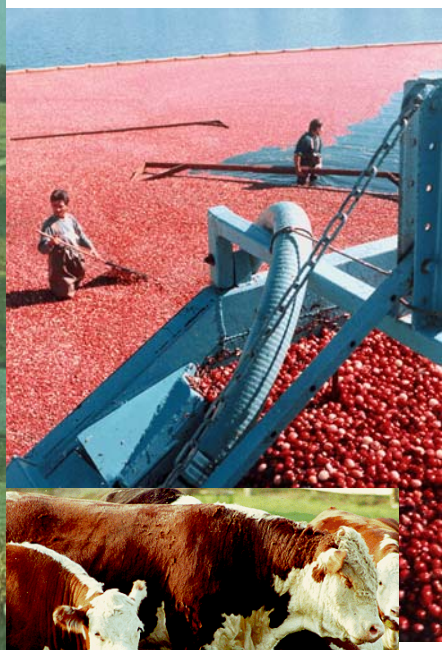
On-Farm Strategies to Protect Water Quality

An Assessment and Planning Tool for Best Management Practices on New Jersey Farms








Prepared by the New Jersey Association of Conservation Districts in Cooperation With:

- **State Soil Conservation Committee, New Jersey Department of Agriculture**
- **Natural Resources Conservation Service, U.S. Department of Agriculture**

ACKNOWLEDGMENTS

This Manual was produced by the New Jersey Association of Conservation Districts in cooperation with the New Jersey Department of Agriculture, State Soil Conservation Committee and the USDA Natural Resources Conservation Service. Its purposes are to help achieve the prevention and control of non-point source pollution from agricultural activities and to respond to water quality goals established by the Coastal Zone Management Act. It was based upon the publication "On Farm Strategies to Protect Water Quality" produced by the New England Small Farm Institute for the Massachusetts Department of Food and Agriculture. The best management practices presented in the Manual are generally those practices developed by the USDA Natural Resources Conservation Service and endorsed by the New Jersey State Soil Conservation Committee and the 16 local conservation districts.

Special acknowledgment and thanks are expressed to Dr. David Smart, State Resource Conservationist and other NRCS staff, for adaptation of the best management practices contained in the Massachusetts Publication to New Jersey's situation and to Samuel Race, Executive Secretary of the State Soil Conservation Committee, and his staff who provided administrative assistance and coordination to help complete the project. Thanks are also extended to representatives of Rutgers Cooperative Extension and to officials and staff of New Jersey's Conservation Districts for their assistance.

Special acknowledgment is also given to the following organizations in Massachusetts which authorized our use of their original publication entitled "On-Farm Strategies to Protect Water Quality".

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An Assessment and Planning Tool for Best Management Practices in New Jersey

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ON-FARM STRATEGIES TO PROTECT WATER QUALITY

An Assessment and Planning Tool for Best Management Practices

This Manual is designed to help farmers take an important first step toward comprehensive conservation management system planning to protect the quality of our water supplies.

PART I: NEW JERSEY AGRICULTURE AND WATER QUALITY

A. Introduction

TODAY, nearly everyone is concerned about water quality. Pollutants from a variety of sources threaten to contaminate public and private drinking water supplies as well as our rivers, coastal waters and lakes. Nationwide, pollutants from such sources as industry, urban stormwater, sewage treatment plants, marinas, construction sites and agriculture can enter surface and ground water in a variety of ways.

In response to federal legislation, the U.S. Environmental Protection Agency (EPA) has developed requirements and guidance for states as they develop non-point source pollution control programs. This guidance addresses six categories of pollution sources for which states are required to implement "management measures": agriculture; forestry; urban areas (including urban runoff, construction, roads and wastewater treatment); marinas and recreational boating; hydro-modification; and wetlands and riparian areas. In New Jersey, the NJ Department of Agriculture (NJDA) and the Department of Environmental Protection (NJDEP) have collaborated to implement these management measures for agricultural land use. They began by recruiting public involvement. Representatives from the agricultural and environmental communities and agency personnel are invited to work as a team, or Task Force, to address agricultural non-point source pollution. Although EPA guidance targets coastal watersheds, the New Jersey program will be implemented statewide, because nearly all watersheds contribute to New Jersey coastal waters.

The Task Force was asked to identify strategies to reduce negative impacts on water quality from agricultural sources in ways that would meet the requirements of both state and federal mandates for non-point pollution control. It met for more than a year to design a comprehensive strategy that would a) address statutory mandates, b) encourage voluntary actions on the part of the farming community, c) focus on a farm-comprehensive planning approach and d) provide tools to help farmers address non-point pollution.

B. Background: New Jersey Water Quality Issues and Programs

NEW JERSEY is predominantly an urban state with a diversity of land uses. Although much of the state is forested, its major land use impacts involve residential, commercial and industrial activities and the associated use and disposal of potential water supply contaminants on the land. These include, for example, industrial and household solvents, fuels, wastewater and sewage, road salt and sand. If not handled properly, these byproducts of everyday life can become pollutants, entering our surface and ground water and posing serious threats to water quality.

New Jersey has established a number of state programs and regulations to protect water quality, including the Wetlands Protection Act.

In addition, agricultural uses cover over 733,450 acres in New Jersey. Agriculture's 10,327 farms make significant contributions to the State's economy, and provide significant "non-market" amenities such as open space and wildlife habitat. Normal farming practices involve activities that can also have unwanted and potentially harmful impacts on surface and ground water. Such activities include the use of pesticides, fertilizers, manure and fuel, and even the mechanical movement of soil.

Like most heavily developed states, New Jersey has established a number of state programs and regulations to protect the quality of its water, including, for example, its Wetlands Protection Act. Some of these programs address specific agricultural activities, such as pesticide use and handling regulations and regulations limiting agricultural practices near public drinking water supply wells. From some farmers' point of view, this "piecemeal" approach to regulation has resulted in frustration and confusion. This Manual is designed to take an important step toward a comprehensive and sustainable farm resource and management plan to protect the quality of our water.

C. New Jersey's "Non-point Source Management Plan" for Agriculture: Strategies for Implementation and Use of this Manual

THE program developed to meet requirements for New Jersey's "agricultural management measures" combines two important approaches to farm management: 1) it promotes the adoption by farmers of appropriate "best management practices" for water quality protection and 2) it promotes the use of those "BMPs" in the context of developing a farm plan that is comprehensive and promotes sustainability. The farm-planning model allows farmers to conduct a self-assessment and to determine successful strategies to meet water quality goals.

This approach provides a framework for a comprehensive and practical "hands-on" program addressing agricultural sources of non-point pollution.

The farm planning tools in this Manual may be used to develop a site-specific, realistic Farm Plan for meeting or working toward the following water quality protection goals:

- reduce soil erosion and minimize sedimentation to surface waters;
- limit the discharge(s) from livestock facilities to surface and ground waters;
- maximize nutrient use efficiency, and minimize excessive nutrient loading into surface and ground waters;
- reduce contamination of surface and ground waters from pesticides;
- protect sensitive areas (such as wetlands and stream banks) from negative impacts from livestock grazing; and minimize the discharge of pollutants to surface and ground waters from irrigation practices.

This Non-point Source Management Plan for agriculture provides a framework for a comprehensive and practical "hands-on" program addressing agricultural sources of non-point pollution.

1. The Purpose of this Manual

This Manual is designed to provide farmers with a structured process to understand and identify on-farm sources of non-point pollution, and choose and implement effective strategies to address them, within the context of a comprehensive farm plan. That way, farmers, along with other New Jersey residents and businesses, will become active participants in the state's non-point pollution control program.

In summary, use of this Manual will:

- increase understanding of potential on-farm non-point sources of pollution;
- provide guidance and tools for farm planning that addresses non-point pollution;
- support the selection of practical and reasonable agricultural management measures;
- provide access to assistance and additional information through listed resources and referrals.

2. A Note on Whole Farm Planning

The increasingly popular concept of Whole Farm Planning centers around the notion that the best farm management is the result of careful and comprehensive planning. Terms like "systems" and "holistic" are often used to describe an approach that begins with articulating farm family goals and then evaluates all components of the farm enterprise.

Water is a shared resource. Water used on the farm has been used by others, and will be used by others again.

The New Jersey Department of Agriculture strongly encourages the development of such farm plans. There are a variety of farm planning assistance tools available through farm service agencies and the Soil Conservation Districts (see page 72 for directory).

While the tools may vary, they share a systems approach that links all management practices in an integrated way through careful and comprehensive planning.

Strategies to protect water quality are a central component of Whole Farm Planning efforts. With the help of this Manual and appropriate technical assistance, New Jersey farmers can design and implement farm plans that, among other goals, work toward successfully meeting standards for controlling non-point pollution.

Part IV of this Manual includes a directory of "best management practices" that can be built into a plan to address particular on-farm water quality concerns or issues. These "best management practices" are site-appropriate farm activities that control, reduce or avoid non-point pollution.

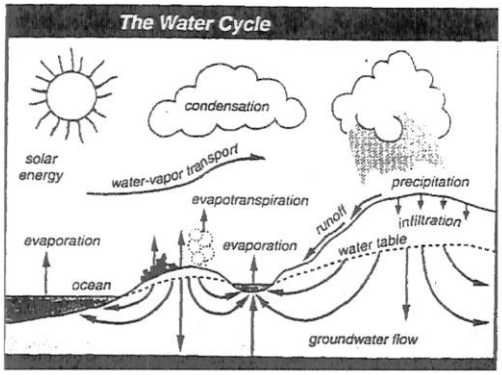
The Worksheets included in this Manual are important tools for comprehensive farm planning. However, there may also be a need for **detailed inventories and professional on-site planning and evaluation that can be provided by public or private sector specialists.**

PART II: PREPARING FOR ACTION

A. Step One: Understanding Water Quality Impacts

ADDRESSING agriculture's impacts on water quality is an important farm management issue. Becoming informed about water quality impacts, both on-farm and off-farm, is a necessary first step.

1. The Water Cycle



Water is a shared resource. It is in constant motion, continually recycling throughout the environment, and agriculture is but one of many users that expect a clean supply to meet a variety of needs. Water used on the farm has been used by others, and will be used by others again after it leaves the farm. This "cycle" includes both **surface water**, such as ponds and lakes, wetlands, streams and rivers, and coastal waters; and **ground water**, which is the water contained in rock and sand formations below the surface of the ground.

2. Point and Non-point Pollution

Water pollutants can come from many sources. The term "point source pollution" refers to pollutants that discharge from a "confined and discrete conveyance" such as a pipe from an industrial or sewage treatment facility. Nationally, there has been considerable success in controlling or eliminating point source pollution. In New Jersey, it is uncommon to find a point source on a farm.

"Non-point pollution" is often more difficult to identify. It usually results from surface runoff, precipitation, drainage or seepage. As water moves over and through the ground, it picks up and carries away both natural pollutants and pollutants resulting from human activity. Contaminants such as soil sediments, nutrients from agricultural and lawn fertilizers, sewage, and chemicals from pesticide use and other sources are picked up as water runs over the ground and through the soil. Contaminated rainwater and snow melt ultimately flow directly into a surface water body such as a pond, river or lake, seep into ground water, or enter a constructed drainage system that eventually carries the contaminants to a surface water body.

Unlike point source pollution from industrial pipe discharges and other direct sources, the sources of non-point pollution are extremely diverse and widespread. Virtually every activity that adds something to the environment or takes something away can cause non-point pollution. For example, adding fertilizers and pesticides to a field can cause non-point pollution when rainwater washes excess nutrients and chemicals into surrounding water bodies. Even cleaning the house, driving to work or walking the dog can contribute to non-point pollution. Although each one of these activities alone may have a small impact, the combined impacts of millions of people add up to a water pollution problem of significant size.

3. The Dynamics of Non-point Pollution

While agriculture's overall contribution to non-point pollution is small compared to other sources in New Jersey, some on-farm practices may cause significant localized, negative impacts on water quality. In most cases, New Jersey's agricultural producers can implement management practices that address non-point pollution once the source of the problem has been identified.

To successfully manage agriculture's impact on water quality, it is important to understand and work with the dynamics or "mechanics" of water pollution. Water's ability to transport non-point pollutants through and/or across the land—and our ability to control it—involves the following:

- Availability
- Detachment
- Transport
- Deposition

a. Availability of a potential pollutant depends on its location and quantity in or on the soil. Reducing the amount of a potential pollutant available for loss can be accomplished by, for example, reducing pesticide or nutrient

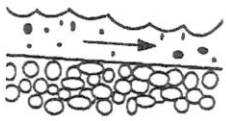
Understanding the "mechanics" of water pollution is important in managing agriculture's impact on water quality.

application rates and avoiding sensitive areas. Source control strategies such as these present the first opportunity in any agricultural pollution control effort. Quite obviously, reduced availability of a potential pollutant means reduced problem potential. As a first line of defense, looking for ways to reduce the use of potential pollutants such as crop nutrients and pesticides makes good sense.

Detachment
Detachment occurs when water splashes onto the soil surface and dislodges soil particles from their original location.

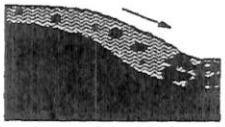
b. **Detachment** is the process in which a soil particle, nutrient or pesticide breaks free from its position in the soil. Soil particles can be separated from the soil mass by wind or rain and deposited in nearby water bodies. Nutrients or pesticides can then move away from the soil material to which they are attached and into the surrounding water. Certain practices can prevent the detachment of a particle or substance, while other practices and naturally occurring events increase the likelihood of detaching soil particles and the nutrients and pesticides that may be attached to them. For example, the impact of raindrops is a major cause of soil particle detachment. Protecting the soil from this impact with crop residues or green covers is one practical solution.

Transport
Transport is the movement of soil particles in moving water across the soil surface.



c. **Transport** involves the movement of a soil particle, nutrient or pesticide from its original position. Nutrients and pesticides can be attached to soil particles that may become detached or they may become dissolved in water collected on the surface or moving through the soil. Pollution prevention often requires transport or delivery reduction in addition to appropriate source control measures. Strategies that limit or direct the movement of a soil particle or other substance are available.

Deposition
Deposition is when the soil particle is no longer moved by the force of the water.



For example, reducing "overland flow" (non-channelized flow of rain or snow melt across the surface of a field) by farming on the contour or increasing crop residues will accomplish this.

d. Deposition results in a new, stabilized resting place for a transported soil particle, nutrient or pesticide. A soil particle, possibly with nutrients or pesticides attached, may be deposited in a water body or in a specially designed trap. Properly designed vegetative filter strips, sediment basins and buffers can perform this trapping function successfully.

In summary, management strategies to avoid or reduce non-point pollution from farms must attack the problem at its source. Understanding the natural progression of

Availability —> Detachment —> Transport —> Deposition

is the key to choosing appropriate actions to avoid or reduce harmful agricultural impacts on water quality.

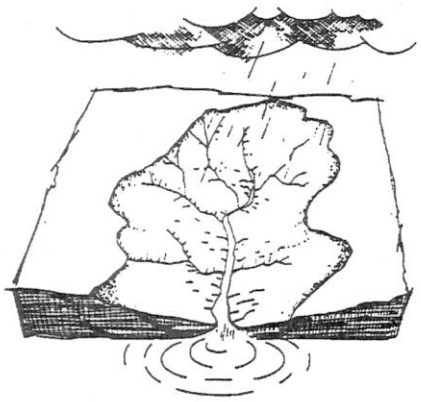
The water cycle includes both "surface water", such as ponds and lakes, wetlands, streams and rivers, and coastal waters; and "ground water", which is the water contained in rock and sand formations below the surface of the ground.

4. Non-point Source Pollutants

Non-point source pollutants that cause agricultural non-point pollution can be grouped into three major categories:

- Sediments
- Nutrients and pathogens
- Toxicants, such as pesticides, fuels and metals

a. Sediments are, quite simply, "materials deposited." In agriculture, this material is typically comprised of soil particles, both organic and inorganic, deposited as a result of water erosion. In New Jersey, wind erosion, which also carries soil particles, is of less concern. Water erosion is the natural process of soil movement from higher areas to lower areas by the action of precipitation or flowing water. Heavy rain events as well as activities such as cultivation can cause erosion. Factors affecting soil erosion include soil type, slope, intensity and duration of precipitation, soil cover and management practice.



On a bare area, a single storm can remove more soil than ten thousand years of geological erosion.

Sediment affects water quality in several ways. Substances such as phosphorous, ammonium and some pesticides stick to sediment particles. They are then transported and may be released from these particles into a water body or ground water. Eroding sediments generally contain higher concentrations of phosphorous, nitrogen and pesticides than the parent soil because small particles (those that are more easily transported, e.g. clay) have a much greater adsorption capacity than larger particles, such as sand.

Sediment also affects the quality of water as a habitat. Suspended particles affect fish gills, spawning areas, food supplies and feeding habits, and reduce sunlight available to aquatic plants. These effects, in turn, combine to decrease the overall value of lakes, streams, estuaries and coastal waters. Recreational opportunities are reduced, fish populations are reduced and the turbidity (cloudiness) of polluted water makes it less appealing for swimming and other recreational use.

Finally, the movement of sediments also has a negative impact on agricultural land productivity. Topsoil loss from erosion has been a major agricultural problem since the days of the dust bowl. On a bare area, a single storm can remove more soil than ten thousand years of geologic erosion. Building and maintaining soil health by employing practices that reduce soil migration, such as those recommended in this document, will help prevent both water pollution and soil loss.

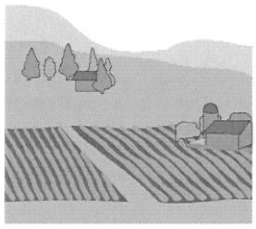
b. Nutrients and Pathogens. Major sources of nutrients and pathogens in agriculture are fertilizers, silage runoff, sludges, crop residues, irrigation water, manures and animal bedding. Runoff and leachate (liquids percolating through the soil into the ground water) from agricultural land may transport pollutants such as the following:

- Excess crop nutrients: both bound to organic soil particles (e.g., phosphorous and organic nitrogen) and soluble (e.g., nitrogen, phosphorous and other major and minor nutrients that dissolve in water); and
- Pathogens: harmful bacteria, viruses and other microorganisms.

Building and maintaining soil health by employing practices that reduce soil migration will help prevent both water pollution and soil loss.

1. **Excess Crop Nutrients.** When treating the soil to provide crop nutrition, the goal is to provide no more nitrogen, phosphorous, potassium and/or other nutrients than is necessary. Excess nutrients (those not used by the crop) become readily available for transport to (and pollution of) surface or ground water.

Nutrients in organic form come from manures, bedding and other materials that are applied to cropland, and from decaying crop residues. The nutrient content of such material varies greatly and can be tested to assure that nutrients are not being applied in excess amounts.



The inorganic nutrients available in commercial fertilizer come in many forms. While nutrient content is clearly identified in product literature and labeling, amounts can become "excess" if they are not carefully applied.

Irrigation water can also be an important source of excess nutrients (particularly nitrogen). These may be picked up from the soil as water passes through it. These amounts can be significant. In addition, fertigation (also called chemigation), the process of adding fertilizer to irrigation water, can add potentially excess nutrients to surface or ground water.

While crop nutrients are necessary for crop production, they can have a negative impact on the growth of native aquatic plants. When excess nitrogen or phosphorous enters surface water bodies, aquatic plant productivity may increase dramatically. The physical presence of these "excess" plants can make water unsuitable for swimming or boating, and adversely affect the quality of water as habitat. Further, the decay of this plant material depletes the water's supply of available oxygen, with negative impacts on aquatic organisms. In addition, runoff, wastewater and/or manure entering surface water can cause toxic conditions resulting in fish kills (the sudden death of large populations of fish) and make surface water unsuitable for drinking, fishing, boating, swimming and other use.

Nitrates in ground water also pose serious public health hazards. Nitrates are potentially dangerous to newborn infants and are a suspected cancer-causing agent. The extent of nitrate contamination of drinking water is only beginning to be documented, but it appears to be widespread in some areas of the country.

2. **Pathogens.** These disease-causing organisms, including bacteria (e.g., E. Coli), viruses and parasites, are found in manures and other materials and can be transported (carried or leached) into surface or ground water. Animal diseases can be transmitted to humans through contact with water contaminated with animal wastes. Contamination by humans and animal fecal material has caused the closing of public beaches and shellfish beds.

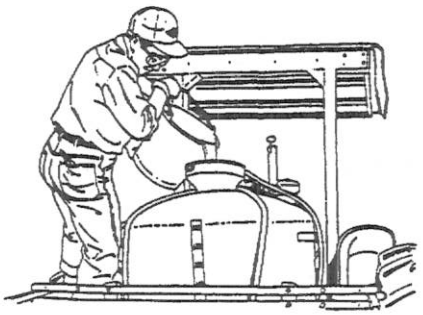
c. Toxicants. The storage and use of toxic or hazardous materials on the farm is likely to be subject to state or federal regulation. Planning considerations to protect water quality offers an opportunity to plan for compliance within the context of a practical, economically sensible and comprehensive farm management plan. Major sources of toxicants in surface and ground water include:

- Pesticides
- Fuels and Metals

1) **Pesticides.** Before World War II, commonly used pesticides consisted of a limited number of products made from natural organic sources such as pyrethrum and naturally occurring inorganic substances such as sulfur and copper compounds. Today, over 50,000 manufactured pesticides are registered with the U.S. Environmental Protection Agency (although a smaller number of these are used extensively); for purposes of identification, they are generally grouped according to their intended targets: e.g. insecticides, fungicides and herbicides. Responsible use of these pesticides requires farmers to implement increasingly complex chemical management systems.

Responsible use of pesticides requires farmers to implement increasingly complex chemical management systems.

These modern agricultural pesticides are generally mixtures of two or more synthetic chemicals—one or, often, several "active" ingredients (those that produce the desired effects) combined with one or more "inert" ingredients added to make the product useable. Although the major pesticide pollutants are these active and inert ingredients, byproducts formed in soil as pesticides degrade can cause problems as well.



Pesticides and their degradation products may enter surface and chemicals are resistant to degradation and may persist and accumulate. On the farm, one major source of contamination from pesticide use can be from normal application. For example, a pesticide that may not be toxic by itself can be lethal in combination with other pesticides. Also, an organism may ingest more of a pesticide than it excretes, and when eaten by another animal higher in the food chain, that pesticide is passed along up the food chain to even higher level animals. Normal application, if poorly timed (such as right before a rain) can cause contamination because the pesticide is washed away from its target and made available for transport to surface or ground water. Other pollutant sources include misuse, spray drift, and spills and leaks associated with storage, handling and disposal.

When these "stray" pesticides enter drinking water directly, they may have a negative impact on human health. Others may impact a wide range of organisms by destroying food sources, affecting the behavioral and structural aspects of animal life, or causing acute toxicity (such as when pesticide residues have been known to cause fish kills).

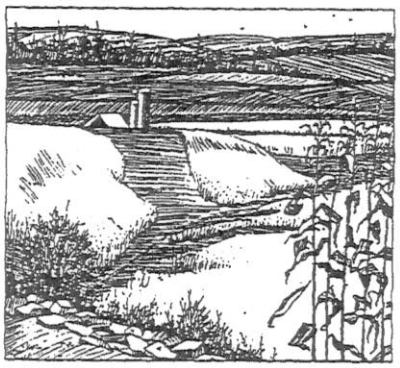
Farm assessment must take into account the whole farm, and should consider the interrelationship of particular use areas, practices and impacts.

While agriculture's pesticide use goals were once almost exclusively tied to production enhancement, farmers now recognize that reckless or wasteful use can threaten not only their own profitability, health and water supplies, but also farm worker health, soil health, on-farm biodiversity, and, potentially, downstream surface water and ground water supplies.

2) **Fuels and Metals.** On the farm, home heating fuel, gasoline, kerosene, diesel fuel, and oil (including drain oil) used in farm machinery pose the main threats to water quality. On-farm use and storage of these petroleum products and inputs containing heavy metals (e.g. sludge-based composts) must be managed with care. Fuels and many products commonly used in farm shops contain potentially toxic compounds such as solvents; some of these chemicals are considered to be human carcinogens (cancer-causing agents). Even a small leak or spill from an above-ground or underground storage tank, for example, can contaminate a water supply.

