

An Integrated Landscape Vision for Sustainable Feedstock Supplies

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Presentation Outline

- ARS - REAP team acknowledgement
 - What is a landscape vision?
 - Why is it important?
 - How can it be implemented?
 - What barriers must be overcome?
- 

Renewable Energy Assessment Project



VISION

Sustainable Feedstock
Production & Harvest

Research Activities

- Evaluating management practices
- Developing decision support tools
- Quantifying ecosystem services of crop residues and other feedstocks

Corn stover was initial focus for REAP, but *miscanthus*, switchgrass, sorghum, sugarcane bagasse, and CRP studies are now included

What is a Landscape Vision?



Recognizing Nature's Diversity!

Why is Diversity Important?

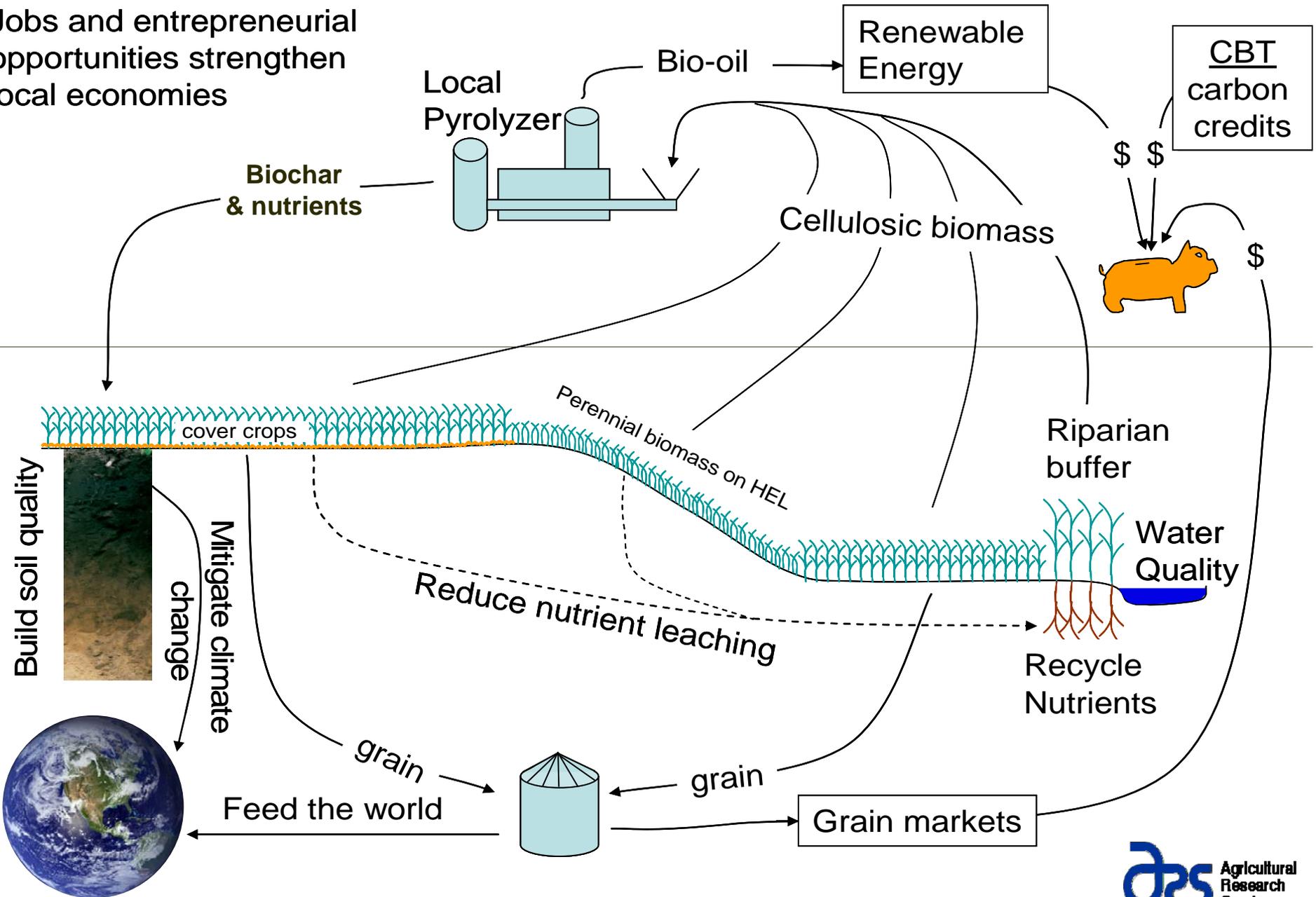


Landscape Diversity Provides -

- Multiple ecosystem functions
 - Feedstock for bioenergy
 - Enhanced nutrient cycling
 - Multiple pathways for sequestering C
 - Food, feed & fiber resources
 - Filtering and buffering processes
 - Wildlife food & habitat
 - Soil protection & enhancement
 - Economic opportunities for humankind

