

# Symbiota: a specimen-based biodiversity portal platform

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National Science Foundation  
WHERE DISCOVERIES BEGIN

# Symbiota Biodiversity Portals

- Virtual flora/fauna
- Specimen search engine
- Biodiversity inventories
  - Floras, faunas, biotas, BioBlitz surveys
- Identification keys
- Images, distribution maps, descriptions, taxonomy, etc.



*Euscepes longisetis* Champion, 1905  
 Go to [Euscepes longisetis](#) data page  
 Family: Curculionidae



Description

Champion, 1905.  
 Oblong-ovate, black, the antennae ferruginous; thickly clothed with reddish-brown scales, which become blackish towards the anterior limit of the very large ochreous patch covering the apical declivity; the prothorax closely, and the elytra sparsely, setose, the setae on the latter long and erect, the legs also setose. Head densely punctate, the eyes widely separated; rostrum closely punctate. Prothorax convex, a little broader than long, somewhat rounded at the sides, bisinuate at the base; closely punctate. Elytra one-half wider than the prothorax, subparallel in their basal half, the humeri obtuse; serrate-punctate, the interstices almost flat. Beneath rather sparsely punctate. Femora feebly dentate. Length 3 mm, breadth 1 mm. Habitat: Panama, Bugaba (Champion). One specimen. Very like *E. porcellus*, but with much longer setae on the elytra, the serrate punctures rather fine.

**Intermountain Region Herbarium Network**

Home > 40.59329, -111.13281; within 50 miles Key

Taxon: All Species  
 Display/Reset Species List  
 Display as: Scientific Name

Species Count: 978

**Aceraceae**  
*Acer glabrum*  
*Acer grandidentatum*  
*Acer negundo*  
*Acer platanoides*

**Amaranthaceae**  
*Amaranthus albus*  
*Amaranthus retroflexus*

**Amaryllidaceae**  
*Allium acuminatum*  
*Allium brandegeei*  
*Allium brandegei*  
*Allium brevistylum*  
*Allium caesia*  
*Allium geyeri*  
*Allium textile*

**Apiaceae**  
*Angelica pinnata*

habit:  herb  shrub  tree  vine  grass-like  cactus-like / desert succulent  fern & allies  aquatic  longevity:  annual or biennial  perennial

Map showing distribution of *Cirsium arizonicum* var. *arizonicum* (red), *Cirsium arizonicum* var. *arizonicum* (blue), and *Cirsium arizonicum* var. *bipinnatum* (green) in the Intermountain Region. Includes a legend, scale bar, and coordinate input fields.

Latitude decimal:  eg: 34.57  
 Longitude decimal:  eg: -112.38  
[Enter in D.M.S. format](#)

# Online demo1 - Dynamic Key

Welcome Edward Gilbert!

Logout My Profile Help

**SEINet**  
Southwest Environmental Information Network


**Welcome to SEINet**

The Southwest Environmental Information Network was created to serve as a gateway to distributed data resources of interest to the environmental research community in Arizona and beyond. Through a common web interface, we offer tools to locate, access and work with a variety of data.

SEINet is more than just a web site - it is a suite of data access technologies and a distributed network of departments, museums and agencies that provide environmental information. Initially created to integrate databases within the Arizona State University, SEINet is growing to extend this network to other partners within the Southwest.

To learn more about the features and capabilities available through this site, read Making Good Use Of SEINet or visit the Symbiota Help Pages. Join SEINet as a regular visitor and please send your feedback to [seinetAdmin@asu.edu](mailto:seinetAdmin@asu.edu). Visit the Data Usage Policy page for information on how to cite data obtained from this web resource.

**Plant of the Day**



**What is this plant?**  
Click here to test your knowledge

Development of SEINet, Symbiota, and several of the specimen databases have been supported by National Science Foundation Grants (DBI 9983132, BRC 0237418, DBI 0743827, DBI 0847966)

**Dynamic Floras**  
Dynamic Checklist  
**Dynamic Key**  
Sitemap

Pan, zoom and click on map to capture coordinates. Upon submitting coordinates, a species list will be generated by looking at all specimens collected within the area. [More Details](#)

Point (Lat, Long): **31.81002, -110.41428**

Taxon Filter (optional)



[Home](#) >> 31.81002, -110.41428; within 20 miles Key

Taxon:

All Species

31.81002, -110.41428; within 20 miles

Display/Reset Species List

Species Count: 1357

Display as: Scientific Name

**Plant**











**habit**

- herb
- shrub
- tree
- vine
- grass-like
- cactus-like / desert succulent
- fern & allies
- aquatic

**longevity**

- annual or biennial
- perennial

**Acanthaceae**

- Anisacanthus thurberi* 
- Carlowrightia arizonica* 
- Carlowrightia linearifolia* 
- Carlowrightia texana* 
- Dicliptera resupinata* 
- Dyschoriste schiedeana* 
- Elytraria imbricata* 
- Justicia sonora* 
- Ruellia nudiflora* 
- Tetramerium nervosum* 

**Adoxaceae**

- Sambucus nigra* 

**Aizoaceae**

- Trianthema portulacastrum* 

**Alismataceae**

- Alisma triviale* 



Welcome Max Licher!

