Agricultural Outlook Forum
U.S. Department of Agriculture
Presented: February 18-19, 2010

An Integrated Landscape Vision for Sustainable Feedstock Supplies

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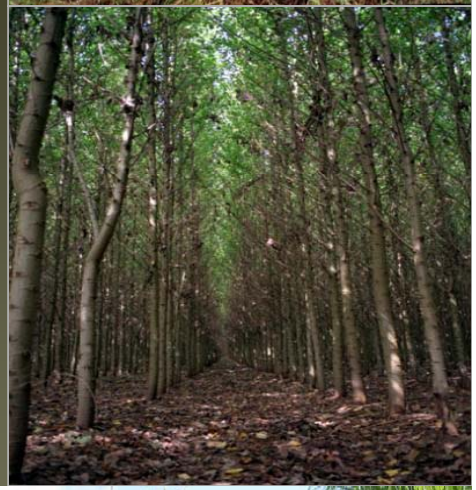
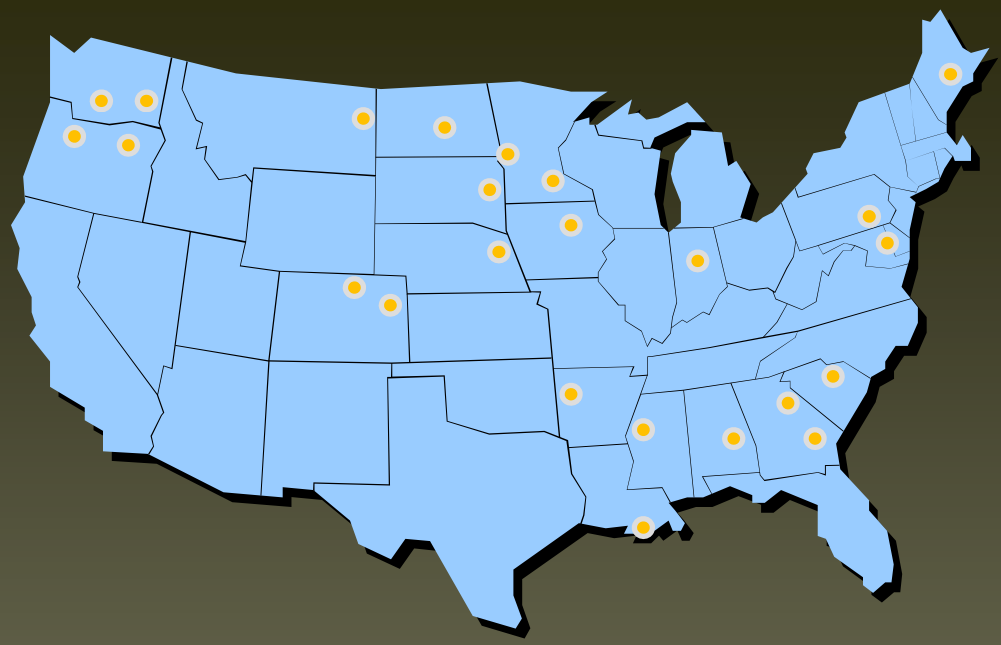


Presentation Outline

- 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?

