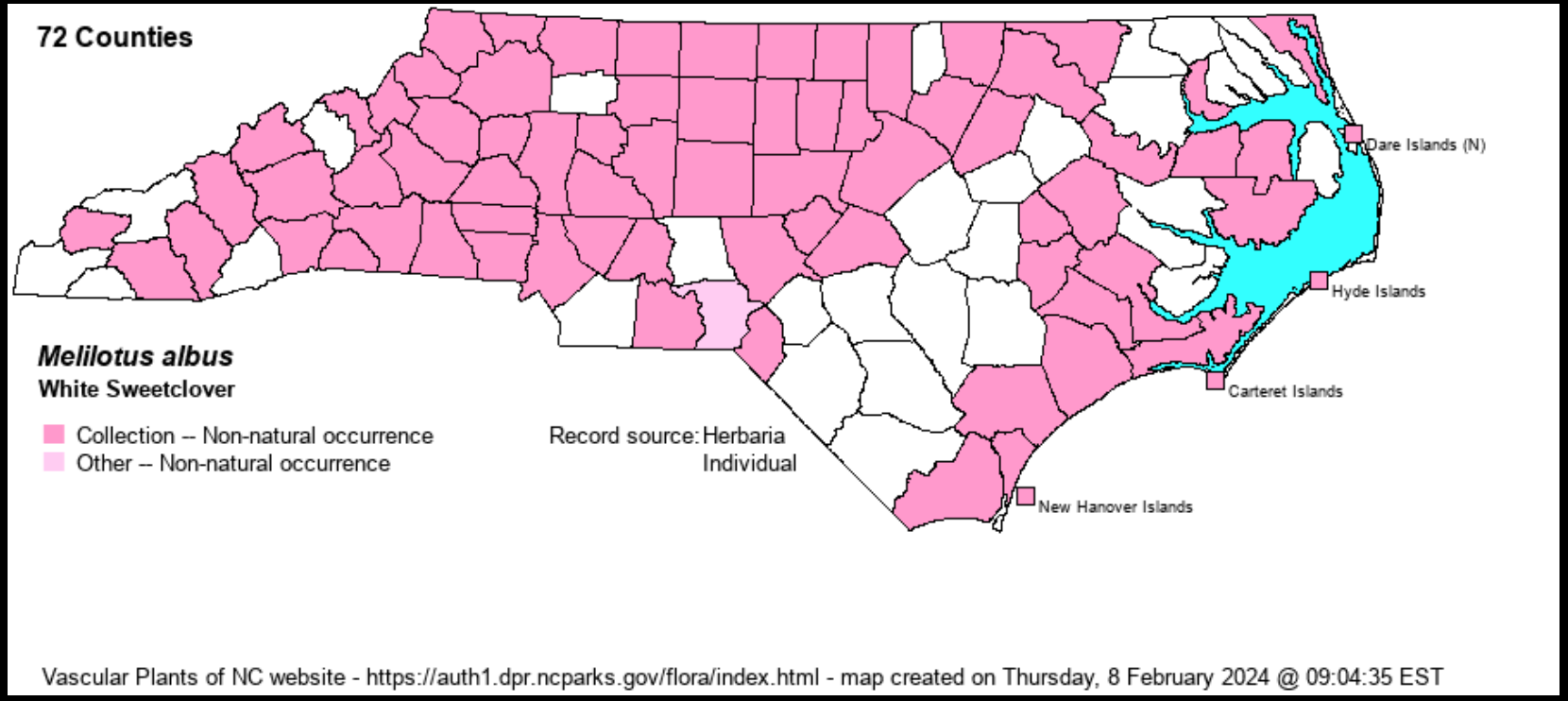
White Sweet Clover

(*Melilotus albus*)

Native of Eurasia

May 29 – July 4 (37-days)

Major Nectar & Pollen Source



Rank 3 Invasive Species (Lesser Threat)

Tuliptree and Sourwood

Sourwood (*Oxydendrum arboreum* (L.) DC.

Alternate Name: Sorrel tree

Only true tree in the Ericaceae family

June 10 – June 30 (20 days)

Pollen Color: FCF3CF

Light grayish yellow

Monofloral Honey:
Straw colored

Nectar Source: Major
Pollen Source: Minor

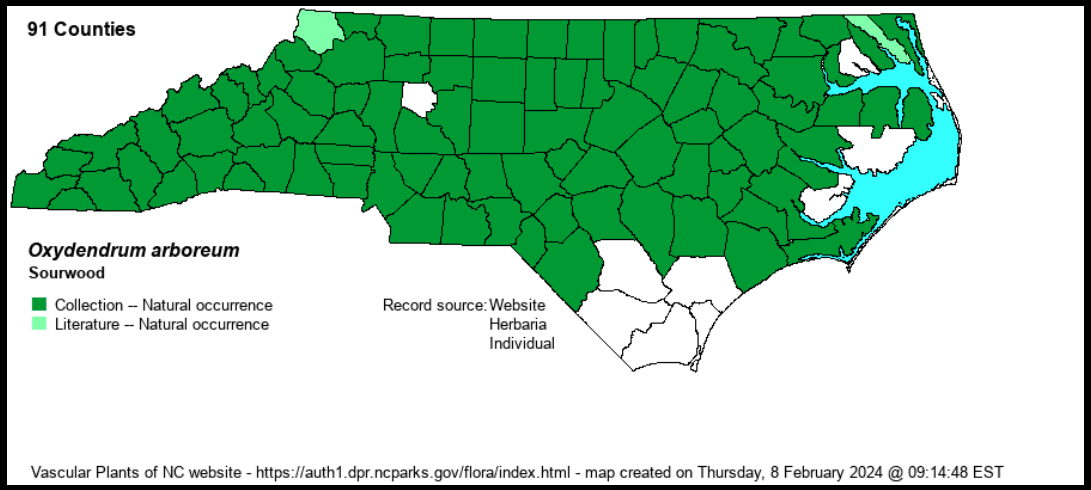
NC Arboretum Asheville
October

Sourwood

Bell or urn shaped
fragrant flowers (June)

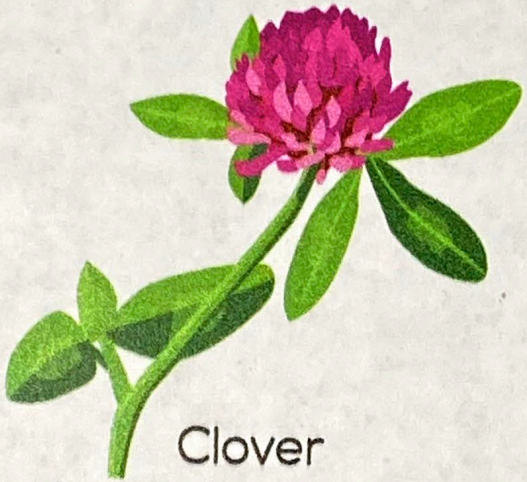
Sourwood

Fruit is a capsule (October)



Melissopalynology: The study and identification of pollen grains in honey, especially as a means of quality control.

