GREAT WALDEN BIO BLITZ

July 5 - 6, 2019

Celebrating

Dr. Edward O. Wilson's 90th Birthday and

the legacy of Henry David Thoreau

Report and Summary

A Partnership of

WALDEN WOODS PROJECT

NATIONAL PARK SERVICE

e.o.wilson BIODIVERSITY FOUNDATION

Naturalist Peter Alden

With Generous Support from

National Geographic Society

Anna Winter Rasmussen and Neil Rasmussen

FREEDOM'SWAY National Heritage Area | Nature · Culture · History

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Digital copies available at www.walden.org

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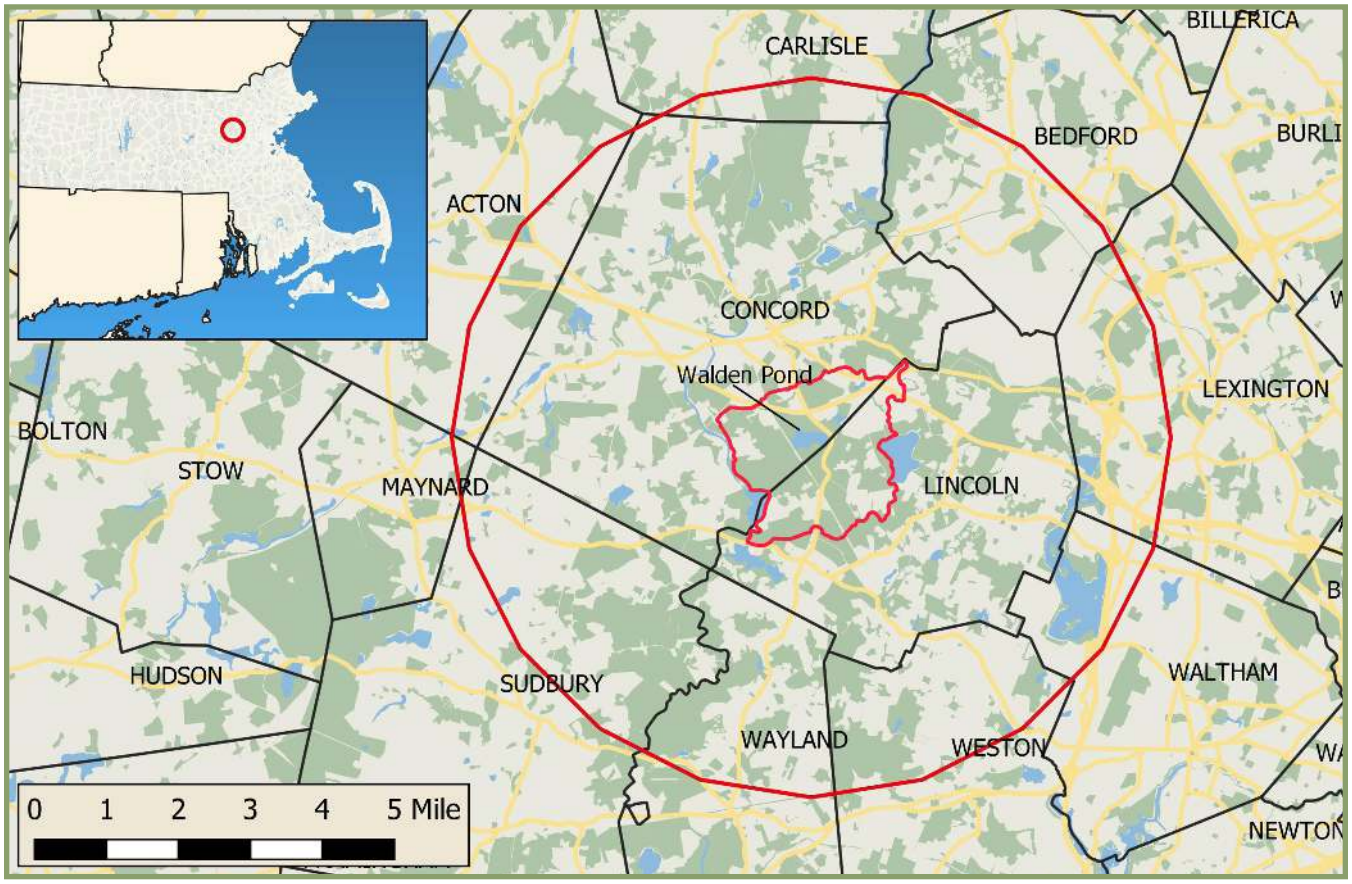
Introduction

On July 5 and 6, 2019, The Walden Woods Project, Minute Man National Historical Park, E.O. Wilson Biodiversity Foundation, and naturalist Peter Alden hosted the 2019 Great Walden BioBlitz in historic Walden Woods and the area within a five-mile radius of Walden Pond. The 2019 Great Walden BioBlitz brought together approximately 100 invited field biology specialists who worked individually and in *ad hoc* teams at a variety of self-selected locations throughout the project area, and around 150 members of the general public who participated in guided hikes focused around Walden Woods Project headquarters and the Minute Man National Historical Park, both in Lincoln, MA. The flora and fauna of historic Walden Woods and the greater Walden project area were intensively surveyed and recorded with the goal of identifying as many distinct species as possible within one day.

Over the course of the 2019 Great Walden BioBlitz, a total of 2,242 species of mammals, birds, reptiles, amphibians, fishes, invertebrates, trees, shrubs, herbs, ferns, mosses, lichens, and fungi larger than 1 mm, were recorded. Observations by the general public were recorded using the iNaturalist smartphone application, a joint initiative between the California Academy of Science and the National Geographic Society, and were compiled in a collection project identified as the Great Walden BioBlitz at iNaturalist.org. Specialists' observations were recorded in a variety of formats, including the iNaturalist platform, but largely consisted of compiled species lists. A small number of specimens were collected under permit by the Massachusetts Department of Conservation and Recreation and US Fish & Wildlife Service, where necessary for proper species identification.



2019 Great Walden BioBlitz Project Area

BioBlitz Overview

BioBlitz events can help provide critical biodiversity metrics for a geographic area. An initial, single BioBlitz event can be used as a baseline starting point for creating lists of species known to occur within a particular geographic area. When compared through time, BioBlitz events can detect new species in an area, indicating the arrival of new invasive species, or suggesting biogeographical shifts that may be driven by environmental change. Over time, BioBlitz events in one area can also help detect loss of species from an area.

These events have become an increasingly popular way to engage the general public in natural history observation and collection of citizen science data on the biological diversity of life in an area with the advent of popular tools such as the National Geographic Society's iNaturalist application, which allows non-experts to identify and document most biological specimens that can be photographed with a smartphone. Though there is still an important role for taxonomic specialists with in-depth knowledge of particular groups of organisms that are often difficult to identify without specialized skills and equipment, the general public engagement aspect of BioBlitz events is tremendously important.

