

Ecosystem Restoration Efforts on Private Lands: The Role of Farm-scale Planning and Delivery

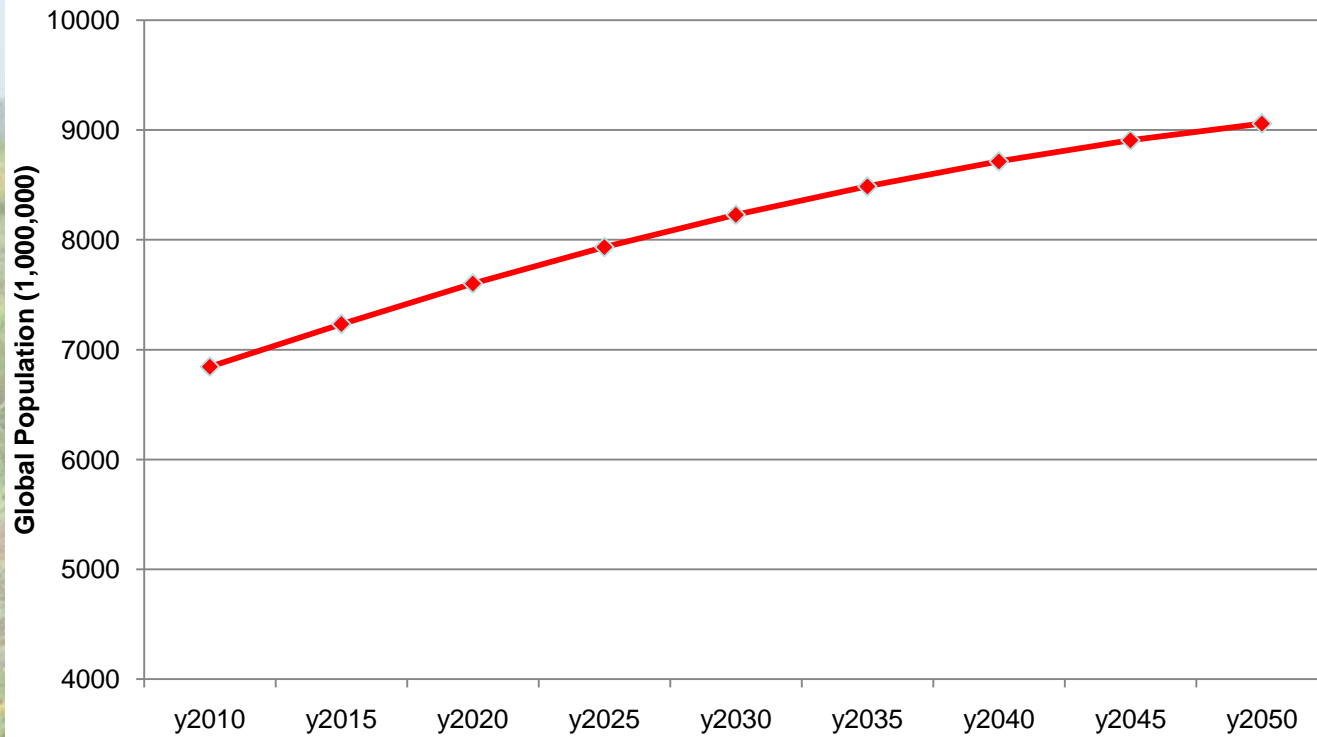
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Dept. Wildlife & Fisheries
Mississippi State University



August 1 – 5, 2011, Baltimore, MD

Challenges

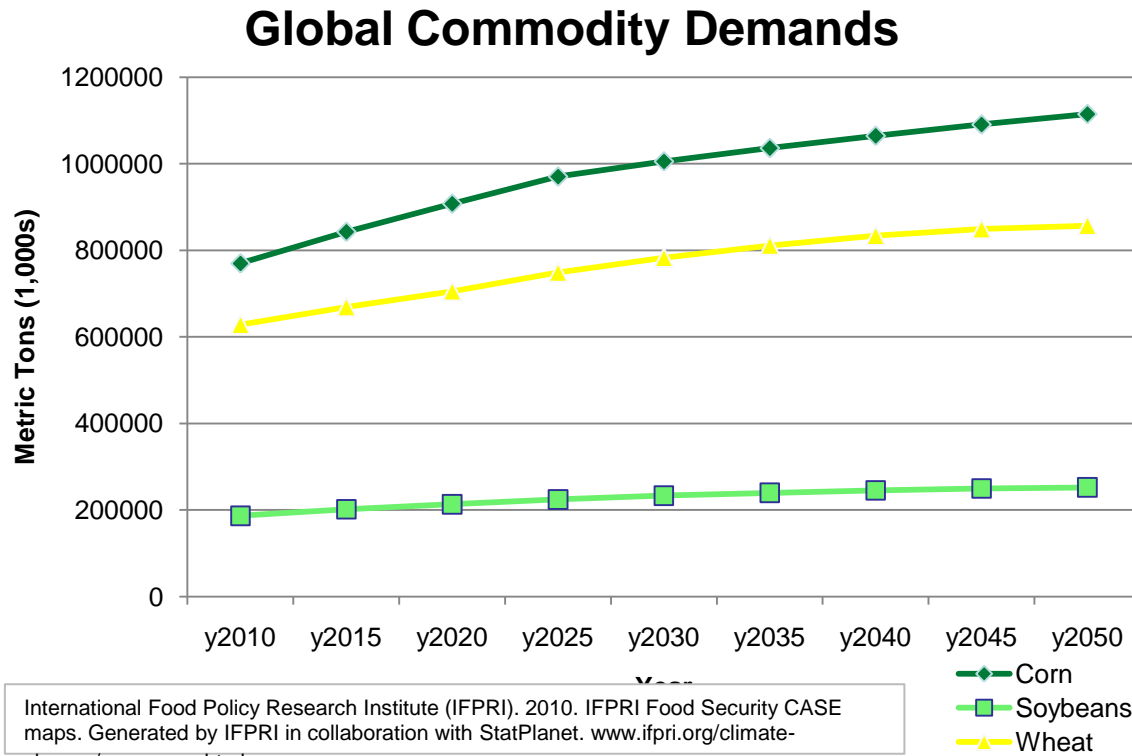
Global Population



International Food Policy Research Institute (IFPRI). 2010. IFPRI Food Security CASE maps. Generated by IFPRI in collaboration with StatPlanet. www.ifpri.org/climate-change/casemaps.html.



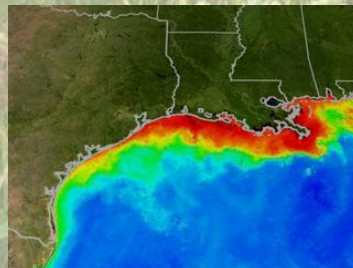
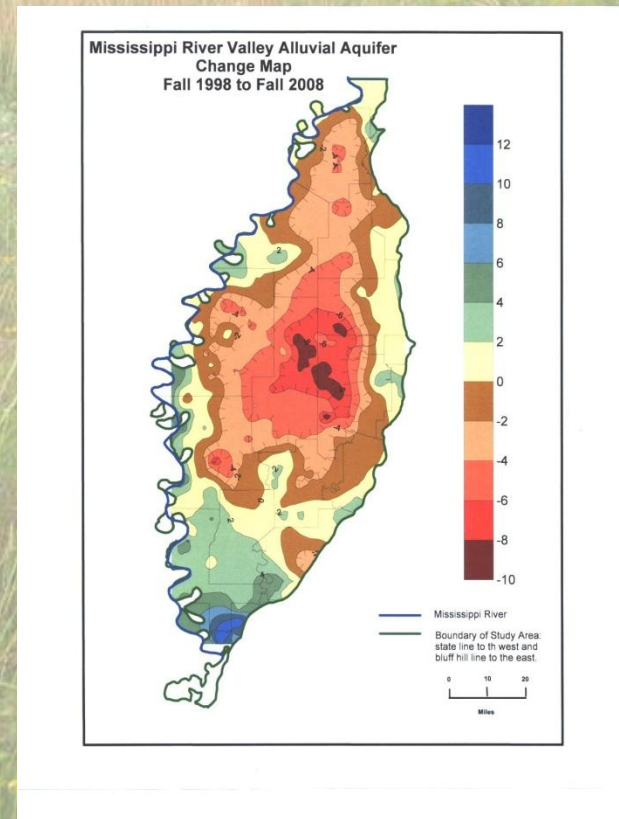
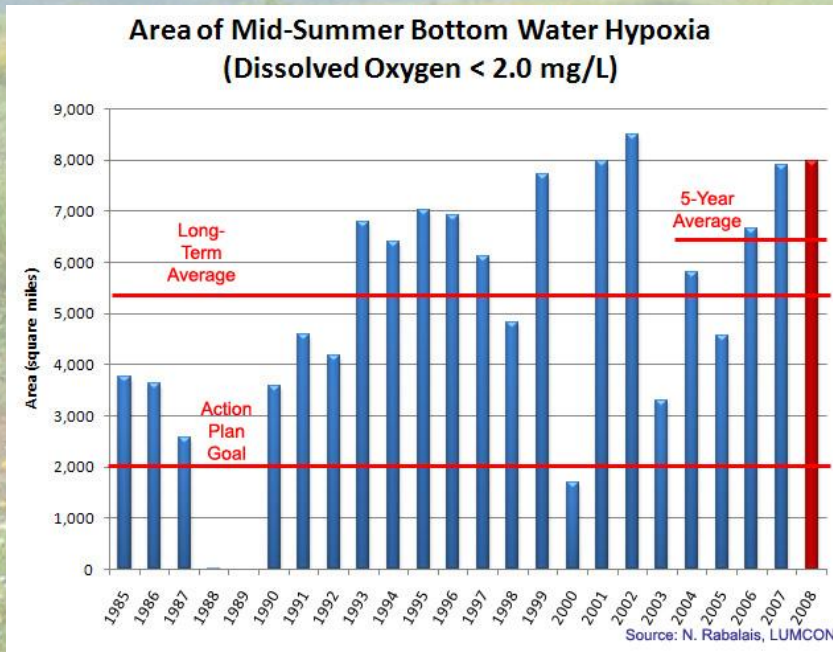
Challenges



- Global food demands expected to increase by 50-100% over next 40 years.
- Rate of growth in demand will exceed growth in yield/production.
- Demand will be met through a combination of technology, intensification, and extensification.