B. Step Two: On-Farm Assessment and Planning

TODAY, farm managers must deal with an increasingly complex set of issues. Profitability and "quality of life" are key core management goals; production, marketing, and maintenance of infrastructure are only a few of the many factors that must also be addressed. As land managers, farmers are well aware of several increasingly critical natural resource issues. In addition to water quality, these include declining soil health, and the loss of prime farmland and biodiversity. The skillful farm manager must address all these issues when developing a comprehensive farm management plan.



Armed with a basic understanding of water quality impacts, a farm manager's next steps include: assessing the farm for potential or existing threats to water quality; and farm-wide planning to implement appropriate management strategies. Farm assessment must take into account the whole farm, and should consider the interrelationship of particular use areas, practices and impacts.

For example, the location of a pesticide mixing area must make practical sense, but certain locations are more risky to water quality than others.

Crop selection, such as replacing silage corn only with a mixture of hay, alfalfa and corn, may offer more opportunities for avoiding pollution of surface and ground water. Assessment and planning for the whole farm, keeping in mind a "systems perspective", is the best approach to making decisions that are both environmentally and economically sound.

While protecting water quality should be a high priority, a farmer's efforts to do so must be economically feasible.

Economics

Quite obviously, implementing some strategies will involve far greater cost than others. However, most best management practices directly increase efficiency and thereby increase farm profits as well. Even if a practice does not pay for itself immediately, it may help to improve soil productivity and sustain yields in the long term. Implementing such strategies can also benefit property and estate values by maintaining a farm without pollution or excessive soil loss.

While protecting water quality should be a high priority, a farmer's efforts to do so must be economically feasible. In fact, the federal guidelines for non-point pollution control state that the required management measures must be "economically achievable." The practical limits of resource protection have been based on application of national, social, cultural and economic criteria. Some management systems may be too costly; if an entire conservation management system cannot be implemented, a "progressive planning approach", the incremental process of building a plan over a period of time, may be used.

Some best management practices have a high benefit-cost ratio; that is, they produce the greatest benefit for the effort or expense required. Farmers may choose to consider these options first. But there will be occasions when a greater level of prevention, correction or reduction of water pollution is necessary. Often, federal cost-sharing funds are available, or grant programs such as the USDA Environmental Quality Incentive Program (EQIP) and New Jersey Department of Agriculture's Farmland Preservation Cost-share Program provide funds to develop and implement proven as well as experimental management practices.

The New Jersey Farm-A-Syst Program

The Farmstead Assessment System or Farm-A-Syst, provides accurate information about how farmstead structures and activities, such as pesticide storage or manure handling, might affect drinking water.

Some of this information will be reassuring, and some of it may encourage the consideration of modifying some practices.

Information regarding the use of Farm-A-Syst worksheets is located in the Appendix. Additional information and worksheets can be obtained by contacting any office of Natural Resources Conservation Service, the NRCS website at www.nj.nrcs.usda.gov/partnerships/farmasyst or Rutgers Cooperative Extension website at http://njaes.rutgers.edu/animal-waste-management/more+educational+resources.asp.

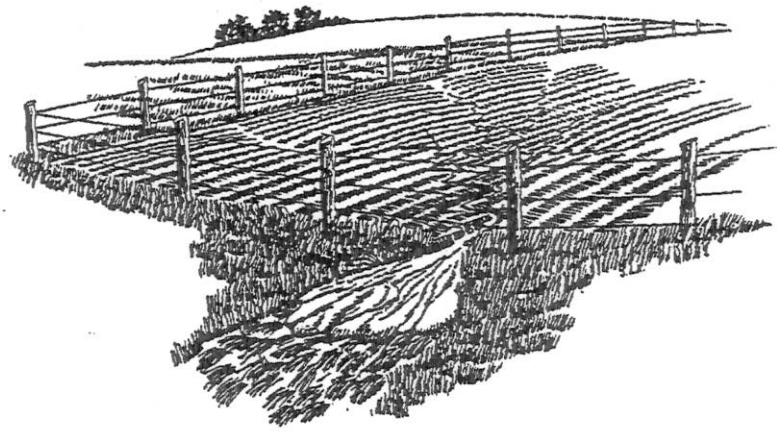
Part III of this Manual contains information, guidance and a set of related Worksheets to help farmers plan to include water quality considerations in their current management systems.

Using the Manual's Farm Assessment and Planning Tools

Part III of this Manual contains information, guidance and a set of related Worksheets to help farmers plan to include water quality considerations in their current management systems. This material encourages a "hands-on" approach to assessment and planning. Paper, pencil and a good eraser are required. More than that, it requires a close, and sometimes renewed acquaintance with all aspects of a farm's natural and built environments. An important part of assessment will include the farmer's footsteps on the land.

The various sections of Part III are designed to be used in sequence, beginning with a map of current conditions and ending with an Action Plan that is both economically sensible and environmentally sound. These sections include:

- Section A: Mapping Your Farm
- Section B: Farm Assessment
- Section C: Best Management Strategies on Your Farm
- Section D: Selecting Management Strategies and BMPs
- Section E: Putting it All Together – Developing an Action Plan



PART III: ON-FARM ASSESSMENT AND PLANNING TOOLS

THE purpose of the planning tools in this section is to help you identify and address current and potential water quality concerns on your farm. Some problems are obvious, others less so. Some may have partial solutions and would benefit from additional or slightly modified practices.

The purpose of the planning tools in this section is to help you identify and address current and potential water quality concerns on your farm.

You already may have taken action to address previously identified water quality concerns. The purpose of these Worksheets is to address those areas and activities of concern that have not been identified or addressed.

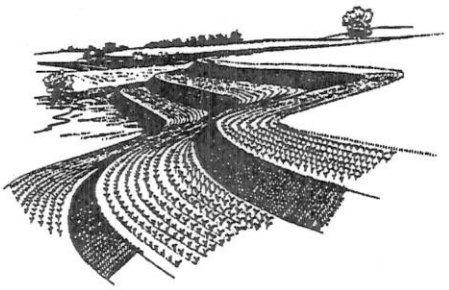
You will have an opportunity to list current management practices that protect water quality.

A. Mapping Your Farm

AN important first step in assessing potential on-farm water quality impacts is to generate a **Farm Map** (see page 77). Your completed Farm Map will be an effective tool for starting to identify sensitive natural features and potentially harmful practices. It will help identify 1) areas on the farm that are vulnerable to water contamination ("sensitive" areas), and 2) practices that may contribute to water pollution. This base map of the farm should show all farm fields, the farmstead and barnyard area, related use areas, and "non-productive" areas such as wetlands and forested land.

Many farmers already have maps and/or aerial photos of their farms, often as part of a Natural Resources Conservation Service (NRCS) Farm Conservation Plan.

These documents are helpful if they are detailed and up-to-date. Mapping tools are also available on the Internet that can be helpful in generating a comprehensive Farm Map.

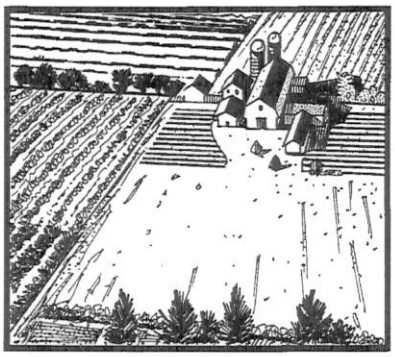


Worksheets A 1–3: Farm Mapping
Worksheets A1 and A2 provide space to sketch in your Farm and Farmstead Maps and list existing and potential problems in or near sensitive areas. Worksheet A3 provides for a summary of areas of concern. Please complete them all. Several pages may be required; the quality of the sketches is not important!

Worksheet A1: Farm Map

Directions:

1. Sketch a map view of the farm, including rented lands.
2. Sketch in areas that are "sensitive" with respect to water quality. Sensitive areas include streams, drainage ditches, springs, other flowing surface



water bodies. Standing water bodies such as natural or man-made ponds and wetlands are also considered sensitive, as are any wells. Areas subject to flooding are considered sensitive and should be located on the map.

Use arrows to indicate direction of flow of any moving water. It is important to locate all sensitive areas, including those that may be outside the boundaries of owned or rented property; water pollution is not stopped at property bounds.

3. Sketch in other natural features of the farm, such as sloping topography and low, seasonally wet areas. Use arrows to indicate the direction of the slope; in other words, clearly show how surface water moves across the ground.

4. Sketch in man-made features of the farm, such as the location of any subsurface drainage systems and their outlets, active terraces or waterways, fencing, and irrigation infrastructure. Include areas of livestock concentration, and areas for waste storage, processing, and equipment storage and repair.

5. Based on the information on sources of non-point pollution in this Manual, identify by circling and numbering any areas that show signs of erosion, sedimentation and/or water degradation, and any known or potential areas or activities of concern or "hot spots". These "areas and activities of concern" will typically fall into one or more of the following categories:

1. erosion and sediment control
2. nutrient management
3. pest and pesticide management
4. livestock barnyard, manure and waste management
5. livestock grazing management
6. irrigation management

Your completed Farm Map will be an effective tool for starting to identify sensitive natural features and potentially impactful practices.

When completed, this Farm Map should identify with numbered circles:

- known problems (e.g., sensitive areas where sediments are collecting)
- locations of activities that may negatively impact sensitive areas
- sensitive areas that may need additional protection

This information will be transferred to Worksheet A3.

Worksheet A2: Farmstead Map

Directions:

1. Sketch a detailed view of the barnyard/farmstead area(s), including sheds, pens and buildings.

2. Sketch in any areas that are sensitive with respect to water quality (i.e. wells, streams, ditches).

3. Sketch in roof and other drains, storage tanks, household waste treatment areas, milking center waste treatment areas, mixing, loading and storage areas. Manure and waste storage and processing areas should be marked; indicate any impervious areas (i.e. ground that is paved or otherwise not able to absorb water).

4. Based on the information on sources of non-point pollution in this Manual, identify by circling and numbering any areas that show signs of erosion, sedimentation and/or water degradation, and any known or potential areas or activities of concern or "hot spots". These "areas and activities of concern" will typically fall into one or more of the following categories:

1. erosion and sediment control
2. nutrient management
3. pest and pesticide management
4. livestock barnyard, manure and waste management
5. livestock grazing management
6. irrigation management

When completed, your Farm and Farmstead Maps should identify known problems, locations of activities that may negatively impact sensitive areas, and sensitive areas that may need additional protection.

When completed, this Farmstead Map should identify:

- known problems (e.g. fuel or manure storage near sensitive areas)
- locations of activities that may negatively impact sensitive areas
- sensitive areas that may need additional protection

This information will be transferred to Worksheet A3.

Worksheet A3: Map Summary Sheet – Areas/Activities of Concern
Directions:

Using the prepared on Worksheets A1 and A2 list the numbered and circled areas and activities where water quality may be a concern on your farm. In the columns on the right of the Worksheet, mark all categories that apply for each area/activity of concern. (See examples at the top of the Worksheet.) This information, by category, will be used to complete the remaining Worksheets.

B. Farm Assessment

THE Farm Assessment Questionnaire (Worksheet B) in this Manual helps you identify and evaluate specific on-farm water quality issues and/or farm management practices that might have a negative impact on water quality, either now or in the future. **It is not a test to pass or fail!** Rather, your answers to these questions will serve as "indicators" for possible problem areas that can then be constructively assessed and addressed, to better protect water resources.

Worksheet B: Farm Assessment Questionnaire
Directions: Answer the questions in all categories relevant to your farm. Use your Farm Map Summary Sheet (Worksheet A3) as a reference. Your answers will be used to complete the remaining Worksheets.

The Farm Assessment Questionnaire is a tool to help you identify and evaluate specific on-farm water quality issues. It is not a test to pass or fail!

C. Best Management Practices on Your Farm

ONCE areas and activities of concern have been identified, how does a farmer decide what steps to take next? Addressing existing or potential water quality problems requires **information about the range of possible options,** or actions, and, then, **selection from among these options** based on site-specific conditions, cost, timing and other concerns.

The comprehensive **Directory** in Part IV has been designed to provide such information: it is an extensive collection of strategies, or best management practices (BMPs). Every farmer is encouraged to become well acquainted with sections relevant to his or her farm. The **Directory** provides information about the purpose, costs and benefits of each listed practice, as well as additional guidance on the need for technical assistance. These best management practices are grouped in the following categories:

1. erosion and sediment control
2. nutrient management
3. pest and pesticide management
4. livestock barnyard, manure and waste management
5. livestock grazing management
6. irrigation management

The **Directory** lists many Best Management Practices. As you read through each section, some BMPs will be familiar to you — you already may be employing the practice on your farm. **These Worksheets give you an opportunity to document your efforts to control water pollution and other problems on your farm.** You might realize that a practice employed in one area of the farm, or for one purpose, might serve elsewhere to perform the same or other valuable resource protecting functions.

Worksheets C 1–6: BMP Summary Charts and Checklists

Directions:

Worksheets C1–6 summarize the Best Management Practices in each category. Each Worksheet lists the BMP alphabetically, indicates whether it is a structural intervention, indicates cost and technical assistance requirements, and tells you where to find a description of the BMP in the Directory.

After you have familiarized yourself with the BMPs listed in the Directory, indicate in the last two columns of each Worksheet whether or not the practice is currently employed on your farm. You may take this information into account when preparing your final **Action Plan** (Worksheet E).

D. Selecting Management Strategies and BMPs

ONCE existing or potential non-point pollution problems on the farm have been identified, the next step is to add or modify strategies to eliminate or reduce the problem.

The management practices and measures that follow should be considered as a menu; farmers may choose one or more from those listed (and there may be others not contained here) that are appropriate and feasible for the particular site and the particular problem.

Now is your opportunity to begin to plan "holistically" by combining selected strategies to address a particular area or activity of concern.

Worksheets D1–6 provide the opportunity to group the activities/areas of concern from Worksheets A1–3 and Worksheet B by category, and then to choose and list possible strategies to address these concerns from the Directory of BMPs. These practices will be those selected in your careful review of the options described in the Directory as having potential value as part of your farm management plan. Each Worksheet (D1–6) corresponds to the categories identified above.

Worksheet D1–6: Selecting Management Strategies

Directions: With Worksheet A3 (Map Summary: Areas/Activities of Concern) in front of you, copy all the areas/activities of concern for which you placed a mark in the column for "erosion and sediment" onto the left side of Worksheet D1. Next, with Worksheet B in front of you, notice that for each question, the "yes" or "no" answer block has been highlighted. If your answer appears in a highlighted block, this indicates an existing or potential area/activity of concern. Transfer each statement in Category 1 (erosion and sediment control) for which the answer is highlighted onto the left side of Worksheet D1.

You will now have a complete listing of areas/activities of concern in the category of erosion and sediment control.

Next, read through the listing of erosion and sediment control Best Management Practices in the Directory. Choose from this section those BMPs which you think would address EACH identified area/activity of concern. You might list more than one BMP to address the concern. List those choices on the right side of Worksheet D1.

You have already identified practices that are active on your farm on Worksheets C1–6; you need not list those again, unless they need modification, or would address a concern on another location on the farm.

Repeat this process for each Worksheet D2 –D6.

E. Putting It All Together – Developing an Action Plan

FARMERS who have taken the time to complete the Worksheets provided thus far will be well prepared to complete Worksheet E. This Worksheet is a tool for summarizing identified areas/activities of concern and developing actions to address them. This is an opportunity to begin to plan "holistically" by combining selected strategies to address a particular area or activity of concern.

In making your selections, you will be considering the pros and cons of each element of the overall plan, prioritizing the action, identifying barriers to implementation and determining next steps. Technical assistance from the NJDA, RCE, NRCS or other consultants may prove useful at this point, to confirm that a plan includes the most appropriate, effective strategies. Part IV of this Manual lists additional resources to which a farmer may turn for assistance in implementing the Action Plan.

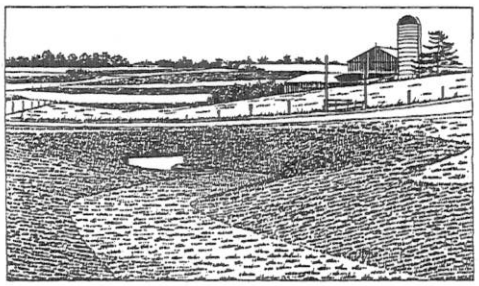
Worksheet E – Action Plan

Directions:

1. From your D1–6 Worksheets, list selected BMPs in the left hand column. You may group or arrange them in any way that is useful to you in thinking about the whole farm. At this point, you may eliminate from consideration some of the BMPs on your D1–6 Worksheets. (For example, if the BMP won't "fit" in your barnyard.) Next, identify those areas/activities of concern that are being addressed. Next, assign a priority to implementation. The priority should correspond to your assessment of the severity of the concern as well as the feasibility for implementation.

2. Next, identify and list what you need in order to act. Another way to think about this is in terms of barriers to action. Examples of such needs or barriers are:

- The need for technical assistance/ expertise or information not available
- The need to acquire equipment or materials/ materials or services not available
- The cost too high
- The need to go through permit process/regulations are a barrier
- The solution not realistic on this farm
- A lack of finances
- A lack of time to implement
- A lack of necessary equipment



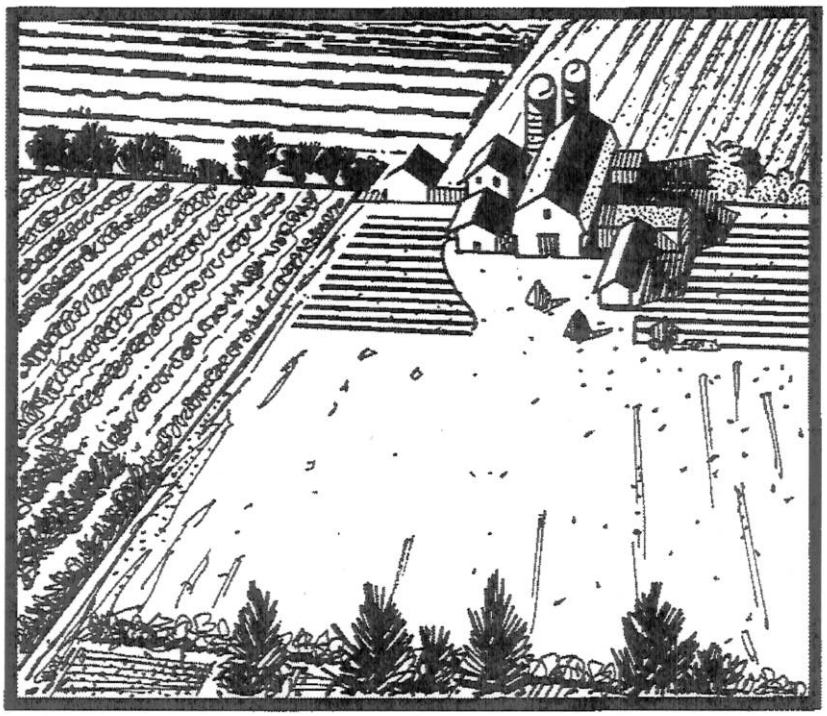
3. Next, consider timing. A chosen strategy may have few barriers to action but be a low priority for immediate attention. Or, a strategy, despite barriers, may be a high priority for immediate attention (for example, making improvements to the pesticide storage facility that is located near a drinking water well). You might think about your timetable for action as follows:

- Immediate *(within the next 3 months)*
- Short term *(within the next year)*
- Long term *(within the next 5 years)*

Each step you take will be a significant contribution by the agricultural community toward the enhancement of New Jersey's water quality.

4. Identifying your next step is critical. Sometimes the biggest barrier to action is simply not identifying and then taking the next step. Next steps are the difference between planning and implementation. This might be a phone call for assistance or information; it might be making repairs on a piece of equipment. You may then refer to the Action Plan to begin the process of implementing components of your management strategy.

The rest is up to you! If you have taken the time to read through this Manual and to complete the Worksheets, you have moved forward to control or eliminate water pollution on your farm. You are armed with both information and a strategy that you developed based on the realities of your farm. There are places to turn for technical and financial assistance. Each step you take will be a significant contribution by the agricultural community toward the enhancement of New Jersey's water quality.



PART IV. DIRECTORY OF BEST MANAGEMENT PRACTICES FOR WATER QUALITY PROTECTION ON THE FARM

A. Introduction

THIS Directory offers a "menu" of management options designed to address water quality impacts on farms. These options are called **Best Management Practices** (BMPs). With respect to water quality, a best management practice is a method, measure or practice applied to prevent or reduce surface and ground water pollution. Another term for "best management practice" is "conservation practice," used for many years by the U.S. Department of Agriculture Natural Resources Conservation Service (NRCS). In fact, many "conservation practices" have been in common practice since the Service was created in the dust bowl days.

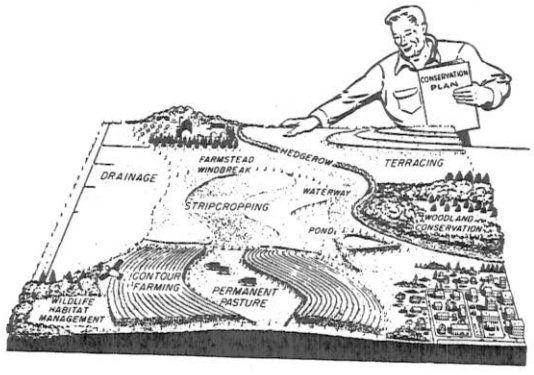
With respect to water quality, a best management practice is a method, measure or practice applied to prevent or reduce surface and ground water pollution.

Many of the practices and measures listed in the **Directory** were, in fact, developed by the NRCS. The New Jersey State Office of the NRCS has assembled those practices most pertinent to New Jersey from a very wide national inventory of BMPs. These BMPs for New Jersey have been collected in the NRCS "Field Office Technical Guide" (FOTG) available at www.nrcs.usda.gov/technical/efotg/.

Each practice or measure contained in the FOTG has a detailed and technical description of the BMP, including the definition, purpose, planning considerations and design criteria.

Other BMPs have been developed by farmers and others in the agriculture industry. These BMPs have been tested and proven to be effective in addressing the problem, but currently are not among the list of practices and measures in the FOTG. Such practices may be innovative and extremely effective; some may not have yet withstood the tests of time or quality control that provide additional assurance of their overall effectiveness.

In most cases, the descriptions of BMPs in the **Directory** do not provide all the information needed to put the measure into practice. Agricultural composting is a good example of a practice that requires far more information than presented here.



Some BMPs, such as the installation of a sediment basin or the implementation of an integrated pest management (IPM) program, require substantial technical assistance. Some installations require engineering. The purpose here is to acquaint farmers with the menu of options, and to provide enough information to enable further steps. These further steps may require collecting more data, obtaining technical assistance, or simply securing the proper equipment.

A BMP may be a practice, such as crop rotation or integrated pest management. Or a BMP may be a structure, such as a manure storage system or a grassed waterway.

Some of the BMPs may require state or federal permits to implement. Working in or near wetlands or water bodies, composting and use of pesticides are examples of activities that may require a permit. It is best to check with Rutgers Cooperative Extension, the Soil Conservation District or Natural Resources Conservation Service office before such a project is initiated.

NOTE: The "Best Management Practices" included in this **Directory** have broad application to a wide range of New Jersey farm enterprises. However, certain commodities, including cranberries, forest products and aquaculture, will have particular concerns and issues that require commodity-specific tools to address them. These are not our focus here; however, Part V of this Manual includes resources and references for these and other more commodity-specific concerns.

