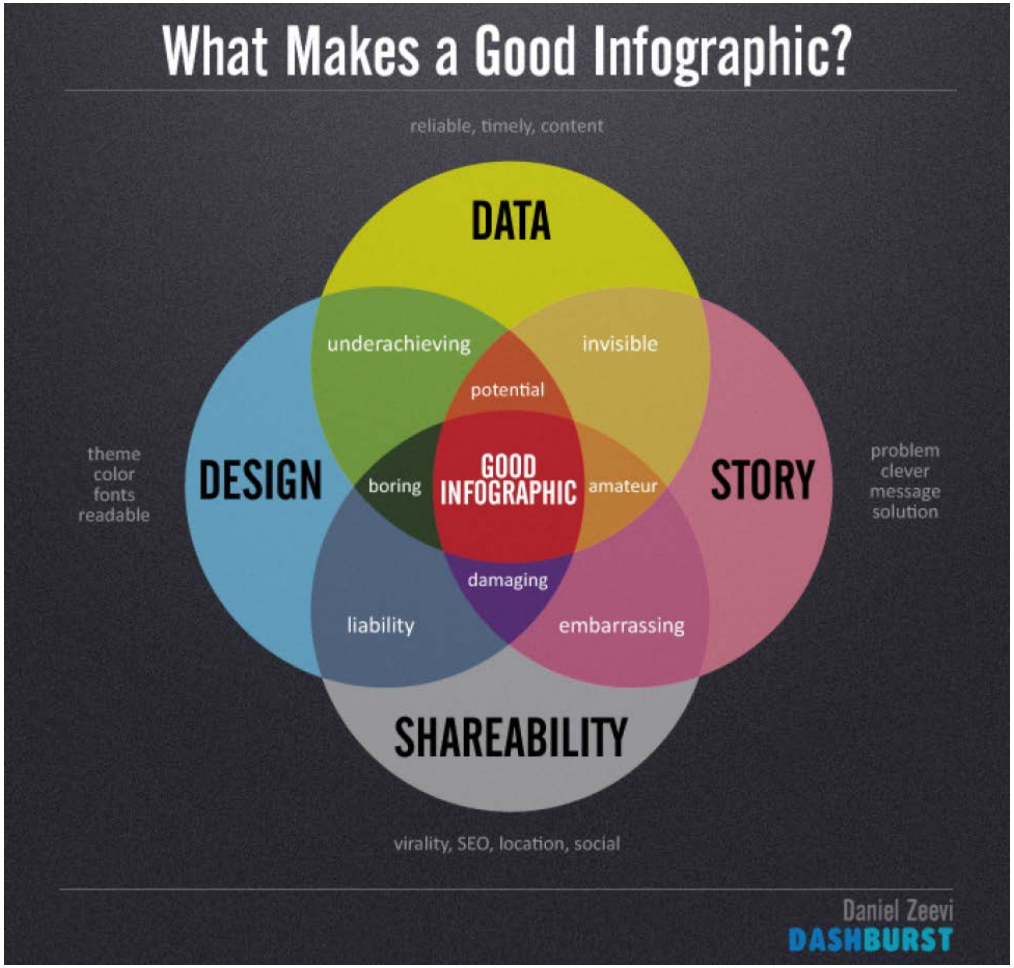
Effective science communication

Caroline Wicks

August 9, 2013

Mid-Atlantic Volunteer Monitoring Conference

Sheperdstown, WV



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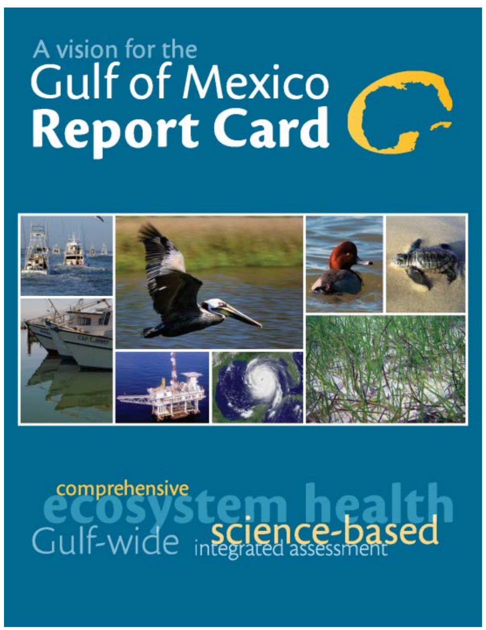
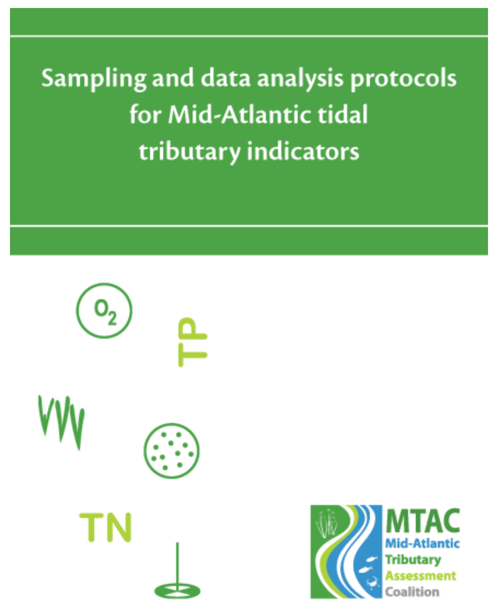
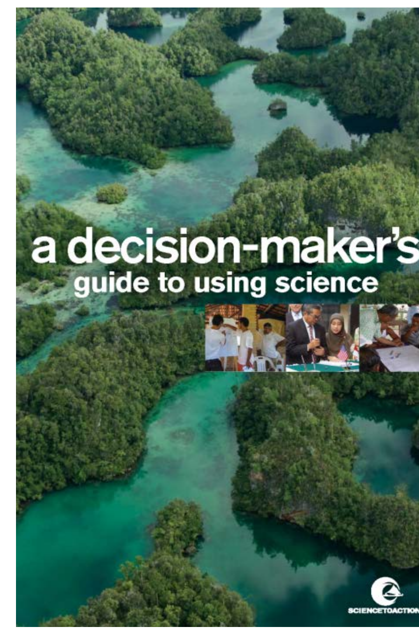
Center for Environmental Science

Overview of presentation

- Science communication theory
- Science communication general principles
- Conceptual diagrams



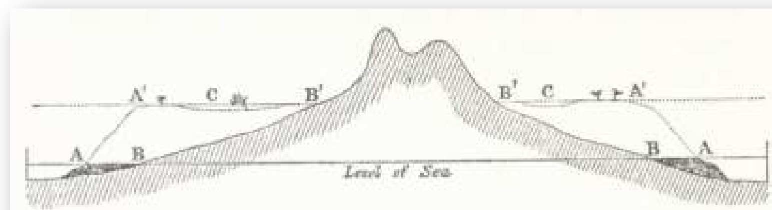




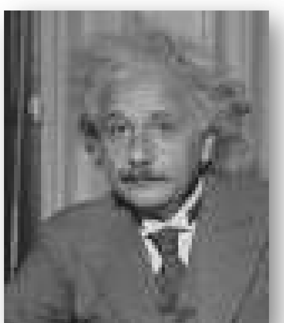
The great scientists are/were also great communicators

Charles Darwin:
119 published books & papers

"Finally when … barrier-reefs … atolls… and fringing-reefs … are laid down on a map, they offer a grand and harmonious picture of the movements which the crust of the earth has undergone within a late period. We there see vast areas rising, with volcanic outbursts; and we may feel sure that the movement has been so slow as to have allowed the corals to grow up to the surface…"



The Structure and Distribution of Coral Reefs
Charles Darwin, 1874 2nd Edition,
revised 1842 1st Edition



Albert Einstein:
248 published books & papers

"Make everything as simple as possible, but not simpler." A. Einstein

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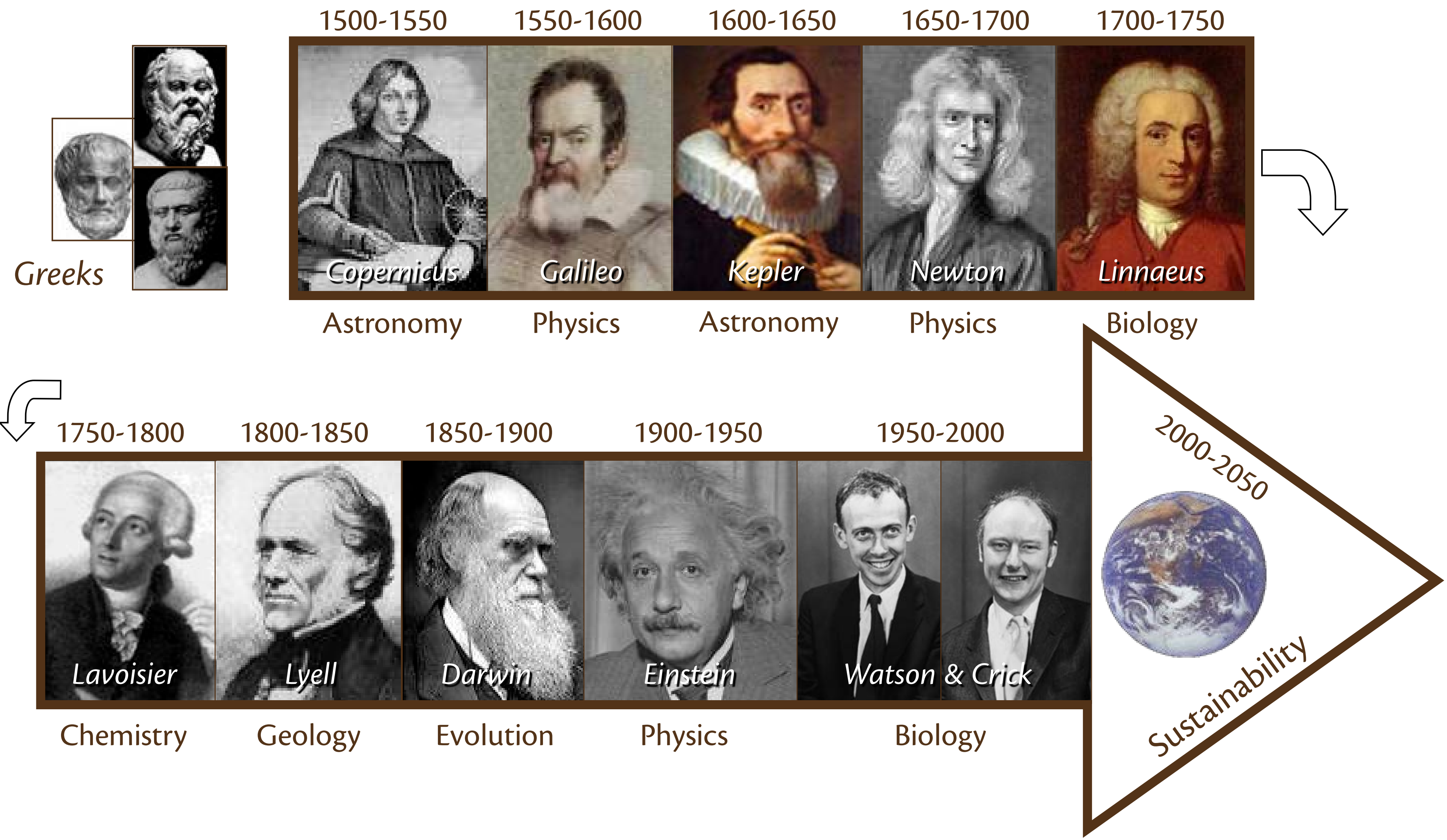
Paradigm shifts occur when scientific discovery is effectively communicated to society