Challenges

- Water Quantity
- Water Quality



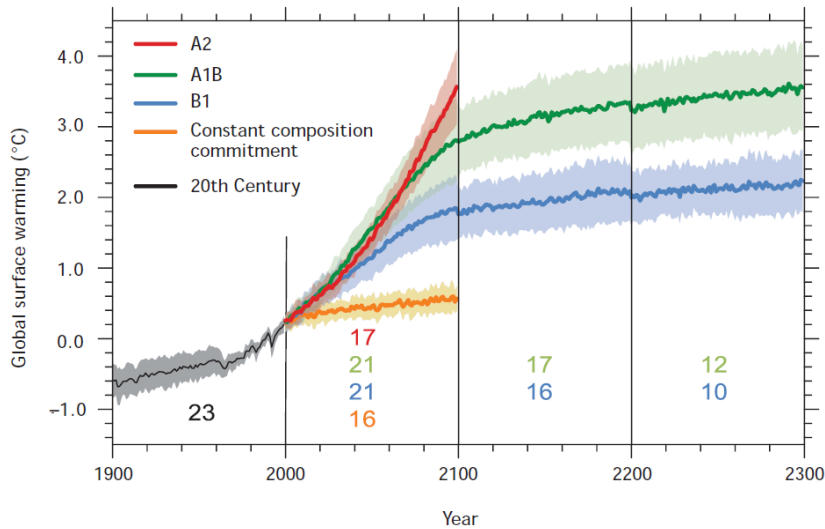
Challenges

- Development
- Urban Sprawl



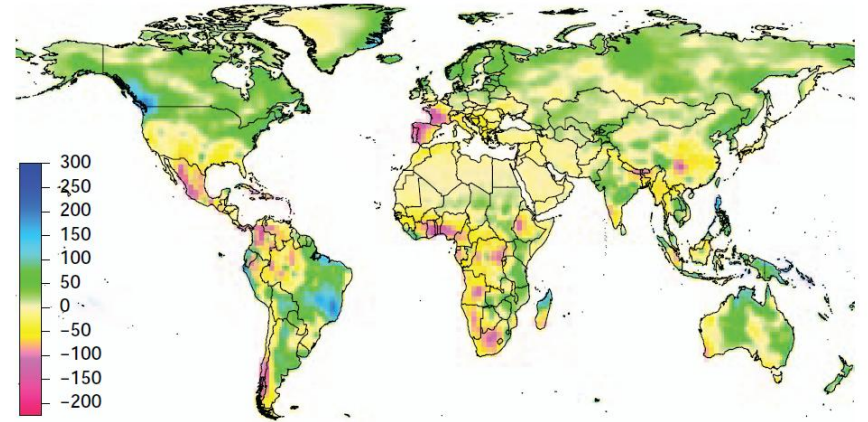
Challenges

- Climate Change

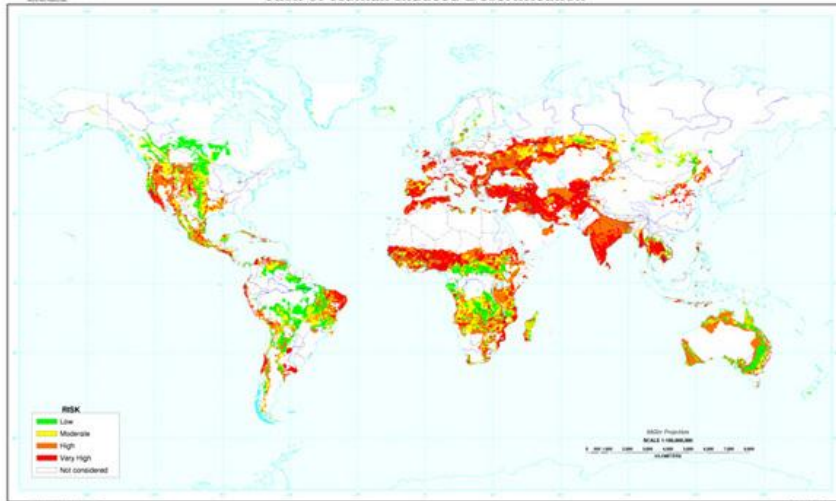


Source: Reprinted with permission from the Intergovernmental Panel on Climate Change (2007).

Figure 1.7 Change in average annual precipitation, 2000-2050, CSIRO, A1B (mm)

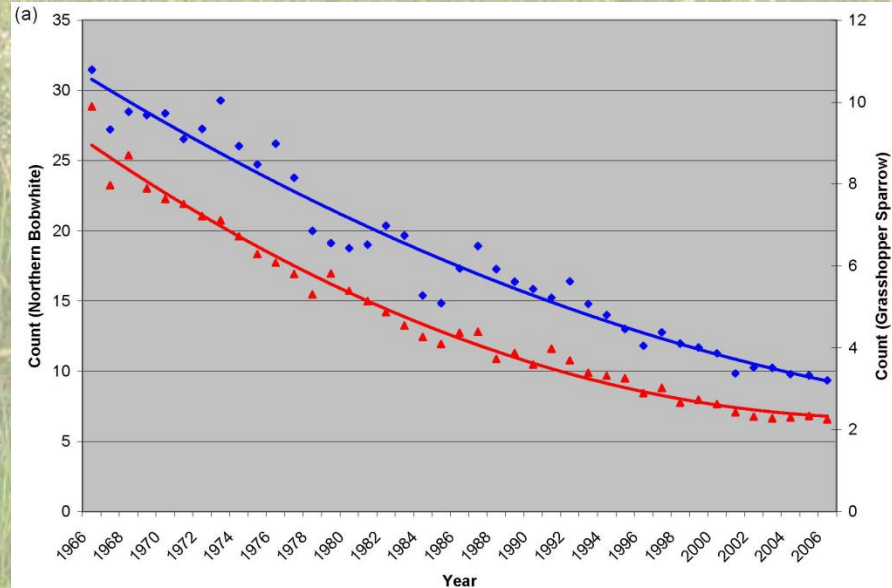
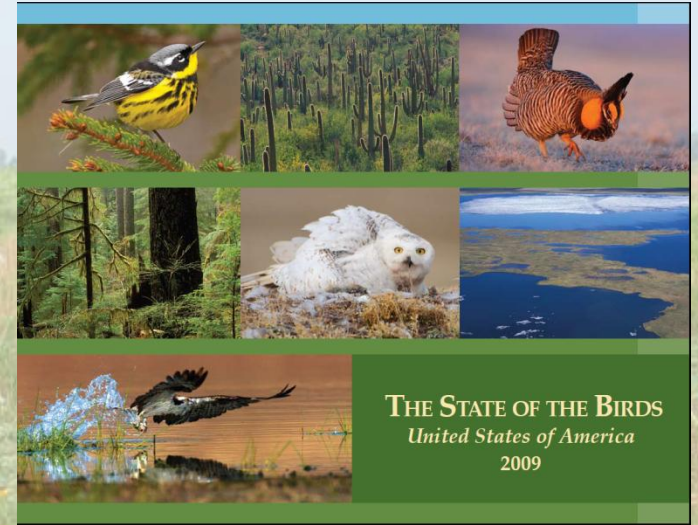
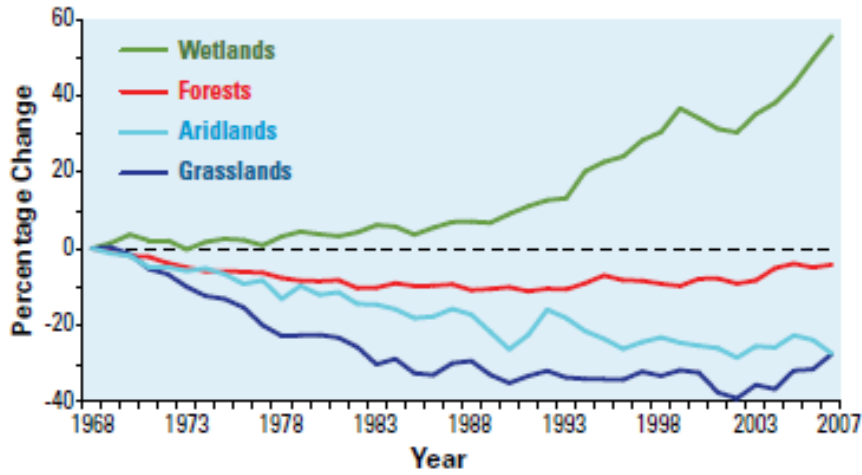


Risk of Human Induced Desertification



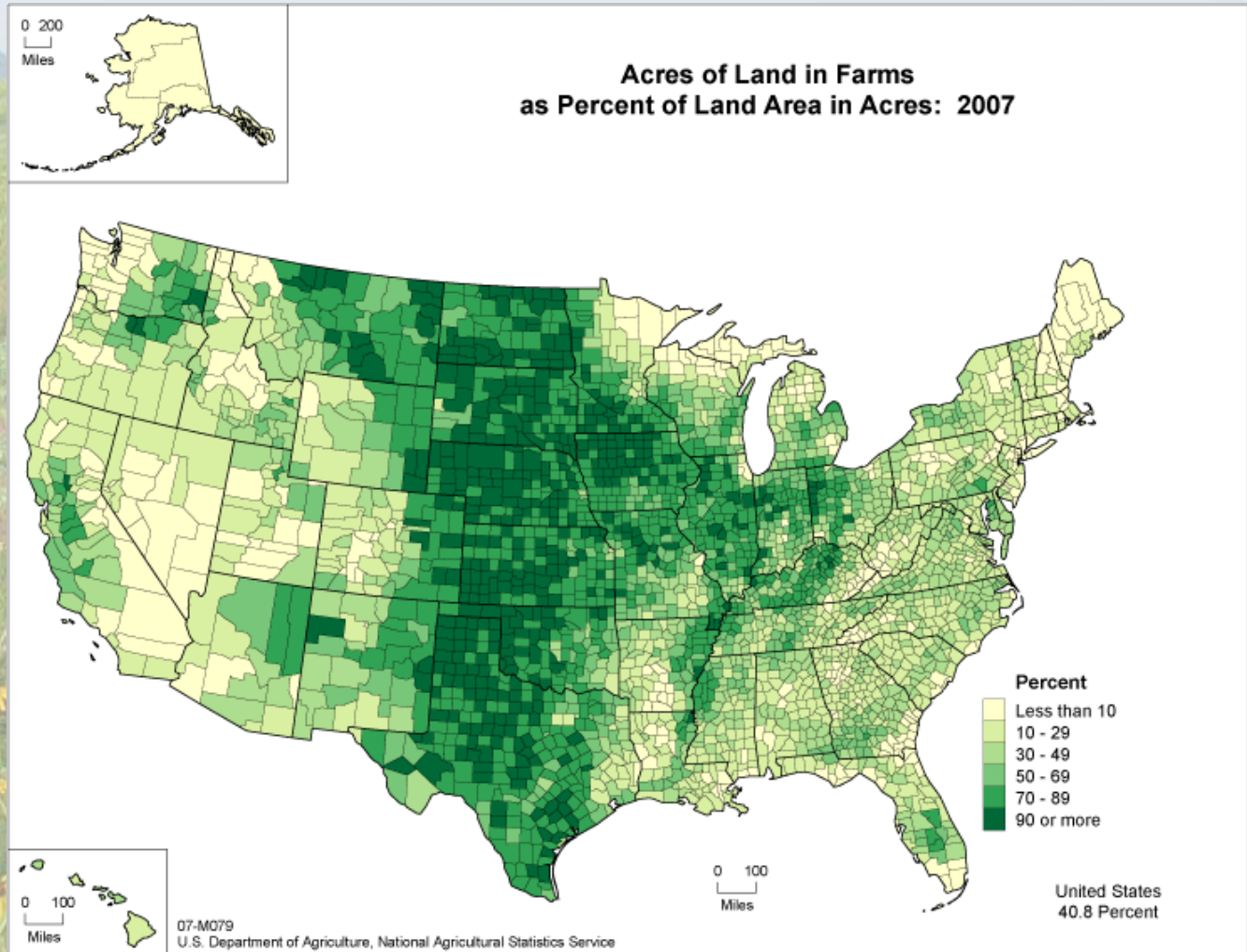
Ecosystem Health

Bird Population Indicators



U. S. Land Use

- 71 % of the lower 48 states in rural, non-federal ownership
- 50% devoted to cropping or grazing land uses (USDA 2003a).