BioBlitz participants. Photo by Richard Carey

The 2019 Great Walden BioBlitz continues a local tradition that started with one of the world's first serious BioBlitz events, convened on July 4, 1998 by Concord naturalist, Peter Alden. The 1998 BioBlitz covered Concord, Lincoln and parts of Carlisle and Sudbury, Massachusetts, and had participation by about 100 specialists, reporting 1,908 species. This event was highlighted in Dr. E.O. Wilson's book "The Future of Life," and is among the earliest models of what has become a world-wide phenomenon of documenting biodiversity within defined geographic areas in a constrained time frame. BioBlitz events happen at a variety of spacial scales, from schoolyards to cities to landscape-scale biogeographical reserves, and have been organized all around the world, engaging scientists and the general public, alike.

Originally referred to as Biodiversity Days in the early Massachusetts events, a BioBlitz brings people together to focus on specific visible life forms for a sort of cooperative "nature Olympics." Following the 1998 BioDiversity Day, Peter Alden organized Massachusetts state-sponsored biodiversity days in 300 towns between 2000 and 2005.

On July 4, 2009, the Walden Woods Project sponsored a Walden Biodiversity Day in celebration of Dr. Wilson's 80th birthday. Close to 100 field biology specialists recorded 1,941 species over the 24-hour event. Together, the 1998 and 2009 Walden Biodiversity Days recorded 2,692 species in the vicinity of Walden Woods. A small scale BioBlitz in September, 2018 focusing on the Minute Man National Historical Park on National Public Lands Day resulted in the detection of 751 species.

BioBlitz events range from informal outings of small groups of amateur naturalists, to highly-organized, multi-national coordinated events such as the City Nature Challenge (www.citynaturechallenge.org), which started as a friendly competition between the citizen science teams at the Natural History Museum

of Los Angeles County and California Academy of Sciences in 2016. Participation in the annual City Nature Challenge has grown to over 35,000 participants in 159 cities around the world, documenting over 31,000 species during the 2019 event.

Participating in a BioBlitz is as easy as participating in an event planned for a particular area or putting together a team for a localized event as a challenge or benefit, to organizing a city to participate in the annual City Nature Challenge. There are ample resources available on-line to help individuals and organizations that are interested in participating in or organizing a BioBlitz, including the E.O. Wilson Biodiversity Foundation website (eowilsonfoundation.org), National Geographic Society (nationalgeographic.org), and iNaturalist (inaturalist.org). BioBlitzes are very effective at engaging the general public in getting out of doors, in natural history observation, and in contributing to the growing body of citizen science. For information on using BioBlitzes to meet scientific research needs, the Society of Conservation Biology and the E.O. Wilson Half-Earth Project are excellent resources.

The 2019 Great Walden BioBlitz

The 2019 Great Walden BioBlitz was organized by the Walden Woods Project, Minute Man National Historical Park, the Edward O. Wilson Biodiversity Foundation and naturalist Peter Alden. It celebrated Dr. Wilson's 90th birthday and added to the extensive record of species known from the Walden Woods area. The BioBlitz was divided into two distinct, but related events.

Starting on the evening of July 5, 2019, invited specialists attended an event kick-off at the Hartwell Tavern in Minute Man National Historical Park with Dr. Wilson. Biological surveys began in the early evening hours and extended well into the night with light traps set at the National Historical Park and at MassAudubon's Drumlin Farm in Lincoln. Light traps remained active overnight at both locations.

On July 6, 2019 specialists began intensive surveys of self-selected sites scattered throughout the project area, with a small number of organized groups working in known biodiversity hot-spots within the project area.

Also on the morning of July 6, over 150 members of the general public participated in one of eight guided walks at the Walden Woods Project headquarters in Lincoln, Massachusetts, and in the afternoon, a smaller number of people participated in guided walks at the Minute Man National Historical Park Battle Road Unit. Professor Wilson spent over an hour with a group of intrepid young explorers in the morning at the Walden Woods Project, looking for ants, other invertebrates, and discovering the

Dr. Edward O. Wilson helps kick off the 2019 Great Walden BioBlitz. Photo by Matt Burne


EarthWise Aware team recording dragonflies at kick-off event. Photo by Matt Burne

wonderful creatures found in a small pond on the Walden Woods Project grounds. He addressed the gathering of participants at the end of the morning walks, encouraging the continued efforts to document biological diversity as a critically important step to understanding both what is at stake in the face of on-going climate change, and as a means to help document our current state of knowledge and establish baseline information for measuring change in the future.

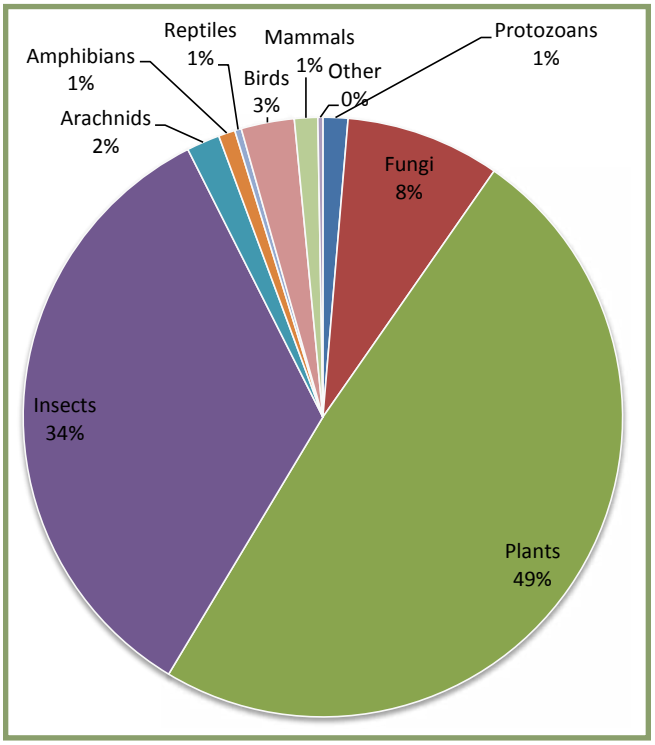
Mid-day on Saturday, nearly 200 invited specialists, major donors, and volunteers paused their pursuits of plants and animals for a luncheon hosted by Anna Winter Rasmussen and Neil Rasmussen at their home on the southern edge of the Estabrook Woods in Concord. Professor Wilson and Jeff Corwin, renowned television biologist, spoke about the importance of BioBlitz efforts, and of the challenges facing us in the conservation of the richness of biodiversity for future generations.

The 2019 Great Walden BioBlitz resulted in the observation of 2,242 vertebrates, invertebrates, trees, shrubs, herbs, mosses, lichens, and fungi larger than 1 mm within 5 miles of iconic Walden Pond in one day. The 2019 Great Walden BioBlitz project within the iNaturalist application included 4280 individual observations of 1124 species by 146 contributors. At the time of writing this report, 586 observations have been confirmed at the species-level and have become "research grade" observations. Statistics for the iNaturalist observations can be reviewed by logging into iNaturalist.org and searching for the "2019 Great Walden BioBlitz" in the Projects tab.

