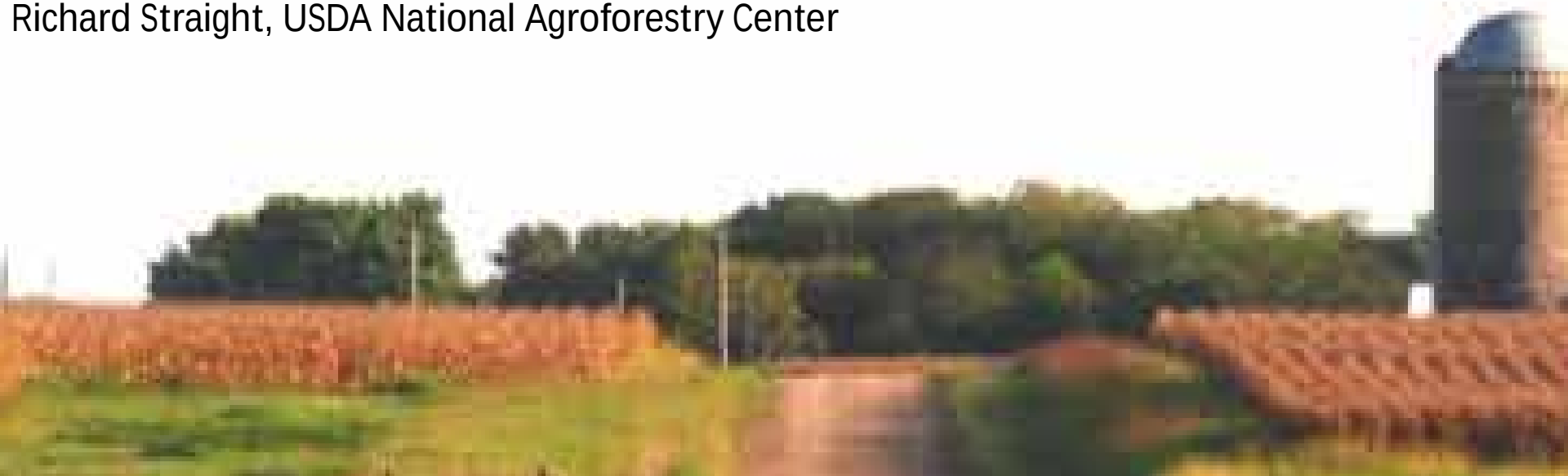
Kansas Rural Center 2016 Farm & Food Conference

Transforming Our Farms, Our Food & Our Future:

Building the Road As We Go

Agroforestry – Tools for Transforming Farms

Richard Straight, USDA National Agroforestry Center



My Agenda For This Morning

- USDA National Agroforestry Center
- Agroforestry
- Climate Change and Agroforestry
- Biodiversity and Agroforestry
- Cute picture at the end of the presentation

USDA National Agroforestry Center

- **Enhance benefits of agroforestry;**
- **Accelerate agroforestry adoption.**

US Forest Service (Research and Development, and State and Private forestry) and the Natural Resources Conservation Service

USDA National Agroforestry Center

- Based at the University of Nebraska at Lincoln
- Technology Transfer
  - Technical publications
  - Training and demonstration
  - Regional networks
- Research
  - Models and tools for efficient design

What is Agroforestry?

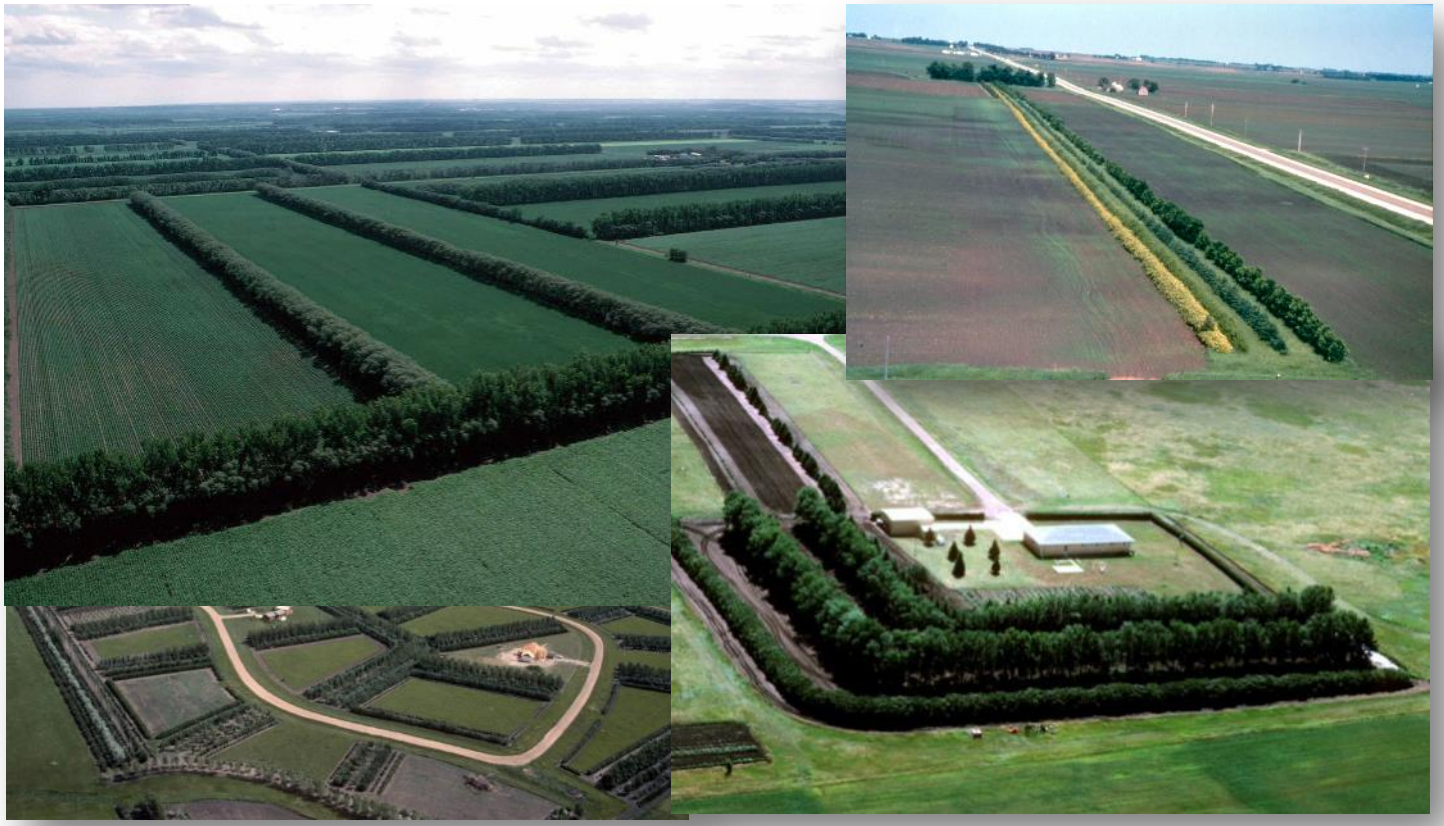
Intentional integration of trees with agriculture to:

- Provide environmental, economic and social benefits; and
- Support productive, sustainable farms, ranches, and woodlands;

Most Common Agroforestry Systems (U.S.)