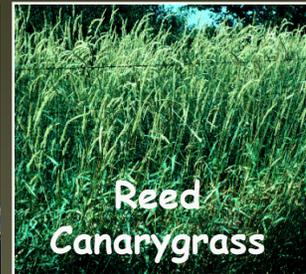
Diversity Is the Key to Sustainable Systems

Jobs and entrepreneurial opportunities strengthen local economies



Bioenergy & Conservation are Compatible IF We Utilize -

◆ Multiple feedstock options



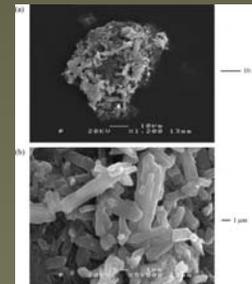
◆ Multiple conversion platforms



Biochemical /
fermentation
(Through sugar
intermediates)



Thermochemical /
pyrolysis
(Direct to building
blocks (CO, H₂))



Direct /
catalyst

◆ And recognize that -

There Is No Single Solution!



How Do You Implement this Vision?





What are the air quality impacts?

What are the water quality impacts of current practices?

Is the soil improving or degrading?

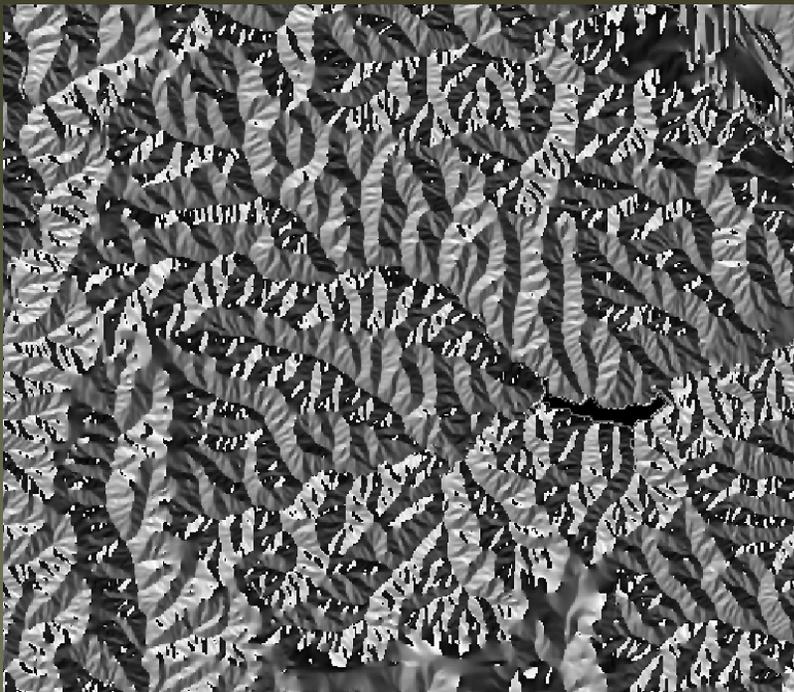
Do we have the best spatial arrangement of plants on the landscape?

Are crop and livestock production affecting environmental quality?

What cropping system is best for the landscape?

