

The Macroalgal Herbarium Consortium

Accessing 150 Years of Specimen Data to Understand
Changes in the Marine/Aquatic Environment



What are Macroalgae?

Rhodophyta (Red Algae) - 6,300 species in 10 orders

Chlorophyta (Green Algae) - 4,300 species in 15 orders

Charophyta - 3,500 species in 8 orders

Phaeophyta (Brown Algae) - 2,000 species in 18 orders



Why Are They Important

- ▶ Foundation of aquatic ecosystems – provide food, shelter and substrate for other organisms
- ▶ Maintain nutrient balance in aquatic ecosystem and produce oxygen
- ▶ \$7.4 billion industry as human food, phycocolloids, pharmaceuticals
- ▶ **Sensitive indicators of environmental changes in aquatic ecosystems**



How Many Specimens Are There in US Herbaria?



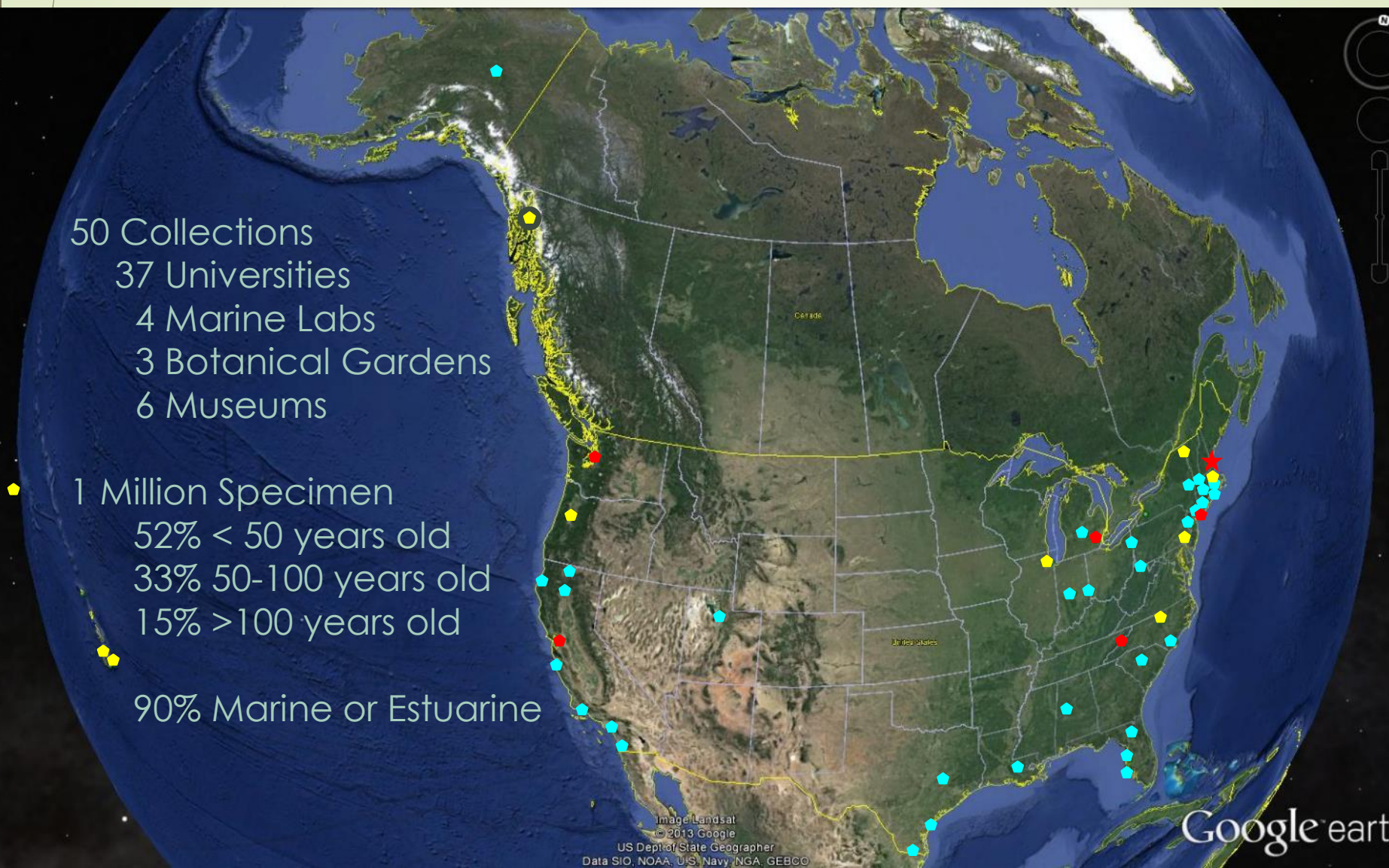
- Over one million macroalgal herbarium specimens in collections ranging from 50 specimens to 200,000

Where Are The Herbaria?

