SNAP-PLUS

Bill Pearson, Kevin Erb, Wes Jarrell, Paul Kaarakka, Larry Bundy and Laura Ward Good
Tool Name – SNAP-PLUS

Purpose

- To manage crop nutrient amounts, source, placement, form, and timing of these applications to minimize nutrients entering groundwater and surface water
- To integrate several programs (RUSLE2, WI. P Index, P and K balancing, SNAP2000) to simplify NMP development in accordance with WI. NRCS 590 standard
Descriptive Information

- Developers/Contacts
  - Bill Pearson, Kevin Erb, Wes Jarrell, Paul Kaarakka, Larry Bundy and Laura Ward Good
  - **General software questions**: Bill Pearson, Kevin Erb and Paul Kaarakka
  - **WI. P Index**: Larry Bundy and Laura Ward Good
  - **RUSLE2/software programming**: Paul Kaarakka and Laura Ward Good
Stage of Development
- SNAP (version 1.0) released in August of 1996
- SNAP2000 (version 2.0) released in August of 2000
  - Incorporate feedback from farmers, UWEX staff, crop consultants and agency personnel
- SNAP-PLUS in development with beta version in early 2004
Tool Focus and Scale

- To develop NMP that meet the ‘new’ NRCS 590 standard for Wisconsin
- CNMP have been mandated on commercial animal production farms receiving NRCS cost-sharing
  - Conservation plan (RUSLE2)
  - NM plan (P based)
  - Record-keeping program (SNAP)
  - Manure management (SNAP)
Tool Focus and Scale

- Most farms have one or two of these components on hand and are often independent of each other.

- SNAP-PLUS - brings together RUSLE2, WI. P Index, P and K balancing and SNAP2000.
Tool Focus and Scale

Focus:
- Single interface for inputs - SNAP
- No redundant data entry
- Consistent data among all programs
- Bring soil conservation planning and NM together
- More comprehensive approach, using P Index and RUSLE2, to managing manure and P
- Facilitate farm level “what-if” experimentation by providing whole farm views and immediate feedback
Tool Focus and Scale

- **Scale:**
  - *Field by Field* - nutrient plan, manure plan, P and K balance, rotational soil loss, record-keeping, and P index
  - *Whole-farm* – nutrient plan, manure plan, fertilizer plan, record-keeping and P index
  - *Primary area of concern* – P runoff, soil loss, nutrient application rates to crop needs, and identify problems to facilitate changes in management by producers
SNAP-PLUS

Nutrient application calculator

P Index calculator

RUSLE2 soil loss calculator

Entry: Field by field crop and soil info

Management Decision Loop

Output: Field by field fertilizer and manure application plan, P Index value, soil loss estimate
Tool Application

- **Intended Users:** Farmers (large and small), NRCS and state employees, UWEX staff, crop consultants, teachers and students
- **Development environment:** Borland Delphi
- **Database:** Currently FlashFiler, an open source relational database product, future probably switch to xml
- **Lookup data:** In xml, searched using XPath
- **NRCS Rusle2 model:** Obtain soil loss and potentially other parameters (for example runoff volumes)
- **Documentation:** Help screens and manual will be included
- **Intended to be non-technical** for use by farmers and others with limited computer knowledge
Knowledge and Data Transferability

- SNAP-Plus is specific to Wisconsin cropping systems and soil test recommendations for field and vegetable crops
- Transfer data with NRCS toolkit, commercial GIS software (MapWorks, EASi-Suite, SST), export as .txt, .xml, .html, .pdf, Excel and other formats
- Easy data exchange between farmers and consultants within state and federal agencies
Knowledge and Data Transferability

- Inputs
  - Farmer’s name, county where farm is located, crops grown and fertilizers used
Knowledge and Data Transferability

- **Inputs**
  - Farmer and farm information - county, crops grown and fertilizers used
  - Specific field data and soil test data sampled according to UWEX recommendations and imported electronically
<table>
<thead>
<tr>
<th>Field Name</th>
<th>FSA Farm No.</th>
<th>Field Size</th>
<th>Soil Name</th>
<th>Slope/Slope Length</th>
<th>Distance to water</th>
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</table>

**Field Name**

**FSA Farm No.**

**Field Size**

**Soil Name**

**Slope/Slope Length**

**Distance to water**

**Strip cropping**

**Contoured**

**Terraced**
### Plan Field Data:

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<tr>
<th>Field</th>
<th>Rotation length</th>
<th>Soil test date</th>
<th>pH</th>
<th>Org %</th>
<th>P</th>
<th>K</th>
<th>Mg</th>
<th>Ca</th>
<th>Mn</th>
<th>Z</th>
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</table>
Knowledge and Data Transferability