JONAH VENTURES



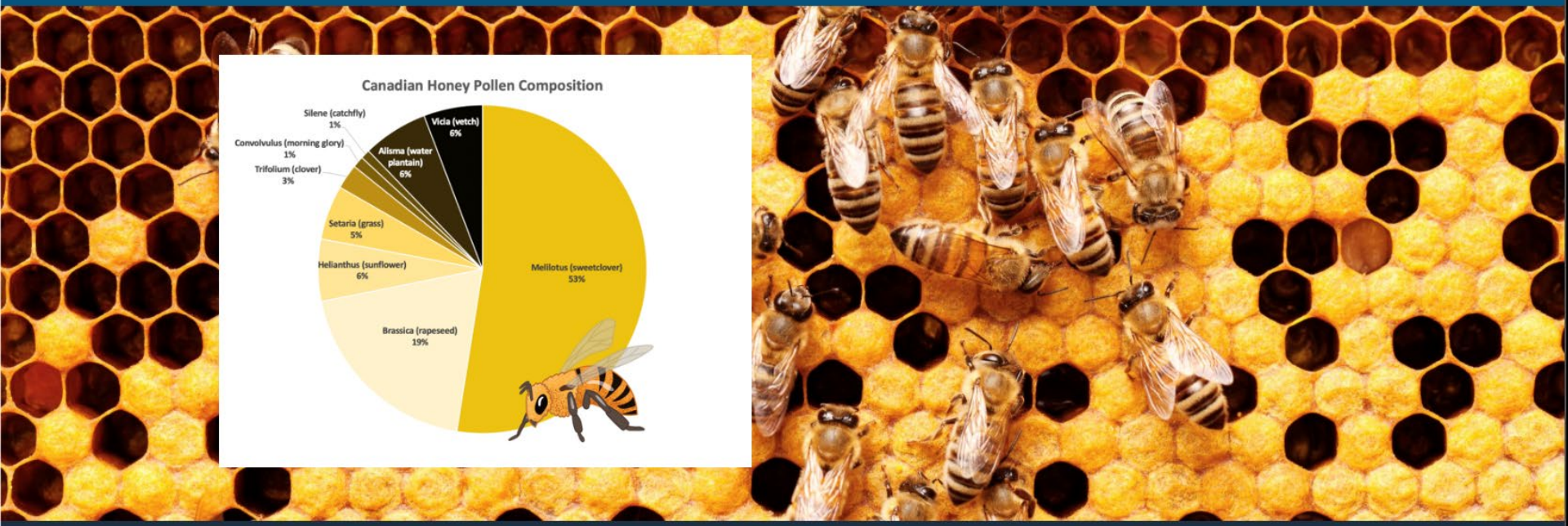
Clover

Honey bee

JonahAnimal™
Honey DNA Kit
Honey, bee pollen

Quantify the plants that bees pollinate .
Good for honey or bee pollen.

DNA sequencing for pollen identification can be much more accurate and less time consuming than a microscope, with a much quicker turnaround.



Honey/Pollen Sample Pricing

Single sample

$94 /sample

- Sequence for **plant DNA**
- Good for any pollinator
- Barcoded sample vials provided
- 10-point quality control
- Full bioinformatics
- 1-year storage of raw data

Jonah Ventures
5485 Conestoga Ct #210,
Boulder, CO 80301
(720) 515-6624
email: info@jonahventures.com

Collection and Identification of Pollen from Honey Bee Colonies

Discover the plants honey bees are visiting

- Next Generation Sequencing for pollen identification in honey and pollen samples.
- Sequence the plant DNA in these samples to determine country of origin, truth in labeling, forensics, pollen and health, research, and beekeeper education.

Deliverables

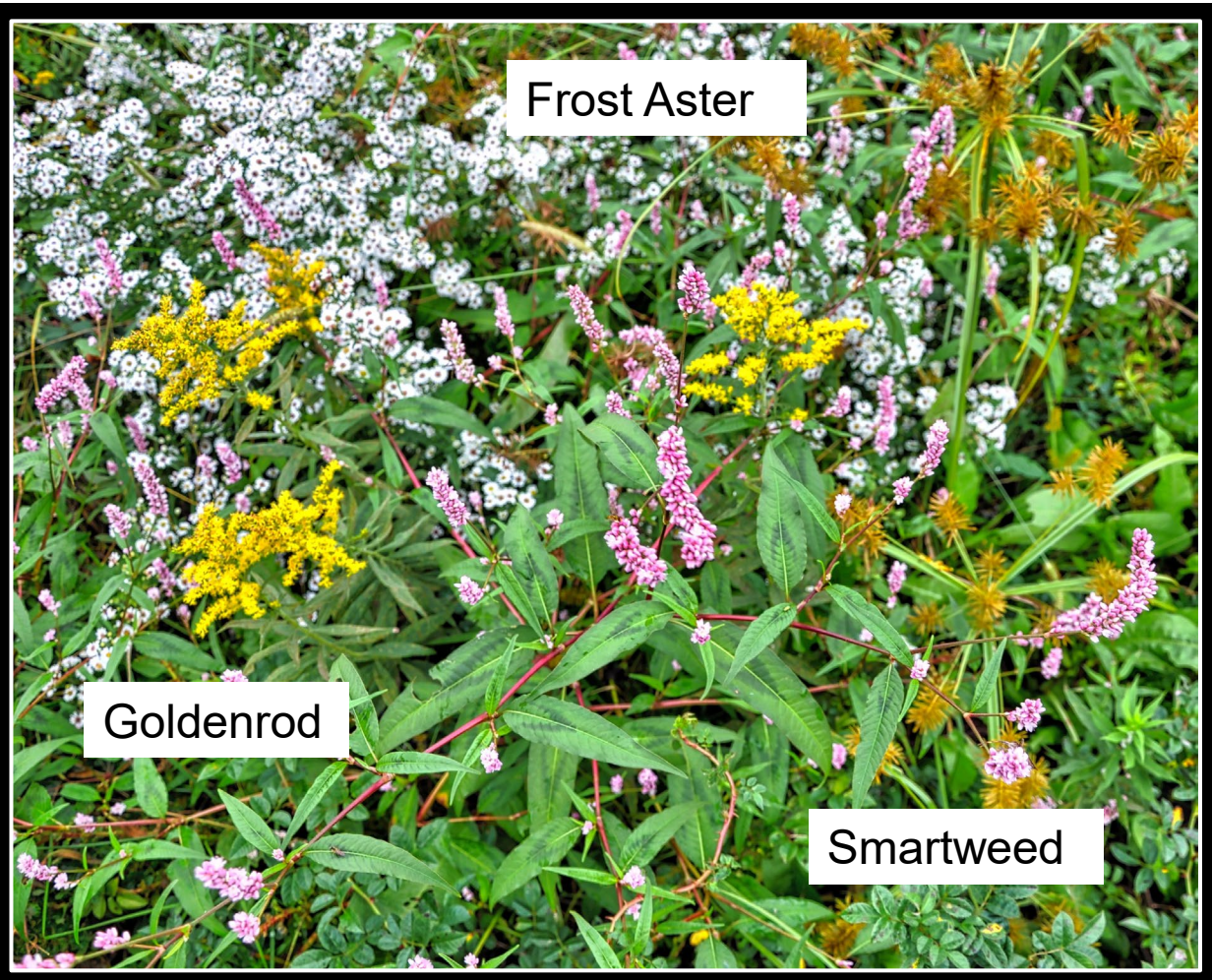
ESV	Family	Genus	Species	%match	# Species	Sequence	S10001.1	S10001.2	S10003.1	S10003.2
ESV_000080	Fagaceae	Quercus	NA	100	7	AAAAAG...	3066	1340	5780	3462
ESV_000818	Fabaceae	Trifolium	Trifolium pratense	100	1	AAAAAG...	0	2582	249	0
ESV_000006	Poaceae	NA	NA	100	77	GAAAAG...	584	101	0	1039
ESV_000050	Poaceae	NA	NA	100	12	GAAAAG...	1328	0	0	0
ESV_000308	Asteraceae	Leucanthemum	Leucanthemum vulgare	100	2	AAAAAG...	902	0	0	278
ESV_000027	Lamiaceae	Monarda	Monarda fistulosa	100	1	ATAAAG...	341	124	282	381
ESV_000520	Nymphaeaceae	Nymphaea	Nymphaea odorata	99	1	AAAAAG...	126	0	0	994

Honey/Pollen Identification Report

Our pollen identification report includes the DNA sequences we detected, the species they match to, the % match, and the frequency of the sequence, which can be translated into relative abundance.