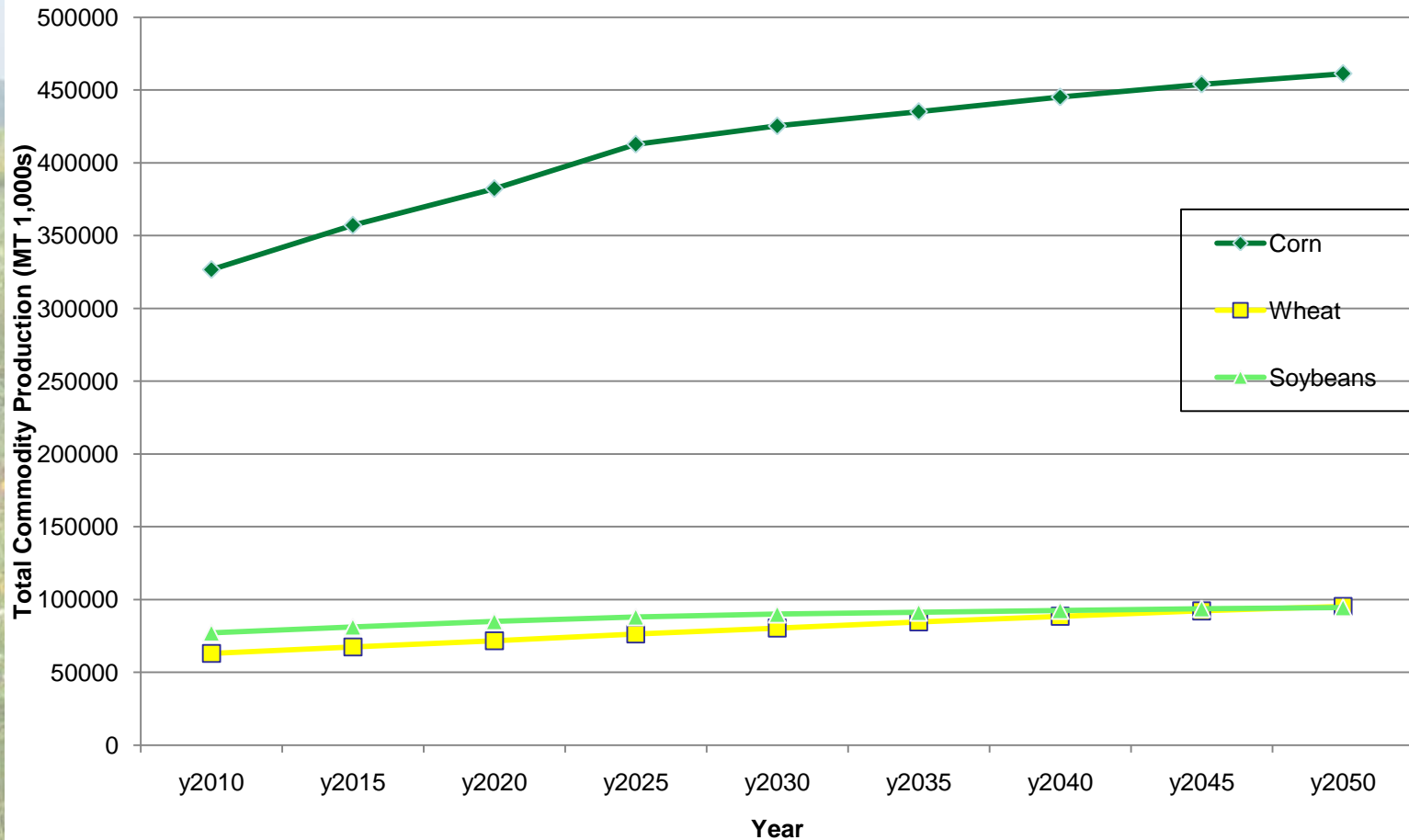
Why Private Lands?

- Agricultural and forest systems produce food and fiber to meet global needs
 - Growing human population
 - Ever increasing rates of per capita consumption.
- The condition of these lands directly and indirectly influences the function and integrity of natural ecosystems.



Competing Demands

Projected US Commodity Production



International Food Policy Research Institute (IFPRI). 2010. IFPRI Food Security CASE maps.
Generated by IFPRI in collaboration with StatPlanet. www.ifpri.org/climate-change/casemaps.html.

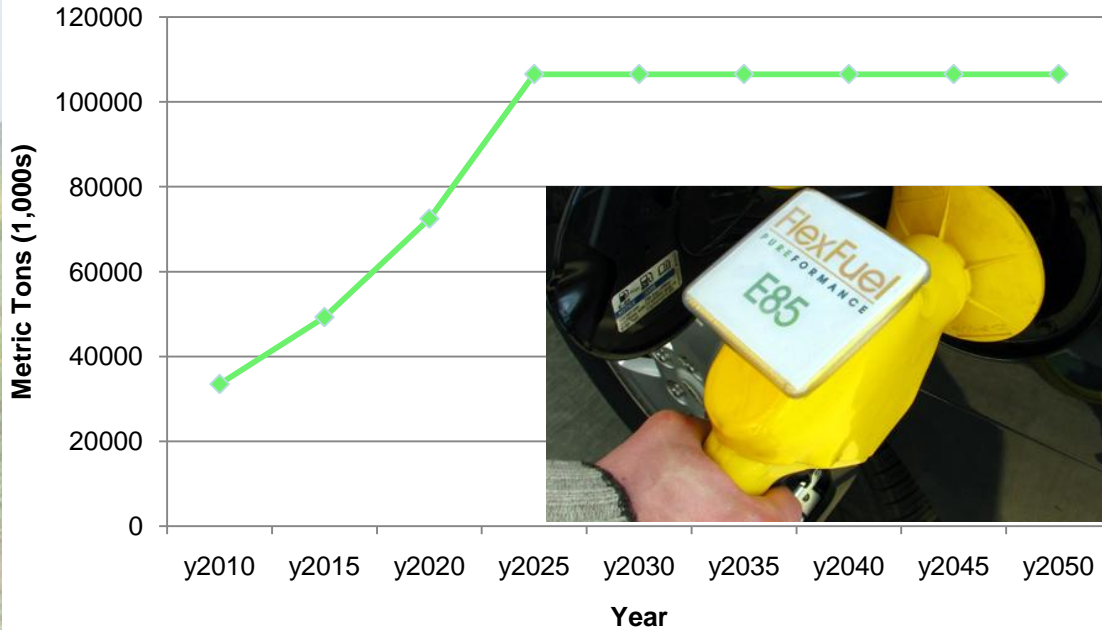
Competing Demands

- Commodity Prices



Competing Demands

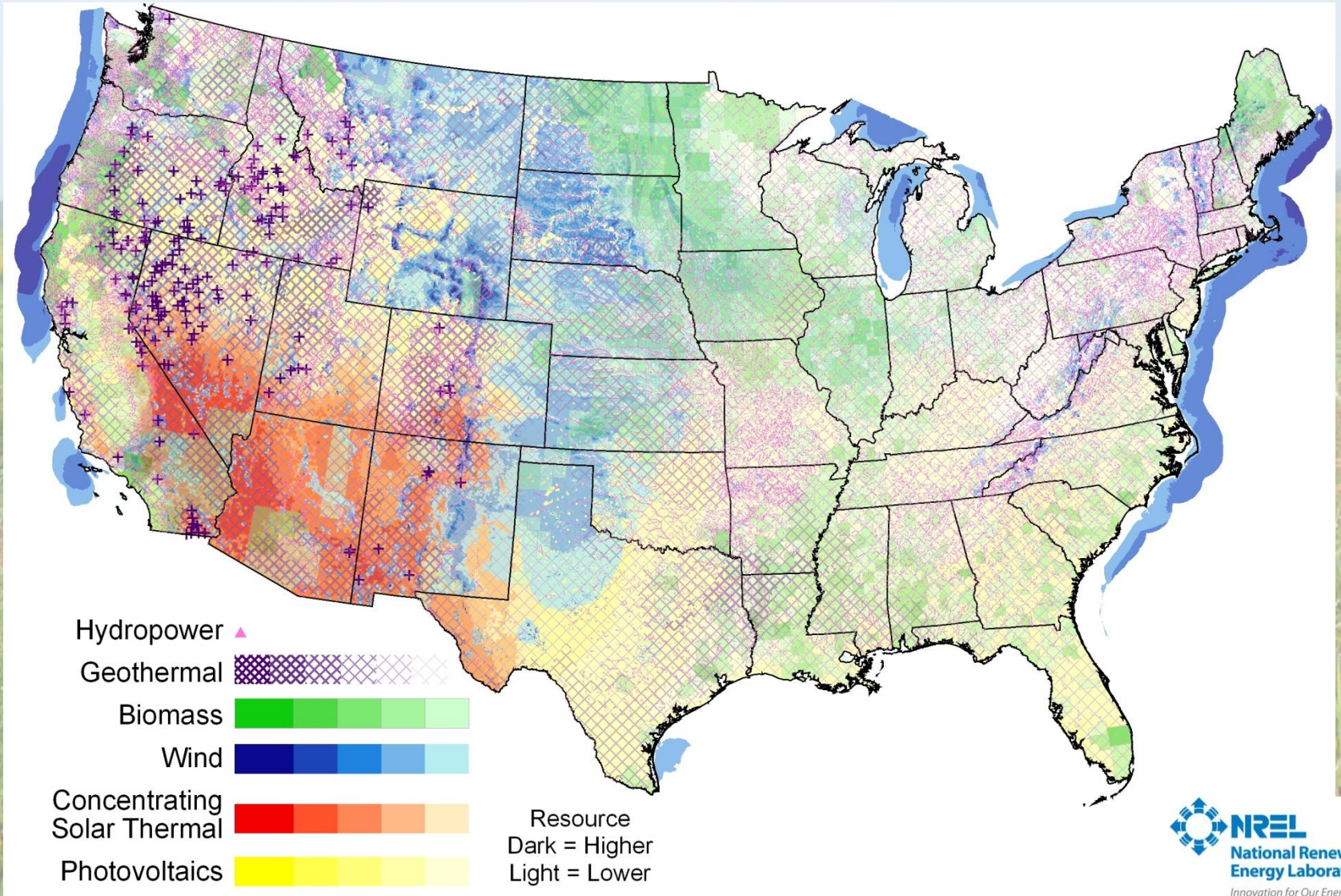
US Demand Corn Ethanol



International Food Policy Research Institute (IFPRI). 2010. IFPRI Food Security CASE maps. Generated by IFPRI in collaboration with StatPlanet. www.ifpri.org/climate-change/casemaps.html.



U.S. Renewable Resources



Effective Conservation

- **Strategic**
- **Science-based**
- **Intentional**
- **Hierarchical**
- **Deliverable**
- **Measurable**

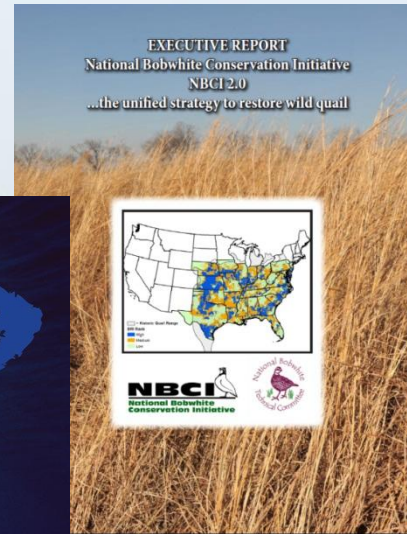
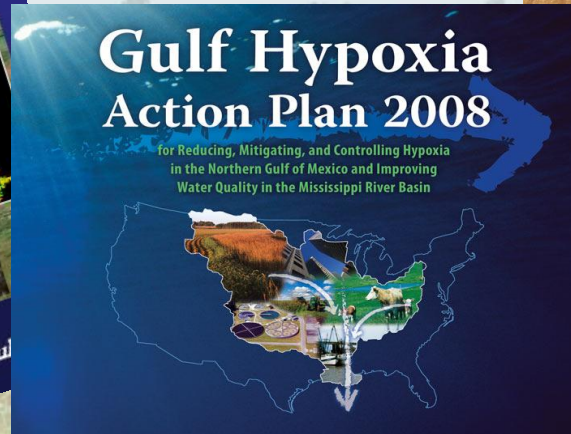
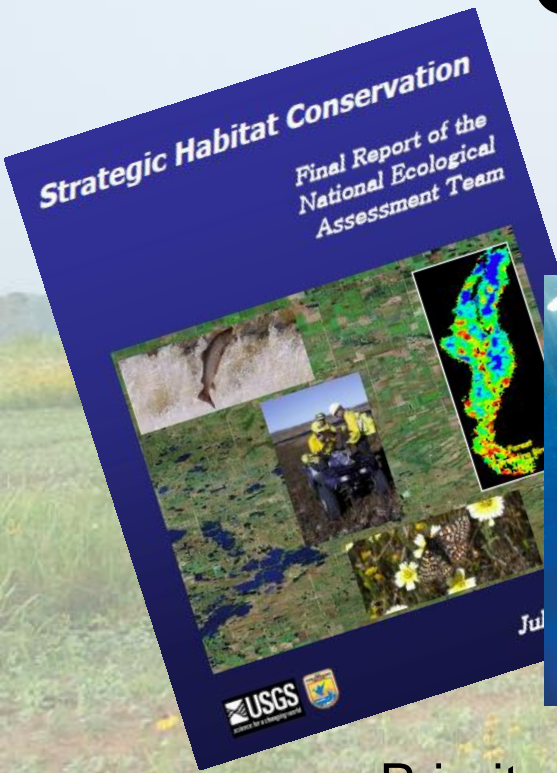


