

HUMAN DIMENSIONS IN AMPHIBIAN CONSERVATION: ADDRESSING THREATS

June 28, 2021
Version 1

Level

- Introductory Undergrad
- Intermediary Undergrad
- Advanced Undergrad
- Graduate

Duration

- Class period (60-75 min)
- Lab session (3 hr)
- Week long (class + lab)
- Multi-week
- Ability to customize

Supporting Resources

- Student Handout
- Data
- Visual Resource
- Other

Method

- In-person
- Virtual
- Hybrid

Topic

- Biology
- Biochemistry
- Conservation
- Ecology
- Evolution
- Genetics
- Health Science
- Social Science

BioSkills

- Process of Science
- Quantitative Reasoning
- Modeling
- Interdisciplinary Nature of Science
- Communication and Collaboration
- Science and Society

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Learning Objectives:

At the completion of this learning module, students will be able to:

- Explain the role and importance of human dimensions research in wildlife management and conservation.
- Appreciate and understand how different experiences impact beliefs, attitudes and behaviors of people towards wildlife.
- Discuss threats to amphibians and conservation interventions.
- Be familiar with and practice the lexicon of social science research.
- Implement the use of a conceptual model as a conservation tool.
- Apply social science research techniques to develop a project proposal on amphibian conservation.
- Consider ethics when conducting human subject research.
- Become aware of new research and career opportunities.

Background Information:

Are the fields of wildlife management and wildlife conservation about wildlife? Could they instead be human-centric fields? After all, it is human beliefs, value systems, attitudes, needs and behaviors that determine what transpires in terms of policies, funding and other conservation actions.

The important relationship between the social sciences and the natural sciences has not always been realized. Ironically, many wildlife biologists admit to pursuing wildlife-related degrees because they prefer working with wildlife to people. Later they realize the need to understand, engage and influence people to manage wildlife and achieve conservation goals.

This module builds on previous student knowledge about amphibian ecology and the scientific method to add the human element (the role of diverse values, attitudes, needs and behaviors; relationship of people to the natural world) and incorporation of the social sciences (sociology, psychology, economics, politics, communication).

The lesson described below provides a 1.5-2 week-long module (Table 1). However, instructors can select a subset of components or extensions to make it a shorter or longer activity .

Table 1: Overview of human dimensions in conservation module components

Title	Type of Activity	Duration
Explore Threats to Amphibians	This pre-module assignment involves students gathering useful information on threats to amphibians in preparation for a future activity.	~ 1 hr. (homework)
Activity 1: Discussion on Human Dimensions Activity 2: Stakeholder Analysis	Facilitated small group and class discussion introduce what human dimensions means. A stakeholder analysis demonstrates how human dimensions influence conservation.	~ 1 hr. 15 min. (class period)
Application of Social Science and Ethics of Human Research	Students read a scientific paper on human dimensions in conservation and answer questions. They may also take their university's IRB training to learn about ethics involving human research subjects.	~ 1 - 1.5 hrs. (homework)
Using Conceptual Models to Explore Human Dimensions	Students in small groups use their notes on threats to amphibians to develop a conceptual model and identify interventions for those threats.	~ 1 - 1.5 hrs. (class or lab period)
Social Science Research Techniques	Students explore the various techniques used to conduct social science research by using online resources.	~ 1 hr. (homework)
Developing an IRB Research Proposal	Students synthesize what they learned and use their creativity to develop a research proposal related to one of the identified interventions.	~ 3-4 hrs. (start in class/lab and finish homework)
Wrap-Up Discussion	The class will engage in a facilitated discussion to wrap-up the module.	~ 15-20 minutes (class)

Description:

I. Explore Threats to Amphibians (homework)(~ 1 hr.):

Students are asked to conduct background research on threats to amphibians as a homework assignment in preparation for the conceptual module activity. Threats to amphibians include over-exploitation, disease, ultraviolet radiation, habitat loss/destruction, invasive species, pollution, and climate change. Prior knowledge of the biology and ecology of amphibians provides the foundation for students to understand how each of these threats impact amphibian populations, communities and ecosystems.

The method in which students undertake to gain their background knowledge depends on the size of the class, the focal topics and what skills the instructor wants students to practice. For instance, the instructor may assign one threat to a small group of students to research in depth (like a jig-saw activity), or engage the entire class on a webquest to investigate all the threats. Students may be asked to learn about threats broadly or those that specifically affect local amphibians. Instructors may only want primary literature used or allow students to read popular articles and websites.