Flowering begins in July, August, & September

Heartsease, Smartweed, Knotweed	*Polygonum spp.*	4-Jul	126	7-Nov	FCF3CF
Goldenrod	*Solidago spp.*	8-Aug	67	14-Oct	FAD749
Aster	*Aster spp.*	25-Sep	35	30-Oct	F8CD76



Pennsylvania Smartweed (*Persicaria pensylvanica*)

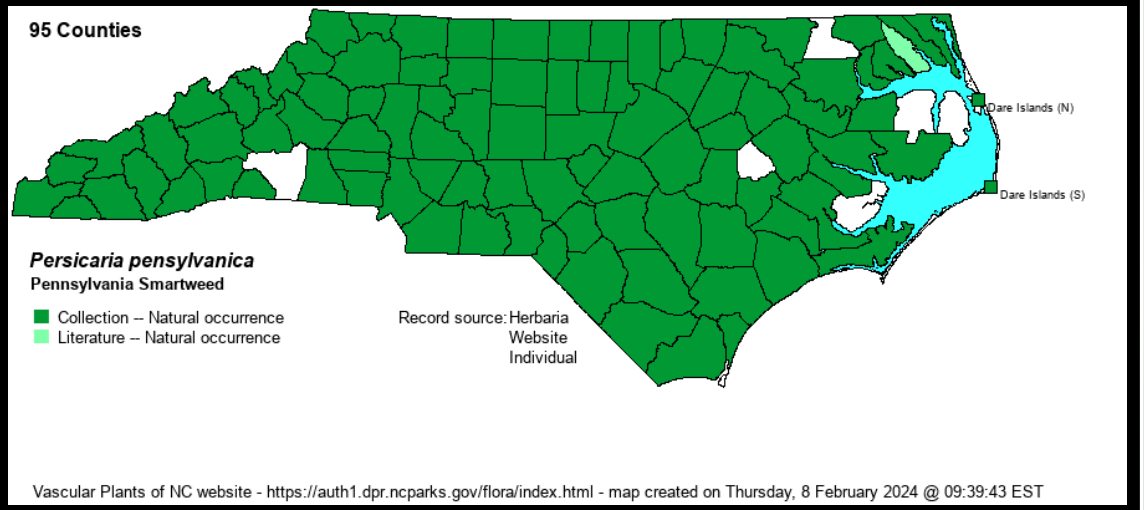
July 4 –Nov 7 (126-days)

Pennsylvania Smartweed (*Persicaria pensylvanica*)

Major Nectar & Pollen Source

Pollen Color: FCF3CF

Light grayish yellow



6 Native and 2 Non-native species of Persicaria in Alamance County

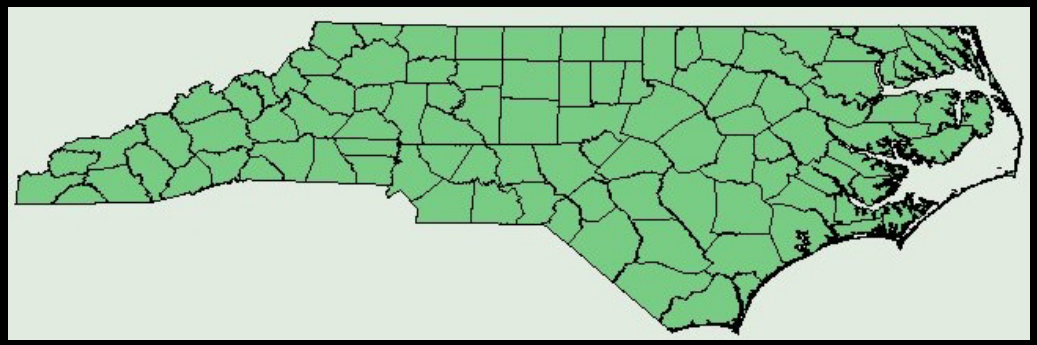
Member of buckwheat family (Polygonaceae)

Goldenrod (*Solidago spp.*)

Aug 8 – Oct 14 (67 days)

Yellow (light yellow) FAD749

Common along NC



County Distribution Goldenrod

Honey: Amber, but has rank odor

Rough-Leaved Goldenrod (*Solidago rugosa)*

Rough-Leaved Goldenrod (*Solidago rugosa* 'Fireworks') Asteraceae

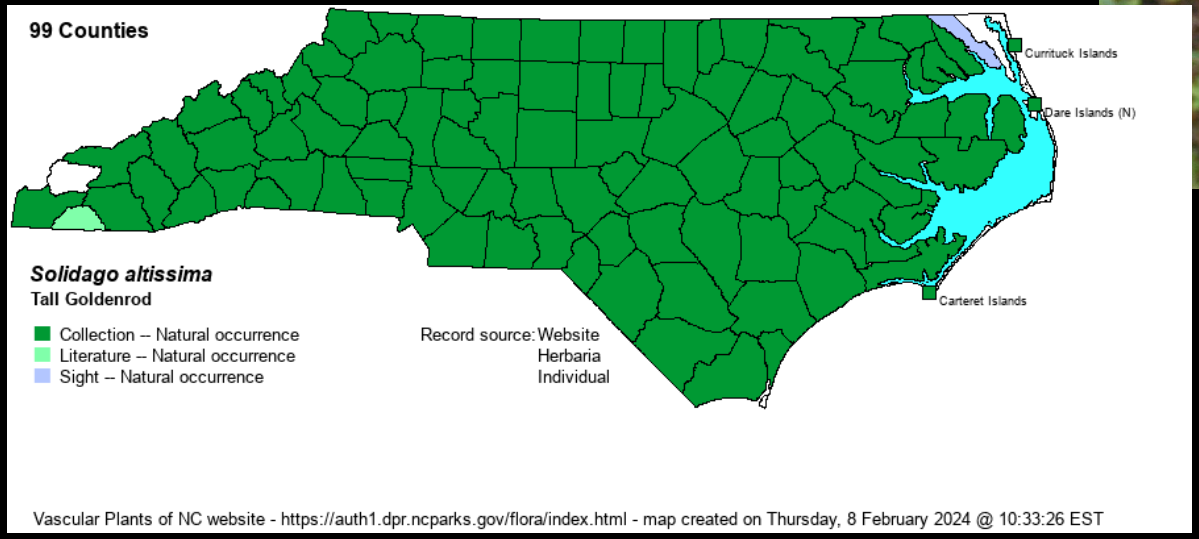
Full Sun
Drought Tolerant
Native
Cut Flowers
Dried Flowers
Attracts Birds
Attracts Butterflies

* Butterfly food for 18 species
* Nectar & Pollen source:
  * Honey Bees
  * Bumblebees
  * Native Bees
  * Butterflies
  * Wasps
* Moth caterpillars
* Seeds eaten by birds

Allergy Sufferers?