Strategic Conservation

- Biological planning with measurable landscape level outcomes
- Conservation design that integrates biological objectives
- Conservation delivery on the ground
- *“Putting the right stuff in the right places”*

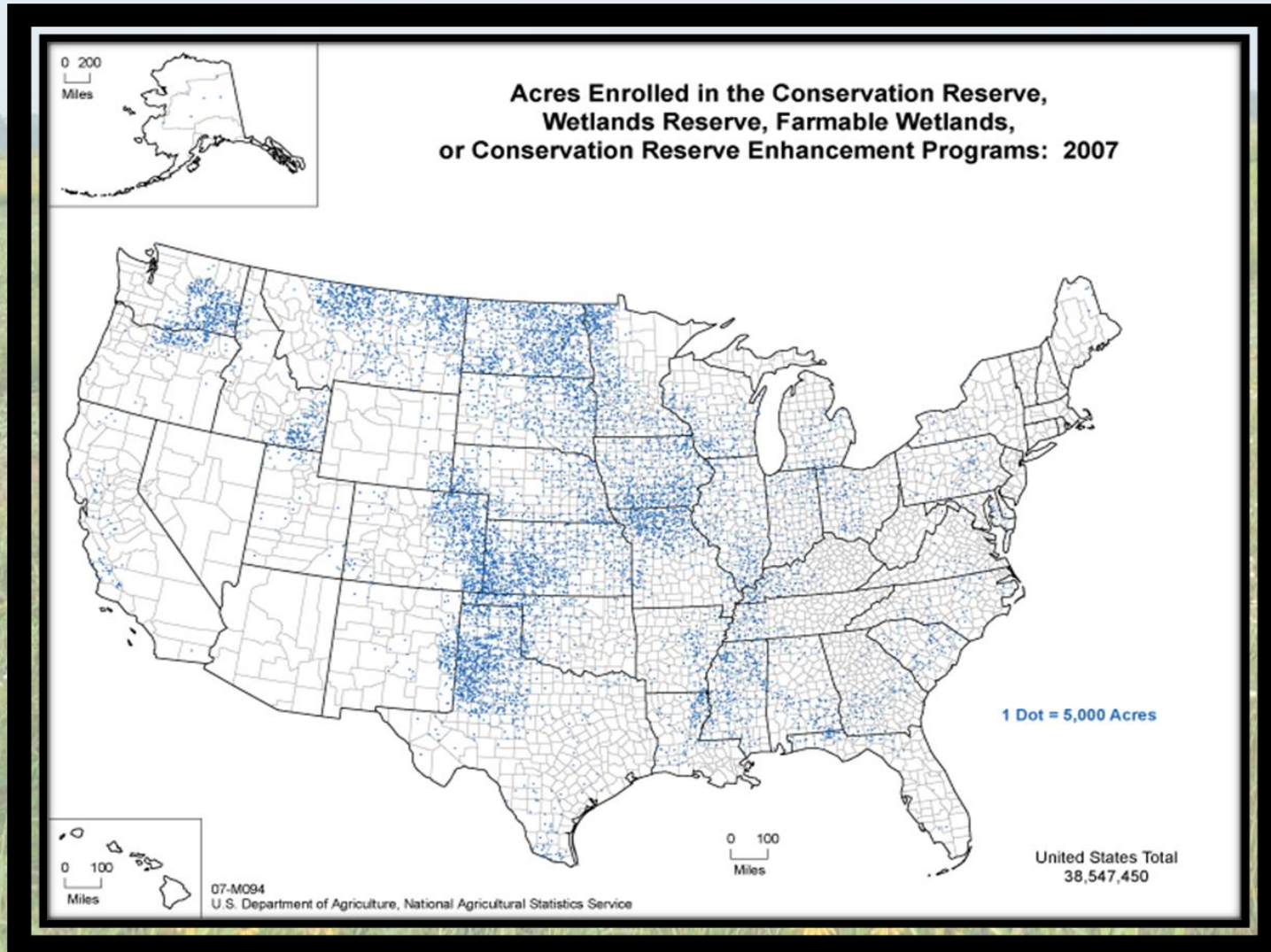


Science-Based



- Priority systems, assemblages, species
- Population objectives
- Biological foundation
- Process-based, data driven models of ecological function
- Spatially explicit objectives
- Targeted delivery
- Measurable outcomes

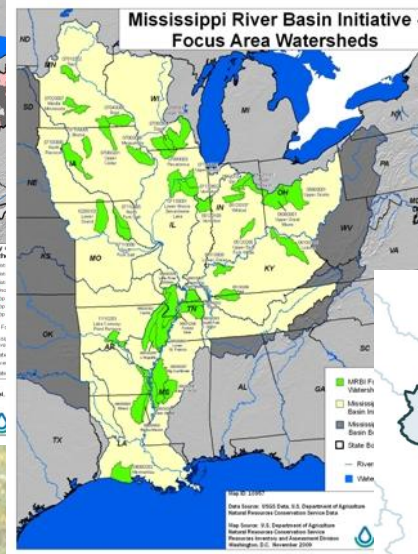
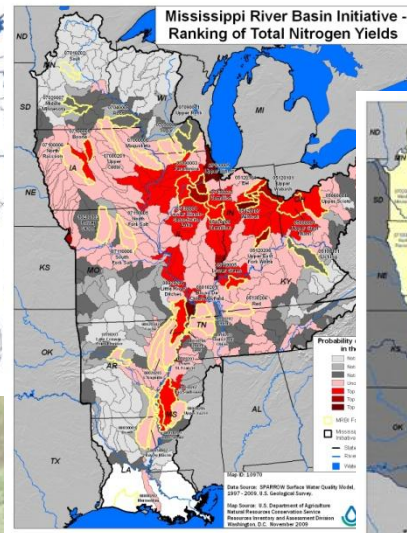
Intentional - Targeted



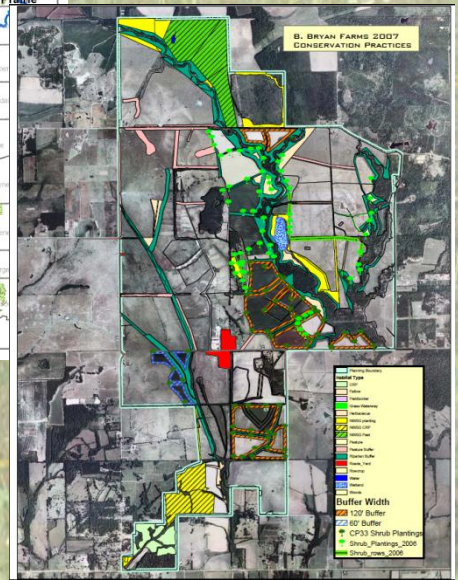
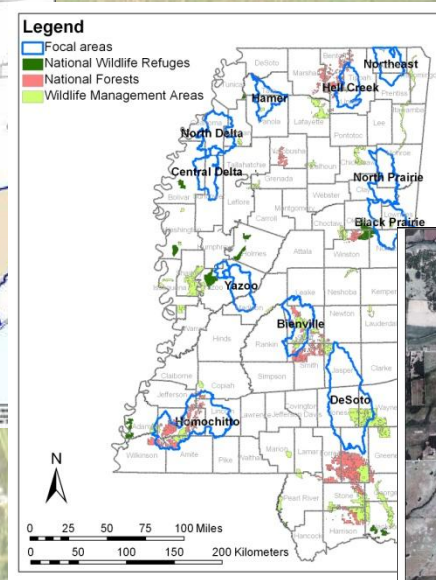
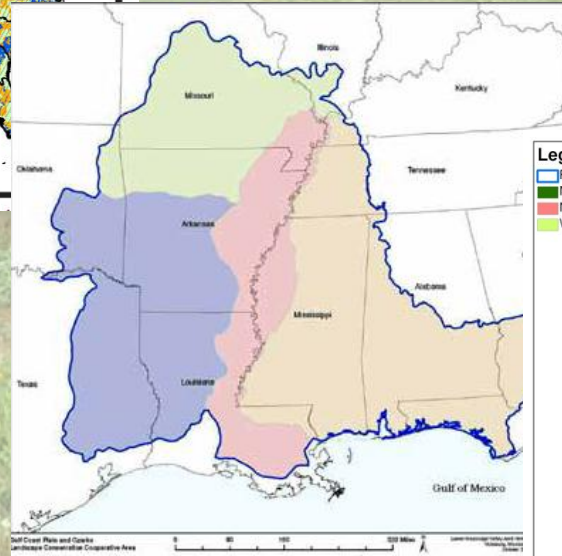
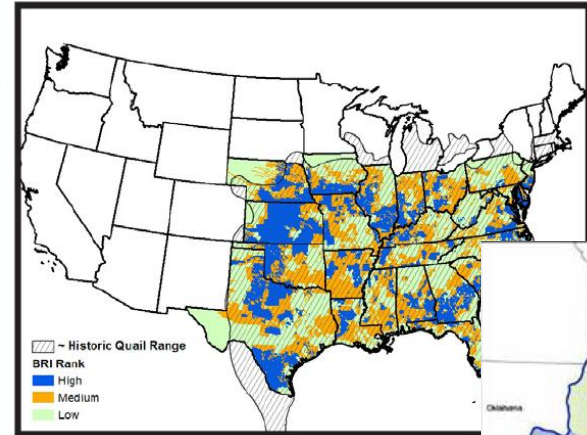
Conservation Must be Intentional



Hierarchical



Hierarchical



Deliverable

Realistic Expectations

- It is not realistic to expect a reversion to less intensive agricultural practices across North America
- “Effective conservation of farmland birds will require innovative solutions based on current agricultural practices that benefit the greatest number of farmland birds.”
Peterjohn (2003:17)



Opportunity Costs

- Allocation of land to uses that protect or enhance wildlife resources involves economic tradeoffs.
- Producers incur the costs of conservation but may find it difficult to garner profits from these actions that benefit the larger society
- *Economic asymmetry*



Policy Tools

- Economic assistance that rewards environmental stewardship is **key** to securing the participation of the farming and ranching sectors.
- Agricultural producers **will** alter land management practices and shift land from commodity production into conservation, provided economic costs are addressed with just compensation (USDA 2003b).