No matter how this background work is conducted, it is important for students to become aware of the causes, effects and solutions to these threats. Students can turn in a notes document with sources of information, complete the webquest, make ArcGIS StoryMaps or similar products for assessment.

Some helpful websites on threats to amphibians include:

<https://amphibiaweb.org>

<https://www.iucn-amphibians.org>

<https://www.amphibians.org/>

II. Introduction to Human Dimensions (1 hr. 15 min. class)

The two activities below introduce students to human dimensions. The first activity provides a simple demonstration of how experiences and values affect how people think, feel and respond to situations and topics. The second activity engages students in a tool used in the social sciences, called a Stakeholder Analysis. Both of these activities can be implemented in a 75-minute class period. However, instructors may choose to implement one or the other based on time, class size and course goals.

Discussion (~30 minutes):

This activity can be conducted as a general class discussion, in small groups or in a combination format. Instructors may choose to use a subset of the questions to accommodate for class time or introduce tailored questions related to other course content or local issues.

Instructors should have students take a few minutes to discuss their answers to the bolded questions below with a partner or in small groups. As a class, ask students to share some of the answers and discuss why the responses differed among the students.

- 1. What are your most and least favorite organisms and why?**
- 2. Do you enjoy going to a zoo or aquarium? Why or why not?**
- 3. Do you support hunting of wildlife? Why or why not?**
- 4. Do you support the removal of invasive species (define invasive species)? Why or why not?**

Students should now recognize that people have different thoughts and feelings based on their experiences and values. It is also important for the students to realize that their thoughts and feelings may change over time based on additional information, new experiences or the context of the situation. To demonstrate how our thoughts, beliefs and experiences influence conservation, revisit the topics by asking students to consider some follow-up questions.

Note: Instructors may consider providing additional supporting information if the instructor believes their students lack the background to support a good discussion.

1. What are your most and least favorite organisms and why?
 - a. What is the likelihood you would donate money or act to conserve your favorite organism versus your least favorite?**
 - b. Would it change your mind to know the organism you dislike the most is actually far more important to the functioning of the ecosystem and needs greater protection?**
 - c. Should governments provide greater support to fisheries (which are important for human consumption) versus amphibians?**
2. Do you enjoy visiting a zoo or aquarium? Why or why not?
 - a. How do you feel about wild animals in captivity (what if they are captive born vs. taken from the wild)?**
 - b. Do you believe educating people is a critical aspect of conservation?**
 - c. How do you feel about zoos and aquariums reaching millions of people each year with a conservation message?**
 - d. Do you think people should own exotic pets, like tigers and monkeys? What about reptiles and amphibians? How do you feel about exotic fish as pets?**
 - e. What's the difference between zoos being allowed to keep exotic animals compared to people, and what makes it okay to have some species as pets and not others? Should a government agency be responsible for making these decisions?**

3. Do you support hunting? Why or why not?
 - a. Do you support hunting of deer if it is the best management method to control their overpopulation?
 - b. Would you support hunting of deer if you knew that the reason they are overpopulated in many locations is because humans drove their primary predators, wolves, out of those areas? What if you knew overpopulation of deer negatively impacts entire forest communities and people?
 - c. Do you believe state fish and wildlife agencies should encourage people to hunt and fish?
 - d. Would you change your mind if I told you these agencies get their funding (including money for conservation) from selling hunting and fishing licenses and the taxes on related equipment and supplies, and not general tax dollars?
 - e. Do you support the hunting of wolves? What if they are considered pests when they kill livestock?
 - f. Do you support trophy hunting as a means of supporting conservation in other countries? Do you support eco-tourism? Does trophy hunting meet the definition of eco-tourism?
 - g. Do you support canned hunts or game ranches (animals are in enclosed acreage and captive bred) of endangered species?

4. Do you support the removal of invasive species (define it)? Why or why not?
 - a. Would you vote to spend millions of dollars every year just to keep an invasive species from spreading, let alone remove it?
 - b. Would you feel differently if it was an invasive species that was only going to wipe out a wildlife species or an invasive species that potentially could transmit a zoonotic disease (transmission from wildlife to human) to people?
 - c. If you saw an injured feral cat, would you try to help it – maybe feed it or take it to a vet or animal shelter?
 - d. Do you believe it is important to protect wild song birds?
 - e. Would you be okay with humanely euthanizing feral cats since they are killing millions of song birds each year?
 - f. Do feral cats meet the definition of an invasive species?

Would it be challenging to gain consensus among the class on any of the conservation topics discussed? How about gaining consensus across the campus, city, state or nation?