Ragweed vs. Goldenrod

Tall Goldenrod (Solidago altissima)



Pollinator Plants for Your Garden

A

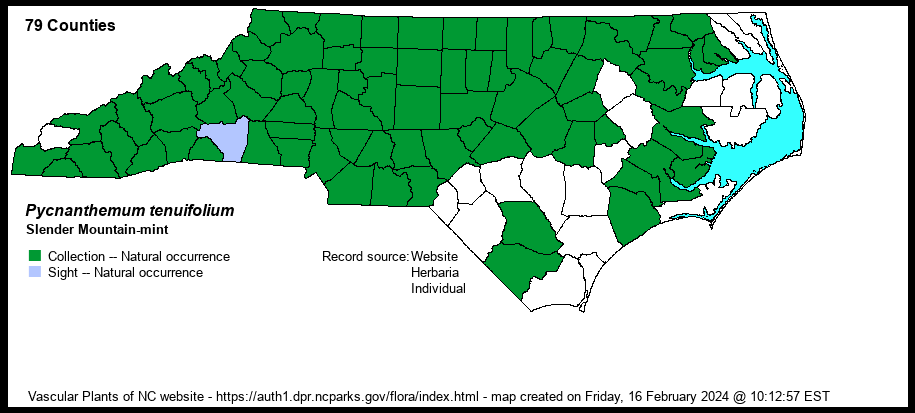
				8
Silverleaf mountain mint	*Pycnanthemum incanum*	Perennial	**N**	Summer 2018

Anise Hyssop (*Agastache foeniculum*) Cuckoo-Leafcutter bee

- ✓ Mint family (Lamiaceae)
- ✓ **Native:** Northern North America
- ✓ Bloom: June to September
- ✓ Sun: Full sun to part shade
- ✓ **Attracts:** native bees, honey bees, wasps, butterflies, hummingbirds
- ✓ Deer Resistant

Anise Hyssop (*Agastache foeniculum*)

Slender Mountain Mint (*Pycnanthemum tenuifolium*)



Type: Herbaceous perennial

Family: Lamiaceae (Mints)

Native Range: Eastern and Central US and Eastern Canada

Zone: 4 to 8

Bloom Time: June to August

Sun: Full sun to part shade

Attracts: native bees, honey bees, wasps

Mountain Mint (*Pycnanthemum muticum*)

Black-eyed Susan (*Rudbeckia hirta*)

- ✓Asteraceae Family
- ✓Native: Most of US
- ✓Blooms: May – July
- ✓Full Sun
- ✓Nectar & Pollen

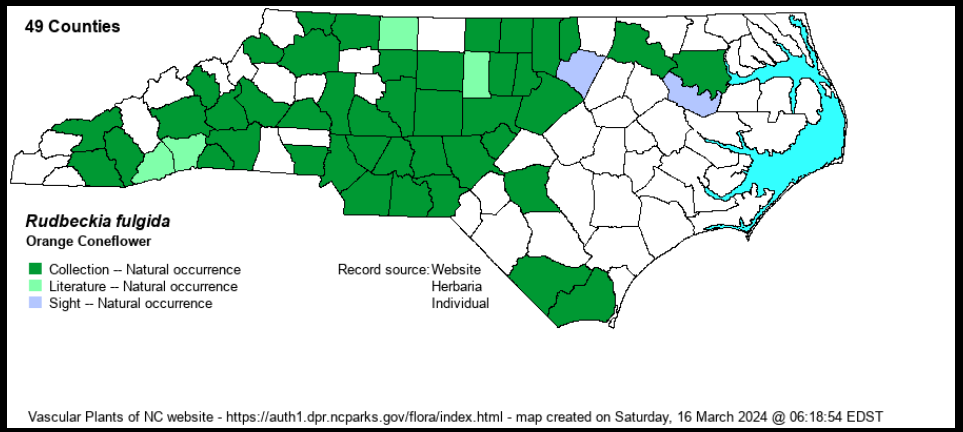
Attracts: honey bees, native bees, wasps, & hover flies

Black-eyed Susan (*Rudbeckia hirta*)

Orange Coneflower (*Rudbeckia fulgida*)

- ✓Asteraceae Family
- ✓Blooms: Aug - Oct
- ✓Full Sun
- ✓Nectar & Pollen
- ✓Perennial

Attracts: honey bees, native bees, wasps, & hover flies



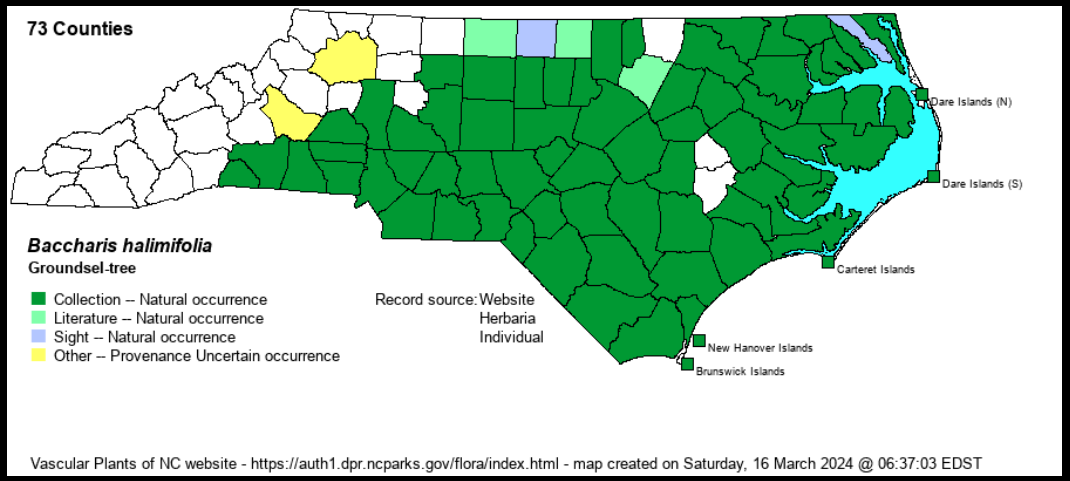
Climbing Aster (*Ampelaster carolinianus*)

- ✓Native SE US (only Bladen county in NC)
- ✓Blooms: Sept-Nov
- ✓Full Sun
- ✓Nectar & Pollen: Bees, Bumblebees.

Groundsel-tree (*Baccharis halimifolia* L.)

