

BERRIES FOR BIRDS

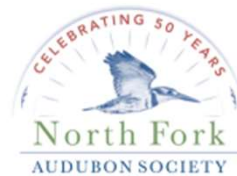
A Community Approach to Biodiversity Restoration

1

A NORTH FORK AUDUBON SOCIETY Initiative

In Partnership with Homegrown National Park®

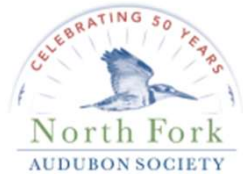
Ellen Birenbaum, MD



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PRESENTATION OUTLINE

1. Ecosystems and Biodiversity
2. The Biodiversity Crisis
3. Coevolution of plants, insects and birds
4. Keystone Plants
5. Solutions for the Biodiversity Crisis
 - Home Grown National Parks®
 - Berries for Birds

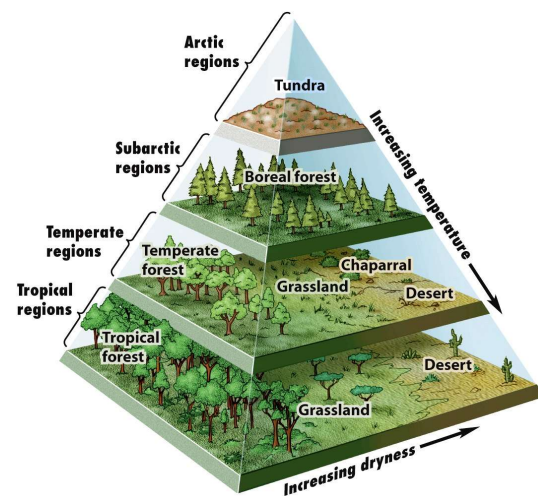


BERRIES for BIRDS

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ECOSYSTEMS

ECOSYSTEM: a community of living organisms interacting with each other and the surrounding environment



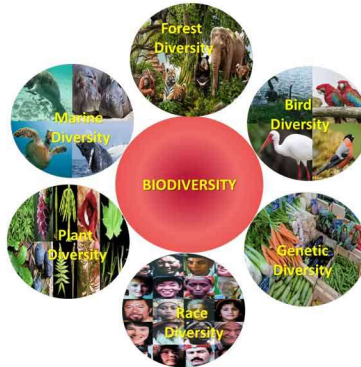
Source: Discover Biology, W.W. Norton & Co., 2006

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BIODIVERSITY

BIODIVERSITY: measured by the number of species in a given location

- Each species has a specific role in maintaining balance within the ecosystem
- Biodiverse ecosystems can better withstand environmental stresses



Source: filtrectechnologies.com

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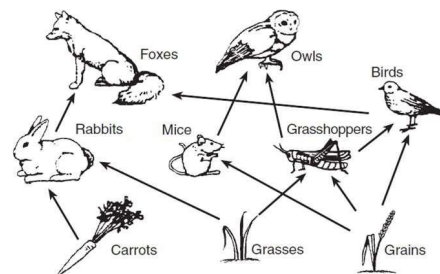
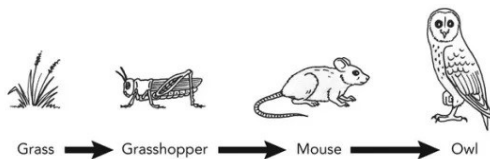
THE FOOD CHAIN and FOOD WEBS

FOOD CHAIN: linear movement of energy through the ecosystem

- Plants convert solar energy to food through photosynthesis
- Plant-eating animals are eaten by flesh-eating animals (predator chain)

FOOD WEB: all food chains in a single ecosystem

- Each organism in an ecosystem is part of multiple food chains



Source: Desertoasisgarden.wordpress.com

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E. O. WILSON'S 1987 THOUGHT EXPERIMENT*



What would happen if humans disappeared?

"If human beings were to disappear tomorrow, the world would go on with little change...and set about healing itself and return itself to the rich environmental states of a few thousand years ago."

What would happen if insects disappeared?

"I doubt that human species could last more than a few months. Most of the fishes, amphibians, birds and mammals would crash into extinction.... Next would go the bulk of flowering plants..."

*The Little Things That Run the World,
Conservation Biology, 1987

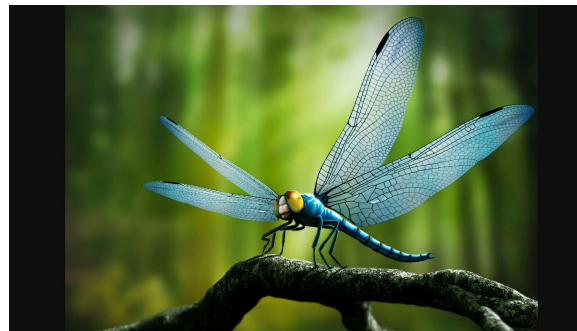
7

IMPORTANCE of INSECT FUNCTION

Vital pollinators

Recyclers of ecosystems

Basis of all food webs



Source: whatsthatbug.com

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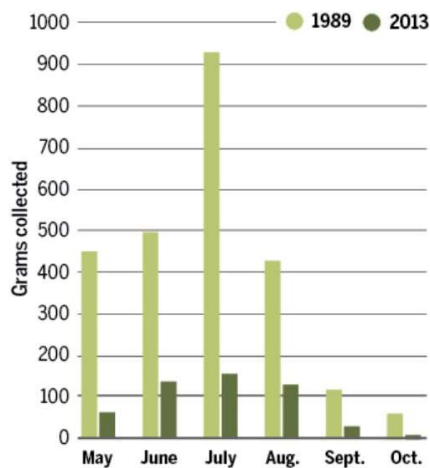
KREFELD ENTOMOLOGICAL SOCIETY

