



The North American Mycoflora Project

* Mycoflora of Chicago Region *



Patrick R. Leacock PhD
Field Museum of Natural History
www.Mycoguide.com



Biota: Fauna, Flora, Funga?

Plants	Fungi	Animals
Flora	Funga	Fauna
Megafloora, Vegetation	Mycota	Cryofauna, Cryptofauna, Epifauna, Infauna, Macrofauna, Megafauna, Meiofauna, Mesofauna, Microfauna
	Mycoflora	
	Mycobiota	
floristics	fungistics	
Botanist	Mycologist	Zoologist
Herbarium	Fungarium	Collections

skin flora, gut flora,
microbiome, mycobiome

Zoarium = a colony of
colonial bryozoans

2007 symposium to assess the world's diversity of fungi.

How big is the mycoflora?

Biodivers Conserv (2007) 16:37–48
DOI 10.1007/s10531-006-9108-8

ORIGINAL PAPER

Global diversity and distribution of macrofungi

Gregory M. Mueller · John P. Schmit · Patrick R. Leacock ·
Bart Buyck · Joaquín Cifuentes · Dennis E. Desjardin ·
Roy E. Halling · Kurt Hjortstam · Teresa Iturriaga ·
Karl-Henrik Larsson · D. Jean Lodge · Tom W. May ·
David Minter · Mario Rajchenberg · Scott A. Redhead ·
Leif Ryvardeen · James M. Trappe · Roy Watling ·
Qiuxin Wu

Based on current names

10,000 macromycetes occur in North
America and 65% are unique to the
continent



<http://mycoflora.org>

Yale Workshop - 2012

<http://www.northamericanmycoflora.org/>



NORTH AMERICAN MYCOFLORA PROJECT

Without a sequenced specimen, it's a rumor



Many presentations and long discussions among “professionals” and “amateurs”.



Rod

Scott
Scott

Patrick

Todd
Brandon

Nathan

Betty

Andy

Gary

Rick

Maj

Leon

Andy

David

Anna

Greg

Bart

Tom



Yale Workshop - 2012

Many presentations and long discussions among “professionals” and “amateurs”.

Macrofungi of the Chicago Region and the North American Mycological Association Voucher Program

Patrick R. Leacock, Adjunct Curator
Department of Botany
Field Museum of Natural History, Chicago



https://www.youtube.com/watch?v=h_x2toknu2Y



Athens, GA Workshop – 2017, at MSA

Progress since 2012

- Digitalization of most macrofungal herbarium records in the USA (MaCC)
- Mycoportal – a versatile platform for organizing, searching, entering and viewing herbarium records (MaCC)
- Vouchering and sequencing projects from multiple mushroom clubs – see Bill Sheehan's article

MaCC = Macrofungi Collection Consortium

https://www.idigbio.org/wiki/index.php/The_Macrofungi_Collection_Consortium



Athens, GA Workshop – 2017, at MSA

MYCOFLORA 2.0 BACKGROUND & GOALS

Citizen Science Model

Collect

→ Identify

→ **Document on Internet**

→ **Voucher**

→ **Sequence**

→ Create Local Mycoflora



Immediate Goal

Make it **easy and cheap (or free)** for serious amateurs, working with professionals, to **document, voucher and sequence** fungal specimens.

Larger Goals

1. Enlist and empower citizen scientists to contribute to important conservation work.
2. Transform amateur mushrooming.
3. Revitalize professional mycology.
4. Create a new model for citizen science.



MUSHROOM CITIZEN SCIENCE: From Species Lists to Mycoflora 2.0

Bill Sheehan, Ph.D.
Mushroom Club of Georgia
bill@productpolicy.org

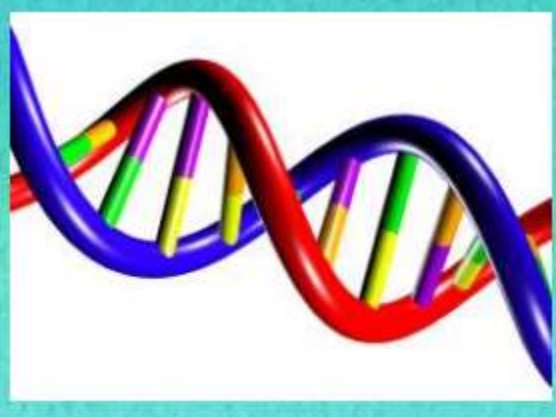
Survey Results: Clubs Vouchering and Sequencing

Vouchering

Club members voucher at home	8
Club members voucher at established fungaria	12
<u>% of 38 clubs with some vouchering</u>	53%

Sequencing

Clubs conducting club-led barcoding	8
Clubs engaged with professional-led barcoding	12
Clubs with members interested in sequencing	10
<u>% of 38 clubs sequencing or interested</u>	63%



Selected Club Expenditures for DNA Sequencing

Mushroom Club	Amount
Fungus Federation of Santa Cruz (500 specimens)	15,000
Missouri Mycological Society	5,000
NAMA Vouchering & Amanita Project	4,340
Hoosier Mushroom Society (for 2016)	2,000
Puget Sound Mycological Society (to FFSC, one-time)	2,000
Western Pennsylvania Mushroom Club (annual)	1,000
Oregon Mycological Society (for 2017)	500
Arizona Mushroom Society (for 2017)	250
Mycological Association of Washington, DC (for 2017)	200



What can professional mycologist do to help on this project?