Alternate names: Groundsel-bush, Sea Myrtle, Eastern Baccharis

Male flowers with abundant nectar



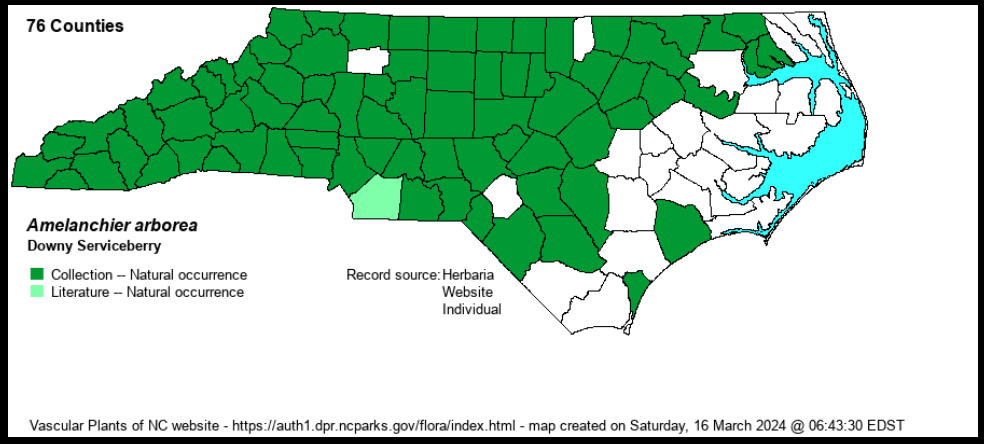
Female Flowers

Downy Serviceberry (*Amelanchier arborea* ‘Autumn Brilliance’)

Alternate Names: Juneberry or Shadbush

Blooms March to May

Member of the Rose Family



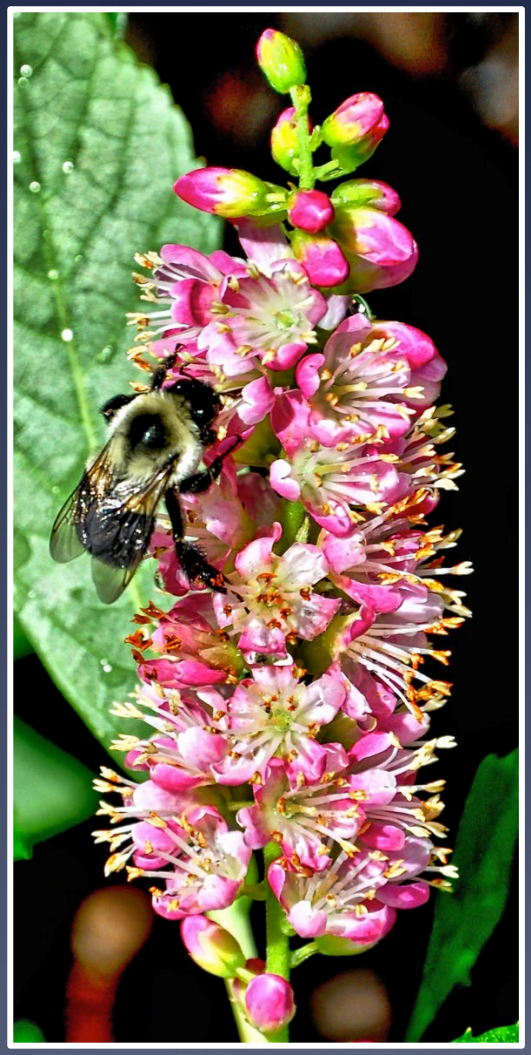
Coastal Sweet Pepperbush *(Clethra alnifolia)*

Sweet Pepperbush or Summersweet

Eaten by mammals, bees, butterflies & other insects

* Racemes of spicily sweet fragrant white flowers appear in summer

Sweet Pepperbush (*Clethra alnifolia* 'Ruby Spice')



* Seeds eaten by birds & mammals. Nectar & pollen source of bees, butterflies & other insects

Cross Vine (*Bignonia capreolata)*

Cross Vine (*Bignonia capreolata)*

Full Sun

Native

Evergreen

Attracts Birds

Benefits: Woody vine; fence rows; eaten by mammals & nectar food source of Hummingbirds, bumblebees, honey bees

Cross Vine Flower

Coral Honeysuckle (*Lonicera sempervirens*)

Coral Honeysuckle (*Lonicera sempervirens)*

- ✓ Height: 15-25 feet
- ✓ Foliage: Sun to partial shade
- ✓ Larva food for spring azure butterflies;
- ✓ Flowers attracts:
- ✓ Hummingbirds
- ✓ Bees
- ✓ Butterflies;
- ✓ Fruit eaten by birds

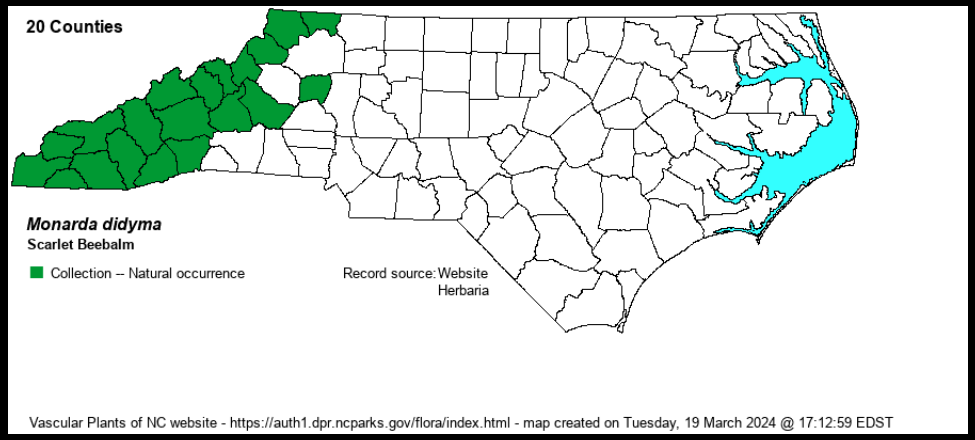
Wild Bergamot or Bee Balm

(*Monarda fistulosa* L) Mint Family

- Full Sun
- Partial Shade
- Native
- Fragrant
- Deadhead
- Cut Flowers
- Attracts Birds
- Attracts Butterflies

* Also Benefits: Hummingbirds, Native bees, Bumblebees, Honey Bees

Bee Balm (*Monarda didyma)*



Dotted Horsemint (*Monarda punctata)*

Type: Herbaceous perennial

Family: Lamiaceae

Native Range: United States

Zone: 3 to 8

Bloom Time: June to July

Sun: Full sun to part shade

Attracts: native bees, honey bees, wasps

Great Blue Lobelia (*Lobelia siphilitica*)

Alternate name: Blue Cardinal Flower

- ✓Campanulaceae (Bellflower)
- ✓Native: Eastern North America
- ✓Blooms: July-Sept
- ✓Full Sun-part shade
- ✓Nectar & Pollen

Attracts hummingbirds, butterflies, native insect pollinators, Bumblebees, honey bees

White Wood-aster

Partial Shade

Full Shade

N Native

Deadhead

Cut Flowers

Attracts Birds

Attracts Butterflies

* Also Benefits: Native Bees, Bumblebees, Honey Bees & Food for 19 species of Butterflies

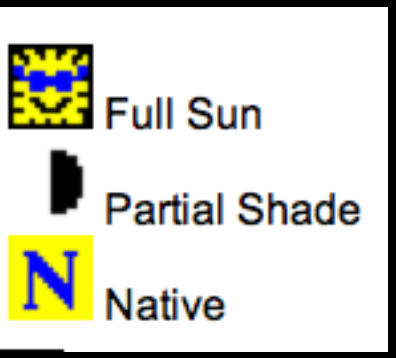
Rose Vervain (Glandularia *canadensis* 'Homestead Purple')

Hummingbird clearwing moth (*Hemaris thysbe*) nectaring on Rose Vervain (also known as Verbena)

Full Sun
Drought Tolerant
N Native
Deadhead
Cut Flowers
Attracts Butterflies

* Hummingbirds
* Butterfly food: 9 species
* Nectar source: Bees, Honey Bees, Bumblebees, moths