B. More on BMPs

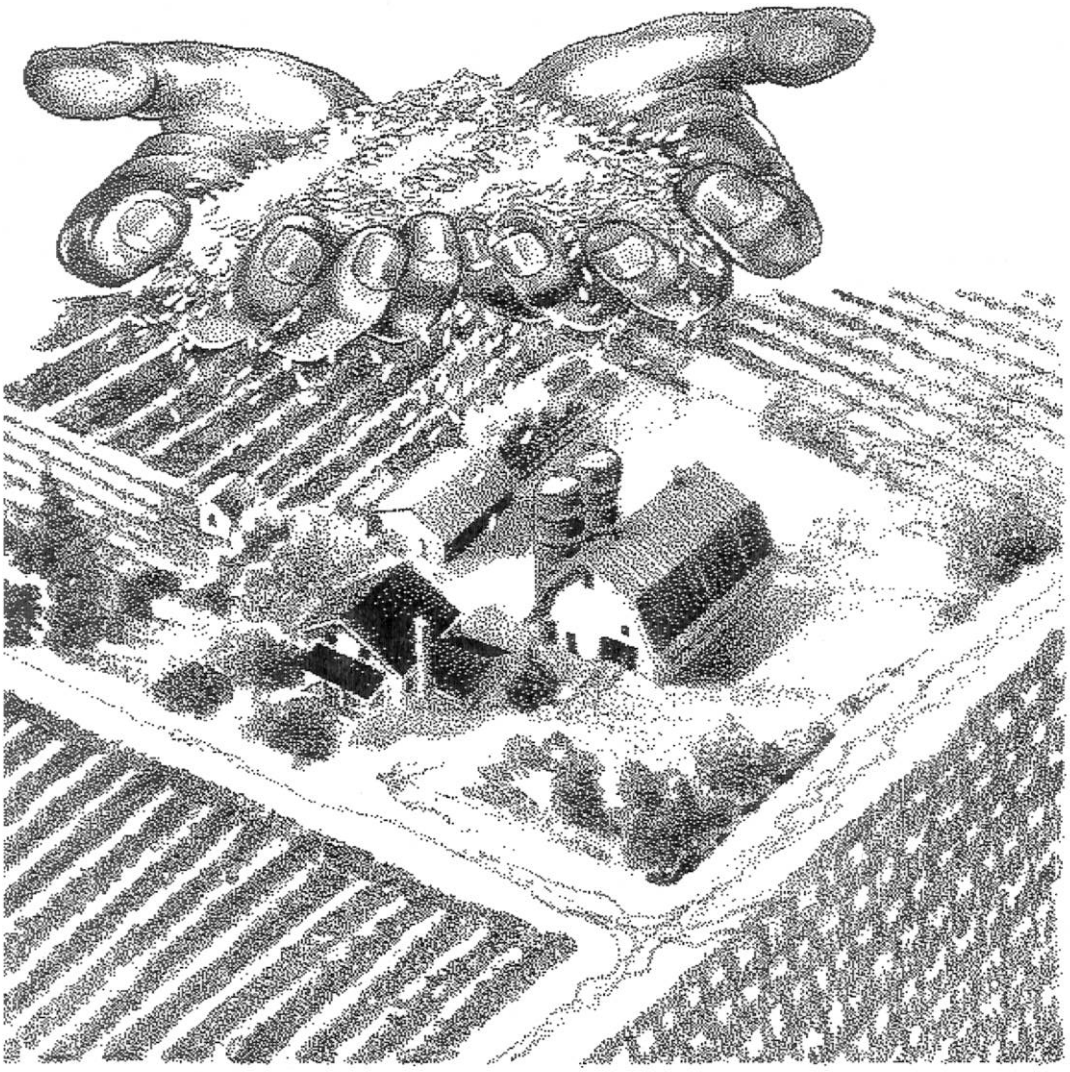
A **BMP** may be a practice, that is, a non-structural operation such as crop rotation or integrated pest management. Or a BMP may be the installation of a structure, such as a manure storage system or a grassed waterway. A BMP may be used to correct existing problems and/or to prevent future potential degradation of water resources.

Rarely will the use of a single BMP for any land use activity be sufficient to adequately address water quality problems. More often, several BMPs, individually selected to fit the unique characteristics of each site and farming operation, will be required. These practices, when grouped, may be referred to as a **"conservation management system."**

Rather than focus on individual practices, a conservation management system focuses on the sum of the parts. It takes into account the range of effectiveness of any single practice, its cost, and the resulting overall cost and effectiveness. Some individual practices may not be very effective alone, but, in combination with others, may provide a key function in a highly effective system.

A single BMP may address more than one problem. For example, a riparian (streamside) buffer may remove or reduce nutrient, sediment and pesticide contamination, while also enhancing the biological diversity of plant and animal species. It is also possible that a BMP designed to address one problem may actually contribute to another. For example, a farmer who uses conservation tillage, which can reduce erosion and sedimentation, may wind up applying increased amounts of herbicides to control weed pressure, with potentially detrimental impacts to ground water.

One or more "Best Management Practices" may be selected to eliminate, prevent or reduce farm-related water pollution. Professional technical assistance is recommended to provide a more detailed assessment and a set of recommendations for modifications to farm practices. Worksheets C1–6, offer farmers the opportunity to make appropriate selections from the "menu" of best management practices included here.



C. Using the Directory

Best Management Practices address strategies for managing erosion and sediments, nutrients, pests and pesticides, livestock, barnyard, manure and waste, livestock grazing and irrigation.

THE BMPS listed in this **Directory** have been organized into sections. These sections address strategies for:

1. Erosion and sediment control
2. Nutrient management
3. Pest and pesticide management
4. Livestock barnyard, manure and waste management
5. Livestock grazing management
6. Irrigation management

In each section, there is a description of specific BMPs that can be incorporated into a management plan to address the problem. Each BMP is described as follows:

- **Name** of the BMP. Those that require structures to be built are designated with an "(s)".
- **Definition –** describes the practice or structural change.
- **Purpose –** describes how the practice protects water quality. Some details about implementation and options are included.
- **Initial Cost –** provides a rough estimate of costs involved in implementing or installing the practice.

  LOW – the cost of implementation or installation is less than $1,000; it may cost nothing

  MEDIUM – the cost of implementation or installation is between $1,000 and $4,000

  HIGH – the cost of implementation or installation is above $4,000
- **Maintenance Cost –** provides a rough estimate of the annual cost of maintaining the practice or the installation. For most practices, this is estimated on a per acre basis; for structural measures, the estimate will be further defined by the particular site.
- **Technical Assistance –** indicates whether outside technical assistance is: not required, desirable, or required to implement the practice.
- **Other Benefits –** gives a partial listing of additional benefits that may be derived from implementing the BMP, including other environmental protections, cost savings or efficiencies. These benefits are useful in planning for the whole farm.
- **Other Considerations –** gives a partial listing of possible "side effects" and other implications of implementing the BMP that are useful in thinking about the whole farm system.

Conservation cover prevents soil erosion by keeping the soil from being disturbed. Typical plantings are grass, shrubs or trees.

1. Strategies for Erosion and Sediment Control

Management systems for controlling soil erosion and sedimentation address two resource issues: water quality and soil loss. The erosion and sediment control management practices in this section may also serve to satisfy other concerns, such as nutrient or pest management.

In addressing pollution issues, the first line of defense is to control the problem at the source, that is, to reduce the availability of the pollutant and the opportunity for it to detach from its surroundings. For sediment control, this means employing methods to keep the soil on the field. The next line of defense is to prevent the pollutant, in this case traveling soil particles, from entering a water source.

The following is a list of BMPs that are recommended to reduce or eliminate water pollution from sediments.

Best Management Practices for Erosion and Sediment Control

a. Conservation Cover

Definition: establishment and maintenance of permanent vegetative cover on land retired from production.

Purpose: to prevent soil erosion by keeping the soil from being disturbed. A permanent (perennial) cover is not typically cultivated, and the cover protects the soil from exposure. Typical plantings are grass, shrubs or trees. Such plantings may have productive value, such as walnut trees or blueberry bushes.

Initial Cost: low
Maintenance Cost: low
Technical Assistance: not required
Other Benefits: improves soil tilth; decreases pesticide and fertilizer use; may provide economic gain from perennial crops; may enhance wildlife.
Other Considerations: loss of annual cropland acreage if field is planted to a permanent cover.

b. Conservation Crop Rotation

Definition: a planned sequence of growing annual or perennial crops on the same field - the opposite of continuous cropping, where the same crop is grown in the same field year after year.

Purpose: to reduce detachment and transport of sediment by maintaining or improving the physical, chemical and biological conditions of the soil. A sequence of crops is selected to provide a high degree of soil cover and adequate organic residue for maintenance or improvement of soil tilth. Including a legume or grass in a rotation can be very effective for reducing erosion and improving soil structure. Also, rotations decrease loss of dissolved and sediment-attached nutrients and pesticides. Rotations designed for erosion control may differ from rotations planned as components of pesticide and/or nutrient management.

Initial Cost: low
Maintenance Cost: low
Technical Assistance: desirable
Other Benefits: may reduce nutrient loss and need for commercial nitrogen; addition of organic matter increases soil fertility; may disrupt build-up of insect populations, disease life cycles and weeds, thereby reducing applications of pesticides; may maximize water use efficiency; may benefit wildlife; may increase yields; may enhance enterprise diversity.
Other Considerations: when legumes are used in a rotation, the nitrogen supplied should be taken into account to prevent over-application of nitrogen on subsequent crops. Soil fertility levels should be monitored and maintained within acceptable ranges for all crops in the rotation. There are economic and management considerations regarding crop selection, as well.

The ridges and furrows created by contour farming reduce surface runoff by blocking water movement, allowing soil particles to remain in place.

c. Contour Farming

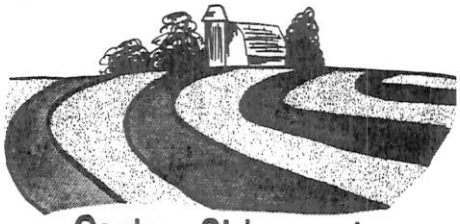
Definition: tilling, planting, cultivating and harvesting crops across the field slope.

Purpose: to reduce surface runoff and transport of sediments. Farming on the contour reduces both velocity and volume of runoff by presence of ridges and furrows that block water movement, allowing soil particles to remain in place. Contour farming may follow the establishment of terraces or diversions.

Initial Cost: low
Maintenance Cost: low
Technical Assistance: desirable
Other Benefits: see pesticide management; see nutrient management; increased infiltration may promote better crop growth and increased soil tilth.
Other Considerations: slowing surface runoff may increase infiltration of pesticides or nutrients.

d. Contour Strip-cropping

Definition: the practice of planting strips of crops across the contour (see contour cropping, above) so that those crops that provide limited soil cover (such as annual row crops like corn) are alternated with those that provide protective soil cover (such as hay).
Purpose: to reduce surface runoff and transport of sediments. Strip-cropping may be designed in a rotation.
Initial Cost: low
Maintenance Cost: low
Technical Assistance: desirable



Contour Stripcropping

Critical area planting reduces erosion by providing suitable plant cover on areas that are eroding or likely to erode.

Other Benefits: if in a rotation, legumes can contribute to soil nitrogen.
Other Considerations: may increase or decrease pesticide and/or fertilizer use.

e. Contour Buffer Strips
Definition: strips of perennial vegetation on the contour, 15 to 30 feet wide, separating sections of annual row crops.
Purpose: to slow runoff flow, trap sediment, nutrients and pesticides, and increase water infiltration.
Initial Cost: low
Maintenance Cost: low
Technical Assistance: desirable
Other Benefits: vegetation provides food and cover for small upland birds and mammals. Beneficial insects can find habitat in strips, if proper vegetation is chosen.
Other Considerations: slightly reduces amount of crop production acreage, although hay can be harvested from contour buffer strips.

f. Cover Cropping

Definition: a cover of close-growing grasses, legumes or small grains grown primarily for seasonal protection and soil improvement.
Purpose: to control erosion and sedimentation by providing a soil cover, reducing exposure of soil particles; applied when the major crop does not furnish adequate cover, or following harvest; used to cover the soil during winter months; usually planted annually except where used as a permanent cover as in orchards; cover and green manure cropping also serve other important purposes (see below). Sometimes cover crops are seeded by aerial application.
Initial Cost: low
Maintenance Cost: low
Technical Assistance: not required
Other Benefits: see pesticide management; see nutrient management; cover and green manure crops add organic material to the soil, improve infiltration, aeration, tilth and wildlife habitat.
Other Considerations: cost of seeds and additional management.

g. Critical Area Planting
Definition: planting vegetation such as trees, shrubs, grasses or legumes on highly erodible or critically eroding areas.
Purpose: to reduce erosion and sedimentation by providing a suitable plant cover on areas that are eroding or likely to erode. Typically, plantings are perennial.
Initial Cost: medium
Maintenance Cost: low
Technical Assistance: desirable
Other Benefits: see nutrient management; may enhance habitat for wildlife, including "beneficials".
Other Considerations: an increase in erosion may occur during establishment of the planting in these areas; loss of cropland area.

h. Diversion(s)

Definition: a channel or drainageway constructed across a slope.
Purpose: to divert water away from areas where it is excessive to sites where it can be used or disposed of properly and safely. The channel is constructed with a supporting ridge on the downhill side. It intercepts surface runoff water, and reduces runoff volume and velocity by reducing the length of the slope. Diversions are not designed to accommodate a large amount of sediment in the channel, and are not a substitute for other erosion control measures such as terracing. Diversions may be vegetated or non-vegetated and have an outlet.

Initial Cost: medium
Maintenance Cost: low
Technical Assistance: required
Other Benefits: diverts water carrying pollutants such as barnyard waste from surface waters; may improve wildlife habitat; improves crop health and farmability by diverting excess water.
Other Considerations: may increase delivery of pollutants to surface waters.

Channels or drainageways constructed across a slope divert water away from areas where it is excessive to sites where it can be used or disposed of properly.

i. Field Borders

Definition: a strip of perennial vegetation established at the edge of a field.
Purpose: to reduce transport of sediment by providing "anchoring points" for contour rows, terraces, diversions and contour strip farming.
Initial Cost: low
Maintenance Cost: low
Technical Assistance: not required
Other Benefits: may have benefits for wildlife.
Other Considerations:

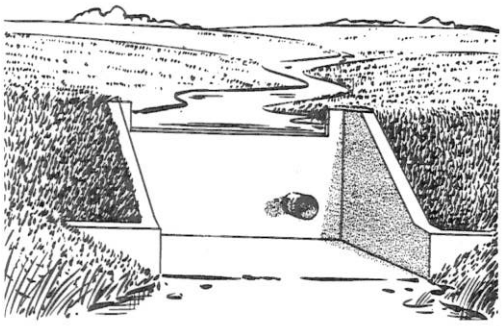
j. Field Strip-cropping

Definition: systematic arrangement of crops in strips across the general slope (not contour).
Purpose: to reduce delivery of sediments to water bodies by alternating crops that provide limited soil cover with those that provide high soil cover. Since crops are not grown on the contour, there will be areas of concentrated flow. Strip cropping may be done in a rotation.
Initial Cost: low
Maintenance Cost: low
Technical Assistance: desirable
Other Benefits: see pesticide management; see nutrient management; rotation may increase soil tilth.
Other Considerations: areas of concentrated flow potentially may increase delivery of sediments at a more rapid pace. There are crop selection and management considerations as well.

k. Filter Strip

Definition: an area (typically a strip) of vegetation that is planted and maintained as a permanent cover.

Purpose: with regard to control of erosion and sedimentation, the purpose of a filter strip is to capture sediment transported by runoff. Filter strips trap and remove solids, especially coarser grained and organic materials. Filter strips may be installed at the lower edge of fields, upgradient of terraces or diversions, or on fields next to wetlands, streams or ponds. They vary in their effectiveness and maintenance requirements.
Initial Cost: medium
Maintenance Cost: low
Technical Assistance: desirable
Other Benefits: nutrient management; pesticide management; filter strips can also be designed to handle silage juice runoff.
Other Considerations: depending on the function(s) that a filter strip is designed to perform, the degree of efficiency and level of management may vary.



Grade stabilization structures control erosion in channels and prevent the formation or advance of gullies. They may also enhance habitat.

l. **Grade Stabilization Structure** – Water Control Structure(s)
Definition: a structure used to control the grade and head cutting in natural or artificial channels.
Purpose: to stabilize the grade and control erosion in channels and to prevent the formation or advance of gullies. The structure may be a combination of earth embankment, mechanical spillway, and detention-type structure, and could include an inlet or surface drain component.
Initial Cost: high
Maintenance Cost: low
Technical Assistance: required
Other Benefits: may enhance habitat.
Other Considerations: attention to fish and wildlife habitat in design and construction; livestock should be fenced out to protect the structure.

m. **Grassed Waterway(s)**
Definition: a natural or constructed channel or outlet that is shaped or graded to certain dimensions and vegetated.
Purpose: to provide a stable and controlled outlet for the disposal of runoff. Grassed waterways are planted in a suitable grass/legume mix and may have a stone center. The vegetation slows runoff and filters out sediments; usually installed on sites where additional control is required to manage concentrated runoff, as from diversions.
Initial Cost: medium
Maintenance Cost: low
Technical Assistance: required

Other Benefits: see nutrient management; see pesticide management; may provide habitat for beneficials.
Other Considerations: may provide habitat for pests.

Mulching can reduce runoff and transport of sediment by trapping rain drops, especially in areas that are eroding and/or bare. It may also control weeds and provide nutrients through microbial breakdown.

n. Mulching
Definition: applying plant residues or other suitable materials to the soil surface.
Purpose: to reduce runoff and transport of sediment by trapping rain drops, especially in areas that are eroding and/or bare; used to allow vegetation to establish itself, to provide cover where vegetation is not possible or desired, or in association with a crop. Plastic mulches perform some of these functions.
Initial Cost: low
Maintenance Cost: low
Technical Assistance: not required
Other Benefits: mulching conserves moisture, prevents surface compaction or crusting, controls weeds and helps establish plant cover; may provide nutrients through microbial breakdown.
Other Considerations: may lower soil temperature; may introduce weed seeds; plastic mulches do not degrade and must be removed from the field.

o. Outlet or Lined Waterway(s)
Definition: a waterway with an erosion-resistant lining of concrete, stone or other permanent material.
Purpose: to reduce erosion in concentrated flow areas, resulting in the reduction of sediment and other substances delivered to receiving waters. This practice may be a component of a waste management system where barnyard runoff is directed away from sensitive areas.
Initial Cost: medium - high
Maintenance Cost: low
Technical Assistance: necessary
Other Benefits:
Other Considerations:

p. Pasture and Hayland Planting
Definition: appropriate treatment and use of pastureland or hayland.
Purpose: regarding erosion and sedimentation, appropriate planting and management of hay or pastureland will reduce erosion and transport of soil particles. Fields covered in permanent vegetation year round are very resistant to erosion.
Initial Cost: medium
Maintenance Cost: low
Technical Assistance: not required

No-till, strip till, mulch till and ridge till systems are known to reduce erosion and sedimentation by as much as 90% in certain circumstances.

Other Benefits: may enhance plant vigor; may improve forage and haylage quality leading to improved animal health; may decrease pest and/or nutrient management requirements.
Other Considerations:

q. Residue Management: No-till, Strip Till, Mulch Till, Ridge Till
Definition: any tillage and planting system that minimizes physical disturbance of the soil and leaves approximately 30% of the surface covered by plant residue after planting.
Purpose: to reduce runoff causing detachment and transport of sediments.

There are a variety of conservation tillage systems including mulch-till, ridge-till, and strip-till. Conservation tillage is applicable on sloping, highly erodible cropland, where adequate plant residues are produced. It is known to reduce erosion and sedimentation by as much as 90% in certain circumstances. In mulch-tillage the entire soil surface is tilled; at least 30% residue cover is left on the soil surface immediately following planting. In ridge-tillage, ridges are initially established and then planted year after year, with or without subsequent cultivation; at least 30% residue remains. Ridge-till is appropriate primarily for continuous row crops. Strip-till requires tilling of narrow strips for seeding or transplanting, leaving undisturbed surface residues in between; strip-till may be combined with ridge-till, and is appropriate for vegetable and small fruit crops. No-till is a method of planting in prior crop residue, cover crop or perennial sod crop where the surface of the field is left undisturbed. Specialized equipment is needed.
Initial Cost: low, if equipment is rented; medium if equipment is purchased.
Maintenance Cost: low
Technical Assistance: desirable for start-up
Other Benefits: increases soil tilth; increases soil temperature and moisture retention; may break pest and disease cycles; may decrease available weed seeds (no longer brought to the surface by plowing); reduces compaction; reduces fuel and labor costs and saves time.
Other Considerations: may increase ground water contamination by increased fertilizer and pesticide use and by increasing infiltration rates (but application rates may decrease over time); incorporation of fertilizers and pesticides is more difficult; careful nutrient management is advised; may delay germination due to cooler soil temperatures; residues may serve as host site for pests.

r. Riparian Buffer
Definition: an area of trees and other vegetation located adjacent to and up-gradient from water courses, water bodies and associated wetlands.
Purpose: to protect water quality by preventing streambank erosion, removing sediment, absorbing nutrients and pesticides and allowing

better nutrient uptake. When plantings are carefully selected and maintained, and the practice is used together with other nutrient and sediment control practices, riparian buffers are highly effective and low maintenance.

Sediment basins trap and collect sediments and excess water, allowing sediments to settle out of runoff water before it discharges into surface water bodies.

Initial Cost: low
Maintenance Cost: low
Technical Assistance: not required
Other Benefits: may enhance conditions for desirable aquatic plants and animals; may provide commercial timber or forage; may improve wildlife habitat.
Other Considerations:

Nutrient and Sediment Control System (NSCS) is both a biological filter and physiochemical treatment system. The goal of an NSCS is to maximize reduction of total and soluble phosphorus, and reduction of nitrogen, organic matter, bacteria and fine sediments reaching lakes and streams. The system is functional at different levels of efficiency during all seasons under a broad range of ecological, hydrologic and pollutant load conditions.

The complete NSCS is a combination of a sediment basin, grassed buffer, a vegetated shallow pond, a deep pond, and a vegetated "polishing" area.
Initial Cost: high
Maintenance Cost: low
Technical Assistance: required
Other Benefits: Will increase habitat value
Other Considerations: Will require over one acre for a drainage area of fifty acres and increase proportionally from there.

t. Sediment Basin(s)
Definition: a depression constructed to collect and store debris or sediment.
Purpose: to trap and collect sediments and excess water and to combination of ridge and channels. It allows sediments to settle out of runoff water before it discharges into surface water bodies. The basin needs to be maintained by periodically removing collected materials.
Initial Cost: high
Maintenance Cost: low
Technical Assistance: required
Other Benefits: may increase habitat value if permanently seeded.
Other Considerations: may increase infiltration of soluble materials such as some pesticides.

u. Stream Channel Stabilization Measures
Definition: any of a number of constructed measures along or across natural or constructed waterways.

Purpose: to reduce erosion and sedimentation into water bodies. These measures include: spur dikes, which are fingers of stone that extend into a creek; grade control structures, which control the grade and head cutting in channels by creating a series of small "waterfalls"; and riprap bank protection, in which layers of large stones are placed along stream banks or crossings. Measures may also include vegetative "bio-engineered" solutions such as installation of organic rolls and mats and plantings of suitable vegetation.

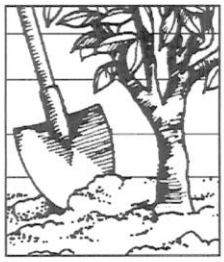
Initial Cost: medium - high
Maintenance Cost: medium
Technical Assistance: required
Other Benefits: may prevent loss of land or damage of facilities located near banks; may maintain capacity or stability of a channel; may enhance habitat.
Other Considerations: some constructed measures, such as riprap, may negatively impact riparian habitat, especially in stream banks.

A farm nutrient plan is a comprehensive strategy for addressing nutrient input needs on the farm. It includes information on crop requirements, nutrient availability, proper timing and amount of application and environmental considerations.

v. Tree Planting
Definition: planting and maintenance of trees.
Purpose: to reduce erosion and sedimentation by providing stable, perennial cover and root mass.
Initial Cost: low - medium
Maintenance Cost: low
Technical Assistance: not required
Other Benefits: see nutrient management; may attract beneficial insects and birds.
Other Considerations:

2. Strategies for Nutrient Management

Plants must receive sufficient and proper nutrients, at the proper times and in the necessary amounts, in order to grow and produce a crop. Farmers use a variety of amendments, including commercial fertilizers, animal and green manures and composts to assure nutrient availability for crops.



Sound nutrient management not only assures optimum production but also reduces input costs and protects water quality. Additionally, soil tilth and organic matter can be improved by correct manure and sludge application. Input costs are reduced by preventing over-application of commercial fertilizers and manures, while also reducing the amount of nutrients lost to receiving waters. It has been proven that over-application of fertilizers serves no beneficial purpose to the crop. In fact, excess nitrogen fertilizer can be harmful to crop yield and quality.

