Undergraduates' Understanding of Agricultural Impacts on Wildlife: A Case for Wildlife Conservation Education

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Agriculture and Biodiversity Loss

- Agriculture is extremely important for maintaining a growing human population

- But, is a leading driver for declines in wildlife populations worldwide
  - Habitat loss and degradation
  - Is a threat to 40% of all mammal species (Schipper et al. 2008. *Science* 322: 225-230.)
  - 62% of all species (n = 8,688) listed under IUCN as 'threatened' or 'near-threatened' with extinction (Maxwell et al. 2016. *Nature* 356: 143-145.)
    - 54% by cropping systems, 26% by livestock, 8% by timber production, 1% by aquaculture

- Landscape conversions to agricultural land-use is happening at unprecedented rates and outpacing conservation efforts

Education is Key for Success!

- Students enrolled in Colleges of Agriculture will be leaders in the agricultural industry

- As such, their understanding about how agriculture impacts biodiversity will be critical for future restoration and management of wildlife populations

- Attitudes and perceptions about wildlife conservation can be contrary to producers' need for profit-based land-management practices
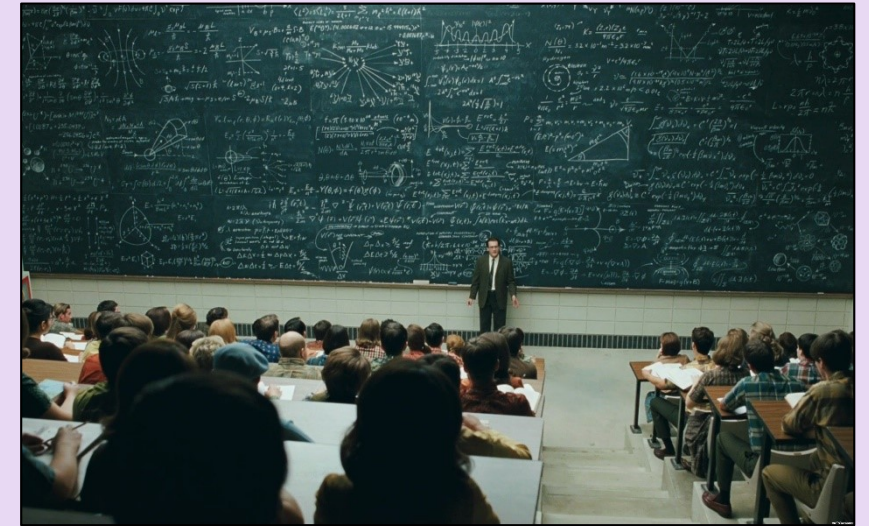
Objectives

- Do students in a college of agriculture understand the impacts of agriculture on wildlife conservation?

- Does area of academic concentration (i.e., major) influence their understanding and perceptions related to agriculture and wildlife conservation?

- How are undergraduate students in a college of agriculture obtaining their information about wildlife conservation?

Methods

- Developed a survey to address these objectives and invited students from KSUs College of Agriculture to participate in Spring 2016
- Two main constructs were tested:
  - Students' level of concern regarding wildlife conservation
  - What human-related activities pose the greatest threat to wildlife conservation
- Administered survey via Qualtircs and sent two reminders to participants who did not take the survey every two weeks
- We tested our survey on 100 undergraduate students to assess length and clarity of questions (no issues were identified)
- ANOVA and Pearson Chi-square tests to assess non-response biases between study respondents and overall sample
- ANOVA (with Tukey's post hoc tests) to test differences in how students in different majors perceived impacts of agriculture on wildlife

Results

- Of 2,290 students invited to participate, 536 surveys were completed (23% response rate)

- 49% of respondents were female

- Mean age was 21.93 years (range = 18-52)

- 59% were upper-class students, 92% were white, and most were from rural areas (77%)

- Most students had not taken a wildlife-related class in high school (85%) or in college (82%)

- Information about wildlife conservation was obtained from the news media (34%), friends and family (24%) or television and movie documentaries (18%)

Results

- Habitat loss is a major contributor to wildlife population declines
  (1 = Not true of what I believe, 4 = Neutral, 6 = Very true of what I believe)

  - Mean response = 5.91 (SD = 1.09)
  - 90.7% of respondents indicated this is somewhat true or very true of what they believe