- Windbreaks/Shelterbelts
- Riparian Forest Buffers
- Silvopasture
- Alley Cropping
- Multi-story cropping (Forest Farming)

Windbreaks

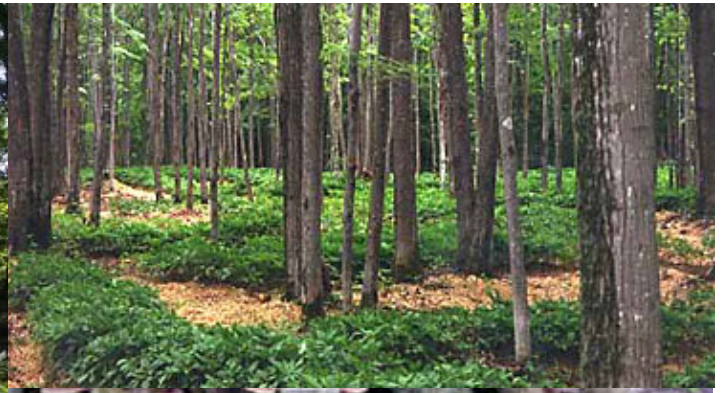


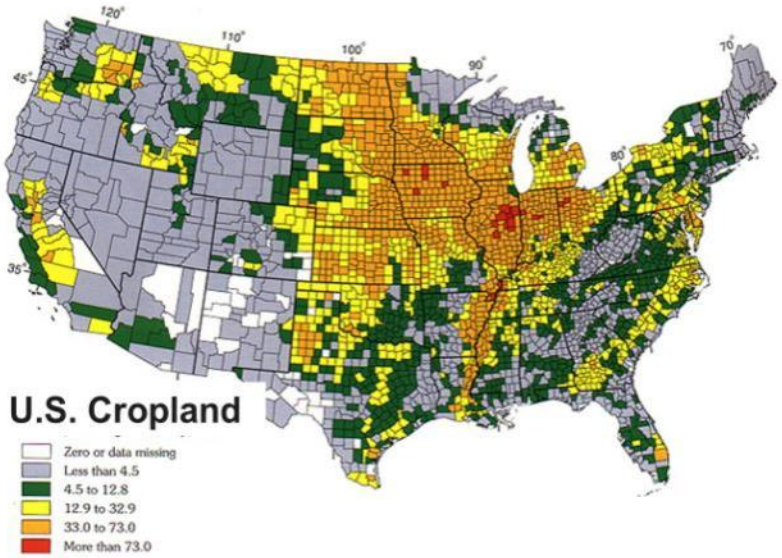
Riparian Forest buffers

Silvopasture

Alley cropping

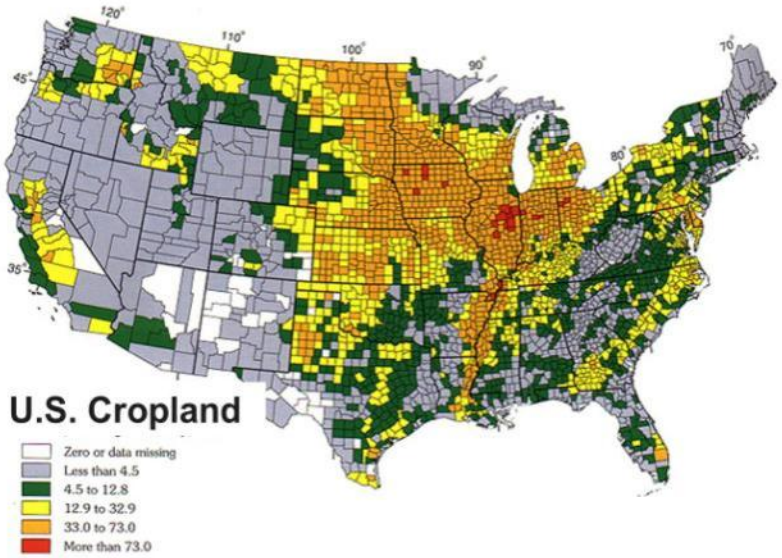
Forest farming





From agricultural lands:

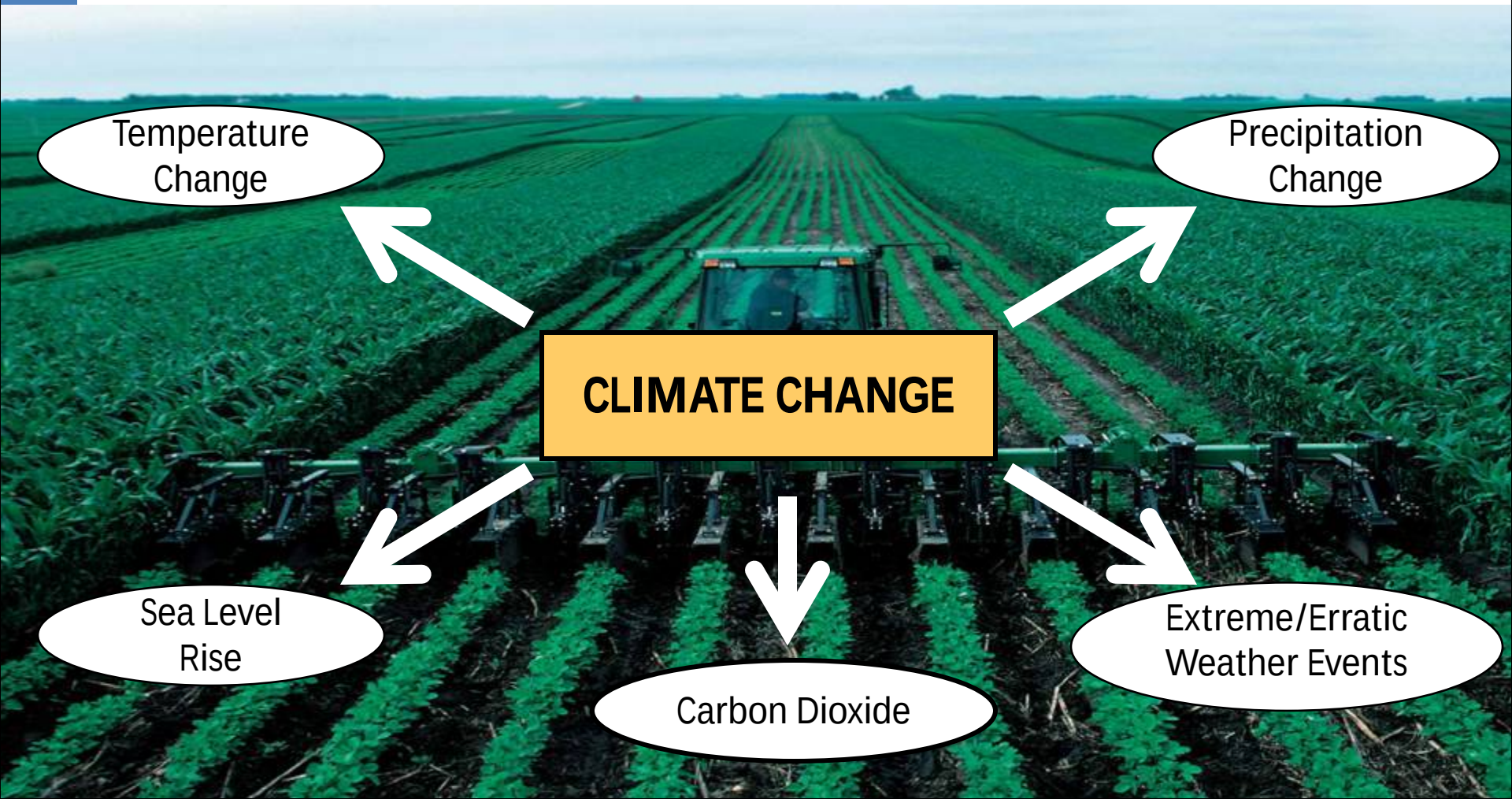
We want it all.



To provide for a growing population:

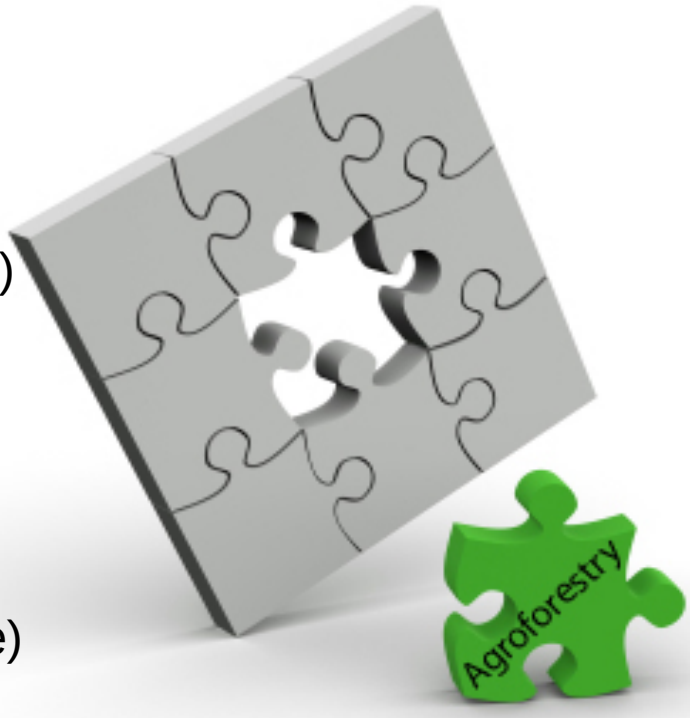
<u>We will want more of it all.</u>

Realizing Agriculture's Potential?



Many Actions for Building Climate-Ready Agriculture

- Conservation tillage
- Crop rotations
- Crop species
- Irrigation management
- Fertilization (type, timing, placement)
- Grazing (species, rotations)
- Cover crops
- Perennial crops
- Eliminate fallow
- Converting (i.e., cropland to pasture)



Agroforestry: providing ReLeaf to Ag

Agroforestry: one strategy with multiple services

- Diversity of income
- Crop protection & enhancement
- Livestock protection
- Pollinator services
- Biological pest control
- Protection of soil resources
- Water & air quality
- Wildlife habitat
- Recreational opportunities
- Aesthetics

……..*and more.*

….*the right trees in the right places for the right jobs.*

Agroforestry: A 'Leatherman' w/in the 'CC-Integrated' Toolbox for Agriculture

Mitigation

- Sequestering carbon (C)
- Reducing GHG emissions

Adaptation

- Reducing threats & enhancing resilience
- Facilitating species migration

….While providing other services

Carbon Sequestration Potential – 2 Options

Mead Farm – Nebraska (50 years)

Option	Ha	%total	MT CO_2	MT CO_2/ha/yr
Conservation tillage only	254 No-tillage	100	9,203*	1.17-0.18
			9,203	

*COMeT-VR (Brenner et al.)

