Researchers are struggling to understand the trends and drivers of changing pollinator populations. In a changing world, we may have to prioritize research efforts. Which species should we focus on? What conservation approaches are most effective? How can we engage policy makers and community members in the decisions and behaviors that will protect pollinators? In the first lecture, we discussed the diversity of pollinators, and a variety of threats, in a multitude of settings around the world. A one-size-fits-all solution won't work here. In this lecture, we outline a general approach for customizing a solution for each pollinator scenario. This lecture may provide you with an approach that can be applied to your final project.

BIODIVERSITY MAINSTREAMING

Increased pressure on Protected Areas that traditionally offered haven for pollinators

Increased intensification of agricultural practices means fewer weeds, crop margins, open areas for pollinators

Biodiversity mainstreaming is a new paradigm for embedding conservation policies into all levels of policies, strategies, and practices of key actors and agencies

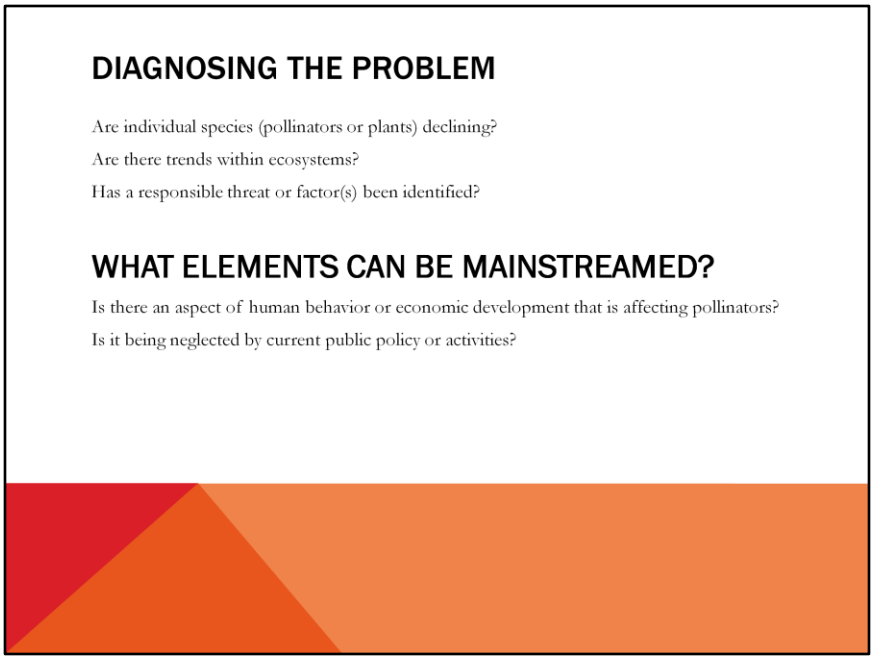
This can expand conservation measures to include areas outside of Protected Areas

Biodiversity mainstreaming must first change how governments, institutions, and individuals value the natural world

Strong governments and institutions are important for the success of implementing strategies emerging from this approach

Lesser Long Nosed Bat
Photo by Merlin D. Tuttle,
Bat Conservation International.
http://www.fs.fed.us/wildflowers/pollinators/pollinator-of-the-month/lesser_long-nosed_bat.shtml

It is easy to see the economic value and need to preserve honey bees. For more obscure species, it is harder to make a case for preservation. For many years, a core concept in protecting biodiversity has included setting aside protected areas. This presented a dichotomy: biodiversity within a protected area, less without. As land use and agricultural intensification place more and more pressure on islands of protected areas, a new paradigm is needed. Instead of biodiversity OR development, Biodiversity Mainstreaming seeks to achieve biodiversity AND development. To be successful, this approach must enlist the support and active participation of individuals and institutions that impact or are impacted by the system of interest. In our case, it could include helping stakeholders understand the economic value of pollination.



The first step is diagnosing the problem. This could involve scientific research across multiple disciplines. Field scientists may assess a pollinator population, and work to understand pollinator relationships with plants and the rest of the system. The problem could be restricted to one plant, or multiple species within a region. Social scientists or economists may be enlisted, to understand some of the human elements.