[Logout](#)[My Profile](#)[Help](#)[Home](#) >> 31.81002, -110.41428; within 20 miles [Key](#)

Taxon:

All Species

Display/Reset Species List

Display as: Scientific Name

**Plant****habit** herb shrub tree**sap** latex absent (sap clear) latex present**Leaves****type** simple compound**stipules** stipules absent stipules present**arrangement** alternate opposite whorled fascicled/clustered along stem**blade margin**

31.81002, -110.41428; within 20 miles

Species Count: 62

**Adoxaceae***Sambucus nigra***Anacardiaceae***Rhus microphylla**Rhus virens***Bignoniaceae***Catalpa bignonioides**Chilopsis linearis**Tecoma stans***Cannabaceae***Celtis reticulata***Cupressaceae***Juniperus coahuilensis**Juniperus deppeana***Ericaceae**

Home >> 31.81002, -110.41428; within 20 miles Key

Taxon:

All Species

Display/Reset Species List

Display as: Scientific Name

Plant

habit

- shrub
- tree

Leaves

type

- simple
- compound

arrangement

- opposite
- whorled

blade margin

- entire
- toothed
- lobed

Fruit

consistency at maturity

- dry/leathery
- fleshy

31.81002, -110.41428; within 20 miles

Species Count: 10

Adoxaceae

*Sambucus nigra*



Bignoniaceae

*Catalpa bignonioides*



*Tecoma stans*



Cupressaceae

*Juniperus coahuilensis*



*Juniperus deppeana*



Oleaceae

*Fraxinus gooddingii*



*Fraxinus velutina*



Rubiaceae

*Cephalanthus occidentalis*



Sapindaceae

Home >> 31.81002, -110.41428; within 20 miles Key

Taxon:

All Species

Display/Reset Species List

Display as: Scientific Name

Plant

habit

- shrub
- tree

Leaves

type

- compound
- once-pinnately compound
- trifoliolate (w/ 3 leaflets)

arrangement

- opposite

Inflorescence

position

- axillary
- terminal

type

- raceme
- umbel
- panicle

31.81002, -110.41428; within 20 miles

Species Count: 5

Adoxaceae

*Sambucus nigra*



Bignoniaceae

*Tecoma stans*



Oleaceae

*Fraxinus gooddingii*



*Fraxinus velutina*



Sapindaceae

*Acer negundo*







## *Acer negundo* L.

Go to [Encyclopedia of Life...](#)

Family: Sapindaceae

boxelder, more...

[*Negundo aceroides* (L.) Moench [more](#)]



Max Licher

### VPAP Treatment

JANAS 29(1)

**Plant:** tree; to 10 m high, sparsely to densely pubescent on young growth and lower leaf surfaces, usually dioecious; young twigs glabrous to densely pubescent, often more or less glaucous, the epidermis smooth, greenish or reddish, the older twigs more or less rough, gray; buds covered by two reddish, tan, or yellowish valvate scales, these sparsely to densely hairy, the pubescent inner scales greatly elongating as the bud opens **Leaves:** mainly 3-foliolate, occasionally 3-lobed, 3.5-13.5 cm long, 3.5-18 cm wide, concolorous, the terminal leaflet up to 11 cm long by 8 cm wide, the lateral leaflets up to 9 cm long by 6 cm wide; apex of leaflets acute to acuminate; base of leaflets rounded to cuneate, sometimes oblique in lateral leaflets, sometimes acuminate in terminal leaflets; petiole 2-7.5 cm long, green or reddish; margin of leaflets coarsely toothed or lobed, the teeth acuminate to obtuse **INFLORESCENCE:** inflorescences many flowered, the staminate umbel-like, the pistillate racemose **Flowers:** ca. 5 mm long, less than 1 mm wide at base of perianth, the perianth greenish-yellow, with ca. 4 subelliptic segments ca. 0.2-2 mm long, the receptacle blending with filiform pedicel; pedicels 1-4 cm long **Fruit:** samaras 2.3-3.6 cm long, the wing 0.7-1.4 cm wide, the infructescences up to 15 cm long **Misc:** Riparian habitats and other wet wooded areas; 900-2750 m (3000-9100



Max Licher



Max Licher



Max Licher



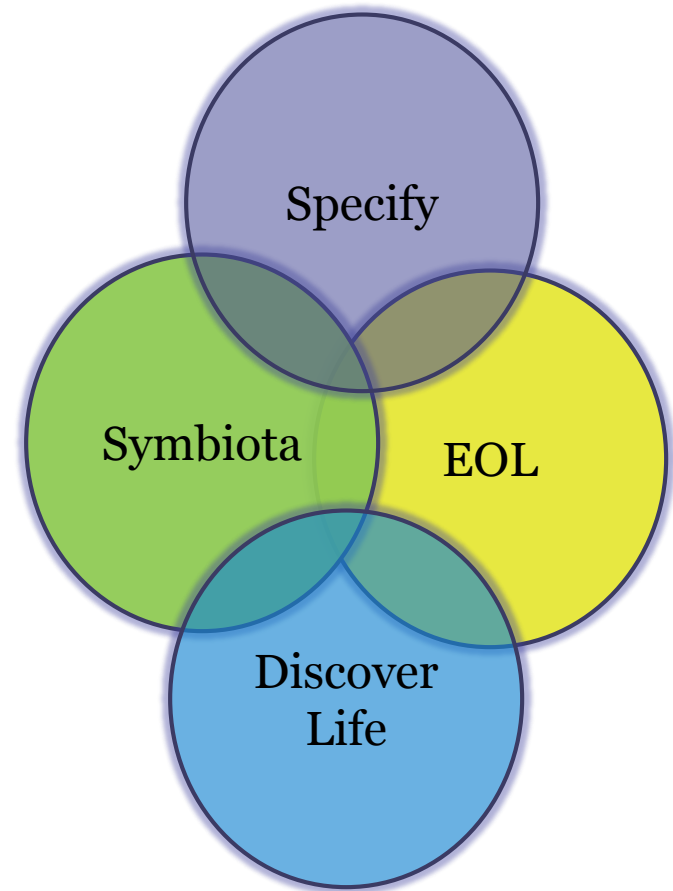
Max Licher



[Open Interactive Map](#)

# Duplication -vs - Niche Overlap

- Encyclopedia of Life (EOL)
- Specify
- GBIF
- Discover Life
- Navikey / Lucid / Xper2
- Symbiota
  - Community data portals
  - Specimen centric
  - Biodiversity CMS