- interact with public groups and help facilitate training and interactions
- Provide access to the literature (and sequencing if possible) to advanced members of the general public
- Help guide and develop the templates for monographs
- Write that monograph that you always planned to do!



And what can citizen scientists do to help on this project?

- Continue honing taxonomic abilities
- Help train others
- Organize forays
- **SAVE SPECIMENS** and take good data on them, and enter it in mycoportal
- Discover, describe, and straighten out species, and write monographs (given access to sequence and literature)



START YOUR LOCAL MYCOFLORA

We are here to provide the tools and assistance you need to start your own local floristic surveys. Explore this page to learn what you need to do to become an official member of the North American Mycoflora Project.

REGISTER TODAY!



Select a Region

You can start work on a mycoflora for a state, county, city, or even your own personal property.



Begin Collecting

Head out into the field and start collecting specimens that you encounter. Photograph each specimen, post them online, and send them to your local herbarium.



Get DNA Sequences

We are working with professional mycological labs to provide a low-cost service so you can get genetic information from the mushrooms you encounter.



Create your Mycoflora

With a network of professional mycologists and citizen scientists from across the continent, we can work together to ensure the knowledge being gained is accessible to everyone.

About North American Mycoflora Project

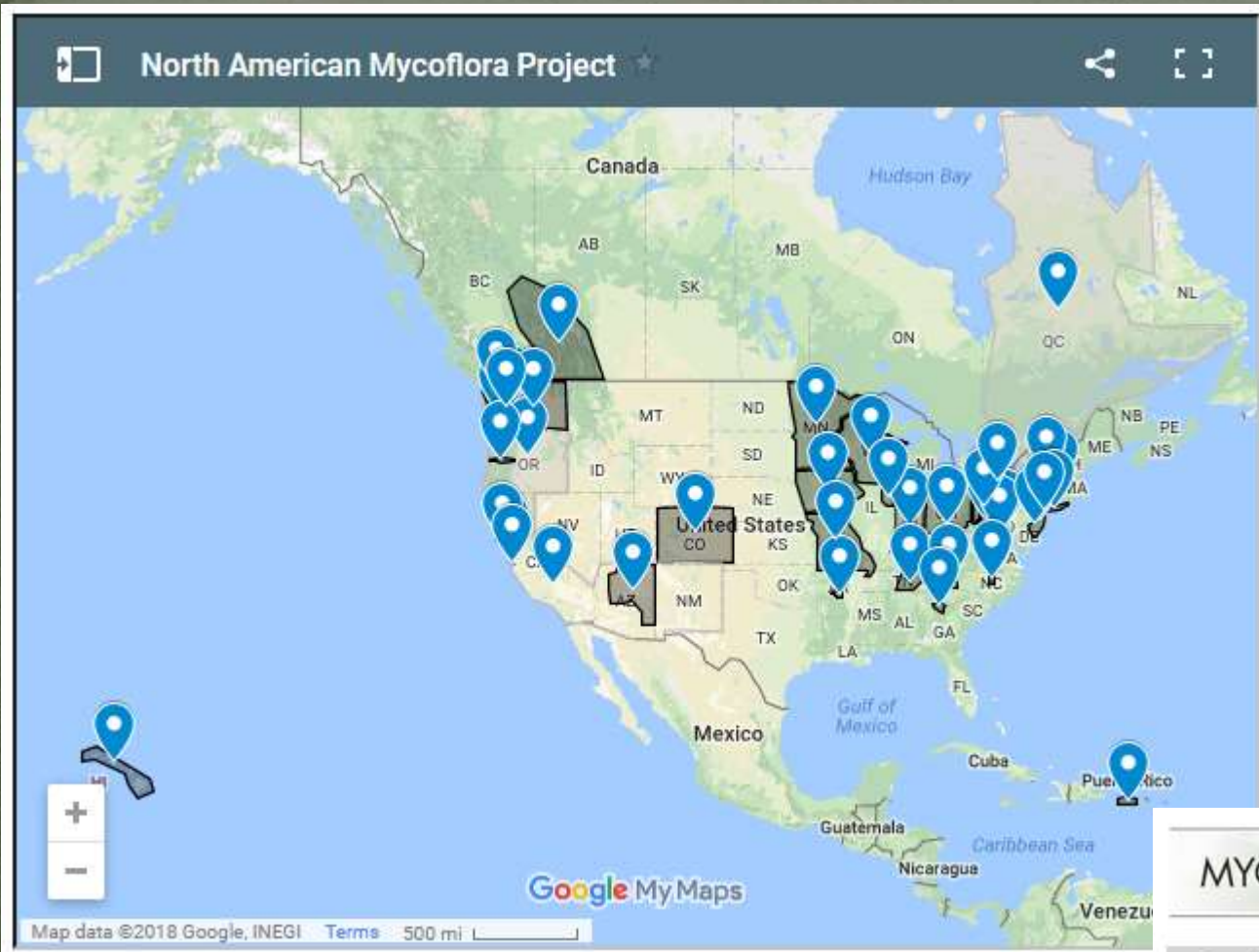
We are working towards a single goal - the development of the first comprehensive mycoflora of North America. This project is a consortium of citizen scientists and professional mycologists performing a biological survey of all the macrofungi that occur in North America.