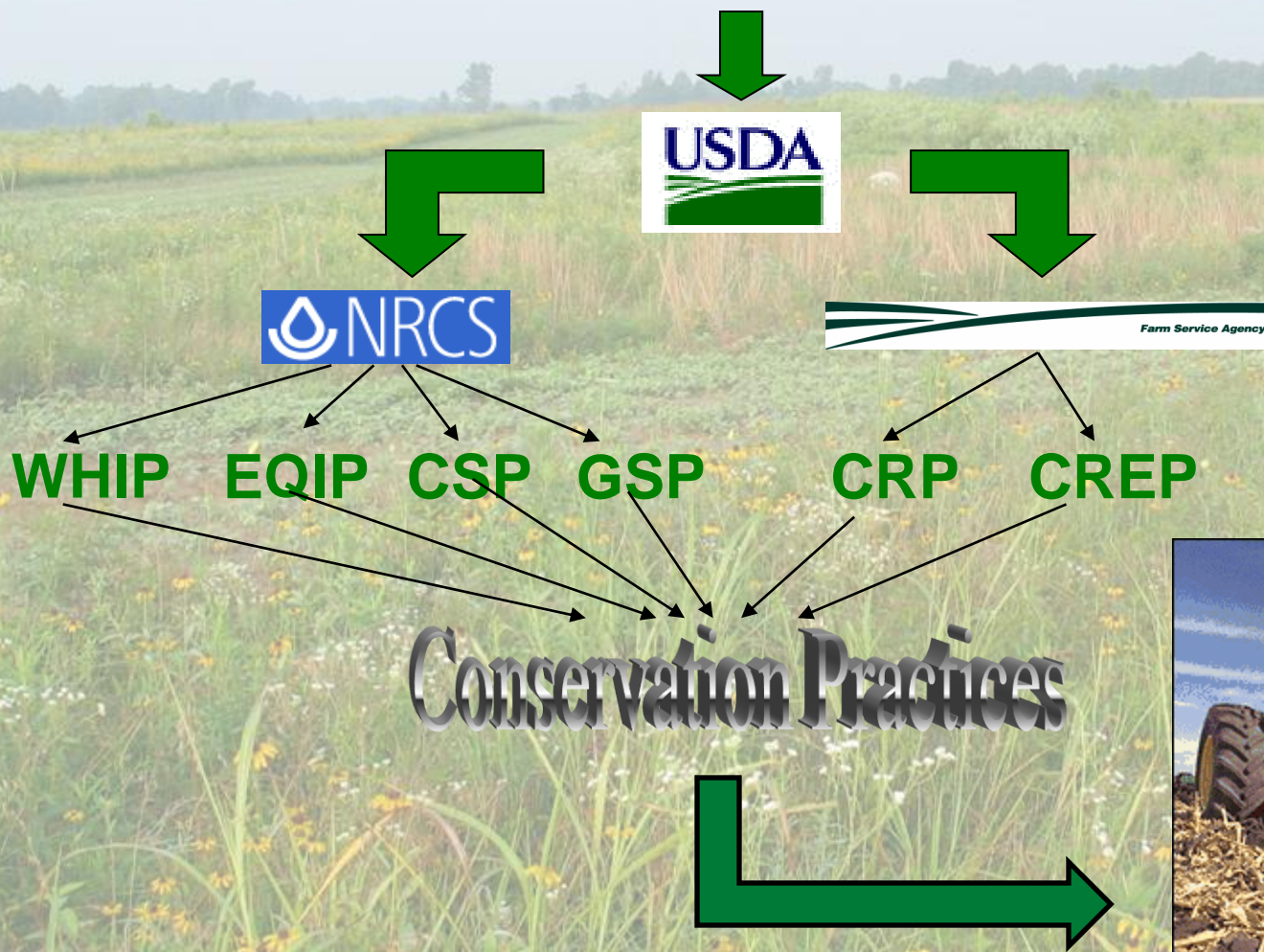


Conservation Strategies

- *“Farmland conservation programs provide the best hope for (grassland) birds and other wildlife. Agricultural practices can become more compatible with birds, and land can be managed inexpensively for birds with funding from conservation programs.”*

(The State of the Birds: United States of America, 2009)

Programmatic Opportunities Farm Bill



How Conservation Programs Fail



Conservation Delivery Partnerships

- Growing demand, exceeds capacity of USDA Service centers to deliver
 - More programs
 - More specialized
 - Greater conservation planning required
- State budgets tight, agencies cannot meet the need
- Achieved through creative partnerships:
 - USDA-NRCS
 - State Agencies
 - Joint Ventures
 - NGO Conservation organizations
- Creates a “Conservation Delivery Network”



Resource Planners

(with the right skills)

- **People skills**
 - Listen
 - Ability to relate to the layman
 - Salesmanship
- **Communication**
 - Written and Oral Skills
- **Agriculture**
 - Agronomy
 - Soils
 - Animal Science
- **Farm Bill Programs**
 - Conservation Planning
- **Wildlife/Ecological knowledge**
 - Habitat Management
- **Working lands knowledge**
 - Turn row Credibility!!!



Objective-Driven Approach

Landowner Objectives



Objective Driven

- Desired resource outcomes drive practice selection
- Practice selection leads to programmatic options
- Intentional implementation
 - The right conservation practice
 - In the right location
 - To achieve a specific resource outcome



Objective-Driven Planning

Coahoma County, MS



Northern Bobwhite Management on Private Lands

Historically, abundant bobwhite populations were an accidental byproduct of broadly applied practices. In modern landscapes, the intentional creation and maintenance of early succession plant communities is generally required to produce sustainable bobwhite populations. The net bobwhite population response to habitat management is scale-dependent. This means that the more intensive and extensive the habitat management, the greater the bird response. Expected population response to management is also influenced by landscape context. Throughout the South we have our large (1,000-5,000 ac) public and private properties under varying degrees of active rangeland. The degree of habitat management on these properties depends on landowner objectives and level of conservation practices and opportunities. Management can vary in scale and intensity from no management, to broadly applied low-intensity conservation buffers, to comprehensive management involving a suite of conservation practices integrated throughout a production system.

Coahoma County Property Management Activities

- Coahoma County is located in the Lower Mississippi Alluvial Valley ("the Delta") and is characterized by large-scale row-crop farming.
- Our case study focuses on a 6,400-acre property managed for row crops and recreational hunting.
- Bobwhite are not a specific management objective, but instead are a desirable byproduct of broadly applied conservation practices.
- Thirty-three percent is maintained in conservation practices that provide early successional habitat.
- The property is composed of 48% row crop (corn, soybean, and rice), 10% hardwood refugia, 10% forested or herbaceous wetlands, 4% conservation buffers, 7% forest, and 7% herbaceous dunes.
- Conservation planning by USDA-NRCS field office personnel, working in cooperation with a consultant wildlife biologist. Conservation practices include CRP (CP) in hardwood forest (planted in 1997 - still in early successional stage), CP21 (open fields) (planted in 2004 - still in early successional stage), and CP22 (row crops) (planted in 2008 with early successional grasses).



Clay County, MS



Northern Bobwhite Management on Private Lands

Historically, abundant bobwhite populations were an accidental byproduct of broadly applied best-practices. In modern landscapes, the intentional creation and maintenance of early successional and open plant communities is generally required to produce sustainable bobwhite populations. The magnitude of bobwhite population response to habitat management is scale-dependent. This means that the more intensive and extensive the habitat management, the greater the bird response. Expected population response to management is also influenced by landscape context. Throughout the South we have more (1,000-5,000 ac) public and private properties under varying degrees of active management. The degree of habitat management on these properties depends on landowner objectives and knowledge of conservation practices and opportunities. Management can vary in scale and intensity ranging from no management, to broadly applied low-intensity conservation buffers, to comprehensive management involving a suite of conservation practices integrated throughout a production system.

Clay County Property Management Activities

- 5400 acres working cattle and row crop farm located in the Black Prairie Physiographic region.
- Goal: To run a profitable, diversified cattle and row crop operation in the context of a land ethic based recreational stewardship.
- Management Objectives: To control erosion in pastures and cropland, improve bank stability and water in drainage ways, and restore bobwhite populations to sustainable levels.
- Twenty-five percent of the property is maintained in conservation practices including riparian buffers, warm-season grass (NRSG) buffers, NRSG pasture, and CRP grasslands.
- Specific management practices include:
 - Restoration of exotic grasses.
 - Establishment of buffers and native grasslands.
 - 100-150' forested riparian buffers (CRP) with 20-30' native herbaceous zones (7% of total landscape).
 - 10-600' forested pasture buffers planted to native fields, grasses, and shrubs (2.4% of total landscape).
 - 60-120' NRSG riparian habitat buffers (CRP-CP2) around cropland (3.5% of total landscape).
 - 120-340' (1.57 total acres) Chinquapin plus shrub thickets.
 - Conversion of forest pastures to rotationally grazed NRSG pasture (4.2% of total landscape).
 - Establishment of 171 acres of NRSG (0.1% of total landscape).
 - Miles of game food plots.
 - Rationalized timber and prescribed fire used to maintain early successional habitats.
 - Conservation planning was accomplished by a consultant wildlife biologist working in cooperation with USDA-NRCS field office personnel. Conservation practices were implemented under the NRCS CRP, CRP, (IDEA-PIA), and U.S.F.W.S. Pasture Programs.



Panola County, MS

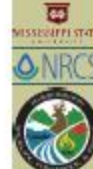


Northern Bobwhite Management on Private Lands

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Panola County Property Management Activities

- 3,200-acre property located in the Lower hills of the Lower Mississippi.
- Prior to 1997, the property had been primarily dedicated to the production of row crops, forage crops, and forest products. Over the past decade the property has been systematically managed for increased wildlife habitat. Today, 33% of the property is actively managed for bobwhite with the goal of creating excellent recreational hunting opportunities.
- Management objective was to provide 100% suitable habitat for bobwhite within portions of the property allocated to wildlife habitat and increase the habitat quality to more correctly supporting birds.
- Management practices included:
 - Habitat restoration of forest and Bartragsgrass.
 - Conversion of row crop to native-warm season grasses (NRSG), fields, and legumes.
 - Management of existing grass CRP fields using strip-grazing and prescribed fire.
 - Extensive food plotting to provide additional food resources.
 - Establishment of shrub thickets, mowed dunes, and corridors for nesting, roosting, and escape cover.
 - Installation of grass/legume field borders on agricultural fields.
 - Creation of transition zones between forest edges and early successional landscapes.
 - Heavy timbering, herbicidal mow/wool control, and prescribed burning of pine plantations.
- Conservation planning was accomplished by a consultant wildlife biologist working with USDA-NRCS field office personnel. Conservation practices were implemented under the NRCS CRP, CRP, (IDEA-PIA), and U.S.F.W.S. Pasture Programs.



Hindrances to Conservation Adoption

- Landowners do not understand conservation eligibility
- Landowners do not know the economic outcomes of conservation adoption
- Landowners may not understand the conservation outcomes of practice adoption

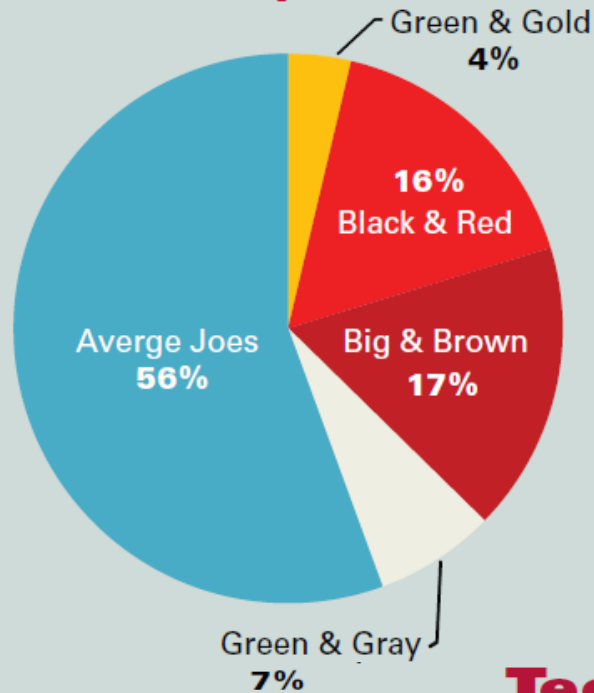


Conservation Plan

- Must provide compelling *conservation* and *economic* justification.
- To have credibility the conservation planner must understand the *business* of farming or forestry.