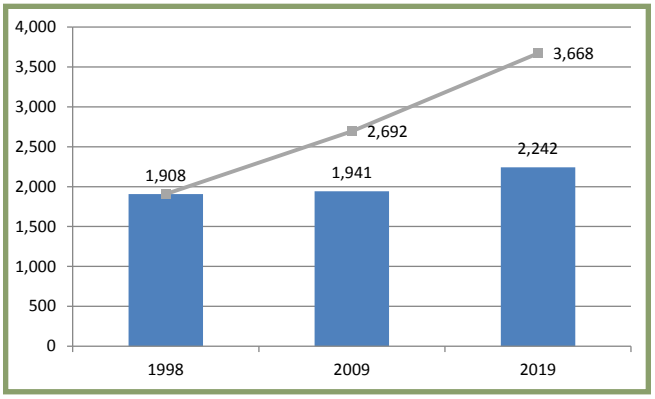
When considered along with data from earlier BioBlitzes, including one conducted by Minute Man NHP in September of 2018, 3,691 unique species have been recorded within the Great Walden BioBlitz project area since 1998.

The Great Walden BioBlitz would not have been as successful in recording over 2,000 species without the contribution of time and energy by the taxonomic specialists that were invited to participate, and by that of the general public that participated in several organized activities.

Examining insects attracted to light trap at Minute Man NHP. Photo by Matt Burne



iNaturalist results overview



Total species observations over the three decennial Walden BioBlitzes with curve showing cumulative number of species

Participants in the morning guided walks at the Walden Woods Project. Photos by Phil Lupsiewicz

Walden Woods Project's Matt Burne shows morning particpants how to identify a common dragonfly. Photo by Phil Lupsiewicz

Peter Alden records plant species along the main trail at Walden Pond. Photo by Richard Carey

Professor Edward O. Wilson talks with a group of young BioBlitz participants. Photo by Phil Lupsiewicz

National Park Service's Margie Coffin Brown leads an afternoon public iNaturalist walk at the Minute Man National Historical Park. Photo by Phil Lupsiewicz

Young participants in the guided walks search for bugs and small creatures. Photo by Phil Lupsiewicz

Professor Wilson addresses the gathered specialists and event volunteers at the luncheon near Estabrook Woods. Photo by Paul Reitano

Jeff Corwin discussing the challenges facing biodiversity in a warming future. Photo by Paul Reitano

Dr. E.O. Wilson, with Jeff Corwin, prepares to cut into a remarkable birthday cake celebrating his 90th birthday. Photo by Paul Reitano

Specialists pause in the tremendous heat of the day for lunch with Professor Wilson. Photo by Paul Reitano

Observations were basically restricted to species that are 1mm or larger. An alga and a bacteria have been noted in the results, but the diversity of bacteria, viruses, nematodes and microscopic pond and soil life were not included in the project.

Most species recorded during the Great Walden BioBlitz are native, naturalized, or invasive. Some horticultural plants were included the final list and observations recorded in iNaturalist. Where known, these are labeled with an H in the plant lists. While many horticultural plants do provide food and/or habitat resources for native wildlife, most are not truly naturalized and spreading, and therefore are not yet considered a component of our local biodiversity.

A great many species do not have common, English names, though recent attempts to create standardized common names have been underway for some groups. Common names have been included in this report where possible. Capitalization of full English names for species follows a number of conventions. We use capitalization of the modifier and group name throughout (e.g. Red-winged Blackbird).

The Great Walden BioBlitz species list is grouped taxonomically, and we have attempted to present the list using a consistency of taxonomic hierarchy throughout. Where it helps clarify relationships among groups, units of taxonomy such as Class and Order are used. The basic unit in much of this compilation of sightings is generally the Family. Scientific names for animal families end in –idae, while plant families end in –aceae. Families are usually (except in birds, dragonflies and butterflies) listed from A – Z. Within each family the genera are listed from A – Z. Within each genus the species are listed A – Z by scientific name.

Taxonomic changes are frequently made in all groups of organisms to reflect improving understanding of relationships among organisms. Comparing the 2019 Great Walden BioBlitz lists to previous lists, to state checklists, and other resources can lead to frustrating challenges in following nomenclature. We have made an effort to use currently accepted taxonomy and made notes in the list where large, once-familiar groups of species have been reorganized. Some recent alternate names are included.

The sequence of the comprehensive list of observations for the Great Walden BioBlitz starts with mammals and birds and works down the evolutionary scale to invertebrates, and among non-animals, vascular plants down to mosses, lichens and fungi.

Included are some comments on observations and key observers. Where present, the two letter initials after entries in the species list indicate a taxonomic expert who observed a particular species, even if multiple observers recorded the same species. A list of observers with initials codes used in the list is at the beginning of the list.

Press coverage of the event included an article by Don Lyman in *The Boston Globe,* "At 90, biologist E.O. Wilson is still counting species," and the Half-Earth Project published a nice summary of Professor Wilson's comments at several events over the course of the BioBlitz (half-earthproject.org/the-great-walden-bioblitz-of-2019).

Fungus expert, Larry Millman, spots an *Amanita*. Photo by Jessica Benson Evans

Tom Tyning showing some of the amphibian larvae found at a vernal pool near Walden Pond. Photo by Matt Kelly

Caitlin Fisher-Reid from Bridgwater State University showing one of the frogs found at Walden Pond State Reservation. Photo by Richard Carey

Alan Bragg of Bedford at Great Meadows NWR in Concord. Photo by Cherrie Corey

Group of specialists, lead by Peter Alden, at Walden Pond. Photo by Richard Carey

Joan Milam and a team of bee experts searching for specimens at Great Meadows. Photo by Kyle Bradford

Mid-morning break along Thoreau's Path at Brister's Hill. Photo by Kelvin Chen

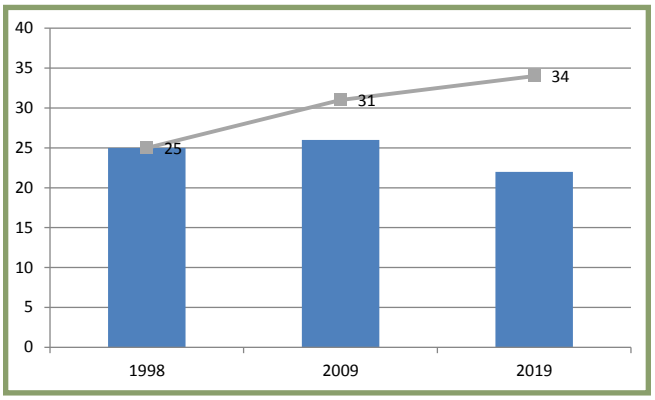
Professor Wilson in the field with colleagues, Professor Richard Primack and Professor Robert Thorson. Photo by Richard Carey

Some of our youngest BioBlitz participants. Photo by Paul Reitano

Summary Results

Mammals (22 species)

Twenty-one mammal species were observed or recorded during the 2019 Great Walden BioBlitz. Across the Northeastern United States, mammal species diversity has increased over past decades, in part as a result of declining hunting and trapping. Many species, such as deer, coyote, fisher, and beaver were absent from Walden Woods a century ago, but have repopulated the area and are now often seen in the woods and back yards. Of particular note from this event is the observation of evidence of Black Bear. Mammals such as moose, otter and bobcat, while known to be occasionally encountered in the area, were not detected during the 2019 Great Walden BioBlitz.