Our Partners

- > North American Mycological Assn.
- > Mycological Society of America
- > Botanical Research Institute of Texas
- > NCBI (GenBank, BLAST)
- > New York Botanical Garden



Mycoflora Participants (as of 5 March 2018)



11 State-level Projects
17 Regional Projects
4 County-level Projects
3 Natural Area Projects

10 Taxa-focused Projects

- *Amanita*
- *Hebeloma*
- *Russula*

1 National Project

NAMA Voucher Collections Project

Project Lead: Andy Wilson

Sponsored by: North American Mycological Assn.



MYCOLOGY COLLECTIONS PORTAL

GenBank



MUSHROOM
OBSERVER

iNaturalist.org

Mycoflora Participants: Regional Projects

Mycoflora of Chicago Region

name
Mycoflora of Chicago Region

description
Project Lead: Patrick Leacock
Sponsored by: Illinois Mycological Association
Region: Cook County, IL and adjacent counties

The map displays the Chicago region, including parts of Illinois, Indiana, Michigan, and Kentucky. A blue location pin is placed over the Chicago area, and another blue location pin is placed over Indianapolis, Indiana. The map also shows major cities like Oshkosh, Madison, Milwaukee, Grand Rapids, Rockford, Peoria, Springfield, St. Louis, Evansville, Louisville, and Lexington. The text 'My Maps' and 'National Forest' are visible in the bottom left corner of the map area.

- Hoping at least a dozen people will be trained to document specimens. Other IMA members will contribute by participating in forays and finding fungi.
- We will target unknown or poorly known species or cryptic species groups, and species of interest.
- Two goals: 1) to increase club member participation in documenting fungi and preserving voucher collections; 2) to generate DNA sequence information for specimens.
- Dr. Leacock saves 150 - 300 voucher specimens per year from IMA forays. In addition 400 - 750 observations of mushrooms are gathered per year from IMA forays.
- IMA specimens go to the herbarium of the Field Museum of Natural History.

Coordinates with IMA forays

BECOMING A PARTICIPANT



1. Select your Region

Decide the scale of your project. Over what geographic area will your collecting take place?



2. Name your Project

What do you want your project to be called? Click the link for examples from other projects.



3. Choose a Report Platform

Most clubs utilize [Mushroom Observer](#) or [iNaturalist](#). Storing your data online allows us to integrate it.



4. Select a Fungarium

Where will you store your collections in perpetuity? Click the link for our partner fungaria.



5. Register your Project

This gives us information on your project and allows you to take advantage of our sequencing service and other benefits.



6. Learn NAMP Protocols

Learn how to document your finds and to take advantage of our services.



7. Begin Collecting

Follow our protocols for data submission to have your project integrated.



8. Apply for Grants

Coming early 2018, these grants will cover sequencing costs for select projects.

Project Coordinators

Bill Sheehan - Athens, GA

Stephen Russell - Purdue University, West Lafayette, IN



Genetic Sequencing

Todd Osmundson - UW La Crosse

Rytas Vilgalys - Duke University



PROJECT PROTOCOLS



Begin Your Project

Register your project and obtain the materials you will need to get started.



Upload Content

Explore the options you have for uploading your photographs and data into our online databases.




Vouchering Specimens

Learn how to properly document your specimens in the field.

In the field

- Photograph
- Collect
- Data form

FIELD DATA SLIP		Species	Comments/Microscopic Data on back []
 #00001		Field Photos: <input type="checkbox"/> Yes <input type="checkbox"/> No	
		Nearby Trees <input type="checkbox"/> Hardwood <input type="checkbox"/> Conifer <input type="checkbox"/> Other/Species: _____	
Date: _____ State: _____ County: _____ Foray ID: _____ Site Name: _____		Substrate: <i>Wood</i> <input type="checkbox"/> Dead <input type="checkbox"/> Living <input type="checkbox"/> Conifer <input type="checkbox"/> Hardwood <input type="checkbox"/> Soil <input type="checkbox"/> Leaf Litter <input type="checkbox"/> Moss <input type="checkbox"/> Needle Duff <input type="checkbox"/> Grass <input type="checkbox"/> Dung <input type="checkbox"/> _____	
MO/iNat/MM #: _____		Habit <input type="checkbox"/> Single <input type="checkbox"/> Few <input type="checkbox"/> Many	
MO/iNat/MM #: _____		Odor Taste Collected By: _____ ID Verified By: _____	
#00001 <small>Voucher Label for Drying</small>		#00001 <small>Tissue Label</small>	



PROJECT PROTOCOLS



Tissue Collection

To get the best price on sequencing, learn one of these simple techniques to send tissue to our facility.



Fungarium Submission

Learn how to prepare your physical specimens for submission to your partner repository (fungarium).



DNA Sequencing

Learn the options we offer to have your mushrooms genetically sequenced.



Analyzing your Results

Learn what types of data you will get back and what you can do with the data you receive.



