CONCEPTUAL DIAGRAMS

Tools for science communication

WHAT IS A CONCEPTUAL DIAGRAM?

The term *concept* means something conceived in the mind and the term *diagram* refers to a drawing that shows relations. A *conceptual diagram* is essentially an illustration depicting the arrangement and relationships of key attributes within a system by using a variety of appropriate symbols that are easily understood. Put simply, conceptual diagrams are "thought drawings."

con·cept / ˈkänsept/

noun: Something conceived in the mind

di·a·gram / ˈdīe gram/

noun: A drawing that shows relations

conceptual diagram/
A diagram using symbols that depicts the essential attributes of a system

WHY SHOULD YOU USE CONCEPTUAL DIAGRAMS?

Conceptual diagrams are an effective tool to communicate complex messages in a simple and informative manner. It can take many letters, words, sentences, and paragraphs to describe the processes that make up an ecosystem. Conceptual diagrams can take our current understanding of science, help to identify priorities and environmental values, and create a shared vision. If a picture is worth a thousand words then a conceptual diagram must be worth ten thousand words.

There are four important reasons to use conceptual diagrams:

1. To help communicate key messages and visualize scientific data.
2. To provide a better understanding of the 'big picture' that can't be captured in a single photograph.
3. To span cultural boundaries and language barriers.
4. To better define words that are ambiguous by committing the image to the message being portrayed.

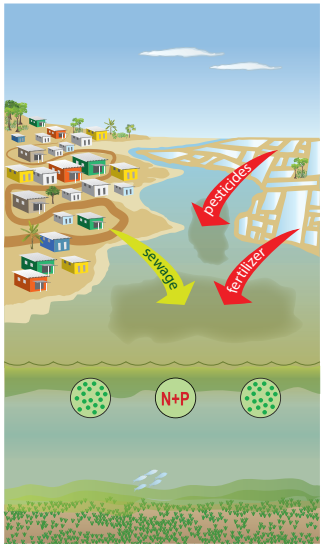
This series of diagrams (right) show some of the pressures facing the Chilika Lake ecosystem in India. The symbols are embedded into the text of the legend to help explain what is happening in each scenario.

Pollution

The recent abundance of fish stocks is not sustainable with overfishing and so many fishers. At landings, dead fish thrown back into the water contaminate the lake. Active shrimp pens and abandoned nets trap sediment and kill juvenile fish.

Sedimentation

During monsoon season, an excess of sediment is deposited in the Lake, mostly from Mahanadi River tributaries, nearby settlements, and agricultural lands. As the Lake becomes more shallow and its sea outlets fill in with sediment increased flooding occurs.



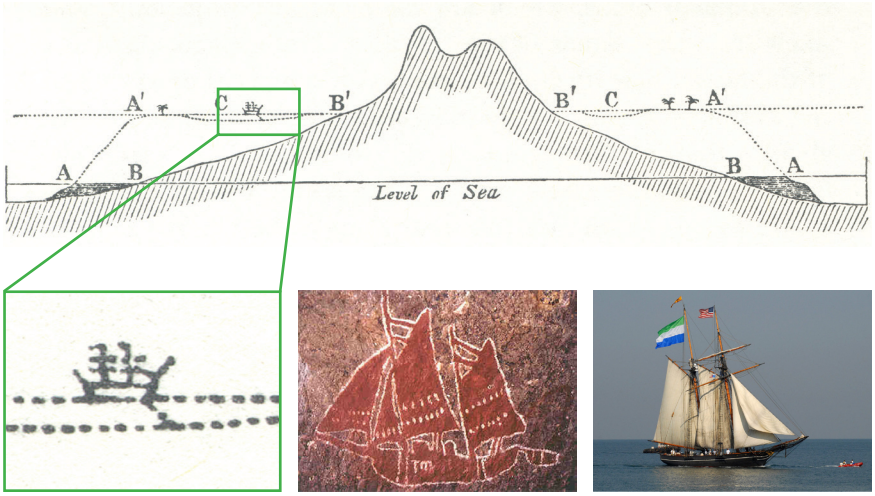
Fishing and Aquaculture

As land use changes from forest to settlements and paddy agriculture, sewage, and fertilizer and pesticides runoff increases into the Lake. Algae blooms that float and sit on the bottom are the result of that extra nutrient input N+P.