Stakeholder Analysis (~45 minutes):

Students will now conduct a Stakeholder Analysis related to preventing the spread of *Bsal* (*Batrachochytrium salamandrivorans* – fungal pathogen of salamanders) into North America. Stakeholders are a group of individuals or organizations that have an interest or 'stake' in a particular issue. Stakeholders can either affect or be affected by the issue. A Stakeholder Analysis seeks to understand the thoughts, needs and expectations of the stakeholders in relation to a particular topic.

Introduce the *Bsal* Case Study to students by having them read the Student Activity quietly themselves or read it aloud. Based on the identified stakeholders, break the students into small groups for a jig-saw activity. All the students in one group represent the same stakeholder. Have each group:

1. **Explore their particular stakeholder's profile. What is their stakeholder's level of interest and influence on this issue?**
2. **Discuss how the spread of *Bsal* would impact their stakeholder.**
3. **Discuss how the proposed policy would affect their stakeholder.**
4. **Determine if their stakeholder supports the proposed policy to stop the spread of *Bsal* into the U.S.**

After 10 minutes, reform the groups where one student from each original group comes together to form a new group. Each new group has one representative of each stakeholder. Ask each stakeholder-student to share with their new group how they would be affected by both the spread of *Bsal* and the policy. Groups should determine if, among the different stakeholders, there is consensus on the policy?

Come back together as a class to brainstorm thoughts on the following two questions:

- (1) What would be the next steps in gaining full consensus?
- (2) Are there compromises or alternatives that can be proposed?

Wrap-up the class by summarizing how both our individual perspectives and professional responsibilities can impact decisions being made regarding conservation of species. Therefore, consideration must be given to human dimensions when making conservation priorities and management decisions.

III. Application and Ethics (homework) (1-1.5 hrs)

Now that students understand the role of human dimensions in conservation, assign them to read Bennett et al. 2017 or another relevant paper that demonstrates how human dimensions are used in conservation.

Bennett, N. J., Roth, R., Klain, S. C., Chan, K., Christie, P., Clark, D. A., ... & Greenberg, A. (2017). Conservation social science: Understanding and integrating human dimensions to improve conservation. *Biological Conservation*, 205, 93-108.

Discussion questions related to the Bennett et al. 2017 paper:

1. Why are the social sciences necessary for conservation work?
 - a. In what ways are conservation efforts lacking when social science is not applied?
 - b. What are some examples of how social science has been used in conservation?
 - c. Why do you think the integration of social science knowledge into conservation practice remains limited?

2. Why is it necessary to conduct social science research on issues at different scales?
 - a. Give an example of a conservation social science issue at a large scale.
 - b. Give an example of a conservation social science issue at a small scale.
3. What are the categories of social science methods?
 - a. Provide an example of each category.
 - b. Do you think it's important to use more than one method when conducting social science research? Why or why not?
 - c. What is the distinction between the methods and how do they overlap?
4. How important is it for resource managers to be aware of human dimensions in conservation? What about citizens?
 - a. How does a greater understanding of conservation social science benefit humans?
 - b. How does a greater understanding of conservation social science benefit wildlife?

Ethics must be considered when conducting research. Just as we would seek approval to conduct research on vertebrate species through the Institutional Animal Use and Care Committee, approval to conduct research involving humans is also needed. Each university has an Institutional Review Board (IRB) for this purpose. It is useful for students to complete the relevant IRB training from their university to gain an understanding of the guidelines that researchers must follow and to learn about ethical issues related to conducting research on human subjects. If students are not engaging in actual research as part of this activity, instructors may choose to have a discussion on this topic instead.

IV. Using Conceptual Models to Explore Human Dimensions (~ 1 - 1.5 hr. class or lab period)

Conceptual models are used in a variety of contexts, including to explain complex systems, plan projects and evaluate efforts. They provide a visual representation of the system's components and show linkages between these components. Conceptual models are often used in conservation to demonstrate the complexities of interrelated factors (cultural, social, economic, political and biological factors).

This activity uses a modified version of the Open Standards of Conservation Practice to pinpoint conservation targets, threats and drivers related to amphibian conservation. The Open Standards of Conservation Practice (<https://cmp-openstandards.org/>) is a process used by many agencies and organizations to establish a framework for a conservation project and is developed collaboratively with stakeholders.

This activity will employ a simplified version to identify conservation targets, threats and drivers related to amphibian conservation. Before students engage in developing their own conceptual models, familiarize them with the terminology and process.

