NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD

NUTRIENT MANAGEMENT
(ACRE)
No. 590

DEFINITION

Managing the amount, source, placement, form and timing of the application of nutrients and soil amendments.

PURPOSES

- To budget and supply nutrients for plant production.
- To properly utilize manure or organic by-products as a plant nutrient source.
- To minimize agricultural non-point source pollution of surface and ground water resources.
- To protect air quality by reducing nitrogen and/or particulate emissions to the atmosphere.
- To maintain or improve the physical, chemical and biological condition of soil.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to all lands where plant nutrients and soil amendments are applied.

CRITERIA

General Criteria Applicable to All Purposes

Plans for nutrient management shall comply with all applicable Federal, state and local laws and regulations.

Persons who review or approve plans for nutrient management shall be certified by the West Virginia Department of Agriculture's Nutrient Management Certification program.

Plans for nutrient management that are elements of a more comprehensive conservation plan shall recognize other requirements of the conservation plan and be compatible with its other requirements. Example (CNMP and CAFO Plans)

A nutrient budget for nitrogen, phosphorus, and potassium shall be developed that considers all potential sources of nutrients (animal manure, organic by-products, waste water, commercial fertilizer, crop residues and legume credits.) *Use the Nutrient Budget Worksheet in Appendix 1 or equivalent.*

Realistic yield goals shall be established based on soil productivity information (soil survey), client's historical yield data, climatic conditions, level of management and/or local research on similar soil, cropping systems, and soil and manure/organic by-products. For new crops or varieties, industry yield recommendations may be used until documented yield information is available.

Plans for nutrient management shall specify the form, source, amount, timing and method of application of nutrients on each field to achieve realistic yield goals, while minimizing nitrogen and/or phosphorus movement to surface and/or ground waters.

Erosion and runoff control practices shall be installed on fields that receive nutrients to reduce potential nutrient losses to acceptable levels. Soil loss will be reduced to tolerable (T) level.

Soil Sampling and Laboratory Analysis (Testing)

Nutrient planning shall be based on current West Virginia University (WVU) soil test results. Current soil tests are those that are no older than three years.

If a soil test is not available, the plan will be based upon crop requirements for the expected yield. **A soil test is required within one year of the initial plan date where book values are used.**

Soil samples shall be collected and prepared according to WVU guidance in Appendix 2.

Plant Tissue Analysis

Tissue sampling and analysis, where used, shall be done in accordance with Land Grant University recommendations and guidance.

Nutrient Application Timing

Timing of nutrient application shall correspond as closely as possible with the crop nutrient uptake characteristics. Use the Penn State Agronomy Guide *(http://agguide.agronomy.psu.edu/agdefault.cfm)* to identify the timing of nutrient application for a specific crops establishment and/or maintenance.

NUTRIENT APPLICATION METHODS

Nutrients shall not be applied to frozen, snow-covered, or saturated soil.

Nutrient applications associated with irrigation systems shall be applied in accordance with the requirements of Irrigation Water Management (Code 449).

Criteria Applicable to Nutrient Application Rates for *Inorganic Fertilizers*

Recommended soil amendments and nutrient application rates shall be based on WVU soil test for pH, P_2O_5 and K_2O. Nitrogen application will be based upon ***realistic yield goal.***

Estimated yield values may be used to develop a preliminary plan that should be revised upon availability of actual yield data.

- **Nitrogen Application –** Planned nitrogen application rates shall account for the residual amount of nitrogen in the soil and crop residue use FOTG Reference, University of Maryland Mineralization Rates, March 2004 *http://www.agnr.umd.edu/users/agron/nutrient/Plan/plan_min_rates.pdf* and *Appendix 6* (Adapted from Penn State Agronomy Guide). Use FOTG Reference, Penn State Agronomy Guide – Nitrogen Recommendations for Agronomic Crops (Table 1.2-6; *http://agguide.agronomy.psu.edu/cm/sec2/table1-2-6.cfm)* and/or Fertilizer Recommendations (Table 1.2-5; *http://agguide.agronomy.psu.edu/CM/PDF/table1-2-5.pdf)* to determine nitrogen recommendation based upon a realistic yield goal.
- **Potassium Application –** On permanent pasture, avoid applying heavy rates of potash in early spring in order to minimize potential for grass tetany. Mg availability is reduced if the forage is high in potassium. Instead, make late spring, summer, or fall applications of potash.
- **Other Plant Nutrients –** The planned

rates of application for other nutrients shall be consistent with WVU soil lab analysis results and recommendations.

- **Starter Fertilizers –** Starter fertilizers containing nitrogen, phosphorus and potassium may be applied in accordance with WVU recommendations. When starter fertilizers are used, they shall be included in the nutrient budget.

If litter, manure or other organic by-products are a source of nutrients, follow the section in the standard titled *Nutrient Application Rate for Organic Fertilizer*.

Criteria Applicable to Manure or Organic By-Products (Excluding Sewage Sludge/Bio-Solids) Applied as a Plant Nutrient Source

Nutrient values of manure and organic by-products (excluding sewage sludge/Bio-Solids) shall be determined prior to land application based on laboratory report provided by the landowner. Book values recognized by the NRCS and/or WVU, or historic records for the operation may be used to develop an initial plan. **A manure analysis is required within 1 yr. of the initial plan where book values or historic records are utilized.** A manure sample shall be submitted each year for analysis and the nutrient management plan modified to reflect changes in the nutrient content of manures.

Nutrient Application Rates for Organic Fertilizers

The planned rates of nitrogen and phosphorus application recorded in the plan shall be determined based on the following:

- **Statewide –** Manure or litter may be applied at the nitrogen based application rate when soil test phosphorus levels are low to medium.

  If the current soil test indicates the soil phosphorus level is high, a phosphorus based application rate of up to 1.5 times the crop removal rate will be used.

  If the phosphorus level is very high, greater than 80lbs/ac, manure or litter will be applied at the crops estimated phosphorus removal rate.

  If the phosphorus level does not exceed 120 lbs., a single application of phosphorus applied as manure may be made at a rate equal to the recommended phosphorus application or estimated phosphorus removal in harvested plant biomass for a maximum period of 3 years. When such application is made the nitrogen application rate will not exceed crop needs during the year of organic fertilizer application.

  If excess litter, manure or organic by-products are generated on the farm the plan will identify the quantity, and the planned use of the excess. (See Waste Utilization Standard 633)

  Application equipment will be calibrated to insure accuracy and uniformity of manure or litter application and documented on Manure Spreader Calibration form in Appendix 3.

Phosphorus Field Risk Assessment (Potomac Valley SCD)

When animal manures or other organic by-products are applied and the current soil test indicates the soil phosphorus level is very high, greater than 80lbs/ac, a field-specific assessment of the potential for phosphorus transport from the field shall be completed. *This assessment will be completed using the Phosphorus Index in Appendix 4.*

For fields with high or very high potential losses, appropriate conservation practices identified in the Phosphorus Index must

be installed to reduce the vulnerability to off-site phosphorus transport.

A record of the assessment rating for each field or sub-field, and information about conservation practices and management activities that can reduce the potential for phosphorus movement from the site, will be included in the plan.

When such assessments are done, the results of the assessment and recommendations shall be discussed with the producer during the development of the plan.

In situations where the plan is being implemented on a phosphorus standard, and additional application of inorganic nitrogen may be required, N application will be based upon PSNT or estimated crop needs.

Nitrogen Field Risk Assessment

In areas where there are state and/or locally identified or designated nitrogen-related water quality impairments, (for example: karst and well-head protection areas), an assessment shall be completed of the potential for nitrogen using the Leaching Index (Appendix 5). The results of these assessments and recommendations shall be discussed with the producer and included in the plan.

Plans developed to minimize agricultural non-point source pollution of surface or ground water resources shall include practices and/or management activities that can reduce the risk of nitrogen movement from the field.

Nutrient Application Rates for Sewage Sludge/Bio-Solids

Nutrient values for sewage sludge shall be determined by reviewing a laboratory analysis provided by the landowner. Where more than one analysis is available, an average value will be calculated.

If the current soil test indicates the soil phosphorus level is greater than 80lbs/ac, sludge may be applied at the estimated crop removal rate. When such application is made the nitrogen application rate will not exceed crop needs during the year of sludge application. Manure or litter may only be applied in lieu of the sludge.

Heavy Metals Monitoring

When sewage sludge is applied, the accumulation of potential pollutants (including but not limited to arsenic, cadmium, copper, lead, mercury, selenium, and zinc) in the soil shall be monitored by the owner/client in accordance with the US Code, Reference 40 CFR, Parts 403 and 503, and/or any applicable state and local laws or regulations.

Criteria for Application and Management to Manure or Organic of Nutrients Where Wildlife is a Primary Concern

Nutrients should be applied outside the primary nesting season (March 15 – July 15)

Since soil test recommendations are based on estimated yields for agricultural crops, caution should be used when recommending nutrient applications for areas to be established and/or maintained for wildlife (e.g. grassland communities). Nutrient application may result in vegetation too dense for many target and non-target species. Fertilizers should be carefully evaluated prior to making any recommendations. Under most circumstances, fertilizer applications should not be recommended.

Contact the State Agronomist or State Biologist for recommendations.