Results

- <u>Rank the greatest threat to wildlife conservation</u>

Ranking Relative Threats to Wildlife	Mean (SD)
Habitat loss through urbanization	1.78 (1.07)
Pollution	2.83 (1.30)
Climate change	3.66 (1.61)
Habitat loss through agricultural production	3.83 (1.45)
Regulated hunting	3.85 (1.57)
Accidental mortality	5.04 (1.22)

(1 = greatest threat, 6 = least threat)

Results

Department-level differences between the way students perceived various threats to wildlife conservation:

Relative Threats to Wildlife	F	η
Habitat loss through urbanization	0.89	0.12
Pollution	2.53*	0.20
Climate change	1.43	0.15
Habitat loss through agricultural production	6.55*	0.32
Regulated hunting	2.12*	0.19
Accidental mortality	1.19	0.14

Results

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Relative Threats to Wildlife	F	η
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Pollution	2.53*	0.20
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Accidental mortality	1.19	0.14

Department means:
Natural Resources = 3.04 (SD = 1.40)
Animal Science   = 3.94 (SD = 1.32)
Grain Science   = 3.97 (SD = 1.29)
Ag Economics   = 4.27 (SD = 1.57)
Ag Communication = 4.39 (SD = 1.17)

(1 = greatest threat, 6 = least threat)

Results

Comparisons of perceptions of agriculture's contribution to wildlife population declines based on previous coursework experience

- <u>Agriculture is a major contributor to declines in wildlife populations</u>

Have you previously taken a wildlife conservation course	Mean (SD)	F	p	η
In high school				
Yes	4.36 (1.83)	6.65	0.01	0.12
No	3.82 (1.59)			
In college				
Yes	4.31 (1.67)	6.59	0.01	0.13
No	3.81 (1.62)			

(1 = Very untrue of what I believe, 4 = Neutral, 7 = Very true of what I believe)

Results

Comparisons of perceptions of agriculture's contribution to wildlife population declines based on source of knowledge acquisition

- <u>Agriculture is a major contributor to declines in wildlife populations</u>

Knowledge of wildlife conservation derived from:	Mean (SD)	F	p	η
Conversations with family and friends	3.21 (1.56)	6.08	0.01	0.25
News media coverage	4.00 (1.60)			
Other	4.08 (1.64)			
High school course(s)	4.15 (2.23)			
Television or movies	4.17 (1.56)			
College course(s)	4.43 (1.55)			

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Results

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Conclusions

- Students enrolled in the College of Agriculture generally were aware that habitat loss and degradation is the greatest threat to wildlife populations worldwide

- However, they were less informed about the relative impacts that agriculture has on wildlife populations

- Those who have taken at least one wildlife-related course (in high school or college) were more aware of how agriculture can potentially impact wildlife populations

Conclusions

- Surprisingly, students were less knowledgeable about the impacts of agriculture on wildlife when their information was coming from family or friends

- We found that at least one class related to wildlife could effectively inform students about potential threats to wildlife

- Curricula are generally loaded down, and finding room to offer these types of classes will be challenging

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Undergraduates' Understanding of Agricultural Impacts on Wildlife: A Case for Wildlife Conservation Education

Ryan Sharp* and Adam Ahlers

Abstract

Agricultural production is considered one of the leading drivers of declines in wildlife populations, and educating future land managers about agriculture's threat to biodiversity is required to help restore and maintain wildlife populations. University students enrolled in agriculture-based majors will likely be future leaders in the agricultural industry; however, we have a limited understanding of the knowledge and perceptions our future agricultural leaders toward contemporary wildlife-conservation issues. College students from an agriculture program at a land-grant university in the U.S. Midwest were given an online survey that assessed their understanding of wildlife conservation related issues, and how agriculture may contribute to habitat loss for wildlife. Sample respondents (90.7%) felt that habitat loss is a major contributor to wildlife population declines; however, there was a difference in department-specific responses in the college of agriculture for the questions about agriculture's contribution to declines in wildlife populations. There was also a difference between students with previous coursework related to wildlife conservation and those that had not taken wildlife related courses ($F = 6.59$, $p = 0.01$). The observed differences in this study revealed that those with majors related to natural resources management and previous exposure to wildlife related classes were more likely to understand the impact that agriculture has on wildlife conservation. For these reasons, we suggest that all students graduating from agriculture colleges be required to take at least one course pertaining to wildlife conservation.