- Established in 1905 in the small industrial town of Krefeld, Germany
- Group of ~50 amateur entomologists
- Began collecting flying insects in 1982 with identical traps in same locations with a standardized method for weighing the insects
- Data first published in 2013, reanalyzed, and republished in 2017 in PLOS ONE, an open-sourced on-line publication



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KREFELD ENTOMOLOGICAL SOCIETY



Mass of insects declined 78% in 24 years!

(GRAPHIC) G. GRULLÓN/SCIENCE; (DATA) M. SORG ET AL.,
 MITTEILUNGEN AUS DEM ENTOMOLOGISCHEN VEREIN KREFELD 1, 1-5
 (2013) © 2013 ENTOMOLOGISCHER VEREIN KREFELD

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BIODIVERSITY CRISIS ATTRACTS MEDIA ATTENTION

According to *The Economist*, the Krefeld Entomological Society paper was the third most frequently cited scientific study in the world in 2017.

Where have all the insects gone?

Surveys in German nature reserves point to a dramatic decline in insect biomass

10 MAY 2017 • BY [GRETCHEN VOGEL](#)

Source: *Science*, 2017

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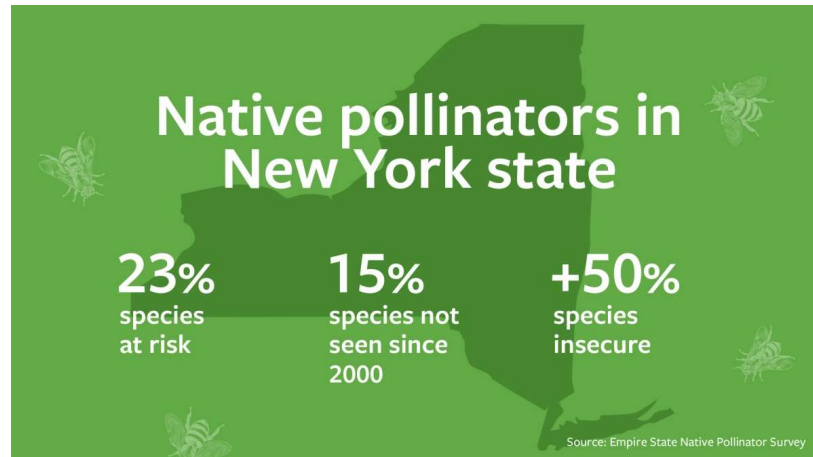
BIODIVERSITY CRISIS ATTRACTS MEDIA ATTENTION



Source: *New York Times Magazine*, November 27, 2018

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BIODIVERSITY CRISIS: Local Decline in Native Pollinators



Source: Empire State Native Pollinator Survey, August, 2022 (3-year survey).

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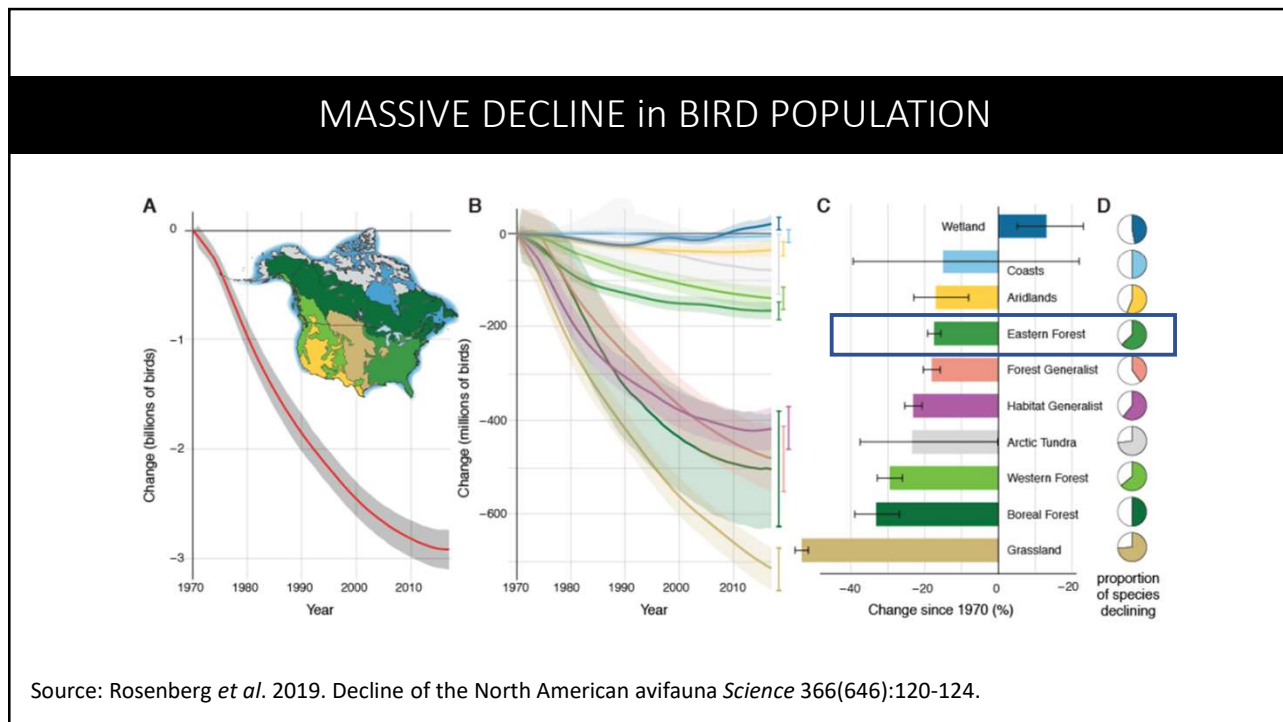
'WINDSHIELD PHENOMENON'