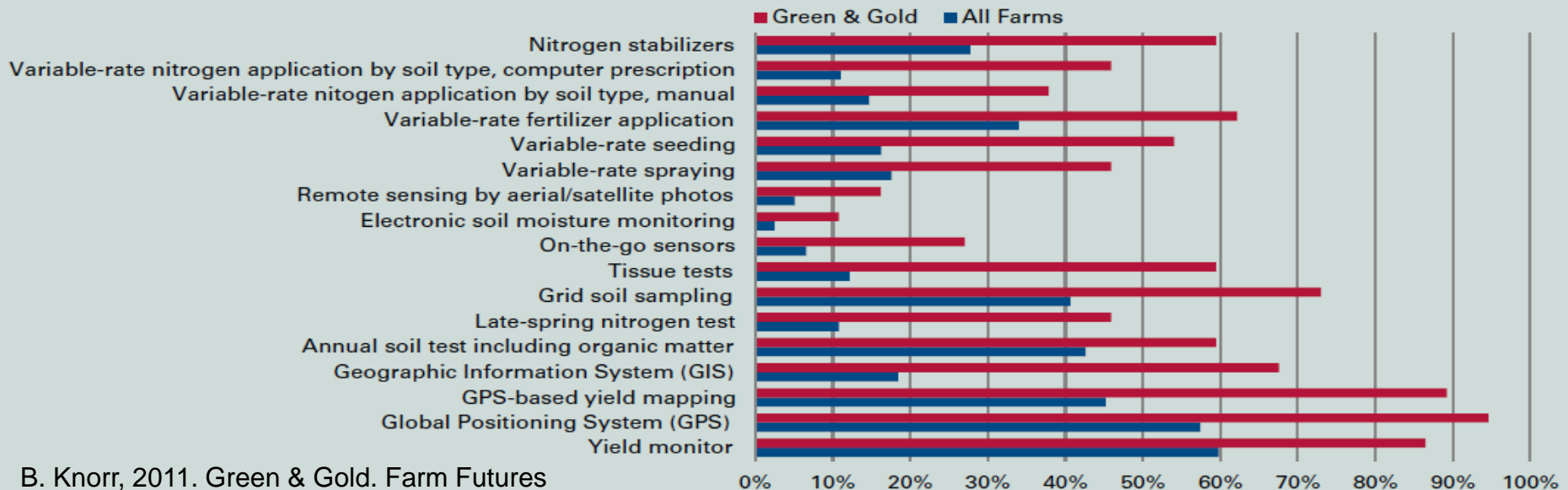
What type of farmer are you?



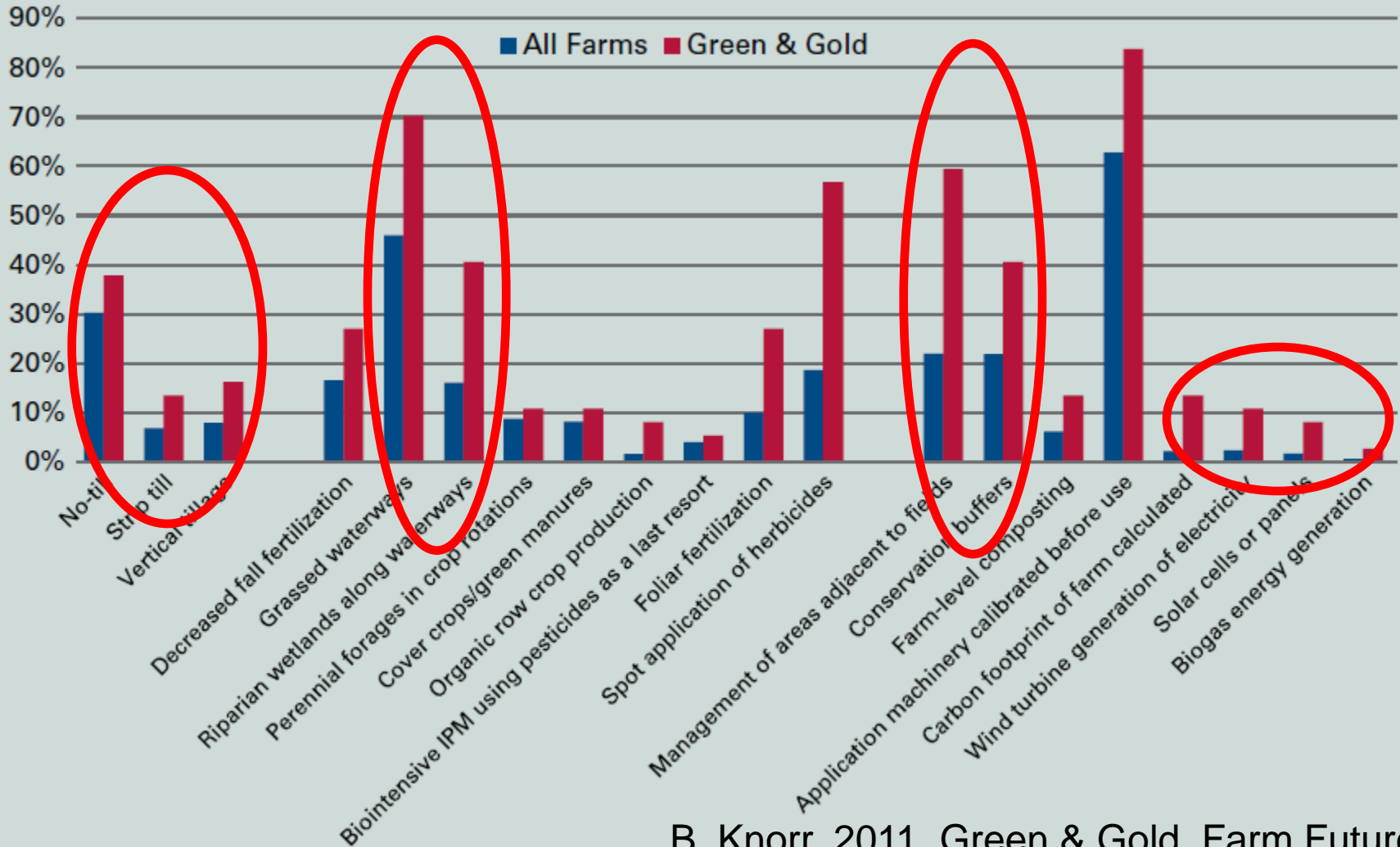
Green & Gold Farmers

- Younger
- Larger operation
- More likely to adopt technology
- More likely to adopt conservation
- More profitable

Technology adoption rates



How farmers differ



B. Knorr, 2011. Green & Gold. Farm Futures

Information Needs

- Where on a given farm are different conservation practices eligible?
- What are the opportunity costs?
- What are the differences in net revenues with and without conservation practice?
- What are the conservation outcomes?
- How does the producer value the conservation outcomes relative to costs?

Precision Conservation

A Geospatial Decision Support Tool that:

- Identifies spatially explicit conservation opportunities
- Characterizes economic tradeoffs of conservation enrollment vs. agricultural production



ArcGIS-based Interface

MSU Precision Conservation

CRP Practice
CP33

Project Name
4002005

Project Folder
C:\Shit\Davis_Run\CP33\CP33_Profitability

Hydro data: Rivers (optional)

Hydro data: Streams (optional)

Hydro data: Wetlands (optional)

Field boundary data
C:\Shit\Chip_Davis\2005_Projected\2005_soybeans\4002005\Field_1.shp

Field unique identifier
FID

Soils data
W:\Home\mmccconnell\public\Davis_Farms\soil_ms135\spatial\soilmu_a_ms135.shp

(Soils) Soil survey area identifier
AREASYMBOL

(Soils) Soil type identifier
MUSYM

Soil rental rate table
W:\Home\mmccconnell\public\Davis_Farms\Soil_Table.xlsx\Sheet1\$

(SRR) Soil survey area identifier
AREASYMBOL

(SRR) Soil type identifier
MUSYM

(SRR) Soil rental rate field
2007 CRP Rental Rate

Maximum buffer (feet) (optional)

Average stream width (feet) (optional) 10

Average stream width (field) (optional)

Compute profitability? (optional)


Yield data (optional)
C:\Shit\Chip_Davis\2005_Projected\2005_soybeans\4002005\Comm_Prices\7\Clean_yield_7.shp

ID of field with yield data (optional)

Commodity price (single value) (optional)

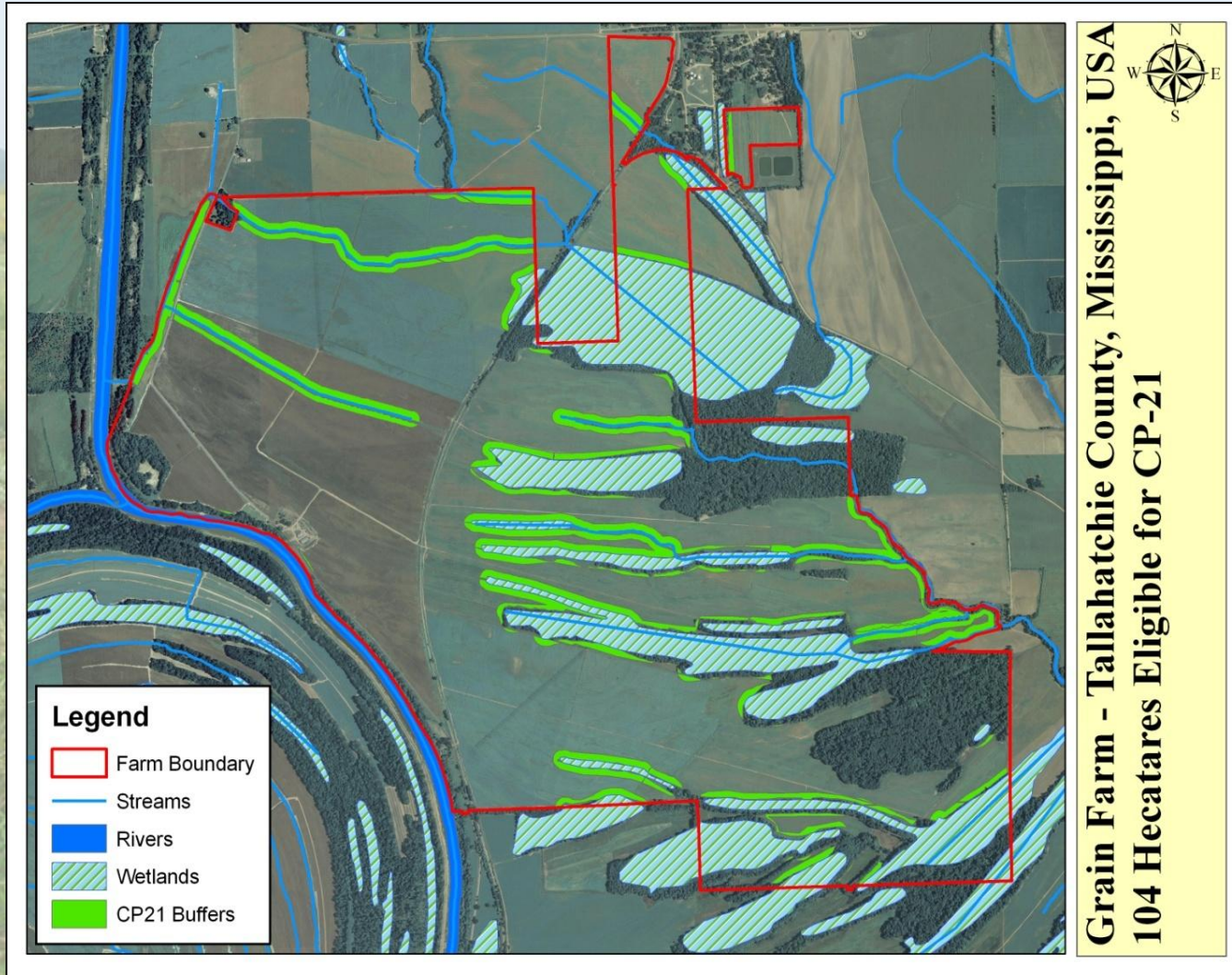
CRP Practice

Choose the CRP practice for which to assess eligibility:
CP21, CP22, or CP33.

