Eighty plus percent of the Iowa landscape is devoted to agriculture, either row-crop or grazing. More than 90% of the original wetlands and prairies and over 70% of the original forests were cleared to provide for the agricultural land-use. Our goal today is to compare the same basic parameters we have been comparing in the prairie, stream and forest ecosystems over the past few weeks. We will make direct comparisons between corn and soybean fields and some reconstructed ecosystems along streams north of Ames.

The laboratory objectives are:

1. To identify the biotic and abiotic factors (clipsrot) that control the structure and functioning of the agricultural ecosystems (focus on row-cropped fields).
2. To describe the movement of energy, nutrients, and water through these ecosystems.
3. To compare the differences between this ecosystem and the forest, prairie/pothole, reconstructed and aquatic ecosystems.

Field Action Items

Each group will have: meter stick, coffee can, mallet, cutting tool and access to a shovel. We will visit a corn and a soybean field adjacent to a reconstructed riparian buffer. This site lies just north of Roland Iowa.

Collect the following data for the corn, soybean and reconstructed buffer:
   1. Number of plant canopies
   2. Plant species in overstory & understory canopies
   3. Number species of grasses, forbs, woody plant seedlings (m² plots)
   4. % cover of live plants in m² plots
   5. % cover of soil by dead organic matter in the m² plots
   6. Soil texture and infiltration rates (in/hr)
   7. Parent material
   8. Slope position (toe, foot, back, shoulder, summit & aspect if significant)
      (in floodplain consider oxbows, levees, etc)
   9. Shape of topography (concave, convex, straight)
   10. Evidence of erosion or deposition of soil and potential for water movement.
   11. Microclimatic conditions in relation to other sites (cool, warm, moist, dry)(consider whole year)
   12. Comment on the amount and timing of solar radiation.

We will analyze soil texture using the texture-by-feel method (see next page) and will estimate infiltration using infiltrometers. Our infiltrometers consist of coffee cans with the bottoms cut out of them. We will gently push them into the surface, fill the cans with water to a designated height and time the drop in water to determine rate of infiltration. To use them, gently clear the organic matter from the surface of the soil in the ring of space that the edge of the can will sit on. Place the can on the ground and use a knife to cut the soil around the base of the can. Gently tap the can into the ground and use fingers to seal inside of soil to can. Fill with water to top line (lines are approximately 1 in apart). Time the drop from one line to the next. Calculate the rate of infiltration in inches/hour.
KEY TO SOIL TEXTURE BY FEEL
(Adapted from flow chart by Steve Thilen, 1979, source unknown.)

Begin at the place marked "Start" and follow the flow chart by answering the questions, until you identify the soil sample.

Place approximately 2 teaspoons of soil in your palm. Add water by drops and knead the soil until it is moldable and feels like moist putty.

Add dry soil to soak up water.

Does soil remain in a ball when squeezed?  
YES  NO

Add drops to make wetter.

Is soil too dry?  NO  YES

Place ball of soil between thumb and forefinger. Gently push the soil with thumb, squeezing it upward into a ribbon. Form a ribbon of uniform thickness and width. Allow the ribbon to emerge and extend over forefinger, until it breaks from its own weight. Does soil form a ribbon?

NO  YES

Wet a small pinch of soil in palm until it is very wet. Rub soil around with your finger.

Does soil make a weak ribbon <1" long before it breaks?

YES

Does soil make a medium ribbon 1-2" long before it breaks?

YES

Does soil make a strong ribbon >2" or longer before it breaks?

YES

SANDY LOAM

Does soil feel very gritty?  
YES  NO

SANDY CLAY LOAM

Does soil feel very gritty?  
YES  NO

SANDY CLAY

Does soil feel very gritty?  
YES  NO

LOAM

Is soil really neither gritty nor smooth?  
YES  NO

CLAY LOAM

Is soil really neither gritty nor smooth?  
YES  NO

CLAY

Is soil really neither gritty nor smooth?  
YES  NO

SILTY LOAM

Does soil feel very smooth?  
YES

SILTY CLAY LOAM

Does soil feel very smooth?  
YES

SILTY CLAY

Does soil feel very smooth?  
YES

LO

% CLAY

HI
<table>
<thead>
<tr>
<th>Agricultural Ecosystem</th>
<th>Corn Field</th>
<th>Soybeans</th>
<th>Reconstructed Prairie</th>
<th>Reconstructed Woody</th>
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<tbody>
<tr>
<td><strong>OVERSTORY</strong></td>
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<td># of strata (canopies) and approximate height of each</td>
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<td># of species in each stratum (give species names where possible)</td>
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<td>Basal area (density) of trees (prism plot method)</td>
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<td><strong>UNDERSTORY (1m² plots)</strong></td>
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<td># of species in each group (annual crop, grasses, forbs, woody) (give names where possible)</td>
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<tr>
<td>% cover of live plants in m² plots</td>
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<td>% cover of soil by dead organic matter in m² plots</td>
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<td>Ave. depth of organic matter cover</td>
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<td>Soil texture &amp; infiltration rate</td>
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<td>Parent material</td>
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<td>Slope position (toe, foot, back, shoulder, summit) &amp; aspect If in floodplain consider oxbows, levees, etc.</td>
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<td>Shapes of topography at given slope position</td>
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<td>Evidence of erosion or deposition of soil &amp; potential for surface water movement</td>
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<td>Microclimate conditions in relation to other sites (temperature, humidity, wind speeds) (consider on an annual basis – average conditions through whole year)</td>
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<td>Amount and timing of solar radiation</td>
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<td>Soil Texture using Feel Method</td>
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<tr>
<td>Infiltration Rates: 1) drop in can per unit time; 2) inches per hour for soil.</td>
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</table>
• What do you think the root systems of the major plant species look like (depth, width, fibrous nature, etc.) below ground - compare them to what you think root systems in each of the major ecosystems of the region are like (forest, prairie, pothole and agricultural field)?

• What is meant by basal area – compare the area of the tree cross-section to the area of an acre. How might basal area of corn and beans differ from trees?

• Who are the major consumers in the ag field (wildlife (animals and birds), insects)? How do they compare to those in the forest and prairie?

• Is this ecosystem an island (patch) (area surrounded by a very different ecosystem), corridor (a long narrow ecosystem that connects two larger ecosystems), or large block ecosystem (matrix) (probably at least a 1/2 section, 320 acres in size) within this landscape?

• Is the interior to edge ratio large or small (large if the ecosystem is a large square, small if it is the same area but a long narrow ecosystem that has a lot of edge)? How does this influence wildlife distribution?

• What are the major differences in survival strategies between the plants in the reconstructed ecosystem and those in the crop field?
• Is nutrient cycling open or closed (is this a leaky system (open)) in the crop field? Defend your response – what makes it either leaky or conservative (closed)?

**Evaluation of environmental services and products** – Describe the major benefits obtained from the native ecosystem(s) in terms of environmental services and products for each of the following general categories:

<table>
<thead>
<tr>
<th>Water resources/watershed management:</th>
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<tr>
<td>Nutrients (including soil fertility):</td>
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<td>Biodiversity:</td>
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<td>Wildlife:</td>
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<td>Marketable products:</td>
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<td>Carbon sequestration:</td>
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<td>Landscape diversity:</td>
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<td>Productivity:</td>
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<td>Sustainability:</td>
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Figure 2.—Pattern of soils and parent material in the Clarion-Webster-Nicollet association.