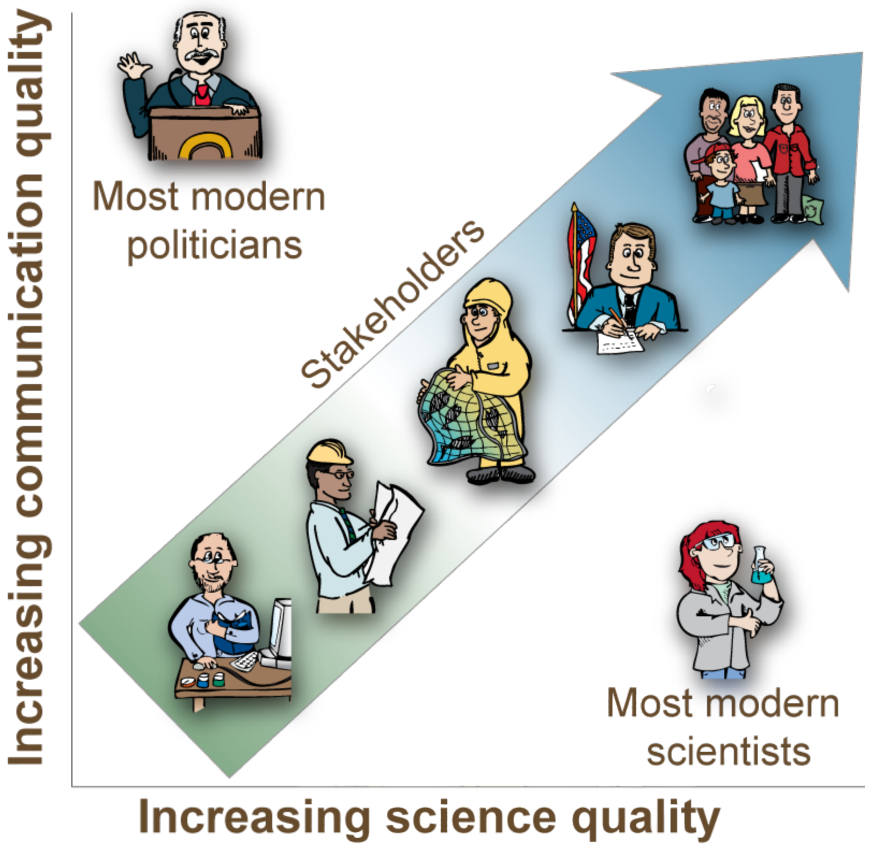


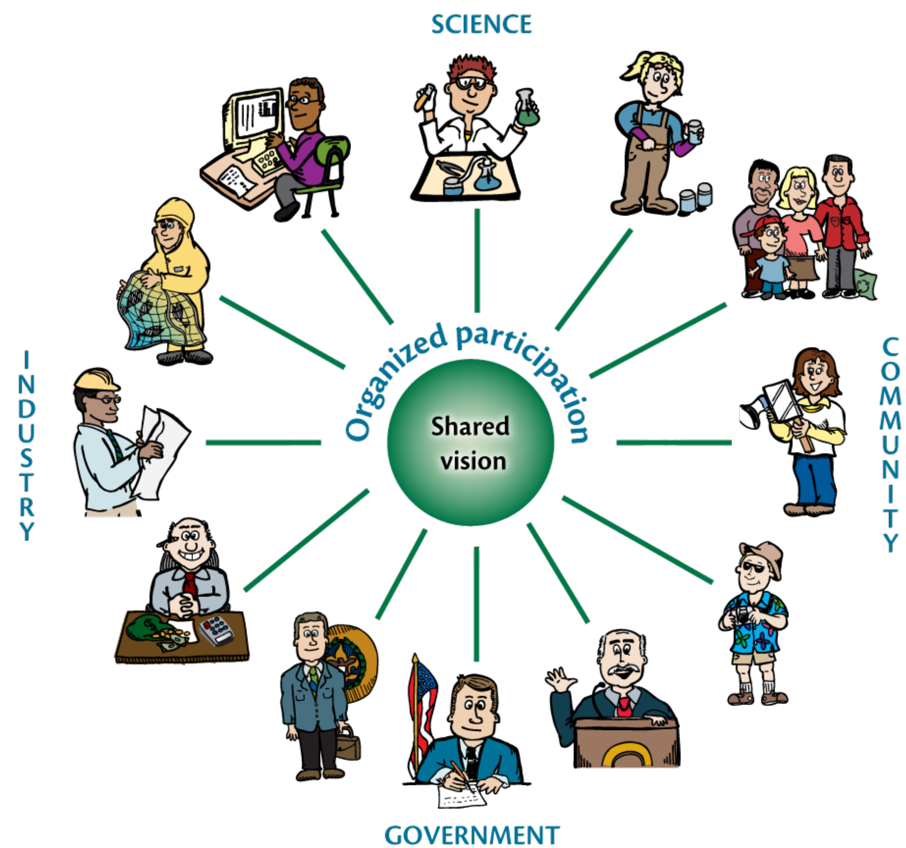
What is science communication?

- Successful dissemination of knowledge to a wide range of audiences (science and non-science)

- You are not doing anything if nobody knows about it

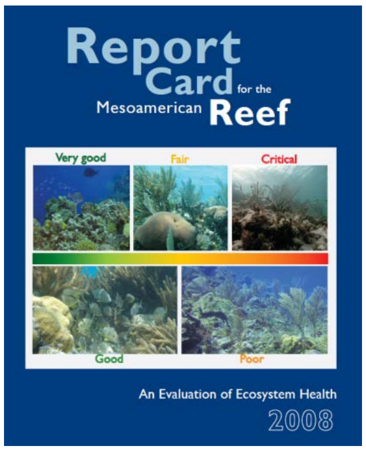
Science communication is a balance of quality science and communication





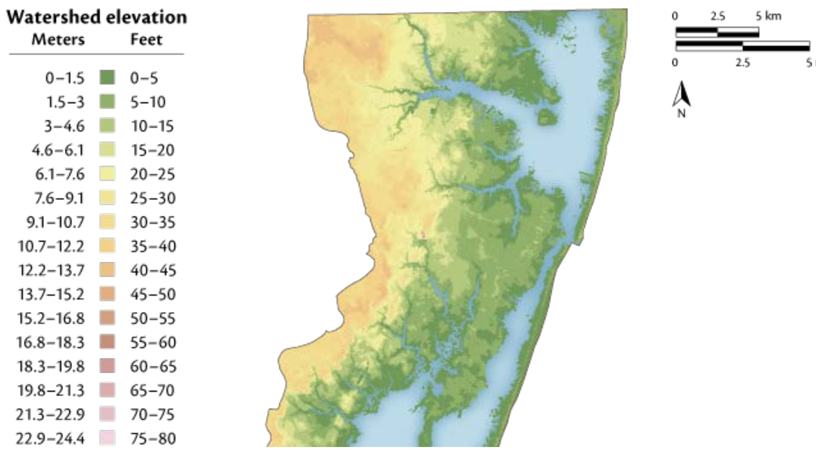
Synthesizing information for less technical audiences

Synthesis



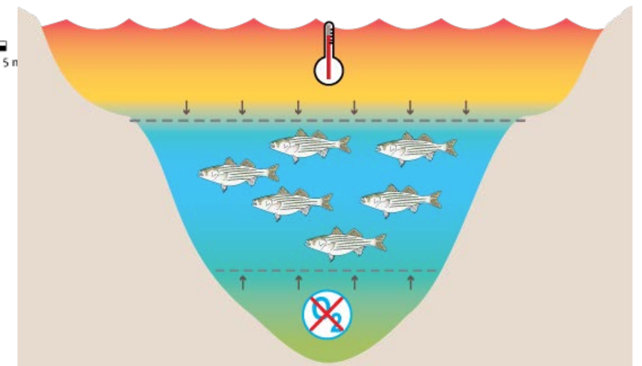
Interpreted
& synthesized
data

Visualization



Sense of place: who, what,
where, when, how & so that
you can tell them why

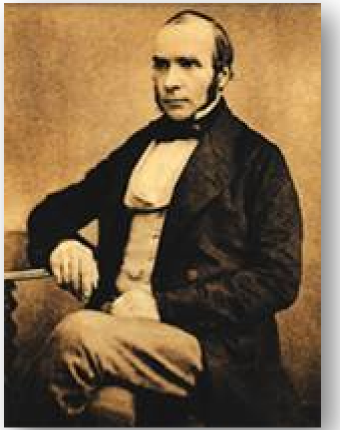
Context



So what?

