

TECHNICAL NOTES

SOIL QUALITY TECHNICAL NOTE NO. 2

Pesticide Management, WIN-PST 3.0 and Soil Data

Wise pesticide use is important from a water quality, soil quality, and a farm economics perspective. Properly applied pesticides may reach surface or ground water through either runoff or leaching. Important pesticide properties include persistence or resistance to degradation (half-life), volatility or how easily they evaporate, and solubility in water. Measures of soil persistence only describe pesticide behavior at or near the soil surface where degrading agents such as sunlight and bacteria are present. An ideal pesticide is not readily leached and degrades rapidly. The infinite variability in soils, climate, and application sites make pesticide management complex.

Summary

WIN-PST 3.0 allows users to edit soil and site information. Users should be aware that soils data used in WIN-PST contain thin, high organic layers that may affect soil/pesticide interaction outcomes. These organic surfaces on upland soils are easily removed by tillage. A preferred process is presented here to correct the soil data to current site conditions. Planning inventory data and soil test data can now be used to adjust inputs to a WIN-PST run. Information and a preferred planning process are presented on water tables and WIN-PST.

Windows Pesticide Screening Tool 3.0

The Windows Pesticide Screening Tool (WIN-PST) is the pesticide environmental risk screening tool used in the NRCS conservation planning process. WIN-PST 3.0 was released in November of 2005. This new version of WIN-PST offers increased flexibility in the use of soil information. This technical note provides information to help the user benefit from the added features and flexibility incorporated into WIN-PST 3.0.

The "PCT_COMP" column under the WIN-PST soils tab is soil component percent composition. The user must select the appropriate soil map unit component for the pesticide evaluation. In most cases the map unit component with the largest percent composition should be used for evaluations.

User edits

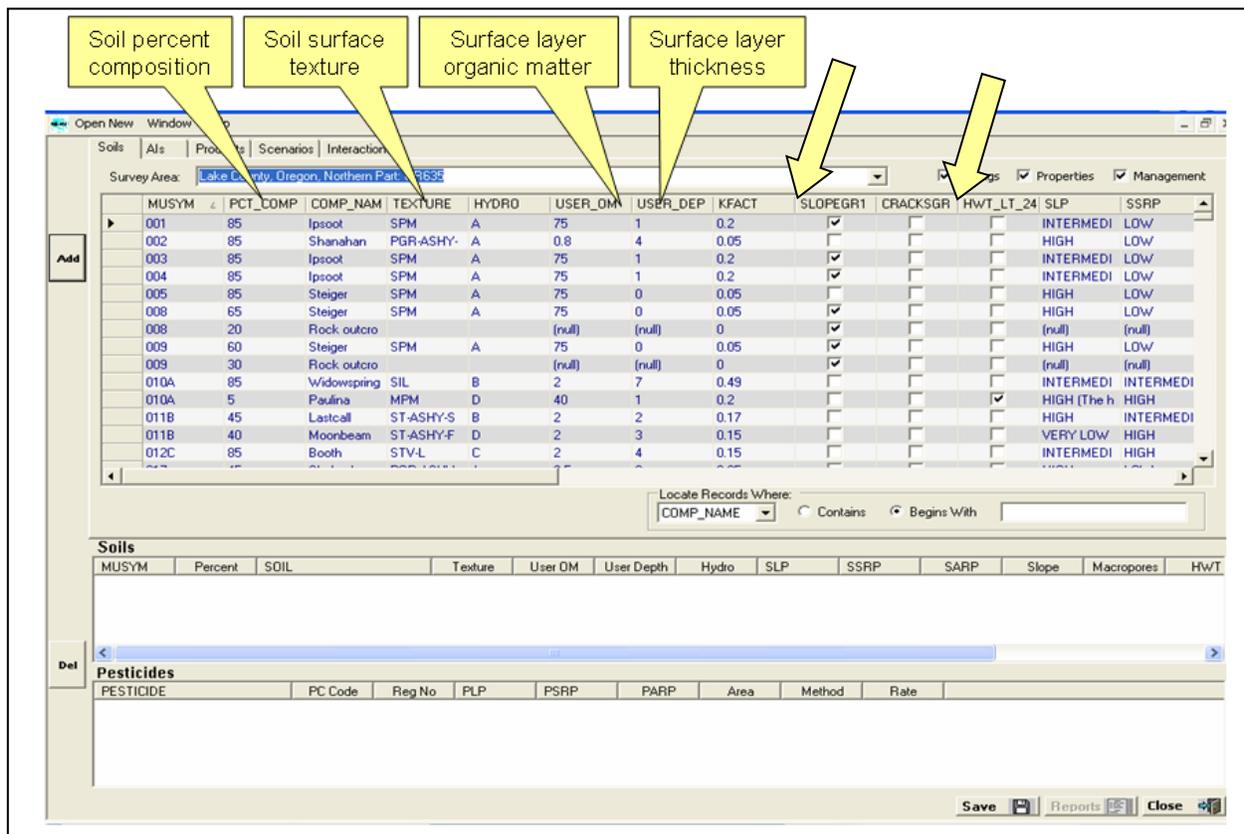
WIN-PST 3.0 allows the user to override the database entry for organic matter percent (USER_OM) and surface layer thickness (USER_DEP). The surface layer thickness is important because this is where the highest soil organic matter accumulation ties up and degrades pesticides. In addition, the "SLOPEGR1", "CRACKSGR", and "HWT_LT_24" columns have database default entries that may be changed by the user. (See figure 1)