Additional Criteria to Protect Air Quality by Reducing Nitrogen and/or Particulate Emissions to the Atmosphere

Handle and apply poultry litter or other dry types of animal manures when weather conditions are calm and there is less potential for blowing and emission of particulates into the atmosphere. A spreading pattern will be followed that minimizes applicator exposure to airborne particulates.

SPECIAL CONSIDERATIONS

Consider application methods and timing that further reduce the risk of nutrients being transported to ground and surface waters, or into the atmosphere. Suggestions include:

- split applications of nitrogen to provide nutrients at the times of maximum crop utilization,
- on cropland, incorporate surface applications of solid forms of manure or some commercial fertilizer nitrogen formulations (i.e. Urea) into the soil within 24 hours of application.
- avoiding fall or winter nutrient application for spring seeded crops,
- band applications of phosphorus near the seed row,
- applying nutrient materials uniformly to application areas,
- rotate livestock feeding areas to minimize build up of manure and nutrients,
- delayed field application of animal manures if precipitation capable of producing runoff and erosion is forecast within 24 hours of the time of the planned application.

Consider annual reviews to determine if changes in the nutrient management plan are desirable (or needed) for the next planned crop.

Consider removing animals from fields receiving poultry litter applications for a period of at least two weeks.

GENERAL CONSIDERATIONS

- Consider micronutrient deficiencies of nutrients due to excessive levels of other nutrients. (e.g. zinc, manganese, and boron)
- Consider additional practices to improve soil nutrient and water storage, infiltration, aeration, tilth, diversity of soil organisms and to protect or improve water quality.
- Consider cover crops and their harvest whenever possible to utilize and reduce residual nitrogen.
- Priority areas for land application of manure should be on slopes less than 15% and located a minimum of 50 feet from waterways, sinkholes and other waterbodies. It is preferable to apply manure on pastures and hayland soon after cutting or grazing before re-growth has occurred.
- Consider the potential problems from odors associated with the land application of animal manures, especially when applied near or upwind of residences.
- Consider avoiding, when possible, the land application of animal manures during weekends and holidays.
- Consider nitrogen volatilization losses associated with the land application of animal manures. Volatilization losses can become significant, if manure is not immediately incorporated into the soil after application.

- Consider the potential to affect National Register listed or eligible cultural resources.
- Consider using soil test and manure or litter analysis information no older than one year when developing new plans, particularly if animal manures are to be a nutrient source.
- On sites on which there are special environmental concerns, consider other sampling techniques to monitor soil fertility. (For example: Pre-Sidedress Nitrogen Test (PSNT), or soil surface sampling for phosphorus accumulation or pH changes.)
- Consider utilizing crops with higher phosphorus uptake in correlation with no application of phosphorus on fields where soil test P is greater than 120 lbs. (See FOTG reference http://www.nrcs.usda.gov/technical/land/pubs/nlapp1a.html (Crop nutrient uptake and removal.)

PLANS AND SPECIFICATIONS

Plans and specifications shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose(s), using nutrients to achieve production goals and to prevent or minimize water quality impairment.

The following components shall be included in the nutrient management plan:

- Aerial photograph or map and a soil map of the site.
- Current and/or planned plant production
- sequence or crop rotation.
- Results of soil, plant, water, manure sample analyses.
- Realistic yield goals for the crops in the rotation.
- Quantification of nutrient sources for N, P and K.
- Recommended nutrient rates, timing, form, and method of application and incorporation.
- Location of designated sensitive areas or resources and the associated nutrient management restriction.
- Guidance for implementation, operation, maintenance, and recordkeeping.
- Complete nutrient budget for nitrogen, phosphorus, and potassium for the rotation or crop sequence.
- Manure or litter spreader rate calibrations and the desired application rate.
- A statement that the plan was developed based on the requirements of the current standard and any applicable Federal, state or local regulations or policies; and that changes in any of these requirements may necessitate a revision of the plan.
- Signature of a West Virginia Certified Nutrient Management Planner and certificate number.

OPERATION AND MAINTENANCE

The owner/client is responsible for safe operation and maintenance of this practice including all equipment. Operation and maintenance addresses the following:

- Periodic (3 years maximum) plan review to determine if adjustments or modifications to the plan are needed.
- Protection of fertilizer storage facilities from weather and accidental leakage or spillage.
- Calibration of all fertilizer application equipment to ensure uniform distribution of material at planned rates *according to*

Appendix 3.

- ♦ Maintaining records to document plan implementation.
- ♦ Records include:
  - soil test results and recommendations for nutrient application,
  - quantities, analyses and sources of nutrients applied,
  - dates and method of nutrient applications,
  - crops planted, planting and harvest dates, yields, and crop residues removed,
  - application rate of nutrients,
  - results of water and plant heavy metal analyses (if applicable),
  - Dates of review and person performing the review, and recommendations that resulted from the review.

Records should be maintained for a minimum of five years or longer if required by other Federal, state, or local ordinances, or program or contract requirements.

WORKER PROTECTION AND BIO-SECURITY

Workers should be protected from and avoid unnecessary contact with chemical fertilizers, manures or poultry litter. Protection should include the use of protective clothing. Extra caution must be taken when handling ammonia sources of nutrients, or when dealing with organic wastes stored in unventilated enclosures.

The disposal of material generated by the cleaning of nutrient application equipment should be conducted so as not to contaminate surface or groundwater. Excess material should be collected and stored or field applied in an appropriate manner. Excess material should not be applied on areas of high potential risk for runoff and/or leaching.

The disposal or recycling of nutrient containers should be done according to state and local guidelines or regulations.

The operator should follow bio-security measures published by the West Virginia Department of Agriculture to minimize the risk of introduction or spreading of disease. *(See FOTG Technical Reference – Conservation Planning "WVDA Routine Bio-Security Measures for On-Site Farm Visits or Other Livestock Concentration Points".)*

Appendix 1

NUTRIENT BUDGET WORKSHEET

Decision Maker:____________________________ Field Number:____________

Prepared by:_______________________________________ Date:____________________

Dominant soil type:____

Previous crop:_______________ Yield:___________________ Nutrients applied:___________

Planned crop:____________________________ Yield goal[1]:____________________________

	N	P_2O_5	K_2O	
Nutrients required for yield goal[2] or Nutrient recommendations from soil tests	________	________	________	[1]

Conversion values:

P multiplied by 2.3 = P_2O_5

K multiplied by 1.2 = K_2O

Nutrient credits

	N	P_2O_5	K_2O	
Legume credit[3] [2]	________	NA	NA	
Manure and organic waste[4] [3]	________	__________	__________	
Other contributions[5] [4]	________	__________	__________	
Total credits [2]=[3]=[4]	________	__________	__________	[5]

Nutrient balance

	N	P_2O_5	K_2O	
Nutrient additions needed (or surplus) for crop yield[1]-[5]	________	__________	__________	[6]

Nutrient source:

Application method:

Application dates:

FOOTNOTES

1. Yield goal can be based on any of the following criteria:

a. Soil - Expected yields are published in soil survey reports. States have developed soil productivity groups.

b. Available soil moisture - with and without irrigation.

c. Field records - Farm records over extended periods (5 year minimum), FSA cropping history, field plot trials.

d. Growing degree days, crop maturity days for the variety.

e. Other acceptable methods of determining realistic yield goals.

2. Nutrient requirements based on university and extension recommendations using soil test results. The amount of nutrients required by the plants can be used if Extension Service soil test recommendations are not available.

3. Based on Penn State University Agronomy Guide.

4. Record the plant available nutrients that will be supplied during the planned crop growing season. Include residual nutrients available from previous manure applications.

5. Other contributions may be:

a. nutrients contained in irrigation water.

b. material used as soil amendment (fly ash, cover and green manure crop).

***History of nutrient application for recent crops will be helpful in revealing fields when crops are not responding as expected to applied nutrients.**

Appendix 2

West Virginia University
Extension Service

Soil
Management

Sampling Soils

Willem A. vanEck
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September, 1995

Fertilizer and lime are most effective when used in the proper amounts. That is the reason for soil testing: to determine the amount of lime (if lime is needed) and the proper fertilizers for the crop or plants to be grown.

Many years of research have gone into developing soil testing equipment and methods which accurately correlate the fertility and acidity of any kind of soil with the crop to be grown and the expected yield. Modern soil testing methods are very accurate but this accuracy is of no vale if the small sample is of poor quality and not representative of the entire area. It is important to remember that this small sample may represent an area that is 10 to 20 million times larger than the sample. Thus the quality of the soil sample sets the limits on the reliability of the soil test and on the recommendations based on soil test results.

Like machinery and people, soils need checkups. With periodic soil tests combined with fertility management practices an economic return can be obtained from investments in fertilizer, lime and time. For the homeowner this return is satisfaction in healthier plants and lawns, and for the farmer or gardener it may be money in the bank and food on the table.

Each year the West Virginia University Soil Testing Service analyzes as many as 25,000 soil samples for available plant nutrients and soil acidity. Unfortunately, one out of every five of these samples is of poor quality. The most common reasons for this are:

1. Samples are taken from only one or two locations and are not representative of the entire area.
2. Samples are contaminated by using containers previously used for lime, fertilizers, detergents, etc.
3. Samples are taken at depths not reflecting lime and fertilizers previously applied.
4. Samples are taken and mailed to the laboratory while wet or frozen.
5. Wet soils were dried in the oven or in hot sun.
6. Samples are too small, less than 1/2 lb.
7. Plant debris was included in the sample.