John Snow's 1854 cholera map

- Cholera outbreak in London
- John Snow mapped cholera cases
- Linked cholera cases to pump locations
- Pump handle removed; cholera subsided



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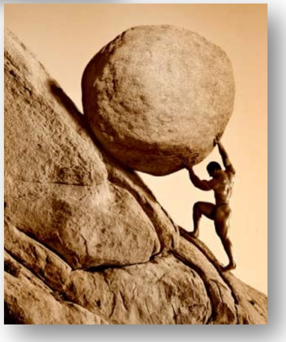
The 'zen' of science communication

- ***Enthusiasm*** counts: get excited

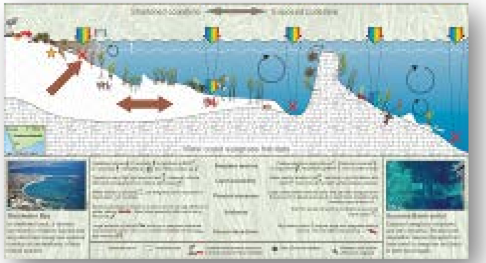
- ***Quality time*** needed: schedule it

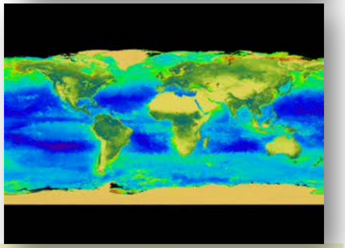


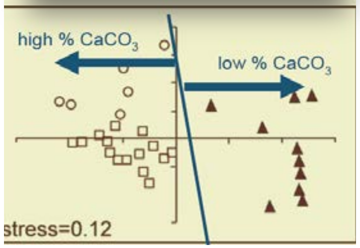
- ***Feedback & revision*** essential: seek it out

The art of science communication

- Conceptual diagrams: context and synthesis
- Maps: geographic context and information-rich
- Photos: describe methods, study site description, processes and relevance
- Video clips: capture system dynamics
- Tables and figures: scientific data

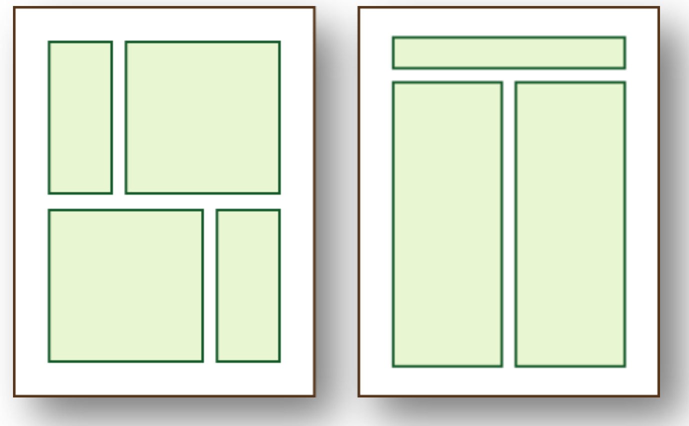


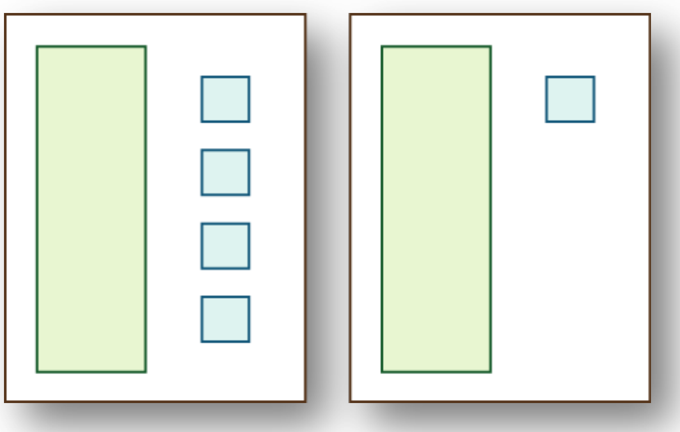




General design principles: Balance

These designs are symmetrical

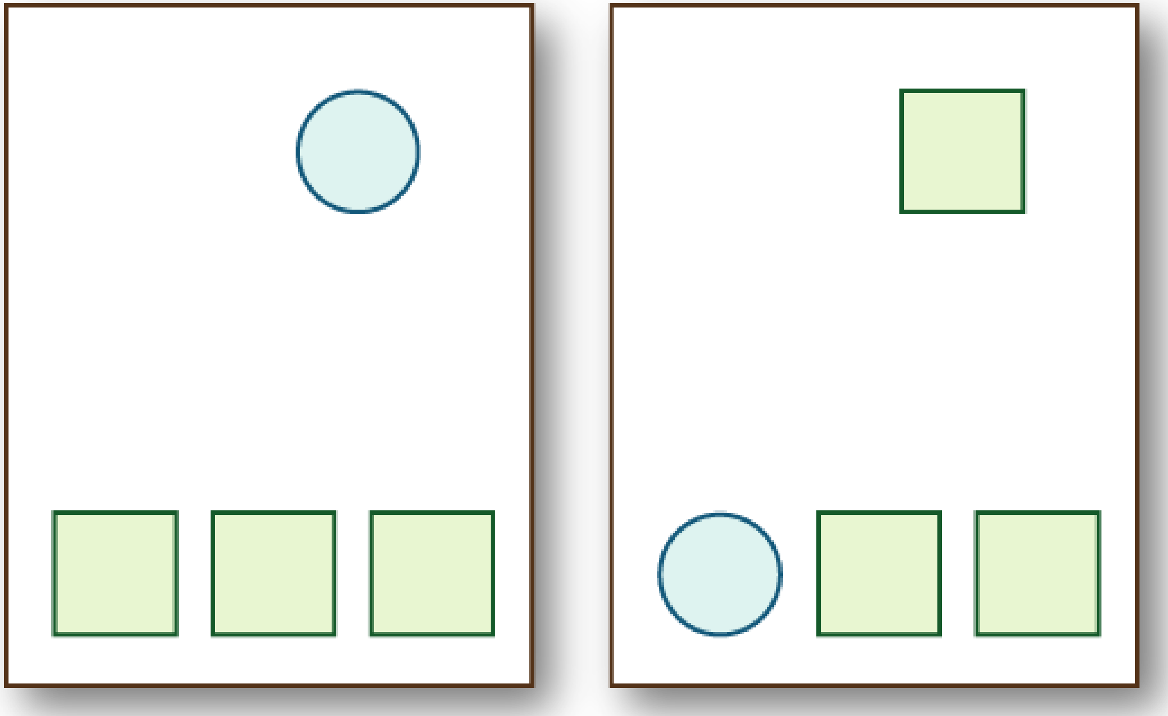




The left design is balanced, the right draws attention to a particular area

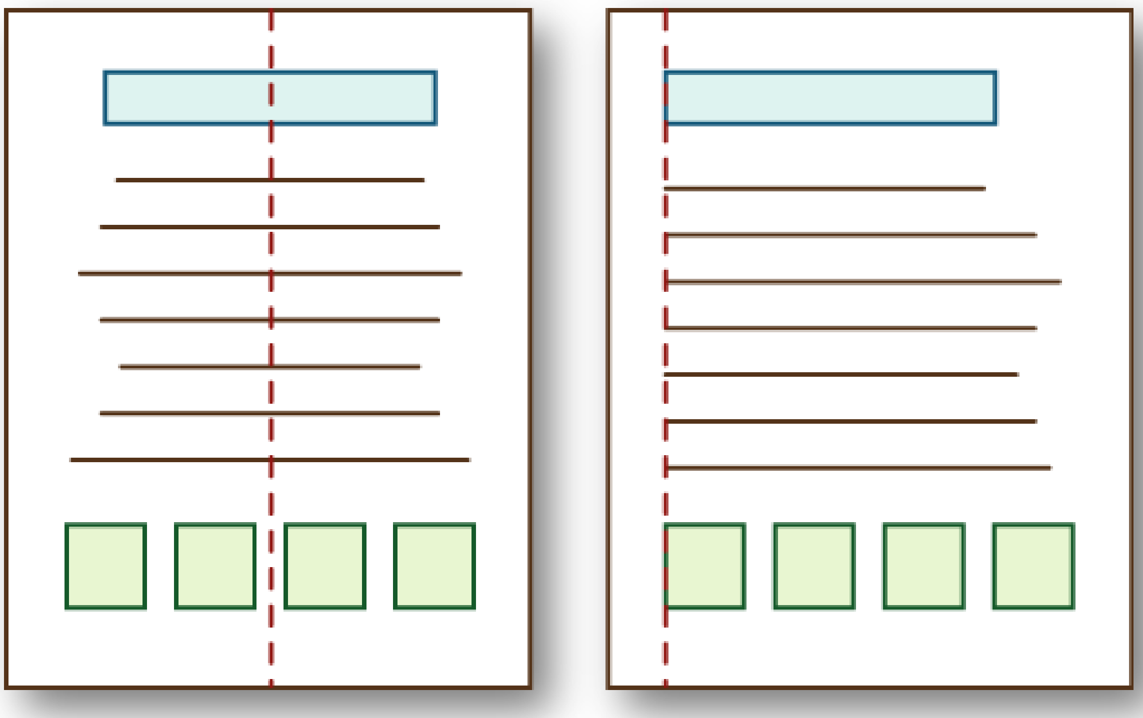
General design principles: Proximity

- Proximity of objects can be used to imply association, whether objects are similar or different