Research has shown that nitrates are a leading ground water contaminant. Commercial fertilizer and manure are significant sources of nitrates in ground

water, as well as nitrates and phosphates in surface waters. Careful management of nutrients will reduce the amount of nutrients available for transport from the field because they will be properly taken up by the plant or stored in the soil. Excess nutrients are lost with surface runoff, and by leaching through the soil into ground water. Erosion and sediment control practices are the primary mechanisms to control the transport of nutrients, especially phosphorus, that are attached to soil particles.

The benefits of agricultural composting are many. Compost is an excellent soil conditioner which, when properly managed, is free of weed seeds.

Nutrient Management Plans

A whole farm plan includes a comprehensive strategy for addressing nutrient input needs on the farm. It contains information on crop requirements, nutrient availability, proper timing and amount of application, and environmental considerations. When the source of the nutrients is not commercial fertilizer, it is important to determine the nutrient value and availability of those contributions. For example, the nitrogen contribution of any legume crop should be calculated and credited, and manures and composts should be tested for nutrient content.

Nutrient management includes the following core components:

a. farm and field maps showing acreage, soils, crops and water bodies

b. yield expectations

c. a summary of the nutrient planning resources available to the farmer, including:

1) soil tests results

2) nutrient analysis of manures and composts

3) nitrogen contribution to the soil from legumes (if applicable)

4) other significant nutrient sources

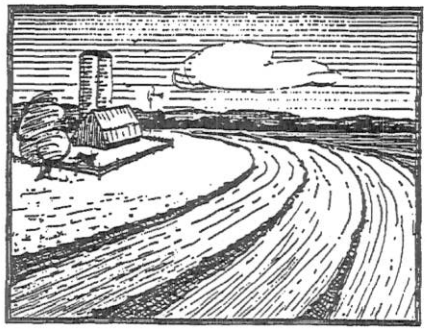
d. an evaluation of field limitations based on environmental considerations

e. establishing mix of nutrient sources and requirements

f. timing and application methods

g. equipment operation and calibration

Such a plan requires that farmers have a good understanding of crop requirements, soil types and sensitive areas on and near the farm, such as wetlands and shallow aquifers. Nutrient management incorporates this knowledge with a site-specific set of management practices to 1) apply nutrients at rates necessary to achieve realistic crop yields, 2) improve the timing of nutrient application, and 3) use agronomic crop production technology to increase nutrient use efficiency.



The following is a list of the BMPs that are recommended to reduce or eliminate water pollution from crop nutrients.

Filter strips-strips of close growing vegetation along a water body-can reduce nutrients in runoff entering the water. They may also provide habitat for wildlife.

Best Management Practices for Nutrient Management

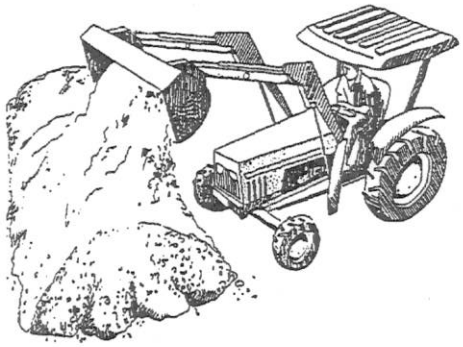
a. Agricultural Composting

Definition: the aerobic, biological decomposition of organic matter, including manure, leaves, bedding and crop residues. It is a natural process that can be enhanced and accelerated by: selecting organic waste "recipes" with proper carbon/nitrogen balance; mixing to provide proper aeration; and monitoring to assure that ideal moisture levels and temperatures are maintained. These extra steps provide optimal conditions for the microbes that transform "raw" on-farm wastes into a relatively stable soil amendment/crop nutrient.

Purpose: to conserve nutrients produced on the farm; to lower the risk of pollution by stabilizing nitrogen in an organic form, and reducing its loss to ground and surface water.

Initial Cost: low - high

Maintenance Cost: low to high



Technical Assistance: highly desirable for start-up.

Other Benefits: The benefits of agricultural composting are many. Compost is an excellent soil conditioner which, when properly managed, is free of weed seeds. Farmers can lower their risk of nuisance complaints about odor and flies. Compost is often easier to handle than manure. Farmers have the opportunity to create a product with significant economic value; many garden centers, suburban neighbors and landscapers are eager to purchase high quality farm compost.

Other Considerations: Most of the nutrients in agricultural compost are in a stable organic form and are released slowly to growing plants. Nutrient availability, timing, and rates of application need to be accounted for in the overall nutrient management plan. The compost "pad," or site where active composting will take place, should be carefully located and designed. A poorly situated pad, like a poorly situated manure stacking area, can contribute to pollution problems.

b. Filter Strips

Definition: strips of close growing vegetation surrounding or along a water body.

Purpose: to reduce nutrients in runoff entering the water. The width of the vegetative strip will depend on soil characteristics, type of vegetation used, topography and hydrology.

Initial Cost: low

Maintenance Cost: low

Technical Assistance: desirable for initial information

Other Benefits: see pesticide management; may provide wildlife habitat.

Other Considerations:

c. Conservation Crop Rotation

Definition: the successive planting of different crops in the same field — the opposite of continuous cropping.
Purpose: one purpose of crop rotation is to reduce the need for nitrogen fertilizer by planting a legume. Also, continuous applications of manure can result in the build-up of excessive levels of phosphorus; crops in an unmanured part of the rotation may take up phosphorus, thereby reducing the potential for loss by run-off of excess phosphorus. Rotation is valuable for controlling soil erosion, building soil tilth, increasing yields and eliminating or reducing certain diseases or pests.
Initial Cost: low
Maintenance Cost: low
Technical Assistance: desirable for start-up
Other Benefits: see erosion and sediment management; see pesticide management; may improve soil fertility.
Other Considerations:

Proper and timely adjustment of equipment used to apply nutrients can minimize the chance of over-application of fertilizer and manure.

d. Cover Cropping

Definition: the practice of planting a crop primarily for protecting and improving the soil between periods of regular crop production.
Purpose: regarding nutrient management, to provide nutrients for subsequent crops, thus reducing the total amount of additional nutrients necessary; to take up all the excess nutrients left in the field after the harvest of the main crop (called a "catch crop"); also, to utilize excess nutrients from the field, thus reducing the amount of nutrients that may leach to ground water. Annual cover crops are either harvested, plowed under, grazed or killed with herbicides before the primary crop is planted. Perennial cover crops, between trees and vines in orchards, for example, are left in place and managed by mowing.
Initial Cost: low
Maintenance Cost: low
Technical Assistance: not required
Other Benefits: see erosion and sediment management; weed pest control.
Other Considerations:

e. Equipment Calibration

Definition: proper and timely adjustment of equipment used to apply nutrients.
Purpose: to minimize the chance of over-application of fertilizer and manure. Calibration insures that recommended rates are being applied.
Initial Cost: low
Maintenance Cost: low
Technical Assistance: desirable for start-up

Intercropping-the growing of two or more crops simultaneously on the same field-adds nitrogen and other nutrients to the soil. Inter-cropping of certain crops is also intended to improve yields per acre and provide "crop insurance".

Other Benefits: this practice also applies to calibration of pesticide application equipment.
Other Considerations: should be done annually, and whenever fertilizer or pesticide is changed.

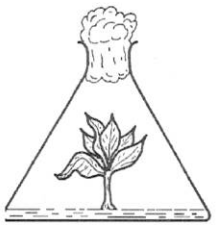
f. Fertilizer Storage, Handling and Containment
Definition: the management of fertilizer substances on the farm.
Purpose: to assure safety and prevent spills and leaks in which uncontrolled amounts of fertilizer might leach or run off into surface or ground water. Fertilizer storage areas, valves and containers should be secured when not in use. Dry fertilizer should be stored inside a structure or device capable of preventing it from getting wet. Liquid fertilizer should be stored in containers approved for and compatible with the fertilizer being stored. Fertilizer storage areas should be located away from wells, areas that are very porous, and any surface water bodies.
Initial Cost: low - medium
Maintenance Cost: low
Technical Assistance: not required
Other Benefits: may improve health and safety.
Other Considerations: storage areas should be inspected annually to ensure safety.

g. Green Manure Cropping
Definition: the practice of planting a grass or legume crop primarily to be plowed down for its contribution to soil fertility.
Purpose: to provide nutrient value to the subsequent crop.
Initial Cost: low
Maintenance Cost: low
Technical Assistance: not required
Other Benefits: moisture retention; enhances soil tilth and organic matter; reduces soil salinity; may reduce need for purchased fertilizer.
Other Considerations: may increase costs (seed and labor); plowdown may provide excess nitrogen.

h. Intercropping
Definition: the growing of two or more crops simultaneously in a specific pattern or fashion on the same field.
Purpose: regarding nutrient management, the purpose of intercropping is to add nitrogen and other plant nutrients to the soil. Legumes and grass crops are often used. Seeding in of the second crop may be done at various stages of the main crop's development.
Initial Cost: low
Maintenance Cost: low

Technical Assistance: desirable for start-up
Other Benefits: may reduce weeds.
Other Considerations: intercropping of certain crops is also intended to improve yields per acre and to provide "crop insurance" in case of a crop failure.

Providing fertility through enriching the soil with naturally occurring amendments "feeds the soil, then the soil feeds the plant."



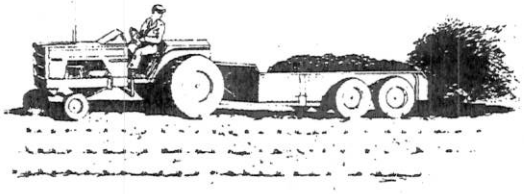
i. Nutrient Budgeting
Definition: evaluation of the contributions of all sources of nutrients to the needs of a particular crop.
Purpose: to encourage the use of manure and other agricultural wastes, and other nutrient-contributing practices (e.g., cover cropping, planting legumes) and to avoid application of excess nutrients. Nutrient budgeting accounts for the contributions of all sources of nutrients, so that additional commercial fertilizers and/or animal manures are only applied to make up a lack. Testing of manures, composts, effluents as well as green manure and legume contributions can be performed. Management that focuses on providing fertility through enriching the soil with naturally occurring amendments "feeds the soil, then the soil feeds the plant".
Initial Cost: low
Maintenance Cost: low
Technical Assistance: required for start-up
Other Benefits: may reduce costs of purchased inputs; may promote recycling of on-farm wastes.
Other Considerations:

j. Nutrient Record Keeping
Definition: a system of documenting field, crop and nutrient application data.
Purpose: to provide historical and planning data in order to make informed decisions about nutrient applications that are resource-protecting and efficient. Record keeping is an important part of a nutrient management plan. Useful forms are available from technical assistance providers.
Initial Cost: none
Maintenance Cost: not applicable
Technical Assistance: not required
Other Benefits: helps to make efficient use of both manures and purchased inputs.
Other Considerations:

k. Plant Tissue Testing (Optional for AWMP)
Definition: a test that determines the nutritional status of plant tissues.

Proper timing and application of fertilizers in environmentally sensitive ways can avoid runoff and maximize plant uptake.

Purpose: to determine existing or potential nutrient problems. Plant tissue testing is an excellent tool for determining exact plant nutrient needs for many essential nutrients including nitrogen, phosphorus, potassium, calcium, magnesium, iron, zinc, manganese, copper, boron, molybdenum, chlorine, sulfur and others. Though not routinely done on all crops, testing may help diagnose nutrient deficiencies.
Initial Cost: low
Maintenance Cost: not applicable
Technical Assistance: required
Other Benefits:
Other Considerations:



l. <u>Proper Timing and Application Methods</u>
Definition: a set of practices that addresses the application of nutrients in environmentally sensitive ways.
Purpose: to protect water resources by selecting the best fertilizer, properly timing and locating applications to avoid runoff and maximize plant uptake. Manure and fertilizer should not be applied on frozen ground; they should be incorporated immediately. Fertilizer nitrogen is best applied just before the period of maximum uptake by crops, and in amounts matching the ability of the crop to take it up. Application under rainy conditions or when soil is saturated should be avoided. Application to very shallow soils or to exposed bedrock also should be avoided. Sometimes split applications are effective. In selecting fertilizers, less leachable forms and slow release varieties are advantageous both for water protection and effectiveness. Banding, which is the application of fertilizer along the row, close to the plant, rather than broadcasting, is an effective method of crop fertilization that can reduce nutrient loss.
Initial Cost: none
Maintenance Cost: not applicable
Technical Assistance: not required
Other Benefits: may enhance efficient use of fertilizers.
Other Considerations:

m. <u>Soil Nitrate Testing</u> (Optional for AWMP)
Definition: a test that determines the soil nitrate-nitrogen concentrations immediately prior to side- or top-dressing with nitrogen fertilizer.
Purpose: to avoid the application of excess nitrogen fertilizer by determining crop nitrogen needs.
Initial Cost: low
Maintenance Cost: not applicable
Technical Assistance: required (soil testing lab)
Other Benefits:
Other Considerations: may reduce farm fertilizer and labor costs.

n. Soil Testing (Optional for AWMP)
Definition: determination of nutrient content of a soil sample by a laboratory.
Purpose: to avoid excessive use of nutrients while ensuring that the right amounts are applied for desired crop yield. At least one soil sample for each field and crop type should be tested for phosphorus, potassium, calcium, magnesium and soil pH, and any other nutrients of concern for the planned crop. Nitrogen application should not be based on a routine soil test prior to planting a crop; a special nitrogen soil test is needed during the growth of the crop. Soil tests should be updated on a regular basis, and before fertilizers are applied; results will change over time, depending on fertilizer and other additions, precipitation, runoff, leaching, erosion and crop uptake.
Initial Cost: low
Maintenance Cost: not applicable
Technical Assistance: required
Other Benefits: may yield economic savings from reduced fertilizer purchase.
Other Considerations:

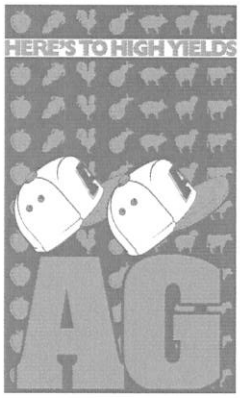
The management of agricultural pests is a major concern to nearly every New Jersey farmer.

o. Yield data
Definition: information about crop yields to determine realistic expectations.
Purpose: to manage nutrient applications to match realistic yield expectations. Yield data is based on yield history and other relevant information provided by the grower. For example, a farmer might average the three highest yields in five consecutive crop years. Information from Rutgers Cooperative Extension can be used when field data is not available. Increased yield expectations due to new and improved varieties and hybrids should be considered. Yield data will also depend on climatic conditions, available moisture and soil type.
Initial Cost: low
Maintenance Cost: not applicable
Technical Assistance: not required
Other Benefits:
Other Considerations:

3. Strategies for Pest and Pesticide Management
The management of agricultural pests is a major concern to nearly every New Jersey farmer. Pests include insects, weeds, diseases, fungi and vertebrates (e.g., rodents) that can reduce if not destroy crop production. Agriculture has always been faced with the need to limit crop damage due to pests. Since the 1950s, petrochemical-based pesticides have become an important tool for farmers. Of course, pesticides are applied in non-agricultural settings as well, for example on home lawns, golf courses, roadsides and utility rights-of-way.

Wherever pesticides are used, there are concerns about potential impacts to water quality. Negative impacts to surface water bodies have been documented since the 1940's. More recently, studies have shown public and private water

A good pest management plan will emphasize natural controls and non-chemical tactics whenever possible, while maintaining a healthy crop with high yield and quality.



supply contamination from pesticides. Because of these and other concerns (e.g., the health and safety of the pesticide handler), pesticides and their application have become increasingly regulated, resulting in higher costs to the grower.

- pesticide application: including the rate, formulation, timing and mode of application (e.g., foliar, injection, surface incorporation)
- pesticide properties: including solubility, mobility, stability, and degradation
- climate: including precipitation, temperature and wind
- soil properties: including composition (% sand, clay and silt; soil organic matter), porosity, moisture content and pore size
- site characteristics: including topography, slope, proximity to water resources
- agricultural management practices: including tillage choices, mixing, loading and storage practices, cover cropping, irrigation/chemigation

Clearly, a goal of any pest management strategy is to reduce risks of contaminating surface and ground water. The basic concept of pest management in this regard is to encourage effective and safe use of pesticides, only when necessary, without causing environmental harm. The most effective approach is, first, to limit the amounts and types of pesticides (availability), and second, to use practices that minimize the movement (detachment, transport and deposition) of pesticides to surface and ground water.

Pest Management

As with nutrient management, the most effective approach for environmentally sensitive pest control is to develop and implement **pest management plan**. The goal of pest management is to reduce the impact of pests to tolerable levels. The plan focuses on the assessment of options based on site- and crop-specific data. Developing a whole farm plan that includes sound agricultural management practices for how, what, where and when to apply pesticides will help minimize the problems associated with pesticide use. Natural controls and non-chemical tactics should be emphasized wherever possible. A good plan will maintain a healthy crop with high yield and quality, while protecting water quality and other environmental interests.

At minimum, pest management includes:

an evaluation of past and current pest problems and cropping history

- an evaluation of the physical and biological characteristics of the site
- evaluation, selection and implementation of appropriate alternative pest management strategies

- proper selection, application and timing of pesticide(s)
- proper mixing, loading, and storage of pesticides

In New Jersey, IPM programs have reduced pesticide use on such crops as apples, strawberries, cranberries, corn, alfalfa, eggplant and potatoes.

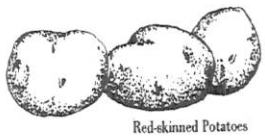
An integral component of pest management is the practice of integrated pest management (IPM). IPM is an approach aimed at reducing pesticide use to the minimum quantity while ensuring high quality crops and protecting human health and environmental quality. IPM includes the selection, integration and implementation of pest control methods based on predicted economic, ecological and sociological consequences. IPM includes the use of pesticides only when pest populations exceed economic thresholds (when making a decent return on the crop is threatened) and only when alternative control tactics are not appropriate or available. An IPM program strives to minimize crop losses by optimizing the use of cultural management techniques and biological pest controls.

Typically, there are four components of an IPM system:

- **pest identification:** all potential pests as well as all beneficial insects are inventoried; particular species or varieties may require special treatment
- **monitoring:** also known as scouting, the aim is to accurately sample and record pest populations and to identify the location and time where a pest problem may become intolerable
- **action thresholds:** action thresholds and injury levels are established for each individual pest species. The action threshold is the level at which a control action must be taken in order to prevent damage
- **methods of prevention and suppression:** include some combination of controls described below to manage pest populations

There are many options for suppressing pests, usually used in combination. These tactics may be grouped in the following categories:

- biological controls
- cultural controls (including host resistance)
- physical and mechanical controls
- chemical controls

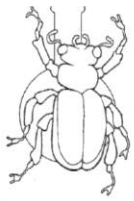


Red-skinned Potatoes

IPM guidelines have been established for a number of field crops, fruits and vegetables in New Jersey. New guidelines for other crops are continually being developed. Nonetheless, certain integrated pest management strategies can be successfully employed in a wide variety of situations, even without a certified program in place. Plans may be developed by the producer or by a private crop consultant who may be employed to help develop and implement the plan.

Once pest management has been developed, a variety of best management practices can be employed to implement aspects of the plan. Some plans may include particular IPM strategies that are included in the best management practices that follow. Best management practices that comprise elements of an IPM Program are included below.

Appropriate biological controls include the use of natural predators to help keep pest populations in check.



The following is a list of the BMPs that are recommended to reduce water pollution from pesticide storage and use.

Best Management Practices for Pest and Pesticide Management

a. <u>Appropriate Biological Controls</u>
Definition: use of natural enemies, including predators, parasites and diseases to help keep pest populations in check.
Purpose: to reduce or eliminate pests by introducing biological control agents that may not be native to the area, or not present in sufficient quantities, into the environment. For example, beneficial mites are commercially available and can be released in the field. These must be introduced before pest numbers are out of control, and periodic re-releases are usually needed. These agents include parasites, predators or disease pathogens such as bacteria, fungi and viruses.
Initial Cost: low
Maintenance Cost: low
Technical Assistance: required for initial information and start-up
Other Benefits:
Other Considerations:

b. <u>Appropriate Cultural Controls</u>
Definition: use of various farming practices that impact pest populations.
Purpose: to destroy or remove a pest's habitat by such practices as plowing, crop rotation, manipulation of planting and harvest dates, animal housing sanitation and manure management, and tillage. For example, alfalfa fields with significant numbers of alfalfa weevils may be harvested early to avoid further losses and reduce weevil populations. Crop rotation can be extremely effective in breaking up pest life cycles (e.g. the Colorado potato beetle). Various methods can be employed to destroy breeding refuges and over-wintering sites, including escaped apple trees for apple maggot. Included in this category are all practices that provide optimum growing conditions for the crop, thereby enhancing plant health and resistance and reducing plant stress.

There is a wide range of cultural controls. Not all of them are appropriate on all farms, and farmers need to select carefully.

Examples of cultural controls include the following:

site selection: choosing sites that are less favorable to pests, cultivar selection: choosing varieties that are resistant to pests, crop rotation: rotating away from crops of the same family can prevent weed growth and break up pest cycles, **intercropping**: planting a mixture of crops may reduce insect damage.

e.g., underseeding broccoli with clover

- cover cropping: can provide shelter for beneficials
- trap cropping: planting crops to attract the pest away from the main crop; for example in tomatoes, trap crops of potatoes and eggplant can be used for Colorado potato beetle
- tillage: provides weed control and may kill some insects and pathogens
- timing and method of planting: may help to avoid a generation of the pest
- sanitation: removal of pest habitat such as cull piles or dropped fruit; for example, potato cull piles provide a place for potato late blight and other diseases to overwinter
- pruning: removes a food source or point for infection and increases circulation
- healthy seed and transplants: avoids introducing pests; use of seed that has been certified disease-free

Properly calibrating pesticide application equipment assures proper application rates throughout the season, reducing both pesticide waste and the risk of environmental contamination.

Initial Costs: low
Maintenance Cost: low
Technical Assistance: not required - desirable
Other Benefits: certain cultural control practices may also improve soil tilth and fertility.
Other Considerations:

c. <u>Appropriate Physical Controls</u>

Definition: use of physical structures or mechanisms to exclude pests from crops.

Purpose: to prevent or reduce crop losses from pest damage by providing physical barriers such as netting over small fruits and screening in greenhouses or milkhouses. Row covers and fencing are also examples.

Initial Cost: low - high
Maintenance Cost: low
Technical Assistance: not required
Other Benefits:
Other Considerations:

d. <u>Calibrate and Maintain Pesticide Application Equipment</u>

Definition: adjustment of application equipment by properly calibrating applicator nozzles; general maintenance of equipment parts.
Purpose: to assure proper pesticide application rates throughout the season. Such calibration should occur minimally at the beginning and middle of each season; ideally, each time pesticides or application rates are changed. Improper calibration of application equipment can result in application rates that are significantly different from the intended rate. Low applications can result in poor pest control, yield losses and costly repeat applications. Rates which are too high, waste pesticide reduce profitability and pose a greater

Data collection allows farmers to make informed pest management decisions based on knowledge of cropping patterns, current and historical pest problems, pesticide use and soil and physical characteristics of the site.

risk of environmental contamination than necessary. Higher than recommended application rates also promote the development of pest resistance to the pesticide, do not achieve better pest control and may result in poor pest control. Since nozzle wear can increase application rates and change spray patterns, calibration rates should be checked during the spray season. Even small, hand operated applicators, such as hand-pump sprayers, should be calibrated each season. Sprayer equipment should be maintained regularly.