Creating your Mycoflora

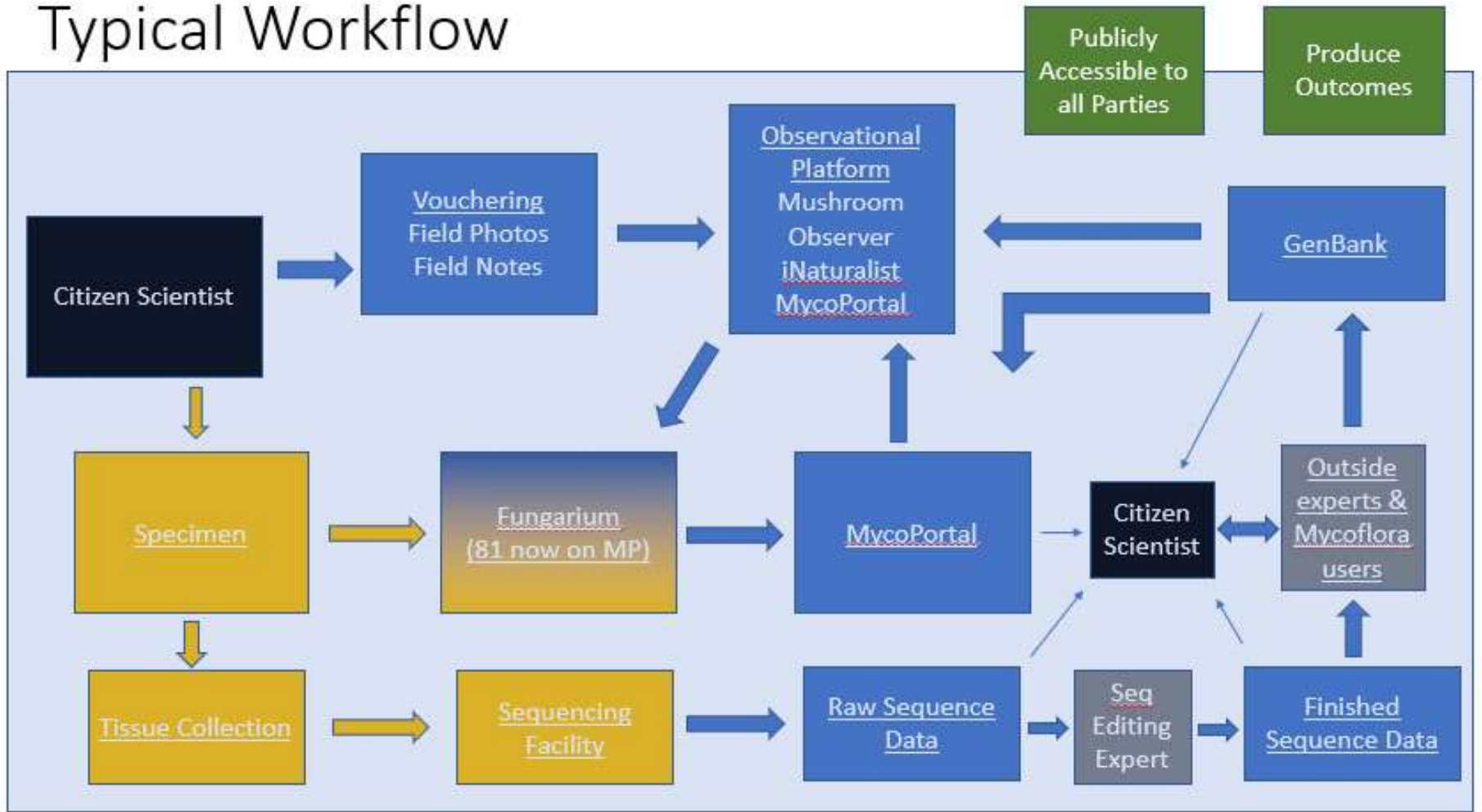
Bring all the data you have generated into a cohesive end product by generating your local mycoflora.

At home base

- Close-up photos
- Upload photos and data
- Select for tissue collection
- Dry specimens
- Prepare list and labels
- Specimens to fungarium
- Tissue samples to lab



Typical Workflow



Most of these data-linkages will be automatically created and maintained by our technological interface. Users will only be responsible for entering the primary and secondary metadata as a part of the initial observational report.



Create individual reports online

<http://mushroomobserver.org>

MUSHROOM OBSERVER

Q pluteus americanus Observations Search Advanced Search MycoGuide

Introduction
How To Use
Observations
Create Observation
Your Observations
Sort by Date
Latest
Changes by Users
Images
Comments
Species Lists
Your Lists
Create List
Sort by Date
Sort by Title
Indexes
Glossary
Herbaria
Locations
Names
News
Projects

« Prev | Index | Map | Next »

Observation 145100: *Pluteus americanus* (P. Banerjee & Sundb.) Justo, E.F. Malysheva & Minnis

When: **2013-09-09**
Collection location: USA, Illinois, Elk Grove Village, Busse Woods [Click for map]
Who: Rocky Houghtby
Specimen available
Herbarium record:
145100 @ Rocky Houghtby: Personal Herbarium

No sequences [Add Sequence]
Notes:
cf. *salicinus*
1-5 cm. pungent odor. On Ash limbs that are covered with bryophytes.

