A petri dish is not a primary source, or is it?

Opportunities for school, public, and academic libraries

Megan Carlton, MLIS
Science Librarian, UNC-Greensboro
Agenda

- Primary and secondary sources in the sciences
- Data
- Collecting primary data
- Using secondary data
What is Primary Literature?

A document reporting new and original research or findings written by the original researcher.
2. Methods

2.1. Study species

Giant knotweed (P. sachalinense F. Schmidt ex Maxim) is one of three closely related congeners that include Japanese knotweed (Polygonum cuspidatum Sieb. & Zucc.) and their hybrid, hybridachemian.
What is Secondary Literature?

Publications about primary sources that discuss, abstract, index or evaluate the publication; written by someone other than the original researcher.
A review of the biology and ecology of three invasive perennials in New York State: Japanese knotweed (Polygonum cuspidatum), mugwort (Artemisia vulgaris) and pale swallow-wort (Vincetoxicum rossicum)

Leslie A. Weston¹,³, Jacob N. Barney¹ & Antonio DiTommaso²
¹Department of Horticulture, Cornell University, Ithaca NY, 14853, USA. ²Department of Crop and Soil Sciences, Cornell University, NY 14853, USA. ³Corresponding author*

Received 13 December 2004. Accepted in revised form 1 March 2005
Let’s test what we’ve learned!

go.uncg.edu/primaryorsecondary
Evaluating the utility of camera traps in field studies of predation

Christopher K. Akcali, Hibrain Adán Pérez-Mendoza, Deivid Salazar-Valenzuela, David W. Kikuchi, Juan M. Guayasamin, David W. Pfennig

Published February 25, 2019 PubMed 30828493
Primary or Secondary

Species composition and geographic distribution of invertebrates in fouling communities along the east coast of the USA: a regional perspective

Ronald H. Karlson¹,³,*, Richard W. Osman²

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²Smithsonian Environmental Research Center, PO Box 28, 647 Contees Wharf Road, Edgewater, Maryland 21037, USA
³Present address: 266 Carters Mill Road, Elkton, Maryland 21921, USA
Primary or Secondary

RESEARCH ARTICLE

Conservation Status of North American Birds in the Face of Future Climate Change

Gary M. Langham¹*, Justin G. Schuetz², Trisha Distler², Candan U. Soykan², Chad Wiese²

¹ National Audubon Society, Washington, DC, United States of America, ² National Audubon Society, San Francisco, California, United States of America

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Primary or Secondary

The Ozone Component of Global Change: Potential Effects on Agricultural and Horticultural Plant Yield, Product Quality and Interactions with Invasive Species

Fitzgerald Booker\textsuperscript{1*}, Russell Muntifering\textsuperscript{2}, Margaret McGrath\textsuperscript{3}, Kent Burkey\textsuperscript{1}, Dennis Decoteau\textsuperscript{4}, Edwin Fiscus\textsuperscript{1}, William Manning\textsuperscript{5}, Sagar Krupa\textsuperscript{6}, Arthur Chappelka\textsuperscript{7} and David Grantz\textsuperscript{8}

\textsuperscript{1}United States Department of Agriculture-Agricultural Research Service, Plant Science Research Unit, and Department of Crop Science, North Carolina State University, Raleigh, North Carolina 27695, USA;
\textsuperscript{2}Department of Animal Sciences, Auburn University, Auburn, Alabama 36849, USA;
\textsuperscript{3}Department of Plant Pathology and Plant-Microbe Biology, Long Island Horticultural Research Extension Center, Cornell University, Riverhead, New York 11901, USA;
## What about Data?

<table>
<thead>
<tr>
<th>Primary Data</th>
<th>Secondary Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collected by a researcher from first-hand sources</td>
<td>Gathered from studies, surveys, or experiments that have been run by other people</td>
</tr>
<tr>
<td>• Surveys</td>
<td>-or- for other research.</td>
</tr>
<tr>
<td>• Observations</td>
<td></td>
</tr>
<tr>
<td>• Interviews</td>
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</tr>
<tr>
<td>• Experiments</td>
<td></td>
</tr>
</tbody>
</table>
Why use data?

• To prepare students to address real world complex problems;
• To develop students’ ability to use scientific methods;
• To prepare students to critically evaluate the validity of data or evidence and of their consequent interpretations or conclusions;
• To teach quantitative skills, technical methods, and scientific concepts;
• To increase verbal, written, and graphical communication skills; and
• To train students in the values and ethics of working with data.
What data should you use?

NC Environmental Literacy Plan
- “Provide field experiences as part of the regular school curriculum…”

NC standards correlations available in:
- Project WILD
- Project WET
- Project Learning Tree
What data should you use?

The kind of data that is valuable in the classroom setting depends directly on the learning goals and content of the course.
Collecting Primary Data

- Provides an opportunity for students to directly participate as scientists.
- Students experience the scientific process first hand.
- Learn technology skills for collecting data.
What is citizen science?