The observation that fewer dead insects accumulate on the windshields of people's cars since the 2000s

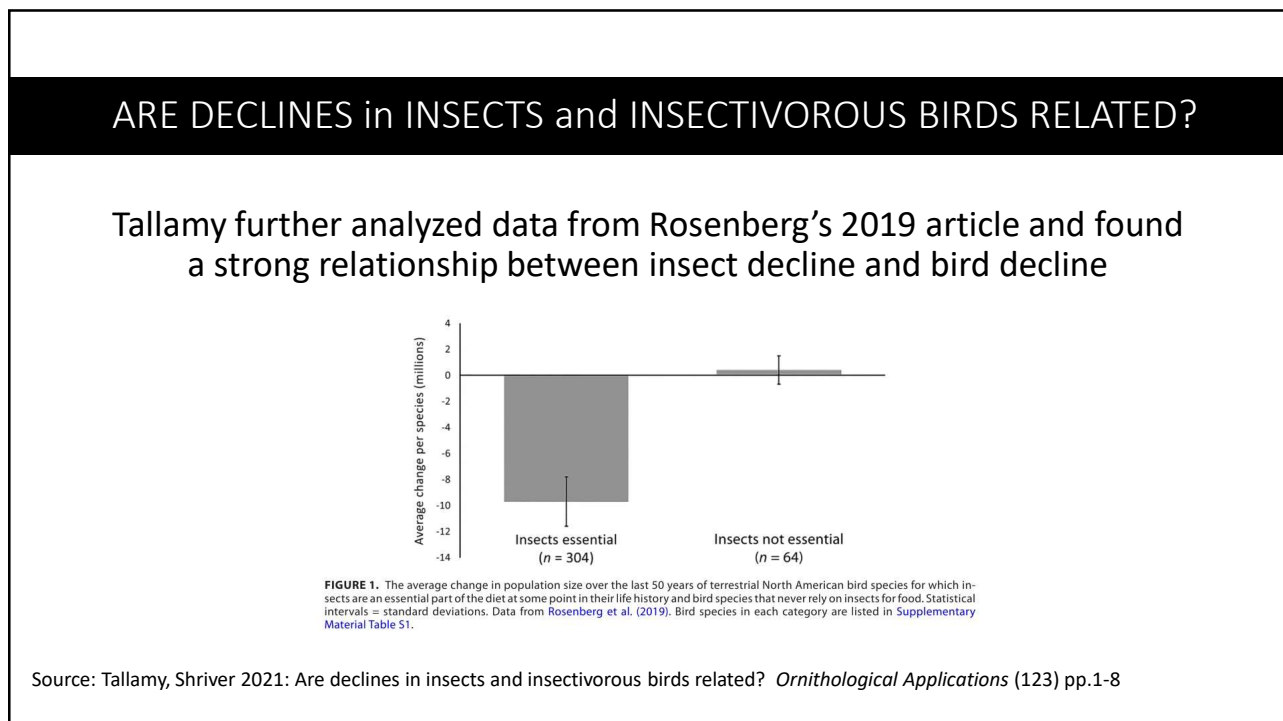


Source: Forbes.com

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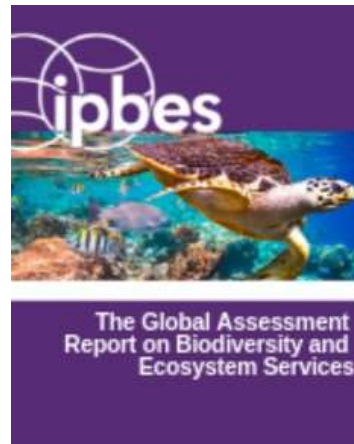
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BIODIVERSITY CRISIS

One million animal and plant species are now threatened with extinction.

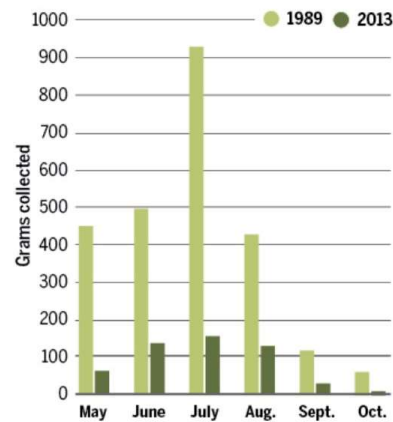


Source: 2019 Global Assessment Report by Intergovernmental Platform on Biodiversity and Ecosystem Services.