Eastern Joe Pye Weed (*Eupatorium dubium 'Gateway'*)



* Food Source for 9 Butterfly species
* Honey Bees
* Native Bees
* Bumblebees

Compact Purple Coneflower (*Echinacea purpurea* 'Kim's Knee-High')

- Full Sun
- Partial Shade
- Drought Tolerant
- Native
- Deadhead
- Cut Flowers
- Attracts Birds
- Attracts Butterflies

* Nectar source: Honey Bees, Native Bees, Bumblebees

* Seed: Finches

American Witch Hazel (*Hamamelis virginiana*)

- ✓Hamamelidaceae
- ✓Native: Eastern N. Am.
- ✓Blooms: Oct - Dec
- ✓Full Sun
- ✓Nectar & Pollen: Honey bees, bumblebees, carpenter bees

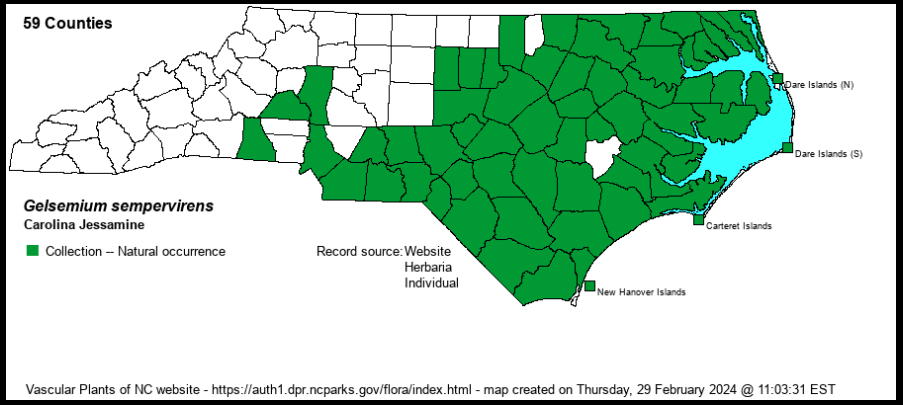
Plants toxic to honey bees

Carolina Jessamine (*Gelsemium sempervirens*)

Carolina Jessamine (Gelsemium sempervirens)

Vine

Carolina Jessamine



Double-flowered cultivar that stays in bloom longer than the species. Bees avoid.

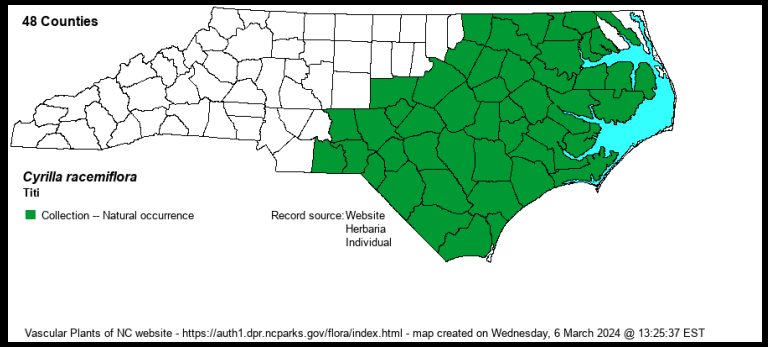
Carolina Jessamine 'Pride of Augusta'

Titi or Leatherwood (*Cyrilla racemiflora*)

Shrub

Titi or Leatherwood

Seed Capsules



Rhododendron (*Azalea* is a subgenus)

Rhododendrons and Azaleas

Both are included in the Rhododendron family. Rhododendron is a genus (group) of plants with common characteristics, whilst azaleas are a sub-group within this genus, rather than being a genus of their own.

With Hummingbird Clearwing moth

Butterfly pollinated Southern Pinxter Azalea

Plant a pollinator garden

- ✓ **Choose plants native to the region**; natives will flourish without pesticides and fertilizers, which can be harmful to bees.

- ✓ Due to the diversity of pollinator types, **choose nectar-rich and pollen-rich flowers with a range of shapes, size and colors**. ‘Generalist’ pollinators can utilize a wide variety of flowers, whereas ‘specialists’ need a specific diet and may only be able to feed from one or two types of plants. To attract the most diversity of pollinators, choose plants such as Joe Pyes, goldenrods and milkweeds.

Plant a pollinator garden

- ✓ **Avoid modern hybrids**, as many have been manipulated for larger blooms/greater color and have lost their ability to produce nectar and pollen. Additionally, during the breeding process, some flowers may become so complex that pollinators can't locate the nectar.

- ✓ Have several **different plants in bloom from early spring through late fall**. Some pollinators may appear in the spring, while others don't appear until mid-summer. Overlapping bloom times will ensure pollinators always have something nutritious.

Plant a pollinator garden

- ✓ **Plant in drifts**. When purchasing plants, try to get at least three or more of one kind and plant them near one another; pollinators are more likely to find them this way.

- ✓ **Avoid landscape fabric and mulch**. Instead, plants of varying heights planted close together will form a weed barrier much stronger than a bed of mulch.

- ✓ **Save perennial garden cleanup for spring**, as pollinators overwinter in different life stages. Some may attach to plants or overwinter in leaf litter, while others may overwinter in hollow stems. To protect overwintering pollinators, don’t cut down perennial gardens until early April, keeping beds of leaves intact through the winter.