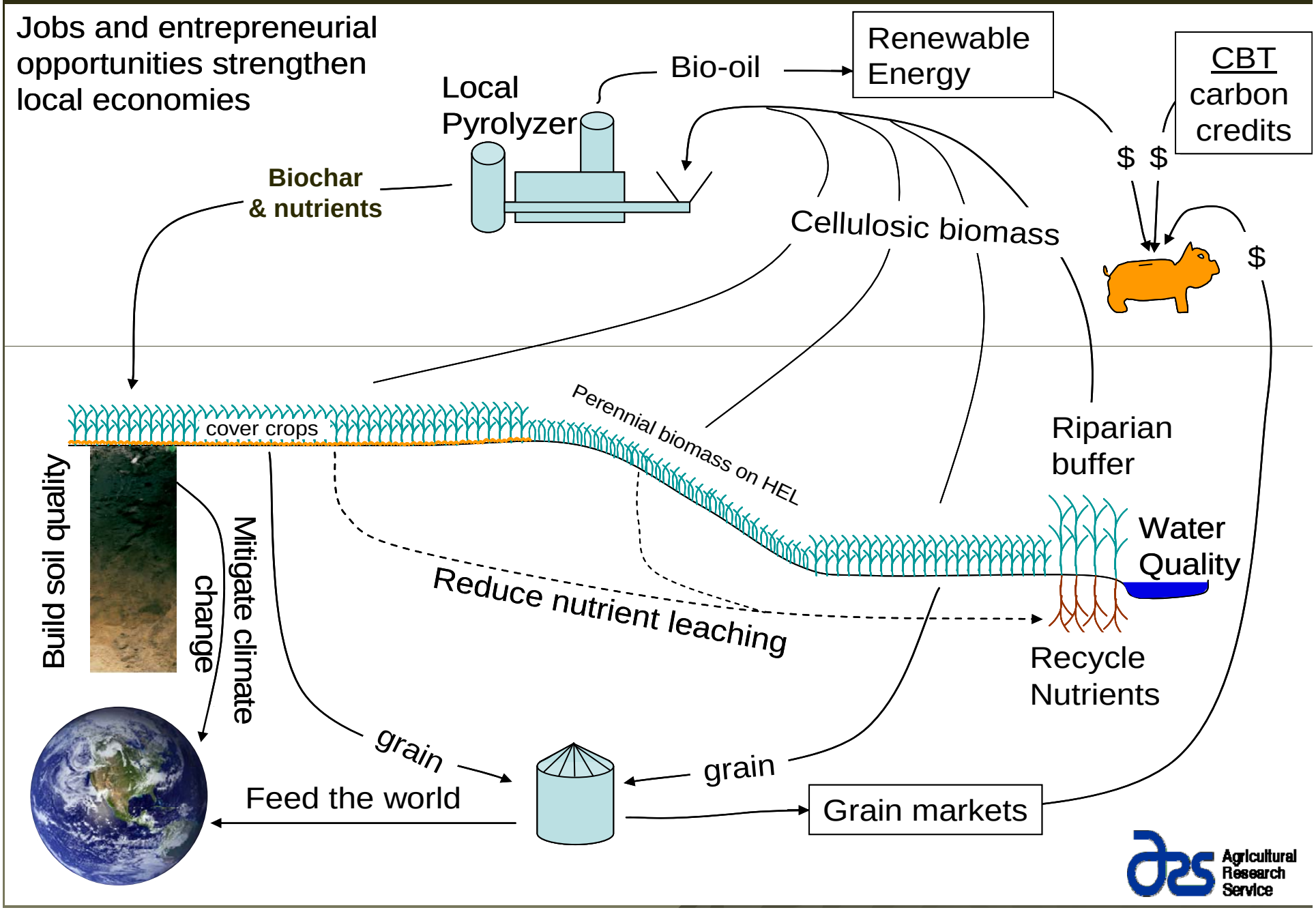
Why is Diversity Important?

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

REAP

Diversity Is the Key to Sustainable Systems



Bioenergy & Conservation are Compatible IF We Utilize –

- Multiple feedstock options

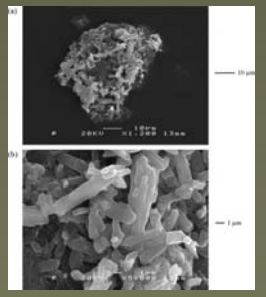
- Multiple conversion platforms

Biochemical / fermentation

(Through sugar intermediates)

Thermochemical / pyrolysis

(Direct to building blocks (CO, H_2)



Direct / catalyst

- And recognize that –

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There Is No Single Solution!

How Do You Implement this Vision?