**Inputs**
- Farmer and farm information - county, crops grown and fertilizers used
- Specific field data and soil test data sampled according to UWEX recommendations and imported electronically
- Livestock type and quantity by class, manure source and percent collected, analysis and volumes on an annual basis
Knowledge and Data Transferability

- **Inputs**
  - Farmer and farm information - county, crops grown and fertilizers used
  - Specific field data and soil test data sampled according to UWEX recommendations and imported electronically
  - Livestock type and quantity by class, manure source and percent collected, analysis and volumes on an annual basis
  - **Cropping data**
    - Crop to be grown
    - Yield goal
    - Tillage type
    - Legume and manure credit information
    - Fertilizer application information
### Soil Loss and P Index Calculations

- **Rotation Ave Soil Loss (Ton/acre):** 6.5
- **Rotation Ave P Index:** 7.8
- **Plan Period P Balance:** 195

### Crop Rotation Details

<table>
<thead>
<tr>
<th>Year</th>
<th>Crop</th>
<th>Yield Goal</th>
<th>Tillage</th>
<th>Special Crop Needs</th>
<th>Recommendation</th>
<th>Total Needs</th>
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</thead>
<tbody>
<tr>
<td>2000</td>
<td>Alfalfa</td>
<td>3.5 4.5</td>
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<tr>
<td>2001</td>
<td>Alfalfa</td>
<td>3.5 4.5</td>
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<tr>
<td>2002</td>
<td>Alfalfa</td>
<td>3.5 4.5</td>
<td>No till</td>
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<tr>
<td>2003</td>
<td>Corn grain</td>
<td>130-150</td>
<td>No till</td>
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<td>2004</td>
<td>Beets</td>
<td>131-150</td>
<td>No till</td>
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</table>

### Nutrient Management

- **Nitrogen (N):**
  - 2000: 5
  - 2001: 5
  - 2002: 10
  - 2003: 0
  - 2004: 0

- **Phosphorus (P):**
  - 2000: 8
  - 2001: 0
  - 2002: 0
  - 2003: 0
  - 2004: 0

- **Potassium (K):**
  - 2000: 5
  - 2001: 205
  - 2002: 0
  - 2003: 60
  - 2004: 70

### Additional Notes

- **Rotation Wizard**
- **Rotation Ave Soil Loss (Ton/acre):** 6.5
- **Rotation Ave P Index:** 7.8
- **Plan Period P Balance:** 195

---

The recommended crop rotation to reach pH 6.0 is 6-9-9 lime.
### Farm Data

| Field: | 1 |

#### Rotation ave soil loss (Ton/acre):
- 2000: 6.5
- 2001: 3.0
- 2002: 7.8
- 2003: Rotation ave P Index: 7.8
- 2004: Plan period P Balance: -195

#### Crop Data

<table>
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<th>Year</th>
<th>Crop</th>
<th>Yield Goal</th>
<th>Tillage</th>
<th>N</th>
<th>P205</th>
<th>K20</th>
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<td>8</td>
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<td>2002</td>
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</table>

#### Special Crop Needs

<table>
<thead>
<tr>
<th>Year</th>
<th>Recommendation</th>
<th>Total Needs</th>
<th>Prior years legume credit</th>
<th>Prior years manure credit</th>
<th>Plan manure applications</th>
<th>Plan fertilizer applications</th>
<th>Total credits</th>
<th>Nutrient excess or deficit</th>
<th>Crop P removal / P balance</th>
<th>P Index (Total = Part + Sol)</th>
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</thead>
<tbody>
<tr>
<td>2000</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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#### SnapPlus Legume Credit Data

**Field: 1**

**Cropping Year: 2003**

- **Type:** None
- **Plants/sq ft:**
- **Regrowth greater than 6”:**

#### Notes

The time required for this rotation to reach pH 6.8 is 0.1/a 80.89 time.
Field: 1
Year: 2003

Manure / Biosolid Applications

Fertilizer Applications

The lime required for this rotation to reach pH 6.8 is 0 t/a 30-89 lime.
### Rotations

<table>
<thead>
<tr>
<th>Crop</th>
<th>Yield Goal</th>
<th>Tillage</th>
<th>Total Needs</th>
<th>Prior years legume credit</th>
<th>Prior years manure credit</th>
<th>Plan manure applications</th>
<th>Plan fertilizer applications</th>
<th>Total credits</th>
<th>Nutrient excess or deficit</th>
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</thead>
<tbody>
<tr>
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<td><strong>0 0 0</strong></td>
<td><strong>0 0 0</strong></td>
<td><strong>5 80</strong></td>
<td><strong>-5 -8 -5</strong></td>
</tr>
</tbody>
</table>