Scientific work undertaken by members of the general public, often in collaboration with or under the direction of professional scientists and scientific institutions (Oxford English Dictionary).

Public participation in scientific research
Projects are excellent for developing science-related skills:

- Identifying organisms
- Using measurement instruments
- Collecting field data
- Following protocols
- Process of research
- How scientific questions are asked and answered
Perform skits and graph data to understand effects of climate change on bird population.

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**Student Pages**
- Phenology Data Sheet #1
- Phenology Data Sheet #2
- Phenology Graph #1
- Phenology Graph #2
- Phenology at Play Script

**Additional Resources**
- Effective Climate Change Education (Appendix)
- National Audubon Society’s Geographical Search on Climate Impacts (animated map of shifting ranges of bird species)

**In Step with STEM Resources**
- Make a Rain Gauge: https://www.theecologycenter.org/resources/build-a-rain-gauge/
- Citizen Science Programs
  - iNaturalist: https://www.inaturalist.org/
Citizen Science

**Water Monitoring Equipment**

**Resources**

There are several different types of water monitoring and sampling equipment that have been used in citizen science work. All equipment is specific to the type of data being collected, i.e. macroinvertebrates, water quality parameters, pathogens, etc. A few examples of common citizen science equipment are listed below:

**Multiparameter Sonde** – Multiparameter sondes are rugged, customizable and replaceable, and are used for surface water monitoring. Sensors are purchased individually, and the most common sensors measure temperature, pH, dissolved oxygen, conductivity, turbidity, and others can be purchased as well. These instruments can be used in a variety of water bodies and are capable of producing real-time data.

**Bacteriological Monitors** – There are several different types of bacteriological monitors that are useful for testing of bacteria, which is generally a good indicator of human pollution. Common monitors include total coliforms, fecal coliforms, e.coli, and enterococci. Though the most common method of measurement is using an E.Coli meter, there are also various rapid and portable testing kits that allow for quick results.

**Microbialboards** – Microbialboards are handheld devices that are used to test water for the presence of harmful bacteria. They work by using a small amount of water to react with a chemical strip that changes color depending on the level of bacteria present in the water.
Using Secondary Data

• Save time by using researchers data

• Government data

• Data repositories

• Expand skills beyond traditional information sources
iNaturalist Data

Brown-headed Nuthatch (*Sitta pusilla*)

Native to United States

Top Observer: kkeivit

Top Identifier: texaskingbird

Last Observation: August 04, 2019

Total Observations: 1,080

Seasonality Graph

Images from iNaturalist.org
These animated nuthatches roam about in small flocks in longleaf pine forests—a habitat at risk even without the threat of climate change. Audubon’s climate model for this species highlights one of the biggest challenges for anticipating the effects of climate change, namely, the decoupling of summer and winter ranges. The Brown-headed Nuthatch is non-migratory, adapted for yearlong residence in its favored habitat. But the model shows divergent climate trajectories, with a substantial increase of suitable climate space in winter and a near-collapse of such climate space in summer. Unfortunately, any gains in winter survivorship will be wiped out by sharp summertime losses in productivity.
NC Coastal Changes

Google Earth Engine Annual Timelapse 1984-2016 Tour Editor

Using the tool below, create and share interactive tours through locations in Google Earth Engine Annual Timelapse. Here’s a tutorial.

Resolution for: This Window, Meters per pixel: 16.84
Air Quality Curriculum

MODULE 1 - AIR POLLUTANTS AND THEIR SOURCES

- MODULE 1 SUMMARY
  7 activities and 4 videos covering the basic science of air quality including: properties of air, combustion, the criteria pollutants, local & regional pollution data, and detecting ozone and particulate matter.

+ 1-1 WHAT IS AIR?
+ 1-2 COMBUSTION & COMBUSTION EQUATIONS
+ 1-3 PARTS PER MILLION

MODULE 2 - PREDICTING AIR POLLUTION

- MODULE 2 SUMMARY
  3 activities and 1 video exploring the science of predicting air pollution including: the air quality index, developing a model to predict ground-level ozone, and air quality monitoring forecasting.

+ 2-1 WHAT’S AN AIR QUALITY INDEX?
+ 2-2 MAKING A SIMPLE PREDICTIVE MODEL FOR GROUND-LEVEL OZONE POLLUTION
+ 2-3 FORECASTING AIR QUALITY

MODULE 3 - AIR POLLUTION PROBLEMS AND SOLUTIONS

- MODULE 3 SUMMARY
  5 activities and 4 videos introducing possible solutions to our air quality problems including: scientific research, personal energy and driving choices, technology solutions, energy efficiency, alternative energy, regulations.

+ 3-1 SCIENTIFIC LITERACY AND AIR QUALITY
+ 3-2 INTRODUCTION TO SOLUTIONS & HOME ENERGY CHOICES
+ 3-3 DRIVING CHOICES & CALCULATING CAB
Resources

Platforms

• Citizenscience.gov
• Zooniverse.org
• inaturalist.org

More Resources

http://go.uncg.edu/k12stemresources