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CAUSES of INSECT POPULATION DECLINE

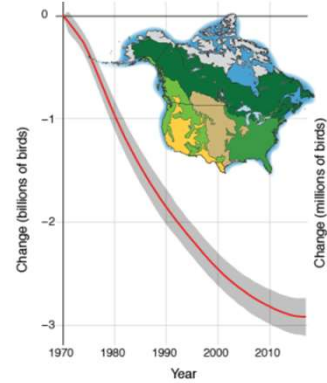
- Habitat loss
- Plant choice
- Invasive species
- Pesticide use
- Light pollution
- Climate change



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CAUSES of BIRD POPULATION DECLINE

- Habitat loss
- Plant choice
- Invasive species
- Pesticide use in breeding and wintering areas
- Light pollution
- Climate change
- Insect decline
- Cat predation
- Human-caused mortality: unregulated harvest, building and automobile collisions, electrocutions due to power line collisions



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HABITAT LOSS

- Grass has replaced >40 million acres of diverse native plant communities.
- In new suburban developments, >90% of the landscape is planted in grass.
- Grass chemicals, overfertilization, increased water consumption, and mower emissions all contribute to a negative environmental impact



Sources: Milese, C. Mapping and modeling the biogeochemical cycles of turf grasses in the US *Environmental Management* 36(3):426-38; vacant-land-usa.com

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HOW DO PLANTS, INSECTS and BIRDS INTERACT?

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PLANT CATEGORIES

NATIVE PLANT SPECIES:

Plants historically or currently present in a particular ecosystem as a result of natural evolution

INTRODUCED PLANT SPECIES (exotic, alien or non-native plants):

Plants living outside their native distribution range, introduced into a region by human activity, either intentionally or inadvertently

- Impact of introduced plants is variable, some plants may have little or no impact while others have a substantial negative impact on local ecosystems

INVASIVE PLANT SPECIES:

Introduced plants that cause ecological, environmental, and/or economic damage in their new location, spreading naturally

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THE IMPORTANCE of COEVOLUTION of NATIVE PLANTS and BIRDS

- Native plants and native birds have evolved together over 3.8 billion years and are mutually dependent
- Birds eat the fruits, buds and nectar of plants, thereby pollinating plants and dispersing their seeds



Source: sites.psu.edu

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THE IMPORTANCE of COEVOLUTION of NATIVE PLANTS and BIRDS

- Seeds are dispersed by attaching to feathers, being carried on beaks or claws during and after feeding, and through fecal material
- High nitrogen content in bird excrement serves as fertilizer for the seed
- In eastern deciduous forests, at least 300 trees, shrubs and vines depend solely on birds to spread their seed



Source: coolkidsfacts.com

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PLANTS HAVE EVOLVED to PROMOTE SEED DISPERSAL

- Brightly-colored fruits attract birds who have an acute sense of vision and color discrimination
- Some berries and fruits have waxy coatings that reflect UV light, visible to birds
- Shrubs and trees without brightly colored fruit have bright stems and brilliant fall leaves that attract birds when their fruit ripens



Source: academy.allaboutbirds.org; longislandnatives.com; plants.gardens.com

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HOW DO NATIVE and NON-NATIVE BERRIES COMPARE?

- The nutritional value of native berries is greater than that of invasive berries.
- Invasive plants have high growth rates compared to natives which gives them a competitive advantage



Source: John Baird "The Selection and Use of Fruits by Birds in an Eastern Forest 1980 *The Wilson Bulletin*."

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HOW DO NATIVE and NON-NATIVE BERRIES COMPARE?

Observational studies have shown the following:

- Birds prefer native berries when they have the option
- Migrating birds will not stay long in an invasive predominant habitat but will linger in habitats with native berries
- The most abundant native berries are consumed at a faster rate than invasives.
- As preferred foods are exhausted, berries that have been ignored are added to the diet.
- The persistence of berries of invasive species during the winter promotes invasion and range expansion by non-native plants.

Sources: John Baird, 1980, "The Selection and Use of Fruits by Birds in an Eastern Forest 1980 *The Wilson Bulletin* 92(1):63-73;
Smith, S.B 2013 "The Value Of Native and Invasive Fruit-Bearing Shrubs for Migration Songbirds" *Northeastern Naturalist* 20(1):171-184

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THE IMPORTANCE of CATERPILLARS

- Caterpillars are the larval stage of members of the order **Lepidoptera**, comprising butterflies and moths
- 97% of North American terrestrial birds rear their young on caterpillars and adult moths with soft bodies rather than seeds, berries or hard-shelled insects
- Caterpillars have high amounts of proteins, fats and carotenoids, which improve color vision and reproduction and are a major component of colorful feather pigments
- Nestlings eat full caterpillar meals 30-40 times daily!

Habitat that does not contain enough caterpillars is not suitable for successful breeding



Source: birdsandbiology.com

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COEVOLUTION of INSECTS and PLANTS

- Native plants differ by orders of magnitude in their ability to host insects.
- There are specialized relationships between most plant eating insects and the plants they eat.
- 90% of plant eating insects are diet specialists: they can only develop on the plants with which they share an evolutionary history.