Core Ideas

- Students' perceptions of agriculture's impact on wildlife populations differ from science-based information.
- Academic major may influence students' perceptions of agriculture's impact on wildlife populations.
- Where students obtain their information influences perceptions of wildlife conservation.

Although important for sustaining Earth's increasing human population, agricultural production is considered a leading driver of declines in wildlife populations (Green et al., 2005; Hoffmann et al., 2011). For instance, agricultural intensification often results in habitat loss and degradation, which is considered the main threat to 40% of all mammal species (Schipper et al., 2008). Landscape conversions to agriculture are occurring at unprecedented rates and outpacing conservation efforts (Wright and Wimberly, 2013; Lark et al., 2015), prompting a need for alternative conservation strategies.

Educating future agricultural leaders (e.g., land managers, farmers, industry managers) about agriculture's threat to biodiversity is required to help restore and maintain wildlife populations. This task may be challenging; however, attitudes and perceptions about wildlife conservation can be contrary to agricultural producers' need for profit-orientated land-management practices (Carr and Tait, 1991). Past research has highlighted many factors that can affect farmers' attitudes and perceptions of agriculture's contributions to environmental change. McCracken et al. (2015) found that farmers will successfully implement conservation-related programs if they are experienced with and knowledgeable about their benefits. Additionally, Borges et al. (2014) found that livestock farmers' use of improved grassland-management techniques was dependent on both social pressures and perceptions of their own behavioral control. To our knowledge, there have been no studies specifically investigating agricultural producers' attitudes and perceptions toward wildlife conservation.

University students enrolled in agriculture-based majors will likely be future leaders in the agricultural industry and have the unique ability to shape the outcomes of future wildlife conservation efforts. Although this responsibility is important for the future of Earth's biodiversity, there is a limited understanding of the knowledge and perceptions our future agricultural leaders have toward contemporary wildlife-conservation issues. This is concerning as balancing agricultural intensification and biodiversity maintenance will be necessary for future sustainable ecosystems (Matson et al., 1997). Thus, to better inform college-level curricula, it is important that we assess baseline student knowledge of common wildlife conservation issues and understand perceptions.

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Conservation coursework for ag students

by Tracy Hmielowski

Backdrop photo: U.S. Fish and Wildlife Service; Insert: Chesapeake Bay Program

Undergraduate students who plan to pursue careers in agriculture take courses focused on crop production, animal science, and agricultural economics. However, when these students become practicing professionals, their actions will have broad environmental impacts. Ryan Sharp and Adam Ahlers, who are faculty in the College of Agriculture at Kansas State University, wondered how students perceived these broader impacts of agriculture.

To better understand student perceptions, Sharp and Ahlers conducted a survey of undergraduate students within the College of Agriculture at a Midwestern land grant university. The results were recently published in *Natural Sciences Education* (see www.dx.doi.org/doi:10.4195/nse2016.11.0030).

"We realize that undergraduate students at the College of Agriculture have this important responsibility where they're going to be future leaders in agriculture," says Ahlers, an Assistant Professor of Wildlife & Outdoors Management. But he also wondered if they saw themselves impacting biodiversity.

In general, students agreed with a statement that habitat loss contributes to wildlife population declines. However, when asked to rank a list of risks to wildlife populations from greatest to least, students ranked urbanization, pollution, and climate change higher than habitat loss due to agriculture. This suggests that while students recognize wildlife populations are at risk due to human activities, they do not see agriculture as being a part of this problem. "It's important for people who are becoming leaders in this field to understand that there are positive things with agriculture, but there are some negative things," Ahlers says.

The College of Agriculture includes departments that focus on agricultural production, agricultural economics, and natural resource management. Students within the department who focused on natural resources ranked agriculture as a greater threat to wildlife than students from other departments (e.g., animal science and agricultural economics). Students in the natural resource department were also more likely to agree with a statement that agriculture contributes to declines in wildlife populations.

Coursework in wildlife conservation was an important influence. More than 500 students responded to the survey, and less than 20% of them reported taking a wildlife course as undergraduates. However, students with prior wildlife ecology coursework (as either undergraduates or in high school) were more likely to respond that agriculture had a negative impact. "One of the biggest takeaways [from this

Questions?