Voucher Specimen Assignment (50 pts)

Voucher specimens comprise a critical component of ethnobiological and economic botanical studies (Lee et al. 1982; Bye 1986). Any study that purports that "Species X is used for Purpose Y by Ethnic Group Z," for example, should collect a physical, permanent sample of the used plant in question and archive it in a herbarium such that the specimen can be consulted by experts should the identity of the species or subspecific taxon ever be called into question. The plant reported in the article may have been misidentified by the study's author, for example (Lucjaz 2010). Or perhaps a subsequent taxonomic revision of the species reveals that there actually exists two or more species or subspecies where there had once thought to be just one; thus, which species or subspecies had actually been reported on in the study? What if the species in question was used by a shaman to cure or treat a disease, yet subsequent researchers were not able to show that the reported species was truly effective in treating that disease? Either the shaman's cure was really no cure after all, or perhaps the cure is real but the plant was misidentified by the author of the study, thus misdirecting subsequent studies to the wrong species. The availability of a voucher specimen in a herbarium then leaves subsequent researchers with recourse to inspect the voucher specimen and to reassess the true identity of the species in question. Published photographs are surely a useful complement to the voucher specimen, but the limitations of photographs, which include limited depth of field, resolution and detail, make it so that photographs are but poor substitutes for an actual, physical sample of the plant in question. As a last resort in the event that even morphological characteristics of the specimen are poorly preserved or insufficient for accurate identification, DNA could be extracted from the specimen, even decades later, for a confident identification. Additionally, a good voucher specimen has very precise locality information associated with it on a label, thus providing subsequent researchers with opportunities to familiarize themselves with both the plant and the locality before attempting to relocate material for further study.

Because of the importance of voucher specimens, this project was created to give you experience in making such collections and preserving them for archiving in a herbarium. You will be asked to make both typical collections where the specimen includes stem, leaves and, if possible, reproductive parts (flowers, fruits, seeds or spores), as well as more challenging collections of fruits or vegetable produce (e.g., bulky or fleshy parts of plants) that are often needed in ethnobotanical or economic botanical studies (Nguyen 2005).

A. Procedural Overview

1. **Prepare a total of four herbarium specimens** from four separate plants or produce items from localities within the United States as follows:

   a. **1 typical collection:** whole cultivated plant or a sample thereof that fits onto a herbarium sheet and which includes stem with attached leaves and, if present, reproductive parts (e.g. flowers, fruits, seeds or sporangia).
      - *This time of year, any plant with leaves outside would have to be an evergreen. House plants or greenhouse plants would also have leaves. All of these are acceptable subjects. If wishing to collect from a plant in the MU greenhouse, have it approved by your instructor first.*
      - *Collect only from plant that is clearly in cultivation. Not from a plant in the wild.*
      - *You may not collect from a plant on private property without the permission of the owner.*
      - *For herbaceous plants: you may not collect the only plant of that species at a site and you must include a representative portion of the root system. For larger plants (e.g., shrubs and trees), you may collect a cutting from the plant that is large enough to fit a herbarium sheet but not so large as to negatively affect the chances of that plant's survival; roots are not necessary on these larger plants, for obvious reasons.*

b. 3 Marketplace collections.
- *These must be purchased from a store or market (or can be of a product that you have grown yourself).*
- *Any one produce collection may be from the same species as the typical collection, but no produce collection may be of the same species, subspecific taxon or cultivar as another produce collection. For example, you may not have two collections of a navel orange, etc.*

2. **Do not team up with others to collect the "same" plants or species.** Although you can go out into the field with a classmate as a travel companion, you cannot collect the same species or at least the same subspecific taxon or cultivar from those localities.
3. **You should keep a field notebook or data sheets** that describe all necessary information and this information must be taken at the time of collection.
4. **These specimens must be completely dry and securely mounted** to herbarium paper and placed on your assigned shelf in Roddy 268 by 4 pm, Friday afternoon, on April 20. Late projects are deducted 10% per 24 hr period.