Mammal observations with cumulative total curve

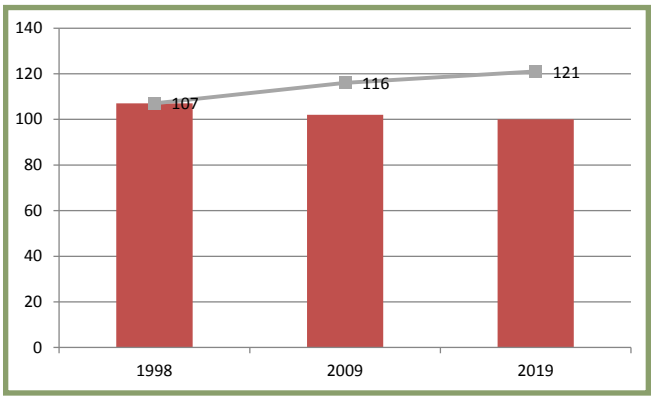

Evidence of bear found in Concord by participating specialist. Photo by Delia Kaye

Birds (100 species)

A number of talented birders participated in the 2019 Great Walden BioBlitz. Many are members of the Nuttall Ornithological Club and/or the Brookline Bird Club. There were 5 birds recorded that had not been noted in the earlier Walden area BioBlitzes: Mute Swan (an invasive alien), Hooded Merganser, Bald Eagle (now nesting nearby and frequent visitor to Walden), Sora, and Common Raven (reoccupying its former range from the north). Highlights included 6 Least Bitterns at Great Meadows and a Yellow-billed Cuckoo.

Many now-common birds were not present in the mid-nineteenth century, when Henry Thoreau made extensive observations of birds. The Mallard Duck, Mute Swan, Wild Turkey, Turkey Vulture, Pileated and Red-bellied Woodpeckers, Raven, Tufted Titmouse, Carolina Wren, Blue-gray Gnatcatcher, Mockingbird, Starling, and Cardinal were all absent, but are regular residents now.

The Ruffed Grouse (a native species), Pheasant (an alien introduced for hunting) and Bobwhite (introduced for hunting) are believed gone from the area. Grassland and shrubbery species such as Meadowlark, Bobolink, Brown Thrasher and



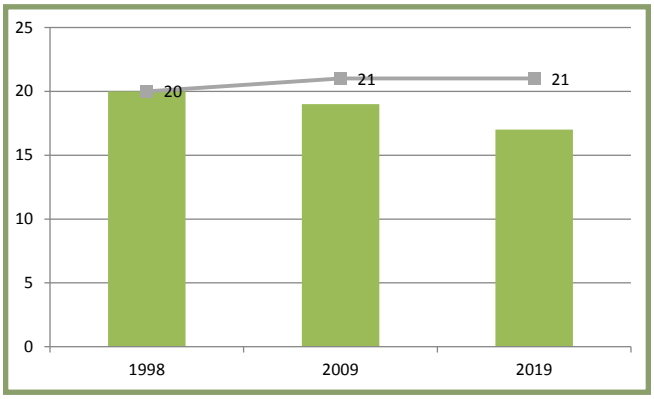
Bird observations with cumulative total curve


Will Martens searching for uncommon birds early on Saturday morning. Photo by Cris Van Dyke

grassland sparrows, all common in the mid-1800s, are vanishing regionally because of successional changes to the landscape, exacerbated by climate change and habitat loss.

Reptiles and Amphibians (17 species)

Weather conditions during the 2019 Great Walden BioBlitz are believed to have negatively affected the detectability of most reptiles. All of the frog species expected in the area were recorded, but a number of fossorial salamanders and snakes were not seen. A Ring-necked Snake and Eastern Red-spotted Newt were found. Several native turtles, while present, are increasingly difficult to find, including the Eastern Box Turtle, Wood Turtle, Blanding's Turtle, and Spotted Turtle. The latter can be reliably found in some locations within the project area, but were nonetheless missed on the day of the BioBlitz.



Reptile and Amphibian observations


Juvenile Green Frog. Photo by Matt Kelly


Great Blue Heron. Photo by Matt Kelly

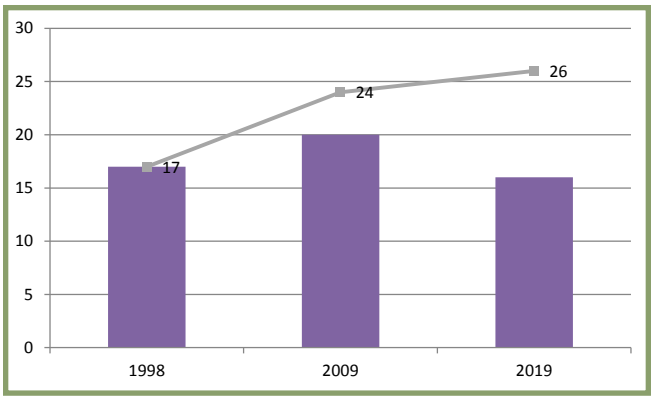

Immature Chipping Sparrow. Photo by Cristine Van Dyke


Larval salamander and Gray Treefrogs. Photo by Matt Kelly


Painted Turtles. Photo by Matt Kelly

Fishes (16 species)

We were not able to bring in many fish specialists for the 2019 event, though we did have records of several species, including the Bridle Shiner and Rainbow Trout, both new to the all-time list looking at this BioBlitz in addition to previous events. A number of species recorded on the list were based on observations of local sportsmen fishing during the event.



Fishes observed

Insects (988 species)

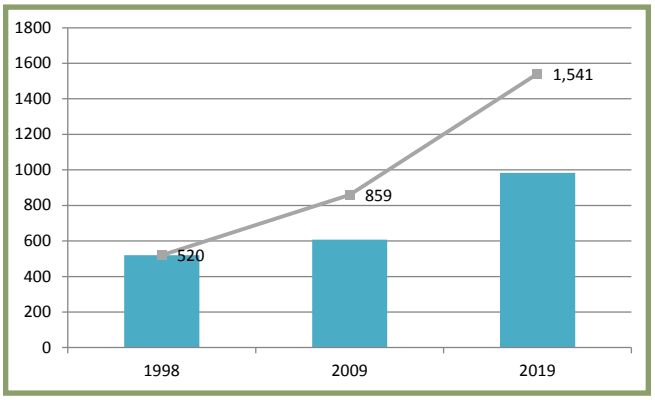
A number of prominent local entomologists participated in the 2019 Great Walden and recorded 988 species of insects, adding 682 novel species to the previous Walden BioBlitz lists of 1998, 2009, 2018.

Thirty-four species of Odonates (Dragonflies) were noted, including five species that had not been detected in earlier efforts. Among novel species were the Umber Shadowdragon and Mocha Emerald (both listed as Species of Special Concern in Massachusetts), and the Petite Emerald and Hudsonian Whiteface.

Orthopterans, especially the vocal crickets and katydids, are more prominent later in the summer, yet 11 species were noted. Five species of Barklice were recorded, and 74 species of "true" bugs, including 64 species not previously recorded. Beetles (Coleoptera) numbered 184 species, 157 of which were novel. Bees and ants (Hymenoptera) numbered 122, with 68 firsts.