Schoeneberger, Brandle & Zhou

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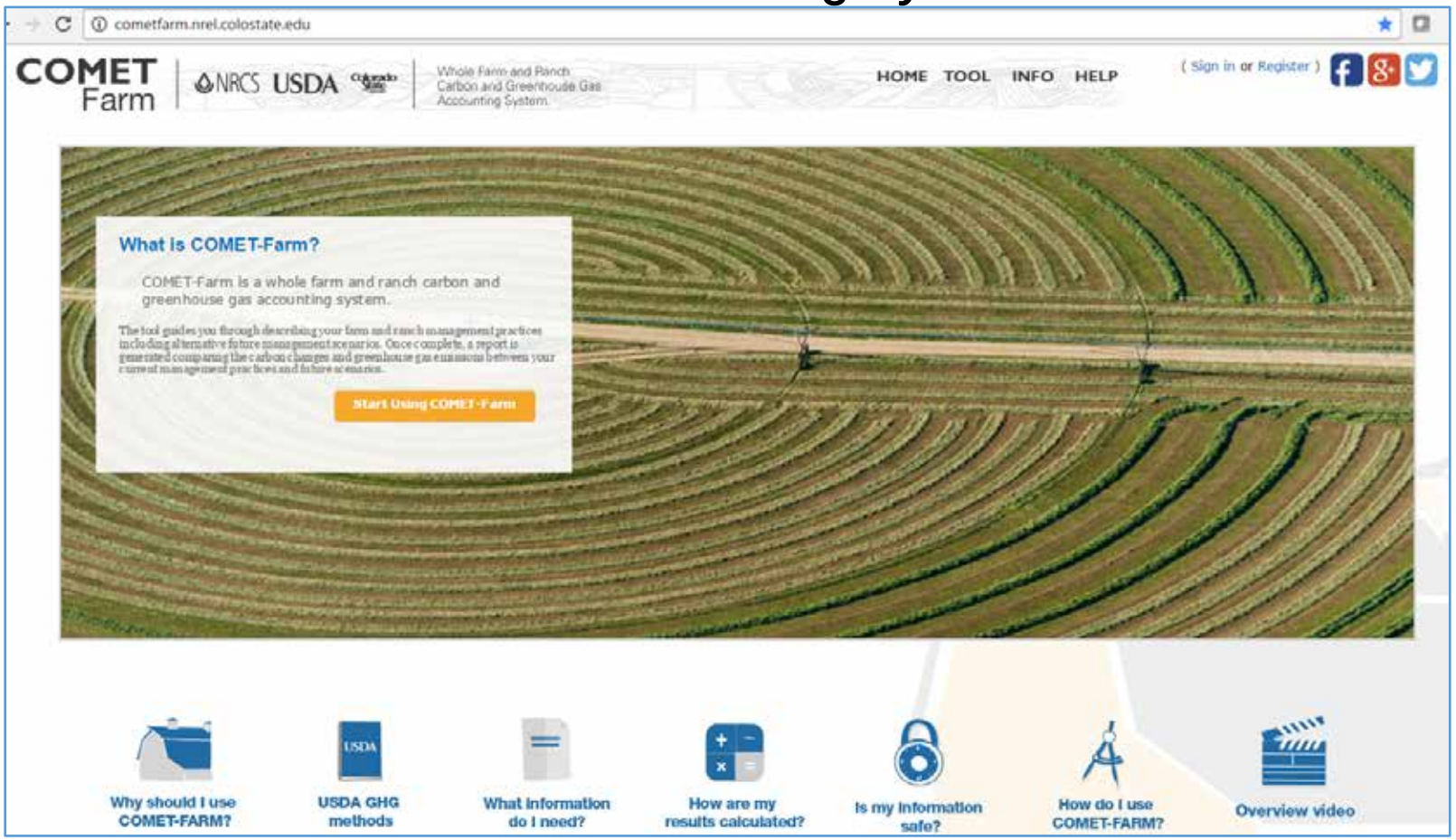
Conservation tillage only	254 No-tillage	100	9,203*	1.17-0.18
			9,203	
Conservation tillage & windbreaks	241 No-tillage	95	8,712*	1.17-0.18
	13 Windbreaks	5	7,416	2.36-17.23
			16,128	

*COMeT-VR (Brenner et al.)

Schoeneberger, Brandle & Zhou

COMET Farm – Carbon & Greenhouse Accounting System



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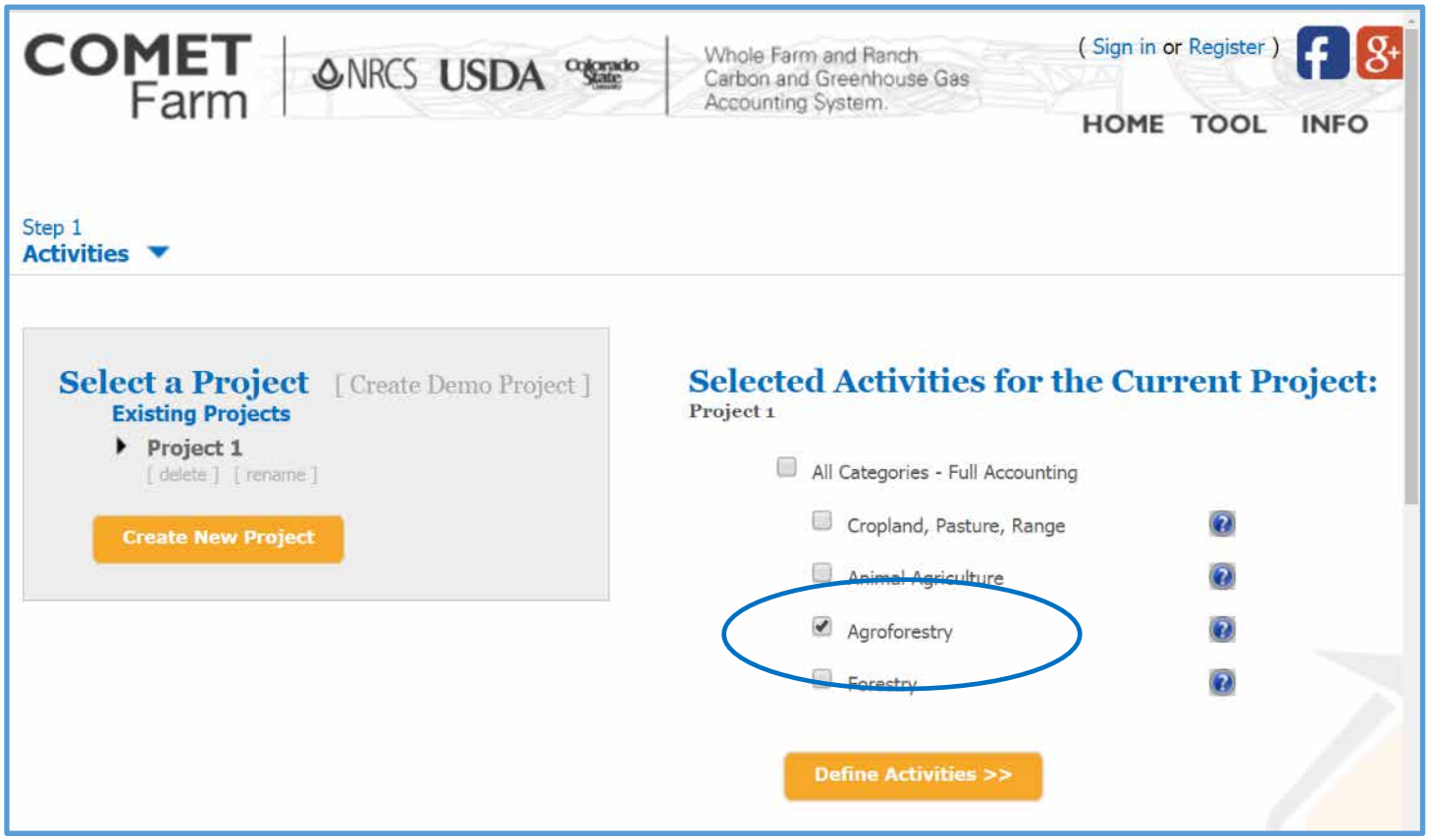