50 Collections
37 Universities
4 Marine Labs
3 Botanical Gardens
6 Museums

1 Million Specimen
52% < 50 years old
33% 50-100 years old
15% >100 years old

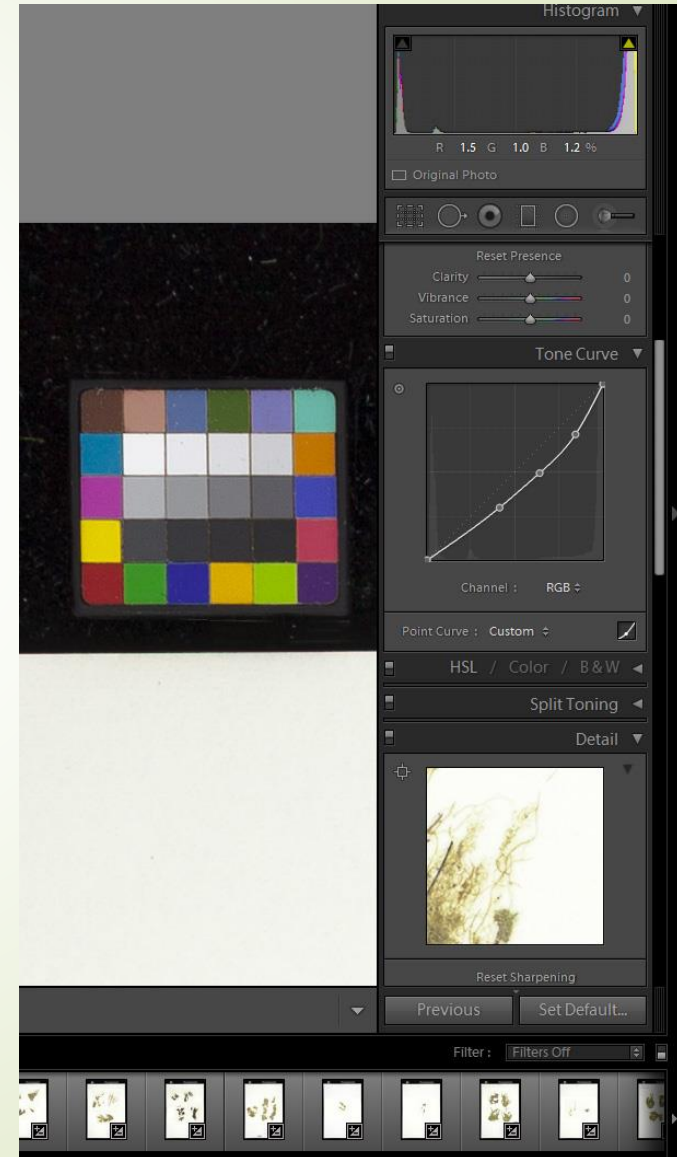
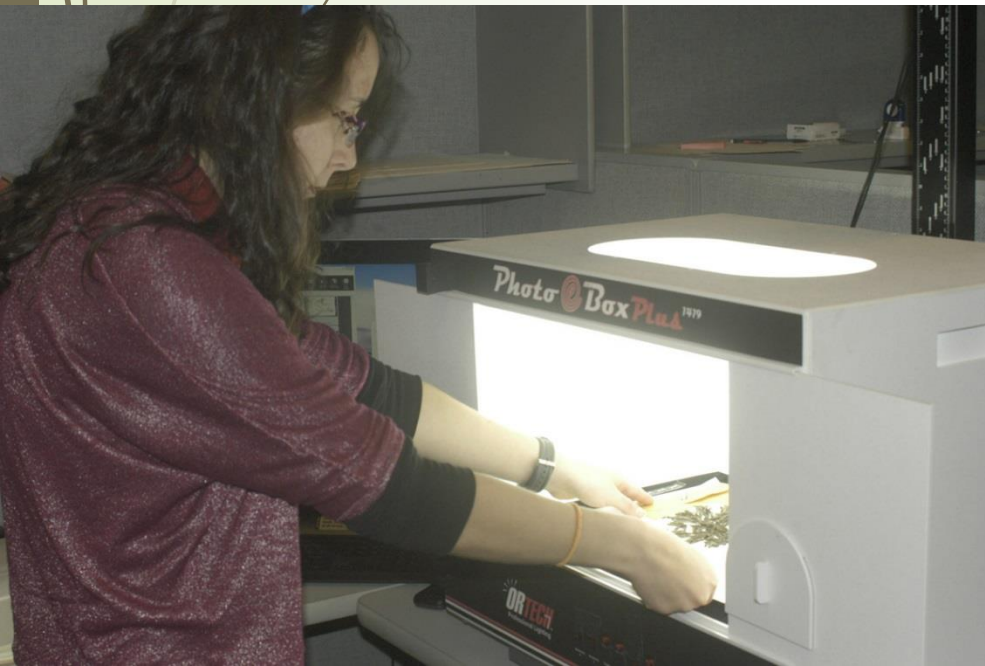
90% Marine or Estuarine



How Are They Being Digitized?

➤ Imaging

- Lightbox/copystand
- 21 to 36 megapixel camera
- Camera Control Software
- Adobe Lightroom (white balance, tone curve adjustment, jpg & dng export)



How Are They Being Digitized?

Label Transcription in Symbiota Portal (Macroalgae.org)

The screenshot displays the Symbiota Portal (Macroalgae.org) interface for editing a specimen record. The browser address bar shows the URL: `macroalgae.org/portal/collections/editor/occurrenceeditor.php`. The page title is "University of New Hampshire (NHA)".