# Scientific Community Portals

- Distinct datasets
  - Taxonomic scope
  - Geographic scope
- Custom look & feel
  - CSS, config files
- Open source
- Modular
- Framework architecture

**CoTRAM:**

**SCAN**  
Southwest Collections of Arthropods Network

**SCAN Data Portal Home**

- SCAN Project Website
- Background
- Search Collections
- Summary Statistics
- Image Library

**Faunistic Projects**

- [Dynamic Checklist](#)
- Weevils of North America

**Resources**

- Calendar
- Symbiota
- Symbiota Help
- Contacts
- Log In
- New Account
- Sitemap

**Southwest Collections of Arthropods Network (SCAN): A Model for Collections Digitization to Promote Taxonomic and Ecological Research**

The Southwest Collections of Arthropods Network (SCAN) project brings together arthropod collections at universities and museums from the Southwest and beyond to create a virtual information network of arthropod occurrences. This web site is the central data portal for the SCAN project. It is hosted at the University of Florida [iDigBio](#) data center. All other information about the SCAN project can be found at our project website: <http://scan1.acis.ufl.edu/>, including How-To-Guides and network updates.

The primary focus of our NSF-ADBC funding is to develop an online occurrence database of regional ground-dwelling arthropod species. Additionally, we have made our online data website available for storing occurrence data for any arthropod group. We hope this will initiate the creation of other important data portals, including a North American Arthropod Database and more focused thematic data portals for specific taxa (e.g., weevils) and geographically-delineated portals.

We are using [Symbiota](#) (a web-based collections database system designed by Ed Gilbert) to power the SCAN portal. Symbiota is also used for several other digitization of museum collections projects such as the [Southwest Environmental Information Network \(SEINet\)](#), the [Madrean Archipelago Biodiversity Assessment Project](#), the [Consortium of North American Bryophyte Herbaria](#) and several others. Please refer to Symbiota ([tutorials](#)) and our more specific "insect" tutorials for entering and managing collection data as well as using the data for research and education.

**The key features of all Symbiota databases include**

1. Easy web-based data entry
2. Download entire datasets in two clicks
3. Map georeferenced records in two clicks
4. Upload high-resolution images & create species profile pages
5. Design custom species lists for any locality at multiple scales (in progress)
6. Develop educational games with data
7. Create taxonomic keys

The key organizational feature is that each museum or project is listed as a separate collection, so that one database group does not interfere with another and yet from the end user side they can select all "collections" or just a subset. In the future we hope to serve observational data as well as museum specimen data.

# TCN Project Portals

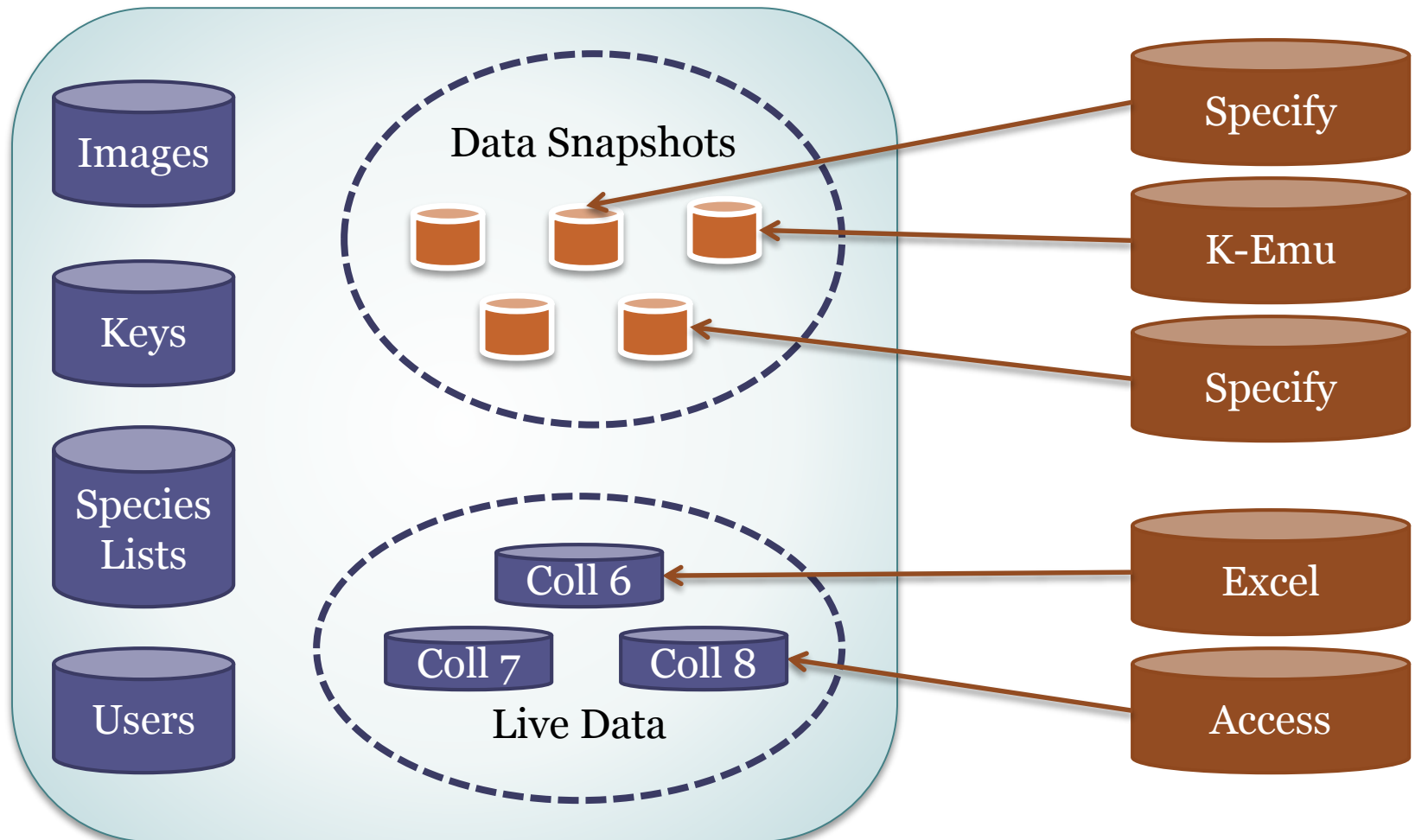
- **Lichen Consortium**
  - 36 collections
  - 958,062 occurrences
- **Bryophyte Consortium**
  - 28 collections
  - 1,368,977 occurrences
- **MycoPortal**
  - 23 collections
  - 1,217,489 occurrences
- **SCAN**
  - 15 collections
  - 389,088 occurrences
- **CNH**
  - 19 collections
  - 440,934