B. Each Collection is Worth 12.5 pt as Follows

1. NatureAtlas Entry
- **a. Accuracy of pushpin marker placement** (2 pt)
- **b. Completeness and accuracy of information:** all NA fields excluding "voucher comments" are required for this project (0.5 pt ea)
- **c. Entry information must match precisely** the information on the herbarium specimen label (0.5 pt ea)
- **d. Photograph of the specimen:** must be of that plant or part and must be your own photo (1 pt)
  - *must be your own of a specimen at the reported locale,*
  - *must be in focus,*
  - *the plant specimen must be the focus of the photograph and be of reasonable resolution,*
  - *must be well-lit,*
  - *must be right-side-up (i.e. photo should not be sideways),*
  - *must include a ruler or other scale tool*
  - *must not include images that would enable viewers to identify persons in the photograph (unless that person is you).*

2. Herbarium Specimen (unmounted, unlabeled or not completely dried glue or specimens receive no credit)

- **a. Label** (follow the format and instructions for making labels in NA user's manual online):
  - *On acid-free paper? Glued well? Not obscured by specimen and positioned correctly in the lower right of paper? (1-2 pt ea)*
  - *Taxon Block: All fields required; species, genus, and family IDs (1 pt ea), species or subspecific author (0.5 pt ea)*
  - *Location Block: Country, State, County, Municipality, Watershed, Locale Description, and Coordinates required; Park or Campus name if appropriate (0.5 pt ea)*

- *Organism Block: All fields required; Wild status, Phenology, DBH (incl. 0 cm when not reaching BH), Abundance, Description (e.g., height, color of leaf, stem, flower, or fruit) (0.5 pt ea). Of the plant at that locality: not a description out of a book, etc.*
- *Formatted correctly? Did you use the template file to make them? (0.5-1 pt)*

b. Typical Specimen:

- *Follow the procedure of Dirig (2005).*
- *Stem and attached leaves present at minimum? (no credit if not)*
- *Roots and all of plant present for plants small enough to fit onto sheet? (to 4 pt deduction)*
- *Leaves: top and bottom surfaces visible; pressed flat, spread apart and uncluttered (0.5 pt)*
- *Specimen should fill at least half the length or width of sheet but not be so big that part of it extends beyond the sheet's edges? (0.5-2 pt)*
- *Was the specimen dried properly in a press (i.e., not wrinkled, etc.)? (to 4 pt deduction)*
- *Glued well? Thicker parts will take undiluted glue direct from a bottle or sewing. (to 4 pt deduction)*

c. Marketplace Specimens:

- *Follow the procedure of Dirig (2005) but as modified regarding any need for sectioning of bulky or fleshy items by Nguyen (2005) and as discussed in class.*
- *The whole marketplace item item should be mounted to the herbarium sheet.*
- *No part of it should extend beyond the sheet's edges? (0.5-2 pt)*
- *Bulky fruits, bulbs, tubers, etc., should be sectioned transversely and/or longitudinally and these sections should be mounted to the sheet along with parts that show the external surface of the organ(s). (1-2 pt)*
- *The specimens must be dried completely in a press (i.e., not wrinkled, etc.)? (to 4 pt deduction)*
- *Glued well? Thicker parts will take undiluted glue direct from a bottle or sewing. (to 4 pt deduction)*

C. Project Flowchart

1. Collect specimen(s) in accordance with the guidelines specified above.
2. Photograph the specimen in situ.
3. Record detailed notes about the location, date, and physical appearance of each specimen
4. Dissect (as needed), press and dry the specimen as per Dirig (2005) and Nguyen (2005) and your instructor's instructions.

a. Newspaper sheets should open to the left and should have your name and unique collection number for each specimen written neatly on the outside in the lower right of the sheet.
b. Specimens in the press can be left on the large table in the Herbarium for Dr. Hardy to dry.
c. Bulky, fleshy parts appropriately section can be pre-dried as per Nguyen (2005) in the oven dryer in Roddy 277. You must not make any adjustments to the temperature of the oven.
d. Do not attempt to dry any specimens in a kitchen oven as this is a fire hazard.

5. Make your NatureAtlas entry as follows:

a. Use a desktop or laptop computer with internet connection.
b. Open up NatureAtlas (www.natureatlas.org/plants/earth/ and register and then login.
c. Enter the record following the instructions at the NatureAtlas online users' manual. At the time of entry or later using the edit record function, enter information for all fields in Fig1 except for

voucher comments. Explanations of the following subset of the fields that typically confuse students are as follows:

- The Contributor name should match the Collector name since it is your who is both collecting the specimen and entering the record on NatureAtlas;
- All specimens will be housed in the Parks herbarium and so the Voucher Institution field should be entered as "MVSC (The James C. Parks Herbarium at Millersville University; USA)".
- Marketplace items should include the information that had been included for the marketplace assignment (e.g., market or vendor name as well as its unit price).