Terms:

Biodiversity Scope: Broad parameters of project; the thematic and geographic focus

Conservation Target: Identify the specific goal(s); should be measurable and achievable

Threat: Direct human action or unsustainable use which is impacting target

Driver: a factor that contributes to or causes the direct threats; a.k.a. indirect threat

Intervention: an action or opportunity which can reduce, prevent, mitigate or alter a Driver

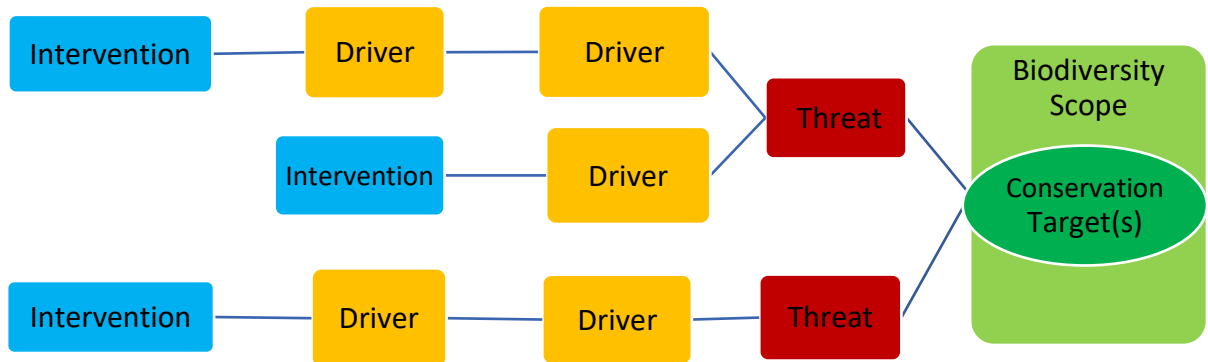


Figure 1. An example framework of a conceptual model showing factors and their relationship to each other. This conceptual model is an adaptation from the Open Standards for Conservation.



Figure 2. Example of a simplified conceptual model to address the issue of deforestation of tropical forests in Western Brazil.

Note: Some students find modeling challenging. Spending time to go over the terms, how the process works and the example is important. You may even want to collectively engage in one more example from the start using an entirely different topic (e.g. coral reef protection). There are also websites and resources exploring this topic of conceptual models further, such as Kathy Schrock's Guide to Everything <https://www.schrockguide.net/concept-mapping.html>.

Depending on the size of your class and how your students conducted the background research on the causes, effects and solutions to threats of amphibians (from Part I), you will now divide your class in groups where all the threats are represented. Provide these groups with colored sticky notes, a white board with different colored markers, or a shared online platform for development of their own conceptual model (various tools for making conceptual models can be found here (for various tools review <https://www.schrockguide.net/concept-mapping.html>)).

Amphibian conservation is the overarching Biodiversity Scope of the model. The Conservation Target (what is to be achieved by the project) will depend on the direction provided to students in Part I. For example, if students were asked to conduct background research on threats related to a local endangered salamander, the Conservation Target may be to increase the population to a certain size or to protect a particular area of breeding habitat, or if students were asked to look at threats to amphibians in the Mid-Atlantic region, the Conservation Target may be to maintain current levels of species diversity. Instructors may have every group use the same Conservation Target or ask each to develop their own. No matter the scenario, the best Conservation Targets are goals and therefore should be something achievable. This allows for evaluation and adaptive management to take place throughout the project life.

Now that a Conservation Target has been selected, students will work backwards to develop the conceptual model by linking Direct Threats and the Drivers or Indirect Threats. It is helpful for students to keep asking "why" questions to get back to specific root causes of the threats. It is also important to remind students there may be multiple Drivers for each Direct Threat or the same Driver relating to more than one Direct Threat.

Next, students are to identify possible human interventions - ways for the Driver to be reduced, mitigated or eliminated. When the models are complete, have the students save their file or take a photo of their completed model to document, and then ask each group to share their model with each other. You can assess the models for a grade or have students provide peer-feedback.

Note: Development of the conceptual model can be challenging for some students. The instructor should circulate around the room, ask probing questions and assist as needed.

V. Social Science Research (homework) (~ 1 hr)

Similar to natural resource research, each technique used to collect social science data has its pros and cons. Students are to explore methods for collecting social science data. Instructors may ask students to develop a table with each method and list pros and cons or have students complete a Kahoot related to which technique to use under certain circumstances.

These websites provide a good foundation for exploring techniques.