# Specimen Centric Model

- Baseline data
- Expert reviewed vouchers
- Verifiable
- Proof of occurrence
- Reproducible
- Millions of occurrence records



# Consortia of Collections



# Demo 4: Specimen Import

- Methods
  - Flat file
  - DiGIR, IPT, Tapir
  - Direct DB read
  - Darwin Core Archive
- Typical issues
  - Diverse schemas
  - Data types
  - Determination history
  - Images

## Data Upload Module

Arizona State University Vascular Plant Herbarium

Last Upload Date: 21 December 2011 3:25:52

[View/Edit Metadata](#)

### Satellite Upload (File Upload)

Source Field	Target Field
catalognumber	catalognumber <input type="text"/>
family	family <input type="text"/>
sciname	sciname <input type="text"/>
scientificnameauthorship	scientificnameauthorship <input type="text"/>
identifiedby	identifiedby <input type="text"/>
dateidentified	dateidentified <input type="text"/>
typestatus	typestatus <input type="text"/>
recordedby	recordedby <input type="text"/>
recordnumber	recordnumber <input type="text"/>
associatedcollectors	associatedcollectors <input type="text"/>
eventdate	eventdate <input type="text"/>
associatedtaxa	associatedtaxa <input type="text"/>
dynamicproperties	dynamicproperties <input type="text"/>
verbatimattributes	verbatimattributes <input type="text"/>
reproductivecondition	reproductivecondition <input type="text"/>
cultivationstatus	cultivationstatus <input type="text"/>
establishmentmeans	establishmentmeans <input type="text"/>

# Symbiota - Biodiversity CMS

- Read-only user interface
- Password Protected
  - Online Browser-based application
  - Platform independent
  - Globally accessible
  - No special software installation (free)
  - Make use of web services

The screenshot displays the Symbiota Biodiversity CMS interface, showing a data entry form for an occurrence record. The form is organized into several sections:

- Occurrence Data**: Includes fields for Catalog Number (1281888), Occurrence ID, Collector, Number, and Date. A "Dupes" button is present.
- Associated Collectors**: A field for "Other Catalog Numbers" with a search icon.
- Latest Identification**: Fields for Scientific Name, Author, ID Number, Family, Identified by, and Date Identified.
- Locality**: Fields for Country, State/Province, County, and Municipality. A "Locality" text area is present, along with a "Locality Security" checkbox. Below are fields for Latitude, Longitude, Uncertainty, Datum, Elevation in Meters, and Verbatim Elevation (ft.).
- Misc**: Fields for Habitat, Associated taxa, Description, and Notes.
- Curation**: Fields for Type Status, Disposition, Reproductive Condition, Establishment Means (with a "Cultivated" checkbox), Owner Code, Basis of Record (set to "Preserved Specimen"), and Language.
- Other**: A section for additional information.

The interface includes navigation tabs at the top: Occurrence Data, Determination History, Images, and Admin.

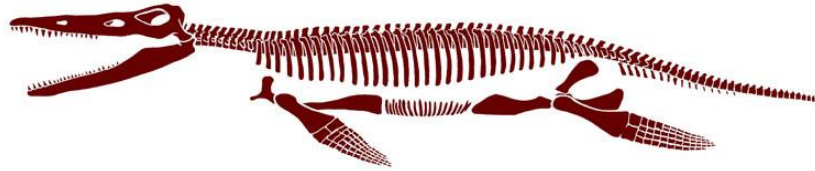


# Online Demo 2

- Search Acarospora within Arizona
  - Show edit form by fixing a couple bad georeference errors
  - Show GeoLocate integration
  - Display Review Edits interface