The Lepidoptera, which comprises butterflies and moths, were most effectively sampled using light traps on the evening of July 5 at the Minute Man National Historical Park and Drumlin Farm in Lincoln, along with additional light trap sampling at the Great Meadows National Wildlife Refuge and in West Concord on the evening of July 6. In addition, diurnal observations of many butterfly species, especially, were included in project results and in iNaturalist observations.

Twenty-nine species of Butterflies and Skippers were noted with 3 first-occurrence observations.



Insect observations with cumulative totals


Red Admiral. Photo by Peter Trimble


Ebony Jewelwing. Photo by Peter Trimble

A species of the Hymenopteran Ichneuman genus. Photo by Linda Graetz

One of the many moths found during the 2019 Great Walden BioBlitz. Photo by Mark Rosenstein

Andrena wilkella. Photo by Kyle Bradford

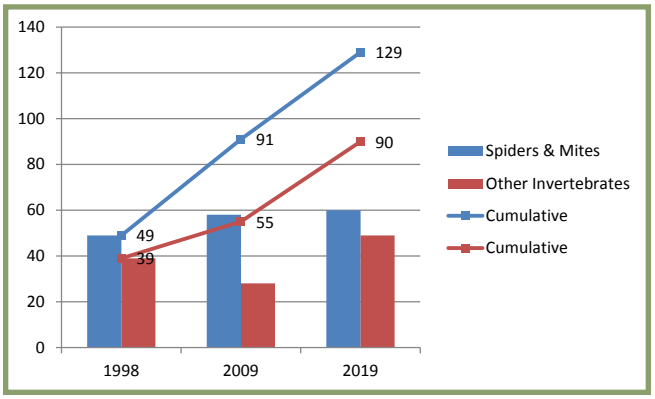
A yellow-thighed stag beetle, attracted to a light trap on the first night of the bioblitz. Photo by Linda Graetz

Moths numbered 411 species, including 271 firsts. It is of note that the large Saturnid Moths are rarely observed in the area in recent decades.

Flies (Diptera) had 80 firsts out of 91 species recorded, including the spectacular Phantom Crane Fly.

Other Invertebrates (113 species)

A number of non-insect invertebrates were recorded in the 2019 Great Walden BioBlitz. However, this is an area of taxonomic richness that was under represented in the results presented here. There are great numbers of species to be found in aquatic ecosystems for which we were unable to adequately survey.



An aquatic amphipod. Photo by Leo Kenney

Vascular Plants

The vascular plants have been split into four categories, and follows the "Vascular Plants of Massachusetts: A County Checklist" First Revision published in 2011 by Mass NHESP of the Mass. Division of Fisheries and Wildlife. It, along with iNaturalist, were used to trace common and scientific names and the many changes in families and genera. Where species are state listed, the list includes a note indicating status: E = Endangered, SC = Special Concern or WL = Watch List. It also lists "Waifs" which have escaped but have not naturalized. Horticultural specimens are indicated with an H in the list. A dozen or more plants noted may be new species for Middlesex County.

Ferns & Allies (39 species)

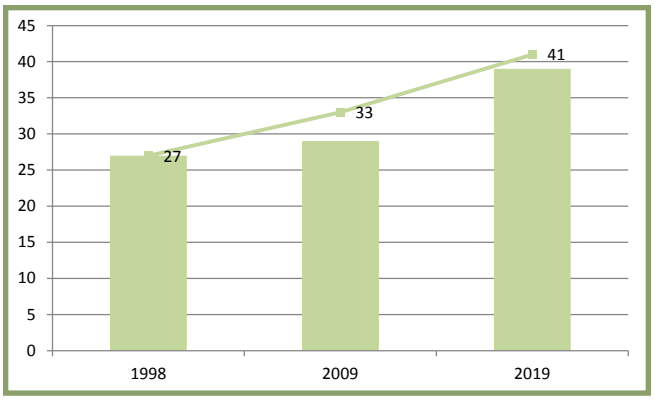
This group also includes clubmosses. There were eight first-sightings in this group of plants. The Climbing Fern is a species of Special Concern (SC) in Massachusetts, while the Mountain Wood Fern may be new for Middlesex County.

Conifers (12 species)

Of particular note for the conifers group is a huge Bald Cypress with many knees in a swamp at the October Farm Riverfront, owned by the Concord Land Conservation Trust. It is likely that this specimen was planted around 1900 by William Brewster the first President of both the Nuttall Ornithological Club and MassAudubon.

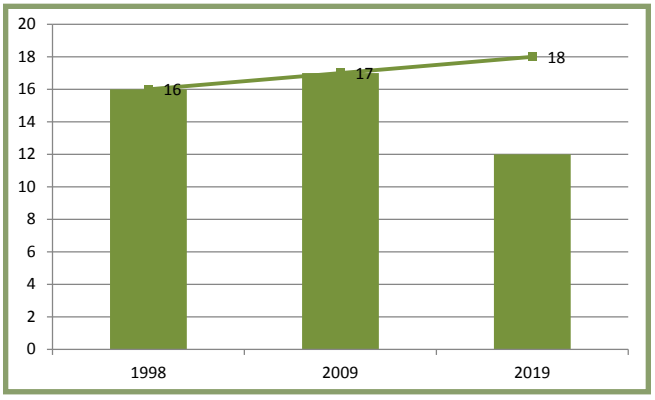
Monocots (153 species)

These generally non-woody plants include the difficult grasses and sedges. There are fewer orchids and native lilies observed in the area. Monocot invasive plants (INV) include Yellow Iris, newly arrived Japanese Stilt Grass and Phragmites. The Back's Sedge is state Endangered while Buxbaum's and Hayden's Sedges are on the Watch List. The Porcupine and Fernald's Sedges and Chinese Plume Grass may be new to Middlesex County.

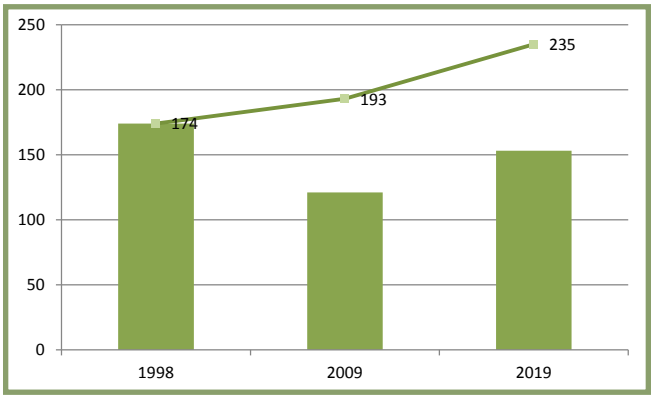


Ferns and fern allies with cumulative totals

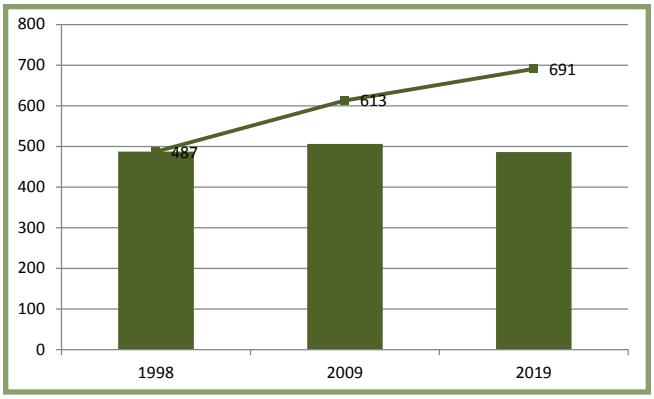

The American Climbing Fern, Lygodium palmatum. Photo by Cherrie Corey



Conifers with cumulative totals



Monocots with cumulative totals



Dicots with cumulative totals

Dicots (483 species)