General design principles: Alignment

- Helps draw a reader through a document
- Center alignment of text can be difficult to read



General design principles: Contrast and emphasis

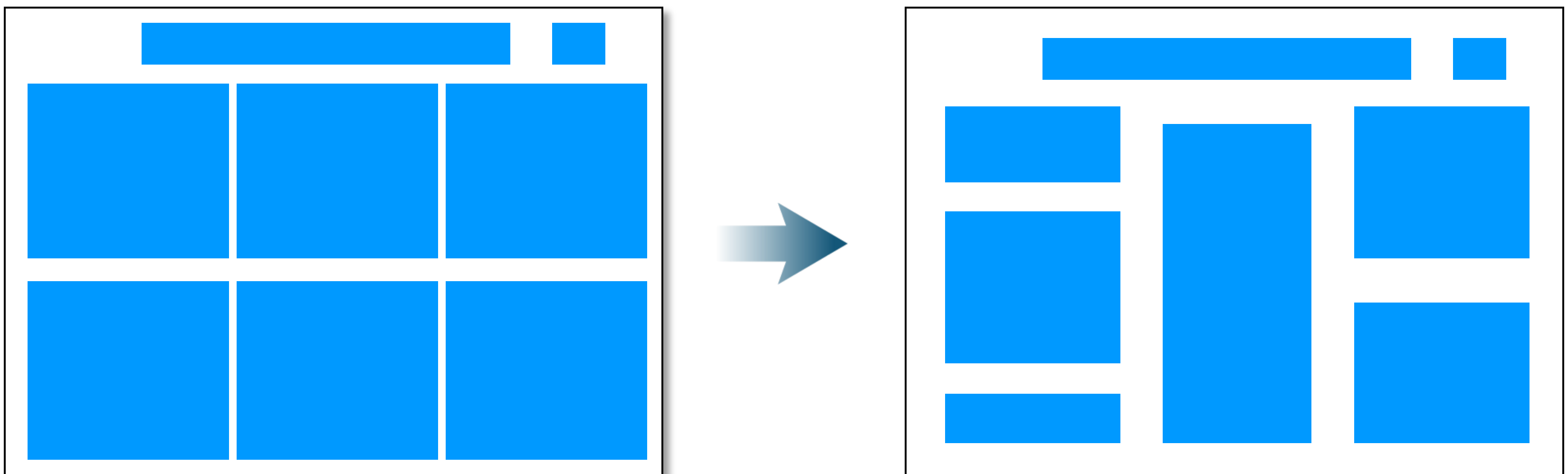
Contrast
with color

Contrast
with TYPE

Contrast with
SIZE

General design principles: White space helps readability

- No blank space creates a ‘crowded’ feel
- Blank space is easier to read, and allows for flow

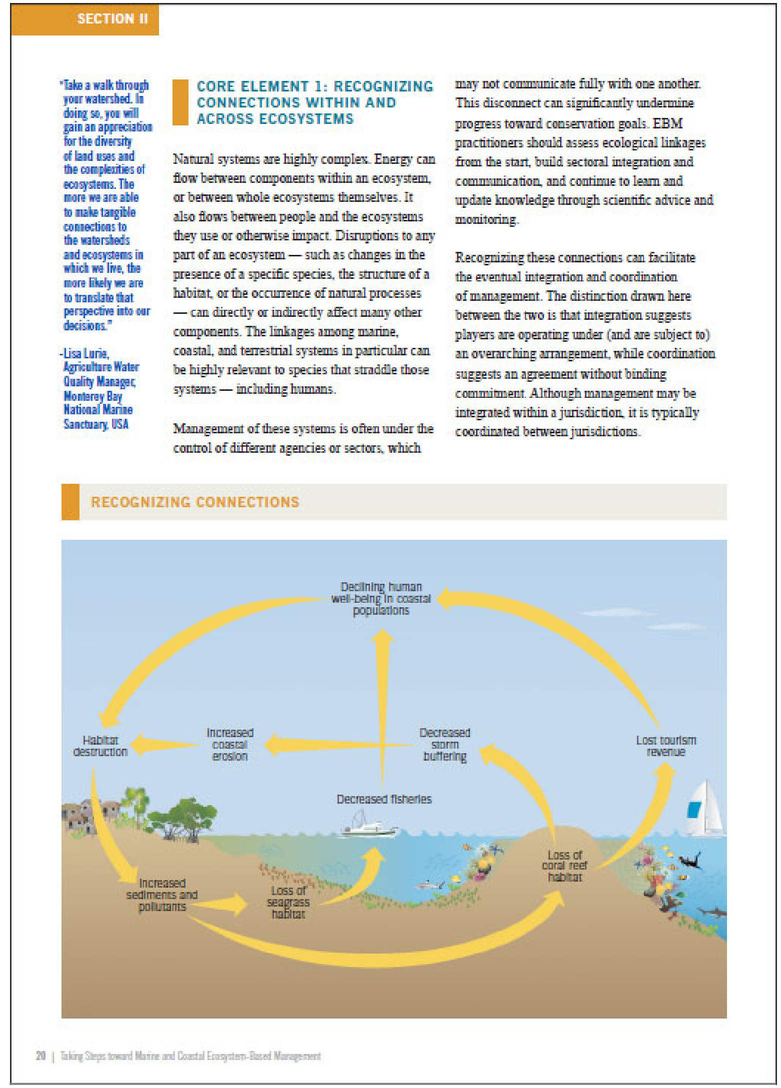


Ineffective

Effective

General design principles: Use color wisely

- Choose color scheme
- Contrasting colors
- Light background + dark text
- Color accentuates content and does not distract from it



SECTION II

"Take a walk through your watershed. In doing so, you will gain an appreciation for the diversity of land uses and the complexities of ecosystems. The more we are able to make tangible connections to the watersheds and ecosystems in which we live, the more likely we are to translate that perspective into our decisions."

-Lisa Lurie, Agriculture Water Quality Manager, Monterey Bay National Marine Sanctuary, USA

CORE ELEMENT 1: RECOGNIZING CONNECTIONS WITHIN AND ACROSS ECOSYSTEMS

Natural systems are highly complex. Energy can flow between components within an ecosystem, or between whole ecosystems themselves. It also flows between people and the ecosystems they use or otherwise impact. Disruptions to any part of an ecosystem — such as changes in the presence of a specific species, the structure of a habitat, or the occurrence of natural processes — can directly or indirectly affect many other components. The linkages among marine, coastal, and terrestrial systems in particular can be highly relevant to species that straddle those systems — including humans.

Management of these systems is often under the control of different agencies or sectors, which may not communicate fully with one another. This disconnect can significantly undermine progress toward conservation goals. EBM practitioners should assess ecological linkages from the start, build sectoral integration and communication, and continue to learn and update knowledge through scientific advice and monitoring.

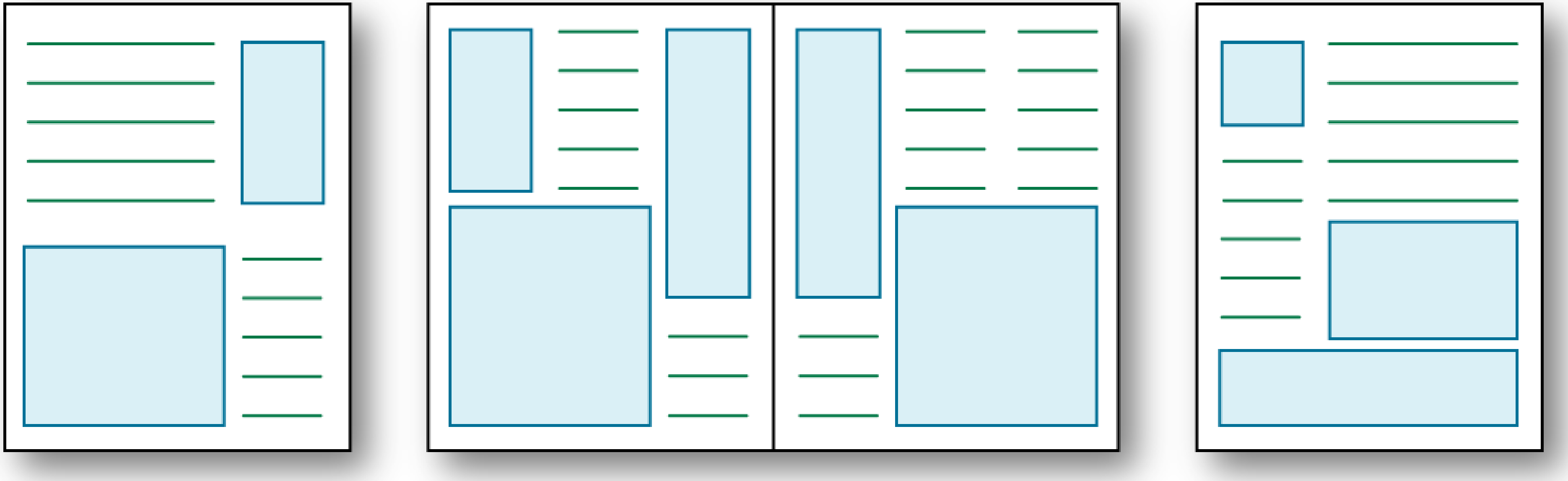
Recognizing these connections can facilitate the eventual integration and coordination of management. The distinction drawn here between the two is that integration suggests players are operating under (and are subject to) an overarching arrangement, while coordination suggests an agreement without binding commitment. Although management may be integrated within a jurisdiction, it is typically coordinated between jurisdictions.