# FilteredPush

## MUSEUM OF COMPARATIVE ZOOLOGY



## HARVARD UNIVERSITY



Agriculture and  
Agri-Food Canada

Agriculture et  
Agroalimentaire Canada



University of California, Davis



Harvard University Herbaria



University of Massachusetts, Boston

PI James Hanken

Maureen A. Kelly  
David B. Lowery  
Paul J. Morris  
Robert A. Morris

James A. Macklin

Bertram Ludacher  
Lei Dou

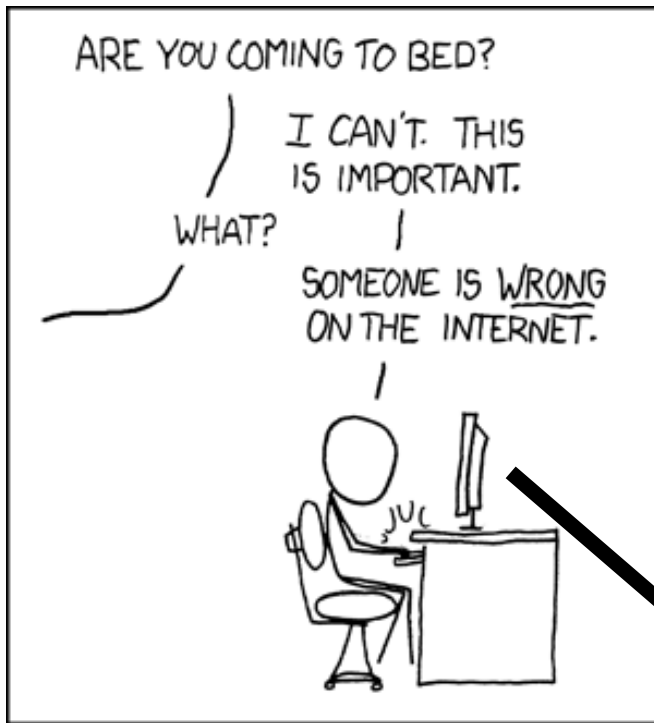
Former Project Participants

Chinua Iloabachie  
Timothy McPhillips  
Donna Tremonte  
Zhimin Wang



NSF: DBI #0960535 (Production, Starting Year 3 of 3.)  
NSF: DBI #0646266 (Prototype, Complete)  
<http://etaxonomy.org/FilteredPush>





<http://xkcd.com/386/>

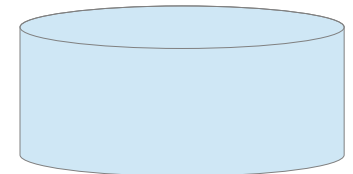
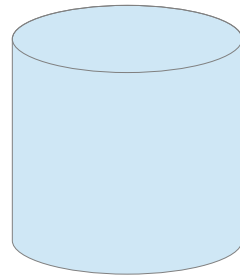
(1) Kvetch about data

(2) Push to interested parties

(3) Human Filter

(4) Change data in databases

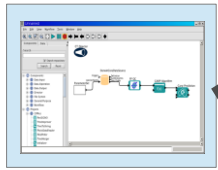
(5) Store all assertions



# Clients Kepler

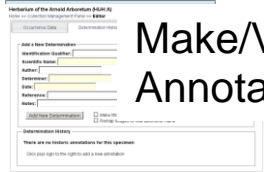
# Client Library

# Network



Test Fitness

## Symbiota



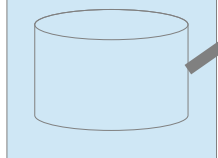
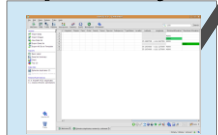
Make/View Annotations

## Morphbank

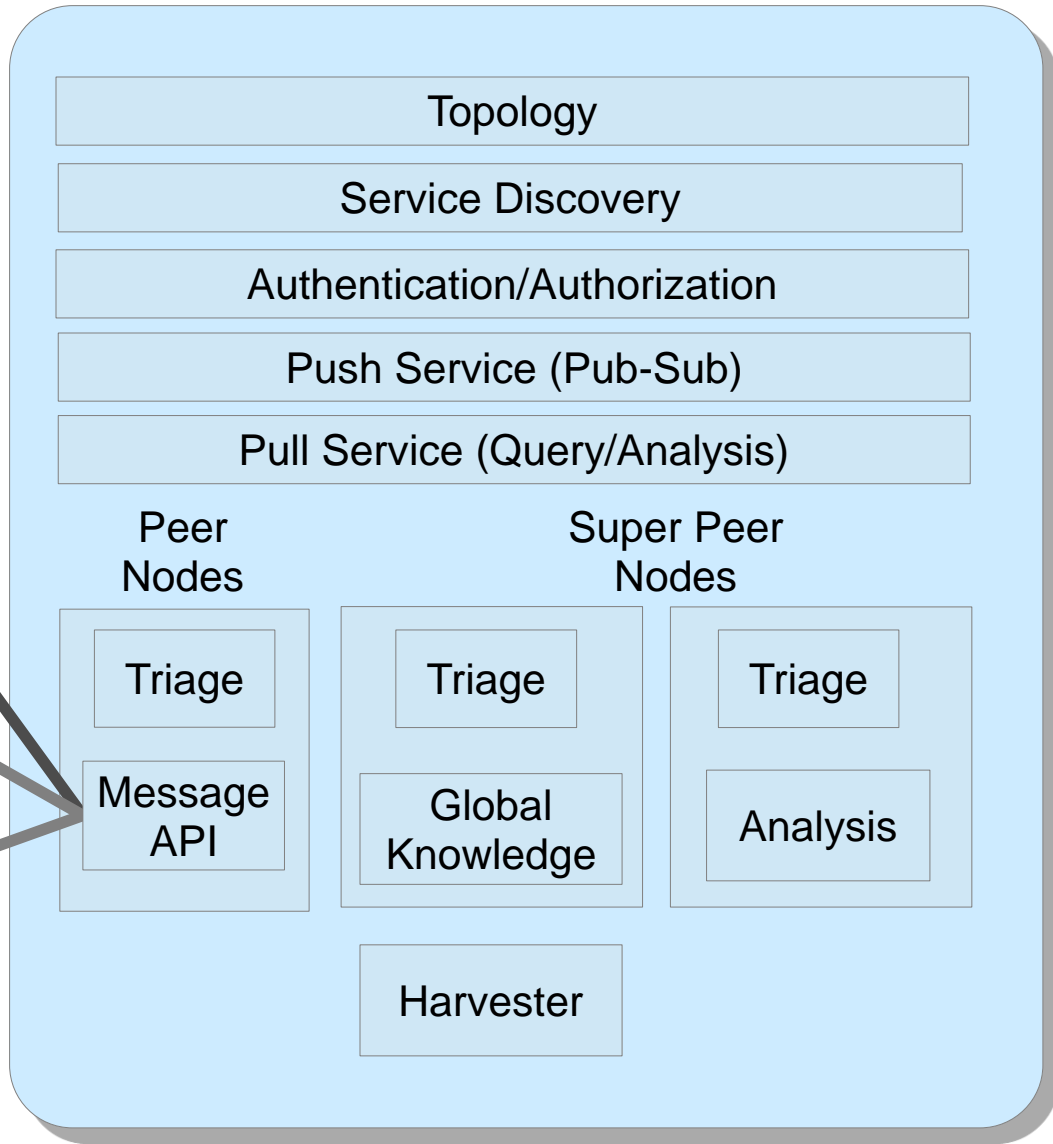
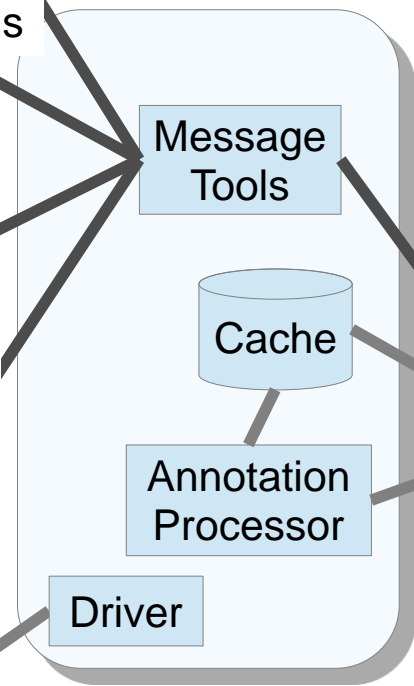


