Improving water quality through conservation on rented land

Collin Weigel | TNC Behavioral Economics Postdoc Fellow at JHU, Project Lead

Heartland Conference | September 28, 2019

The Nature Conservancy
Protecting nature. Preserving life.

PURDUE UNIVERSITY

JOHNS HOPKINS UNIVERSITY

Intensive Farming and Nutrient Runoff

- High productivity, but nutrient runoff is bad
- Government and NGOs encourage using practices that reduce runoff
  - Typically information from NGOs
  - USDA provides payments

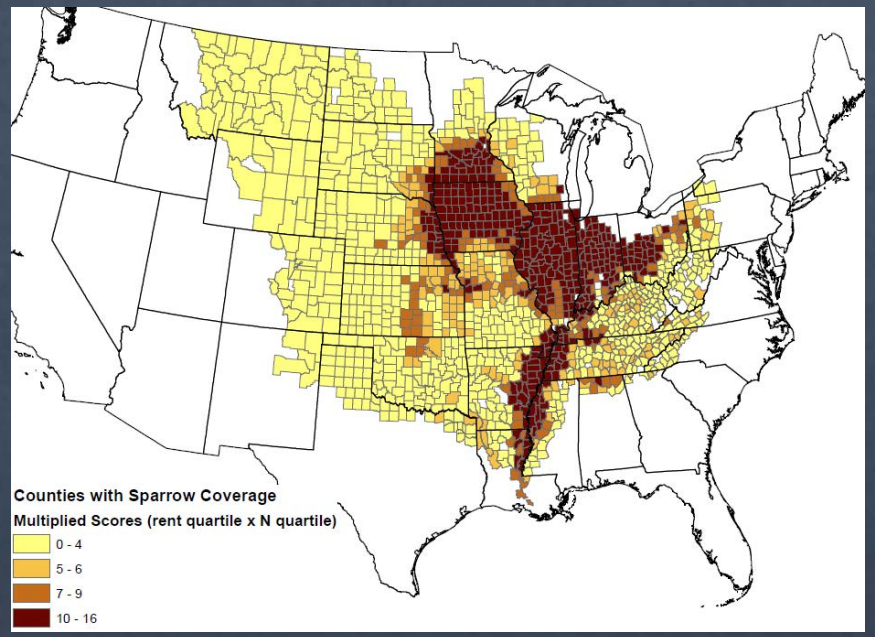
How to Reduce Runoff?

- Adopt conservation practices
  - **Cover crops**
  - No-till, reduced tillage
  - Bioreactors
  - Buffer strips

- Cover crops have on-farm benefits, may be profitable
  - Increased yield, resilience, reduced erosion, potential machinery and gas savings, increased nutrient retention

Low Adoption Rates

- Despite headlines touting large increases in adoption, take-up rate of cover crops is about 2%--7%
  - "200% increase in cover crop seed spending from 2010 to 2013"
  - This includes Department of Agriculture incentives
- Take-up especially low on rented lands
  - About 60% of farmland in Midwest
  - Landowners often know little about farming



Midwest is the top location for rented land with nitrogen runoff

Critical Location and Population

- Midwest has high runoff and a lot of rented land
- Rented land especially unlikely to adopt conservation practices
  - Special barriers to adoption on rented land

Barriers to Adoption

- Purdue University sociologists interviewed landowners, farmers, and other stakeholders. (Ranjan et al. 2019)

1) Landowners lack information
    1) Principal-agent problem, information asymmetry

2) Landowners and tenant do not know how to write a lease
    1) Leases are typically oral

3) Cover crops are not profitable
    1) Little yield benefit, costly to implement, risky, government funding loaded with paperwork

Addressing Barriers to Adoption

- We test solutions to barriers by providing resources directly to landowners

1) Information Treatment
    1) Local resources, information on conservation, how to talk to your tenant

2) Information + Lease Treatment
    1) Lease template with cover crops

3) Information + Lease + Financial Incentive Treatment
    1) $1,500 for 40 acres of cover crops, paid in advance

Enrolled 2,223 landowners controlling 560k acres of crops randomized into main experiment.