Surface Texture and Land Use Changes

In the soil surface texture column (TEXTURE), the entries SPM (slightly decomposed plant material), MPM (moderately decomposed plant material), and HPM (highly decomposed plant material) indicate an upland forest soil with a mat of decomposing leaves, conifer needles, and woody debris. These horizons are thin, usually 1 to 2 inches, and very high in organic matter content. When these soils are in agricultural use the thin organic surface layer is mixed and removed.

WIN-PST 3.0 Select Soil and Pesticide Window: Soils Tab

Figure 1



When the WIN-PST "TEXTURE" field displays SPM, MPM, or HPM and tillage has removed the organic surface, use the organic matter percent and surface layer thickness from the soil layer immediately below the organic surface. The soil database "Physical Properties" report for the selected map unit displays the data that should be entered for evaluations (see figure 2). The bottom depth of the soil layer below the organic surface

and the midpoint of the range of organic matter should be entered in the appropriate WIN-PST cells. If organic material is applied to a field, soil test data may be used for organic matter percent. In this situation, the “USER_DEP” should be adjusted to the normal depth of tillage if annually tilled, or for pasture use the depth of the mineral surface layer.

Field Measured Slope

If checked, the “SLOPEGR1” column (see figure 1) under the Soils tab indicates the component slope percent high is greater than 15 percent. The slope ranges for the component are found under the “SLOPE_H” and “SLOPE_L” columns in WIN-PST. If the planner has on-site inventory documentation of predominant slopes, the default entry can be changed to reflect site conditions.

ACCESS database Physical Properties Report

Figure 2

Physical Soil Properties (OR)
DRAFT - SUBJECT TO CHANGE
Lake County, Oregon, Northern Part

[Entries under "Erosion Factors--T" apply to the entire profile. Entries under "Wind Erodibility Group" and "Wind Erodibility Index" apply only to surface layer. Absence of an entry indicates that data were not estimated]

| Map symbol and soil name | Depth | Sand | Silt | Clay | Moist bulk density | Saturated hydraulic conductivity | Available water capacity | Linear extensibility | Organic matter | Erosion factors | | | Wind erodibility group | Wind erodibility index |
|----------------------------|-------|--------|-------|-------|--------------------|----------------------------------|--------------------------|----------------------|----------------|-----------------|-----|---|------------------------|------------------------|
| | | | | | | | | | | Kw | Kf | T | | |
| | In | Pct | Pct | Pct | g/cc | In/Hr | In/in | Pct | Pct | | | | | |
| 001: Ipsoot, lowlev | 0-1 | -- | -- | 0-25 | 0.10-0.30 | 6-100 | 0.30-0.60 | -- | 60-90 | -- | -- | 2 | 4 | 86 |
| | 1-5 | 78-85 | 15-18 | 0-5 | 0.49-0.84 | 20-100 | 0.08-0.11 | 0.0-2.9 | 0.2-0.5 | .20 | .20 | | | |
| | 5-8 | 78-85 | 15-18 | 0-5 | 0.49-0.85 | 20-100 | 0.08-0.11 | 0.0-2.9 | 0.1-0.4 | .28 | .28 | | | |
| | 8-31 | 78-100 | 0-19 | 0-3 | 0.50-0.85 | 20-100 | 0.06-0.09 | 0.0-2.9 | 0.1-0.3 | .17 | .17 | | | |
| | 31-61 | -- | -- | --- | -- | 20-100 | -- | 0.0-2.9 | 0.0 | -- | -- | | | |
| 002: Shanahan, cool,dry | 0-4 | 75-90 | 10-20 | 5-15 | 0.78-1.20 | 6-20 | 0.08-0.11 | 1.0-2.9 | 0.5-1.0 | .05 | .15 | 5 | 3 | 86 |
| | 4-38 | 75-95 | 0-20 | 2-15 | 0.90-1.20 | 6-20 | 0.06-0.09 | 1.0-2.9 | 0.2-0.6 | .10 | .15 | | | |
| | 38-60 | 50-70 | 10-30 | 10-15 | 1.34-1.40 | 2-6 | 0.07-0.13 | 1.0-2.9 | 0.2-0.6 | .20 | .37 | | | |
| 005: Steiger, MOIST | 0-0 | -- | -- | 0-25 | 0.10-0.30 | 6-100 | 0.30-0.60 | -- | 60-95 | -- | -- | 5 | 2 | 134 |
| | 0-4 | 75-85 | 10-20 | 1-5 | 0.52-0.74 | 6-20 | 0.08-0.11 | 1.0-2.9 | 2.0-7.0 | .05 | .05 | | | |
| | 4-45 | 75-95 | 5-20 | 1-5 | 0.77-1.16 | 6-20 | 0.02-0.09 | 1.0-2.9 | 0.2-2.0 | .05 | .05 | | | |
| | 45-60 | 40-70 | 20-40 | 5-18 | 1.16-1.20 | 0.6-6 | 0.07-0.13 | 1.0-2.9 | 0.2-0.6 | .17 | .37 | | | |