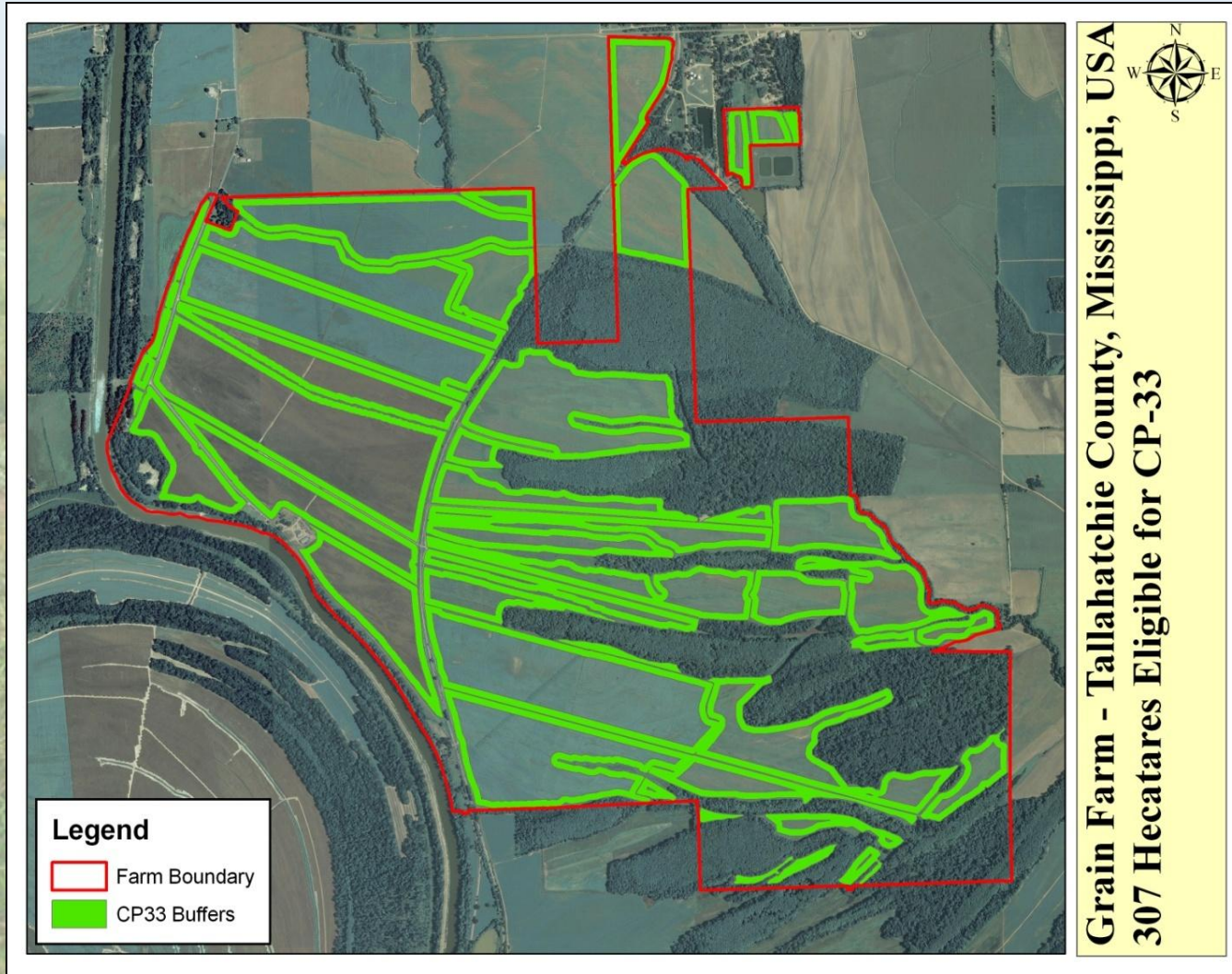


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Illustrating Eligibility



Illustrating Eligibility



Characterizing Economic Tradeoffs of Conservation Enrollment vs. Agriculture Production



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Yield Reductions



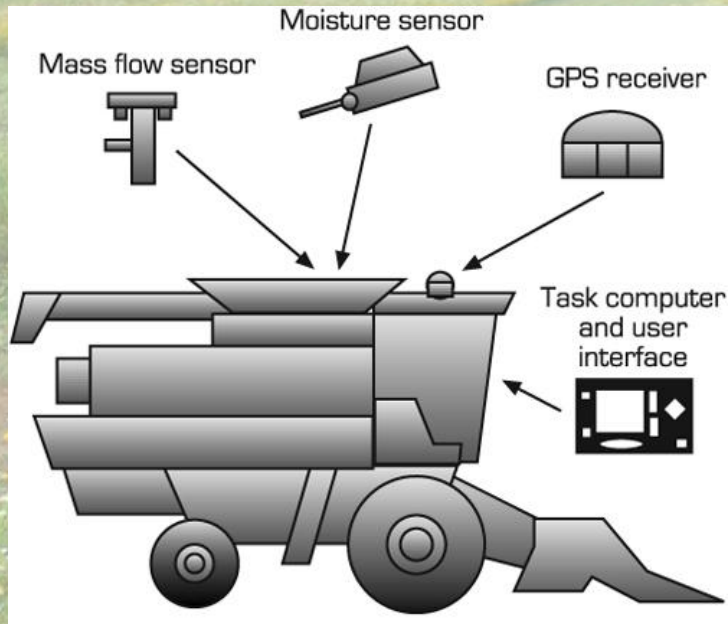
Connecting Yield to Profitability



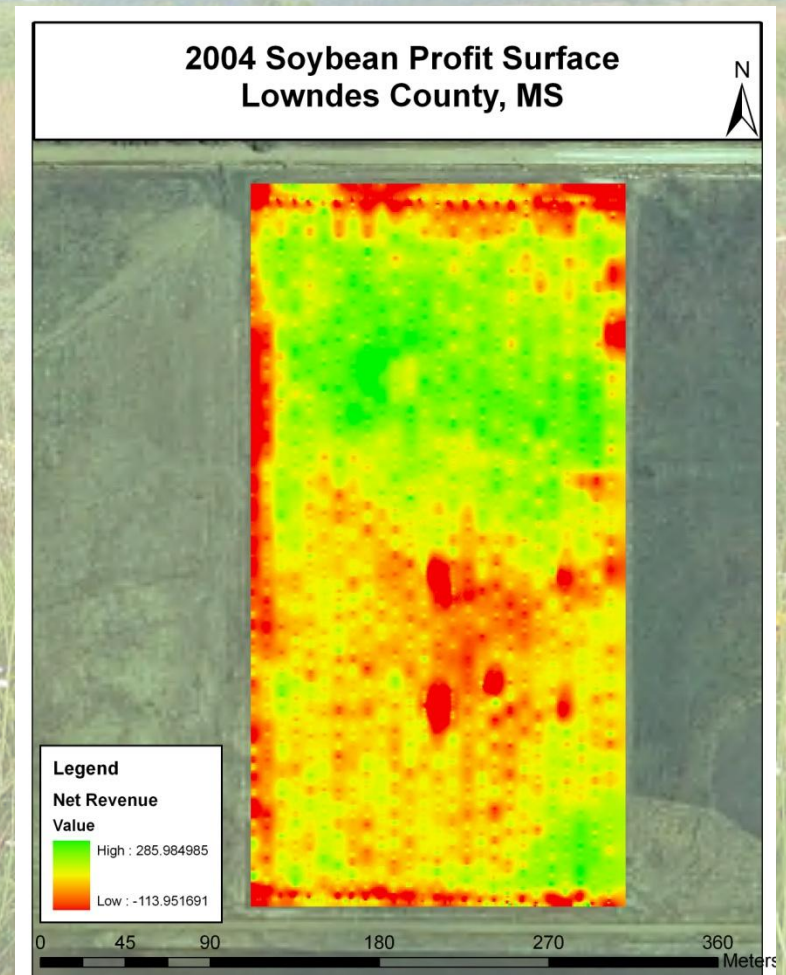
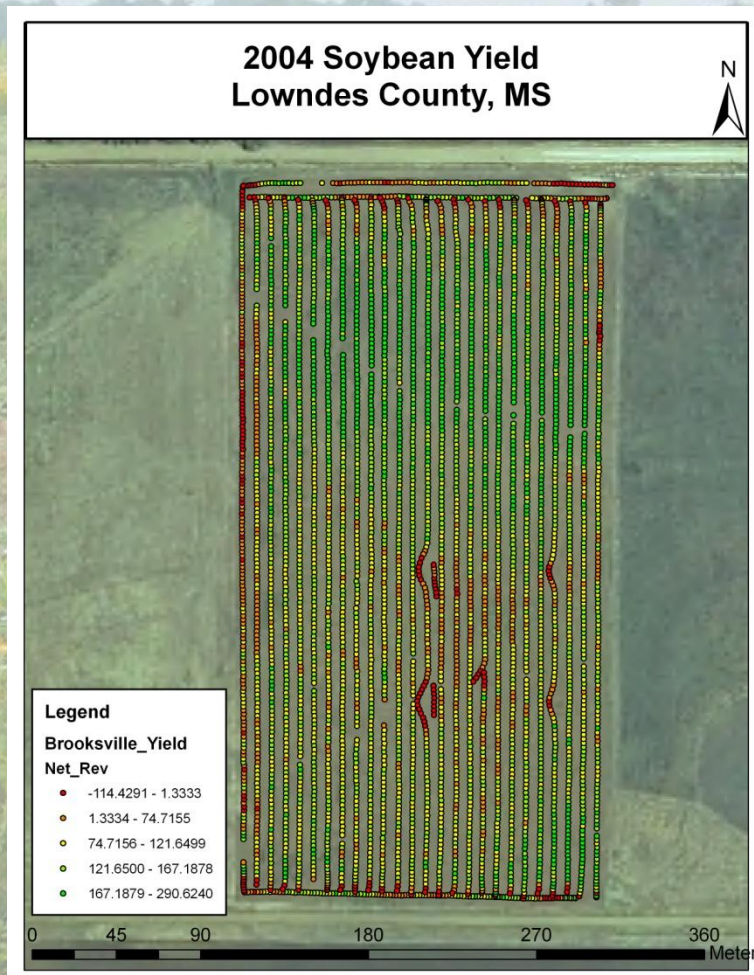
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- Use Precision Agriculture Technology to Quantify Spatial Variability in Yield




Translating Yield Reductions to Profit Reductions




Profitability Process

Compute profitability? (optional)


Yield data (optional)
C:\Shit\Chip_Davis\2005_Projected\2005_soybeans\4002005\Comm_Prices\7\Clean_yield_7.shp 

ID of field with yield data (optional)


Commodity price (single value) (optional)


Commodity price (field) (optional)
Comm_Price 

Government payments (single value) (optional)