Make/View Annotations

## Specify6

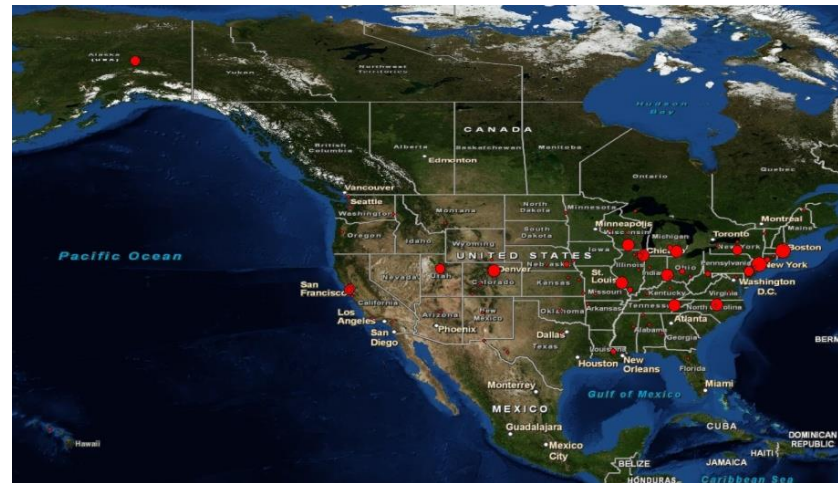
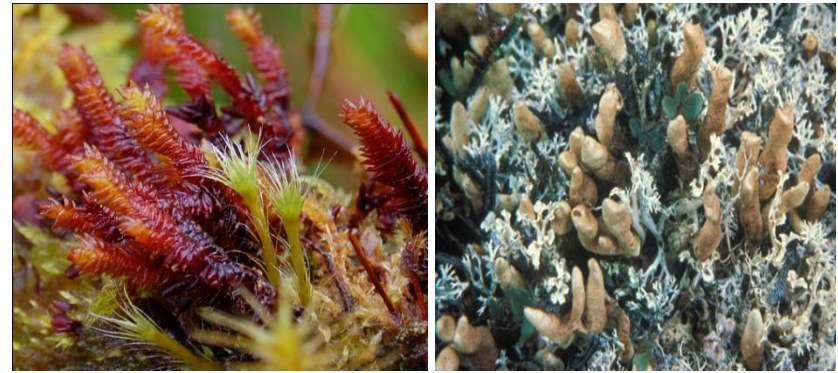