### Soil Test Date
- Date: 5/8/2003
- pH: 6.6
- OM %: 2.3
- P (ppm): 15
- K (ppm): 90

### Soil Information
- Soil Name: Kewaunee
- Soil Symbol: Kn8
- Soil Group: Winnebago

### Fertilizer Data

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<th>Class</th>
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<th>P205 %</th>
<th>K20 %</th>
<th>S %</th>
<th>Mg %</th>
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### P Index
- 2000: 50
- 2001: 50
- 2002: 55
- 2003: 50
- 2004: 50

**The time required for this rotation to reach pH 6.8 is 0 t/a 80-83 line**
Knowledge and Data Transferability

- Outputs
  - Rotational soil loss estimates for each field from RUSLE2
  - P index estimate for each field by year, rotation and whole farm
  - P and K balancing for each field by year and rotation
  - Multi-year view facilitates long range planning for manure and P balancing
Knowledge and Data Transferability

- Outputs
  - User can be lead to appropriate management practices from a range of options to decrease cost and/or environmental risks
  - P based NM plan field by field and whole farm
  - Record-keeping – program itself serves as a record-keeper
<table>
<thead>
<tr>
<th>Type of Activity</th>
<th>Date</th>
<th>Time</th>
<th>Material or Event</th>
<th>Worker</th>
<th>Amount</th>
<th>Units</th>
<th>Time required</th>
<th>Cost</th>
<th>Comments</th>
</tr>
</thead>
</table>

View: Disease scouting
# Pesticide Applications

## Table

<table>
<thead>
<tr>
<th>Pesticide Type</th>
<th>Date</th>
<th>Time</th>
<th>Material</th>
<th>Restricted</th>
<th>Applicator</th>
<th>Amount</th>
<th>Units</th>
<th>Area Treated</th>
<th>Application Rate</th>
<th>Target Pests</th>
<th>Mixing Location</th>
<th>Time Required</th>
<th>Cost</th>
<th>Comments</th>
</tr>
</thead>
</table>

*Note: This table is empty and requires data entries.*
### Farm Nutrient Summary for Year XXX

<table>
<thead>
<tr>
<th>Field</th>
<th>Size</th>
<th>Crop</th>
<th>Yield Goal</th>
<th>N Rec (lbs/acre)</th>
<th>N Credits (lbs/acre)</th>
<th>N excess / deficit (lbs/acre)</th>
<th>P Rec (lbs/acre)</th>
<th>P Credits (lbs/acre)</th>
<th>P excess / deficit (lbs/acre)</th>
<th>P Index</th>
<th>P Balance (lbs/acre)</th>
<th>K Rec (lbs/acre)</th>
<th>K Credits (lbs/acre)</th>
<th>K excess / deficit (lbs/acre)</th>
<th>Lime Rec (lbs/acre)</th>
</tr>
</thead>
</table>

*Note: The table is empty and no data is currently entered.*
### Fertilizer applications by field:

<table>
<thead>
<tr>
<th>Field</th>
<th>Size</th>
<th>Restricted</th>
<th>Date</th>
<th>Material</th>
<th>Incorporated</th>
<th>Rate</th>
<th>Total amount</th>
<th>Material cost</th>
<th>Cost/acre</th>
<th>Travel and labor time</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

### Fertilizer amounts by type for all fields

<table>
<thead>
<tr>
<th>Material</th>
<th>Total amount</th>
<th>Units</th>
<th>Cost/unit</th>
<th>Total cost</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total years cost of all fertilizers: Label24
Tool Limitations

- Limited to Wisconsin soil test recommendations and P index
- More data entry than previous versions
- User interface – too complicated for some
- GIS compatibility – not grid data (tabular)
- Software compatibility issues with RUSLE2
  - Communication problems might prevent soil loss calculations
Reducing Nutrient Load to Environment

- Quality of results
  - Helps manage nutrients, P and manure
  - Brings soil conservation together with NM
  - Increases awareness and participation in NM planning

- Confidence level
  - Increases confidence that management changes can and will happen due to multi–year view for long range planning
Reducing Nutrient load to Environment

- Field validation
  - P index and soil test recommendation will continue
  - Beta test software, 15 – 20 users to gain feedback and comments
- SNAP users
  - Farmers, consultants, NRCS, teachers, students, UWEX, state and federal agencies
  - 65% of NM plans in Wisconsin use SNAP
  - ~1000 copies distributed
  - ~500 users
Meeting Current and Future Regulatory Requirements

- Regulatory issues addressed
  - Meets “new” NRCS 590 NM standard for Wisconsin
  - CAFO rules
    - Conservation plan (RUSLE2)
    - NM plan (P based)
    - Record-keeping program (SNAP)
    - Manure management (SNAP)
  - Multi-year management and risk assessment tool
Future Plans

- Complete software development
- Beta test software, feedback incorporated
- GIS integration with commercial software
- Advanced version for consultants and agencies
- Economic software
- P leaching model
- N and P whole farm balancing software