No-Till

• Continuous No-Till is the most effective conservation practice for the maintenance or improvement of soil productivity
• However, it must be done correctly for this practice to be sustainable.
No-Till Management

• NRCS Definition:
  – No full width inversion tillage
  – Can utilize:
    • Low disturbance subsoil tillage
    • Low disturbance fertilizer injection
    • Low disturbance manure injection
    • Strip-tillage=30% or less of surface is cultivated
    • No-till drills and planters with fluted coulters
Subsoil Tillage in No-Till

- Alleviate subsoil compaction
  - Shank maybe pulled to depths of 10-16 inches
- Not needed for shallow compaction
Fertilizer Injection

- Can be done with liquid, granular, and gaseous fertilizers
- Reduces volatilization and runoff losses
Manure Injection

• Greatly increases nutrient use efficiency and decreased runoff losses
USDA-ARS Subsurface Applicators (Subsurfers)

Variable Spacing
Developed by Dr. Tom Way
USDA-ARS Alabama

Fixed Spacing
Developed by Dr. Dan Pote
USDA-ARS Arkansas
Pennsylvania 2008 Runoff Experiments

P runoff (lbs/acre)

<table>
<thead>
<tr>
<th></th>
<th>Broadcast</th>
<th>Subsurfer</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.45</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4 tons/acre

Courtesy of P. Kleinman (USDA-ARS)
Broadcast Application

Subsurface application

Ammonia (lbs/acre)

- **Broadcast**
- **Subsurface**
- **No Manure**

Measuring Ammonia in PA

Broadcast Application

Subsurface application

Courtesy of C. Dell (USDA-ARS)
No-till Planters and Drills

• No-till planters and drills are **heavier**
• Designed to allow residue to flow through them
• Must be able to cut or move residue in the crop row
• Useful videos on Planters
• **Maintenance** and **differences** between NT and CT planters
Basic Planter

- Planter boxes and frame are level
- Parallel arms should be level in planting position to achieve maximum benefits of down pressure springs
- Planter frame is correctly set
- Very important that planter is level
- Hitch high enough to level main tool bar
- Sufficient down pressure seed trench properly closed
- Seed placement is consistent
- Coulter is above or level with the planter openers

Figure A. (Correct)
Down Force
Coulters

- Cut residue in front of openers
- Can ‘hairpin’ residue into seed slot
- Residue condition can seriously impact performance
- Reduce wear on opener disks
Row Cleaners

- Move residue from the opener path
- Should only tickle the surface
  - Should not move much soil
- Exposes soil that will now warm up quicker
- Gauge wheels have a smoother surface to operate on
Combination Openers

• Might be the most popular
• Row cleaners mover residue and coulter loosens soil for the opener disks
• Can work better than row cleaner in tough conditions (wheat stubble)
Seed-Soil Contact
No-Till Closing Wheels
Case-IH Gauge Wheels

- Retrofit to Deere and White planters
- Allegedly reduce side wall compaction
No-Till Planter Options

• Surface residue and soil conditions can vary greatly
• Producers must select the combination of residue management equipment that works best in their conditions.
• Most often the best advice can come from a successful neighbor.
Adjustments before Attachments

- Adjustments *ARE* more important than attachments
  - Planter level
  - Well maintained
  - Attachment set correctly
  - Good seed-soil contact
No-till Drills

• Drills are used for narrow row crops
  – Less than 15 inches
• Again no-till drills must be designed to allow residue to flow through them
• They are also heavier than conventional drills
No-till Drills

• There are as many options for drills as for Planters
• Residue management is often achieved with a coulter caddy or sufficient down force to cut through residue with seed trench openers
• Hoe drills are also available for no-till
Benefits of No-Till Management

• Great reduction in soil erosion by wind and water

• Improved soil structure
  – Improved permeability
    • AKA, air, water, and root movement in the soil profile
  – Improved water holding capacity
Benefits of No-till

• Improved microbial activity
  – Improved nutrient cycling
  – Diversity can hinder outbreaks of pathogens and pests.
  – Results from the maintenance of elevated concentrations of active organic carbon and more stable soil moisture and temperature