Images

About *Pluteus americanus* (P. Banerjee & Sundb.) Justo, E.F. Malysheva & Minnis
MyCoPortal
Mycobank
Observations of:
This Name (52)
This Taxon, any name (52)
Other Taxa, this name proposed (17)
Other Taxa, this taxon proposed (17)
Species in *Pluteus* Fr. (348)

Map

Hide thumbnail map.

Google
Map data ©2018 Terms of Use

Proposed Names	User	Count
<i>Pluteus</i> Fr.	Rocky Houghtby	8
Recognized by sight		
<i>Pluteus salicinus</i> group	Fredo	59
Recognized by sight		
<i>Pluteus americanus</i> (P. Banerjee & Sundb.) Justo,	Fredo	97

Create individual reports online

<http://mushroomobserver.org>

MUSHROOM OBSERVER

Introduction

How To Use

Observations

Create Observation

Your Observations

Sort by Date

Latest

Changes by Users

Images

Comments

Species Lists

Your Lists

Create List

Sort by Date

Sort by Title

Indexes

Glossary

Herbaria

Locations

illinois

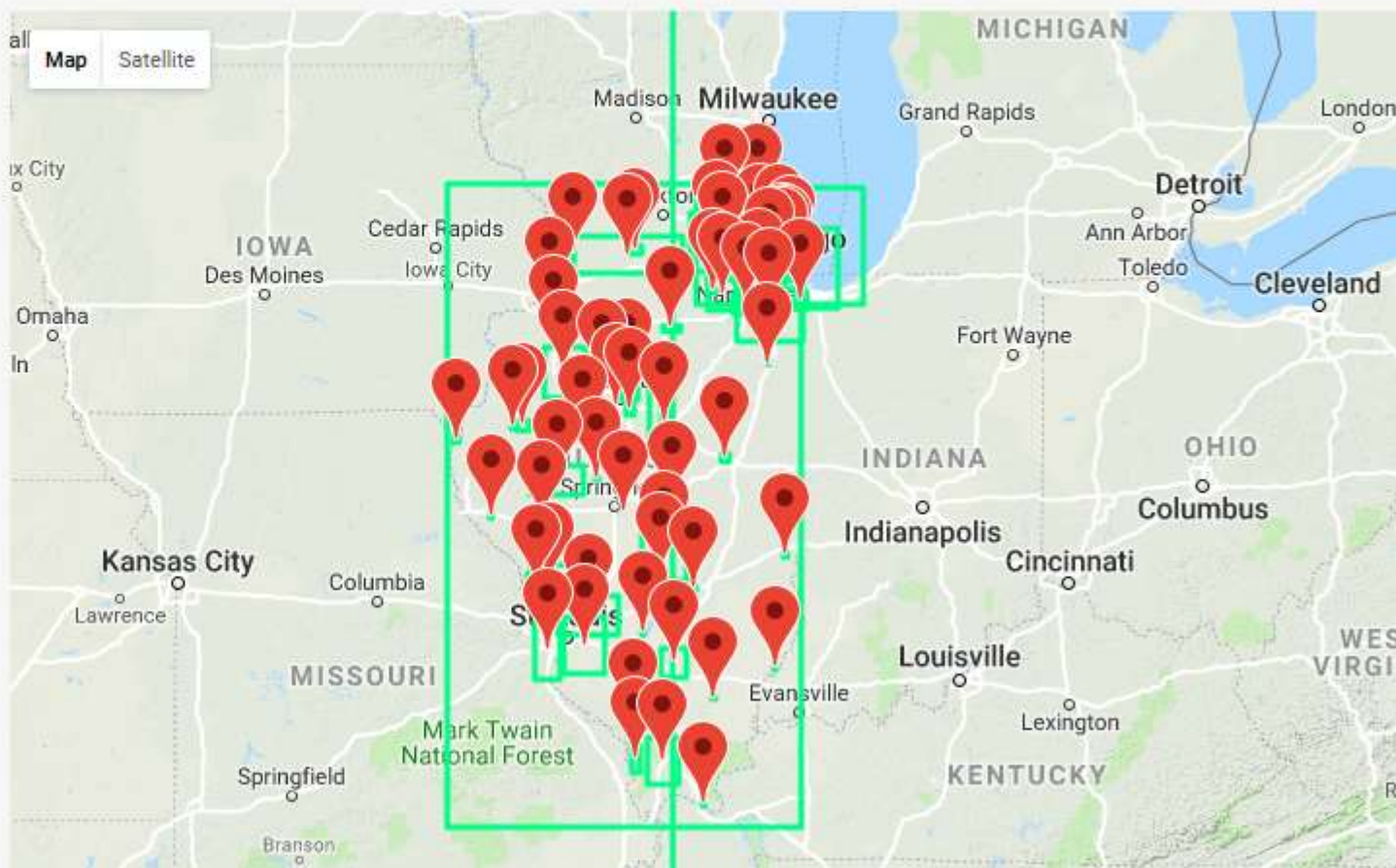
Observations

Search

(1953 results in 2.53 sec)

[Advanced Search](#)

Map of Observations Matching 'illinois'