What are the water quality impacts of current practices?
What are the air quality impacts?
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

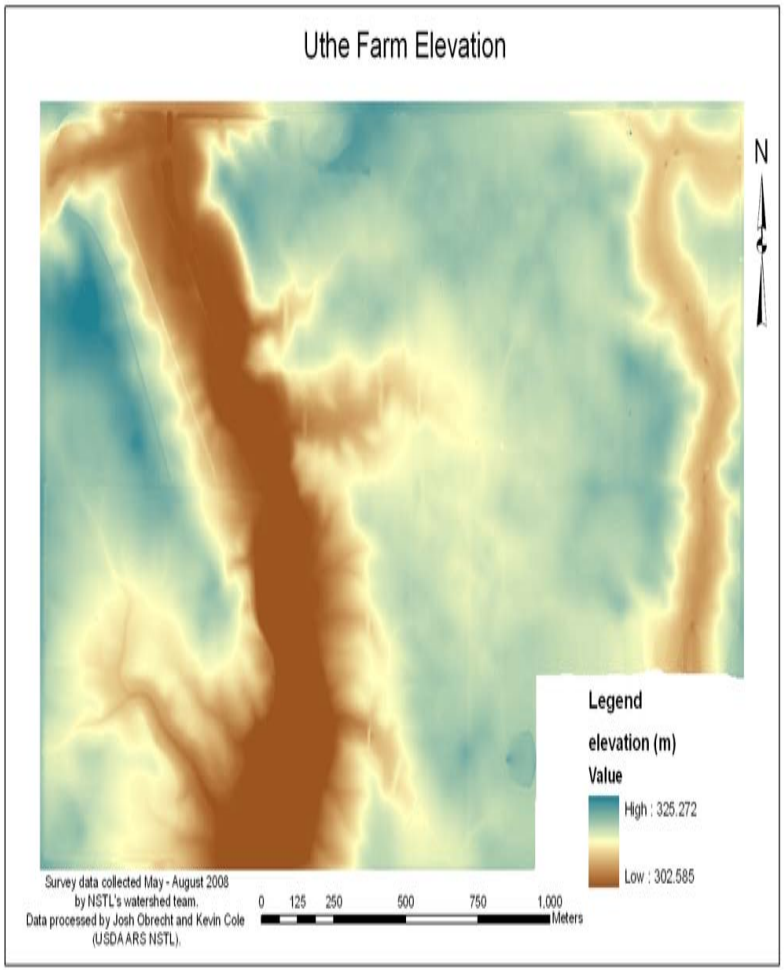
Determine Landscape Characteristics

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

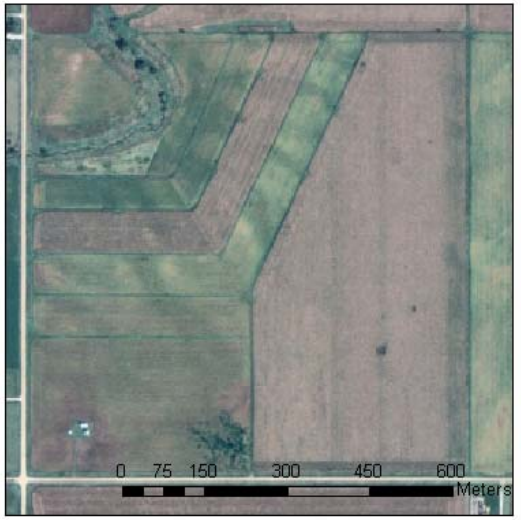
Digital elevation Map or DEM

REAP

A Central Iowa DEM



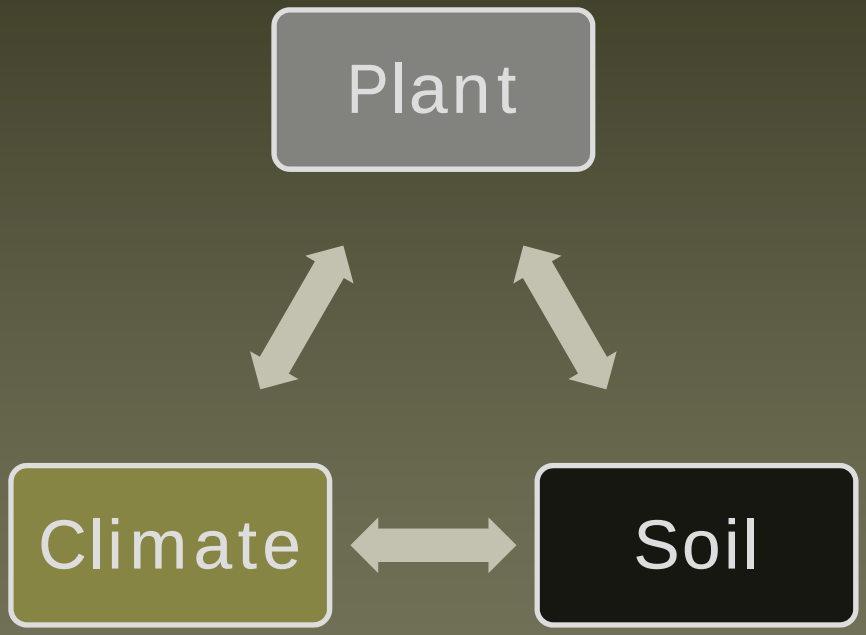
Uthe Farm North and South Areas



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