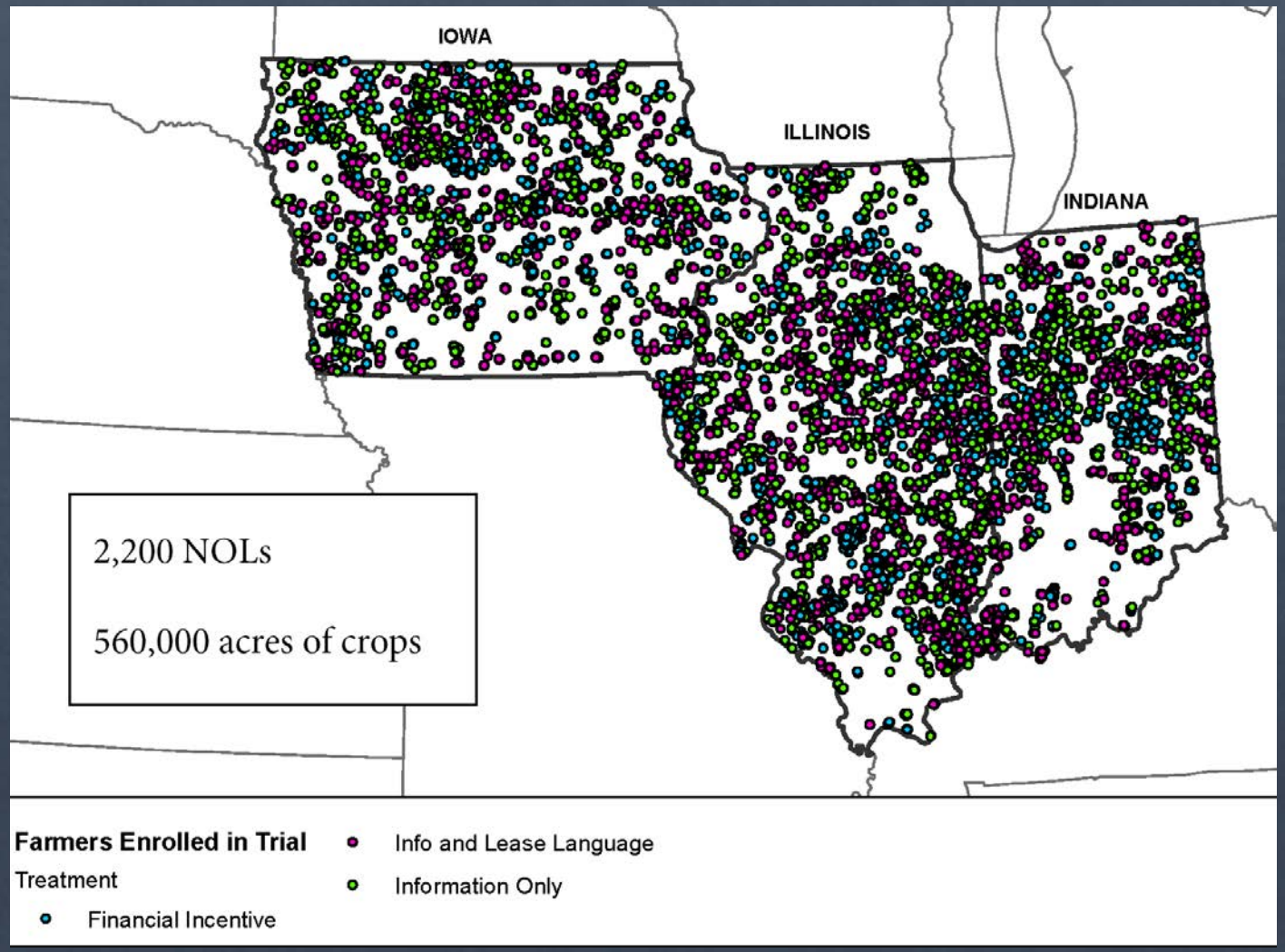
"Yes, I want to learn more about soil health"

Our sample:

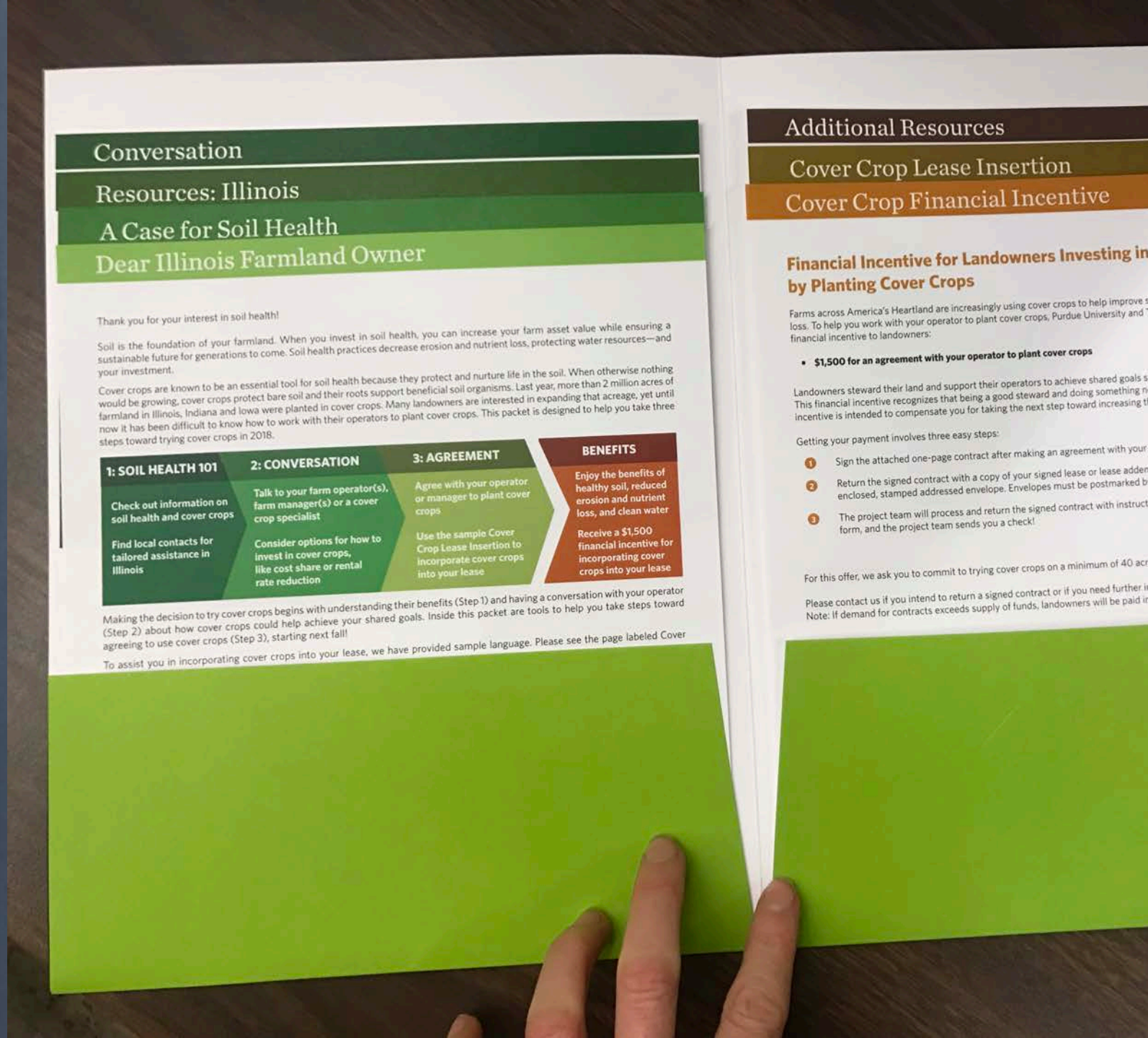
- 2,223 non-operator landowners
- Report not using cover crops in last three years

Treatment of no CC:

- 876 Information
- 868 Lease
- 479 Financial



Three treatment packets



Conversation

Resources: Illinois

A Case for Soil Health

Dear Illinois Farmland Owner

Thank you for your interest in soil health!