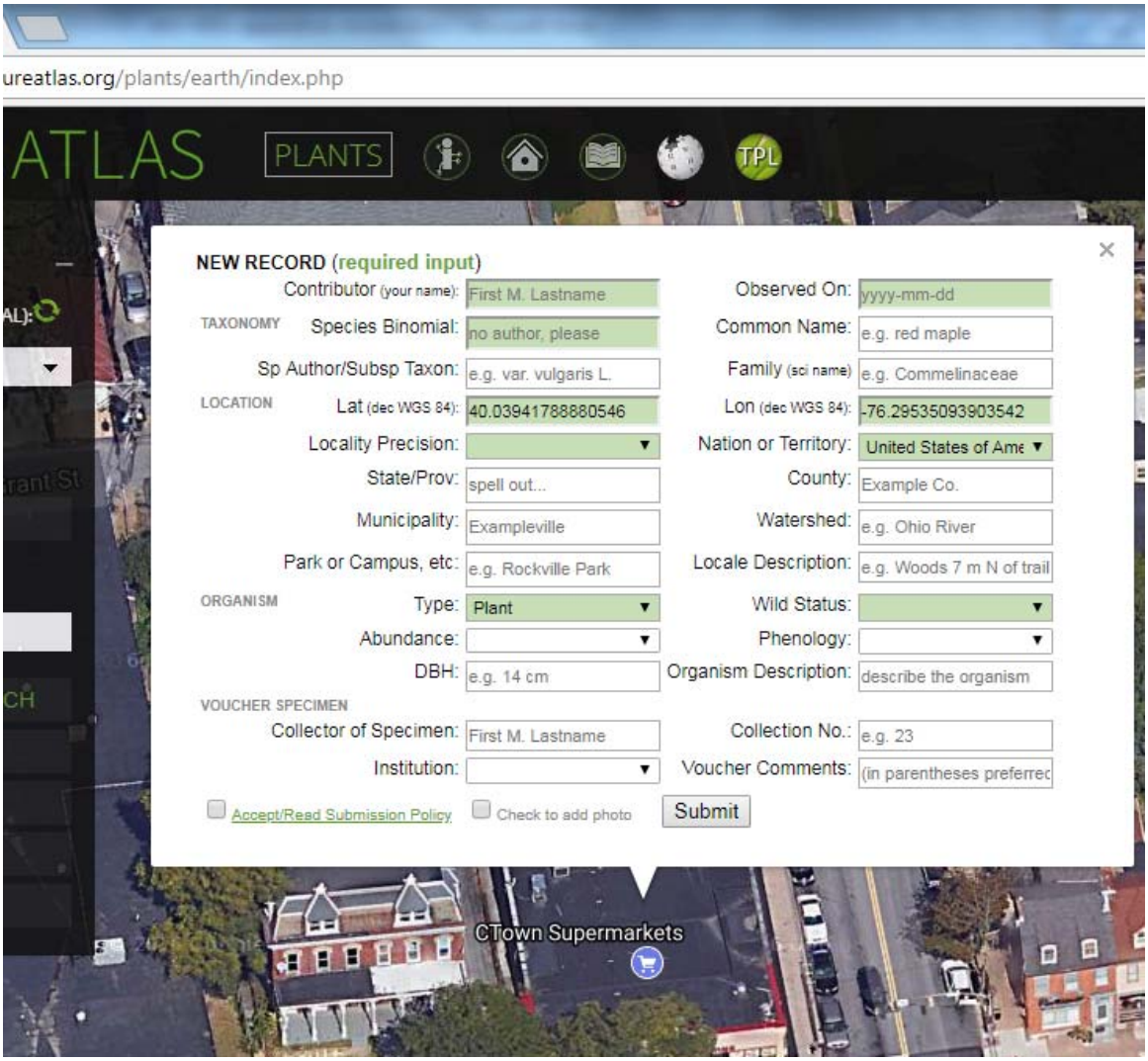

Fig 1. Screenshot of the data-entry box that appears when one clicks with the mouse on the interactive map at NatureAtlas (www.natureatlas.org/plants/earth/).

6. **Prepare labels using the instructions and template available from the NatureAtlas online users' manual.**
7. **Mount specimens using the procedure of Dirig (2005) and as demonstrated by your instructor.**
8. **Leave finished specimens in your assigned shelf in Roddy 268 by the project due date.**

D. Literature Cited

Bye RA. 1986. Voucher specimens in ethnobiological studies and publications. *Journal of Ethnobiology* 6: 1-8.

Dirig R. 2005. Preparing herbarium specimens. Published and distributed by the author in Ithaca, NY.

Lee WL, BM Bell, JF Sutton. 1982. Guidelines for acquisition and management of biological specimens. Association of Systematic Collections, Lawrence, Kansas.

Luczaj LJ. 2010. Plant identification credibility in ethnobotany: a closer look at Polish ethnographic studies. *Journal of Ethnobiology and Ethnomedicine* 6 (36): 1-16.

Nguyen MLT. 2005. Cultivated plant collections from market places. *Ethnobotany Research & Applications* 3: 5-15.