Laboratory instruments do not distinguish between properly and improperly taken samples. Soil test results reflect the analysis of the soil submitted. If a soil sample does not represent the true fertility or acidity of the area, then the lime and fertilizer recommendations based on this sample will be inaccurate.

<u>Where To Sample</u>

Soils are as variable as people. For an accurate assessment of the average fertility that plant roots encounter in a soil, a minimum of 15 to 20 randomly selected soil borings or slices should be taken. These samples need to be combined and mixed well and a small sub sample taken and submitted to the laboratory. If the field is larger than 10 acres a minimum of 30 borings should be made. Divide larger fields into 10 acre areas, especially if portions may have been managed differently. (Figure 1). Generally, 10 to 15 borings will suffice for small areas such as lawns and gardens.

Consider Unusual Areas

Sample separately areas not characteristic of entire field, lawn or garden; for example: wet spots, eroded areas, bare spots, back furrows, and field edges. Do not combine samples from areas in a field that were limed and fertilized or otherwise treated differently

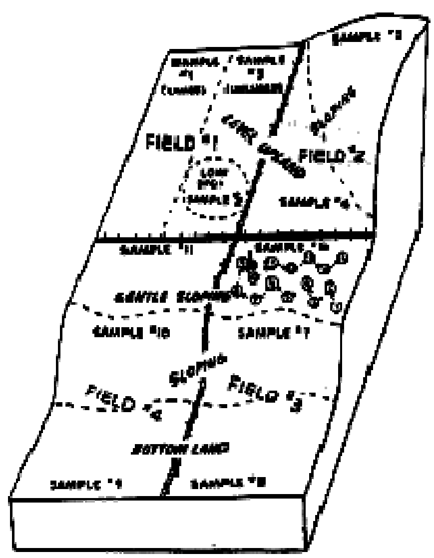
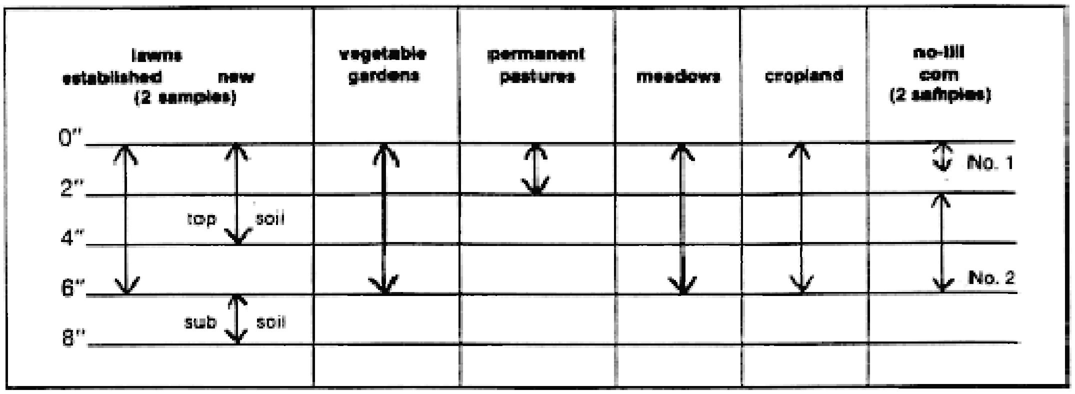


Figure 1. Field Sampling. Sketch your fields before sampling to reflect known differences in soils, history of liming, fertilizing, and cropping. Soil differences to consider are wet spots, slope, degree of erosion, texture (sandy, loamy, clayey), color, organic matter content. Traverse each field to take the samples as indicated for sample No. 6 in the figure.

<u>Sampling Depth</u>

Lime and fertilizer applied to the surface, require many years to move down into the soil, especially if the soil is primarily clay. The extent to which lime and fertilizer penetrate and react with the soil depends upon

the amount applied, whether incorporated or applied to the surface, and the time that has elapsed since application. These are the reasons the sampling depths given in figure 2 should be strictly followed. However, sampling soils that were recently limed or fertilized usually result in misleading soil test results and incorrect recommendations.



Consider the Crop

Lawns - Remove organic debris, from the surface sample soil 6 inches in established lawns, and to 4 to 6 inches for new lawns.

Vegetable Gardens and Planting Beds - Sample soil to plow or spading depth, usually 6 inches.

Permanent Pastures - Remove organic debris from the surface, sample to 2 inches.

Meadows - Remove organic debris from the surface sample to 6 inches.

Cropland - Sample to plow depth, usually 6 inches.

No-till corn - Take two samples, zero to 1 inch and a second between the 1 inch and 6 inch level.

Soil Sampling Tools

The best tool for soil sampling is a soil sampling tube or auger that can be punched into the soil to the proper depth to extract a small core of soil. Most West Virginia University County Extension Offices have these tools which may be borrowed or purchased. Other tools are available and are satisfactory but require more time and patience. When using a garden spade or trowel, cut a "V" out of the soil. Then make a 1 inch slide down one side to the desired depth.

Handling The Soil Sample

Collect the cores of soil in a clean container and gently crush and mix thoroughly. If the samples are wet, spread on a clean piece of paper long enough for it to dry naturally in a shaded place, then crush and mix and place in the plastic sample bag. Never oven-dry soils as this will adversely affect the test results.

Soil Test Information Sheets

Fill out the information sheet as completely as possible, including your name and address written legibly. Include as much information as possible. Check each information block. Other additional information or questions may be included under Remarks By Landowner.

When to Sample

Soil samples should preferably be taken in late summer or early fall because they come closer to representing the true nutrient status of the soil that a growing crop encounters than those taken in late fall through early spring. Soil samples should not be taken when the soil is wet or frozen or shortly after applying lime or fertilizer. A pinch of fertilizer or lime in a soil sample will give a very high analysis resulting in incorrect recommendations. Soil samples should not be taken shortly after organic matter has been incorporated into the soil.

Mail Samples Early

Soil samples should be mailed well in advance of planting. Allow about 3 weeks for processing the samples. Samples sent to the laboratory between the middle of January and the middle of April may take longer to process. Copies of the results are sent to local West Virginia University County Extension Agents who will be pleased to discuss the results with you.

How Often To Sample

The frequency of sampling soils depends primarily on the crops to be grown, previous fertilization rates, when lime was applied, yields of previously harvested crops, the crop sequence, or other crops grown before. Land that has recently been converted into cropland or gardens will need to be tested every year until the proper fertility level has been reached. In general, however, the following schedule is recommended:

New lawns - after topsoil has been placed and final grading completed.

Established lawns - every 3 to 5 years.

Gardens - every 2 to 3 years.

Permanent pastures - every 3 to 5 years.

Continuous row crops and alfalfa - every 1 to 3 years.

Perennial crops - every 3 years or once each rotation. If these instructions have been carefully followed, an accurate soil analysis will result and effective recommendations can be made. Remember, soil tests results are no better than the soil sample submitted for analysis!

Soil testing is a chemical analysis only

Since soil testing is limited to chemical analysis, no recommendations are made to solve physical problems such as excessive wetness or droughtinous, soil hardpans or impervious layers, compaction from continuous corn production, previous herbicide use, stoniness, climatic problems. As for soil-related insects and diseases, these often disappear after soil physical or chemical problems are corrected, or they can be separately identified by the WVU Extension Plant Pathologist or Entomologist, 414 Brooks Hall, WVU. If problems persist, there is no substitute for an on-site visit by the County Extension Agent who can advise you on the interpretation of your soil test results for your specific conditions.

West Virginia Soil Testing Service

Soil testing is a cooperative program between the Cooperative Extension Service and Agricultural Experiment Station at West Virginia University. Since 1972, it has been supported by annual budget allocations by the West Virginia Legislature for the benefit of West Virginia residents.

Persons wishing to leave soil samples analyzed should:

- Secure a soil test packet from the local County Extension Office, the West Virginia Soil Testing Laboratory, any County USDA office, or the West Virginia State Department of Agriculture. A soil test packet will contain an information sheet to be completed, plastic bag in which to place soil sample, and a mailing container.

- Take samples according to instructions given in this brochure or on the back of the information sheet.

- Fill out the information sheet as completely as possible, use a separate soil test form for each sample submitted.

- Send soil samples and soil test information sheet forms to:

Soil Testing Laboratory
Agricultural Science Building
West Virginia University
Morgantown, WV 26506

The West Virginia University Cooperative Extension Service through the County Extension Agent will:

- Furnish soil sampling packets

- Advise on taking soil samples and filling out test forms

- Discuss the results and recommendations with the landowner

The Soil Testing Laboratory, at no cost to West Virginia residents, will:

- Test soil samples for pH (acidity), lime requirements, and available amounts of phosphorus, potassium, calcium and magnesium

- Upon request and for a small fee, test for other elements or properties. Contact the Soil Testing

Laboratory or County Extension Agent for details

* Recommend fertilizer and lime rates based on the soil test results and on the site and crop information supplied on the soil test information sheet

* Repeat soil analysis if results are questioned (a second soil sample will be required)

* Discuss the results and recommendations by telephone (293-6258 or 293-2219) or by writing to the Soil Testing Laboratory (see address on Page 3).