Pinpointing the drivers of the problem is next. What changes should be made, and can policies be crafted to address them?

ALIGNING POLLINATOR AND ECONOMIC/DEVELOPMENT INTERESTS

What is the root cause of the problem? Is there an agency or industry that could impact the situation?

Are there several entities that could be more effecting working together?

Depending on the problem identified, it may be effective to target national, sectoral (agricultural commodities, forestry, pesticide industry), or local entities.

IDENTIFY SHARED OUTCOMES

Can improvements in both pollinator health and development/economic prosperity be achieved?

What policies can meet both goals?

Beekeeping can be an important tool for addressing poverty in developing countries

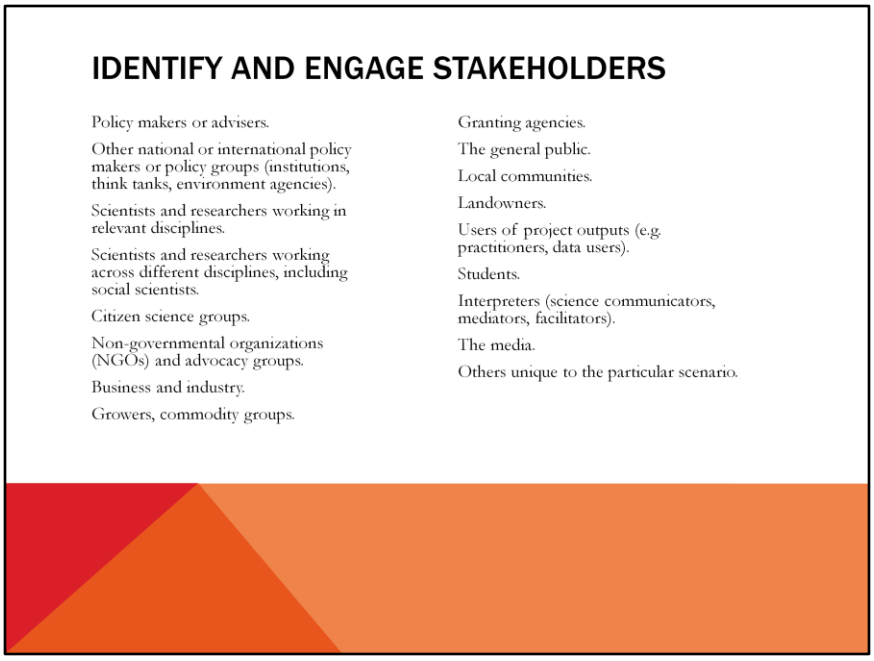
A core premise of biodiversity mainstreaming is that conservation and economic development are not diametrically opposed. Is poverty or economic need the root cause of the problem? Perhaps stakeholders feel they must use the land in a certain way in order to make a living, which affects a pollinator population. Maybe there is an agency or organization interested in increasing economic well being in this area. If a change in land use can increase economic prosperity for these stakeholders, AND protect pollinators, it is a win-win situation.

COMMUNICATION STRATEGY

- Communication
  - The problem
  - Communicate to key players
  - Make a case
- Education
  - What needs to change
  - Who needs to change
  - Impacts of change
- Public awareness
  - Reach all stakeholders

Bee pollinating a rose.
http://en.wikipedia.org/wiki/File:Bee_pollenating_a_rose.jpg

Communicating the problem to key players, and making a case for how it might be addressed with their benefit in mind, is needed to elicit support. Education and outreach tailored to various stakeholder groups, informing of them of what needs to change, the benefits of change, and what will happen if change doesn't happen, are essential to address the problem.



It is essential to identify the various stakeholder groups, and get them involved from the very beginning.

IDENTIFY TOOLS AND ASSETS

Political will and leadership.