Sources: Tallamy, D. 2019, *Nature's Best Hope*, pp 139 – 141; mymblesmith.com

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KEYSTONE PLANTS

- Approximately 5% of our local plants host 70 -75% of the local caterpillar species
- These hyper-productive plants are called **KEYSTONE PLANTS**.
- Without keystone plants the local food web falls apart.



Sources: Tallamy, D. 2019, *Nature's Best Hope*, pp 139 – 141; mymblesmith.com

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KEYSTONE PLANTS REGENERATE BIODIVERSITY

- Keystone plants support insects which then support animals that feed on them
- Most animals do not eat plants directly but eat insects that feed on plants
- **Planting keystone plants increases the number of species (biodiversity) in the local ecosystem**

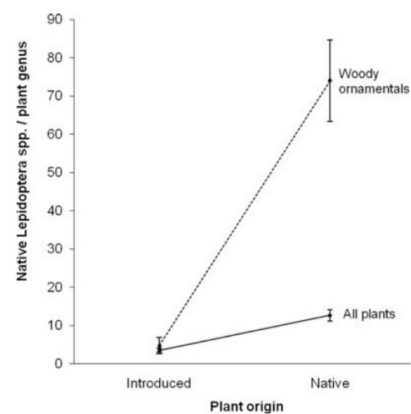


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KEYSTONE PLANT RANKINGS

In 2009, Tallamy compared the value of native vs. introduced plants in their ability to serve as host plants for lepidoptera:




1. native plants supported more species than introduced plants
2. woody plants (trees and shrubs) supported more lepidoptera species than herbaceous plants



Source: Tallamy, D.W. 2009 Ranking lepidopteran use of native versus introduced plants, *Biology* 23(4):941-47.

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KEYSTONE PLANT RANKINGS for LEPIDOPTERA SPECIES

<p># 1 <i>Quercas</i>: oaks 534 species</p> 	<p># 2 <i>Prunus</i>: cherry, plum 456 species</p> 	<p># 3 <i>Salix</i>: willow 455 species</p> 
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Source: longislandnatives.com

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KEYSTONE PLANT RANKINGS for LEPIDOPTERA SPECIES

<p># 4 <i>Betula</i>: birches 411 species</p> 	<p># 5 <i>Populus</i>: poplar, cottonwood 367 species</p> 	<p># 6 <i>Malus</i>: crabapple 308 species</p> 
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Source: longislandnatives.com

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HERBACEOUS PLANTS BEST at SUPPORTING INSECTS

Solidago:
goldenrods



Symphyotrichum:
aster



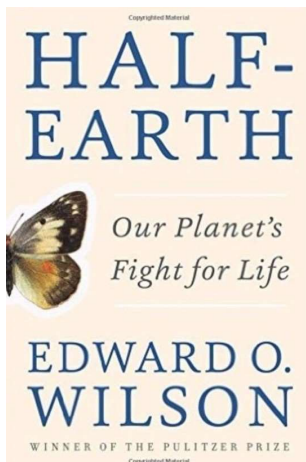
Helianthus:
sunflower



Source: longislandnatives.com

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SOLUTIONS for the BIODIVERSITY CRISIS: E.O. WILSON



Published in 2016

"The Half-Earth proposal offers [a solution] commensurate with the magnitude of the problem:

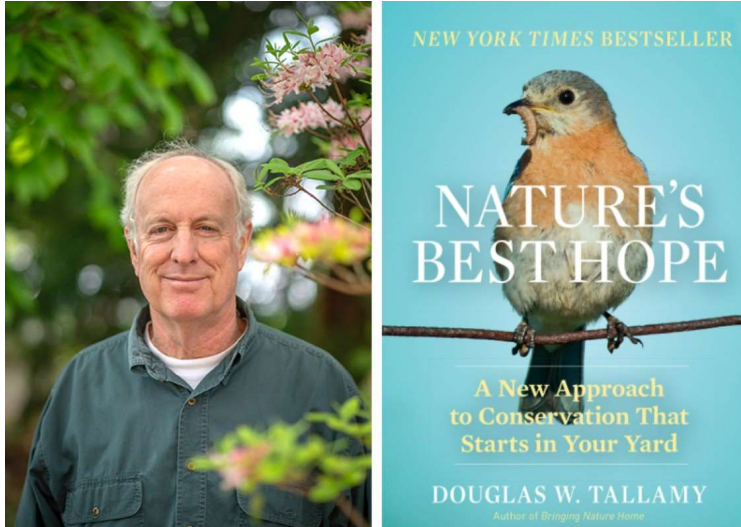
...only by setting aside half the planet in reserve, or more, can we save the living part of the environment and achieve the stabilization required for our own survival."