Soil is the foundation of your farmland. When you invest in soil health, you can increase your farm asset value while ensuring a sustainable future for generations to come. Soil health practices decrease erosion and nutrient loss, protecting water resources—and your investment.

Cover crops are known to be an essential tool for soil health because they protect and nurture life in the soil. When otherwise nothing would be growing, cover crops protect bare soil and their roots support beneficial soil organisms. Last year, more than 2 million acres of farmland in Illinois, Indiana and Iowa were planted in cover crops. Many landowners are interested in expanding that acreage, yet until now it has been difficult to know how to work with their operators to plant cover crops. This packet is designed to help you take three steps toward trying cover crops in 2018.

1: SOIL HEALTH 101	2: CONVERSATION	3: AGREEMENT	BENEFITS
Check out information on soil health and cover crops Find local contacts for tailored assistance in Illinois	Talk to your farm operator(s), farm manager(s) or a cover crop specialist Consider options for how to invest in cover crops, like cost share or rental rate reduction	Agree with your operator or manager to plant cover crops Use the sample Cover Crop Lease Insertion to incorporate cover crops into your lease	Enjoy the benefits of healthy soil, reduced erosion and nutrient loss, and clean water Receive a $1,500 financial incentive for incorporating cover crops into your lease

Making the decision to try cover crops begins with understanding their benefits (Step 1) and having a conversation with your operator (Step 2) about how cover crops could help achieve your shared goals. Inside this packet are tools to help you take steps toward agreeing to use cover crops (Step 3), starting next fall!

To assist you in incorporating cover crops into your lease, we have provided sample language. Please see the page labeled Cover

Additional Resources

Cover Crop Lease Insertion

Cover Crop Financial Incentive

Financial Incentive for Landowners Investing in
by Planting Cover Crops

Farms across America's Heartland are increasingly using cover crops to help improve s
loss. To help you work with your operator to plant cover crops, Purdue University and T
financial incentive to landowners:

- **$1,500 for an agreement with your operator to plant cover crops**

Landowners steward their land and support their operators to achieve shared goals s
This financial incentive recognizes that being a good steward and doing something n
incentive is intended to compensate you for taking the next step toward increasing t

Getting your payment involves three easy steps:

1. Sign the attached one-page contract after making an agreement with your
2. Return the signed contract with a copy of your signed lease or lease adden
enclosed, stamped addressed envelope. Envelopes must be postmarked b
3. The project team will process and return the signed contract with instruct
form, and the project team sends you a check!

For this offer, we ask you to commit to trying cover crops on a minimum of 40 acr

Please contact us if you intend to return a signed contract or if you need further i
Note: If demand for contracts exceeds supply of funds, landowners will be paid in

An Advance in Program Design

- Randomization and rigorous evaluation
  - Implement a large-scale conservation program while conducting research

- Three measures of take-up
  - Accept financial incentive
  - Post-experiment survey
  - Remote sensing

What Do You Expect?