Initial Cost: low
Maintenance Cost: low
Technical Assistance: desirable for initial information
Other Benefits: lower costs due to less pesticide use.
Other Considerations:

e. <u>Data Collection</u>
Definition: inventory of field, crop and pest information.
Purpose: to make informed pest management decisions based on knowledge of cropping patterns, current and historical pest problems, pesticide use and soil and physical characteristics of the site. Attention should be paid to the history of crop production, information on soil types, exact acreages of each field, and information about past pest problems, pesticide use and other information for each field. Additionally, particular attention should be directed to areas where mixing, loading and storage activities take place, and physical limitations such as proximity to well heads and surface water, runoff potential, highly permeable or poorly drained soils, and shallow aquifers.
Initial Cost: none
Maintenance Cost: not applicable
Technical Assistance: not required
Other Benefits: may enhance efficiency and reduce cost
Other Considerations:

f. <u>Pesticide Application Plans and Records</u>
Definition: a procedure for planning and documenting pesticide use that includes specific pesticide selection, application and handling.
Purpose: to assure the proper selection, timing and rates of application to maximize effective and judicious use of pesticides while minimizing unnecessary, excessive or inappropriate uses. Pesticides that are least likely to cause contamination to surface or ground water should be selected. Available models such as NPURG can assist in determining relative risk from a pesticide given crop, soil, water and topographic conditions. If an evaluation indicates a high risk, consideration of slope, foliar coverage and other risk reducing site factors or management practices such as spot spraying or banding will help. Such plans should also account for proper timing of applications. Replace calendar date scheduled applications with crop, pest and weather specific timing to increase effectiveness and reduce risk as well as waste from, for example, application before a heavy rain or during windy conditions. Record

keeping is an important component of any pesticide use, as well as a legal requirement. Knowing what went on which field and how successful it was in obtaining desired results is useful planning data.

Initial Cost: low
Maintenance Cost: low
Technical Assistance: desirable for start-up
Other Benefits: may enhance wildlife habitat; may contribute to farmer health and safety
Other Considerations:

Proper storage and handling of pesticides avoids contamination risks associated with accidental spills and misuse of pesticides.

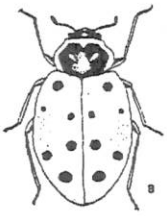
g. Protect and Enhance Natural Controls

Definition: The encouragement of naturally-occurring populations of biological control agents such as beneficial mites and certain fungi, worms and wasps.

Purpose: to allow natural controls to contribute to pest management by fostering and not destroying their habitat. Natural enemies can be encouraged by providing shelters or food sources. For example, a sod or weedy cover in an apple orchard provides an overwintering site for predatory mites, which control European red mite and two-spotted spider mite. Selecting pesticides that have minimal effect on beneficials is an important consideration; applying only when needed, and carefully scheduling to have the least effect on beneficials, will also encourage native populations of many biological control organisms.

Appropriate biological controls include the use of natural predators to help keep pest populations in check.

Initial Cost: none
Maintenance Cost: not applicable
Technical Assistance: desirable for initial information
Other Benefits:
Other Considerations: other management practices, such as burning or mowing of field edges, may diminish beneficial populations.



Convergent Lady Beetle
A. Larva B. Adult

h. Safe Storage, Mixing, Loading and Disposal of Pesticides

Definition: specific management activities for the proper storage and handling of all pesticides.

Purpose: to avoid contamination risks associated with accidental spills and misuse of pesticides. Surface water, ground water and soil can be contaminated in areas where pesticides are stored under inappropriate conditions, or improperly mixed and loaded into application tanks, where equipment is washed and rinsed after application, and where containers are disposed of improperly. Pesticides should be stored in the original containers with the label intact, in a closed and locked building. Such containers should be recycled where possible. The building should be located at least 200 feet down-gradient from any surface water body and 150 feet down-gradient from any wellhead. A secondary containment area, such as a curbed, impermeable pad, is recommended to contain any accidental spills or leaks.

Scouting for pests provides an early detection system that locates and identifies potentially serious pest situations before economic losses occur.

Chemical mixing and storing and equipment rinsing stations should be located at least 300 feet away from aquifer and wellhead areas and open water. Backflow prevention devices should be installed and operating properly. Proper warning signs must be posted, and use of an impervious pad to contain spills and facilitate clean-up is desirable. Of course, such materials should be locked and out of reach of children and animals. Mixing and loading areas should be located to minimize the impact of spills. All transfer of pesticides between containers should be conducted over a spill containment surface designed to intercept, retain and recover spills, leaks and wash water. This can be a specially constructed pad or alternate system such as a portable basin.

Initial Cost: medium - high
Maintenance Cost: low - medium
Technical Assistance: required
Other Benefits: may reduce human health and safety risks, may reduce future liability risks
Other Considerations:

i. <u>Scout for Pests</u>
Definition: crop monitoring for presence of pests.
Purpose: to accurately sample and record pest populations and to recommend and track control actions based on scouting data. Determining how many pests are present on a crop at a point in time requires that the crop be monitored on a regular schedule. Scouting usually involves visual plant or animal inspections and/or environmental monitoring. Scouting provides an early detection system that locates and identifies potentially serious pest situations before economic losses occur. Used with pest action thresholds, it also helps to avoid unnecessary pesticide applications. Samples are collected according to certain protocols. Often, scouting is done by agribusinesses or private consultants.
Initial Cost: low
Maintenance Cost: low - medium
Technical Assistance: desirable for initial information
Other Benefits: may result in higher quality crop
Other Considerations: a consultant may be hired to perform this function and provide pest management advice.

j. <u>Special Handling of Sensitive Areas</u>
Definition: with respect to pesticide application, particular attention to and appropriate management of areas such as wet spots, stream sides and areas near well heads; may include avoiding application entirely.
Purpose: to reduce risk of contamination by identifying sensitive areas and reducing or eliminating pesticide applications there. Use of a map locating such areas is helpful, making sure that the applicator is aware of such locations and any specific requirements. New Jersey Department of Agriculture has useful fact sheets about applying high risk pesticides in high risk areas.

Initial Cost: low
Maintenance Cost: low
Technical Assistance: not required
Other Benefits:
Other Considerations: these sensitive areas should be treated with special handling when applying nutrients also, to avoid leaching of nutrients, especially nitrates, into ground water.

Special handling of sensitive areas involves reducing or eliminating pesticide applications to wet spots, stream sides and areas near well heads.

4. Strategies for Livestock Barnyard, Manure and Waste Management
Concerns about potential contamination of surface and ground water from livestock focus on two components of farm animal management. The first is on areas or structures where animals are stabled or held and fed or maintained, plus areas used for processing and storage of product (such as feed), manure, facility wastewater (e.g., milkhouse waste, barn and pen cleaning water, animal washing) and other related runoff. These areas are typically centered around the barnyard and are sometimes referred to as "confined animal facilities". The second is on animal grazing areas, particularly riparian, or stream-side zones (see Section 5, below).

Pollutants from confined animal facilities include nutrients, salts, pathogens and organic solids from manure and bedding. Phosphorus is a concern from milkhouse cleaning. Milk itself, if it gets into a stream and decomposes, uses up oxygen, and bacteria growing in milk transmit diseases downstream. Surface waters can be seriously impacted, causing fish kills, anaerobic conditions, eutrophication and unsuitability for drinking, fishing or swimming. Ground water can be contaminated by nutrients and salts from manure storage areas and related runoff seeping into the ground. Silage wastes are extremely concentrated and can be toxic to plant and animal life if discharged directly. Water running from up-slope through a confined animal facility, as well as rain and snow from roofs, increases the volume of facility runoff.

While most livestock manures are applied to cropland, improperly stored or handled manure can pose a direct threat to water resources. Direct runoff from manure stockpiles, leaking or overflowing storage units and barnyards can contribute nutrients (and pathogens; see below) directly into sensitive areas.

It has become commonplace to think of manure as a "waste". **Regarding manures as valuable and cost-saving resources that contribute to farm fertility, rather than as a waste, may lead to improved handling and utilization.** As a resource, manures applied to cropland add nutrients and organic matter to soils. But over-application of manures can contribute to water pollution because excess nutrients that are not taken up by the crop leach or runoff. So "waste management" and "nutrient management" are companions in a comprehensive management system and whole farm plan.

Some common disposal practices not only threaten groundwater but also may be illegal.

As with pest management and nutrient management above, developing a waste management system is the recommended first step. Such a system will address limiting discharges from confined animal facilities by identifying appropriate systems that collect solids, reduce contaminant concentration and reduce runoff. The system will also address management of stored runoff and accumulated solids by identifying an appropriate waste utilization system. Utilizing wastes to the fullest extent possible is a prudent waste management strategy as well as a potentially effective and cost-efficient nutrient management strategy. A good waste management system will include management practices for storage, handling, treatment and disposal of manure and other agricultural wastes. The aim is to minimize the potential impact of the manure-associated pollutants in both ground and surface waters. A waste management system may consist of one or more components, appropriately suited to the particular operation.

Cost effectiveness is a major concern when choosing appropriate waste management practices for a farm. Livestock operations of all sizes may need to or choose to install storage structures, which can be a costly component of a livestock enterprise. There are numerous manure storage systems available; the choice of the system will depend on the location, type and size of the farm operation, available sites and equipment, and economics.

Consider the variety of products commonly used in households and on farms: paints, solvents, oils, cleaners, wood preservatives, batteries, adhesives and pesticides. In addition, some common disposal practices not only threaten groundwater but also may be illegal.

Small, unusable amounts often wind up spilled, buried, dumped or flushed onto farm property. Minimizing the amounts of these substances used on the farm, along with practicing proper disposal practices, can reduce both health risks and the potential for groundwater contamination. Farmers and their families are generally familiar with the hazards of pesticides commonly used in the farm operation, but they may be less aware of the hazards of other chemicals that make many tasks around the home and farm easier or more efficient.

Improper use of hazardous products may cause toxic health effects. Improper storage may allow chemicals to leak, causing potentially dangerous chemical reactions, toxic health effects or groundwater contamination. Improper disposal allows these dangerous chemicals to enter directly into drinking water through surface water or groundwater.

Your drinking water is least likely to be contaminated by your hazardous wastes if you follow appropriate management procedures or dispose of wastes in any location that is **off your farm site**. However, proper offsite disposal practices are essential to avoid risking contamination that could affect the water supplies and health of others.

A good waste management plan will include management practices for storage, handling, treatment and disposal of agricultural wastes.

The following is a list of the BMPs that are recommended to reduce or eliminate water pollution from barnyards, manures and wastes.

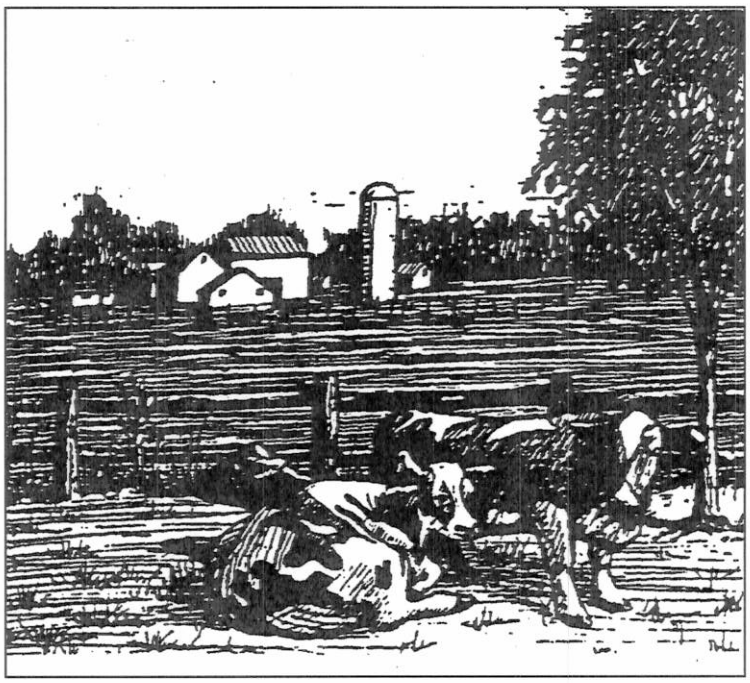
Best Management Practices for Barnyard, Manure and Waste Management

a. Combined Waste Facility(s)

Definition: a structure or system for handling more than one type of waste.

Purpose: to meet environmental protection needs by maximizing efficient waste facility design. For example, milkhouse waste may be added to liquid manure or manure run-off storages that already exist. If a facility is being constructed to handle multiple storages, it must be designed to handle the total volume. Milkhouse wash water will dilute manure which makes it easier to pump. Silage leachate also may be combined with other wastes and manures.

Initial Cost: high
Maintenance Cost: medium
Technical Assistance: required
Other Benefits:
Other Considerations: federal cost share may be available



b. Diversion(s) – grass or other

Definition: a drainageway constructed across a slope to divert surface runoff.
Purpose: to divert water away from barnyard, bunker silage storage areas and other heavy use areas, preventing excessive runoff from carrying organic wastes, sediments and other pollutants to surface water bodies.
Initial Cost: medium - high
Maintenance Cost: low
Technical Assistance: required
Other Benefits: may facilitate barnyard maintenance by reducing surface water
Other Considerations: will require periodic maintenance to remove debris and assure stability.

Filter strips are areas of vegetation for removing sediment, organic matter and other contaminants from runoff and wastewater.

c. Filter Strip

Definition: a strip or area of vegetation for removing sediment, organic matter and other contaminants from runoff and wastewater.
Purpose: to trap organic materials from concentrated livestock areas by trapping them in the vegetative material of the filter strip. Properly located filter strips may also filter pollutants from controlled overland flow treatment of liquid wastes. Filter strips must be managed and maintained. Saturated filter strips will not function properly.
Initial Cost: medium - high
Maintenance Cost: medium
Technical Assistance: desirable
Other Benefits: may provide wildlife and/or beneficials habitat
Other Considerations: will require maintenance.

d. Heavy Use Area Protection(s)

Definition: installation of semi-impervious or hard impervious surfaces in heavily used areas.
Purpose: to prevent degradation and to stabilize areas intensely used by livestock, and to allow for collection, management, and utilization of animal wastes, thereby reducing migration of contaminants to surface water bodies. Grading and surfacing of heavily used areas helps protect them from erosion, trampling, rutting or other deterioration, and helps prevent the collection of pollutants. Concrete or asphalt paving will be necessary if runoff is to be collected for treatment. Compacted gravel or other earth materials may otherwise be sufficient to stabilize the ground surface. Drainage and runoff control devices and filter strips may be components of heavy use area protection.
Initial Cost: medium - high
Maintenance Cost: low
Technical Assistance: desirable
Other Benefits:
Other Considerations:

Manure composting prevents water contamination by biologically treating organic wastes. The by-product of this process is a safe-to-use soil amendment.

e. Manure Composting

Definition: the process of controlled and accelerated aerobic biodegradation and stabilization of livestock manures. (See also, Agricultural Composting, under Nutrient Management)

Purpose: to prevent water contamination by biologically treating organic wastes. The by-product of this process is a safe-to-use soil amendment. Composting stabilizes nutrients and reduces pathogens, making them less likely to leach into surface or ground water. Active composting usually takes place in windrows, static aerated piles or in-vessel structures. Passive "composting", with no active effort to manage or monitor the process, is not an effective or acceptable technique for managing organic wastes high in nitrogen. Successful composting requires careful attention to: site selection and design, selection and carbon : nitrogen ratio of ingredients, moisture, temperature, timing, proper equipment and management.

Initial Cost: medium - high

Maintenance Cost: low

Technical Assistance: required

Other Benefits: compost may be used on farm as a soil amendment/crop nutrient or sold commercially.

Other Considerations: needs careful management; there may be odor concerns; there may be regulatory considerations.

f. Manure Storage Facility(s)

Definition: a permanent, constructed structure for temporary storage of animal manures or other organic agricultural by-products.

Purpose: to reduce contaminant loading to surface waters by intercepting and storing polluted runoff from manure stacking areas, barnyards and feedlots. Such structures may be earthen impoundments (ponds), tanks or other facilities constructed of concrete, wood, steel, plastic or other materials. Tanks are used for liquid and slurry wastes and can be open or covered, inside or outside or beneath slotted floors. Stacking facilities are used for solids and may be open or roofed.

Initial Cost: high

Maintenance Cost: medium

Technical Assistance: required

Other Benefits:

Other Considerations: federal cost share may be available.

g. Manure Storage Field Stacking Area

Definition: a temporary stacking area for solid manures located in a field.

Purpose: to temporarily stockpile manure for at most six months in a location where ground and surface water will be least threatened by contamination. As a component of a waste management plan, such an area is not a substitute for a manure storage structure, but may supplement the storage volume of such a

structure. A stacking area allows temporary storage, when weather or field conditions may prevent daily field application, or when waiting to spread until after crop harvest. A well designed, located and managed stacking area may help in the timely application of stored manures, thereby reducing water quality impacts; a poorly designed, sited or maintained area may cause increased water quality problems.

Manure storage facilities reduce contaminant loading to surface water by intercepting and storing polluted runoff from manure stacking areas, barnyards and feedlots.

Initial Cost: low - medium
Maintenance Cost: low
Technical Assistance: desirable; may be necessary for establishment
Other Benefits:
Other Considerations: site must be carefully selected to avoid negative impacts to ground water, wetlands and other sensitive areas, and to avoid odor problems with neighbors.

h. <u>Plan for Manure and Waste Utilization</u>
Definition: using animal manures or other appropriate by-products on land in an environmentally acceptable manner while maintaining or improving soil and plant resources.
Purpose: to reduce transport of sediment and other pollutants to surface waters by applying wastes to fields where they may be incorporated, allowing crops to use nutrients that might otherwise contaminate ground water. As an essential part of a manure management plan, a waste utilization plan needs to be coordinated with a nutrient management plan that determines the amount, form, placement and timing of waste applications to meet agronomic needs. Technical assistance is useful to evaluate field and other conditions to maximize utilization without compromising water quality.
Initial Cost: low
Maintenance Cost: low
Technical Assistance: desirable
Other Benefits:
Other Considerations:

i. <u>Roof Runoff Management(s)</u>
Definition: a facility for collecting, controlling and disposing of runoff water from roofs.
Purpose: to prevent roof runoff water from flowing into or across concentrated waste areas, barnyards, livestock or equipment laneways or other areas where clean roof runoff could wash contaminants into surface or ground waters. Such facilities include erosion-resistant channels or subsurface drains installed along building foundations below eaves, and roof gutters and downspouts.
Initial Cost: low - medium
Maintenance Cost: low
Technical Assistance: not required

Using animal manures or other appropriate by-products on land in an environmentally acceptable manner; maintains and improves soil and plant resources.

Other Benefits: may contribute to animal health and safety
Other Considerations:

j. <u>Sediment Basin(s)</u>
Definition: a depression constructed to collect and store polluted runoff.
Purpose: to slow runoff that may contain animal manures. The basin may be dug or constructed as an earthen embankment. It allows solids to settle before runoff is discharged.
Initial Cost: medium - high
Maintenance Cost: low
Technical Assistance: required
Other Benefits: may control erosion and sediment; may enhance nutrient management
Other Considerations: basin will need periodic cleaning or dredging.

k. <u>Silage Leachate Waste Management</u>
Definition: a planned system for collection, storage and disposal of silage wastes in an environmentally acceptable manner.

Purpose: to collect, store and dispose of silage leachate in a manner that minimizes threats to water resources. Silage leachate is an extremely strong organic waste, using up tremendous amounts of oxygen if released into water bodies or into the soil. The best strategy is to prevent or minimize the formation of silage leachate and to safely store and dispose of if any generated. Proper siting and sizing of silage facilities is the first step.

Practices such as harvesting the silage at a moisture content that will not result in excessive silage leachate production, covering the silage pile to eliminate rain infiltration, and installing drains and/or diversions to separate ground water and surface water runoff from the ensiled forage are also important.

A properly designed waste collection and storage system may combine silage leachate with other agricultural wastes. Leachate may be land applied, alone in diluted form, or mixed with manure or other wastes according to a waste utilization plan and a nutrient management plan, paying particular attention to application rates.
Initial Cost: high
Maintenance Cost: medium - high
Technical Assistance: required
Other Benefits: may have nutrient value as soil amendment
Other Considerations: federal cost share may be available.

l. Wastewater Treatment System(s)

Definition: a planned system for biological treatment of wastewater generated in milkhouses, typically consisting of a settling tank, distribution system and treatment system.

Purpose: to reduce threats to water quality by biologically treating organic milkhouse waste. In situations where milkhouse waste is not combined with liquid manures, biological systems for treatment will reduce the amount of suspended solids, biological oxygen demand and dissolved nitrogen that may enter the water table. Such systems are not designed to include waste milk or sewage. An underground treatment system is similar to a traditional septic system. In suitable soils, organic matter treatment beds function like leach fields, using organic matter to absorb the waste.

Initial Cost: high

Maintenance Cost: medium

Technical Assistance: required

Other Benefits:

Other Considerations: regular maintenance is required; discharging milkhouse wastes into a municipal sewer should be considered; this practice may not be effective in treating the cleaning agents used to disinfect the milking system; availability and disposal of organic bedding material must be considered

Silage leachate may be land applied, alone in diluted form or mixed with manure or other wastes according to a waste utilization plan and a nutrient management plan, paying particular attention to application rates.

m. Petroleum Product Storage Facility

Definition: a permanent above ground structure for the storage of petroleum products for use in farm machinery.

Purpose: to reduce contaminant loading to surface and groundwater by preventing spills and leakage. Such structures should be made of non-corrosive materials located above ground so they can be periodically examined for leakage.

Initial Cost: High

Maintenance Cost: Low

Technical Assistance: desirable for siting

Other Benefits:

Other Considerations:

n. Hazardous & Household Waste Management

Definition: proper use and disposal of toxic or pathogenic products as a result of domestic use around the farmstead. This includes but is not limited to sewage, paint, solvents, cleaners, preservatives, batteries, adhesives.

Purpose: to reduce the use and encourage the proper disposal of hazardous wastes. Small amounts of these materials can be hazardous to your health especially when found in the drinking water. Proper management can reduce the potential for toxic effects.

Initial Cost: high

Maintenance Cost: medium

Technical Assistance: desirable

Other Benefits: proper use of chemicals can save money
Other Considerations: small amounts of toxic materials can be deadly to humans and animals.

5. Strategies for Livestock Grazing Management

Water quality concerns related to livestock grazing focus on potential impacts to sensitive areas such as streambanks, wetlands, estuaries, ponds and lakeshores. Sensitive areas also include the riparian zone, an extremely diverse and vital vegetated ecosystem along a water body.

Impacts to ground water, surface water bodies and the riparian zone include sedimentation, and the introduction of nutrients, pathogens and organic solids. Healthy riparian and wetland ecosystems rely, in part, on good management of the immediate areas as well as upland areas. Careful selection of grazing management systems, controlled access and vegetative stabilization practices all should be considered in the development of a grazing and pasture management plan.

A grazing management system needs to accommodate the demands of vegetation, terrain and type of livestock operation. A well-designed system supplies and improves grazing lands and facilities, develops appropriate water sources, and protects streamsides and other sensitive water resources. Well-managed pastures are stable, with suitable plantings and minimal erosion.

Uncontrolled access to streams and ponds for watering may seem economical and convenient, but cost-efficient alternatives that avoid negative water quality impacts are available. Pasturing systems (for example, rotational grazing) can be designed to maximize forage opportunities while minimizing stresses on land and water systems.

The following is a list of the BMPs that are recommended to reduce or eliminate water pollution from livestock grazing.

Water quality concerns related to livestock grazing focus on potential impacts to sensitive areas such as streambanks, wetlands, estuaries, ponds, and lake shores.

Best Management Practices for Livestock Grazing Management

a. Alternative Water Supply(s)

Definition: several options for livestock watering that keep animals away from streambanks and riparian zones.

Purpose: to protect streambanks, wetlands and riparian zones from adverse impacts from livestock trampling and waste. For example, a pipeline may be installed to convey water to an upland area. A livestock pond can be excavated or constructed with a dam or embankment. A trough or tank, with devices for water control and wastewater disposal may be installed. This practice may encourage better distribution of livestock over the pasture and grazing may be better controlled. In some cases, the development of a well or spring is a positive alternative.

Initial Cost: low - high
Maintenance Cost: low
Technical Assistance: desirable
Other Benefits:
Other Considerations:

b. Fencing(s) (Optional for AWMP)

Definition: enclosing or dividing an area of land with a suitable structure that acts as a barrier to livestock.

Purpose: to keep animals from riparian zones and other sensitive water resources, to prevent wastes from entering water bodies, streambank degradation, compaction of soils and loss of vegetation in riparian zones. As part of a grazing management plan, location of fencing should take into account the fact that fencing can have the effect of concentrating animals in particular areas, such as along the fence line, where paths may become channels that concentrate and accelerate runoff. Some fencing, when installed across the slope, can serve to slow down runoff. Exclusion fencing may be accompanied by installation of properly designed and located livestock crossing across streams.