Reset Site Conditions

The Soils tab under “Data Management” is where soil databases are selected. Detailed instructions on selecting soil databases are contained in the “WIN-PST 3.0 Getting Started Guide.” If the user is customizing soil data in the “Select Soils and Pesticides” window the “Reset Site Conditions” feature may need to be utilized at some point. This feature allows the user to reload the soils data to default entries. To utilize this feature, make sure all Site Condition buttons are checked, and click the “Reset” button in the upper right of the screen. The “Close” button in the lower right of the screen must be used to complete the reload of soils data and return to the “Select Soils and Pesticides” window. Closing the program also reloads the soil data to default settings (See figure 3).

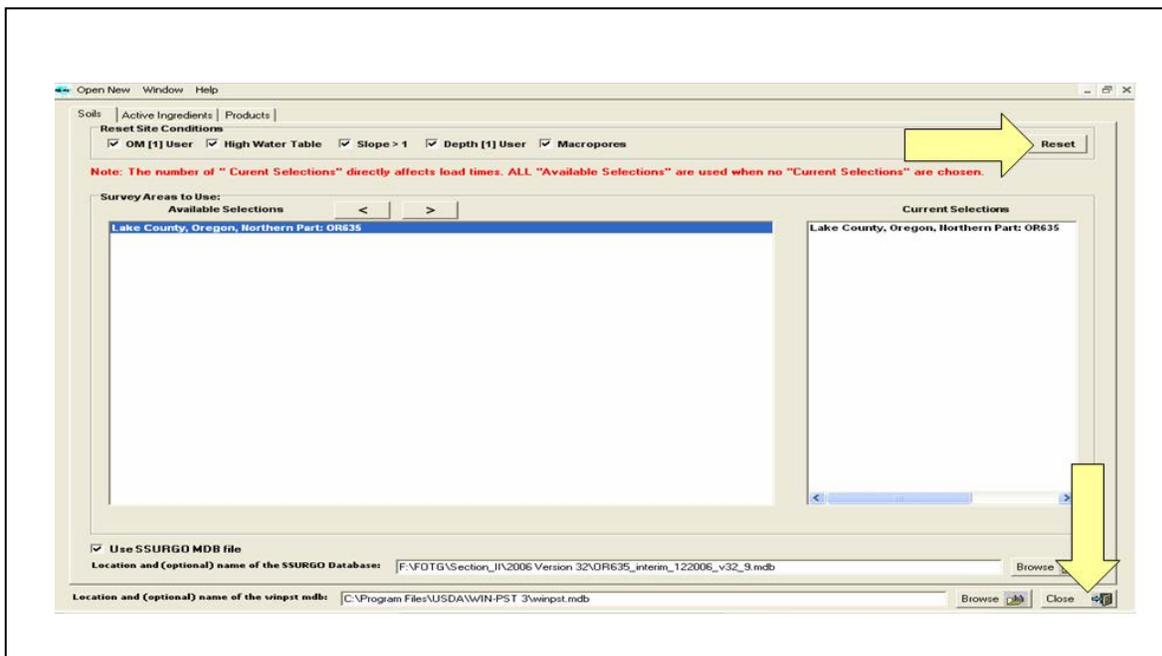
Water Table Issues

A check in the “HWT_LT_24” column (see figure 1) indicates that the water table is within 24 inches of the surface during the growing season. The columns “WTBEG”, “WTEND”, “WTDEPH”, “WTDEPL”, and “WTKIND” provide the soil database information on water table months, depths, and kind. For soils with tile lines installed do not remove the “HWT_LT_24” default check. Leaching potential to the tile line remains high in these drained soils.