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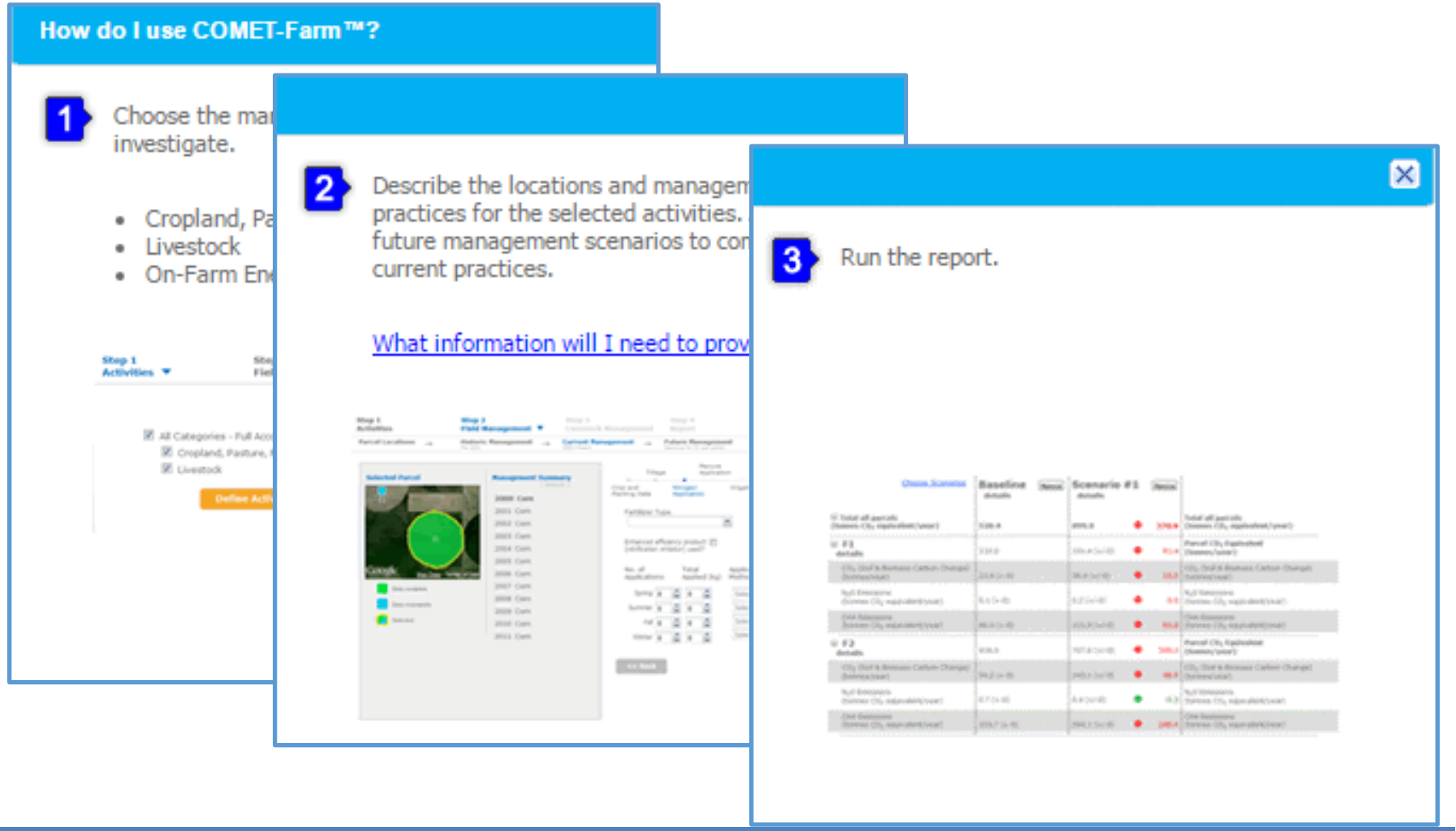

Agroforestry: A 'Leatherman' w/in the 'CC-Integrated' Toolbox for Agriculture

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Agroforestry: Reducing Threats & Enhancing Resiliency in Ag-Lands

Risk management difficult in monocultures and annual-only systems.

Mixing in woody plants offers:

- Crop diversification
- Structural and functional diversity

Agroforestry: Reducing Threats & Enhancing Resiliency in Ag-Lands

- Microclimate modification
- Habitat diversification
- Maintenance & protection of natural resource services
- Diversified production opportunities

- Yield increases due to wind protection *(Kort 1988)*

  (average of 15% in winter wheat, 25% in soybeans, 12% in corn)

- Higher grain yields in alley-grown wheat during drought compared to the control. *(Rivest et al. 2013)*

Microclimate modification: forage

- Air and soil temperatures too cold or too warm for forage growth can be favorably modified by silvopasture systems to create extended production. *(Feldhake 2002; Moreno et al. 2007)*

- Higher levels of CO_2 reduce forage quality. Shading may increase forage quality (increasing protein content while reducing fiber). *(Morgan et al. 2004; Kallenbach et al. 2006)*

Microclimate modification: livestock

- Livestock shelterbelts increased feed efficiency 13-50% in winter and milk production by 9-76%. *(Hintz 1983)*
- Cattle provided with shade reached their target body weight 20 days earlier than those without shade. *(Mitlöhner et al. 2001)*

Where Can I Find Climate Change Information?

Related to Farming

USDA Climate Hubs

- Develop and deliver science-based, region-specific information and technologies
- To agricultural and natural resource managers
- That enable climate-informed decision-making, and
- To provide access to assistance to implement those decisions.