The interface is divided into several sections:

- Occurrence Data** (selected tab):
 - Collector Info**:
 - Catalog Number: NHA-575360
 - Other Numbers: 56174
 - Collector: A. C. Mathieson
 - Number: [empty]
 - Date: 1995-04-01
 - Buttons: Dupes?, Auto search
 - Latest Identification**:
 - Scientific Name: *Monostroma grevillei*
 - Author: [empty]
 - ID Qualifier: [empty]
 - Family: [empty]
 - Identified By: [empty]
 - Date Identified: [empty]
 - Locality**:
 - Country: United States
 - State/Province: Maine
 - County: Hancock
 - Municipality: [empty]
 - Locality: Lamoine State Park, Eastern Bay, Lamoine, Maine
 - Locality Security:
 - Latitude: 44.453513
 - Longitude: -68.301485
 - Uncertainty: 504
 - Datum: [empty]
 - Verbatim Coordinates: [empty]
 - Elevation in Meters: [empty]
 - Verbatim Elevation: [empty]
 - Georeferenced By**: hmt
 - Georeference Sources**: georef batch tool 2013-
 - Georeference Remarks**: [empty]
 - Georeference Protocol**: [empty]
 - Georef Verification Status**: reviewed - high confidence

- Label Processing** (right sidebar):
- Image 1 of 1
- OCR Image: OCR whole image, OCR w/ analysis
- Transcribed text: 56174, PLANTS OF NEW ENGLAND (Maine), *Monostroma grevillei* (Thuret) Wittrock, Lamoine State Park, Eastern Bay, Lamoine, Maine, April 1, 1995 A. Mathieson, Hodgdon Herbarium UNIVERSITY OF NEW HAMPSHIRE.

How Are They Being Digitized?

- Georeferencing (Using GeoLocate from the Symbiota Portal)

The screenshot displays the GEOlocate Tool interface in a Google Chrome browser window. The address bar shows the URL: `macroalgae.org/portal/collections/georef/geolocate.php?country=United%20States&state=Maine&county=Hancock&locality=Lamoine%20Stat`. The main content area features a satellite map of Lamoine State Park, Maine, with a large circular search area. Two possible locations are marked: a green dot at Lamoine State Park and a red dot at Eastern Bay. The interface includes a 'Workbench' section with options for 'Georeference', 'Options', 'Draw polygon', 'Place marker', and 'Measure'. The 'Georeference' section shows the following details:

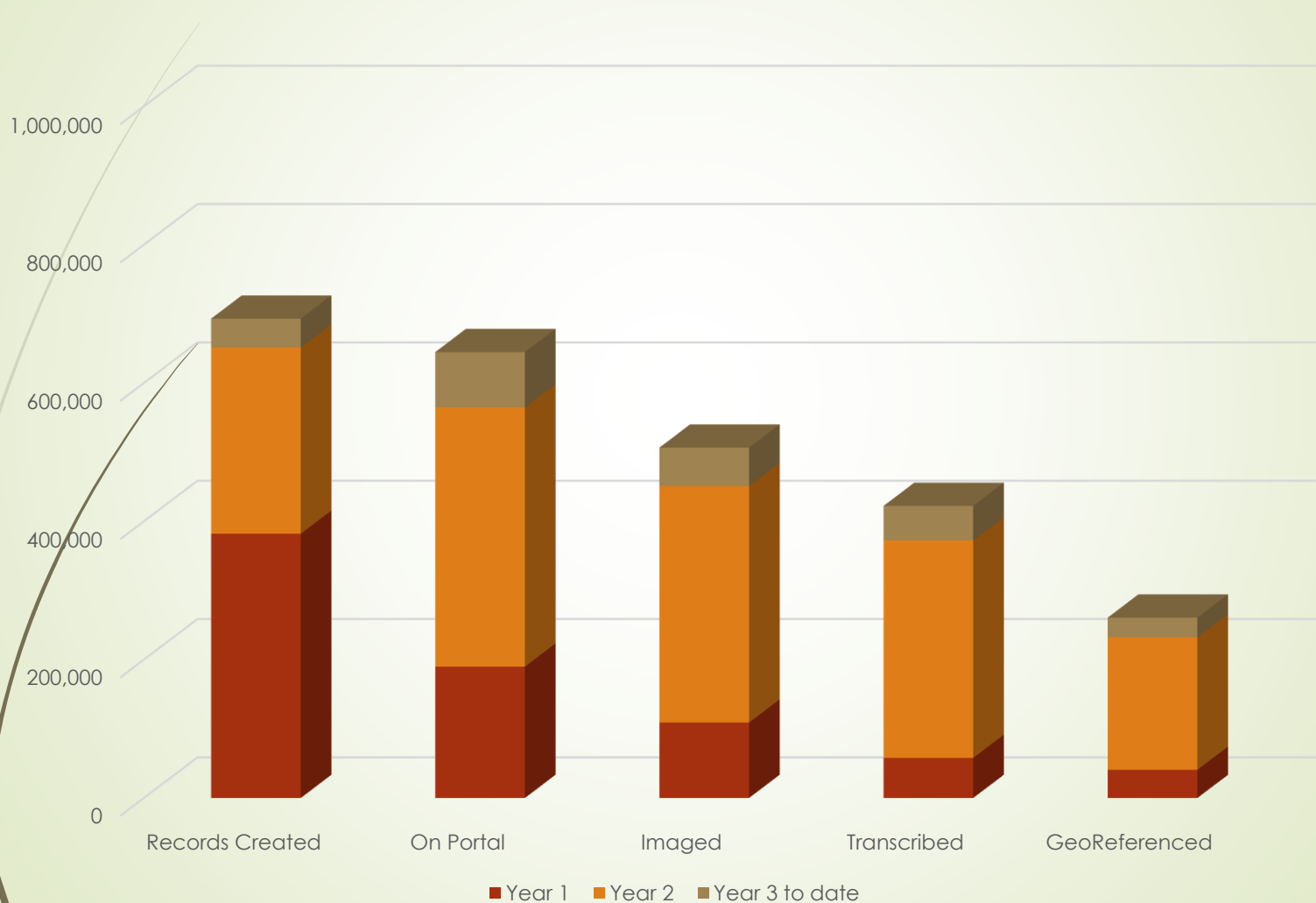
- Locality String: `Lamoine State Park, Eastern Bay, Lamoine, Maine`
- Country: `UNITED STATES OF AMERICA`
- State: `Maine`
- County: `Hancock`
- Latitude: `44.45722`
- Longitude: `-68.29861`
- Uncertainty: `2289 m`
- Error polygon: `Unavailable`