– E.O. Wilson (1929-2021)

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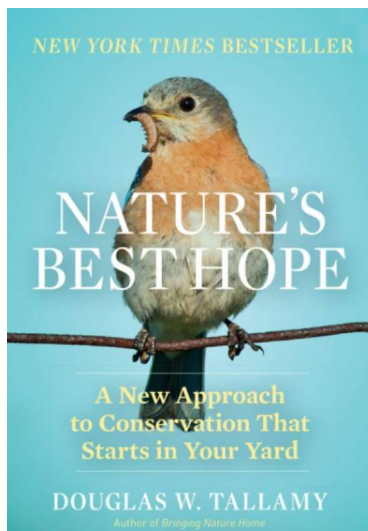
SOLUTIONS for the BIODIVERSITY CRISIS: DOUGLAS W. TALLAMY

Published in 2019



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SOLUTIONS for the BIODIVERSITY CRISIS : NATURE'S BEST HOPE



Key Concepts:

- Grass roots approach to conservation
- Conservation of private property where people live and work
- Relies on the initiatives of private individuals to turn their yards into conservation corridors which he names **Homegrown National Parks**

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HEMGROWN NATIONAL PARK®



- “National-global awareness, not just of the problem **but of the solution.**”
- “A changed culture: recognition that nature is not optional and that everybody owns responsibility to sustain it.”

Website: <https://homegrownnationalpark.org>

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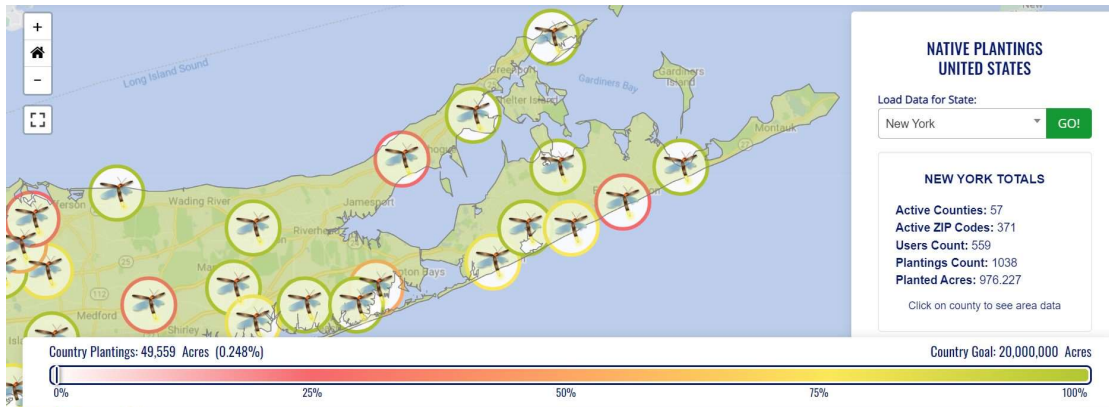
MEASURE CONSERVATION PROGRESS



Website: <https://homegrownnationalpark.org>

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MEASURE CONSERVATION PROGRESS



Website: <https://homegrownnationalpark.org>

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LOCAL SOLUTION for the BIODIVERSITY CRISIS

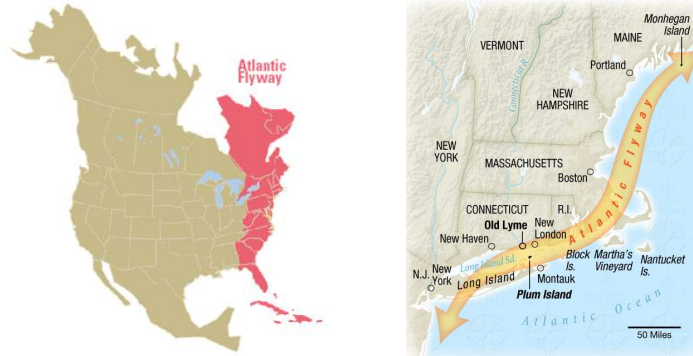


BERRIES for BIRDS

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BIRD MIGRATION along the ATLANTIC FLYWAY

For a successful annual migration, birds must consume large quantities of highly nutritious food to quickly refuel. Fruits (berries) are the major food source for many songbirds during fall migrations along the Atlantic Flyway. Loss of suitable habitat is a major factor in the declining population of migrating songbirds.



Source: National Science Foundation; mapmanusa.com

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WHAT CAN WE DO to SUPPORT
MIGRATING and OVER-WINTERING BIRDS?

PROVIDE BERRIES for BIRDS

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NATIVE SPRING and SUMMER BERRIES

- Fruits of different plants contain different amounts of sugars, fatty acids and other nutrients and ripen in different seasons
- **Sweet fruits** predominate in the spring and summer

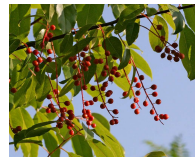
***Amelchier* spp.:** Downy, Shadbush, Allegheny and Apple Serviceberries



***Morus rubra*:** Red mulberry



***Prunus serotina*:** Black cherry, Wild cherry, Wild Rum Cherry



Source: academy.allaboutbirds.org; longislandnatives.com; plants.gardens.com

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NATIVE AUTUMN BERRIES

- Ripen in late summer or early fall; become available just before the southbound migration
- Autumn fruits are high in calorie rich **fatty acids**, often 50% fat by weight