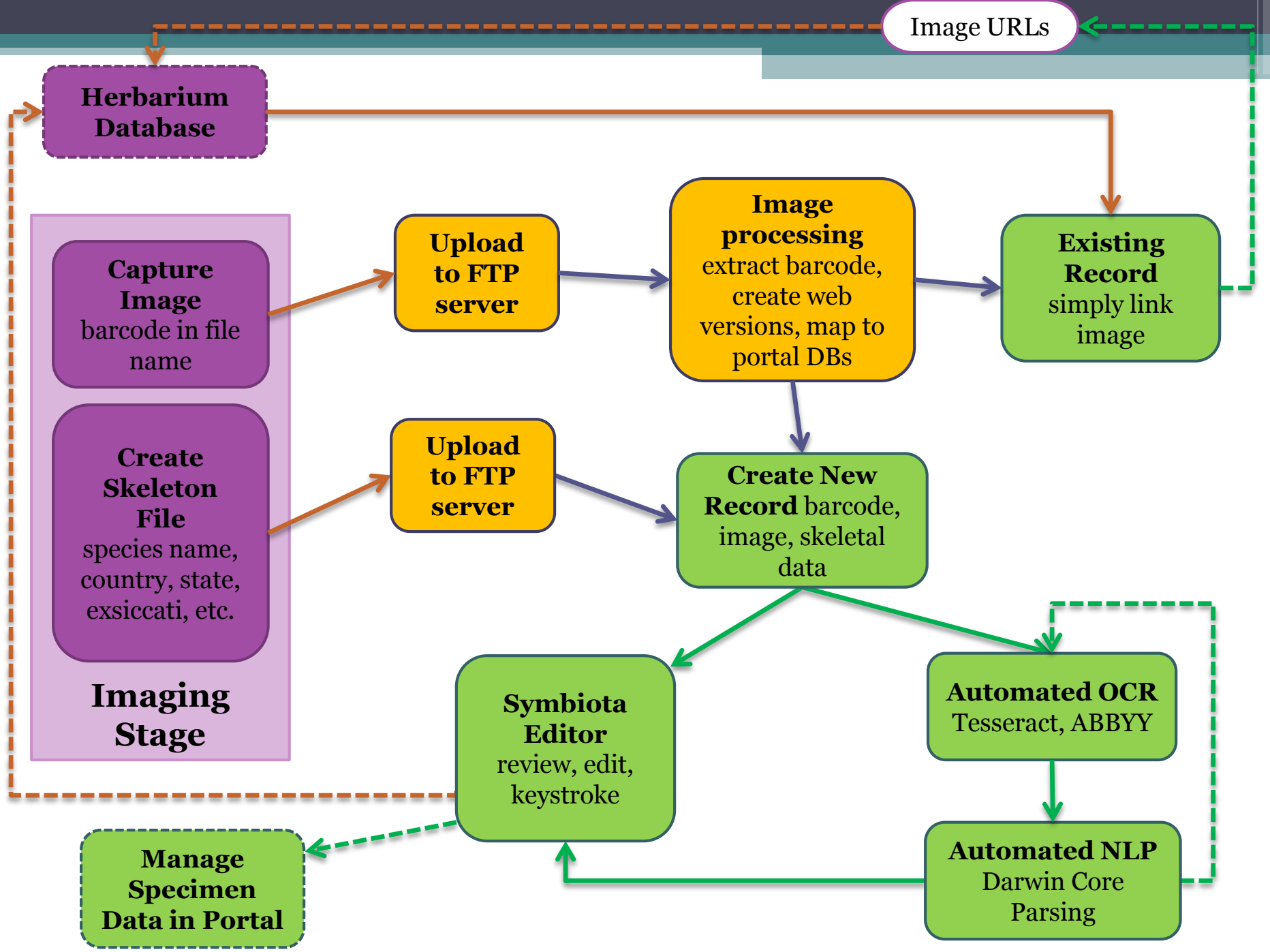
Authoritative Datastore



# Goals and Scope

- NSF ADBC (#1115116)
- ~ 2.3 million specimen
  - 90% of all specimens
  - 900,000 lichens
  - 1.4 million bryophytes
- > 60 non-governmental US herbaria (95%)
  - Mexico, US, Canada
  - 16 digitization centers





# Data Entry from Label Images

Texas Tech University - Invertebrate Zoology (TTU:TTU-Z)

[Home](#) >> [Collection Management](#) >> Editor

< << | 1 of 20650 | >> > >

Occurrence Data

Determination History

Images

Admin

## Collector Info

Catalog Number ? Accession # ? Collector ? Number ? Date ?   Auto search

## Associated Collectors ?

## Latest Identification

Scientific Name: ? Author: ?  
   
ID Qualifier: ?  Family: ?   
Identified By: ?  Date Identified: ?

## Locality

Country State/Province County Municipality

## Locality:

Locality Security

Latitude Longitude Uncertainty ? Datum ? Elevation in Meters Verbatim Elevation  
      -  ≤

## Misc

Habitat:   
Substrate:   
Associated Taxa:    
Description:   
Notes:    
Life Stage ? Sex ? Individual Count ? Sampling Protocol ? Preparations ?

## Label Processing



OCR Image

Options

- OCR whole image
- OCR w/ analysis

Image 1 of 1

# Online Demo 3

Occurrence Data    Determination History    Images    Admin

**Collector Info**

Catalog Number: 1281888    Occurrence ID:    Collector:    Number:    Date:    Dupes

Associated Collectors:    Other Catalog Numbers: +

**Latest Identification**

Scientific Name:    Author:    ID Qualifier:    Family:    Identified by:    Date Identified: +

**Locality**

Country:    State/Province:    County:    Municipality:    Locality:     Locality Security

Latitude:    Longitude:    Uncertainty:    Datum:    Elevation in Meters:    Verbatim Elevation: ft.    Tools

**Misc**

Habitat:    Associated Taxa:    Description:    Notes: +

**Curation**

Type Status:    Disposition:    Reproductive Condition:    Establishment Means:     Cultivated    Owner Code:    Basis of Record: Preserved Specimen    Language:

**Other**

**Label Processing**

**Lichens of New York**  
Ex Lichen Herbarium of James C. Lendemer (nb. Lendemer)  
DUPLICATE  
*Dictyoactenulata alba* Finley & Morris  
Det. James C. Lendemer - September 29, 2004

UNITED STATES OF AMERICA, NEW YORK, ESSEX COUNTY.: On the base of a small maple (*Acer*), in a mixed hardwood forest (*Acer*, *Juglans*, *Betula*) with a small maple (*Acer rubrum*) swamp, low portions of drainage for Holcomb Pond into Ausable River, along NY Route #21 - elev. 500 ft. - UTM 18 585231E 4904273N - Lat. 44° 17' 12" N, Long. 73° 55' 54" W - Assoc. spp.: *Pbelictis* sp., sterile *sorediate crustose* spp., *Graphis scripta*, *Rinodina* sp.  
Thallus corticelous, crustose, thick, grey, ascerous salsed, tan; "capitulum" white; conidia globose to subglobose, multicellular, colorless, 10µm x 6-10µm

Collect on data: James C. Lendemer et al. #3025  
w/ participants of 2004 A. Levey Andrews Foray  
September 18, 2004 - 18, September 2004 - 18, DC 2004

OCR Image    image 2 of 2

Lichens of New York  
Ex Lichen Herbarium of James C. Lendemer (nb. Lendemer)  
DUPLICATE  
*Dictyoactenulata alba* Finley & Morris  
Det. James C. Lendemer - September 29, 2004  
UNITED STATES OF AMERICA, NEW YORK, ESSEX COUNTY.: On the base of a small maple (*Acer*), in a mixed hardwood forest (*Acer*, *Juglans*, *Betula*) with a small maple (*Acer rubrum*) swamp, low portions of drainage for Holcomb Pond into Ausable River, along NY Route #21 - elev. 500 ft. UTM 18 585231E 4904273N Lat. 44° 17' 12" N, Long. 73° 55' 54" W - Assoc. spp.: *Pbelictis* sp., sterile *sorediate crustose* spp., *Graphis scripta*, *Rinodina* sp.