1. USGS HD gov website: <https://my.usgs.gov/hd/methods>
2. Better Evaluation website
https://www.betterevaluation.org/en/rainbow_framework/describe/collect_retrieve_data

VI. IRB Project Proposal (~3-4 hrs)

Students will develop a research project proposal to submit to their “class” Institutional Review Board (IRB). Guide students to select one of the Conservation Interventions from their conceptual model and think about what social science information would make it possible. For example, the conceptual model on protecting Brazilian forests includes “Demand Reduction” as an intervention. Successful implementation of this strategy relies on knowing what demographic of the human population is mostly demanding the wood or what influence or driver is behind the demand.

Each student can develop their own proposal or continue to work in small groups. The initiation of this activity can be conducted in class, particularly if students work in small groups, and the remainder conducted as a homework assignment. Depending on the initial focus of the class activity from Part I, the research questions developed may be more specific or localized. For instance, students may want to know how stakeholders feel about installing a culvert pipe under a neighborhood road to facilitate salamander migration to/from a vernal pool, or gauge the interest of local community members in supporting a policy that limits the amount of fertilizer and pesticide used in the watershed where a threatened salamander resides.

After developing the research question, students are to use their prior knowledge about the scientific method and the social science research methods explored previously for homework to develop their study design and methods. Instructors can ask students to use the actual IRB form from their university or use the IRB handout in the Student Activity for their proposal. The final proposal may be a written document or an oral presentation, with the rest of the class (or even invited university IRB members) assessing the proposals.

VII. Wrap-Up (15-20 minutes)

Hold a class discussion related to threats to amphibians and thoughts about social science research as a conservation tool, including its applications and how it is similar or different from ecological research. Discuss any challenges faced in conducting the assignment or how the assignment could be modified for a better result. Solicit thoughts on how conceptual models can be used for other purposes.

Options/Extensions:

1. Students can implement their research proposals and produce a full lab report, research poster, or oral presentation for assessment.
2. Students can critique conceptual models from other projects found through the Open Standards website, in publications or other sources, or create them for other projects related to the class.
3. The amphibian conceptual model can be expanded to the right side by including the benefits brought to society having achieved the Conservation Target, such as ecosystem services – services that a functioning system, species or habitat provides to humans, and human wellbeing targets – goals related to specific aspects of human lives, such as relationships, emotional or physical health, safety, recreation, spiritual or cultural and more.
4. Students can investigate current global events or local issues related to human dimensions in conservation. Students can attend or virtually watch a county commission meeting, debate sides of an issue, write blogs and more.
5. Invite a guest speaker, such as your state’s herpetologist, a local amphibian researcher, or someone from a non-governmental organization addressing the threats and interventions explored.

Supplemental Information:

Project Proposal Rubric

Points

- 4 = Advanced (exceeds standards)
- 3 = Proficient (meets standards)
- 2 = Work in Progress (nearly meets standards)
- 1 = Novice (does not meet minimum standards)
- 0 = Not turned in or components missing

Total Points

____ **Background:** Demonstrates understanding of the relationship between natural and social sciences leading to the purpose of the research; current state of research in this field is summarized. cohesive and concise theoretical and contextual background provided; information flows; demonstrates adequate information literacy including at least three citations from relevant primary sources.

____ **Research Question and Hypothesis:** Research question is specific and related to scope and focus of topic; it's written in a clear and concise manner and included in the introduction; it can be addressed using social science research and doable within a semester or other timeframe; hypothesis is accurately formulated, based on background knowledge and is testable.

____ **Study Design:** Written using best study design principles in mind; describes the research approach to be used with supporting rationale (if applicable, consider citing appropriate methodological literature or providing figures or tables to assist with description); at minimum includes what, how, when, where and by whom data are to be collected; may include a timeline.

____ **Participants:** Describes in detail the study participants (who) including anticipated number and any specific characteristics, such as age, geographic region, and economic status; describes how participants will be recruited and notes any identified vulnerable populations and ethical considerations.

____ **Data, Management and Analysis:** Questions for surveys, interviews or other sources of data collection are provided and are appropriate (i.e. unbiased, length, content); details a data management and analysis plan, including protection of personal identifying information; states how data will be analyzed.

____ **Outcomes and Outputs:** Discuss the intended outcomes and/or outputs of research, how the findings will be disseminated and their intended application.

____ **Citations:** a minimum of three citations from relevant and timely primary literature are required for the introduction; use of APA format for in text citations and literature cited sections.

____ **Overall:** Uses proper headings and format (double spaced, 12-point font, one-inch margins, pages numbered, name of student and date on each page); written at upper level undergraduate level; information flows easily and is clear, concise and relevant; free of errors related to punctuation, grammar and spelling; all scientific names, proper names, and titles written correctly; all figures and tables are labeled, captioned and cited in text properly.

General Comments