At the bottom of the interface, there is a 'Save To Your Application' button. The map includes a scale bar (1000m / 2000ft) and a coordinate display (44.462656, -68.211171).

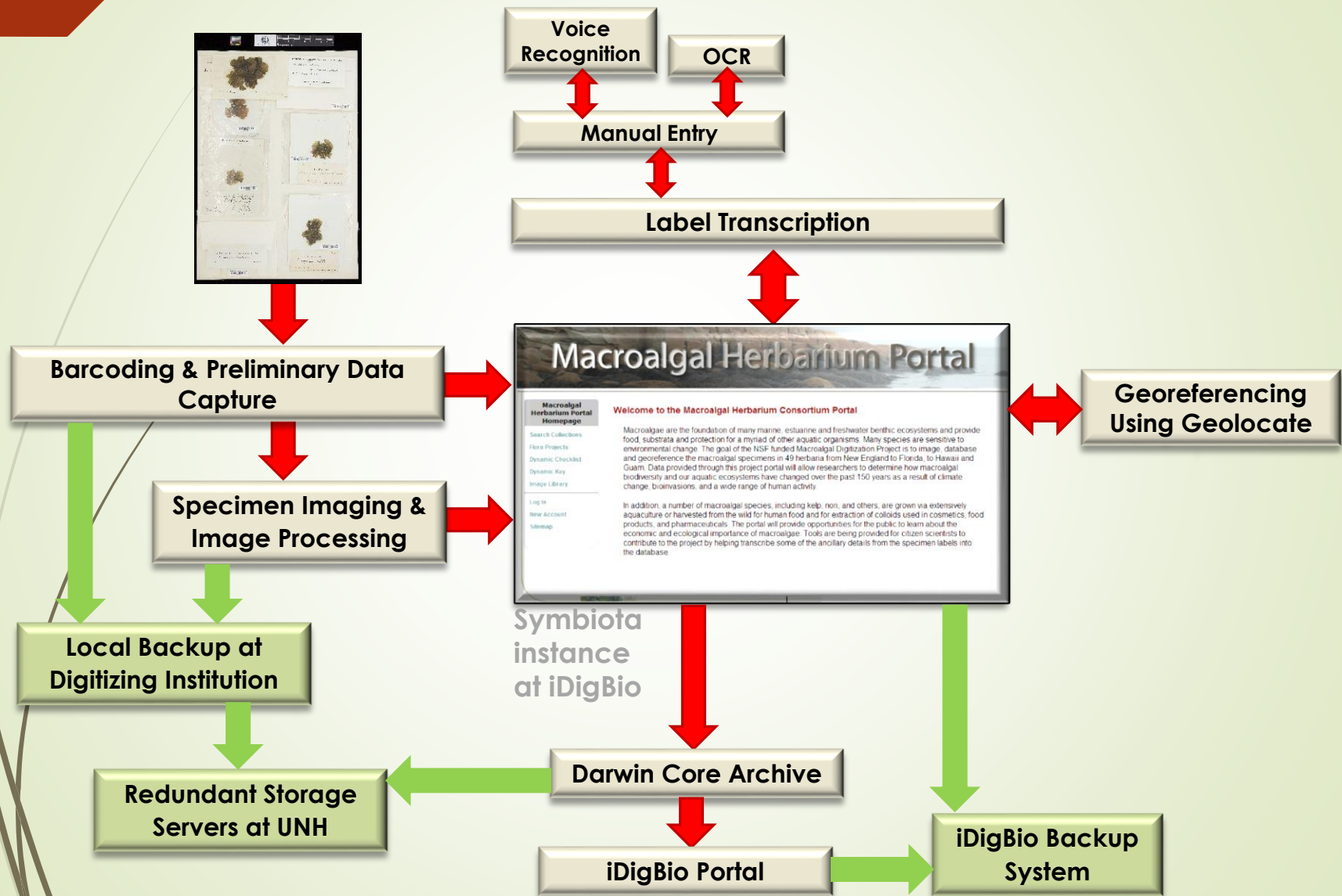
What is the Progress to Date?