Media and public perception and awareness

Inter-sectoral coordination

Lobbying by interest groups

Transparent, accountable, inclusive governance

Stakeholder participation

Availability of funding

Hummingbird Moth
Snowberry clearwing (*Hemaris diffinis*).
Photo by Hugh Christy.
http://www.fs.fed.us/wildflowers/pollinators/pollinator-of-the-month/hummingbird_moth.shtml

There are commonalities in the coevolution of plants and pollinators, which are termed pollination syndromes. These are simply sets of plant characteristics that match specific types of pollinators. Some pollinators are highly specialized, and adapted to pollinate a limited set of plants. Plants, in turn, may be specialized for fertilization by a limited number of pollinators. In these cases, the loss of a plant or a pollinator can have devastating consequences. In contrast, generalist pollinators are able to pollinate many types of plants, which enables them to adapt to multiple environments.

CRAFT AN APPROACH

Make a business case

- Valuation and strategic environment assessments of ecosystem services

Policy and legal approaches

Education

Partnering with key stakeholders

Spatial and land use planning

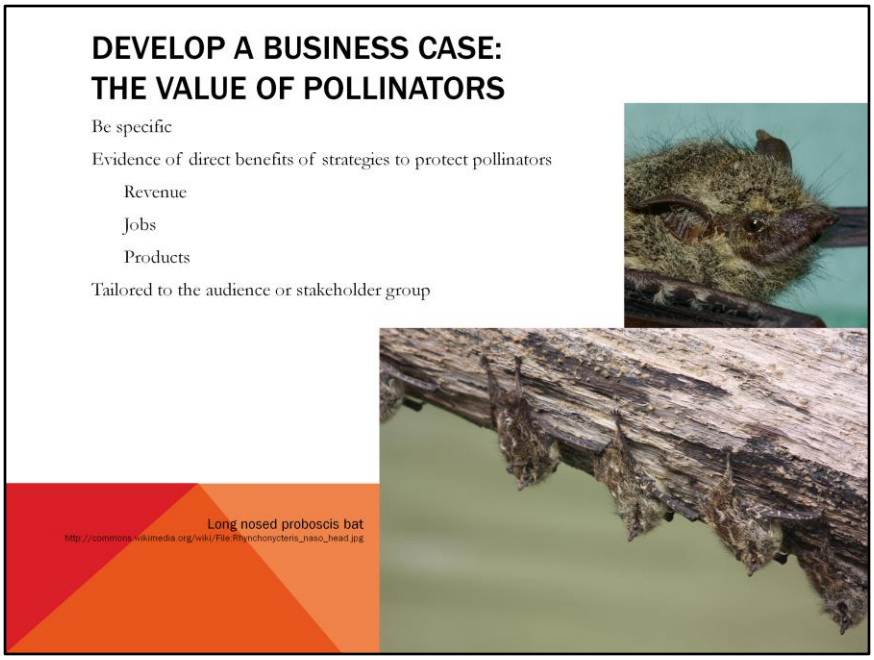
Prioritizing

Economic incentives

- Payment for ecosystem services
- Revenue sharing

Mosquito pollinating a flower.
Photo by Beatriz Moisset.
http://www.fs.fed.us/wildflowers/pollinators/pollinator-of-the-month/aedes_communis.shtml

Let's talk about some of the threats that pollinators face. We will go into these threats in more detail in the weeks to come. If you read the news about pollinators in the last few years, you might be tempted to conclude that bees are going extinct due to pesticide use, and you may not have heard other types of pollinators mentioned. Land use in general, and agricultural practices specifically, definitely do take their toll on ecosystems, including pollinators. The human population is increasing, which increases the need for cultivated land to grow food, timber, and other products. In order to squeeze more food out of less land, agricultural practices are increasingly intensive. Uncultivated land is diminishing, leaving less forage for pollinators. Habitat may be fragmented, which may impede the movement and migration of pollinators between plant populations. While pesticides are certainly a concern, how much attention should be given to other aspects of land use intensification? Does this affect other important species besides bees?



The effects of climate change on plant/pollinator interactions have yet to be fully understood. There are concerns that climate change will disrupt these interactions. For example, the areas that plants and pollinators have adapted to live in may shift, and no longer overlap. Plants could bloom earlier, before pollinators have emerged. Drought could affect bloom timing or plant or pollinator survival. Extreme weather events could affect pollination activity.