Create individual reports online

<https://www.inaturalist.org>

iNaturalist

Observations ▾

Species ▾

Projects ▾

Places

Guides


People

Log in or Sign up

deer mushroom (*Pluteus cervinus*) Research Grade



skrentnyjeff

 3,892 observations

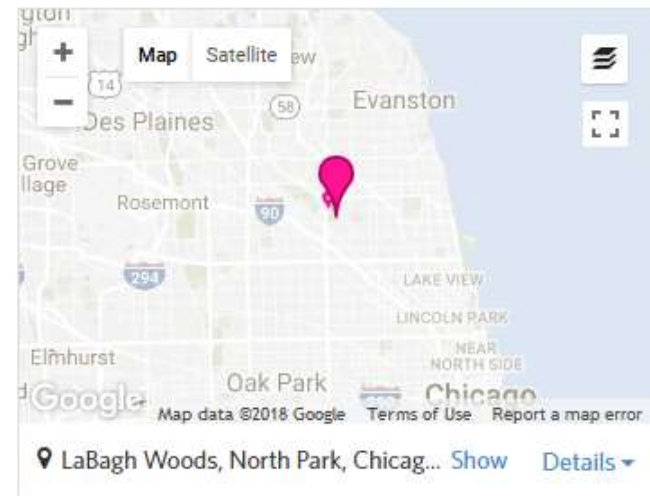


Observed:

Jul 27, 2017 · 10:29 AM CDT

Submitted:

Mar 3, 2018 · 10:02 PM CST



Create individual reports online

<https://www.inaturalist.org>

The screenshot displays the iNaturalist website interface. At the top left is the iNaturalist logo. Navigation links include Observations, Species, Projects, Places, Guides, People, and Log in. A dark navigation bar shows the state of Illinois selected, with statistics: 3,522 OBSERVATIONS, 377 SPECIES, 346 IDENTIFIERS, and 537 OBSERVERS. Below this is a map of Illinois with a red outline, showing numerous grey observation points. Map controls include a location pin, zoom in (+), zoom out (-), a compass, and a full-screen icon. A 'Places of Interest' button and a 'Redo search in map' button are also visible. On the right, a list of reports is shown, each with a photo and text: 'deer mushro...' (Pluteus cervinu...), 'Roridomyces ...', 'turkey-tail' (Trametes versi...), and 'Blushing Ros...' (Abortiporus bi...). Each report includes the user name, date, and a 'Research Grade' badge.

Pluteus americanus

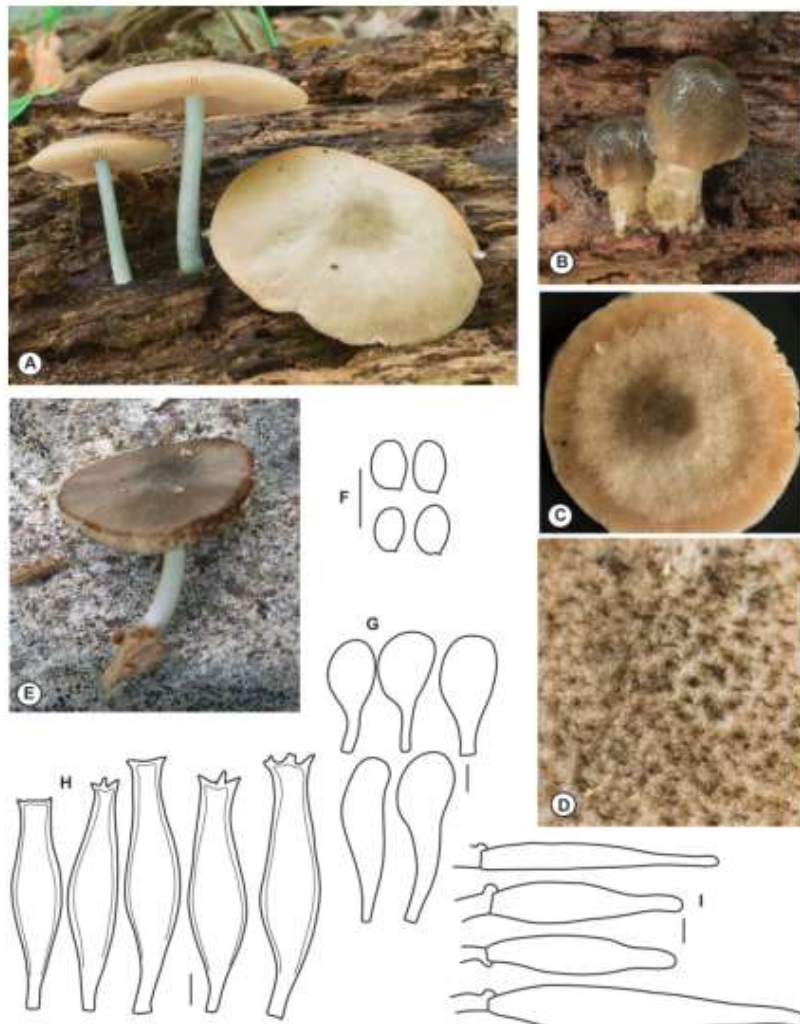


FIGURE 28. *Pluteus americanus*. A–D, Collection MO 145100 (photos by A. Houghtby). A, Mature basidiocarps. B, Young basidiocarps. C, Detail of pileus showing the hygrophanous surface. D, Detail of pileus center. E, Collection AJ 596. F, Basidiospores. G, Cheilocystidia. H, Pleurocystidia. I, Pileipellis. F–I from MO 145100. All line drawings by A. Justo. Scale bars = 10 µm.