Assess Current Practices

Determine Landscape Characteristics

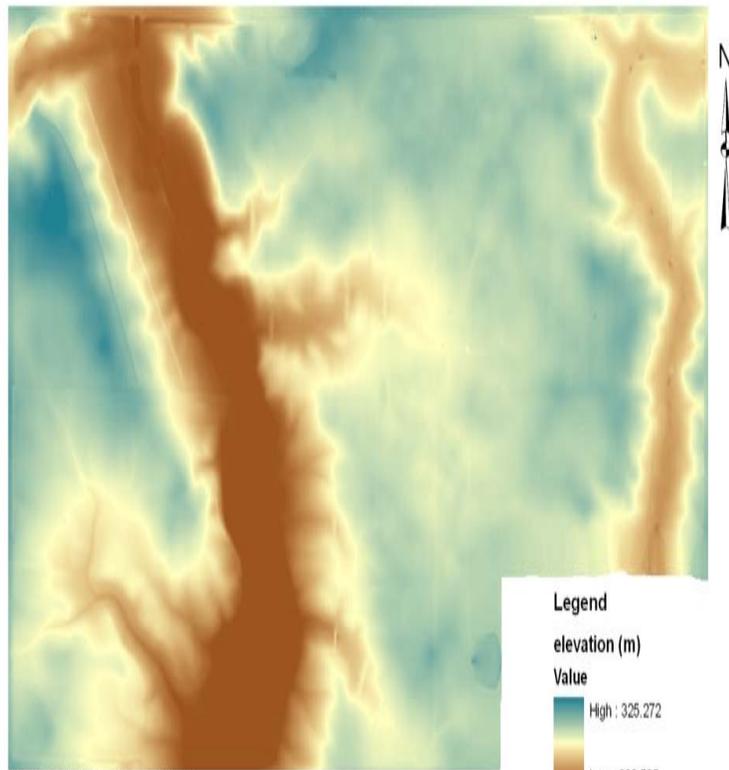


- ◆ Elevation
- ◆ Slope
- ◆ Curvature
 - Average
 - Planform
 - Profile
- ◆ Upslope Contributing area
- ◆ Aspect

Digital elevation Map or DEM

A Central Iowa DEM

Utthe Farm Elevation



Survey data collected May - August 2008
by NSTL's watershed team.
Data processed by Josh Obrecht and Kevin Cole
(USDA ARS NSTL).

0 125 250 500 750 1,000 Meters



Utthe Farm North and South Areas

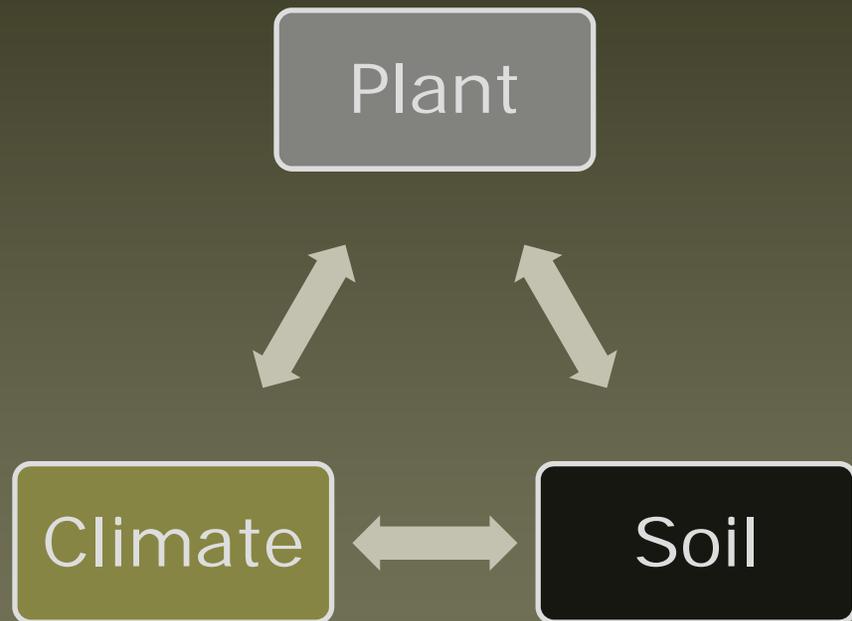


Quantify Current Productivity and Risk



What's Causing the Variability?

- ◆ Plant
 - Genetics
 - Disease
 - Weeds/Pests
- ◆ Soil
 - Chemical - pH, N, P, K
 - Physical - BD, PAWC
 - Landscape effects
 - ◆ Runon
 - ◆ Runoff
 - ◆ Drainage
- ◆ Climate
 - Rainfall/Irrigation
 - Temperature regimes
 - Humidity
 - Solar radiation

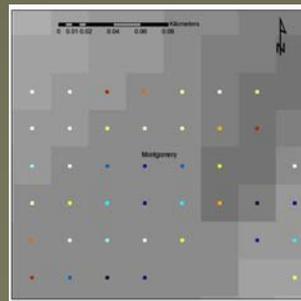
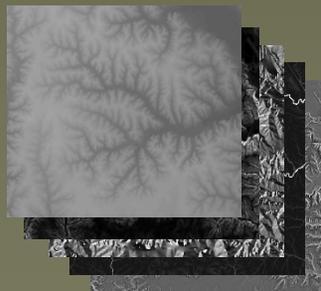
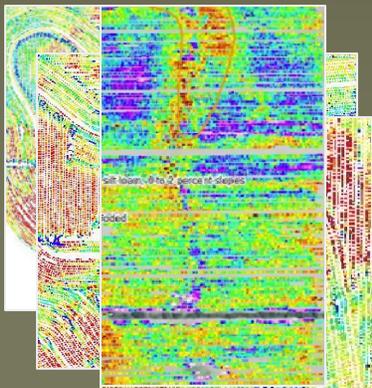