SYMBOLS FORM A VISUAL LANGUAGE

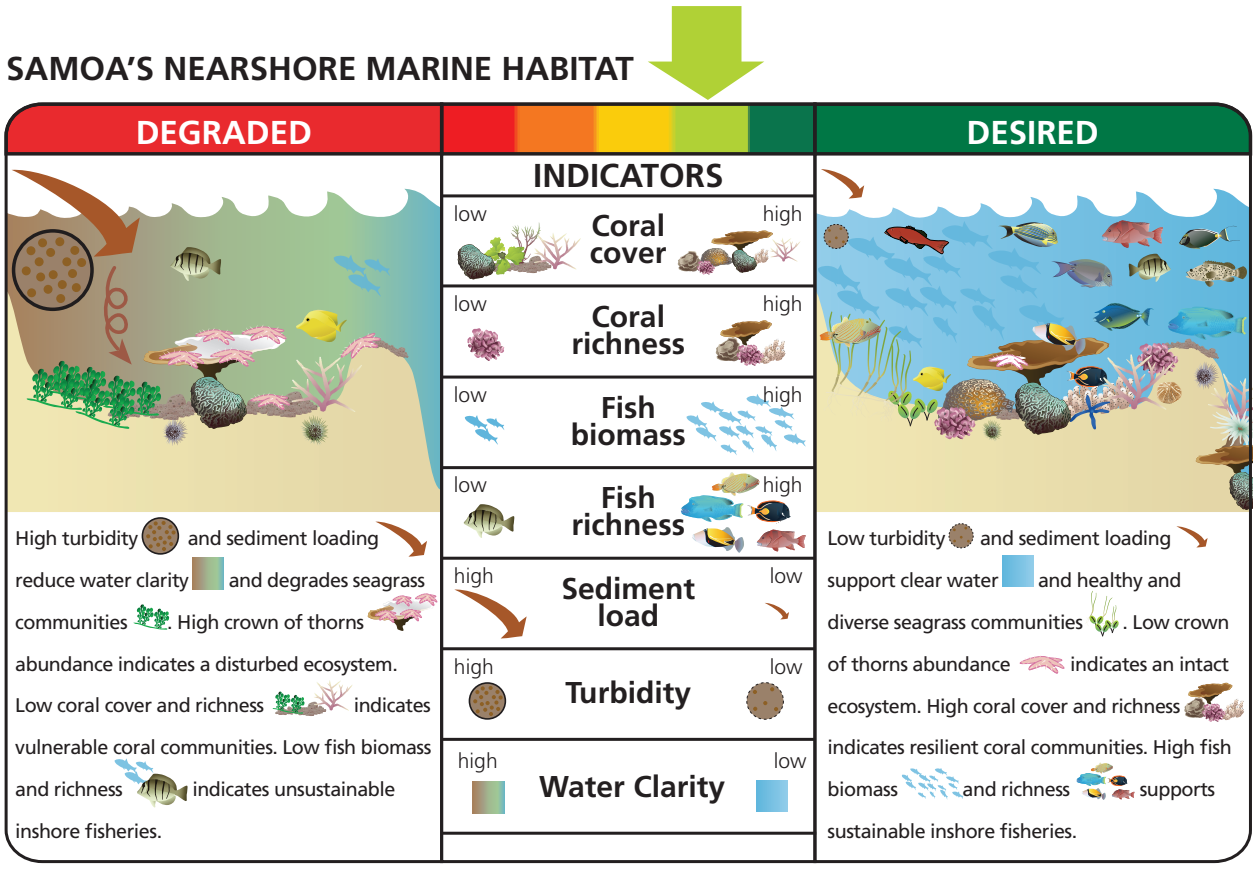
Symbols are one of the most ancient forms of human communication and when they are arranged in a diagram they can augment or replace words. Symbols are universally understood, language-independent, and an important feature of everyday life.

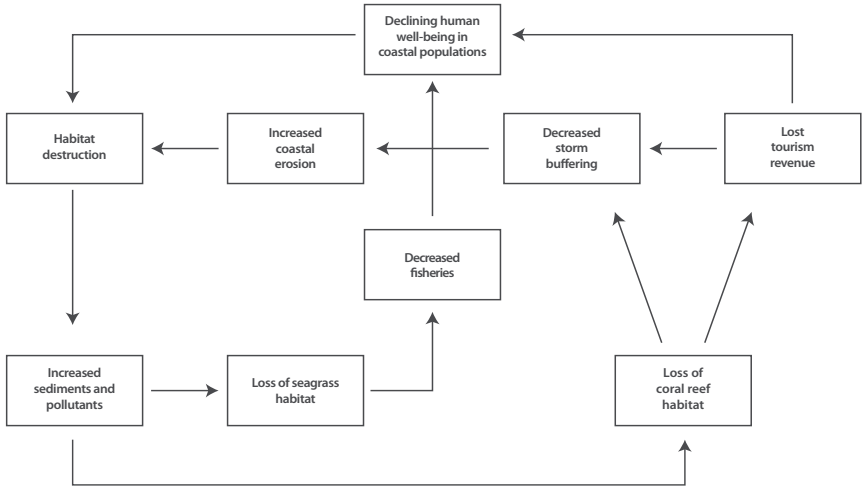
Charles Darwin's diagram depicting his theory of coral reef formation has been reproduced thousands of times since it was first published in 1842. The depiction of a sailboat is unequivocal, as is the image of a sailboat created centuries ago in a cave painting by an indigenous Australian.