Appendix 3

MANURE SPREADER CALIBRATION (1)

Type of spreader ________Converted Box Spreader

________Wet Lime Spreader
(Pull Behind)

Manure spreader Capacity

Length avg. ____________A

Width avg. ____________B

Depth avg. ____________C

A*B*C=D

Length * Width * Depth = Cubic feet ________D

Manure/Litter Density

Weight of filled container in pounds ________E

Cubic feet in Container ________F

Pounds per cubic feet ________G

Volume of spreader in tons $\frac{D*G}{2000}$

$\frac{\text{Cubic feet of spreader * Pounds per cubic foot}}{\text{2000 pounds per ton}}$ ________H

Application Area

Length * Width = Square Feet ________I

Application Rate Tons/Acre

$\frac{H}{I}$ $\frac{\text{Tons applied * 43560 Ft2}}{\text{Application Area Ft}^2}$ ________J

MANURE SPREADER CALIBRATION (2)

Length * Width = ________A **Square feet in Tarp**

Tare Weight of tarp = ________________B

Weight of tarp covered with manure/litter ________C

Pounds of litter on tarp C-B = ________D

Pounds of litter per square foot of area = D/A

________E

Application Rate **Tons/Acre**

E* 43560 ft2 in one area = ________F pounds

F/2000 pounds in one ton = ________G

Appendix 4

Phosphorus Index for Nutrient Management

Purpose:

The Phosphorus Index (P Index) is a tool that can identify farm fields that are a potential source of phosphorus (P) pollution of surface waters. Using the P Index can help a farmer identify fields and management practices that have the greatest potential to pollute bodies of water with phosphorus. The P index can help land users assess management strategies to minimize P loss from agricultural areas.

Concept:

On agricultural land when annual application of phosphorus exceeds its removal by crops, then phosphorus will accumulate in soils. Phosphorus accumulation in soils leads to high soil test values for phosphorus. A soil testing high for P can be a source of phosphorus pollution. Movement of phosphorus from crop fields into bodies of water may lead to excessive growth of algae (algal bloom). Algal bloom adds easily decomposable organic matter to water. Decomposition of organic materials requires oxygen. Thus, algal bloom caused by phosphorus movement to a body of water leads to reduction of oxygen in water. This lack of oxygen can kill aquatic animals such as fish. However, most P initially added to land through fertilizer or manure reacts with soil components, converting to an insoluble form or attaching to soil particles. Thus, most P loss in agriculture is associated with loss of soil particles.

A large number of factors determine phosphorus loss from a field. These include a soil test value for phosphorus; source, method, rate, and timing of P application; susceptibility of a given soil to erosion; and management practices. The P index quantitatively determines the relative risk of P movement from a given field by considering most of the factors that govern P losses. The P Index for a field can be calculated by using the following worksheet.

Worksheet for Calculating P Index for a Field
P Index rating value from soil test
If soil test value is 0 to 50 lbs P/acre, enter 1 in box A.
If soil test value is 51 to 80 lbs P/acre, enter 2 in box A.
If soil test value is 81 to 200 lbs P/acre, enter 4 in box A
f soil test value is more than 200 lbs P/acre, enter 8 in box A.
Box A ___________________________

P Index rating value from manure application
If applying no manure, enter 0 in box B.
If applying 1 to 30 lbs P2O5/acre from manure, enter 1 in box B.
If applying 31 to 60 lbs P2O5/acre from manure, enter 2 in box B.
If applying 61 to 90 lbs P2O5/acre from manure, enter 4 in box B.
If applying more than 90 lbs P2O5/acre from manure, enter 8 in box B.
Box B ___________________________

P Index rating value from fertilizer application
If applying no fertilizer, enter 0 in box C.
If applying 1 to 30 lbs P/acre from fertilizer, enter 1 in box C.
If applying 31 to 90 lbs P/acre from fertilizer, enter 2 in box C.
If applying 91 to 150 lbs P/acre from fertilizer, enter 4 in box C.
If applying more than 150 lbs P/acre from fertilizer, enter 8 in box C.
Box C __________________________

P Index rating value from manure/fertilizer application method
If applying no manure/fertilizer, enter 0 in box D.
If placing manure/fertilizer deeper than 2 inches, enter 0.5 in box D.
If incorporating manure/fertilizer immediately before crop, enter 1 in box D.
If incorporating manure/fertilizer more than 3 months before crop or are surface applying manure/fertilizer less than 3 months before crop, enter 2 in box D.
If surface applying manure/fertilizer (no incorporation of manure/fertilizer into soil) more than 3 months before crop or are surface applying manure to a pasture land, enter 4 in box D.
Box D _________________________

P Index rating value from soil erosion
If soil loss from this field is less than 5 tons/acre/year, enter 1.5 in box E.
If soil loss from this field is 5 to 10 tons/acre/year, enter 3 in box E.
If soil loss from this field is 10 to 15 tons/acre/year, enter 6 in box E.
If soil loss from this field is more than 15 tons/acre/year, enter 12 in box E.
Box E _________________________

P Index rating value from surface runoff
If surface runoff from this field is less than 0.1 cm enter 0 in box F
If surface runoff from this field is 0.1 to 1.0 cm enter 0.5 in box F
If surface runoff from this field is 1.0 to 5.0 cm enter 1.0 in box F
If surface runoff from this field is 5.0 to 10.0 cm enter 2 in box F
If surface runoff from this field is more than 10 cm enter 4 in box F
Box F ________________________

Total P Index rating value for the site.
Add the P Index value points from boxes A, B,C, D, E and F and enter the total in box G.
The value in box G represents Total P Index value for the site.
Box G ___________________________________

Site vulnerability to P-loss as a function of Total P Index rating values

Site vulnerability rating	Total P Index rating value
Low	<8
Medium	8 to 14
High	15 to 32
Very High	>32

Low to medium site vulnerability ratings indicate that current management practices are adequate for protection of surface waters from phosphorus pollution. High and very high site vulnerability ratings indicate a need for improved management practices.

Phosphorus Index Flow Chart

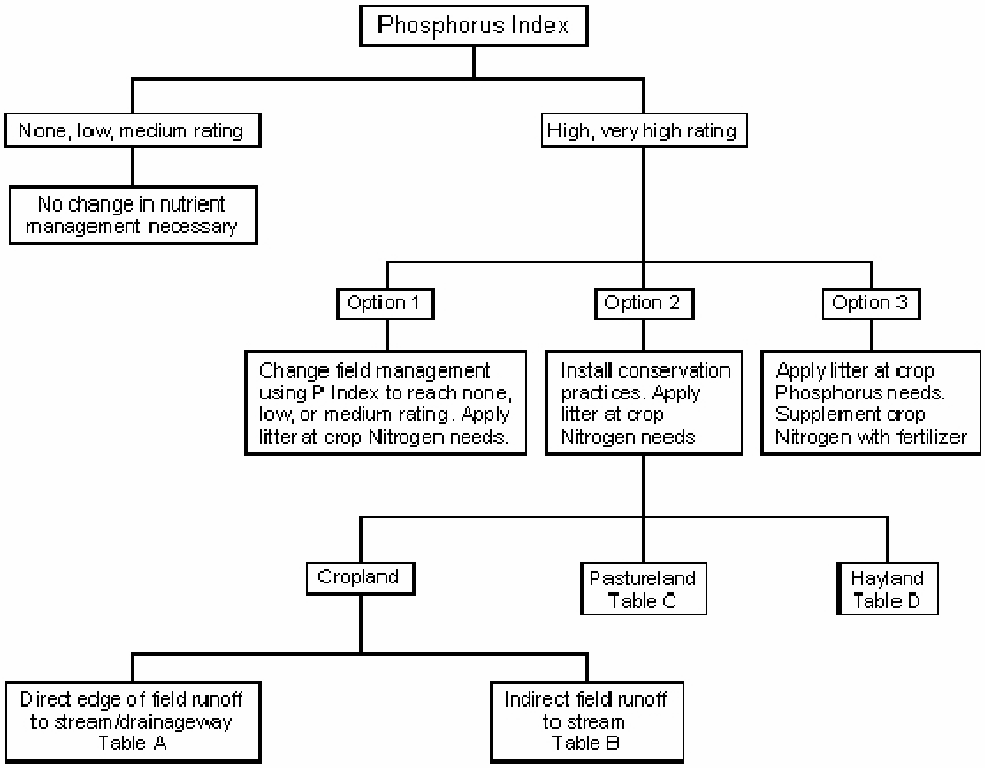


Table A

Management practices to minimize phosphorus movement from crop land to bodies of water when P index is rated high /Very high. These options are for the fields that are directly discharging water to an adjacent stream.

Slope	Practices
0 - 8% feet	Grass filter strips that are more than 30 wide. NUTRIENT MANAGEMENT ■ Apply manure based on the crop requirements for nitrogen ■ Calibrate spreader for manure application ■ Apply litter at a distance of more than 50 feet from the water source ■ Avoid litter application on snow or frozen soils PROPER LITTER STORAGE ■ Stack litter with cover in field MARKET SURPLUS LITTER COVER CROPS OR RESIDUE MANAGEMENT ■ To prevent movement of sediment-bound phosphorus
8 – 15%	All the practices for 0 – 8% slope and ■ Crop rotations ■ No-Till
15 – 25%	All the practices for 8 – 15% slope and ■ Field or Contour Strips

Table B

Management practices to minimize phosphorus movement from crop land to bodies of water when P index is rated high /Very high. These options are for the fields that are indirectly discharging water to an adjacent stream.