Match Critical Resource Needs With Appropriate Conservation Practices



Utilize Modeling to Expand Scale

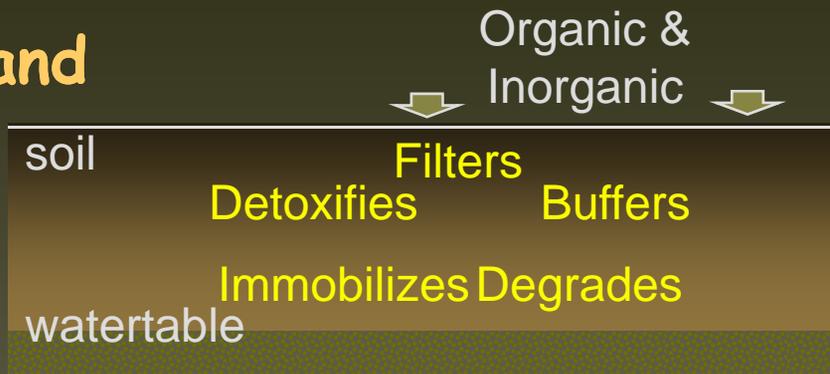
(e.g. $\text{Yield} = f(x)$ (soil & landscape variables))



REAP

Evaluate For All Ecosystem Services

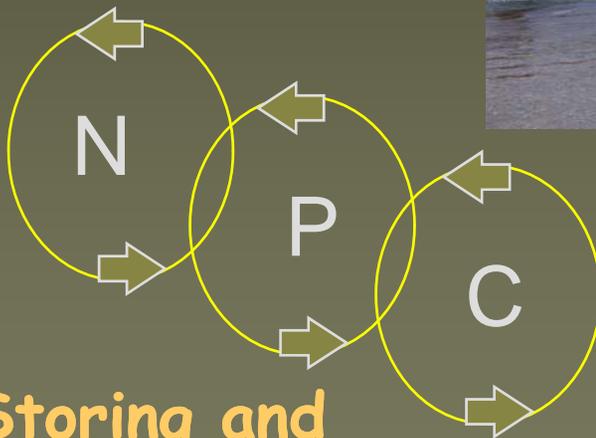
Filtering and Buffering



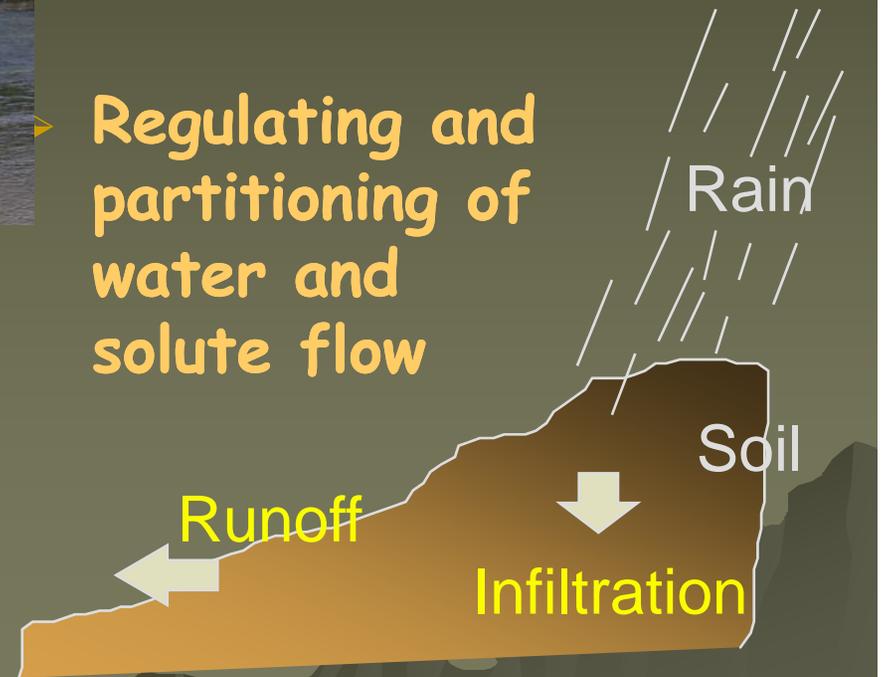
Wildlife
Economics
Community



Regulating and partitioning of water and solute flow



Storing and cycling nutrients



A Hypothetical Landscape Plan

Water runs downhill, **SO**



To solve erosion, water quality, low SOM, lack of wildlife, dwindling community, yield variation, low profit, & ...

