

# How can the Santa Ana sucker be saved?

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## 1 Introduction

According to Kolbert 2015, we are in the midst of a dramatic extinction event that is rivaling major catastrophic extinctions in the past. The difference with the current situation is the cause: The dominance of human beings over the Earth's surface led to the extirpation of thousands of species, and counting.

It's easy to second guess various scientific and policy questions with respect to endangered species, but when we begin to evaluate what is actually being done on the ground for various species, we quickly learn that we are not just in a ecological web, but our policy and regulatory processes are embedded in a complex context of landuse history and economic agendas.

### 1.1 Driving Question

This project will attempt to answer the following question, "How can we save the Santa Ana sucker?" As we have seen, this type of generic question needs to be constrained, defined, and subject to what we already know or will learn about the topic. In addition, we need to define the terms used in the question, such as who is "we"?

What do we mean by "save"? And finally, when we ask "how", what are the options available that might fit into the "how"?



Figure 1: Birds

## 2 Learning Goals

- Evaluate sucker habitat using the following tools:
  - Define Water Quality Goals

- Characterize Hydrology and Geomorphology
- Analyze Community Profile of Periphyton
- Propose and evaluate options to improve Santa Ana sucker habitat.
- Prepare sets of practical and effective measures that might protect (or increase) the extant populations of the Santa Ana sucker.

## 2.1 Why these learning goals?

## 3 Project Stages

- Session 1: Define 'Public Product'
- Session 2: Revise 'Driving Question' and list resources needed
- Session 3: Read, clarify, or develop appropriate SOPs
- Session 4: Field Work
- Session 5: Data Analysis
- Session 7: Development of Public Products
- Session 6: Presentation of Public Products

## 4 Defining the Public Product



Figure 2: Birds

For this project, each student will contribute one science brief that describes the knowledge available to "resore and protect" the Santa Ana Sucker.

Thus, we will be collating, organize, and summarize scientific resources that can be digested by a range of stakeholders to help "answer" the driving question. Each re-

search brief, will address a different scientific issues associated with the Santa Ana sucker—where each issue addresses a specific driving question with respect to the sucker. And as the topics develop, we will bundle topics to produce 3-5 reports.

EA 30 Research Briefs are short (3-4 pages) descriptions of recently EA30 project results. These "briefs" highlights also include one image, a caption (50 words), and several publication citations. Each student scientists are invited to develop one to several breifs that will be made available to the public.

Each brief will include 5 sections:

- Problem definition
- Evidence of problem
- Scientific knowledge to address the problem
- Information gaps
- Next Steps (which could be translated by stakeholders as potential research needs)

Although the audience is the public at large, we will use several collaborators to help us define, refine, and evaluate our public products.

Our collaborators include:

- USFWS
- RCD of SB?
- ??

As the develop of individual topics forms, we will form into teams to facilitate field work, literature reviews, and evaluation of current or unpublished data. Note: each student is responsible for an individual contribution.

Once we create topical themes, we will create teams to arrange and order of individual briefs based on the quality and potential interests for each of the sections.

Below is a list of possible themes, but this list is only one potential list and not meant to constrain how we decide to work as a group:

**Issue 1: Habitat Loss**

**Issue 2: Food Quality**

**Issue 3: Water Quality**

**Issue 4: Hydrology**

**Issue 5: Geomorphology**

## **4.1 Examples**

<https://www.fws.gov/Endangered/esa-library/index.html>

<http://blogs.scientificamerican.com/extinction-countdown/>

## 4.2 Stakeholders and Evaluation Criteria of Public Product

Working with stakeholders is a key component doing environmental science, which might be contrasted with regular scientific research. Although some make the distinction between applied and pure science, I don't find the divide all that useful.

Better than getting into the morass of these definitions, let's move on to figure out what skills we need to apply while working with stakeholders:

**Active Listening** Careful listening and echoing what stakeholders say is an extremely important tool to develop a successful partnership with stakeholders. Asking for clarity and follow up questions will help you define what the goals of the project in collaboration.

**Defining Success** As a key component of collaboration is ensuring that all parties agree on what success looks like. For example, this would include examples of "models" to emulate or avoid. In addition, going through the project will help articulate clear expectations about the public product and the workload to get there.

**Outlining a Process** The process can also be called, "project management"

### Professionalism and Completion

#### 4.2.1 Kai Pelenscar – US Fish and Wildlife Service

Based on the current dataset we have on sucker biology and habitat preference, I would like to identify data gaps where student work would contribute to species' conservation as well as contribute to research or other types of projects. In order to prioritize a list of data gaps, I need to know where we stand on the ongoing research projects relating to sucker.

Also, instead of tying the change in habitat to a shutdown, potentially a high velocity flushing flow from RIX [Water treatment facility] would provide data for a measure proposed by Heather's group.

#### 4.2.2 Heather Dyer – San Bernardino Municipal Water District

I think it would be great to have them [EA30 students] focus on the red algae and its effect on sucker behavior.

#### 4.2.3 Carl Demetropoulos–Fish Ecologists, Consultant

In discussions with other members of the group, we have come along way over the past year and now just need to put it together in a single report, and consider the next phase of analysis.

#### **4.2.4 Larry Brown–USGS**

Scott and a colleague have developed a 2-D habitat model of a reach below Rix and Jason works with me on the population estimates and habitat utilization. I am really interested in the dynamics of the red algae below RIX within the modeling reach. This could involve mapping of algae patches and measurements of depth, velocity, and substrate to characterize "algae habitat utilization". This could be compared against sucker habitat utilization to determine if they are "competing" for habitat. Doing this before and several times after a big shutdown would be ideal. This data would be very useful (in my mind anyway) to understanding the sucker population below RIX. I also think this data could contribute to a scientific publication. I was planning on doing this during our fall field work to the extent possible in a week but multiple observations would make for a stronger paper. I think the timing is good since our plan is to do the work in late Sep. The class could overlap or work in Sep-Oct.

## **5 Driving Question**

### **5.1 Define and constrain driving question**

As one of our first exercises, we will explore the meaning of the driving question. As we work to understand our driving question, we will create groups of students to act as research teams that will address a portion of the driving question.

### **5.2 Understanding the Recovery Plan of the Santa Ana sucker**

In the XXX of 20XX, the USFWS release a Draft Recovery Plan for the Santa Ana sucker. Please read the Draft Plan before class and we will use this to help create the driving question and refine the public product.

### **5.3 Resources to answer driving question**

Each team will determine what resources are available and/or needed to address the driving question. Working with the instructor is key because these resources need to be made available for the following week.

#### **5.4 Determine Required Resources and Methods**

#### **5.5 Answering the Driving Questions**

#### **5.6 Data Collection and Analysis**

### **6 Create Public Product**

To create public product, we will develop four/five pdf briefs, using LaTeX and Rstudio.

#### **6.1 Selecting a Style**

We will rely on the Tufte style that we can access in Rstudio.

#### **6.2 Writing and Presenting Results**

#### **6.3 Evaluation of the Public Product**

Our stakeholders will evaluate the public product using the criteria that we develop together that will likely include accuracy, scholarship, and clarity.