Digitizing Institution	Start	Collections	Specimens	Percent Complete				
				Records Created	On Portal	Imaged	Transcribed	Geo-referenced
University of New Hampshire	Year 1	10	131,677	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>
New York Botanical Garden	Year 1	5	169,150	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>
University of North Carolina	Year 1	7	49,736	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>
University of Michigan	Year 1	5	95,892	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>
University of Washington	Year 1	3	36,102	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>
Duke University	Year 1	1	21,837	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>
University of Alaska SE	Year 1	1	9,889	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>
Bishop Museum	Year 1	1	65,000	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>
Field Museum	Year 1	1	47,791	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>
Oregon State University	Year 1	1	12,109	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>
University of Guam	Year 1	1	13,600	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>
University of California - Berkeley	Year 2	9	228,862	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>
University of Hawaii	Year 2	1	2,401	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>
Harvard University	Year 2	1	150,000	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>
Academy of Natural Sciences	Year 3	1	37,000	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>
University of Vermont	Year 3	1	3,500	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>	<div style="width: 100%;"></div>
Totals		49	1,074,546	693,059	644,737	506,584	422,270	260,775

What is the Progress to Date?

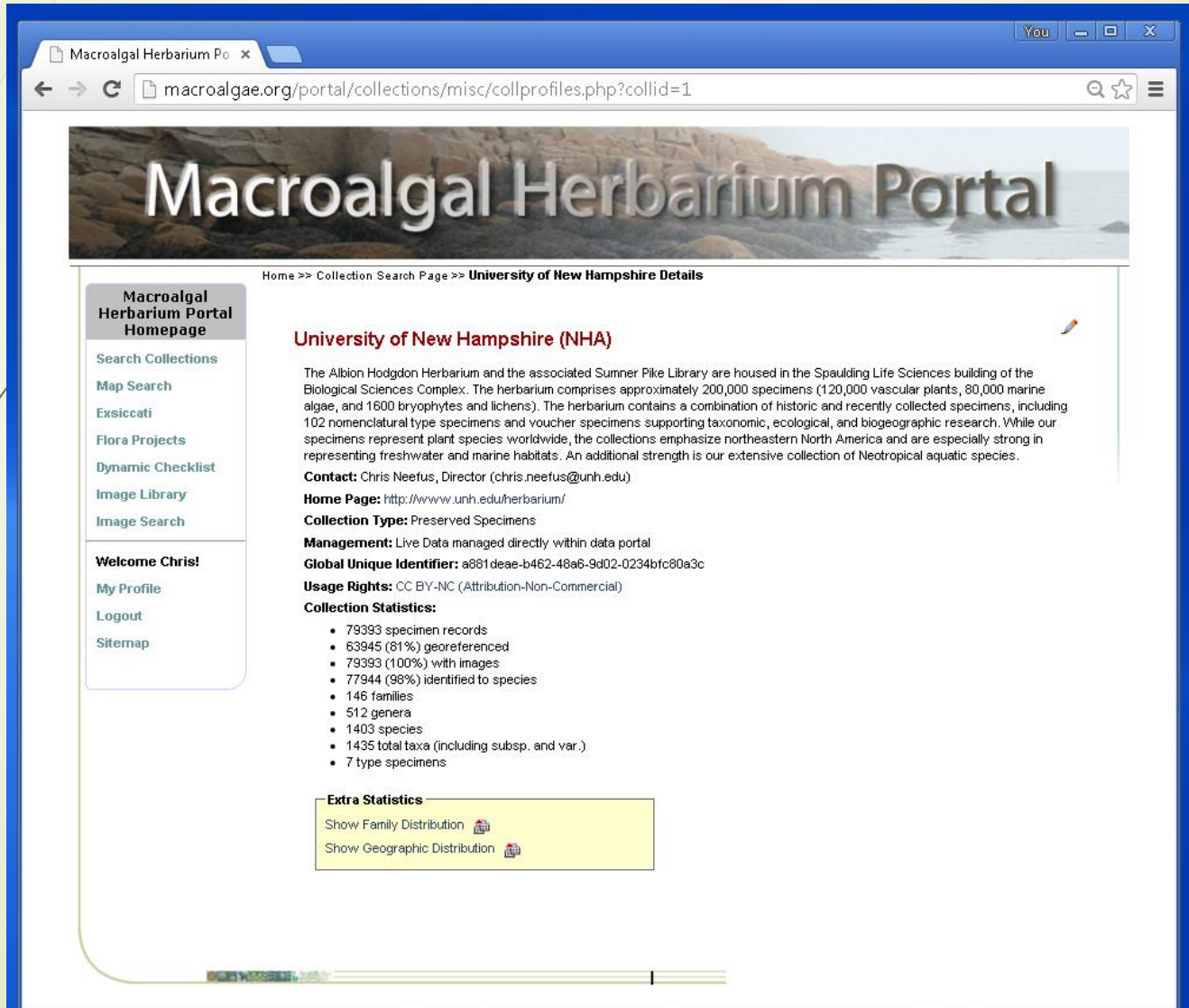


How is Data Being Managed?



How Is Data Disseminated?

- ▶ Open access via the Macroalgae.org specimen data portal (Symbiota)



The screenshot shows a web browser window with the URL `macroalgae.org/portal/collections/misc/collprofiles.php?collid=1`. The page title is "Macroalgal Herbarium Portal". The main content area displays "University of New Hampshire (NHA)" details. A left sidebar contains navigation links such as "Search Collections", "Map Search", "Exsiccati", "Flora Projects", "Dynamic Checklist", "Image Library", "Image Search", "Welcome Chris!", "My Profile", "Logout", and "Sitemap". The main content includes a description of the herbarium, contact information for Chris Neefus, and a list of collection statistics.

Macroalgal Herbarium Portal

Home >> Collection Search Page >> University of New Hampshire Details

Macroalgal Herbarium Portal Homepage

- Search Collections
- Map Search
- Exsiccati
- Flora Projects
- Dynamic Checklist
- Image Library
- Image Search

Welcome Chris!