Most of our trees, shrubs and herbs are in this group, and the 2019 Great Walden BioBlitz recorded 70 first observations. Nearly two dozen invasive alien dicots were noted. Garlic Mustard, several Asian Bush Honeysuckles, Oriental Bittersweet, Purple Loosestrife, Japanese Knotweed, Glossy Buckthorn, Multiflora Rose, Norway Maple and Porcelain Berry are prominent throughout the project area and represent significant problems for local biodiversity. A Tansy Ragwort was identified from an iNaturalist photo. The (Mid) American Lotus is a serious problem in the Great Meadows National Wildlife Refuge Concord unit.

Non-Vascular Plants: Mosses and Liverworts (44 species)

These plants are inconspicuous and can be challenging to identify for non-experts. They are non-vascular, spore-forming plants that remain small and tend to be found in microhabitats that are inhospitable for many plant species.

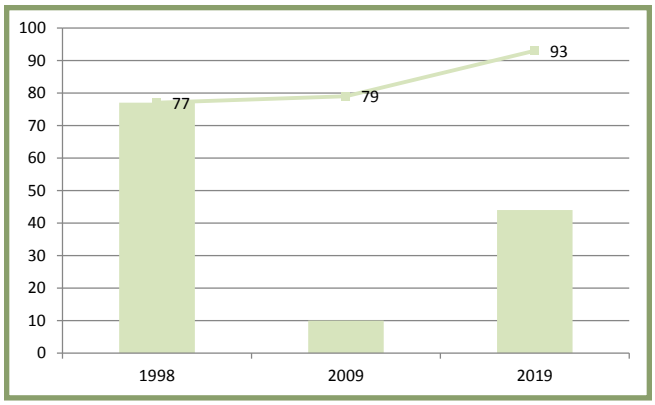
Lichens (106 species)

A complex group of organisms, lichens were long classified along with the Fungi but have been separated out as a group. Lichens are symbiotic associations of fungus and algae or cyanobacteria and can be quite difficult to key out to species.

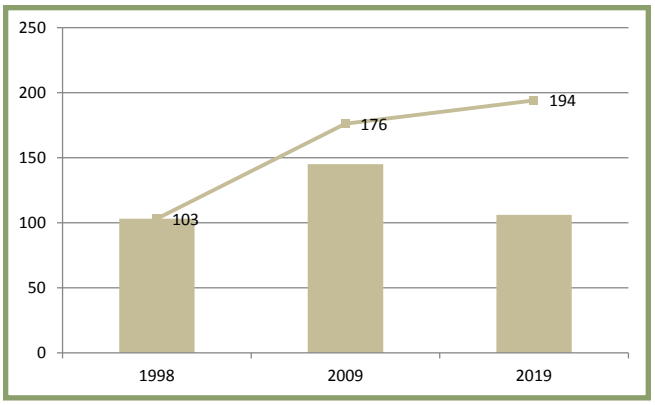

Common Skullcap, Scutellaria galericulata. Photo by Cherrie Corey


One of the most-reported plants in the iNaturalist Great Walden BioBlitz project, Indian Pipe, Monotropa uniflora. Photo by Matt Kelly


Fringed Black Bindweed, Fallopia cilinodis, is a new record for Concord, MA. Photo by Walter Kittredge



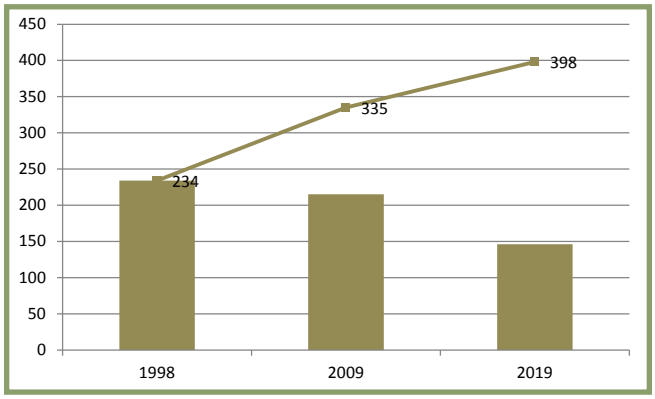
Mosses and Liverworts with cumulative totals



Lichens with cumulative totals

Shingle Moss, Neckera pennata. Photo by Walter Kittredge

A lichen, Xanthoparmelia conspersa. Photo by Elizabeth Kneiper



Fungi with cumulative totals

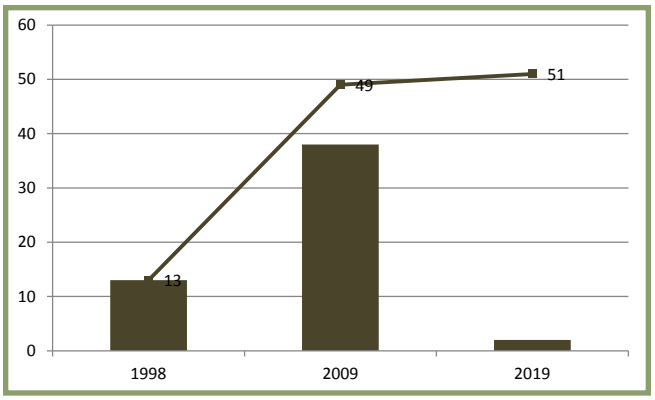
Stinking Earth Fan, Thelephora palmatum. Photo by Jessica Benson Evans

Fungi and Slime Molds (146 species)

The slime molds are not part of the Fungus Kingdom, but have fruiting bodies that make them similar in some respects. Slime molds are in an entirely separate kingdom. These organisms are another very challenging group to work with, and require years of practice to get to know very well.

Algae & Bacteria (2 species)

These were not expressly included in our goals for the 2019 Great Walden BioBlitz, but we nonetheless received records of two species that are included in the results.



Algae and Bacteria with cumulative totals

Invited Specialists

Participating invited specialists provided invaluable contributions to the 2019 Great Walden BioBlitz. These people were instrumental in our success in reaching over 2,000 species at locations throughout the project area. The following two-letter codes are used throughout the species list to identify observers who contributed observations of notable or important species. iN code indicates an invited observer that reported observations in the iNaturalist application as opposed to reporting a species list that is attributable to the observer.