Plant woody & perennial grasses close to streams



Next deep-rooted species to catch nutrients & fix C

Moderate sideslope - grain & cover crops

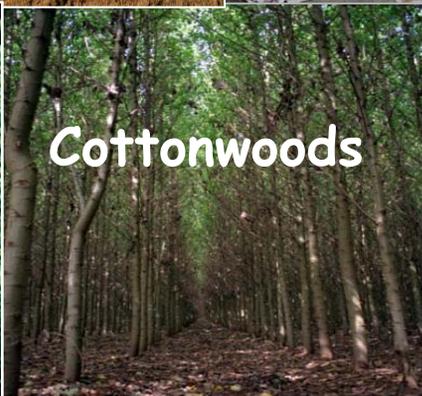
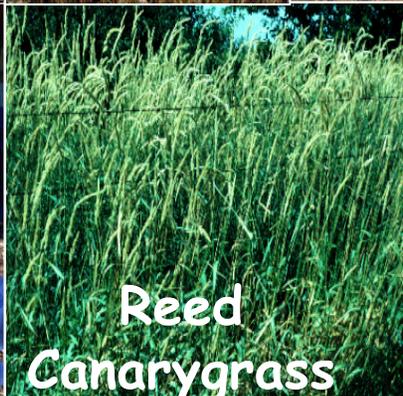
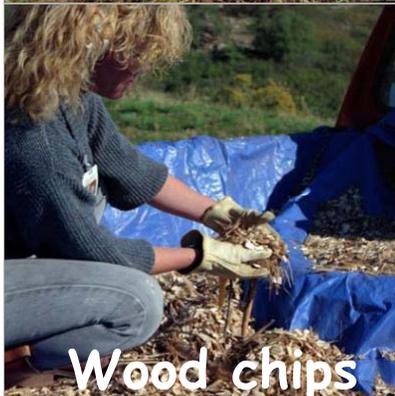
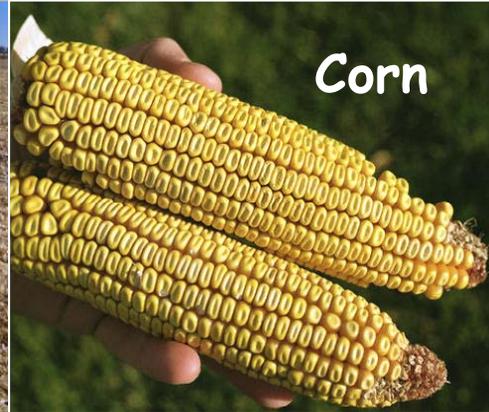


Severe sideslope - perennial biomass crops

Highly productive areas - intensive crop production

REAP

Adjust & Modify as Needed



Summarizing the Implementation Steps

- Identify & record current landscape characteristics
- Determine all production & conservation needs
- Match critical needs & conservation practices (models)
- Apply practices using site-specific management
- After implementation, monitor against the baseline
- Evaluate, model & make adaptive changes

Critical Barriers and What Policy Makers Could Do To Help

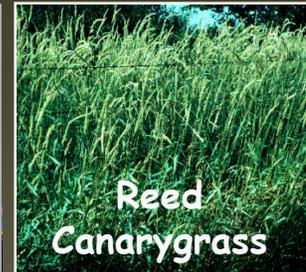
1st stop addressing individual problems

A landscape vision must address bioenergy, air quality, water quality, soil quality, wildlife, C sequestration, rural development, & other issues as an integrated system (**SWAPA+H**)



2nd Promote Optimal Technology Use

◆ Multiple feedstock options



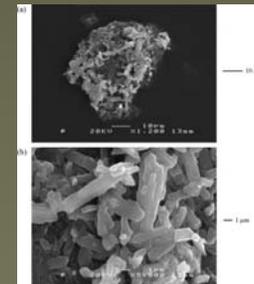
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Direct /
catalyst

◆ and Multiple solutions

REAP

3rd Change the Public Message



Crop residue is **NOT**
a **WASTE** material

It has multiple roles
that help sustain soil
resources & humankind

Economic growth that destroys
ecological support systems is neither
sustainable nor true progress

REAP