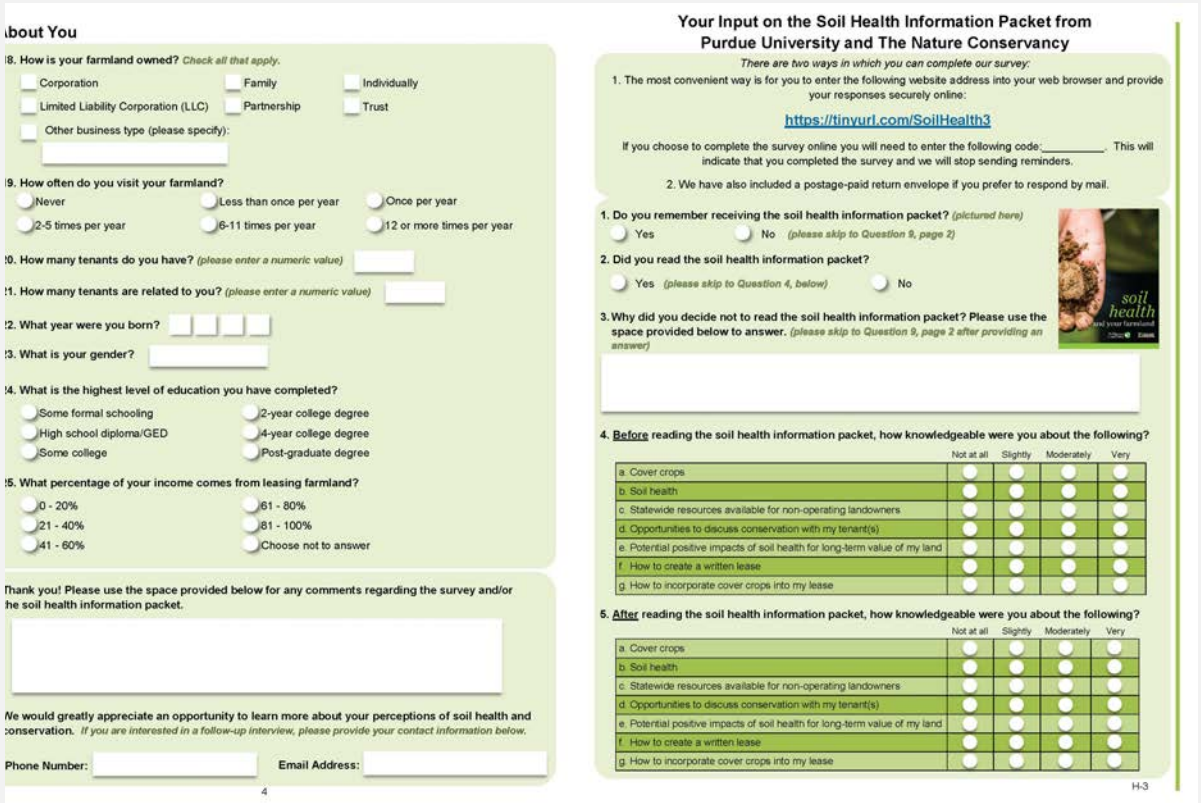
- Adoption: 30 acres of cover crops
- Are any treatments different?
  - Randomly assigned
- What is the cover crop rate for the information group?
  - Landowners showed an interest in soil health
  - Have not/maybe not used cover crops before
- What is the take-up of the financial incentive?
  - $1,500 for 40 acres or more
  - 1-page contract and 1-page lease
  - Paid in advance with no stipulations on cover crop mix

Financial Incentive

- Seven (1.5%) took financial offer

Survey Results

- Roughly 50% response rate
  - Many don't answer all questions
  - Selection concerns
- 8.5% claim they adopted cover crops due to packet
  - 13.5% say maybe



bout You

8. How is your farmland owned? *Check all that apply.*
   - Corporation
   - Family
   - Individually
   - Limited Liability Corporation (LLC)
   - Partnership
   - Trust
   - Other business type (please specify):

9. How often do you visit your farmland?
   - Never
   - Less than once per year
   - Once per year
   - 2-5 times per year
   - 6-11 times per year
   - 12 or more times per year

0. How many tenants do you have? *(please enter a numeric value)*

1. How many tenants are related to you? *(please enter a numeric value)*

2. What year were you born?

3. What is your gender?

4. What is the highest level of education you have completed?
   - Some formal schooling
   - 2-year college degree
   - High school diploma/GED
   - 4-year college degree
   - Some college
   - Post-graduate degree

5. What percentage of your income comes from leasing farmland?
   - 0 - 20%
   - 61 - 80%
   - 21 - 40%
   - 81 - 100%
   - 41 - 60%
   - Choose not to answer

hank you! Please use the space provided below for any comments regarding the survey and/or he soil health information packet.

Ve would greatly appreciate an opportunity to learn more about your perceptions of soil health and conservation. *If you are interested in a follow-up interview, please provide your contact information below.*

Phone Number: Email Address:

4

Your Input on the Soil Health Information Packet from Purdue University and The Nature Conservancy

There are two ways in which you can complete our survey:

1. The most convenient way is for you to enter the following website address into your web browser and provide your responses securely online:

https://tinyurl.com/SoilHealth3

If you choose to complete the survey online you will need to enter the following code:_____. This will indicate that you completed the survey and we will stop sending reminders.