RECOGNIZING CONNECTIONS

20 | Taking Steps toward Marine and Coastal Ecosystem-Based Management

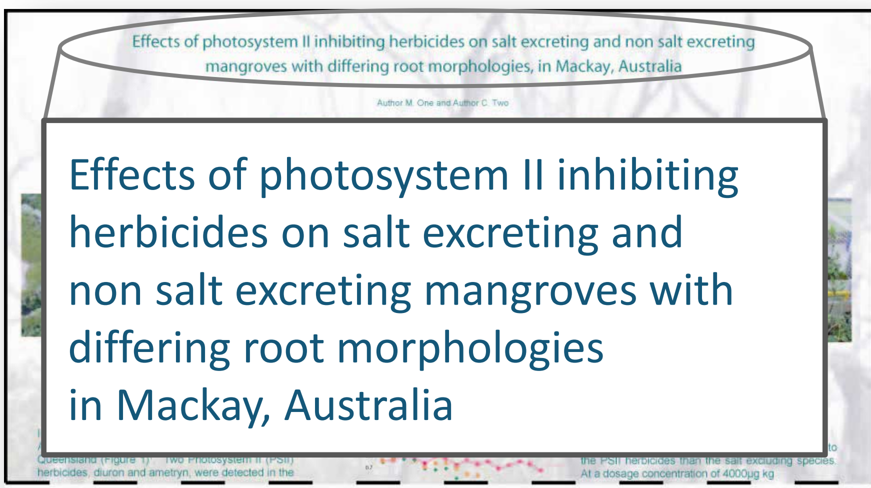
Example newsletter: 4-page spread

- Depending on size, use 2 or 3 column pages
- Text boxes and visuals can take up 1,2, or 3 columns



Use short and active titles

- Summarize the key message in the title
- Title can be a statement or a question
- Posters: you need to be able to read from 30 ft away



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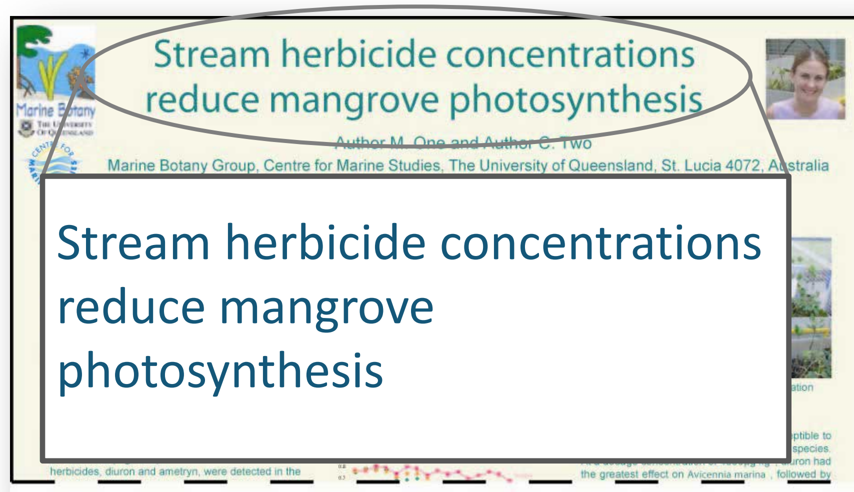
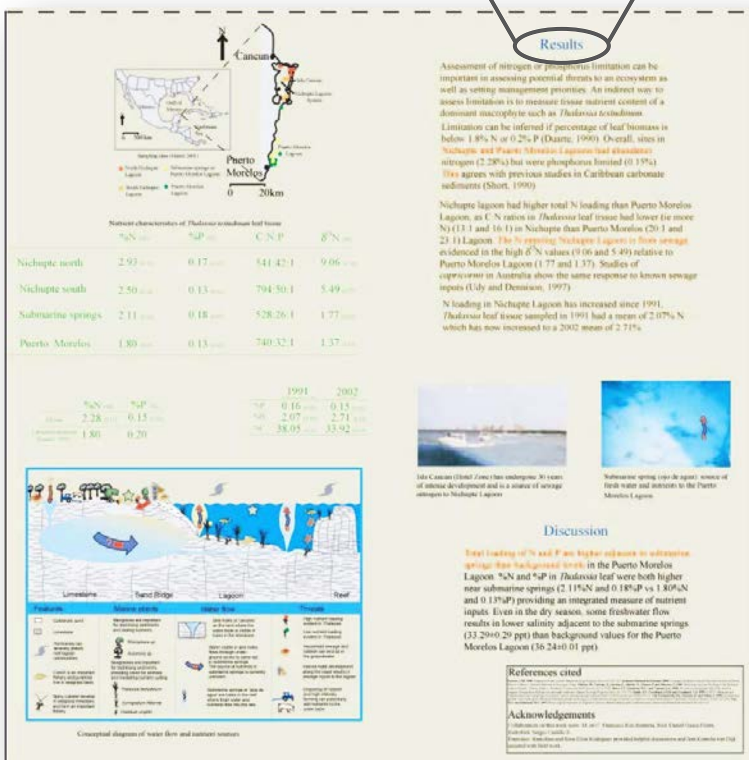


Effective

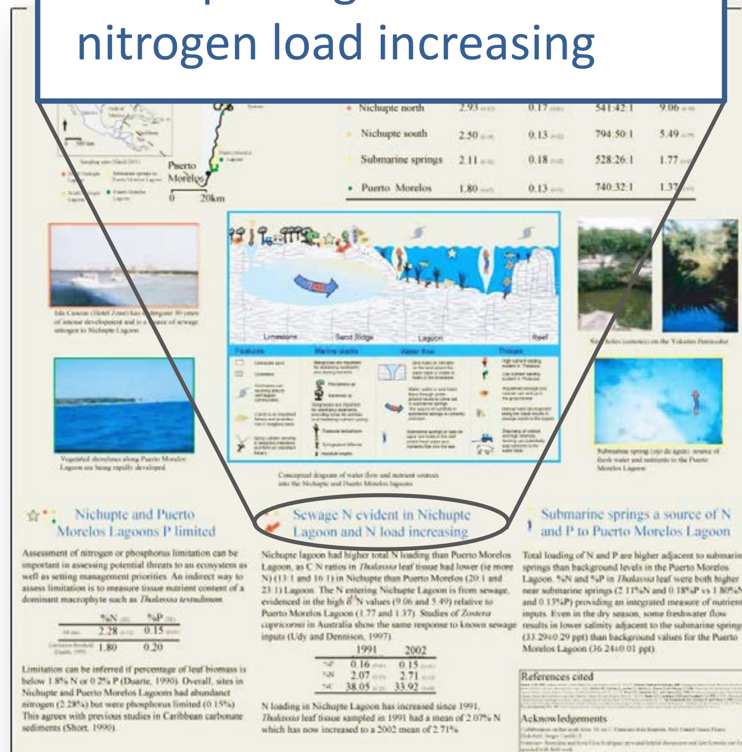
Use descriptive subtitles

Results



Ineffective

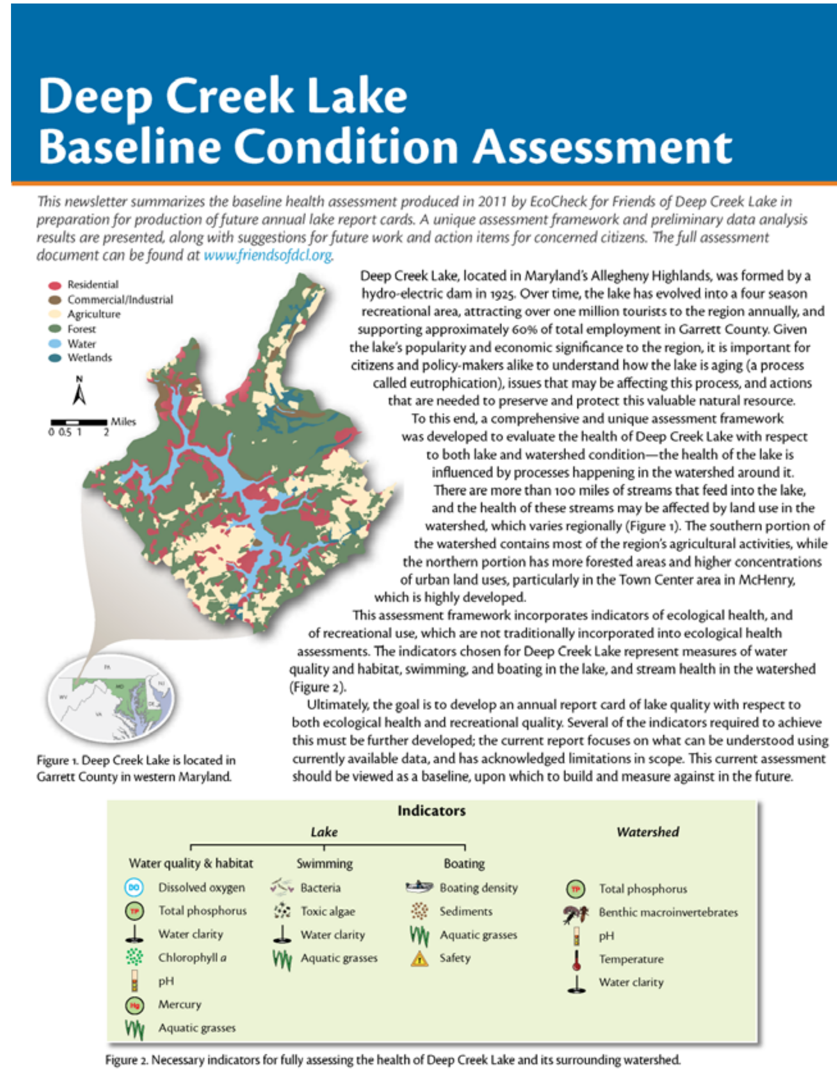
Sewage nitrogen evident in Nichupte Lagoon and nitrogen load increasing



Effective

Use stand-alone visuals

- Readers may only look at visuals and read captions
- Each visual should have a caption
- Every visual should be referenced in the text



Deep Creek Lake Baseline Condition Assessment

This newsletter summarizes the baseline health assessment produced in 2011 by EcoCheck for Friends of Deep Creek Lake in preparation for production of future annual lake report cards. A unique assessment framework and preliminary data analysis results are presented, along with suggestions for future work and action items for concerned citizens. The full assessment document can be found at www.friendsofdcl.org.