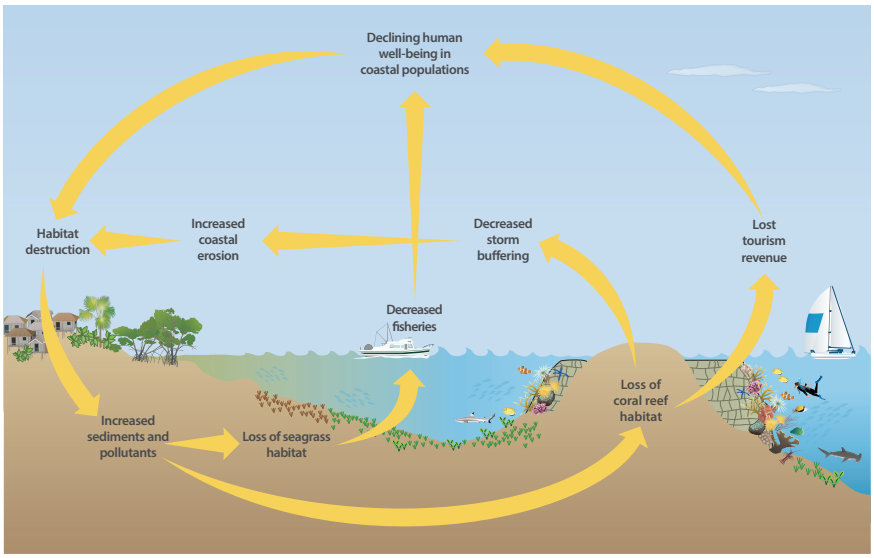


THE SIZE, SHAPE, COLOR, & LOCATION OF SYMBOLS ALL CONVEY CRITICAL INFORMATION

What is the best way to tell your story? Every choice—from size, color, and shape of each symbol to the way the symbol is positioned—needs to be made with your communication goals in mind. For example, the large sediment arrow on the left side of the diagram below shows that there are high amounts of sediment loading, in contrast with the smaller arrow on the right. The color of the water indicates degraded (brown) vs desirable (blue) water quality. The number and diversity of fish are also important to distinguish between a healthy and unhealthy ecosystem. Well-constructed conceptual diagrams help the audience to visualize the message.







HUMANS ARE VISUAL CREATURES

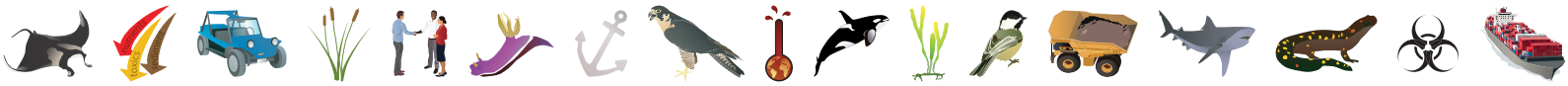
People perceive objects in one of five ways: by sound, sight, touch, smell, or taste. Eyes are one of the strongest muscles humans have and through sight, we interpret information by collecting data and presenting it in a visual form so that the information conveyed can be better understood.

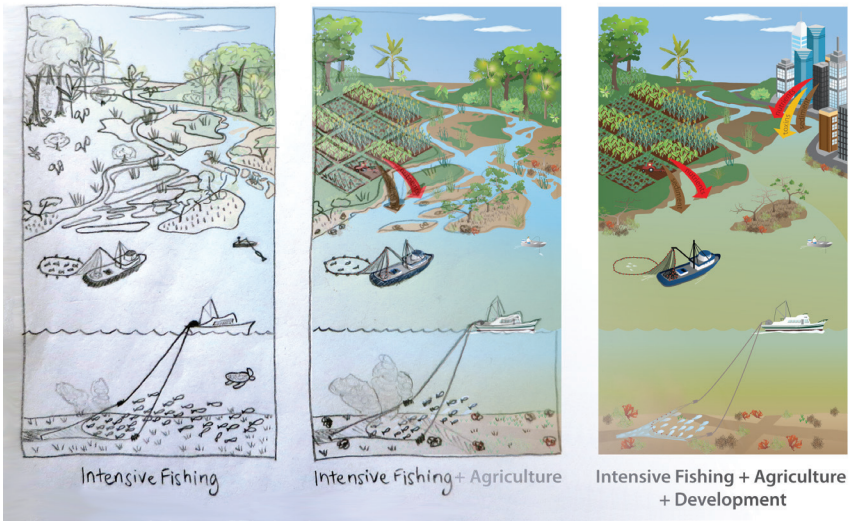
This figure (left) showing connections within an ecosystem was originally a box and arrow diagram that required two pages of accompanying explanatory text. By making it visual, it attracts the eye of the reader and makes the connections easier to understand.