It is good practice to review the soil database Water Features table (see figure 4) to provide the planner and grower with predicted water table information. Water table is considered in WIN-PST only when “WTDEPL” is 24 inches or less. Water Features tables with the “water table lower limit” less than 6.0 feet indicate a perched water table and a potential hazard to surface waters. Perched water tables are not addressed in WIN-PST. Clients shall be encouraged to pay close attention to pesticide label instructions for limiting leachate when water tables are anywhere in the soil profile. When pesticides are applied during months with a water table, clients should be encouraged to closely consider the chemical solubility, half-life and utilize mitigation techniques (see NRCS Oregon Pest Management Conservation Practice Standard—Code 595).

WIN-PST 3.0 Data Management Window: Soils Tab

Figure 3



Soil Quality Considerations

Soils are the medium relied upon to retain and degrade pesticides. Important soil properties related to pesticide retention include organic matter, clay content, pH, soil

permeability, and surface charge characteristics. For most pesticides, organic matter is the most important soil property controlling retention.

Soil quality is important because impaired function of soils can lead to unpredicted results. For example, if poor soil quality leaves the soil resource with low organic matter content, then predictive tools such as WIN-PST may mislead the user. Lower than predicted organic matter in the soil surface will affect pesticide retention and degradation, as well as increasing the potential for wind or water erosion from poorly structured soils. Similarly, a management induced tillage pan will not be predicted by soil survey data and would not be considered in a WIN-PST output.

ACCESS database Water Features Report

Figure 4

| Water Features | | | | | | | | | | |
|--|------------------|----------------|----------|-------------|-------------|---------------------|----------|-----------|----------|-----------|
| Benton County, Oregon | | | | | | | | | | |
| [Depths of layers are in feet. See text for definitions of terms used in this table. Estimates of the frequency of ponding and flooding apply to the whole year rather than to individual months. Absence of an entry indicates that the feature is not a concern or that data were not estimated] | | | | | | | | | | |
| Map symbol and soil name | Hydrologic group | Surface runoff | Months | Water table | | Ponding | | | Flooding | |
| | | | | Upper limit | Lower limit | Surface water depth | Duration | Frequency | Duration | Frequency |
| | | | | <i>R</i> | <i>R</i> | <i>R</i> | | | | |
| 10S: Linslaw | C | -- | January | 1.3-2.3 | >6.0 | -- | -- | None | -- | Rare |
| | | | February | 1.3-2.3 | >6.0 | -- | -- | None | -- | Rare |
| | | | March | 1.3-2.3 | >6.0 | -- | -- | None | -- | Rare |
| | | | April | 1.3-2.3 | >6.0 | -- | -- | None | -- | None |
| | | | May | 3.5-4.7 | >6.0 | -- | -- | None | -- | None |
| | | | December | 1.3-2.3 | >6.0 | -- | -- | None | -- | Rare |
| Noti | D | -- | January | 0.0-1.0 | 3.3-5.0 | -- | -- | None | Brief | Frequent |
| | | | February | 0.0-1.0 | 3.3-5.0 | -- | -- | None | Brief | Frequent |
| | | | March | 0.0-1.0 | 3.3-5.0 | -- | -- | None | Brief | Frequent |
| | | | April | 0.0-1.0 | 3.3-5.0 | -- | -- | None | Brief | Frequent |
| | | | May | 0.0-1.0 | 3.3-5.0 | -- | -- | None | Brief | Frequent |
| | | | October | 0.0-1.0 | 3.3-5.0 | -- | -- | None | Brief | Frequent |
| | | | November | 0.0-1.0 | 3.3-5.0 | -- | -- | None | Brief | Frequent |
| | | | December | 0.0-1.0 | 3.3-5.0 | -- | -- | None | Brief | Frequent |

Additional WIN-PST and Soil Quality Resources

The National WIN-PST website is located at <http://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/?cid=stelprdb1044769>. The “WIN-PST 3.0 Getting Started Guide” is available at this site. A document entitled “Pesticides in the Next Decade: The Challenge Ahead”, is also available at this website. This document provided the basis for WIN-PST as a pesticide screening tool using NRCS soil survey data. The algorithms for soil loss potentials, pesticide loss potentials, and the resulting soil/pesticide interaction potentials are presented here.

The NRCS Soil Quality website has information on soil quality and pesticides. Soil quality publications are located at the following address: <http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/resource/>. The following publications related to pesticides are found here.

Agronomy Technical Note 5: Herbicides, with accompanying Herbicides Table.
Soil Quality Information Sheet: Resource Concerns, Pesticides.