Government payments (field) (optional)
Govt_Pmnts 

Production costs (single value) (optional)

Production costs (field) (optional)
Prod_Costs 

Dry yield volume field (optional)
Tons_ha 

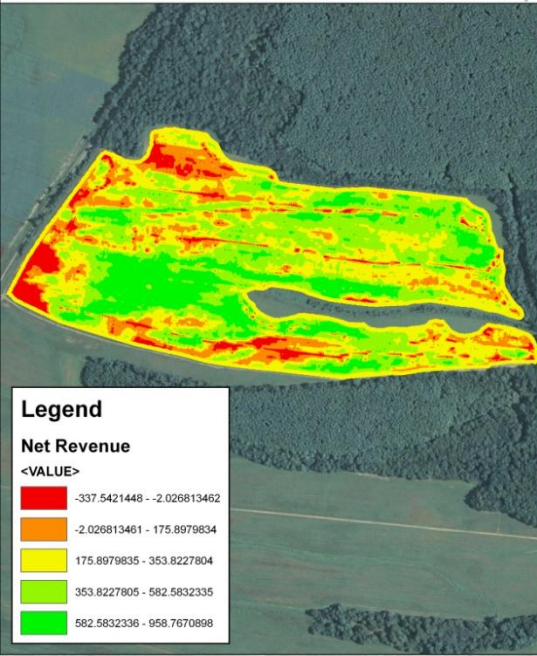
CRP establishment costs (\$/acre) (optional)
_____ 7

CRP maintenance costs (\$/acre/year) (optional)
_____ 7

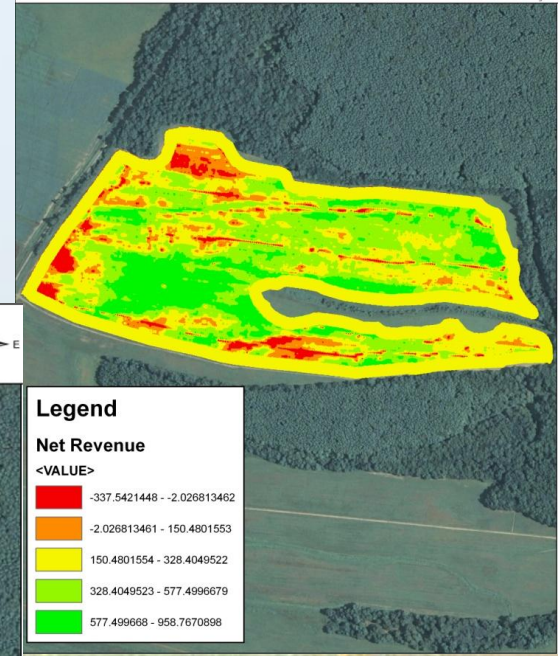
Generate profit surface raster? (optional)

OK Cancel Environments... << Hide Help

Soybean Profit Surface with 9.1 meter CP33 Buffer in Tallahatchie, Mississippi

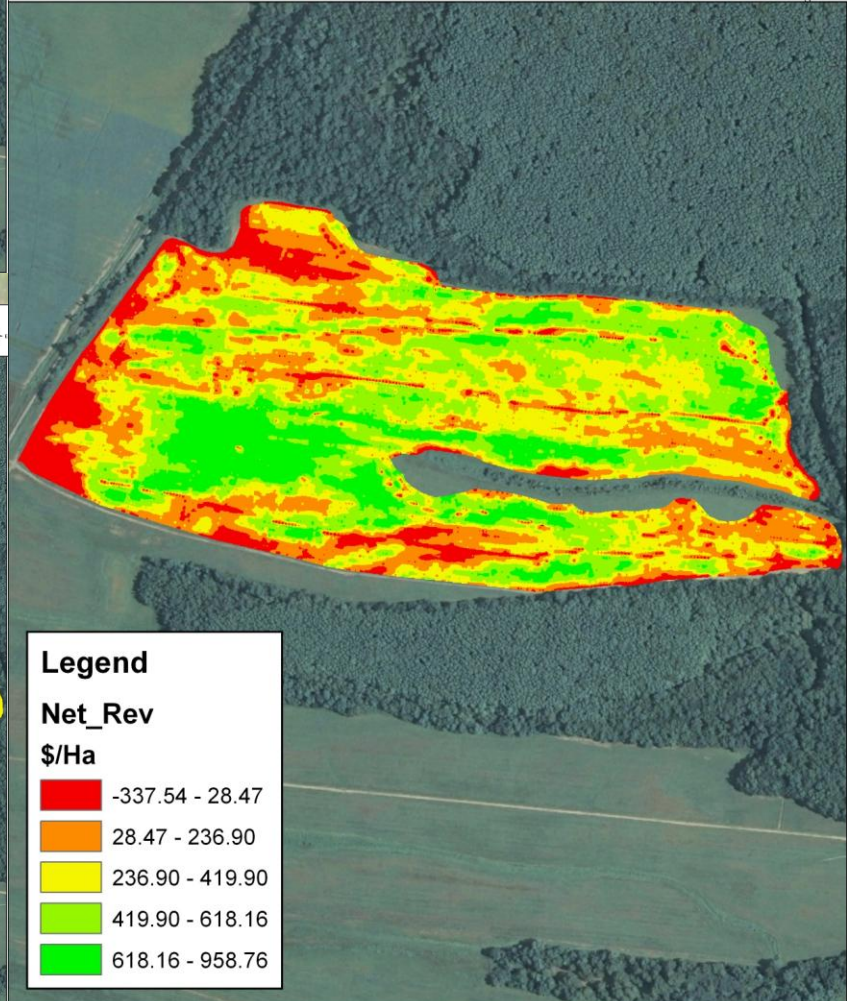


Soybean Profit Surface with 27.4 meter CP33 Buffer in Tallahatchie, Mississippi

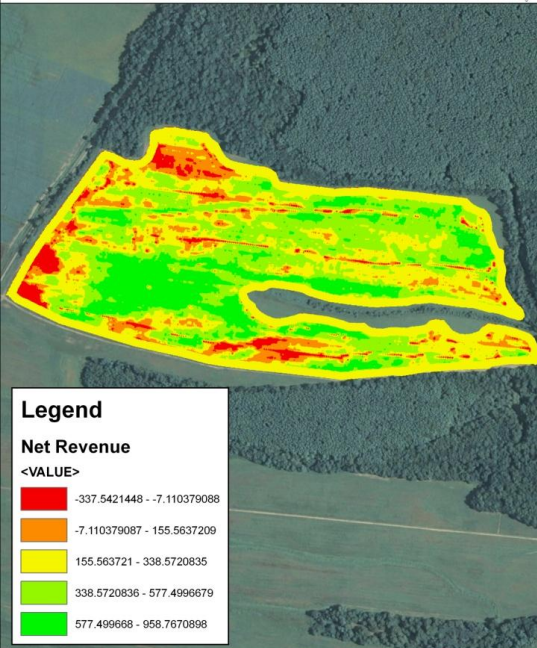


Compare Profitability of Buffer Scenarios vs. Ag. Production Alone

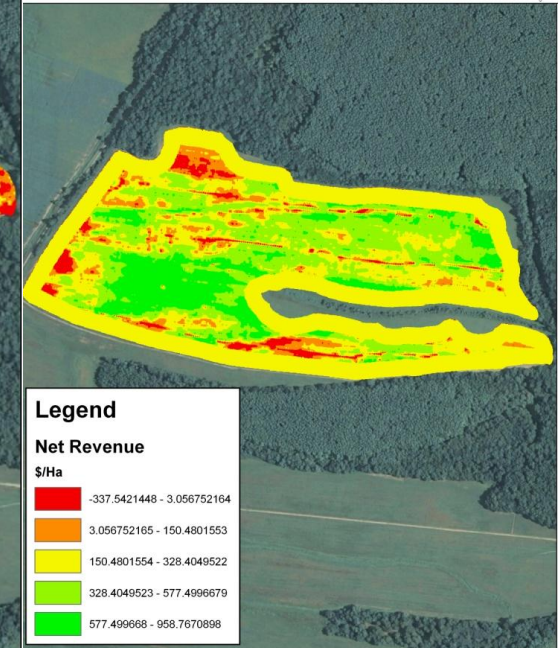
Soybean Profit Surface on Grain Field in Tallahatchie, Mississippi



Soybean Profit Surface with 18.2 meter CP33 Buffer in Tallahatchie, Mississippi



Soybean Profit Surface with 36.5 meter CP33 Buffer in Tallahatchie, Mississippi



Profitability Output

Economic Advantage of Conservation Buffers on Soybean Field in Mississippi

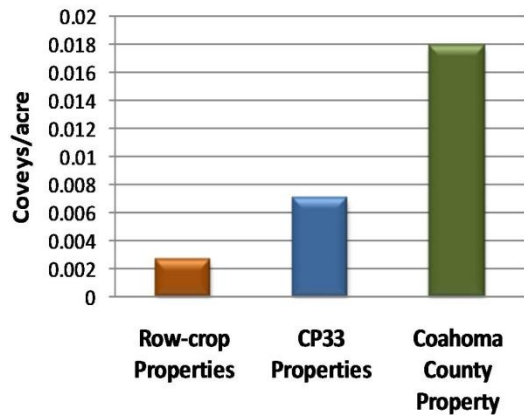


Delivering Precision Conservation

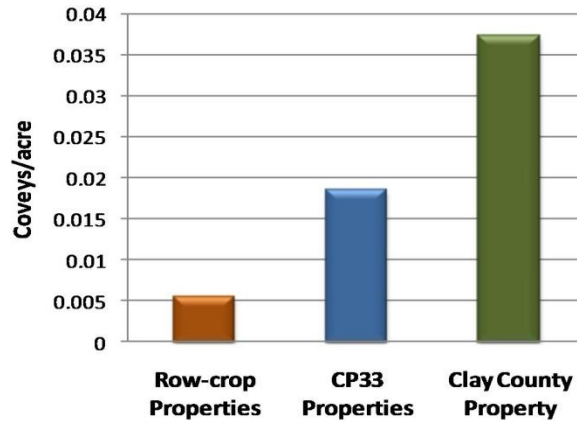
- To promote conservation we must address both ecological and economic demands.
- If landowners understand the economic and ecological tradeoffs they can make informed decisions.
- Technology tools can be the key to strategic conservation implementation by helping landowners visualize costs and opportunities.
- The “right” conservation practice is the one that delivers the landowners objectives, within the context of exemplary land stewardship.

Effective Conservation Measurable

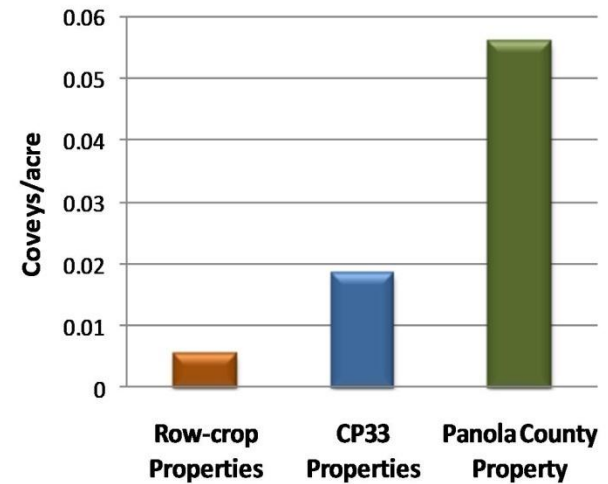
**Northern Bobwhite Fall
Covey Densities, 2007/2008**



**Northern Bobwhite Fall
Covey Densities, 2007/2008**



**Northern Bobwhite Fall
Covey Densities, 2007/2008**



Effective Conservation

- Strategic
- Science-based
- Intentional
- Hierarchical
- Deliverable
- Measurable