Figure 1. Deep Creek Lake is located in Garrett County in western Maryland.

Deep Creek Lake, located in Maryland's Allegheny Highlands, was formed by a hydro-electric dam in 1925. Over time, the lake has evolved into a four season recreational area, attracting over one million tourists to the region annually, and supporting approximately 60% of total employment in Garrett County. Given the lake's popularity and economic significance to the region, it is important for citizens and policy-makers alike to understand how the lake is aging (a process called eutrophication), issues that may be affecting this process, and actions that are needed to preserve and protect this valuable natural resource.

To this end, a comprehensive and unique assessment framework was developed to evaluate the health of Deep Creek Lake with respect to both lake and watershed condition—the health of the lake is influenced by processes happening in the watershed around it.

There are more than 100 miles of streams that feed into the lake, and the health of these streams may be affected by land use in the watershed, which varies regionally (Figure 1). The southern portion of the watershed contains most of the region's agricultural activities, while the northern portion has more forested areas and higher concentrations of urban land uses, particularly in the Town Center area in McHenry, which is highly developed.

This assessment framework incorporates indicators of ecological health, and of recreational use, which are not traditionally incorporated into ecological health assessments. The indicators chosen for Deep Creek Lake represent measures of water quality and habitat, swimming, and boating in the lake, and stream health in the watershed (Figure 2).

Ultimately, the goal is to develop an annual report card of lake quality with respect to both ecological health and recreational quality. Several of the indicators required to achieve this must be further developed; the current report focuses on what can be understood using currently available data, and has acknowledged limitations in scope. This current assessment should be viewed as a baseline, upon which to build and measure against in the future.

Figure 2. Necessary indicators for fully assessing the health of Deep Creek Lake and its surrounding watershed.

Use photos and maps for context… not decoration!

- Provide good context (maps/aerial photos)
- Include photo captions
- Distinguish captions from the rest of the text

Park resource setting/resource stewardship context

Photo: istockphoto.com

Ecosystem features

Abundant ecosystem features are supported by the diverse and unique habitats of Assateague Island (Figure 2.11). Globally rare sand over-wash habitat provides nesting sites for the shorebird, *Charadrus melodus* (piping plover), federally listed as threatened

Sand overwash provides nesting sites for the threatened Piping Plover (*Charadrius melodus*).

Use photos and maps for context… not just decoration!

Streamlined reporting examples

Case study: Streamlined reporting for biodiversity Multilateral Environmental Agreements

In 2008, Australia and the Secretariat of Pacific Regional Environment Programme collaborated to trial the integration of reporting templates for five biodiversity multilateral environmental agreements (MEAs), including those for Convention on Biological Diversity, Convention on International Trade in Endangered Species of Wild Fauna and Flora, Convention on Migratory Species, Convention Concerning the Protection of the World Cultural and Natural Heritage and the Ramsar Convention on Wetlands. Reporting against a single consolidated reporting template was successfully tested in eight Pacific island countries, demonstrating the feasibility and practicality of the process. While the template was not endorsed by MEA Secretariats, the trial represents a practical example of how national reports to MEAs can be streamlined and harmonised.

Lessons from human rights treaty reporting

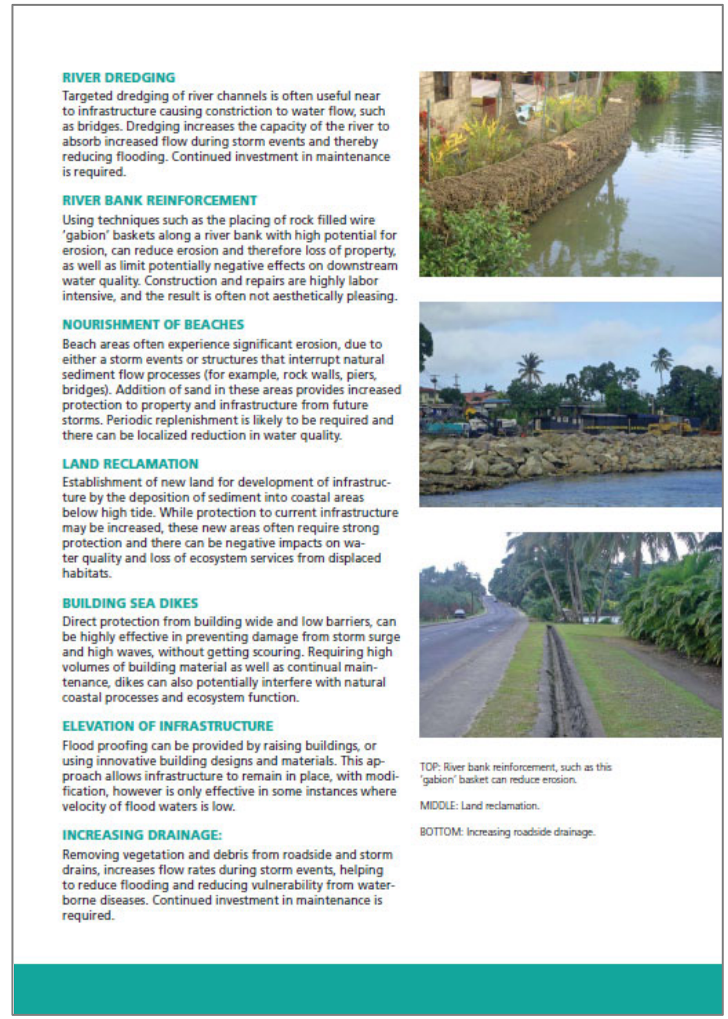
Important lessons have been learnt in the region from the streamlining of human rights treaty reporting processes:

1. A 'driver' is needed to facilitate change. Responsible agencies need dedicated time and resources to drive the process and ensure the input of all stakeholders.
2. Start small, and take measurable steps over time. Reform takes time, and is a complex process requiring careful negotiation, monitoring, and adjustment at appropriate milestones.
3. Consult with all stakeholders. The views of stakeholders need to be considered and reflected in the streamlining process. These include national governments, reporting bodies, beneficiaries, and development agencies.
4. Strengthen the mandate for change. 'Reducing the burden of reporting' is a common reason for streamlining, however the mandate to streamline can be strengthened when the total 'cost' to all parties is also considered.
5. Be bold, but realistic. The streamlining process as a whole may need to occur over a long time span, split into realistic steps, and guided by an agreed and well-articulated vision.

Case study: Sharing the burden through regional reporting

In 2005, Pacific Island Countries signed the Mauritius Strategy for the Implementation of the Barbados Plan of Action (MSI). In the same year, the region finalised its Pacific Plan—the regional blueprint for regionalism and development. Recognising the need to minimise duplication, a United Nations agreement was secured in 2007 to utilise countries' reporting on the Pacific Plan as the region's global reporting on progress towards the MSI. As a result, one collective regional report was submitted to the United Nations by the Pacific Islands Forum Secretariat on behalf of countries, demonstrating how a regional approach can be harnessed to reduce reporting burdens.

Ineffective



RIVER DREDGING

Targeted dredging of river channels is often useful near to infrastructure causing constriction to water flow, such as bridges. Dredging increases the capacity of the river to absorb increased flow during storm events and thereby reducing flooding. Continued investment in maintenance is required.

RIVER BANK REINFORCEMENT

Using techniques such as the placing of rock filled wire 'gabion' baskets along a river bank with high potential for erosion, can reduce erosion and therefore loss of property, as well as limit potentially negative effects on downstream water quality. Construction and repairs are highly labor intensive, and the result is often not aesthetically pleasing.

NOURISHMENT OF BEACHES

Beach areas often experience significant erosion, due to either a storm events or structures that interrupt natural sediment flow processes (for example, rock walls, piers, bridges). Addition of sand in these areas provides increased protection to property and infrastructure from future storms. Periodic replenishment is likely to be required and there can be localized reduction in water quality.

LAND RECLAMATION

Establishment of new land for development of infrastructure by the deposition of sediment into coastal areas below high tide. While protection to current infrastructure may be increased, these new areas often require strong protection and there can be negative impacts on water quality and loss of ecosystem services from displaced habitats.

BUILDING SEA DIKES

Direct protection from building wide and low barriers, can be highly effective in preventing damage from storm surge and high waves, without getting scouring. Requiring high volumes of building material as well as continual maintenance, dikes can also potentially interfere with natural coastal processes and ecosystem function.

ELEVATION OF INFRASTRUCTURE

Flood proofing can be provided by raising buildings, or using innovative building designs and materials. This approach allows infrastructure to remain in place, with modification, however is only effective in some instances where velocity of flood waters is low.

INCREASING DRAINAGE:

Removing vegetation and debris from roadside and storm drains, increases flow rates during storm events, helping to reduce flooding and reducing vulnerability from water-borne diseases. Continued investment in maintenance is required.

TOP: River bank reinforcement, such as this 'gabion' basket can reduce erosion.

MIDDLE: Land reclamation.

BOTTOM: Increasing roadside drainage.