- My Profile
- Logout
- Sitemap

University of New Hampshire (NHA)

The Albion Hodgdon Herbarium and the associated Sumner Pike Library are housed in the Spaulding Life Sciences building of the Biological Sciences Complex. The herbarium comprises approximately 200,000 specimens (120,000 vascular plants, 80,000 marine algae, and 1600 bryophytes and lichens). The herbarium contains a combination of historic and recently collected specimens, including 102 nomenclatural type specimens and voucher specimens supporting taxonomic, ecological, and biogeographic research. While our specimens represent plant species worldwide, the collections emphasize northeastern North America and are especially strong in representing freshwater and marine habitats. An additional strength is our extensive collection of Neotropical aquatic species.

Contact: Chris Neefus, Director (chris.neefus@unh.edu)

Home Page: <http://www.unh.edu/herbarium/>

Collection Type: Preserved Specimens

Management: Live Data managed directly within data portal



Global Unique Identifier: a881deae-b462-48a6-9d02-0234bfc80a3c

Usage Rights: CC BY-NC (Attribution-Non-Commercial)

Collection Statistics:

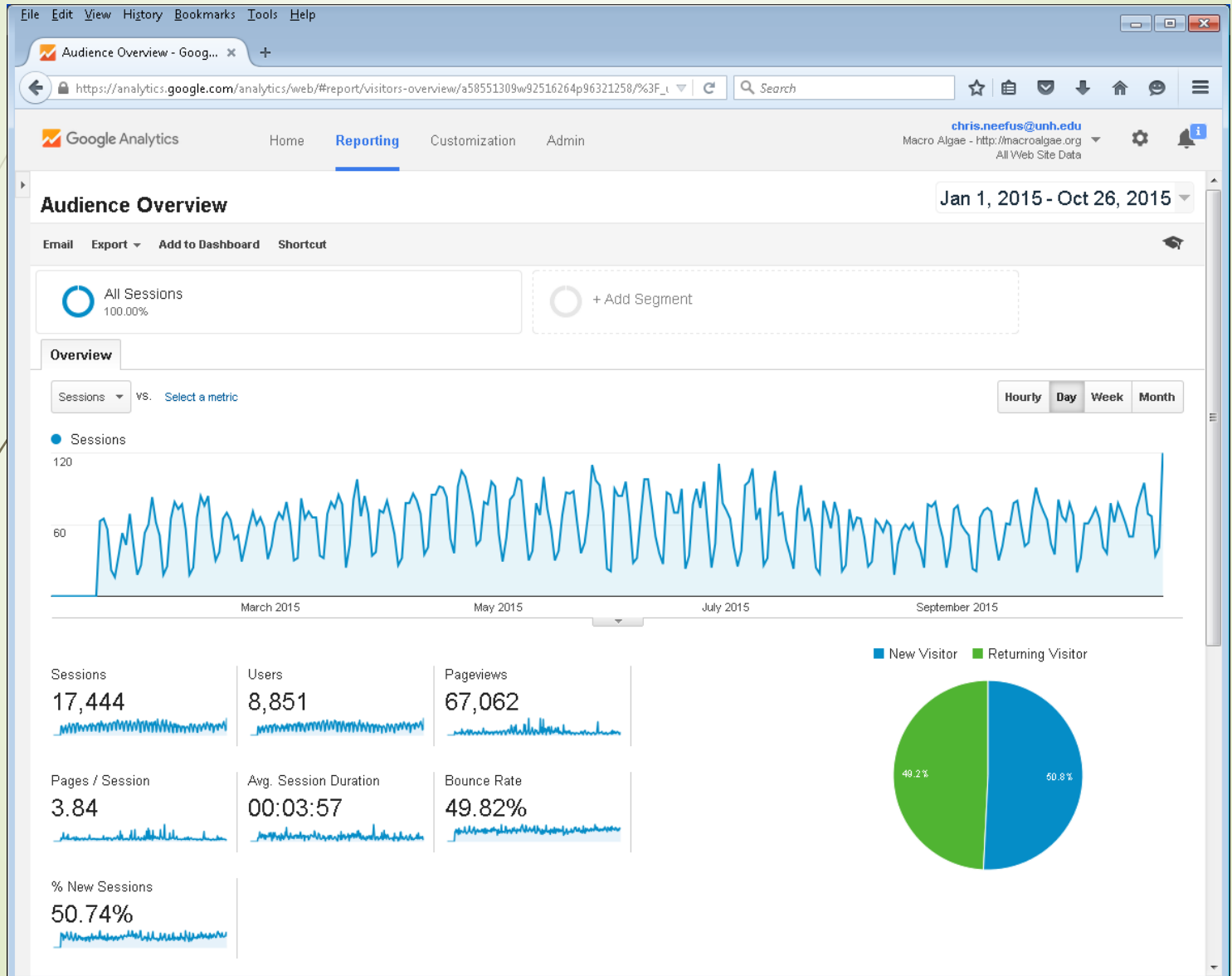
- 79393 specimen records
- 63945 (81%) georeferenced
- 79393 (100%) with images
- 77944 (98%) identified to species
- 146 families
- 512 genera
- 1403 species
- 1435 total taxa (including subsp. and var.)
- 7 type specimens