USDA Climate Hubs

https://www.climatehubs.oce.usda.gov/

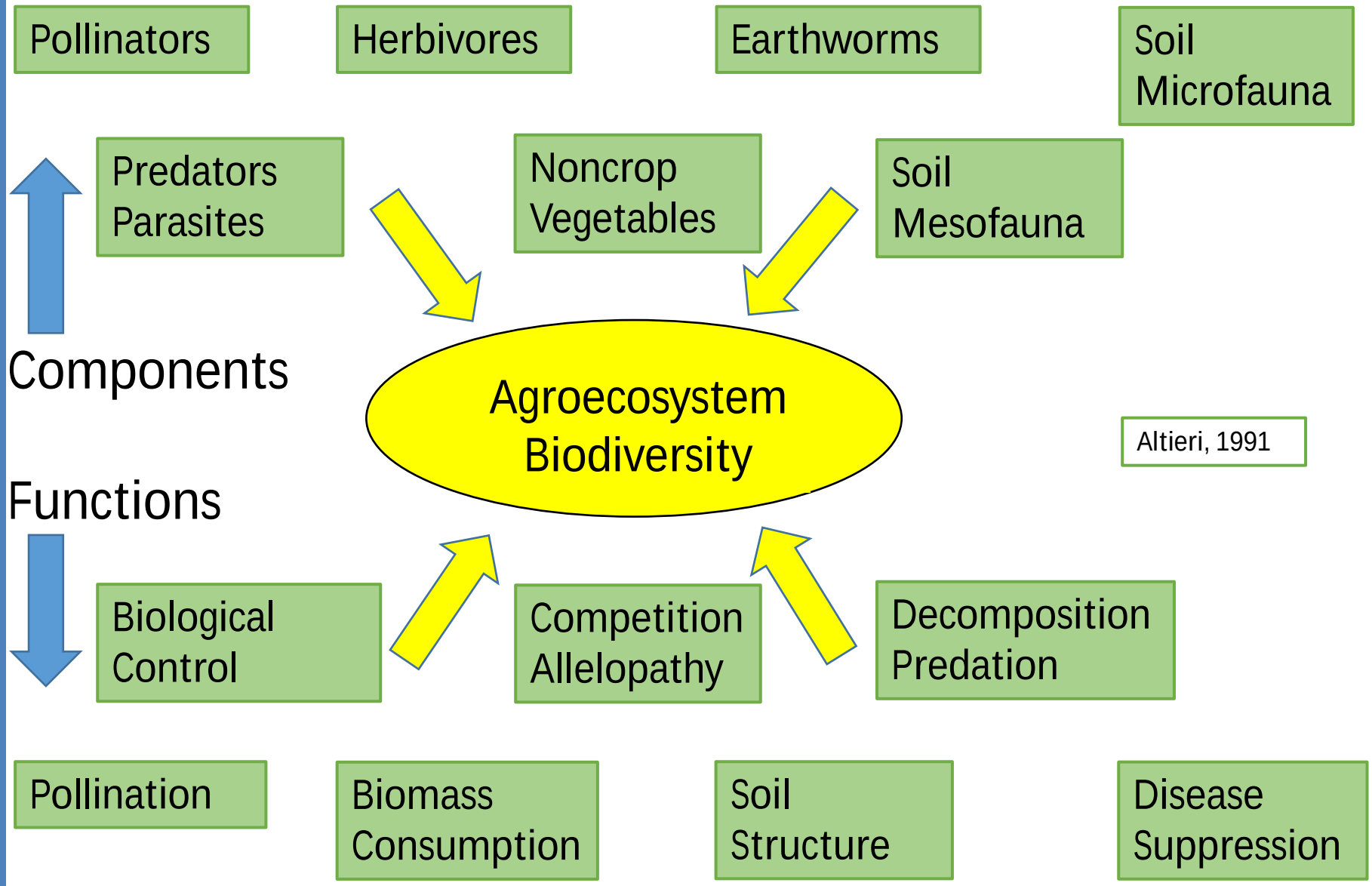
Southern Plains Climate Hub

Biodiversity

- Different Scales
  - field
  - farm
  - watershed
- Intentionally
  - crop rotation
  - variety of crops
  - cover crops
  - windbreaks
  - leaving untilled areas
- Unintentional
  - stuff happens

Benefits of Encouraging Diversity:

- Improve soil quality
- Support insect, weed and disease control
- Encourage beneficial organisms
- Reduce economic risk