Slope	**Practices**
0 - 8%	Grass waterways NUTRIENT MANAGEMENT ■ Apply manure based on the crop requirements for nitrogen ■ Calibrate spreader for manure application ■ Apply litter at a distance of more than 50 feet from the water source ■ Avoid litter application on snow or frozen soils PROPER LITTER STORAGE ■ Stack litter with cover in field MARKET SURPLUS LITTER COVER CROPS OR RESIDUE MANAGEMENT ■ To prevent movement of sediment- bound phosphorus
8 – 15%	All the practices for 0 – 8% slope and ■ Crop rotations ■ No-Till
15 – 25%	All the practices for 8 – 15% slope and ■ Field or Contour Strips

Table C

Management practices to minimize phosphorus movement from pasture lands when P index is high /very high.

Slope	**Practices**
0 - 8%	Treatment of runoff from livestock concentration areas by grassy filter strips NUTRIENT MANAGEMENT ■ Apply manure based on the crop requirements for nitrogen ■ Calibrate spreader for manure application ■ Apply litter at a distance of more than 50 feet from the water source ■ Avoid litter application on snow or frozen soils PROPER LITTER STORAGE ■ Stack litter with cover in field MARKET SURPLUS LITTER
More than 8%	All the practices for 0 – 8% slope and ■ Maintain a minimum grazing height of 3 inches ■ For rotationally grazed pastures use WVU recommendations for grazing heights

Table D

Management practices to minimize phosphorus movement from hay lands when P index is high /very high.

Slope	**Practices**
All Slopes	NUTRIENT MANAGEMENT ■ Apply manure based on the crop requirements for nitrogen ■ Calibrate spreader for manure application ■ Apply litter at a distance of more than 50 feet from the water source ■ Avoid litter application on snow or frozen soils
	PROPER LITTER STORAGE ■ Stack litter with cover in field
	MARKET SURPLUS LITTER
	CROP ROTATION ■ Incorporate P into plow layer during reseeding or change of crop

Determination of Soil Erosion for Phosphorus Index

The following is a step by step procedure for farmers to estimate sheet and rill erosion:

Step 1: Determine soil type for the field for which you are calculating phosphorus index.

Step 2: Determine slope gradient (% slope) for your field. Slope gradient can be estimated from the slope class given with the soil name. Slopes A, B, C, and D refer to slopes of 0-3%, 3-8%, 8-15% and 15-25% respectively.

Step 3: Using Table-I, determine the erosion soil group for your soil. Soils are grouped into Group I, Group II, and group III on the basis of their susceptibility to erosion. Soils in the Group I are the least erodible and soils in Group III are the most erodible.

Step 4: For com grain use tables A-1 to A-3; for com silage use tables B-1 to B-3 and for pastures use Table C-1. Next determine potential soil erosion for the crop rotation that you are using.

Note: For most of the soils when slope gradient is less than 4%, soil erosion is less than 5 tons/acre. When slope gradient for a field is greater than 8% contact your local USDA Natural Resources Conservation Service officials for the determination of soil erosion. NRCS employees will use the most current soil erosion methodology to determine sheet and rill erosion.

Table 1. Grouping of soils for erosion estimation

Group I	Group II	Group III
Ashtom loam	Albright silt loam	Brinkerton variant silt loam
Berks channery silt loam	Allegheny loam	Caneyville
Berks-Weikert channery silt loam	Allegheny variant sandy loam	Cavode silt loam
Blackthorn channery sandy loam	Ashton	Coolville
Calvin channery silt loam	Atkins	Dormont
Craigsville	Basher fine sandy loam	Duncannon
Dekalb	Belmont-Cateache silt loam	Dunning silty clay loam
Duffiel silt loam	Blackthorne	Elkins
Eliber extremely channery loam	Buchanan channery loam	Ernest silt loam
Gilpin silt loam	Calvin	Gallia
Guyandotte	Cateache	Lobdell loam
Hagerstown silt loam	Cavode	Massanetta loam
Hagerstown and Frederick charty silt loam	Cedarcreek	Melvin silt loam
Hazelton	Celleoka	Monogahela silt loam
Huntington loam	Chargin loam	Nolvin
Lakin	Charies	Opequon
Lectonia	Chillowice silty clay	Orrville loam
Lehew and Dekalb	Clarksburg channery silt loam	Otwell
Lindside silt loam	Clymer	Peaboy
Philo fine sandy loam	[illegible]om silt loam	Philo
Philo silt loam	Fenwick	Purdy silt loam

Pope gravelly sandy loam	Fiveblock	Taggart
Schaffeukar	Gayan	Tilsit
Simoda	Gilpin	Tioga loam
Skidmore	Hackers	Toms silt loam
	Holly	Tygart silt loam
	Huntington	Tyler
	Itamann	Upshur
	Janelewe	Vincent
	Jefferson	Westmorrland
	Kanawha	Wheeling
	Kaymine	Woodsfield
	Laidig	Zoar
	Lickdale	
	Lily	
	Lindside and Lobdell soils	
	Mandy	
	Mertz cherty loam	
	Mononghela variant fine sandy loam	
	Murrill cherty silt loam	
	Murrill variant channery fine sandy loam	
	Pineville	
	Pope	
	Potomoc	
	Rushtown	
	Senecaville	
	Sewell	

	Shelocta	
	Shouns	
	Trussel	
	Vandalia	
	Weikert	
	Wharton	

Table A-1. Estimated Erosion from Fields Planted with Corn Grain After Hay (Group I soils)

Slope %	First Year after Hay			Second Year after Hay			Continuous Corn or More than Two Years after Hay		
	No Conservation Practice	Strip Cropping	Contour Strip Cropping	No Conservation Practice	Strip Cropping	Contour Strip Cropping	No Conservation Practice	Strip Cropping	Contour Strip Cropping
	Soil Loss (tons/acre)								
4.0	1.8	1.2	1.1	3.2	2.2	1.9	3.5	2.5	2.1
5.0	2.2	1.5	1.3	4.0	2.8	2.4	4.4	3.1	2.7
6.0	2.4	1.7	1.4	4.4	3.1	2.6	4.8	3.4	2.9
8.0	3.0	2.1	1.8	5.4	3.8	3.3	6.0	4.2	3.6

Table A-2. Estimated Erosion from Fields Planted with Corn Grain After Hay (Group II soils)

Slope %	First Year after Hay			Second Year after Hay			Continuous Corn or More than Two Years after Hay		
	No Conservation Practice	Strip Cropping	Contour Strip Cropping	No Conservation Practice	Strip Cropping	Contour Strip Cropping	No Conservation Practice	Strip Cropping	Contour Strip Cropping
	Soil Loss (tons/acre)								
4.0	2.5	1.7	1.5	4.5	3.2	2.7	5.0	3.5	3.0
5.0	3.1	2.2	1.9	5.6	3.9	3.4	6.2	4.4	3.7
6.0	3.4	2.4	2.0	6.1	4.3	3.7	6.8	4.7	4.1
8.0	4.2	3.0	2.5	7.7	5.4	4.6	8.5	5.9	5.1

Table A-3. Estimated Erosion from Fields Planted with Corn Grain After Hay (Group III soils)

Slope %	First Year after Hay			Second Year after Hay			Continuous Corn or More than Two Years after Hay		
	No Conservation Practice	Strip Cropping	Contour Strip Cropping	No Conservation Practice	Strip Cropping	Contour Strip Cropping	No Conservation Practice	Strip Cropping	Contour Strip Cropping
	Soil Loss (tons/acre)								
4.0	3.5	2.5	2.1	6.4	4.5	3.9	7.1	4.9	4.2
5.0	4.4	3.1	2.6	8.0	5.6	4.8	8.8	6.2	5.3
6.0	4.8	3.4	2.9	8.7	6.1	5.2	9.6	6.7	5.8
8.0	6.0	4.2	3.6	10.9	7.6	6.5	12.0	8.4	7.2

Table B-1. Estimated Erosion from Fields Planted with Silage Corn After Hay (Group I soils)

Slope %	First Year after Hay			Second Year after Hay			Continuous Corn or More than Two Years after Hay		
	No Conservation Practice	Strip Cropping	Contour Strip Cropping	No Conservation Practice	Strip Cropping	Contour Strip Cropping	No Conservation Practice	Strip Cropping	Contour Strip Cropping
	Soil Loss (tons/acre)								
4.0	2.3	1.6	1.4	4.6	3.2	2.8	5.1	3.5	3.0
5.0	2.9	2.0	1.7	5.8	4.1	3.5	6.3	4.4	3.8
6.0	3.2	2.2	1.9	6.3	4.4	3.8	6.9	4.8	4.1
8.0	3.9	2.8	2.4	7.9	5.5	4.7	8.6	6.0	5.2

Table B-2. Estimated Erosion from Fields Planted with Silage Corn After Hay (Group II soils)

Slope %	First Year after Hay			Second Year after Hay			Continuous Corn or More than Two Years after Hay		
	No Conservation Practice	Strip Cropping	Contour Strip Cropping	No Conservation Practice	Strip Cropping	Contour Strip Cropping	No Conservation Practice	Strip Cropping	Contour Strip Cropping
	Soil Loss (tons/acre)								
4.0	3.3	2.3	2.0	6.5	4.6	4.0	7.2	5.0	4.3
5.0	4.1	2.9	2.5	8.2	5.7	4.9	8.9	6.3	5.4
6.0	4.5	3.1	2.7	8.9	6.2	5.3	9.7	6.8	5.8
8.0	5.6	3.9	3.3	11.1	7.8	6.7	12.2	8.5	7.3