Extra Statistics

- Show Family Distribution 
- Show Geographic Distribution 

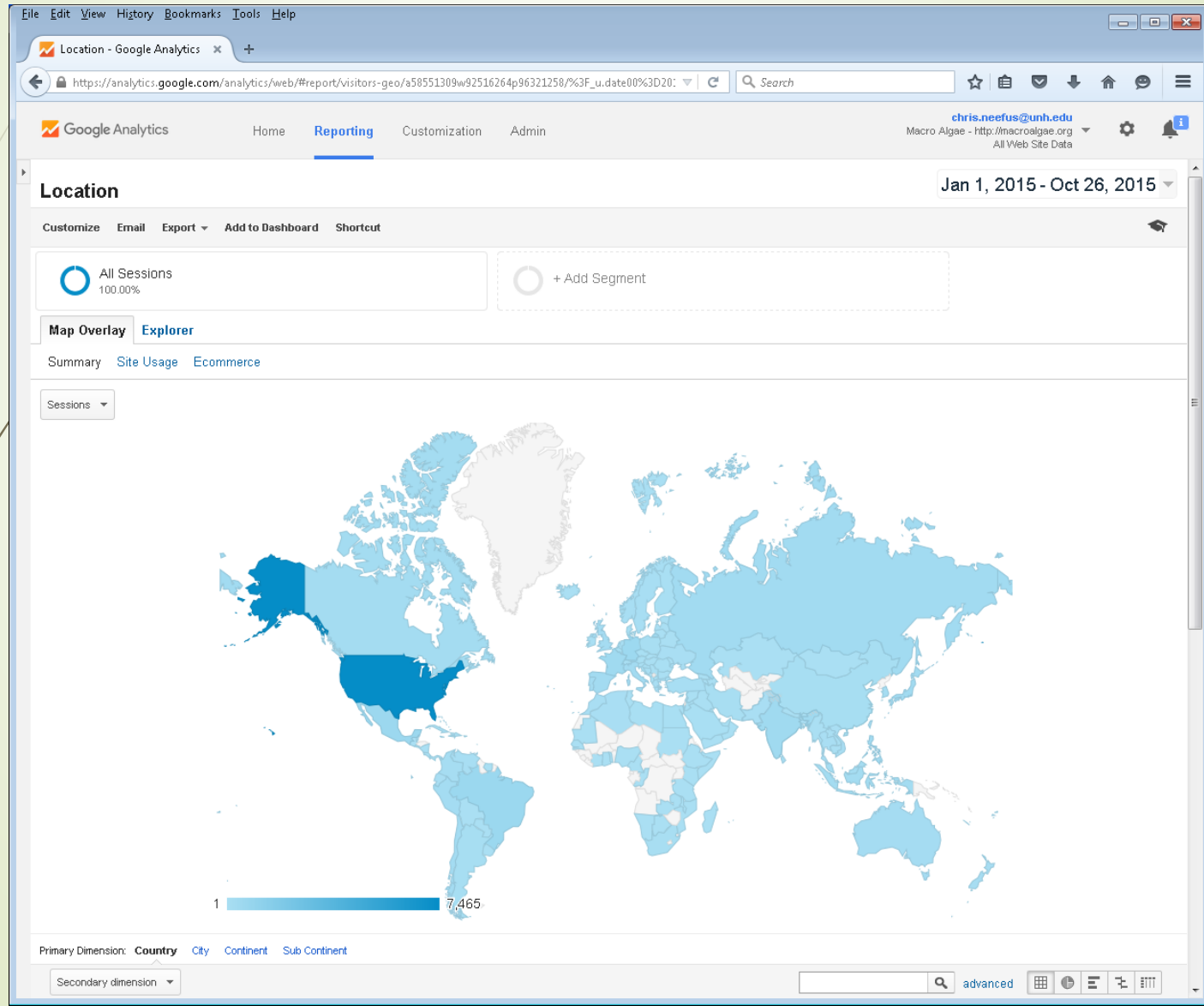
Who is Using the Data?

➔ Google Analytics for Macroalgae.org



Who is Using the Data?