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Match Critical Resource Needs With Appropriate Conservation Practices

Utilize Modeling to Expand Scale

(e.g. Yield = fx (soil & landscape variables)

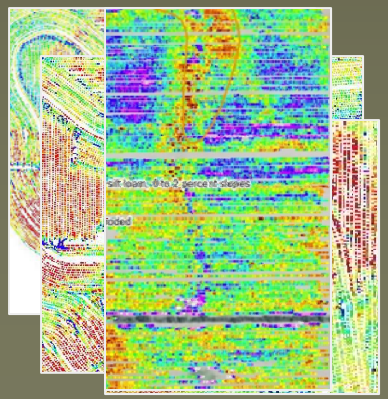
Collect Yield Data (mean/CV)

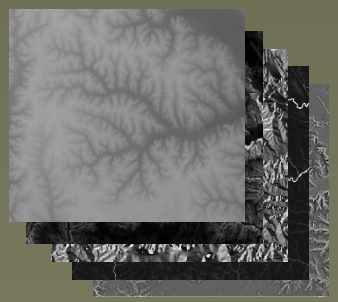
Collect Soil-Landscape Data

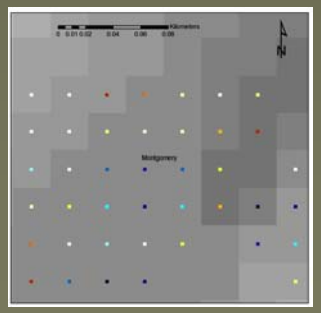
Merge These Data

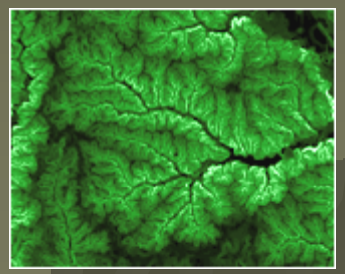
Model (mean/CV)