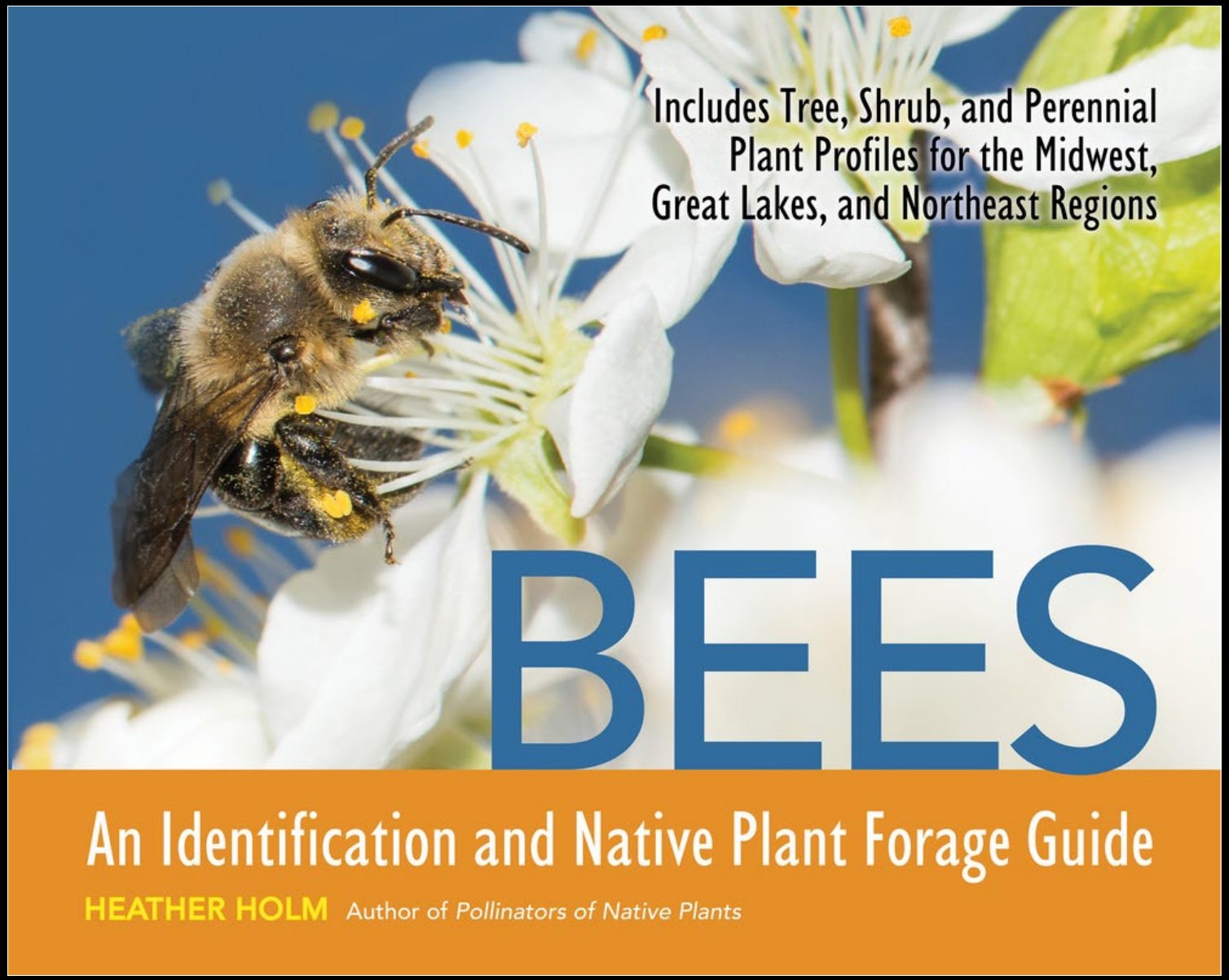
ACB Pollinator Garden

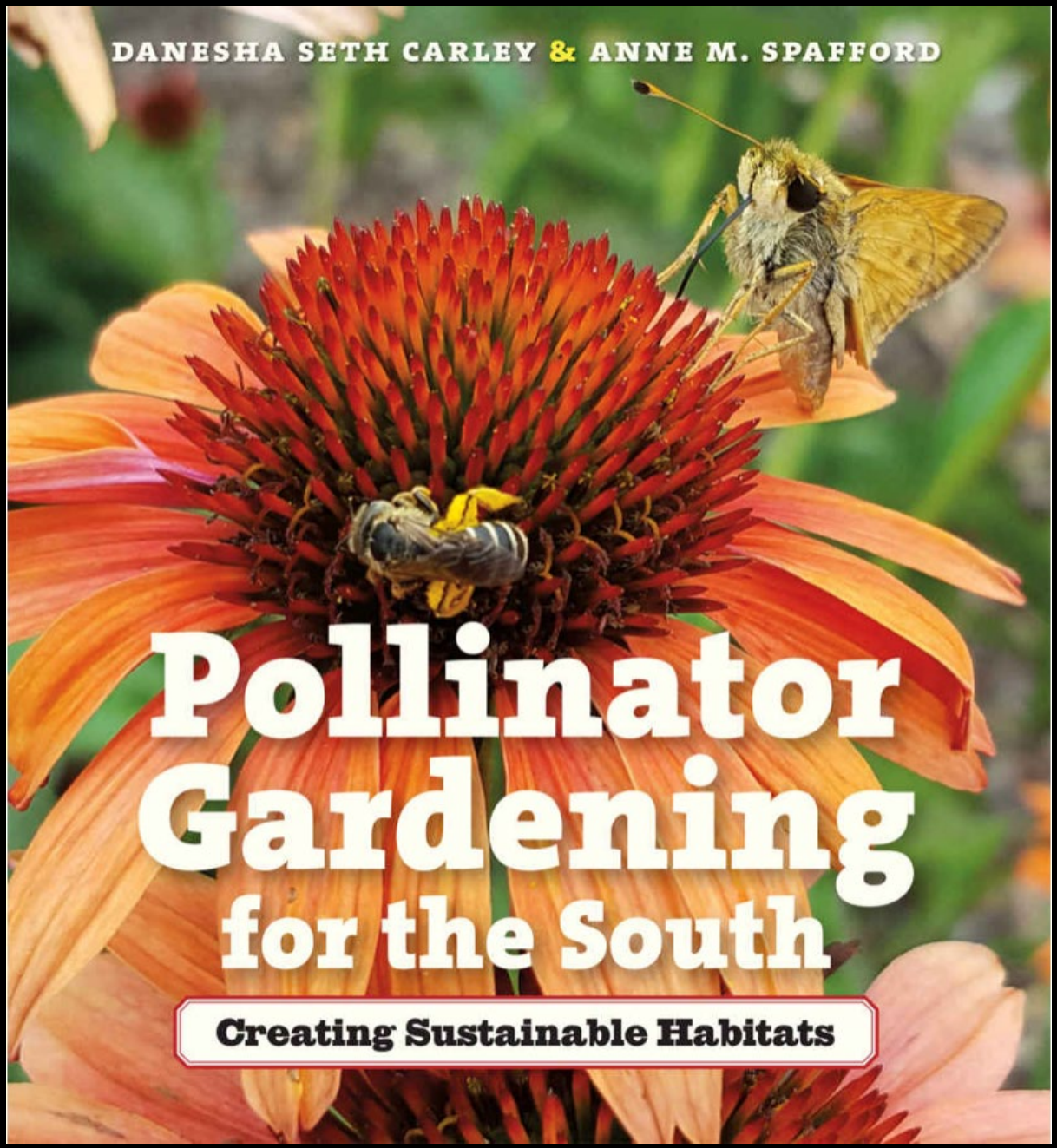
Cane Creek Mountains Natural Area

ACB Pollinator Garden

Cane Creek Mountains Natural Area

Pollinator & Plant Reference Books





Both are associate professors of horticultural science at NC State University

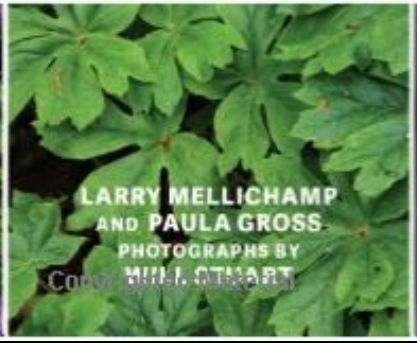


THE SOUTHEAST
Native Plant Primer

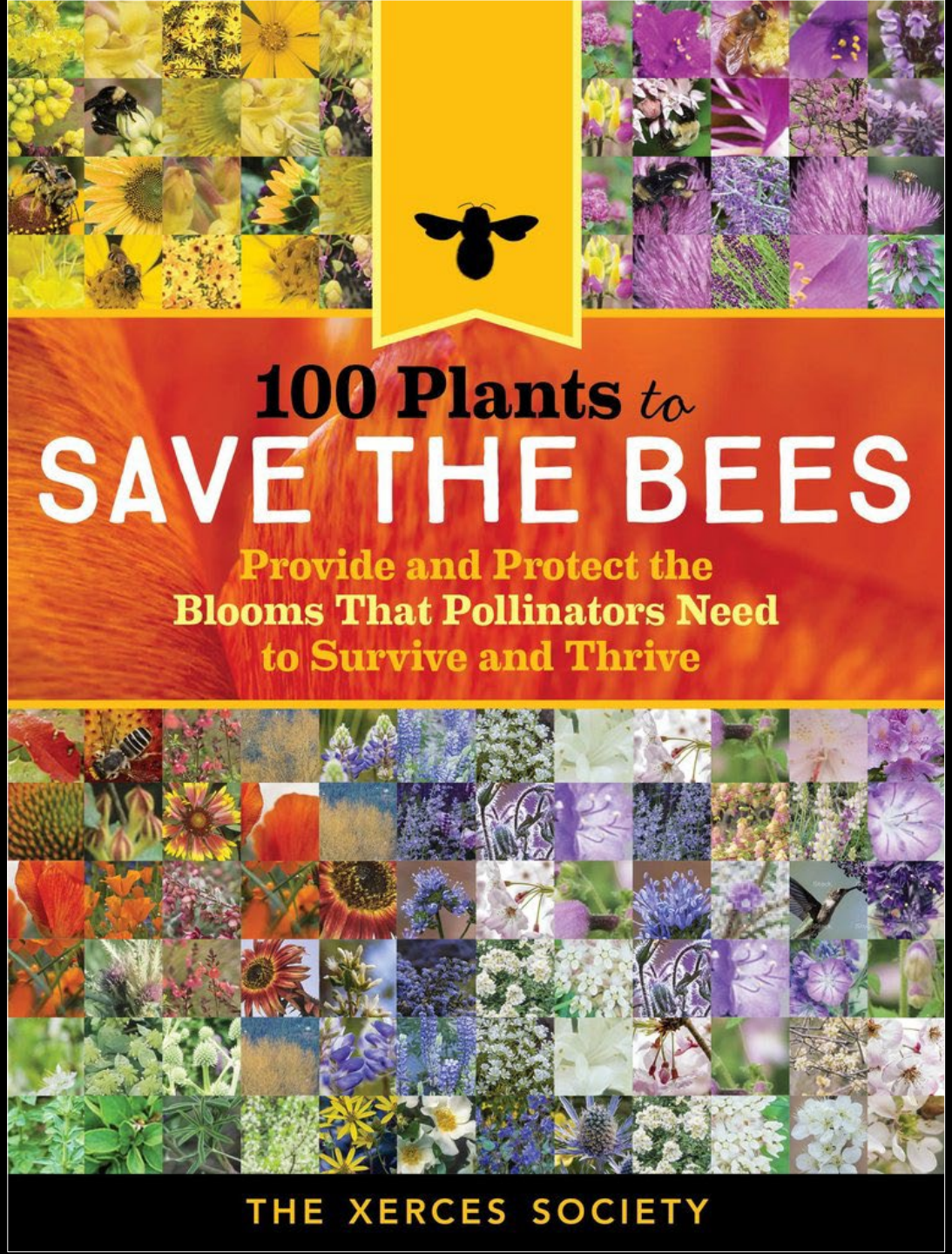
225 Plants for an Earth-Friendly Garden



Attract Pollinators Support Wildlife Reduce Maintenance