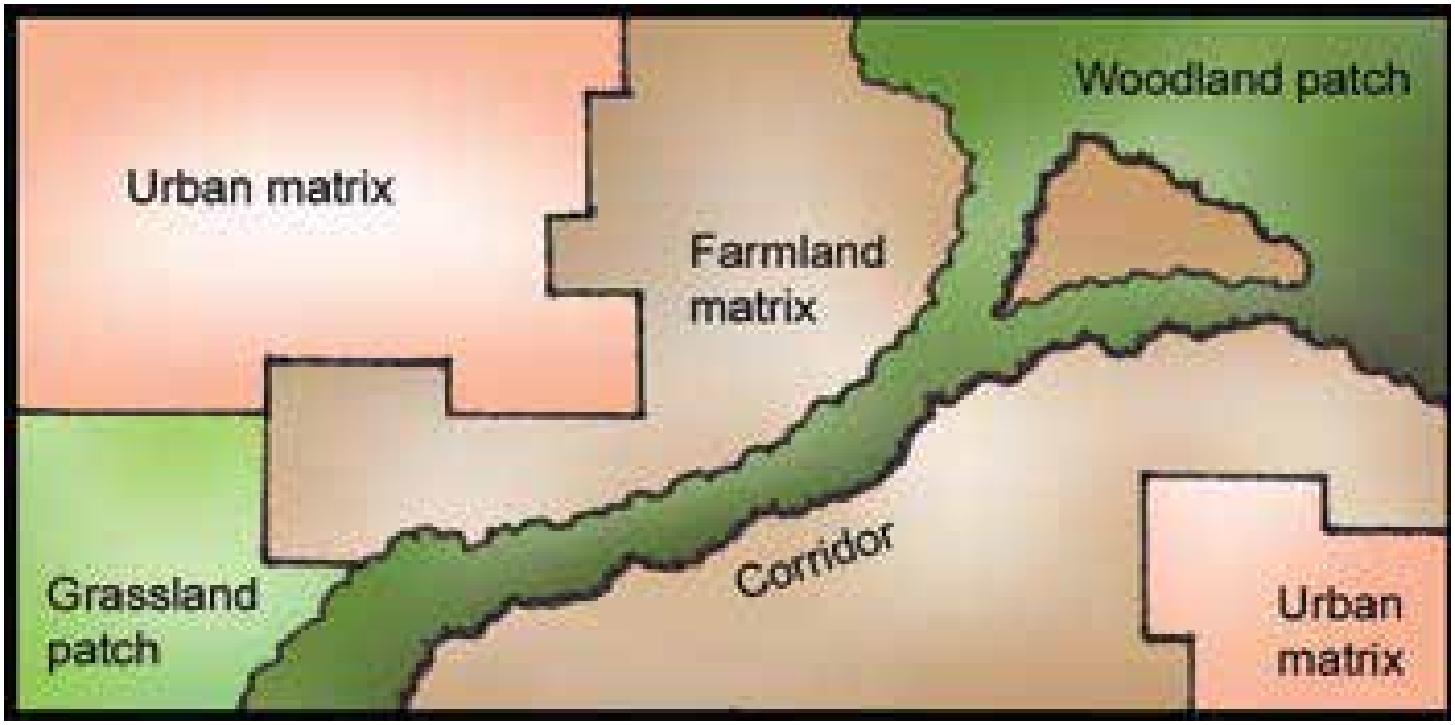


Altieri, 1991

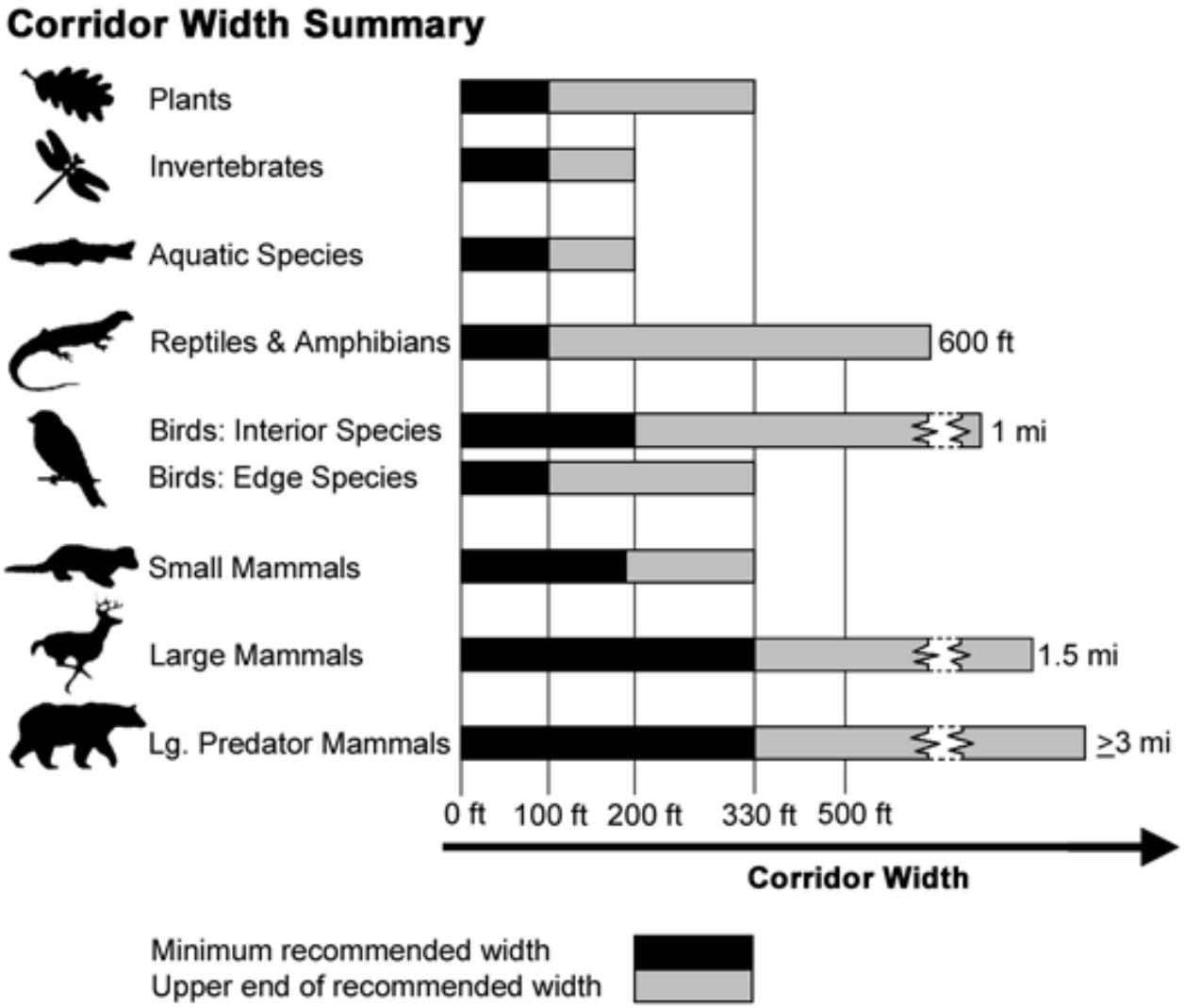
Habitat diversification

- Agroforestry plantings can provide critical habitat to native pollinators, and
- Natural enemies to crop pests.