***Lindera benzoin*:** spicebush



***Cornus* spp.:** Flowering dogwood, gray dogwood, red twig dogwood



***Sassafras albidum*:** sassafras



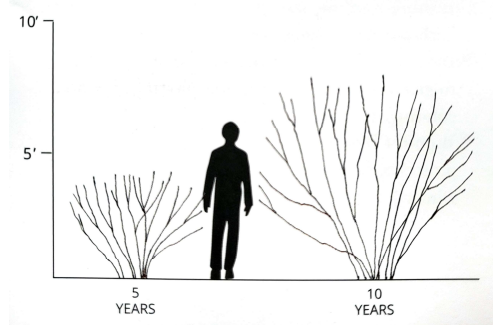
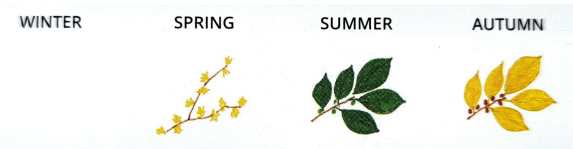
Source: pbase.com, davesgarden.com; lemonbayconservancy.org

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NATIVE SHRUB: *Lindera benzoin*

Spicebush

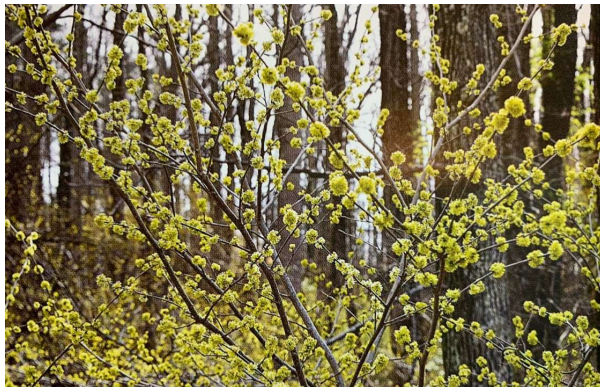
- Full sun to full shade
- Moisture: moist to wet
- Leaves have spicy fragrance
- Separate sexes with red berries on females
- Sometimes browsed by deer but not a favorite



Source: Dove and Woolridge, 2018 Essential Native Trees and Shrubs for the Eastern United States

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NATIVE SHRUB: *Lindera benzoin*



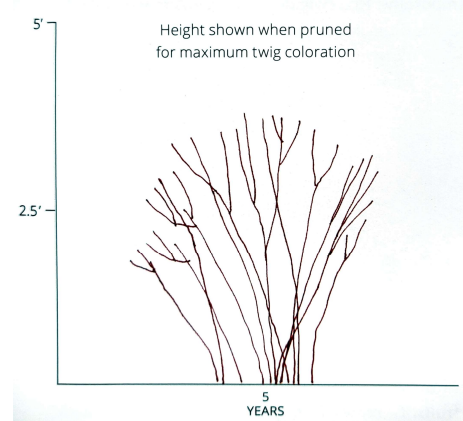
Source: Dove and Woolridge, 2018 Essential Native Trees and Shrubs for the Eastern United States, longislandnatives.com

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NATIVE SHRUB: *Cornus sericea*

Red Twig Dogwood

- Full sun to part shade
- Moisture: most to wet
- Can be affected by powdery mildew and leaf spot in late summer
- Attracts butterflies and other pollinators
- Bright red stems beautiful against snow
- Deer may browse but not preferred plant



Source: Dove and Woolridge, Essential Native Trees and Shrubs for the Eastern United States

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NATIVE SHRUB: *Cornus sericea*



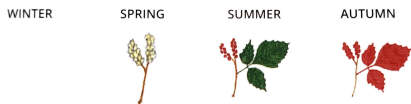
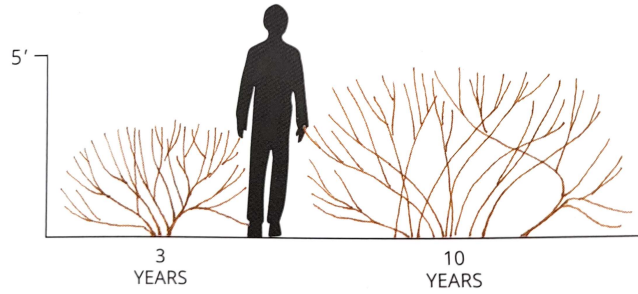
Sources Longislandnatives.com; pinterest.com; Joyce-roadblogspot.com

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NATIVE SHRUB: *Rhus aromatica*

Fragrant sumac

- Full sun to part shade
- Moisture: dry to moist
- Low-growing
- Slow to moderate growth rate
- Useful for ground cover and steep slope stabilization
- Tolerates extreme drought
- Rarely browsed by deer



Source: Dove and Woolridge, Essential Native Trees and Shrubs for the Eastern United States

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NATIVE SHRUB: *Rhus aromatica*



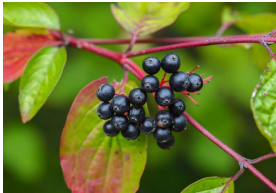
Sources: longislandnatives.com; Phipps.conservatory.org

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NATIVE AUTUMN BERRIES PERSISTING INTO WINTER

- Persistent fruits are available later in the fall season and winter and are an important source of food for over wintering birds and early spring migrants, especially when late snowfalls prevent birds from finding earthworms, insects and other invertebrates.
- These berries have a **lower lipid content** than other autumn berries and are less prone to turn rancid and rot on the vine.