Initial Cost: high
Maintenance Cost: low
Technical Assistance: desirable
Other Benefits: prevention of livestock access to some areas can preserve desirable habitat and plant species.
Other Considerations: Fencing must be installed properly using appropriate materials to be effective.

c. Pasture Management

Definition: proper treatment and use of pastureland.

Purpose: to minimize adverse impacts to ground and surface water by maintaining or improving the quality and quantity of forage, protecting the soil, conserving water and optimizing the use of fertilizers and pesticides on pasture. Practices include postponing grazing or resting grazing land for a prescribed period, which protects pasture areas with bare ground or little ground cover from eroding. Proper pastureland management will minimize movement of sediments from exposed soils and nutrients from manures to ground and nearby surface waters. As vegetative cover increases, the filtering processes are enhanced, trapping more silt and nutrients. Early spring grazing on wet and soft soils should be avoided. Soil testing and proper application of lime, manures and other nutrients are key to healthy pasture management.

Initial Cost: low

Maintenance Cost: low

Technical Assistance: not required

Other Benefits: may enhance crop health and vigor

Other Considerations:

Fencing keeps animals from riparian zones and other sensitive water resources, preventing wastes from entering water bodies.

d. Plan for Proper Grazing

Definition: A plan for grazing at an intensity that will maintain enough cover to protect the soil and maintain or improve the quantity and quality of desirable vegetation.

Purpose: to reduce transport of sediments and other pollutants from grazed areas by assuring a healthy and stable vegetative cover. Overgrazed pastures result in poor plant cover and plant health, and exposed soils. Deferred grazing and rotational grazing are two practices that encourage proper grazing intensity. Pasturing animals in woodlands should be limited to areas that produce a significant amount of forage that can be harvested without damaging other forest values or creating negative impacts to ground or surface water quality. Wooded areas should be grazed at a rate that maintains adequate cover for soil protection and maintains or enhances the quantity and quality of trees and forage vegetation.

Initial Cost: low

Maintenance Cost: low

Technical Assistance: desirable

Other Benefits: optimum livestock health; improved forage production and quality

Other Considerations: grazing areas may be restricted by eliminating wooded and/or wet areas.

A plan for proper grazing reduces transport of sediments and other pollutants from grazed areas by assuring a healthy and stable vegetative cover.

e. Prescribed Grazing (Planned Grazing System)

Definition: a practice in which two or more grazing units are alternately rested and grazed in a planned sequence.

Purpose: to decrease movement of sediments, nutrients and other substances into downstream waters by increasing the quality and quantity of vegetation in grazed areas. With a planned grazing system (e.g., the "Voisin" method, or intensive rotational grazing) livestock spend less time in each pasture or section of pasture. The vegetation helps trap manure.

Vegetative stabilization practices which improve or reestablish vegetative cover on pastures reduce erosion into water bodies.

Initial Cost: low - medium

Maintenance Cost: medium (for management time)

Technical Assistance: desirable

Other Benefits: may yield economic savings; may increase grazing efficiency; may increase and improve quality and production of forage (including season extension); may improve flexibility in a grazing program; grass-based livestock management may decrease manure handling, decrease fertilizer use, require less machinery; may enhance wildlife habitat

Other Considerations: requires increased management; requires supplying livestock water.

f. Riparian Buffer

Definition: an established area of vegetation located next to and up-gradient of water courses, water bodies and associated wetlands.

Purpose: to maintain or improve surface water quality by removing or buffering the effects of sediment, nutrients, organic matter and some pesticides. As a grazing practice, it is most applicable in areas downslope from pastures. Management practices include protecting or establishing vegetation, installing an up-gradient filter strip, installing livestock exclusion fencing, excluding heavy equipment, and designing and installing proper livestock access and crossings. Buffer width varies depending on soil type and vegetative cover; 35 feet is considered minimum. If possible, native species should be planted/encouraged and fertilizers and pesticides should not be used.

Initial Cost: low - medium

Maintenance Cost: low

Technical Assistance: desirable

Other Benefits: may enhance streambank stabilization; may improve wildlife and aquatic habitat (see also, nutrient management, pest management and erosion and sediment control)

Other Considerations: may reduce amount of active grazing land; may limit livestock access to water or shade.

g. Stream Crossing

Definition: a stabilized area to provide access across a stream for livestock; may be used for farm machinery.

Purpose: to avoid degradation of streams and streambanks from animal trampling and wastes. Properly designed and installed stream crossings minimize bank and streambed erosion, reduce sediment and enhance water quality. A crossing might be graded and stoned or might consist of a constructed bridge or a culvert.

Initial Cost: low - medium
Maintenance Cost: low
Technical Assistance: desirable
Other Benefits: some stream crossings may enhance wildlife habitat
Other Considerations: may require wetlands permit.

h. Vegetative Stabilization
Definition: practices designed to improve or reestablish vegetative cover on pastures.
Purpose: to reduce erosion into water bodies. Such practices include seeding or reseeding stands of adapted forage species, planting vegetation such as grasses, shrubs or trees on highly erodible or critically eroding areas, brush and weed management and prescribed burning.
Initial Cost: low
Maintenance Cost: low
Technical Assistance: desirable
Other Benefits: may enhance habitat
Other Considerations:

6. Strategies for Irrigation Management

While cranberry producers are the most significant users of irrigation water in New Jersey, other growers irrigate vegetable, fruit, nursery, greenhouse and other specialty crops. While New Jersey typically is blessed with abundant rainfall, irrigation is occasionally necessary. Chemigation, the practice of applying fertilizers and/or pesticides to crops through irrigation systems, is also used by some farmers.

The concern associated with irrigation is the potential movement of pollutants such as sediments, organic solids, pesticides, metals, microbial organisms, salts and nutrients from the land into ground and surface waters. Ground water is particularly vulnerable where coarse textured soils allow high infiltration.

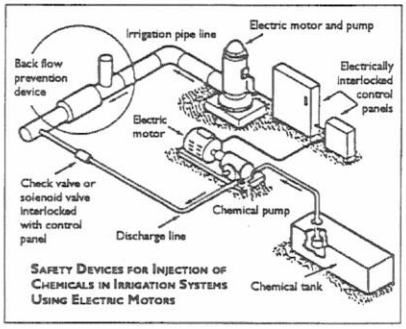
Proper irrigation management will help minimize discharge of pollutants while also reducing water waste and improving water use efficiency. An irrigation management plan will include components that address irrigation scheduling practices, efficient application, proper utilization of tailwater, drainage and runoff, and backflow prevention. The first step in such a plan is the development of a water budget and water balance for the crop to be irrigated. Technical assistance may be required for these calculations.

The following is a list of the BMPs that are recommended to reduce or eliminate water pollution from crop irrigation.

Best Management Practices for Irrigation

A backflow prevention system prevents chemical backflow to the water source during chemigation
.

a. Backflow Prevention(s)
Definition: a system to prevent chemical backflow to the water source during chemigation.
Purpose: to prevent contamination of a water source by installing devices that prevent chemicals from entering the irrigation water source in cases when the irrigation pump shuts down. There are several different systems used as backflow preventers such as an air gap, a check valve with vacuum relief and low pressure drain, a double check valve, a reduced pressure principal backflow preventer and an atmospheric vacuum breaker. Factors to consider when selecting a backflow prevention system are the characteristics of the chemical that can backflow, the water source and the geometry of the irrigation system.
Initial Cost: low - medium
Maintenance Cost: low
Technical Assistance: not required
Other Benefits:
Other Considerations:



Safety Devices for Injection of Chemicals in Irrigation Systems Using Electric Motors

b. Efficient Irrigation System
Definition: a planned system of crop irrigation that has as one goal the efficient use of water resources. Systems will vary with the type of crop grown, the soils and the topography.
Purpose: to ensure efficient use and distribution, minimize runoff or deep percolation and eliminate soil erosion. Several kinds of systems, properly designed and operated, can be used. Drip or trickle irrigation is a system in which all necessary facilities are installed for efficiently applying water directly to the root zone of plants by means of applicators (e.g. porous tubing or perforated pipe) operated under low pressure. A typical trickle system has a mainline with a control head, leading to laterals placed in the field. Runoff is reduced in this system, but potential hazards to shallow ground water exist if chemigation is used.

A sprinkler irrigation system applies water by means of perforated pipes or nozzles operated above ground, under pressure. Proper management of such a system controls runoff and prevents negative impacts to downstream surface waters. Chemigation with this system allows management of nutrients, wastewater and pesticides, but poor management may cause pollution of surface and ground water. Surface and subsurface irrigation systems deliver water by surface means, such as furrows, borders, contour levees or ditches, or by subsurface means. Proper management of such systems will prevent downstream pollution associated with runoff and percolation, including elevated temperatures of receiving waters.

Initial Cost: medium - high
Maintenance Cost: medium
Technical Assistance: not required

Other Benefits: conserves water; enhances efficient delivery of fertilizer and/or pesticides (known as "fertigation")
Other Considerations:

A planned system of crop irrigation has as its goal the efficient use of water resources. Systems will vary with the type of crop grown, the soils and the topography.

c. Irrigation Water Management
Definition: determining and controlling the rate, amount and timing of irrigation water in a planned and efficient manner.
Purpose: to minimize the loss of dissolved substances and sediments from the irrigation system to surface or ground water. Effective use of available irrigation water will promote the desired crop response, control water loss and protect water quality. An irrigation management plan will take into account the various and complex factors that need to be considered. The grower must know how to determine when irrigation water should be applied and how to measure or estimate the amount of water required for each irrigation. Proper scheduling requires consideration of factors such as soil properties, type of crop, its drought sensitivity and status of crop stress, stage of crop development, availability of a water supply and climatic factors such as rainfall and temperature. Proper irrigation also requires the ability to make necessary adjustments to the water stream, rate and time, and management of irrigation runoff.
Initial Cost: low
Maintenance Cost: low
Technical Assistance: required
Other Benefits: conserves water
Other Considerations:

A tailwater recovery system collects, stores and transports irrigation tailwater for reuse in the farm irrigation distribution system.

d. Tailwater Recovery System(s)
Definition: a facility to collect, store and transport irrigation tailwater for reuse in the farm irrigation distribution system.
Purpose: to increase water efficiency and reduce potential for contamination by recovering irrigation water for reuse in irrigation or for proper disposal. Using runoff water to provide additional irrigation or to reduce the amount of water diverted increases the efficiency of irrigation water use. In a tailwater recovery facility, sediments and substances attached to them (e.g. salts, metals, soluble nutrients and pesticides) are trapped, thereby decreasing downstream impacts to water quality. Recovered water with high salt or metal content will have to be disposed of in an environmentally safe manner and location.
Initial Cost: high
Maintenance Cost: medium
Technical Assistance: not required
Other Benefits:
Other Considerations:

e. Water-measuring Device(s)

Definition: an irrigation water meter, flume, weir or other water-measuring device installed in a pipeline or ditch.

Purpose: to measure the rate of flow and/or application of water and the total amount of water applied to the field with each irrigation. Such information can assist the grower in maximizing the efficiency and effectiveness of irrigation scheduling and equipment and provide data with which to consider modifications.

Initial Cost: low

Maintenance Cost: low

Technical Assistance: not required

Other Benefits: conserves water

Other Considerations:

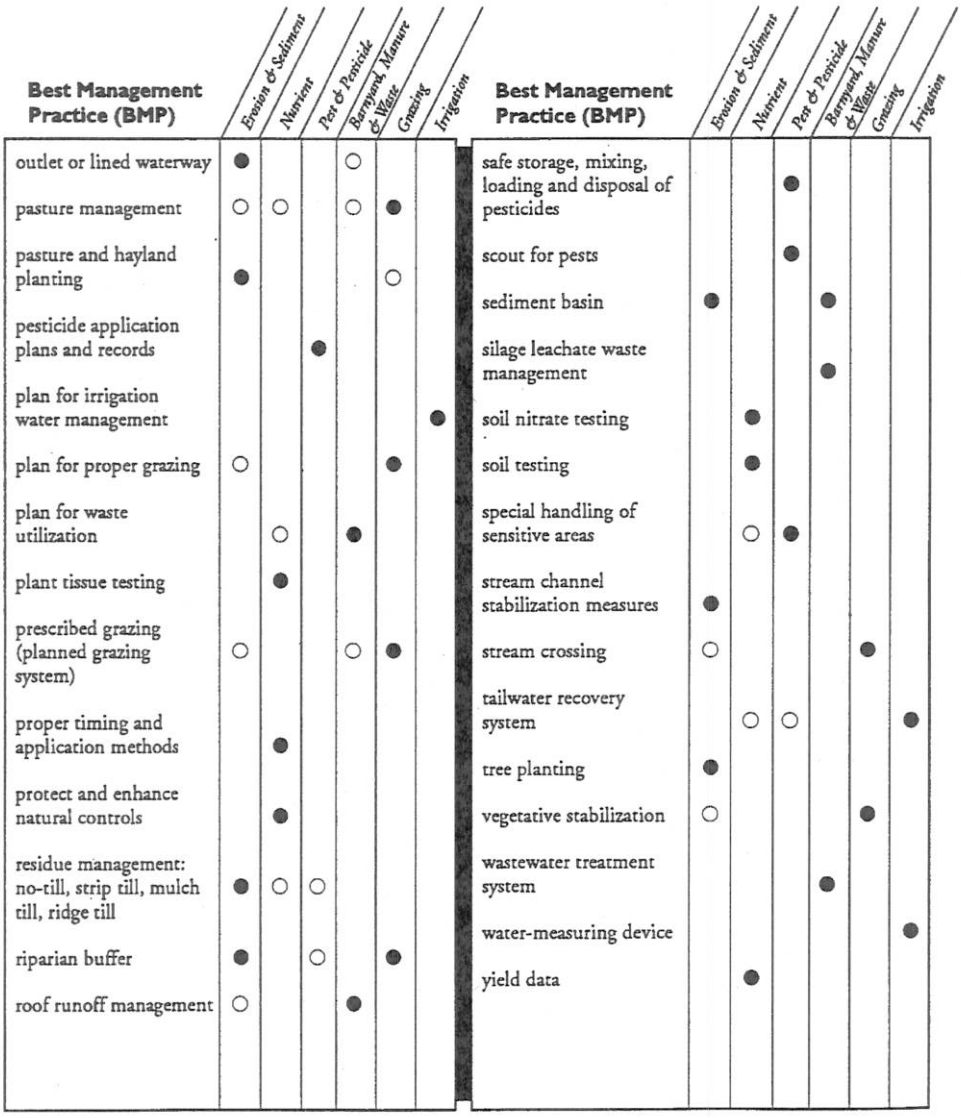
Summary of BMP Contributions to Farm Management Systems

Best Management Practice (BMP)	Erosion & Sediment	Nutrient	Pest & Pesticide	Barnyard, Manure & Waste	Grazing	Irrigation
agricultural composting		●		●		
alternate water supply					●	
appropriate cultural controls		○	●			
appropriate biological controls			●			
appropriate physical controls			●			
backflow prevention						●
buffer strips	○	●		○		
calibrate and maintain pesticide application equipment			●			
combined waste facility		○		●		
conservation cover	●	○				
conservation crop rotation	●	●	○			
contour farming	●					
contour strip-cropping	●	○				
cover cropping	●	●	○			
critical area planting	●					
data collection			●			
diversion (grass and other)	●			●		

Best Management Practice (BMP)	Erosion & Sediment	Nutrient	Pest & Pesticide	Barnyard, Manure & Waste	Grazing	Irrigation
efficient irrigation system						●
equipment calibration		●				
fencing	○				●	
fert. storage, handling and containment		●				
field borders	●					
field strip-cropping	●	○				
filter strip	●	○		●		
grade stabilization structure (water control structure)	●					
grassed waterway	●	○				
green manure cropping	○	●				
heavy use area protection	○			●		
intercropping		●	○			
manure storage facility		○		●		
manure composting		●		●		
manure storage field stacking area		○		●		
mulching	●					○
nutrient budgeting	●			●		
nutrient record keeping		●				

● = primary benefit ○ = additional benefit

Summary of BMP Contributions to Farm Management Systems



Best Management Practice (BMP)	Erosion & Sediment	Nutrient	Pest & Pesticide	Barnyard, Manure & Waste	Grazing	Irrigation
outlet or lined waterway	●			○		
pasture management	○	○		○	●	
pasture and hayland planting	●				○	
pesticide application plans and records			●			
plan for irrigation water management						●
plan for proper grazing	○				●	
plan for waste utilization		○		●		
plant tissue testing		●				
prescribed grazing (planned grazing system)	○			○	●	
proper timing and application methods		●				
protect and enhance natural controls		●				
residue management: no-till, strip till, mulch till, ridge till	●	○	○			
riparian buffer	●		○		●	
roof runoff management	○			●		

Best Management Practice (BMP)	Erosion & Sediment	Nutrient	Pest & Pesticide	Barnyard, Manure & Waste	Grazing	Irrigation
safe storage, mixing, loading and disposal of pesticides			●			
scout for pests			●			
sediment basin	●			●		
silage leachate waste management				●		
soil nitrate testing		●				
soil testing		●				
special handling of sensitive areas		○	●			
stream channel stabilization measures	●					
stream crossing	○				●	
tailwater recovery system		○	○			●
tree planting	●					
vegetative stabilization	○				●	
wastewater treatment system				●		
water-measuring device						●
yield data		●				

● = primary benefit ○ = additional benefit

PART V. AGENCIES AND ORGANIZATIONS

Introduction

The following agencies and organizations can provide information, technical assistance, financial assistance and/or referrals to New Jersey farmers about best management practices and on-farm water quality concerns.

County	Soil Conservation District	USDA Natural Resources Conservation Service	Rutgers Cooperative Extension	Farm Services Agency (FSA)
Atlantic	**Cape-Atlantic Soil Conservation District** 6260 Old Harding Highway Mays Landing, NJ 08330 Phone: (609) 625-3144 Fax: (609) 625-7360 Email: capeatlanticscd@comcast.net	Building 3, Suite A 1317 South Main Road Vineland, NJ 08360 Phone: (856) 205-1225 Fax: (856) 205-0691	6260 Old Harding Highway Mays Landing, NJ 08330 Phone: (609) 625-7000 Ext 5448 Fax: (609) 625-3646	(Atlantic-Cape May Cumberland) 1317 S. Main Rd. Bldg. 3, Suite A Vineland, NJ 08360 Phone: (856) 205-1225 Ext 2 Fax: (856) 205-0691
Bergen	**Bergen County Soil Conservation District** 700 Kinderkamack Rd. Oradell, NJ 07649 Phone: (201) 261-4407 Fax: (201) 261-7573 Email: acaruso@bergenscd.org	220 Davidson Avenue Somerset, NJ 08873 Phone: (732) 537-6040 Fax: (732) 537-6095	One Bergen County Plaza Hackensack, NJ 07601 Phone: (201) 336-6780 Fax: (201) 336-6874	(Bergen-Essex-Passaic-Warren-Morris-Sussex) 101 Bilby Road, Building 1-H Hackettstown, NJ 07840 Phone: (908) 852-2574 Fax: (908) 852-4666
Burlington	**Burlington County Soil Conservation District** 1971 Jacksonville-Jobstown Rd Columbus, NJ 08022 Phone: (609) 267-7410 Fax: (609) 267-3347 Email: dyarus@bscd.org	1971 Jacksonville-Jobstown Rd Columbus, NJ 08022 Phone: (609) 267-1639 Fax: (609) 261-3007	2 Academy Drive, Westhampton, NJ 08060 Phone: (609) 265-5050 Fax: (609) 265-5613	(Burlington-Camden-Ocean) 1971 Jacksonville-Jobstown Rd Columbus, NJ 08022 Phone: (609) 267-1055 Fax: (609) 261-3007
Camden	**Camden County Soil Conservation District** 423 Commerce Lane, Ste. I West Berlin, NJ 08091 Phone: (609) 767-6299 Fax: (609) 767-1676 Email: robert.dobbs@camdenscd.org	1971 Jacksonville-Jobstown Rd Columbus, NJ 08022 Phone: (609) 267-0811 Fax: (609) 267-3007	152 Ohio Avenue Clementon, NJ 08021 Phone: (856) 566-2900 Fax: (856) 566-2910	(Burlington-Camden-Ocean) 1971 Jacksonville-Jobstown Rd Columbus, NJ 08022 Phone: (609) 267-1055 Fax: (609) 261-3007
Cape May	**Cape-Atlantic Conservation District** 6260 Old Harding Highway Mays Landing, NJ 08330 Phone: (609) 625-3144 Fax: (609) 625-7360 Email: capeatlanticscd@comcast.net	Building 3, Suite A 1317 South Main Road Vineland, NJ 08360 Phone: (856) 205-1225 Fax: (856) 205-0691	4 Moore Rd. Cape May Court House, NJ 08210 Phone: (609) 465-5115	(Atlantic-Cape May Cumberland) 1317 S. Main Rd. Bldg. 3 Suite A Vineland, NJ 08360 Phone: (856) 205-1225 Ex 2 Fax: (856) 205-0691

County	Soil Conservation District	USDA Natural Resources Conservation Service	Rutgers Cooperative Extension	Farm Services Agency (FSA)
Cumberland	**Cumberland-Salem Soil Conservation District** 1516 Route 77 PO Box 144 Deerfield, NJ 08313 Phone: (856) 451-2422 Fax: (856) 451-1358 Email: cumbsoil@aol.com	Building 3, Suite A 1317 South Main Road Vineland, NJ 08360 Phone: (856) 205-0396 Fax: (856) 205-0691	291 Morton Avenue Millville, NJ 08332 Phone: (856) 451-2800 Fax: (856) 451-3995	(Atlantic- Cape May-Cumberland) 1317 S. Main Rd. Bldg. 3 Suite A Vineland, NJ 08360 Phone: (856) 205-1225 Ext 2 Fax: (609) 205-0691
Essex	**Hudson, Essex, Passaic Soil Conservation District** 15 Bloomfield Avenue North Caldwell, NJ 07006 Phone: (973) 364-0786 Fax: (973) 364-0784 Email: glen@hepscd.org	220 Davidson Avenue Somerset, NJ 08873 Phone: (732) 537-6040 Fax: (732) 537-6095	162 Washington St Newark, NJ 07102 Phone:(973) 353-1340 Fax:(973) 481-5302	(Bergen-Essex-Passaic-Morris-Sussex -Warren) I 01 Bilby Road, Building 1-H Hackettstown, NJ 07840 Phone: (908) 852-2576 Fax: (908) 852-4666
Gloucester	**Gloucester County Soil Conservation District** 14 Park Place, Suite C Sewell, NJ 08080 Phone: (856) 589-5250 Fax: (856) 256-0488 Email: gloucester@gloucesterscd.org	51 Cheney Road, Suite 2 Woodstown, NJ 08098 Phone: (856) 769-2790 Fax: (856) 769-0718	County Office Building 1200 N. Delsea Drive Clayton, NJ 08312 Phone: (856) 307-6450 Fax: (856) 881-4191	(Gloucester -Salem) 51 Cheney Road, Suite 2 Woodstown, NJ 08098 Phone: (856) 769-1126 Fax: (856) 769-0718
Hudson	**Hudson, Essex, Passaic Soil Conservation District** 15 Bloomfield Avenue North Caldwell, NJ 07006 Phone: (973) 364-0786 Fax: (973) 364-0784 Email: glen@hepscd.org	220 Davidson Avenue Somerset, NJ 08873 Phone: (732) 537-6040 Fax: (732) 537-6095	114 Clifton Ave. ? 3rd Flr. Murdock Hall Jersey City, NJ 07302 Phone: (201) 915-1399 Fax: (201) 915-1394	(Bergen-Essex-Passaic-Morris-Sussex -Warren) 101 Bilby Road, Building 1-H Hackettstown, NJ 07840 Phone: (908) 852-2576 Fax: (908) 852-4666
Hunterdon	**Hunterdon County Soil Conservation District** 687 Pittstown Rd, Ste #1 Frenchtown, NJ 08825 Phone: (908) 788-9466 Fax: (908) 788-0795 Email: hcscd@att.net	687 Pittstown Road Frenchtown, NJ08825 Phone: (908) 782-4614 Fax: (908) 852-4666	PO Box 2900 Flemington, NJ 08822-9058 Phone: (908) 788-1338 Fax: (908) 806-4735	(Hunterdon-Somerset-Union) 687 Pittstown Rd, Ste #2 Frenchtown, NJ 08825 Phone: (908) 782-4614 Fax: (908) 782-0501
Mercer	**Mercer County Soil Conservation District** 508 Hughes Drive Hamilton Square, NJ 08690 Phone: (609) 586-9603 Fax: (609) 586-1117 Email: mercersoil@aol.com	4000 Kozloski Road Freehold, NJ 07728 Phone: (732) 462-0075 Fax: (732) 462-5274	930 Spruce Street Trenton, NJ 08648 Phone: (609) 989-6830 Fax: (609) 396-9573	(Mercer- Middlesex-Monmouth) 4000 Kozloski Road Freehold, NJ 07728 Phone: (732) 462-0075 Fax: (732) 462-5274

