

**Delaware Nutrient Management
Program**

**DELAWARE CONSERVATION
PRACTICE STANDARD**

PRECISION AGRICULTURE

(Reported on a per acre basis)

6. Energy conservation through precisely controlled cropping equipment, resulting in less fuel being used.
7. Reduced compaction by limiting traffic to specified travel lanes
8. Increased opportunity to operate equipment after dark
9. Labor savings through reduced implement overlap
10. More accurate farming records.

DEFINITION

Precision agriculture is defined as a management system that uses information, technology, and site specific data to manage variability within fields for optimum profitability, sustainability, and environmental protection. This method also includes guidance systems for agricultural equipment.

PURPOSES

For purposes of this standard, the purposes of using precision agriculture are:

1. To improve water quality by targeting pesticide or soil amendment applications to meet field-specific cropland yield capabilities.
2. To reduce the potential off-site impacts of fertilizer and pesticide applications.
3. To improve water quality by reducing pesticide and fertilizer inputs through avoidance of overlapping and end row/turn row applications.
4. To reduce surface runoff and subsurface loss of pesticides and fertilizer through decreased inputs.
5. To enhance soil quality through repeatable field travel pathways, thus reducing soil compaction and erosion.

**CONDITIONS WHERE PRACTICE
APPLIES**

This practice applies to all farming operations plant, growing and/or harvesting crops.

CONSIDERATIONS

- Consider pairing nutrient management track with pest management track for controlling and reducing nutrient cropland inputs resulting in additional water quality benefits
- Consider implementation of a conservation cropping system of no-till with cover crop mixes or sod-based rotations with perennials to reduce field erosion, surface runoff and enhance soil quality.
- Precision agriculture could also yield long-term economic benefits through potential fuel savings as well as reductions in fertilizer costs
- Producers are encouraged to consider a long-term goal of a comprehensive precision agriculture system that includes variable rate applications of nutrients and pesticides
- Consider using nutrient management practices described in the NRCS Nutrient Management Standard (590).

CRITERIA

General Criteria Applicable to All Purposes

Precision field operations and precision nutrient management can provide both environmental and economic benefits.

- **Light Bars:** One of the quickest and least expensive environmental payoffs for pesticide applications is the use of light bar guidance systems. Light bar guidance systems are relatively inexpensive, compared to other guidance systems, and they provide an easy way to guide equipment across a field to prevent overlapping when spraying pesticides.
- **Auto-steer:** Real Time Kinematic, or RTK, correction is the most accurate GPS correction because it uses a privately-owned reference station located close to the GPS receiver. RTK can provide one-inch pass-to-pass accuracy and is the only GPS correction that provides year-to-year position stability. RTK allows controlled traffic, strip tillage/fertilization/planting and extremely precise auto-steering.

The information necessary to determine appropriate nutrient application rates can include the following items. Not all of this information is needed, but more information can provide more detailed application maps.

- **Grid soil sampling**—over time, as more information is learned about a field, grid sampling can evolve into sampling of similar zones to reduce the number of samples taken.
- **Yield monitoring**—knowing how much different areas of a field actually yield provides the most important information about potential and appropriate application rates of fertilizers and other nutrients.
- **Detailed soils information**—knowing the properties of the soils in a field provides important information about yield potential and environmental sensitivity. County soils maps, while helpful, generally do not provide the necessary level of detail. Electrical conductivity mapping provides information about soil texture

that is useful in understanding its production potential.

- **Remote sensing**- uses aerial photography to identify in-season nutrient deficiencies and other problems causing crop stress and reduced yield. This is an evolving science. Generally, field scouting is still necessary to positively identify the cause of poor growth patterns identified remotely.
- **Environmentally sensitive areas**—geo-referenced the location of waterways, streams, ditches, wetlands, high leach potential soils, and tile inlets can help protect these areas from over application of nutrients.

Precise pesticide applications can provide both environmental and economic benefits. One of the quickest and least expensive environmental payoffs for pesticide applications is the use of light bar guidance systems. Light bar guidance systems are relatively inexpensive, compared to other guidance systems, and they provide an easy way to guide equipment across a field to prevent overlapping when spraying pesticides. More sophisticated variable rate application plans can be developed for pesticides, similar to those used for nutrients, but additional planning information and equipment will be needed for implementation. As with nutrients, sub three-meter accuracy is usually sufficient for the variable rate application of pesticides. The information necessary for the variable rate application of pesticides can include the following items. As with nutrients, not all of this information is needed, but more helps.

- **Scouting**—georeferencing areas that show insect, weed or other pest problems.
- **Remote sensing**—new technology promises to identify in-season insect damage from aerial photography.
- **Yield monitoring**—when other causes have been ruled out, pests may be the cause of low yields.
- **Environmentally sensitive areas**- geo-referencing the location of waterways, streams, ditches, wetlands, high leach potential soils, and

tile inlets can help protect these areas from over application of pesticides.

- Detailed soils information—knowing the properties of the soils in a field will provide important information about yield potential and environmental sensitivity. County soils maps, while helpful, generally do not provide the necessary level of detail. Electrical conductivity mapping provides information about soil texture that is useful in understanding the potential for a soil.

PLANS AND SPECIFICATIONS

Plans and specifications for this practice shall be prepared in accordance with the previously listed criteria. Plans and specifications shall contain sufficient detail to ensure successful implementation of this practice. Documentation shall be in accordance with the section “Supporting Data and Documentation” in this standard.

OPERATION AND MAINTENANCE

A site-specific operation and maintenance (O&M) plan shall be developed and reviewed with the operator prior to implementation of the practice. The O&M plan shall be consistent with the purposes of the practice, safety considerations, and other instructions provided by the equipment manufacturer or vendor.

Pesticide applications shall be based on appropriate maps that specify site specific rates that in turn, are based on appropriate recommendations from chemical manufacturers. Similarly, nutrient application rates shall be based on a site specific fertilizer map based on a nutrient management plan.

Equipment shall be operated at speeds and conditions recommended by the manufacturer, and maintenance schedules will be based on the schedules recommended in the operator’s manual.

The O&M plan shall detail all safety precautions necessary when handling the specific chemicals to be used.

The O&M plan shall provide for record keeping in sufficient detail to document the product used, the date, location, rate, method of application, and any test performed (including nutrient analysis).

SUPPORTING DATA AND DOCUMENTATION

The following is a list of the minimum data and documentation to be recorded in the case file:

1. Location of the practice on the conservation map.
2. The name of the amendment, the purpose(s) for its use, and rate and form.
3. Application methodology, including timing, equipment, instructions, etc.

REFERENCES

1. NRCS Agronomy Technical Note 1. Precision Agriculture: NRCS Support for Emerging Technologies. June, 2007.