Table B-3. Estimated Erosion from Fields Planted with Silage Corn After Hay (Group III soils)

Slope %	First Year after Hay			Second Year after Hay			Continuous Corn or More than Two Years after Hay		
	No Conservation Practice	Strip Cropping	Contour Strip Cropping	No Conservation Practice	Strip Cropping	Contour Strip Cropping	No Conservation Practice	Strip Cropping	Contour Strip Cropping
	Soil Loss (tons/acre)								
4.0	4.6	3.2	2.8	9.3	6.5	6.1	10.1	7.1	6.1
5.0	5.8	4.1	3.5	11.6	8.1	7.6	12.7	8.9	7.6
6.0	6.3	4.4	3.8	12.6	8.8	8.3	13.8	9.7	8.3
8.0	7.9	5.5	4.7	15.7	11.0	10.3	17.2	12.1	10.3

Table C-1. Estimated Erosion from Pasture Fields

Slope %	Overgrazed Pasture			Pasture with Good Cover		
	Group I Soils	Group II Soils	Group III Soils	Group I Soils	Group II Soils	Group III Soils
	Soil Loss (tons/acre)					
4.0	1.1	1.5	2.1	0.5	0.7	1.1
5.0	1.3	1.9	2.6	0.7	0.9	1.3
6.0	1.6	2.2	3.2	0.8	1.1	1.8
8.0	2.1	3.0	4.2	1.1	1.5	2.1
10.0	2.8	4.0	5.6	1.4	2.0	2.8
12.0	3.6	5.1	7.3	1.8	2.6	3.6
14.0	4.5	6.3	9.0	2.2	3.2	4.5
16.0	5.3	7.5	10.6	2.7	3.7	5.3
18.0	6.1	8.7	12.3	3.1	4.3	6.1
20.0	7.0	9.7	14.0	3.5	5.0	7.0

Determination of surface runoff for phosphorus index

The following is a step by step procedure for surface runoff determination:

Step 1.	Determine soil type for the field for which you are calculating phosphorus index.
Step 2.	Using table D-1, determine the hydrologic soil group for your soil . Hydrologic soil groups are letters A. B. C. OR D in the table D-1.
Step 3.	Using the table D-2, determine surface runoff for your field.

Table D-1 Hydrologic Groups for Various Soils

A	B	C	D
Allegheny Variant	Allegheny	Albrights	Andover
Elliber	Ashton	Beech	Atkins
Lakin	Barbour	Benevola	Blago
Potomac	Basher	Betheda	Brinkerton
Rushtown	Belmont	Blairton	Corydon
Schaffenaker	Blackthorn	Briery	Dunning
Wheeling gr. Sandy loam	Braddock	Brookside	Elkins
	Chagrin	Buchanan	Ginat
	Chavies	Calvin	Latham
	Clifton	Caneyville	Lickdale
	Clymer	Captina	Melvin
	Craigsville	Carbo	Nolo
	Culleoka	CaLeache	Peabody
	Drall	Cavode	Purdy
	Duffield	Cedarcreek	Ramsey
	Duncannon	Chilhowie	Robertsville
	Dunmore	Clarksburg	Tygart
	Edgeont	Cookport	Tyler
	Frankstown	Coolville	Upshur
	Fredrick	Dekalb	Vandali
	Gallia	Dormont	Weikert
	Grigsby	Edom	
	Guyandotte	Ernest	
	Hackers	Fairpointe	

A	B	C	D
	Hazelton	Faywood	
	Huntington	Fenwick	
	Jafferson	Fiveblock	
	Kanawha	Gauley	
	Landes	Gilpin	
	Lily	Glenford	
	Linden	Guerensey	
	Lobdell	Guyan	
	Macove	Hagerston	
	Massanetta	Holly	
	Murril	Itmann	
	Nelse	Janelew	
	Nolin	Kaymine	
	Philo	Laidig	
	Pineville	Lawerence	
	Pope	Leetonia	
	Rayne	Lehew	
	Senecaville	Leatherbark	
	Sensabaugh	Lindside	
	Shelocta	Litz	
	Shouns	Lodi	
	Skidmore	Mandy	
	Snowdog	Markland	
	Summers	McGary	
	Tioga	Meckesville	
	Westmoreland	Mertz	

A	B	C	D
	Wheeling fine sandy loam	Monongahela	
		Muskingum	
		Opequon	
		Orrville	
		Otwell	
		Sciotovile	
		Sees	
		Sewell	
		Simoda	
		Taggart	
		Tilsit	
		Toms	
		Trussal	
		Vincent	
		Weikert	
		Wharton	
		Woodsfield	
		Zoar	

Table D 2. Surface runoff from soils in various hydrologic groups under different land use practices

Land use	Hydrologic groups			
	A	B	C	D
	Surface Runoff (cms)			
Row Crops with Conservation Practices	0.4	1.1	1.8	2.7
Row crop without Conservation Practices	1.1	2.1	3.3	3.7
Pasture Overgrazed	0.9	1.8	3.3	3.4
Pasture with Good Cover	0.00	0.4	1.5	2.9
Hay Field	0.00	0.4	1.0	1.8

Appendix 5

Soil Rating for Nitrate and Suitable Nutrients

Introduction

This section provides a way to determine the degree to which water percolates below the rootzone in certain soils. Percolating water containing dissolved nitrates or other soluble nutrients could be a hazard to ground water. The method is based on a Leaching Index (LI)[1].

For areas with ground water concerns, the LI should be determined to evaluate the potential for contaminating the ground water with soluble nutrients. The LI uses annual precipitation, hydrologic soil group, and rainfall distribution data.

Leaching Index

A LI map for each hydrologic soil group was developed for each state and is being provided during the Water Quality workshops. The hydrologic group describes those soils that do not have dual hydrologic ratings because of differences in drainage. Soils with hydrologic rating such as A/D should be evaluated on the basis of the current drainage status. If the soil has a high LI and is over a shallow aquifer, soluble nutrients-especially nitrates-may contaminate the water.

The LI does not account for irrigation. If irrigation is applied only to supply plant needs, there will be little additional loss below the rootzone. The additional loss would be relative to the precipitation events after the soil profile is saturated or nearly saturated due to irrigation.

In areas of marginal water quality, the amount of irrigation water applied includes a leaching fraction to insure that salts do not build up in the soil. If a leaching fraction is applied, this amount of water must be added to the LI. For example, if the leaching fraction is 1.2 and irrigation is applied to make up a 4 inch soil-water deficit, a 4.8 inch (1.2 x 4.0 in) irrigation would be applied. The LI should be increased by 0.8 inches. The same calculation must be made for each irrigation.

Procedure

Follow these steps to determine the leaching index of a certain soil:

1. Find the soil's hydrologic group.
2. Locate the iso-leaching map for that group.
3. From the map, based on the soil location, determine the LI.

Guidelines for Recommendations:

1. A LI below 2 inches would probably not contribute to soluble nutrient leaching below the rootzone.

2. A LI between 2 and 10 inches may contribute to soluble nutrient leaching below the rootzone and nutrient management should be considered.