County	Soil Conservation District	USDA Natural Resources Conservation Service	Rutgers Cooperative Extension	Farm Services Agency (FSA)
Middlesex	**Freehold Soil Conservation District** 4000 Kozloski Road Freehold, NJ 07728 Phone: (732) 683-8500 Fax: (732) 683-9140 Email: info@freeholdscd.org	4000 Kozloski Road Freehold, NJ 07728 Phone: (732) 462-0075 Fax: (732) 462-5274	42 Riva Ave North Brunswick, NJ 08902 Phone: (732) 398-5262 Fax: (732) 745-3478?	(Mercer-Middlesex-Monmouth) 4000 Kozloski Road Freehold, NJ 07728 Phone: (732) 462-0075 Fax: (732) 462-5274
Monmouth	**Freehold Soil Conservation District** 4000 Kozloski Road Freehold, NJ 07728 Phone: (732) 683-8500 Fax: (732) 683-9140 Email: info@freeholdscd.org	4000 Kozloski Road Freehold, NJ 07728 Phone: (732) 462-0075 Fax: (732) 462-5274	4000 Kozloski Road Freehold, NJ 07728 Phone: (732) 431-7260 Fax: (732) 409-4813	(Mercer- Middlesex-Monmouth) 4000 Kozloski Road Freehold, NJ 07728 Phone: (732) 462-0075 Fax: (732) 462-5274
Morris	**Morris County Soil Conservation District** 560 West Hanover Ave Morris Twp, NJ 07950 (973) 285-2953 Fax: (973) 285-8345 Email: jdunn@mcscd.org	Hackettstown Com. Park Bldg 1-H, 101 Bilby Road Hackettstown, NJ 07840 Phone: (908) 852-2571 Fax: (908) 852-4666	PO Box 900 Morristown, NJ 07963 Phone: (973) 285-8300 Fax: (973) 605-8195	(Bergen-Essex-Passaic-Warren-Morris-Sussex) 101 Bilby Road, Building I -H Hackettstown, NJ 07840 Phone: (908) 852-2576 Fax: (908) 852-4666
Ocean	**Ocean County Soil Conservation District** 714 Lacey Road Forked River, NJ 08731 Phone: (609) 971-7002 Fax: (609) 971-3391 Email: Info@ocscd.org	1971 Jacksonville-Jobstown Rd Columbus, NJ 08022 Phone: (609) 267-1639 Fax: (609) 261-3007	1623 Whitesville Rd. Toms River, NJ 08755 Phone: (732) 349-1246? Fax: (732) 505-8941?	(Burlington-Camden-Ocean) 1971 Jacksonville-Jobstown Rd Columbus, NJ 08022 Phone: (609) 267-1639 Fax: (609) 261-3007
Passaic	**Hudson, Essex, Passaic Soil Conservation District** 15 Bloomfield Avenue North Caldwell, NJ 07006 Phone: (973) 364-0786 Fax: (973) 364-0784 Email: glen@hepscd.org	220 Davidson Avenue Somerset, NJ 08873 Phone: (732) 537-6040 Fax: (732) 537-6095	1310 Route 23 North Wayne, NJ 07470 Phone: (973) 305-5740 Fax: (973) 305-8865	(Bergen-Essex-Passaic-Morris-Sussex-Warren) 101 Bilby Road, Building 1-H Hackettstown, NJ 07843 Phone: (908) 852-2576 Fax: (908) 852-4666

County	Soil Conservation District	USDA Natural Resources Conservation Service	Rutgers Cooperative Extension	Farm Services Agency (FSA)
Salem	**Cumberland-Salem Soil Conservation District** PO Box 168 Deerfield, NJ 08313-0168 Phone: (856) 769-1124 Fax: (856) 451-1358 Email: cumbsoil@aol.com	51 Cheney Road, Suite 2 Woodstown, NJ 08098 Phone: (856) 769-2790 Fax: (856) 769-0718	51 Cheney Rd., Suite 1 Woodstown, NJ 08098 Phone: (856) 769-0090 Fax: (856) 769-1439	(Salem-Gloucester) 51 Cheney Road, Suite 2 Woodstown, NJ 08098 Phone: (856) 769-1126 Fax: (856) 769-0718
Somerset	**Somerset-Union Soil Conservation District** Somerset County 4-H Center 308 Milltown Road Bridgewater, NJ 08807 Phone: (908) 526-2701 Fax: (908) 526-7017 Email: soilconsrv@co.somerset.nj.us	687 Pittstown Road, Ste. 2 Frenchtown, NJ 08825 Phone: (908) 782-4614 Fax: (908) 788-0795	310 Milltown Rd. Bridgewater, NJ 08807 Phone: (908) 526-6293 Fax: (908) 704-1821	(Hunterdon-Somerset-Union) 687 Pittstown Rd, Ste. 2 Frenchtown, NJ 08825 Phone: (908) 782-4614 Fax: (908) 782-0501
Sussex	**Sussex County Soil Conservation District** 186 Halsey Rd, Ste. 2 Newton, NJ 07860 Phone: (973) 579-5074 Fax: (973) 579-7846 Email: Sussex@sussexscd.org	Hackettstown Com. Park Bldg 1-H, 101 Bilby Road Hackettstown, NJ 07840 Phone: (908) 852-2576 Fax: (908) 852-4666	129 Morris Turnpike Newton, NJ. 07860 Phone: (973) 948-3040 Fax: (973) 948-5582	(Bergen-Essex-Morris-Passaic-Sussex -Warren) 101 Bilby Road, Building 1-H Hackettstown, NJ 07840 Phone: (908) 852-2576 Fax: (908) 852-4666
Union	**Somerset-Union Soil Conservation District** Somerset County 4-H Center 308 Milltown Road Bridgewater, NJ 08807 Phone: (908)526-2701 Fax: (908) 526-7017 Email: soilconsrv@co.somerset.nj.us	687 Pittstown Rd. Frenchtown, NJ 08825 Phone: (908) 782-4614 Fax: (908) 788-0795	300 North Avenue East Westfield, NJ 07090 Phone: (908) 654-9854 Fax: (908) 654-9818	(Hunterdon-Somerset-Union) 687 Pittstown Rd, Ste. 2 Frenchtown, NJ 08825 Phone: (908) 782-4614 Fax: (908) 782-0501
Warren	**Warren County Soil Conservation District** 224 W. Stiger Street Hackettstown, NJ 07840 Phone: (908) 852-2579 Fax: (908) 852-2284 Email: smscd@verizon.net	Hackettstown Com. Park Bldg 1-H, 101 Bilby Road Hackettstown, NJ 07840 Phone: (908) 852-2576 Fax: (908) 852-4666	Wayne Dumont, Jr. Administration Building 165 County Rte. 519 South Belvidere, NJ 07823 Phone: (908) 475-6505 Fax: (908) 475-6514	(Bergen-Essex-Passaic-Warren-Morris-Sussex) Building 1-H 101 Bilby Road Hackettstown, NJ 07840 Phone: (908) 852-2576 Fax: (908) 852-4666

STATE AND FEDERAL GOVERNMENT AGENCIES

NEW JERSEY DEPARTMENT OF AGRICULTURE:

STATE SOIL CONSERVATION COMMITTEE
PO Box 330
Trenton, NJ 08625
Frank Minch, Administrative Analyst
Phone: (609) 292-5540
Fax: (609) 633-7229

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION:

PESTICIDE CONTROL PROGRAM
PO Box 411
Trenton, NJ 08625-0411
Phone: (609) 530-4070
Fax: (609) 984-6555

DIVISION OF FISH, GAME AND WILDLIFE
PO Box 400
Station Plaza
Trenton, NJ 08625
Phone: (609) 292-9410
Fax: (609) 984-1414

DIVISION OF PARKS AND FORESTRY
Bureau of Forest Management
PO Box 404
Trenton, NJ 08625
Phone: (609) 292-2531
Fax: (609) 984-0378

NEW JERSEY PINELANDS COMMISSION
PO Box 7
15 Springfield Road
New Lisbon, NJ 08064
Phone: (609) 894-7300
Fax: (609) 894-0026

HIGHLANDS COUNCIL
100 North Road (Route 513)
Chester, NJ 07930-2322
Phone: (908) 879-6737
Fax: (908) 879-4205

USDA NATURAL RESOURCE CONSERVATION SERVICE
State Office
220 Davidson Avenue
Somerset, NJ 08873
Thomas Drewes, State Conservationist
Phone: (732) 537-6040
Fax: (732) 537-6095

COOPERATIVE EXTENSION SERVICE
SEBS, Rutgers University
P.O. Box 231
New Brunswick, NJ 08903
Dr. Larry Katz, Director
Phone: (732) 932-5000 ext. 581
Fax: (732) 932-6633

FARM SERVICES AGENCY
Mastoris Professional Plaza
163 Rte. 130, Building 2, Suite E 2nd fl.
Bordentown, NJ 08505
State Executive Director
Phone: (609) 298-3446
Fax: (609) 298-8761

TEMPLATE FOR DEVELOPING SELF-CERTIFIED & HIGH-DENSITY ANIMAL WASTE MANAGEMENT PLANS

NJDA Animal Waste Management Rules
FAQ

Why did the NJDA develop these rules? The New Jersey Department of Agriculture (NJDA) has been authorized by the Legislature to develop criteria and standards for animal waste management through the Leaf Composting Law of 1989 and the Aquaculture Development Act of 1997. The NJDA is developing these rules to fulfill its legislative mandate and to proactively address non-point source pollution that may emanate from agricultural animal operations.

Which animal farms are affected by these rules? All farms, as defined in the rules, will have to follow the General Requirements of the rules. Operations with 8 or more Animal Units (AU) [1 AU= 1000 pounds of live animal weight] or those receiving or applying 142 or more tons of animal waste per year will be required to develop and implement a self-certified Animal Waste Management Plan. Operations with Animal Densities (ADs) greater than 1 AU per acre will be required to develop and implement a high-density Animal Waste Management Plan and have it reviewed to ensure conformance with the New Jersey Field Office Technical Guide (NJ-FOTG). Operations with 300 or more AUs, regardless of animal densities, will need to develop and implement a Comprehensive Nutrient Management Plan (CNMP) and be certified by the NJDA. Operations with 1 to 7 AUs or those receiving or applying less than 142 tons of animal waste per year, are encouraged, but not required to develop a self-certified Animal Waste Management Plan.

What must an operator do to comply with these rules? All farms, as defined in the rules, are required to implement the General Requirements of the rules within 12 months of the effective date of these rules. Operations with 8 to 299 AUs or those receiving or applying 142 or more tons of animal waste per year are required to develop a self-certified or high-density Animal Waste Management Plan within 18 months of the effective date of these rules. The plans must be completely implemented within 36 months of the effective date of these rules. Operations with 300 or more AUs are required to have a CNMP developed and completely implemented within 36 months of the effective date of these rules and must receive certification from the NJDA.

What are the General Requirements of the rules? There are 5 General Requirements: 1) No agricultural animal operation shall allow animals in **confined** areas to have access to waters of the State unless such access is controlled in accordance with the NJDA BMP Manual. 2) Manure storage areas shall be located at least 100 linear feet from surface waters of the state. 3) The land application of animal waste shall be performed in accordance with the principles of the NJDA BMP Manual. 4) No livestock that have died from a reportable contagious disease or an act of bio-terrorism (nor associated animal waste) shall be disposed of without first contacting the State Veterinarian. 5) Any person entering a farm to conduct official business related to these rules shall follow bio-security protocol.

How does an operator develop a self-certified or high-density plan? The NJDA BMP Manual will contain a template for both types of Animal Waste Management Plans. The plan may be developed by the owner/operator or in consultation with an NJDA, NRCS or Rutgers Cooperative Extension (RCE) staff person. The self-certified and high-density plan template and the NJDA BMP Manual will also be available in electronic format.

What if the operation already has a CNMP? If the CNMP was developed and approved after October 1, 2001, implementation of such plan shall deem the operation in compliance. However, the CNMP must be reviewed annually and updated if the number of AUs increases by 25 percent or more.

Is there any financial assistance available for plan development and implementation? It is anticipated that there will be little to no cost associated with plan development. Plan implementation costs will vary depending on the size of the operation and complexity of the plan. The more extensive

plans may qualify for cost-share assistance that is available through state and federal conservation programs.

Do the rules require any permits? No. However, farms with 300 or more AUs are required to be certified by the NJDA. The NJDA will issue a certification once the required CNMP is approved by the district and submitted to the NJDA.

Do the rules require any fees? No. There are no fees involved with these rules.

Are there any penalties for rule violations? Yes, there are penalty provisions in the rules. When non-compliance is found, the NJDA may allow the owner/operator up to 60 days to take corrective action. The NJDA will consider the seriousness of the violation, the conduct of the operator and the type of plan required when determining penalties.

Do the rules consider animal densities? Yes. Farms with 8 to 299 AUs with animal densities greater than 1 AU per acre are required to have their high-density animal waste management plan reviewed to ensure conformance with the NJ-FOTG, while those with densities less than 1 AU per acre do not. However, animal operations with 300 or more AUs are required to develop and implement a CNMP and be certified by the NJDA, regardless of animal density.

Is it necessary to fence along water bodies? Animals in "confined areas" – as defined in the rules -- need to be fenced. Although highly recommended, animals in areas that are not "confined" are not required to be fenced from adjacent water bodies.

Are the plans required by these rules protected from the Open Public Records Act (OPRA)? Self-certified plans will be retained by the owner/operator and are not subject to OPRA. High-density plans will need to be reviewed to ensure conformance with the NJ-FOTG and must be approved by the local Soil Conservation District. However, they also will be retained by the owner/operator and not be subject to OPRA. Owner/operators that are required to develop and implement CNMPs will authorize their release to the NJDA for certification purposes. A copy of the CNMP and certification will be retained by the NJDA and may be subject to OPRA.

Do the rules restrict the land application of animal manure? No. Land application of animal waste can continue as long as it is performed in accordance with the principles of the NJDA BMP Manual.

How do the rules apply to aquatic farms? Aquatic farms must follow the waste management provisions set forth at N.J.A.C. 2:89 and the Aquaculture Management Practices set forth at 2:76-2(a) 11.

CALCULATING ANIMAL UNITS & ANIMAL DENSITY

Before you begin, you will need to calculate the number of **Animal Units** on your farm and your **Animal Density**.

- Animal Units = 1,000 pounds of live body weight calculated on an annual average basis.

- Animal Density - the number of **Animal Units** per acre of available farmland for pasturing animals and other land available for the application of animal waste. Available farmland only includes land used for pasturing or where animal waste is actually applied, excluding land with structures, woodlands and waters of the State.

To calculate Animal Units use the Midwest Plan Service chart on the following page.

- **Animal Units = _____**

To calculate **Animal Density** divide the number of Animal Units into the number of acres of available farmland as defined above. The result is the number of animal units per acre, which is your **Animal Density**.

- **Animal Density = _____AU/acre**

For Example:

A 150 acre farm with 100 acres of available farmland for pasturing and land application of waste has 50 mature beef cows (1,000 pounds each).

1. Calculate Animal Units (AU)
   50 beef cows = 50 AU

2. Calculate Animal Density (AD)
   50 AU/100 Acres = .5

The calculated AD for this example is **.5 AU/Acre**.

If your **Animal Density** is less than 1 AU per acre, you are required to develop and implement a Self-Certified AWMP, file the Declaration page included with this template with your local RCE office, and retain a copy of the Plan on your farm.

If your **Animal Density** is greater than 1AU per acre, you are required to develop a High-Density AWMP using the same template, have it reviewed by a certified Conservation Planner to ensure that it meets the NJ Field Office Technical Guide standards and have it approved by your local Soil Conservation District.

The original High-Density AWMP will be filed at your local NRCS office. Please retain a copy of the Plan on your farm.

Animal Unit Equivalents and Manure Production

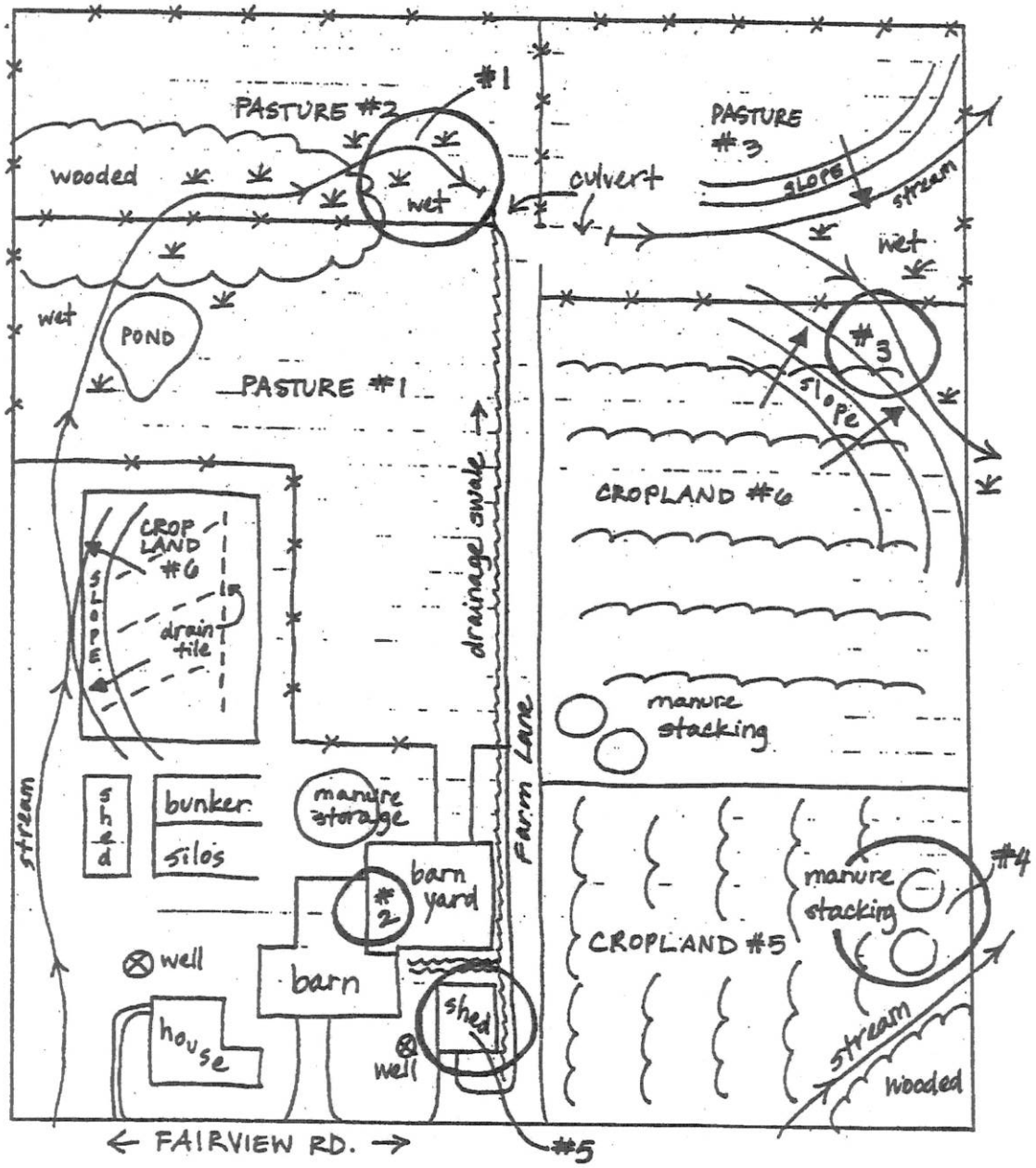
All Values Calculated from Midwest Plan Service - MWPS-18, 2000 (by the American Society of Agricultural Engineers)

Note: Animals not identified in the list shall be calculated based on species, production goals, breed or accepted species weights as determined by RCE.

Animal	Weight Pounds	Number of Animals / 1000 Pounds	Number of Animals to Equal 8 AU	10 AU	12 AU	Manure	Pounds/ Year	Pounds/ Year/ Unit	Manure Tons/Year 8 AU	10 AU	12 AU
Dairy											
Dairy	150	6.7	53.3	66.7	80.0						
	250	4.0	32.0	40.0	48.0						
Heifer	750	1.3	10.7	13.3	16.0	Solid	13000	17333.3	69.3	86.7	104.0
Lactating	1000	1.0	8.0	10.0	12.0	Solid	19992	19992.0	80.0	100.0	120.0
	1400	0.7	5.7	7.1	8.6	Solid	28000	20000.0	80.0	100.0	120.0
	1000	1.0	8.0	10.0	12.0	Liquid	38856	38856.0	155.4	194.3	233.1
	1400	0.7	5.7	7.1	8.6	Liquid	54000	38571.4	154.3	192.9	231.4
Dry Cow	1000	1.0	8.0	10.0	12.0						
	1400	0.7	5.7	7.1	8.6						
Veal	250	4.0	32.0	40.0	48.0	Solid	2200	8800.0	35.2	44.0	52.8
Veal	250	4.0	32.0	40.0	48.0	Liquid	3500	14000.0	56.0	70.0	84.0
Beef											
Calf	500	2.0	16.0	20.0	24	Solid	7000	14000.0	56.0	70.0	84.0
Finishing	750	1.3	10.7	13.3	16	Solid	11800	15733.3	62.9	78.7	94.4
Cow	1000	1.0	8.0	10.0	12	Solid	13400	13400.0	53.6	67.0	80.4
Swine											
Nursery	25	40.0	320.0	400.0	480.0	Solid	480	19200.0	76.8	96.0	115.2
Grow/ Finish	150	6.7	53.3	66.7	80.0	Solid	2100	14000.0	56.0	70.0	84.0
Gestation	275	3.6	29.1	36.4	43.6	Solid	2000	7272.7	29.1	36.4	43.6
Lactating	375	2.7	21.3	26.7	32.0	Solid	4540	12106.7	48.4	60.5	72.6
Boar	350	2.9	22.9	28.6	34.3						
Sheep	100	10.0	80.0	100.0	120	Solid	1460	14600.0	58.4	73.0	87.6
	200	5.0	40.0	50.0	60	Solid					
Poultry											
Layer	4	250.0	2000.0	2500.0	3000	Solid	39	9750.0	39.0	48.8	58.5
Broiler	2	500.0	4000.0	5000.0	6000	Solid	18	9000.0	36.0	45.0	54.0
Turkey	20	50.0	400.0	500.0	600	Solid	46	2300.0	9.2	11.5	13.8
Duck	6	166.7	1333.3	1666.7	2000	Solid	60	10000.0	40.0	50.0	60.0
Horse	1000	1.0	8.0	10.0	12.0	Solid	18250	18250.0	73.0	91.3	109.5

WORKSHEET A1: SAMPLE FARM MAP

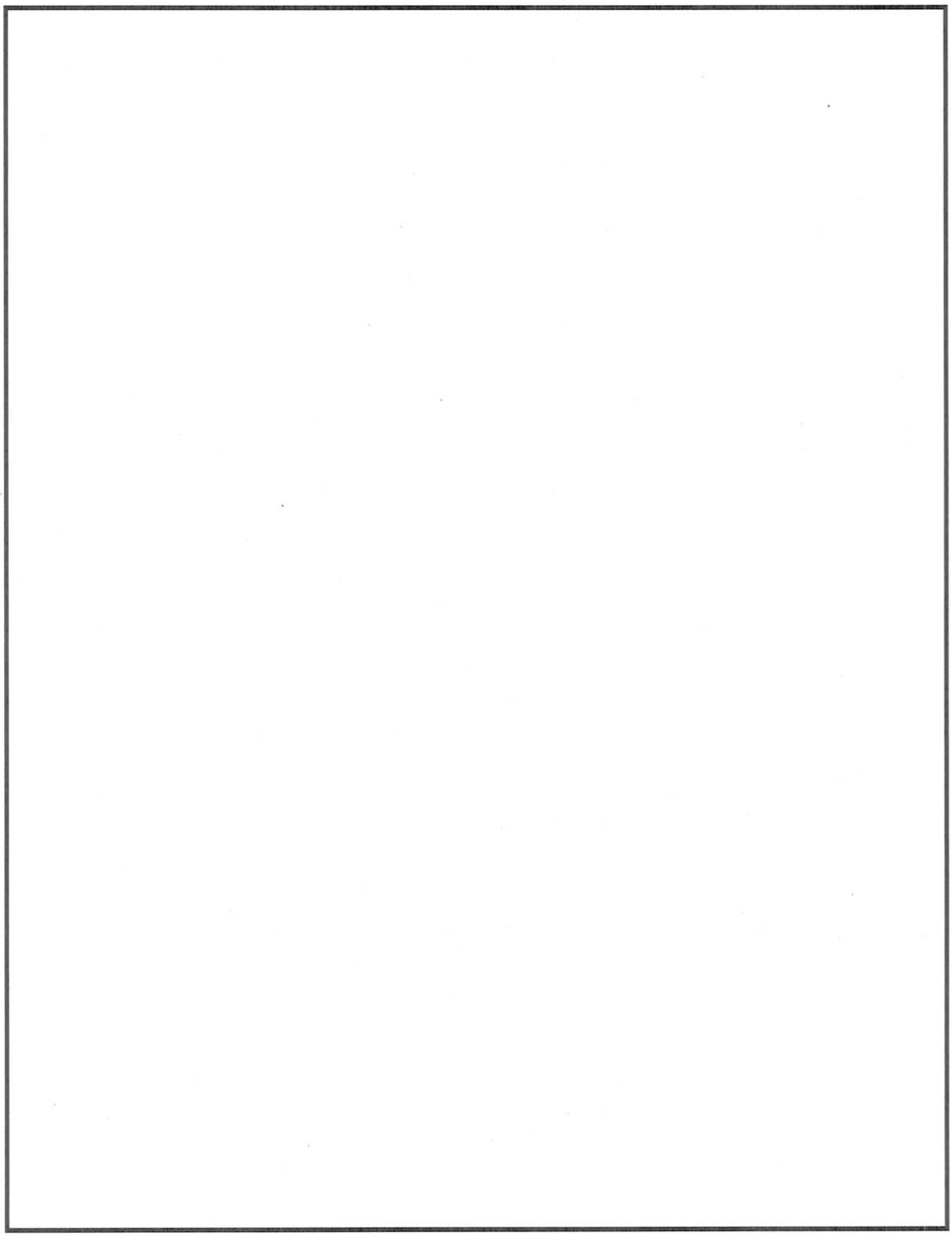
Note: Numbered circles are examples of known or potential problems or sensitive areas. The numbered areas correspond to examples on Worksheets A3 and D1-D5. Not every known or potential problem and sensitive area on this Sample Farm Map has been circled!



