25 March 2005
28th class meeting
(Miller Chapters 8 and 11)

Environmental Biology
ECOL 206
University of Arizona
spring 2005

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Environmental Biology 206
- SE Chapter 8, Levidow, Rifkin
- SE Chapter 11, Gore, Colborn
- Project Installment due 28 March 2005:
  - Push back to Wednesday 30 March
- Lab next week: meet at van, going to Los Reales Landfill

206 Course Web Link:
Group Project Methods

3. Methods / Action Plan (35 points)
Due 28 March 2005 (Change to Wednesday 30 March 2005)
(This portion of the project will likely require 2-5 pages or more).
How are you going to affect change? Who will you talk to and why? What will you invent? How will you convince decision makers to make a change? How will you assess if your project did, indeed, effect change? Include quantitative and qualitative measures of assessment. Are your proposals cost-effective (be sure to include externalities)? Include a timeline of your proposed actions. Be creative, thorough, and persistent.

-how implement?
Target, Scale, Thought through, etc. Will your timeline work?

-who work with?
Are you dealing with appropriate decision makers?
Do you know how to contact them?

-how convince?
What is your sales pitch? Is it persuasive? Have you thought of the counterarguments and met them head-on? Cost effective?

-how assess?
How will you know that your implemented changes are working? Data collection? Graphic analyses?

-previous successes...
http://www.nwf.org/campusecology/index.cfm

CORN

A combine works its way through the CornCam field in East Central Iowa. Yields in this part of the state are up over 9 percent from last year.
**Kingcorn.org**, also known as the Corn Growers' Guidebook, is a World Wide Web site devoted to more profitable corn management systems. The Guidebook has been available on the Web since 1994!

http://www.agry.purdue.edu/ext/corn/about.htm

<table>
<thead>
<tr>
<th>Grass, <em>Zea mays</em> ssp.</th>
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<tbody>
<tr>
<td>Domesticated 6,000 years ago by mesoamerican civilizations in <em>tropical mexico</em></td>
</tr>
<tr>
<td>- still a region of genetic diversity</td>
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</tbody>
</table>

456.2 million tons/year
- Food
- Animal Feed
- Pharmaceuticals
- Industrial Production

http://maize.agron.iastate.edu/maizearticle.html

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**CORN**

If you are looking for the world famous **Chat 'n Chew Café**, then look no farther than [www.kingcorn.org/cafe](http://www.kingcorn.org/cafe).

Questions about **drought stress and crop production**? Check out [Purdue's Agronomic Drought Stress Information site](http://www.agry.purdue.edu/ext/drought).

Searching for **corn hybrid performance data**? Check out the North Central Crop Evaluation Committee page at [http://www.ksu.edu/kscpt/nccec/](http://www.ksu.edu/kscpt/nccec/).

Interested in **'biotech' issues**? Go to the archive of 'biotech' issues at [www.kingcorn.org/cafe/biotech.html](http://www.kingcorn.org/cafe/biotech.html).

Want to build a **corn maze**? Check out what others have done at [www.kingcorn.org/cgg5/maze.htm](http://www.kingcorn.org/cgg5/maze.htm).

Looking for **smut**? Check out the edible corn smut recipes at [www.kingcorn.org/cgg5/recipes.htm](http://www.kingcorn.org/cgg5/recipes.htm).

Need some corny ideas for your **classroom activities**? Go to the head of the class at [www.kingcorn.org/cgg5/classroom.htm](http://www.kingcorn.org/cgg5/classroom.htm).
Corn Blight

USA 1970s, **15%** corn died, $1 billion lost

Fix:
Mexican heirloom varieties and traditional cross breeding

Similar stories (peruvian tomato contribution)
(see discussion in McPherson, KtN, chapter 5)

Teosinte

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Native Seeds/SEARCH is a non-profit organization that seeks to preserve the crop seeds that connect Native American cultures to their lands.

- To conserve, distribute and document the adapted and **diverse varieties** of agricultural seed, their wild relatives and the role these seeds play in cultures of the American Southwestern and northwest Mexico.

- We safeguard **2000 varieties** of arid-land adapted agricultural crops. Some, like watermelons, were adapted from seeds brought by early Europeans. Most of our collection consists of varieties of **indigenous crops** developed over centuries or millennia to suit the needs of their human partners.

- We promote the use of these ancient crops and their wild relatives by distributing seeds to traditional communities and to gardeners world wide. Currently we **offer 350 varieties** from our collection, grown out at our Conservation Farm in Patagonia, Arizona.

- We also work to **preserve knowledge about the traditional uses** of the crop we steward.

- To **protect biodiversity and to celebrate cultural diversity**: crop loss means an inevitable reduction in genetic diversity; thousands of years of evolution down the drain. The loss, in human terms, is equally severe.

Contact Us
Phone: (520) 622-5561
Fax: (520) 622-5591
info@nativeseeds.org

Mailing Address
Native Seeds/SEARCH
526 N. 4th Ave.
Tucson, AZ 85705-8450

http://www.nativeseeds.org/
Pesticides
biocides, herbicides, insecticides, fungicides, etc.

Chemical arms race is hundreds of millions of years old!

Some banned in US but still produced here and exported. Ethical implications?

Ideal:
1. kill only target pest
2. not lead to genetic resistance
3. disappear or breakdown into harmless components
4. more cost effective than doing nothing

US: Pesticide use up 33x since 1942, but lose more crops to pests than in 1940s (37% vs. 31%; Miller p. 166)
GMO’s (genetically modified organisms)

How different from cross breeding?

See Levidow 1999

Continuing the Green Revolution?

GMO’s (genetically modified organisms)

See Levidow 1999
**Levidow 1999 (Regulating Bt Maize in the U.S. and Europe)**

**Bt = Bacillus thuringiensis** bacterium  
(contains gene that codes for protein toxic to some insects)  
**Genetically Modified** Crops (cotton, potatoes, maize)

**Costs and Benefits**  
- Yields and Fewer Agrochemicals  
- Agriculture, Environment (Monarchs), Humans  
- Resistance, Arms Race, ‘Genetic Treadmill’  
- Herbicide and Ampicillin markers

**IRM = Insect Resistance Management**  
“High-Dose/Refuge” Strategy  
3-5 year time window

**Solutions**  
Crop Rotation, IPM etc.

**EPA, EU**

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**Monarch Butterfly**  
*Danaus plexippus*

- Lepidoptera (order)  
- Papilionoidea  
- Danaidae  
- Milkweed Butterflies

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*Figure 82-4*  
Emigration (movement away from a specific area)  
and immigration (movement into a specific area) are important factors in the population sizes of migratory animals. Shown here is a population of monarch butterflies spending the winter in the mountains of central Mexico. Monarch butterflies migrate into the United States and Canada for the summer months and return to Mexico for the winter. A round trip often involves several generations. Somehow, individual monarchs know where to winter in Mexico without having seen the sites before.  
(William F. Fugerson)  
*Solomon et al. 1993*
Migration - 2000 miles
Canada <-> Mexico
(Hawaii, Australia)
Millions
Multiple Generations!

egg → adult, 4 weeks
Mullerian Mimicry

Figure 17–19  Mullerian mimicry. These various butterflies are all unpalatable.

Milkweed (foliage, flowers, buds, fluid)
Poisonous cardenolides

Bacillus thuringiensis
Bt corn pollen --> milkweed