2. We have also included a postage-paid return envelope if you prefer to respond by mail.

1. Do you remember receiving the soil health information packet? *(pictured here)*
   - Yes
   - No *(please skip to Question 9, page 2)*

2. Did you read the soil health information packet?
   - Yes *(please skip to Question 4, below)*
   - No

3. Why did you decide not to read the soil health information packet? Please use the space provided below to answer. *(please skip to Question 9, page 2 after providing an answer)*

4. Before reading the soil health information packet, how knowledgeable were you about the following?

	Not at all	Slightly	Moderately	Very
a. Cover crops				
b. Soil health				
c. Statewide resources available for non-operating landowners				
d. Opportunities to discuss conservation with my tenant(s)				
e. Potential positive impacts of soil health for long-term value of my land				
f. How to create a written lease				
g. How to incorporate cover crops into my lease				

5. After reading the soil health information packet, how knowledgeable were you about the following?

	Not at all	Slightly	Moderately	Very
a. Cover crops				
b. Soil health				
c. Statewide resources available for non-operating landowners				
d. Opportunities to discuss conservation with my tenant(s)				
e. Potential positive impacts of soil health for long-term value of my land				
f. How to create a written lease				
g. How to incorporate cover crops into my lease				

H-3

Remote Sensing

Satellite imagery shows cover crop adoption for all participants

Measurement may not be perfect, but uncorrelated with treatment

Company claims high confidence of detecting for valid pixels

Remote Sensing: What is a Cover Crop?

- Winter Kill
- Spring Emergence
- General
  - Unknown timing due to limited data
- Full Cover
- Commodity (may have environmental benefits)

Remote Sensing: Did They Cover Crop?

- Outcome variable is binary
  - Threshold is met or not

- At least 30 acres of full cover on nearby fields (stringent)
- At least 30 acres of Full cover, winter kill, spring emergence, or general cover (generous)

- Is 30 acres a reasonable threshold? Are people to "adopt" cover crops with fewer acres?

Adoption Rates (Preliminary)

- Summing data over all fields owned by landowner, estimates could decrease

- About 1% adopted full cover
- About 6% adopted any cover

- No significant differences between any treatment, point estimates very similar

Treatment	Odds Ratio	CI
Info + Lease	1.07	0.71 – 1.6
Info + Lease + Financial	0.98	0.6 – 1.6

Low Compliance or Data Issues?

- Seven landowners paid to adopt at least 40 acres

- Full cover: 0
- Full, winter, spring, or general: 1

- Asking imaging company to check these explicitly
- Company claims 85% accuracy at determining existence of cover (not classification)

Conclusions

- Survey and remote sensing data may differ
- Take-up rate may be lower than NGOs hope
  - Surprisingly low given incentives?
  - Testing $5,000 offer on small population
- Compliance may be low without auditing

Conclusions

- Successful implementation of a conservation initiative integrated with a research
  - Random assignment
  - Large sample
  - Objective measurement for **all** participants

- Should not expect to find immediate success, important to try **and measure**!

Acknowledgements

Project Team

- Sheila Reddy, TNC – Project Director
- Linda Prokopy, Purdue
- Chloe Wardropper, Purdue/TNC
- Pranay Ranjan, Purdue
- Francis Eanes, Purdue
- Laura Esman, Purdue
- Jackie Getson, Purdue
- Paul Ferraro, Johns Hopkins University
- Yuta Masuda, TNC
- Seth Harden, TNC
- Dave Harlan, TNC
- Randy Dell, TNC

TNC Steering Committee and Internal Advisors

- Larry Clemens
- Heather Tallis
- Michael Doane
- Caroline Wade
- Susan Hickey
- Michael Dunn
- Greg Wandrey
- Soil Health Team Members

Thank you!

Collin Weigel

CollinW@jhu.edu