Diana Abrashkin	iN	Lincoln MA: nature in general
Peter Alden	**PA**	Concord MA: organizer,compiler; birds, invasive plants
Maria Aliberti-Lubertazzi		Cambridge, MA: Aquatic invertebrates
Alan Ankers	**AA**	Lincoln MA: Mass Audubon Soc.; Dragonflies, birds
John Baur	**BC**	Results listed with Brian Cassie; dragonflies, plants
Liam Beguhn	**LB**	Concord MA: Volunteer with MMNHP and iNaturalist
Alison Beucler	iN	Medford: natural history
Giovanna Bishop	iN	Somerville MA/Harvard Farlow: bryophytes, lichens
Julia Blyth	**CE**	Northfield MA; results listed with Charles Eiseman: insects
Peggy Brace	**PB**	Concord MA: bluebirds, insects
Kyle Bradford	**JM**	UMass Amherst; results listed with Joan Milam: bees
Alan Bragg	iN	Bedford MA;plants, birds; iNaturalist
Margie Coffin Brown	**MCB**	Concord & Lincoln MA: MMNHP iNaturalist walk coordinator
Peter Burn	iN	Carlisle MA/Suffolk U; plants, invertebrates iNat
Matt Burne	**MB**	Lincoln MA @ Walden Woods Project; data, vernal pools
Molly Cahill	iN	Waltham MA/Brandeis U/ Harvard Forest; plants
Jasmin Camacho	iN	Somerville MA/ Bats
Daren Card	iN	Harvard U postdoc; birds, reptiles, amphibians
Richard Carey		Brooklyn NY; invited photographer of specialists
Brian Cassie	**BC**	Foxborough MA/Park School; birds, dragonflies, plants
Matthew Charpentier	iN	VP New England Botanical Club, was NEWFS; plants
Daniel Charron	**CT**	UConn Botany; plants
Kelvin Chen	iN	Worked with ants, spiders and mites
Russ Cohen	iN	Arlington MA; was with Mass DCR:Riverways; plants
Jeff Collins	iN	Concord MA; Mass Audubon Society; nature in general
Cherrie Corey	iN	Concord MA & Brattleboro VT; expert on plants
Jeff Corwin		Marshfield MA; special luncheon speaker; world wildlife
Stefan Cover	iN	Harvard U MCZ; works with E.O. Wilson; ants
Brandon Cramphorn	iN	Insects
Kathryn Dia	iN	Concord MA; led all morning rarer bird search party
Nicholas Dorian	iN	Medford MA/ bees
Scott Edwards	**SE**	Concord MA/Harvard U MCZ Bird Dept; birds
Cheryl Eggert		Philipston MA; natural history
Charles Eiseman	**CE**	Northfield MA; leaf miners, gall inducers, other insects
Jessica Evans	**LM**	Shutesbury MA; PVMA; worked w/Larry Millman; fungi
Kay Fairweather	**KF**	Carlisle MA; lichens and nature in general
Aliza Fassier	**JM**	Turner's Falls MA; w/ Joan Milam UMass party; bees
Caitlin Fisher-Reid	iN	Sharon MA; reptiles and amphibians
Jason Forbes	iN	Waltham MA; birds, dragonflies and butterflies
Zoe Foster	iN	Northborough MA; iNaturalist, City Nature Challenge

Tom French	**TF**	Princeton MA; was w/ Mass Wildlife; fish, mollusks, etc.
Linda Graetz	**LG**	Waltham MA; nocturnal insects at Drumlin Farm; moths
David Gregg	iN	Kingston **RI**; Rhode Island Nat Hist Survey Exec Dir: Ants
Mike Hammond	**MH**	Concord MA: fish
Sarah Haughney	iN	Medford MA; with EarthWise Aware; iNaturalist expert
Rachel Hawkins	iN	Watertown MA; Harvard MCZ Entomology; insects
Roy Herold	**RH**	Carlisle MA; City Nature Challenge (#1 in Boston); plants
Al Hinde	**AH**	Cambridge MA; Nuttall Ornithological Club; raptors
Marc Hoffmann	**MH**	Braunschweig, **Germany**; expert in beetles
Daniel Jaffe	iN	Phillipston MA; New England Wild Flower Society; plants
Lori Johnson	iN	Belchertown MA; Mass Wildlife NHESP herps, vernal pools
Steve Johnson	iN	Belchertown MA; birds, plants
Drew Jones	iN	Williamstown MA; reptiles and amphibians
Sarah Karikó	iN	Cambridge MA; Harvard MCZ; spiders
Delia Kaye	**DK**	Concord MA Div. Natural Resources; plants incl. grasses
Matt Kelly	iN	New Ashford MA; Hoffmann Bird Club; birds
Walter Kittredge	**WK**	Cambridge MA; Harvard U Gray Herbarium; moss, lichens
Jacqueline Kluft	iN	Newton MA; Walden Pond State Res; iNaturalist walk leader
Elizabeth Kneiper	**EK**	Weston MA; Harvard U Farlow Herbarium; lichens
David Larson	**DL**	Bradford MA; Mass Audubon, Nuttall Ornithological Club
Ron Lockwood	**RL**	Bolton MA; Nuttall Ornithological Club; birds
Charlie Low	iN	Newburyport MA; EarthWise Aware; iNaturalist
David Lubertazzi	iN	Cambridge MA; ants
Don Lubin	**DLu**	Allston MA; N. E. Botanical Club; ferns, club mosses
Don Lyman	**DLy**	Wilmington MA; Boston Globe writer; herpetology
Crystal Maier	iN	Cambridge MA; beetles
Will Martens	iN	Concord MA; with Kathy Dia bird party; birds
Kirsten Martin	iN	West Hartford **CT**; dragonflies
Joe Martinez	iN	Salem MA; Harvard MCZ Herpetology; herps
Ron McAdow	iN	Lincoln MA; nature in general
Max McCarthy		Andover MA; bees
Michael McCarthy	iN	West Roxbury MA; vernal pool ecology
Rich McGeough	iN	Jacksonville Beach **FL**; birds
Mark Mello	iN	South Dartmouth MA; Lloyd Center; moths
James Mickley	**CT**	UConn Botany; worked with Daniel Charron; plants
Joan Milam	**JM**	UMass Amherst Bee Lab: bees, herps
Paul Miliotis	**PM**	Epping **NH**; birds, dragonflies, butterflies, plants
Larry Millman	**LM**	Cambridge MA; w/Jessica Evans & James Mitchell; fungi
Daphne Minner	iN	West Roxbury MA; vernal pool ecology
James Mitchell	**JaM**	Cambridge MA: lichens, fungi
Miranda Moore		Boston MA; plants
Renata Moretti	iN	Sao Paulo **Brazil**; Harvard MCZ; friend of E.O. Wilson
Tom Murray	**TM**	Groton MA; author Insects NE & NY; insects Spent 20+ hours identifying beetles from Marc Hoffmann
Erik Nielsen	**EN**	Westwood MA; Nuttall O.C.; birds, dragonflies, butterflies
Claire O'Neill	iN	Somerville MA; President EarthWise Aware; iNaturalist
Daniel Onea	iN	Medford MA; EarthWise Aware; iNaturalist
Steven Orzack	(**BS**)	Cambridge MA; worked w/Bill Stubblefield; bees & wasps