Effective

What are conceptual diagrams?

con·cept /ˈkänsept/

Noun: Something conceived in the mind

(Webster's 3rd Dictionary, 1986)

di·a·gram /ˈdīəˌgram/

Noun: A drawing that shows relations

(Webster's 3rd Dictionary, 1986)

conceptual diagram

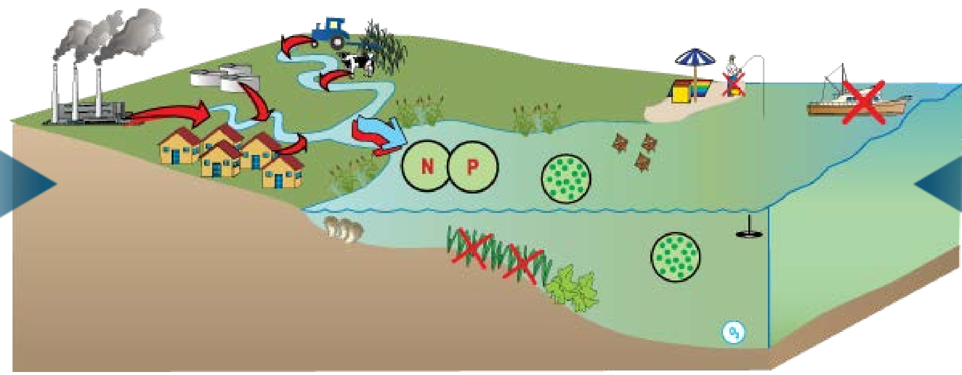
A diagram using symbols that depicts the essential attributes of a system

Conceptual diagrams provide synthesis, visualization, and context

Science

Current understanding

Credibility & support

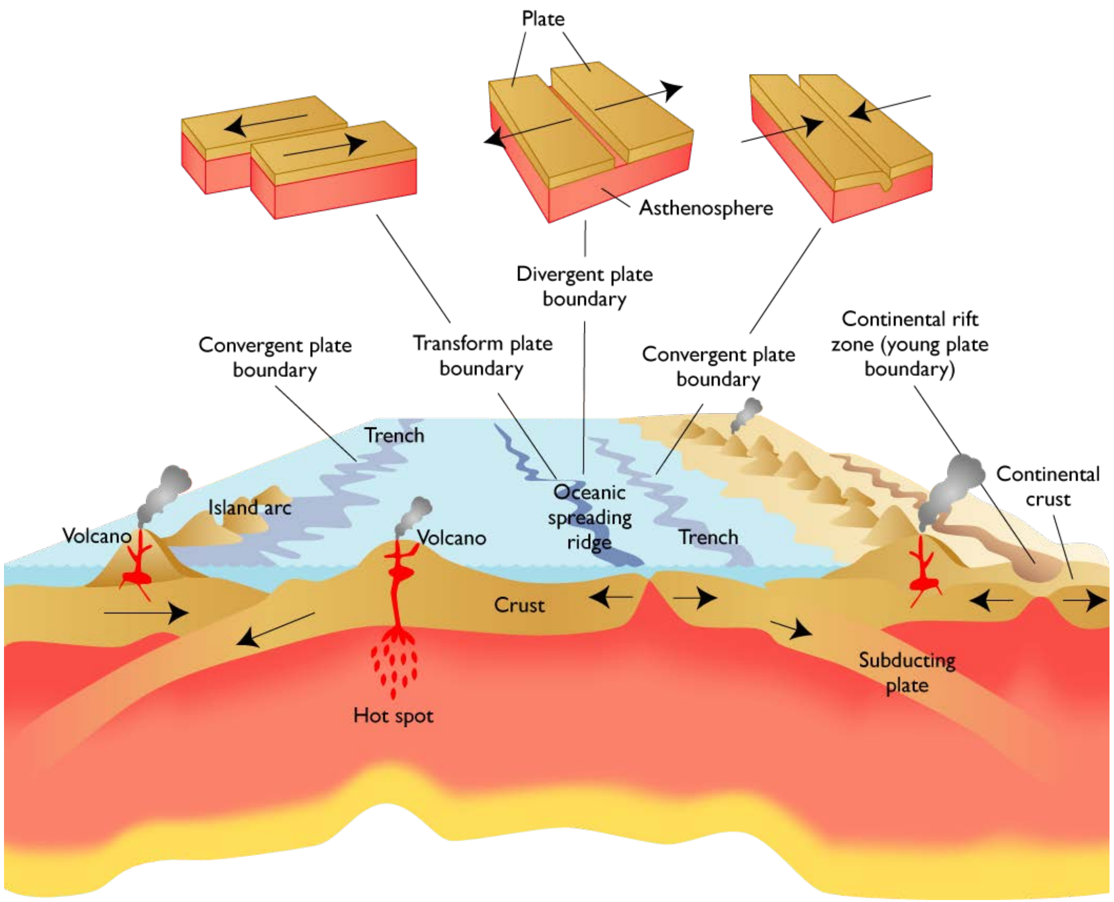


Community

Priorities & environmental values

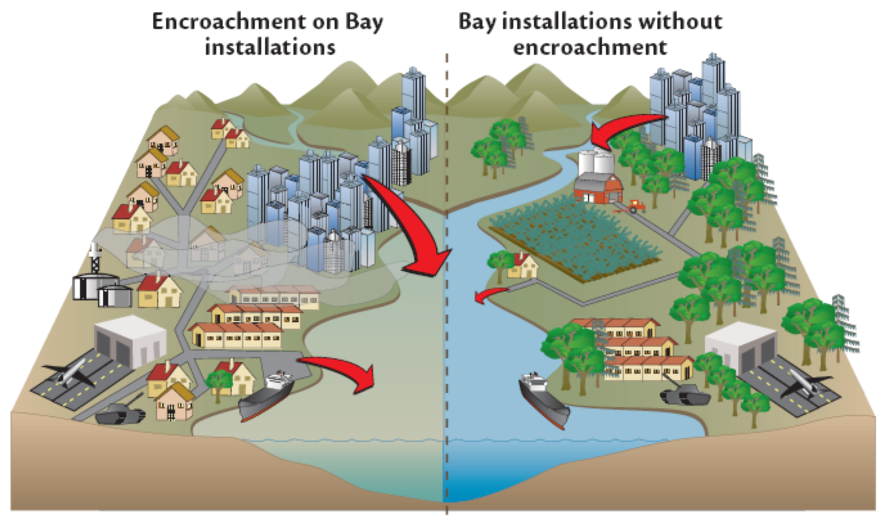
Commitment & resources

Good conceptual diagrams synthesize and present information clearly



What makes conceptual diagrams so effective?

- Help to clarify thinking
- Aid communication
- Can identify data gaps, management priorities, or key features and threats

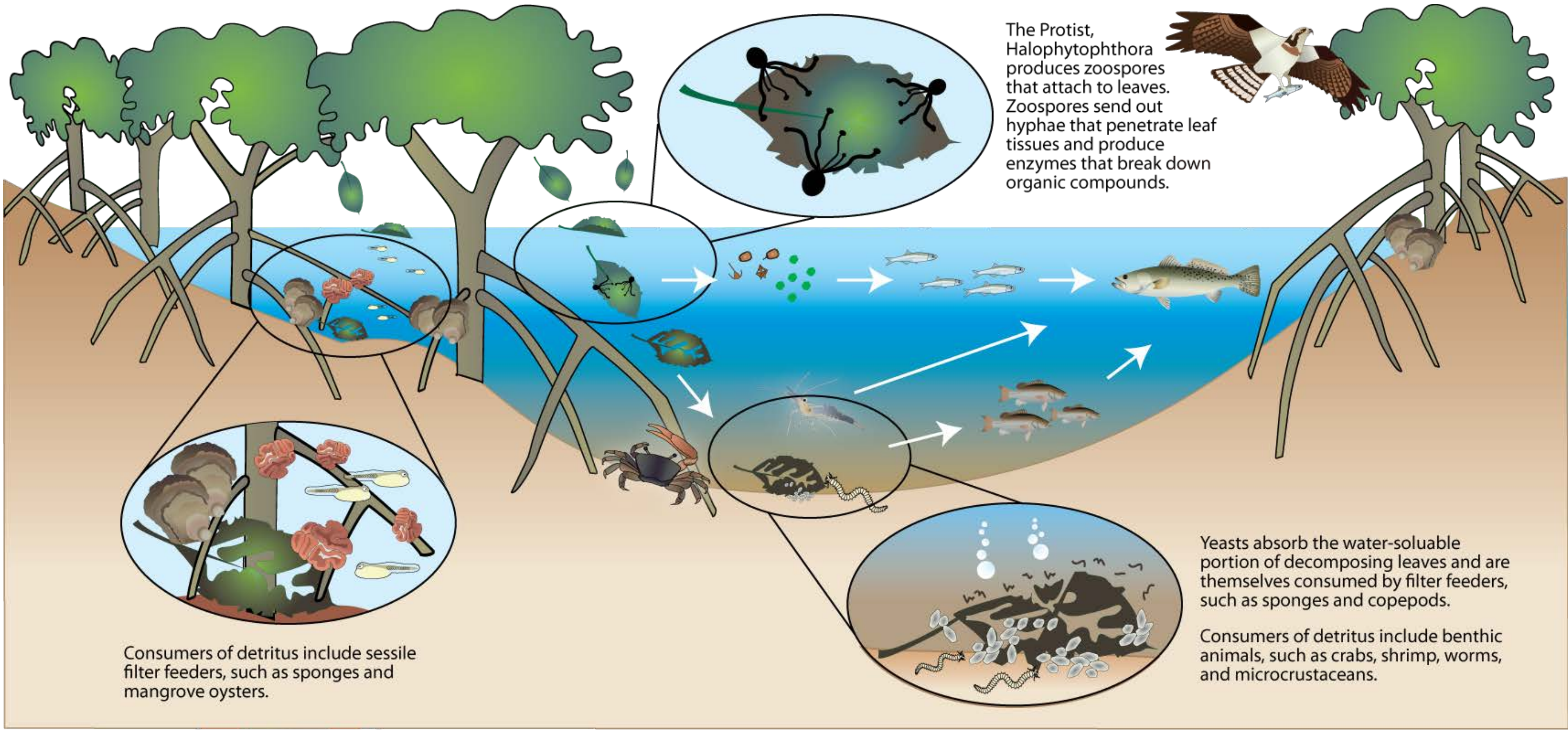


As urban development increases, housing developments may encroach upon Bay installations. This may include the construction of transportation corridors that cut through Bay installations. Increased development surrounding installations leads to elevated nutrient inputs and increased pollution.

