

What's the buzz? A case study on pollinators in Chicago

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Introduction

Jen Rosenthal is worried about her squash plants.

“Last year they looked just amazing!” she said. “I had enough zucchini blossoms to harvest for my favorite squash blossom soup in our restaurant, Uncommon Ground, and we still had loads of zucchini production for other dishes.”

But this year, Jen is facing different challenges as the manager of the rooftop garden at Uncommon Ground. Her squash plants are looking puny and the fruit production is almost non-existent.

“I called up some friends that are also urban gardeners, and felt frustrated that no-one has an answer.” Jen stepped back from her rooftop beds and mused.

“Lots of us have guesses about what could be going on, and I suspect that it may have something to do with reduced numbers of pollinators—but we just don’t know,” she said. “Since I manage a market garden, the pressure to produce is on. We’re also the first certified organic rooftop garden in the nation, so people look at what we’re doing, and I want it to look good.”

“I was curious about the pollinator angle, so I called my pal Jennifer Hopwood, who’s a pollinator specialist with Xerces Society. Jennifer said that “urban habitats can provide important habitat and floral resources for pollinators, but often times we fall short of designing urban green spaces that benefit pollinators. Then, in turn, people get short-changed on all the benefits that pollinators provide.” ”

Jen’s curiosity was piqued, and questions were popping into her mind. She wondered, “Do we have enough pollinator habitat in Chicago? What about in my neighborhood, Roger’s Park? What are we doing to support pollinators in Chicago? What can we do to conserve and increase pollinators in our city?”

Name _____; Collaborators _____

Write your notes from the in-class discussion centered on the following guiding questions. Please write legibly, as these responses will be turned in at the end of today's class.

Guiding Questions:

- 1) What are the biotic and abiotic resources needed for producing food in an urban environment? Do these have management considerations that are similar/different from considerations in rural farms?

Key abiotic factors:

--Management considerations for abiotic factors:

Biotic factors:

--Management considerations for biotic factors:

- 2) Pollinators were among the important biotic factors in our agroecosystem. How do growers determine the importance of pollination on their garden or farm? Hint: What crops are being grown? Which depend on pollinators? What are some of the key considerations highlighted in the reading from the Xerces Society chapter on conserving native pollinators?

Draft Concept Map: A case study on pollinators in Chicago

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BLOCK TWO

THE STORY - Part B

“BEE” Confused by Climate Change

Jen has heard a lot about climate change. While she is worried about her garden, she is also concerned about the melting glaciers and rising sea level. “I wonder if they are related.” She thinks.

One day, as she is driving down Sheridan Road, she sees the sign of the Farmer’s Market run by the Loyola University Chicago students. She is interested in what these student farmers grow. So she parks her car and walks in to the market.

“Welcome to the Farmer’s Market!” Jen receives a warm welcome from the student manager, Alexandra, “Is there anything I can help you with?”

“Um... Yes. Actually there is.” Jen notices on the badge that Alexandra wears, it says she is associated with the Institute of Environmental Sustainability. She decides to ask Alexandra, “Have you heard of the declining bee population in the U.S.?”

“Yes. I have. And I am concerned about it.” Alexandra replies.

“Do you think it has anything to do with climate change?” Jen asks.

“Yes. I think climate change can affect bees. I read a few articles last semester that directly address this issue. One way that climate change affects bees is that there may be less pollen for bees to feed on.” Alexandra answers.

“How does that happen?” Jen asks.

“For example in the Rocky Mountains, as a result of warmer spring temperatures, on average, the onset of spring snowmelt in the Rockies now occurs approximately two weeks earlier than it did in the late 1970s. Some plants respond to this change by starting to grow earlier in spring. However, if they start to grow buds earlier than the last frost of the spring, the buds would be damaged by the frost [1]. Some less-responsive plants would begin to flower 35 to 60 days after the snowmelt, and miss the opportunity to make the best use of the water from the melting snow [2]. Both have resulted in fewer wildflowers observed in the Rockies, which reduced the amount of pollen available to bees. This can contribute to the declining bee population,” says Alexandra.

“That makes sense. Is that it?”

“Another important way that climate change affects bees is causing a mismatch of phenology of plants and bees, meaning the timing of the flowering of plants and the timing of the pollination of bees are mismatched.”

“I know that plants will start to green-up earlier in spring if the temperature is warmer,” says Jen. “You’re right. And plants are more likely to advance their lifecycle stages than bees in response to warmer spring temperatures. This means plants may start to flower in spring before bees wake up from hibernation [3],” says Alexandra.

“Then, that’s bad for both. Bees miss the flowers and flowers don’t get pollinated!”

“Yes. Think about the crops and trees in Illinois that are pollinator-dependent. Studies show that vegetation zones are shifting poleward as the climate becomes warmer. This means plants that are normally found in southern states will start to grow in northern states. In the Midwest, average temperatures have become warmer and the largest increase has been measured in winter. The length of the frost-free season has been extended by more than one week, mainly due to earlier dates for the last spring frost. It is predicted that by 2050 Illinois will have a climate similar to the current climate of Mississippi and Missouri [4]. This means bees’ habitat will change.”

“Now I am even more worried about the vegetables growing in my garden!” says Jen.

Resources used:

[1] McKinney and Inouye (2012), Phenology of species interactions in response to climate change: two case studies of plant-pollinator interactions using long-term data, 2012 Fall Meeting, AGU, San Francisco, CA, 3-7 Dec.