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Monograph

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PHYTOTAXA
ISSN 1179-3163 (online edition)



<http://dx.doi.org/10.11646/phytotaxa.180.1.1>

PHYTOTAXA

Molecular phylogeny and phylogeography of Holarctic species of *Pluteus* section *Pluteus* (Agaricales: Pluteaceae), with description of twelve new species

ALFREDO JUSTO¹, EKATERINA MALYSHEVA², TATIANA BULYONKOVA³, ELSE C. VELLINGA⁴, GERRY COBIAN⁵, NHU NGUYEN⁶, ANDREW M. MINNIS⁷ & DAVID S. HIBBETT⁸

¹Clark University, Biology Department, 950 Main St., Worcester, Massachusetts 01610, U.S.A.; ajusto@clarku.edu

²Komarov Botanical Institute of the Russian Academy of Sciences, Prof. Popova Str. 2, St Petersburg, RUS-197376, Russia; ef.malysheva@gmail.com

³A. P. Ershov Institute of Forest Sciences, Siberian Federal University, 660075, Novosibirsk, RUS-630090

⁴Plant and

⁵USDA,

Well documented collections can be used in monographs and other publications.

Pluteus americanus (P. Banerjee & Sundb.) Justo, E.F. Malysheva & Minnis, *comb. & stat. nov.* Fig. 28
Mycobank 808736

Basionym: *Pluteus salicinus* var. *americanus* Banerjee & Sundberg, Mycotaxon 47: 393. 1993. Holotype:—UNITED STATES OF AMERICA. Michigan: Emmet Co., Pellston Hills, west of Pellston, 03 September 1957, on wood of *Populus*, A.H. Smith 57842, nrITS KJ009762, *tefl* KJ010037 (MICH!).

Pileus 10–60 mm in diameter, hemispherical or campanulate when young, expanding to convex or plano-convex, with or without a low, broad umbo, sometimes slightly depressed at center; surface usually with distinct squamules at center, radially fibrillose or smooth towards margin; usually with predominant brown or pale brown colors

Additional collections examined:—RUSSIA. Far East Federal District: Primorsky Territory, Ussuriyskiy Nature Reserve, Peishula Reserve Field Station, valley of Suvorovka River, floodplain forest (*Chosenia*, *Salix*, *Corylus*), on decayed wood of deciduous tree, 15 August 2011, E.F. Malysheva s.n. LE 289369, nrITS KJ009759, *tefl* KJ010034 (LE). UNITED STATES OF AMERICA. Illinois: Cook Co., Elk Grove Village, Busse Woods, mixed forest, on *Fraxinus* wood, 09 September 2013, A. Houghtby MO145100, nrITS KJ009785, *tefl* KJ010038 (CUW). Michigan: Emmet Co., French Farm, 25 September 2009, M. Keirle SF2-BPI 882765, nrITS HM562174, *tefl* KJ010035 (BPI). New York: Essex Co., Adirondack Ecological Center, Huntington Wildlife Forest, mixed forest, on decayed wood, 18 August 2012, A. Justo 591, nrITS KJ009760 (CUW); *ibid.*, A. Justo 596, nrITS KJ009761, *tefl* KJ010036 (CUW).

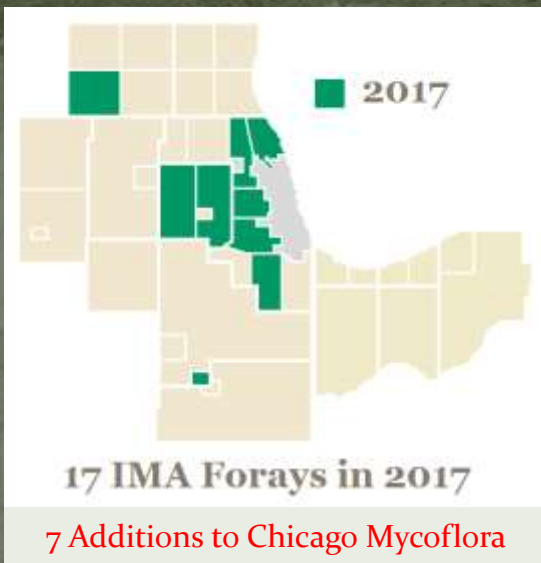
Mycology and “Citizen Science”



Illinois Mycological Association forays have contributed over 4300 observations from 35 locations in the Chicago Region.

Forays provide valuable collections for science and offer firsthand experience for the public.