***Viburnum lentago*:**
nannyberry



***Aronia arbutifolia*:**
red chokeberry



***Ilex opaca*:**
American holly



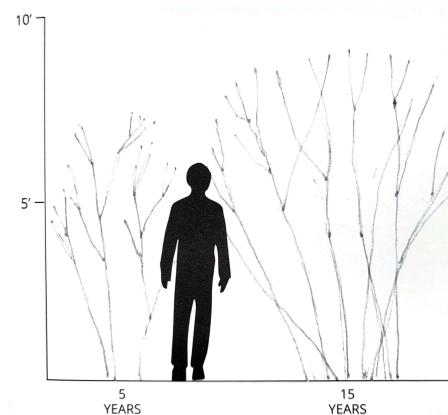
Source: directnativeplants.com; gmadewellnursery.com; longislandnatives.com

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NATIVE SHRUB: *Aronia latifolia*

Red Chokeberry

- Full sun to part shade
- Moisture: dry to wet
- Black chokeberry is closely related
- 1"-2" clusters of white flowers in spring
- Red berries persist into winter
- Drought tolerant
- Irresistible to deer



Source: Dove and Woolridge, Essential Native Trees and Shrubs for the Eastern United States

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NATIVE SHRUB: *Aronia latefolia*



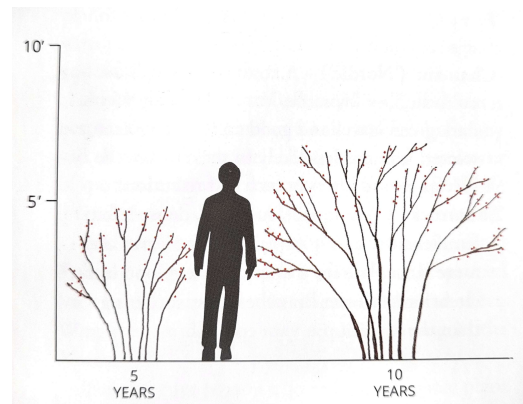
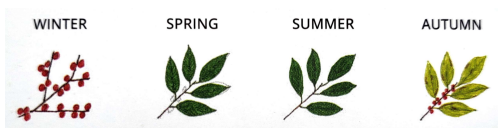
Source: Longislandnatives.com

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NATIVE SHRUB: *Ilex verticillata*

Winterberry

- Full sun to full shade
- Moisture: dry to wet
- Tolerant of moderate drought
- Separate sexes, male plant must be present for female plant to produce berries
- Deer will frequently browse leaves



Source: Dove and Woolridge, Essential Native Trees and Shrubs for the Eastern United States

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NATIVE SHRUB: *Ilex verticillata*



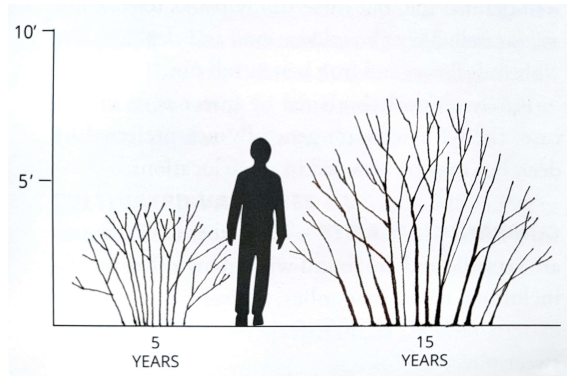
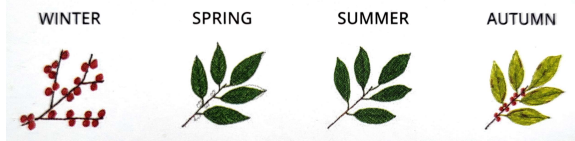
Sources: greatgardenplants.com; Longislandnatives.com

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NATIVE SHRUB: *Viburnum nudum*

Smooth witherod viburnum

- Full sun to part shade
- Moisture: dry to wet
- Showy, profuse flowers in late spring
- Excellent plant for caterpillars
- Generally not preferred by deer



Source: Dove and Woolridge, Essential Native Trees and Shrubs for the Eastern United States

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NATIVE SHRUB: Smooth witherod viburnum



Sources: gobotany.newenglandwild.org; Longislandnatives.com

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BEST WOODY and HERBACEOUS PLANTS for LOCAL FOOD WEBS

National Wildlife Federation Native Plant Finder
([https://www.nwf.org/Native Plant Finder](https://www.nwf.org/Native-Plant-Finder))



National Wildlife Federation Garden for Life
([https://www.nwf.org > garden-for-wildlife](https://www.nwf.org/garden-for-wildlife))



Audubon Plants for Birds
(<https://www.audubon.org/native-plants>)



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FUTURE SITE OF RICK'S TOWHEE GARDEN



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TAKE HOME MESSAGES

- Plant keystone plants to regenerate biodiversity
- Plant berry-producing trees and shrubs to support migrating and overwintering birds
- Reduce lawn area
- Remove invasive plants
- Don't use pesticides
- Get "ON THE MAP"

DOUG TALLAMY: "In the past conservationists worked exclusively where people *weren't*; we now need to save nature where people *are*."

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HOMEGROWN NATIONAL PARK® START A NEW HABITAT®

WE CAN DO THIS!

ONE PERSON AT A TIME

REGENERATE BIODIVERSITY

Website: <https://homegrownpark.org>

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ACKNOWLEDGEMENTS

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BERRIES for BIRDS

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