[2] Steltzer et al. (2012), When Snow Melts Early: The Unusual Alpine Plant Life Histories During the Summer of 2012, 2012 Fall Meeting AGU, San Francisco, CA 3-7 Dec.

[3] Forrest and Thomson (2011), An examination of synchrony between insect emergence and flowering in Rocky Mountain meadows, *Ecological Monographs*, 81(3), 2011, pp. 469–491

[4] U.S. Climate Change Research Program (2009), Climate Change in the Midwest, <http://nca2009.globalchange.gov/midwest>

Names _____ Date _____

Read Part B of the story, “Bee” Confused by Climate Change. Answer the following questions. Each group submits one copy.

1. How are bees affected by climate change in the Rocky Mountains?
2. Do you think bees in a city like Chicago will be affected by climate change as well? If yes, will they be affected in the same way as in the Rockies?
3. How might pollinators like bees respond to climate change? [Think of three possibilities.]
4. When plants are migrating poleward and changing the habitat of bees, can bees migrate along with them?
5. How will farmers be affected by the declining bee population? What should they do to conserve pollinators?

[Write on the back of this page if you need more space.]

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BLOCK 3: SOLUTIONS

"What *can* we do to conserve and increase pollinators in our city?"

3.1 - Site Scale: Uncommon Ground

Having learned more about native bees, Jen has decided to attract more of these pollinators to Uncommon Ground's garden. She wonders, "What can I do in the coming growing season to increase pollinators at our site?" Working in the same small groups, your task is to identify specific actions that Jen can take at the Uncommon Ground site to increase pollinators in the garden.

1. Using the research you did outside of class on native pollinators, develop a list of recommendations for Jen based on your knowledge of what crops each bee pollinates, its habitat preferences, and foraging distances. Each group will turn in one copy of its recommendations at the end of class. Be sure to include the following:
 - a. Target pollinator (i.e., which bee?)
 - b. Actions Jen can take to conserve or increase this pollinator's presence in the garden
 - c. Rationale for why these actions makes sense based on what you know about this pollinator

2. As a group discuss:
 - a. Will these actions be sufficient to reach Jen's goal of increasing pollinators in the garden? Why or why not? Reference your system map to answer these questions.

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3.2 - Larger Scales: Rogers Park Neighborhood and Chicago Region

It's your turn to conduct a stakeholder analysis! Working in your small group, complete the stakeholder analysis worksheet for your assigned scale (Rogers Park neighborhood or Chicago region). Take notes for your own reference on your worksheet, because you will use this information later in an individual written assignment. Prepare a larger version of the chart (on whiteboard, chalkboard, or newsprint) to share your group's analysis with the rest of the class.

1. At the top of the chart, write the goal(s).
2. In the left-hand column, list the stakeholders (persons or groups who are affected by or can influence a decision or action).
3. For each stakeholder, work across the columns to:
 - a. estimate their attitude toward pollinator conservation,
 - b. assess how confident you are in this estimate,
 - c. estimate their influence in pollinator conservation,
 - d. assess how confident you are in this estimate, and
 - e. identify strategies for involving this person or group based on your estimates of attitude and influence.
4. Post your group's completed chart for the rest of the class to see.
5. Be prepared to explain to the class your rationale for the stakeholder involvement strategies you are recommending.

What's the buzz? Stakeholder Analysis

Name: _____

Write goal here (including the scale of focus):

Stakeholders	Att		Inf		Strategies
	E	C	E	C	

Att=attitude **Inf**=influence **E**=estimate **C**=confidence

See reverse side for explanations of columns.

Column 1. A stakeholder is anyone who is affected by, or can influence, a decision or action. These might be individuals (e.g., Jen) or groups (e.g., gardeners). If stakeholders can be treated as a group, use groups. On a separate piece of paper, list as many stakeholders as you can. Then transfer them to the chart in rough order of importance. You might change your mind about their importance after this analysis.

It is recommended to work across the page for Columns 2 to 5.

Column 2: Your best estimate of the stakeholder's attitude, from supportive to opposed.

++ strongly in favor

+ weakly in favor

0 indifferent or undecided

- weakly opposed

-- strongly opposed

Column 3: How confident you are about your estimate in column 2.

/ (a tick) for fully confident

? for reasonably confident (some missing information or some doubts about interpretation)

?? for an informed guess

??? for wild guess or sheer fantasy

Unless the group achieves immediate agreement, then at least one question mark is warranted.

Column 4: Your best estimate of the influence of the stakeholder.

H high (this person or group has power of veto, formally or informally)

M medium (you could probably achieve your goals against this person's or group's opposition, but not easily)

L this person can do little to influence the outcomes of your intended actions

Column 5: How confident you are about your estimate in column 4. Use the same codes as in column 2.

Column 6: Decide upon strategies you will use to approach and involve each person or group. For some, the strategy will be to obtain more information about this person or group to estimate more confidently their attitudes and influence. For others, the strategies will include specific ways that you will inform, consult with, or directly involve the stakeholder to create change in the system. Use your estimates in columns 2 to 5 to inform your strategies:

In general, question marks indicate a need for more information. The more question marks, and the more influence the stakeholder has, the greater the need. You might choose to approach the person concerned, or you might instead approach someone else assumed to know about the person's attitude or influence.

In general, high influence indicates a need to involve the person in some way. Or, if you choose not to do this, and they are opposed, you will need to find some way to neutralize their influence.

Source: Dick, B. (1997) *Stakeholder analysis* [Online]. http://www.uq.net.au/action_research/arp/stake.html