2004 September foray
with Walt Sundberg



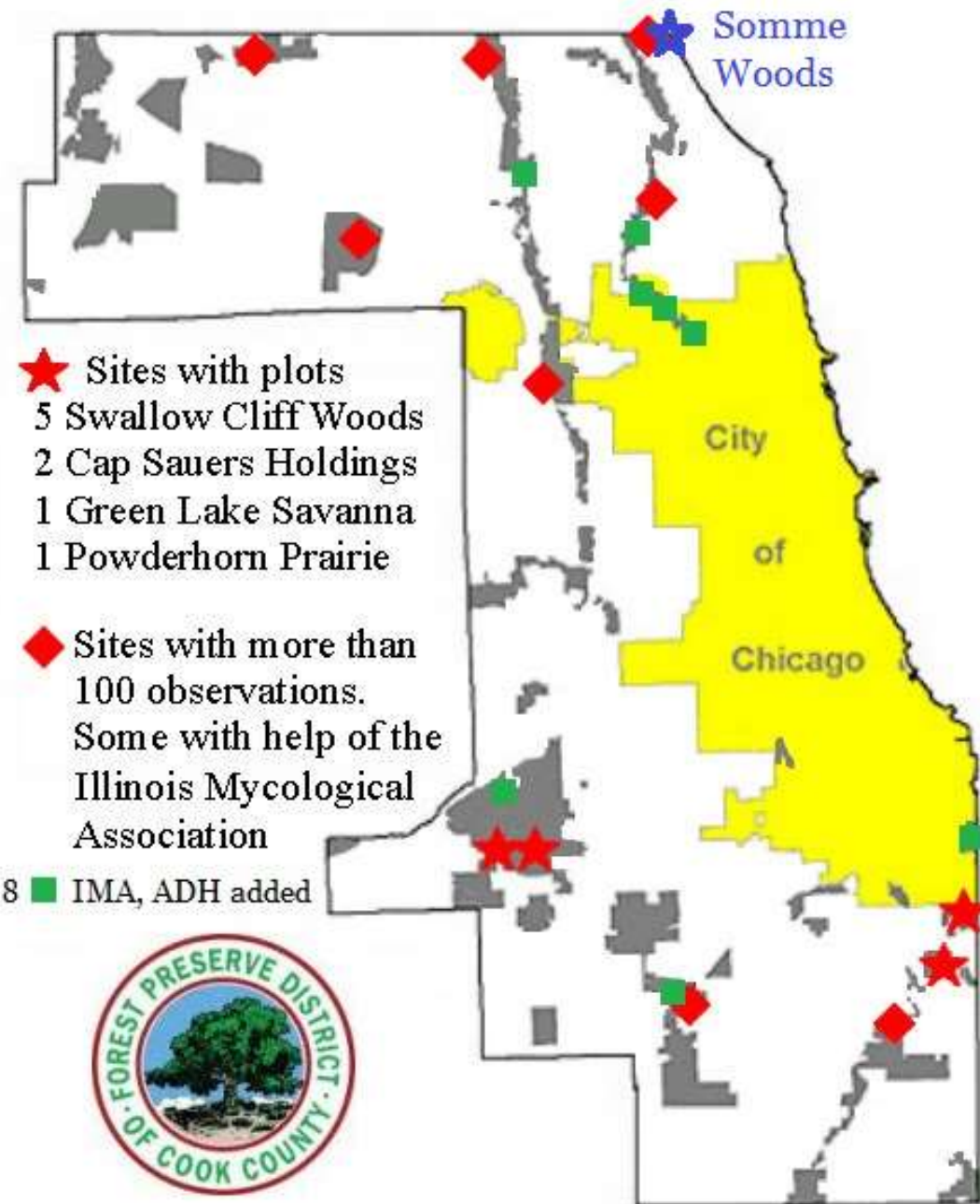
Mushroom species lists are compiled for each foray. Selected fungi are documented with preserved collections.

All records for IMA forays, 1994 - 2017

YEAR	Collected / Observed
1994	28 / 28
1995	15 / 15
1998	52 / 71
1999	5 / 5
2000	76 / 162
2001	43 / 120
2002	0 / 114
2003	162 / 223
2004	30 / 48
2007	1 / 1
2009	84 / 145
2010	99 / 169
2011	259 / 431
2012	178 / 366
2013	314 / 899
2014	288 / 709
2015	181 / 663
2016	205 / 730
2017	166 / 770
Totals	2186 / 5669



Plots and Surveys



IMA forays



More info at MycoGuide.com

<http://www.mycoguide.com/guide/chicago>

MycoGuide

[Home](#) » [CHICAGO REGION](#) » [KEY](#) » [FUNGI](#) » [GLOSSARY](#) » [METHODS](#) » [NORTH AMERICA](#) » [RESOURCES](#) » [DONATIONS](#)

Home » Guide » Chicago Region

GUIDE

▼ Chicago Region

1890–1925

1926–1993

1994–2010

2011–2014

2015–2017

► Field Museum

► Counties

► Map Sets

Chicago Region History and Partners

The study of mushrooms and other fungi in the Chicago Region has a long history beginning in the 1890's. The early 1909 publication on Chicago fungi covered 400 species. The documentation of fungi since then, particularly the past 20 years of intense local research by mycologists of the Field Museum of Natural History (FMNH) and involvement with the Illinois Mycological Association (IMA), has demonstrated that there are well over 1200 species. These fungi inhabit the diverse oak woodlands, forests, and other habitats of the Chicago Metropolitan area. The core of this area, in north-eastern Illinois and north-western Indiana, is twelve counties that have had various amounts of fungal research.

The compilation of historical collections with recent work will provide better understanding of the Chicago Region fungi: their actual diversity and distribution, their role and impact on forest ecosystems, and changes

“ When we try to pick out anything by itself, we find it hitched to everything else in the universe.

John Muir

Chicago Region Map



These twelve counties are the core of the Chicago Wilderness Region.