# OCR Challenges

- Issues
  - Old fonts
  - Faded labels
  - Form labels
  - Handwritten labels
  - Specialized terms
- Solutions
  - Image treatments
  - OCR tuning
  - Dictionaries
  - Consensus OCR

PLANTS OF NEW MEXICO  
Herbarium of Arizona State University  
*Parmelia ulophyllodes* (Vain.) Sav.  
COUNTY Dona Ana  
LOCATION Joranada Experimental Station -  
New Mexico State University  
HABITAT on Juniperus  
COLLECTOR T. H. Nash #7914  
DET. T. H. N.  
ELEV. 4400'  
DATE 8/27/73

PLANTS OF NEW MEXICO  
Herbarium of Arizona State University  
*Parmelia ulophyllodes* (Vain.) Sav.  
COUNTY Dona Ana  
Joranada Experimental Station -  
New Mexico State University  
"on Juniperus  
ELEV. ' 4400  
DATE  
DU T. H. Nash #7914 8/27/73

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# NLP Challenges

- Issues
  - Variable layouts
  - Loose standards
  - OCR error
- Solutions
  - Authority tables
  - Levenshtein distance
  - Word stats
  - Format recognition
  - Parsing profiles
  - Duplicate harvesting


DESERT BOTANICAL GARDEN HERBARIUM  
*Cylindropuntia prolifera* (Engelmann) F. M. Knuth

SOUTH DAKOTA, USA

Staurothele cf. monicae (Zahlbr.)  
Wet

Badlands National Park  
on fossil ammonites and  
weathered Pierre shale  
breaks W of Sage Creek  
campground, shortgrass  
plains  
T2S, R14E, E $\frac{1}{2}$ , SW $\frac{1}{4}$ , Sec 2  
lat 43°54'N  
long 102°25'W

Date: Aug 20, 1990  
Collected by Susan Will-Wolf  
Det.



County: Pennington  
Elev: 780-820m  
No. 2347

NPS Acc. # BADL-276      Cat. #

R. Trelease and N. Foisy  
Herbarium of Desert Botanical Garden (DES)


# Plant Atlas of Arizona Project

- Arizona Native Plant Society
- Grand Canyon Trust
- Desert Botanical Garden
- U.S. Forest Service
- Northern Arizona University
- Museum of Northern Arizona



# My Profile

Welcome Max Licher!

SEINet Southwest Environmental Information Network 

[Logout](#) [My Profile](#) [Help](#)

**SEINet Home**  
[Search Collections](#)  
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**Species Checklists** **Specimen Management** **Edit Profile**

**Management**

**Checklists**

- Sedona/Oak Creek Canyon  
- Tent Rocks/Cottonwood Basin area  
- Hart Prairie  
- San Francisco Peaks  
- Verde Valley Botanical Area  

**Inventory Project Administration**

- Arizona Flora 
- Colorado Plateau 
- Plant Atlas of Arizona Projects (PAPAZ) 
- Arizona Native Plant Society Checklists 

**Create a New Checklist**

Checklist Name:

Authors:

Locality:

# Personal Specimen Management

- Data entry
- Data Management
- Label Printing
- Cloud management
  - Password Protected
  - Web browser
  - Platform independent
  - Globally accessible
  - No special software
- Initially “Observations”

General Observations (SEINet)  
Home >> Personal Management >> Editor

Occurrence Data | Determination History | Images | Admin

Collector info  
Catalog Number: 3024, Other Numbers: , Collector: M. Licher, Number: 3024, Date: 2011-03-27  
Associated Collectors:

Latest Identification  
Scientific Name: *Medicago minima*, Author: (L.) L.  
ID Qualifier: , Family: Fabaceae  
Identified By: , Date Identified:

Locality  
Country: USA, State/Province: Arizona, County: Yavapai, Municipality:   
Locality: Tent Rocks, SE of Camp Verde, south side of tuff formations  
 Locality Security  
Latitude: 34.496667, Longitude: -111.748972, Uncertainty (meters): 10, Datum: NAD83, Elevation in Meters: 1030, Verbatim Elevation: 3370ft  
Verbatim Coordinates: 34° 29' 02.5" N 111° 46' 16.7" W, Georeferenced By: , Georeference Protocol:   
Georeference Sources: , Georef. Verification Status: , Georeference Remarks:

Misc  
Habitat: Dry wash channel at base of tuff formations in Desert Scrub habitat, with widely scattered junip  
Substrate:

Plants of Arizona  
Scrophulariaceae  
*Castilleja exilis* A. Nels.  
USA, Arizona, Yavapai County, Mesquite Spring, Cottonwood Basin SE of Camp Verde. 34° 29' 02.5" N 111° 46' 16.7" W [NAD83] Elev: 930m. (3040ft)  
Damp bank at spring location, N facing slope. Riparian zone in desert scrub habitat.  
Annual herb, 45 to 65 cm, green bracts with red tips; infrequent  
Associated species: *Solidago altissima*, *Dalea candida*, *Epipactis gigantea*, *Schoenoplectus americanus*, *Toxicodendron rydbergii*, *Mimulus cardinalis*, *Salix laevigata*, *Fraxinus velutina*, *Salix gooddingii*, *Andropogon glomeratus*  
M. Licher 2792 16 July 2010  
Northern Arizona University Herbarium



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Plants of Arizona  
Poaceae  
*Eragrostis cilianensis* (All.) Vign. ex Janchen  
USA, Arizona, Yavapai County, Confluence of Mesquite and Cottonwood Springs, Cottonwood Basin SE of Camp Verde. 34° 28' 59.2" N 111° 46' 22.1" W [NAD83] Elev: 920m. (3020ft)  
Sandy riparian creek bed without surface water in desert

# Voucher Network