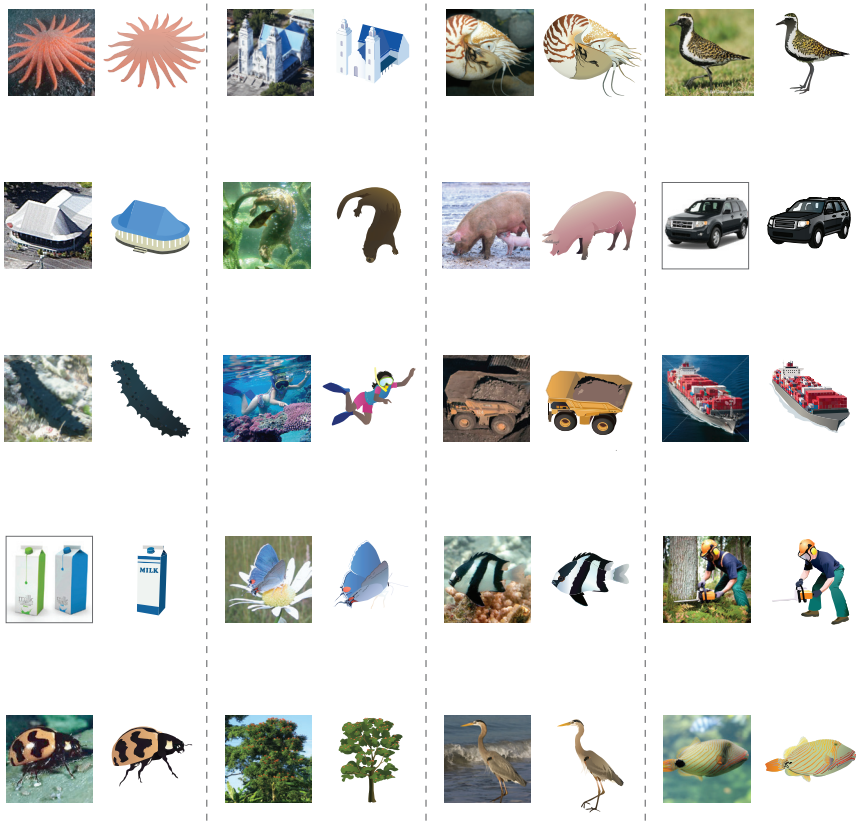
CONCEPTUAL DIAGRAMS CAN BE USED OVER & OVER ... & OVER

Whether you are sharing your research, synthesizing others' research, monitoring an ecosystem, or creating management practices, conceptual diagrams can help you share your key message. Once you've made the investment in creating a conceptual diagram, they can be used online, for presentations, and in a wide range of print media.

- **WEBSITES**
- **NEWSLETTERS**
- **JOURNAL ARTICLES**
- **PRESENTATIONS**
- **REPORTS**
- **POSTERS**
- **SOCIAL MEDIA**
- **BOOKS**







MAKE YOUR OWN CONCEPTUAL DIAGRAM

So you want to take the plunge and create your own conceptual diagram. Here are some questions to get you started...

- who is your audience?
- what is the story you want to tell?
- have you identified the key features you want to show on your diagram?

Once you have the answer to these questions, pick up a pencil and paper and start drawing a rough sketch. Experiment with different ways to visualize the key issues. Sometimes it can take several iterations to figure out the best way to fully capture the message you want to share. Make sure you get input and feedback from your colleagues. Is your message clear and easy to understand?

DOWNLOAD THE IAN SYMBOL LIBRARIES

The Integration and Application Network (IAN) has produced a series of scientific symbol libraries, for use with Adobe Illustrator. The libraries contain over 2,800 custom-made symbols designed specifically for enhancing science communication.

Create your own diagram with minimal graphical skills using the click-and-drag functionality of our symbol libraries.

The IAN symbol libraries are available cost- and royalty-free when you follow our attribution requirements. Our aim is to make them a standard resource for scientists, resource managers, community groups, and environmentalists worldwide.

To download the IAN Symbol libraries go to:
ian.umces.edu/symbols

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