Apply Model Everywhere





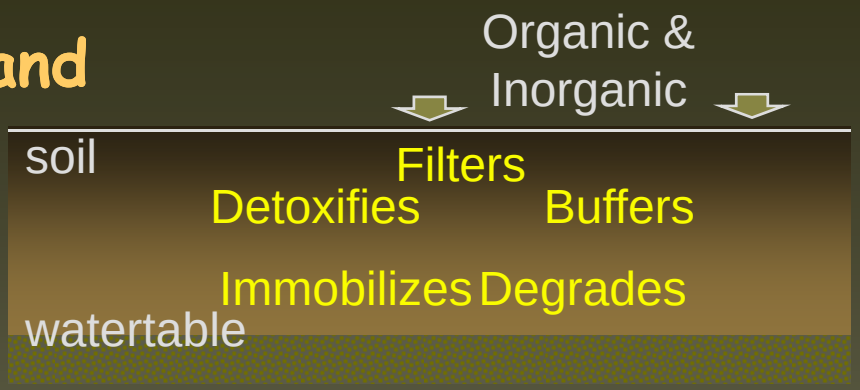




REAP

Evaluate For All Ecosystem Services

- Filtering and Buffering

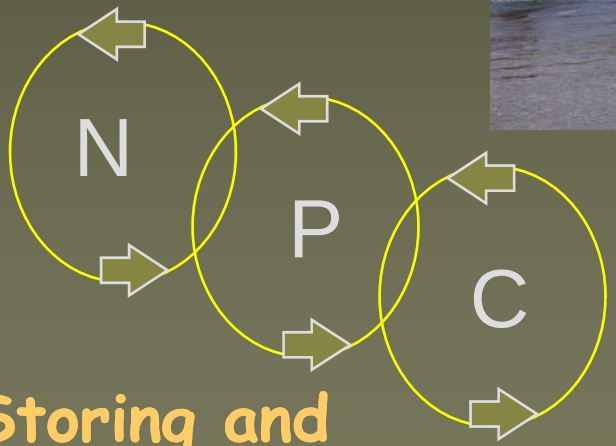


Wildlife

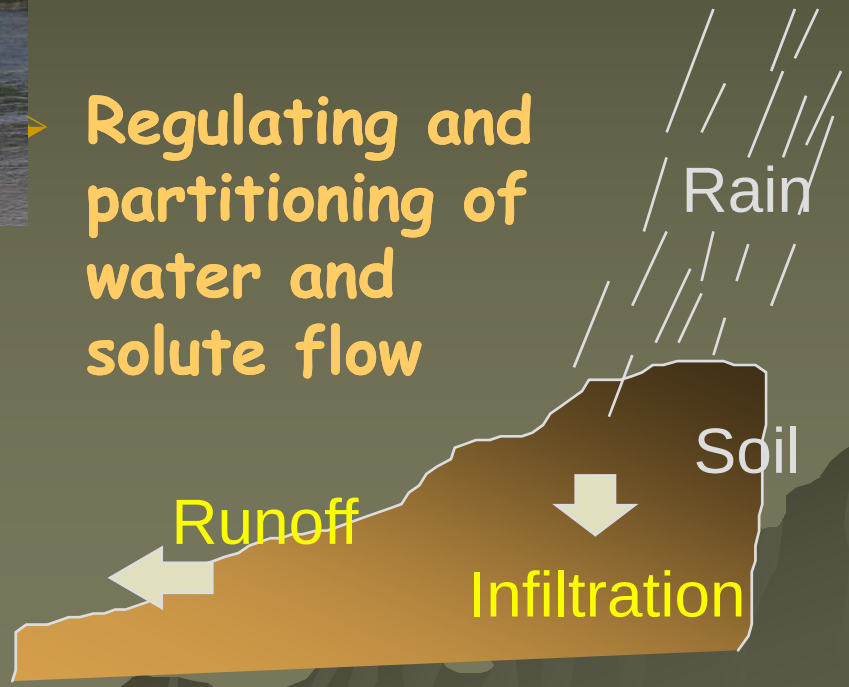
Economics

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

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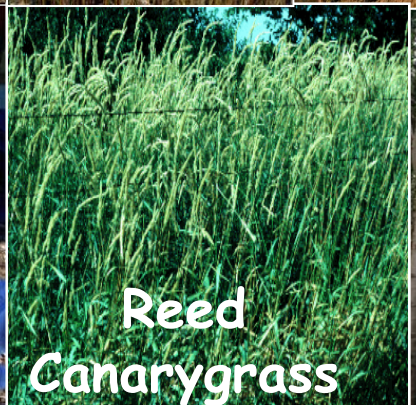
Adjust & Modify as Needed



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

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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)

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2nd Promote Optimal Technology Use

- Multiple feedstock options

- Multiple conversion platforms

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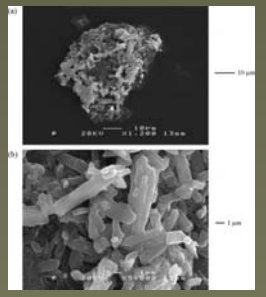
(Through sugar intermediates)

Thermochemical / pyrolysis

(Direct to building blocks (CO, H_2)



Direct / catalyst

- and Multiple solutions

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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

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