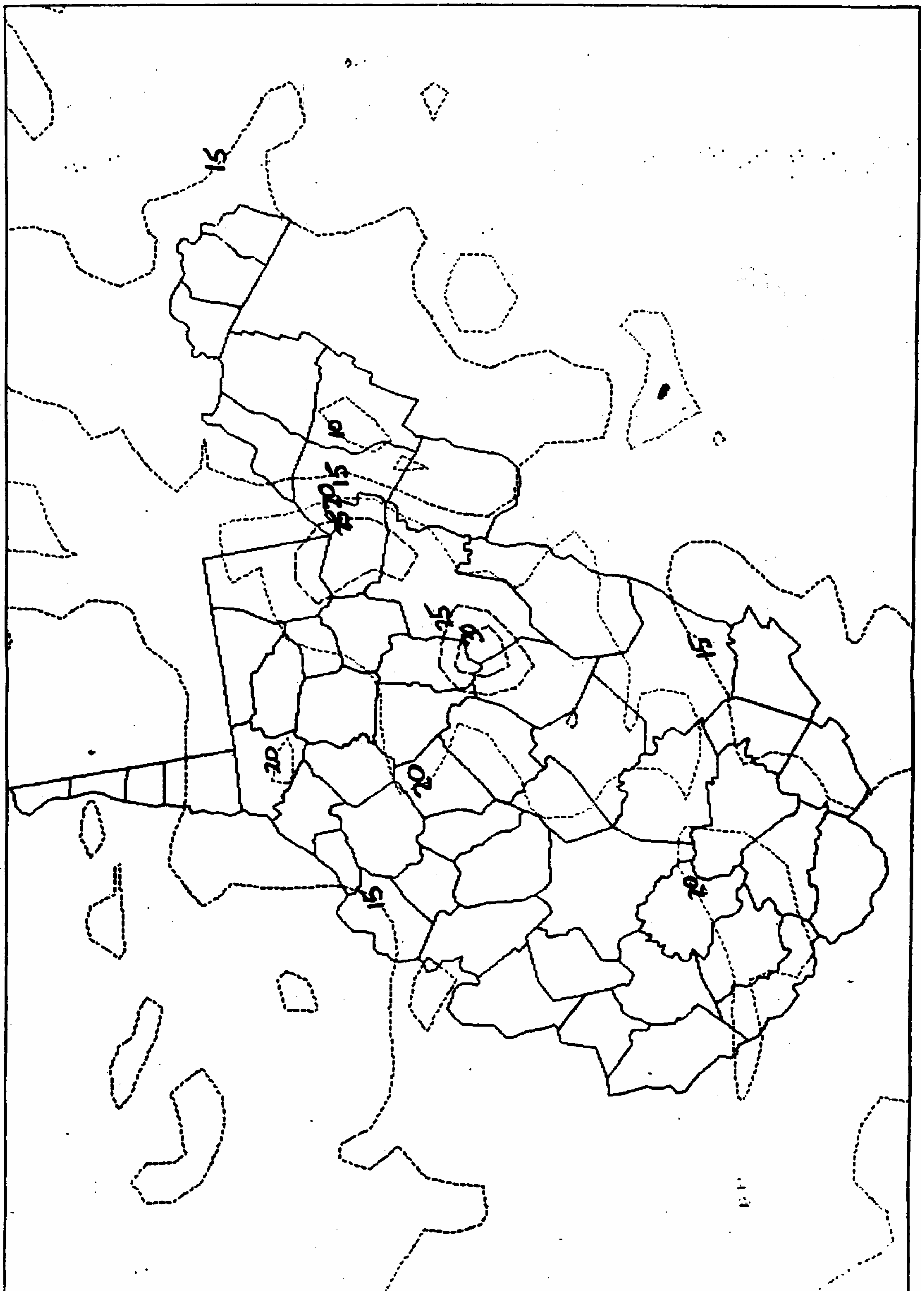
3. A LI larger than 10 inches will contribute to soluble nutrient leaching below the rootzone. Nutrient management practices should be intense or soluble nutrients should not be applied. Also, consider using conservation practices that minimize infiltration, such as strip cropping rather than pipe outlet terraces.

Definitions:

1. Equals SMALL Leaching Index

2. Equals INTERMEDIATE Leaching Index

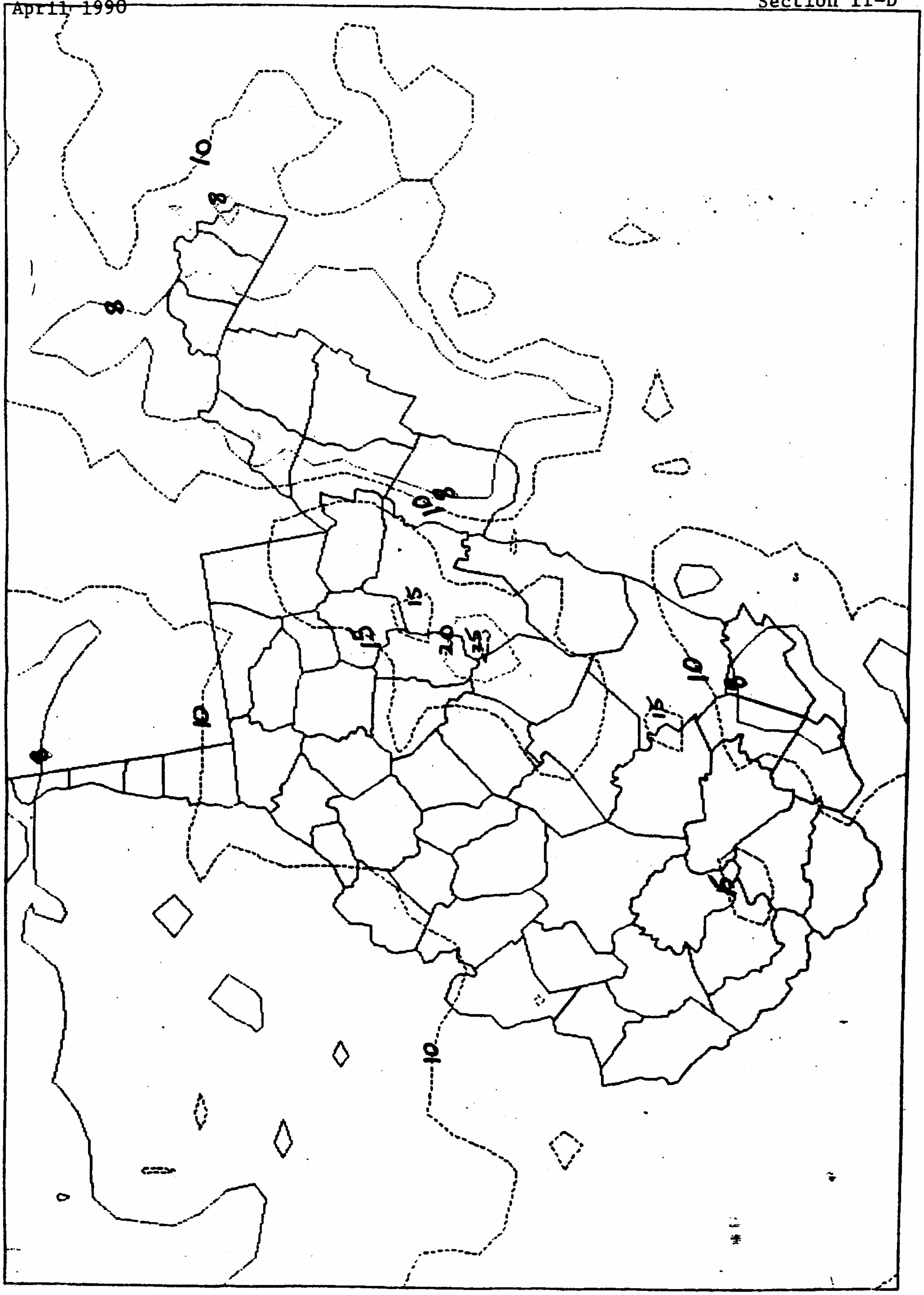
3. Equals LARGE Leaching Index



LEACHING INDEX FO[illegible] /DROLOGIC GROUP A
WEST V[illegible]RGINIA

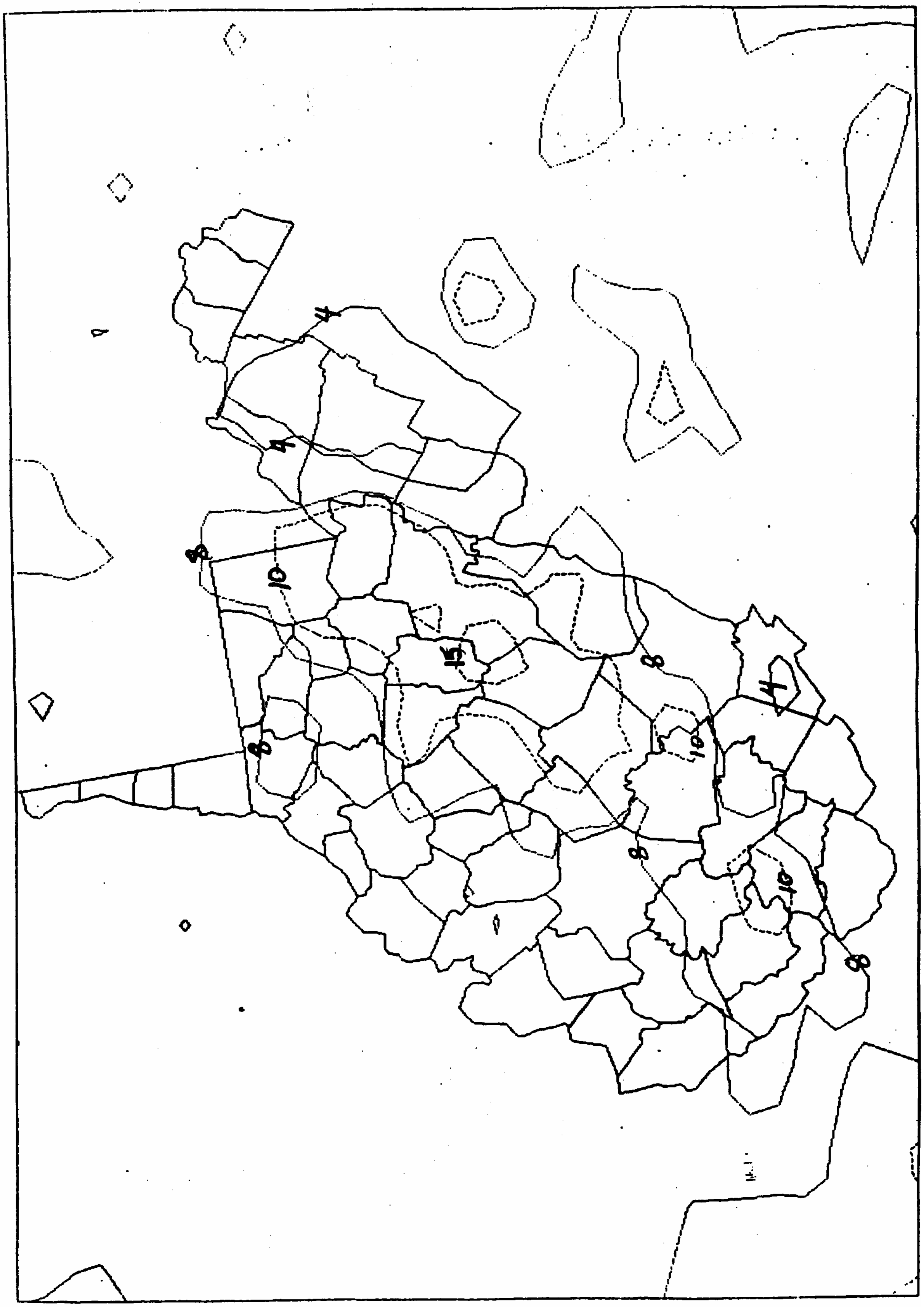
LEACHING INDEX FOR HYDROLOGIC GROUP B

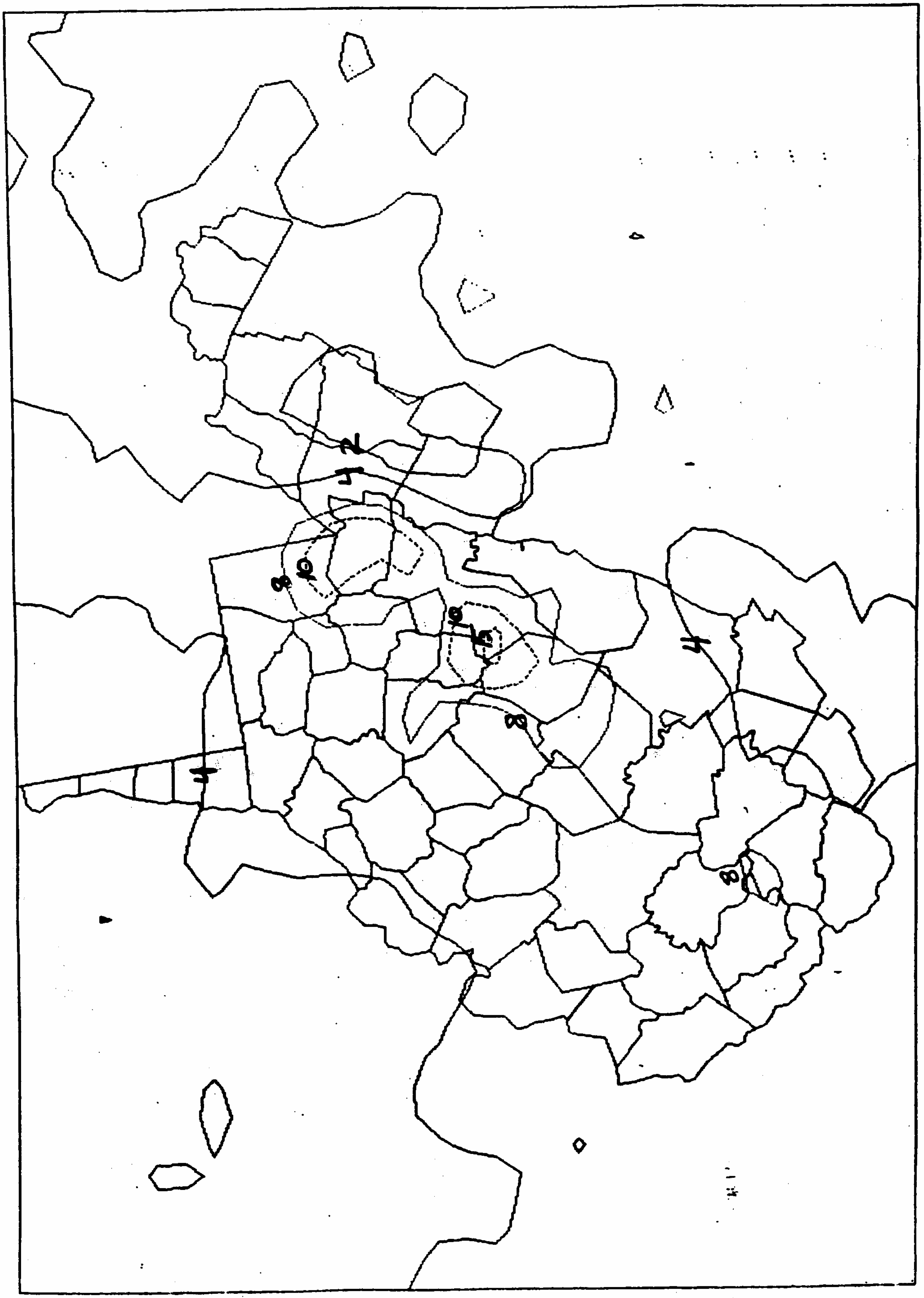
WEST VIRGINIA



LEACHING INDEX FO DROLOGIC GROUP C

WEST RGINIA





LEACHING INDEX FOR HYDROLOGIC GROUP D
WEST VIRGINIA

HYDROLOGY: Soil Names and Hydrologic Soil Groups

Albrights - C
Allegheny - B
Allegheny Variant- A
Allen (use Gallia)
Andover - D
Ashton - B
Atkins - D
Barbour - B
Basher - B
Belmont - B
Benevola - C
Berks - C
Bethesda - C
Blackthorn - B
Blago - D
Blairton - C
Bodine (use Elliber)
Braddock - B
Briery - C
Brinkerton - D
Brooke - D
Brookside - C
Buchanan - C
Calvin - C
Calvin High Base Substratum (use Cateache)
Calvin Netural Substratum (use Cateache)
Caneyville - C
Captina - C
Carbo - C
Cateache - C
Cavode - C
Cedarcreek - C
Chagrin - B
Chavies - B
Chilhowie - C
Chilo (use Ginat)
Clarksburg - C
Clifton - B
Clymer - B
Cookport - C
Coolville - C
Corydon - D
Cotaco - C
Craigsville - B
Culleoka - B
*Dekalb - C
Dormont - C
Drall - B
Duffield - B
Duncannon - B
Dunmore - B
Dunning - D
Edgemont - B
Edom - C
Elkins - D
Elliber - A
Ernest - C
Fairpoint - C
Faywood - C
Fenwick - C
Fiveblock - C
Frankstown - B
Frederick - B
Gallia - B
Gauley - C
Gilpin - C
Ginat - D
Glenford - C
Grigsby - B
Guernsey - C
Guthrie (use Lawrence)
Guyan - C
Guyandotte - B
Hackers - B
Hagerstown - C
Hartsells (use Cylmer)
Hazleton - B
Holly - D
Holston (use Allegheny)
Huntington - B
Itmann - C
Janelew - C
Jefferson - B
Kanawha - B
Kaymine - C
Laidig - C
Lakin - A
Landes - B
Latham - D
Lawrence - C
Leadvale (use Ernest)
Leetonia - C

*For Dekalb, use B where bedrock is fractured.

Reference; Chap. 2, EFM, Table 2-1 WV County Soil Reports and Soil 5's	U.S. DEPARTMENT OF AGRICULTURE Soil Conservation Service West Virginia	Exhibit WV 2-1 Sheet 1 of 2

HYDROLOGY:

Soil Names and
Hydrologic Soil Groups

Lehew - C
Lickdale - D
Licking - C
Lily - B
Linden - B
Lindside - C
Litz - C
Lobdell - B
Mandy - C
Markland - C
Massanetta - B
McGary - C
Meckesville - C
Melvin - D
Mertz - C
Monongahela - C
Montevallo
(use Weikert)
Moshannon - B
Murrill - B
Muskingum - C
Myra - C
Nolin - B
Nolo - D
Opequon - C
Orrville - C

Otwell - C
Peabody - D
Philo - B
Pickaway
(use Lawrence)
Pineville - B
Pope - B
Potomac - A
Purdy - D
Ramsey - D
Rayne - B
Robertsville - D
Rushtown - A
Schaffenaker - A
Sciotoville - C
Sees - C
Senecaville - B
Sensabaugh - B
Sequatchie
(use Chavies)
Sewell - C
Shelocta - B
Shouns - B
Simoda - C
Skidmore - B
Summers - B

Taggart - C
Teas (use Cateache)
Tilsit - C
Tioga - B
Toms - C
Trussel - C
Tumbez (use
Opequon)
Tygart - D
Tyler - D
Upshur - D
Vandalia - D
Vincent - C
Waynesboro
(use Braddock)
**Weikert - C/D
Wellston -
(use Rayne)
Westmoreland - B
Wharton - C
Wheeling fine
sandy loam - B
Wheeling gr. sandy
loam - A
Woodsfield - C
Wyatt (use
Markland)
Zoar - C

**For Weikert, use C where bedrock is fractured and D where bedrock is solid and impervious.

Reference; Chap. 2, EFM, Table 2-1 WV County Soil Reports	U.S. DEPARTMENT OF AGRICULTURE Soil Conservation Service West Virginia	Exhibit WV 2-1 Sheet 2 of 2

WV 2-91(4)

Appendix 6

Residual Nitrogen Contribution from Legumes

Previous crop	% Stand			
Alfalfa First year after alfalfa	>50% stand 25-49% stand <25% stand		110 70 40	
Red clover and trefoil First year after clover or trefoil	>50% stand 25-49% stand <25% stand		80 60 40	
Soybeans First year after soybeans harvested for grain.		---- 1 lb N/bu soybeans ----		