Herb Pierce	iN	Arlington MA; Bird and plant expert
Simon Perkins	**SP**	Concord MA: Thoreau Farm walk leader: birds, insects
Wayne Petersen	iN	Hingham MA; Mass Audubon IBA program; birds, plants
John Pickering	iN	Athens **GA**; UGeorgia Biology; discoverlife.org; moths
Richard Primack		Boston Univ: Botany; plants; author Walden Warming
Marj Rines	**MR**	Woburn MA; Mass Audubon Soc.; birds, odes, butterflies
Dorian Rose	iN	Melrose MA; birds
Mark Rosenstein	iN	Cambridge MA; Fiji Reef Fish; moth lights MMNHP; moths
Janet Rothrock		Concord MA; invasive plants
Noel Rowe	iN	Charlestown **RI**; RINHS bioblitz veteran; fungi
Jackson Schilling	iN	Arlington MA; EarthWise Aware; iNaturalist
Harold Shaefer	iN	Dorchester MA; Am. Bryophyte & Lichen Soc.; lichens, fungi
Shilpa Sen	iN	Brighton MA; EarthWise Aware; iNaturalist; wetland ecology
Toby Shaya	**JM**	UMass Amherst Bee Lab: helped Joan Milam w/bees
Robert Sherman	IN	Gloucester MA; Walden Pond State Res. walk leader w/PA
Jay Shetterly	iN	Cambridge MA; Cambridge Ent, Club; tiger beetles
Melani Sleder	iN	Concord & Maynard MA; birds (age 11)
Lisa Standley	**LS**	Needham MA; President N.E. Botanical Club; plants, esp. sedges
Langdon Stevenson	iN	Concord MA; Am. Birding Ass'n.; birds
Bill Stubblefield	**BS**	Wendell MA; worked w/ Steve Orzack; bees & wasps
Nick Tepper	**NT**	Stow MA; Mass. Audubon Soc., mammals, herps, iNaturalist
Shaya Toby	iN	Acton MA; bees and ants
Genevieve Tocci	**GT**	Cambridge MA; Harvard Farlow Herbarium; mosses, fungi
Jeremiah Trimble	**JT**	Cambridge MA/Harvard U MCZ Bird Dept; birds, odes, leps
Peter Trimble	**PT**	Centerville MA; Nuttall Orn Club; birds, odes, butterflies
Tom Tyning	**TT**	Pittsfield MA; Berkshire College; birds, herps, butterflies
Cristine Van Dyke		Concord MA; invited photographer of specialists
Rachel Vincent	iN	Boston MA; natural history
Richard Walton		Concord MA; spiders, insects, birds
Joseph Warfel	**JW**	Lowell MA; Am. Arachnological Society; spiders and mites
James Waters	**JWt**	North Attleboro MA; w/ RINHS; ants
Steven Whitebread	**SW**	Quincy MA; moth lights at Drumlin & GMNWR; moths
Laney Widener	**LW**	Phillipston MA; Concord Land Cons. Trust; plants
Edward O. Wilson	**EO**	Lexington MA; Harvard MCZ; luncheon speaker; ants
Cole Winstanley	**CW**	Stanford **CA** & Concord MA; plants (esp. sedges), odes, bird
Jalen Winstanley	**JWi**	Concord MA at CCHS; birds, fish, herps,dragonflies
Dave Witherbee	iN	Guide for lichenologist Elizebeth Kneiper; photographer
Eddie Woodin	iN	Scarborough **ME**; also a donor; birds, pesticide issues
Dr. Patricia Wright	iN	Charlestown **RI**; with Noel Rowe; fungi
Zoheil Zendah	iN	Lexington MA; Nuttall Orn Club; birds, iNaturalist

Volunteer Walk Leaders

General public participation in the 2019 Great Walden BioBlitz was a key component of the success of the event. We were grateful to have a number of local area experts volunteer to lead walks on the Walden Woods Project headquarters property and surrounding woods in the Town of Lincoln and Lincoln Land Trust properties. These volunteer leaders took a group of between 10 and 20 participants on a guided walk of area trails in search of biodiversity, and helped their groups engage with the iNaturlist application to document observations.

The morning public participation sessions of the 2019 Great Walden BioBlitz would not have been successful without their participation. Special thanks go to:

Ellen Meadors	Lincoln Land Conservation Trust
Bryn Gingrich	Lincoln Land Conservation Trust
Laney Widener	Concord Land Conservation Trust
Dr. Robert Thorson	University of Connecticut
Deb Field	South Windsor High School, CT
Tom Longnecker	Wayland Middle School
Lucia Longnecker	
Jacqui Kluft	Walden Pond State Reservation
Jane Layton	Lincoln Land Conservation Trust
Jeff Collins	Mass Audubon's Ecological Extension Service
Christa Collins	Sudbury Valley Trusees
Jim Meadors	

Contributing Photographers

Photographs were contributed by a number of participants, including specialists working in small teams and others who captured images of the day's activities and gatherings. Contributed images came from:

Maria Aliberti-Lubertazzi

Jessica Benson Evans

Kyle Bradford

Peter Burn

Matt Burne

Richard Carey

Kelvin Chen

Cherrie Corey

Jim Cunningham

Kathy Dia

Linda Graetz

Delia Kaye

Matt Kelly

Leo Kenney

Walter Kittredge

Elizabeth Knieper

Phil Lupsiewicz

Paul Reitano

Mark Rosenstein

Noel Rowe

Peter Trimble

Cris Van Dyke

Resources for planning and running a BioBlitz

Biodiversity and three decades of BioBlitzes, from the Walden Woods Project:

https://www.walden.org/explore-walden-woods/protecting-walden-woods-2/walden-biodiversity/

Designing and running a BioBlitz, from the National Geographic Society:

https://www.nationalgeographic.org/activity/designing-bioblitz-learning-experience/

A guide to organizing a BioBlitz, from iNaturalist:

https://www.inaturalist.org/pages/bioblitz+guide

Biodiversity and BioBlitzes, from the National Park Service

https://www.nps.gov/subjects/biodiversity/index.htm

https://www.nps.gov/subjects/biodiversity/the-nps-national-geographic-society-bioblitzes.htm

Report on 2018 BioBlitz, from Minuteman National Historical Park

https://www.nps.gov/mima/learn/nature/results-of-bioblitz-2018.htm

Website of the E.O. Wilson Biodiversity Foundation

https://eowilsonfoundation.org/

Website of the Half-Earth Project, an initiative of the E.O. Wilson Biodiversity Foundation, which is working to protect half the Earth's land and sea in order to manage sufficient habitat to ensure the long-term health of our planet.

https://eowilsonfoundation.org/half-earth-project/

Using BioBlitzes to meet scientific research needs, from the Society for Conservation Biology

https://conbio.onlinelibrary.wiley.com/doi/full/10.1111/cobi.13103

Expert BioBlitzes, from Cool Green Science

https://blog.nature.org/science/2018/03/12/fast-cheap-and-collaborative-expert-bioblitzes-meet-conservation-needs/