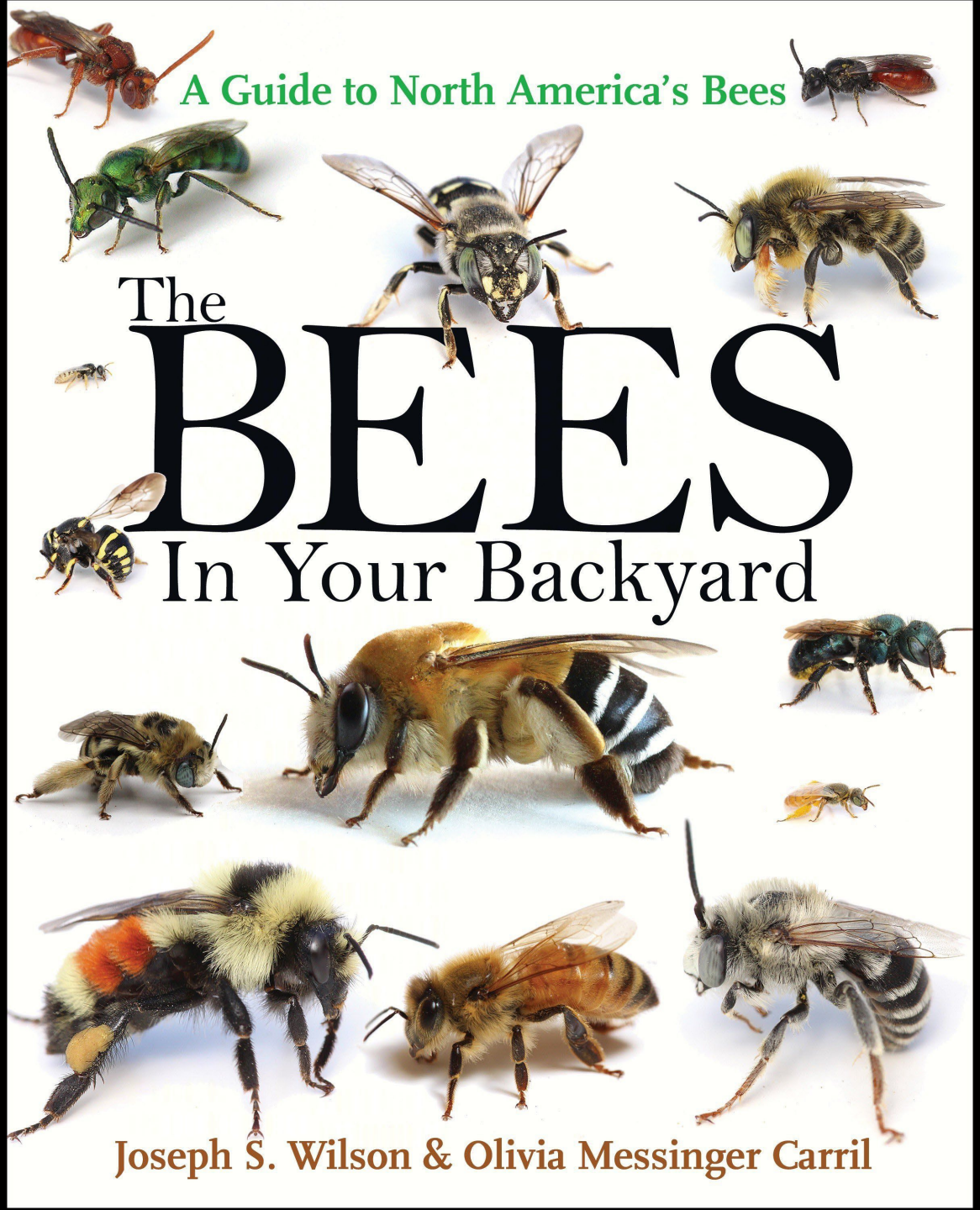

LARRY MELLICHAMP
AND PAULA GROSS
PHOTOGRAPHS BY
WILL STUART


100 Plants to
SAVE THE BEES
Provide and Protect the
Blooms That Pollinators Need
to Survive and Thrive
THE XERCES SOCIETY

POLLINATORS OF NATIVE PLANTS

Attract, Observe and Identify Pollinators and Beneficial Insects with Native Plants

Heather Holm


A Guide to North America's Bees
The
BEES
In Your Backyard
Joseph S. Wilson & Olivia Messinger Carril

QUESTIONS?

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