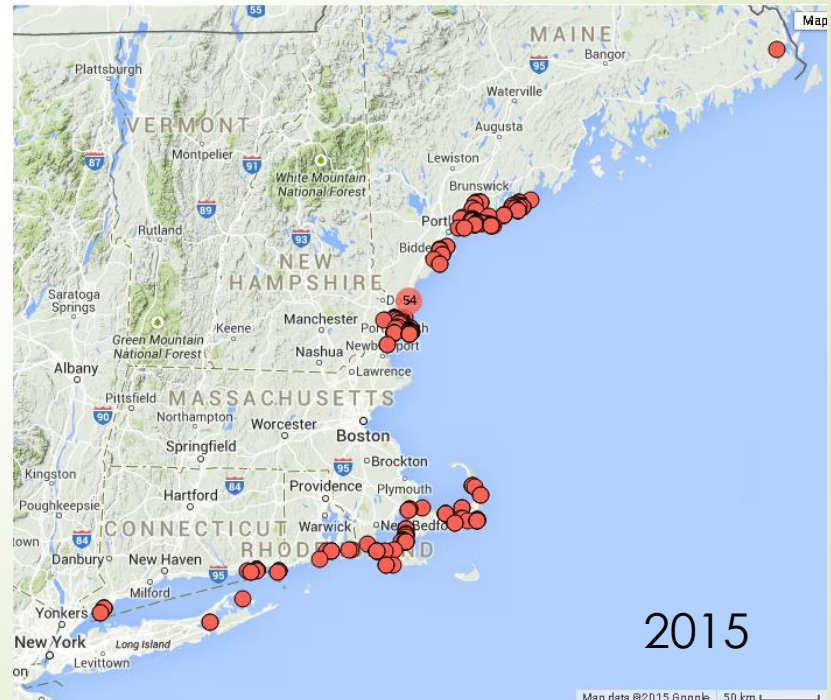
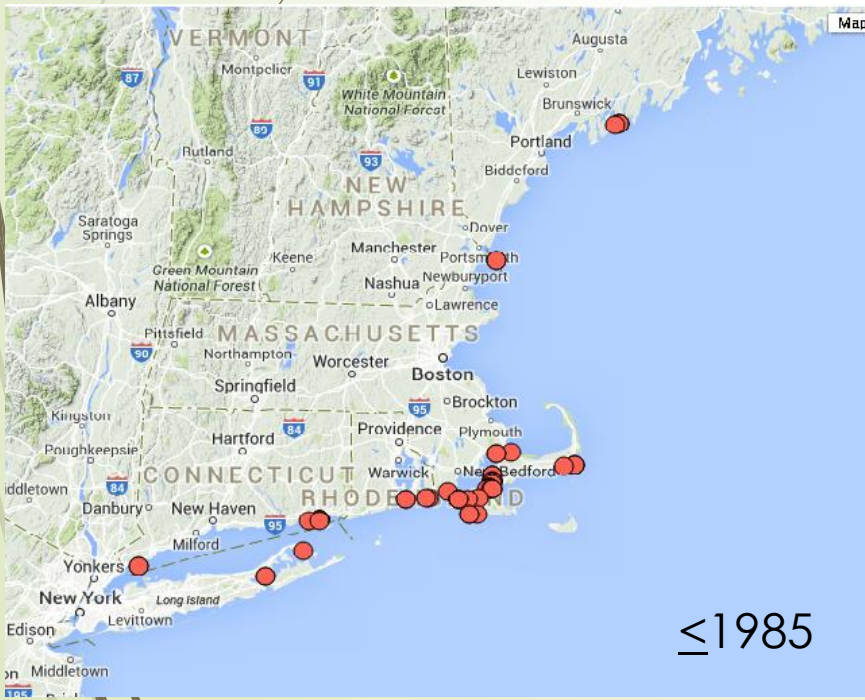
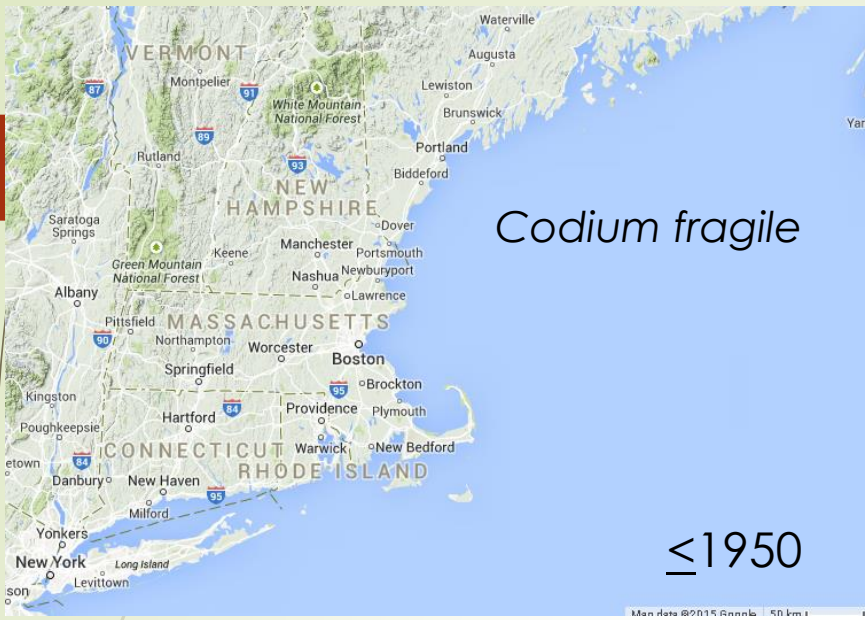
➔ Google Analytics for Macroalgae.org





How is the Data Being Used?

- ▶ Education
 - ▶ Lab exercises and assignments in aquatic botany courses
 - ▶ Field trip preparation (checklists)
- ▶ Research
 - ▶ Determine when and where a species can be collected
 - ▶ Taxonomic studies
 - ▶ Biogeographic studies
 - ▶ Effects of environmental changes or disturbances on species distribution and community structure
 - ▶ Track progression of invasive species and loss/displacement of native species





TCN Project Management

- ▶ Training
 - ▶ Online videos and training documents (macroalgae.unh.edu)
 - ▶ Site visits
 - ▶ iDigBio workshops/webinars and online documentation
- ▶ Communication
 - ▶ Primarily eMail (phone / Skype)
 - ▶ In-person meetings of subsets of the TCN at:
 - ▶ SPNHC
 - ▶ Regional, National and International Phycology symposia
 - ▶ iDigBio Workshops
- ▶ Progress Tracking
 - ▶ Periodic progress reports from Digitizing Institutions and Collaborating PI's
 - ▶ Track records/images/transcription/georeferencing on portal

Acknowledgments



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Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily
reflect the views of the National Science Foundation.*