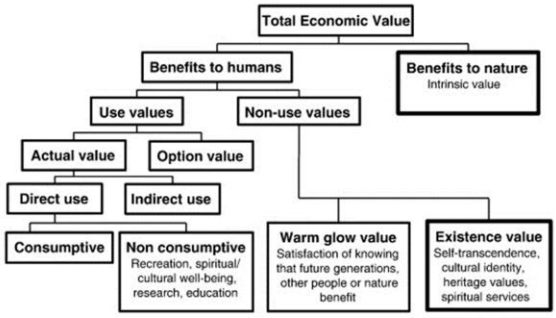


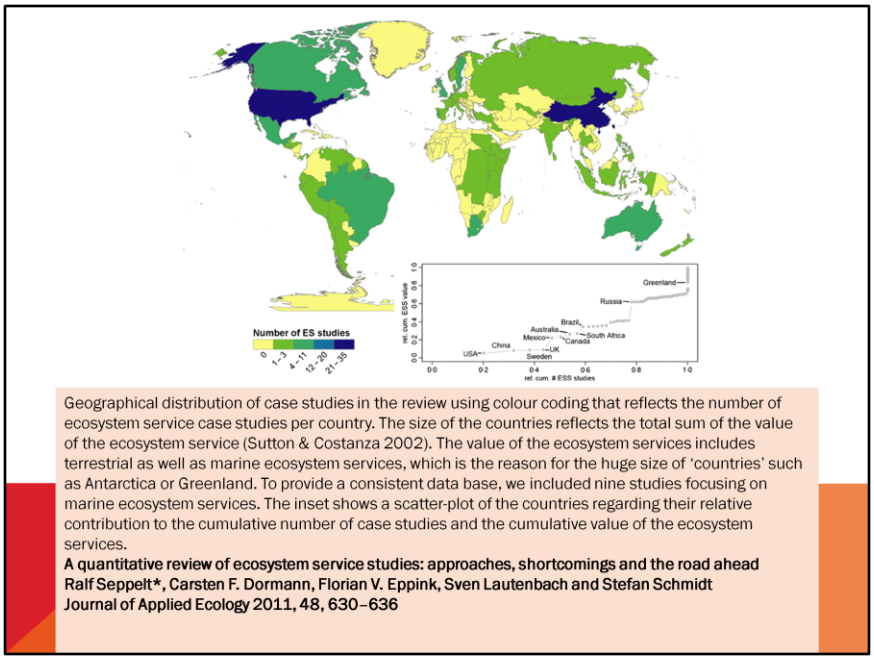
Fig. 1 Topology of values. <ce:source> Adapted from <ce:cross-ref refid="bb0350" id="cf0005"> Pascual et al. (2010): 195</ce:cross-ref> .</ce:source>

Marc D. Davidson

On the relation between ecosystem services, intrinsic value, existence value and economic valuation

Ecological Economics, Volume 95, 2013, 171 - 177

http://dx.doi.org/10.1016/j.ecolecon.2013.09.002



Geographical distribution of case studies in the review using colour coding that reflects the number of ecosystem service case studies per country. The size of the countries reflects the total sum of the value of the ecosystem service (Sutton & Costanza 2002). The value of the ecosystem services includes terrestrial as well as marine ecosystem services, which is the reason for the huge size of 'countries' such as Antarctica or Greenland. To provide a consistent data base, we included nine studies focusing on marine ecosystem services. The inset shows a scatter-plot of the countries regarding their relative contribution to the cumulative number of case studies and the cumulative value of the ecosystem services.

A quantitative review of ecosystem service studies: approaches, shortcomings and the road ahead
Ralf Seppelt*, Carsten F. Dormann, Florian V. Eppink, Sven Lautenbach and Stefan Schmidt
Journal of Applied Ecology 2011, 48, 630–636

This figure shows ecosystem service studies around the world with the following characteristics: how the data and models were good parameters for measuring ecosystem function; an analysis of trade-offs; recognition of off-site effects; and comprehensive involvement of stakeholders in assessing the problem. This figure shows how the types of research and information about ecosystem services in countries and regions may not be proportional to the values that ecosystem offers. Without the type of information that can be used to engage stakeholders, shape policy, or make an economic case, it is difficult to mainstream pollinator preservation efforts.