Farm Name: _____ Address: _____ Municipality: _____

Zip Code: _____Phone Number: _____

WORKSHEET A1: FARM MAP



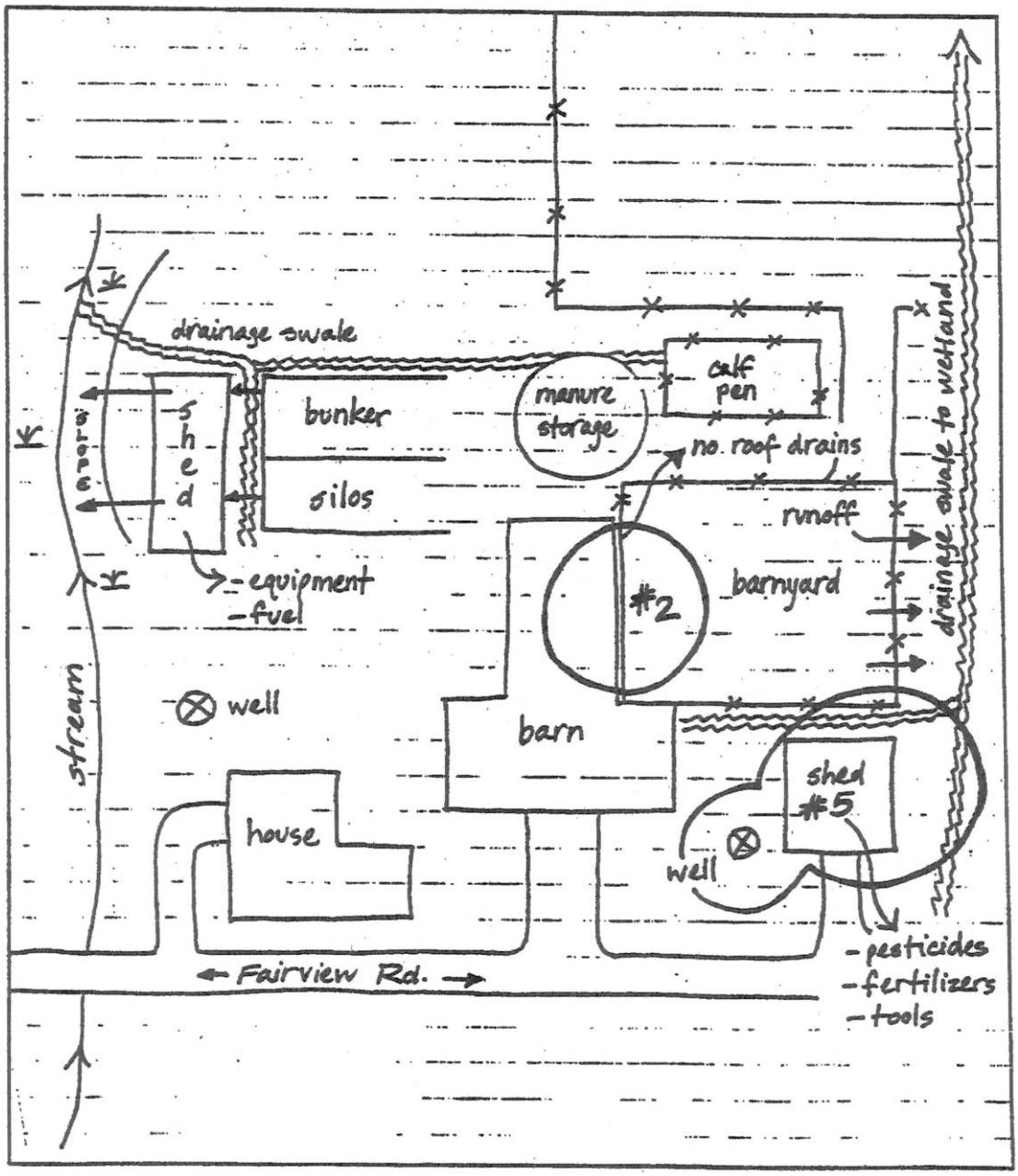
Farm Name: _____ Address: _____ Municipality: _____

Zip Code: _____Phone Number: _____

Premises Identification Number (if available) _____

WORKSHEET A2: SAMPLE FARMSTEAD MAP

Note: Numbered circles are examples of known or potential problems or sensitive areas. The numbered areas correspond to examples on Worksheets A3 and D1-D5. Not every known or potential problem and sensitive area on this Sample Farm Map has been circled!



Farm Name: _____ Address: _____ Municipality: _____

Zip Code: _____ Phone Number: _____

WORKSHEET A2: FARMSTEAD MAP

Farm Name: _____ Address: _____ Municipality: _____

Zip Code: _____Phone Number: _____

Premises Identification Number (if available) _____

WORKSHEET A3: MAP SUMMARY-AREAS/ACTIVITIES OF CONCERN

Example:

Area #	Location	Area/Activity of Concern	1 Erosion & Sediment	2 Nutrient	3 Pest & Pesticide	4 Barnyard, Manure & Waste	5 Grazing	6 Irrigation
1	Stream Bank in upper pasture	Banks eroded by livestock	•				•	
2	Barn	Roof runoff into barnyard		•		•		
3	Field #6	Erosion & sediment at toe of slope	•					
4	Manure stockpile	Too near wetland		•		•		
5	Pesticide shed	Wash-down water not contained			•			

Area #	Location	Area/Activity of Concern	1	2	3	4	5	6

Worksheet A3: Map Summary- Areas/Activities of Concern

			Erosion & Sediment	Nutrient	Pest & Pesticide	Barnyard, Manure & Waste	Grazing	Irrigation
Area #	Location	Area/Activity of Concern	1	2	3	4	5	6

WORKSHEET B: FARM ASSESSMENT QUESTIONNAIRE

Category 1 : Erosion & Sediment Control	YES	NO	N/A
a. Are there visible signs of erosion anywhere on the farm?			
b. Are there visible signs of erosion in sensitive areas (such as into or near water bodies)?			
c. Are any crop land soils left uncovered or eroding?			
d. Are any crops planted up and down the hillside?			
e. Are any conservation tillage practices employed (no-till or minimum-till)?			
f. Does runoff water from fields directly enter water bodies?			
g. Are crops planted up to or past the edge of a wetland or water body??			
h. Are there visible signs of sediment deposits?			
i. Is all highly erodible land identified?			
j. Is soil structure open and crumbly with little sign of crusting or compaction?			
Category 2 : Nutrient Management			
a. Are fertilizers applied in any sensitive areas?			
b. Are fertilizers stored in a covered, watertight facility, away from sensitive areas?			
c. Are soil tests performed regularly for pH and nutrients?			
d. Are manures and other farm wastes routinely applied to fields?			
e. Are manures, organic wastes and other wastes tested and credited in nutrient budgeting?			
f. Is equipment used to apply nutrients calibrated regularly?			
g. Are alternatives to chemical fertilizers being used?			
h. Are soil characteristics considered when applying nutrients?			
i. Are fertilizers mixed and loaded on a properly designed impermeable pad?			

WORKSHEET B: FARM ASSESSMENT QUESTIONNAIRE

Category 3 : Pest & Pesticide Management *(Optional for AWMP)*	YES	NO	N/A
a. Are pesticides applied within identified sensitive areas?			
b. Is a current pest management plan in use?			
c. Are pesticides stored, mixed or loaded within or near sensitive areas?			
d. Are cultural controls (e.g. cultivation, row covers, crop rotation) used to manage pests?			
e. Are pesticides stored, mixed and loaded in a properly designed structure?			
f. Are crops inspected for pests to determine pest control strategies?			
g. Are records kept for all pesticides used?			
h. Is equipment serviced and calibrated before each crop season and between applications?			
i. Are strategies used to enhance presence/effectiveness of biological agents?			
Category 4 : Barnyard, Manure & Waste Management			
a. Is manure stored in or within 100 feet of any sensitive area?			
b. Is manure spread in any sensitive area?			
c. Is the slope of the storage area greater than 3%? (Note: See "Determining Slope" document in Appendix)			
d. Is manure stored on a pad or other impermeable base?			
e. Are animal wastes composted?			
f. Is barnyard runoff controlled?			
g. Is manure stored and routinely inspected to prevent "leaking"?			
h. Are records kept on the land application of waste and on waste leaving the farm?			
i. Does milkhouse waste or silage leachate directly enter sensitive areas?			
j. Are hazardous materials such as fuels stored in leak proof containers?			
k. Are hazardous wastes being disposed of properly?			
l. Is your septic system functioning properly?			
m. Is your well in good condition and water tested?			

WORKSHEET B: FARM ASSESSMENT QUESTIONNAIRE

Category 5 : Grazing Management	YES	NO	N/A
a. Are livestock allowed unrestricted access into sensitive areas?			
b. Are fences, crossings and/or limited access points used to control livestock?			
c. Are streams, lakes or other open waters utilized for livestock water consumption?			
c. Is shade available to livestock away from sensitive areas?			
d. Are pasture soils exposed due to overgrazing or erosion?			
e. Are pastures routinely managed for brush and weeds?			
f. Are pastures routinely dragged to assist with manure decomposition?			
g. Are sacrifice or exercise lots available?			
Category 6 : Irrigation Water Management *(Optional for AWMP)*			
a. Is a water-measuring device installed in the irrigation system?			
b. Is a backflow prevention device installed in the irrigation system?			
c. Does the irrigation system provide for tailwater recovery?			
d. Are current crop data and water budget figures used in irrigation?			
e. Is irrigation water applied at precise time and in precise amounts?			

WORKSHEET C1: BMP SUMMARY CHART & CHECKLIST

Erosion & Sediment Control

Best Management Practice (BMP)	Structural	Initial Cost	Maintenance Cost	Technical Assistance	Guide Pg. #	Currently Done? Y	N	N/A
Conservation Cover		L	L	NR	27			
Conservation Crop Rotation		L	L	D	27			
Contour Farming		L	L	D	28			
Contour Strip-Cropping		L	L	D	28			
Cover Cropping		L	L	NR	29			
Critical Area Planting		M	L	D	29			
Diversion(s)		M	L	R	30			
Field Borders		L	L	NR	30			
Field Strip-Cropping		L	L	D	30			
Filter Strip		M	L	D	30-31			
Grade Stabilization Structure-Water Control Structure	S	H	L	R	31			
Grassed Waterway		M	L	R	31			
Mulching		L	L	NR	32			
Outlet or Lined Waterway(s)	S	M-H	L	N	32			
Pasture and Hayland Planting		M	L	NR	32			
Residue Management: No-till, Strip till, Ridge till		L-M	L	D	33			
Riparian Buffer		L	L	NR	33			
Sediment Basin(s)	S	H	L	R	34			
Stream Channel Stabilization measures	S	H	M	R	34-35			
Tree Planting		L-M	L	NR	35			

Legend: S= Structural; L= Low; M= Medium; H=High; NR= Not Required; D= Desirable; R=Required

WORKSHEET C2: BMP SUMMARY CHART & CHECKLIST

Nutrient Management

Best Management Practice (BMP)	Structural	Initial Cost	Maintenance Cost	Technical Assistance	Guide Pg. #	Currently Done? Y	N	N/A
Agricultural Composting		L-H	L-H	D	37			
Filter Strips		L	L	D	37			
Conservation Crop Rotation		L	L	D	38			
Cover Cropping		L	L	NR	38			
Equipment Calibration		L	L	D	38			
Fertilizer Storage, Handling and Containment		L-M	L	NR	39			
Green Manure Cropping		M	L	NR	39			
Intercropping		L	L	D	39			
Nutrient Record Keeping		0	NA	NR	40			
Plant Tissue Testing		L	NA	R	40-41			
Proper Timing and Application Methods		0	NA	NR	41			
Soil Nitrate Testing		L	NA	R	41			
Soil Testing		L	NA	R	42			
Yield Data		L	NA	NR	42			

Legend: S= Structural; L= Low; 0= No Cost; M= Medium; H=High; NA = Not Applicable; NR= Not Required; D= Desirable; R=Required

WORKSHEET C3: BMP SUMMARY CHART & CHECKLIST

Pest & Pesticide Management

(Optional for AWMP)

Best Management Practice (BMP)	Structural	Initial Cost	Maintenance Cost	Technical Assistance	Guide Pg. #	Currently Done? Y	N	N/A
Appropriate Biological Controls		L	L	R	45			
Appropriate Cultural Controls		L	L	NR-D	45			
Appropriate Physical Controls		L-H	L	NR	46			
Calibrate & Maintain Pesticide Application Equipment		L	L	D	46			
Data Collection		L	NA	NR	47			
Pesticide Application Plans & Records		L	L	D	47			
Protect & Enhance Natural Controls		0	NA	D	48			
Safe Storage, Mixing, Loading & Disposal of Pesticides		H	L-M	R	48			
Scout for Pests		L	L-M	D	49			
Special Handling of Sensitive Areas		L	L	NR	49			

Legend: S= Structural; L= Low; 0= No Cost; M= Medium; H=High; NA = Not Applicable; NR= Not Required; D= Desirable; R=Required

WORKSHEET C4: BMP SUMMARY CHART & CHECKLIST

Barnyard, Manure & Waste Management

Best Management Practice (BMP)	Structural	Initial Cost	Maintenance Cost	Technical Assistance	Guide Pg. #	Currently Done? Y	N	N/A
Combined Waste Facility	S	H	M	R	52			
Diversion(s) – Grass and Other	S	M-H	L	R	53			
Filter Strip		M-H	M	D	53			
Heavy Use Area Protection(s)	S	M-H	L	D	53			
Manure Composting		M-H	L	R	54			
Manure Storage Facility	S	H	M	R	54			
Manure Storage Field Stacking Area		L-M	L	D	54			
Plan for Manure & Waste Utilization		L	L	D	55			
Roof Runoff Management	S	L-M	L	NR	55			
Sediment Basin(s)	S	M-H	L	R	56			
Silage Leachate Waste Management		H	M-H	R	56			
Wastewater Treatment Systems(s)	S	H	M	R	57			
Petroleum Product Storage Facility	S	H	L	D	57			
Hazardous & Household Waste Management	S	H	M	D	57			

Legend: S= Structural; L= Low; 0= No Cost; M= Medium; H=High; NA = Not Applicable; NR= Not Required; D= Desirable; R=Required

WORKSHEET C5: BMP SUMMARY CHART & CHECKLIST

Livestock Grazing Management

Best Management Practice (BMP)	Structural	Initial Cost	Maintenance Cost	Technical Assistance	Guide Pg. #	Currently Done? Y	N	N/A
Alternative Water Supply(s)	S	L-H	L	D	59			
Fencing(s)		L-M	L	NR	59			
Pasture Management		L	L	D	60			
Plan for Proper Grazing		L	L	D	60			
Prescribed Grazing (planned grazing system)		L-M	M	D	61			
Riparian Buffer		L-M	L	D	61			
Stream Crossing		L-M	L	D	61			
Vegetative Stabilization		L	L	D	62			

Legend: S= Structural; L= Low; 0= No Cost; M= Medium; H=High; NA = Not Applicable; NR= Not Required; D= Desirable; R=Required

WORKSHEET C6: BMP SUMMARY CHART & CHECKLIST

Irrigation Management

(Optional for AWMP)

Best Management Practice (BMP)	Structural	Initial Cost	Maintenance Cost	Technical Assistance	Guide Pg. #	Currently Done? Y	N	N/A
Backflow Prevention(s)	S	L-M	L	NR	63			
Efficient Irrigation System		M-H	M	NR	63			
Irrigation Water Management		L	L	R	64			
Tailwater Recovery System(s)	S	H	M	NR	64			
Water-measuring device(s)	S	L	L	NR	65			

Legend: S= Structural; L= Low; 0= No Cost; M= Medium; H=High; NA = Not Applicable; NR= Not Required; D= Desirable; R=Required

WORKSHEET D1: SELECTING MANAGEMENT STRATEGIES

Erosion & Sediment Control

Area/Activity of Concern (from Worksheets A3 & B)	Selected BMPs
Example: Farm Map area #3 – stream bank erosion	1. stream channel control 2. critical area planting 3. riparian zone management

WORKSHEET D2: SELECTING MANAGEMENT STRATEGIES

Nutrient Management

Area/Activity of Concern (from Worksheets A3 & B)	Selected BMPs
Example: Questionnaire category 2(h) – no alternative to chemical fertilizers	4. Agricultural composting 5. Green manure cropping 6. Intercropping

WORKSHEET D3: SELECTING MANAGEMENT STRATEGIES

Pest & Pesticide Management

(Optional for AWMP)

Area/Activity of Concern (from Worksheets A3 & B)	Selected BMPs
Example: Farm Map area #5 – pesticide shed Questionnaire category 3(c) – pesticide mixing	7. Safe storage, mixing and disposal of pesticides

WORKSHEET D4: SELECTING MANAGEMENT STRATEGIES

Barnyard, Manure & Waste Management

Area/Activity of Concern (from Worksheets A3 & B)	Selected BMPs
Example: Farm Map area #4 – manure stockpile too near wetland Questionnaire category 4(a) – manure storage	8. Manure storage field stacking area 9. Manure composting 10. Plan for manure utilization

WORKSHEET D5: SELECTING MANAGEMENT STRATEGIES

Livestock Grazing Management

Area/Activity of Concern (from Worksheets A3 & B)	Selected BMPs
Example: Farm Map area #1 & questionnaire category 5(a) – livestock in stream	11. Alternate water supply 12. Fencing

WORKSHEET D6: SELECTING MANAGEMENT STRATEGIES

Irrigation Management

(Optional for AWMP)

Area/Activity of Concern (from Worksheets A3 & B)	Selected BMPs
Example: Questionnaire category 6(b)-no backflow measuring device	13. backflow prevention

WORKSHEET E: DEVELOPING THE ACTION PLAN

Selected Best Management	Area/Activity of Concern being Addressed	Priority (h,m,l)	Needs/Barriers to Action	Timetable for Action	Next Step
Example: Manure Composting	*Manure stockpiling Alternative fertilizer*	*High*	*Need technical assistance*	*Within 6 months*	*Contact NRCS and Extension Service*

Worksheet E: Developing the Action Plan (cont'd)

Selected Best Management	Area/Activity of Concern being Addressed	Priority (h,m,l)	Needs/Barriers to Action	Timetable for Action	Next Step

Worksheet E: Developing the Action Plan (cont'd)

Selected Best Management	Area/Activity of Concern being Addressed	Priority (h,m,l)	Needs/Barriers to Action	Timetable for Action	Next Step

FARM NUTRIENT MANAGEMENT RECORD

Tract_____ Location/Owner _____ Year _____

Field	Acres	Crop-Yield	Type of Manure Applied, Date and Weather	Total Amount Applied (tons)	Date Incorporated	Fertilizer Applied: Type, Amount (lbs), Date
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						

FARM NUTRIENT MANAGEMENT RECORD (cont'd)

Tract_____ Location/Owner _____ Year _____

Field	Acres	Crop-Yield	Type of Manure Applied, Date ar Weather	Total Amou Applied (to	Date Incorporate	Fertilizer Applied: Type, Amount (lbs), Date
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						

MANURE HAULING RECORD

Date	Type & Amount of Manure Received	Name & Address of Manure Source	Type & Amount of Manure Exported	Name & Address of Recipient

MANURE HAULING RECORD (cont'd)

Date	Type & Amount of Manure Received	Name & Address of Manure Source	Type & Amount of Manure Exported	Name & Address of Recipient

Certification: I hereby certify that I am the operator of the above identified farm, (as defined in N.J.A.C. 2:91). I further certify that I have developed and implemented a Self-Certified Animal Waste Management Plan for this farm in accordance with the requirements of N.J.A.C. 2:91.

I further certify that the foregoing statements made by me are true and the information provided in this document is true, accurate and complete. I am aware that if any of the foregoing statements made by me are willfully false, I am subject to punishment, including but not limited to the penalties contained in N.J.A.C. 2:91- 4.1.

Signature: _____ Date: _____

NEW JERSEY
DEPARTMENT OF AGRICULTURE

SELF-CERTIFIED ANIMAL WASTE MANAGEMENT PLAN

Operator Declaration

To be filed at local Rutgers Cooperative Extension Office

Farm Name: _____

Farm Address: _____

Municipality _____ Zip Code: _____

Phone #: _____

Type of Operation: _____

Owner/Operator Name: _____

Owner/Operator Address: _____

_____

Premises Identification Number (if available) _____

Certification: I hereby certify that I am the operator of the above identified farm, (as defined in N.J.A.C. 2:91). I further certify that I have developed and implemented a Self-Certified Animal Waste Management Plan for this farm in accordance with the requirements of N.J.A.C. 2:91.

I further certify that the foregoing statements made by me are true and the information provided in this document is true, accurate and complete. I am aware that if any of the foregoing statements made by me are willfully false, I am subject to punishment, including but not limited to the penalties contained in N.J.A.C. 2:91- 4.1.

Signature: _____ Date: _____