Many Agroforestry Practices Can Function as Corridors

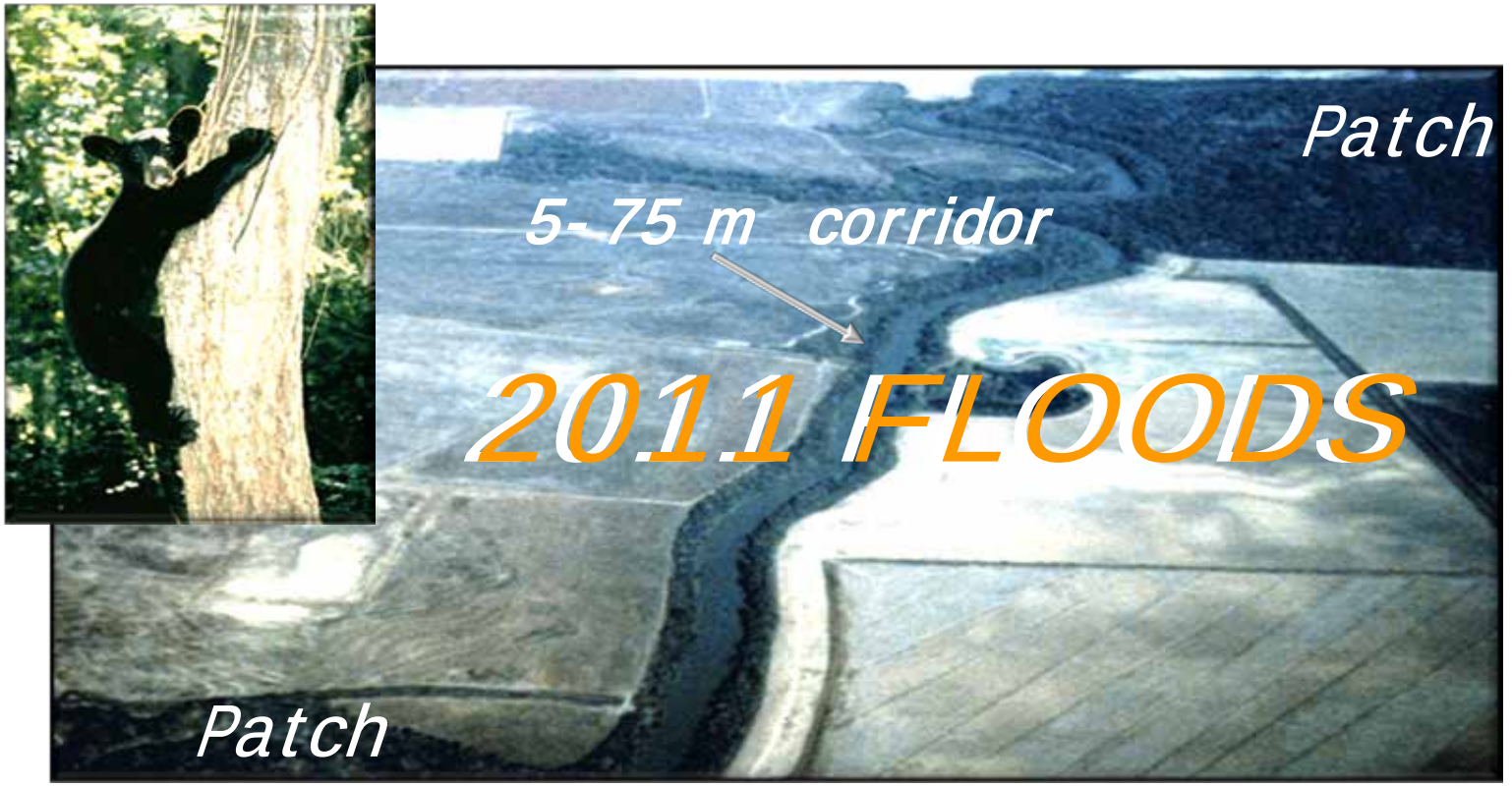


Critical travel corridors in the highly fragmented ag/urban landscape.



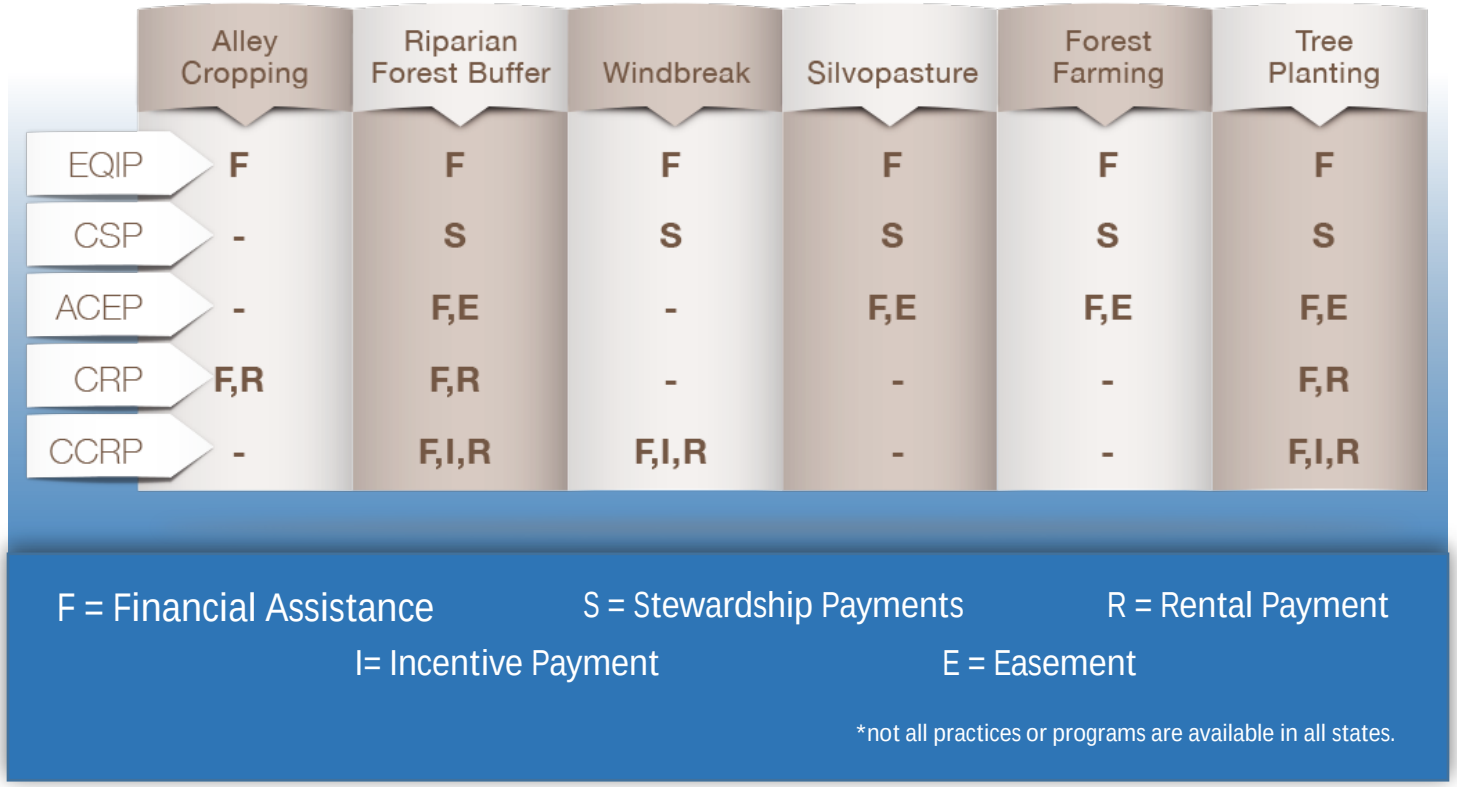
Source: Conservation Buffers – Design Guidelines for Buffers, Corridors and Greenways by Gary Bentrup

Habitat diversification: Connectivity



- *Critical habitat for 'every day' survival in-place.*
- *Critical migration corridors to escape climate change-impaired habitat.*
- *Critical habitat to escape extreme weather event - FLOODS*

Agroforestry in the Farm Bill



	Alley Cropping	Riparian Forest Buffer	Windbreak	Silvopasture	Forest Farming	Tree Planting
EQIP	F	F	F	F	F	F
CSP	-	S	S	S	S	S
ACEP	-	F,E	-	F,E	F,E	F,E
CRP	F,R	F,R	-	-	-	F,R
CCRP	-	F,I,R	F,I,R	-	-	F,I,R

F = Financial Assistance S = Stewardship Payments R = Rental Payment

I= Incentive Payment E = Easement

*not all practices or programs are available in all states.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