If smart growth is employed during housing developments, they do not encroach upon Bay installations. In addition, patches of forest, farmland, and urban centers are separated from installations. Smart growth also leads to smaller nutrient inputs than conventional urban development.

Conceptual diagrams can illustrate complex processes

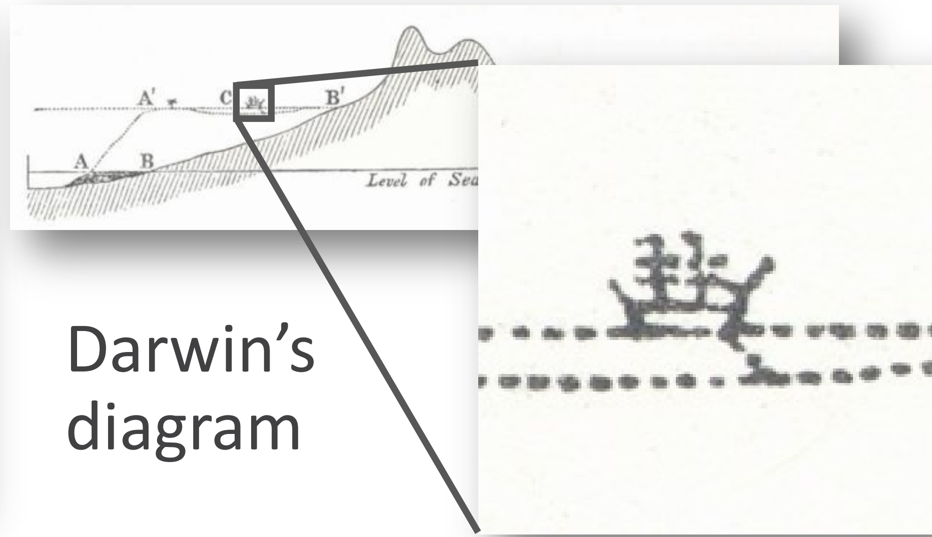
Conceptual diagrams can describe processes at different scales



meters ⟶ centimeters

Symbols depict unequivocal messages

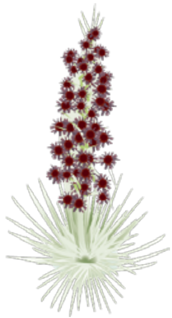
Cave painting



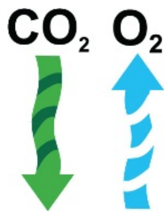
Darwin's diagram

Symbols are language independent and universal

- Symbols can represent something tangible

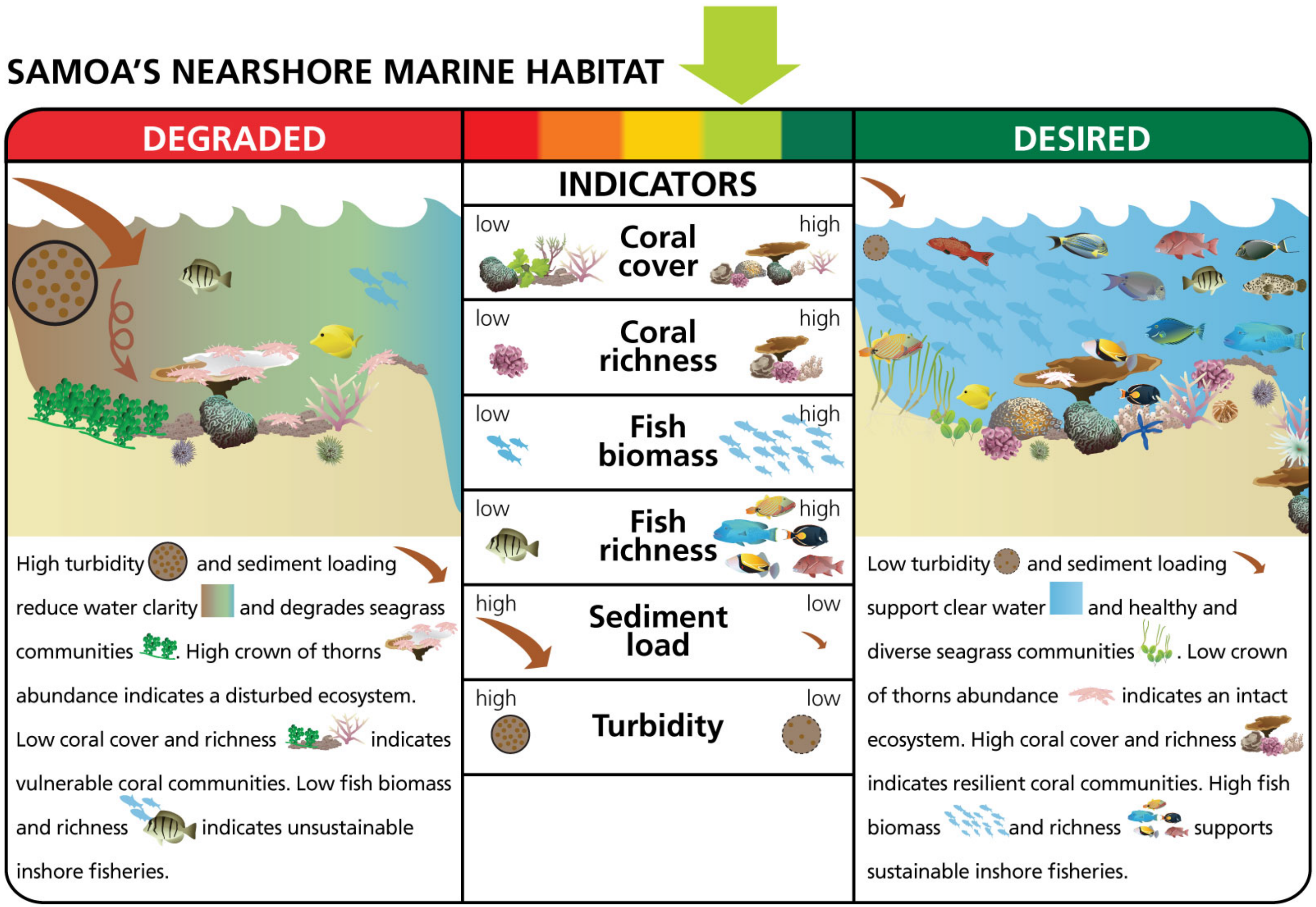



- Symbols can represent something invisible or intangible



- Symbols are used and identified all over the world: mathematics π , weather  , music  ,
- religion  , corporate branding , signage  , and organizations .

Size, shape, color, and position of symbols conveys information



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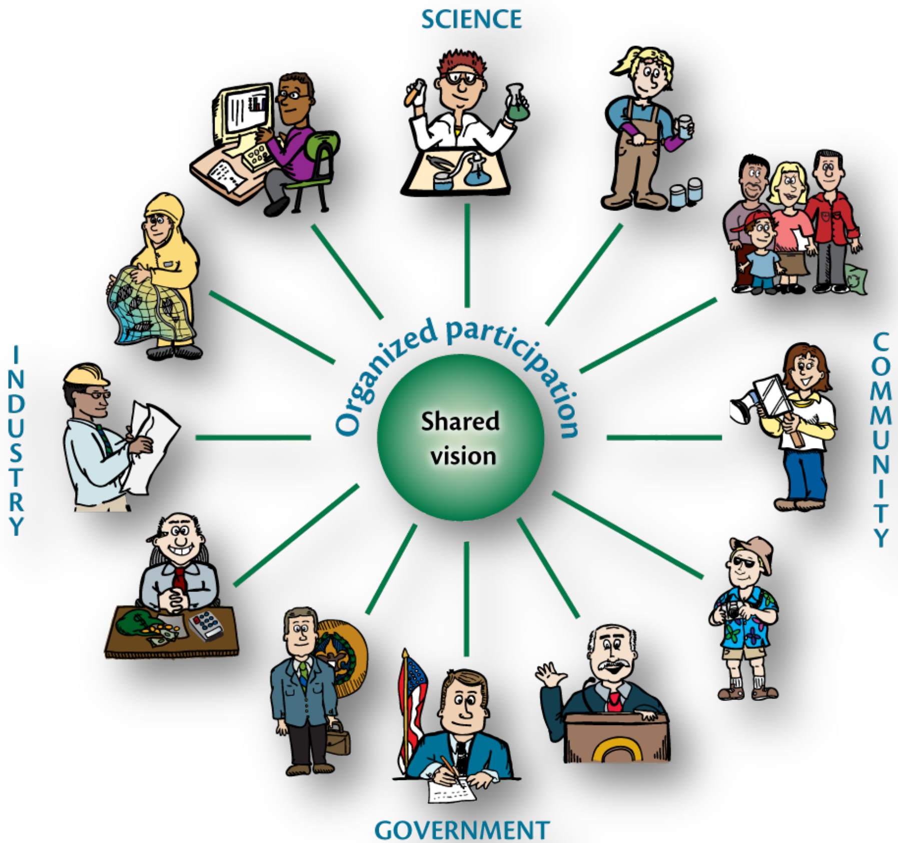
Recipes for success



- Provide synthesis, visualization & context
- Incorporate white space
- Use general design principles
- Include effective visual elements
- Consistent style & format
- Use active titles & subtitles
- Use color, but use it judiciously

Thanks!

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Sciencementality.wordpress.com